



NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

September 2019

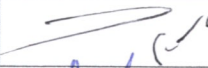

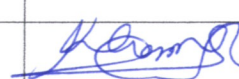
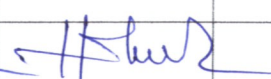
					
					
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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BBS	Biodiversity Baseline Survey
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
CTA	Common Terms Agreement
DEB	Department of Energy Business, MEM
DEPP	Department of Energy Policy and Planning, MEM
DEQP	Department of Environment and Quality Promotion, MONRE
DESIA	Department of Environmental and Social Impact Assessment, MONRE
DFRM	Department of Forest Resources Management, MONRE
DLA	Department of Land Administration, MONRE
DSRP	Dam Safety Review Panel
EC	Electrolytic Conductivity
EC OCD	EGAT Construction Obligation Commencement Date
EDL	Electricite du Laos
EDL PPA	Power Purchase Agreement between NNP1PC and EDL
EGAT	Electricity Generating Authority of Thailand
EGATi	EGAT International Company Limited
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
ERIC	Environmental Research Institute Chulalongkorn University
ERM	Environmental Resource Management
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
FY	Fiscal Year
GOL	Government of Lao PDR
GIS	Geographic Information Systems
HH	Household
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
km	kilometre
kV	kilo-Volt
LEPTS	Lao Electric Power Technical Standard
LHSE	Lao Holding State Enterprise
LTA	Lender's Technical Advisor
M	million
m	metre
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines, Lao PDR
MOF	Ministry of Finance, Lao PDR
MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
NBCA	National Biodiversity Conservation Area
NCI	Non-Compliance Issue
NCR	Non-Compliance Report
NN2	Nam Ngum 2 Power Company Limited
NNP1PC	Nam Ngiep 1 Power Company Limited

NPF	National Protection Forest
NTFP	Non-Timber Forest Products
NT2	Nam Theun 2 Hydropower Project
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
PAFO	Provincial Department of Agriculture and Forestry
PAP	Project Affected People
PD	Property Damage
PONRE	Provincial Department of Natural Resource and Environment, MONRE
PvPA	Provincial Protection Area
RCC	Roller Compacted Concrete
SIR	Site Inspection Report
SLBMP	Salvage Logging Biomass Management Plan
SOP	Standard Operating Procedure
SMO	Social Management Office of ESD within NNP1PC
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TD	Technical Division of NNP1PC
TOR	Terms of Reference
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
UXO	Unexploded Ordinance
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Waste Water Treatment System

EXECUTIVE SUMMARY

In September 2019, the Environmental Management Office (EMO) of Nam Ngiep 1 Power Company (NNP1PC) received one Site Decommissioning and Rehabilitation Plan for review and approval.

During 19 - 20 September 2019, Bolikhamxay Provincial EMU as well as the Bolikan District EMUs carried out a monthly inspection of the NNP1 Project. The draft EMU report is under preparation and will be circulated to NNP1PC by early October 2019.

The effluent monitoring results for the camps in September 2019 indicate that the results of COD, BOD5, ammonia nitrogen and total nitrogen continue to fluctuate over the month and comply with the relevant effluent standards for some camps whereas the results for the former IHI Camp [EF14] which was taken over by NNP1PC (Environmental and Social Division) in August 2019 did not comply with the Standards due to some issues with the allocation of human resource in charge. An Observation of Non-Compliance (ONC) was issued to the NNP1PC- Administration Department for a corrective action. In addition, non-compliances for total coliform and faecal coliform were recorded at the Obayashi Camp [EF02], SongDa5 Camp No.1 [EF07] and V&K Camp [EF10].

The Dissolved Oxygen (DO) levels at the surface of the Main Reservoir (R1, R2, R3, R4 and R5) were generally between 6 mg/L and 8 mg/L (with one measurement in R5 of 4.55 mg/L). In the Re-regulation Reservoir (R6 and R7), the DO was generally above 6 mg/L during periods with spillway discharge and below 2 mg/L during periods with only turbine discharge.

The turbine in the re-regulation powerhouse is under repair and all water from the re-regulation dam has therefore been discharged through the gate and/or over the labyrinth weir, which has aerated the water and brought the DO in Nam Ngiep downstream of the Re-regulation Dam above 6 mg/L in all stations.

As a result of low DO in the re-regulation reservoir during periods with only turbine discharge, some dead fish was observed in the re-regulation reservoir on 26 September 2019 but not further downstream from the re-regulation dam due to aeration of the water by the gate discharge.

A total of 73.4 m³ of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 11 m³ compared to August 2019. A total of 3,296 kg of recyclable waste was recorded at the Community Waste Bank. A total of 58 m³ of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at the Houay Soup Landfill.

The Vice-Minister of Ministry of Agriculture and Forestry (MAF) officially endorsed the NNP1 Watershed Management Plan (WMP) on 06 September 2019.

Xaysomboun Provincial WRPO have submitted their revised Annual Implementation Plan (AIP) on 15 September 2019 and the budget summary of AIP2019 covering the implementation period from October – December 2019 from both provinces was consolidated by NNP1PC and submitted to ADB on 25 September 2019 for review and approval.

Biodiversity Offset related activities under the Components of Spatial Planning and Regulation and, Law Enforcement were carried out according to the approved NC-NX AIP2019.

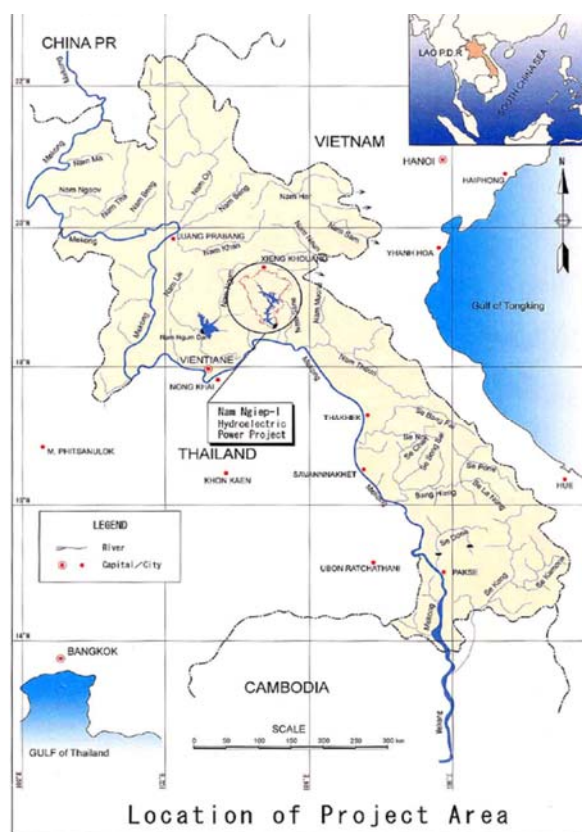
The fish catch monitoring for August 2019 in Nam Ngiep watershed was dominated by three species groups and two species. These species are classified as Least Concern (LC) according to the IUCN Red List. However, the record also included three species that are classified as Vulnerable (VU) species and four Near Threatened (NT) species.

1. 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 Pakxan in Bolikhamxay Province (Fig. 1-1).

FIGURE 1-1: LOCATION MAP

The project will consist of two dams. The main dam which is located 9.0 km upstream of Hat Gnuin Village in Bolikhan District, will create a 70-km-long, narrow reservoir that extends up the Ngiep Valley as far as Thathom District. At almost 150 m high, the main dam will be the second largest in Lao PDR. The Power Station at this dam will generate up to 272 MW of electricity for export to Thailand. With a combined capacity of 290 MW, Nam Ngiep 1 will generate around 1,620 GWh of electricity annually. Two transmission lines will be required to transport the electricity generated by the project. From the main power station, a 230-kV line will run for 125 km to the Nabong outside Vientiane Capital. A 115-kV transmission line will be constructed by EDL from the Re-regulation Power Station to Pakxan substation over a distance of 40 km.



This Environmental Monthly Monitoring Report (EMMR) provides a summary of environmental monitoring activities and mitigation actions in January 2017. The EMMR was prepared by the Project's Environmental Management Office (EMO). It has been internally reviewed and cleared by EMO senior technical staff and management prior to submitting the report to the Government of Lao PDR (GoL) related agencies.

The EMMR and other related reports including related construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are publicly disclosed on the Project website in line with the ADB and GoL Public Disclosure Policies. Hard copies of the final reports will also be available upon requests at the Project's main office in Vientiane Capital and field office in Pakxan, Bolikhamxay Province.

2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

Construction works for the Project were carried out through four separate main construction contracts under the supervision of the Technical Division of NNP1PC. The four contracts are the Civil Works, the Electrical and Mechanical Works, the Hydraulic Metal or Hydro-Mechanical Works and the 230 kV Transmission Line Works.

Figure 2-2 shows the overall progress of the Project in terms of value of work done and paid. It is shown that all works are substantially complete except for the Hydro-Mechanical Works. In fact the works of this Contractor are complete but not yet paid under contract payment terms. Both Civil and Transmission Line Works are complete except for minor outstanding work and defects with the Civil Contractor carrying out almost 20 per cent more value of work in the original contract period. The Electrical and Mechanical Works Contractor is shown almost 100 per cent complete but additional work has been necessary to disassemble and reassemble the units due to the main powerhouse inclination problem. Actual overall cumulative work progress by value of work carried out and paid for until the end of August 2019 for all Contracts was 99.7 %¹ (compared to planned progress of 100 %), based on achieved Interim Milestone Payments for all Contracts excluding the value of Advance Payments, varied works and other adjustments allowed under each Contract.

FIGURE 2-1: SUMMARY OF PUNCH LIST PROGRESS AS OF THE END OF SEPTEMBER

Type of Contract Works		Total Items	Items Completed	Completion by No. of Items	Total Value of Items	Value Completed	Completion by Value	Expected Taking-Over
		(No.)	(No.)	(%)	(USD)	(USD)	(%)	(Date)
Civil	RR Power Station	74	73	99	108,890	108,770	99	31-Jan-19
	Main Power Station	479	431	90	5,207,375	3,868,825	74	31-Jan-19
Electro-Mechanical	RRPS	170	170	100	6,515	6,515	99	16-Mar-19
	MPS	95	90	94.7	10,950	9,450	86.3	31-Oct-19
Hydro-Mechanical	RRPS	39	39	100	8,825	8,825	100	31-Mar-19
	MPS	174	174	100	13,775	13,775	100	
230 kV Transmission Line		301	301	100	150,000	150,000	100	31-Jul-18

¹ The progress to-date is calculated as (Cumulative Amount of Achieved Interim Milestone Payments) / (Total Agreed Original Price of Construction Contracts) and expressed as a percentage. These totals exclude varied works and other adjustments allowed under each Contract.

² The progress to-date is calculated as (Cumulative Value Achieved for Completed Work by Variation Order or Other Adjustment) / (Total Budget Contingency Amount)

2.1 CIVIL WORK

The Civil Works Contract was executed between Obayashi Corporation and the Nam Ngiep 1 Power Company on 30 September 2013 and the Notice to Proceed was issued on 03 October 2014. Excavation works of the main dam, the diversion tunnel and the re-regulation dam were commenced in October 2014 and completed in February 2016, following which the concreting works were commenced.

The cumulative actual work progress of the Civil Works until the end of March 2019 was 100 % (compared to planned progress of 100 %) calculated in the same manner as described above for the value of achieved Interim Milestone Payments excluding advance payment.

The Civil Works overall was always on or ahead of schedule despite increased quantities of dam excavation and slope stabilisation and additional RCC placed in the shear key. During the initial dam excavation and since, it has been written in each Monthly Report, *'the complex bedding of hard over soft layers of rock and the folding nature of these layers in the foundation rock of the main dam below the old river bed had created difficulty to finalise the foundation design to the satisfaction of the Dam Safety Review Panel in all respects'*.

Accordingly, further review of the dam foundation design was carried out to create sufficient safety factor for stability against sliding of the dam on the weak zones. This resulted in further excavation and concreting of a shear key structure in the old river bed, taking the dam height to 167 m, measured from the deepest excavation level to the crest level, some 19 m higher than anticipated. The original schedule is maintained as a result of the combined efforts of the Owner, the Owner's Engineer and all the principal Contractors and their Subcontractors. The additional excavation works were completed at the end of February 2016 and RCC consolidation grouting and RCC placement for the main dam were commenced on 10 May and 19 April 2016 respectively. The concrete level at the main dam reached El. 321.9 m at the left bank on 29 April 2018 and at the right bank at the end of March 2018. The placed volume of RCC was achieved in close to the planned schedule despite the losses of time resulting from the additional excavation and concreting in the foundation, the loss of fly-ash supply in December 2016, and the fatal accident.

Since the impounding of the Main Dam started on 15 May 2018, monitoring has been carried out to confirm the dam stability, especially to the right abutment where some anomalous results had been noted. Dam monitoring results are shown in a separate 'Monthly Report on Main Dam Instrumentation and Monitoring' and over several weeks of monitoring deeper understanding has resulted. Many of the original concerns have been explained or are better understood. The unforeseen consequences of the somewhat prophetic statement in *italics* above began unfolding with events in August and September 2018 when loading of the dam toe appeared to have caused a rotation and settlement of the main powerhouse to upstream and towards the old river bed such that the setting and fixing vertically of both turbine generating units within the required tolerances was not possible. This movement of the powerhouse also affected associated structures such as the penstocks and the intake valve. It has been found that artesian pressure of water under the main powerhouse foundation is one significant factor in explaining the movement of the powerhouse. Drainage to relieve the pressure is an important means of alleviating the problem of movement. As related above, all current information and opinion is contained in the separate Report on the Main Powerhouse Issue. This Report has been sent to the Lenders' Technical Adviser for review and comment.

Progress has been made with containing and limiting the leakage through the Bottom Conduit Gate to 27 cum/minute, a manageable amount, and the permanent concrete plug in this Conduit had been placed since 08 November 2018 after obtaining agreement of the DSRP. Partial encapsulation of the valves in concrete was carried out in March 2019 but leakage was still taking place through concrete shrinkage interfaces and further contact grouting has been undertaken in the period with final valve closure expected in June 2019.

The taking-over date of the Civil Works for both the Re-regulation Power Station and the Main Dam and Main Powerhouse is expected to be 31 January 2019.

All main access road construction works were completed following an early December 2013 start, and maintenance of these will continue until the anticipated commissioning date in August 2019, six months after when the Civil Contract Time for Completion is reached. Temporary access roads are constructed to reach the various construction activities and others will be developed or modified as is necessary as activities change to reach current or new areas of dam concreting and consolidation grouting, the upstream and downstream cofferdams and the main powerhouse and belt conveyor support tower foundations. The layout of the access road system is as shown in Figure 4.1-1 below. The Civil Contractor is responsible for decommissioning and rehabilitating the temporary roads as they become redundant.

Map of the construction site for the Re-regulation Dam, showing the Main Dam, Disposal Areas, Worker's Camps, and various facilities. The map includes a legend indicating 'Completed' (blue line) and 'Under Development' (red line). Key features include the Diversion Tunnel, RCC Plant, Temporary Bridge, Aggregate Plant, Quarry, and JICA Road. The map also shows the location of the Re-regulation Dam and the Main Dam.

2.1.2 MAIN DAM AND POWER HOUSE

After starting the main dam excavation in October 2014 on the left bank, these works were about one month advanced when diversion of the Nam Ngiep River was achieved at the end of October 2015. However, excavated volumes were 20 % greater in total than expected and part of this additional work was necessary to construct a 'shear key' structure due to the weak layers of rock encountered in the dam foundation. Following significant efforts on Site, the additional excavation work was completed at the end of February 2016. The cost of the additional excavation and RCC concrete placement necessitated expenditure of contingency amounts provided exactly for such eventualities. The dental concreting works were commenced in March 2016, and conventional levelling concrete placement for the main dam in the 'shear key' structure up to El. 170.5 m was completed in the middle of April 2016. Consolidation grouting at the main dam area was commenced on 10 May 2016 and RCC concrete placement for the main dam body was commenced on 19 April 2016. Consolidation grouting covers the whole footprint of the main dam and RCC concrete placement and consolidation grouting are implemented in parallel, section by section. The progress of RCC concrete placement is 100 % complete. The dam height has reached crest level at El. 321.9 m at both left bank and right bank. The plunge pool excavation was started after main dam impounding and this work has been suspended because of spilling water from spillway gate during rainy season in 2018. It has resumed from the end of October when the amount of inflow has decreased to around 100 m³/s and around 121,000 m³ or 100 % of total excavation has now been completed.

The diversion conduit gate of the main dam body has some leakage of water initially and the casting of the temporary concrete plug behind it was completed in the conduit in June 2018. The permanent concrete plug had been placed since 08 November 2018 after DSRP permission was granted.

Main powerhouse sub-structure excavation works were completed in January 2016 and levelling concrete works were started in coordination with installation of the grounding system and the penstock concrete encasement. Major concrete of the main powerhouse was substantially completed in December 2017. The powerhouse concreting works has been completed in January 2019.

2.1.3 RE-REGULATION DAM, POWERHOUSE AND DYKE

The re-regulation powerhouse excavation and cofferdam works for the first river diversion were commenced in early October 2014. The excavation works for the powerhouse on the left bank were fully completed down to El. 146.7 m at the end of February 2015.

Structural concrete works were commenced in March 2015, in coordination with installation of the grounding system. The progress of overall re-regulating dam and powerhouse works at the left bank section and the right bank and labyrinth weir are shown in **Figure** below. After the completion of the re-regulation dam above, impounding of the reservoir has been carried out having been commenced on 15 May and been completed on 24 May 2017. After Main Dam impounding started, the reservoir storage of the re-regulation dam has been used for the riparian discharge to downstream in accordance with the Concession Agreement.



FIGURE 2-3: COMPLETED RE-REGULATION DAM AND POWERHOUSE AT THE END OF JUNE 2018

2.1.4 TEMPORARY WORK FACILITY

2.1.4.1 DIVERSION TUNNEL INLET AND OUTLET

The diversion tunnel, excavated over 600 m in length and 10 m in diameter, was commenced in October 2014 by drill and blast techniques and completed in late September 2015. The river diversion took place on 31 October 2015 after completion of inlet and outlet structures together with construction of earth-fill cofferdams upstream and downstream.

The second diversion to divert the river from the diversion tunnel through the bottom outlet or conduit in the dam was implemented on 13 January 2018. Dewatering of the diversion tunnel and construction of the concrete plug was commenced during January 2018. Concrete works and the valve installation for discharge was completed before the start of main dam impounding. On 22 May 2018, the valve discharge commenced by using 3 valves with around 5 m³/s discharge in total. Construction of concrete plug including valve was completed on 27 January 2019.

2.1.4.2 SECONDARY UPSTREAM COFFERDAM

The concrete placement works in both conventional and roller-compacted concrete (CVC and RCC respectively) for the secondary upstream cofferdam were started in November 2015 and completed ahead of construction schedule in the middle of February 2016. The grout curtain works for this cofferdam were completed on 02 April 2016.

2.1.4.3 PLANT YARDS

These comprise the Aggregate Crushing Plant, the CVC Batching Plant and the RCC Batching Plant.

Foundation work and installation of equipment were completed at all the plant yards and the belt conveyor system from the RCC plant to the main dam was completed in early April 2016. Decommissioning and rehabilitation is underway on both plants and almost completed for the Aggregate Crushing Plant.

2.1.4.4 QUARRY

After removal of overburden the excavation of raw materials for aggregate crushing were started in July 2015. The nature and type of the rock being exploited is acceptable though unsuitable soil layers are removed to spoil disposal areas, and good quarry management continues.

2.1.4.5 DISPOSAL AREAS

The disposal areas on the right bank have been available for operation since January 2015, as was the adjacent waste Disposal Area No.9. Disposal Area No.9 along Road P1 near the start of Road T5 started operation in April 2015. Unsuitable material from the quarry has ceased to be hauled to Disposal Area No.6 and Disposal Area No.9 has been developed by the Electrical and Mechanical Works Contractor as stated above.

2.2 ELECTRICAL AND MECHANICAL WORKS

The EMW Contract was executed between Hitachi-Mitsubishi Hydro Corporation and NNP1PC on 13 June 2014 and the NTP was issued on 03 October 2014. The cumulative work progress of the Electrical and Mechanical Works by value at the end of May 2019 was 98.8 % (compared to planned progress of 100.0 %). This delay is due to the delay of issuing Taking-Over Certificate for Re-regulation power station and the powerhouse inclination issue for Main power station. As verticality of the generating Unit 1 was being set within tolerance it was found there was inclination of the shaft. Further checking confirmed that the verticality could not be achieved since the powerhouse structure itself was inclined in the upstream direction. The initial cumulative inclinations of the shaft were 0.50 mm/m for No.1 shaft and 0.28 mm/m for No.2 shaft compared to the allowable inclination in the shaft level 0.02 mm/m. Also, the fixed parts of turbine generator, such as the stator base, have inclined in the upstream direction in the same manner as the generator shaft. The EMW Contractor suspended its installation works of Unit 2 and wet test work for Unit 1 because of these events, but resumed in December 2018. The cause is considered to be fully understood and all movement of the powerhouse is believed to be plastic deformation and to have taken place. It is concluded that no remedial works or countermeasures for the main powerhouse are necessary.

The main activities carried out during this month are described below:



Figure 4.2-1: Commercial Operation Date (COD) was commenced



Figure 4.2-2: Relocation of 22kV power line from overhead to the ground



Figure 4.2-3: Relocation of 22kV power line from overhead to the ground



Figure 4.2-4: Relocation of 22kV power line from overhead to the ground



Figure 4.2-5: New bypass fiber optic cable from 230kV tower No.3 to powerhouse's roof



Figure 4.2-6: New bypass fiber optic cable from 230kV tower No.3 to powerhouse's roof



Figure 4.2-7: Dewatering of draft tube and inspection oil leakage from runner hub



Figure 4.2-8: Set up the scaffolder for countermeasure work of oil leakage inside runner hub

2.3 HYDRO-MECHANICAL WORKS

The HMW Contract was executed between IHI Infrastructure Systems (IIS) and NNP1PC on 18 April 2014 and the NTP was issued to the Contractor on 03 October 2014. The actual cumulative work progress of the Hydro-Mechanical Works until the end of March 2019 was 100 % (compared to planned progress of 100 %).

2.4 230 kV TRANSMISSION LINE WORKS

The 230 kV Transmission Line Contract was executed between Loxley-Sri Consortium and NNP1PC on 11 July 2014 and the NTP was issued to the 230 kV TL Works Contractor on 03 October 2014. The cumulative actual work progress of the Transmission Line Works at the end of July 2018 was 100 %, the same as planned progress.

The foundation of the Tower No.1 moved due to a slope failure of approximately 150m³ behind the Tower No.1, which was supposed to occur from the evening of 17 August 2019 to the morning of the following day, and steel members of the Tower No.1 were deformed. Currently, the Tower No.1 has not been moving and electricity can be sent. On the other hand, the possibility of deep slope failure cannot be ruled out, and the possibility of collapse of the steel tower itself cannot be negligent provided that the slope failure develops. A temporary tower is to be constructed and the transmission line is to be replaced at an early stage. In parallel, the construction of the permanent tower is under consideration.

3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 COMPLIANCE MANAGEMENT

In September 2019, the Environmental Management Office (EMO) of Nam Ngiep 1 Power Company (NNP1PC) received one Site Decommissioning and Rehabilitation Plan for review and approval.

TABLE 3-1: SS-ESMMP AND DOCUMENTS REVIEW STATUS IN SEPTEMBER 2019

Title	Date Received	Status
Site Specific Decommissioning and Rehabilitation Plan for CVC Plant and V&K Camp	26 August 2019 (1 st submission)	No objection with comments on 3 rd September 2019
	12 September 2019 (2 nd submission)	No objection with no further comments on 18 th September 2019

The status of compliance reports (Observation of Non-Compliance or ONC, Non-Compliance Report or NCR) issued by NNP1PC to the Contractors is summarized in below.

TABLE 3-2: SUMMARY OF ONC AND NCR

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from August 2019	4	0	0	0
Newly Opened in September 2019	6	0	0	0
Total in September 2019	10	0	0	0
Resolved in September 2019	5	0	0	0
Carried over to October 2019	5	0	0	0
Unsolved Exceeding Deadlines	3	0	0	0

3.1.1 INSPECTION BY ENVIRONMENT MANAGEMENT UNIT

During 19 - 20 September 2019, Bolikhamxay Provincial EMU as well as Bolikan District EMU carried out a monthly site inspection of the NNP1 Project. The draft EMU report is under preparation and will be circulated to NNP1PC by early October 2019.

3.2 ENVIRONMENTAL QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), faecal coliforms, E.Coli bacteria and total coliforms have been carried out by NNP1PC's environmental laboratory since August 2017.

All data are reported to the Ministry of Natural Resources and Environment (MONRE) monthly and quarterly to the ADB. The reports are also published on the Company's website at <https://namngiep1.com/resources/monitoring-reports/>

3.2.1 EFFLUENT DISCHARGE FROM CAMPS AND CONSTRUCTION SITES

Detailed monitoring results are provided in Annex B of this Report. The effluent monitoring results for the camps in September 2019 indicate that the results of COD, BOD5, ammonia nitrogen and total nitrogen continue to fluctuate over the month and comply with the relevant effluent standards for some camps. The results for the former IHI Camp [EF14] which was taken over by NNP1PC (Environmental and Social Division) in August 2019 did not comply with the Standards. In addition, non-compliances for total coliform and faecal coliform were recorded at the Obayashi Camp [EF02], SongDa5 Camp No.1 [EF07] and V&K Camp [EF10].

The status of implementation of the corrective actions addressing non-compliances at the camps and key construction sites that continue to have non-compliances is summarized below;

TABLE 3-3: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT CAMPS AND CONSTRUCTION SITES

Site	Sampling ID	Status	Corrective Actions
Owner's Site Office and Village (OSOV)	EF01	Non-compliance for total nitrogen and ammonia nitrogen.	On 09 September 2019, the SIR ref. no NNP1-ESD-EMO-SIR-NNP1_AM-0001 was issued to the ADM to improve the second wetland pond which included the following work: <ul style="list-style-type: none"> - Cleaning-up the vegetation, replace dirty sand layer with washed sand, check and fix the HDPE sheet, plant wetland vegetation as in the first pond; - Adjusting the wastewater pipeline inclination and;

Site	Sampling ID	Status	Corrective Actions
			Cutting and cleaning up vegetation inside of the first wetland pond.
Obayashi Corporation Camp	EF02	Non-compliance for total coliform (first fortnight) and total nitrogen.	On 09 September 2019, the SIR ref. no.: NNP1-ESD-EMO-SIR-OC-0093 was issued to OC to adjust the chlorine dosing rate to obtain the residual chlorine of between 0.3-0.9 mg/l and also perform overall cleaning-up of the WWTS (ONC-OC-032).
SongDa5 Camp No. 1	EF07	Non-compliance for total coliform (first fortnight). No effluent camp sampling due to no outflow from wetland.	On 09 September 2019, the SIR ref. no NNP1-ESD-EMO-SIR-OC-0093 was issued to OC to instruct the SongDa5 contractor to adjust the chlorine dosage to obtain residual chlorine of between 0.3-0.9 mg/l; <ul style="list-style-type: none"> - Clean up all wetland ponds and repair the wastewater circulation system (ONC-OC-0323).
V&K Camp	EF10	Non-compliance for total coliform (first fortnight).	On 09 September 2019, the SIR ref. no NNP1-ESD-EMO-SIR-OC-0093 was issued to OC to instruct the V&K contractor to: <ul style="list-style-type: none"> - Adjust the chlorine dosing rate to obtain the residual chlorine of between 0.3-0.9 mg/l and; Repair the mixing pump and chlorine dripping pipeline/valve (ONC-OC-0322)
HM Hydro Main Camp (WWTS)	EF13	Non-compliance for ammonia nitrogen and total nitrogen in the	The WWTS is under-dimensioned and has difficulties reducing the

Site	Sampling ID	Status	Corrective Actions
		second fortnight sampling.	concentrations of ammonia nitrogen and total nitrogen.
ESD Camp (former IHI Main Camp)	EF14	Non-compliance for BOD ₅ , total nitrogen, ammonia nitrogen, faecal coliform and total coliform.	- Fully accommodated by a total 10 people (ESD staff and their dependants) since early August 2019. An ONC was issued to the NNP1PC-Administration Department for corrective actions.
Lilama 10 Camp	EF17	No sampling because no outflow from the wetland system.	The camp is under decommissioning
Main Powerhouse	EF19	Non-compliance for total nitrogen, ammonia nitrogen and total phosphorus. No discharge during the second fortnight sampling.	A newly built WWTS was completed in early September 2019 and is being adjusted.
CVC Plant	DS03	No discharged water during the sampling dates.	The plant is under decommissioning
Spoil Disposal Area No.2	DS04	Full compliance.	
Upstream Spoil Disposal Area No.2	DS04-US	Full compliance.	

3.2.2 AMBIENT SURFACE WATER QUALITY MONITORING

The ambient surface water quality monitoring programme comprises five monitoring stations in the main reservoir (R1-R5), two stations in the re-regulation reservoir (R6 and R7), five stations in the mainstream Nam Ngiep (NNG01 and NNG05 to NNG08) and four stations in the main tributaries to Nam Ngiep (Nam Chiane [NCH01], Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]).

In addition, weekly depth profile monitoring (pH, DO, Conductivity, TDS and Temperature) has been started since 18 September 2018 for stations located in the re-regulation and main reservoirs. The water quality programme is summarized in Table 3-4 and the location of the monitoring stations are shown in Figure 3-1

TABLE 3-4: MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Saturday	pH, DO (%), DO (mg/l), Conductivity ($\mu\text{S}/\text{cm}$), TDS (mg/l), Temperature ($^{\circ}\text{C}$) and Turbidity (NTU).	<ul style="list-style-type: none"> - R5, main reservoir immediately upstream the main dam; - NNG05, Nam Ngiep downstream the re-regulation dam at Hat Gniun Village.
Wednesday and Friday (Intensive Monitoring)	pH, DO (%), DO (mg/l), Conductivity ($\mu\text{S}/\text{cm}$), TDS (mg/l), Temperature ($^{\circ}\text{C}$) and Turbidity (NTU)	<ul style="list-style-type: none"> - R5, main reservoir immediately upstream the main dam; - Tailrace main dam; - Re-regulation reservoir: R6 and R7; - Tailrace re-regulation dam; - Nam Ngiep at the bridge; - NNG05, Nam Ngiep downstream of the re-regulation dam at Hat Gniun Village
Weekly	pH, DO (%), DO (mg/l), Conductivity ($\mu\text{S}/\text{cm}$), TDS (mg/l), Temperature ($^{\circ}\text{C}$), Turbidity (NTU), TSS (mg/l), BOD ₅ (mg/l), Faecal coliform (MPN/100 ml), Total coliform (MPN/100 ml)	<ul style="list-style-type: none"> - Main Reservoir: R1, R2, R3, R4, R5; - Nam Ngiep downstream: NNG05, NNG06, NNG07 and NNG08; Tributaries: Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01].
Fortnightly	pH, DO (%), DO (mg/l), Conductivity ($\mu\text{S}/\text{cm}$), TDS (mg/l), Temperature ($^{\circ}\text{C}$), 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) and Hydrogen sulphide (mg/l)	All stations

The monitoring results for key parameters (DO, TSS and BOD₅) during September 2019 are presented in Table 3-5, 3-6 and 3-7. The full set of data for September 2019 is attached in Annex A. In addition, the results for DO are presented as line graphs in Figure 3-2

Main Reservoir

During September 2019, the water level in the main reservoir decreased from EL. 319.21 m asl. to EL. 319.17 m asl.

At R5, the DO level in the upper 5 m was generally between 5 mg/L and 7 mg/L, except on 11 September 2019 (between 0.31 mg/L - 4.55 mg/L), and the entire water column below 20.0 m had a DO level less than 0.5 mg/L.

At R4, the DO level in the upper 4.5 m was between 6 mg/L and 8 mg/L, and the entire water column below 9.0 m had DO levels below 1 mg/L.

The DO concentrations at R3 were recorded between 5 mg/L and 8 mg/L in the upper 4.0 m. The concentration of DO in the water column below 7.0 m was generally less than 2 mg/L, however, with some occasional spikes at 12 m to 15 m depth of 4 mg/L to 5 mg/L.

The DO concentrations at R2 were generally recorded between 5 mg/L and 9 mg/L in the upper 3 m. The concentration of DO in the water column below 4.0 m generally fluctuated between 0.5 mg/L and 4 mg/L.

And at R1, the DO level was generally between 5 mg/L and 8 mg/L in the entire water column.

The measurements indicate the formation of oxyclines in R2, R3, R4 and R5.

As expected, the TSS concentrations in the main reservoir have been consistently low since the start of impounding with a mean in R4 and R5 of 5 mg/L compared to high flow season means of about 100 mg/L – 250 mg/L and low flow season means of 20 mg/L - 50 mg/L.

The BOD₅ measurements in September 2019 were all (except R2) within the standard and some of them below the limit of detection.

Re-regulation Reservoir

In September 2019, the discharge alternated between discharge from the main dam spillways, discharge from the turbines and combined discharges from spillways and turbines. The spillway discharges generally varied between 50 m³/s and 160 m³/s and the discharges from the turbines generally varied between 110 m³/s and 220 m³/s.

The DO measurements at R6 and R7 representing spillway discharges from the main dam generally had DO concentrations about 7 mg/L (04-Sep-19, 11-Sep-19, 13-Sep-19, 14-Sep-19, 20-Sep-19, 21-Sep-19), the measurements representing turbine discharges generally had DO concentrations below 2 mg/L in the entire water column (06-Sep-19, 07-Sep-19, 25-Sep-19, 27-Sep-19, 28-Sep-19). The measurements at R6 and R7 on 18-Sep-19 mainly represent turbine discharge with some effect from spillway discharges that stopped a couple of hours before the measurements were carried out. Some dead fish was observed on 26 September 2019 in the re-regulation reservoir but not downstream of the re-regulation dam.

Downstream

The discharge from the re-regulation dam alternated between discharge from the gate and occasionally combined with discharge over the labyrinth weir, which aerated the water to DO concentrations above 7 mg/L. Thus, during September 2019, all DO measurements in the downstream stations complied with the National Standard.

FIGURE 3-1: SURFACE WATER AND RE-REGULATION RESERVOIR WATER QUALITY MONITORING STATIONS

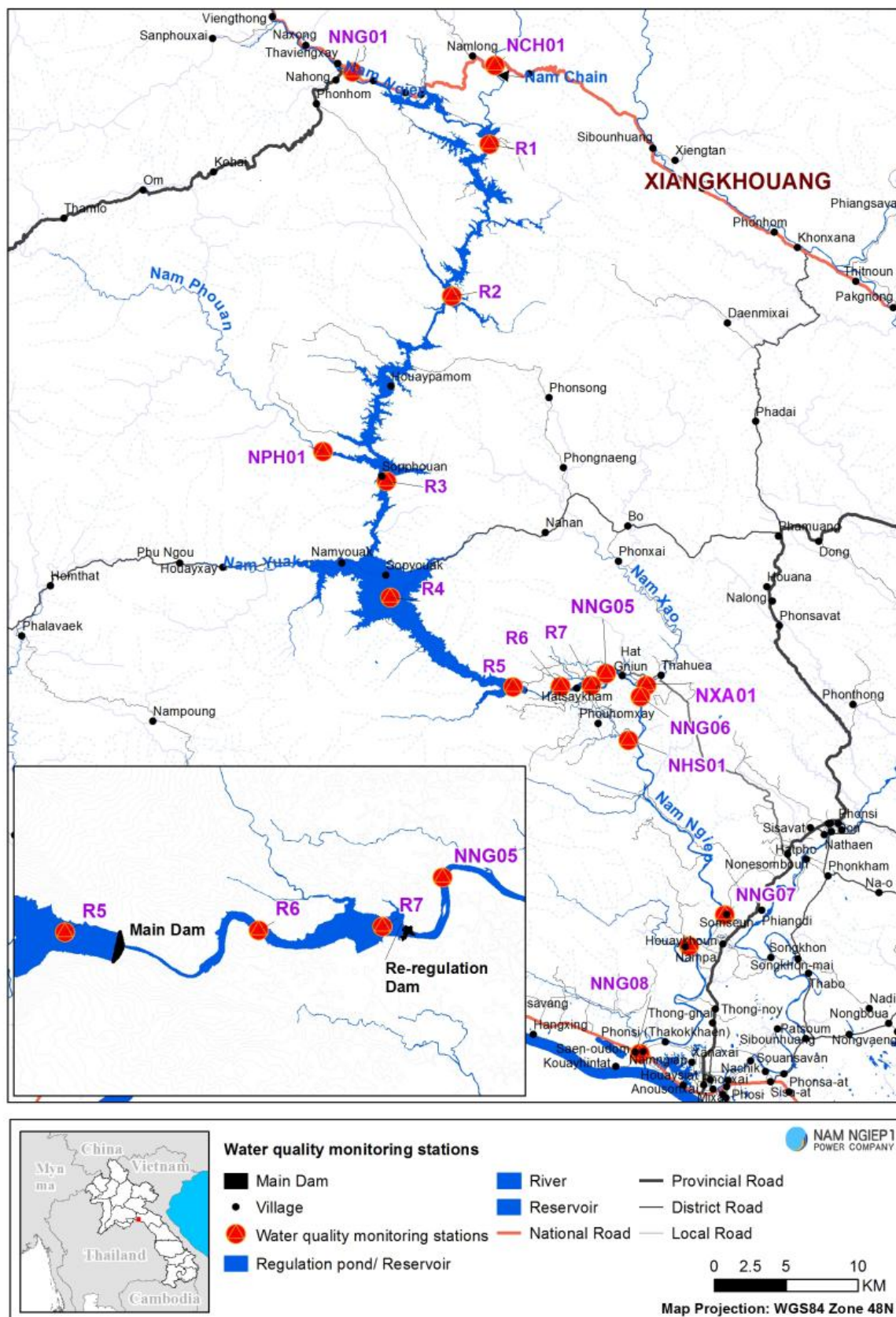
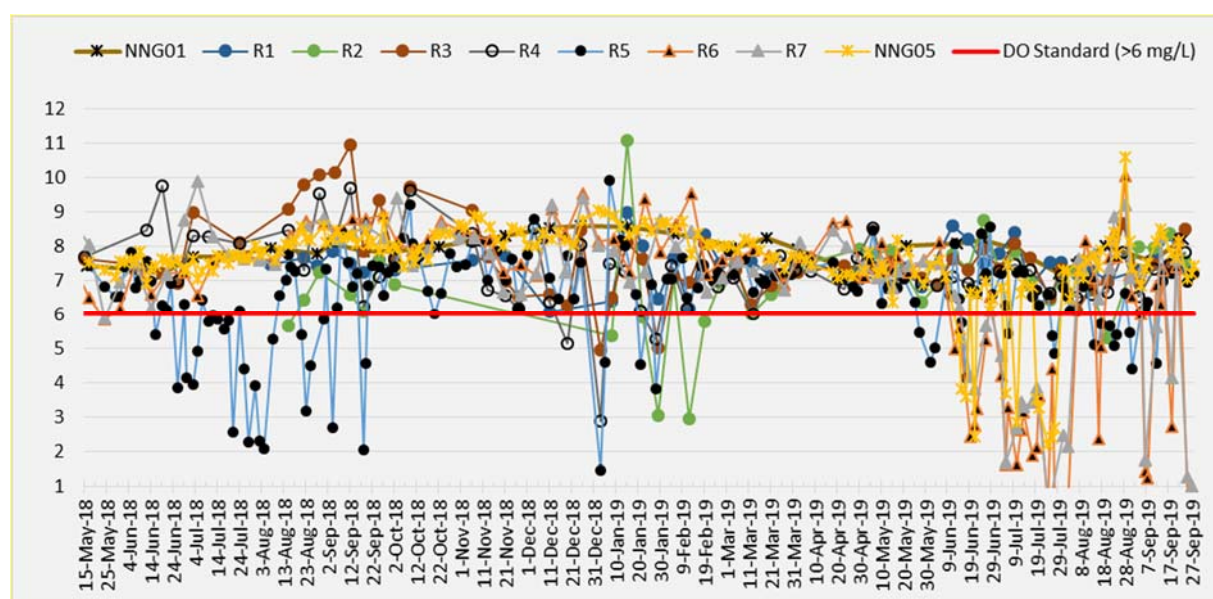


FIGURE 3-2: CONCENTRATION OF DISSOLVED OXYGEN IN THE UPPER 0.2 M SINCE THE START OF IMPOUNDING

3.2.3 GROUNDWATER QUALITY MONITORING

During September 2019, community groundwater quality analyses were carried out for four wells located in Somseun Village, Nam Pa Village, Thong Noy Village and Pou Village.

All results of community groundwater complied with the groundwater quality standards for water supply purposes, except faecal coliform and E.Coli bacteria in Somseun, Thong Noy and Pou Villages as per below Table.

TABLE 3-5: GROUNDWATER QUALITY MONITORING RESULTS IN SOMSUEN, NAM PA, THONG NOI AND POU VILLAGES

	Site Name	Somseun Village	Nam Pa Village	Thong Noy Village	Pou Village
Parameter (Unit)	Station	GSXN01	GNPA01	GTHN01	GPOU01
	Guideline				
pH	6.5 - 9.2	6.63	6.78	6.88	6.12
Sat. DO (%)		77.2	89.7	92.1	93.5
DO (mg/l)		6.0	6.94	7.1	6.95
Conductivity (µS/cm)		327	307	297	64.8
TDS (mg/l)		163.5	153.5	149	32.4
Temperature (°C)		27.4	27.3	27.5	28.1
Turbidity (NTU)	<20	1.81	1.85	1.89	2.94
Fecal coliform (MPN/100 ml)	0	22	0	23	2
E.Coli Bacteria (MPN/100 ml)	0	22	0	23	2

In addition, on 02 September 2019, NNP1PC carried out a landfill groundwater monitoring at NNP1 Solid Waste Landfill (4 monitoring wells) and at Houay Soup Solid Waste Landfill (1 monitoring well). Similar to the previous monitoring results, the concentration of lead in the

monitoring wells MW1, MW2, MW3, MW4 and MW5 exceeded the relevant groundwater quality standard. This is most likely the (natural) background level and is not attributed to the landfill. Lead has been detected in all wells from time to time both upstream and downstream of the landfill. Furthermore, lead has not been detected in the leachate from landfill treatment ponds and the waste pits and all ponds of both landfills are lined with a HDPE liner protecting the groundwater against infiltration of leachate. These boreholes are more than 50 m deep and not used by staff or villagers.

3.2.4 GRAVITY FED WATER SUPPLY (GFWS) QUALITY MONITORING

During September 2019, water samples from water taps at Hat Gniun Village and Phouhomxay Village were analysed. The WPHX01 represents raw water in the head tank before the filtration system.

The results of the water quality analyses are presented in Table 3-9. All parameters complied with the National Drinking Water Standards except for faecal coliforms and E.Coli at WTHH02, WHGN02, WPHX01 (intake), WPHX02 (tap water at the primary school in Phouhomxay Village) and WPHX03 (tap water at a house in Phouhomxay Village). In addition, low pH was recorded for Hat Gnuin (WHGN02), however, this does not pose any health risk. The villagers generally use tap water for washing and cleaning. They were informed about the results and were encouraged to boil the water before drinking.

TABLE 3-6: RESULTS OF THE GRAVITY FED WATER SUPPLY QUALITY MONITORING

		Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village		
			WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
16-Sep-19	pH	6.5 - 8.6	7.42	6.36	8.1	8.05	7.69
16-Sep-19	Sat. DO (%)		98.6	96.9	100.1	97.7	98.1
16-Sep-19	DO (mg/l)		7.53	7.35	7.93	7.32	7.33
16-Sep-19	Conductivity (µS/cm)	<1,000	33	41.6	5.0	5.6	4.73
16-Sep-19	TDS (mg/l)	<600	16.5	20.6	2.5	2.8	2.4
16-Sep-19	Temperature (°C)	<35	27.9	28.3	25.7	28.8	28.9
16-Sep-19	Turbidity (NTU)	<10	10.12	2.34	1.76	2.19	1.81
16-Sep-19	Faecal Coliform (MPN/100 ml)	0	70	17	13	2	13
16-Sep-19	E.coli Bacteria (MPN/100 ml)	0	26	17	13	2	13
16-Sep-19	Arsenic (mg/l)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
16-Sep-19	Lead (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16-Sep-19	Fluoride (mg/l)	<1.5	0.18	0.26	0.29	0.16	0.33
16-Sep-19	Nitrate (mg/l)	<50	<0.09	<0.09	<0.09	<0.09	<0.09
16-Sep-19	Nitrite (mg/l)	<3	<0.02	<0.02	<0.02	<0.02	<0.02
16-Sep-19	Total hardness (mg/l)	<300	22	42.2	17.7	26.2	11.8

3.2.5 LANDFILL LEACHATE MONITORING

During September 2019, the landfill leachate monitoring was conducted at NNP1 Project Landfill (Last pond - LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6).

The results indicate that NNP1 Project Landfill did not comply with the total coliform and Houay Soup Landfill did not comply with the standard on COD, total nitrogen and total coliform. However, the leachate was contained in the leachate ponds without discharging to the environment. EMO will continue to monitor the results during the next MPR. The landfill leachate monitoring results for September 2019 can be found in Table below.

Table 3-7: RESULTS OF THE LANDFILL LEACHATE MONITORING

			Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
			Location	Pond No.01	Pond No.02	Pond No.03	Last Pond	Discharge Point	Last Pond	Discharged Point
			Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline								
2-Sep-19	pH	6.0-9.0					7.68		8.43	
2-Sep-19	Sat. DO (%)						123.4		203	
2-Sep-19	DO (mg/l)						9.43		14.45	
2-Sep-19	Conductivity (μS/cm)						72.6		362	
2-Sep-19	TDS (mg/l)						36.3		181	
2-Sep-19	Temperature (°C)						31.2		31.2	
2-Sep-19	Turbidity (NTU)						7.63		16.69	
2-Sep-19	BOD ₅ (mg/l)	<30					4.52		17.3	
2-Sep-19	COD (mg/l)	<125					26.4		147	
2-Sep-19	Faecal Coliform (MPN/100 ml)	<400					110		220	
2-Sep-19	Total Coliform (MPN/100 ml)	<400					920		540	
2-Sep-19	Total nitrogen (mg/l)	<10					6		13	
2-Sep-19	Arsenic (mg/l)						<0.0003		0.0031	
2-Sep-19	Lead (mg/l)	<0.2					<0.010		<0.010	
2-Sep-19	Iron (mg/l)						0.829		3.72	
2-Sep-19	Total Petroleum Hydrocarbons (mg/l)						<1		<1	

3.2.6 DUST MONITORING

The results indicate that the dust levels at all monitoring stations comply with the National Standard during the monitored period in September 2019. The results were shared internally

with NNP1PC Technical Department as a reference for following-up inspection to ensure proper establishment of health and safety procedures.

3.2.7 NOISE MONITORING

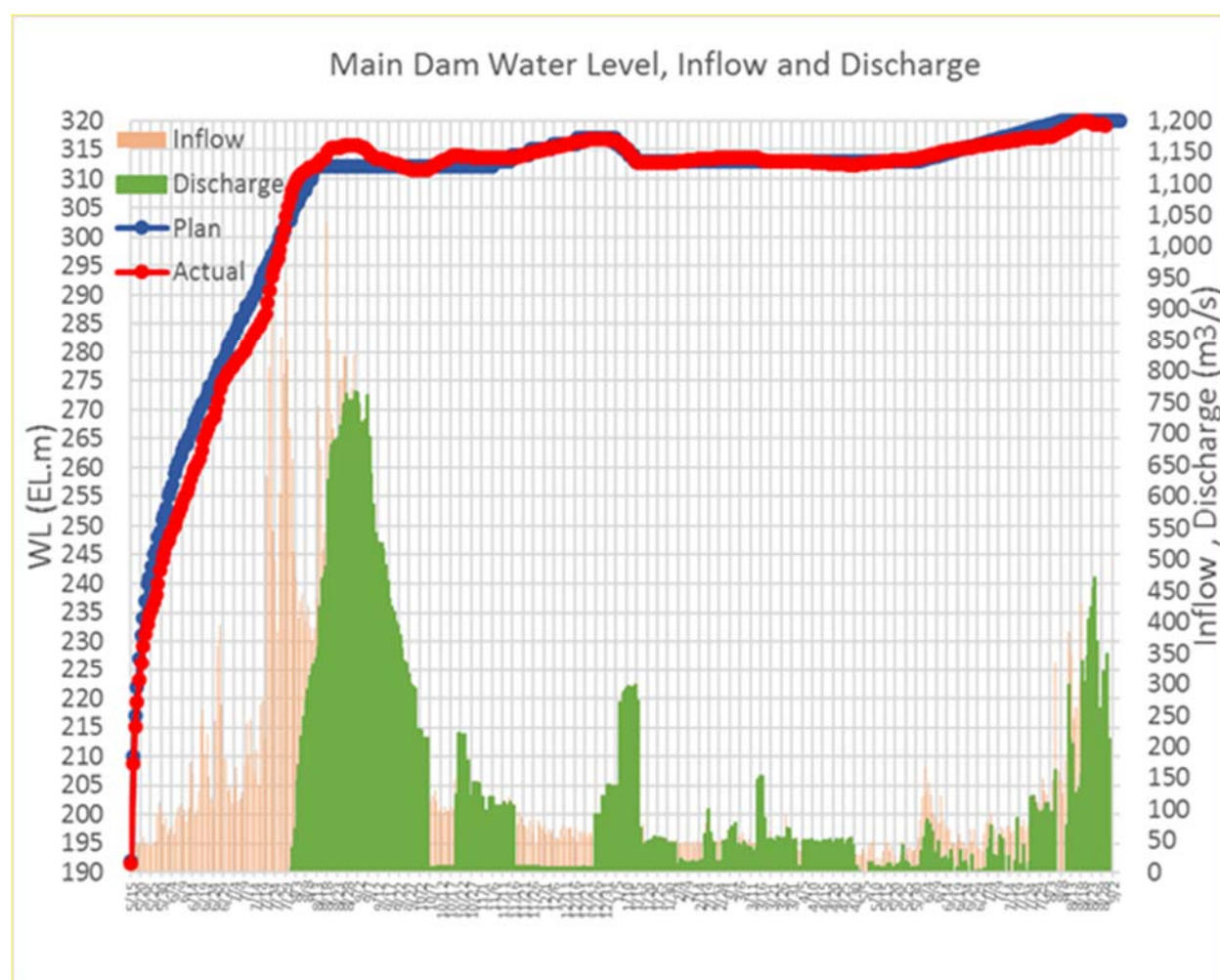
During September 2019, there was no noise monitoring due to equipment failure. NNP1PC are contacting a supplier in Vietnam for checking and repairing purposes. Regardless, noise was not a major issue at the village after all the construction activities were completed in August 2019.

3.2.8 DISCHARGE MONITORING

The progress of impounding from 15 May 2018 to 30 September 2019 is presented on the graph in Figure 3-3 indicating the water level in the main reservoir, the inflow to the main reservoir and the discharge from the main reservoir into the re-regulation reservoir.

During September 2019, the inflow to the main reservoir decreased from an average of about 300 m³/s during the first two weeks to an average of about 140 m³/s during the subsequent 2 weeks. The water level in the main reservoir varied between El. 319.0 m asl and El. 319.6 m asl.

Commercial operations started on 05-Sep-19 and the turbines have been operating almost continuously with only short daily breaks until 19-Sep-19. Generation was temporarily stopped on 19-Sep-19 and resumed on 25-Sep-19.

FIGURE 3-3: PROGRESS OF IMPOUNDING THE MAIN RESERVOIR

The discharge monitoring data for the re-regulation dam (August and September 2019) is presented in Figure below;

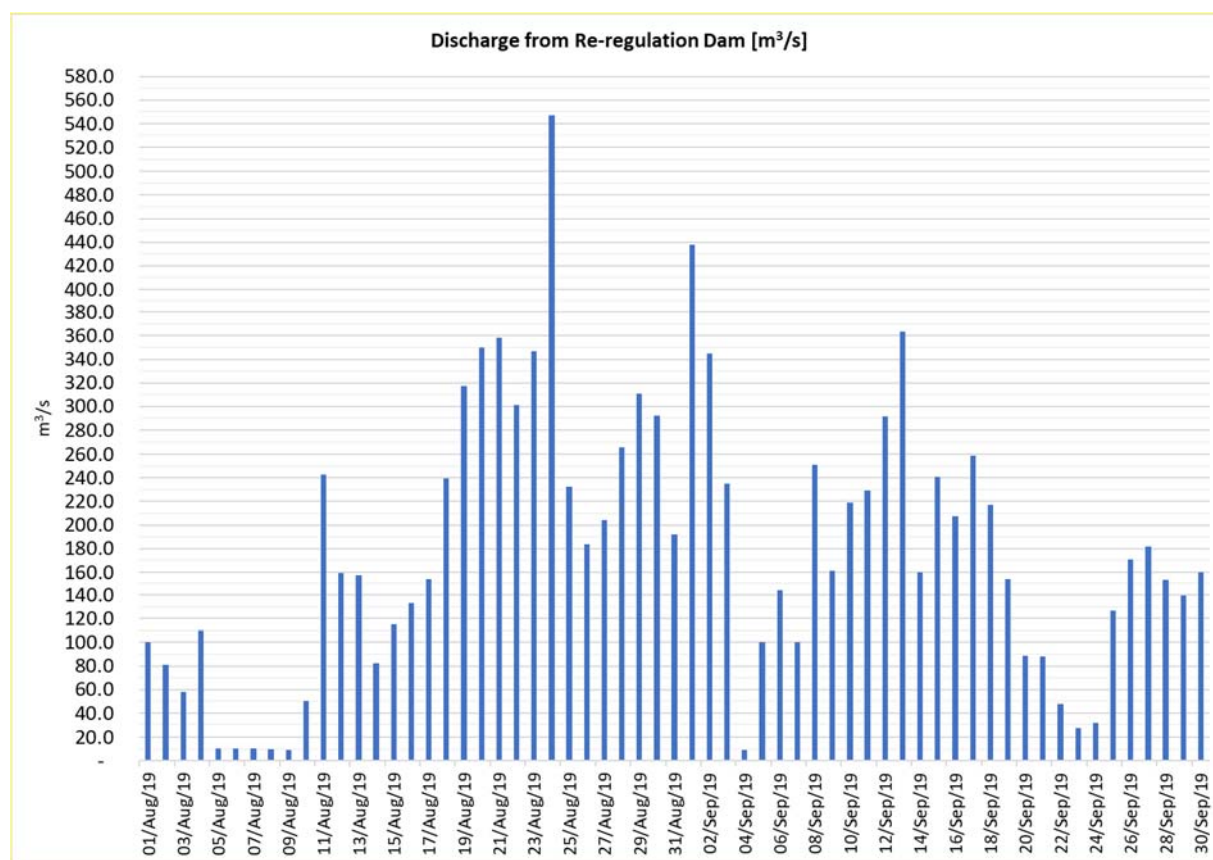
During September 2019, all discharges from the re-regulation dam went through the gate and during most of the first two weeks also over the labyrinth weir. The turbine at the re-regulation powerhouse is under repair and there has therefore not been any turbine discharge during September 2019.

During the short period from 19-Sep-19 to 25-Sep-19 when generation at the main powerhouse was stopped, the discharge from the re-regulation dam was reduced to about 50 m³/s.

The discharge from the re-regulation dam has been kept above the minimum flow requirement of 27 m³/s at all times since start of commercial operations on 05-Sep-19.

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 3-4: DISCHARGE MONITORING AT THE RE-REGULATION DAM IN AUGUST AND SEPTEMBER 2019



3.2.9 NAM NGIEP DOWNSTREAM WATER DEPTH MONITORING

In September 2019, EMO carried out four missions by a wooden boat to monitor the water depth in the Nam Ngiep downstream of the re-regulation dam. A total of 19 sites have been identified with potential shallow water depths. Out of the 19 sites monitored, there were 02 sites (4 September 2019) that were difficult to navigate due to shallow water depths caused by decreased discharge from the re-regulation dam and low amount of rainfall as mentioned in Section 1.3 above.

3.3 PROJECT WASTE MANAGEMENT

3.3.1 SOLID WASTE MANAGEMENT

In September 2019, a total of 73.4 m³ of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 11 m³ compared to August 2019. During September 2019, EMO conducted three waste spot checks at the NNP1 Project Landfill, construction sites and camps. Mixed waste inside the waste bins continued to be found at the LILAMA 10 Camp, Song Da5 Camp No.1, V&K Camp, RCC Plant and CVC Plant as part of their decommissioning activities. NNP1PC instructed the supervisors of all concerned Contractors and subcontractors to improve and ensure proper waste management practices including issuing ONCs for them to rectify the poor practices.

A total of 260.5 Kg of recyclable waste was sold to Khounmixay Processing Factory. The remaining scrap metal is expected to be sold or transported off site by the Contractor later next month.

TABLE 3-8: AMOUNTS OF RECYCLABLE WASTE SOLD

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by 30 September 2019
Construction Activity				
1	Scrap metal	kg	36	5,000
Sub-Total 1		kg	0	36
Camp Operations				
2	Glass bottles	kg	84	432
3	Plastic bottles	kg	58	114
4	Paper/Cardboard	kg	77	115
5	Aluminium cans	kg	5.5	37
Sub-Total 2		kg	224.5	698
Grand Total 1+2		kg	260.5	5,698

The villagers of Phouhomxay Village collected a total of 2,870 kg of food waste from selected camps for animal feed in September 2019, a decrease of 72 kg compared to August 2019 as a result of GFE, Zhefu, 276 and LILAMA 10 Camp decommissioning and a reduction in the number of construction workers at the Song Da5 Camps.

TABLE 3-9: AMOUNTS OF FOOD WASTE COLLECTED BY VILLAGERS

No.	Site Name	Unit	Total
1	SongDa5 Camp No. 1	kg	520
2	Obayashi Corporation Camp	kg	908
3	Owner's Village and Site Office (OSOV)	kg	948
4	Lilama 10 Camp	kg	494
Total		kg	2,870

3.3.2 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

The types and amounts of hazardous waste stored on site for treatment and final disposal at Khounmixay Processing Factory in September 2019 are shown in below.

TABLE 3-10: RESULTS OF HAZARDOUS MATERIAL INVENTORY

No.	Hazardous Waste Type	Unit	Total in July 2019 (A)	Disposed (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre	4,672	20	4,652
2	Contaminated soil, sawdust and concrete	bag	498	100	398
3	Used tyre	piece	238	0	238

No.	Hazardous Waste Type	Unit	Total in July 2019 (A)	Disposed (B)	Remainder (A - B)
4	Used oil mixed with water	litre	200	0	200
5	Ink cartridge	unit	178	18	196
6	Used oil filters	piece	201	45	156
7	Empty used chemical drum/container	drum (200 L)	115	50	65
8	Empty used oil drum/container	drum (20 L)	29	3	26
9	Lead acid batteries	unit	22	0	22
10	Empty contaminated bitumen drum/container	drum (200 L)	24	4	20
11	Contaminated textile and material	kg	17	0	17
12	Clinic Waste	kg	13	0	13
13	Lithium-ion batteries	unit	7	0	7
14	Empty paint and spray cans	can	7	0	7
15	Halogen/fluorescent bulbs	unit	169	164	5
16	Empty used oil drum/container	drum (200 L)	0	0	0

In addition, a total of 650 kg of compost was produced from organic waste from the canteens. A total of 30 m³ of sewage sludge/black water from toilets of LILAMA 10 Camp was transported and disposed of at Spoil Disposal Area No. 6 by following the NNP1PC Standard Operating Procedure (SOP) on Sewage/Black Water Disposal.

3.4 COMMUNITY WASTE MANAGEMENT

3.4.1 COMMUNITY RECYCLING PROGRAMME

In September 2019, the Community Waste Bank received 153 kg of recyclable waste making a total of 3,296 kg of recyclable waste remaining in the Bank.

TABLE 3-11: TYPES AND AMOUNTS OF RECYCLABLE WASTE TRADED AT THE COMMUNITY WASTE BANK

Types of Waste	Unit	Remaining in August 2019	Additions in September 2019	Sold	Remaining in September 2019
Scrap metal	kg	0	2.5	0	2.5
Glass bottles	kg	2,662	50	350	2,362
Paper/cardboard	kg	769.5	56	0	825.5
Aluminium cans	kg	1	0	0	1
Plastic bottles	kg	60.5	44.5	0	105
Total	kg	3,493	153	350	3,296

3.4.2 COMMUNITY SOLID WASTE MANAGEMENT

In September 2019, a total of 58 m³ of solid waste was collected from Phouhomxay, Thahuea and Hat Gniun Villages. The solid waste was transported to Houay Soup Landfill, where recyclable materials were segregated before the waste was disposed of at the landfill.

During 18–19 September 2019, villagers of Host and Phouhomxay Villages carried out a monthly village cleaning-up, the solid waste was transported to and disposed of at Houay Soup landfill by the local Contractor.

3.5 WATERSHED AND BIODIVERSITY MANAGEMENT

3.5.1 WATERSHED MANAGEMENT

3.5.1.1 WATERSHED MANAGEMENT PLAN

The Vice-Minister of Ministry of Agriculture and Forestry (MAF) officially endorsed the NNP1 Watershed Management Plan (WMP) on 06 September 2019.

3.5.1.2 IMPLEMENTATION OF ANNUAL IMPLEMENTATION PLAN (AIP) 2019

A technical meeting on the finalization of Xaysomboun AIP was organized on 09 September 2019 in the afternoon at the Department of Forestry (DoF), MAF. The meeting was chaired by the Deputy Director General of DoF and attended by representatives of Xaysomboun Provincial WRPC and WRPO, NNP1PC-ESD Management and NNP1PC-EMO team.

The main discussion points could be summarized as follow:

- The meeting agreed on the allowance and arrangement for village level workshop; the daily allowance of patrolling team; and the phone allowance for Chair and Vice Chair of WRPC that was not specifically provided in the Minister of MOF's Agreement No. 4000 dated December 2018 to make sure that they are in line with the NNP1 BOMP and other Projects implemented by MAF;
- Since the establishment of the sub-station in Houayxay Village is likely to commence in 2020, it was agreed that NNP1PC will provide support to rent a house as a temporary WRPO sub-station. It is important for the WRPC to obtain an approval from the Xaysomboun Provincial Governor on issuing the land title for the future permanent WRPO sub-station that will be established.

After this technical meeting, the Xaysomboun Provincial WRPO submitted their revised AIP on 22 September 2019, and the budget summary of AIP2019 related to the No Net Loss from both Provinces was submitted to ADB on 30 September 2019 for review and approval.

NNP1PC-EMO together with a consultant is preparing a Fishery Co-management Plan. An inception report that covers the plan outline and detailed working schedule was submitted to NNP1PC-EMO on 16 September 2019. The further data collection including discussion with relevant GOL offices and communities is scheduled to start in October 2019.

3.5.2 BIODIVERSITY OFFSET MANAGEMENT

3.5.2.1 APPROVAL OF BIODIVERSITY SERVICE PROVIDER (BSP)

A meeting on the approval of Biodiversity Service Provider (BSP) was organized on 9 September 2019 at DoF-MAF meeting room by NNP1PC. The meeting was chaired by the DDG of DoF, MAF and attended by 34 people (including 5 women) comprising representatives from DoF, International Organization Department under the Ministry of Foreign Affairs (MoFA), PAFO and Provincial Office of Foreign Affairs, WCS Laos (as selected BSP by ADB), ADB and NNP1PC.

The key discussion points are summarized below:

- The participants requested WCS and ADB to reconsider the expert team members and their time input to ensure the effective technical support for achieving NNL. The position of the proposed junior team members should be field assistant instead of expert. Regarding these comments, it was proposed by WCS to maintain the same team members for at least 6 months as the selection by ADB was already concluded;
- GOL suggested that NNP1PC should submit an official request letter to DoF-MAF on the engagement of WCS Laos as the BSP for Nam Ngiep 1 Hydropower Project;
- ADB Laos would submit an official letter to GOL on the financial support provided to NNP1PC through engaging WCS Laos as BSP for Nam Ngiep 1 Hydropower Project;
- Livelihood development activity, particularly the allocation of agriculture land and promoting permanent occupation linked with conservation of the villagers within and surrounding the offset site and TPZs should be one of the priorities in order to ensure sustainable biodiversity, forest land management and traditional livelihood conservation;
- A follow-up meeting on detailed working arrangements among GOL, NNP1PC and WCS should be organized immediately after the official endorsement of WCS by GOL.

3.5.2.2 IMPLEMENTATION OF BOMP ANNUAL IMPLEMENTATION PLAN (AIP) 2019

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

a. Component 1 - Spatial Planning and Regulation

Consultation meetings were organised during 26 August 2019 to 06 September 2019 at six target villages in Nam Choane-Nam Xang (NC-NX) Biodiversity Offset Site.

The GOL offices and village communities have noted that the land use practices during 2017-2019 in some areas have extended beyond the Participatory Land Use Plan (PLUP) completed by GOL in 2012. Some of these extensions are also within the proposed TPZ boundary of the NC-NX Offset Site. Five out of the six villages (excluding Natan Village) proposed to adjust the TPZ boundary to exclude the existing land uses such as rice fields, livestock raising, NTPF collection and fishing. The Natan village proposed to expand the TPZ within their administrative area for better forest conservation and management.

- Bolikhamxay Provincial BOMU will seek further guidance from Bolikhamxay Provincial BOMC on the proposal of Na Gngang Village to extend their future land use to cover most of the proposed TPZ. The proposal includes areas with steep slopes (more than 35 degrees) that are not suitable for upland agriculture and defined as protection forests under the Lao Forestry Law.
- The villagers noted the clarification provided by Bolikhamxay Provincial BOMU team that they may continue practicing their agriculture within the NC-NX Controlled Use Zone (CUZ) area as long as they comply with the relevant laws and regulations.

- After the decision and action made at Na Gngang Village, an official request letter will be submitted by Bolikhamxay Provincial BOMU to Bolikhamxay Provincial Governor for an official acknowledgement and certification on the NC-NX TPZ boundary.

The chair of Bolikhamxay Provincial BOMC who is also Vice Governor of Bolikhamxay Province advised the BOMC team to visit Na Gngang Village to discuss thoroughly on the village proposal related to their future land use expansion prior to make further decision on the NC-NX TPZ boundary. The visit was scheduled in the first week of October 2019.

b. Component 2 – Law Enforcement

Four teams continued patrolling in September 2019. Two teams continued the patrolling activity in the highest priority area whilst the other two teams commenced the patrolling in the higher priority area (Nam Ma area). The first team focused on Nam Chouane and the western part of the highest priority area but later on adjusted to Nam Chang and Houay Xai Gnai due to difficult access over the long week of raining. The second team focused on Nam San within the highest priority area but later on adjusted to Hoay Pong which also due to difficult access over the long week of raining. The third team focussed on Nam Mong and Nam Pang area which are located along the northern boundary of Nam Ma's higher priority area. The fourth team focussed on Nam Sa Gna and its tributary and most of the eastern boundary of Nam Ma's higher priority area.

The team in the highest priority area spent 13 days on foot patrolling in the forests covering a distance of 86 km. The teams made a total of 11 direct observation and seven indirect observations of the following wildlife: Macaque, Muntjac, Wild pig, Lizard, Red-shanked douc langur, Phayre's leaf monkey, White-cheeked gibbon, Great hornbill, Silver pheasant, Indochinese Serow and Otter. The team only encountered one hunting camp around Houay Pong area throughout the patrolling.

The team in the higher priority area spent 13 days foot patrolling in the forest covering a distance of 107.5 km. The teams made a total of 15 direct observation and eight indirect observations of the following wildlife: Macaque, Wild pig, Muntjac, Sambar, Cobra, Black giant squirrel, Red-shanked douc langur, Phayre's leaf monkey, White-cheeked gibbon, Brown hornbill and Indochinese Serow. The team only encountered a total of three hunting camps around Houay Pong area throughout the patrolling period.

The monthly patrolling meeting was organized on 12 September 2019 with the following key notes:

- The two new patrolling teams were able to commence the patrolling as planned. The teams were advised to improve their recordings of observations with more details on hunting camps and their surroundings;
- For the case of Na Gngang Village, it was recommended that issues related to their future land use planning should be settled soonest so that the team could also patrol the Nam Ma's higher priority area along Nam Hung;
- Three teams will continue patrolling in the highest priority area next month including identifying the access points from Vietnam side and to survey the existing land use along Nam Chouane near Kaengsouk area. One team will commence patrolling in the Nam Houg higher priority area in Xaychamphone District including identifying the access points from

Vietnam side and to survey the existing land use along Nam Houng from the mouth of Nam Kha Gni to Nam Chamhung.

- The information on access points from Vietnam side will be shared and discussed with Pu Mat National Park team as a reference to plan for a joint patrolling activity in October 2019.

c. Component 4 – Conservation linked livelihood development

NNP1PC was in the process of recruiting a consultant to prepare a Community Development Plan (CDP) for the six NC-NX villages.

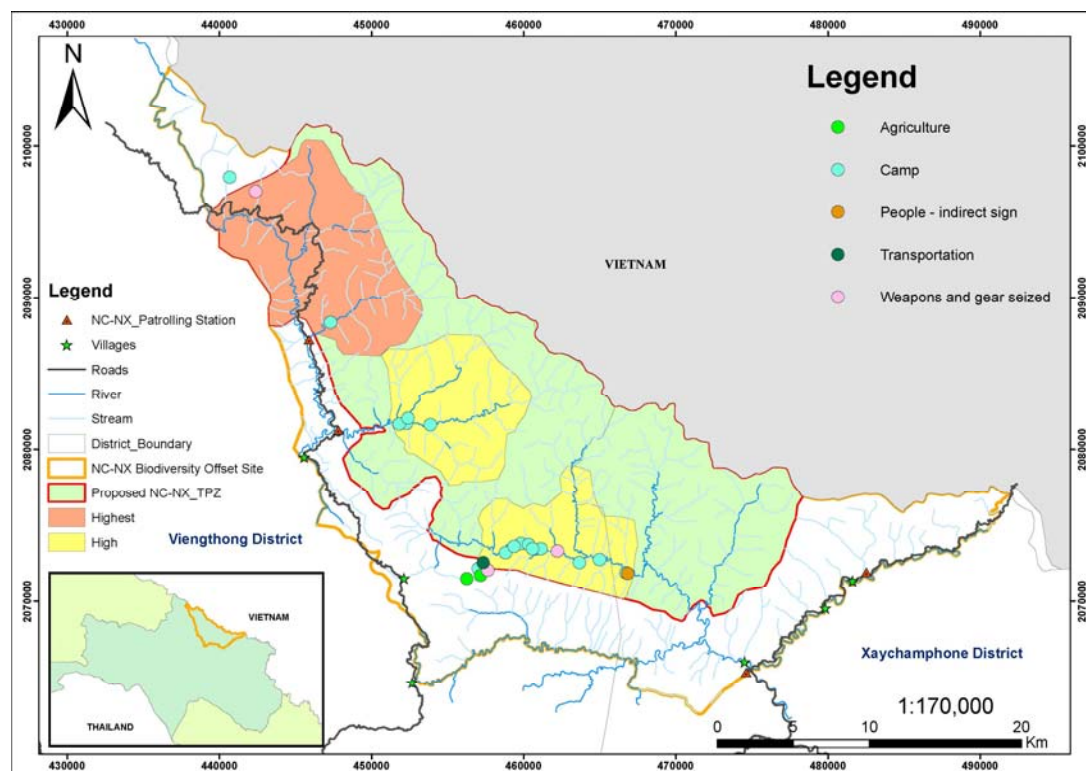


FIGURE 3-5. MAP OF THREATS RECORDED BY TWO PATROLLING TEAMS IN AUGUST - SEPTEMBER 2019

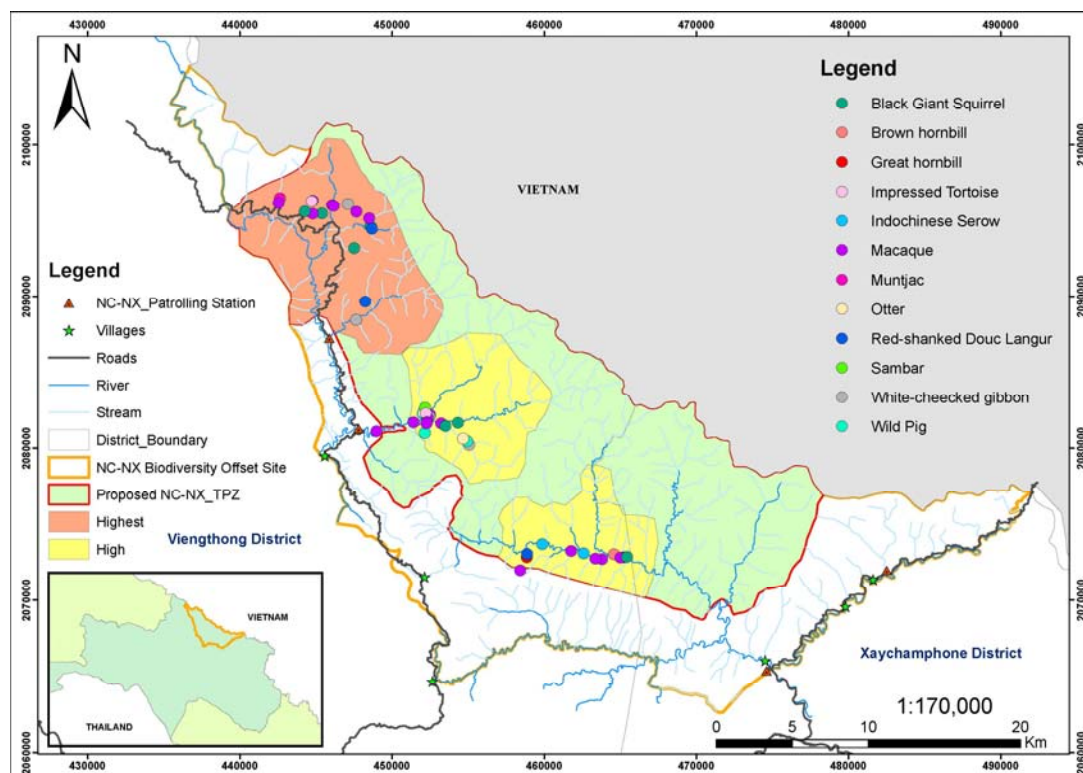


FIGURE 3-6. MAP OF WILDLIFE SIGNS RECORDED BY TWO PATROLLING TEAMS IN AUGUST-SEPTEMBER 2019



FIGURE 3-7. FEMALE MUNTJAC IN MOUNTAIN AREA WITHIN NAM CHOUANE (TPZ HIGHEST PRIORITY AREA)



FIGURE 3-8. FEMALE GIBBON IN MOUNTAIN AREA WITHIN NAM SAN (TPZ HIGHEST PRIORITY AREA)



FIGURE 3-9. BLACK GIANT SQUIRREL IN NAM MA AREA (TPZ HIGHER PRIORITY AREA)



FIGURE 3-10. HUNTING CAMP IN NAM SA GNA (TPZ HIGHER PRIORITY AREA)

3.6 FLOATING DEBRIS REMOVAL

As planned during the wet season, there was no cutting and burning during this reporting period. The work will be resumed from the middle of October or in November 2019. NNP1PC-EMO conducted regular monitoring and removal of floating materials/logs from the temporary log-boom as needed.

4. FISHERY MONITORING

Three species groups and two species dominated the fish catch by weight in August 2019 as listed in **Table 4-1**. These species are all classified as Least Concern (LC) according to the IUCN Red List of Threatened Species².

² The IUCN Red List of Threatened Species is the world's most comprehensive inventory and classification of threatened species. The Red List classifies species into nine groups: Extinct (EX), Extinct in the wild (EW), Critically endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least concern (LC), Data deficient (DD), and Not evaluated (NE). The term "Threatened" includes Critically Endangered, Endangered, and Vulnerable.

TABLE 4-1: FISH SPECIES DOMINATING THE FISH CATCH IN AUGUST 2019

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Poropuntius normani</i> , <i>Poropuntius laoensis</i> , <i>Poropuntius carinatus</i>	ປາຈາດ	209.9	LC
<i>Hampala dispar</i> , <i>Hampala macrolepidota</i>	ປາສຸດ	161.4	LC
<i>Channa striata</i>	ປາຄໍ້	125.4	LC
<i>Mastacembelus armatus</i> , <i>Mastacembelus favus</i>	ປາຫຼາດ	109.9	LC
<i>Clarias batrachus</i>	ປາດຸກ	76.8	LC

The recorded catch of Threatened and Near Threatened species (IUCN Red List classification) in August 2019 is presented in **Table 4-2**. The list includes three species that are classified as Vulnerable (VU) species and four Near Threatened (NT) species.

TABLE 4-2: THREATENED SPECIES OF AUGUST 2019 FISH CATCH

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Cirrhinus cirrhosus</i>	ປາແກງ/ປານວນຈັນ	0.6	VU
<i>Neolissochilus stracheyi</i>	ປາສອງ	1	NT
<i>Onychostoma gerlachi</i>	ປາຄຶງ	1.9	NT
<i>Scaphognathops bandanensis</i>	ປາວຽນໄຟ/ປາປຽນ	13.1	VU
<i>Syncrossus beauforti</i>	ປາແຂ້ວໄກ້/ປາໝູ	0.1	NT
<i>Tor sinensis</i>	ປາແດງ	28.2	VU
<i>Wallago attu</i>	ປາເຄິງ	1	NT

The total recorded monthly fish catch for the downstream and upstream fishing households and the Mekong control group involved in the monitoring programme from July 2015 to August 2019 is presented in *Error! Not a valid bookmark self-reference..* 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.

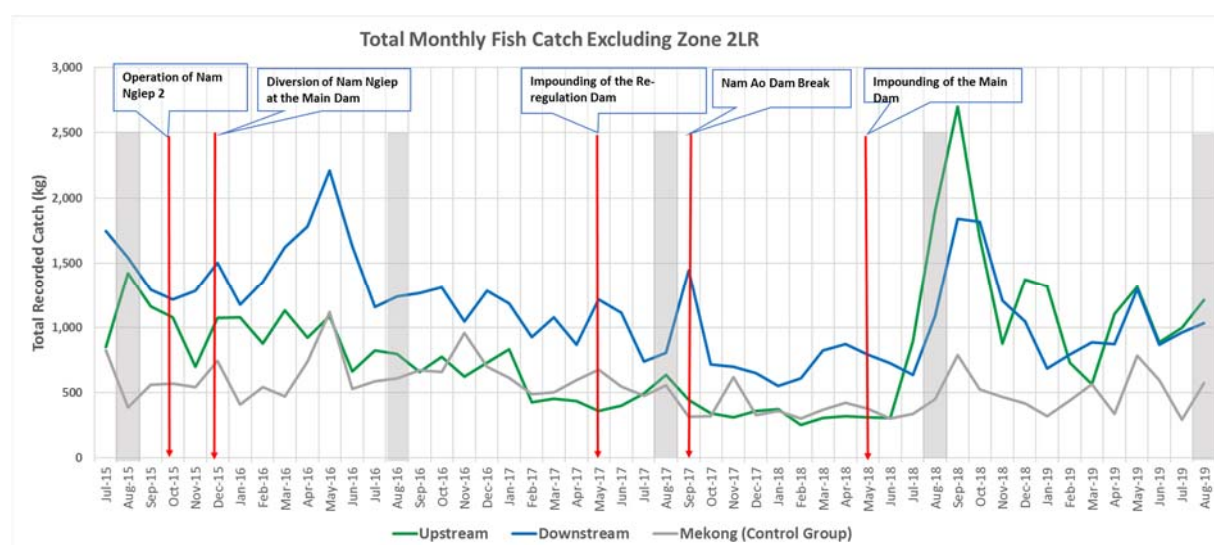
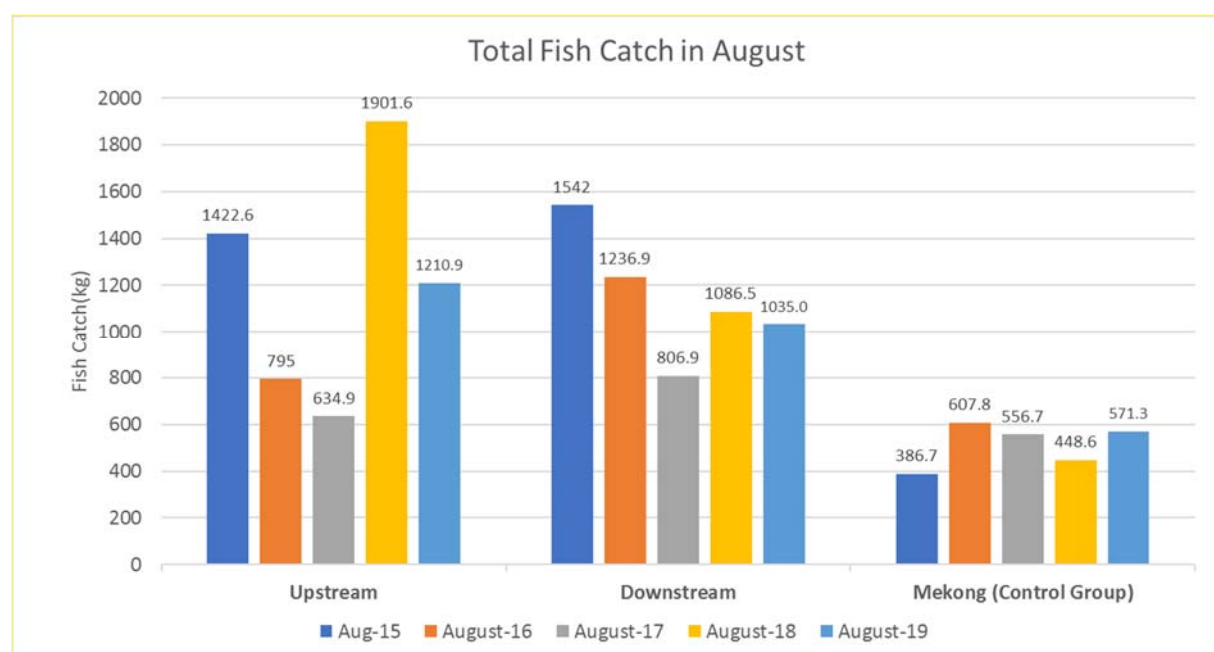
FIGURE 4-1: TOTAL RECORDED MONTHLY FISH CATCH JULY 2015 – AUGUST 2019

Table 4-3 and **Figure 4-2** show the total recorded fish catch for August 2015, August 2016, August 2017, August 2018 and August 2019 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group. The total fish catch data represents the total fish supply provided by the involved fishing households.

TABLE 4-3: TOTAL FISH CATCH BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS IN AUGUST 2015, AUGUST 2016, AUGUST 2017, AUGUST 2018 AND AUGUST 2019

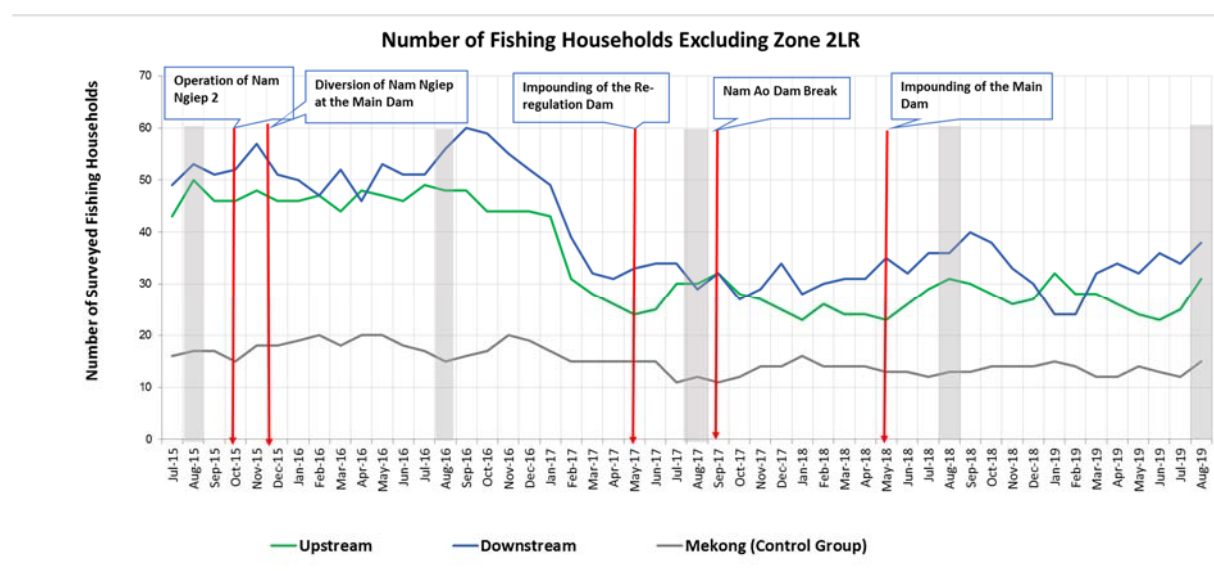
Fishing Zone	August 2015 (kg)	August 2016 (kg)	August 2017 (kg)	August 2018 (kg)
Upstream	1,422.6	795	634.9	1,901.6
Downstream	1,542	1,236.9	806.9	1,086.5
Mekong Control Group	386.7	607.8	556.7	448.6

FIGURE 4-2: TOTAL FISH CATCH BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS IN AUGUST 2015, AUGUST 2016, AUGUST 2017, AUGUST 2018 AND AUGUST 2019

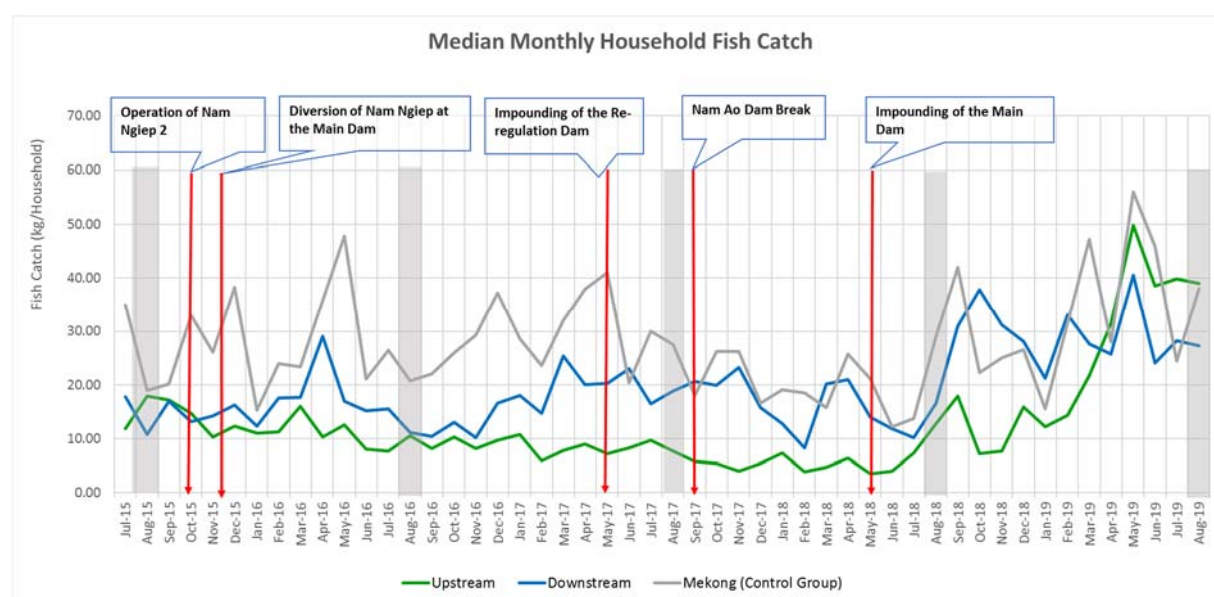


The numbers of fishing households involved in the fish catch monitoring programme are displayed in **Figure 4-3**Error! Reference source not found..

FIGURE 4-3: NUMBER OF FISHING HOUSEHOLDS INVOLVED IN THE FISH CATCH MONITORING PROGRAMME



The median monthly household fish catch from July 2015 to August 2019 for the upstream (excluding Zone 2LR) and downstream communities, and the Mekong control group are presented in Figure below.

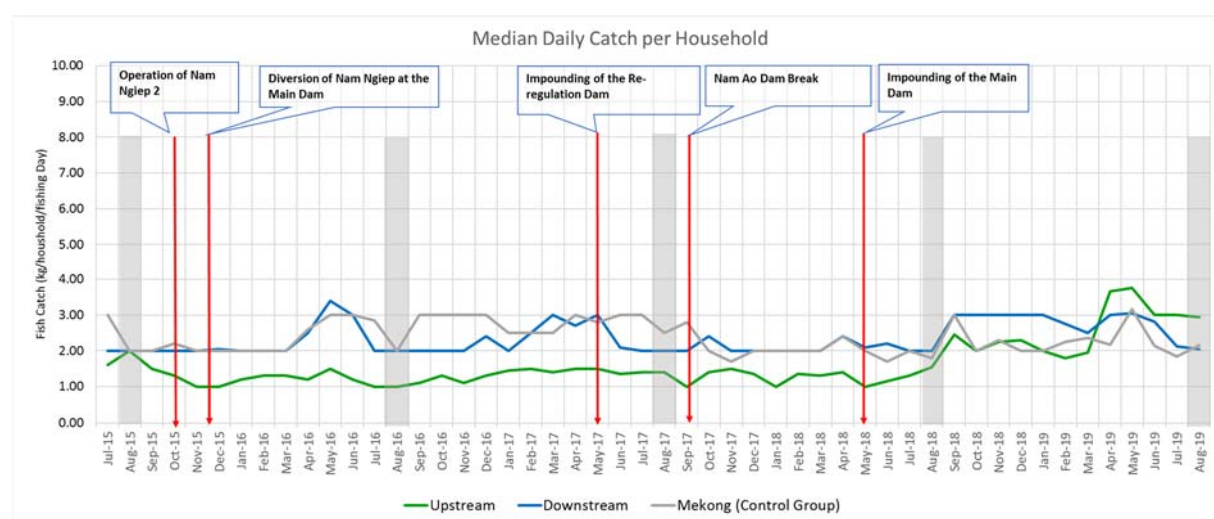
FIGURE 4-4: MEDIAN MONTHLY HOUSEHOLD FISH CATCH WITHOUT ZONE 2LR

The median household fish catch for August 2015, August 2016, August 2017, August 2018 and August 2019 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group are displayed in Table below;

TABLE 4-4: MEDIAN MONTHLY HOUSEHOLD FISH CATCH IN THE UPSTREAM AND DOWNSTREAM COMMUNITIES EXCLUDING ZONE 2LR

Fishing Zone	August 2015 (kg)	August 2016 (kg)	August 2017 (kg)	August 2018 (kg)	August 2019 (kg)
Upstream	17.9	10.5	7.7	12.8	39.1
Downstream	10.8	11.2	18.8	16.6	27.2
Mekong Control Group	19	20.8	27.6	29.1	38.1

The median daily fish catch per household are displayed in *Error! Reference source not found.*, and the median fish catch per household per fishing day in August 2015, August 2016, August 2017, August 2018 and August 2019 are shown in in below;

FIGURE 4-5: MEDIAN DAILY FISH CATCH PER HOUSEHOLD

TABLE 4-5: MEDIAN DAILY FISH CATCH PER HOUSEHOLD IN AUGUST 2019

Fishing Zone	August 2016 (kg)	August 2016 (kg)	August 2017 (kg)	August 2018 (kg)	August 2019 (kg)
Upstream	2.00	1.00	1.40	1.55	2.94
Downstream	2.00	2.00	2.00	2.00	2.05
Mekong (Control Group)	2.00	2.00	2.50	1.80	2.15

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

TABLE A- 1: RESULTS OF MAIN RESERVOIR, RE-REGULATION RESERVOIR AND SURFACE WATER (NAM NGIEP RIVER) QUALITY MONITORING

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
3-Sep-19	pH	5.0 - 9.0		8.4	8.74	8.45	8.36							
4-Sep-19	pH	5.0 - 9.0						8.32	7.97	8.15	8.41	8.32	8.2	8.24
6-Sep-19	pH	5.0 - 9.0						7.7	7.52	7.52	6.38	6.59		
7-Sep-19	pH	5.0 - 9.0						8.2	7.68		7.87			
9-Sep-19	pH	5.0 - 9.0	6.57											
10-Sep-19	pH	5.0 - 9.0		7.56	7.96	7.63	7.16							
11-Sep-19	pH	5.0 - 9.0						6.75	6.67	6.59	6.72	6.87	6.63	6.64
13-Sep-19	pH	5.0 - 9.0						7.35	7.22	7.36	6.5	7.03		
14-Sep-19	pH	5.0 - 9.0						7.75	7.71		7.42			
17-Sep-19	pH	5.0 - 9.0		8.63	8.77	8.23	8.28							
18-Sep-19	pH	5.0 - 9.0						7.53	6.97	6.94	7.17	6.74	6.54	6.39
20-Sep-19	pH	5.0 - 9.0						7.26	7.31	7.5	7.22	7.57		
21-Sep-19	pH	5.0 - 9.0						6.5	6.7		6.66			
23-Sep-19	pH	5.0 - 9.0	6.61											
24-Sep-19	pH	5.0 - 9.0		8.07	8.23	7.96	7.98							
25-Sep-19	pH	5.0 - 9.0						6.42	6.53	6.5	6.47	6.37	6.47	6.56
27-Sep-19	pH	5.0 - 9.0						7.6	7.03	7.09	6.46	6.22		
28-Sep-19	pH	5.0 - 9.0						7.88	7.09		7.21			
3-Sep-19	Sat. DO (%)			93.8	103.9	91.4	84.5							
4-Sep-19	Sat. DO (%)							77.5	73.8	90.2	86.3	84.4	83.3	82.3
6-Sep-19	Sat. DO (%)							79.8	16.4	21	92.7	93.3		
7-Sep-19	Sat. DO (%)							81.7	14.1		89.6			
9-Sep-19	Sat. DO (%)		100.8											
10-Sep-19	Sat. DO (%)			96.6	104.2	98.5	95.6							
11-Sep-19	Sat. DO (%)							57.5	82.4	65.8	101	100.4	96.7	91.7
13-Sep-19	Sat. DO (%)							88.9	76.3	102.6	110.1	107.6		
14-Sep-19	Sat. DO (%)							90.2	91.8		102.9			
17-Sep-19	Sat. DO (%)			114.9	113.2	98.2	98.7							
18-Sep-19	Sat. DO (%)							94.5	31.2	68	93.8	96.8	91.9	89.2
20-Sep-19	Sat. DO (%)							96.1	94.6	96.6	95.9	96.2		
21-Sep-19	Sat. DO (%)							107.2	106.1		106			
23-Sep-19	Sat. DO (%)		105.4											
24-Sep-19	Sat. DO (%)			98.6	103.1	113.2	102.5							
25-Sep-19	Sat. DO (%)							90.2	10.7	14.8	84.1	94.4	89.3	92

Date	Parameters (Unit)	Station Code	Guideline	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
27-Sep-19	Sat. DO (%)								92.6	9.2	12.7	95.1	96.5		
28-Sep-19	Sat. DO (%)								93.5	10.01		88.7			
3-Sep-19	DO (mg/L)	>6.0			7.29	7.97	6.98	6.53							
4-Sep-19	DO (mg/L)	>6.0							6.07	6.01	7.28	6.84	6.73	6.66	6.62
6-Sep-19	DO (mg/L)	>6.0							6.2	1.43	1.75	7.33	7.29		
7-Sep-19	DO (mg/L)	>6.0							6.36	1.24		7.49			
9-Sep-19	DO (mg/L)	>6.0		7.57											
10-Sep-19	DO (mg/L)	>6.0			7.65	7.96	7.45	7.33							
11-Sep-19	DO (mg/L)	>6.0							4.55	6.86	5.63	8.13	8.04	7.73	7.32
13-Sep-19	DO (mg/L)	>6.0							6.89	6.32	8.28	8.49	8.25		
14-Sep-19	DO (mg/L)	>6.0							6.99	7.3		8.34			
17-Sep-19	DO (mg/L)	>6.0			8.34	8.38	7.45	7.47							
18-Sep-19	DO (mg/L)	>6.0							7.21	2.74	4.14	7.79	7.51	7.13	6.96
20-Sep-19	DO (mg/L)	>6.0							7.35	7.41	7.62	7.65	7.66		
21-Sep-19	DO (mg/L)	>6.0							8.25	8.16		8.14			
23-Sep-19	DO (mg/L)	>6.0		8.21											
24-Sep-19	DO (mg/L)	>6.0			7.34	7.57	8.49	7.81							
25-Sep-19	DO (mg/L)	>6.0							6.96	0.9	1.28	7.05	7.44	6.54	7.1
27-Sep-19	DO (mg/L)	>6.0							7.18	0.85	1.03	7.2	7.4		
28-Sep-19	DO (mg/L)	>6.0							7.21	0.87		7.42			
3-Sep-19	Conductivity (µs/cm)				79	79	78	71							
4-Sep-19	Conductivity (µs/cm)								72	79	68	70	71	69	65
6-Sep-19	Conductivity (µs/cm)								72	95	94	61.1	59.7		
7-Sep-19	Conductivity (µs/cm)								73	94		90			
9-Sep-19	Conductivity (µs/cm)			66.8											
10-Sep-19	Conductivity (µs/cm)				89	77	76	72							
11-Sep-19	Conductivity (µs/cm)								72	88	85	58.6	58.5	47.2	39.3
13-Sep-19	Conductivity (µs/cm)								71	82	73	51	52.1		
14-Sep-19	Conductivity (µs/cm)								72	77		85			
17-Sep-19	Conductivity (µs/cm)				88	77	76	71							
18-Sep-19	Conductivity (µs/cm)								71	91	84	84	79.6	117.1	57.3

		Station Code	NGG01	R1	R2	R3	R4	R5	R6	R7	NGG05	NGG06	NGG07	NGG08
Date	Parameters (Unit)	Guideline												
20-Sep-19	Conductivity (µs/cm)							72	75	75	75	77		
21-Sep-19	Conductivity (µs/cm)							74.9	53.6		55.9			
23-Sep-19	Conductivity (µs/cm)		89.5											
24-Sep-19	Conductivity (µs/cm)			79	80	73	71							
25-Sep-19	Conductivity (µs/cm)							71	96	96	92	63.9	60.2	77.2
27-Sep-19	Conductivity (µs/cm)							71	94	84	77	62.4		
28-Sep-19	Conductivity (µs/cm)							71	93		90			
3-Sep-19	TDS (mg/L)			39.5	39.5	39	35.5							
4-Sep-19	TDS (mg/L)							36	39.5	34	35	35.5	34.5	32.5
6-Sep-19	TDS (mg/L)							36	47.5	47	30.55	29.85		
7-Sep-19	TDS (mg/L)							36.5	47	45				
9-Sep-19	TDS (mg/L)		33.4											
10-Sep-19	TDS (mg/L)			44.5	38.5	38	36							
11-Sep-19	TDS (mg/L)							36	44	42.5	29.3	29.2	23.5	19.5
13-Sep-19	TDS (mg/L)							35.5	41	36.5	25.5	26.05		
14-Sep-19	TDS (mg/L)							36	38.5		42.5			
17-Sep-19	TDS (mg/L)			44	38.5	38	35.5							
18-Sep-19	TDS (mg/L)							35.5	45.5	42	42	39.8	58.55	28.65
20-Sep-19	TDS (mg/L)							36	37.5	37.5	37.5	38.5		
21-Sep-19	TDS (mg/L)							37.45	26.8		27.95			
23-Sep-19	TDS (mg/L)		44.75											
24-Sep-19	TDS (mg/L)			38.5	40	36.5	35.5							
25-Sep-19	TDS (mg/L)							35.5	48	48	46	31.95	30.1	38.6
27-Sep-19	TDS (mg/L)							35.5	47	42	38.5	31.2		
28-Sep-19	TDS (mg/L)							35.5	46.5		45.5			
3-Sep-19	Temperature (°C)			28.32	29.05	29.26	28.79							
4-Sep-19	Temperature (°C)							28.22	25.82	27.34	27.28	26.93	26.82	26.53
6-Sep-19	Temperature (°C)							27.98	23.86	23.99	25.8	26.2		
7-Sep-19	Temperature (°C)							28.31	24		24.46			
9-Sep-19	Temperature (°C)		27.5											

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
10-Sep-19	Temperature (°C)			27.45	29.37	29.6	29.23							
11-Sep-19	Temperature (°C)							27.56	24.62	24.57	25.1	25.3	25.5	25.7
13-Sep-19	Temperature (°C)							28.52	25.43	26.27	27.2	27.4		
14-Sep-19	Temperature (°C)							28.58	27.19		25.92			
17-Sep-19	Temperature (°C)			32.15	31.02	30.85	30.1							
18-Sep-19	Temperature (°C)							29.43	24.58	25.1	24.87	26.8	26.9	26.7
20-Sep-19	Temperature (°C)							29.2	27.37	27.9	27.13	27.12		
21-Sep-19	Temperature (°C)							28.3	27.7		27.6			
23-Sep-19	Temperature (°C)		26											
24-Sep-19	Temperature (°C)			30.64	30.92	30.19	29.51							
25-Sep-19	Temperature (°C)							28.63	23.99	24.17	24.46	26.1	28.5	27.5
27-Sep-19	Temperature (°C)							28.54	24.16	25.9	28.5	26.3		
28-Sep-19	Temperature (°C)							28.68	24.12		24.25			
3-Sep-19	Turbidity (NTU)			4.73	1.46	1.41	1.15							
4-Sep-19	Turbidity (NTU)							1.86	2.66	3.75	3.25	8.59	7.63	4.15
6-Sep-19	Turbidity (NTU)							1.96	4.06	5.11	4.44	10.99		
7-Sep-19	Turbidity (NTU)							2.23	4.39		8.11			
9-Sep-19	Turbidity (NTU)		25.29											
10-Sep-19	Turbidity (NTU)			20.01	<5	<5	<5							
11-Sep-19	Turbidity (NTU)							<5	<5	<5	<5	5.85	7.55	11.03
13-Sep-19	Turbidity (NTU)							2.42	3.92	2.6	4.24	83		
14-Sep-19	Turbidity (NTU)							1.95	3.83		4.44			
17-Sep-19	Turbidity (NTU)			6.79	1.66	1.42	1.2							
18-Sep-19	Turbidity (NTU)							1.22	1.96	2.63	3.23	4.42	4.07	5.03

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
20-Sep-19	Turbidity (NTU)							1.2	1.95	2	3.42	5.12		
21-Sep-19	Turbidity (NTU)							1.32	2.31		2.62			
23-Sep-19	Turbidity (NTU)		7.69											
24-Sep-19	Turbidity (NTU)			1.16	2.91	1.16	2.24							
25-Sep-19	Turbidity (NTU)							1.16	1.39	2.39	2.25	4.99	4.8	8.72
27-Sep-19	Turbidity (NTU)							1.16	1.2	6.33	4.06	4.83		
28-Sep-19	Turbidity (NTU)							1.35	4.75		4.85			
4-Sep-19	TSS (mg/L)							<5	5.42	<5	5.48			
9-Sep-19	TSS (mg/L)		48.15											
10-Sep-19	TSS (mg/L)			29.76	<5	<5	<5							
11-Sep-19	TSS (mg/L)							<5	<5	<5	8.48	13.05	16.14	37.78
18-Sep-19	TSS (mg/L)							<5	<5	<5	<5			
25-Sep-19	TSS (mg/L)							<5	<5	<5	5.53			
4-Sep-19	BOD ₅ (mg/L)	<1.5						<1.0	2.12	<1.0	<1.0			
9-Sep-19	BOD ₅ (mg/L)	<1.5	<1.0											
10-Sep-19	BOD ₅ (mg/L)	<1.5		<1.0	1.5	<1.0	<1.0							
11-Sep-19	BOD ₅ (mg/L)	<1.5						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
18-Sep-19	BOD ₅ (mg/L)	<1.5						<1.0	2.39	1.65	<1.0			
25-Sep-19	BOD ₅ (mg/L)	<1.5						<1.0	10.38	7.84	1.38			
9-Sep-19	COD (mg/L)	<5.0	5.6											
10-Sep-19	COD (mg/L)	<5.0		<5.0	13.8	7.4	7							
11-Sep-19	COD (mg/L)	<5.0						<5.0	5.4	<5.0	5.4	6.2	6	10
9-Sep-19	NH ₃ -N (mg/L)	<0.2	<0.2											
10-Sep-19	NH ₃ -N (mg/L)	<0.2		<0.2	<0.2	<0.2	<0.2							
11-Sep-19	NH ₃ -N (mg/L)	<0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
9-Sep-19	NO ₃ -N (mg/L)	<5.0	0.03											
10-Sep-19	NO ₃ -N (mg/L)	<5.0		0.02	<0.02	<0.02	<0.02							
11-Sep-19	NO ₃ -N (mg/L)	<5.0						0.03	<0.02	<0.02	<0.02	0.29	0.03	0.03
4-Sep-19	Faecal coliform (MPN/100 ml)	<1,000						0	5	8	13			
9-Sep-19	Faecal coliform (MPN/100 ml)	<1,000	540											

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
10-Sep-19	Faecal coliform (MPN/100 ml)	<1,000		350	0	2	0							
11-Sep-19	Faecal coliform (MPN/100 ml)	<1,000						7	17	27	27	27	170	110
18-Sep-19	Faecal coliform (MPN/100 ml)	<1,000						2	0	22	2			
25-Sep-19	Faecal coliform (MPN/100 ml)	<1,000						22	13	17	79			
4-Sep-19	Total Coliform (MPN/100 ml)	<5,000						79	920	130	920			
9-Sep-19	Total Coliform (MPN/100 ml)	<5,000	1,600											
10-Sep-19	Total Coliform (MPN/100 ml)	<5,000		1,600	220	5	33							
11-Sep-19	Total Coliform (MPN/100 ml)	<5,000						49	34	350	920	920	920	1,600
18-Sep-19	Total Coliform (MPN/100 ml)	<5,000						14	11	130	79			
25-Sep-19	Total Coliform (MPN/100 ml)	<5,000						350	130	240	350			
9-Sep-19	Total Iron (mg/L)		2.64											
10-Sep-19	Total Iron (mg/L)			2.14	0.159	0.096	0.086							
11-Sep-19	Total Iron (mg/L)							0.084	2.78	2.94	1.38	2.89	2.38	2.44
10-Sep-19	TOC (mg/L)			1.86	3.98	2.75	2.36							
10-Sep-19	TOC (mg/L)							2.01	2.04	1.86				
10-Sep-19	Phytoplankton Biomass (g dry wt/m³)			28	2.4	1.8	1.8							
11-Sep-19	Phytoplankton Biomass (g dry wt/m³)							0.6	2	1.2				
10-Sep-19	Total Phosphorus (mg/L)			<0.01	<0.01	<0.01	<0.01							
11-Sep-19	Total Phosphorus (mg/L)							<0.01	<0.01	<0.01				
10-Sep-19	Total Dissolved			<0.01	<0.01	<0.01	<0.01							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
	Phosphorus (mg/L)													
11-Sep-19	Total Dissolved Phosphorus (mg/L)							<0.01	<0.01	<0.01				
11-Sep-19	Hydrogen Sulfide (mg/L)							<0.02		<0.02	<0.02			

TABLE A-2: RESULTS OF SURFACE WATER QUALITY MONITORING IN NAM CHIAN, NAM PHOUAN, NAM XAO AND NAM HOUAY SOUP

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
3-Sep-19	pH	5.0 - 9.0		8.67		
4-Sep-19	pH	5.0 - 9.0			8.34	7.74
6-Sep-19	pH	5.0 - 9.0			6.62	
9-Sep-19	pH	5.0 - 9.0	6.44			
10-Sep-19	pH	5.0 - 9.0		7.99		
11-Sep-19	pH	5.0 - 9.0			6.79	6.77
13-Sep-19	pH	5.0 - 9.0			6.87	
17-Sep-19	pH	5.0 - 9.0		8.28		
18-Sep-19	pH	5.0 - 9.0			6.63	6.67
20-Sep-19	pH	5.0 - 9.0			7.47	
23-Sep-19	pH	5.0 - 9.0	7.85			
25-Sep-19	pH	5.0 - 9.0			6.43	6.35
27-Sep-19	pH	5.0 - 9.0			5.86	
28-Sep-19	pH	5.0 - 9.0				
3-Sep-19	Sat. DO (%)			94.4		
4-Sep-19	Sat. DO (%)				83.4	78.7
6-Sep-19	Sat. DO (%)				95.3	
9-Sep-19	Sat. DO (%)		105.5			
10-Sep-19	Sat. DO (%)			97.2		
11-Sep-19	Sat. DO (%)				96.8	92.7
13-Sep-19	Sat. DO (%)				98.7	
17-Sep-19	Sat. DO (%)			95.8		
18-Sep-19	Sat. DO (%)				98.8	91.2
20-Sep-19	Sat. DO (%)				88.1	
23-Sep-19	Sat. DO (%)		102.3			

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
25-Sep-19	Sat. DO (%)				102.1	98.4
27-Sep-19	Sat. DO (%)				100.2	
28-Sep-19	Sat. DO (%)					
3-Sep-19	DO (mg/L)	>6.0		8.11		
4-Sep-19	DO (mg/L)	>6.0			6.63	6.31
6-Sep-19	DO (mg/L)	>6.0			7.38	
9-Sep-19	DO (mg/L)	>6.0	8.39			
10-Sep-19	DO (mg/L)	>6.0		8.22		
11-Sep-19	DO (mg/L)	>6.0			7.65	7.32
13-Sep-19	DO (mg/L)	>6.0			7.56	
17-Sep-19	DO (mg/L)	>6.0		8.11		
18-Sep-19	DO (mg/L)	>6.0			7.58	7.11
20-Sep-19	DO (mg/L)	>6.0			6.83	
23-Sep-19	DO (mg/L)	>6.0	8.04			
25-Sep-19	DO (mg/L)	>6.0			8.05	7.77
27-Sep-19	DO (mg/L)	>6.0			7.83	
28-Sep-19	DO (mg/L)	>6.0				
3-Sep-19	Conductivity (µs/cm)			83		
4-Sep-19	Conductivity (µs/cm)				77	18
6-Sep-19	Conductivity (µs/cm)				54.9	
9-Sep-19	Conductivity (µs/cm)		52.9			
10-Sep-19	Conductivity (µs/cm)			75		
11-Sep-19	Conductivity (µs/cm)				56.6	8.44
13-Sep-19	Conductivity (µs/cm)				51.4	
17-Sep-19	Conductivity (µs/cm)			8.11		
18-Sep-19	Conductivity (µs/cm)				67.2	14.7
20-Sep-19	Conductivity (µs/cm)				76	
23-Sep-19	Conductivity (µs/cm)		24.2			
25-Sep-19	Conductivity (µs/cm)				73.4	17.17
27-Sep-19	Conductivity (µs/cm)				74.3	
28-Sep-19	Conductivity (µs/cm)					
3-Sep-19	TDS (mg/L)			41.5		
4-Sep-19	TDS (mg/L)				38.5	9
6-Sep-19	TDS (mg/L)				27.45	
9-Sep-19	TDS (mg/L)		26.45			
10-Sep-19	TDS (mg/L)					
11-Sep-19	TDS (mg/L)				28.3	4.2
13-Sep-19	TDS (mg/L)				42.05	
17-Sep-19	TDS (mg/L)			38		
18-Sep-19	TDS (mg/L)				33.6	7.35

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
20-Sep-19	TDS (mg/L)				47.5	
23-Sep-19	TDS (mg/L)		12.1			
25-Sep-19	TDS (mg/L)				36.7	8.5
27-Sep-19	TDS (mg/L)				37.15	
28-Sep-19	TDS (mg/L)					
3-Sep-19	Temperature (°C)			22.79		
4-Sep-19	Temperature (°C)				27.06	26.72
6-Sep-19	Temperature (°C)				26.7	
9-Sep-19	Temperature (°C)		24.3			
10-Sep-19	Temperature (°C)					
11-Sep-19	Temperature (°C)				26	25.7
13-Sep-19	Temperature (°C)				27.5	
17-Sep-19	Temperature (°C)			23.3		
18-Sep-19	Temperature (°C)				27.5	26.7
20-Sep-19	Temperature (°C)				27.97	
23-Sep-19	Temperature (°C)		25.3			
25-Sep-19	Temperature (°C)				26.3	26.2
27-Sep-19	Temperature (°C)				26.8	
28-Sep-19	Temperature (°C)					
3-Sep-19	Turbidity (NTU)			11		
4-Sep-19	Turbidity (NTU)				10.47	4.7
6-Sep-19	Turbidity (NTU)				19.73	
9-Sep-19	Turbidity (NTU)		9.51			
10-Sep-19	Turbidity (NTU)					
11-Sep-19	Turbidity (NTU)				15.87	5.82
13-Sep-19	Turbidity (NTU)				24.49	
17-Sep-19	Turbidity (NTU)			4.62		
18-Sep-19	Turbidity (NTU)				5.88	3.08
20-Sep-19	Turbidity (NTU)				6.42	
23-Sep-19	Turbidity (NTU)		5.2			
25-Sep-19	Turbidity (NTU)				5.53	4.63
27-Sep-19	Turbidity (NTU)				5.81	
28-Sep-19	Turbidity (NTU)					
4-Sep-19	TSS (mg/L)					
9-Sep-19	TSS (mg/L)		9.37			
10-Sep-19	TSS (mg/L)			84.27		
11-Sep-19	TSS (mg/L)				48.57	16.17
18-Sep-19	TSS (mg/L)					
25-Sep-19	TSS (mg/L)					
9-Sep-19	BOD ₅ (mg/L)	<1.5	<1.0			

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
10-Sep-19	BOD ₅ (mg/L)	<1.5		<1.0		
11-Sep-19	BOD ₅ (mg/L)	<1.5			<1.0	<1.0
9-Sep-19	COD (mg/L)	<5.0	<5.0			
10-Sep-19	COD (mg/L)	<5.0		19.4		
11-Sep-19	COD (mg/L)	<5.0			14.4	21.6
9-Sep-19	NH ₃ -N (mg/L)	<0.2	<0.2			
10-Sep-19	NH ₃ -N (mg/L)	<0.2		<0.2		
11-Sep-19	NH ₃ -N (mg/L)	<0.2			<0.2	<0.2
9-Sep-19	NO ₃ -N (mg/L)	<5.0	<0.02			
10-Sep-19	NO ₃ -N (mg/L)	<5.0		<0.02		
11-Sep-19	NO ₃ -N (mg/L)	<5.0			0.1	0.09
4-Sep-19	Faecal coliform (MPN/100 ml)	<1,000				
9-Sep-19	Faecal coliform (MPN/100 ml)	<1,000	1,700			
10-Sep-19	Faecal coliform (MPN/100 ml)	<1,000		920		
11-Sep-19	Faecal coliform (MPN/100 ml)	<1,000			920	170
9-Sep-19	Total Coliform (MPN/100 ml)	<5,000	3,500			
10-Sep-19	Total Coliform (MPN/100 ml)	<5,000		9,200		
11-Sep-19	Total Coliform (MPN/100 ml)	<5,000			9,200	280
9-Sep-19	Total Iron (mg/L)		0.798			
10-Sep-19	Total Iron (mg/L)			2.51		
11-Sep-19	Total Iron (mg/L)				1.96	1.05

ANNEX B: RESULTS OF EFFLUENT ANALYSES

TABLE B-1: RESULTS OF CAMP EFFLUENTS IN SEPTEMBER 2019

Parameters (Unit)	Site Name	Owner's Site Office and Village		Obayashi Camp		SongDa5 Camp No.1	
	Station Code	EF01		EF02		EF07	
	Date	05-Sep-19	19-Sep-19	05-Sep-19	19-Sep-19	05-Sep-19	19-Sep-19
	Guideline						
pH	6.0 - 9.0	6.72	6.85	7.17	6.95	7.01	
Sat. DO (%)		70.1	51.8	55	74.7	45.1	
DO (mg/l)		5.24	3.83	4.09	5.41	3.44	
Conductivity (µs/cm)		290	367	301	405	529	
TDS (mg/l)		145	183.5	155	202.5	264.5	
Temperature (°C)		28.5	29.4	28.9	30.7	27.8	
Turbidity (NTU)		2.52	0.84	2.82	1.68	4.16	
TSS (mg/l)	<50	<5	<5	<5	<5	5.7	
BOD5 (mg/l)	<30	15.6	11.7	14.82	<6	7.11	
COD (mg/l)	<125	<25	<25	<25	<25	<25	
NH3-N (mg/l)	<10.0	9.3	12.9	5.7	7.4	6.6	
Total Nitrogen (mg/l)	<10.0	17.7	28.3	13.2	16.2	7.41	
Total Phosphorus (mg/l)	<2	1.05	1.16	0.81	0.72	0.6	
Oil & Grease (mg/l)	<10.0	<1		<1		<1	
Total coliform (MPN/100ml)	<400	220	140	1,600	49	1,600	
Faecal Coliform (MPN/100ml)	<400	17	140	33	2	14	
Effluent Discharge Volume (L/mn)		12	60	12	12	12	
Chlorination Dosing Rate (ml/mn)		n/a	n/a	35	62	90	
Residual Chlorine (mg/l)	<1.0	n/a	n/a	0.07	0.16	0.12	

Parameters (Unit)	Site Name	V&K Camp		HM Main Camp		ESD Camp		Main Powerhouse	
	Station Code	EF10		EF13		EF14		EF19	
	Date	05-Sep-19	19-Sep-19	05-Sep-19	19-Sep-19	05-Sep-19	19-Sep-19	12-Sep-19	19-Sep-19
	Guideline								
pH	6.0 - 9.0	7.15	7.13	6.73	7.08	7.04	6.98	8.12	
Sat. DO (%)		67	98.9	44.9	49.4	6.8	17.5	29.3	
DO (mg/l)		5.12	7.28	3.38	3.58	0.51	1.39	2.35	

Parameters (Unit)	Site Name	V&K Camp		HM Main Camp		ESD Camp		Main Powerhouse	
	Station Code	EF10		EF13		EF14		EF19	
	Date	05-Sep-19	19-Sep-19	05-Sep-19	19-Sep-19	05-Sep-19	19-Sep-19	12-Sep-19	19-Sep-19
	Guideline								
Conductivity (µs/cm)		220	244	793	690	390	572	930	
TDS (mg/l)		110	122	396.5	345	195	286	465	
Temperature (°C)		27.5	29.2	28.2	30.5	28.2	30.4	29.9	
Turbidity (NTU)		3.64	2.21	19.06	17.84	10.44	12.5	6.12	
TSS (mg/l)	<50	10.7	6.8	41.9	6.8	17.2	14.4	23.3	
BOD5 (mg/l)	<30	<6	6.03	<6	<6	47.7	57.45	<6	
COD (mg/l)	<125	<25	<25	123	104	61.8	44.6	48	
NH3-N (mg/l)	<10.0	2.4	1.7	<2	15.3	12.1	15.5	73.4	
Total Nitrogen (mg/l)	<10.0	2.99	6.76	1.44	30.4	26.8	25	112	
Total Phosphorus (mg/l)	<2	0.29	0.24	1.11	1.44	0.96	1.53	3.66	
Oil & Grease (mg/l)	<10.0	<1		4		<1		<1	
Total coliform (MPN/100ml)	<400	920	350	0	0	16,000	16,000	49	
Faecal Coliform (MPN/100ml)	<400	0	7	0	0	16,000	16,000	0	
Effluent Discharge Volume (L/mn)		3.33	6	6	3	4	4	1800	
Chlorination Dosing Rate (ml/mn)		9	15	15	0.8	0	0	500	
Residual Chlorine (mg/l)	<1.0	0.11	0.09	1.50	0.72	0.01	0.03	0.91	

TABLE B-2: RESULTS OF THE CONSTRUCTION AREA DISCHARGE IN SEPTEMBER 2019

	Site Name	Upstream Spoil Disposal Area No.2			
	Station Code	DS04 - US			
	Date	05-Sep-19	12-Sep-19	19-Sep-19	26-Sep-19
	Guideline				
pH	6.0 - 9.0	6.12	6.71	7.16	7.15
Sat. DO (%)		99.1	101.3	99.2	89.2
DO (mg/L)		7.71	7.99	7.87	7.37
Conductivity (µs/cm)		32.8	10	7	23
TDS (mg/l)		26.4	5	3.5	11.5
Temperature (°C)		26.4	26.1	25.8	24.99
Turbidity (NTU)		4.63	3.82	2.6	2.46
TSS (mg/L)	<50	4.51	1.64	1.67	0.8
Oil & Grease (mg/L)	<10	<1			

	Site Name	Spoil Disposal Area No.2			
	Station Code	DS04			
	Date	05-Sep-19	12-Sep-19	19-Sep-19	26-Sep-19
	Guideline				
pH	6.0 - 9.0	6.04	6.12	6.78	6.22
Sat. DO (%)		73.8	77.7	72.8	82.3
DO (mg/L)		5.85	6.12	5.77	6.75
Conductivity (µs/cm)		14.16	16.45	13.43	27
TDS (mg/l)		7.8	8.22	6.7	13.5
Temperature (°C)		25.4	26	25.6	25.38
Turbidity (NTU)		10.82	8.36	7.07	7.8
TSS (mg/L)	<50	9.17	6.48	4.97	6
Oil & Grease (mg/L)	<10	<1			

ANNEX C: AMBIENT DUST QUALITY

TABLE C-1: 24-HOUR AVERAGE DUST CONCENTRATIONS MEASURED IN HAT GNIUN VILLAGE

Hat Gnuin Village - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	09-Sep-19 18:00	10-Sep-19 18:00	11-Sep-19 18:01
End Time	10-Sep-19 18:00	11-Sep-19 18:00	12-Sep-19 18:00
Average Data Record in 24h (mg/m ³)	0.055	0.050	0.058
Guideline Average in 24h (mg/m³)	0.12	0.12	0.12

TABLE C-2: 24-HOUR AVERAGE DUST CONCENTRATIONS MEASURED IN PHOUHOMXAY VILLAGE

Phouhomxay Village - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	16-Sep-19 18:00	17-Sep-19 18:01	18-Sep-19 18:01
End Time	17-Sep-19 18:00	18-Sep-19 18:00	19-Sep-19 18:00
Average Data Record in 24h (mg/m ³)	0.061	0.061	0.058
Guideline Average in 24h (mg/m³)	0.12	0.12	0.12

TABLE C-3 AND TABLE C-4: AVERAGE RESULTS OF DUST MONITORING AT SONG DA5 CAMP No. 2 AND LILAMA10 CAMP IN SEPTEMBER 2019

Song Da5 Camp No.2 - Dust Emission Average in 24 hours	
Period	24 Hours
Start Time	25-Sep-19 18:30
End Time	26-Sep-19 18:00
Average Data Record -24h	0.078
Guideline	0.12

Lilama10 Camp - Dust Emission Average in 24 hours	
Period	24 Hours
Start Time	24-Sep-19 18:00
End Time	25-Sep-19 18:00
Average Data Record -24h	0.081
Guideline	0.12

TABLE C-5 AND TABLE C-6: AVERAGE RESULTS OF DUST MONITORING AT MAIN DAM AND MAIN POWERHOUSE IN SEPTEMBER 2019

Main Dam - Dust Emission Average in 24 hours	
Period	24 Hours
Start Time	02-Sep-19 18:00
End Time	03-Sep-19 18:00
Average Data Record (mg/m ³) -24h	0.012
Guideline Average (mg/m³) - 24h	0.12

Main Powerhouse - Dust Emission Average in 24 hours	
Period	24 Hours
Start Time	04-Sep-19 18:00
End Time	05-Sep-19 17:30
Average Data Record -24h	0.018
Guideline Average - 24h	0.12