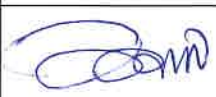
NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report
First Quarter of 2019

January to March 2019

Rev	Date	Author	Checked	Approved	Modification Details
A	15 December 2020				Final
A1	29 August 2020				2nd draft sent to ADB for Review
A0	28 April 2019	Hendra WINASTU	Wanidaporn RODE	Khamlar PHONSAVAT	1st draft sent to LTA for Review

Accessibility	
☑	Public
☐	Internal
☐	Confidential

Document No.

NNP1-C-J0905-RP-017-A

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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
BOMU	Biodiversity Offset Management Unit
CA	Concession Agreement between the NNP1PC and GOL
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
DOF	Department of Forestry
DWR	Department of Water Resource
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
HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
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
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	Waste Water Treatment System

1 EXECUTIVE SUMMARY

The quarterly environment monitoring reports of Nam Ngiep 1 Hydropower Project provide 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 Construction Phase (ESMMP-CP).

During Q1 2019, the Environmental Management Office (EMO) of NNP1PC reviewed and approved one Detailed Work Program (DWP) and Site Specific ESMMPs (SS-ESMMP) and four Site Decommissioning Plans. A total of sixteen Observations of Non-Compliance (ONCs), one Non-Compliance Level-1 (NCR1) and one Non-Compliance Level-2 (NCR2) were active. Out of these, fifteen ONCs, one NCR-1 and one NCR-2 were resolved during the reported period, one ONC shall be carried over to the second quarter of 2019.

A total of 281.6 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 18.5 m^3 compared to Q4 2018. A total of 15,619 kg of recyclable waste (mostly scrap metal) was collected by Khounmixay Processing Factory and transported offsite to its facilities for recycling or processing and final disposal. A total of 327 m^3 of solid waste from Phouhomxay, Thaheua and Hat Gniun Villages was disposed of at the Houay Soup Landfill.

The Dissolved Oxygen (DO) levels in the Main Reservoir in all five stations (R1-R5) were between 1.29 – 11.3 mg/L and in Re-regulation Reservoir were greater than 6.65 mg/L. However, the DO levels in Nam Ngiep Downstream (all 4 stations) were greater than 7.01 mg/L. In terms of effluents from project sites, faecal coliform and total coliforms at OSOV (EF01) were decreasing in February 2019. It could be the results from the wetland improvement.

The monthly site inspection by the Environmental Management Unit (EMU) of Bolikhamxay Province was carried out on 11 January 2019. The inspection focused on the site decommissioning activities at the RCC Plant and Kenber Camp. There was no significant environmental issued identified during this inspection.

EMU Xaysomboun Province conducted a quarterly site inspection during 15 - 18 January 2019. This inspection focused on the water quality monitoring in the main reservoir, waste management and the social development programme. The EMU requested NNP1PC to support the construction of a small solid waste landfill as well as raising the local people's awareness on waste management in Houay Xay Village. NNP1PC has incorporated the waste management activities in the NNP1 Watershed Management Plan and will consider this as part of the Annual Implementation Plan for 2019.

The revised version of the Watershed Management Plan (WMP) was submitted to ADB, IAP, and BAC twice in response to their comments on 4 and 14 January 2019. A further revised version of the Plan was submitted to ADB, IAP, and BAC on 22 January 2019. ADB finally confirmed the WMP approval on 23 January 2019 with condition that both the IAP and BAC had no objection with the Plan. IAP and BAC provided comments on 24 and 27 January 2019 and the Plan was further revised and re-submitted on 31 January 2019. IAP and BAC finally confirmed on 31

January 2019 that they had no objection on the Plan approval and strongly recommended to focus on the implementation including the readiness of the Biodiversity Service Provider (Technical Assistance on Biodiversity) to be hired by ADB. NNP1PC continued with further improvement of the Lao version of the Plan in-house in February 2019.

A final consultation workshop to discuss and endorse the Plan was organized on 13 March 2019 at the Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF), in Vientiane Capital. The workshop was chaired by a Vice Minister of MAF and attended by 40 people consisting of representatives of concerned GOL sectors. The meeting agreed in principle to endorse the Plan but prior to submission to the MAF for signing, it was recommended that the Drafting Committee including NNP1PC should improve and revise some of the points related to the village land uses in order to define and agree on the boundary of the Totally Protection Zones and Controlled Use Zones within NNP1 watershed, the development of community infrastructure for the villages located in the watershed area as well as to increase the budget allocation for livelihood development. NNP1PC-EMO continues to improve the Lao translation of the Plan addressing comments received from the workshop and aims to submit the final Plan to MAF in April 2019 for review and signing.

Xaysomboun Provincial WRPO (Provincial Agriculture and Forestry Office) further improved the draft Watershed Management Regulation after the Xaysomboun WRPC coordination meeting on 20 December 2018. Xaysomboun Provincial WRPO submitted the improved Watershed Management Regulation to Xaysomboun Provincial Assembly for further review and certification on 05 February 2019. A Final Technical Workshop to review the draft Provincial Regulation for NNP1 Watershed and Reservoir Management with WRPO was organized in Xaysomboun Province on 26 March 2019. The Final Workshop with the Drafting Committee members consisting of the vice-chair of Provincial Assembly and Head of the Department of Justice as well as other key members from line departments is scheduled to be held in April 2019 to discuss and endorse the final draft Regulation.

NNP1PC provided an official response to the draft AIP 2019 prepared by the Bolikhamxay Provincial WRPO on 31 January 2019. NNP1PC continued to work with Xaysomboun and Bolikhamxay Provincial WRPOs in February 2019 to finalize the draft Annual Implementation Plan (AIP) 2019. The WRPO's coordination meeting on the AIP2019 development was organized on 13 March 2019 after the Final Workshop on NNP1 WMP. Xaysomboun and Bolikhamxay Provincial WRPOs agreed with the review and comments to further improve the draft AIP2019. The draft AIP2019 will be reviewed and approved by NNP1PC and ADB prior to further submission and approval by Provincial Governor of each province. The implementation of AIP 2019 is expected to start from June 2019.

The improved Biodiversity Offset Management Plan (BOMP) was submitted to ADB, IAP and BAC on 25 January 2019. The IAP Biodiversity Specialist provided comments on 27 January 2019 and the Biodiversity Advisory Committee (BAC) provided comments on 29 January 2019. ADB provided further comments on 2 February 2019. NNP1PC together with its Biodiversity Consultant completed the Plan improvement in the first week of March 2019. The improved Plan was resubmitted to ADB and BAC on 11 March 2019. They provided confirmations to approve the Plan on 21 and 22 March 2019 respectively after NNP1PC had addressed their final comments on 13 and 20 March 2019.

NNP1PC-EMO continued improving the Lao translation of the BOMP in March 2019. The improved Lao translation is expected to be ready by the end of April 2019. A technical workshop with Bolikhamxay Provincial Biodiversity Offset Management Unit (BOMU) and concerned GOL sectors was tentatively scheduled in mid-May 2019.

The Bolikhamxay Provincial BOMU together with NNP1PC-EMO have started the preparation of the AIP2019 (for biodiversity management in the Nam Chouan-Nam Xang Biodiversity Offset Site) and the initial draft was ready at the end of February 2019 for further review by NNP1PC. Based on recommendations from IAP and ADB, and as further emphasized by the Head of Bolikhamxay PAFO in January 2019, the aim is to have the AIP2019 approved and ready for implementation by 31 March 2019 when the pre-BOMP2B funding is over.

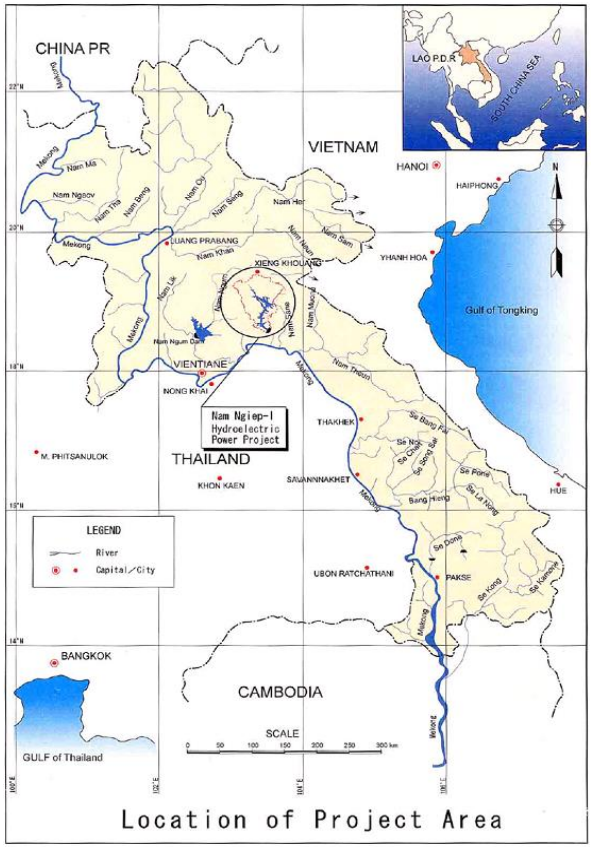
Bolikhamxay Provincial BOMU together with NNP1PC-EMO have completed the draft AIP2019 and NNP1PC submitted it to ADB and BAC for review and approval on 22 March 2019. BAC provided comments on 27 March 2019 accepting the proposal with a condition that the AIP will be revised by the Biodiversity Service Provider once they are on board. ADB had not provided any comments by the end of March 2019. Thus, GOL and NNP1PC expect there will be a gap of at least one month in implementation from the end of the pre-BOMP2B funding period at the end of March 2019 until final approval by ADB.

The five species that dominated the fish catch by weight in Q1 2019 are all species that are categorized as Least Concern, except *Tor sinensis* that are Data Deficient according to the IUCN Red List. The recorded catch included four Vulnerable species (VU), and five 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.

The Project consists of two dams. The main dam is located 9.0 km upstream of Hat Gniun Village in Bolikhan District. The 70-km-long, narrow reservoir extends up to the Nam Ngiep Valley as far as Thathom District. At 167 m high, the main dam is the second largest in Lao PDR. The Power Station at this dam will generate up to 1,546 GWh of electricity for export to Thailand. With a combined capacity of 290 MW, Nam Ngiep 1 Project will generate around 1,620 GWh of electricity annually. Two transmission lines were constructed to transport the electricity generated by the Project. From the main power station, a 230-kV transmission line runs for 125 km to the Nabong Substation outside Vientiane Capital. A 115-kV transmission line was constructed by EDL from the Re-regulation Power Station to Paksan substation over a distance of 40 km.



This Quarterly Environment Report provides a summary of environmental monitoring activities and mitigation actions during Q1 2019. The report is published on the Company website (https://namngiep1.com/).

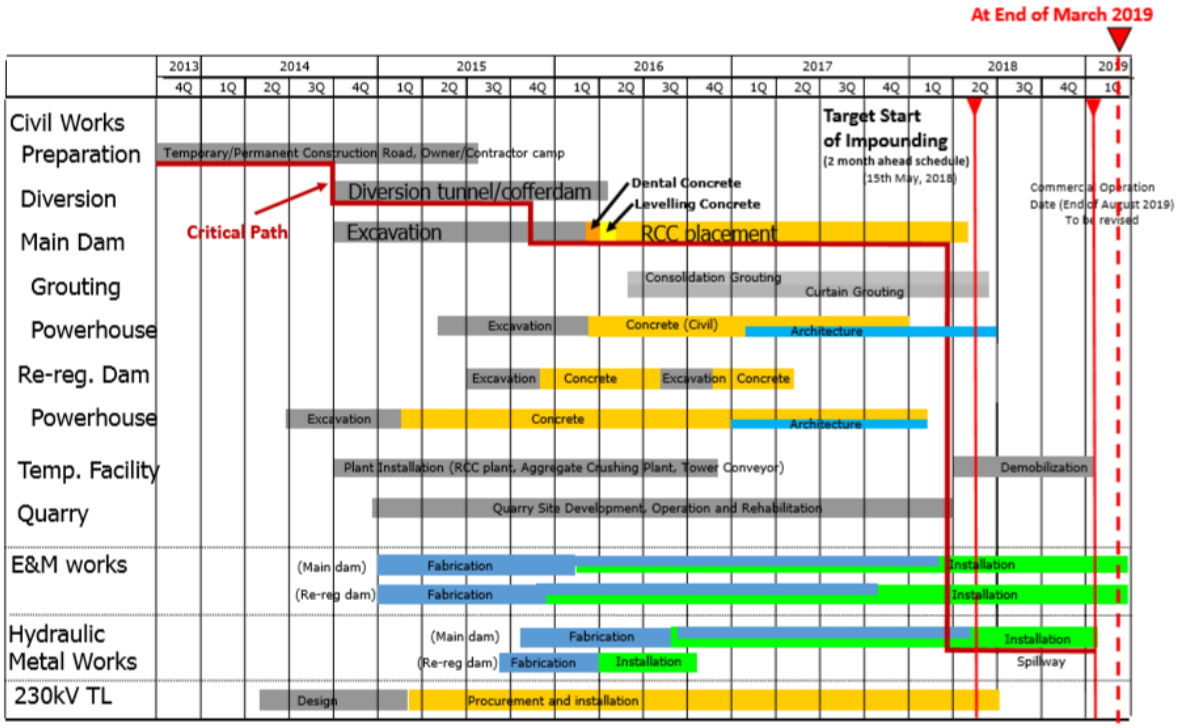
Related construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are also publicly disclosed on the Company website as required under the Concession Agreement.

3 CONSTRUCTION PROGRESS

Construction Works for the Project are being 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. Actual overall cumulative work progress until the end of March 2019 was 99.7 % (compared to planned progress of 100 %).

The overall construction schedule and progress curve (by achieved Milestone Payments) are shown in ***Figure 3-1.***

Figure 3-1: Overall Construction Schedule



3.1 CIVIL WORK

The cumulative actual work progress of the Civil Works until the end of March 2019 was 100 % (compared to planned progress of 100 %).

3.2 MAIN DAM AND POWERHOUSE

For the Civil Works at the end of April 2018, RCC placement was completed 100% by volume and by dam height by which the crest level of El. 321.9 m was reached at both the left and right banks.

The powerhouse concreting works has been completed in January 2019 and ground finishing work is ongoing as shown in ***Figure 3-2***.

Figure 3-2: Work around main powerhouse

3.3 ELECTRICAL AND MECHANICAL WORKS

The cumulative work progress of the Electrical and Mechanical Works (EMW) by value at the end of March 2019 was 98.8 % (compared to planned progress of 100 %).

This delay is due to the delay of 115-kV transmission line construction work by EDL 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 Riparian Release Conduit underwent repair and the downstream valve was replaced with two new valves. All work including testing was completed in March 2019.

At the Re-regulation powerhouse, wet tests for the generator unit were carried out from 14 February 2019 and completed on 16 March 2019.

3.4 230 kV Transmission Line Works

The cumulative work progress of the Transmission Line Works until the end of June 2018 was 100% (compared to planned progress of 100%). Final inspection work was complete 100 % for the part that was done in advance to sustain the schedule of the pre-connection commissioning test. The report being submitted to the OE and also to EGAT PPA respectively after OE review. Furthermore, OPGW test by Optical Time Domain Reflectometer was carried out during 13 to 15 June 2018 after Nam Ngum2 allowed NNP1 to work at Nabong Substation. The Contractor has submitted the test report already.

The megger test as OETL and NNP1 requested before energization as planed on August 2018 has been carried out on 07 August 2018 by line radar equipment and complete 100% and submitted all test to NNP1 already. The energization planned for 10 August 2018 has been shifted to 13 September 2018 since Nabong Substation has still not concluded its agreement with NNP1 at the time. The energization Test as planned for 13 September 2018 has been completed successfully on that date for 230 kV Transmission Line Work.

3.5 115 kV Transmission Line

The 115 kV Transmission Line from the re-regulation powerhouse to Paksan substation is an associated facility to NNP1, owned and being constructed by Électricité du Laos (EDL). The construction of tower foundations was started in December 2017 and has been completed being a total of 86 towers. All 86 No. towers have been erected and stringing works completed for 33.0km out of total 33km. Bush clearing and access are completely finished. The cumulative work progress of 115kV Transmission Line Works until the end of December 2018 was almost 100 % completed in February 2019.

The remaining Dong Fang work to complete the connection to Paksan Substation was completed by the end of November 2018, thereby delaying the ability of NNP1PC to generate electricity for sale to EDL by several months.

The energization Test which was planned for 10 February 2019 was shifted to 13 February 2019 for EDL ‘s own reasons.

4 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 Construction Phase during Q1 2019.

4.1 Contractor SS-ESMMPs

During Q1 2019, one Detailed Work Programme and Site Specific Environmental and Social Management Plans (DWP & SS-ESMMPs) and four Site Decommissioning and Rehabilitation Plans were submitted for review and approval by the Environmental Management Office (EMO). Out of these, one DWP & SS-SEMMPs and four Site Decommissioning Plans were cleared as ***Table 4-1*** below. More details can be found in ***Appendix 1***.

Table 4-1: List of SS-ESMMP and Site Decommissioning Plans Reviewed During Q1 2019

Name of SS-ESMMP Document/ Site Decommissioning Plans	Rev. 1	Rev. 2	Rev. 3	Approved
DWP & SS-ESMMP for Houay Soup Landfill Operation	√			√
Site Decommissioning and Rehabilitation Plan for Song Da5 Camp No.2	√			√
Site Decommissioning and Rehabilitation Plan for Main Dam Workshop and Spoil Disposal No.2	√	√		√
Site Decommissioning and Rehabilitation Plan for IIS's Field Shop and 276 subcontractor Camp	√	√		√
Site Decommissioning and Rehabilitation Plan for HM's Labor Camp No.1 (ZHEFU Camp)	√			√

4.2 Results of Compliance Inspections at Construction Sites

Bolikhamxay Provincial Environmental Management Unit (EMU) site inspection was conducted during 10-11 January 2019. Their inspection focused on the site decommissioning activities at the RCC Plant and Kenber Camp. There was no significant environmental issued identified during this inspection.

On the other hand, the EMU of Xaysomboun Province conducted a quarterly site inspection during 15 - 18 January 2019, this inspection focused on the water quality monitoring in the main reservoir, waste management and the social development programme. The EMU requested NNP1PC to support the construction of a small solid waste landfill as well as raising the local people's awareness on waste management in Houay Xay village. NNP1PC has incorporated the waste management activities in the NNP1 Watershed Management Plan and will consider this as part of the Annual Implementation Plan for 2019.

The monthly site inspection by the Environmental Management Unit (EMU) of Bolikhamxay Province was not planned in March 2019. The quarterly site visit by the EMU Xaysomboun Province is planned after the Lao New Year in April 2019.

During Q1 2019, the NNP1PC-EMO conducted bi-weekly and weekly follow-up inspections at 28 construction sites and camps of the main civil works, the 230 kV Transmission Line, the 115 kV Transmission Line and construction sites in Phouhomxay Village. The total number of inspected sites has decreased this quarter from 29 to 28 monitoring sites because the KCP camp at Houay Soup Resettlement Area (Phouhomxay Village) was decommissioned during the end of Q4 2018.

A total of sixteen Observations of Non-Compliance (ONCs), one Non-Compliance Level-1 (NCR1) and one Non-Compliance Level-2 (NCR2) were active. Out of these fifteen ONCs, one NCR-1 and one NCR-2 were resolved during the reported period, one ONC will be carried over to Q2 2019. The status of these non-compliance reports is summarized in ***Table 4-2*** and ***Figure 4-1.*** The progress of corrective actions is presented in ***Appendix 2***.

Table 4-2: Status of Non-Compliance Report during Q1 2019

Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3
Carried over ONC/NCR	0	1	1	0
Newly opened ONC/NCR	16	0	0	0
Total No. of ONC/NCR	16	01	01	0
Resolved ONC/NCR	15	01	01	0
Unresolved ONC/NCR carried forward to the next Quarter	1	**0**	**0**	0

Figure 4-1: Status of ONC during Q1 2019

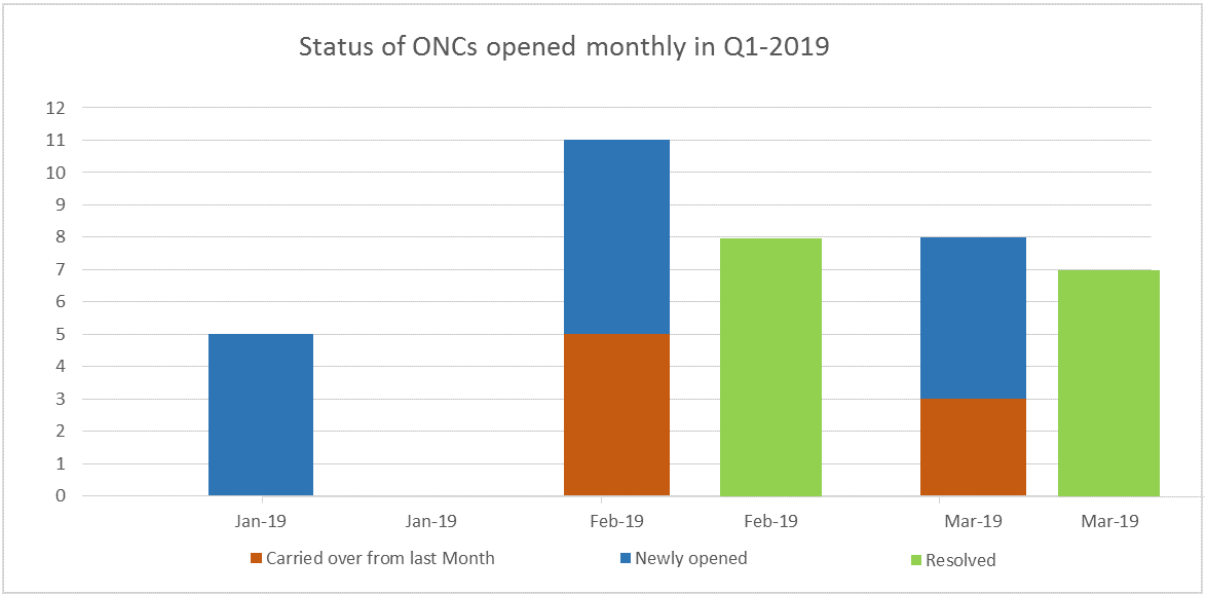
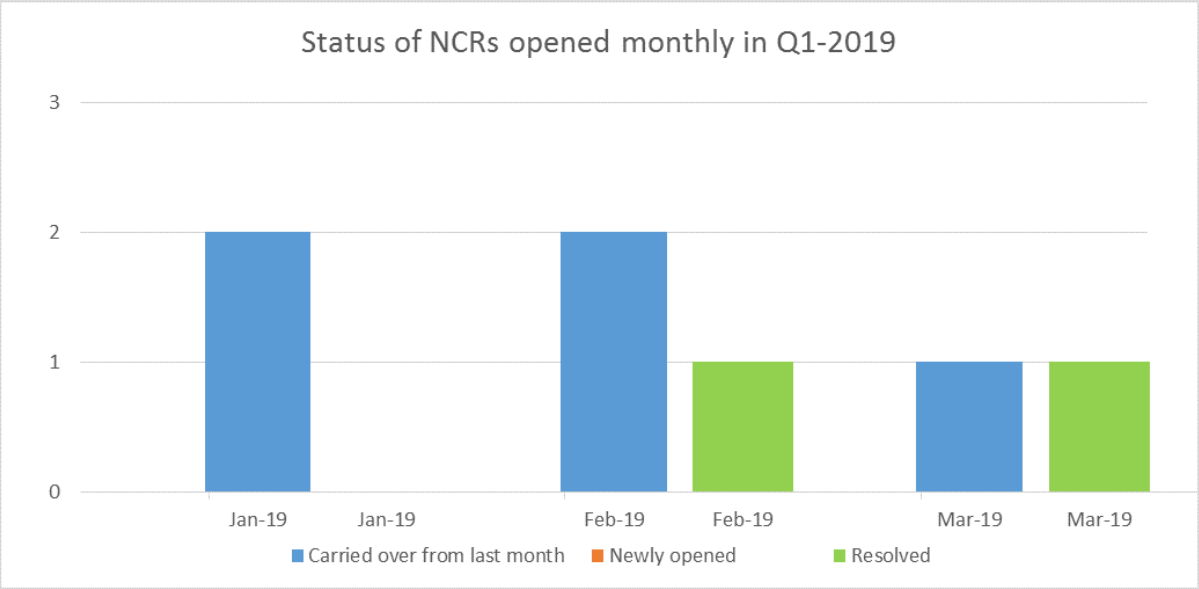


Figure 4-2: Status of NCR during Q1 2019



Photograph 1: Site inspection at a borrow area of Road P1 and P1A 	***Photograph 2: Joint Inspection for the Waste Water Treatment System installation at the Main Powerhouse*** 
Photograph 3: Xaysomboun Provincial EMU visited 2LR & 2UR during 15 - 18 January 2019 	***Photograph 4: Bolikhamxay Provincial EMU conducted site inspection During 10 - 11 January 2019*** 

4.3 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

4.3.1 General Waste Management

During Q1 2019, a total of 281.6 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 18.5 m^3 compared to Q4 2018. EMO conducted three waste spot checks at the NNP1 Project Landfill, construction sites and the camps. Waste mixed with recyclables was still found at ZHEFU Camp, LILAMA10 Camp, 276 Camp, and Song Da5 camp No.1 and 2. NNP1PC instructed the supervisors of all concerned Contractors and subcontractors to ensure proper waste management practices.

A total of 500 kg of compost was produced from grass, cow dung, rice husks, molasses, bio-extract, vegetable and fruit waste from the canteens.

A total of 15,619 kg of recyclable waste mainly consisting of scrap metal was collected by Khounmixay Processing Factory and transported offsite to its facilities for recycling or processing as shown in ***Table 4-3***. The remaining amount will be slowly collected and transported offset by an authorised dealer.

Table 4-3: Amounts of recyclable waste sold during Q1 2019

Source and Type of Recyclables		Unit	Total in Q1 of 2019 (A)	Sold (B)	Remaining Amount (A - B)
Construction activity					
1	Scrap metal	kg	61,446	14,860	46,586
Sub-Total 1		**kg**	**61,446**	**14,860**	**46,586**
Operation camp					
2	Glass bottles	kg	668	141	527
3	Plastic bottles	kg	291	172	119
4	Aluminium cans	kg	158.5	107.5	51
5	Paper/Cardboard	kg	388	338	50
Sub-Total 2		**kg**	**1,505.5**	**758.5**	**747**
Grand Total 1+2		**kg**	**62,951.5**	**15,618.5**	**47,333**

4.3.2 Hazardous Waste Management

During Q1 2019, joint hazardous materials and waste inventories was carried out at the main construction sites and the contractors' camps. The amounts of hazardous waste collected, stored and disposed during Q1 2019 are shown in **Table 4-4.** The treatment and final 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 of by Khounmixay Processing Factory over the next months.

Table 4-4: Hazardous waste recorded during Q1 2019

No.	Hazardous Waste Type	Unit	Total in Q1 2019	Disposal	Remaining
1	Used hydraulic and engine oil	liter (l)	6,470	2,410	4,060
2	Contaminated soil, sawdust and concrete	kg	515	0	515
3	Used tyre	No.	239	0	239
4	Used oil filters	No.	208	0	208
5	Used oil mixed with water	Litre	200	0	200
6	Ink cartridge	No.	207	63	144
7	Halogen/fluorescent bulbs	No.	174	33	141
8	Empty paint and spray cans	can	126	0	126
9	Empty contaminated bitumen drum/container	drum (200 l)	138	54	84
10	Empty used chemical drum/container	drum (200 l)	52	18	34
11	Contaminated textile and material	kg	27	0	27
12	Lead acid batteries	No.	22	0	22
13	Empty used oil drum/container	drum (20 l)	44	31	13
14	Clinical waste	kg	10	1	9
15	Lithium-ion batteries	No.	7	0	7
16	Empty used oil drum/container	drum (200 l)	8	4	4
17	Empty used chemical drum/container	Drum (20 l)	0	0	0
18	Acid and caustic cleaners	Bottle	0	0	0
19	cement bag	bag	0	0	0

4.3.3 Sewage Sludge Disposal

A total of 24 m^3 of sewage sludge from HM Hydro Contractor was transported and disposed of at Spoil Disposal Area No. 6 by following NNP1PC's Standard Operating Procedure (SOP) on Sewage/Black Water Disposal.

4.4 COMMUNITY WASTE MANAGEMENT SUPPORT

4.4.1 Animal Fodder (Pig Feed) Collection Programme

During Q1 2019, local villagers collected a total of 11,169 kg of food waste from the Owner's Site Office and Village (OSOV) and Contractors' camps for feeding their animals. This is a decrease of 4,418 kg compared to Q4 2018 as a result of Kenber Camp decommissioning and a reduction in the number of construction workers at Song Da5 Camps, details are shown in ***Table 4-5*** below.

Table 4-5: Amount of food waste collected by local villagers for use as pig feed during Q1 2019

NO.	SITE NAME	UNIT	TOTAL
1	Song Da5 Camp No. 2	kg	285
2	Song Da5 Camp No. 1	kg	1,779
3	Obayashi Corporation Camp	kg	3,202
4	Owner's Site Office and Village (OSOV)	kg	3,335
5	LILAMA 10 Camp	kg	2,568
Total		**kg**	11,169

4.4.2 Community Recycling Programme

The Community Recycle Waste Bank collected a total of 5,134 kg of recyclables from villagers and 1,279.5 kg was sold to Khounmixay Processing Factory as presented in ***Table 4-6*** below.

Table 4-6: Amounts of recyclables sold at the Community Recycle Waste Bank

Types of Waste	Unit	Collected Amount During the First Quarter of 2019 (A)	Sold (B)	Remaining Amount (A - B)
Scrap metal	kg	74.5	38	36.5
Glass	kg	2,511	345	2,166
Paper/cardboards	kg	1,632	0	1,632
Plastic bottles	kg	779	768	11
Aluminium	kg	137.5	128.5	9
Total	**kg**	**5,134**	**1,279.5**	**3,854.5**

In addition, during 06 – 07 February 2019, NNP1-EMO and the local waste management Contractor conducted a community consultation on waste management for host villages (Thaheua and Hat Gnuin village) and Phouhomxay Village which included role and responsibility of the villagers for waste separation and temporary storage, scopes of solid waste collection and Houay Soup landfill operation by the Contractor as well as waste collection and HS landfill operation schedule.

4.4.3 Houay Soup Landfill

A local Contractor started the waste management services in December 2017. The work includes solid waste collection and transportation from Phouhomxay, Thaheua and Hat Gniun villages to Houay Soup landfill three days per week (Monday, Wednesday and Friday), waste segregation, waste compaction and daily waste cover at the Houay Soup landfill.

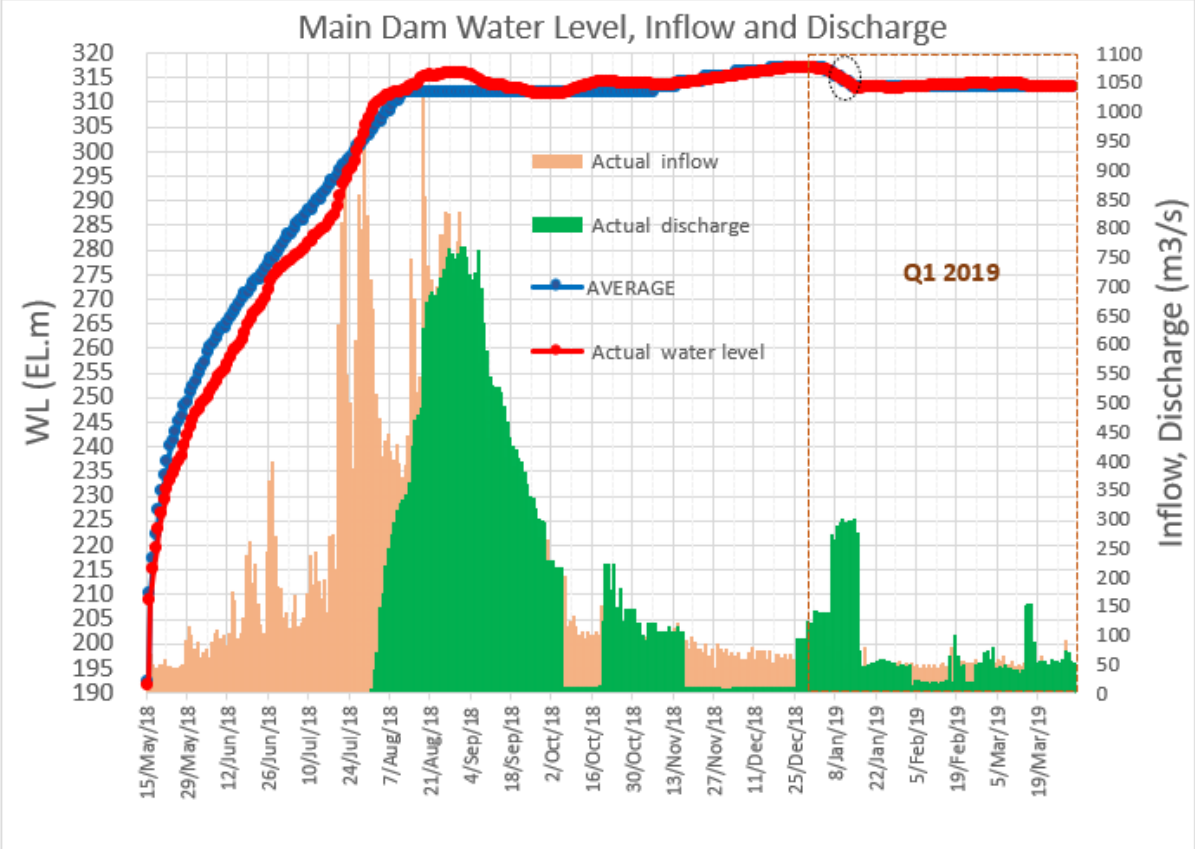
During Q1 2019, approximately 327 m^3 of solid waste was collected from the Thaheua, Hat Gniun and Phouhomxay villages.

NNP1PC completed the post evaluation of this local Contractor in November 2018. Due to their satisfactory performance, their contract was extended for another year, i.e., until November 2019.

4.5 MAIN RESERVOIR IMPOUNDING

The progress of impounding from 15 May 2018 to 31 March 2019 is presented on the graph in ***Figure 4-3*** 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. The data on inflow to the main reservoir during Q1 2019 shows dry season flows with a quarterly mean of about 50 m^3/s, which is some 10 m^3/s lower than the long-term Q1 mean.

Figure 4-3: Progress of impounding the Main Reservoir



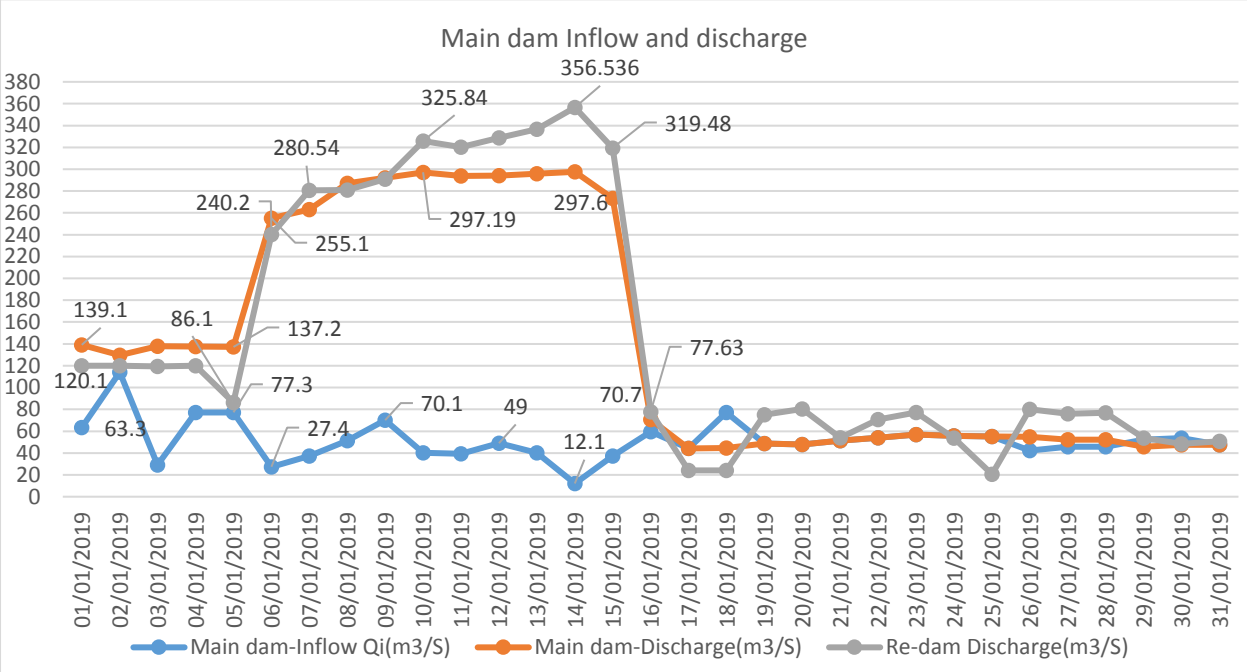
NNP1PC monitors the discharge from the re-regulation dam to ensure compliance with the minimum flow requirements and the results are presented in ***Figure 4-7***. The discharge from the re-regulation dam has been above the required minimum flow requirement of 5.5 m^3/s during impounding since the start of impounding.

In the period from from 06 January 2019 to 15 January 2019, NNP1PC carried out a controlled rapid lowering of the reservoir water level from El. 316.4 m asl to El. 312.8 m asl. This was carried out in consultation with the external Dam Safety Review Panel, as it was considered prudent to spill water to ensure lowering of the water level somewhat quickly because water pressure higher than anticipated was found to have built up in the downstream right abutment and this needed to be relieved expediently for safety reasons. Permanent drilled drainage holes in the abutment would be undertaken subsequently.

NNP1 put best efforts into ensuring a controlled release of water downstream by gradually increasing the discharged volume. To achieve this, the discharge from the main dam was increased to between 150 m^3/s and 300 m^3/s which is 200 m^3/s - 250 m^3/s above the normal flow.

The main dam inflow and discharge from the main dam and the re-regulation dam during the period with controlled rapid lowering of the reservoir water level are presented in Figure 4-4 Line Graph Indicating Main Dam Inflow and Discharges ***Figure 4-4***.

FIGURE 4-4 LINE GRAPH INDICATING MAIN DAM INFLOW AND DISCHARGES



The staff gauge measurements at the downstream hydrometric monitoring stations in Hat Gniun Village and Somseun Village are displayed in ***Figure 4-5*** and ***Figure 4-6*** respectively. The data from Hat Gniun station show an increase in water level of about 1 m during the high discharge period compared to the days immediately prior; and for Somseun station, the data indicate an increase of 3 m to 3.5 m.

FIGURE 4-5 STAFF GAUGE DATA AT HAT GNIUN HYDROMETRIC STATION

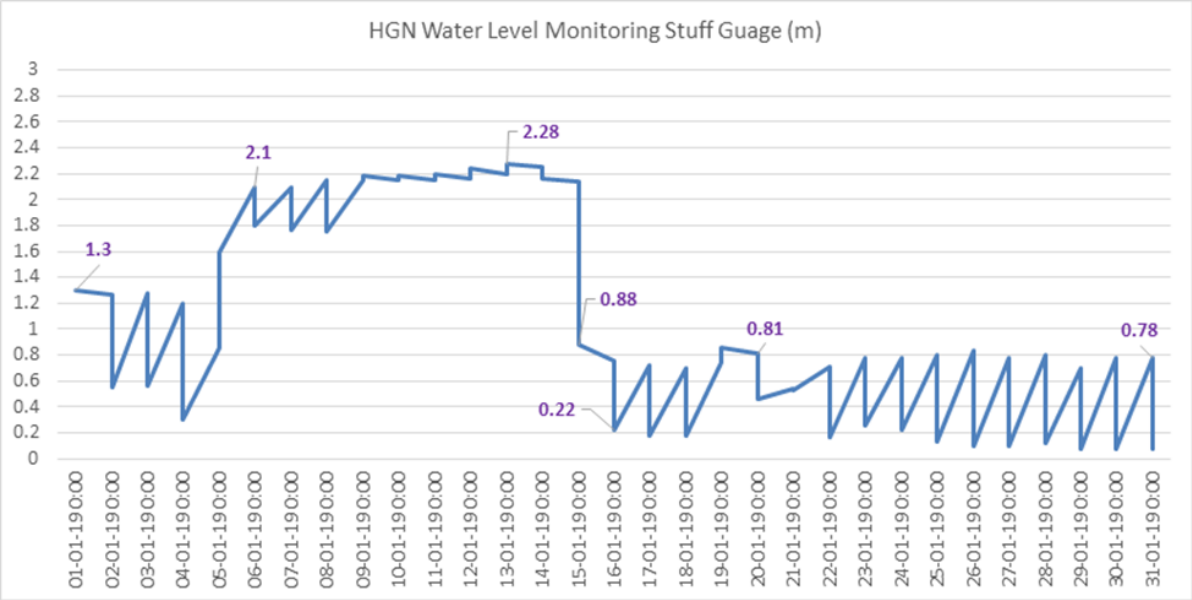
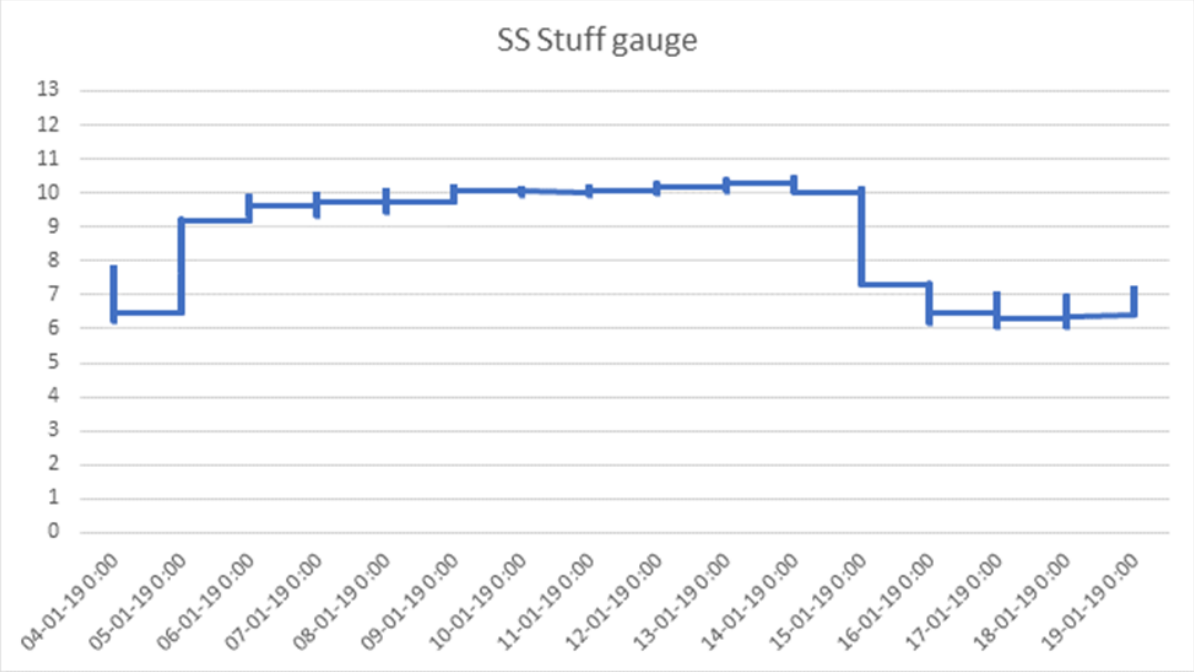


FIGURE 4-6 STAFF GAUGE DATA AT SOMSEUN HYDROMETRIC STATION



This unscheduled increase in discharge was informed in advance to the RMU and to the heads of the downstream villages in accordance with standard procedures.

In cooperation with the RMU, NNP1PC-ESD/SMO arranged surveys to document and assess impacts likely caused by the increased discharge from the Project. The surveys were joined by the relevant village headman and representatives of the relevant District Coordination Committee. Based on the surveys, it was found that the impacts caused by the increase in discharge were temporary and mainly resulted in loss of riverbank garden produce. Nine boats were lost or damaged and some fishing gear was lost. No permanent structures were impacted, but a temporary cofferdam around an excavation for a water supply intake near the mouth of Nam Ngiep was flooded, and a sand extraction company has claimed loss of materials and some equipment. NNP1PC will compensate for losses in close consultation with the affected people or businesses and the RMU. NNP1PC is also preparing a Corrective Action Plan for submission to ADB.

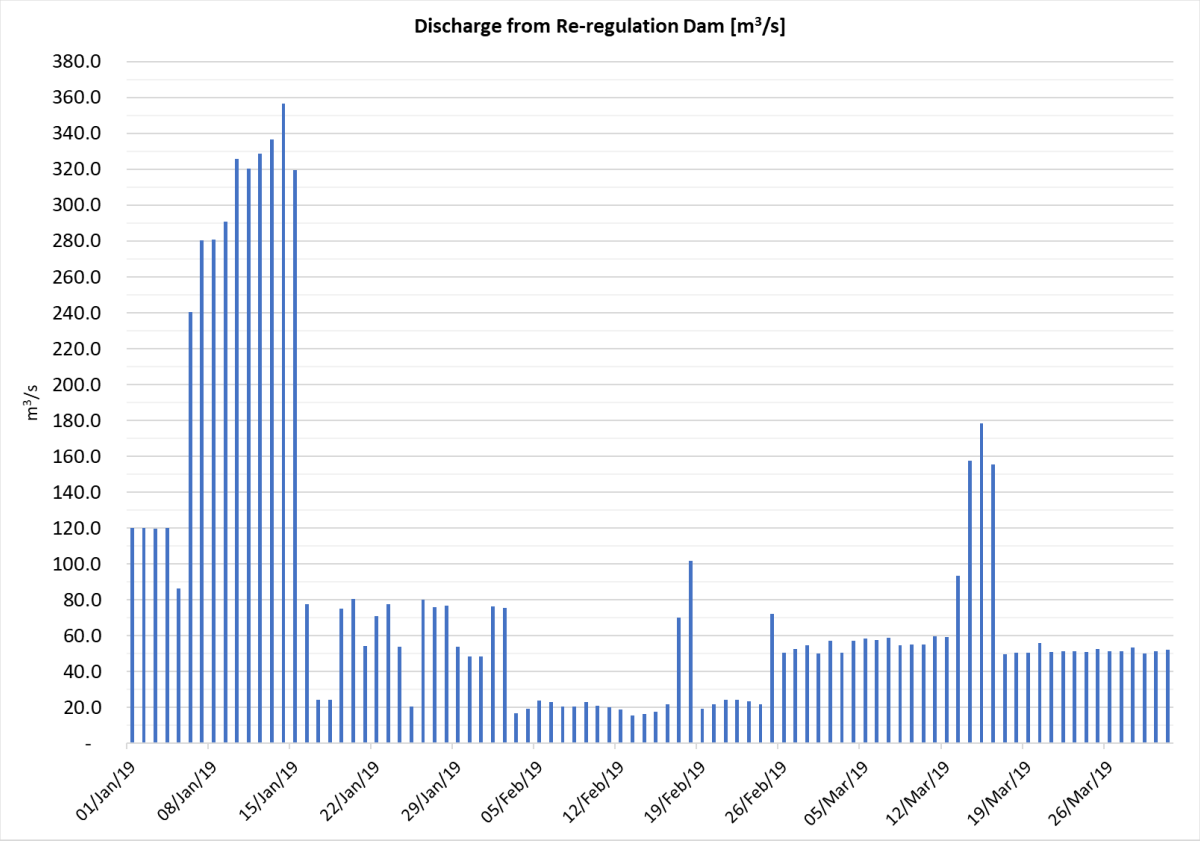
The water level in the main reservoir has been maintained at about El. 312.8 m asl. for the remaining part of Q1 2019.

During the remaining part of January 2019, the discharge from the re-regulation dam was generally kept about 10-20 m3/s above the inflow to the main reservoir, which allowed various construction works and plunge pool excavations near the main dam to be undertaken.

From 03 February 2019 to 25 February 2019, the mean discharge from the re-regulation dam was kept at about 20 m^3/s (approximately 20 m^3/s lower than the inflow to the main reservoir) and then increased to about 50 m^3/s until the end of March 2019, however with intermittent higher outflows in connection with testing of the turbine and the power generation in the re-regulation powerhouse.

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 4-7: Discharge from the Re-regulation Dam during Q1 2019



During Q1 2019, EMO has carried out measurements of water depths in the downstream reach of Nam Ngiep to confirm compliance with the water depth requirements in the Concession Agreement (at least 0.5 m measured immediately downstream the re-regulation dam).

EMO has identified 19 sites with potential shallow water depths.

For January 2019, the monitoring showed water depths from 0.9 – 3.7 m with no difficulties navigating on the river. In February and March 2019, EMO measured occasional low water depths with difficulties navigating at between 4 and 8 sites due to decreased discharge from the re-regulation dam.

4.6 Environmental Monitoring

The environmental monitoring activities followed the programmes presented in the ESMMP-CP Volume III. The programmes consist of the following components:

a) Effluent discharge from camps and construction sites
b) Ambient surface water quality monitoring
c) Groundwater quality monitoring

d) Reservoir water quality monitoring
e) Landfill leachate quality monitoring
f) Ambient air quality monitoring (particulate matter of less than 10 microns)
g) Ambient noise and noise emission monitoring.

The monitoring results are assessed against the relevant National Environmental Standards and Effluent Standards specified in the Concession Agreement Annex C as applicable. This Section focuses on the key results that did not meet the Standards. All monitoring results can be found in ***Appendix 5***.

The NNP1PC Environmental Laboratory carries out water quality analyses for TSS, BOD_5, total coliform, faecal coliform and E. Coli bacteria. All other laboratory water quality analyses are performed by United Analysis and Engineering Consultant Company Ltd (UAE).

4.6.1 Surface Water (River) Quality

The regular surface water quality monitoring programme was adjusted in May 2018 due to the impounding of the main reservoir, which started on 15 May 2018. The programme comprises 5 monitoring stations in the main reservoir (R1-R5), 2 stations in the re-regulation reservoir (R6 and R7), 5 stations in the main stream Nam Ngiep (NNG01, and NNG05-NNG08) and 4 stations in the main tributaries to Nam Ngiep (Nam Chian [NCH01], Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]).

The depth profile reservoir water quality measurement (only physical parameters) was carried out for main reservoir and re-regulation reservoir commencing in mid-September 2018.

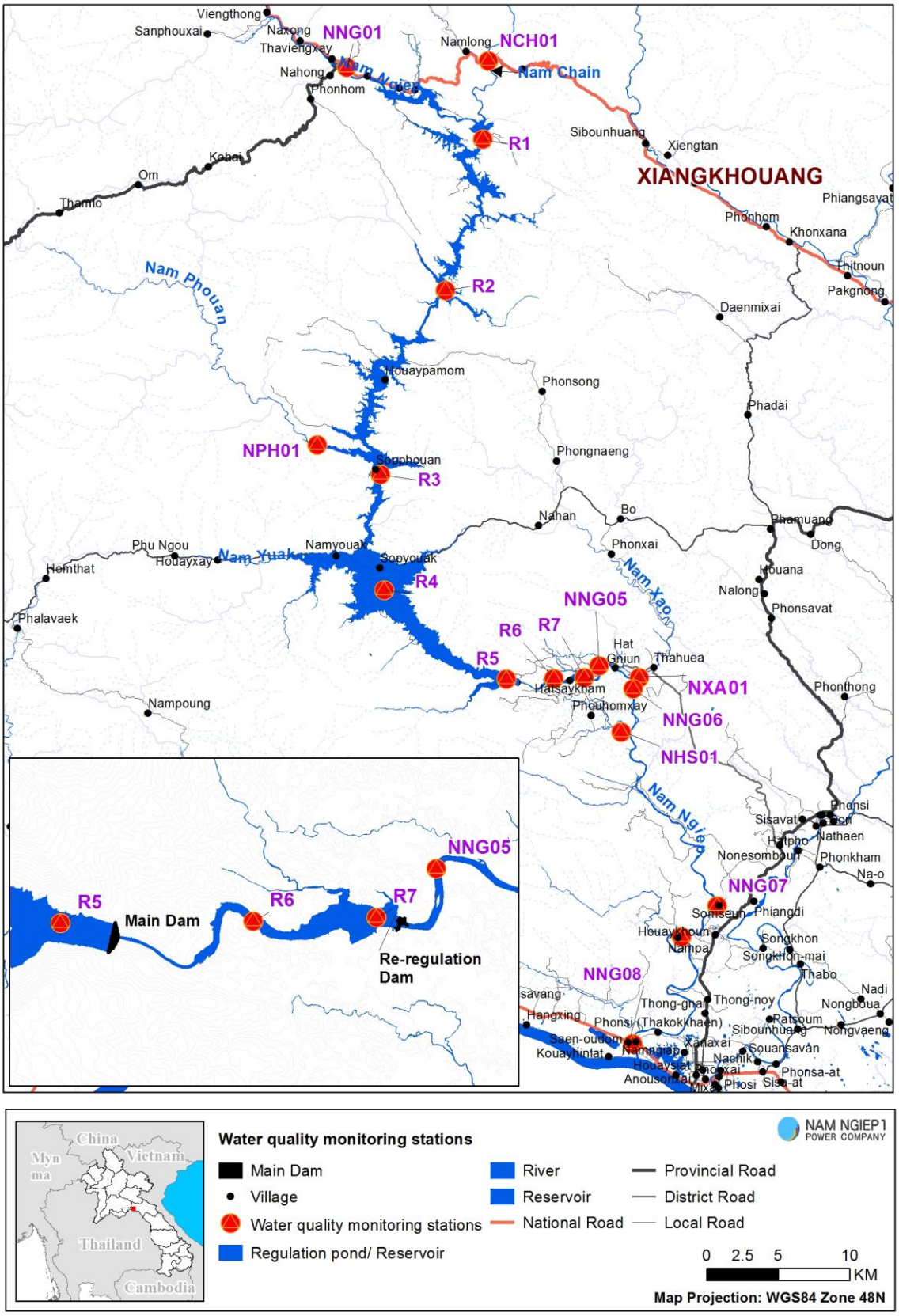
The frequency of monitoring is presented in ***TABLE 4-7*** and the locations of monitoring stations are shown in ***FIGURE 4-8*.**

Table 4-7: Monitoring frequency for surface water quality parameters

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Saturdays	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C) and Turbidity (NTU)	- R5, Main Reservoir 0.5 Km Upstream Main Dam; - NNG05, Nam Ngiep Downstream the Re-regulation Dam at Ban Hat Gniun.
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	- NPH01, Lower Nam Phouan; - R1, Main Reservoir 50 Km Upstream Main Dam; - R2, Main Reservoir 35 Km Upstream Main Dam; - R3, Main Reservoir 21 Km Upstream Main Dam; - R4, Main Reservoir 13 Km Upstream Main Dam;

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS (mg/l), BOD_5 (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	- R5, Main Reservoir 0.5 Km Upstream Main Dam; - R6, Re-regulation Reservoir; - R7, Re-regulation Reservoir 0.3 km Upstream the Re-Regulation Dam; - NNG05, Nam Ngiep Downstream the Re-regulation Dam at Hat Gniun Village.
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)	All stations
Quarterly	total phosphorus (mg/l), total dissolved phosphorus (mg/l), phytoplankton biomass (g dry weight/m^3), TOC (mg/l)	All stations

Figure 4-8: Surface water quality monitoring locations

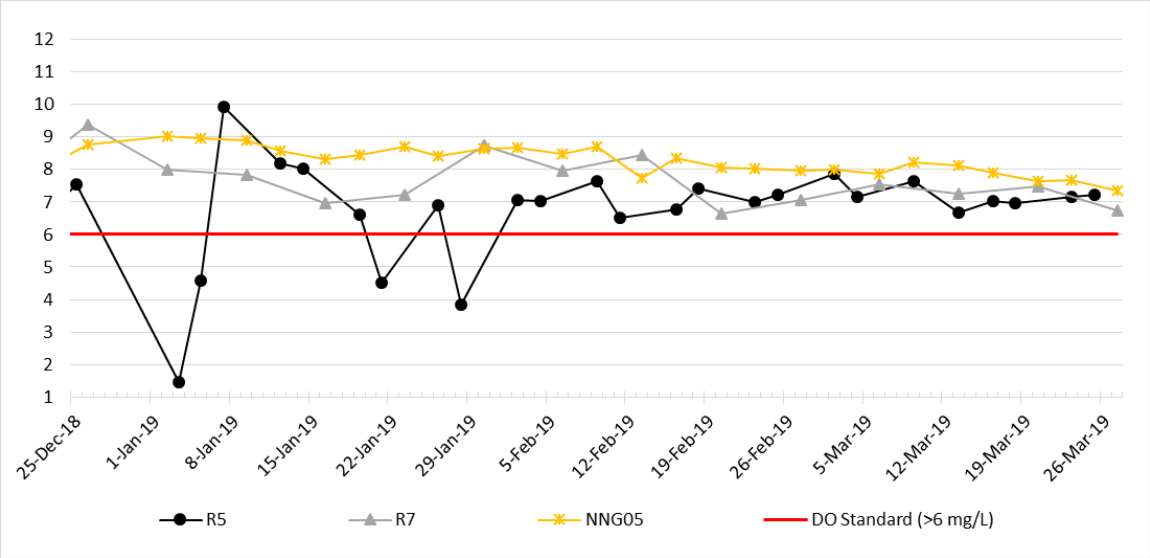


Descriptions of each monitoring station and surface water quality monitoring parameters can be found in ***Appendix 3*** and all surface water quality data for Q1 2019 are listed in ***Appendix 5.1***

Dissolved Oxygen (DO)

The results of dissolved oxygen measurements for the stations immediately upstream and downstream the Project are presented in the line graph in ***FIGURE 4-9,*** and the full set of surface water data are shown in ***TABLE 4-8.***

Figure 4-9: Dissolved Oxygen of surface water immediately Upstream and Downstream the Project



During Q1 2019, the concentration of dissolved oxygen (DO) in the surface level (0.2 m) at R5 (Main Reservoir, illustrated in Figure 4-6) which is located immediately upstream of the main dam, was generally between 6.5 mg/L and 9.9 mg/L, however, there were 3 occasions in January 2019 with significantly lower DO ranging from 1.5 mg/L to 4.5 mg/L.

The DO concentrations in the re-regulation reservoir (R6 and R7) and in the downstream stations (Nam Ngiep [NNG05, NNG06, NNG07 and NNG08], Nam Xao [NXA01], and Nam Houay Soup [NHS01]) have remained above 6 mg/L and within normal (pre-impounding) ranges. All discharges from the main dam went through the spillways and therefore drew water from the upper usually well-oxygenated water layer and the water was further aerated as it plunged into the re-regulation reservoir.

In addition, the Nam Ngiep Upstream station [NNG01], Nam Chian [NCH01], Nam Phouan [NPH01] and Main Reservoir [R1-R4] were above 6 mg/L, except at R2 for a few occasions in January and February, R3 (on 03 and 29 January 2019), and R4 (on 03 and 28 January 2019).

The depth profile monitoring indicates formation of oxyclines in the main reservoir (R2-R5, except R1) at depths between 2.5 m and 19.0 m. There are no indications of neither an oxycline nor a thermocline in R6 and R7 in the re-regulation reservoir.

The DO depth profile in the main reservoir and in the re-regulation reservoir in Q1 2019 is summarized in ***FIGURE 4-11***.

Figure 4-10: Main Reservoir Dissolved Oxygen at the end of Q1 2019

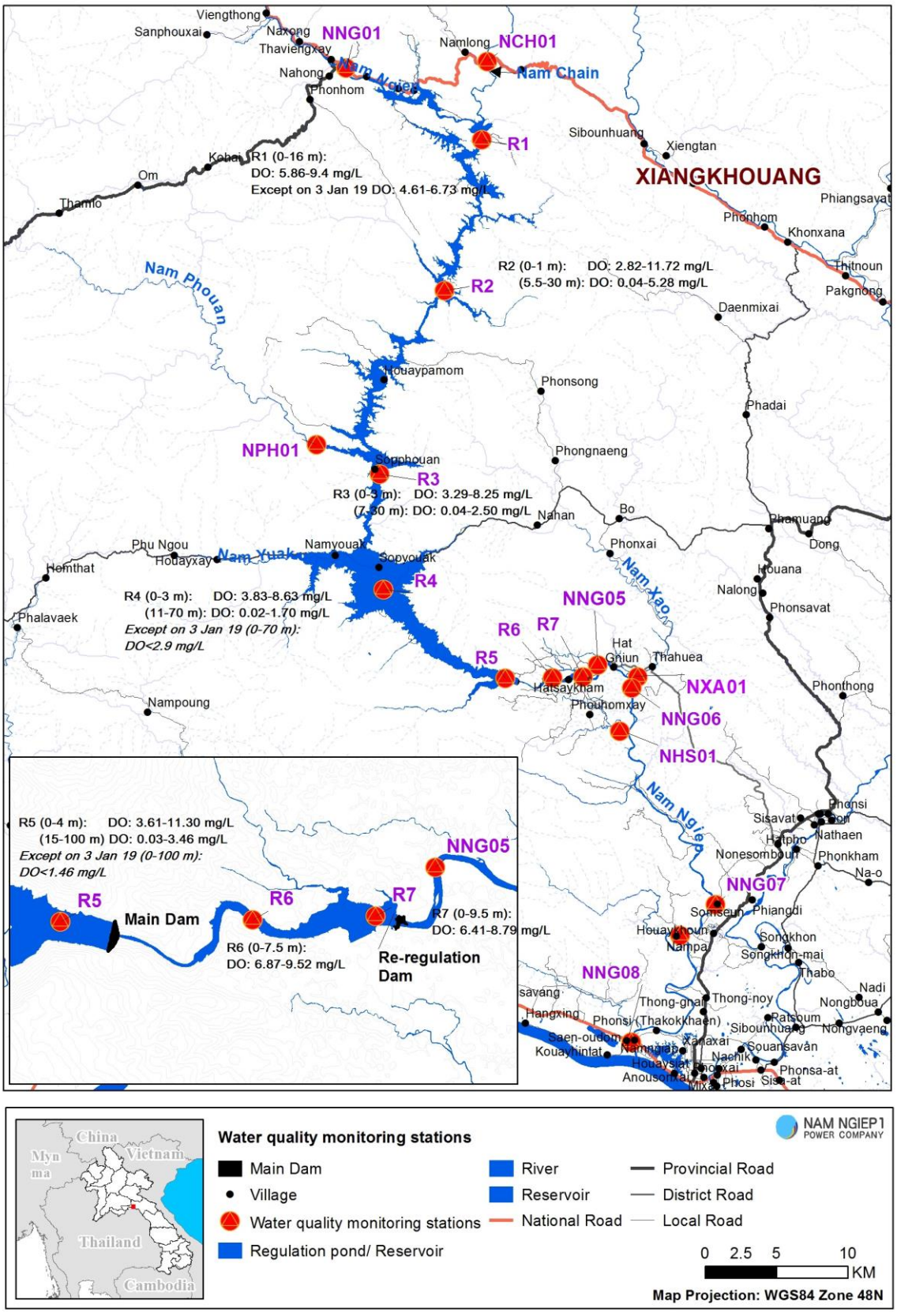
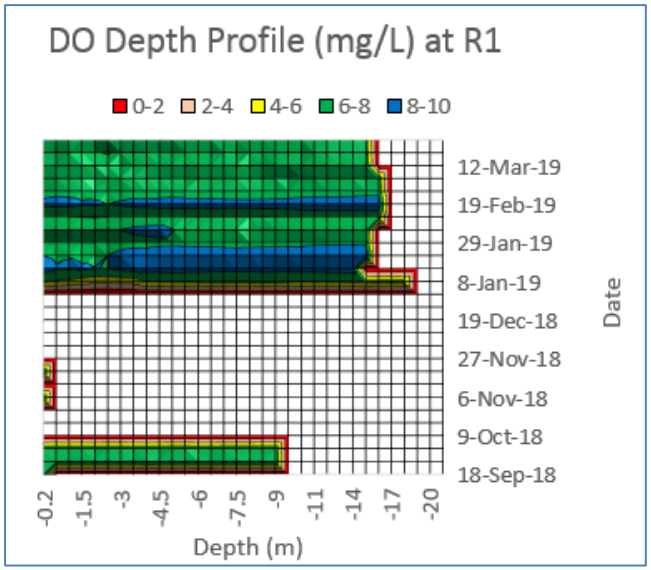
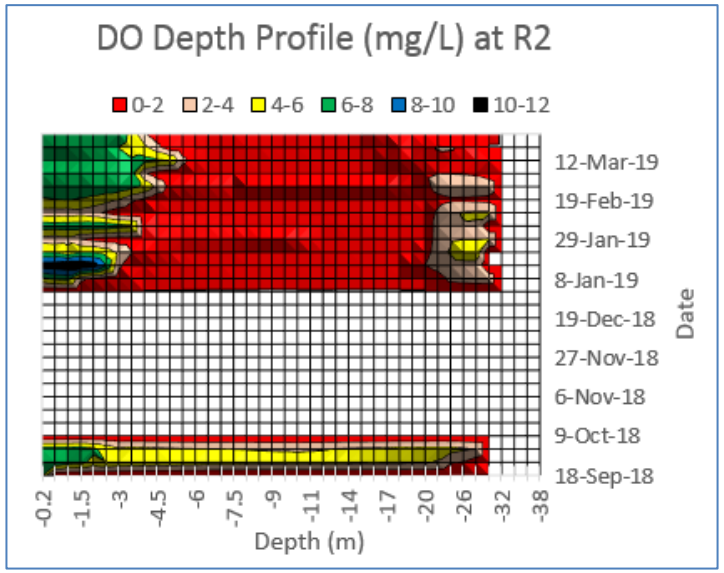
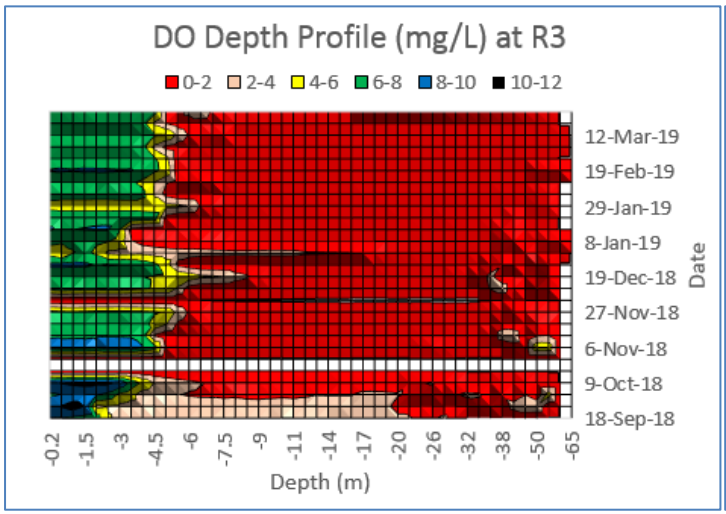
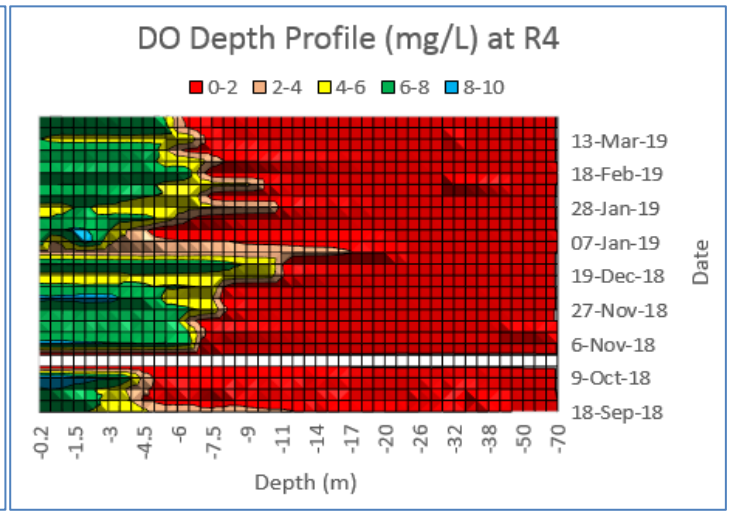


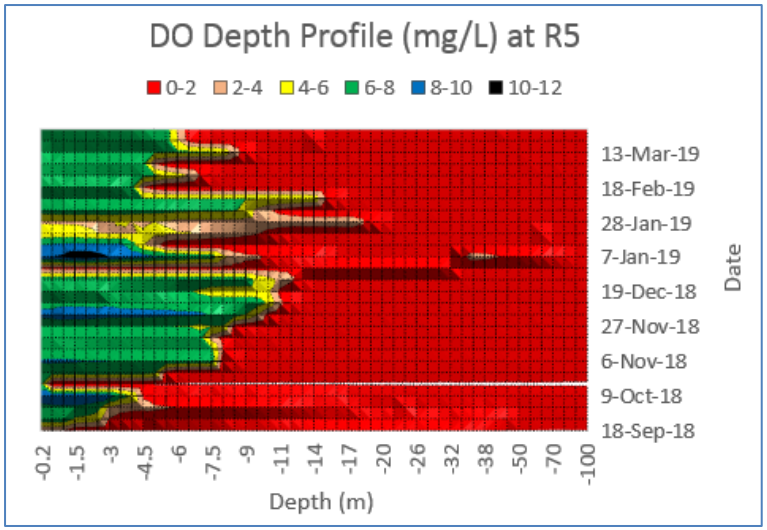
Figure 4-11: Dissolved Oxygen – depth profile in the main reservoir and Re-regulation Reservoir

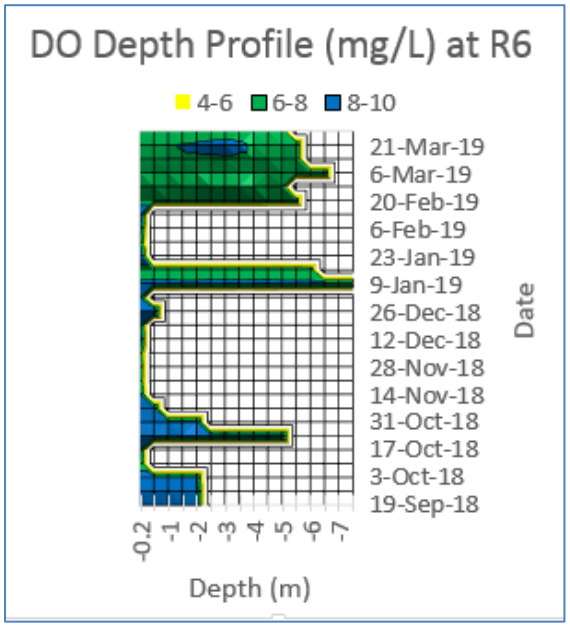









DO Depth Profile (mg/L) at R5
0-2
2-4
4-6
6-8
8-10
10-12
13-Mar-19
18-Feb-19
28-Jan-19
7-Jan-19
19-Dec-18
27-Nov-18
6-Nov-18
9-Oct-18
18-Sep-18
Date
-0.2
-1.5
-3
-4.5
-6
-7.5
-9
-11
-14
-17
-20
-26
-32
-38
-50
-70
-100
Depth (m)


DO Depth Profile (mg/L) at R6
4-6
6-8
8-10
21-Mar-19
6-Mar-19
20-Feb-19
6-Feb-19
23-Jan-19
9-Jan-19
26-Dec-18
12-Dec-18
28-Nov-18
14-Nov-18
31-Oct-18
17-Oct-18
3-Oct-18
19-Sep-18
Date
-0.2
-1
-2
-3
-4
-5
-6
-7
Depth (m)

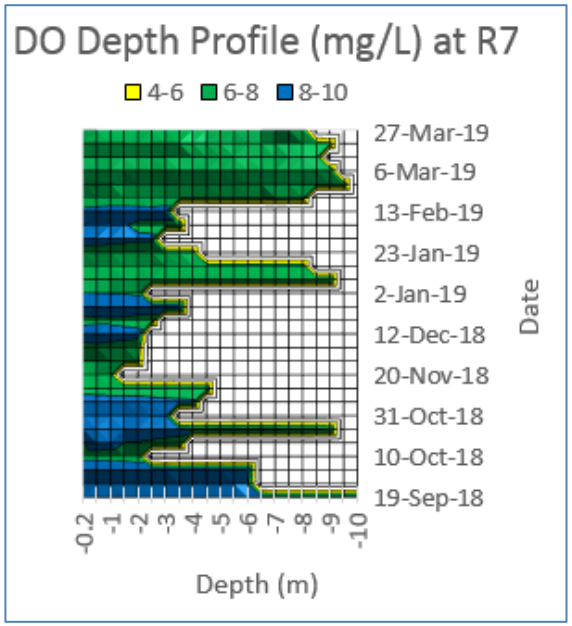

DO Depth Profile (mg/L) at R7
4-6
6-8
8-10
27-Mar-19
6-Mar-19
13-Feb-19
23-Jan-19
2-Jan-19
12-Dec-18
20-Nov-18
31-Oct-18
10-Oct-18
19-Sep-18
Date
-0.2
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
Depth (m)

Table 4-8: DO Results of surface water in the Main Reservoir, Re-regulation reservoir, Nam Ngiep and its main tributaries monitored from January to March 2019

Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
2-Jan-19							8.13	8	9.04	9.06	8.39	7.92			8.45	7.07
3-Jan-19				5	2.9	1.5								8.52		
5-Jan-19						4.6			8.98							
7-Jan-19					7.5	9.9										
8-Jan-19		6.39	5.38	6.5										7.94		
9-Jan-19							8.22	7.84	8.89	8.9	8.6	8.19			8.59	8.53
12-Jan-19						8.2			8.57							
14-Jan-19					7.3	8										
15-Jan-19	8.55	8.97	11.06	8.1									8.37	9.25		
16-Jan-19							7.24	6.96	8.32	8.21	7.82	7.37			7.31	6.84
19-Jan-19						6.6			8.46							
21-Jan-19					6.1	4.5										
22-Jan-19		8.01	5.91	7.6										9.95		
23-Jan-19							9.37	7.23	8.71	8.54	8.02	7.76			7.55	8.54
26-Jan-19						6.9			8.42							
28-Jan-19					5.3	3.8										
29-Jan-19		6.47	3.05	5										8.56		
30-Jan-19							7.82	8.74	8.65	8.51	7.55	7.61			7.77	8.13
30-Jan-19							7.82	8.74	8.65	8.51	7.55	7.61			7.77	8.13

Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
2-Feb-19						7.1			8.69							
4-Feb-19					7.4	7										
5-Feb-19	8.37	7.66	7.09	7.1									8.81	9.06		
6-Feb-19							8.63	7.98	8.49	7.75	7.97	7.99			7.2	7.82
9-Feb-19						7.7			8.72							
11-Feb-19					6.2	6.5										
12-Feb-19		6.16	2.94	6.9										8.9		
13-Feb-19							9.52	8.44	7.75	7.33	7.63	7.82			6.72	7.06
16-Feb-19						6.8			8.36							
18-Feb-19					7.4	7.4										
19-Feb-19	8.22	8.35	5.78	8.1									8.29	10.12		
20-Feb-19							7.19	6.65	8.06	8.14	7.79	7.32			6.71	6.09
23-Feb-19						7			8.04							
25-Feb-19					6.8	7.2										
26-Feb-19		7.5	6.93	7.2										8.21		
27-Feb-19							7.6	7.07	7.97	7.89	7.61	7.4			6.36	7.72
2-Mar-19						7.9			8							
4-Mar-19					7.1	7.2										
5-Mar-19	7.94	7.42	7.5	7.3									8.11	8.04		
6-Mar-19							7.69	7.55	7.87	7.82	7.58	7.58			6.8	6.37

Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
9-Mar-19						7.6			8.21							
12-Mar-19		7.56	6.00	6.3										8.13		
13-Mar-19					6.00	6.7	7.87	7.26	8.12	8.34	7.6	7.32			7.67	7.55
16-Mar-19						7			7.9							
18-Mar-19					7	7										
19-Mar-19	8.23												8.24			
20-Mar-19							7.73	7.49	7.64	7.36	7.34	7.14			6.33	6.16
21-Mar-19		7.15	6.58	6.9										7.76		
23-Mar-19						7.2			7.69							
25-Mar-19					7.7	7.2										
26-Mar-19		7.15	6.76	7.1										7.89		
27-Mar-19							6.87	6.73	7.35	7.16	7.17	7.01			6.44	7.33

Biochemical Oxygen Demand (BOD_5)

Since 2014, the Biochemical Oxygen Demand (BOD_5) levels in the Nam Ngiep River and its tributaries have generally been below the detection limit (< 1 mg/L) with only occasional minor exceedances of the National Surface Water Quality Standard of < 1.5 mg/L. The results for this quarter are within the normal ranges previously measured.

Table 4-9: BOD_5 results of surface water in the Reservoirs and in Nam Ngiep and its main tributaries in Q1 2019

Station Code	NNG 01	R1	R2	R3	R4	R5	R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
2-Jan-19							<1	<1	<1							
3-Jan-19						1.4										
7-Jan-19						1.1										
9-Jan-19							<1	<1	1.06							
14-Jan-19					<1	1.4										
15-Jan-19	<1	1.56	1.1	<1									<1	<1		
16-Jan-19							<1	<1	<1	<1	<1	<1			<1	<1
21-Jan-19						<1										
23-Jan-19							<1	<1	<1							
28-Jan-19						<1										
30-Jan-19							<1	<1	<1							
4-Feb-19					<1	1.5										
5-Feb-19	<1	1.1	<1	<1									<1	<1		
6-Feb-19							1.1	<1	1.08	1.13	1.1	1.12			1.01	1.1
11-Feb-19						<1										
13-Feb-19							<1	<1	<1							
18-Feb-19						<1										
20-Feb-19							<1	<1	<1							
4-Mar-19					<1.0	<1.0										
5-Mar-19	<1.0	1.09	<1.0	<1.0									<1.0	<1.0		
6-Mar-19							<1.0	1.28	<1	<1	<1	<1			<1	<1
13-Mar-19						<1.0	<1.0	<1.0	<1.0							
18-Mar-19						<1.0										
20-Mar-19							<1.0	1.2	1.26							

Chemical Oxygen Demand (COD)

The COD measurements in Q1 2019 are presented in ***Table 4-10***. The COD values are within normal ranges measured in January to March.

Table 4-10: COD results for surface water in Nam Ngiep and its main tributaries during Q1 2019

Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
14-Jan-19					<5.0	<5.0										
15-Jan-19	5.4	<5.0	<5.0	<5.0									<5.0	<5.0		
16-Jan-19							<5.0	<5.0	<5.0	<5.0	<5.0	<5.0			<5.0	<5.0
4-Feb-19					6.1	5.3										
5-Feb-19	6.6	11	5.3	10.4									<5.0	<5.0		
6-Feb-19							6.1	5.7	7.8	8.4	<5	6.9			11	6.1

Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
4-Mar-19					<5.0	<5.0										
5-Mar-19	<5	<5.0	<5.0	<5.0									<5.0	<5.0		
6-Mar-19							<5.0	<5.0	<5.0	<5.0	<5.0	<5.0			5.1	<5.0

Faecal Coliforms

The results of the faecal coliform analyses in Q1 of 2019 are presented in ***Table 4-11***. The concentration of faecal coliform bacteria was below the standard in all samples except two samples, one in R5 and one in Nam Houay Chain (NCH01, in upstream tributary).

Table 4-11: Results of faecal coliforms in the Reservoirs and in Nam Ngiep and its main tributaries in Q1 2019

Station Code	NNG 01	R1	R2	R3	R4	R5	R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
2-Jan-19							23	23	33							
3-Jan-19						23										
7-Jan-19						0										
9-Jan-19							12	7	2							
14-Jan-19					0	7										
15-Jan-19	920	33	79	130									1,400	130		
16-Jan-19							0	2	0	0	2	2			40	110
21-Jan-19						1,600										
23-Jan-19							7	5	17							
28-Jan-19						0										
30-Jan-19							0	0	49							
4-Feb-19					23	23										
5-Feb-19	130	34	240	33									240	22		
6-Feb-19							5	0	2	8	17	34			22	17
11-Feb-19						7										
13-Feb-19							4	2	0							
18-Feb-19						13										
20-Feb-19							2	5	14							
4-Mar-19					22	17										
5-Mar-19	540	7	8	13									110	47		
6-Mar-19							130	79	79	130	110	130			280	130
13-Mar-19						0	0	2	21							
18-Mar-19						5										
20-Mar-19							26	49	70							

Total Coliforms

The results of measurements for total coliform bacteria are presented in ***Table 4-12***. The results indicate a similar pattern and same tendency as for faecal coliform bacteria.

Table 4-12: Results of total coliforms in Nam Ngiep and its main tributaries from January to March 2019

Station Code	NNG 01	R1	R2	R3	R4	R5	R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
2-Jan-19							49	23	49							
3-Jan-19						23										
7-Jan-19						13										
9-Jan-19							130	130	170							
14-Jan-19					2	11										
15-Jan-19	920	33	79	130									1,400	130		
16-Jan-19							49	130	79	79	240	540			700	1,600
21-Jan-19						1,600										
23-Jan-19							7	5	17							
28-Jan-19						27										
30-Jan-19							33	22	110							
4-Feb-19					49	33										
5-Feb-19	540	130	350	33									240	79		
6-Feb-19							8	0	13	26	49	350			79	110
11-Feb-19						7										
13-Feb-19							17	14	49							
18-Feb-19						22										
20-Feb-19							17	22	130							
4-Mar-19					79	27										
5-Mar-19	1,600	22	17	21									170	280		
6-Mar-19							130	79	240	350	350	350			920	350
13-Mar-19						23	8	17	350							
18-Mar-19						8										
20-Mar-19							140	110	140							

4.6.2 Compliance Monitoring of Effluents from Camps

A total of 12 camps including OSOV were in use during Q1 2019, however effluents were only sampled from 9 camps, because the Wastewater Treatment System (WWTS) at the Sino Hydro Camp (EF06), TCM Camp (EF03), Kenber Camp (EF16) and Lilama10 Camp (EF17) had no discharge due to small number of workers and/or ongoing decommissioning – see ***FIGURE 4-12*** for the effluent monitoring locations.

The results are described in ***Table 4-13*** and the full data set is in ***Appendix 5.2***.

The status of compliance as of 31 March 2019 can be summarised as follows:

- Non-compliance with total coliform bacteria for five camps (EF01, EF02, EF07, EF09 and EF18) and;
- All the camps have experienced varied degree of non-compliance with ammonia and total nitrogen;

Figure 4-12: Map of effluent monitoring locations during Q1 2019

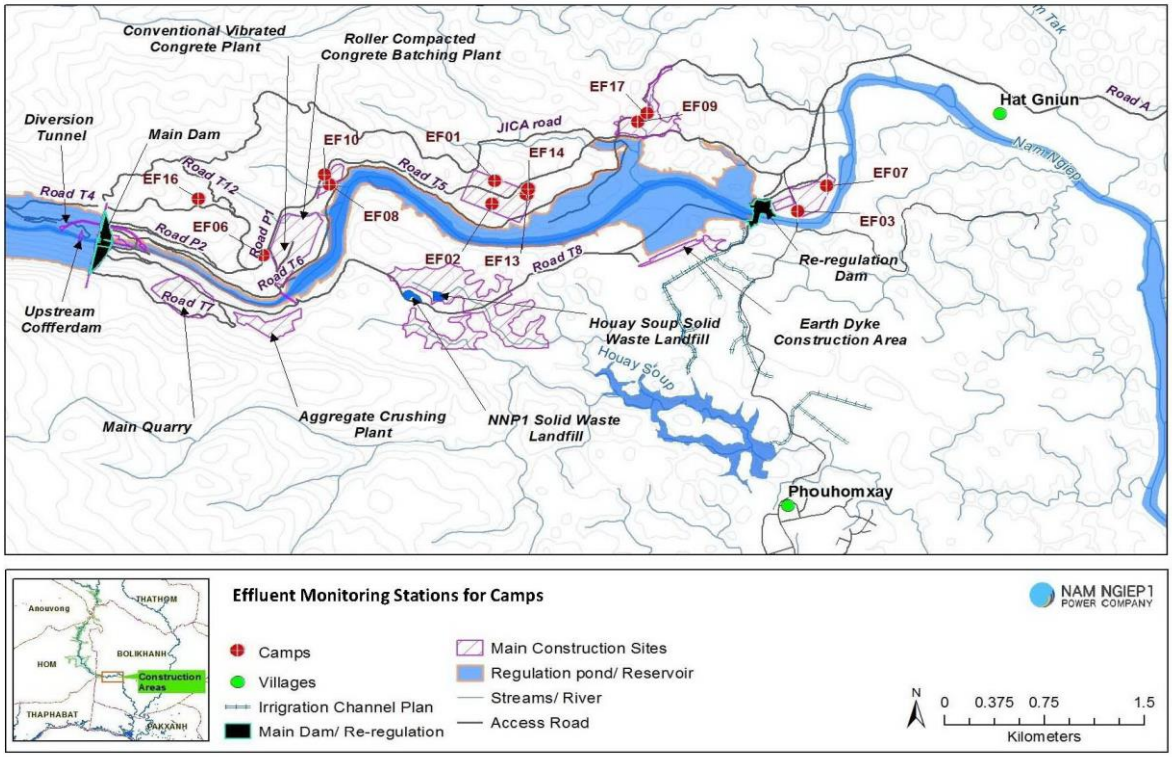


Table 4-13: Results of the effluent monitoring of the remaining camps from January to March 2019

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
11-Jan-19	TSS (mg/l)	<50	7.37	11.03	33.75	<5	27.7	8.33	24.83	19.34	81.93
22-Jan-19	TSS (mg/l)	<50	<5	5.21	7.14		26.67	2.54	25	16.02	11.73
01-Feb-19	TSS (mg/l)	<50	<5	7.29	6.92		42.52	11.11	34.75	43.75	<5
15-Feb-19	TSS (mg/l)	<50	<5	6.25	7.35			15.33	18.18	10.41	9.13
01-Mar-19	TSS (mg/l)	<50	<5	6.79	13.49		58.67	16.3	52.03	14.44	41.41
15-Mar-19	TSS (mg/l)	<50	<5	5.77	8.13		40.47	25.89	21.11	14.73	10.24
11-Jan-19	BOD_5 (mg/l)	<30	57.52	<6	<6	13.98	<6	<6	<6	<6	124.27
22-Jan-19	BOD_5 (mg/l)	<30	12.72	<6	<6		12.06	7.8	<6	<6	22.08
01-Feb-19	BOD_5 (mg/l)	<30	<6	<6	<6		<6	7.2	<6	21.6	<6
15-Feb-19	BOD_5 (mg/l)	<30	45.55	<6	69.56			9.63	95.7	<6	15.78
01-Mar-19	BOD_5 (mg/l)	<30	<6	<6	<6		45.66	7.77	<6	<6	46.44
15-Mar-19	BOD_5 (mg/l)	<30	<6	<6	<6		<6	<6	<6	<6	<6
11-Jan-19	COD (mg/l)	<125	48.7	40.8	55.3	36.3	65.8	27.2	180	156	248
22-Jan-19	COD (mg/l)	<125	37	34.5	53.3		140	<25	144	122	41.8
01-Feb-19	COD (mg/l)	<125	<25	39.5	64.1		99.8	31.3	143	154	<25
15-Feb-19	COD (mg/l)	<125	<25	30.8	54.9			30.8	155	35.4	29.4
01-Mar-19	COD (mg/l)	<125	<25	31.3	40.6		252	34.3	198	37.3	210
15-Mar-19	COD (mg/l)	<125	<25	31.3	49.8		196	49.3	135	45.3	53.4
11-Jan-19	NH_3-N (mg/l)	<10	19	15.4	21.6	22.2	42.1	6	13.5	4.3	12
22-Jan-19	NH_3-N (mg/l)	<10	20.7	15	20.7		51.8	6.2	24.9	9.1	6.4
01-Feb-19	NH_3-N (mg/l)	<10	16.5	13.4	21.7		28.8	6.5	21.8	<0.2	<0.2
15-Feb-19	NH_3-N (mg/l)	<10	18.5	13.3	19.9			3	24	10.6	1.6
01-Mar-19	NH_3-N (mg/l)	<10	16.4	13.8	13.8		50.4	4.5	7.2	5.2	19.4
15-Mar-19	NH_3-N (mg/l)	<10	10.5	16	18.6		59.2	2.1	22.2	19.6	4.2
11-Jan-19	Total Nitrogen (mg/l)	<10	19.9	15.9	22.4	23.1	45.8	19.3	14	4.74	12.6
22-Jan-19	Total Nitrogen (mg/l)	<10	25.7	16.4	21.5		53.2	8.52	25.6	13	7

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
01-Feb-19	Total Nitrogen (mg/l)	<10	17.1	16.1	23.5		30.4	8.37	27.4	0.64	0.7
15-Feb-19	Total Nitrogen (mg/l)	<10	19.3	14.1	21.1			8.1	25	12.7	4.96
01-Mar-19	Total Nitrogen (mg/l)	<10	17.7	14.9	15.3		51.5	5.05	13.5	19.3	20.6
15-Mar-19	Total Nitrogen (mg/l)	<10	17	20.1	20.6		61.1	3.31	23.4	24	7.26
11-Jan-19	Faecal Coliform (MPN/100 ml)	<400	16,000	0	0	0	0	0	0	0	35,000
22-Jan-19	Faecal Coliform (MPN/100 ml)	<400	160,000	0	0		33	130	0	0	160,000
01-Feb-19	Faecal Coliform (MPN/100 ml)	<400	220	0	0		0	11	0	0	0
15-Feb-19	Faecal Coliform (MPN/100 ml)	<400	33	0	1,600			0	0	0	0
01-Mar-19	Faecal Coliform (MPN/100 ml)	<400	2200	0	0		920	0	0	0	0
15-Mar-19	Faecal Coliform (MPN/100 ml)	<400	47	1,600	7.8		0	0	0	0	0
11-Jan-19	Total Coliform (MPN/100 ml)	<400	16,000	0	0	17	0	0	0	0	35,000
22-Jan-19	Total Coliform (MPN/100 ml)	<400	160,000	0	0		33	130	0	0	160,000
01-Feb-19	Total Coliform (MPN/100 ml)	<400	1,600	0	2		0	220	0	0	0
15-Feb-19	Total Coliform (MPN/100 ml)	<400	170	0	2,200			0	0	0	6.8
01-Mar-19	Total Coliform (MPN/100 ml)	<400	2,200	0	0		920	0	0	0	0
15-Mar-19	Total Coliform (MPN/100 ml)	<400	350	1,600	130		0	2	0	0	0
11-Jan-19	Oil & Grease (mg/l)	<10	<1	<1	<1	<1	<1	<1	5	9	<1
22-Jan-19	Oil & Grease (mg/l)	<10									
01-Feb-19	Oil & Grease (mg/l)	<10	<1	<1	<1		<1	<1	11	9	<1
15-Feb-19	Oil & Grease (mg/l)	<10									
01-Mar-19	Oil & Grease (mg/l)	<10	<1	<1	<1		5	<1	11	<1	6
15-Mar-19	Oil & Grease (mg/l)	<10									
11-Jan-19	Residual Chlorine (mg/l)	<1.0		0.47	0.39	0.17	1.47	0.33	0.99	0.45	0.03
22-Jan-19	Residual Chlorine (mg/l)	<1.0		0.74	0.55		0.19	0.07	1.07	1.56	0.01
01-Feb-19	Residual Chlorine (mg/l)	<1.0		0.38	0.32		1.89	0.08	0.75	1.65	1.95
15-Feb-19	Residual Chlorine (mg/l)	<1.0		0.75	0.08			0.29	1.13	1.08	0.32
01-Mar-19	Residual Chlorine (mg/l)	<1.0		0.17	0.81		0.47	0.1	0.98	0.91	0.17
15-Mar-19	Residual Chlorine (mg/l)	<1.0		0.45	0.36		0.99	0.51	1.31	1.52	0.51

Table 4-14: Compliance status of effluent discharge from the camps in Q1 2019

Site	ID	WWTS	Key Non-Compliance Issues in Q1 2019	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	- BOD_5 (<30 mg/L): Non-compliance in 2 out of 6. Q1 mean 20.52 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Q1 mean 19.45 mg/L. - Ammonia (<10 mg/L): Non-compliance in 6 out of 6. Q1 mean 16.93 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 3 out of 6. Q1 mean 29,750 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 4 out of 6. Q1 mean 30,053 MPN/100 mL.	- EMO continues to monitor, share effluent monitoring results with the Admin team for their WWTS improvement and implementation of the corrective action. - The NNP1PC Admin started improving the WWTS in late November 2018 and completed the work in February 2019.
OC Camp – WWTS01	EF02	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Q1 mean 14.48 mg/L. - Total nitrogen (<10 mg/L): Q1 mean 16.25 mg/L. - Faecal coliform and total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 6. Q1 mean 266.67 MPN/100 mL.	- EMO continues to monitor, and share effluent monitoring results with the Contractor.
TCM Camp	EF03	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)		- There was no discharge of wastewater for sampling during Q1 2019. - Note: this facility was handed over to GFE subcontractor who will stay for another year (the property handing over paper is available).

Site	ID	WWTS	Key Non-Compliance Issues in Q1 2019	Corrective Actions
Zhefu Camp (HMH Worker Camp No.1)	EF09	Septic tank (kitchen and black water), sediment ponds (grey water)	- TSS (<50 mg/L): Non-compliance in 1 out of 5. Q1 mean 39.21 mg/L. - BOD_5 (<30 mg/L): Non-compliance in 1 out of 5. Q1 mean 13.01 mg/L. - COD (<125 mg/L): Non-compliance in 3 out of 5. Q1 mean 150.72 mg/L. - Ammonia-nitrogen (<10 mg/L): Non-compliance in 5 out of 5. Q1 mean 46.46 mg/L. - Total nitrogen (<10 mg/L): Q1 mean 48.4 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 1 out of 1. Q1 mean 190 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 5. Q1 mean 190 MPN/100 mL.	-
V&K Camp	EF10	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Total nitrogen (<10 mg/L): Non-compliance in 1 out of 6. Q1 mean 8.87 mg/L.	- As above
HMH Main Camp – WWTS01	EF13	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- TSS (<50 mg/L): Non-compliance in 1 out of 6. Q1 means 29.32 mg/L. - BOD_5 (<30 mg/L): Non-compliance in 1 out of 6. Q1 mean 18.44 mg/L. - COD (<125 mg/L): Non-compliance in 6 out of 6. Q1 mean 159.17 mg/L. - Ammonia (<10 mgL): Non-compliance in 5 out of 6. Q1 mean 18.93 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Q1 mean 21.48 mg/L. - Oil and grease (<10 mg/L): Non-compliance in 2 out of 3. Q1 mean 9 mg/L.	

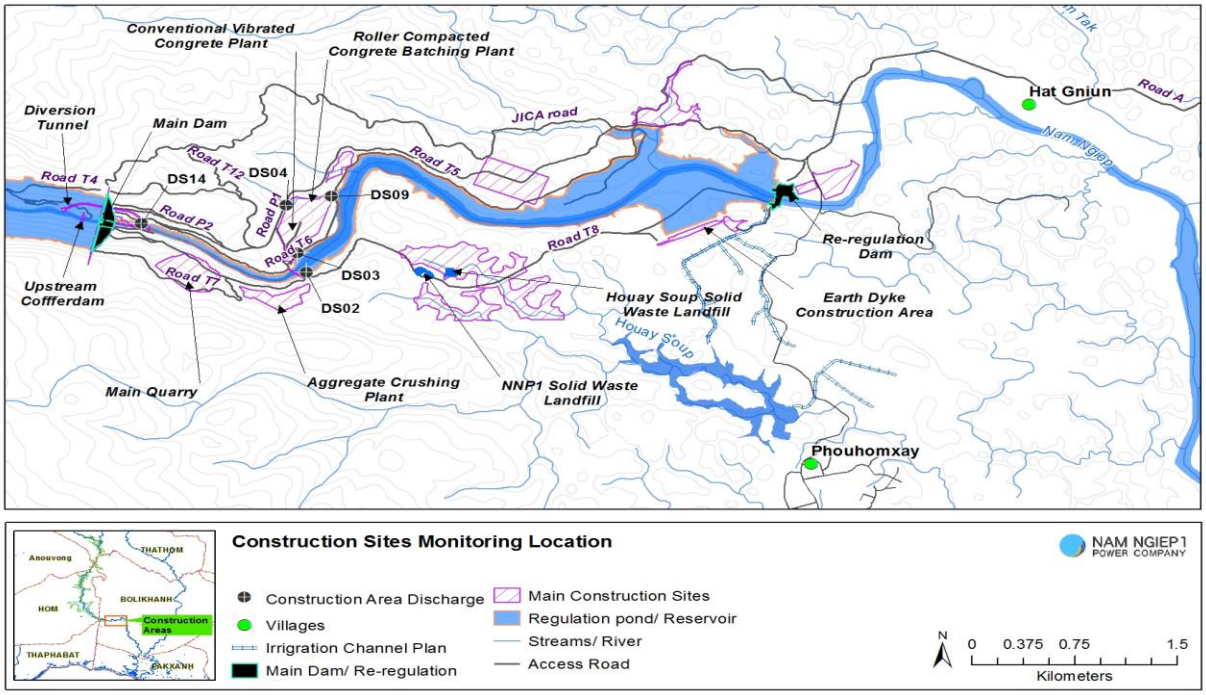
Site	ID	WWTS	Key Non-Compliance Issues in Q1 2019	Corrective Actions
IHI Camp	EF14	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- COD (<125 mg/L): Non-compliance in 2 out of 6. Q1 mean 91.67 mg/L. - Ammonia (<10 mg/L): Non-compliance in 2 out of 6. Q1 mean 9.67 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 4 out of 6. Q1 mean 12.40 mg/L.	- As above
Song Da5 Camp No. 1	EF07	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Q1 mean 19.38 mg/L. - Total nitrogen (<10 mg/L): Q1 mean 20.73 mg/L. - BOD_5 (<30 mg/L): Non-compliance in 1 out of 6. Q1 mean 13.64 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 1 out of 6. Q1 mean 267.97 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 6. Q1 mean 388.67 MPN/100 mL.	-
Song Da5 Camp No. 2	EF08	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Non-compliance in 1 out of 1. Q1 mean 22.2 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 1 out of 1. Q1 mean 23.1 mg/L.	
Lilama10 Camp	EF17	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- No discharge from the wetland.	- EMO will continue monitoring and taking water samples once the wastewater reaches the chlorination tank.
IHI Field Shop 276 Camp	EF18	Septic tanks (kitchen and black water) with chlorination system (grey water)	- TSS (<50 mg/L): Non-compliance in 1 out of 6. Q1 mean 26.11 mg/L. - BOD_5 (<30 mg/L): Non-compliance in 2 out of 6. Q1 mean 35.58 mg/L.	

Site	ID	WWTS	Key Non-Compliance Issues in Q1 2019	Corrective Actions
			- COD (<125 mg/L): Non-compliance in 2 out of 6. Q1 mean 97.93 mg/L. - Ammonia (<10 mg/L): Non-compliance in 2 out of 6. Q1 mean 8.72 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 2 out of 6. Q1 mean 8.85 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 2 out of 6. Q1 mean 32,500 MPN/100mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 2 out of 6. Q1 mean 32,501 MPN/100 mL.	

4.6.3 Compliance Monitoring of Discharges from Construction Sites

Discharges from the key construction sites (see ***Figure 4-13***) were monitored during the reported period. The results are presented in ***Table 4-15*** Results that are above the prescribed standards are highlighted in yellow. The full set of data is in ***Appendix 5.3***.

Figure 4-13 Location of Discharge Points of Key Construction Sites



Following the completion of the RCC placement work at the main dam on 29 April 2018, the production of aggregate and RCC has stopped resulting in no discharge of water from the sedimentation ponds of the Aggregate Crushing Plant and the RCC Plant. These monitoring points will be discontinued from the next quarter.

Table 4-15: Results of the construction area discharge monitoring in Q1 2019

Date	Parameter (Unit)	Site Name (Code)	Spoil Disposal Area No.2 (DS04)	Aggregate Crushing Plant (DS02)	RCC Plant (DS09)	Main Dam Construction Area Treatment No.3 (DS14)
		Effluent Standard				
03-Jan-19	TSS (mg/l)	<50	3.05	These sites were decommissioned.		
07-Jan-19	TSS (mg/l)	<50	7.71			
16-Jan-19	TSS (mg/l)	<50	7.77			
22-Jan-19	TSS (mg/l)	<50	3.63			
30-Jan-19	TSS (mg/l)	<50	4.44			
07-Feb-19	TSS (mg/l)	<50	3.48			
13-Feb-19	TSS (mg/l)	<50				
21-Feb-19	TSS (mg/l)	<50	126.68*			
27-Feb-19	TSS (mg/l)	<50	5.16			
07-Mar-19	TSS (mg/l)	<50				
14-Mar-19	TSS (mg/l)	<50				
20-Mar-19	TSS (mg/l)	<50	20.28			
28-Mar-19	TSS (mg/l)	<50	18.14			

Note: *The water sampling was carried out just after the rain event.

Table 4-16: Compliance status of effluent discharge and corrective action during the Q1 2019

Site	ID	Treatment System	Key Non-Compliance Issues in Q2-2018	Corrective Actions
Aggregate Crushing Plant	DS02	Sediment ponds		- This site was decommissioned.
CVC Plant	DS03	Sediment ponds	- No discharge during Q1 2019	
Spoil Disposal Area No.2	DS04	Sediment pond	- TSS (<50 mg/L): Q1 mean 20 mg/L. Non-compliance in 1 out of 10 measurements.	
RCC Plant (at the lower ponds)	DS09	Sediment ponds		- This site was decommissioned.
Main Dam Construction Area (treatment plant no.3)	DS14	pH adjustment and chemical flocculation		- This site was decommissioned.

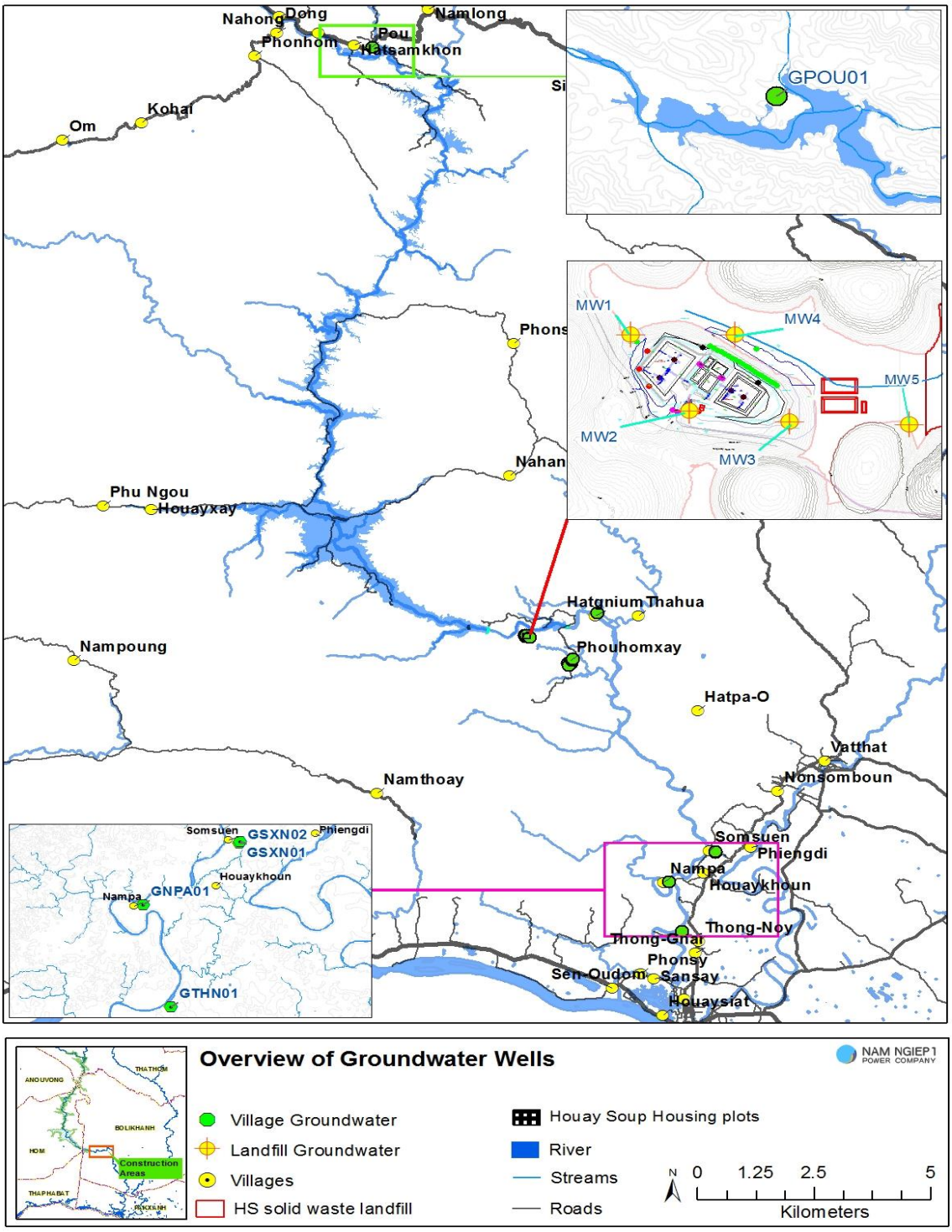
4.6.4 Groundwater Quality Monitoring

During Q1 2019, the community groundwater monitoring was carried out for four boreholes located at Somseun, Nam Pa, Thong Noy and Pou Villages (one borehole each) on a monthly basis for 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).

In addition, landfill groundwater samples were taken at NNP1 Solid Waste Landfill (4 wells) and Houay Soup Landfill (1 well) on a quarterly basis.

All groundwater sampling locations are displayed in ***Figure 4-14*** and the groundwater monitoring data is presented in ***Appendix 5.4 and Appendix 5.7***

Figure 4-14: Groundwater Sampling Locations



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

Somsuen Village: All monitored parameters complied with the standard except for faecal coliform and E.Coli bacteria in the March 2019 sample.

Pou village: All monitored parameters complied with the standard except for faecal coliform for March 2019 sample.

Nam Pa Village: All monitored parameters complied with the standard except for faecal coliform and E.Coli bacteria for the January 2019 sample.

Thong Noy Village: All monitored parameters complied with the standard except for faecal coliform and E.Coli bacteria for the January and March 2019 samples.

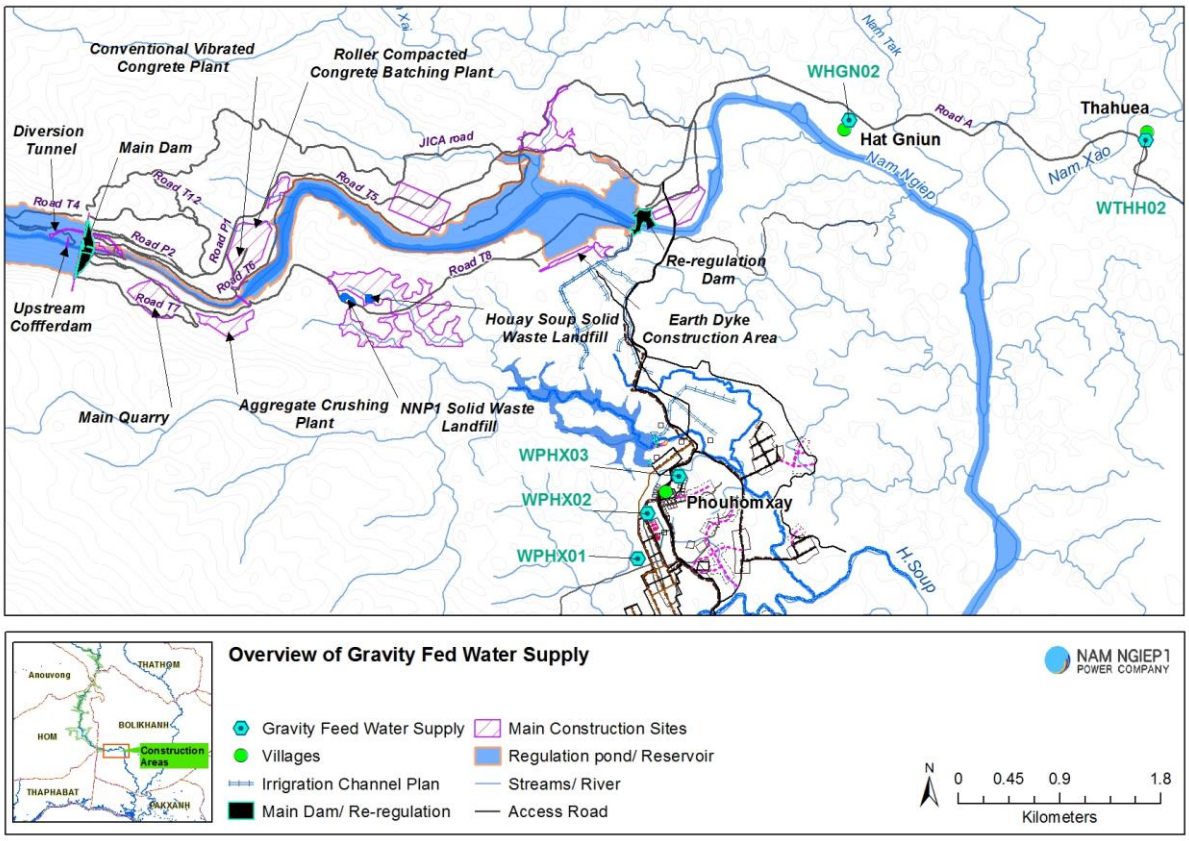
The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be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

NNP1 Solid Waste Landfill and Houay Soup Solid Waste Landfill: All monitored parameters complied with the standard except for lead in MW1, MW3, MW4 and MW5. Similar elevated levels of lead have been detected in all monitoring wells from time to time since they were established in July 2016 and it is assessed that these levels represent natural background levels.

4.6.5 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, Thahuea and Phouhomxay villages. The use of gravity fed water supply at Phouhomxay Village was commenced in December 2017.

Figure 4-15: Overview of gravity fed water supply (GFWS) system



Water samples were taken from the taps for analysis during the reported period and selected results are shown in ***Table 4-17***. The full set of data is presented in ***Appendix 5.5***

Table 4-17*: The GFWS system monitoring result in Q1 2019*

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
24-Jan-19	Faecal Coliform (MPN/100 ml)	0	22	79	130	130	79
22-Feb-19	Faecal Coliform (MPN/100 ml)	0	49	22	33	33	49
11-Mar-19	Faecal Coliform (MPN/100 ml)	0	33	26	110	34	130
24-Jan-19	E.coli Bacteria (MPN/100 ml)	0	22	79	130	79	49
22-Feb-19	E.coli Bacteria (MPN/100 ml)	0	49	22	17	17	22
11-Mar-19	E.coli Bacteria (MPN/100 ml)	0	17	13	110	34	130

Thahuea Village (WTHH02): all parameters complied with the National Drinking Water Standards, except for faecal coliform and E.Coli bacteria.

Hat Gniun Village (WHGN02): all parameters complied with the National Drinking Water Standards, except the faecal coliform and E.Coli bacteria.

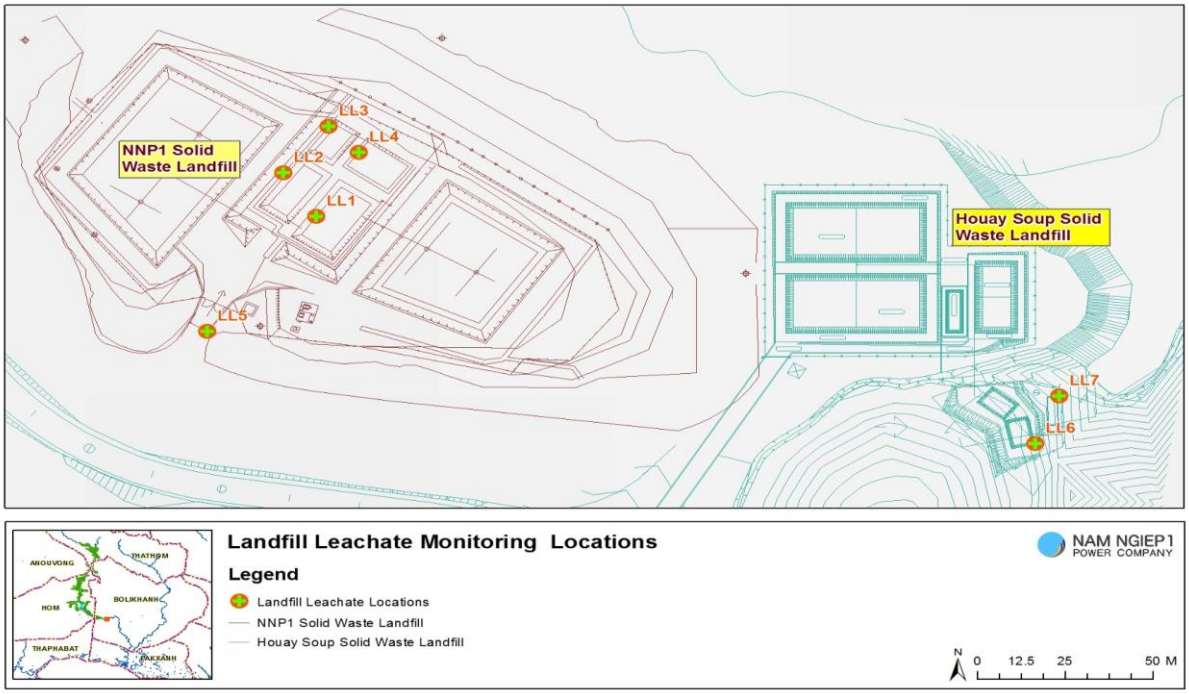
Phouhomxay Village: all parameters complied with the National Drinking Water Standards, except the faecal coliform and E.Coli bacteria.

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 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.

4.6.6 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 4-16***.

Figure 4-16: Landfill Leachate Monitoring Location



There is no water sampling from NNP1 Solid Waste Landfill and Houay Soup Solid Waste Landfill because there was no leachate in the pits of both landfills.

4.6.7 Air Quality (Dust) Monitoring

4.6.7.1 Ambient Air Quality in the Host Villages

The ambient air quality monitoring for dust (measured as PM_{10} – particulate matter with diameter of 10 micrometre or smaller) was carried out for 72 consecutive hours at Hat Gniun and Phouhomxay villages. The main purpose of the dust monitoring at Hat Gniun and Phouhomxay villages is to assess if the project construction works may have caused significant dust levels in the ambient air.

The monitoring stations are displayed in ***Figure 4-17*** and the results are summarized in ***Table 4-18.*** The measured concentrations of PM_{10} in the ambient air did not comply with the standard at Hat Gniun Village in March 2019**.** This exceedance of PM_{10} in Hat Gniun Village was caused from local slash and burn activities nearby. All other measurements complied with the ambient air quality standard.

Figure 4-17: Noise and dust monitoring locations at the construction sites and nearby villages

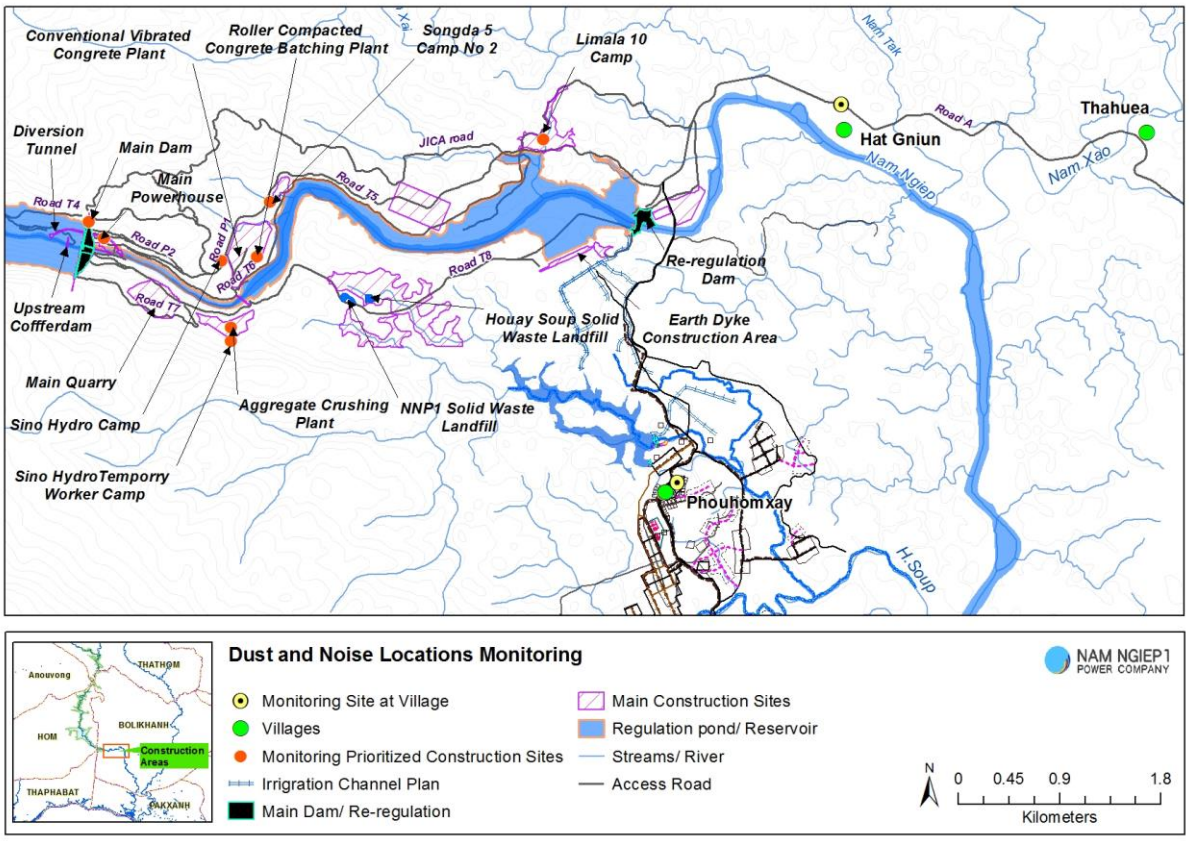


Table 4-18: Results of air Quality (dust) monitoring at the villages near the Project construction sites during January to March 2019

Site Name	**Hat Gniun Village**								
Start Time	07-Jan-19 18:00	08-Jan-19 18:01	09-Jan-19 18:01	04-Feb-19 18:00	05-Feb-19 18:00	06-Feb-19 18:00	11-Mar-19 18:00	12-Mar-19 18:00	13-Mar-19 18:00
End Time	08-Jan-19 18:00	09-Jan-19 18:00	10-Jan-19 18:00	05-Feb-19 18:00	06-Feb-19 18:00	07-Feb-19 18:00	12-Mar-19 18:00	13-Mar-19 18:00	14-Mar-19 18:00
Average Data Record - 24 hours	0.02	0.02	0.02	0.07	0.06	0.07	0.33	0.35	0.37
Guideline	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12

Site Name	**Phouhomxay Village**								
Start Time	14-Jan-19 18:00	15-Jan-19 18:01	16-Jan-19 18:02	11-Feb-19 18:00	12-Feb-19 18:00	13-Feb-19 18:00	18-Mar-19 18:00	19-Mar-19 18:00	20-Mar-19 18:00
End Time	15-Jan-19 18:00	16-Jan-19 18:01	17-Jan-19 18:00	12-Feb-19 18:00	13-Feb-19 18:00	14-Feb-19 18:00	19-Mar-19 18:00	20-Mar-19 18:00	21-Mar-19 18:00
Average Data Record - 24 hours	0.055	0.057	0.049	0.093	0.101	0.116	0.03	0.05	0.04
Guideline	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12

4.6.7.2 Project Construction Sites

During Q1 2019, dust (PM_{10}) monitoring was carried out monthly for periods of 24 consecutive hours at four priority construction sites and camps to assess possible impact on workers' health. The results summarized in ***Table 4-19*** indicate non-compliance with the standard (0.12 mg/m^3 PM_{10}) for all construction sites in March 2019 and at the main powerhouse in the February 2019 monitoring. These exceedances are likely caused by slash and burn activities on the hills surrounding the project sites.

Table 4-19: Dust monitoring results at the construction sites during January to March 2019

Site Name	**Main Dam**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	22-Jan-19 18:00	21-Feb-19 18:30	04-Mar-19 18:00
End Time	23-Jan-19 18:00	22-Feb-19 18:00	05-Mar-19 17:30
Average Data Record – 24 h	0.033	0.086	0.135
Guideline	0.12	0.12	0.12

Site Name	**Song Da 5 Camp No.2**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	02-Jan-19 18:00	20-Feb-19 18:00	25-Mar-19 18:00
End Time	03-Jan-19 18:00	21-Feb-19 18:00	26-Mar-19 18:00
Average Data Record - 24 h	0.012	0.081	0.130
Guideline	0.12	0.12	0.12

Site Name	**Lilama 10 Camp**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	30-Jan-19 18:00	18-Feb-19 18:00	14-Mar-19 18:30
End Time	31-Jan-19 18:00	19-Feb-19 18:00	15-Mar-19 18:00
Average Data Record – 24 h	0.047	0.082	0.339
Guideline	0.12	0.12	0.12

Site Name	**Main Powerhouse**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	28-Jan-19 18:00	25-Feb-19 18:00	26-03-19 18:30
End Time	29-Jan-19 18:00	26-Feb-19 18:00	27-03-19 18:00
Average Data Record -24h	0.056	0.136	0.163
Guideline	0.12	0.12	0.12

4.6.8 Noise Monitoring

4.6.8.1 Nearby Communities

Noise monitoring was carried out in Hat Gniun Village and Phouhomxay Village for 72 consecutive hours. The recorded values were measured against the standards, including maximum average noise levels for daytime during 06:00-18:00, evening time during 18:00-22:00 and night time during 22:00-06:00.

The results (see ***Table 4-20***) show that the noise levels at the villages were within the allowable maximum peak value at 115 dB(A), and one of the night-time average noise levels were slightly higher than the standard in Hat Gniun and Phouhomxay villages.

Table 4-20: Noise monitoring results at the host villages in Q1 2019

Hat Gnuin Village - Noise Monitoring 72 consecutive hours - January 2019									
Noise Level (dB)	**07-08/January/19**			**08-09/January/19**			**09-10/January/19**		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	60.00	55.80	62.00	56.90	45.50	60.90	56.00	57.90	60.10
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	38.10	32.89	39.61	37.86	34.41	40.99	37.15	36.41	38.78
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Hat Gnuin Village - Noise Monitoring 72 consecutive hours - February 2019									
Noise Level (dB)	**04-05/February/19**			**05-06/February/19**			**06-07/February/19**		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	61.60	47.00	67.10	62.40	53.40	65.90	56.20	53.80	71.20
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	38.60	35.52	38.58	39.07	37.49	40.61	38.16	36.92	38.96
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Hat Gnuin Village - Noise Monitoring 72 consecutive hours - March 2019									
Noise Level (dB)	**11-12/March/19**			**12-13/March/19**			**13-14/March/19**		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	68.70	58.80	70.20	56.20	60.50	67.10	56.80	55.40	65.70
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	49.19	47.19	44.20	42.66	40.88	42.60	44.51	43.07	41.99
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Phouhomxay Village - Noise Monitoring 72 consecutive hours - January 2019									
Noise Level (dB)	**14-15/January/19**			**15-16/January/19**			**16-17/January/19**		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	70.70	49.90	62.00	49.90	46.10	66.90	62.00	6.00	69.40
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	43.49	36.35	38.80	38.25	36.16	36.72	40.40	37.25	37.21
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Phouhomxay Village - Noise Monitoring 72 consecutive hours - February 2019									
Noise Level (dB)	**11-12/February/19**			**12-13/February/19**			**13-14/February/19**		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	59.70	58.70	75.70	67.20	50.20	70.70	56.70	6.00	76.10
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	46.36	44.92	43.06	40.44	38.46	39.83	39.54	38.36	38.71
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Phouhomxay Village - Noise Monitoring 72 consecutive hours - March 2019									
Noise Level (dB)	**18-19/March/19**			**19-20/March/19**			**20-21/March/19**		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	54.10	48.70	83.30	54.60	51.30	69.10	67.50	6.00	67.50
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	39.03	36.52	43.21	44.51	43.99	42.92	51.59	48.21	46.07
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

4.6.8.2 Project Camps and Construction Sites

During Q1 2019, noise monitoring was conducted at the Song Da5 Camp No.2, Lilama10 camp, Main Dam and Main Powerhouse to assess possible impacts on workers' health as well as to estimate any potential impact on the ambient noise levels in nearby communities.

The results show that all maximum peak noise levels were within the National Standard. However, Main Powerhouse (March 2019) was higher than the National standard. The elevated noise levels at the main powerhouse are most likely caused by the diving water discharged over the spillway. All staff were advised to wear ear mugs while working in these areas.

Table 4-21: Noise monitoring results for Project construction sites in Q1 2019

Site Name	Main Dam								
Noise Level (dB)	22-23/Jan/19		23/Jan/19	21-22/Feb/19		22/Feb/19	04-05/Mar/19		05/Mar/19
	18:00 – 22:00	22:01 – 06:00	06:01-18:00	18:30 – 22:00	22:01 – 06:00	06:01-18:00	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	53	52.8	60.5	60.1	65.2	65.3	57.3	57.4	60.3
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	50.90	50.97	48.69	51.23	53.83	49.43	54.20	54.66	51.49
Guideline Average	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***
Site Name	**Song Da5 Camp No.2**								
Noise Level (dB)	02-03/Jan/19		03/Jan/19	20-21/Feb/19		21/Feb/19	25-26/Mar/19		26/Mar/19
	18:00 – 22:00	22:01 – 06:00	06:01-18:00	18:00 – 22:00	22:01 – 06:00	06:01-18:00	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	57.30	56.90	58.30	48.4	67	67.3	61.2	61.6	81.5
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	38.32	35.53	33.94	36.52	41.77	35.82	44.91	41.60	42.94
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***
Site Name	**Lilama 10 Camp**								
Noise Level (dB)	30-31/Jan/19		31/Jan/19	18-19/Feb/19		19/Feb/19	14-15/Mar/19		15/Mar/19
	18:30 – 22:00	22:01 – 06:00	06:00-18:00	18:00 – 22:00	22:01 – 06:00	06:00-18:00	18:30 – 22:00	22:01 – 06:00	06:00-18:00
Maximum Value Recorded	44.6	78.3	59.3	59.3	56.1	72.4	55.2	54.6	62
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	38.10	38.56	34.33	44.85	42.40	40.03	40.13	36.99	41.06
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***
Site Name	**Main Powerhouse**								
Noise Level (dB)	**28-29/Jan/19**		**29/Jan/19**	**25-26/Feb/19**		**26/Feb/19**	**26-27/Mar/19**		**27/Mar/19**
	18:00 – 22:00	22:01 – 06:00	06:01-18:00	18:00 – 22:00	22:01 – 06:00	06:01-18:00	18:30 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	67.3	62.8	82	61.6	65.5	84.3	71.4	71.6	83.3
Guideline Max	*115*	*115*	*115*	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	56.76	59.94	57.70	59.90	59.80	62.64	70.67	70.67	69.43
Guideline Averaged	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***

4.6.9 Vibration

The construction work during Q1 2019 is unlikely to generate vibrations that would impact the human health and surrounded environment.

5 WATERSHED AND BIODIVERSITY MANAGEMENT

5.1 WATERSHED MANAGEMENT

5.1.1 Preparation of Watershed Management Plan

A revised version of the Watershed Management Plan (WMP) was submitted to ADB, IAP, and Biodiversity Advisory Committee (BAC) on 04 January 2019. ADB provided specific comments on 14 January 2019 about the GOL's Watershed Management Organisation structure requiring only one Watershed Management Committee and one secretariat office in Xaysomboun Province. NNP1PC-ESD management had an internal discussion and considered the ADB comments. NNP1PC discussed with the Director General (DG) of the Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF), on 22 January 2019. The DG of DOF clarified that it is necessary for each Province to have their own Committee and Secretariat to oversee the management of the watershed since they are in different administration boundaries and have their own Provincial Governors. In case that the arrangement with two different Committees and two Secretariats (WRPOs) turns out not to be suitable then this can be changed in due course with a Prime Minister Agreement but this is likely to be a long process. In Lao PDR, only Nam Theun 2 Hydropower Project that has such arrangement.

A revised version of the WMP was submitted to ADB, IAP and BAC on 22 January 2019 with revised organisation structure to have both WRPCs reported to the Vice-Minister of MAF. This structure was later agreed by the ADB but they suggested that the Committees of the WMP and Biodiversity Offset Management Programs are included in the same structure. The ADB confirmed the WMP approval on 23 January 2019 with the conditions that IAP and BAC also had no objection on the approval.

The IAP Biodiversity Specialist provided comments on 27 January 2019. The IAP comments are related to: 1) the confusion over the proposed organogram with the combined committees of watershed and biodiversity programs as suggested by ADB; 2) the need for further details on reservoir and fishery management activities that could be elaborated in the Annual Implementation Plan (AIP); and 3) the need to prepare an executive summary of a maximum of 20 pages for the easy reference by all parties including the GOL.

A BAC member provided his comments on 24 and 27 January 2019. His main comments are related to: 1) the clarity of the Service Provider's role; 2) the correction of the information in the baseline information sections particularly on the citation on the Biodiversity Baseline Survey in 2015; 3) the clarity on the proposed checkpoint operation; 4) the engagement of law enforcement officers in the patrolling program and; 5) and the clarity of livelihood development program.

Another revised version was submitted to ADB, IAP and BAC on 31 January 2019. Both IAP and BAC confirmed on the same date that they had no objections on the WMP approval by ADB and strongly recommended to focus on implementation including the readiness of a Biodiversity Service Provider (BSP).

NNP1PC continued improving the Lao version of the Plan in-house in February 2019. A final consultation workshop with GOL to discuss and endorse the final draft WMP was organized on 13 March 2019 at DOF, MAF in Vientiane Capital. The workshop was chaired by a Vice Minister of MAF and attended by 40 people consisting of representatives from the Watershed and Reservoir Protection Offices (WRPOs) and Watershed and Reservoir Protection Committees (WRPCs) as well as relevant Provincial Departments from Xaysomboun and Bolikhamxay Provinces, and central Government related Ministries including representatives from the Department of Water Resources (DWR) under the Ministry of Natural Resources and Environment (MoNRE).

The conclusions and agreements from the workshop are summarized as the following:

1. The meeting agreed in principle to endorse the NNP1 Watershed Management Plan but prior to the submission to the Vice Minister of MAF for signing, the Chair recommended the drafting Committee including NNP1PC to improve and revise some of the following points:
   - Under Component 1, the land-uses including the agriculture and forest land shall be revisited and improved in accordance to the relevant laws and regulations in order to define and agree on the TPZs and CUZs within the NNP1 watershed.
   - Based on the lessons learned from Xe Pian-Xe Nam Noi Project, Component 5 needs to add activities on the Emergency Response Plan, particularly the early warning system at the upper and downstream areas of NNP1 and coordination mechanism need to be elaborated in the NNP1 WMP. NNP1PC clarified that the Company has prepared a project specific Emergency Action Plan which the Company will further develop in collaboration with the Ministry of Labour and Social Welfare. The Chair suggested to make references to this Emergency Action Plan in the WMP.
   - Under Component 6, the Chair advised to include the development of community infrastructure for the villages located in the watershed area. For instance, schools, healthcare centres, clean water supply systems, electricity supply, etc.
   - The allocation of budget to each component shows that Component 6 is quite small compared with the administrative budget and budget for hiring experts, thus it is recommended for revision.
2. Regarding the Organisation Structures of NNP1 Watershed Management Plan and Biodiversity Offset Management Plan, the Chair agreed to amend the MAF Minister Agreement on the Establishment of Forest Resources Management and Protection Committee in the Watershed of Hydropower Projects for the whole country to include relevant stakeholders, such as relevant departments under MONRE and Ministry of Energy and Mines (MEM). Provincial Committees and Secretariats shall also improve their institutional arrangements by involving line agencies at the district and village levels.
3. Regarding the issues of rubber plantation, the Chair asked NNP1PC together with XSB and BLK WRPOs to collect data of the rubber plantation areas including information on how many hectares were compensated, owned by how many households, how many hectares are flooded by the NNP1 reservoir as well as how many hectares located inside the Total Protected Zones and Controlled Use Zones and how many households own these plots, make it clear and promptly find the solution for future management.

4. The procurement of technical assistance should be open for both external (NGO) and internal experts like the National University of Lao PDR and other research centres in order to support the local technicians and professionals, etc.

NNP1PC-EMO continues to improve the Lao version of the Plan addressing the comments from the workshop. The Plan is expected to be submitted to MAF in April 2019.

NNP1PC has provided an official response to the draft AIP 2019 prepared by the Bolikhamxay Provincial WRPO on 31 January 2019. NNP1PC continues to work with Xaysomboun and Bolikhamxay WRPOs to finalize the draft AIP 2019 in February 2019. Further internal discussion between NNP1PC and WRPOs was made during 6-8 March 2019.

The WRPO's coordination meeting on the AIP2019 development was organized on 13 March 2019 after the Final Workshop on NNP1 WMP. Xaysomboun and Bolikhamxay Provincial WRPO presented the overall progress of development and draft of AIP2019. The key notes from the discussions are summarised below:

1. Bolikhamxay Provincial WRPO agreed with the latest revision of AIP2019 by NP1PC-EMO. NNP1PC also clarified that the advance payment by GOL for WRPO utilities and administration during 2016-2018 when the AIP was yet approved could be reimbursed but it is subject to further discussion and agreement with ADB.
2. Xaysomboun Provincial WRPO was advised by NNP1PC and DOF to revisit the draft and prioritize the proposed activities considering the period of implementation (remaining months in 2019) and their resource capacities.
3. AIP and fund disbursement should be reviewed and approved on an annual basis which is in line with NNP1PC financial procedure.
4. The AIP2019 needs to be reviewed and approved by NNP1PC and ADB prior to further submission and approval by Provincial Governor of each Province.

The remaining field verification surveys for the Total Protection Zone 1 (TPZ Phou Samsao) at Anouvong District and TPZ2 (TPZ Phou Khata) at Hom District will be continued as part of AIP2019 as per a discussion and agreement between NNP1PC-EMO and Xaysomboun Provincial WRPO on 24 January 2019.

In January 2019, the checkpoints made 471 records of people accessing the main reservoir. Out of these, a total of 305 records of people from Houayxai Village (Hom District, Xaysomboun Province) and 166 records of people from Nahan Village (Bolikhan District, Bolikhamxay Province). The main reasons why people access the reservoir include fishing and hunting (64 records), agriculture (132 records), livestock raising (116 records) and other purposes (149 records). In addition, the checkpoint in Pou Village recorded 382 boats entering the reservoir and 291 boats leaving the reservoir.

In February 2019, the checkpoints made 596 records of people accessing the main reservoir. Out of these, a total of 492 records of people from Houayxai Village (Hom District, Xaysomboun Province) and 104 records of people from Nahan Village (Bolikhan District, Bolikhamxay Province). The checkpoint in Nahan Village will not be continued from March 2019 and onward due to the end of pre-WMP funding for Bolikhamxay Province. Bolikhamxay Provincial WRPO removed the checkpoint structure at the end of February 2019.

In March 2019, the Houaxay checkpoint in Xaysomboun Provinces made 666 records of people accessing the main reservoir through the checkpoint at Houayxai Village (Hom District, Xaysomboun Province). The main reasons why people access the reservoir include fishing

and hunting (142 records), agriculture (142 records), livestock raising (127 records) and other purpose (255 records). The checkpoint in Pou Village recorded 950 boats entering the reservoir and 911 boats leaving the reservoir.

Military staff appointed at the checkpoints are not law enforcement officers for Forestry Law and Wildlife and Aquatic Animal Law. Thus, they are only responsible for security checks and report the incidents to the WRPO for further actions. The approval of the WMP will be needed to provide the basis for the preparation and implementation of the AIP2019 that will include full patrolling activities in the TPZs and the reservoir.

The management of NNP1PC-ESD and Xaysomboun Provincial Watershed and Reservoir Protection Committee (WRPC) conducted a site visit in the NNP1 main reservoir on 26 March 2019 with the following discussion and agreements:

1. Xaysomboun Provincial WRPO technical staff to be immediately assigned in Huayxay Village once the AIP2019 is approved;
2. The fishery activities in the main reservoir particularly in Houaypamom area to be stopped because they use electric fishing and other prohibited equipment that do not comply with existing law and regulation;
3. Relevant GOL sectors should coordinate with Xaysomboun Provincial WRPO to monitor and register all the boats that operate in the main reservoir. The navigation route will be identified and the fee will be based on the boat size and boat engine capacity;
4. NNP1PC-SMOteam will provide information on compensated land within Huayxay Village. It is necessary to have an official notification letter from GOL that the compensated cultivated area will be a reforestation area according to the watershed regulation so that any activities within it can be stopped to avoid further forest encroachment;
5. Strict patrolling should be commenced by military and relevant GOL officers to avoid further encroachment into the TPZ;
6. Xaysomboun PAFO to complete the improvement of Provincial Regulation and submit it to Xaysomboun Provincial Assembly as soon as possible so that the approval could be obtained not later than 04 April 2019;
7. Xaysomboun Provincial WRPC and WRPO agreed on the process for WRPO sub-office establishment that a construction company will be procured and a field survey will be commenced together with Xaysomboun Provincial WRPO technical team prior to bidding. In addition, Xaysomboun Provincial WRPC and WRPO also planned to procure boats with boat engine of 20 to 30 horse power for patrolling activity and a communication system will be established using walkie-talkie to ease the communication in the off-network coverage within NNP1 watershed and main reservoir.

5.1.2 Preparation of Provincial Regulation for the Watershed Management

Xaysomboun Provincial WRPO (Provincial Agriculture and Forestry Office) further improved the draft watershed management regulation after the Xaysomboun WRPC coordination meeting on 20 December 2018. Xaysomboun Provincial WRPO submitted the improved Regulation to Xaysomboun Provincial Assembly for further review and certification on 05 February 2019.

A Final Technical Workshop to review the draft Provincial Regulation for NNP1 Watershed and Reservoir Management with concerned GOL sectors was organized in Xaysomboun Province on 26 March 2019 with the participants from Watershed and Reservoir Protection Office (WRPO). The main objectives of the Final Technical Workshop were:

1. To present and discuss the improved draft Regulation based on the comments provided by Provincial Assembly and concern sectors obtained between January and March 2019;
2. Make amendments for submission to the Drafting Committee to further discuss and finalize this draft in a Final Workshop scheduled on 01 April 2019.

5.2 BIODIVERSITY OFFSET MANAGEMENT

5.2.1 Preparation of Biodiversity Offset Management Plan

The improved Biodiversity Offset Management Plan (BOMP) was submitted to ADB, IAP and BAC on 25 January 2019 after the discussions and agreements made during the joint IAP and ADB mission held in December 2018.

The IAP Biodiversity Specialist provided comments on 27 January 2019. Main comments are related to: 1) the confusion over the proposed organisation structures which show combined committees of the Watershed Management Program and Biodiversity Offset Management as suggested by the ADB; 2) the clarity on the ambitious conservation targets; 3) the negative opinion about the threats in the area as well as the capacity gap of GOL; and 4) further improvement on the content of risk assessment of social displacement.

The BAC member provided comments on 29 January 2019. Key comments were related to: 1) on Biodiversity Service Provider's roles; 2) conservation targets; 3) proposed management activities; 4) the negative opinion about the threats in the area as well as the capacity gap of GOL; 5) funding sources for social development program; and 6) the overall funding for the BOMP.

ADB provided further comments on the improved Biodiversity Offset Management Plan (BOMP) on 02 February 2019. NNP1PC together with its Biodiversity Consultant continued improving the Plan addressing comments from ADB, IAP and BAC, in particular with respect to developing the logical framework comprising conservation objectives, threat reduction objectives, expected results and management activities.

NNP1PC together with its Biodiversity Consultant completed the improvement of the Biodiversity Offset Management Plan in the first week of March 2019. The improved Plan was resubmitted to ADB and BAC on 11 March 2019. They provided their no objections to the Plan on 21 and 22 March 2019 respectively after NNP1PC addressed their final comments on 13 and 20 March 2019.

NNP1PC-EMO has continued improving the Plan in Lao version. The improved Lao version is expected to be ready by end of April 2019 for sharing with GOL. A technical workshop with Bolikhamxay Provincial Biodiversity Offset Management Unit (BOMU) and concerned GOL sectors was tentatively scheduled in mid-May 2019.

5.2.2 Implementation of pre-Biodiversity Offset Management Plan

The Pre-BOMP-2B proposal was approved by ADB and agreed by BOMC at the end of September 2018. A total of USD 88,578 was disbursed in September 2018 for the continuation of the checkpoint operation and patrolling from September 2018 – March 2019.

In January 2019, two patrolling teams with a total of 18 people conducted forest patrolling for 16 days in both Viengthong and Xaychamphone Districts. The patrolling covered 8 biodiversity areas within the NC-NX Offset Site in these Districts. The main threats found in the area are wildlife hunting, unregulated fishing by local villagers and unregulated Non-Timber Forest Products (NTFPs) collection by local villagers. Six temporary hunting camps and

370 small wire snares were recorded by Viengthong District's patrolling team. The highest record of small wire snares is located in the new patrolling route around Nam Sone area which is inside the proposed highest priority area of Totally Protected Zone (TPZ) in the north-western part of the NC-NX area. A total of three temporary hunting camps and two small wire snares were recorded by Xaychamphone District's patrolling team.

In February 2019, two patrolling teams with a total of 18 people conducted forest patrolling for 16 days in both Viengthong and Xaychamphone Districts. The patrolling covered 13 biodiversity areas within the NC-NX Offset Site in these Districts. The main threats found in the area are wildlife hunting and unregulated fishing by local villagers. Five temporary hunting camps, eight unregulated fishing activities, 41 small wire snares, 26 large wire snare, and 17 log trap were recorded by Xaychamphone District's patrolling team. In addition, one Serow (approximate weight of 30 kg) and one Muntjac (approximate weight of 15 kg) were confiscated with fines and written warning made to the offenders by this team. In addition, Viengthong District's patrolling team recorded one temporary hunting camp and one unregulated fishing camp.

BOMC members conducted a site visit and monitoring of the pre-BOMP activities during the first week of February 2019. The BOMC team was led by the Deputy Head of the Bolikhamxay Provincial Military and accompanied by Vice Governor of Viengthong District and the Chairman of the State Audit of Viengthong District. The main purposes of the visit: 1) to obtain the updates on the overall progress of pre-BOMP activities and provide advice to enhance the management of NC-NX Offset Site and; 2) to have discussions with relevant GOL offices and communities at the three target villages in Viengthong District particularly on preventing a forest fire during the dry season, reducing or stopping the slash and burn farming practices and urging the local villagers to be more aware and be part of the biodiversity protection inside NC-NX especially for the proposed TPZ areas.

In March 2019, two patrolling teams with a total of 18 people conducted forest patrolling for 16 days in Viengthong and 17 days in Xaychamphone Districts. The patrolling covered 10 biodiversity areas within the NC-NX Offset Site in these Districts. The team recorded nine cases of wildlife hunting with five temporary hunting camps and two small wire snares, 10 cases of unregulated fishing, and three cases of NTFP extraction by local villagers. In addition, one Serow (approximate weight of 25 kg) was confiscated with fines and written warning made to the offenders at Sopkhone Village by the Xaychamphone team.

It is noted from the recommendations of the IAP and ADB Mission in December 2018, the discussion with the Head of Bolikhamxay PAFO in January 2019 and as further advised by NNP1PC Management that the AIP2019 should be ready for implementation immediately after the pre-BOMP2B funding is over to avoid any gaps in implementation. Thus, Bolikhamxay Provincial BOMU together with NNP1PC-EMO have started the preparation of AIP2019 and the initial draft was ready at the end of February for further review by NNP1PC.

Bolikhamxay Provincial BOMU together with NNP1PC-EMO have completed the preparation of AIP2019 and NNP1PC submitted it to ADB and BAC for review and approval on 22 March 2019. BAC provided comments on 27 March 2019 accepting the proposal with a condition that the AIP will be revised by the Biodiversity Service Provider once they are on board. ADB had not provided any comments by the end of March 2019.

Figure 5-1: Overall patrolling track record from September 2017 until end of 1st Quarter 2019

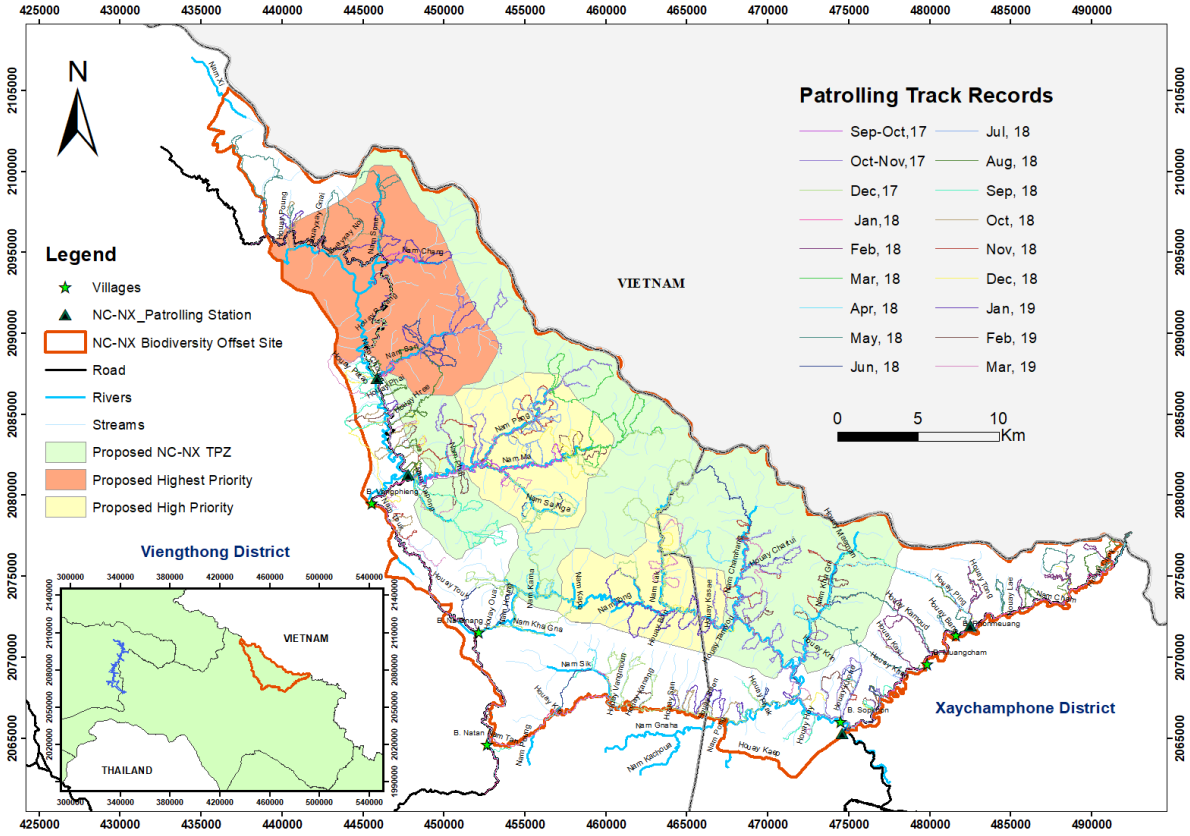


Figure 5-2: Overall threats recorded until the end of Q1 2019 in Viengthong District

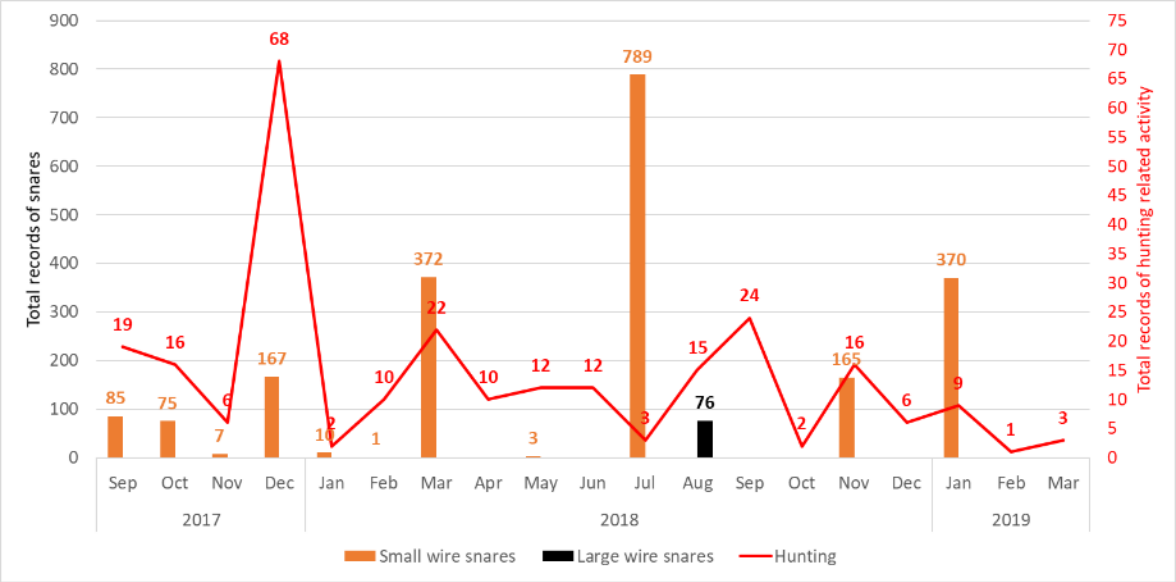
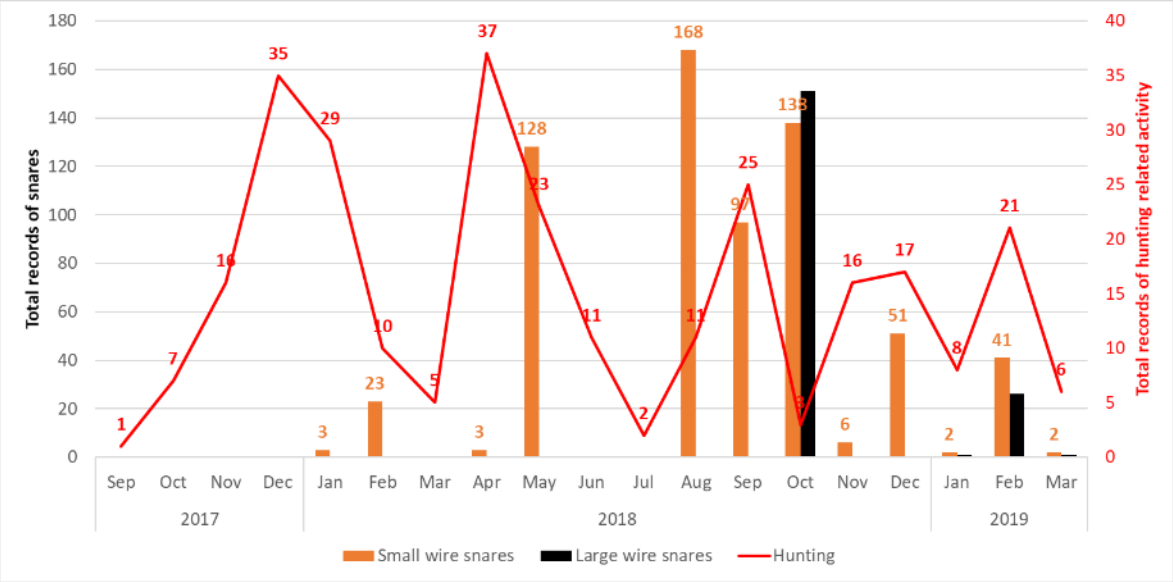


Figure 5-3: Overall threats recorded until the end of Q1 2019 in Xaychamphone District



6 BIOMASS CLEARANCE / FLOATING DEBRIS REMOVAL

A contractual agreement between NNP1PC and floating debris contractor was signed on 01 March 2019 and a Notice to Proceed was issued by NNP1PC on 04 March 2019.

The Contractor started cutting and burning the logs in the middle of main reservoir from 14 March 2019 and mobilized the equipment to assemble the log boom on 26 March 2019.

FIGURE 6-1: POTENTIAL LOCATION FOR TEMPORARY LOG BOOM INSTALLATION

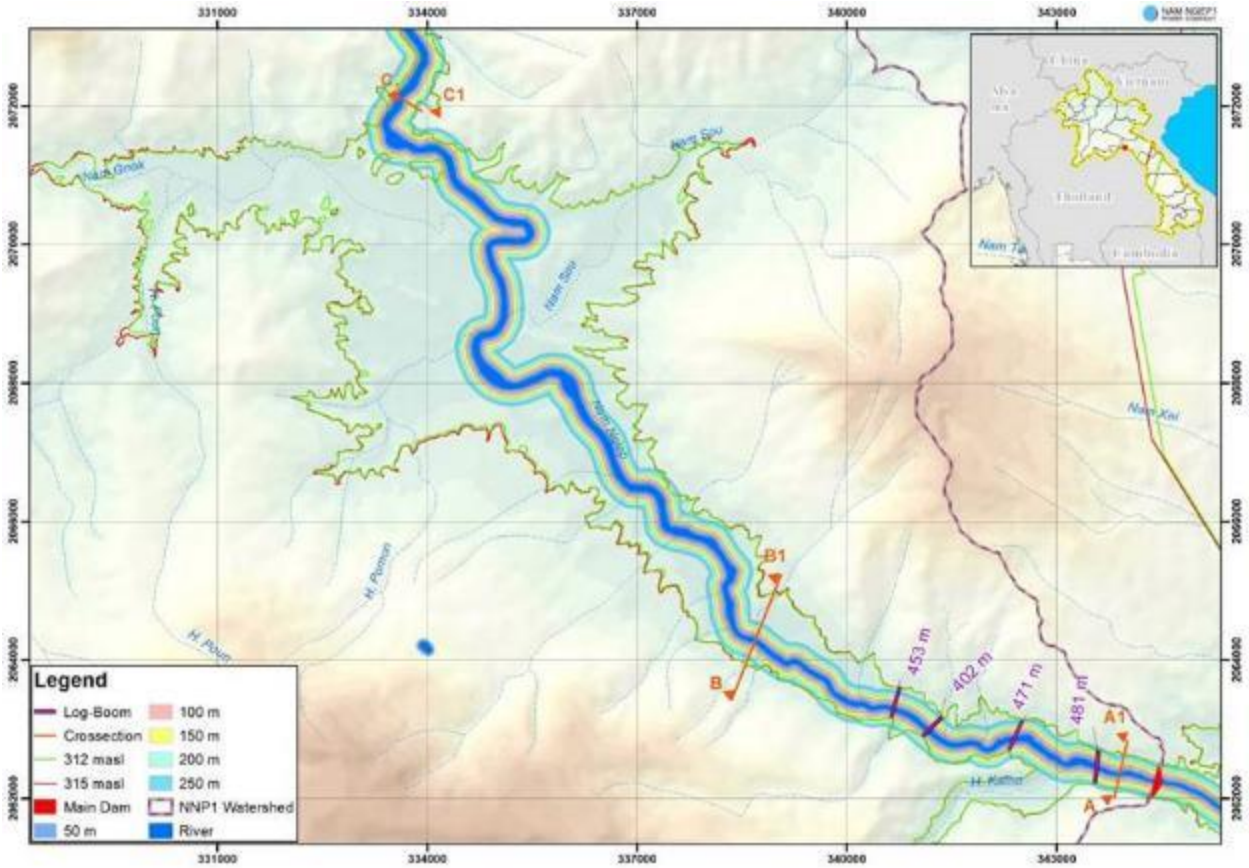
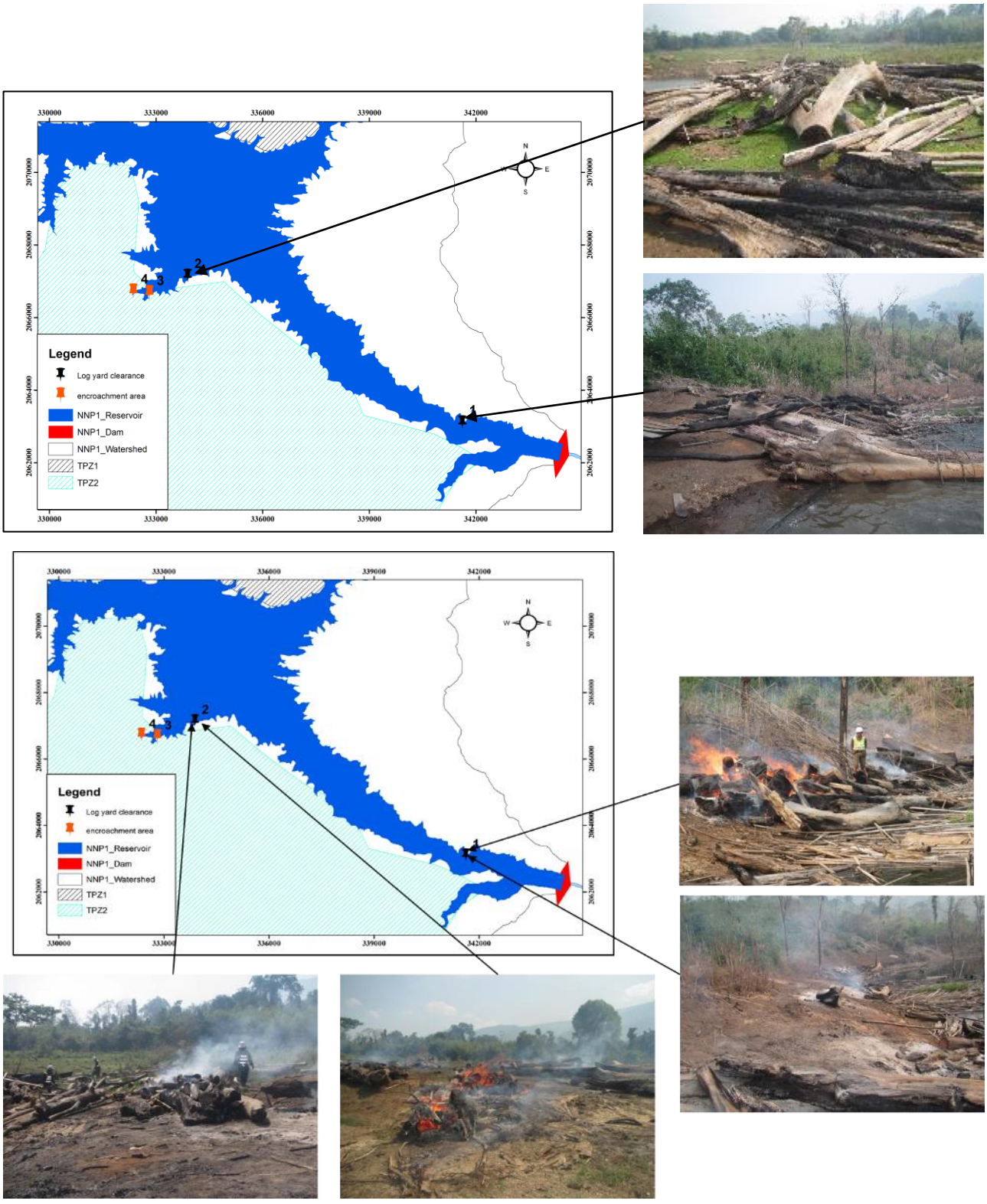


Figure 6-2: Representative photos of collected logs, cutting and burning in the middle of main reservoir



7 FISHERY MONITORING

The five types that dominated the fish catch by weight in Q1 2019 are listed in ***Table 7-1.*** This includes four species and one species group that are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Tor sinensis* which is classified as Data Deficient (DD) species.

Table 7-1: Fish Species dominating the Fish Catch in Q1 2019

Species	Lao Name	Fish Catch in Q1 2019 (kg)	IUCN Red List Classification
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	1773.7	LC
Channa striata	ปาถ่ำ	266.3	LC
Systomus orphoides	ปาปึก	207.1	LC
Scaphiodonichthys acanthopterus	ปาม้อม	175.3	LC
Tor sinensis	ปาแดง	171.2	DD

The recorded catch of threatened species (IUCN Red List classification) in the Q1 2019 fish catch is presented in ***Table 7-2***. The list includes four Vulnerable species (VU), and five Near Threatened species (NT).

Table 7-2: Threatened and Near Threatened Species of the Fish Catch in Q1 2019

Species	Lao Name	Fish Catch in Q1 2019 (kg)	IUCN Red List Classification
Bagarius bagarius	ปาแข้	0.5	NT
Bangana behri	ปาอ่า	67.8	VU
Cirrhinus cirrhosus	ปามอมจัม/ปาแกง	13.2	VU
Cirrhinus molitorella	ปาแกง	15.7	NT
Cyprinus carpio	ปาไน	2	VU
Neolissochilus stracheyi	ปาสอง	11.6	NT
Ompok bimaculatus	ปาเซือม	16.1	NT
Onychostoma gerlachi	ปาถึง	73.6	NT
Scaphognathops bandanensis	ปาอวนไฟ/ปาป่วน	38.7	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 7-3***.

Table 7-3: 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
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)	+				+									+	
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)		+	+	+	+	+					+			+	
Wallago attu (NT)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	

The total recorded monthly fish catch from July 2015 to March 2019 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 7-1***. 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 7-1: Total Recorded Fish Catch July 2015- March 2019

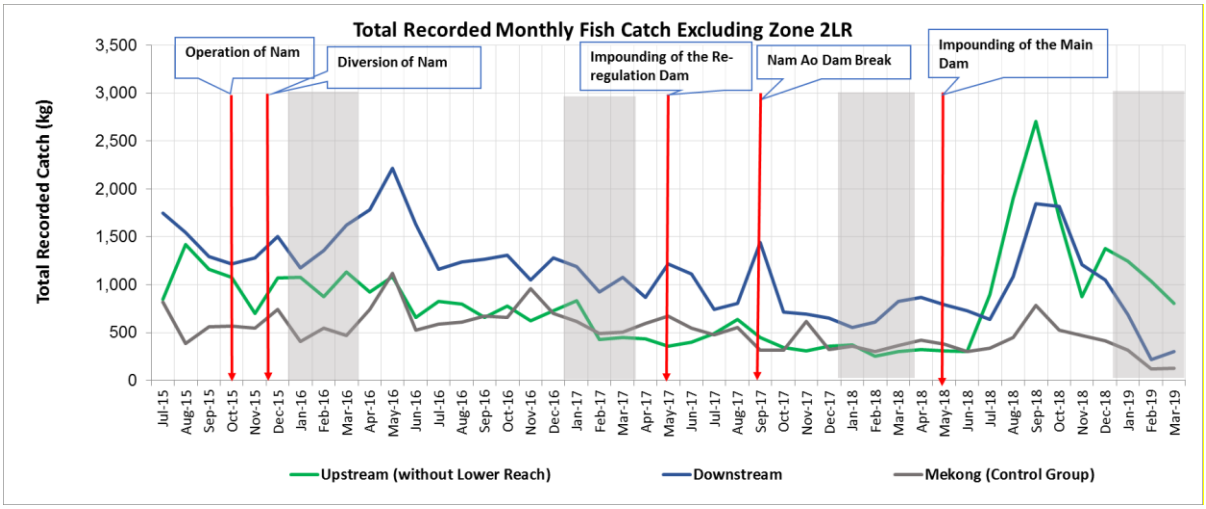


TABLE 7-4 and Figure 7-2 show the total recorded fish catch for Q1 2016, Q1 2017, Q1 2018 and Q1 2019 by the upstream (excluding Zone 2LR), downstream and the Mekong control group fishing households. Note that the recording days was reduced from 30 days/month to only seven days/month starting from February 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 7-4: Total recorded fish catch in Q1 by Upstream (Excluding Zone 2LR), Downstream and by the Mekong Control Group Fishing Households

	Q1 2016 (kg)	Q1 2017 (kg)	Q1 2018 (kg)	Q1 2019 (kg)
Upstream	3,083.7	1,708.2	928.8	3,084.1
Downstream	4,156.6	3,189.7	1,986.6	1,208.4
Mekong Control Group	1,422.1	1,605.4	1,027.7	567.9

Figure 7-2: Total recorded fish catch in Q1 by Upstream (Excluding Zone 2LR), Downstream and Mekong Control Group fishing households

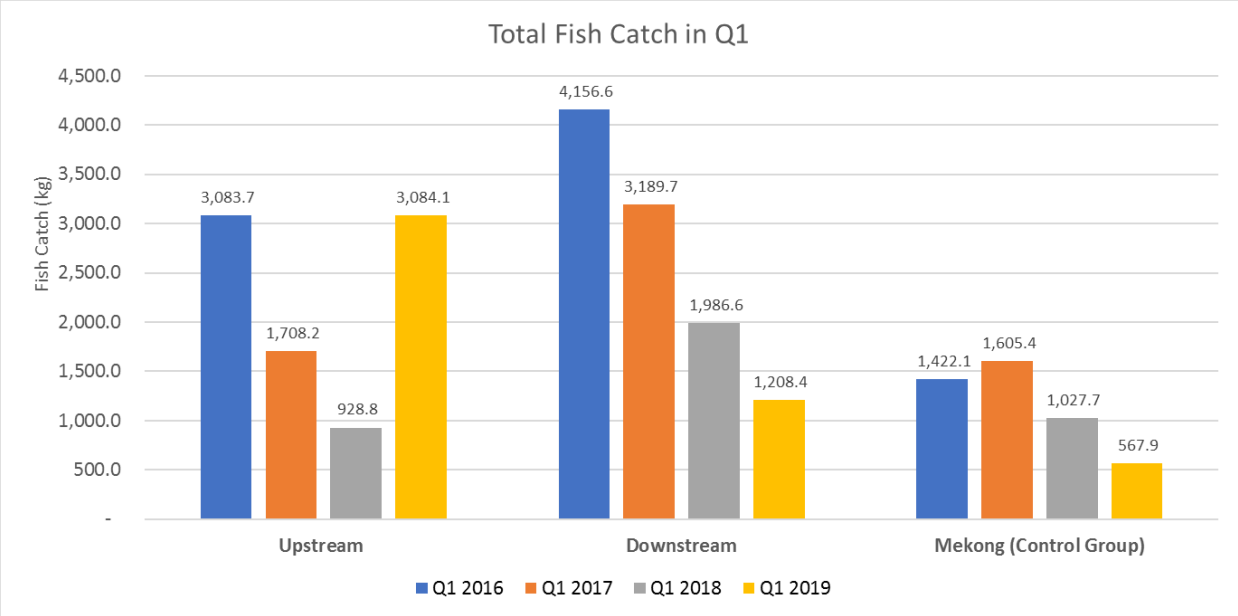
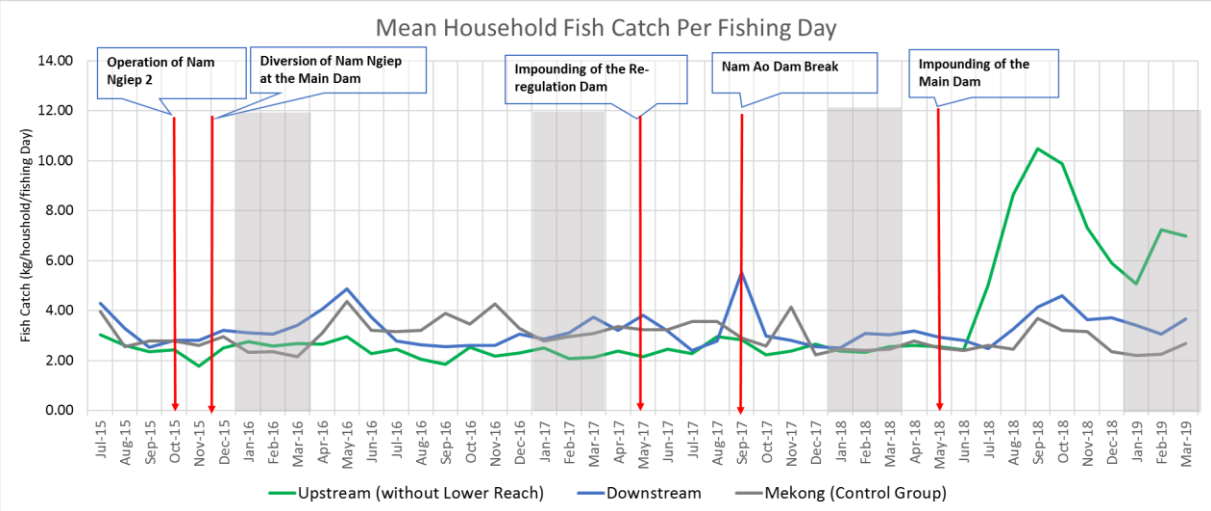


Table 7-5 presents the mean household fish catch per fishing day for Q1 2016, Q1 2017, Q1 2018 and Q1 2019 in the upstream (excluding Zone 2LR), downstream and the Mekong Control Group, and *Figure 7-3* shows the mean monthly household fish catch per fishing day from July 2015 to March 2019.

Table 7-5: Mean household fish catch per fishing day in Q1 2016, Q1 2017, Q1 2018 and Q1 2019

Fishing Zone	Q1 2016 (kg)	Q1 2017 (kg)	Q1 2018 (kg)	Q1 2019 (kg)
Upstream (Excluding Zone 2LR)	2.67	2.24	2.42	6.43
Downstream	3.19	3.23	2.87	3.37
Mekong (Control Group)	2.28	2.94	2.45	2.38

Figure 7-3: Mean 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 7-6.***

Table 7-6: Results of One-Way ANOVA Tests on Mean Household Fish Catch in Q1

Fishing Zone	F-Statistic	*P*-value	F-Critical	Significance
Upstream	44.102	$8.17*10^{-28}$	2.608	Highly Significant
Downstream	2.238	0.082	2.608	Not Significant
Mekong Control Group	16.523	$1.35*10^{-10}$	2.610	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 7-6*** indicates that upstream and the Mekong area means are highly significantly different, while the downstream are means are not significantly different.

Further statistical analyses will be carried out when longer time series become available and the data and information from the monitoring programme will be studied to identify the possible reasons for the decrease in fishing households and fishing days.

APPENDICES

APPENDIX 1: STATUS OF SS-ESMMPS REVIEW AND APPROVAL DURING Q1 2019

No	Site name	List of documents and SS-ESMMP	Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction& Operation Status
1	Houay Soup Landfill	Detail Work Programme & Site Specific Environmental & Social Management and Monitoring Plan (DWP & SS-ESMMP) for Houay Soup Landfill Operation	PKC & SCC	Under review the second submission	Community waste management and operation of Houay Soup Landfill	On-going
2	Song Da5 camp No.2	Site Decommissioning and Rehabilitation Plan for Song Da5 Camp No.2	Song Da5	Under review the second submission		On-going
3	Main Dam workshop at spoil disposal No.2	Site Decommissioning and Rehabilitation Plan for Main Dam workshop and spoil disposal No.2	Song Da5	No Objection with Comment on 28 February 2019		On-going
4	IIS field shop and sub-contractor 276 camp	Site Decommissioning and Rehabilitation Plan IIS's field shop and 276 contractor camp	IHI (IIS)	No Objection with Comment on 11 March 2019		On-going
5	HM's Hydro labor camp No.1	Site Decommissioning and Rehabilitation Plan for HM's labor camp No.1 (ZHEFU Camp)	HM Hydro	No Objection with Comment on 18 March 2019		On-going

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q1-2019

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
NCR_IHI-0001	06.11.2018	Field shop and sub-contractor 276 camp	On 02 November 2018, during the scheduled camp's effluent monitoring and sampling conducted by the EMO-Water Quality Monitoring team, the black and grey water was observed to seep from the wastewater collection tank. - On 05 November 2018, EMO-Compliance team visited the 276 camp and found out that a thick concrete wall of black/ grey water collection tank was drilled in two holes to intentionally release the wastewater to the nearby drainage canals without prior treatment. - Whilst on site, EMO could not find any subcontractor's staff who could talk to fix the holes. Therefore, EMO emailed the representative of IHI Contractor to inform on the non-compliant issue and stop	Stop direct wastewater discharge immediately and seal the holes to avoid future discharges. The wastewater can be retained in the septic tank and treated properly before discharging; - Train the subcontractor's staff on the environmental awareness and remind them to not repeating this practice. The training record shall be submitted to EMO as part of the Contractor's response on the corrective actions; - Install chlorination mixing container and water circulation system for the chlorination tank; and - Referring the NNP1PC's comments to the document Ref. no. 0-0065 dated 23 January 2018,	15.11.2018	28.03.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			direct wastewater discharge from 276 camp immediately. On 06 November 2018, EMO followed up the corrective action and noted that such direct wastewater discharge was stopped by the 276 subcontractors. - The discharged wastewater sample was analysed by EMO at the Environmental Laboratory on site and the result of the wastewater discharge reveals very high bacteria.	please revise such pending comments and incorporate the as-built drawing of the wastewater treatment system for NNP1PC's final review and approval.			
NC_OC-0026	06.11.2018	Main Dam Workshop	1. With reference to the 2nd submission of the DWP and SS-ESMMP for the Main Dam body (Ref: PCL-02234 dated 10 June 2016), the Contractor proposed and confirmed that the Spoil Disposal Area No. 2 would no longer be used for the disposal of spoil, but would be used by Song Da5 as a "Main Dam Workshop". 2. On 04 July 2017, NNP1-EMO	The Contractor is required to implement the following corrective actions: - Immediately stop the disposal of spoil and any types of waste at the site; - Improperly disposed waste shall be segregated and disposed of in accordance to the NNP1PC waste management policy and the ESMMP-CP;	29.11.2018	05.02.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			reported a non-compliance issue for the main dam workshop (former Spoil Disposal Area No.2) (ref. No.: NNP1-ESD-EMO-NCR-OC-0021), about the continuation of new spoil disposal from the main dam body and waste dump. In the said non-compliance report, NNP1-EMO instructed the Contractor to: - Stop disposing spoil on this site. New spoil shall be disposed of at the designated Spoil Disposal No. 6 as per the approved DWP & SS-ESMMP for the Main Dam Body; - Stop all waste disposal on the site including hazardous waste, construction and general waste. Waste shall be segregated and disposed of in accordance with the waste management policy and the ESMMP-CP of NNP1PC; and - Collect and segregate the disposed wastes on the slope	- Recheck the area for proper boundary and install proper signage; - Prepare engineering drawings covering the entire Spoil Disposal Area No. 2 including the extension and the drainage system and submit the drawings to NNP1PC for approval. After obtaining an approval, implement the engineering design; - Dispose spoil at the designated Spoil Disposal Area No. 6. - Should there be changes to the previous approval, submit a request to NNP1PC to approve the use and dispose of spoil from a particular activity at the Spoil Disposal Area No 2. Such request shall include: i) more details on the estimated spoil volume and types of materials; ii)			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			for proper disposal at the landfill, Spoil Disposal Area No. 6 or authorized vender. On 14 November 2018 during a routine site inspection of the main dam workshop (former spoil disposal area No.2), EMO observed that additional spoil had been disposed at the site with unknown source and volume, together with construction waste contained in big plastic bags and general waste (visible at the side-slopes as indicated on the pictures below). EMO observed that the side drainage has been blocked by spoil and construction wastes and that water is ponding at the tip of the disposal site indicating that the drainage system is not functioning as it should.	confirmation that the remaining area is sufficient and spoil can be stabilized; iii) justifications that the spoil disposal is cost effective compared to the disposal at Spoil Disposal Area No. 6; and iv) an updated SS-ESMMP for Spoil Disposal Area No. 2 with explanations on management measures and revised engineering drawings as well as attaching a completed Site Decommissioning and Rehabilitation; - Submit a report to NNP1PC documenting the completion of the corrective actions.			
ONC_HM-0020	22.01.2019	HM Main Camp & Office	Mixed general waste, recycle waste and hazardous waste	Segregate and dispose the waste by following the	25.01.2019	05.02.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			were observed storing / stockpiling beside of the temporary waste storage of the HM Main Camp.	project's waste management procedure; - Record the type and quantity of hazardous waste; - Provide waste management / waste segregation awareness to the related workers and house keepers.			
ONC_HM-0021	22.01.2019	ZHEFU Camp	Four used turbine oil drums were stored on the bare ground without spillage protection facility. This has a potential risk of oil spillage during the handling/ refilling. Please note that this concerning issue was previously found out by ADB/IAP and GoL-EMU during their missions in May 2018.	1. Move these used turbine oil drums to the warehouse where hardstand platform and spillage protection bund are available; 2. An appropriate steel tray(s) need to be provided, to prevent oil spillage during oil handling / refilling activity.	25.01.2019	05.03.2019	Resolved
ONC_HM-0022	22.01.2019	ZHEFU Camp	A continuation of burning of general waste outside the camp perimeter; - Garbage (empty plastic bottles, plastic bags and used	1. Stop burning waste within and around the camp, any general waste generated on site shall be segregated / managed and	25.01.2019	05.02.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			cigarette packs was scattered inside and outside of camp perimeter; - No cleaning up of food waste regularly from the food waste trap. Note: EMO previously issued the Site Inspection Report Ref: SIR-0013 dated 30-Oct-18 with the required corrective action. However, this practice was repeated. Following future finding, the NCR level 2 will be issued immediately	dispose by following the NNP1 project's waste disposal hierarchy (Reduce, Re-use, Recycle and Right disposal); 2. Collect the scattered garbage around the camp yard for proper disposal and; 3. Ensure (i) sufficient waste bins are provided with proper waste separation sticker displayed (general waste, recyclable waste and hazardous waste). (ii) The provided waste bins need to be used; 4. Provide weekly waste management training to staff and workers at the camp.			
ONC_IHI-0010	22.01.2019	IHI Metal Workshop	During this bi-weekly joint inspection, it was observed that decommissioning of the 276-field shop was completed about two weeks ago with no	The contractor is required to prepare and submit the Site-Specific Decommissioning and Rehabilitation Plan to	05.02.2019	05.03.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			submission of the decommissioning plan for NNP1PC's review and approval. Note: During the previous bi-weekly joint inspection, EMO was informed by the 276-camp manager that the 276 camp and all facilities decommissioning will be completed in March 2019.	NNP1PC for review and approval. The document preparation needs to be in accordance to the Construction Site Decommissioning and Rehabilitation Guideline Ref no. NNP1/0075-018/IIS/EPC-HM that was sent to IHI Infrastructure System Co., Ltd (IIS) on 03 October 2018.			
ONC_IHI-0011	22.01.2019	276 camp	On 22 January 2019 (morning time), it was found out by the EMO's Environmental Monitoring Team that the chlorine dosage rate was 3 ml/minute which was10 times less than the EMO's recommended dosage rate (30 ml/minute). In the afternoon time of the same day, the EMO's Compliance Team observed that no chlorine dosage was performed. As a result, this	1. Fix and maintain the chlorination dosage rate as per NNP1/EMO's recommendation (30 ml/minute); 2. Assign key responsible staff to operate and maintain the Wastewater Treatment System properly. Note: The contractor needs to participate in each time of monitoring and sampling of the camp waste water.	30.01.2019	05.02.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			camp fails to comply with the camp effluent standard (see the effluent monitoring results in the below table). Note: No participation from the contractor during this effluent camp sampling, whilst EMO has sent the contractor the monitoring schedule.				
ONC_OC-0293	05.02.2019	Re-regulation dam	Two 200 litter fuel drums and one 20 litter used oil drum are stored on the ground without spillage protection facilities. An evidence of spills and contaminated soil disposed on the ground at surrounding of drums.	- Clean up the contaminated soil for proper disposal / elimination; - Provide steel tray to prevent the spillage from handling and refilling activities. Otherwise, remove the drums to designated hazardous material storage.	12.02.2019	19.02.2019	Resolved
ONC_OC-0294	05.02.2019	V&K Camp	There is no waste bin provided at the cooking area, resulted in food waste being disposed to the slope in front of canteen. The contractor was verbally requested a few times to take an appropriate action.	- Provide a waste bin at in in front of canteen for temporary waste disposal and accumulation for further proper disposal; - Provide waste management awareness	08.02.2019	19.02.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			However, the issue has occasionally resolved and repeated.	training for the relating worker.			
ONC_OC-0295	05.02.2019	Songda5 Camp N#2	During the last bi-weekly joint site inspection on 22 January 2019. It's observed mixed waste (general waste, recycle waste and hazardous waste) stored on site. EMO has recommended the Contractor to implement segregation and store accordingly to waste sorts and management hierarchy. But after one week, those mentioned wastes were transferred from drums to plastic bags (preparing for disposal?). And the waste was still mixed.	The Contractor is required to ensure the mix waste been segregated properly and dispose according to waste's sort and management hierarchy.	15.02.2019	19.02.2019	Resolved
ONC_OC-0296	19.02.2019	Re-regulation dam	Improper waste management on site. General waste, scrap metal and hazardous waste was stockpiled together and scattered on the ground at temporary stock yard area.	Segregate the mixed waste according to waste sorts for further right disposal and elimination; - Recyclable waste shall be stored in the recycle centre of Song Da5 Camp No.1;	28.02.2019	26.02.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				- Conduct site cleaning and housekeeping at each temporary stockyard.			
ONC_OC-0297	19.02.2019	GEF Camp	Improper waste management was implemented on site. Garbage (empty plastic bottles, plastic bags, used cigarette packs and coffee packs were scattered at the outside of the camp perimeter;	- Collect and clean up the garbage disposed and scattered at the outside of camp perimeter fence for proper disposal; - Provide waste management awareness training for the workers on site.	28.02.2019	26.02.2019	Resolved
ONC_OC-0298	19.02.2019	V&K Camp	It was found out that two birds (unknown species) were trapped in the cage.	- Release or remove the birds off-site; - All project staff are prohibited from harvesting forest products and hunting wildlife (terrestrial and aquatic), - Code of conduct on wildlife protection needs to be trained to all workers: F No killing / hunting, catching, possession, selling, buying, and cooking	28.02.2019	05.03.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				wildlife. F No fishing is allowed			
ONC_OC-0299	05.03.2019	Songda5 Stock Yard	Improper waste management on site, mixed general waste, construction waste and scrap metal were left and scattered on the ground at the temporary stock yard area. A drum containing about 100 litters of used oil was observed storing on the bare ground.	- Segregate and dispose the waste by following the project's waste management procedures on general, recycle and hazardous waste disposal; - Move the used oil drum to designated hazardous material storage and update the amount of this hazardous waste in the inventory.	08.03.2019	14.03.2019	Resolved
ONC_OC-0300	05.03.2019	T11	Improper site clean-up for the temporary assembly area of grouting work: - The contractor moved off site, but the underground septic tank of temporary toilet was remained; - Garbage and construction waste (PVC pipes, used cement bags and metal drums) were disposed on the sloping areas and in the road side bush.	- Clean-u the disposed garbage and construction waste from the mentioned areas; - Decommission the temporary toilet and treat the septic tank and black water by following SOP on Sewage/Black Water Disposal.	15.03.2019	14.03.2019	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_HM-0023	05.03.2019	ZHEFU Camp	General, recycle and hazardous waste were mixed and left on the camp site without any segregation and management. This post potential risks of hazardous waste contamination and personnel health.	- Segregate and dispose the waste by following the project's waste management procedures on general, recycle and hazardous waste disposal; - Record the type and quantity of hazardous waste; - Provide waste management awareness and waste handling practices to the related workers and house keepers.	08.03.2019	13.03.2019	Resolved
ONC_OC-0301	19.03.2019	Songda5 Stock Yard	Two 20 litters' drums containing of used oil were stored on the ground without spillage protection facilities. One of them was broken at the top. This posts a high potential risk of oil spillage if it's collapsed.	- Move the two used oil drums to a designated hazardous storage facility; - Change / replace the broken drum with a new one and secure container to prevent any potential spillage.	22.03.2019	27.03.2019	Resolved
ONC_OC-0302	19.03.2019	RCC Plant Yard	Mixed general waste, recycle waste and some hazardous waste (use paint cans) and	Segregate and dispose the waste by following the project's waste	29.03.2019	31.03.2019	Un-resolved

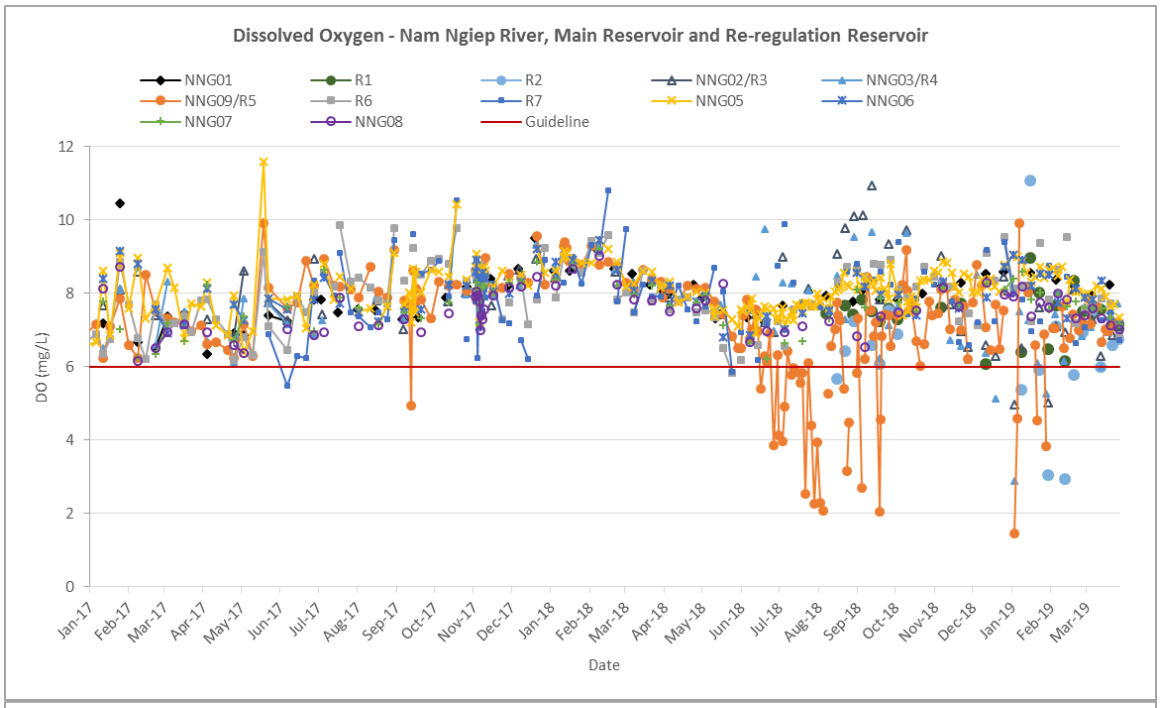
Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			others waste continue to accumulate at the temporary recycle waste storage area. It is concerned that without proper segregation in a timely manner, it will result in poor site amenity, improper waste segregation and mix disposal at the NNP1 project landfill.	management procedures for general, recycle and hazardous waste disposal; - Any cardboard need to be stored indoor area to prevent from rain; - The contractor shall need to instruct its workers and staffs for proper waste management (separation, segregation and right disposal).			

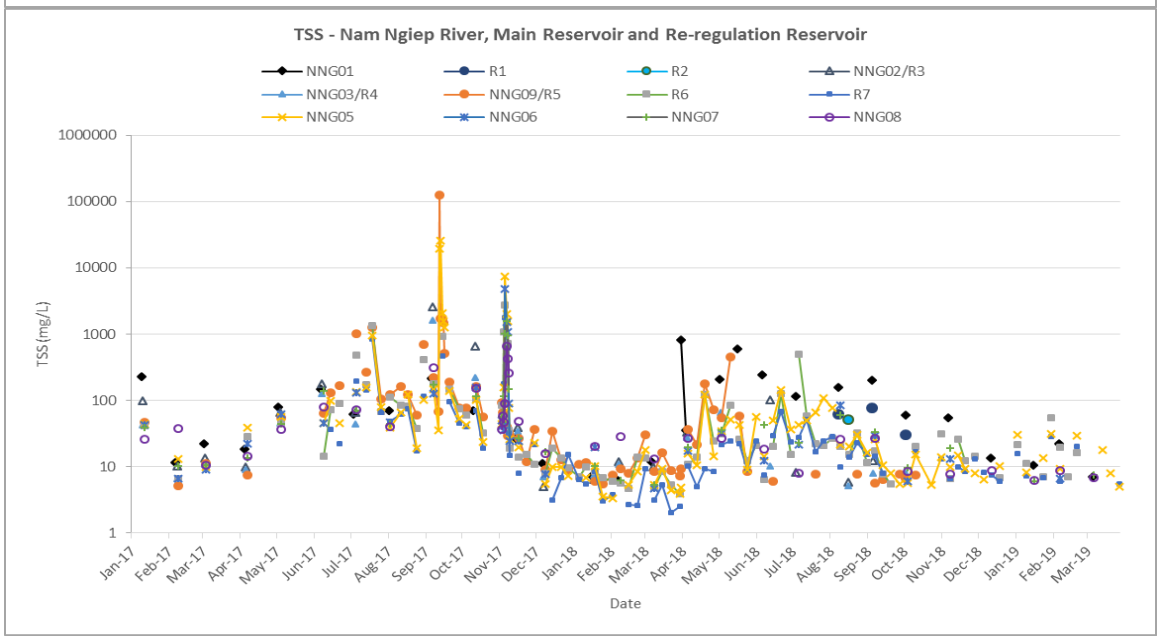
APPENDIX 3: CODES AND LOCATIONS OF THE SURFACE WATER QUALITY MONITORING STATIONS

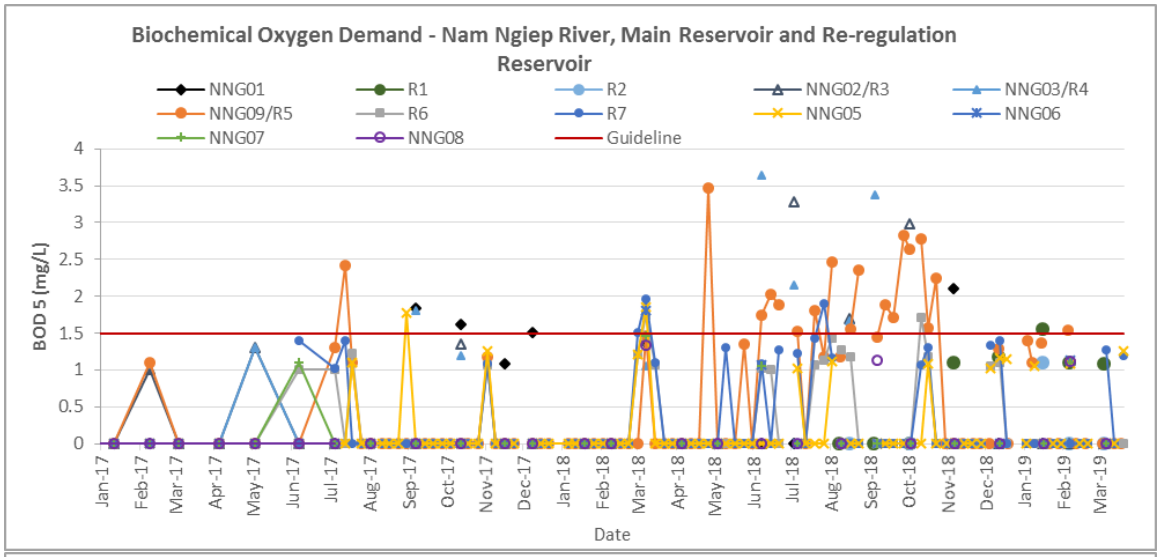
Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Ban Phiengta	Upstream Project Construction Site
R1	Main reservoir upstream main dam approx. 50 Km.	
R2	Main reservoir upstream main dam approx. 35 Km.	
NNG02/R3	Nam Ngiep Upstream of Nam Phouan Confluence / Main reservoir upstream main dam approx. 21 Km.	
NNG03/R4	Nam Ngiep Downstream of Ban Sop-Yuak / Main reservoir upstream main dam approx. 13 Km.	
NNG09/R5	Nam Ngiep Upstream Main Dam / Main reservoir upstream main dam approx. 0.5 Km	
NNG04 / R6	Nam Ngiep Downstream RT Camp (Middle Re-regulation Reservoir)	Within Project Construction Site
R7	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	

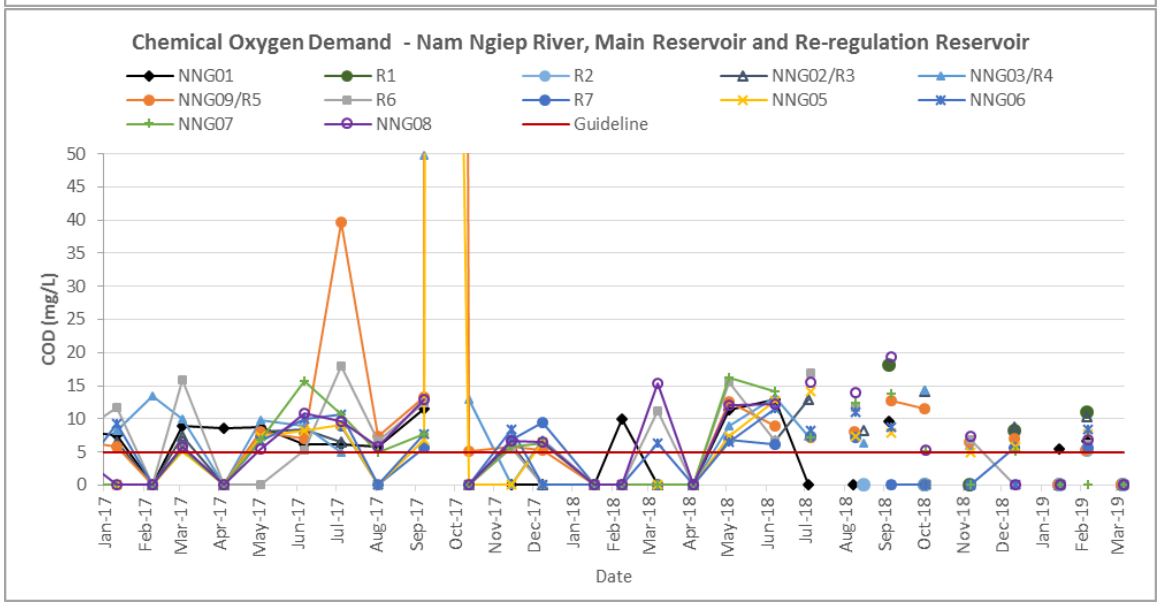
Appendix 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2017 TO END OF MARCH 2019 (ONLY PARAMETERS THAT EXCEEDED GUIDELINE STANDARDS)

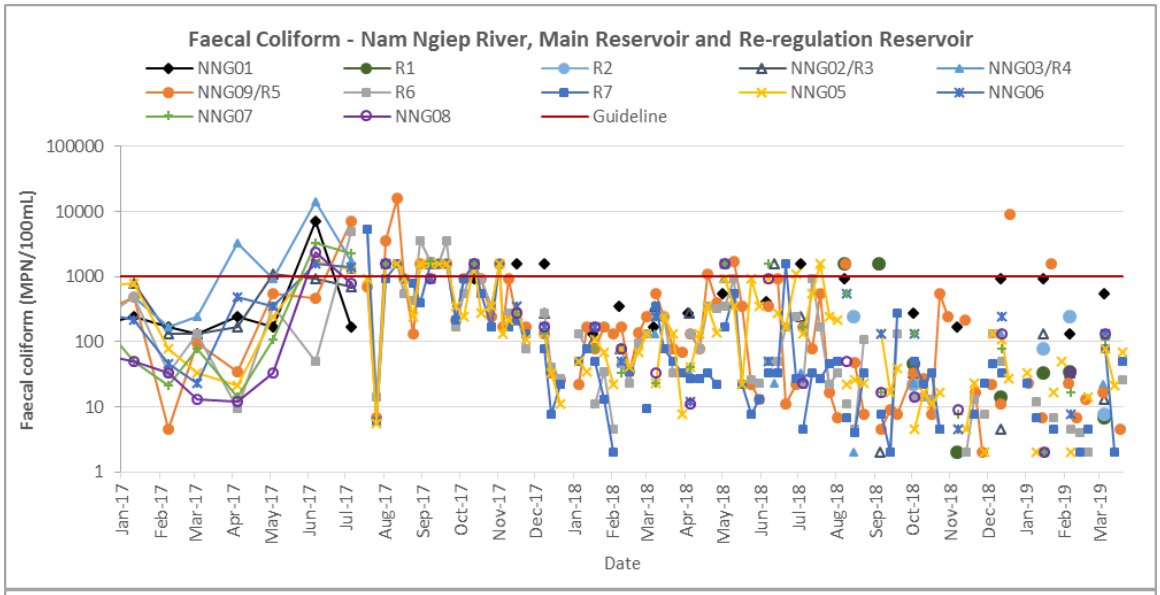
Nam Ngiep Surface Water

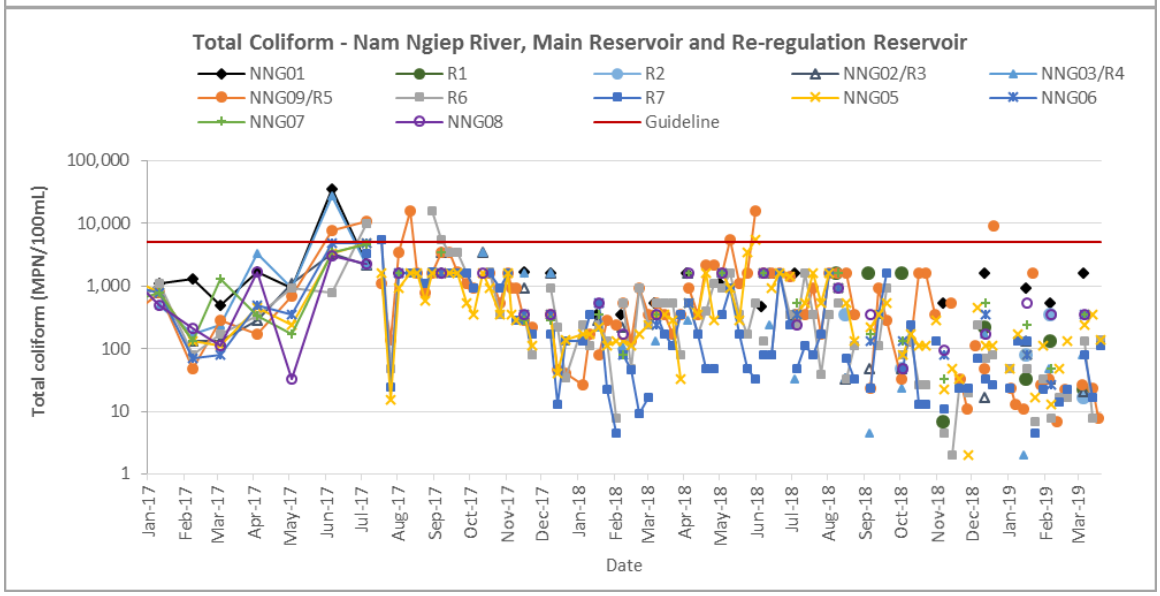




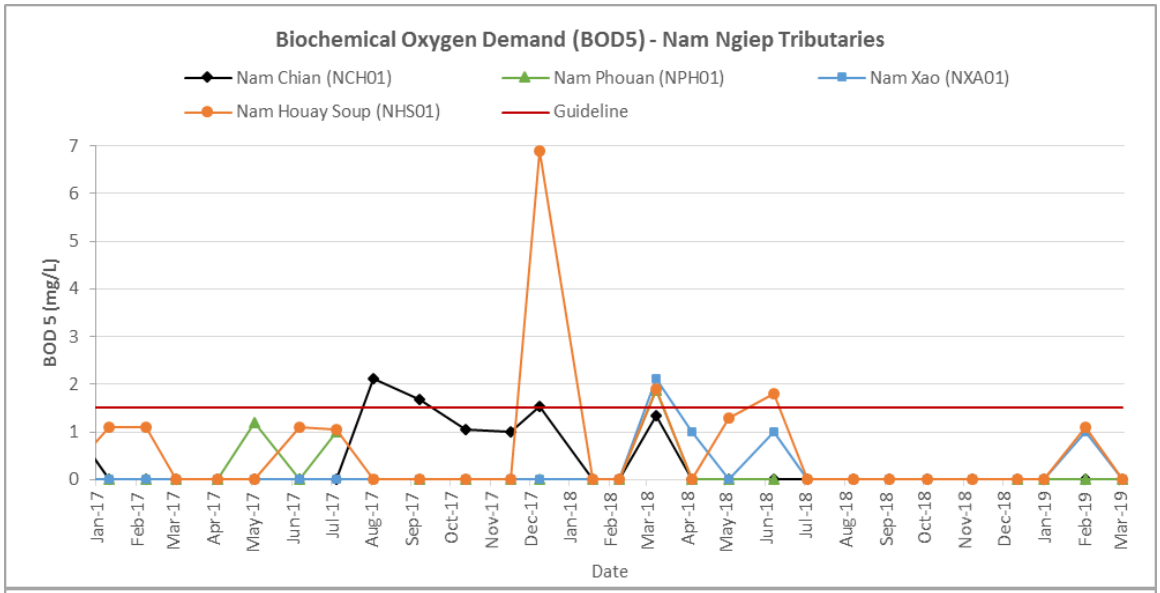

Biochemical Oxygen Demand - Nam Ngiep River, Main Reservoir and Re-regulation Reservoir
NNG01
R1
R2
NNG02/R3
NNG03/R4
NNG09/R5
R6
R7
NNG05
NNG06
NNG07
NNG08
Guideline
BOD 5 (mg/L)
Date

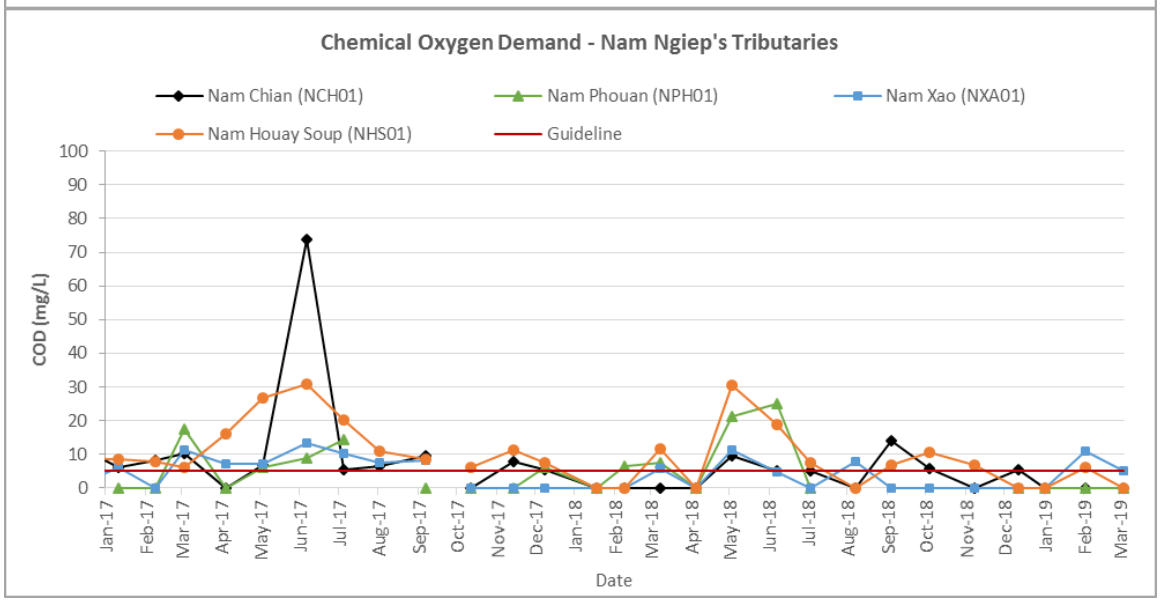

Chemical Oxygen Demand - Nam Ngiep River, Main Reservoir and Re-regulation Reservoir
NNG01
R1
R2
NNG02/R3
NNG03/R4
NNG09/R5
R6
R7
NNG05
NNG06
NNG07
NNG08
Guideline
COD (mg/L)
Date


Faecal Coliform - Nam Ngiep River, Main Reservoir and Re-regulation Reservoir
NNG01
R1
R2
NNG02/R3
NNG03/R4
NNG09/R5
R6
R7
NNG05
NNG06
NNG07
NNG08
Guideline
Faecal coliform (MPN/100mL)
100000
10000
1000
100
10
1
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Date

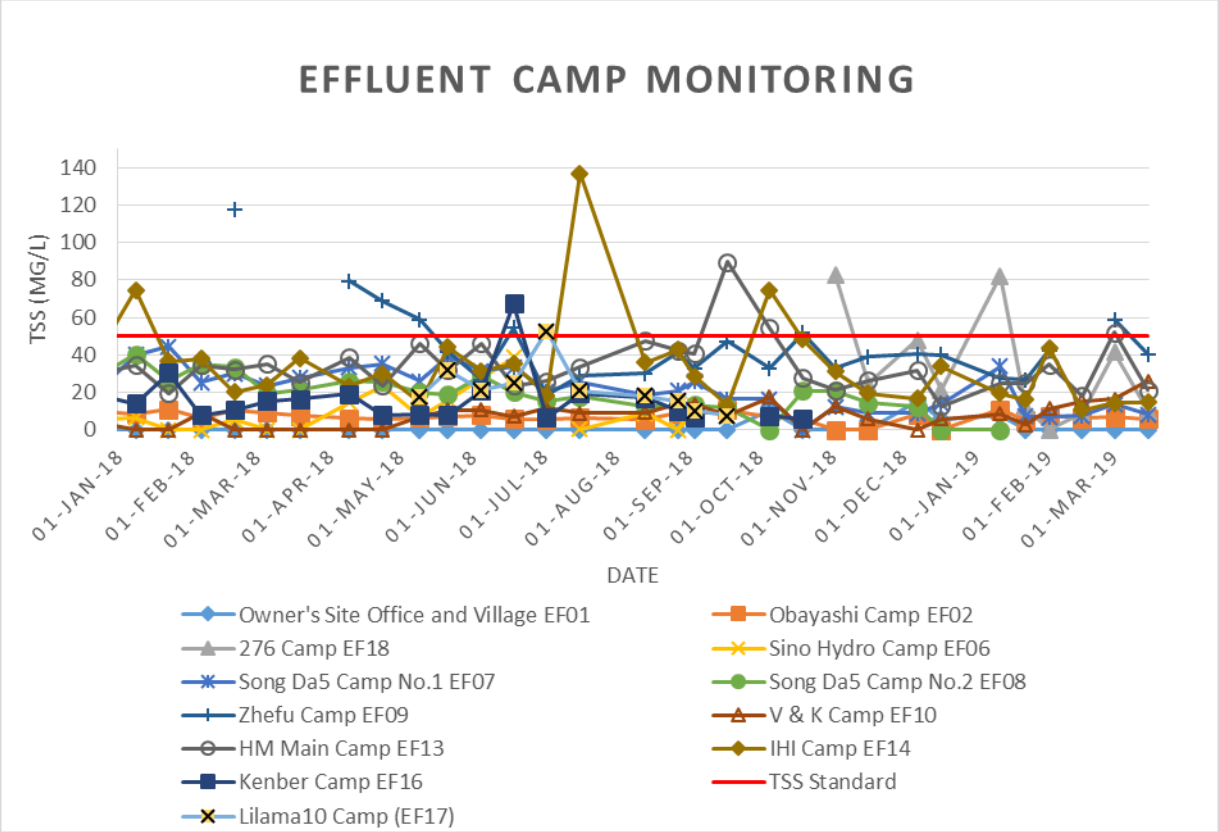

Total Coliform - Nam Ngiep River, Main Reservoir and Re-regulation Reservoir
NNG01
R1
R2
NNG02/R3
NNG03/R4
NNG09/R5
R6
R7
NNG05
NNG06
NNG07
NNG08
Guideline
Total coliform (MPN/100mL)
100,000
10,000
1,000
100
10
1
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Date

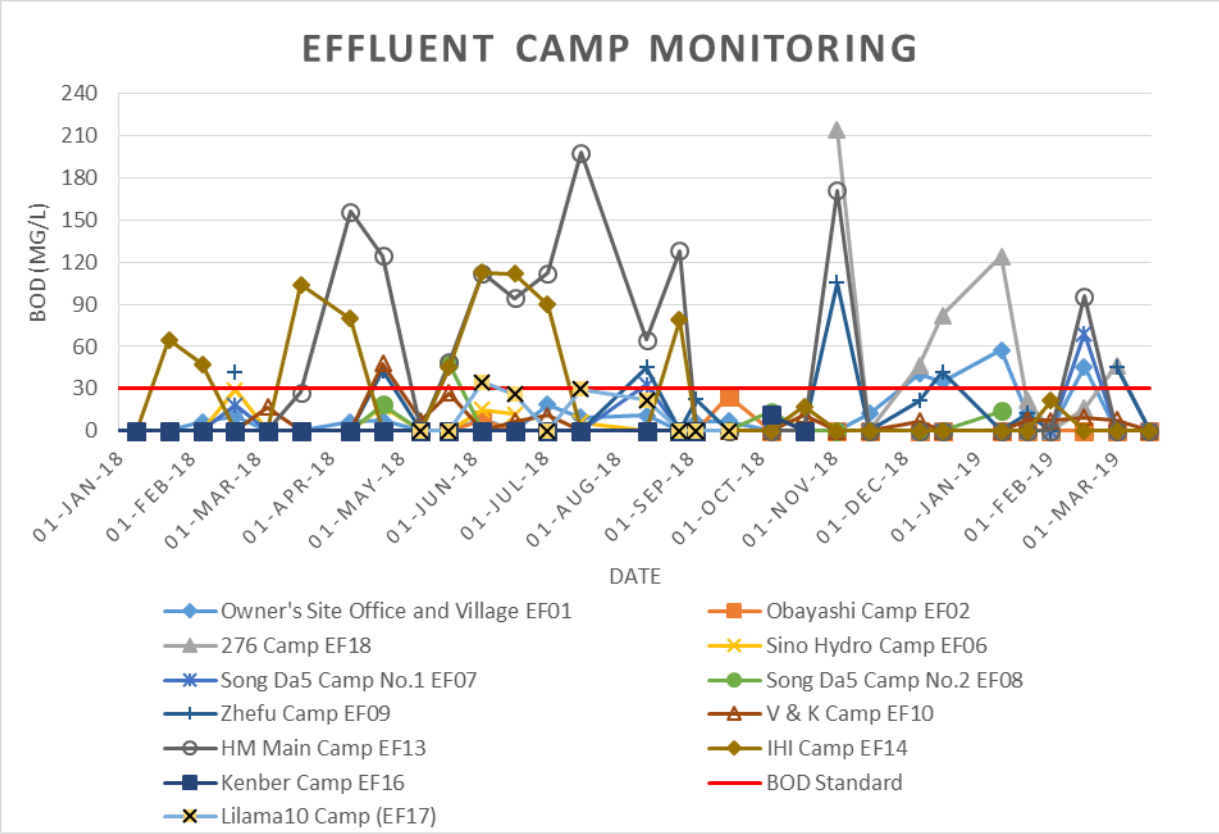
Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup

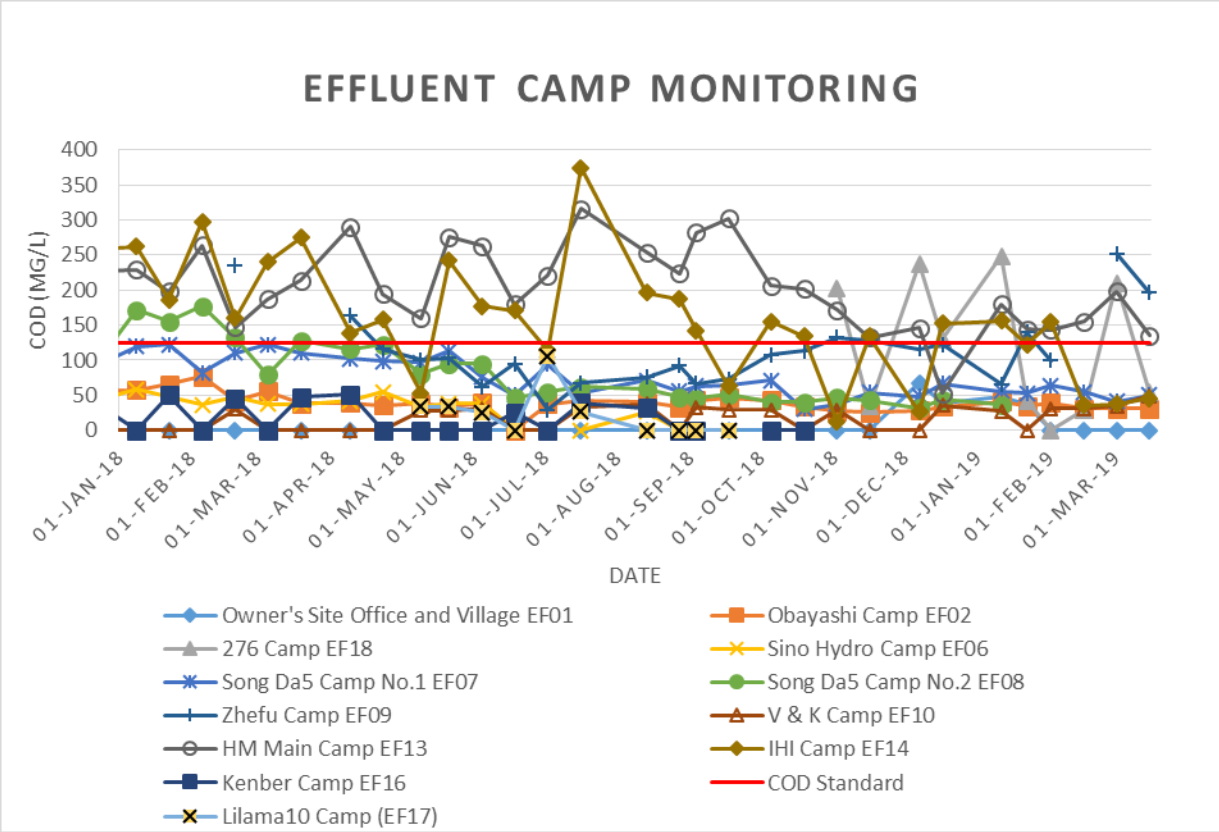


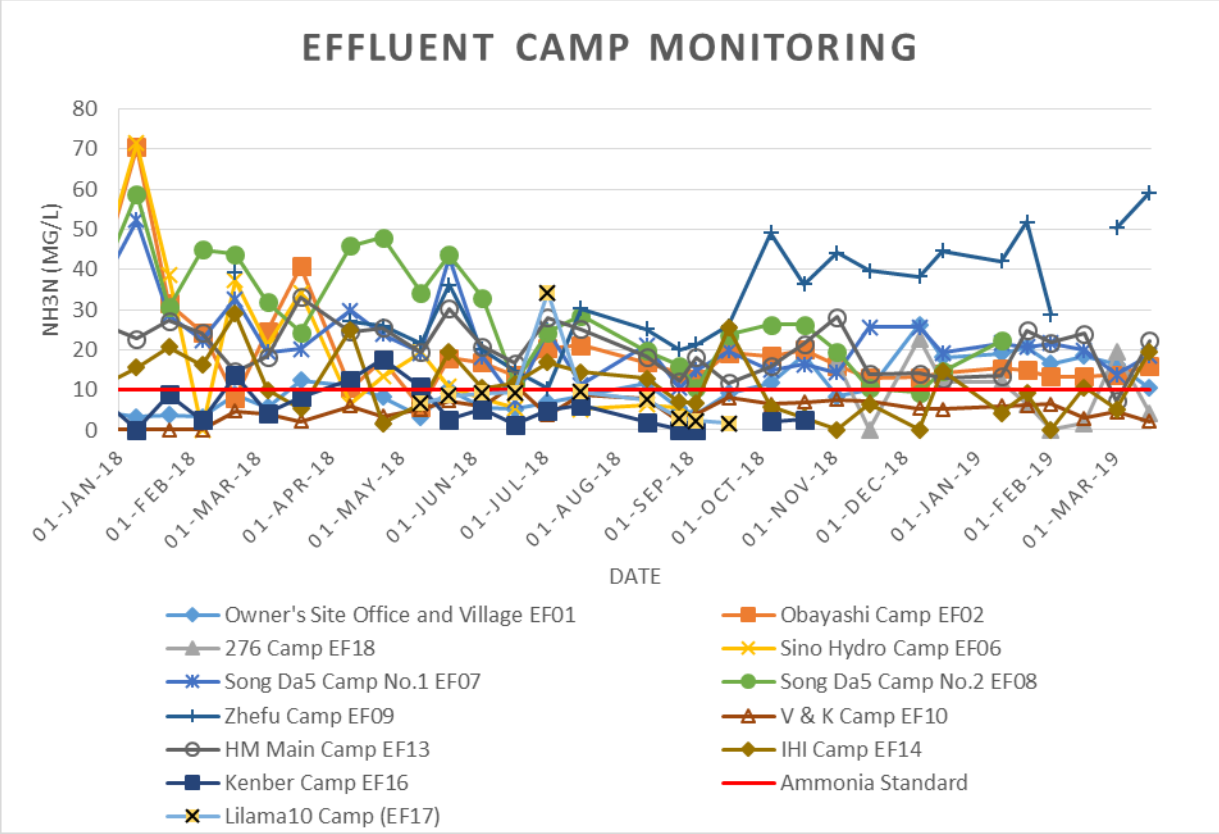


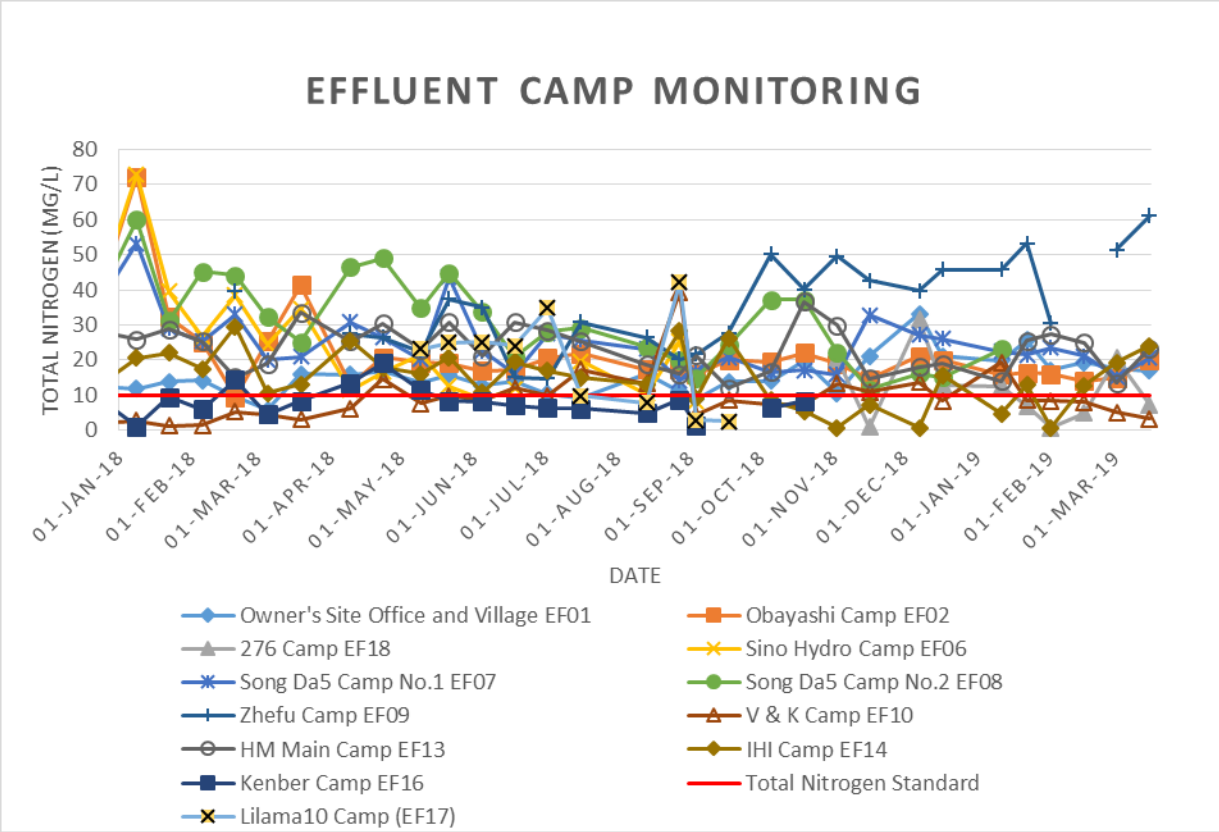
Camps' Effluent Water Quality Trends (Since October 2017 – December 2018)

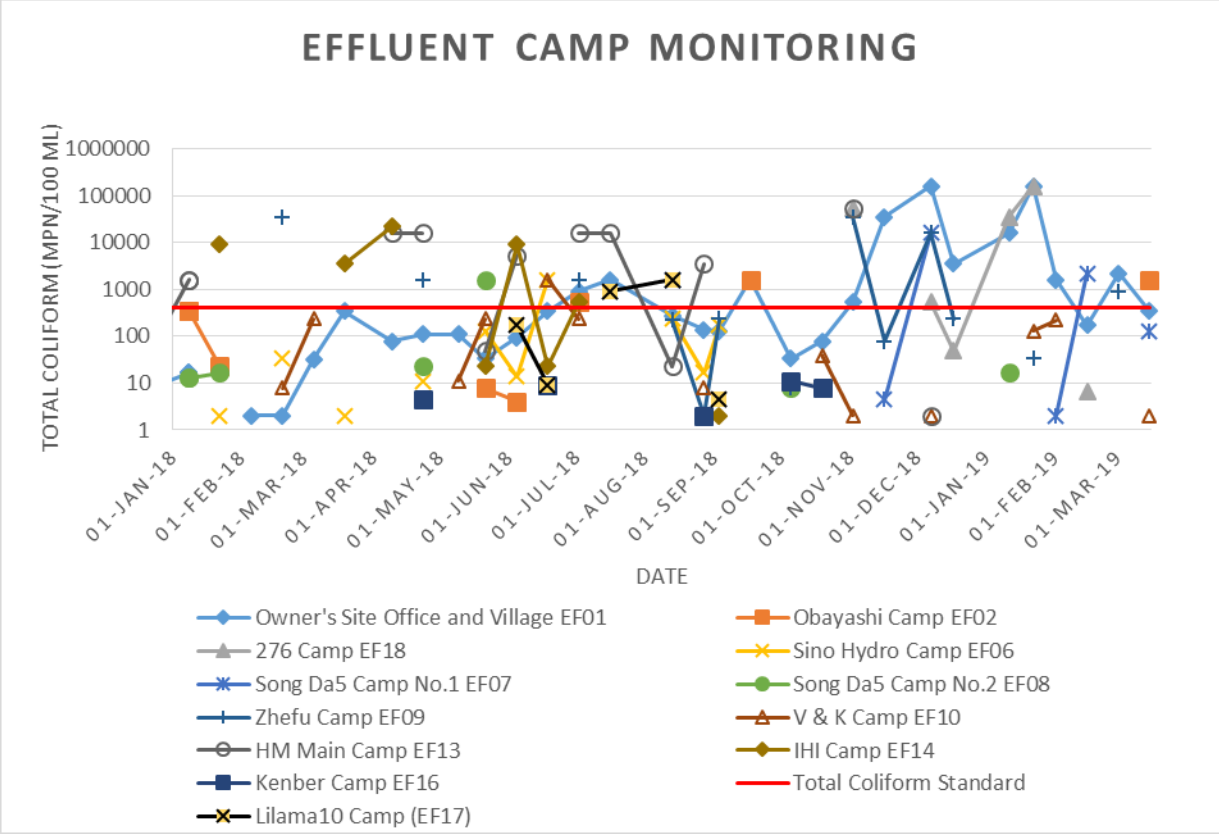





EFFLUENT CAMP MONITORING
COD (MG/L)
400
350
300
250
200
150
100
50
0
01-JAN-18
01-FEB-18
01-MAR-18
01-APR-18
01-MAY-18
01-JUN-18
01-JUL-18
01-AUG-18
01-SEP-18
01-OCT-18
01-NOV-18
01-DEC-18
01-JAN-19
01-FEB-19
01-MAR-19
DATE
Owner's Site Office and Village EF01
Obayashi Camp EF02
276 Camp EF18
Sino Hydro Camp EF06
Song Da5 Camp No.1 EF07
Song Da5 Camp No.2 EF08
Zhefu Camp EF09
V & K Camp EF10
HM Main Camp EF13
IHI Camp EF14
Kenber Camp EF16
COD Standard
Lilama10 Camp (EF17)


EFFLUENT CAMP MONITORING
NH3N (MG/L)
80
70
60
50
40
30
20
10
0
01-JAN-18
01-FEB-18
01-MAR-18
01-APR-18
01-MAY-18
01-JUN-18
01-JUL-18
01-AUG-18
01-SEP-18
01-OCT-18
01-NOV-18
01-DEC-18
01-JAN-19
01-FEB-19
01-MAR-19
DATE
Owner's Site Office and Village EF01
Obayashi Camp EF02
276 Camp EF18
Sino Hydro Camp EF06
Song Da5 Camp No.1 EF07
Song Da5 Camp No.2 EF08
Zhefu Camp EF09
V & K Camp EF10
HM Main Camp EF13
IHI Camp EF14
Kenber Camp EF16
Ammonia Standard
Lilama10 Camp (EF17)


EFFLUENT CAMP MONITORING
TOTAL NITROGEN (MG/L)
80
70
60
50
40
30
20
10
0
01-JAN-18
01-FEB-18
01-MAR-18
01-APR-18
01-MAY-18
01-JUN-18
01-JUL-18
01-AUG-18
01-SEP-18
01-OCT-18
01-NOV-18
01-DEC-18
01-JAN-19
01-FEB-19
01-MAR-19
DATE
Owner's Site Office and Village EF01
Obayashi Camp EF02
276 Camp EF18
Sino Hydro Camp EF06
Song Da5 Camp No.1 EF07
Song Da5 Camp No.2 EF08
Zhefu Camp EF09
V & K Camp EF10
HM Main Camp EF13
IHI Camp EF14
Kenber Camp EF16
Total Nitrogen Standard
Lilama10 Camp (EF17)


EFFLUENT CAMP MONITORING
TOTAL COLIFORM (MPN/100 ML)
1000000
100000
10000
1000
100
10
1
01-JAN-18
01-FEB-18
01-MAR-18
01-APR-18
01-MAY-18
01-JUN-18
01-JUL-18
01-AUG-18
01-SEP-18
01-OCT-18
01-NOV-18
01-DEC-18
01-JAN-19
01-FEB-19
01-MAR-19
DATE
Owner's Site Office and Village EF01
Obayashi Camp EF02
276 Camp EF18
Sino Hydro Camp EF06
Song Da5 Camp No.1 EF07
Song Da5 Camp No.2 EF08
Zhefu Camp EF09
V & K Camp EF10
HM Main Camp EF13
IHI Camp EF14
Kenber Camp EF16
Total Coliform Standard
Lilama10 Camp (EF17)

APPENDIX 5: WATER QUALITY MONITORING DATA

APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q1 2019

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
2-Jan-19	pH	5.0 - 9.0							7.89	8.09	7.19	7.15	7.62	7.16			7.22	7.7
3-Jan-19	pH	5.0 - 9.0				7.39	7.35	7.21								7.69		
5-Jan-19	pH	5.0 - 9.0						7.22			7.1							
7-Jan-19	pH	5.0 - 9.0					7.89	7.89										
8-Jan-19	pH	5.0 - 9.0		7.38	7.21	7.74										7.93		
9-Jan-19	pH	5.0 - 9.0							7.72	7.68	7.54	7.37	6.89	7.02			7.34	7.01
12-Jan-19	pH	5.0 - 9.0						7.57			7.49							
14-Jan-19	pH	5.0 - 9.0					7.93	7.69										
15-Jan-19	pH	5.0 - 9.0	7.47	7.83	8.58	7.85									8.58	7.75		
16-Jan-19	pH	5.0 - 9.0							7.84	7.53	7.77	7.01	7.97	7.98			6.69	7.88
19-Jan-19	pH	5.0 - 9.0						7.84			7.8							
21-Jan-19	pH	5.0 - 9.0					7.76	7.58										
22-Jan-19	pH	5.0 - 9.0		7.74	7.6	7.99										8.3		
23-Jan-19	pH	5.0 - 9.0							7.53	7.83	8.41	8.26	8.42	8.75			8.45	7.72
26-Jan-19	pH	5.0 - 9.0						8.44			8.64							
28-Jan-19	pH	5.0 - 9.0					7.51	7.56										
29-Jan-19	pH	5.0 - 9.0		7.78	7.24	7.36										7.85		
30-Jan-19	pH	5.0 - 9.0							7.71	7.8	7.98	7.61	7.55	8.24			7.65	7.46
2-Feb-19	pH	5.0 - 9.0						7.89			7.81							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
4-Feb-19	pH	5.0 - 9.0					7.98	8.19										
5-Feb-19	pH	5.0 - 9.0	8.17	7.9	7.52	7.8									8.76	8.48		
6-Feb-19	pH	5.0 - 9.0							8.74	8.09	7.97	7.89	8	7.67			7.87	7.78
9-Feb-19	pH	5.0 - 9.0						7.89			7.87							
11-Feb-19	pH	5.0 - 9.0					7.71	7.79										
12-Feb-19	pH	5.0 - 9.0		7.99	7.78	7.7										8.62		
13-Feb-19	pH	5.0 - 9.0							7.98	8.02	8.36	7.71	8.02	8.28			7.76	7.57
16-Feb-19	pH	5.0 - 9.0						7.97			7.93							
18-Feb-19	pH	5.0 - 9.0					8.02	7.75										
19-Feb-19	pH	5.0 - 9.0	8.02	8.17	7.8	7.91									8.22	8.49		
20-Feb-19	pH	5.0 - 9.0							8.07	8.03	8.27	7.27	6.83	6.93			7.28	6.81
23-Feb-19	pH	5.0 - 9.0						8.29			8.3							
25-Feb-19	pH	5.0 - 9.0					8.22	7.91										
26-Feb-19	pH	5.0 - 9.0		8.11	7.85	8.06										8.39		
27-Feb-19	pH	5.0 - 9.0							7.9	7.98	7.89	7.78	6.67	6.78			7.82	7.18
2-Mar-19	pH	5.0 - 9.0						8.35			8.38							
4-Mar-19	pH	5.0 - 9.0					7.99	8.45										
5-Mar-19	pH	5.0 - 9.0	8.5	8.53	8.48	7.8									8.12	8.5		
6-Mar-19	pH	5.0 - 9.0							7.99	7.93	8.17	7.29	6.61	7			7.14	6.69
9-Mar-19	pH	5.0 - 9.0						7.25			7.01							
12-Mar-19	pH	5.0 - 9.0		8.35	7.98	8.41										7.96		
13-Mar-19	pH	5.0 - 9.0					7.86	7.93	8.04	7.06	8.42	7.93	6.84	6.97			8.15	7.38

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
16-Mar-19	pH	5.0 - 9.0						8.49			8.37							
18-Mar-19	pH	5.0 - 9.0					8.32	8.04										
19-Mar-19	pH	5.0 - 9.0	8.29												8.24			
20-Mar-19	pH	5.0 - 9.0							8.01	8.18	8.08	7.26	6.87	6.82			7.21	6.89
21-Mar-19	pH	5.0 - 9.0		8.87	8.39	8.9										8.5		
23-Mar-19	pH	5.0 - 9.1						8.06			8.19							
25-Mar-19	pH	5.0 - 9.2					8.26	8.41										
26-Mar-19	pH	5.0 - 9.3		8.43	8.63	8.44										8.77		
27-Mar-19	pH	5.0 - 9.4							8.15	8.08	8.19	7.79	6.75	6.72			7.96	7.03
2-Jan-19	Sat. DO (%)								96.6	95.4	107.7	106.5	101.4	97.8			99.3	96.3
3-Jan-19	Sat. DO (%)					61	34.4	17.3								90.4		
5-Jan-19	Sat. DO (%)							57.2			111.2							
7-Jan-19	Sat. DO (%)						93.6	112.8										
8-Jan-19	Sat. DO (%)			77.4	65.1	80.1										89.8		
9-Jan-19	Sat. DO (%)								98.2	93.8	107.8	108	104.5	100.7			103.5	103.4
12-Jan-19	Sat. DO (%)							103.1			106							
14-Jan-19	Sat. DO (%)						91.1	99.9										
15-Jan-19	Sat. DO (%)		104.5	86.8	106.4	96.2									101.7	97.9		
16-Jan-19	Sat. DO (%)								86.5	83.2	102.7	100.3	96.1	93			89.4	82
19-Jan-19	Sat. DO (%)							79.6			101.7							
21-Jan-19	Sat. DO (%)						75.1	54.8								107.5		
22-Jan-19	Sat. DO (%)			97.8	71.7	92.2												

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
23-Jan-19	Sat. DO (%)							101	85.6	102.9	101.8	97.3	8.75			88.9	97.9
26-Jan-19	Sat. DO (%)						85.8			104.2							
28-Jan-19	Sat. DO (%)						65.2	46.8									
29-Jan-19	Sat. DO (%)			78.9	36.8	58.7											
30-Jan-19	Sat. DO (%)							92.7	98.2	103.7	102.1	94.8	95.3		90.4	92.4	98.2
2-Feb-19	Sat. DO (%)						87			108.4							
4-Feb-19	Sat. DO (%)						90	85.5									
5-Feb-19	Sat. DO (%)		103.2	94.7	84.3	84.7								103.8	97.6		
6-Feb-19	Sat. DO (%)							99.9	92.6	103.5	94.1	99.5	101.1			87.6	94.3
9-Feb-19	Sat. DO (%)						96.3			107.4							
11-Feb-19	Sat. DO (%)						72.9	78.6									
12-Feb-19	Sat. DO (%)			75	35.3	78.6									92.5		
13-Feb-19	Sat. DO (%)							103.3	91.6	96	89.9	97.3	101.2			82.1	83.1
16-Feb-19	Sat. DO (%)						87.5			104.5							
18-Feb-19	Sat. DO (%)						91.2	90.3									
19-Feb-19	Sat. DO (%)		103	104.2	71.6	99.2								100.4	112.7		
20-Feb-19	Sat. DO (%)							87.6	81.1	100.1	99.9	97.7	96.2			82.3	74
23-Feb-19	Sat. DO (%)						91.8			103.4							
25-Feb-19	Sat. DO (%)						85.6	89.9									
26-Feb-19	Sat. DO (%)			94.5	86.1	88.5									93.4		
27-Feb-19	Sat. DO (%)							92.2	87.7	102.2	99.6	97.5	97.4			81.2	97
2-Mar-19	Sat. DO (%)						99.6			101							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
4-Mar-19	Sat. DO (%)						89.8	90.1										
5-Mar-19	Sat. DO (%)		103.1	96	96.3	93.4									103.7	93.5		
6-Mar-19	Sat. DO (%)								94	94.7	102.8	100.4	99.1	101			89.3	77.6
9-Mar-19	Sat. DO (%)							97.8			103.6							
12-Mar-19	Sat. DO (%)			96.9	75.6	78.4										98.3		
13-Mar-19	Sat. DO (%)						74.5	82.7	94.9	90.4	102.1	103	95.9	94.2			95.6	94.4
16-Mar-19	Sat. DO (%)							90.7			99							
18-Mar-19	Sat. DO (%)						88.3	88.2										
19-Mar-19	Sat. DO (%)		100.3												101.5			
20-Mar-19	Sat. DO (%)								94.8	92.8	97.9	97.2	96.8	94.8			81.4	79.2
21-Mar-19	Sat. DO (%)			93.5	85.2	87.9										90.6		
23-Mar-19	Sat. DO (%)							93.5			96.6							
25-Mar-19	Sat. DO (%)						98.6	92.5										
26-Mar-19	Sat. DO (%)			93.6	87.3	90.7										96.8		
27-Mar-19	Sat. DO (%)								83.7	84.2	95.1	93.1	93.7	95			82	94.4
2-Jan-19	DO (mg/l)	<6.0							8.13	8	9.04	9.06	8.39	7.92			8.45	7.07
3-Jan-19	DO (mg/l)	<6.0				4.96	2.9	1.46								8.52		
5-Jan-19	DO (mg/l)	<6.0						4.58			8.98							
7-Jan-19	DO (mg/l)	<6.0					7.5	9.92										

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
8-Jan-19	DO (mg/l)	<6.0		6.39	5.38	6.51										7.94		
9-Jan-19	DO (mg/l)	<6.0							8.22	7.84	8.89	8.9	8.6	8.19			8.59	8.53
12-Jan-19	DO (mg/l)	<6.0						8.18			8.57							
14-Jan-19	DO (mg/l)	<6.0					7.26	8.02										
15-Jan-19	DO (mg/l)	<6.0	8.55	8.97	11.06	8.12									8.37	9.25		
16-Jan-19	DO (mg/l)	<6.0							7.24	6.96	8.32	8.21	7.82	7.37			7.31	6.84
19-Jan-19	DO (mg/l)	<6.0						6.6			8.46							
21-Jan-19	DO (mg/l)	<6.0					6.1	4.53										
22-Jan-19	DO (mg/l)	<6.0		8.01	5.91	7.62										9.95		
23-Jan-19	DO (mg/l)	<6.0							9.37	7.23	8.71	8.54	8.02	7.76			7.55	8.54
26-Jan-19	DO (mg/l)	<6.0						6.9			8.42							
28-Jan-19	DO (mg/l)	<6.0					5.26	3.83										
29-Jan-19	DO (mg/l)	<6.0		6.47	3.05	5.02										8.56		
30-Jan-19	DO (mg/l)	<6.0							7.82	8.74	8.65	8.51	7.55	7.61			7.77	8.13
30-Jan-19	DO (mg/l)	<6.0							7.82	8.74	8.65	8.51	7.55	7.61			7.77	8.13
2-Feb-19	DO (mg/l)	<6.0						7.06			8.69							
4-Feb-19	DO (mg/l)	<6.0					7.42	7.04										
5-Feb-19	DO (mg/l)	<6.0	8.37	7.66	7.09	7.11									8.81	9.06		
6-Feb-19	DO (mg/l)	<6.0							8.63	7.98	8.49	7.75	7.97	7.99			7.2	7.82
9-Feb-19	DO (mg/l)	<6.0						7.65			8.72							
11-Feb-19	DO (mg/l)	<6.0					6.17	6.51										
12-Feb-19	DO (mg/l)	<6.0		6.16	2.94	6.94										8.9		

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
13-Feb-19	DO (mg/l)	<6.0							9.52	8.44	7.75	7.33	7.63	7.82			6.72	7.06
16-Feb-19	DO (mg/l)	<6.0						6.78			8.36							
18-Feb-19	DO (mg/l)	<6.0					7.43	7.42										
19-Feb-19	DO (mg/l)	<6.0	8.22	8.35	5.78	8.09									8.29	10.12		
20-Feb-19	DO (mg/l)	<6.0							7.19	6.65	8.06	8.14	7.79	7.32			6.71	6.09
23-Feb-19	DO (mg/l)	<6.0						6.99			8.04							
25-Feb-19	DO (mg/l)	<6.0					6.83	7.23										
26-Feb-19	DO (mg/l)	<6.0		7.5	6.93	7.15										8.21		
27-Feb-19	DO (mg/l)	<6.0							7.6	7.07	7.97	7.89	7.61	7.4			6.36	7.72
2-Mar-19	DO (mg/l)	<6.0						7.86			8							
4-Mar-19	DO (mg/l)	<6.0					7.07	7.16										
5-Mar-19	DO (mg/l)	<6.0	7.94	7.42	7.5	7.29									8.11	8.04		
6-Mar-19	DO (mg/l)	<6.0							7.69	7.55	7.87	7.82	7.58	7.58			6.8	6.37
9-Mar-19	DO (mg/l)	<6.0						7.63			8.21							
12-Mar-19	DO (mg/l)	<6.0		7.56	6.00	6.29										8.13		
13-Mar-19	DO (mg/l)	<6.0					6.00	6.67	7.87	7.26	8.12	8.34	7.6	7.32			7.67	7.55
16-Mar-19	DO (mg/l)	<6.0						7.03			7.9							
18-Mar-19	DO (mg/l)	<6.0					6.95	6.97										
19-Mar-19	DO (mg/l)	<6.0	8.23												8.24			

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
20-Mar-19	DO (mg/l)	<6.0							7.73	7.49	7.64	7.36	7.34	7.14			6.33	6.16
21-Mar-19	DO (mg/l)	<6.0		7.15	6.58	6.86										7.76		
23-Mar-19	DO (mg/l)	<6.0						7.15			7.69							
25-Mar-19	DO (mg/l)	<6.0					7.72	7.22										
26-Mar-19	DO (mg/l)	<6.0		7.15	6.76	7.1										7.89		
27-Mar-19	DO (mg/l)	<6.0							6.87	6.73	7.35	7.16	7.17	7.01			6.44	7.33
2-Jan-19	Conductivity (µs/cm)								69	68	52.9	57.1	52.7	51.7			108.3	41.3
3-Jan-19	Conductivity (µs/cm)					74	68	67								66		
5-Jan-19	Conductivity (µs/cm)							52.6			52							
7-Jan-19	Conductivity (µs/cm)						69	76										
8-Jan-19	Conductivity (µs/cm)			89	84	76										68		
9-Jan-19	Conductivity (µs/cm)								70	70	55.1	54.2	53.7	53.1			68.6	53.9
12-Jan-19	Conductivity (µs/cm)							50.7			68.9							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
14-Jan-19	Conductivity (µs/cm)						69	69										
15-Jan-19	Conductivity (µs/cm)		73.1	125	110	81									28.1	72		
16-Jan-19	Conductivity (µs/cm)								69	70	51.9	57.5	52.2	49.5			109.6	53.2
19-Jan-19	Conductivity (µs/cm)							50.6			51.4							
21-Jan-19	Conductivity (µs/cm)						70	69										
22-Jan-19	Conductivity (µs/cm)			90	82	77										69		
23-Jan-19	Conductivity (µs/cm)								79	70	52.6	52.9	51.5	55.2			108.1	52.2
26-Jan-19	Conductivity (µs/cm)							51.3			58.7							
28-Jan-19	Conductivity (µs/cm)						70	69										
29-Jan-19	Conductivity (µs/cm)			90	85	76										69		
30-Jan-19	Conductivity (µs/cm)								71	74	51.6	51.9	54.8	54.8			97.7	52.3
2-Feb-19	Conductivity (µs/cm)							52.6			51.7							
4-Feb-19	Conductivity (µs/cm)						72	69										

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
5-Feb-19	Conductivity (µs/cm)		69.1	91	85	77									26.1	71		
6-Feb-19	Conductivity (µs/cm)								78	76	52.7	55.4	56.1	57.2			117	56.1
9-Feb-19	Conductivity (µs/cm)							50.5			52.9							
11-Feb-19	Conductivity (µs/cm)						73	69										
12-Feb-19	Conductivity (µs/cm)			90	84	82										75		
13-Feb-19	Conductivity (µs/cm)								79	80	54.2	56.2	57.4	59.2			122.2	45.6
16-Feb-19	Conductivity (µs/cm)							50.3			55.1							
18-Feb-19	Conductivity (µs/cm)						69	69										
19-Feb-19	Conductivity (µs/cm)		65.7	89	83	70									32.5	71		
20-Feb-19	Conductivity (µs/cm)								70	71	51.1	54.9	51.7	52.5			94.1	61.5
23-Feb-19	Conductivity (µs/cm)							50.5			51.1							
25-Feb-19	Conductivity (µs/cm)						69	69										
26-Feb-19	Conductivity (µs/cm)			88	82	70										68		

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
27-Feb-19	Conductivity (µs/cm)								71	71	51.9	53.8	52.9	52.2			116.2	40.3
2-Mar-19	Conductivity (µs/cm)							52.5			53.5							
4-Mar-19	Conductivity (µs/cm)						68	69										
5-Mar-19	Conductivity (µs/cm)		60.8	87	82	71									27.4	73		
6-Mar-19	Conductivity (µs/cm)								71	71	51.2	61	53.1	55.6			127.2	45.8
9-Mar-19	Conductivity (µs/cm)							50.8			52.6							
12-Mar-19	Conductivity (µs/cm)			87	84	71										69		
13-Mar-19	Conductivity (µs/cm)						69	69	74	72	52.2	52.8	52.1	53.9			61	53.9
16-Mar-19	Conductivity (µs/cm)							51.1			53.9							
18-Mar-19	Conductivity (µs/cm)						69	69										
19-Mar-19	Conductivity (µs/cm)		69												27.2			
20-Mar-19	Conductivity (µs/cm)								72	72	54.3	55.3	53.3	52.6			129.6	47.3
21-Mar-19	Conductivity (µs/cm)			86	84	72										72		

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
23-Mar-19	Conductivity (µs/cm)						50.4			54							
25-Mar-19	Conductivity (µs/cm)					69	69										
26-Mar-19	Conductivity (µs/cm)		88	84	71										77		
27-Mar-19	Conductivity (µs/cm)							73	73	54	52.4	53.3	52.8			137.7	65.1
2-Jan-19	TDS (mg/l)							34.5	34	26.4	54	26.3	25.5			54	20.5
3-Jan-19	TDS (mg/l)				37	34	33.5								33		
5-Jan-19	TDS (mg/l)						26.3			26							
7-Jan-19	TDS (mg/l)					34.5	38										
8-Jan-19	TDS (mg/l)		44.5	42	38										34		
9-Jan-19	TDS (mg/l)							35	35	27.5	27.1	26.8	26.5			34.3	26.4
12-Jan-19	TDS (mg/l)						25.35			34.5							
14-Jan-19	TDS (mg/l)					34.5	34.5										
15-Jan-19	TDS (mg/l)	36.55	62.3	55	40.5									14.05	36		
16-Jan-19	TDS (mg/l)							34.5	35	25.5	27.5	26.1	24.8			54.3	27.5
19-Jan-19	TDS (mg/l)						25.3			25.7							
21-Jan-19	TDS (mg/l)					35	34.5										
22-Jan-19	TDS (mg/l)		45	41	38.5										34.5		
23-Jan-19	TDS (mg/l)							39.5	35	26.3	26.45	25.75	27.6			54.5	26.1
26-Jan-19	TDS (mg/l)						25.65			29.35							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
28-Jan-19	TDS (mg/l)						35	34.5										
29-Jan-19	TDS (mg/l)			45	42.5	38										34.5		
30-Jan-19	TDS (mg/l)								35.5	37	25.8	26	27.4	27.4			48.85	26.15
2-Feb-19	TDS (mg/l)							26.3			25.85							
4-Feb-19	TDS (mg/l)						36	34.5										
5-Feb-19	TDS (mg/l)		34.55	45.5	42.5	38.5									13.05	35.5		
6-Feb-19	TDS (mg/l)								38.5	38	26.35	27.62	28.05	28.6			58.5	28
9-Feb-19	TDS (mg/l)							25.22			26.5							
11-Feb-19	TDS (mg/l)						36.5	34.5										
12-Feb-19	TDS (mg/l)			45	42	41										37.5		
13-Feb-19	TDS (mg/l)								39.5	40	27.1	28.1	28.7	29.6			61.1	37.8
16-Feb-19	TDS (mg/l)							25			27.5							
18-Feb-19	TDS (mg/l)						34.5	34.5										
19-Feb-19	TDS (mg/l)		33	44.5	41.5	35									16	35.5		
20-Feb-19	TDS (mg/l)								25	25.43	25.55	27.45	25.85	26.25			24.8	30.75
23-Feb-19	TDS (mg/l)							25.25			25.55							
25-Feb-19	TDS (mg/l)						34.5	34.5										
26-Feb-19	TDS (mg/l)			44	41	35										34		
27-Feb-19	TDS (mg/l)								35.5	35.5	25.9	26.9	26.4	26			58	20
2-Mar-19	TDS (mg/l)							26.25			26.75							
4-Mar-19	TDS (mg/l)						34	34.5										
5-Mar-19	TDS (mg/l)		30.4	43.5	41	35.5									13.7	36.5		

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
6-Mar-19	TDS (mg/l)							35.5	35.5	25.5	30.5	26.5	27.8			25.5	22.9
9-Mar-19	TDS (mg/l)						25.4			26.3							
12-Mar-19	TDS (mg/l)			43.5	42	35.5									34.5		
13-Mar-19	TDS (mg/l)						34.5	34.5	37	36	26.1	26.4	26.5	26.95		30.5	26.95
16-Mar-19	TDS (mg/l)							25.55			29.65						
18-Mar-19	TDS (mg/l)						34.5	34.5									
19-Mar-19	TDS (mg/l)		34.5											13.5			
20-Mar-19	TDS (mg/l)								36	36	27	27.5	26.5	26.3		64.8	23.5
21-Mar-19	TDS (mg/l)			43	42	36									36		
23-Mar-19	TDS (mg/l)							25.2			27						
25-Mar-19	TDS (mg/l)						34.5	34.5									
26-Mar-19	TDS (mg/l)			44	42	35.5									38.5		
27-Mar-19	TDS (mg/l)								36.5	36.5	27	26.2	26.65	26.4		68.85	32.55
2-Jan-19	Temperature (°C)								23.93	24.26	23.6	22.8	24.6	25.3		22.6	21.3
3-Jan-19	Temperature (°C)					25.93	24.39	24.02									
5-Jan-19	Temperature (°C)							24.7			25.3						
7-Jan-19	Temperature (°C)						26.24	21.76									
8-Jan-19	Temperature (°C)			25.13	25.38	25.63									20.96		
9-Jan-19	Temperature (°C)								24.3	24.31	24.1	24.2	24.4	24.8		23.9	24.2
12-Jan-19	Temperature (°C)							25.3			25.2						
14-Jan-19	Temperature (°C)						26.98	26.39									
15-Jan-19	Temperature (°C)		23.4	23.98	23.91	23.81								22.9	18.04		

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
16-Jan-19	Temperature (°C)								24.41	24.96	25.1	24.5	25.4	26.2			24.7	23.7
19-Jan-19	Temperature (°C)							24			23.7							
21-Jan-19	Temperature (°C)						26.16	25.5										
22-Jan-19	Temperature (°C)			25.45	25.14	25										19.17		
23-Jan-19	Temperature (°C)								19.24	23.9	22.9	23.3	24.4	25.2			22.9	23.2
26-Jan-19	Temperature (°C)							24.9			25.4							
28-Jan-19	Temperature (°C)						26.51	25.4										
29-Jan-19	Temperature (°C)			25.6	25.3	24.34										18.09		
30-Jan-19	Temperature (°C)								23.9	21.02	23.6	23.7	26.2	26			23.3	24.1
2-Feb-19	Temperature (°C)							24.1			23.2							
4-Feb-19	Temperature (°C)						25.1	25.44										
5-Feb-19	Temperature (°C)		24	25.85	24.48	24.22									21.3	18.94		
6-Feb-19	Temperature (°C)								22.68	22.23	24.3	24.1	25.6	26.3			24.2	24.1
9-Feb-19	Temperature (°C)							25.2			24.8							
11-Feb-19	Temperature (°C)						23.75	25.63										
12-Feb-19	Temperature (°C)			25.57	24.86	21.74										17.25		
13-Feb-19	Temperature (°C)								19.69	19.23	25.4	25	27.1	27.8				
16-Feb-19	Temperature (°C)							25.1			25.5							
18-Feb-19	Temperature (°C)						25.78	24.95										
19-Feb-19	Temperature (°C)		24.6	26.88	26.45	25.72									22.6	20.69		
20-Feb-19	Temperature (°C)								25	25.43	26.4	24.8	25.9	28.4			24.8	24.3

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
23-Feb-19	Temperature (°C)							27.3			27.1							
25-Feb-19	Temperature (°C)						26.82	26.49										
26-Feb-19	Temperature (°C)			27.24	26.41	26.48										21.86		
27-Feb-19	Temperature (°C)								25.16	26.26	26.9	26.1	26.9	28.2			26.8	25.3
2-Mar-19	Temperature (°C)							25.6			25.9							
4-Mar-19	Temperature (°C)						27.62	27.3										
5-Mar-19	Temperature (°C)		26.5	28.77	28.29	28.22									25.4	22.84		
6-Mar-19	Temperature (°C)								25.36	27.08	28	27.9	28	28.6			28.3	25.6
9-Mar-19	Temperature (°C)							26.3			25.6							
12-Mar-19	Temperature (°C)			28.03	27.65	26.76										23.8		
13-Mar-19	Temperature (°C)						26.44	26.37	24.76	26.58	25.9	25	26.2	27.2			25.5	25.6
16-Mar-19	Temperature (°C)							26.6			26							
18-Mar-19	Temperature (°C)						27.8	27.54										
19-Mar-19	Temperature (°C)		23.3												23.5			
20-Mar-19	Temperature (°C)								25.63	25.93	26.8	27.5	28.3	28.8			28.9	26.9
21-Mar-19	Temperature (°C)			29.84	28.56	28.08										23.12		
23-Mar-19	Temperature (°C)							27			25.7							
25-Mar-19	Temperature (°C)						27.86	28.19										
26-Mar-19	Temperature (°C)			29.78	28.45	27.94										23.83		
27-Mar-19	Temperature (°C)								25.61	27.63	27.6	27.7	28.1	29.9			28.8	27.3
2-Jan-19	Turbidity (NTU)								13.47	13.23	13.98	12.26	14.58	19.25			2.36	4.4

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
3-Jan-19	Turbidity (NTU)					2	2.16	2.06								3.05		
5-Jan-19	Turbidity (NTU)							1.31			4.82							
7-Jan-19	Turbidity (NTU)						1.29	1.04										
8-Jan-19	Turbidity (NTU)			1.1	1.22	1.21										2.38		
9-Jan-19	Turbidity (NTU)								5.7	3.39	5.43	6.51	8.89	15.33			6.35	5.53
12-Jan-19	Turbidity (NTU)							3.28			5.21							
14-Jan-19	Turbidity (NTU)						0.96	0.75										
15-Jan-19	Turbidity (NTU)		9.54	2.06	1.3	1.2									81.77	2.49		
16-Jan-19	Turbidity (NTU)								1.73	2.23	3.37	3.6	5.93	6.49			5.75	6.55
19-Jan-19	Turbidity (NTU)							2.82			3.66							
21-Jan-19	Turbidity (NTU)						0.7	0.87										
22-Jan-19	Turbidity (NTU)			1.58	1.15	1.07										1.47		
23-Jan-19	Turbidity (NTU)								7.14	5.51	10.42	12.66	16.48	16.4			3.54	10.38
26-Jan-19	Turbidity (NTU)							1.18			4.09							
28-Jan-19	Turbidity (NTU)						1.49	1.3										
29-Jan-19	Turbidity (NTU)			1.87	3.87	2.34										3.44		
30-Jan-19	Turbidity (NTU)								18.07	16.37	12.86	13.14	24.66	8.64			3.2	13.35
2-Feb-19	Turbidity (NTU)							1.54			16.22							
4-Feb-19	Turbidity (NTU)						1.16	1.43										
5-Feb-19	Turbidity (NTU)		9.1	2.06	1.58	1.57									5.39	2.94		
6-Feb-19	Turbidity (NTU)								6.68	2.97	6.1	5.38	4.4	5.4			3.22	4.2
9-Feb-19	Turbidity (NTU)							2.04			6.4							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
11-Feb-19	Turbidity (NTU)						1.77	2.11										
12-Feb-19	Turbidity (NTU)			2.08	2.24	1.97										3.14		
13-Feb-19	Turbidity (NTU)								3.42	4.04	3.53	3.38	2.17	3.68			3.12	3.58
16-Feb-19	Turbidity (NTU)							1.38			4.36							
18-Feb-19	Turbidity (NTU)						0.84	0.83										
19-Feb-19	Turbidity (NTU)		7.19	1.15	1.6	0.89									3.43	3.35		
20-Feb-19	Turbidity (NTU)								3.02	2.98	4.71	5.12	5.73	8.42			9.25	3.42
23-Feb-19	Turbidity (NTU)							0.89			3.03							
25-Feb-19	Turbidity (NTU)						1.54	1.87										
26-Feb-19	Turbidity (NTU)			1.95	2.07	1.65										13.55		
27-Feb-19	Turbidity (NTU)								4.3	4.16	6.29	5.86	5.91	7.92			4.12	5.79
2-Mar-19	Turbidity (NTU)							1.02			8.88							
4-Mar-19	Turbidity (NTU)						1.14	0.77										
5-Mar-19	Turbidity (NTU)		5.96	1.24	0.92	0.93									5.35	2.17		
6-Mar-19	Turbidity (NTU)								3.98	4.22	4.6	9.13	5.58	6.17			6.1	14.22
9-Mar-19	Turbidity (NTU)							1.06			4.31							
12-Mar-19	Turbidity (NTU)			1.06	0.99	1.07										1.22		
13-Mar-19	Turbidity (NTU)						1.54	1.45	6.33	6.33	8.47	8.68	5.44	5.32			5.44	6.85
16-Mar-19	Turbidity (NTU)							2.6			5.81							
18-Mar-19	Turbidity (NTU)						0.85	0.96										
19-Mar-19	Turbidity (NTU)		6.92												13.19			
20-Mar-19	Turbidity (NTU)								4.9	4.91	8.13	8.44	7.42	9.22			14.6	52.9

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
21-Mar-19	Turbidity (NTU)			1.3	1.01	1.08									11.46		
23-Mar-19	Turbidity (NTU)							2.62			5.09						
25-Mar-19	Turbidity (NTU)						1.04	0.96									
26-Mar-19	Turbidity (NTU)			1.97	1.1	1.17									2.44		
27-Mar-19	Turbidity (NTU)								6.2	5.07	5.14	5.39	5.12	6.33		4.27	5.89
2-Jan-19	TSS (mg/l)								21.72	15.88	30.1						
3-Jan-19	TSS (mg/l)							<5									
7-Jan-19	TSS (mg/l)							<5									
9-Jan-19	TSS (mg/l)								11.23	7.34	8.12						
14-Jan-19	TSS (mg/l)						<5	<5									
15-Jan-19	TSS (mg/l)		10.57	<5	<5	<5								141.61	6.68		
16-Jan-19	TSS (mg/l)								<5	<5	<5	<5	6.07	6.25		<5	<5
21-Jan-19	TSS (mg/l)							<5									
23-Jan-19	TSS (mg/l)								6.99	6.76	13.33						
28-Jan-19	TSS (mg/l)							<5									
30-Jan-19	TSS (mg/l)								55.1	28.16	31.55						
4-Feb-19	TSS (mg/l)						<5	<5									
5-Feb-19	TSS (mg/l)		22.5	<5	<5	<5								8.44	<5		
6-Feb-19	TSS (mg/l)								19.34	6.11	9.39	6.56	<5	8.77		<5	<5
11-Feb-19	TSS (mg/l)							<5									
13-Feb-19	TSS (mg/l)								6.98	<5	<5						
18-Feb-19	TSS (mg/l)							<5									

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
20-Feb-19	TSS (mg/l)								16.41	20	29.58						
25-Feb-19	TSS (mg/l)							<5									
27-Feb-19	TSS (mg/l)								<5	<5	<5						
4-Mar-19	TSS (mg/l)						<5	<5									
5-Mar-19	TSS (mg/l)		6.98	<5	<5	<5								6.76	6.19		
6-Mar-19	TSS (mg/l)								<5	<5	<5	<5	7.42	6.81		<5	6.41
9-Mar-19	TSS (mg/l)																
12-Mar-19	TSS (mg/l)																
13-Mar-19	TSS (mg/l)							<5	<5	<5	18.14						
18-Mar-19	TSS (mg/l)							<5									
20-Mar-19	TSS (mg/l)								<5	<5	8.02						
25-Mar-19	TSS (mg/l)							<5									
27-Mar-19	TSS (mg/l)								<5	5.47	5.06						
2-Jan-19	BOD5 (mg/l)	<1.5							<1	<1	<1						
3-Jan-19	BOD5 (mg/l)	<1.5						1.4									
7-Jan-19	BOD5 (mg/l)	<1.5						1.1									
9-Jan-19	BOD5 (mg/l)	<1.5							<1	<1	1.06						
14-Jan-19	BOD5 (mg/l)	<1.5					<1	1.37									
15-Jan-19	BOD5 (mg/l)	<1.5	<1	1.56	1.1	<1								<1	<1		
16-Jan-19	BOD5 (mg/l)	<1.5							<1	<1	<1	<1	<1	<1		<1	<1
21-Jan-19	BOD5 (mg/l)	<1.5						<1									
23-Jan-19	BOD5 (mg/l)	<1.5							<1	<1	<1						

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
28-Jan-19	BOD5 (mg/l)	<1.5						<1										
30-Jan-19	BOD5 (mg/l)	<1.5							<1	<1	<1							
4-Feb-19	BOD5 (mg/l)	<1.5					<1	1.54										
5-Feb-19	BOD5 (mg/l)	<1.5	<1	1.1	<1	<1									<1	<1		
6-Feb-19	BOD5 (mg/l)	<1.5							1.1	<1	1.08	1.13	1.1	1.12			1.01	1.1
11-Feb-19	BOD5 (mg/l)	<1.5						<1										
13-Feb-19	BOD5 (mg/l)	<1.5							<1	<1	<1							
18-Feb-19	BOD5 (mg/l)	<1.5						<1										
20-Feb-19	BOD5 (mg/l)	<1.5							<1	<1	<1							
4-Mar-19	BOD5 (mg/l)	<1.5					<1.0	<1.0										
5-Mar-19	BOD5 (mg/l)	<1.5	<1.0	1.09	<1.0	<1.0									<1.0	<1.0		
6-Mar-19	BOD5 (mg/l)	<1.5							<1.0	1.28	<1	<1	<1	<1			<1	<1
13-Mar-19	BOD5 (mg/l)	<1.5						<1.0	<1.0	<1.0	<1.0							
18-Mar-19	BOD5 (mg/l)	<1.5						<1.0										
20-Mar-19	BOD5 (mg/l)	<1.5							<1.0	1.2	1.26							
14-Jan-19	COD (mg/l)	<5					<5	<5										
15-Jan-19	COD (mg/l)	<5	5.4	<5.0	<5.0	<5.0									<5.0	<5.0		
16-Jan-19	COD (mg/l)	<5							<5.0	<5.0	<5.0	<5.0	<5.0	<5.0			<5.0	<5.0
4-Feb-19	COD (mg/l)	<5					6.1	5.3										
5-Feb-19	COD (mg/l)	<5	6.6	11	5.3	10.4									<5	<5		

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
6-Feb-19	COD (mg/l)	<5							6.1	5.7	7.8	8.4	<5	6.9			11	6.1
4-Mar-19	COD (mg/l)	<5					<5.0	<5.0										
5-Mar-19	COD (mg/l)	<5	<5	<5.0	<5.0	<5.0									<5.0	<5.0		
6-Mar-19	COD (mg/l)	<5							<5.0	<5.0	<5.0	<5.0	<5.0	<5.0			5.1	<5
14-Jan-19	NH3-N (mg/l)	<0.2					<0.2	<0.2										
15-Jan-19	NH3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2									<0.2	<0.2		
16-Jan-19	NH3-N (mg/l)	<0.2							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			<0.2	<0.2
4-Feb-19	NH3-N (mg/l)	<0.2					<0.2	<0.2										
5-Feb-19	NH3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2									<0.2	<0.2		
6-Feb-19	NH3-N (mg/l)	<0.2							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			<0.2	<0.2
4-Mar-19	NH3-N (mg/l)	<0.2					<0.2	<0.2										
5-Mar-19	NH3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2									<0.2	<0.2		
6-Mar-19	NH3-N (mg/l)	<0.2							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			<0.2	<0.2
14-Jan-19	NO3-N (mg/l)	<5					<0.02	<0.02										
15-Jan-19	NO3-N (mg/l)	<5	<0.02	<0.02	<0.02	<0.02									<0.02	<0.02		
16-Jan-19	NO3-N (mg/l)	<5							<0.02	<0.02	<0.02	<0.02	0.03	<0.02			<0.02	0.03
4-Feb-19	NO3-N (mg/l)	<5					<0.02	<0.02										
5-Feb-19	NO3-N (mg/l)	<5	0.04	<0.02	<0.02	<0.02									0.03	0.03		
6-Feb-19	NO3-N (mg/l)	<5							<0.02	<0.02	<0.02	<0.02	<0.02	0.03			0.03	0.03
4-Mar-19	NO3-N (mg/l)	<5					<0.02	0.03										
5-Mar-19	NO3-N (mg/l)	<5	<0.02	<0.02	<0.02	<0.02									<0.02	<0.02		
6-Mar-19	NO3-N (mg/l)	<5							<0.02	<0.02	<0.02	<0.02	0.03	<0.02			<0.02	0.03

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
2-Jan-19	Faecal coliform (MPN/100 ml)	<1,000							23	23	33							
3-Jan-19	Faecal coliform (MPN/100 ml)	<1,000						23										
7-Jan-19	Faecal coliform (MPN/100 ml)	<1,000						0										
9-Jan-19	Faecal coliform (MPN/100 ml)	<1,000							12	7	2							
14-Jan-19	Faecal coliform (MPN/100 ml)	<1,000					0	7										
15-Jan-19	Faecal coliform (MPN/100 ml)	<1,000	920	33	79	130									1,400	130		
16-Jan-19	Faecal coliform (MPN/100 ml)	<1,000							0	2	0	0	2	2			40	110
21-Jan-19	Faecal coliform (MPN/100 ml)	<1,000						1,600										
23-Jan-19	Faecal coliform (MPN/100 ml)	<1,000							7	5	17							
28-Jan-19	Faecal coliform (MPN/100 ml)	<1,000						0										
30-Jan-19	Faecal coliform (MPN/100 ml)	<1,000							0	0	49							
4-Feb-19	Faecal coliform (MPN/100 ml)	<1,000					23	23										
5-Feb-19	Faecal coliform (MPN/100 ml)	<1,000	130	34	240	33									240	22		

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
6-Feb-19	Faecal coliform (MPN/100 ml)	<1,000							5	0	2	8	17	34			22	17
11-Feb-19	Faecal coliform (MPN/100 ml)	<1,000						7										
13-Feb-19	Faecal coliform (MPN/100 ml)	<1,000							4	2	0							
18-Feb-19	Faecal coliform (MPN/100 ml)	<1,000						13										
20-Feb-19	Faecal coliform (MPN/100 ml)	<1,000							2	5	14							
4-Mar-19	Faecal coliform (MPN/100 ml)	<1,000					22	17										
5-Mar-19	Faecal coliform (MPN/100 ml)	<1,000	540	7	8	13									110	47		
6-Mar-19	Faecal coliform (MPN/100 ml)	<1,000							130	79	79	130	110	130			280	130
13-Mar-19	Faecal coliform (MPN/100 ml)	<1,000						0	0	2	21							
18-Mar-19	Faecal coliform (MPN/100 ml)	<1,000						5										
20-Mar-19	Faecal coliform (MPN/100 ml)	<1,000							26	49	70							
2-Jan-19	Total Coliform (MPN/100 ml)	<5,000							49	23	49							
3-Jan-19	Total Coliform (MPN/100 ml)	<5,000						23										

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
7-Jan-19	Total Coliform (MPN/100 ml)	<5,000						13										
9-Jan-19	Total Coliform (MPN/100 ml)	<5,000							130	130	170							
14-Jan-19	Total Coliform (MPN/100 ml)	<5,000					2	11										
15-Jan-19	Total Coliform (MPN/100 ml)	<5,000	920	33	79	130									1,400	130		
16-Jan-19	Total Coliform (MPN/100 ml)	<5,000							49	130	79	79	240	540			700	1,600
21-Jan-19	Total Coliform (MPN/100 ml)	<5,000						1,600										
23-Jan-19	Total Coliform (MPN/100 ml)	<5,000							7	5	17							
28-Jan-19	Total Coliform (MPN/100 ml)	<5,000						27										
30-Jan-19	Total Coliform (MPN/100 ml)	<5,000							33	22	110							
4-Feb-19	Total Coliform (MPN/100 ml)	<5,000					49	33										
5-Feb-19	Total Coliform (MPN/100 ml)	<5,000	540	130	350	33									240	79		
6-Feb-19	Total Coliform (MPN/100 ml)	<5,000							8	0	13	26	49	350			79	110
11-Feb-19	Total Coliform (MPN/100 ml)	<5,000						7										

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
13-Feb-19	Total Coliform (MPN/100 ml)	<5,000							17	14	49							
18-Feb-19	Total Coliform (MPN/100 ml)	<5,000						22										
20-Feb-19	Total Coliform (MPN/100ml)	<5,000							17	22	130							
4-Mar-19	Total Coliform (MPN/100ml)	<5,000					79	27										
5-Mar-19	Total Coliform (MPN/100ml)	<5,000	1,600	22	17	21									170	280		
6-Mar-19	Total Coliform (MPN/100ml)	<5,000							130	79	240	350	350	350			920	350
13-Mar-19	Total Coliform (MPN/100ml)	<5,000						23	8	17	350							
18-Mar-19	Total Coliform (MPN/100ml)	<5,000						8										
20-Mar-19	Total Coliform (MPN/100ml)	<5,000							140	110	140							
14-Jan-19	Phytoplankton Biomass (g dry wt/m3)						1.2	1.1										
15-Jan-19	Phytoplankton Biomass (g dry wt/m3)			2.4	2.2	1.4												
16-Jan-19	Phytoplankton Biomass (g dry wt/m3)								3.9	2.7								

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**															
4-Feb-19	Phytoplankton Biomass (g dry wt/m3)						0.2	0.3									
5-Feb-19	Phytoplankton Biomass (g dry wt/m3)			0.4	0.3	0.5											
6-Feb-19	Phytoplankton Biomass (g dry wt/m3)								23.1	4.4								
4-Mar-19	Phytoplankton Biomass (g dry wt/m3)						2	1.6									
5-Mar-19	Phytoplankton Biomass (g dry wt/m3)			1.8	2.2	2.6											
6-Mar-19	Phytoplankton Biomass (g dry wt/m3)								2.4	2							
14-Jan-19	Total Phosphorus (mg/l)						<0.01	<0.01									
15-Jan-19	Total Phosphorus (mg/l)			<0.01	<0.01	<0.01											
16-Jan-19	Total Phosphorus (mg/l)								<0.01	<0.01							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
4-Feb-19	Total Phosphorus (mg/l)						<0.01	<0.01										
5-Feb-19	Total Phosphorus (mg/l)			<0.01	<0.01	<0.01												
6-Feb-19	Total Phosphorus (mg/l)								<0.01	<0.01								
4-Mar-19	Total Phosphorus (mg/l)						<0.01	<0.01										
5-Mar-19	Total Phosphorus (mg/l)			<0.01	<0.01	<0.01												
6-Mar-19	Total Phosphorus (mg/l)								<0.01	<0.01								
14-Jan-19	Total Dissolved Phosphorus (mg/l)						<0.01	<0.01										
15-Jan-19	Total Dissolved Phosphorus (mg/l)			<0.01	<0.01	<0.01												
16-Jan-19	Total Dissolved Phosphorus (mg/l)								<0.01	<0.01								

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
4-Feb-19	Total Dissolved Phosphorus (mg/l)						<0.01	<0.01										
5-Feb-19	Total Dissolved Phosphorus (mg/l)			<0.01	<0.01	<0.01												
6-Feb-19	Total Dissolved Phosphorus (mg/l)								<0.01	<0.01								
4-Mar-19	Total Dissolved Phosphorus (mg/l)						<0.01	<0.01										
5-Mar-19	Total Dissolved Phosphorus (mg/l)			<0.01	<0.01	<0.01												
6-Mar-19	Total Dissolved Phosphorus (mg/l)								<0.01	<0.01								
14-Jan-19	TOC (mg/l)						1.69	1.78										
15-Jan-19	TOC (mg/l)			2.03	2.52	1.94												
16-Jan-19	TOC (mg/l)								1.84	1.78								
4-Feb-19	TOC (mg/l)						2.35	2.46										
5-Feb-19	TOC (mg/l)			3.73	2.45	2.29												
6-Feb-19	TOC (mg/l)								2.75	2.49								
4-Mar-19	TOC (mg/l)						1.13	1.18										
5-Mar-19	TOC (mg/l)			1.47	1.38	1.14												

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
6-Mar-19	TOC (mg/l)								1.07	1.13								
4-Feb-19	Hydrogen Sulfide (mg/l)							<0.02										
6-Feb-19	Hydrogen Sulfide (mg/l)									<0.02	<0.02							
4-Mar-19	Hydrogen Sulfide (mg/l)							<0.02										
6-Mar-19	Hydrogen Sulfide (mg/l)									<0.02	<0.02							

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q1 2019

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	**EF01**	**EF02**	**EF07**	**EF08**	**EF09**	**EF10**	**EF13**	**EF14**	**EF18**
Date	**Parameter (Unit)**	**Guideline in the CA**									
11-Jan-19	pH	6.0-9.0	7.16	7.32	6.83	7.31	8.48	7.22	7.34	6.9	6.96
22-Jan-19	pH	6.0-9.0	7.21	7.9	7.71		7.62	7.68	7.34	6.99	6.23
01-Feb-19	pH	6.0-9.0	7.18	7.6	7.57		8.02	7.89	7.22	6.81	7.14
15-Feb-19	pH	6.0-9.0	7.04	7.47	7.58			7.4	7.07	6.68	6.83

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
01-Mar-19	pH	6.0-9.0	7.28	7.64	7.57		7.63	7.83	7.38	6.9	6.42
15-Mar-19	pH	6.0-9.0	7.39	7.7	7.49		7.39	7.82	7.39	7.03	7.11
11-Jan-19	Sat. DO (%)		33.4	82.7	63.3	72.8	37.8	57.6	61.6	69.1	10.4
22-Jan-19	Sat. DO (%)		39.2	78.8	55.6		26.7	28.5	60.3	63.7	20.5
01-Feb-19	Sat. DO (%)		37.3	80.7	55.8		32.2	59.1	62.2	41.2	79.5
15-Feb-19	Sat. DO (%)		46.3	75.6	74.7			87	58.8	44.3	54.2
01-Mar-19	Sat. DO (%)		68	80.6	49.7		26.1	101.7	77.9	50.2	53.6
15-Mar-19	Sat. DO (%)		39.5	82.3	42		19.7	133.3	94.2	42.8	78.7
11-Jan-19	DO (mg/l)		2.65	6.47	5.04	5.88	3.08	4.76	5.05	5.53	0.84
22-Jan-19	DO (mg/l)		3.11	6.43	4.72		2.24	2.39	4.87	5.08	1.68
01-Feb-19	DO (mg/l)		2.96	6.46	4.66		2.91	4.97	5.08	3.38	6.51
15-Feb-19	DO (mg/l)		3.55	9.83	6.01			6.87	4.6	3.48	4.26
01-Mar-19	DO (mg/l)		5.21	6.24	3.92		2.01	8.11	6.05	3.87	4.25
15-Mar-19	DO (mg/l)		3.03	6.5	3.38		1.52	10.56	7.27	3.36	6.21

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
11-Jan-19	Conductivity (µS/cm)		417	458	903	518	1146	366	1076	670	435
22-Jan-19	Conductivity (µS/cm)		413	440	1,110		683	346	853	627	155.2
01-Feb-19	Conductivity (µS/cm)		487	417	1,028		1162	370	662	910	310
15-Feb-19	Conductivity (µS/cm)		408	409	978			601	660	478	294
01-Mar-19	Conductivity (µS/cm)		427	424	1,016		854	415	992	970	816
15-Mar-19	Conductivity (µS/cm)		396	443	1,206		932	253	453	691	385
11-Jan-19	TDS (mg/l)		208.5	228	451.5	259	573	183	538	335	217
22-Jan-19	TDS (mg/l)		206.5	220	555		341	173	426	313.5	79
01-Feb-19	TDS (mg/l)		243.5	208.5	514		581	158	331	455	155
15-Feb-19	TDS (mg/l)		204	204.5	489			300	330	239	147
01-Mar-19	TDS (mg/l)		213.5	212	508		427	207.5	496	485	408
15-Mar-19	TDS (mg/l)		193	221.5	603		466	146.5	226.5	345	192.5
11-Jan-19	Temperature (°C)		26.6	26.8	25.3	25.1	24.8	24.1	24.6	25.6	25.8

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
22-Jan-19	Temperature (°C)		26.2	24.8	22.8		23.7	23.7	25.3	26.1	24.9
01-Feb-19	Temperature (°C)		26	25.8	23.5		24.5	23.4	24.8	24.6	24.7
15-Feb-19	Temperature (°C)		27.8	27.5	25.4			26.4	26.8	27.1	26.7
01-Mar-19	Temperature (°C)		27.5	27.1	26.7		28	25.79	27.1	27.4	26.4
15-Mar-19	Temperature (°C)		28.1	26.4	25.7		27.4	26.1	27.6	26.7	26.2
11-Jan-19	Turbidity (NTU)		6.9	9.39	30.77	13.81	16.85	6.19	0.15	14.89	90.3
22-Jan-19	Turbidity (NTU)		4.56	7.89	17.49		39.15	3.54	42.98	14.92	43.33
01-Feb-19	Turbidity (NTU)		1.67	7.62	20.36		13.48	3.49	39.87	27.75	2.91
15-Feb-19	Turbidity (NTU)		1.85	6.69	14.24			15.21	43.11	9.86	10.61
01-Mar-19	Turbidity (NTU)		1.51	7.62	9.87		39.33	9.25	37.11	9.46	71.89
15-Mar-19	Turbidity (NTU)		0.7	5.63	9.08		32.68	4.06	26.27	13.32	17.33
11-Jan-19	TSS (mg/l)	<50	7.37	11.03	33.75	<5	27.7	8.33	24.83	19.34	81.93
22-Jan-19	TSS (mg/l)	<50	<5	5.21	7.14		26.67	2.54	25	16.02	11.73
01-Feb-19	TSS (mg/l)	<50	<5	7.29	6.92		42.52	11.11	34.75	43.75	<5
15-Feb-19	TSS (mg/l)	<50	<5	6.25	7.35			15.33	18.18	10.41	9.13

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
01-Mar-19	TSS (mg/l)	<50	<5	6.79	13.49		58.67	16.3	52.03	14.44	41.41
15-Mar-19	TSS (mg/l)	<50	<5	5.77	8.13		40.47	25.89	21.11	14.73	10.24
11-Jan-19	BOD5 (mg/l)	<30	57.52	<6	<6	13.98	<6	<6	<6	<6	124.27
22-Jan-19	BOD5 (mg/l)	<30	12.72	<6	<6		12.06	7.8	<6	<6	22.08
01-Feb-19	BOD5 (mg/l)	<30	<6	<6	<6		<6	7.2	<6	21.6	<6
15-Feb-19	BOD5 (mg/l)	<30	45.55	<6	69.56			9.63	95.7	<6	15.78
01-Mar-19	BOD5 (mg/l)	<30	<6	<6	<6		45.66	7.77	<6	<6	46.44
15-Mar-19	BOD5 (mg/l)	<30	<6	<6	<6		<6	<6	<6	<6	<6
11-Jan-19	COD (mg/l)	<125	48.7	40.8	55.3	36.3	65.8	27.2	180	156	248
22-Jan-19	COD (mg/l)	<125	37	34.5	53.3		140	<25	144	122	41.8
01-Feb-19	COD (mg/l)	<125	<25	39.5	64.1		99.8	31.3	143	154	<25
15-Feb-19	COD (mg/l)	<125	<25	30.8	54.9			30.8	155	35.4	29.4
01-Mar-19	COD (mg/l)	<125	<25	31.3	40.6		252	34.3	198	37.3	210
15-Mar-19	COD (mg/l)	<125	<25	31.3	49.8		196	49.3	135	45.3	53.4
11-Jan-19	NH3-N (mg/l)	<10	19	15.4	21.6	22.2	42.1	6	13.5	4.3	12

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
22-Jan-19	NH3-N (mg/l)	<10	20.7	15	20.7		51.8	6.2	24.9	9.1	6.4
01-Feb-19	NH3-N (mg/l)	<10	16.5	13.4	21.7		28.8	6.5	21.8	<0.2	<0.2
15-Feb-19	NH3-N (mg/l)	<10	18.5	13.3	19.9			3	24	10.6	1.6
01-Mar-19	NH3-N (mg/l)	<10	16.4	13.8	13.8		50.4	4.5	7.2	5.2	19.4
15-Mar-19	NH3-N (mg/l)	<10	10.5	16	18.6		59.2	2.1	22.2	19.6	4.2
11-Jan-19	Total Nitrogen (mg/l)	<10	19.9	15.9	22.4	23.1	45.8	19.3	14	4.74	12.6
22-Jan-19	Total Nitrogen (mg/l)	<10	25.7	16.4	21.5		53.2	8.52	25.6	13	7
01-Feb-19	Total Nitrogen (mg/l)	<10	17.1	16.1	23.5		30.4	8.37	27.4	0.64	0.7
15-Feb-19	Total Nitrogen (mg/l)	<10	19.3	14.1	21.1			8.1	25	12.7	4.96
01-Mar-19	Total Nitrogen (mg/l)	<10	17.7	14.9	15.3		51.5	5.05	13.5	19.3	20.6
15-Mar-19	Total Nitrogen (mg/l)	<10	17	20.1	20.6		61.1	3.31	23.4	24	7.26
11-Jan-19	Total Phosphorus (mg/l)	<2.0	0.9	0.84	0.94	0.9	1.04	0.67	0.85	0.65	0.58

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	Parameter (Unit)	Guideline in the CA									
22-Jan-19	Total Phosphorus (mg/l)	<2.0	1.22	1.12	1.19		1.93	0.71	1.37	1.09	0.29
01-Feb-19	Total Phosphorus (mg/l)	<2.0	0.38	0.96	1.06		1.37	0.52	1.06	0.4	0.08
15-Feb-19	Total Phosphorus (mg/l)	<2.0	0.42	1.04	1.1			0.16	1.24	0.96	0.25
01-Mar-19	Total Phosphorus (mg/l)	<2.0	0.69	0.96	0.91		1.65	0.16	1.09	0.88	1.18
15-Mar-19	Total Phosphorus (mg/l)	<2.0	0.94	1.06	1		1.68	0.11	1.12	1.16	0.6
11-Jan-19	Faecal Coliform (MPN/100 ml)	<400	16000	0	0	0	0	0	0	0	35000
22-Jan-19	Faecal Coliform (MPN/100 ml)	<400	160000	0	0		33	130	0	0	160000
01-Feb-19	Faecal Coliform (MPN/100 ml)	<400	220	0	0		0	11	0	0	0
15-Feb-19	Faecal Coliform (MPN/100 ml)	<400	33	0	1600			0	0	0	0
01-Mar-19	Faecal Coliform (MPN/100 ml)	<400	2200	0	0		920	0	0	0	0
15-Mar-19	Faecal Coliform (MPN/100 ml)	<400	47	1600	7.8		0	0	0	0	0

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	**Parameter (Unit)**	**Guideline in the CA**									
11-Jan-19	Total Coliform (MPN/100 ml)	<400	16000	0	0	17	0	0	0	0	35000
22-Jan-19	Total Coliform (MPN/100 ml)	<400	160000	0	0		33	130	0	0	160000
01-Feb-19	Total Coliform (MPN/100 ml)	<400	1600	0	2		0	220	0	0	0
15-Feb-19	Total Coliform (MPN/100 ml)	<400	170	0	2200			0	0	0	6.8
01-Mar-19	Total Coliform (MPN/100 ml)	<400	2200	0	0		920	0	0	0	0
15-Mar-19	Total Coliform (MPN/100 ml)	<400	350	1600	130		0	2	0	0	0
11-Jan-19	Oil & Grease (mg/l)	<10	<1	<1	<1	<1	<1	<1	5	9	<1
22-Jan-19	Oil & Grease (mg/l)	<10									
01-Feb-19	Oil & Grease (mg/l)	<10	<1	<1	<1		<1	<1	11	9	<1
15-Feb-19	Oil & Grease (mg/l)	<10									
01-Mar-19	Oil & Grease (mg/l)	<10	<1	<1	<1		5	<1	11	<1	6
15-Mar-19	Oil & Grease (mg/l)	<10									
11-Jan-19	Residual Chlorine (mg/l)	<1.0		0.47	0.39	0.17	1.47	0.33	0.99	0.45	0.03

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	**Parameter (Unit)**	**Guideline in the CA**									
22-Jan-19	Residual Chlorine (mg/l)	<1.0		0.74	0.55		0.19	0.07	1.07	1.56	0.01
01-Feb-19	Residual Chlorine (mg/l)	<1.0		0.38	0.32		1.89	0.08	0.75	1.65	1.95
15-Feb-19	Residual Chlorine (mg/l)	<1.0		0.75	0.08			0.29	1.13	1.08	0.32
01-Mar-19	Residual Chlorine (mg/l)	<1.0		0.17	0.81		0.47	0.1	0.98	0.91	0.17
15-Mar-19	Residual Chlorine (mg/l)	<1.0		0.45	0.36		0.99	0.51	1.31	1.52	0.51
Jan-19	Chlorination Dosing Rate (ml/mn)			305	228	320	3.1	32	3.1	3.1	30
Jan-19	Chlorination Dosing Rate (ml/mn)			220	200		3.1	116	3.1	40	3
Feb-19	Chlorination Dosing Rate (ml/mn)			61	30		3.1	84	3.1	3.1	20
Feb-19	Chlorination Dosing Rate (ml/mn)			225	12			33	3.1	3.1	33
Mar-19	Chlorination Dosing Rate (ml/mn)			130	130		3.1	26	7	35	25
Mar-19	Chlorination Dosing Rate (ml/mn)			90	47		3.1	45	20	10	30

		Site Name	Owner's Site Office and Village	Obayashi Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	276 Camp
		Station Code	EF01	EF02	EF07	EF08	EF09	EF10	EF13	EF14	EF18
Date	**Parameter (Unit)**	**Guideline in the CA**									
11-Jan-19	Effluent Discharge Volume (L/mn)		12	20	30	30	4.2	7.5	4.2	4.2	12
22-Jan-19	Effluent Discharge Volume (L/mn)		6	0	4		4.2	3	4.2	3	6
01-Feb-19	Effluent Discharge Volume (L/mn)		12	10	12		4.2	4.6	4.2	4.2	3
15-Feb-19	Effluent Discharge Volume (L/mn)		6	6	20			2.6	4.2	4.2	1.6
01-Mar-19	Effluent Discharge Volume (L/mn)		6	12	12		4.2	6	4.2	6	6
15-Mar-19	Effluent Discharge Volume (L/mn)		6	6	3		4.2	4	6	4	6

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

		Date	03-Jan-19	07-Jan-19	16-Jan-19	22-Jan-19	30-Jan-19	07-Feb-19	13-Feb-19	21-Feb-19	27-Feb-19	07-Mar-19	14-Mar-19	20-Mar-19	28-Mar-19
Spoil Disposal No.2 (DS04)	Parameter	Guideline													
	pH	6.0 - 9.0	5.75	6.06	6.24	6.45	6.9	6.77		6.98	6.72		7.32	6.81	6.83
	Sat. DO		87.6	62.6	60.6	42.8	76.3	62.6		50.6	63.5		68.5	46.9	56.1
	DO		7.47	4.87	4.88	4.43	6.26	5.15		4.1	5.05		5.62	3.68	4.48
	Conductivity		48.2	49.9	51.9	53.7	54.3	52.5		57.7	56.8		59.4	81	66.2
	TDS		24.1	24.9	25.2	26.9	27.1	26.2		28.85	28.4		29.7	40.5	33.1
	Temperature		22.6	26.6	25.9	25.3	24.3	24		25	25.7		25	25.7	25.5
	Turbidity		6.33	6.6	8.82	6.48	6.88	7.6		10.22	9.2		8.06	14.37	20.44
	TSS	<50	<5	7.71	7.77	<5	<5	<5		126.68	5.16		<5	20.28	18.14
	Oil & Grease	<10			<1					<1				<1	

APPENDIX 5-4: GROUNDWATER QUALITY MONITORING RESULTS – Q1 2019

Month Year	Parameter (Unit)	Site Name	Somseun Village	Nampa Village	Thongnoy Village	Pou Village
		Station	GSXN01	GNPA01	GTHN01	GPOU01
		Guideline				
15-Jan-19	pH	6.5 - 9.2				6.7
24-Jan-19	pH	6.5 - 9.2	7.79	7.35	7.21	
05-Feb-19	pH	6.5 - 9.2				7.76
14-Feb-19	pH	6.5 - 9.2	7.7	7.01	6.95	
05-Mar-19	pH	6.5 - 9.2				7.07
11-Mar-19	pH	6.5 - 9.2	7.1	6.96	6.94	
15-Jan-19	Sat. DO (%)					92.2
24-Jan-19	Sat. DO (%)		80.7	81.7	79.7	
05-Feb-19	Sat. DO (%)					88
14-Feb-19	Sat. DO (%)		84.3	83.1	87.1	
05-Mar-19	Sat. DO (%)					90.5
11-Mar-19	Sat. DO (%)		84.9	85.2	76.6	
15-Jan-19	DO (mg/l)					7.31
24-Jan-19	DO (mg/l)		6.58	6.6	6.37	
05-Feb-19	DO (mg/l)					6.88
14-Feb-19	DO (mg/l)		6.8	6.55	6.82	
05-Mar-19	DO (mg/l)					6.64
11-Mar-19	DO (mg/l)		6.63	6.46	5.72	
15-Jan-19	Conductivity (µS/cm)					18.75
24-Jan-19	Conductivity (µS/cm)		274	313	301	
05-Feb-19	Conductivity (µS/cm)					23
14-Feb-19	Conductivity (µS/cm)		221	336	320	
05-Mar-19	Conductivity (µS/cm)					22.8
11-Mar-19	Conductivity (µS/cm)		263	323	333	
15-Jan-19	TDS (mg/l)					9.3
24-Jan-19	TDS (mg/l)		137	156.5	150.5	
05-Feb-19	TDS (mg/l)					11.5
14-Feb-19	TDS (mg/l)		110	168	160	
05-Mar-19	TDS (mg/l)					11.4
11-Mar-19	TDS (mg/l)		131.5	161.5	166.5	
15-Jan-19	Temperature (°C)					24.9
24-Jan-19	Temperature (°C)		24.8	25.2	25.6	
05-Feb-19	Temperature (°C)					25.2
14-Feb-19	Temperature (°C)		24.7	26.6	27	
05-Mar-19	Temperature (°C)					28.5
11-Mar-19	Temperature (°C)		27.1	27.8	28.6	
15-Jan-19	Turbidity (NTU)	<20				2.42
24-Jan-19	Turbidity (NTU)	<20	0.96	1.16	1.46	

Month Year	Parameter (Unit)	Site Name	Somseun Village	Nampa Village	Thongnoy Village	Pou Village
		Station	GSXN01	GNPA01	GTHN01	GPOU01
		Guideline				
05-Feb-19	Turbidity (NTU)	<20				1.26
14-Feb-19	Turbidity (NTU)	<20	1.07	1.45	1.88	
05-Mar-19	Turbidity (NTU)	<20				2.87
11-Mar-19	Turbidity (NTU)	<20	0.51	0.73	1.13	
15-Jan-19	Fecal coliform (MPN/100ml)	0				0
24-Jan-19	Fecal coliform (MPN/100ml)	0	0	13	240	
05-Feb-19	Fecal coliform (MPN/100ml)	0				0
14-Feb-19	Fecal coliform (MPN/100ml)	0	0	0	0	
05-Mar-19	Fecal coliform (MPN/100ml)	0				2
11-Mar-19	Fecal coliform (MPN/100ml)	0	22	0	240	
15-Jan-19	E.coli Bacteria (MPN/100ml)	0				0
24-Jan-19	E.coli Bacteria (MPN/100ml)	0	0	13	240	
05-Feb-19	E.coli Bacteria (MPN/100ml)	0				0
14-Feb-19	E.coli Bacteria (MPN/100ml)	0	0	0	0	
05-Mar-19	E.coli Bacteria (MPN/100ml)	0				0
11-Mar-19	E.coli Bacteria (MPN/100ml)	0	17	0	27	

APPENDIX 5-5: GRAVITY FED WATER SUPPLY MONITORING RESULTS – Q1 2019

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
24-Jan-19	pH	6.5 - 8.6	8.23	8.45	8.73	8.87	7.84
22-Feb-19	pH	6.5 - 8.6	8.31	8.44	8.69	8.6	8.25
11-Mar-19	pH	6.5 - 8.6	7.99	8.26	7.82	7.24	7.04
24-Jan-19	Sat. DO (%)		97.6	96.5	97.5	93.3	90.3
22-Feb-19	Sat. DO (%)		96.6	105.9	95.6	93.6	88.9
11-Mar-19	Sat. DO (%)		100.5	106.8	88.6	92	95.6
24-Jan-19	DO (mg/l)		8.02	8.12	8.27	7.81	7.58
22-Feb-19	DO (mg/l)		7.8	8.56	7.97	7.67	7.39
11-Mar-19	DO (mg/l)		8.08	8.39	7.09	6.99	7.12
24-Jan-19	Conductivity (µS/cm)	<1,000	49.6	60	12.73	13.53	13.02
22-Feb-19	Conductivity (µS/cm)	<1,000	48.4	63.2	17.16	17.38	16.41
11-Mar-19	Conductivity (µS/cm)	<1,000	48.1	65.4	17.27	17.85	17.19
24-Jan-19	TDS (mg/l)	<600	24.8	30	6.3	6.8	6.5
22-Feb-19	TDS (mg/l)	<600	24.2	31.6	8.58	8.69	8.25
11-Mar-19	TDS (mg/l)	<600	24	32.6	8.5	8.9	8.5
24-Jan-19	Temperature (°C)	<35	24.2	23.1	22.6	23.4	23.1
22-Feb-19	Temperature (°C)	<35	25.3	25.1	23.2	24.2	23.4
11-Mar-19	Temperature (°C)	<35	24.9	26.2	25	26.8	28.9
24-Jan-19	Turbidity (NTU)	<10	1.47	3.83	1.33	1.87	1.94
22-Feb-19	Turbidity (NTU)	<10	1.13	2.58	0.76	0.8	0.69
11-Mar-19	Turbidity (NTU)	<10	1.45	2.41	0.73	1.12	0.76
24-Jan-19	Faecal Coliform (MPN/100ml)	0	22	79	130	130	79
22-Feb-19	Faecal Coliform (MPN/100ml)	0	49	22	33	33	49
11-Mar-19	Faecal Coliform (MPN/100ml)	0	33	26	110	34	130
24-Jan-19	E.coli Bacteria (MPN/100ml)	0	22	79	130	79	49
22-Feb-19	E.coli Bacteria (MPN/100ml)	0	49	22	17	17	22
11-Mar-19	E.coli Bacteria (MPN/100ml)	0	17	13	110	34	130
11-Mar-19	Lead (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
11-Mar-19	Fluoride (mg/l)	<1.5	0.27	0.31	0.18	0.37	0.15
11-Mar-19	Nitrate (mg/l)	<50	0.13	0.22	0.49	0.44	0.4
11-Mar-19	Nitrite (mg/l)	<3	<0.02	<0.02	<0.02	<0.02	<0.02

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
11-Mar-19	Total hardness (mg/l)	<300	35.4		16.1	16.1	14.5

APPENDIX 5-6: LANDFILL GROUNDWATER QUALITY MONITORING RESULTS – Q4 2018

Date	Parameter (Unit)	Site Name	NNP1 Landfill				Houay Soup Landfill
		Station	MW1	MW2	MW3	MW4	MW5
		Guideline					
12-Mar-19	pH		6.86	6.22	6.7	6.11	6.77
12-Mar-19	Sat. DO (%)		36.1	47.2	31	44.5	43
12-Mar-19	DO (mg/l)		2.82	3.7	2.44	3.37	3.41
12-Mar-19	Conductivity (µS/cm)		128.6	27.4	122.1	28	106.5
12-Mar-19	TDS (mg/l)		64.3	13.7	61.5	14	53.25
12-Mar-19	Temperature (°C)		26.5	26.4	26.2	28.3	25.8
12-Mar-19	Turbidity (NTU)		4.08	1.74	1.21	9.8	7.76
12-Mar-19	Total Nitrogen (mg/l)		0.52	0.3	0.3	0	0.36
12-Mar-19	Lead (mg/l)	<0.01	0.27	<0.01	0.072	0.035	0.426
12-Mar-19	Total Phosphorus (mg/l)		0.09	0.04	0.05	0.14	0.04
12-Mar-19	Faecal Coliform (MPN/100ml)		0	0	0	0	0
12-Mar-19	Total Coliform (MPN/100ml)		0	0	0	0	0
12-Mar-19	NH_3-N (mg/l)		0.35	0.08	0.06	0.11	0.12
12-Mar-19	Copper (mg/l)	<1	<0.003	<0.003	<0.003	<0.003	<0.003
12-Mar-19	Total Petroleum (mg/l)		<1.0	<1.0	<1.0	<1.0	<1.0