NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environment Monitoring Report
Second Quarter of 2018

April to June 2018

REV	DATE	PREPARED	REVIEWED	APPROVED	MODIFICATION DETAILS
A					Final
A0	16 September 2018	Khamsone SAYSOMPHOU Hendra WINASTU	Peter G JENSEN	Vilayhak SOMSOULIVONG	

Accessibility	
☑	Public
☐	Internal
☐	Confidential

Document No.

NNP1-C-J0905-RP-014-A

Table of Contents

Tables

Figures

ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
CA	Concession Agreement between the NNP1PC and GOL,
CAP	Corrective Action Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
DEB	Department of Energy Business, MEM
DEPP	Department of Energy Policy and Planning, MEM
DEQP	Department of Environment and Quality Promotion, MONRE
DESIA	Department of Environmental and Social Impact Assessment, MONRE
DFRM	Department of Forest Resources Management, MONRE
DLA	Department of Land Administration, MONRE
DSRP	Dam Safety Review Panel
EC	Electrolytic Conductivity
EDL	Electricite du Laos
EGAT	Electricity Generating Authority of Thailand
EMMR	Environmental Management and Monitoring Reports
EMO	Environmental Management Office of ESD within NNP1PC
EMU	Environmental Monitoring Unit
EMWC	Electrical-Mechanical Works Contract
EPF	Environmental Protection Fund
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
GOL	Government of Lao PDR
GIS	Geographic Information Systems
HMWC	Hydraulic Metal Works Contract

HR	Human Resources
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
ISP	Intergraded Spatial Planning
kV	kilo-Volt
LEPTS	Lao Electric Power Technical Standard
LTA	Lender's Technical Advisor
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines, Lao PDR
MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
NCNX	Nam Chouane-Nam Xang
NCR	Non-Compliance Report
NN2	Nam Ngum 2 Power Company Limited
NNP1PC	Nam Ngiep 1 Power Company Limited
NTFP	Non-Timber Forest Products
NT2	Nam Theun 2 Hydropower Project
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
OSOV	Owners' Site Office and Village
PAFO	Provincial Department of Agriculture and Forestry
PAP	Project Affected People
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
TD	Technical Division of NNP1PC
TOR	Terms of Reference
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
UXO	Unexploded Ordinance

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

During Q2 2018, the Environmental Management Office (EMO) of NNP1PC reviewed and approved one Site Specific ESMMP and one Site Decommissioning Plan (carried over from last quarter).

The EMO conducted bi-weekly and weekly follow-up inspections at 31 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, Zone 2UR and Zone 4 (downstream community water supply).

During Q2 2018, a total of 534 m^3 of solid waste was disposed at the NNP1 Project Landfill, a decrease of 12 m^3 compared to Q1 2018. A total of 34,886 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.

On 12 April 2018, NNP1PC-EMO, the Environmental Management Unit (EMU) of Xaysomboun Province, the Resettlement Management Unit (RMU) carried out a joint inspection of the completed waste clean-up at 4 villages in Zone 2LR. Following this inspection, EMU and RMU issued a work completion letter to NNP1PC. On 14 May 2018, waste clean-up was completed for seven relocated households in Ban Pou and Hatsamkhone villages. After a joint inspection by NNP1PC, Xaysomboun EMU and local villagers, the EMU issued a work completion letter to NNP1PC on 30 May 2018.

The Watershed and Reservoir Protection Committee (WRPC) organized a workshop for review of the Nam Ngiep 1 Watershed Management Plan (WMP) on 29-30 May 2018. The key conclusions from the workshop included: (i) principle agreement with the plan; (ii) the plan should be further improved based on comments from the workshop participants; (iii) the improved plan shall be submitted to the Chairman of WRPC for final review and signing; and (iv) the annual implementation plan for the period of 2018-2019 needs to be developed and implemented as soon as possible. NNP1PC submitted the plan to ADB for final review and approval on 27 June 2018. The final review and signing by the Chairman of WRPC is expected in August 2018.

The first draft of NNP1 Biodiversity Offset Management Plan was completed on 29 June 2018 and will undergo further internal review in NNP1PC before being submitted to ADB and the Biodiversity Offset Management Committee (BOMC) for their comments. The draft provincial regulations for the management of Nam Chouan – Nam Xang (NCNX) biodiversity offset site were discussed at a provincial technical workshop on 12 June 2018 and subsequently consulted with six villages during the period from 18 to 20 June 2018.

The biomass clearance work was completed. A total of 1,641 ha has been fully cleared. The Department of Natural Resources and Environmental Monitoring (DNREM) of the Ministry of Natural Resource and Environment (MONRE) inspected the completed clearance work together with NNP1PC in April 2018. The DNREM submitted an approval (a certificate) letter to the

Department of Energy Business (DEB) of the Ministry of Energy and Mines (MEM) for issuance of a certificate allowing the Company to start impounding the main reservoir.

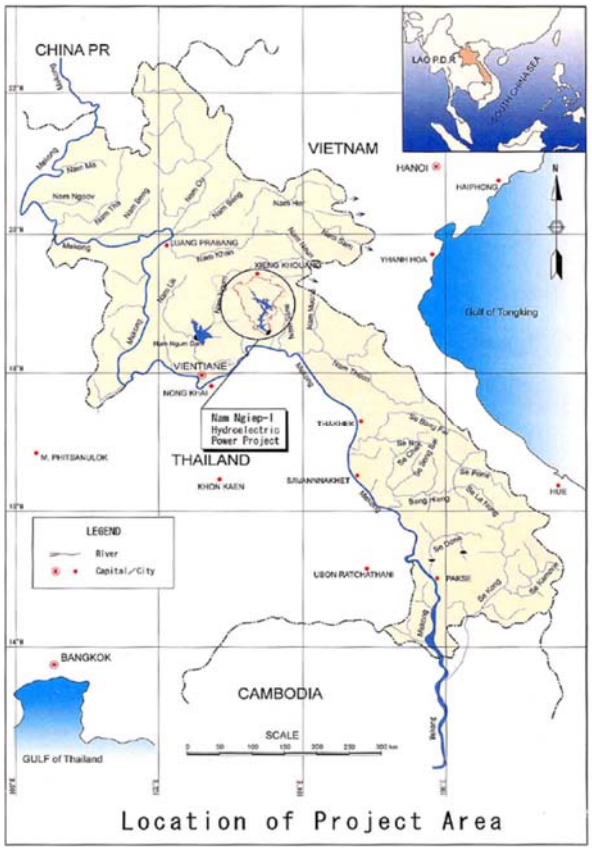
NNP1PC has selected is procuring a contractor to remove floating debris in the Nam Ngiep 1 main reservoir during impounding. The contractor is expected to start working in July 2018.

The 5 species that dominated the fish catch by weight in Q2 2018 are all species that are categorized as Least Concern except two species groups that are Data Deficient and Not Evaluated according to the IUCN Red List. The recorded catch of threatened species in the Q2 2018 fish catch includes one Endangered, five Vulnerable species and seven Near Threatened species.

2 INTRODUCTION

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

The project consists of two dams. The main dam which is located 9.0 km upstream of Hat Gniun Village in Bolikhan District, will create a 70-km-long, narrow reservoir that extends up the Ngiep Valley as far as Thathom District. At 167 m high, the main dam will be the second largest in Lao PDR. The Power Station at this dam will generate up to 272 MW of electricity for export to Thailand. With a combined capacity of 290 MW, Nam Ngiep 1 will generate around 1,620 GWh of electricity annually. Two transmission lines will be required to transport the electricity generated by the project. From the main power station, a 230-kV line will run for 125 km to the Nabong Substation outside Vientiane Capital. A 115-kV transmission line will be constructed by EDL from the Re-regulation Power Station to Pakxan substation over a distance of 40 km.



This Quarterly Environment Report provides a summary of environmental monitoring activities and mitigation actions during Q2 2018. The report is published on the Company website (https://namngiep1.com/).

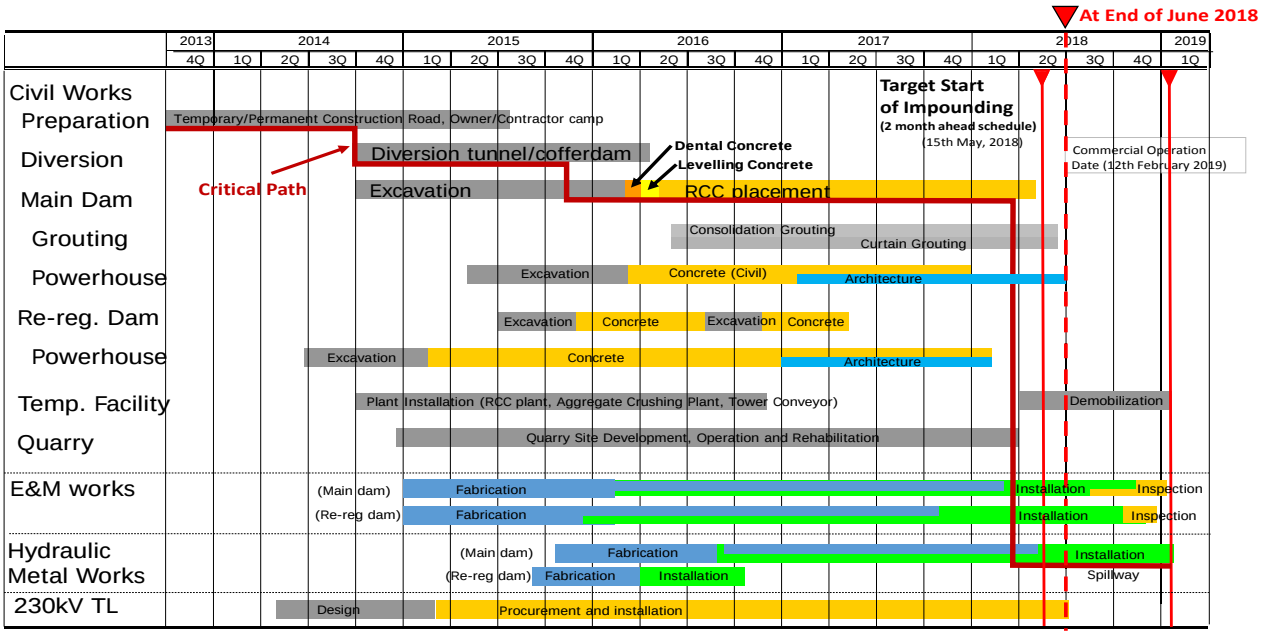
Related construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are also publicly disclosed on the Company website as required under the Concession Agreement.

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 June 2018 was 96.2 % (compared to planned progress of 97.5 %).

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 June 2018 was 97.9 % (compared to planned progress of 98.7 %).

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 spillway concrete is, at 29,500 m3 placed, some 83 % complete and on schedule.

The achievement of curtain drilling and grouting and drilling of drainage holes were the most critical activities that determined the ability to impound the main reservoir on 15 May 2018.

At the main powerhouse the Civil Works has 34,500 m^3 or 99 % of concrete in place and is substantially complete.

The plunge pool excavation was started after main dam impounding and around 33,000 m^3 of excavation has been completed. The diversion conduit gate of the main dam body has some leakage of water initially but the casting of the concrete plug behind it was completed in the conduit in June 2018.

The consolidation drilling and grouting for the main dam started in May 2016 and was completed in June 2018.

3.2.1 Re-regulation dam and powerhouse

All gate structures are complete at the re-regulation powerhouse. The building works are also substantially complete with the water supply system now under installation. Bitumen surfacing of the exterior roads has been completed.

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

3.3 TEMPORARY WORK FACILITY

3.3.1 Diversion tunnel inlet and outlet

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

3.3.2 Quarry

The quarry operations were completed in March 2018 and the final blasting was carried out on 27 March 2018.

The excavated material from the plunge pool, currently being carried out, has been hauled to the quarry and deposited there. A draft decommissioning and rehabilitation plan has been developed and government notification of this practice is under arrangement.

3.4 ELECTRICAL AND MECHANICAL WORKS

The cumulative work progress of the Electrical and Mechanical Works by value at the end of June 2018 was 98.3 % (compared to planned progress of 98.3 %).

The assembly of the generator and hydraulic turbine for unit 1 and unit 2 is ongoing.

3.5 HYDRO-MECHANICAL WORKS

The actual cumulative work progress of the Hydro-Mechanical Works until the end of June 2018 was 68.8 % (compared to planned progress of 79.1 %).

Removal of spider supports and painting work inside the steel penstock pipes Lines 1 and 2 at the main dam was complete 100% at the beginning of May 2018, and dry test and commissioning of line 1 and 2 was completed 100 % at the end of May 2018.

Wet test and commissioning for the riparian release conduit was conducted successfully under water pressure with reservoir water level at El. 273.5 m.

All hydro-mechanical works at the re-regulating powerhouse are complete except for wiring to the permanent power supply. The steel penstock erection and welding were completed on 23 April 2018 and the concrete encasement was completed in April 2018

3.6 230 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%). Tower erection was complete on 04 April 2018 and stringing was completed on 27 April 2018. Testing was completed in June 2018.

3.7 115 kV Transmission Line

The 115 kV Transmission Line from the re-regulation powerhouse to Pakxan substation is an associated facility to NNP1, owned and being constructed by Électricité du Laos (EDL).

The 115 kV transmission line will pass through Phouhomxay Village and EDL and NNP1PC has executed a lease agreement in April 2018, whereby NNP1PC will lease the right of way to EDL under certain conditions. The 115 kV Transmission Line project consists of two components, (1) a small substation at the re-regulation dam (within the project area) and (2) a 32.8 km transmission line with a 25 m wide right-of-way and 86 towers of which 9 km with 24 towers are in Phouhomxay Village.

The lease agreement requires that the construction of the line in Phouhomxay Village shall comply with applicable environmental and social measures of NNP1PC's ESMMP-CP, and in accordance with these requirements, EDL has prepared and submitted a Site Specific ESMMP to NNP1PC. NNP1PC approved the Site Specific ESMMP.

The construction of tower foundations was started in December 2017 and has reached 57 completed out of a total of 86 towers with 49 No. towers erected and all tower materials already delivered to Site. The contractor temporarily suspended construction work in May 2018 and will resume work after the rainy season. The erection of towers No. 1 to 24 from the re-regulation powerhouse through Phouhomxay Village has not started. The remaining work is unlikely to be completed before the end of November 2018.

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, 2018.

4.1 Contractor SS-ESMMPs

During Q2 2018, the Environmental Management Office (EMO) of NNP1PC reviewed and approved one Site Specific ESMMPs and one Site Decommissioning Plan carried over from Q1 2018. The approval of two Site Specific ESMMPs carried over from Q1 2018 is pending additional information.

The status of the Site Specific ESMMPs received in Q2 2018 is shown in ***Table 4-1*** with details in ***Appendix 1***.

TABLE 4-1: SS-ESMMP AND WORKING DRAWINGS REVIEWED DURING Q2 2018

Name of SS-ESMMP Document/ Working Drawings	Rev. 1	Rev. 2	Rev. 3	Approved
Reply to NNP1PC's comment for SS-ESMMP for closing of the dyke at borrow pit No.7 (1st submission)	√	Pending detailed discussion on the scope of re-vegetation and rehabilitation of spoil disposal		
Reply to NNP1PC's comment for SS-ESMMP–RRPS for closing of borrow pit at the corner of road P1 & P1A (1st submission)	√	Pending detailed discussion on the scope of re-vegetation and rehabilitation of spoil disposal		
SS-ESMMP for Construction of Quarry Site **(version A6)**	Pending detailed discussion on the scope of quarry site closure			
TCM contractor's camp decommissioning plan (1st submission)	√	√		√
DWP and SS-ESMMP for Main Dam Impounding Monitoring Plan	√			√

4.2 Results of Compliance Inspections at Construction Sites

During Q2 2018, the EMO conducted bi-weekly and weekly follow-up inspections at 31 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, Zone 2UR and Zone 4 (Dam downstream community water supply) - see ***Figure 4-1***.

In addition, the EMO conducted bi-weekly joint inspection and weekly follow-up inspection for the construction of the 230 kV Transmission Line and 115 kV Transmission Line including tower erection, power lines stringing and right of way clearing areas. The inspections also cover workshops, main camps and mobile camps operations. Some minor issues regarding the temporary hazardous material storage, solid waste management and hygiene were found and they were resolved immediately during the inspection. See monitoring locations in ***Figure 4-2*** and ***Figure 4-3***.

FIGURE 4-1: SITE INSPECTION LOCATION

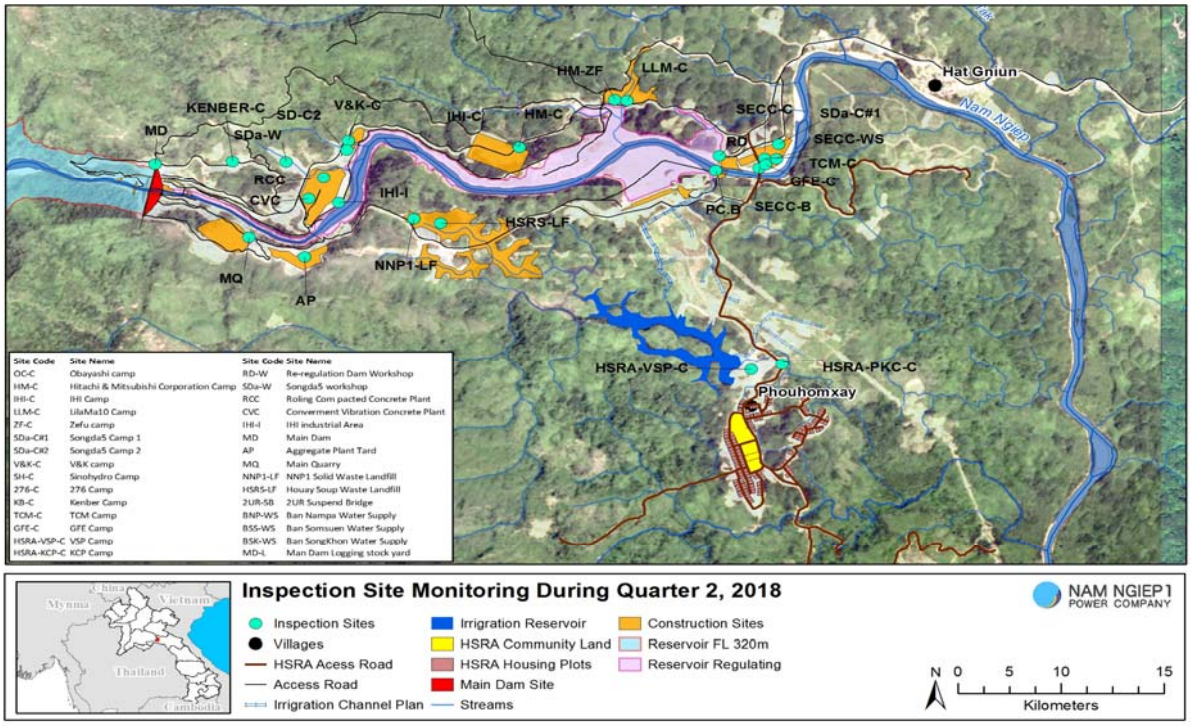


FIGURE 4-2: 230 KV TRANSMISSION LINE CONSTRUCTION MONITORING

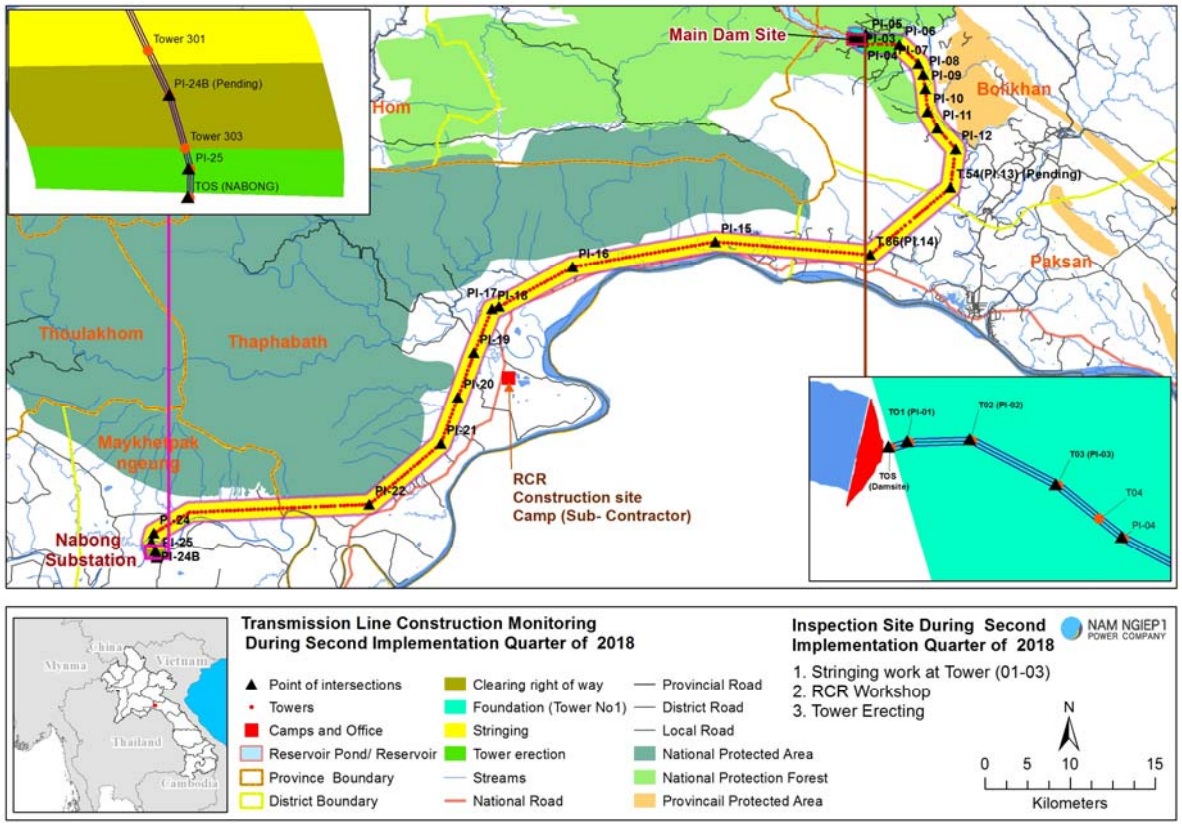
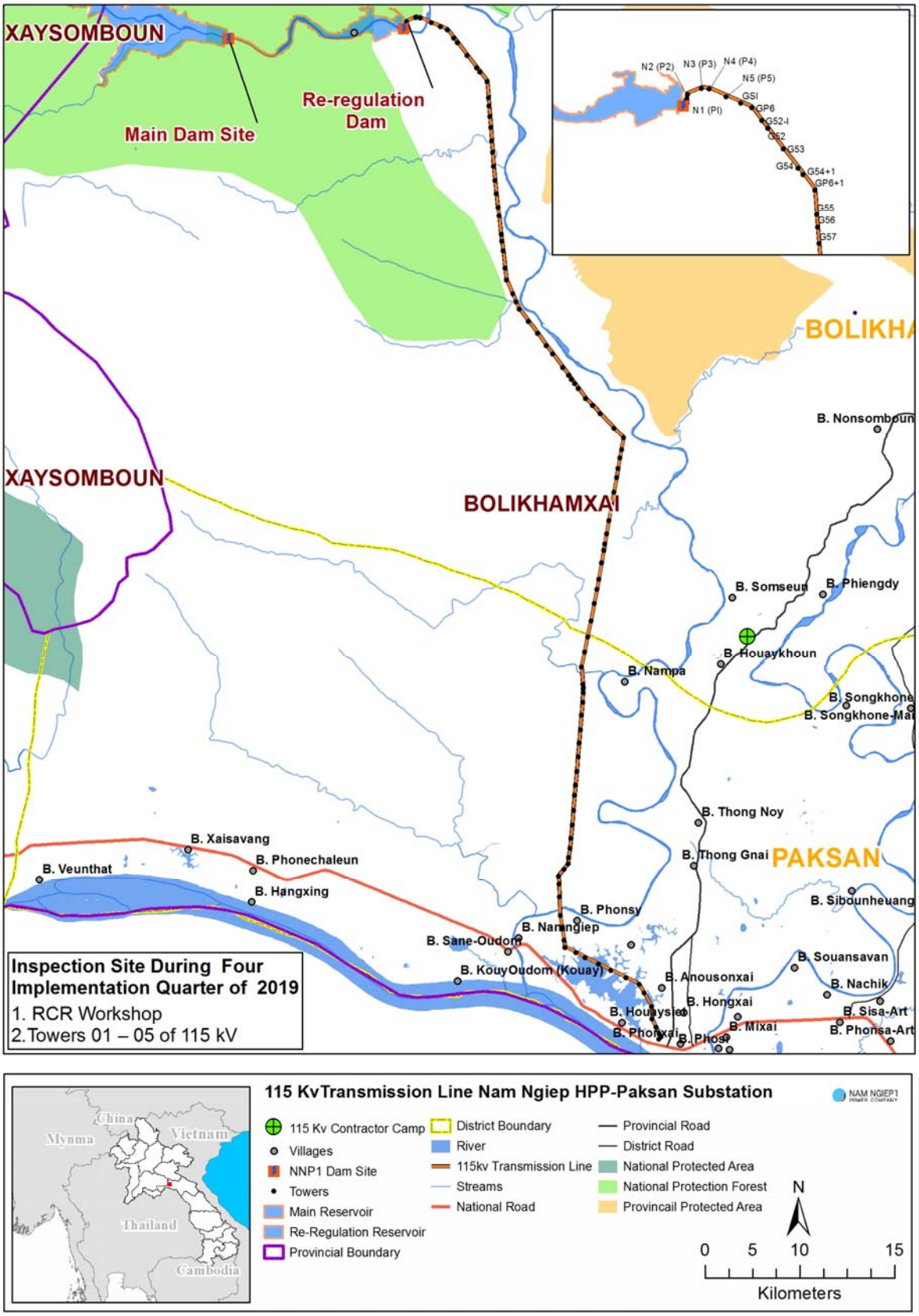


FIGURE 4-3: 115 KV TRANSMISSION LINE CONSTRUCTION MONITORING

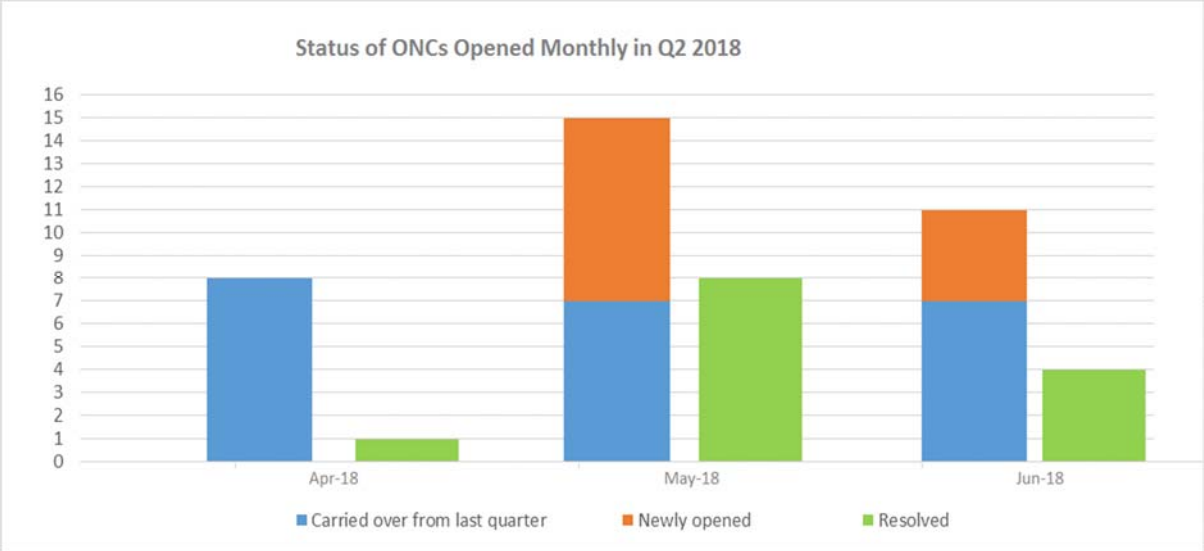


A total of 20 Observations of Non-Compliance (ONCs)[1], one Non-Compliance Level-1 (NCR1)[2] and two Non-Compliance level-2 (NCR2) were active during the reported period. Out of these, eight ONCs and one NCR1, were carried over from the previous Quarter. The 12 ONCs and two NCR2 were newly issued. 13 ONCs, one NCR1 and one NCR2 were resolved. In total seven ONCs and one NCR2 could not be resolved in this Quarter and will be carried over into Q3 2018. The status is summarized in***Table 4-2*** and ***Figure 4-4.*** The progress of corrective actions is presented in ***Appendix 2***.

TABLE 4-2: NON-COMPLIANCE STATUS DURING THE SECOND QUARTER OF 2018

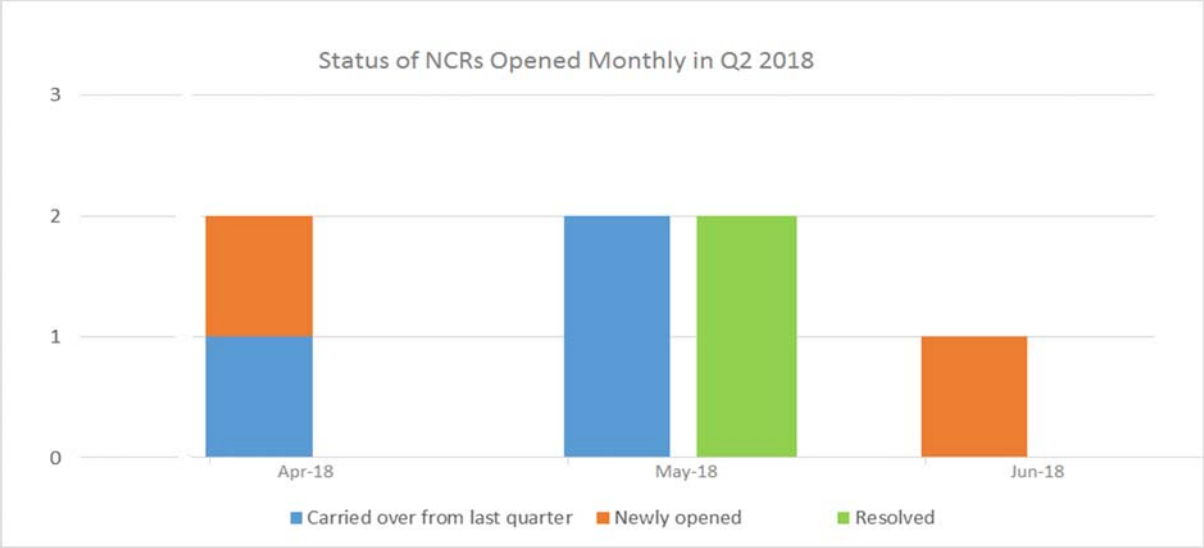
Environmental Non-Compliance Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR	08	01	0	0	0
Newly opened ONC/NCR	12	0	02	0	0
Total ONC/NCR	20	01	02	0	0
Resolved ONC/NCR	13	01	01	0	0
Unresolved ONC/NCR carried forward to the next Quarter	07	0	01	0	0

FIGURE 4-4: STATUS OF ONC DURING THE SECOND QUARTER OF 2018



[1] ONCs are issued for minor environmental issues that can easily be corrected, but which still need to be recorded and followed-up.

[2] There are three levels of NCRs. NCR Level 1 is issued in case of a clear non-compliance with environmental requirements, but which do not pose an immediate risk to human health or the environment. A failure to correct a level 1 will lead to issuance of a NCR Level 2. NCR Level 2 is issued for a non-compliance with environmental requirements that poses significant risks to human health or the environment. NCR Level 3 is issued in case of a critical environmental non-compliance that requires immediate intervention and correction.



PHOTOGRAPH 1: BI-WEEKLY JOINT MONITORING AND INSPECTION BETWEEN NNP1PC AND CONTRACTORS

PHOTOGRAPH 2: CONSTRUCTION WASTE CLEAN-UP AT SPOIL DISPOSAL NO. 6

PHOTOGRAPH 3: JOINT INSPECTION OF IRRIGATION CANAL CONSTRUCTION

Photograph 4: hazardous Material and Waste Inspection

4.3 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

4.3.1 General Waste Management

During Q2 2018, a total of 534 m^3 of solid waste was disposed at the NNP1 Project Landfill, a decrease of 12 m3 compared to Q1 2018. During this quarter, waste compaction and cover was not performed in a timely manner due to weather conditions and improper arrangement of machinery. The contractor was instructed to use a crawler excavator instead of wheeled excavator to carry out compaction and soil cover in the rainy season. Spot checking of waste bags were conducted two times per week at the landfill before disposal of the waste.

A total of 300 kg compost was produced from grass, cow dung, rice husks, molasses, bio-extract (a liquid derived from the fermentation of vegetables and fruits with sugar and used as a natural liquid fertiliser) and vegetable and fruit waste from the canteens for use by villagers who work at the landfill and at OSOV.

A total of 34,886 kg of recyclable waste was collected by Khounmixay Processing Factory and transported offsite to its facilities for recycling or processing and final disposal as shown in ***Table 4-3***.

TABLE 4-3: AMOUNTS OF RECYCLABLE WASTE SOLD DURING Q2 2018

Source and Type of Recycled Waste		Unit	Total in Second Quarter of 2018 (A)	Sold (B)	Remaining Amount (A - B)
Construction activity					
1	Scrap metal	kg	75,668	33,256	42,412
Sub-Total 1		**kg**	**75,668**	**33,256**	**42,412**
Operation camp					
2	Glass bottles	kg	2,846	1,274	1,572
3	Plastic bottles	kg	315	122	193
4	Aluminium cans	kg	90.5	81.3	9.2
5	Paper/Cardboard	kg	289	153	136
Sub-Total 2		**kg**	**3,541**	**1,630**	**1,910**
Grand Total 1+2		**kg**	**79,209**	**34,886**	**44,322**

4.3.2 Hazardous Waste Management

In Q2 2018, joint hazardous materials and waste inventories was carried out monthly at the main construction sites and the contractors' camps. The amounts of hazardous waste collected, stored and disposed during Q2 2018 are shown in **Table 4-4**. The treatment and final disposal of hazardous waste including used hydraulic oil and engine oil is outsourced to Khounmixay Processing Factory**.** The remaining waste will be collected, treated and disposed by Khounmixay Processing Factory over the next months.

A total of 41 kg of clinical waste from NNP1PC, OC, Song Da5 and Sinohydro was incinerated at the Vientiane landfill.

TABLE 4-4: HAZARDOUS WASTE RECORDED DURING Q2 2018

No.	Hazardous Waste Type	Unit	Total in Second Quarter 2018	Disposal	Remaining
1	Used hydraulic and engine oil	liter (l)	9,770	600	9,170
2	Contaminated soil, sawdust and concrete	kg	775	0	775
3	Used oil filters	No.	329	0	329
4	Used tire	No.	324	0	324
5	Empty used chemical drum/container	Drum (20 litter)	180	0	180
6	Empty paint and spray cans	can	180	0	180
7	Halogen/fluorescent bulbs	No.	162	0	162
8	Ink cartridge	No.	130	0	130
9	Empty used chemical drum/container	drum (200 l)	122	31	91
10	Empty used oil drum/container	drum (20 l)	91	13	78
11	Empty used oil drum/container	drum (200 l)	45	5	40
12	Contaminated textile and material	kg	31	0	31
13	Lead acid batteries	No.	22	0	22
14	Empty contaminated bitumen drum/container	drum (200 l)	17	2	15
15	Lithium-ion batteries	No.	7	0	7
16	Clinical waste	kg	40.6	40.6	0
17	Acid and caustic cleaners	Bottle	0	0	0
18	Cement bag	bag	0	0	0
19	Used oil mixed with water	liter (l)	0	0	0

4.3.3 Sewage Sludge Disposal

A total of 8 m^3 of sewage sludge from OC was transported and disposed at Disposal area No. 6 by following NNP1PC's SOP on sewage/black water disposal.

4.4 COMMUNITY WASTE MANAGEMENT SUPPORT

4.4.1 Animal Fodder (Pig Feed) Collection Programme

During Q2 2018, local villagers collected a total of 18,425 kg of food waste from the Owner's Site Office and Village (OSOV) and the contractor camps for feeding their animals. This is a decrease of 3,580 kg compared to Q1 2018, details are shown in ***Table 4-5***.

TABLE 4-5: AMOUNT OF FOOD WASTE COLLECTED BY LOCAL VILLAGERS FOR USE AS PIG FEED DURING Q2 2018

NO.	SITE NAME	UNIT	TOTAL
1	Song Da 5 Camp No. 2	kg	6,332
2	Song Da 5 Camp No. 1	kg	4,567
3	Obayashi Corporation Camp	kg	3,164
4	Owner's Site Office and Village (OSOV)	kg	2,221
5	LILAMA 10 Camp	kg	1,443
6	Kenber Camp	kg	698
Total		**kg**	**18,425**

4.5.2 Community Consultation on Waste Management

On 10 May 2018, EMO conducted a community consultation on waste management for 15 camp followers at Hat Gniun Village, which included the importance of waste collection, segregation for recycling, and disposal of non-recyclable waste at Houay Soup Landfill (*Error! Reference source not found.* and ***Photograph 6***).

PHOTOGRAPHS 5 & 6: COMMUNITY CONSULTATION FOR 15 CAMP FOLLOWERS ON THE WASTE MANAGEMENT

4.4.2 Community Recycling Programme

The Community Recycle Waste Bank collected a total of 3,257 kg of recyclables from villagers and 521 kg was sold to Khounmixay Processing Factory as presented in ***Table 4-6***.

TABLE 4-6: AMOUNTS OF RECYCLABLES SOLD AT THE COMMUNITY RECYCLE WASTE BANK

Types of Waste	Unit	Purchased Amount During Q2 2018 (A)	Sold (B)	Remaining Amount (A - B)
Scrap metal	kg	16	0	16
Glass	kg	2,185	285	1,900

Types of Waste	Unit	Purchased Amount During Q2 2018 (A)	Sold (B)	Remaining Amount (A - B)
Paper/cardboards	kg	655	0	655
Plastic bottles	kg	346.5	195	151.5
Aluminium	kg	54.5	41	13.5
Total	**kg**	**3,257**	**521**	**2,736**

4.4.3 Houay Soup Landfill

The PKC Company started operating Houay Soup Landfill under a one-year contract in December 2017. The works include solid waste collection and transportation from Phouhomxay, Thahuea, Hat Gniun villages to Houay Soup Landfill three days per week (Mondays, Wednesdays and Fridays), waste segregation, waste compaction and daily waste covering at the landfill.

During Q2 2018, approximately 115.1 m^3 of solid waste from the Thaheau Village, Hat Gniun Village, Phouhomxay Village and local contractors was disposed of at Houay Soup Landfill.

4.4.4 Waste Clean-up in Four Villages of Zone 2LR

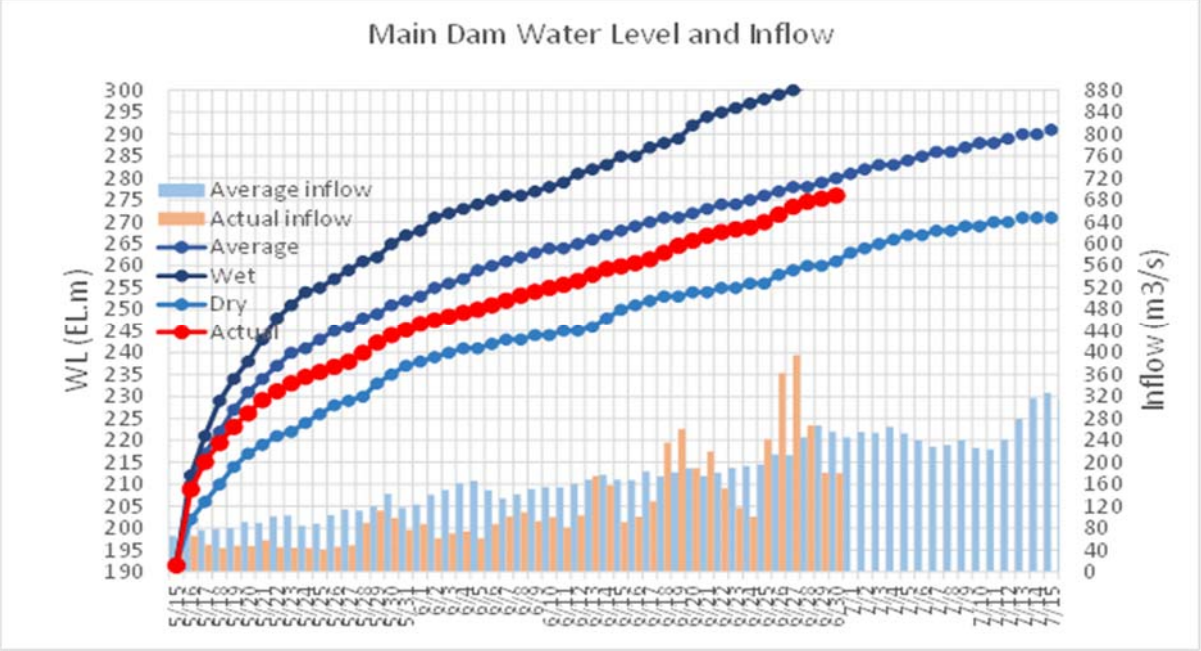
The waste clean-up in the four villages of Zone 2LR (Houaypamom, Sopphoune, Sopyouak and Namyouak villages) started on 01 December 2017 and was completed by the end of March 2018. The purpose of the waste clean-up was to remove and safely dispose waste that remained after relocation of the households before the impounding of main reservoir.

On 12 April 2018, NNP1PC-EMO, EMU, and RMU carried out a joint inspection of the waste clean-up at 4 villages in Zone 2LR. Following this inspection, EMU and RMU issued a work-completion letter to NNP1PC.

4.5 Main Reservoir Impounding

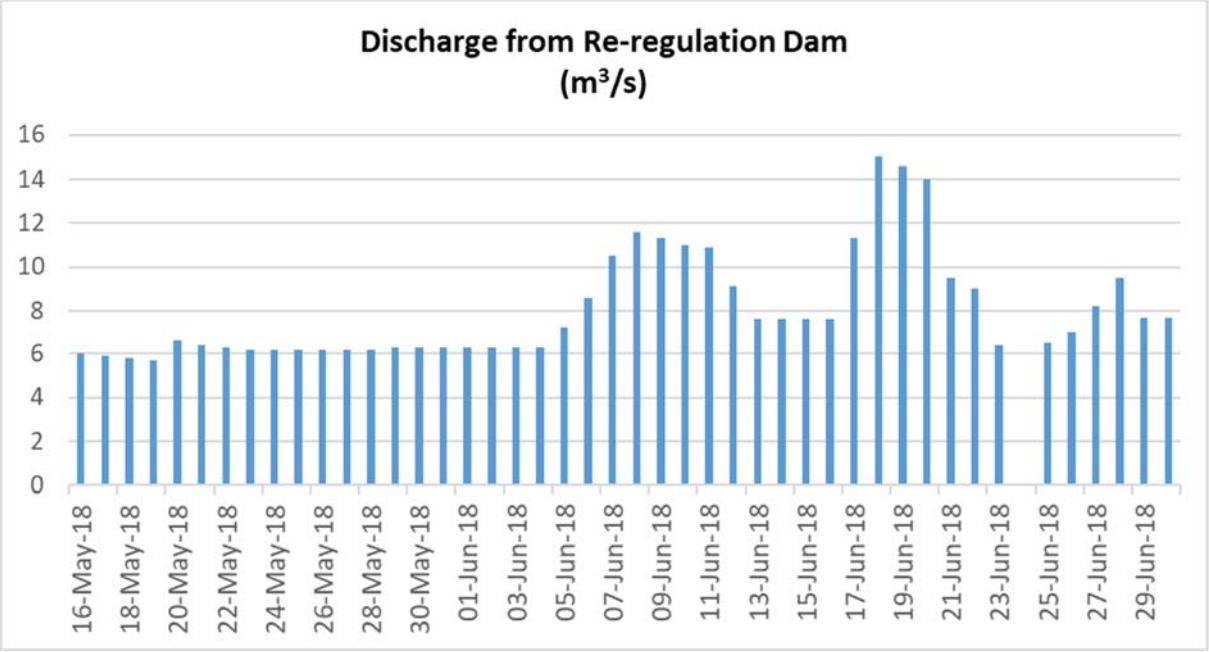
The impounding of the main reservoir started on 15 May 2018 and until the water level in the reservoir reaches 306.5 masl, the discharge from the re-regulation dam will be reduced to a minimum of 5.5 m^3/s (Concession Agreement, Annex C: Minimum flow requirements during impounding). On 30 June 2018 the water level in the main reservoir had reached 276 masl (see ***Figure 4-5***)

FIGURE 4-5 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 4-6***. The discharge from the re-regulation dam has been above the required minimum flow since the start of impounding.

FIGURE 4-6 DISCHARGE FROM THE RE-REGULATION DAM AFTER START OF IMPOUNDING



On 29 May 2018, EMO carried out a survey of Nam Ngiep from the re-regulation dam to the confluence with Mekong River to determine if the downstream reach is navigable by boat typically used by villagers during the period of reduced discharge from the re-regulation dam. The EMO team was able to navigate the entire reach by boat.

EMO will start measurements of water depth in the downstream reach of Nam Ngiep in July 2018 to confirm compliance with the water depth requirements in the Concession Agreement (at least 0.5 m measured immediately downstream 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[3] 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.

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 revised programme comprises:

- 5 monitoring stations in the main reservoir: R1-R5, where R1 and R2 are new stations and R3 corresponds to the location of NNG02, R4 to NNG03 and R5 to NNG09,
- 2 stations in the re-regulation reservoir: R6 and R7 where R6 corresponds to the location of NNG04,
- 5 stations in the main stream Nam Ngiep (NNG01, and NNG05-NNG08), and
- 4 stations in the main tributaries to Nam Ngiep (NCH01 in Nam Chiane, NPH01 in Nam Phouan, NXA in Nam Xao and NHS01 in Nam Houay Soup).

[3] The Effluent Standards in Annex C are **the stricter of** the indicative guideline values applicable to sanitary wastewater in IFC Environmental Health and Safety Guideline, General Guidelines: Wastewater and Ambient Water Quality – and the applicable values in the Lao National Environmental Standards. Note also that the indicative guideline values in the IFC EHS Guideline are meant to apply in the absence of national values

The monitoring programme is presented in ***Table 4-7***Error! Reference source not found. and the location of the monitoring stations is shown in ***Figure 4-7*** (before start of impounding) and in ***Figure 4-8*** (after start of impounding).

TABLE 4-7: SURFACE WATER QUALITY MONITORING PROGRAMME

Frequency of Monitoring	Parameters (Unit)	Monitoring Stations
Tuesdays and Saturdays (after start of impounding)	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C) and Turbidity (NTU)	- R5/NNG09 - NNG05
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS (mg/l),	- NPH01 - R3/NNG02 - R4/NNG03 - R5/NNG09 - R6/NNG04 - R7 - NNG05
Weekly	BOD_5 (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	- R5/NNG09 - R6/NNG04 - R7 - NNG05
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 iron (mg/l), Manganese (mg/l), total phosphorus (mg/l), total dissolved phosphorus (mg/l), phytoplankton biomass (g dry weight/m^3), TOC (mg/l)	All stations
6-monthly	Alkalinity (mg/l), sulphate (mg/l), chloride (mg/l), TKN (mg/l), potassium (mg/l), sodium (mg/l), calcium (mg/l), magnesium (mg/l), arsenic (mg/l), mercury (mg/l), lead (mg/l)	All stations

All water samples are taken at a depth of approximately 0.5 m. Measurements of depth profiles (dissolved oxygen, temperature, conductivity, pH, and total dissolved solids) will start in July 2018.

FIGURE 4-7: SURFACE WATER QUALITY MONITORING LOCATIONS BEFORE START OF IMPOUNDING

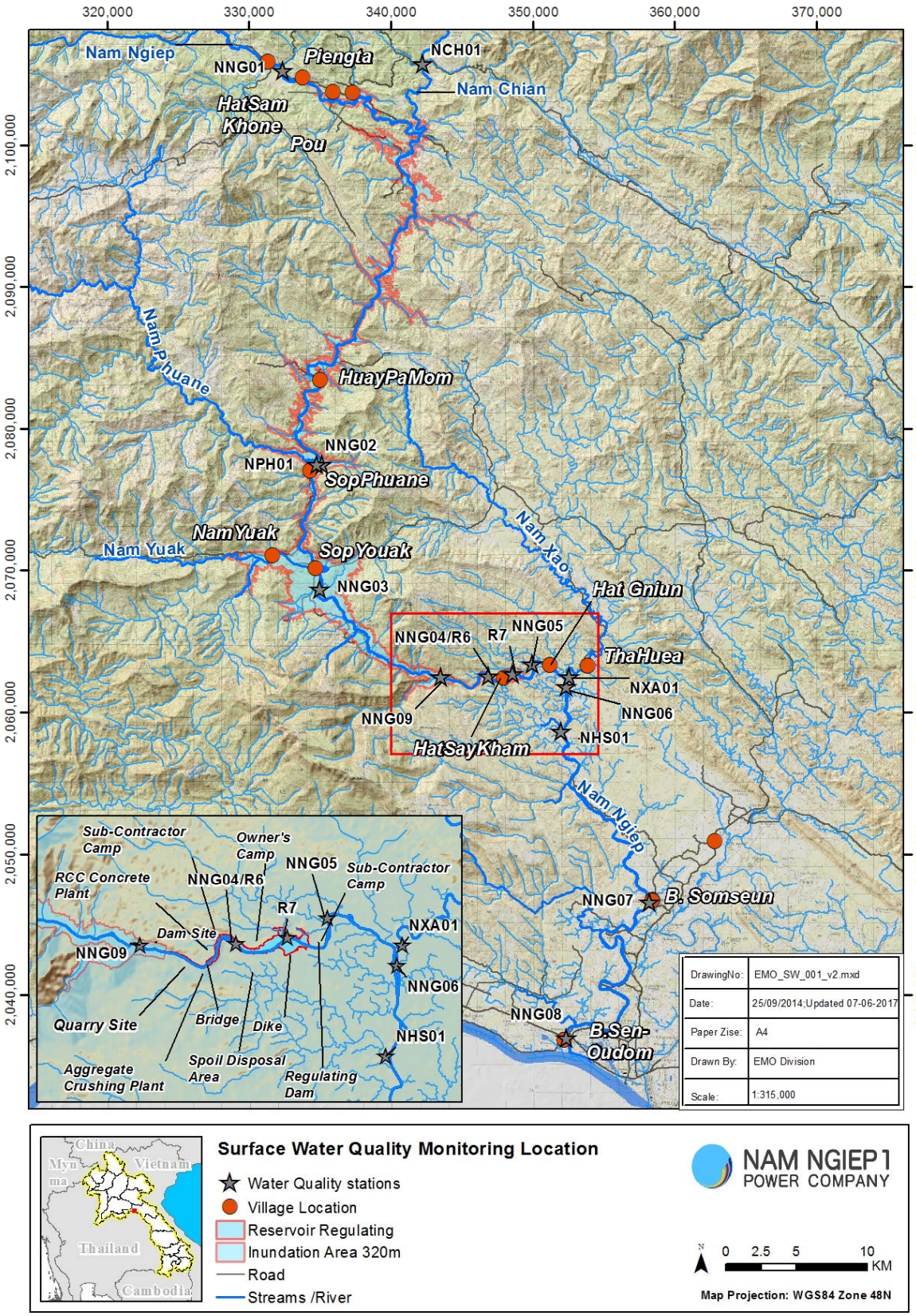
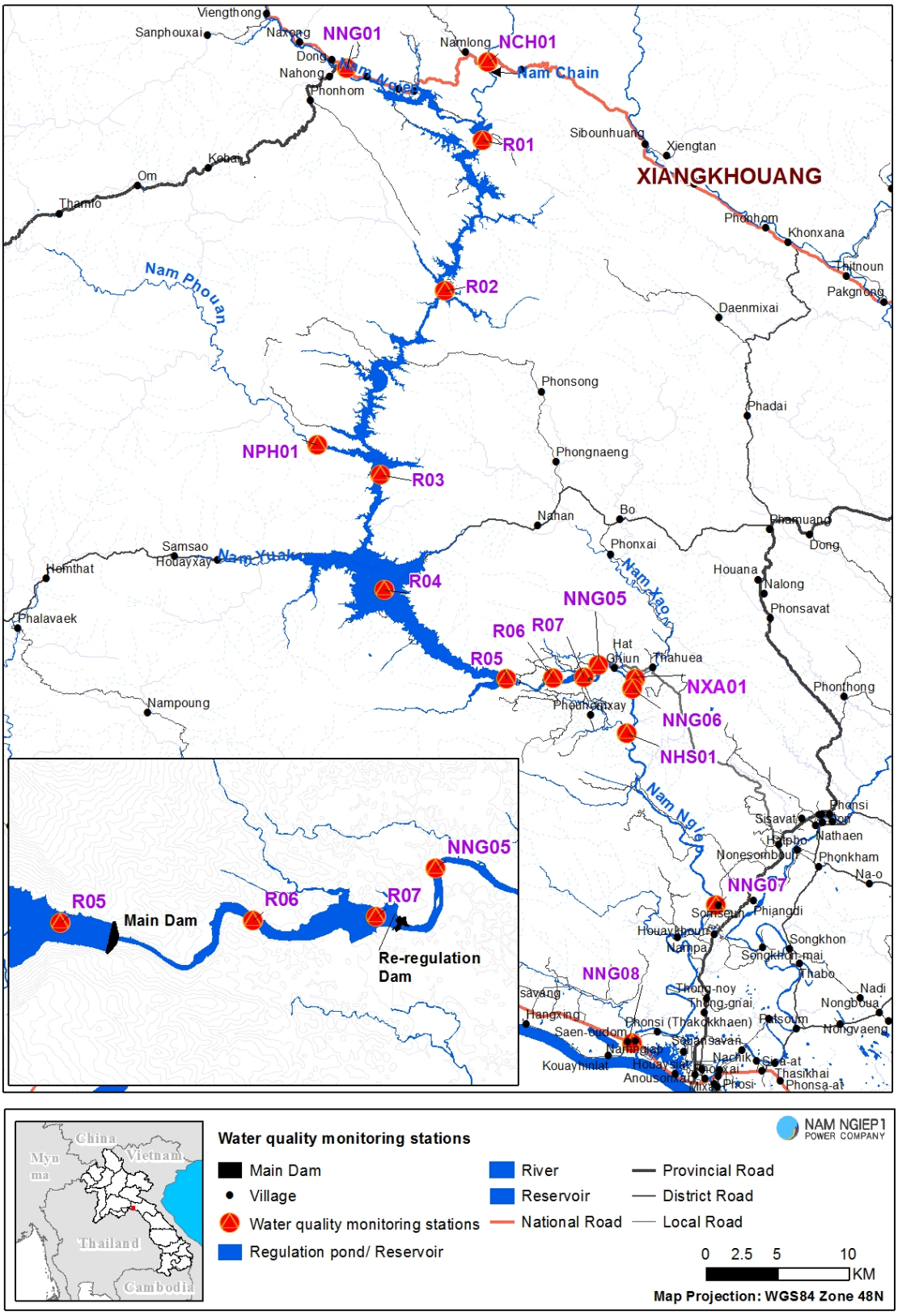


FIGURE 4-8: SURFACE WATER QUALITY MONITORING LOCATIONS AFTER START OF IMPOUNDING

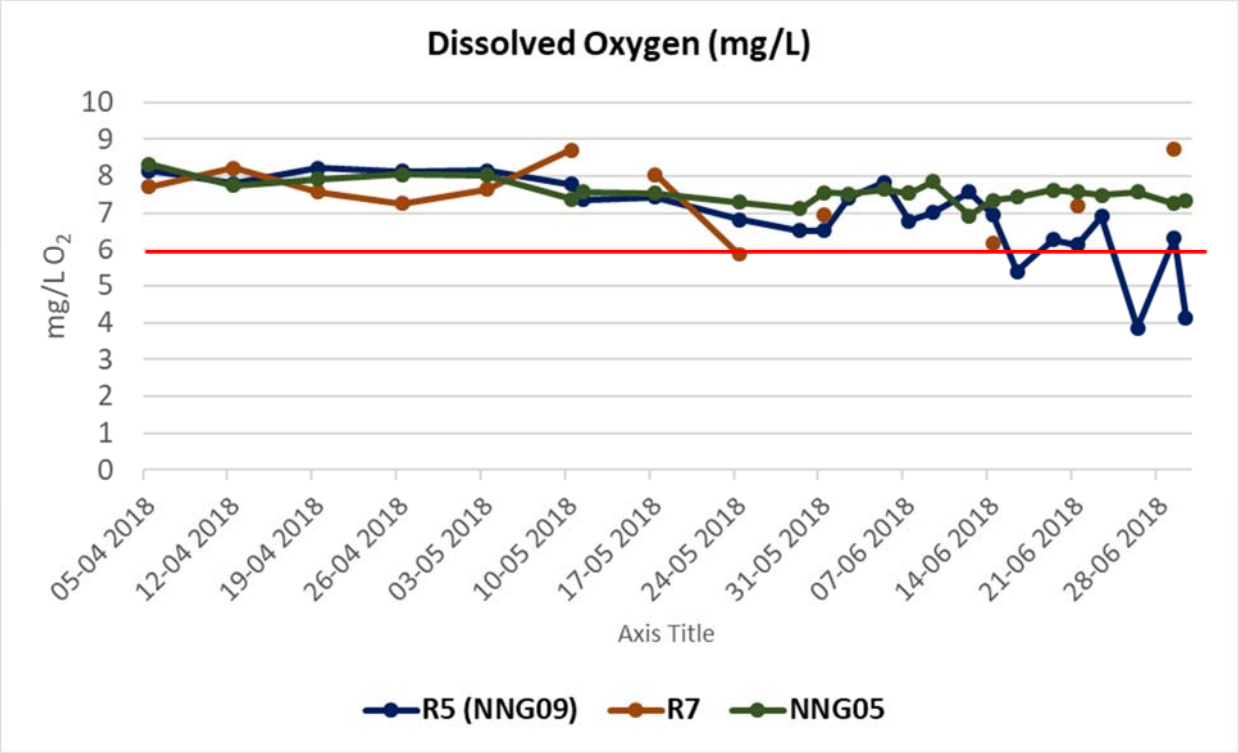


Descriptions of each monitoring station and surface water quality monitoring parameters can be found in ***Appendix 3*** and all surface water quality data for Q2 2018 are listed in ***Appendix 5.1***

Dissolved Oxygen (DO)

The results of dissolved oxygen measurements for the stations immediately upstream the main dam and downstream the re-regulation dam are presented in the line graph in ***Figure 4-9,*** and the full set of data are shown in ***Table 4-8.***

FIGURE 4-9 DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM THE PROJECT



During the first 6 weeks after start of impounding, the concentration of dissolved oxygen in R5 immediately upstream the main dam remained above 6 mg/L (the surface water quality standard) where after the level dropped below 6 mg/L affected by the decay of biomass within the main reservoir. The dissolved oxygen concentrations in the re-regulation reservoir and in the downstream stations have generally remained well above 6 mg/L.

With respect to the three incidences of low levels of dissolved oxygen measured in the downstream tributaries to Nam Ngiep (Nam Houay Soup [NHS01] and Nam Xao [NXA01]) it should be noted that similar levels below 6 mg/L have been measured in these two stations in 7%-10% of the measurements since 2015. These levels are considered unrelated to the Project.

TABLE 4-8: *DO RESULTS OF SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED FROM APRIL TO JUNE 2018 (NATIONAL SURFACE WATER QUALITY STANDARD FOR DO: >6.0 MG/L)*

Station Code	NNG01	R3/NNG02	R4/NNG03	R5/NNG09	R6/NNG04	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Apr-18	7.97										8.28			
4-Apr-18		7.88	8.1									8.47		
5-Apr-18				8.14	7.55	7.71	8.33	8.2	7.66	7.5			6.67	8.07
12-Apr-18				7.8	7.82	8.21	7.74							
19-Apr-18				8.22	7.88	7.57	7.92							
24-Apr-18	8.24										7.82			
26-Apr-18				8.13	7.48	7.25	8.05	7.78	7.74	7.58			5.63	5.95
1-May-18	7.88										8.34			
2-May-18			8.02									8.21		
3-May-18				8.15	7.53	7.64	8.03	7.91	7.93	7.8			6.64	6.62
10-May-18				7.78	7.48	8.7	7.38							
11-May-18	7.33			7.36	7.35		7.58				8.19			
15-May-18		7.64	7.69									8.01		
16-May-18	7.43										8.47			
17-May-18				7.44	6.51	8.04	7.53	6.81	7.13	8.26			5.85	
24-May-18				6.82	5.84	5.87	7.29							
29-May-18				6.52			7.11							
31-May-18				6.52	6.18	6.95	7.55							
2-Jun-18				7.41			7.52							
5-Jun-18	7.35			7.83			7.64				8.11			
7-Jun-18				6.79	7.54	7.53	7.54	6.86	6.65	6.67			6.82	7.18
9-Jun-18				7.01			7.85							
12-Jun-18		7.43	8.45	7.57			6.92					7.74		

Station Code	NNG01	R3/NNG02	R4/NNG03	R5/NNG09	R6/NNG04	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
14-Jun-18				6.97	6.6	6.19	7.35							
16-Jun-18				5.39			7.44							
19-Jun-18	7.21	7.22	9.75	6.28			7.63				8.07	7.87		
21-Jun-18				6.14	7.21	7.18	7.57	7.37	6.21	6.98			7.42	7.22
23-Jun-18				6.91			7.49							
26-Jun-18		6.93	6.98	3.85			7.58					8.22		
29-Jun-18				6.31	7.24	8.74	7.26							
30-Jun-18				4.13			7.35							

Ammonia Nitrogen

Since 2014, the Ammonia Nitrogen levels in the Nam Ngiep River and its tributaries have generally been below the detection limit (< 0.2 mg/L). In May and June 2018, Ammonia Nitrogen exceeded the National Surface Water Quality Standard of < 0.2 mg/L in all stations with levels as high as 2-5 mg/L ammonia nitrogen in the June samples, which is highly unusual. The elevated levels of ammonia nitrogen observed in June 2018 in the main reservoir and immediately downstream could be explained by decomposing biomass due to the impounding of the reservoir, but this cannot explain the elevated levels upstream in NNG01, in the tributaries nor in the further downstream stations NNG07 and NNG08.

TABLE 4-9: *AMMONIA NITROGEN RESULTS OF SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED FROM APRIL TO JUNE 2018 (NATIONAL SURFACE WATER QUALITY STANDARD FOR AMMONIA NITROGEN: <0.2 MG/L)*

Station Code	NNG01	R3 NNG02	R4 NNG03	R5 NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Apr-18	<0.2										0.37			
4-Apr-18		<0.2	<0.2									<0.2		
5-Apr-18				<0.2	0.2	0.2	<0.2	<0.2	<0.2	<0.2			<0.2	<0.2
1-May-18	0.27										0.3			
2-May-18			0.37									0.48		
3-May-18				0.37	0.25	0.26	0.37	0.35	0.27	0.25			0.32	0.28
5-Jun-18	1.68										2.13			
7-Jun-18				0.99	3.4	0.83	4.97	1.6	1.57	2.96			1.59	0.73
12-Jun-18		0.39	2.5									0.74		

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 except in NNG03 and R5/NNG09 which are both located within the main reservoir.

Elevated levels of BOD_5 as measured in R4 and R5 measured in June 2018 after start of impounding would be expected as a result of the decay of biomass in the water column. However, the elevated level of BOD_5 measured in NNG09/R5 on 26-Apr-18 before the impounding is unrelated to the Project. Similar elevated BOD_5 levels at NNG09 have been measured previously; once in 2016 and once in 2017.

TABLE 4-10: *BOD5 RESULTS OF SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED FROM APRIL TO JUNE 2018 (NATIONAL SURFACE WATER QUALITY STANDARD FOR BOD_5: <1.5 MG/L)*

Station Code	NNG01	R3 NNG02	R4 NNG03	R5 NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Apr-18	<1.0										<1.0			
4-Apr-18		<1.0	<1.0									<1.0		

Station Code	NNG01	R3 NNG02	R4 NNG03	R5 NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
5-Apr-18				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			1	<1.0
12-Apr-18				<1.0	<1.0	<1.0	<1.0							
19-Apr-18				<1.0	<1.0	<1.0	<1.0							
26-Apr-18				3.47	<1.0	<1.0	<1.0							
1-May-18	<1.0										<1.0			
2-May-18			<1.0									<1.0		
3-May-18				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0	1.31
10-May-18				<1.0	<1.0	1.31	<1.0							
17-May-18				<1.0	<1.0	<1.0	<1.0							
24-May-18				1.36	<1.0	<1.0	<1.0							
31-May-18				<1.0	<1.0	<1.0	<1.0							
5-Jun-18	<1.0										<1.0			
7-Jun-18				1.75	1.02	1.08	<1.0	1.07	1.06	<1.0			1.01	1.8
12-Jun-18		<1.0	3.64									<1.0		
14-Jun-18				2.03	1.01	<1.0	<1.0							
21-Jun-18				1.89	<1.0	1.27	<1.0							
29-Jun-18				1.24	<1.0	1.5	<1.0							

Chemical Oxygen Demand (COD)

The COD measurements in Q2 2018 are presented in ***Table 4-11***.

TABLE 4-11: COD RESULTS FOR SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES DURING Q2 2018 (NATIONAL SURFACE WATER QUALITY STANDARD FOR COD: < 5 MG/L)

Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Apr-18	<5.0										<5.0			
4-Apr-18		<5.0	<5.0									<5.0		
5-Apr-18				<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0			<5.0	<5.0
1-May-18	11.3										9.6			
2-May-18			9									21.2		
3-May-18				12.6	15.5	6.9	7.3	6.5	16.3	12			11.4	30.4
5-Jun-18	12.9										5.3			
7-Jun-18				8.9	6.7	6.1	12.8	11.5	14.2	12.2			4.9	19
12-Jun-18		6.6	13.3									25.2		

The mean COD values for the high flow and low flow seasons are presented in ***Table 4-12.*** The data indicates seasonal variation with higher values in the high flow season.

TABLE 4-12 MEAN VALUES OF COD MEASUREMENTS

Mean[4] COD Values	Upstream High Flow Season Mean (Jun-Nov) (mg/L)	Upstream Low Flow Season Mean (Dec-May) (mg/L)	Downstream High Flow Season Mean (Jun-Nov) (mg/L)	Downstream Low Flow Season Mean (Dec-May) (mg/L)
Hydrological Year[5] 2015	15.3	6.7	22.0	5.9
Hydrological Year 2016	10.8	5.6	10.6	5.4
Hydrological Year 2017	13.9	7.0	12.4	4.7
Hydrological Year 2018	14.8	5.0	7.1	5.7

The number and percent of measurements that exceed the National Water Quality Standard for COD in Q2 2016, Q2 2017 and Q2 2018 are presented in ***Table 4-13***. The percent exceedances are similar both between Quarters and between up- and downstream stations.

TABLE 4-13 NUMBER AND PERCENT OF EXCEEDANCES WITH THE NATIONAL WATER QUALITY STANDARD FOR COD[6]

	Upstream Q2 2016	Downstream Q2 2016	Upstream Q2 2017	Downstream Q2 2017	Upstream Q2 2018	Downstream Q2 2018
Number of Measurements	15	12	15	12	17	12
Number of Exceedances	10	8	10	8	11	8
Percent Exceedances	67%	67%	67%	67%	65%	67%

With only one complete sampling round (in June 2018) after start of impounding, there is insufficient data to assess if the impounding of the main reservoir has had any impact on COD levels so far.

Faecal Coliforms

The results of the faecal coliform analyses in Q2-2018 are presented in ***Table 4-14***. There were exceedances of the National Water Quality Standard (< 1,000 MPN/100 ml) both upstream and downstream the Project.

[4] If the measurement is below the Limit of Detection, then the value is determined as the Limit of Detection divided by the square root of 2

[5] The hydrological year is from start of the wet season in June to the end of the dry season in May the following year. The year denotes the year of the end of the hydrological year. For the hydrological year 2015 the high flow season data only includes September-November 2014, and for the hydrological year 2018 the low flow season data only until March 2018

[6] The upstream values include the stations in the re-regulation reservoir

The basic statistics of the faecal coliform measurements in Q2 2018 are displayed in the box and whisker diagrams in ***Figure 4-10***. The upstream R5 has a higher mean and median than R6 and R7 in the re-regulation reservoir, but the same median as NNG05 (downstream).

A statistical hypothesis test using Excel's TTEST function (unpaired, two-tailed, different variances, level of significance: 0.05) comparing the upstream sample (R5/NNG09) for Q2-2018 with the downstream sample (NNG05) for Q2-2018 gives a p-value of 0.71, which indicates that the observed data are compatible with the null hypothesis that the true faecal coliform means of the two samples are identical.

Both R6 and R7 have 1-2 extreme outliers, but the means, medians and the interquartile ranges are smaller than those of both R5 and NNG05.

The results indicate that the Project is not a significant source of faecal coliforms.

FIGURE 4-10: BOX AND WHISKER DIAGRAMS OF FAECAL COLIFORM MEASUREMENTS Q2 2018 IN Selected **STATIONS**

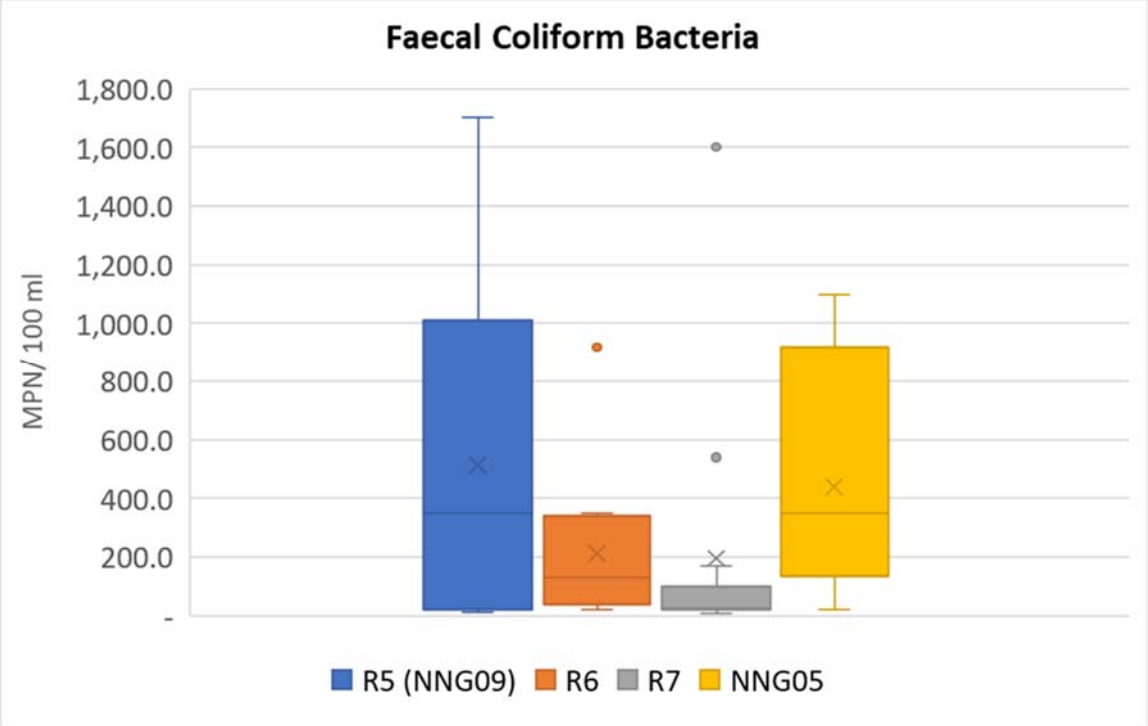


TABLE 4-14: RESULTS OF FAECAL COLIFORMS IN NAM NGIEP AND ITS MAIN TRIBUTARIES FROM APRIL TO JUNE 2018 (NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: < 1,000 MPN/100 ML)

Date	NNG 01	R3 NNG 02	R4 NNG 03	R5 NNG09	R6	R7	NNG 05	NNG06	NNG07	NNG0 8	NCH 01	NPH 01	NXA 01	NHS01
3-Apr-18	280										110			
4-Apr-18		280	33									2		
5-Apr-18				130	130	27	41	12	41	11			33	130
12-Apr-18				79	79	27	130							
19-Apr-18				1100	350	33	350							
26-Apr-18				390	330	22	140							
1-May-18	540										240			
2-May-18			920									350		

Date	NNG 01	R3 NNG 02	R4 NNG 03	R5 NNG09	R6	R7	NNG 05	NNG06	NNG07	NNG0 8	NCH 01	NPH 01	NXA 01	NHS01
3-May-18				1600	350	170	920	1600	1600	1600			540	1600
10-May-18				1700	920	540	350							
17-May-18				350	22	22	22							
24-May-18				22	26	8	920							
31-May-18				13	23	13	350							
5-Jun-18	410										1600			
7-Jun-18				350	49	33	920	49	1600	920			790	170
12-Jun-18		1600	23									1600		
14-Jun-18				920	49	33	280							
21-Jun-18				11	170	1600	170							
29-Jun-18														

Table 4-15 presents seasonal (high flow season and low flow season) means of faecal coliform bacteria upstream the main dam, in the re-regulation reservoir and downstream the re-regulation dam. The data indicates that there is a tendency towards higher values in the high flow season.

TABLE 4-15: SEASONAL MEANS FOR FAECAL COLIFORMS UPSTREAM THE MAIN DAM, IN THE RE-REGULATION RESERVOIR AND DOWNSTREAM THE RE-REGULATION DAM

	Upstream		Re-regulation Reservoir		Downstream	
	High Flow Season Mean	Low Flow Season Mean	High Flow Season Mean	Low Flow Season Mean	High Flow Season Mean	Low Flow Season Mean
	(MPN/100 ml)	(MPN/100 ml)	(MPN/100 ml)	(MPN/100 ml)	(MPN/100 ml)	(MPN/100 ml)
Hydrological Year[7] 2015		659		372		399[8]
Hydrological Year 2016	2,971	529	2,630	629	2,092	570
Hydrological Year 2017	1,286	452	3,710	197	939	171
Hydrological Year 2018	2,055	318	1,249	109	1,157	247

Total Coliforms

[7] The hydrological year is from start of the high flow season in June to the end of the low flow season in May the following year. The year denotes the year of the end of the hydrological year.

[8] This mean excludes an anomaly of 92,000 MPN/100 ml reported for NNG07 in January 2015

The results of measurements for total coliform bacteria are presented in ***Table 4-16***. Only one sample exceeded the National Water Quality Standard (NNG09 on 10 May 2018). The results indicate a somewhat similar pattern as for faecal coliform bacteria.

TABLE 4-16: RESULTS OF TOTAL COLIFORMS IN NAM NGIEP AND ITS MAIN TRIBUTARIES FROM APRIL TO JUNE 2018 (NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: < 5,000 MPN/100 ML)

Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Apr-18	1,600										110			
4-Apr-18		1,600	280									540		
5-Apr-18				920	540	540	540	540	1,600	1,600			220	540
12-Apr-18				350	170	170	350							
19-Apr-18				2,200	400	49	1,600							
26-Apr-18				2,200	1,100	49	280							
1-May-18	1,100										450			
2-May-18			1,600									920		
3-May-18				1,600	920	350	1,600	1,600	1,600	1,600			3,500	3,500
10-May-18				5,400	1,600	920	920							
17-May-18				1,100	350	170	280							
24-May-18				1600	170	49	3500							
31-May-18				16,000	540	33	5,400							
5-Jun-18	480										1,600			
7-Jun-18				1,600	130	79	1,600	1,600	1,600	1,600			3,500	1,600
12-Jun-18		1,600	240									1,600		
14-Jun-18				1,600	79	79	920							
21-Jun-18				1,600	1,600	1,600	1,600							

4.6.2 Special Surface Water Quality Monitoring

Following the failure of the Nam Ao dam located on the Nam Ao in Phaxai District, Xieng Khuang Province on 11 September 2017, NNP1PC has continued to monitor and observe changes in water quality in Nam Ngiep.

Nam Ao is a steep headwater stream of the Nam Ngiep catchment area that feeds into Nam Siem, a right bank tributary to Nam Ngiep. The dam failure on 11 September 2017 sent a flood wave of mud, water, and debris downstream Nam Ngiep and passed the Nam Ngiep 1 Hydropower Project located about 92 km from Nam Ao.

As NNP1PC has reported in the Nam Ao Dam Break Damage Report, the Nam Ao dam failure caused extremely high levels of suspended solids in Nam Ngiep for a period of 5-6 days which further resulted in widespread fish kill.

The water quality of Nam Ngiep both upstream and downstream the main reservoir and the health of the river as a viable ecosystem for fish biodiversity and as a source of livelihood for the fishing households are critical factors for watershed management and for the Company to be able to achieve its environmental and social objectives. Therefore, and in accordance

with the Concession Agreement, Annex C, Clause 51 c[9], NNP1PC has carried out two special water quality investigations in the upper Nam Ngiep.

The first investigation was undertaken in March 2018 and is reported in the Q1 2018 Environment Monitoring Report. The second investigation was carried out on 16 May 2018 and is reported herein.

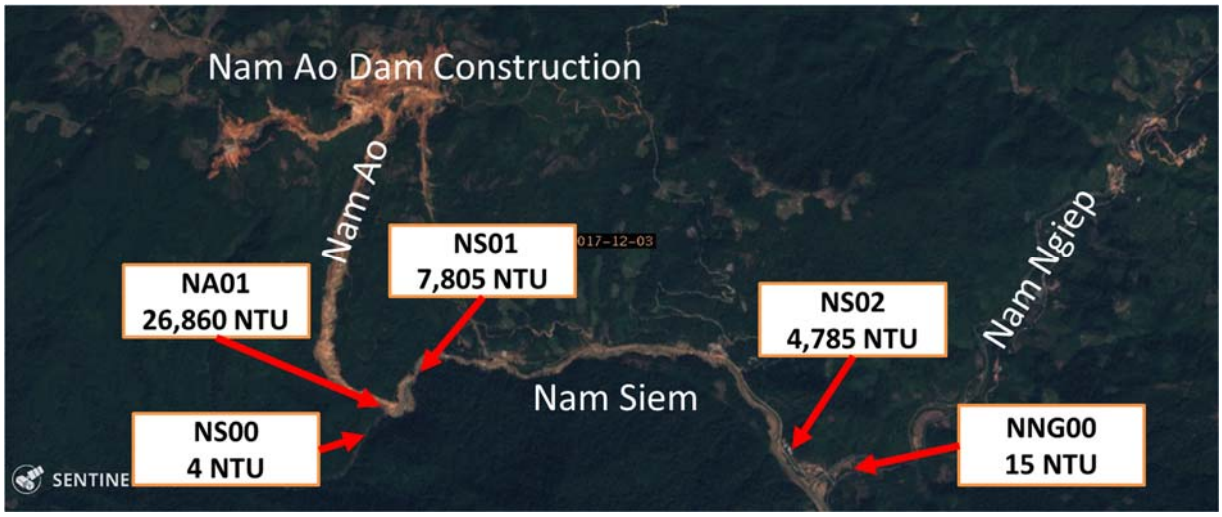
The investigation included measurements of turbidity, TSS, total dissolved sediment, dissolved oxygen, temperature, pH, and conductivity. In addition, the sample from Nam Ao was analysed for metals.

The sampling stations are displayed in ***Figure 4-11*** and included:

- NAO1 in Nam Ao,
- NS00 in Nam Siem upstream the confluence with Nam Ao
- NS01 in Nam Siem 300 m downstream the confluence with Nam Ao,
- NS02 in Nam Siem close to its confluence with Nam Ngiep
- NNG00 in Nam Ngiep upstream the confluence with Nam Siem
- NNG01 in Nam Ngiep (see ***Figure 4-8***)
- NCH01 in Nam Chian a tributary to Nam Ngiep (see ***Figure 4-8***)

[9] The CA, Annex C, Clause 51 c: "*The Company may make periodic surveys of the watershed and shall in writing notify local Governmental Authorities (with copies to MONRE and to Ministry of Agriculture and Forestry (MAF)) of any activities the Company identifies that are occurring within the watershed and which have, or may reasonably be expected to have, any adverse effect on the watershed. In such notification, the Company shall include information, to the extent available to the Company, as to who is engaging in that activity, whether the Company has requested such Person to cease such activity, and what the response was to that request*"

FIGURE 4-11: WATER QUALITY MONITORING STATIONS UPPER NAM NGIEP AND TRIBUTARIES



The results of the water quality measurements are presented in ***Table 4-17***. The measurements of pH, temperature, conductivity, total dissolved solids and dissolved oxygen are all within normal ranges.

The results of the investigations document extremely high concentrations of total suspended solids and very high turbidity levels in Nam Ao and in Nam Siem downstream the Nam Ao confluence. Upstream the confluence with Nam Ao, the turbidity level was very low. The TSS and turbidity levels tapered off downstream from Nam Ao but were still unusually high at NNG01 in Thaviengxay Village. The high turbidity in Nam Ao was also clearly visible as seen from the photo in ***Figure 4-12.*** The photo in ***Figure 4-13*** also shows that the highly turbid water is not from the discharge of Nam Ngiep 2 Powerhouse.

The results of this second investigation are similar to the results of the first investigation carried out in March 2018.

The results indicate continued sediment discharges from the Nam Ao tributary after the collapse of the dam. This appears to be due to continued severe erosion of the stream channel at the construction site.

FIGURE 4-12: THE CONFLUENCE OF NAM AO WITH NAM SIEM ON 16 MAY 2018

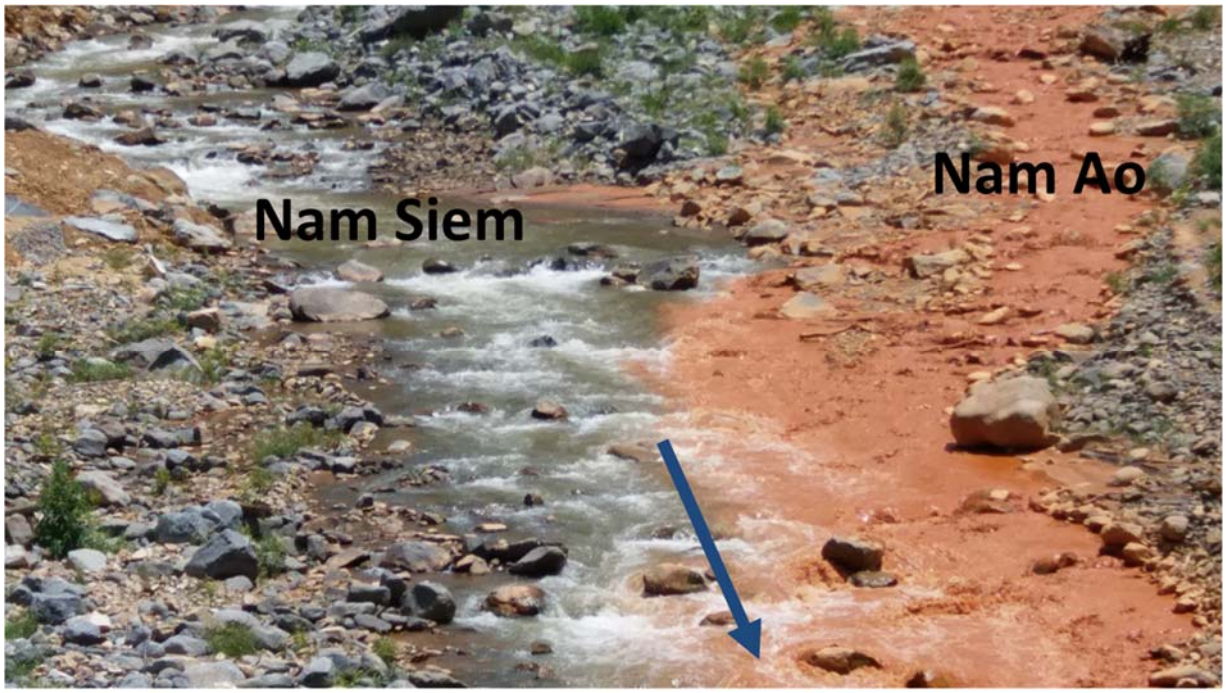


FIGURE 4-13 NAM SIEM AND THE OUTFLOW FROM THE POWERHOUSE OF NAM NGIEP 2 HYDROPOWER PROJECT

TABLE 4-17: RESULTS OF MONITORING THE WATER QUALITY INCIDENT

Parameter (unit	National Surface Water Quality Standard	NA01 (Nam Ao)	NS00 (Nam Siem)	NS01 (Nam Siem)	NS02 (Nam Siem)	NNG00 (Nam Ngiep)	NNG01 (Nam Ngiep)	NCH01 (Nam Chian)
pH	5.0 - 9.0	8.71	7.76	7.7	7.89	7.99	8.12	8.32
Sat.DO (%)		98.9	104.1	100.6	94.7	102.2	97.1	100.4
DO (mg/L)	>6.0	7.4	7.41	7.23	7.03	7.62	7.43	8.47
Conductivity (µS/cm)		10.48	125.7	80.9	65.1	43.3	78.1	33.1
TDS (mg/L)		5	63	40	32	22	39	17
Temperature (°C)		27.1	29.8	29.7	28.2	28	26.8	21.4
Turbidity (NTU)		26,860	4.4	7,805	4,785	15	787	9.7
TSS (mg/L)		44,938.64	13.79	6,315.70	3,141.51	31.00	600.96	50.6
Arsenic (mg/L)	<0.01	0.0116						
Manganese (mg/L)		2.94						
Mercury (mg/L)	<0.002	0.0006						
Zinc (mg/L)	<1.0	0.335						
Aluminium (mg/L)		175						
Cadmium (mg/L)	<0.05	<0.003						
Chromium (mg/L)	<0.05	0.384						

Parameter (unit	National Surface Water Quality Standard	NA01 (Nam Ao)	NS00 (Nam Siem)	NS01 (Nam Siem)	NS02 (Nam Siem)	NNG00 (Nam Ngiep)	NNG01 (Nam Ngiep)	NCH01 (Nam Chian)
Copper (mg/L)	<0.1	0.244						
Lead (mg/L)	<0.05	0.148						
Nickel (mg/L)	<0.10	0.171						
Iron (mg/L)		209						
Total phosphorus (mg/L)		<0.01						

FIGURE 4-14: LOWER NAM AO ON 16 MAY 2018 (NAO1)

4.6.3 Compliance Monitoring of Effluents from Camps

A total of 12 camps including OSOV were in use during Q2-2018 and the effluents were monitored in 11 camps (11 sampling sites) as indicated on the map in ***Figure 4-15.*** The Wastewater Treatment Plant (WWTP) at the TCM camp has no discharge due to small number of workers and was therefore not sampled. The results are described in ***Table 4-18*** and the full data set is in ***Appendix 5.2***.

The status of compliance as of 30 June 2018 can be summarized as follows:

- Non-compliance with total coliform bacteria for six camps (EF06, EF08, EF09, EF10, EF13 and EF14);
- The camps EF13 and EF14 have the worst record of compliance with instances of non-compliance with all parameters;
- All camps have experienced varied degree of non-compliance with ammonia and total nitrogen.

The results indicate high organic loads and inadequate residence time for effective removal of nitrogen. Previous incidences of extremely high coliforms are largely under control, with only occasional exceedances recorded. Proposed corrective actions to improve effluent quality are discussed in ***Table 4-18***.

FIGURE 4-15: MAP OF EFFLUENT MONITORING LOCATIONS DURING THE FOURTH QUARTER OF 2018

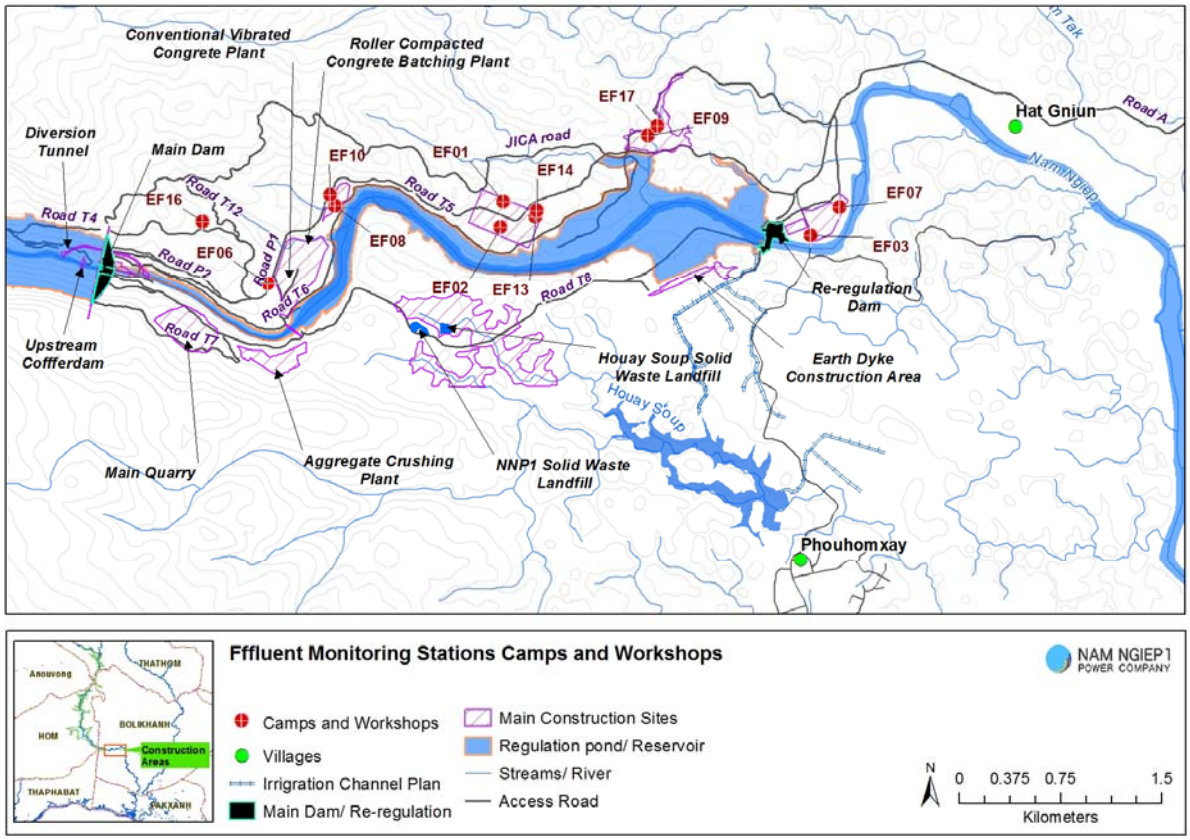


TABLE 4-18: RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS FROM APRIL TO JUNE 2018

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
09-Apr-18	TSS (mg/l)	<50	<5	6.03	14.61	33.15	25.88	79.34	<5	38.75	23.22	19.1	
23-Apr-18	TSS (mg/l)	<50	<5	5.24	23.65	35.25	25.76	68.61	<5	23.48	30	7.78	
09-May-18	TSS (mg/l)	<50	<5	6.34	6.75	26.11	20.18	58.94	7.23	46.1	14.24	8.24	17.88
21-May-18	TSS (mg/l)	<50	<5	7.17	16.15	39.02	18.92	41.8	10.68	31.63	44.02	7.69	31.6
04-Jun-18	TSS (mg/l)	<50	<5	7.96	27.61	31.4	29.14	26.54	10.66	46.02	31.51	20.81	21.26
18-Jun-18	TSS (mg/l)	<50	<5	5.85	38.72	33.53	20.23	54.49	6.96	23.48	35.19	67.37	25
09-Apr-18	BOD5 (mg/l)	<30	6.48	<6	<6	<6	<6	<6	<6	156.3	79.65	<6	
23-Apr-18	BOD5 (mg/l)	<30	7.2	<6	17.46	<6	18.72	43.05	48	124.8	<6	<6	
09-May-18	BOD5 (mg/l)	<30	<6	<6	<6	<6	<6	<6	7.08	<6	<6	<6	<6
21-May-18	BOD5 (mg/l)	<30	<6	<6	<6	<6	47.88	<6	27	48.7	45.06	<6	<6
04-Jun-18	BOD5 (mg/l)	<30	8.61	7.68	15.18	<6	<6	<6	<6	112.35	112.95	<6	34.44
18-Jun-18	BOD5 (mg/l)	<30	<6	<6	11.94	<6	<6	<6	6.57	94.28	111.75	<6	26.16
09-Apr-18	COD (mg/l)	<125	<25	39.4	42.4	102	116	163	<25	290	139	50.8	
23-Apr-18	COD (mg/l)	<125	<25	35.9	54.6	98.4	122	116	<25	194	158	<25	
09-May-18	COD (mg/l)	<125	<25	38.1	32.5	96.8	80.7	100	27.9	160	53	<25	33.8
21-May-18	COD (mg/l)	<125	<25	32.6	38.6	113	95.2	103	28.4	276	242	<25	34
04-Jun-18	COD (mg/l)	<125	<25	39	38.2	76	95.2	62.4	31.4	263	177	<25	25.6
18-Jun-18	COD (mg/l)	<125	<25	<25	<25	49.8	46.2	95.2	<25	180	171	25.2	<25
09-Apr-18	NH3-N (mg/l)	<10	11.1	10.5	6.5	29.8	45.9	27.1	5.9	24.5	25	12.6	
23-Apr-18	NH3-N (mg/l)	<10	8.2	17.5	13.3	23.9	48	25.9	3.5	25.4	1.6	17.6	
09-May-18	NH3-N (mg/l)	<10	3.2	5.6	19.4	19.2	34.3	21.6	5.2	19.4	6.6	10.8	6.6
21-May-18	NH3-N (mg/l)	<10	10.2	18	10.7	42.9	43.6	36.2	7.3	30.2	19.5	2.6	8.5
04-Jun-18	NH3-N (mg/l)	<10	5.7	16.9	7.7	18.3	32.9	20	5.8	20.8	10.5	5.1	9.2
18-Jun-18	NH3-N (mg/l)	<10	5.2	13.6	5.5	7.4	11.5	14.7	11.4	16.6	11.6	1.4	9.4

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
09-Apr-18	Total Nitrogen (mg/l)	<10	15.9	13	11.5	30.8	46.6	27.5	6.18	25.3	25.5	13.5	
23-Apr-18	Total Nitrogen (mg/l)	<10	16.9	20.7	16.6	26.5	49.1	26.4	14.5	30.4	17.9	19.2	
09-May-18	Total Nitrogen (mg/l)	<10	13.4	19.3	21.6	20.3	34.9	22.2	7.67	22.9	16	11.5	23.2
21-May-18	Total Nitrogen (mg/l)	<10	15.8	19.1	12.6	43.6	44.8	37.4	9.84	30.9	20.8	8.29	25
04-Jun-18	Total Nitrogen (mg/l)	<10	12.7	17	8.89	22.6	33.8	35.1	8.37	21.1	10.8	8.28	25.2
18-Jun-18	Total Nitrogen (mg/l)	<10	14.1	17.3	11.8	16.3	21	15.2	12.1	30.8	19.5	7.12	24
09-Apr-18	Total Coliform (MPN/100 ml)	<400	79	0	0	0	0	0	0	16000	22000	0	
23-Apr-18	Total Coliform (MPN/100 ml)	<400	110	0	11	0	23	1600	0	16000	0	4.5	
09-May-18	Total Coliform (MPN/100 ml)	<400	110	0	0	0	0	0	11	0	0	0	0
21-May-18	Total Coliform (MPN/100 ml)	<400	33	7.8	130	0	1600	0	240	49	23	0	0
04-Jun-18	Total Coliform (MPN/100 ml)	<400	94	4	14	0	0	0	0	5400	9200	0	170
18-Jun-18	Total Coliform (MPN/100 ml)	<400	350	0	1600	0	0	0	1600	0	23	9.3	9.2
09-Apr-18	Residual Chlorine (mg/l)	<1.0		1.22	1.99	1.22	0.64	0	0.25	0	0	1.71	
23-Apr-18	Residual Chlorine (mg/l)	<1.0		1.58	0.18	1.98	0.6	0	0.5	0	0.92	0.24	
09-May-18	Residual Chlorine (mg/l)	<1.0		0.5	0.23	0.54	0.74	1.53	0.14	1.24	0.83	0.34	0.73
21-May-18	Residual Chlorine (mg/l)	<1.0		0.32	0.21	1.82	0.1	2.1	0.11	0.56	0.88	1.07	1.32
04-Jun-18	Residual Chlorine (mg/l)	<1.0		0.18	0.07	1.06	0.76	1.06	0.28	0	0	0.32	0.08
18-Jun-18	Residual Chlorine (mg/l)	<1.0		0.61	0.07	0.4	1.7	2.1	0.11	0.12	0.5	0.31	0.07

TABLE 4-19: *COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q2 2018*

Site	ID	WWTS	Key Non-Compliance Issues[10] in Q2-2018	Corrective Actions
Owner's Site Office and Village (NNP1PC)	EF01	Septic tanks (kitchen and black water) and wetland (grey water), discharge: 70 m^3/day	- Total nitrogen (<10 mg/L): Q2 mean 14.8 mg/L. - Ammonia (<10 mg/L): Non-compliance in 2 out of 6. Q2 mean 7.3 mg/L	- EMO continues to monitor and improvement action was suggested including to add healthy wetland reeds that can effectively reduce /remove nitrogen
OC Camp – WWTS01	EF02	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Q2 mean 13.7 mg/L. - Total nitrogen (<10 mg/L): Q2 mean 17.7 mg/L.	- EMO continues to monitor, share effluent monitoring results to the contractor for their WWTP improvement and corrective action were suggested including to add healthy wetland reeds that can effectively reduce /remove nitrogen

[10] The values in brackets indicate the applicable standard

Site	ID	WWTS	Key Non-Compliance Issues[10] in Q2-2018	Corrective Actions
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 Q2 2018
Sino Hydro Camp	EF06	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Non-compliance in 3 out of 6. Q2 mean 10.5 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 5 out of 6. Q2 mean 13.8 mg/L. - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 6.	- EMO instructed Sinohydro to assign a key person to operate and record the chlorination. OC was instructed to closely supervise to assure proper chlorination process. - EMO continues to monitor, share effluent monitoring results to the contractor for their WWTP improvement
Zhefu Camp (HMH Worker Camp No.1)	EF09	Septic tank (kitchen and black water), sediment ponds (grey water)	- BOD_5 (<30 mg/L): Non-compliance in 1 out of 6. - COD (<125 mg/L): Non-compliance in 1 out of 6. Q2 mean 106.6 mg/L. - Ammonia-nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Q2 mean 24.3 mg/L. - Total nitrogen (<10 mg/L): Q2 mean 27.3 mg/L - TSS (<50 mg/L): Non-compliance in 4 out of 6. Q2 mean 54.95 mg/L - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 6.	- As above

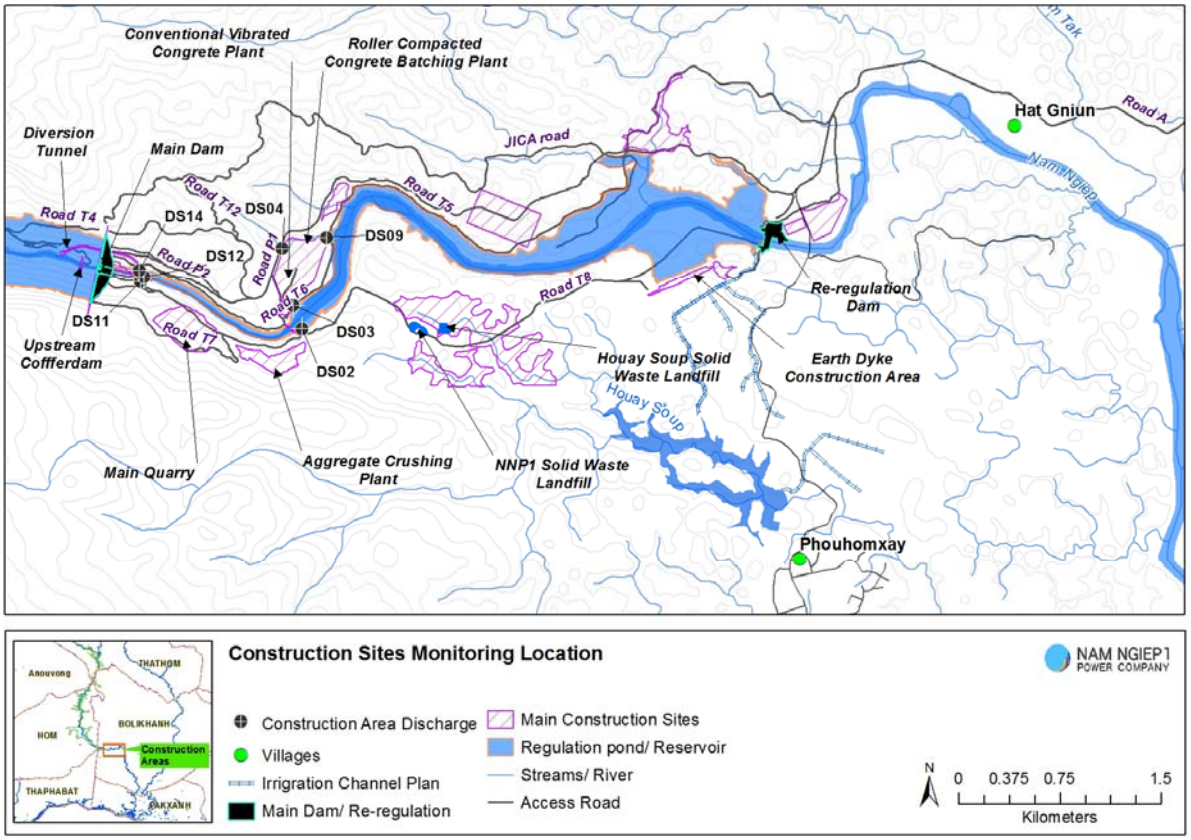
Site	ID	WWTS	Key Non-Compliance Issues[10] in Q2-2018	Corrective Actions
V&K Camp	EF10	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD_5 (<30 mg/L): Non-compliance in 1 out of 6. - Ammonia-nitrogen (<10 mg/L): Non-compliance in 1 out of 6. Q2 mean 6.5 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 2 out of 6. Q2 mean 9.8 mg/L. - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 6.	- As above
HMH Main Camp – WWTS01	EF13	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD_5 (<30 mg/L): Non-compliance in 5 out of 6. Q2 mean 107.3 mg/L. - COD (<125 mg/L): Non-compliance in 6 out of 6. Q2 mean 227.2 mg/L. - Ammonia (<10 mg/L): Non-compliance in 6 out of 6. Q2 mean 22.8 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Q1 mean 26.9 mg/L. - Total coliform (<400 MPN/100 mL): Non-compliance in 3 out of 6.	- As above
IHI Camp	EF14	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD_5 (<30 mg/L): Non-compliance in 4 out of 6. Q2 mean 87.4 mg/L. - COD (<125 mg/L): Non-compliance in 5 out of 6. Q2 mean 156.7 mg/L. - Ammonia (<10 mg/L): Non-compliance in 4 out of 6. Q2 mean 12.5 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Q1 mean 18.4 mg/L. - Total coliform (<400 MPN/100 mL): Non-compliance in 2 out of 6.	- As above

Site	ID	WWTS	Key Non-Compliance Issues[10] in Q2-2018	Corrective Actions
Song Da 5 Camp No. 1	EF07	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Non-compliance in 5 out of 6. Q2 mean 23.6 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Q2 mean 26.7 mg/L.	- As above
Song Da 5 Camp No. 2	EF08	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Non-compliance in 6 out of 6. Q1 mean 36.0 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Q1 mean 38.4 mg/L. - BOD_5 (<30 mg/L): Non-compliance in 1 out of 6.	- As above
Kenber Camp	EF16	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mg/L): Non-compliance in 3 out of 6. Q2 mean 8.4 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 3 out of 6. Q2 mean 11.3 mg/L. - TSS (<50 mg/L): Non-compliance in 1 out of 6. Q2 mean 21.8 mg/L	- As above
Lilama10 Camp	EF17	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Total nitrogen (<10 mg/L): Non-compliance in 4 out of 4. Q1 mean 24.4 mg/L. - BOD_5 (<30 mg/L): Non-compliance in 1 out of 4.	- As above

4.6.4 Compliance Monitoring of Discharges from Construction Sites

Discharges from the key construction sites (see ***Figure 4-16***) were monitored during the reported period. The results are presented in ***Table 4-20.*** Results that are above the prescribed standards are highlighted in yellow. The full set of data is in ***Appendix 5.3***.

FIGURE 4-16 LOCATION OF DISCHARGE POINTS OF KEY CONSTRUCTION SITES



Construction site discharge measurement continues to ensure that the discharges from the construction sites are in compliance with the standard for Total Suspended Solids (50 mg/L). 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.

The results of the discharge measurements at the the Aggregate Crushing Plant and the RCC Plant are presented in ***Figure 4-17***.

The compliance status for each of the key construction sites is summarized in ***Table 4-20.*** Proposed corrective actions to improve discharge quality are discussed in ***Table 4-20***.

FIGURE 4-17: TOTAL SUSPENDED SOLIDS IN THE DISCHARGE FROM THE AGGREGATE CRUSHING PLANT

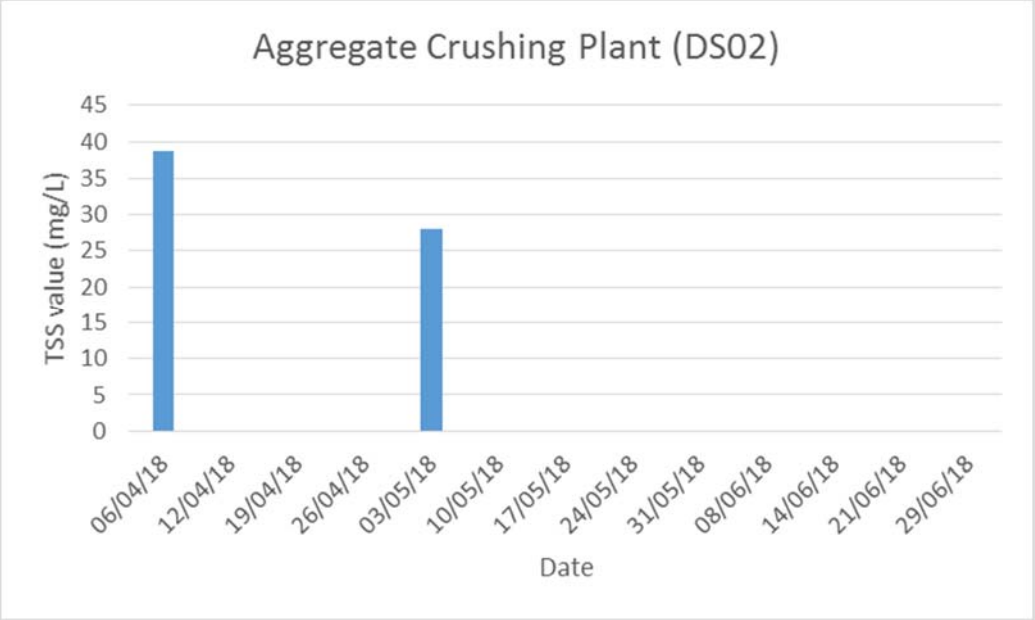


FIGURE 4-18: TOTAL SUSPENDED SOLIDS IN THE DISCHARGE FROM THE RCC BATCHING PLANT

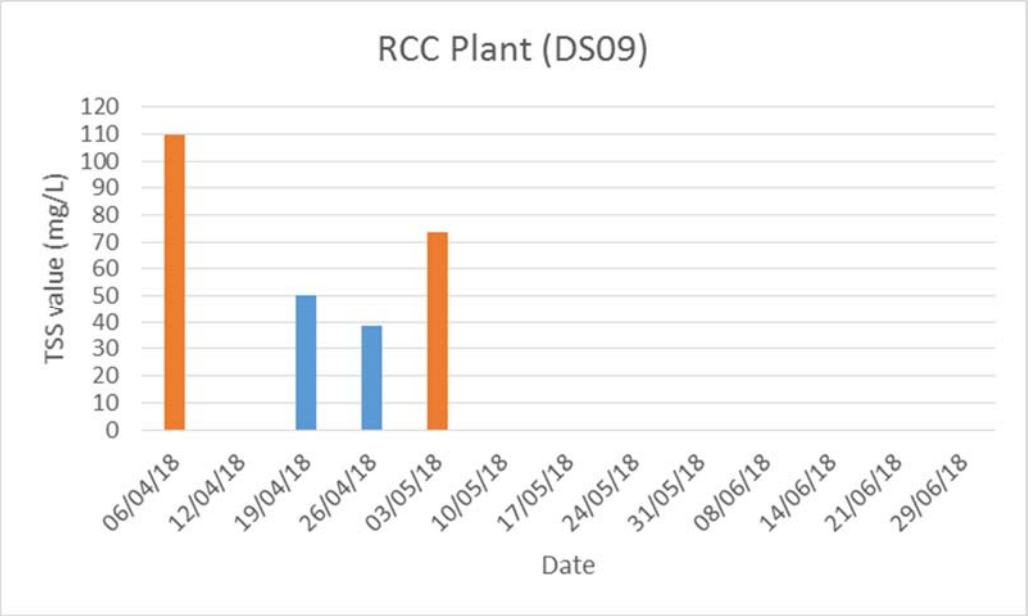


TABLE 4-20 RESULTS OF THE CONSTRUCTION AREA DISCHARGE MONITORING IN Q2 2018

Date	Parameter (Unit)	Site Name (Code)	Aggregate Crushing Plant (DS02)	Spoil Disposal No.2	RCC Plant (DS09)	Main Dam Treatment Plant No.1 (DS11)	Main Dam Treatment Plant No.2 (DS12)	Main Dam Treatment Plant No.3 (DS14)
		Effluent Standard						
6-Apr-18	TSS (mg/l)	<50	38.73	51.68	109.62		44.5	
12-Apr-18	TSS (mg/l)	<50		9.3			24.71	29.8
19-Apr-18	TSS (mg/l)	<50		536.25	50.25		167.65	69.94
26-Apr-18	TSS (mg/l)	<50		26.29	38.49		95.55	6.34
3-May-18	TSS (mg/l)	<50	27.98	72.64	73.53		47.8	
10-May-18	TSS (mg/l)	<50		34.02			24.05	7.41
17-May-18	TSS (mg/l)	<50		40.38				64.48
24-May-18	TSS (mg/l)	<50		24.41				7.58
31-May-18	TSS (mg/l)	<50		23.57				15.9
8-Jun-18	TSS (mg/l)	<50		42.09				97
14-Jun-18	TSS (mg/l)	<50		74.73			Decommissioned	127.37
21-Jun-18	TSS (mg/l)	<50		19.36				34.5
29-Jun-18	TSS (mg/l)	<50		40		Decommissioned		9.51

TABLE 4-21: COMPLIANCE STATUS OF EFFLUENT DISCHARGE AND CORRECTIVE ACTION DURING THE SECOND QUARTER OF 2018

Site	ID	Treatment System	Key Non-Compliance Issues[11] in Q2-2018	Corrective Actions
Aggregate Crushing Plant	DS02	Sediment ponds	- Full compliance.	- No corrective action is required. However, EMO will continue to monitor this site and share the results to contractor for their improvement.
CVC Plant	DS03	Sediment ponds	- No discharge during Q2 2018	
Spoil Disposal No.2	DS04	Sediment pond	- TSS (<50 mg/L): Q2 mean 76.52 mg/L. Non-compliance in 4 out of 13 measurements.	- The contractor was instructed to clean-up the sediment pond more frequently
RCC Plant (at Lower Ponds)	DS09	Sediment ponds	- TSS (<50 mg/L): Q2 mean 67.97 mg/L. Non-compliance in 3 out of 4 measurements.	- The contractor was required to increase the frequency of sediment clean-up to daily clean-up
Main Dam Construction Area (Treatment Plant No.1)	DS11	pH adjustment and chemical flocculation	- No discharge during Q2 2018	
Main Dam Construction Area (Treatment Plant No.2)	DS12	pH adjustment and chemical flocculation	- TSS (<50 mg/L): Q2 mean 67.38 mg/L. Non-compliance in 2 out of 6 measurements.	- The contractor was required to ensure frequent and proper control of the operation by qualified staff
Main Dam Construction Area (Treatment Plant No.3)	DS14	pH adjustment and chemical flocculation	- TSS (<50 mg/L): Q2 mean 42.71 mg/L. Non-compliance in 4 out of 11 measurements.	- As above.

[11] The values in brackets indicate the applicable standard

Site	ID	Treatment System	Key Non-Compliance Issues[11] in Q2-2018	Corrective Actions
			- pH (>6 and <9): Non-compliance in 5 out of 7 measurements. Back in compliance since mid-March 2018.	

4.6.5 Groundwater Quality Monitoring

During the Q2 2018, two boreholes at Somseun, one borehole at Nam Pa, one borehole at Thong Noy and one borehole at Pou villages have been monitored for the following parameters:

a. *Monthly:* pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (^{o}C), Turbidity (NTU), Faecal Coliform (MPN/100 ml) and E. coli (MPN/100 ml);

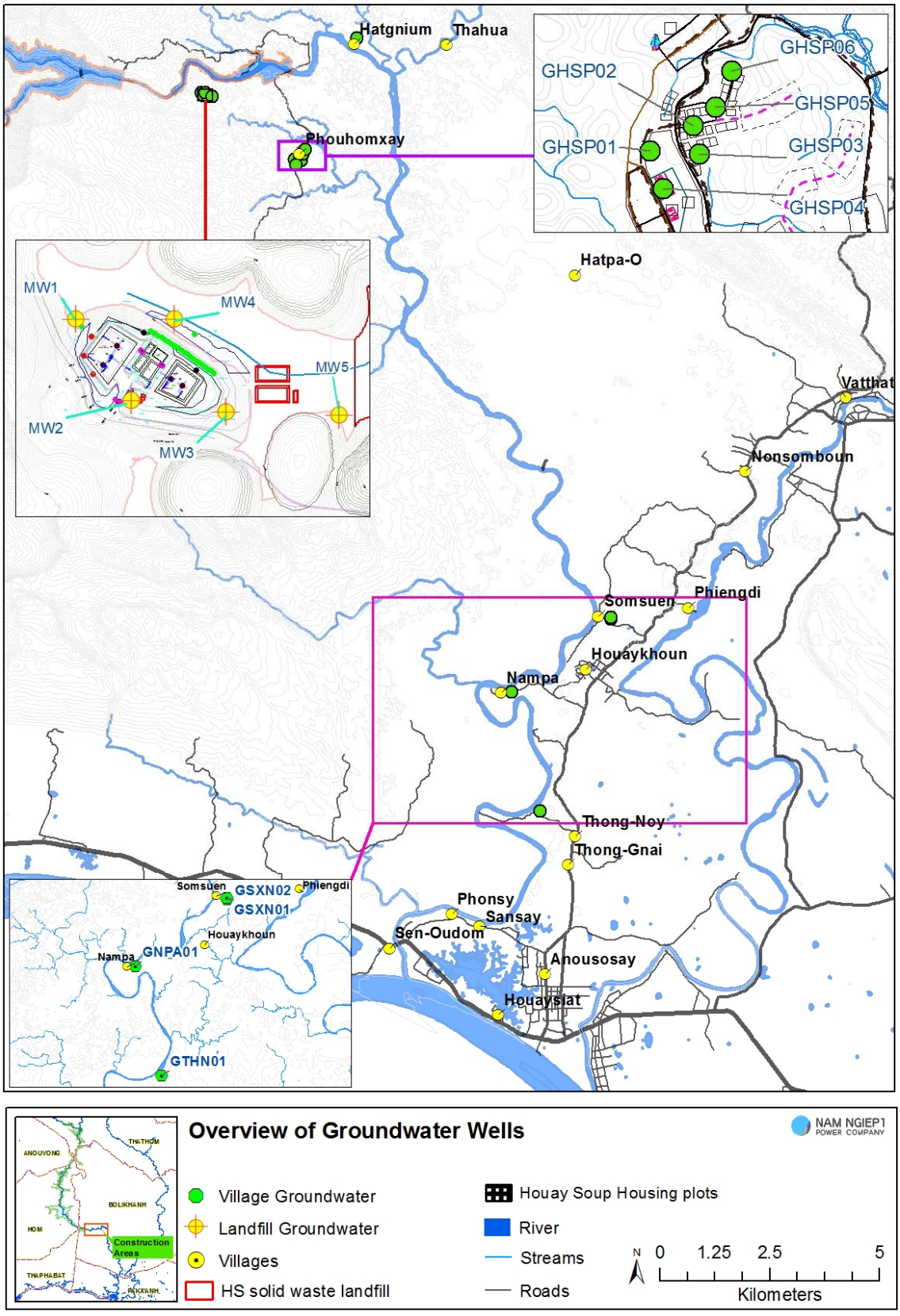
b. *Quarterly:* Arsenic (mg/l), Cadmium (mg/l), Iron (mg/l), Magnesium (mg/l), Manganese (mg/l), Fluoride (mg/l), Nitrate (mg/l), Nitrite (mg/l), Total Hardness (mg/l) Lead (mg/l).

Note that the six boreholes at Phouhomxay Village have been permanently replaced with gravity fed water supply system and have therefore not been monitored.

The groundwater quality in the four monitoring wells located at the NNP1 Project Landfill and the monitoring well at Houay Soup Landfill was monitored.

The groundwater sampling locations are displayed in ***Figure 4-19*** and the groundwater monitoring data is presented in ***Appendix 5.4 and 5.7***

FIGURE 4-19: *GROUNDWATER SAMPLING LOCATIONS*



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

Somsuen and Pou villages: All of monitored parameters complied with the relevant National Standard during the reported period, except a low pH at Pou Village in June 2018.

Nam Pa Village: All monitored parameters complied with the standard except for faecal coliform and *E. coli* bacteria in the June 2018 sample.

Thong Noy Village: All monitored parameters except faecal coliform and *E. coli* bacteria complied with the standard.

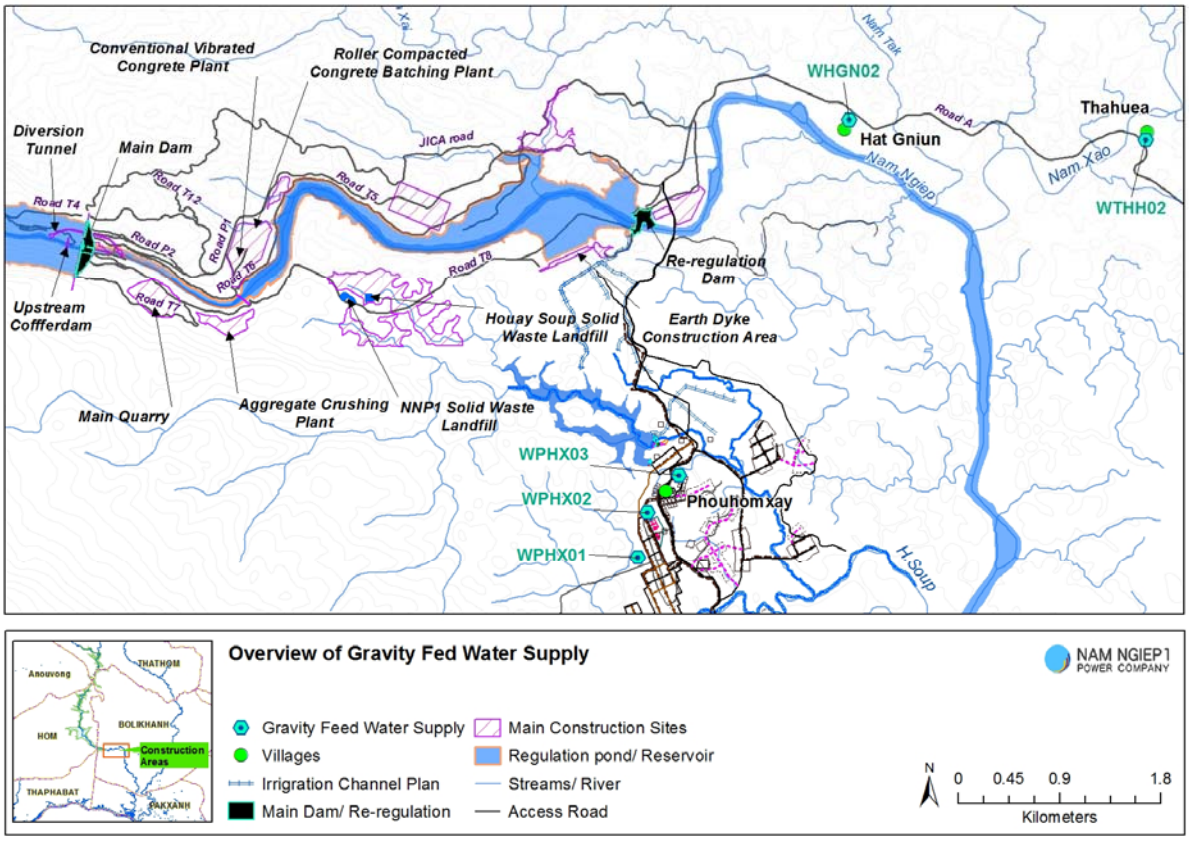
The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be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

NNP1 Landfill and Houay Soup Landfill: All parameters monitored complied with the standard except for lead. 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.

4.6.6 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 (sourced from a local stream) at Phouhomxay Village was commenced in December 2017.

FIGURE 4-20: OVERVIEW OF GRAVITY FED WATER SUPPLY



Water samples were taken from the taps for analysis during the reported period and selected results are shown in ***Table*** 4-22. The full set of data is presented in ***Appendix 5.5***

TABLE 4-22: THE GFWS MONITORING RESULT IN Q2 2018

Date	Parameter (Unit)	Site Name	Tha Heua Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
		National Drinking Water Guideline					
25-Apr-18	E. Coli Bacteria (MPN/100 ml)	0	9.3	79	33	79	33
14-May-18		0	33	240	170	11	13
20-Jun-18		0	240	1,600	39	1,600	1,600
25-Apr-18	Faecal coliform (MPN/100 ml)	0	9.3	79	33	49	33
14-May-18		0	22	27	33	7.8	11
20-Jun-18		0	240	1,600	39	1,600	1,600

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 (WPHX01, WPHX02 & WPHX03): all parameters complied with the National Drinking Water Standards, except the faecal coliform and E.Coli bacteria.

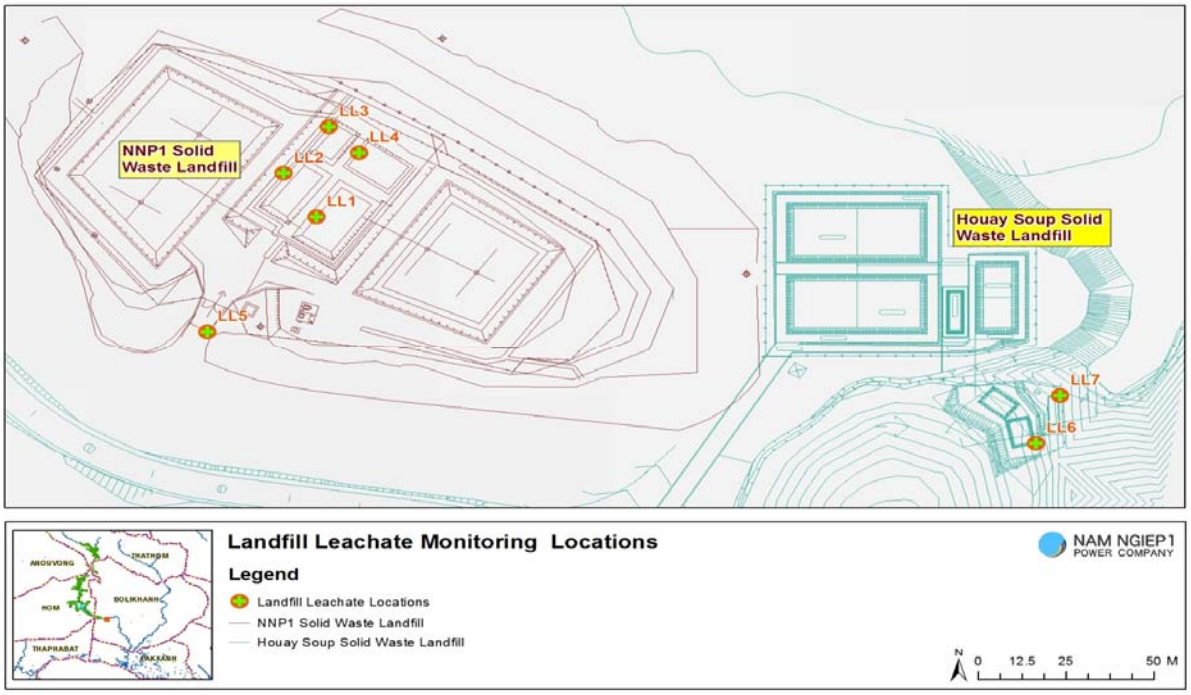
The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be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

The significant increase in bacteria in June 2018 will be further investigated to determine if there is a local source of faecal contamination.

4.6.7 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 4-21***.

FIGURE 4-21: LANDFILL LEACHATE MONITORING LOCATION



The monitoring results for Q2 2018 indicate compliance with the applicable standards for all monitored parameters. The monitoring data can be found in ***Appendix 5.6***

4.6.8 Air Quality (Dust) Monitoring

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 4-22*** and the results are summarized in ***Table 4-23.*** The measured concentrations of PM_{10} in the ambient air generally complied with the standard during the monitored period; however, there were some minor exceedances which are believed to have been caused by slash-and burn activities in the area near to the villages.

FIGURE 4-22: *NOISE AND DUST MONITORING LOCATIONS AT THE CONSTRUCTION SITES AND NEARBY VILLAGES*

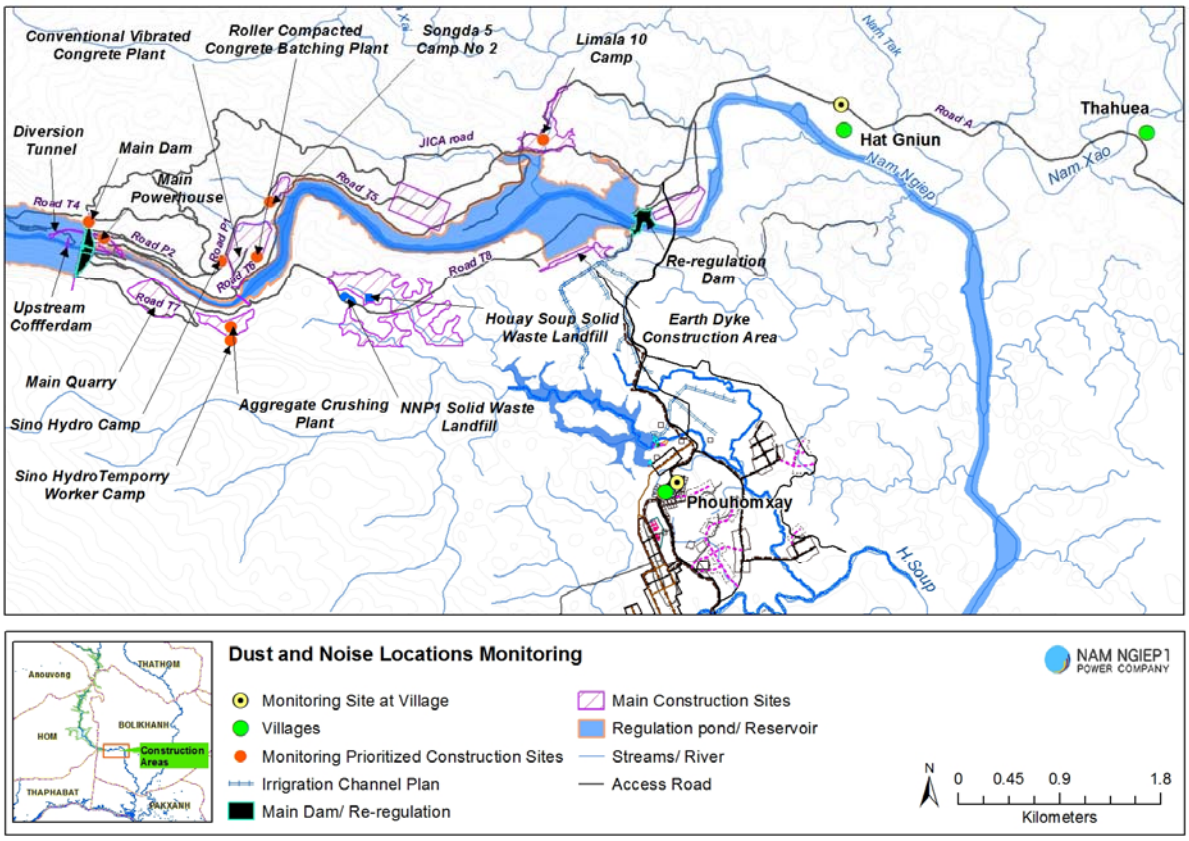


TABLE 4-23: *RESULTS OF AIR QUALITY (DUST) MONITORING AT THE VILLAGES NEAR THE PROJECT CONSTRUCTION SITES DURING APRIL TO JUNE 2018*

Site Name	Hat Gniun Village								
Start Time	02/Apr/18 18:00	03/Apr/18 18:01	04/Apr/18 18:01	21/May/18 18:00	22/May/18 18:01	23/May/18 18:01	04/Jun/18 18:00	05/Jun/18 18:01	05/Jun/18 18:01
End Time	03/Apr/18 18:00	04/Apr/18 18:00	05/Apr/18 18:00	22/May/18 18:00	23/May/18 18:01	05/Apr/18 18:00	05/Jun/18 18:00	06/Jun/18 18:00	05/Jun/18 18:00
Average Data Record - 24 hours	0.14	0.19	0.17	0.03	0.03	0.03	0.023	0.020	0.021
Guideline	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***

Site Name	Phouhomxay								
Start Time	23/Apr/18 18:00	24/Apr/18 18:00	25/Apr/18 18:00	01/May/18 18:00	02/May/18 18:00	03/May/18 18:00	25/Jun/18 18:00	26/Jun/18 18:00	27/Jun/18 18:01
End Time	24/Apr/18 18:00	25/Apr/18 18:00	26/Apr/18 18:00	02/May/18 18:00	03/May/18 18:00	04/May/18 18:00	26/Jun/18 18:00	27/Jun/18 18:01	28/Jun/18 18:00
Average Data Record - 24 hours	0.173	0.099	0.056	0.03	0.04	0.03	0.02	0.02	0.04
Guideline	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***

Project Construction Sites

During Q2 2018, dust (PM_{10}) monitoring was carried out for 24 hours consecutively on a monthly basis at eight priority construction sites and camps to assess possible impact on workers' health. The results summarized in ***Table 4-24*** indicate compliance with the standard (0.12 mg/m^3 PM_{10}) for most of construction sites, except at the Sino Hydro Camp (April 2018)

and the Main Powerhouse (for May and June 2018). All staff were advised to wear dust masks while working in these areas.

TABLE 4-24: DUST MONITORING RESULTS AT THE CONSTRUCTION SITES DURING APRIL TO JUNE 2018

Site Name	**Aggregate Crushing Plant**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	17/Apr/18 18:30	25/May/18 18:01	14/Jun/18 18:01
End Time	18/Apr/18 18:00	26/May/18 18:00	15/Jun/18 18:00
Average Data Record -24h	0.029	0.021	0.020
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**RCC Plant**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	16/Apr/18 18:00	30/May/18 18:00	12/Jun/18 18:00
End Time	17/Apr/18 18:01	31/May/18 18:01	13/Jun/18 18:01
Average Data Record -24h	0.020	0.023	0.016
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**Main Dam**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	20/Apr/18 18:00	28/May/18 18:00	21/Jun/18 18:00
End Time	21/Apr/18 18:01	29/May/18 18:01	22/Jun/18 18:01
Average Data Record -24h	0.094	0.011	0.019
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**Sino Hydro Temporary Worker Camp**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	18/Apr/18 18:30	24/May/18 18:30	20/Jun/18 18:00
End Time	19/Apr/18 18:00	25/May/18 17:30	21/Jun/18 18:00
Average Data Record -24h	0.044	0.026	0.021
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	09/Apr/18 18:00	10/May/18 18:00	13/Jun/18 18:00
End Time	10/Apr/18 18:00	11/May/18 18:00	14/Jun/18 18:00
Average Data Record -24h	0.110	0.035	0.020
Guideline	***0.12***	***0.12***	**0.12**

Site Name	**Lilama 10 Camp**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	06/Apr/18 18:00	09/May/18 18:00	07/Jun/18 18:30
End Time	07/Apr/18 18:00	10/May/18 18:00	08/Jun/18 18:00
Average Data Record -24h	0.035	0.042	0.022

Site Name	Lilama 10 Camp		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	06/Apr/18 18:00	09/May/18 18:00	07/Jun/18 18:30
End Time	07/Apr/18 18:00	10/May/18 18:00	08/Jun/18 18:00
Guideline	***0.12***	***0.12***	**0.12**

Site Name	Main Powerhouse		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	27/Apr/18 18:00	17/May/18 18:00	29/Jun/18 18:00
End Time	28/Apr/18 18:00	18/May/18 18:00	30/Jun/18 18:00
Average Data Record -24h	0.087	0.474	0.248
Guideline	***0.12***	***0.12***	**0.12**

Site Name	Sino Hydro Camp		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	12/Apr/18 18:00	29/May/18 18:30	11/Jun/18 18:00
End Time	13/Apr/18 18:00	30/May/18 18:00	12/Jun/18 18:00
Average Data Record -24h	0.204	0.012	0.014
Guideline	***0.12***	***0.12***	**0.12**

4.6.9 Noise Monitoring

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 4-25***) show that the noise levels at the villages were within the allowable maximum peak value at 115 dB(A), and some of the night-time average noise levels were slightly higher than the standard in Phouhomxay Village.

TABLE 4-25: NOISE MONITORING RESULTS AT THE HOST VILLAGES IN Q2 2018

Hat Gnuin Village -Noise Monitoring 72 consecutive hours - April 2018									
Noise Level (dB)	**02-03/April/18**			**03-04/April/18**			**04-05/April/18**		
	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	58.50	54.20	66.60	59.70	73.40	74.10	50.20	62.00	62.60
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	44.23	37.49	43.38	42.84	42.69	47.67	39.03	38.15	44.33
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Hat Gnuin Village -Noise Monitoring 72 consecutive hours - May 2018									
Noise Level (dB)	21-22/May/18			22-23/May/18			23-24/May/18		
	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	67.70	61.40	64.00	63.10	54.70	88.80	62.40	60.10	78.80
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	45.58	37.78	41.69	45.72	37.71	44.67	44.61	43.41	44.50
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Hat Gnuin Village -Noise Monitoring 72 consecutive hours - June 2018									
Noise Level (dB)	04-05/June/18			05-06/June/18			06-07/June/18		
	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	66.10	64.30	71.00	64.60	68.70	71.20	68.50	52.70	71.70
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	44.09	43.06	46.45	43.68	42.62	45.21	44.07	40.40	48.17
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Phouhomxay Village - Noise Monitoring 72 consecutive hours - April 2018									
Noise Level (dB)	**23-24/April/18**			**24-25/April/18**			**25-26/April/18**		
	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	53.00	73.60	62.40	58.50	75.20	75.60	59.70	67.80	67.80
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	41.77	39.61	40.66	39.73	52.69	40.59	40.34	45.88	43.56
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Phouhomxay Village - Noise Monitoring 72 consecutive hours - May 2018									
Noise Level (dB)	**01-02/May/18**			**02-03/May/18**			**03-04/May/18**		
	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	59.50	53.20	79.60	73.70	60.50	73.00	73.40	74.70	74.70
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	41.23	42.32	45.23	42.38	53.05	40.93	46.51	53.69	47.86
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Phouhomxay Village - Noise Monitoring 72 consecutive hours - June 2018									
Noise Level (dB)	**25-26/June/18**			**26-27/June/18**			**27-28/June/18**		
	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	56.20	74.90	66.60	58.10	77.90	62.80	59.60	59.60	66.30
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	42.80	52.31	45.65	42.67	45.07	41.92	40.80	39.91	40.50
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Project Camps and Construction Sites

During Q2 2018, noise monitoring was conducted at the Aggregate Crushing Plant, RCC Plant, Sino Hydro camp and Song Da 5 camp No.2, Main Dam, Sino Hydro temporary worker camp, Lilama10 camp 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 result shown that all maximum peak noise levels were within the National Standard. However, the average noise level during 22:01-06:00 at Song Da 5 Camp No.2 (April 2018), Lilama10 Camp (April 2018) and Sino Hydro Camp (May 2018) were higher than the National standard. All staff were advised to wear ear mugs while working in these areas.

TABLE 4-26: NOISE MONITORING RESULTS FOR PROJECT CONSTRUCTION SITES IN Q2 2018

Site Name	**Aggregate Crushing Plant - Noise Monitoring (dB (A))**								
Noise Level (dB)	17-18/April/18		18/April/18	25-26/May/18		26/May/18	14-15/June/18		15/June/18
	18:01 - 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	60.1	47	66.1	57.4	56.8	81.1	52.50	52.60	72.60
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	115	115	115
Average Data Recorded	43.30	39.77	40.25	40.26	44.78	44.71	40.47	38.90	43.85
Guideline Averaged	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***

Site Name	**RCC Plant**								
Noise Level (dB)	16-17/April/18		17/April/18	30-31/May/18		31/May/18	12-13/June/18		13/June/18
	18:00 - 22:00	22:01 - 06:00	06:01 - 18:00	18:00 - 22:00	22:01 - 06:00	06:01 - 17:59	18:00 - 22:00	22:01 - 06:00	06:01 - 18:00
Maximum Value Recorded	56.80	84.70	74.90	64.40	60.90	70.60	60.10	73.90	69.10
Guideline Max	115	115	115	115	115	115	115	115	115
Average Data Recorded	49.89	54.20	47.91	50.53	49.62	44.06	42.97	46.75	45.49
Guideline Averaged	70	70	70	70	70	70	70	70	70

Site Name	Main Dam								
Noise Level (dB)	20-21/April/18		21/April/18	28-29/May/18		29/May/18	21-22/June/18		22/June/18
	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 - 22:01	22:01 - 06:01	06:01 - 18:01
Maximum Value Recorded	66.2	65.8	68.7	57.6	77.5	69.6	56	53.8	60.6
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	52.87	52.64	51.70	46.03	49.36	48.94	49.03	47.35	45.37
Guideline Averaged	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***

Site Name	Sino Hydro Temporary Worker Camp								
Noise Level (dB)	18-19/April/18		19/April/18	24-25/May/18		25/May/18	20-21/June/18		21/June/18
	18:00 - 22:01	22:01 - 06:01	06:01 - 18:01	18:00 - 22:02	22:01 - 06:02	06:01- 18:01	18:00 - 22:03	22:01 - 06:00	06:01 -18:01
Maximum Value Recorded	52.4	50.9	74.5	54.6	53	65.2	81.2	71	64
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	46.91	44.53	37.13	47.45	43.77	40.00	49.89	48.89	43.66
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Song Da 5 Camp No.2								
Noise Level (dB)	09-10/April/18		10/April/18	10-11/May/18		11/May/18	13-14/June/18		14/June/18
	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 - 22:01	22:01 - 06:01	06:01 - 18:01
Maximum Value Recorded	77.90	64.00	66.30	54.00	52.60	67.10	60.70	52.20	59.70
Guideline Max	115	115	115	115	115	115	115	115	115
Average Data Recorded	56.20	54.64	49.24	50.87	46.43	44.66	43.96	43.08	40.51
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Lilama 10 Camp								
Noise Level (dB)	06-07/April/18		07/April/18	07-08/June/18		08/June/18	06-07/April/18		07/April/18
	18:00 - 22:01	22:01 - 06:01	06:01 -17:31	18:00 - 22:02	22:01 - 06:02	06:01 -18:00	18:00 - 22:03	22:01 - 06:03	06:01 -18:01
Maximum Value Recorded	69.4	63.8	92.5	54.6	64.6	66.7	69.4	63.8	92.5
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	55.41	58.89	42.43	42.29	42.72	45.14	55.41	58.89	42.43
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Main Powerhouse								
Noise Level (dB)	27-28/April/18		28/April/18	17-18/May/18		18/May/18	29-30/June/18		30/June/18
	18:00 - 22:01	22:01 - 06:01	06:01 -17:59	18:00 - 22:02	22:01 - 06:02	06:01 - 18:00	18:00 - 22:03	22:01 - 06:03	06:01 -18:01
Maximum Value Recorded	83.9	59.7	91.1	85.4	89.0	92.6	78.6	62.8	79.5
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	64.55	53.31	62.61	58.22	57.25	56.28	55.07	46.83	64.45
Guideline Averaged	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***

Site Name	Sino Hydro Camp								
Noise Level (dB)	12-13/April/18		13/April/18	29-30/May/18		30/May/18	11-12/June/18		12/June/18
	18:00 - 22:01	22:01 - 06:01	06:01 -17:31	18:00 - 22:02	22:01 - 06:02	06:01 - 18:00	18:00 - 22:03	22:01 - 06:03	06:01 -18:01
Maximum Value Recorded	63.2	64.2	69.6	61.4	66.3	69	69.6	72.8	67.9
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	46.47	48.62	46.62	43.91	46.19	45.01	44.90	52.96	42.63
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

4.6.10 Vibration

The construction work during Q2 2018 is unlikely to generate vibrations that would impact the human health and surrounded environment. Quarry operations were completed in March 2018 and the final blasting was carried out on 27 March 2018. Therefore, no blasting occurred during this this quarter.

5 WATERSHED AND BIODIVERSITY MANAGEMENT

5.1 WATERSHED MANAGEMENT

5.1.1 Preparation of Watershed Management Plan

NNP1 Watershed and Reservoir Protection Office (WRPO) in coordination with NNP1PC and relevant GOL offices improved the NNP1 Watershed Management Plan based on the workshop at the end of May 2018. The focus of the improvements included institutional arrangements, achievement indicators, budget, monitoring framework, and refining the Lao translation. The improved plan was ready at the end of June 2018 for submission and review by ADB. The final review and signing of the plan is expected in August 2018.

The preparation of the annual implementation plan for NNP1 watershed management for the period of 2018 – 2019 will - as agreed on the workshop at the end of May 2018 - have to wait until the new structure of the WRPOs is established. However, it was also agreed that pre-WMP activities, particularly for operation of check points within Xaysomboun and Bolikhamxay Province during impounding should continue as planned until the plan is approved.

NNP1PC in collaboration with the WRPOs have established three checkpoints. The checkpoints started operations in May and June 2018. The first check point is located at Ban Houaxay (lower reservoir area), Hom District, Xaysomboun Province, the second check point is located at Ban Pou (upper reservoir area), Tathom District, Xayomboun Province, and the third check point is located at Ban Nahan (eastern part of reservoir), Bolikhan District, Bolikhamxay Province. The primary objectives of check point operation could be summarized as follow:

1) To ensure the safety of people living in and adjacent to main reservoir particularly the upstream and downstream communities who may access into the reservoir during the impounding;
2) To control extraction of wildlife and biodiversity from the areas especially within and surrounding the identified Totally Protected Zones (TPZs) within the NNP1 Watershed;
3) To monitor the use of roads built for salvage logging activities in the areas;

4) To monitor and control access to the reservoir and immediately stopping activities that may cause adverse impacts on biodiversity or otherwise pose a threat to habitats, water resources or water quality.

The key findings from the checkpoint operations including monitoring within the nearby areas include:

1) People are still accessing the reservoir and NNP1 watershed area for fishing, livestock raising/grazing, and agriculture plantation/harvesting despite the safety concerns related to reservoir impounding.
2) Fishing are mostly done by villagers from villages in Hom District and nearby.
3) The logging contractors that were contracted by the Government for salvage logging in November 2017 continue to move the cut logs out of the lower reservoir area. The Contractor piles the log in the new log yard at Vangkhiaw's area, Houayxay Village. The Contractor planned to remove the remaining logs during/after impounding.

Further discussions between NNP1PC and Xaysomboun Provincial Governor at the end of June 2018 concluded that the current checkpoints will only able to effectively stop people accessing NNP1 watershed area once the TPZs area are legally proclaimed. The future enforcement should be based on this legal status and managed by GOL. The GOL and NNP1PC are progressing on the issuance of the legal status of NNP1 watershed and its TPZs.

5.1.2 Preparation of Provincial Regulation for the Watershed Management

The final draft regulation has been re-submitted to the Department of Justice. Xaysomboun PONRE will present the regulations at the Provincial Assembly Meeting which is scheduled in the middle of July 2018.

As a temporary measure, the Head of Xaysomboun Provincial Governor's Office has issued a notification on 19 June 2018 to prohibit access into the reservoir. The notification letter was distributed to three districts and some villages within NNP1 watershed on 22 June 2018. At the same date, a similar notification to prohibiting access to the reservoir was also issued by Bolikhamxay Provincial Governor.

5.2 BIODIVERSITY OFFSET MANAGEMENT

5.2.1 Preparation of Biodiversity Offset Management Plan

The initial first draft of the NNP1 Biodiversity Offset Management Plan for NCNX was submitted to NNP1PC on 29 June 2018 for internal review. The draft plan will be submitted to ADB for further review, translated to Lao language, and internally discussed with BOMC in Q3 2018.

5.2.2 Preparation of Provincial Regulations for Biodiversity Offset Management in NCNX

The draft provincial regulations for biodiversity offset management in Nam Chouan-Nam Xang was discussed at a provincial technical workshop on 12 June 2018 and consulted at six NCNX villages from 18 to 20 June 2018. The key comments and conclusions from the district and village level consultations include:

1. The Secretariat of Provincial Regulation Development Committee should continue to improve the draft regulations based on comments from the stakeholders and the committee should keep the content short, practical, and consistent with the law for

legislations development, focus on rearranging the chapters, articles, and contents as well as clearly define the scope for the enforcement.

2. Most of the participants in the six consulted villages agreed on content of the regulations and requested clarification on the tools which are allowed or prohibited for hunting.
3. There is existing land use and expectation of further expansion of land use within the proposed TPZ. Villagers proposed that TPZ boundary to be further away from the land use and its expansion particularly for Na Gnang Village. This issue will be further investigated and dealt with through participatory land use mapping.
4. Land zoning should be started together with villagers as soon as possible. In case of Sopkhone Village, villagers are now accessing the area of Chamhang River for the purpose of fishing and some area along this river is being prepared for rice plantation.
5. Livelihood development activities are strongly required and should be one of the prioritized activities of the Biodiversity Offset Management Plan.
6. Approval for customary use activities such as collecting honey inside the proposed TPZ in Vangphieng Village should be further discussed and considered.
7. The TOR for the implementation unit should be described in the first section in details to make it clear on roles and responsibilities to deal with violator especially the Government employee.

Following the consultations, the Provincial Regulation Development Committee has further improved the draft regulations elaborating the comments from village level consultations, and the committee has submitted the regulations to the Provincial Justice Department for further reviews and feedback at the end of June 2018. Further comments from the Provincial Justice Department and improvements are expected in August 2018. Submission to Provincial Assembly with further comments, improvement, and final approval are expected to be sometime during September / October 2018.

5.2.3 Implementation of pre-Biodiversity Offset Management Plan

NNP1PC has disbursed funds on 16 March 2018 for the implementation of the second pre-BOMP. Patrolling activities have continued throughout Q2 2018. Two patroling teams with a total of 18 people conducted forest patrolling for 16 days per month per team. The patroling covered nine key areas wihtin the NCNX offset site: Nam San, Nam Sangar, Nam Houng, Nam Sik in Viengthong zone and Nam Hung, Kayi, Nam Luck, Nam Chan Thuy and Nam Chamhung in Xaychamphone zone. The main threats found in the areas are hunting camps and upland crop plantations. The detailed information are being recorded into the SMART database and will be presented to BOMC Secretariat early next month.

It was recommended by IAP and ADB mission in May 2018 that the pre-BOMP activities need to be continued until the BOMP is ready. The implementation period was advised to be for another six months from September 2018 to February 2019. ADB provided feedback on 16 June 2018 on the second half of pre-BOMP2 proposal for further clarification. The proposal is expected to be re-submitted for ADB approval in July 2018.

6 BIOMASS CLEARANCE

As of 30 April 2018, the biomass clearance work was completed. A total of 1,640.75 ha is accepted as fully cleared and the completion work was inspected and accepted by

Department of Natural Resources and Environmental Monitoring (DNREM) of the Ministry of Natural Resource and Environment (MONRE) after a join inspection was conducted with NNP1PC in April 2018. DNREM will submit an approval (a certificate) letter to the Department of Energy Business (DEB) of the Ministry of Energy and Mince (MEM) for issuance of certificate for main reservoir impoundment.

TABLE 6-1: BIOMASS CLEARANCE PROGRESS IN EACH PRIORITY AREA AS OF 30 APRIL 2018

Target Area		Progress as of 30 April 2018	
Block	**Total area to be cleared (Ha)**	**Total area in progress (Ha)**	**100% completed within the total area in progress (Ha)**
B1	109.24	109.24	109.24
B2	158.63	158.63	158.63
B3	80.35	80.35	80.35
B4	163.74	163.74	163.74
B5	340.14	340.14	340.14
B6	31.92	31.92	31.92
B7	39.65	39.65	39.65
B8	37.61	37.61	37.61
B9	52.75	52.75	52.75
B10	269.10	269.10	269.10
B11	89.98	89.98	89.98
B12	64.11	64.11	64.11
B13	101.24	101.24	101.24
B14	43.33	43.33	43.33
B15	43.73	43.73	43.73
B16	3.32	3.32	3.32
B17	7.96	7.96	7.96
B18	3.95	3.95	3.95
Total	**1,640.75**	**1,640.75**	**1,640.75**

A contractor is being procured by NNP1PC for the removal of floating debris in the Nam Ngiep 1 main reservoir. The technical evaluation was concluded on 30 May 2018 and the financial evaluation was concluded on 14 June 2018. NNP1PC is currently undertaking contract negotiations with the prospective winner and the contractor is expected to be on board sometimes in July/August 2018.

7 FISHERY MONITORING

The 5 species that dominated the fish catch by weight in Q2 2018 are listed in ***Table 7-1.*** This includes three species and 1 species group that are classified as Least Concern (LC) according

to the IUCN Red List of Threatened Species[12] and two species groups that are classified as Data Deficient (DD) and Not Evaluated (NE).

TABLE 7-1 FISH SPECIES DOMINATING THE FISH CATCH IN Q2 2018

Species	Fish Catch in Q2 2018 (kg)	IUCN Red List Classification
Poropuntius normani, Poropuntius laoensis	234.9	LC
Pseudomystus siamensis	219.6	LC
Sikukia gudgeri, Amblyrhynchichthys micracanthus	201.8	DD, LC
Scaphiodonichthys acanthopterus	183.3	LC
Clarias batrachus	163.7	LC

The recorded catch of threatened species (IUCN Red List classification) in the Q2 2018 fish catch is presented in ***Table 7-2***. The list includes one Endangered species (EN), five Vulnerable species (VU) and seven Near Threatened species (NT).

TABLE 7-2 THREATENED AND NEAR THREATENED SPECIES OF THE Q2 2018 FISH CATCH

Species	Fish Catch in Q2 2018 (kg)	IUCN Red List Classification
Onychostoma gerlachi	42.2	NT
Scaphognathops bandanensis	27.4	VU
Bagarius bagarius	25.6	NT
Bangana behri	14.6	VU
Probarbus jullieni	13	EN
Neolissochilus stracheyi	11.3	NT
Cirrhinus cirrhosus	8.8	VU (Introduced in Laos)
Mekongina erythrospila	6.1	NT
Wallago attu	2.8	NT
Ompok bimaculatus	2.5	NT

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

Species	Fish Catch in Q2 2018 (kg)	IUCN Red List Classification
Cyprinus carpio	2	VU
Cirrhinus molitorella	2	NT
Epalzeorhynchos munense	0.2	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
Bagarius bagarius (NT)			+	+	+	+	+	+	+	+	+	+
Bagarius yarrelli (NT)	+			+					+			
Bangana behri (VU)	+	+	+	+	+	+	+	+	+			+
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 June 2018 for the downstream, upstream 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 2015-2018

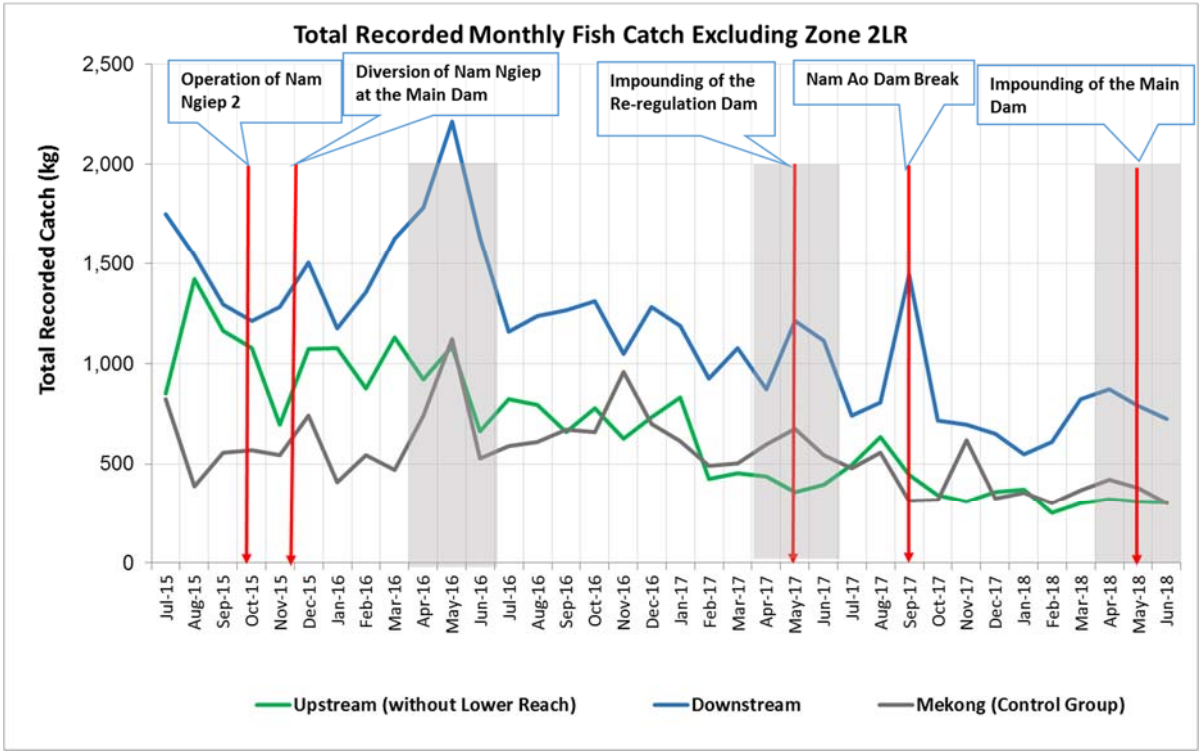
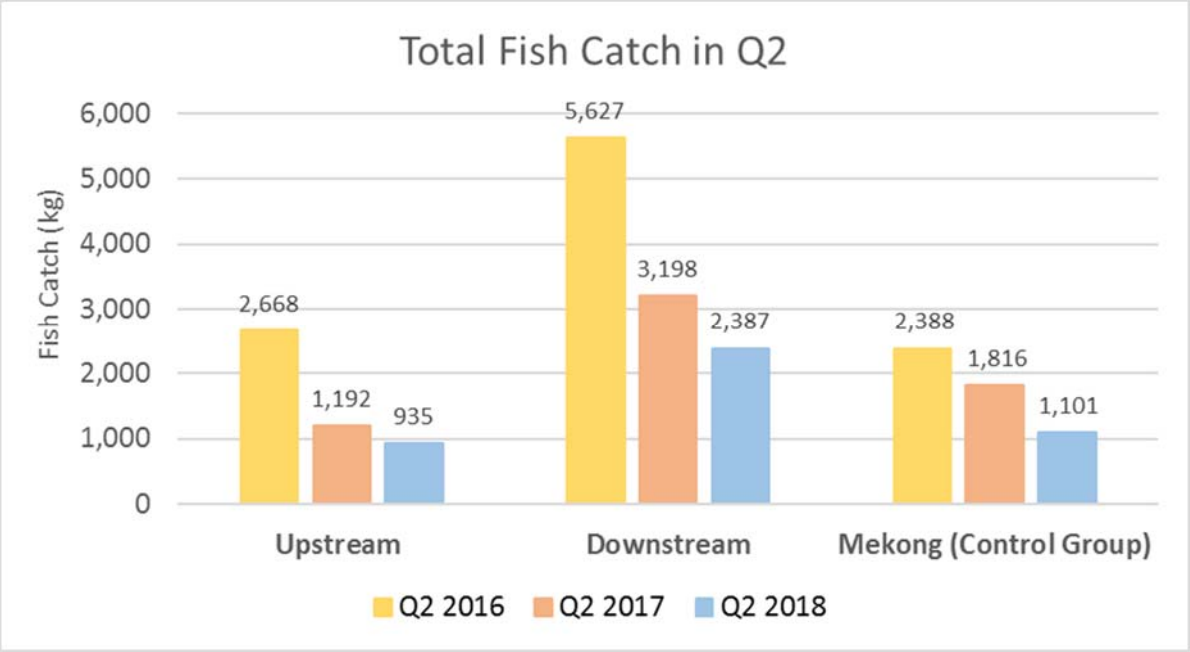


Table 7-4 and ***Figure 7-2*** show the total recorded fish catch for Q2 2016, Q2 2017 and Q2 2018 by the upstream (excluding Zone 2LR), downstream and the Mekong control group fishing households. Both the monthly data ***Figure 7-1*** and the quarterly data in ***Figure 7-2*** indicate a declining trend in the total amount of fish caught both upstream and downstream the project.

TABLE 7-4 TOTAL RECORDED FISH CATCH IN Q1 BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND BY THE MEKONG CONTROL GROUP FISHING HOUSEHOLDS

	Q2 2016 (kg)	Q2 2017 (kg)	Q2 2018 (kg)
Upstream	2,668	1,192	935
Downstream	5,627	3,198	2,387
Mekong Control Group	2,388	1,816	1,101

FIGURE 7-2 TOTAL RECORDED FISH CATCH IN Q2 BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS

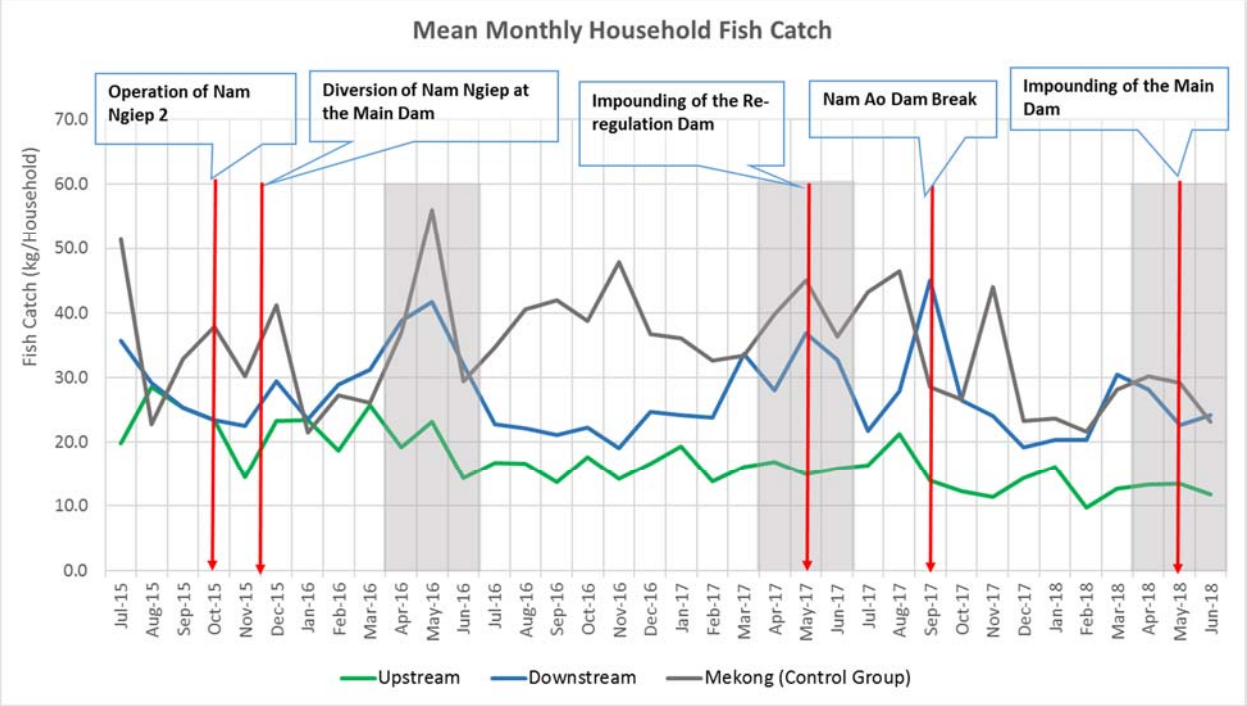


However, when also considering the number of fishing households involved in the monitoring programme and the number of fishing days, the picture is somewhat different. This is presented in ***Table 7-5*** where the mean household fish catch per fishing day for Q2 2016, Q2 2017 and Q2 2018 in the upstream (excluding Zone 2LR), downstream and the Mekong Control Group are displayed, and in ***Figure 7-3***, which shows the mean monthly household fish catch per fishing day from July 2015 to June 2018.

TABLE 7-5 MEAN HOUSEHOLD FISH CATCH PER FISHING DAY IN Q2 2016, Q2 2017 AND Q2 2018

Fishing Zone	Q2 2016	Q2 2017	Q2 2018
Upstream (Excluding Zone 2LR)	2.66	2.32	2.53
Downstream	4.24	3.41	2.98
Mekong (Control Group)	3.62	3.28	2.58

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 Q2

Fishing Zone	F-Statistic	*P*-value	F-Critical	Significance
Upstream	1.427	0.24	3.000	Not Significant
Downstream	37.411	$1.11*10^{-16}$	2.998	Highly Significant
Mekong Control Group	20.103	$2.37*10^{-9}$	3.001	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*** therefore support that for the upstream fishing zone it cannot be rejected that for each fishing zone the true means are equal, but for the downstream and the Mekong Control Group the results indicate that for each of these fishing zones at least one of the means (Q2 2016, Q2 2017, Q2 1018) is very different from the other means.

Both the number of fishing households involved in the programme and the number of fishing days have decreased over the period; and therefore, based on a rough initial interpretation the fish-catch-per-fishing-day data appears rather constant.

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.

8 EXTERNAL MONITORING

8.1 INDEPENDENT ADVISORY PANEL

The Independent Advisory Panel (IAP) carried out their 11th mission to NNP1 from 20-27 May 2018.

With respect to environmental issues, the IAP noted progress in several areas during the site visit:

- The recommendations of the IAP continue to be implemented effectively.
- Overall, the management team is providing strong leadership for implementation of environment and social activities.
- The sediment control systems for quarry, aggregate crushing, and RCC plants continue to be operated with diligence meeting the Lao discharge standards for Total Suspended Solids.
- The biodiversity Impact Mitigation and Offset Management Framework has been updated and was accepted by ADB in March 2018.
- There has been significant progress at the NCNX offset site under the pre-BOMP activities and additional surveys of forest types and trapping activities.
- The draft NNP1 Watershed Management Plan has been updated to include the biodiversity activities proposed for the watershed, focusing primarily on patrolling.
- Biodiversity mitigation activities in the watershed with a specific focus on some key species are now covered in the NNP1 Watershed Management Plan.

The IAP expressed concern about the following environmental challenges that NNP1PC is facing:

- The IAP expressed its serious concern regarding the urgent need for the Government of Lao PDR to provide leadership in coordinating development and investments in the Nam Ngiep basin.
- Since the last IAP visit in November 2017, deadlines on watershed management and biodiversity issues have slipped again. Approval of the NNP1 Watershed Management Plan and preparation of the Biodiversity Offset Management Plan are still delayed.
- It is imperative that work is completed as soon as possible on the Reservoir Management Plan given that impounding of the reservoir began in May 2018 and will be almost completed by August 2018.
- Success in maintaining biodiversity in the watershed will depend on effective protection and strong political commitment and support from the provincial government.

The IAP report and NNP1PC's response are published on NNP1PC's website: https://namngiep1.com/resources/external-monitoring-reports/

8.2 GOL ENVIRONMENTAL MANAGEMENT UNIT

The Environmental Management Unit (EMU) of Bolikhamxay Province carried out an environmental inspection of the construction works on 03 May 2018 and noted the following main findings:

1. Improper waste cover at Houay Soup Landfill causing exposure of solid waste;
2. Improper storage of oil drums at LILAMA 10 Camp;
3. Excavated soil materials were disposed at the quarry, but a site closure plan has not been presented and agreed with the Government.

Subsequently, NNP1PC has implemented the following corrective actions:

1. Instructed the waste management contractor ensure proper soil cover of disposed waste;
2. Issued instruction to the contractor to ensure proper storage of hazardous materials at the LILAMA10 Camp.
3. Preparation of a Construction Site Decommissioning and Rehabilitation Plan

On 28-31 May 2018, the Environmental Management Unit of Xaysomboun Province carried out their second quarterly site visit to Zone 2LR and Zone 2UR. The mission acknowledged the following completed works:

- 100% completion of biomass clearance;
- 100% completion of waste clean-up in the four villages of Zone 2LR; and
- 100% completion of waste clean-up of seven relocated households at Zone 2UR.

APPENDICES

APPENDIX 1: STATUS OF SS-ESMMPS AND WORKING DRAWINGS OF THE CAMPS' WASTE WATER TREATMENT SYSTEMS REVIEW AND APPROVAL DURING Q2 2018

No	Site name	List of ESMMP and SS-ESMMP	Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status
1	Earth Dyke (Saddle Dam)	SS-ESMMP for Closing Dike's Borrow Pit No:.7 (Reply owner's comments)	PKCC	Pending detail discussion on the scope of re-vegetation and rehabilitation.	Dike construction /embankment	Completed
2	Re-regulating Dam	SS-ESMMP for Closing borrow pits at the corner of road P1, P1A.	Songda5	Pending detail discussion on the scope of re-vegetation and rehabilitation.	Re-regulation power station embankment	Completed
3	Main Quarry	SS-ESMMP for Quarry site management	Sino Hydro	Pending detail discussion on the scope of re-vegetation and rehabilitation.	Aggregate production for Dam RCC and CVC works	Completed
4	TCM Camp	Site Decommissioning and rehabilitation 2nd submission	TCM	Under review	Camp facility decommissioning	On-going
5	Main Dam Reservoir	SS-ESMMP for main Dam impounding monitoring plan	PKCC	Return with comment on 11 May 2018	Reservoir impounding monitoring	On-going

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q2-2018

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_OC-0232	30.08.2016	Re-regulation Dam Borrow Pit (Borrow Pit Area at Corner of P1 & P1A Road)	The borrow pit was operated without adequate environmental management actions: - The slope of the cut had no berm and cut-off drains; - Lack of closure plan for the borrow pit.	A Response to Owner's comment was on 03 March 2018 is under review, it is expected to be cleared in July 2018.	27.09.2016	15.02.2018	Pending
ON_INFRA-0001	07.09.2017	Temporary Accommodation for 44 HH from 2LR at HSRA	The decommissioning of a temporary accommodation for resettlement households from 2LR was in complete. The bamboo building structure, toilet septic tanks and waste water ponds were not removed and sanitised.	Decommissioning and clean-up work is ongoing and expected to be completed by early April 2018.	19.09.2017	10.04.2018	Resolved
ONC_OC-0272	13.02.2018	Main quarry site	Waste rock had been pushed down the slope towards Nam Ngiep. The operation has damaged riparian vegetation.	The loose rocks were removed and no more quarry blasting since the end of March 2018. Pending detail discussion on the scope of re-	27.02.2018	26.06.2018	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				vegetation and rehabilitation.			
ONC_KCP-0004	20.02.2018	KCP camp	No waste bins were provided at the camp site for daily waste collection resulting in scattering of garbage, burning of plastic waste was also observed.	- Provide sufficient waste bins on site for daily waste collection; - Regularly remove / transport general waste to Houay Soup Landfill, and construction waste to spoil disposal No: 6 - Stop burning of plastic and non-segregate waste.	06.03.2018	10.04.2018	Resolved
NCR_OC-0022	06.03.2018	Main dam and powerhouse	Improper operation and maintenance of electricity generators and air compressors at the main dam left and right banks causing oil spillage and soil contamination (NCR_OC-0022)	- Repair / fix the sources of oil spillage; - Refuelling of the electricity generator and air compressor shall be undertaken with appropriate protection measures to prevent oil spillage; - Provide spill clean-up materials such as absorbent pads and	20.03.2018	29.05.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				dry sand on site if spills or leaks occur, undertake immediate the clean-up; - Clean-up of any disposed oil contaminated soil for proper elimination by authorized vendor (Khounmixay factory).			
ONC_OC-0274	06.03.2018	Top main dam right bank and left bank	No mobile toilet provided for an approximate of 50 workers of Songda5 and Kenber contractors.	- The Kenber contractor agreed to arrange the mobile toilet for its workers within one week by 20 March 2017; - Obayashi Cooperation was required to instruct Song Da 5 contractors to provide the mobile toilet for their workers by 10 April 2018.	20.03.2018	15.05.2018	Resolved
ONC_OC-0275	06.03.2018	Sino Hydro workers' camp	Poor hygienic cooking / washing areas; a total of 50 workers are staying in the camp, but only	- Provide daily cleaning at cooking and washing	20.03.2018	15.05.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			two toilet rooms are usable, other seven toilet rooms were clogged without maintenance.	areas to keep the location tidy in orderly; - Repair the clogged toilet rooms, wall and door for proper use. In addition, water sink, bowl and water tap need to be provided in each toilet room.			
ONC_HM-0014	27.03.2018	HM Hyro's labor camp N#1 (ZHEFU camp)	Wastewater was discharged into outside environment without proper treatment, a chlorination container was not properly maintained and currently is out of services.	The following action was raised to the contractor to take corrective action by 05 April 2018: - It is noted that the Wastewater Treatment Plant is operated as a "Sequencing Batch Reactor process (SBR) which the effluent does not continuously flow, this would not be suitable for a manual chlorine injection. Therefore, the contractor is required to prepare and submit a	05.04.2018	29.05.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				chlorination manual for Owner's review and approval; - Chlorine container has to be installed in a secure stand with proper roof to prevent sun light, heat and evaporation.			
ONC_IHI-0009	27.03.2018	IHI's labor camp (276 camp)	The WWTS design proposed in the DWP & SS-ESMMP ref no.: 0-0065 submitted on 23 January 2018 has not been put into construction. Instead, the chlorine contact tank and monitoring tank were set up and no chlorination was performed.	The following action was raised to the contractor to take corrective action by 05 April 2018: - The contractor is required to clarify the reason why the actual construction of the Waste Water Treatment System is not consistent with the proposed design which was approved by NNP1PC; - EMO will conduct the effluent monitoring at this site around the beginning of April 2018.	05.04.2018	29.05.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				Renovation/improvement work will be required in case of noncompliance with effluent standards.			
NCR_OC-0023	25.04.2018	Main Dam	EMO has following up the corrective action as per pending NCR1 (Document ref no: ref; NNP1-ESD-EMO-NCR-OC-0022) since it was issued under the letter ref No: NNP1/0173-018/OBA/EPC-CE, dated 13 March 2018). During the last monthly progress meeting held on 6 April 2018, OC informed NNP1PC that the corrective action would be taken and completed by 13 April 2018 and a response to NCR1 would be submitted accordingly. To date, the mentioned NCR1 was 12 days overdue since previous monthly progress meeting between NNP1PC and OC, and there was no implementation of promised corrective action and no	The related contractors are required to take the following actions by 28 April 2018 and the response to this NCR level 2 by 30 April 2018: 1. Repair / fix the sources of oil spillage; 2. Refuelling of the electricity generator and air compressor shall be undertaken with appropriate protection measures to prevent oil spillage or contamination; 3. Provide spill clean-up materials such as absorbent pads and dry sand on site If spills or leaks occur, undertake immediate clean up; 4. Clean up any the	28.04.2018	03.05.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			submission of the response. EMO's inspection and follow-up on 23 April 2018 observed the following: - The contractor did not take suggested corrective actions to prevent oil spillage from air compressors and electricity generators located at three locations (Road T2, T11 and top main dam right bank), it is resulted a continuation of oil spillage on the ground without proper control measures; - About 20 – 30 Kg of oil contaminated soil, contained in 8 bags, were stored on the bare ground at Road T11. EMO's inspection on 24 April 2018 observed that oil spillage from air compressor entered into the Nam Ngiep river upstream of the Main Dam. The investigation concluded that this recklessness practice was due to lack of supervision and proper induction.	disposed oil contaminated soil for proper elimination by authorized vendor (Khounmixay factory). 5. Provide induction/training on the management of machinery, hazardous material and waste management including spill response procedures on regular basis. Note: for oil film in Nam Ngiep River at the Main Dam upstream, EMO has already contacted OC for an immediate clean-up on 24 April 2018.			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_OC-0276	03.05.2018	V&K Camp	There was an evidence of black water leaking from the under-ground septic tank to an adjacent open ditch that ended up in Namngiep River. It has a potential risk of non-compliance effluent camp discharge.	Empty the septic tank and repair the source of leaking to ensure no further leakage of black water; - Pump and dispose black water by following SOP on sewage/black water disposal (Note: The volume of sewage and sewage disposal process (photos) shall be recorded and send to EMO for record and acknowledgement.	11.05.2018	15.05.2018	Resolved
ONC_OC-0277	03.05.2018	Sino Hydro Workshop	A 20 litres capacity drum has been using as a spills response kit to collect hydraulic oil dripping from a backhoe without a proper handling and management. As a result, this opened oil drum was full and led to an overflowing of hydraulic oil into the ground.	Fix leakage point to stop further oil dripping; - Clean up contaminated soil and store in designated hazardous waste storage area for proper incineration at Khounmysay Steel Factory; - Use metal tray with larger quantity if some small oil dripping still occur.	08.05.2018	15.05.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_HM-0015	15.05.2018	HM Hydro Worker Camp N#2	A food waste trap/ oil trap at the canteen were damaged without maintenance. As a result, food waste was flushed and accumulated in the wetland pond. - Wastewater was discharging from the wetland pond without chlorination.	1. Repair/ replace the food waste trap/oil trap; 2. Clean up food waste regularly, collect into plastic bag and dispose in NNP1 Landfill; 3. Treat effluent from the wetland pond with chlorine (Immediately).	18.05.2018	26.06.2018	Partly resolved but some corrective actions still pending
ONC_HM-0016	15.05.2018	HM Hydro Worker Camp N#2	There was an evidence of burning of general waste and construction waste at camp site.	Segregate general waste from wooden waste, general waste needs to be disposed at NNP1 landfill, wooden and other construction wastes need to be disposed at designated spoil disposal No. 6. Note: No more burning of any waste at the camp site due to poor management and supervision. Future burning of any waste observed at site will lead to and issuance of NCR level 2.	15.05.2018	29.05.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_OC-0278	29.05.2018	Spoil Disposal N#6	There was an evidence of uncontrolled dumping of construction waste at spoil disposal no. 6. A mixture of some general, hazardous and construction waste was also observed while all parties are well aware of project's waste management policy and waste segregation hierarchy as well as an availability of NNP1 Landfill. - Furthermore, a mutual agreement has been made that construction waste must be well segregated and properly covered, but there were no such management practices.	1 Segregate the disposed waste manually; 2 Sourced vendor for selling segregation waste (recycle waste/cement bags, others). 3 The residual of segregated waste shall be disposed at NNP1PC landfill under waste management procedures; 4 Break and burry all construction waste at least 60cm in depth by machinery; 5 All step of the corrective activities must be closely supervised by parties in concern (TD-EMO-OC); 6 OC submit report to NNP1PC following a completion of the corrective action.	10.06.2018	26.06.2018	Resolved
ONC_OC-0279	29.05.2018	Aggregate Plant Yard	Indicative timeframe of site removal and rehabilitation provided by CWC's contractors (Camps and Facilities	Revise the site removal and rehabilitation timeframes to be consistent with the actual	07.06.2018	26.06.2018	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			Decommissioning ref: rev.0, 16th March 2018) was not consistent with the actual work on site. given that: - Work completion date: 31 August 2018, and - Removal date: 30 November 2018. However, this bi-weekly joint site inspection observed some decommissioning of conveyor belts, crusher was commenced and ongoing.	work - Sino Hydro main camp & office and Sino hydro magazine (at spoil No.6), need to be added onto the list.			
ONC_OC-0280	29.05.2018	KENBER Camp	Poor operation and housekeeping of workshop and hazardous storage areas: - Oily equipment and machines are stored on the bare ground without spillage protection facilities. This resulted in oil spillage on the ground next to workshop and stock yard; - Hydraulic oil spillage inside the bunding area , but no any containing and clean up; - EMO observed that some contaminated soil / sand bags	The Contractor is required to take the following actions: - Collect and clean a hazardous material storage properly; - Remove or provide a proper mitigation measures and devices for the oily equipment/machines to avoid: (i) Direct store on the ground; (ii) Prevent from oil dripping and spillage onto	07.06.2018	26.06.2018	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			were disappeared from site in comparison with the record and previous inspection photos, with no information of when - where- and by whom?	the ground; (iii) Prevent flushing of oil by rain. - Move any oily rags and / or oil containers into the designated hazardous material storage. - Investigate the cause of disappearance of some contaminated soil / sand bags.			
ONC_OC-0281	29.05.2018	TCM Camp	NNP1PC-EMO provided no objection with a written comment to an unofficial submission of site decommissioning plan from OC in March 2018. Currently, it was noted that some parts of camp facilities were decommissioned with no resubmission of such a revised decommissioning plan as per comments by mentioned;	The Contractor is required to revise and resubmit the site decommissioning plan to NNP1PC for review and approval	26.06.2018	26.06.2018	Resolved
NCR_HM-0004	27.04.2018	HM Hydro Worker Camp N#2	No corrective action done for the pending environmental and health issues identified during EMO, EMU and IAP-ADM inspections.	The contractor is required to take the following actions by 30 June 2018: - Improve the existing oil storage facility as per the	30.06.2018	26.06.2018	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			During the EMU-EMO inspection in April 2018, it was found that- Hazardous material (oil drums) was stored in unsecure storage (no proper bund, floor). Some oil drums and containers were stored on the bare ground;- Poultry was raised in the LILAMA10 camp.During this inspection, HM-Hydro and LILAMA 10 were instructed to resolve those findings within 15 days. On 20-27 May 2018, IAP-ADB identifies similar issues as above and recommendation through NNP1PC for the improvement has been provided.On 07 June 2018 during NNP1PC-HM Hydro monthly progress meeting, EMO discussed and recommended to improve the above pending issues. At the end of this meeting, the discussion note was distributed to all participants for references	provided Best Practice and Best Available Technic;- Display procedures and poster for the correct practice of oil handling at the storage facility;- Provide steel tray and oil spill response kit (dry sand) at this oil storage facility;- Carry out a complete clean-up and disposal of oil contaminated soil/waste by referring to related measures (SP05:Hazardous material management;- Provide training on hazardous material and waste handling to LILAMA10's workers who operate the oil storage facility;- Stop raising of any poultry and dismantle chicken coop;- HM Hydro should follow-up the implementation of their subcontractor's			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			and actions.On 13 June 2016, EMO sent an example "Best Practice and Best Available Technic as per the requirement in ESMMP-CP" to HM Hydro contractor for the improvement of LILAMA10's hazardous material storage.On 20 June 2018, EMO conducted site inspection to follow up the agreed corrective actions, it was confirmed that LILAMA10 subcontractor did not take any action to resolve those pending environmental and health risk issues. Note: NNP1PC-EMO is not satisfied with the contractor's cooperation and effort as no progress has been made to resolve their environmental issues after various recommendations provided by EMO, EMU, and IAP-ADB.	corrective action and report the progress to NNP1PC in a timely manner.			
ONC_OC-0282	26.06.2018	Songda5 Camp N#1	Water pump transporting wastewater from the second to next wetland pond was not	1 Re-install the water pump and ensure these wastewater been	28.06.2018	29.06.2018	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			operated (power line was unplugged), as a result, wastewater was nearly overflow from the pond prior to chlorination. The wastewater pipe line connecting between camps's washing area and WWTS was not properly connected. This caused in wastewater releasing to the open ditches and following to the outside.	transported to the designated chlorination tanks for treatment prior discharge, 2 Repair and well connect the wastewater pipe line to ensure no release and leakage of wastewater to the outside.			
ONC_OC-0283	26.06.2018	Songda5 Camp N#1	Poor operation and housekeeping of workshop and hazardous storage areas. Oily equipment and machines were stored on the bare ground without spillage protection facilities/devices. This resulted in oil spillage and caused soil contamination next to workshop and stock yard.	Provide steel trays to collect oil dripping from the old machine; - Provide plastic sheet cover for oily equipment and machines to prevent from rain wash.	27.06.2018	29.06.2018	Pending
ONC_OC-0284	26.06.2018	RCC Plant Yard	No waste segregation. Hazardous waste and recycle waste was mixed and stored in an improper place (rain water stagnant). This has a potential	The Contractor is required to segregate hazardous waste from non-hazardous waste and store properly in accordance with waste	29.06.2018	29.06.2018	Resolved

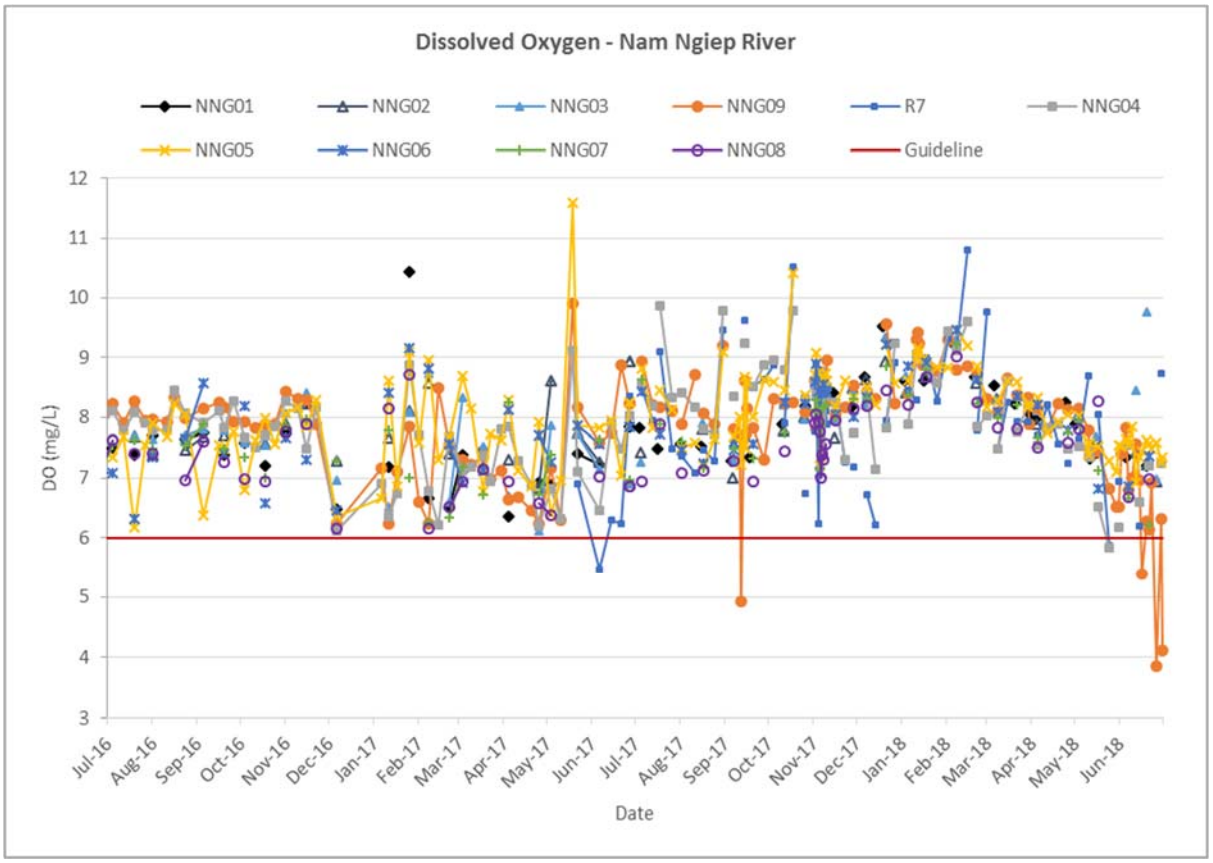
Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			risk of hazardous and chemical substances being washed or released to the environment.	management measures (remove hazardous waste to designated storage facility, dispose general waste at NNP1 landfill and sell recycle waste to local vendor).			
ONC_OC-0285	26.06.2018	RCC Plant Yard	Septic tanks next to the RCC plant laboratory was full and there was an evidence of black water releasing from the septic tank.	Immediately block the septic tank hole to stop black water leaking; - Empty the septic tank and dispose black water by following NNP1PC's Standard Operating Procedure (SOP) for black water/sewage sludge disposal.	05.07.2018	29.06.2018	Pending

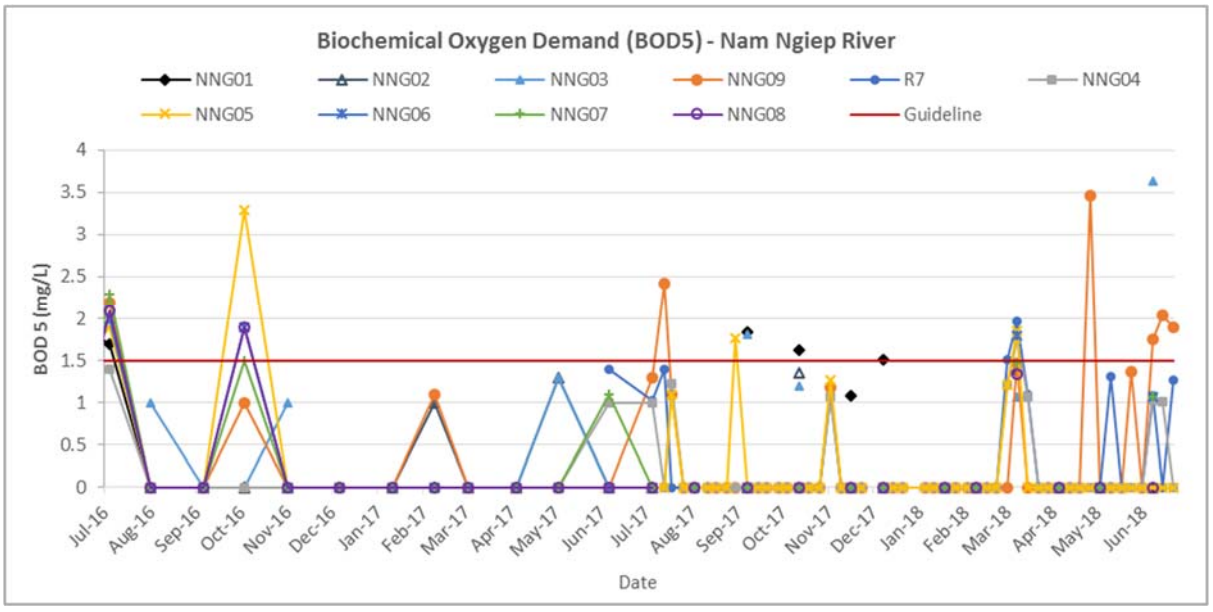
APPENDIX 3: CODES AND LOCATIONS OF THE SURFACE WATER QUALITY MONITORING STATIONS

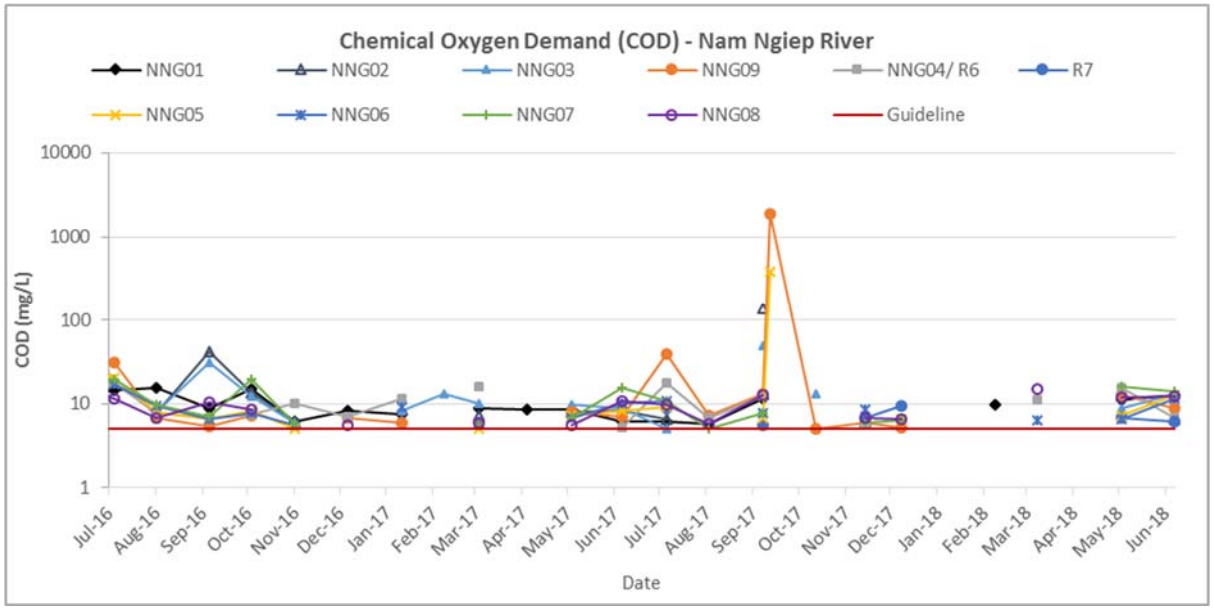
Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Ban Phiengta	Upstream Project Construction Site
NNG02	Nam Ngiep Upstream of Nam Phouan Confluence	
NNG03	Nam Ngiep Downstream of Ban Sop-Yuak	
NNG09	Nam Ngiep Upstream Main Dam	
NNG04 / R6	Nam Ngiep Downstream RT Camp (Middle Re-regulation Reservoir)	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	

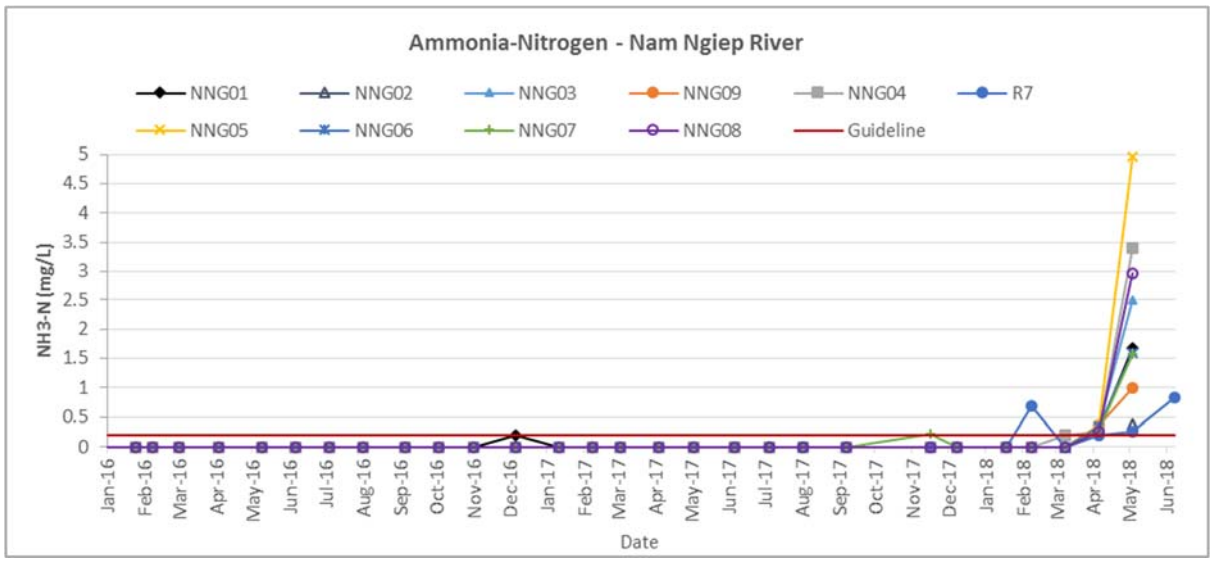
APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JULY 2016 TO END OF JUNE 2018 (ONLY PARAMETERS THAT EXCEEDED GUIDELINE STANDARDS)

Nam Ngiep Surface Water



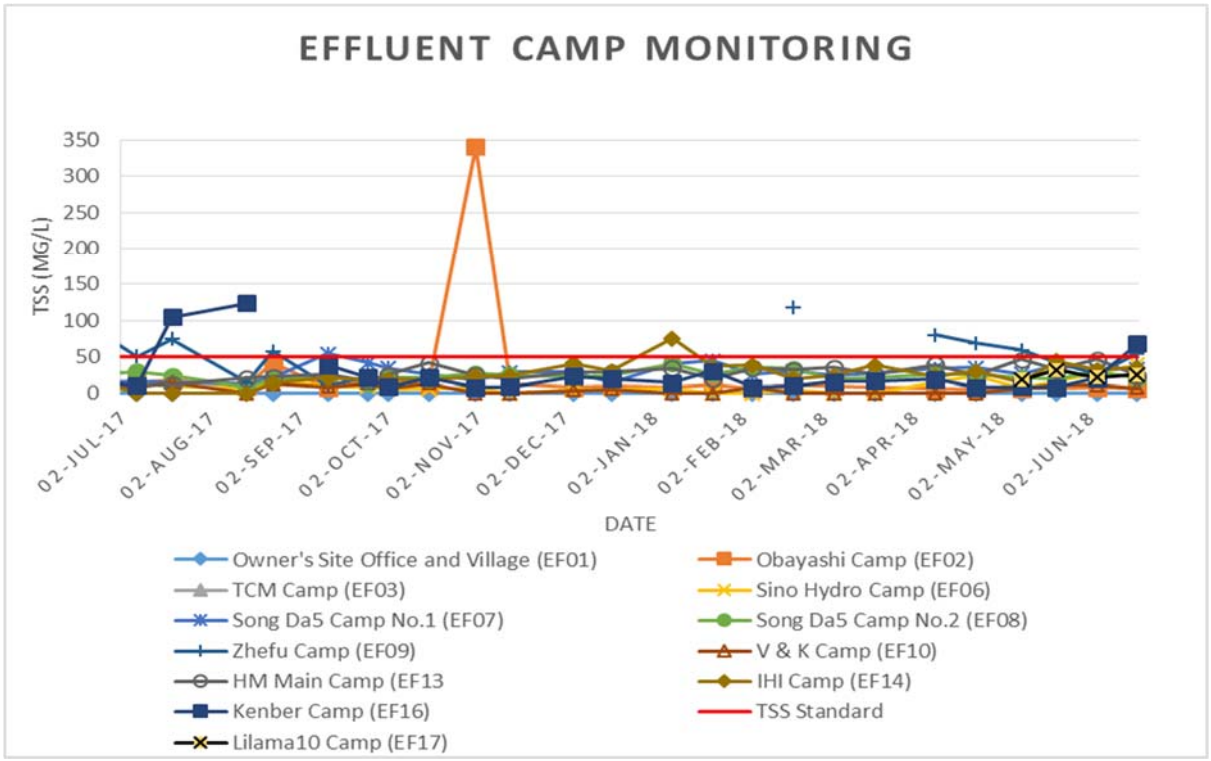


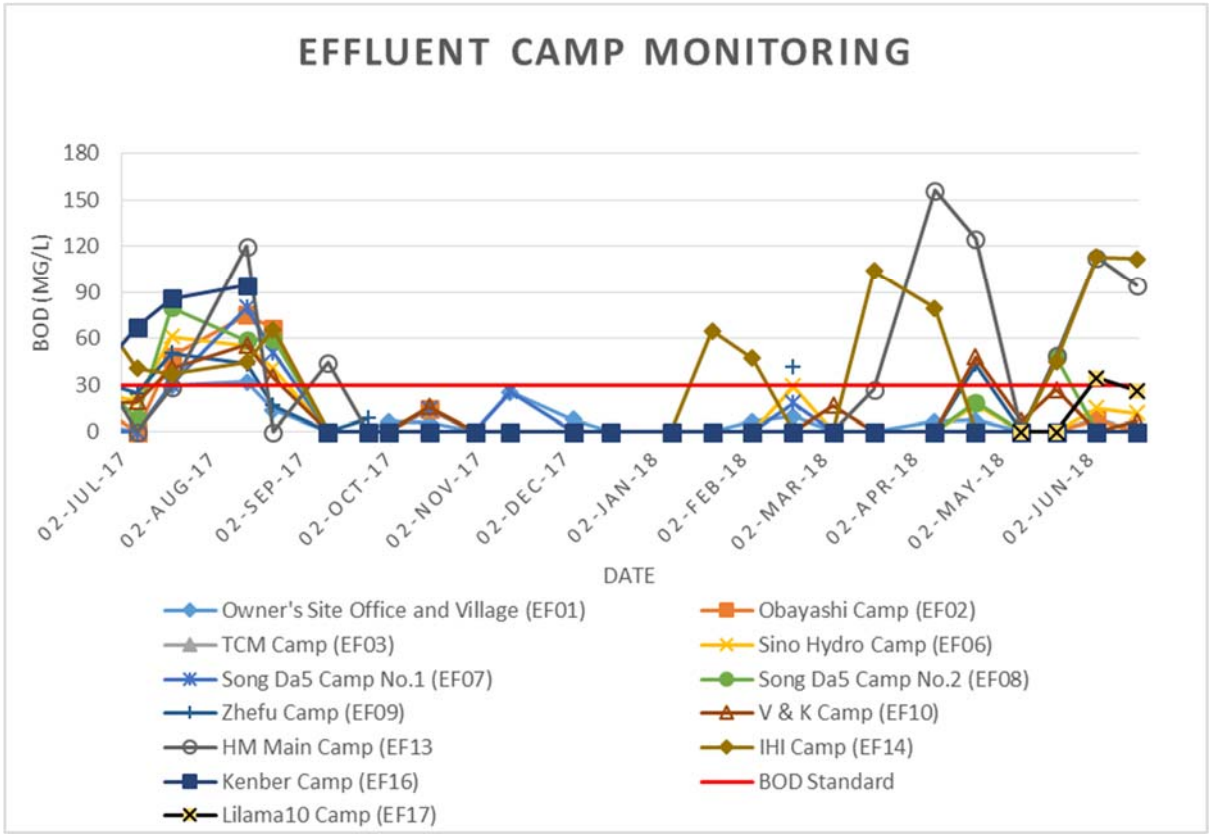


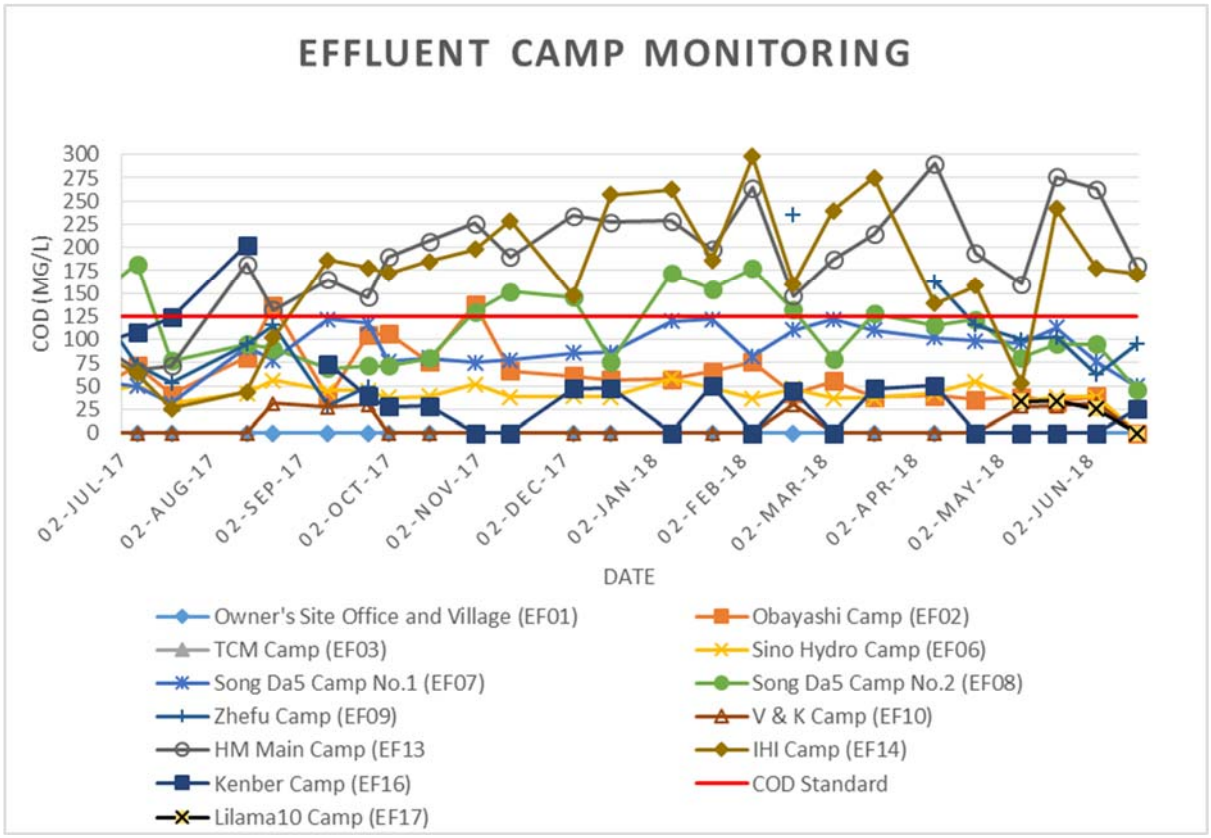


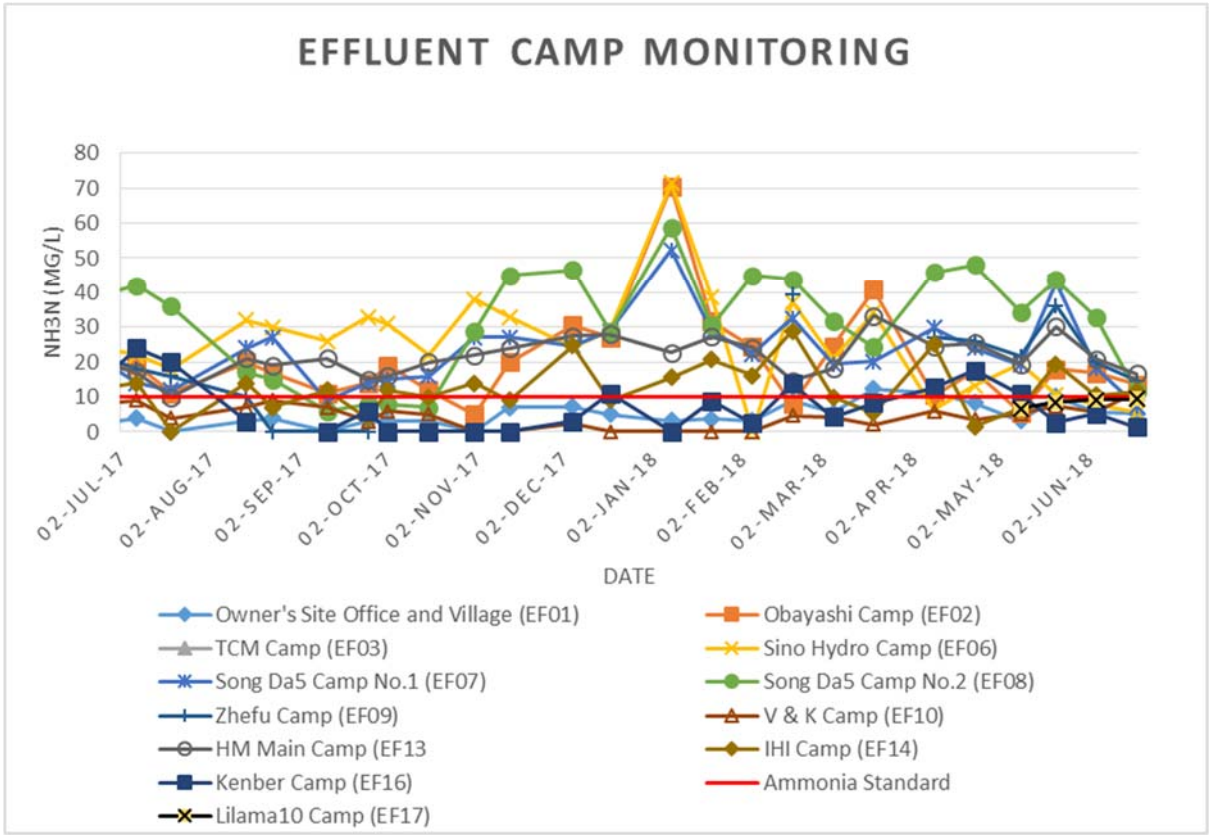
Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup

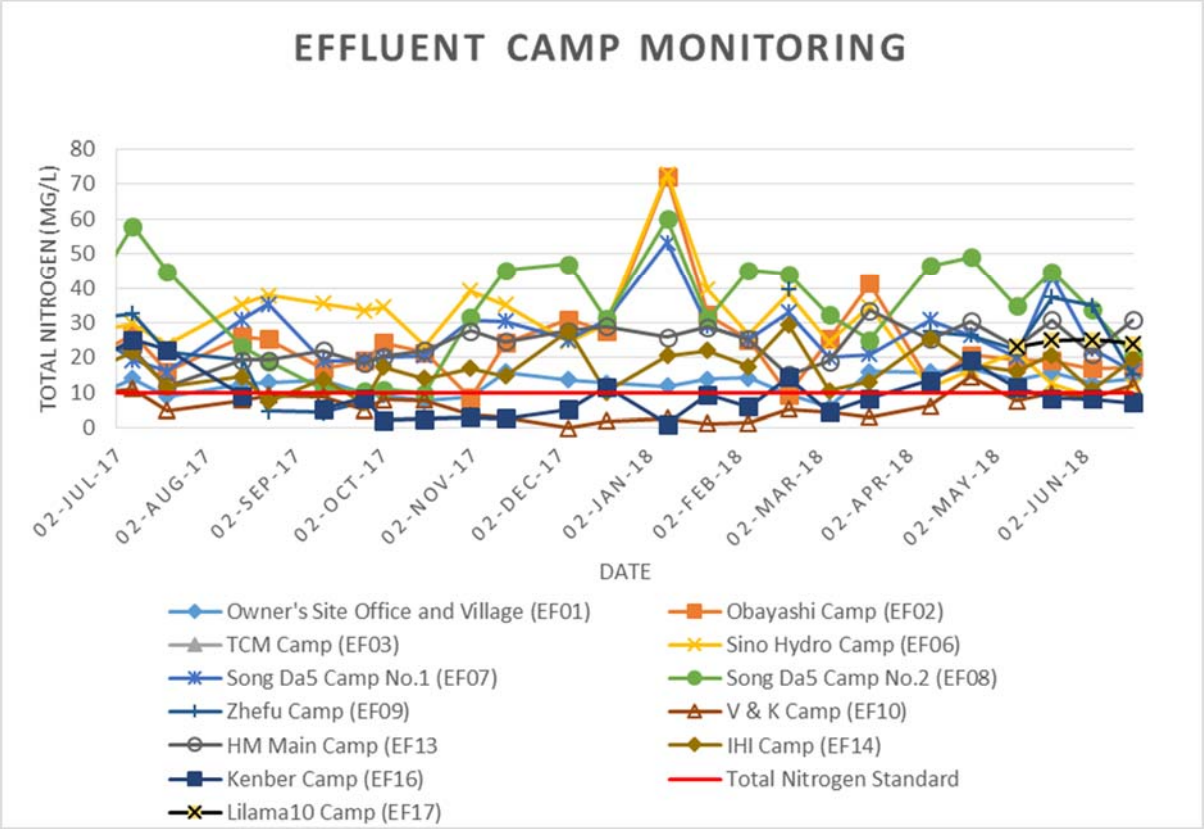
Camps' Effluent Water Quality Trends (Since July 2017 – June 2018)

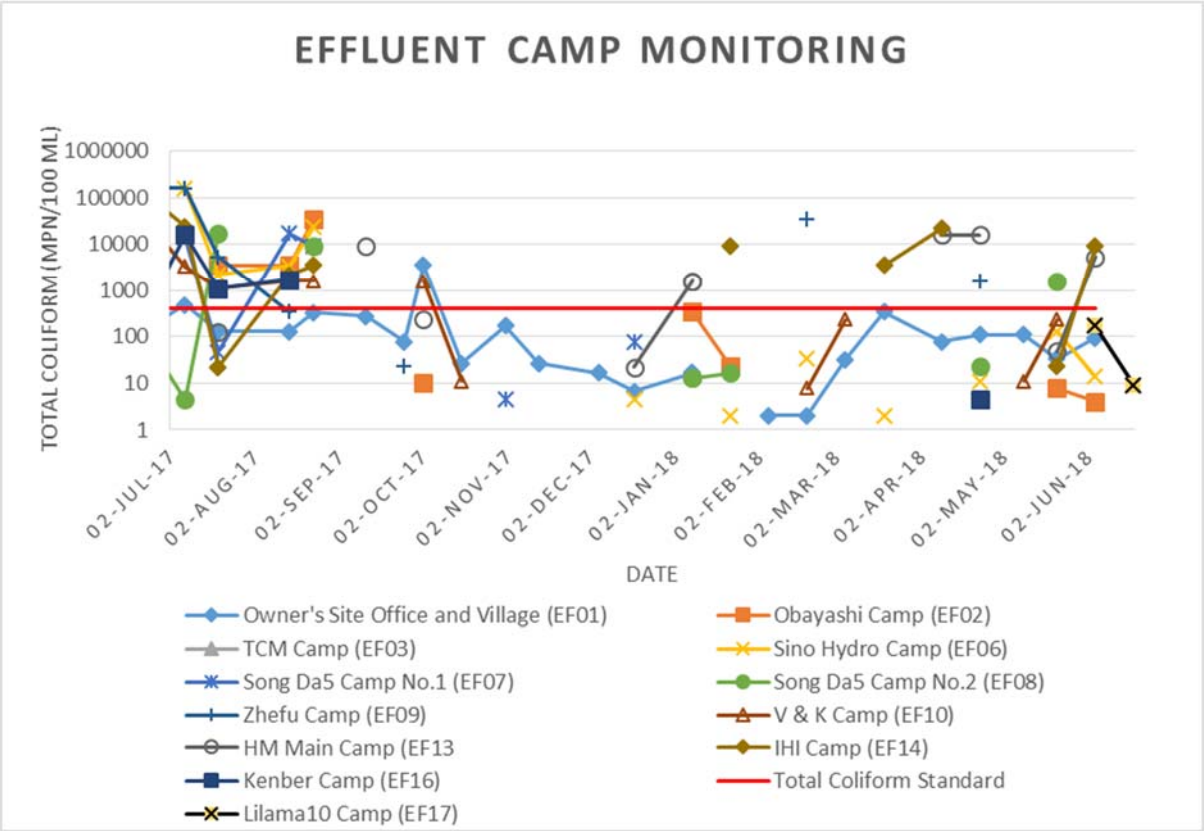




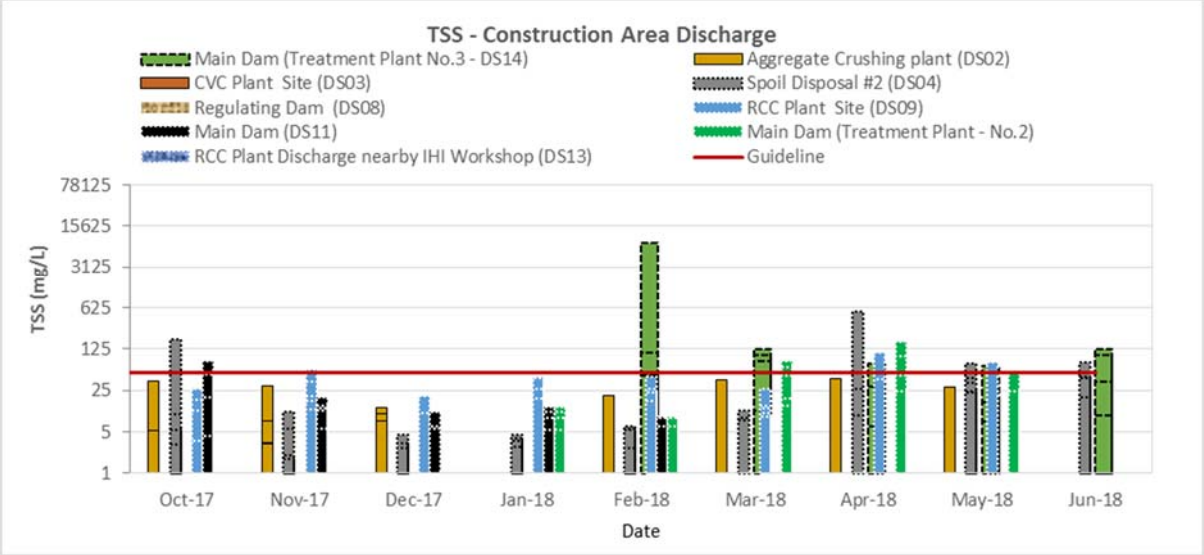

EFFLUENT CAMP MONITORING
COD (MG/L)
300
275
250
225
200
175
150
125
100
75
50
25
0
02-JUL-17
02-AUG-17
02-SEP-17
02-OCT-17
02-NOV-17
02-DEC-17
02-JAN-18
02-FEB-18
02-MAR-18
02-APR-18
02-MAY-18
02-JUN-18
DATE
Owner's Site Office and Village (EF01)
Obayashi Camp (EF02)
TCM Camp (EF03)
Sino Hydro Camp (EF06)
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
02-JUL-17
02-AUG-17
02-SEP-17
02-OCT-17
02-NOV-17
02-DEC-17
02-JAN-18
02-FEB-18
02-MAR-18
02-APR-18
02-MAY-18
02-JUN-18
DATE
Owner's Site Office and Village (EF01)
Obayashi Camp (EF02)
TCM Camp (EF03)
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
02-JUL-17
02-AUG-17
02-SEP-17
02-OCT-17
02-NOV-17
02-DEC-17
02-JAN-18
02-FEB-18
02-MAR-18
02-APR-18
02-MAY-18
02-JUN-18
DATE
Owner's Site Office and Village (EF01)
Obayashi Camp (EF02)
TCM Camp (EF03)
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
02-JUL-17
02-AUG-17
02-SEP-17
02-OCT-17
02-NOV-17
02-DEC-17
02-JAN-18
02-FEB-18
02-MAR-18
02-APR-18
02-MAY-18
02-JUN-18
DATE
Owner's Site Office and Village (EF01)
Obayashi Camp (EF02)
TCM Camp (EF03)
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)

Construction Area Discharge Water Quality (Since October 2017 to June 2018)



APPENDIX 5: WATER QUALITY MONITORING DATA

APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q2 2018

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
3-Apr-18	pH	5.0 - 9.0	7.88										7.71			
4-Apr-18	pH	5.0 - 9.0		7.5	7.87									7.66		
5-Apr-18	pH	5.0 - 9.0				7.86	7.87	7.99	7.94	7.98	7.68	7.61			7.84	7.79
12-Apr-18	pH	5.0 - 9.0				7.84	7.95	8	7.95							
19-Apr-18	pH	5.0 - 9.0				7.92	7.74	7.47	7.98							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
24-Apr-18	pH	5.0 - 9.0	8.08										7.98			
26-Apr-18	pH	5.0 - 9.0				7.66	7.03	7.77	7.88	8.01	8.01	7..78			7.59	7.5
1-May-18	pH	5.0 - 9.0	7.72										7.52			
2-May-18	pH	5.0 - 9.0			7.62									7.57		
3-May-18	pH	5.0 - 9.0				7.62	7.32	7.62	7.79	7.65	7.84	7.49			7.35	7.54
10-May-18	pH	5.0 - 9.0				7.91	7.96	7.77	7.69							
11-May-18	pH	5.0 - 9.0	7.78			7.85	7.5		7.84				7.88			

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
15-May-18	pH	5.0 - 9.0		7.64	7.95									7.76		
16-May-18	pH	5.0 - 9.0	8.12										8.32			
17-May-18	pH	5.0 - 9.0				7.91	7.56	7.65	7.62	8	7.88	8			7.63	
24-May-18	pH	5.0 - 9.0				7.65	7.28	6.86	7.63							
29-May-18	pH	5.0 - 9.0				7.26			7.43							
31-May-18	pH	5.0 - 9.0				7.96	7.37	7.86	7.88							
2-Jun-18	pH	5.0 - 9.0				7.68			7.72							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
5-Jun-18	pH	5.0 - 9.0	7.99			7.89			7.88				8.05			
7-Jun-18	pH	5.0 - 9.0				7.97	7.59	7.57	7.97	6.63	7.38	7.16			6.53	6.76
9-Jun-18	pH	5.0 - 9.0				7.76			7.19							
12-Jun-18	pH	5.0 - 9.0		6.43	6.39	6.37			6.3					6.63		
14-Jun-18	pH	5.0 - 9.0				7.17	7.01	6.29	6.98							
16-Jun-18	pH	5.0 - 9.0				6.73			6.79							
19-Jun-18	pH	5.0 - 9.0	7.17	7.38	7.82	7.3			6.82				7.93	7.69		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
21-Jun-18	pH	5.0 - 9.0				7.38	7.32	6.94	7.48	7.13	6.21	7.1			7.07	7.51
23-Jun-18	pH	5.0 - 9.0				6.85			7							
26-Jun-18	pH	5.0 - 9.0		7.96	8.02	7.71			7.96					7.65		
29-Jun-18	pH	5.0 - 9.0				7.85	7.96	6.93	7.98							
30-Jun-18	pH	5.0 - 9.0				7.45			7.74							
3-Apr-18	Sat. DO (%)		94.9										99.2			
4-Apr-18	Sat. DO (%)			98.7	103.4									104.4		
5-Apr-18	Sat. DO (%)					105	98.9	101.2	106.5	105.2	96.5	95.2			88.3	101.9

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	National Surface Water Quality Guideline														
12-Apr-18	Sat. DO (%)					102.8	104.5	109.8	104.2							
19-Apr-18	Sat. DO (%)					102.8	101.1	98	100							
24-Apr-18	Sat. DO (%)		102.1									97.9				
26-Apr-18	Sat. DO (%)					102.4	95.9	94.8	103	100.8	99.3	98			74.7	75.5
1-May-18	Sat. DO (%)		94.9									100.8				
2-May-18	Sat. DO (%)				100.6								100.2			
3-May-18	Sat. DO (%)					103.6	102.4	104	104.4	102.6	99.3	99.5			89	82.6
10-May-18	Sat. DO (%)					101.3	106.6	122.7	100.6							
11-May-18	Sat. DO (%)		94			97	97.4		98.6			99.6				

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	National Surface Water Quality Guideline														
15-May-18	Sat. DO (%)			98.9	101.3								101.5		
16-May-18	Sat. DO (%)		97.1									100.4			
17-May-18	Sat. DO (%)					98.8	87	109	96.4	91.9	95.7	113.9		79.3	
24-May-18	Sat. DO (%)					92	80.4	80.2	94.1						
29-May-18	Sat. DO (%)					86			92.1						
31-May-18	Sat. DO (%)					87.3	82.3	94.1	98.7						
2-Jun-18	Sat. DO (%)					104.2			103						
5-Jun-18	Sat. DO (%)		94			106.8			99			101			

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
7-Jun-18	Sat. DO (%)					91.9	97.2	97.2	99.1	90.1	85.4	88.2			92.2	92.9
9-Jun-18	Sat. DO (%)					92.8			102.5							
12-Jun-18	Sat. DO (%)			98	109.2	97.3			88.8					99		
14-Jun-18	Sat. DO (%)					90.8	87.7	82	96.4							
16-Jun-18	Sat. DO (%)					62.1			97.9							
19-Jun-18	Sat. DO (%)		91.9	94.8	131.5	83.2			95.9				101.1	99.9		
21-Jun-18	Sat. DO (%)					79.8	90.9	93.8	97.7	94	77.9	86.7			95.2	91.5
23-Jun-18	Sat. DO (%)					94.9			101.9							
26-Jun-18	Sat. DO (%)			88.7	92.7	49.9			94.7					100.3		
29-Jun-18	Sat. DO (%)					83.2	94.2	117.3	95							
30-Jun-18	Sat. DO (%)					54.6			94.5							

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline													
3-Apr-18	DO (mg/l)	>6.0	7.97									8.28			
4-Apr-18	DO (mg/l)	>6.0		7.88	8.1								8.47		
5-Apr-18	DO (mg/l)	>6.0				8.14	7.55	7.71	8.33	8.2	7.66	7.5		6.67	8.07
12-Apr-18	DO (mg/l)	>6.0				7.8	7.82	8.21	7.74						
19-Apr-18	DO (mg/l)	>6.0				8.22	7.88	7.57	7.92						
24-Apr-18	DO (mg/l)	>6.0	8.24									7.82			
26-Apr-18	DO (mg/l)	>6.0				8.13	7.48	7.25	8.05	7.78	7.74	7.58		5.63	5.95
1-May-18	DO (mg/l)	>6.0	7.88									8.34			
2-May-18	DO (mg/l)	>6.0			8.02								8.21		
3-May-18	DO (mg/l)	>6.0				8.15	7.53	7.64	8.03	7.91	7.93	7.8		6.64	6.62

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
10-May-18	DO (mg/l)	>6.0				7.78	7.48	8.7	7.38							
11-May-18	DO (mg/l)	>6.0	7.33			7.36	7.35		7.58				8.19			
15-May-18	DO (mg/l)	>6.0		7.64	7.69									8.01		
16-May-18	DO (mg/l)	>6.0	7.43										8.47			
17-May-18	DO (mg/l)	>6.0				7.44	6.51	8.04	7.53	6.81	7.13	8.26			5.85	
24-May-18	DO (mg/l)	>6.0				6.82	5.84	5.87	7.29							
29-May-18	DO (mg/l)	>6.0				6.52			7.11							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
31-May-18	DO (mg/l)	>6.0				6.52	6.18	6.95	7.55							
2-Jun-18	DO (mg/l)	>6.0				7.41			7.52							
5-Jun-18	DO (mg/l)	>6.0	7.35			7.83			7.64				8.11			
7-Jun-18	DO (mg/l)	>6.0				6.79	7.54	7.53	7.54	6.86	6.65	6.67			6.82	7.18
9-Jun-18	DO (mg/l)	>6.0				7.01			7.85							
12-Jun-18	DO (mg/l)	>6.0		7.43	8.45	7.57			6.92					7.74		
14-Jun-18	DO (mg/l)	>6.0				6.97	6.6	6.19	7.35							
16-Jun-18	DO (mg/l)	>6.0				5.39			7.44							
19-Jun-18	DO (mg/l)	>6.0	7.21	7.22	9.75	6.28			7.63				8.07	7.87		
21-Jun-18	DO (mg/l)	>6.0				6.14	7.21	7.18	7.57	7.37	6.21	6.98			7.42	7.22
23-Jun-18	DO (mg/l)	>6.0				6.91			7.49							

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline													
26-Jun-18	DO (mg/l)	>6.0		6.93	6.98	3.85			7.58					8.22		
29-Jun-18	DO (mg/l)	>6.0				6.31	7.24	8.74	7.26							
30-Jun-18	DO (mg/l)	>6.0				4.13			7.35							
3-Apr-18	Conductivity (µs/cm)		77.9										35.9			
4-Apr-18	Conductivity (µs/cm)			78.4	75.8									61.2		
5-Apr-18	Conductivity (µs/cm)					75.1	69.8	70.4	75.3	76	77.9	78.7			145.9	60.7
12-Apr-18	Conductivity (µs/cm)					78	76.7	75.8	75.5							
19-Apr-18	Conductivity (µs/cm)					64.9	66.9	73.8	66.4							
24-Apr-18	Conductivity (µs/cm)		31.1									82.1				

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
26-Apr-18	Conductivity (µs/cm)					73.4	69.3	74.3	74.3	73.2	75.9	77.5			122.7	61.2
1-May-18	Conductivity (µs/cm)		78.4										26.8			
2-May-18	Conductivity (µs/cm)				71.2									68.2		
3-May-18	Conductivity (µs/cm)					72.9	64.9	70.6	71.9	72.5	73.9	72.4			134.9	24.6
10-May-18	Conductivity (µs/cm)					66.4	71.7	72.4	70.1							
11-May-18	Conductivity (µs/cm)		74.1										36.6			
15-May-18	Conductivity (µs/cm)			78.9	78.4									69.8		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
16-May-18	Conductivity (µs/cm)		78.1										33.1			
17-May-18	Conductivity (µs/cm)					78			74.4	79	76.3	74.5			99.9	
24-May-18	Conductivity (µs/cm)					74.6	87.8	80.5	90.7							
29-May-18	Conductivity (µs/cm)					71.2			55.5							
31-May-18	Conductivity (µs/cm)					70.1	73.8	75.2	54.5							
2-Jun-18	Conductivity (µs/cm)					72.9			48.6							
5-Jun-18	Conductivity (µs/cm)		77.9			70.1			54.9				30.1			

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	National Surface Water Quality Guideline														
7-Jun-18	Conductivity (µs/cm)					70.4	68	70.2	54.6	69.7	42.9	43.3			109.5	17.62
9-Jun-18	Conductivity (µs/cm)					86.8			51.9							
12-Jun-18	Conductivity (µs/cm)			68	69.2	71			53.7					44.4		
14-Jun-18	Conductivity (µs/cm)					71.8	56.1	57.4	47.1							
16-Jun-18	Conductivity (µs/cm)					84.7			48.7							
19-Jun-18	Conductivity (µs/cm)		77.3	56	67.5	65.7			45.2				25.8	68.4		
21-Jun-18	Conductivity (µs/cm)					66.5	38.7	41.1	27.4	48.9	19.33	24.8			59.1	10.25

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
23-Jun-18	Conductivity (µs/cm)					67.3			47.4							
26-Jun-18	Conductivity (µs/cm)			52.4	65.6	65.2			30.4					62.9		
29-Jun-18	Conductivity (µs/cm)					66.4	39.3	40.3	33.2							
30-Jun-18	Conductivity (µs/cm)					66.6			33.8							
3-Apr-18	TDS (mg/l)		39										18			
4-Apr-18	TDS (mg/l)			39.2	36									30.5		
5-Apr-18	TDS (mg/l)					37.5	35	35	37.5	38	38.5	39			73	30.3
12-Apr-18	TDS (mg/l)					39	38.35	37.54	37							
19-Apr-18	TDS (mg/l)					32.4	33.4	36.9	33.2							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
24-Apr-18	TDS (mg/l)		15.55										41.05			
26-Apr-18	TDS (mg/l)					36	34	37	37.15	36.6	37.95	38.75			61.35	30.6
1-May-18	TDS (mg/l)		39										13			
2-May-18	TDS (mg/l)				35.6									34.1		
3-May-18	TDS (mg/l)					36.4	32	35	36	12.3	36.5	36.2			67.4	12.3
10-May-18	TDS (mg/l)					33	35	36	35							
11-May-18	TDS (mg/l)		37										18			
15-May-18	TDS (mg/l)			34	34									35		

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	National Surface Water Quality Guideline														
16-May-18	TDS (mg/l)		39									17			
17-May-18	TDS (mg/l)					39			37.2	39	38	37			49.95	
24-May-18	TDS (mg/l)					37	49	40	45							
29-May-18	TDS (mg/l)					35			27.25							
31-May-18	TDS (mg/l)					35	36	36	27							
2-Jun-18	TDS (mg/l)					36.4			24.3							
5-Jun-18	TDS (mg/l)		38.5			35			27.4			15				
7-Jun-18	TDS (mg/l)					35.2	34	35	27.3	34.8	21.4	21.5			54.5	8.8
9-Jun-18	TDS (mg/l)					43.4			26							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
12-Jun-18	TDS (mg/l)			34	34	35			27					22		
14-Jun-18	TDS (mg/l)					36	28	28.5	23.5							
16-Jun-18	TDS (mg/l)					42.35			24.35							
19-Jun-18	TDS (mg/l)		38.65	28	33.75	32.85			22.6				12.9	34.2		
21-Jun-18	TDS (mg/l)					33	19.35	20.1	14	24	10	12.4			30	5
23-Jun-18	TDS (mg/l)					33.65			23.7							
26-Jun-18	TDS (mg/l)			26	32	32			15.2					31		
29-Jun-18	TDS (mg/l)					33.2	19.1	20.1	16.5							
30-Jun-18	TDS (mg/l)					33			17							
3-Apr-18	Temperature (°C)		22.1										22.1			
4-Apr-18	Temperature (°C)			25.1	25.5									24.2		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
5-Apr-18	Temperature (°C)					26.8	27.9	28	26.8	26.8	25.9	26.3			28.6	26.1
12-Apr-18	Temperature (°C)					28.1	29	29	29.4							
19-Apr-18	Temperature (°C)					25.5	27.1	27.5	26.8							
24-Apr-18	Temperature (°C)		23.7										24.5			
26-Apr-18	Temperature (°C)					25.9	26.9	28	27	27.6	27	28			29	26.5
1-May-18	Temperature (°C)		22.7										22.6			
2-May-18	Temperature (°C)				25.3									23.8		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
3-May-18	Temperature (°C)					26.5	30.2	30.3	27.9	27.6	26.2	26.8			29.6	28
10-May-18	Temperature (°C)					27.6	30.9	31.1	30.2							
11-May-18	Temperature (°C)		26			28.2	28.6		27.7				23.1			
15-May-18	Temperature (°C)			26.8	27.8									25.7		
16-May-18	Temperature (°C)		26.8										21.4			
17-May-18	Temperature (°C)					28.3	29.6	29.8	26.9	29.8	29.4	30.9			30	
24-May-18	Temperature (°C)					29.3	30.9	30.4	27.3							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
29-May-18	Temperature (°C)					28.1			28.1							
31-May-18	Temperature (°C)					28.6	29	29.8	28							
2-Jun-18	Temperature (°C)					31			30.2							
5-Jun-18	Temperature (°C)		25.6			29.6			27.2				24			
7-Jun-18	Temperature (°C)					28.2	27.5	27.3	28.1	28.0	26.8	28.5			29.3	27.2
9-Jun-18	Temperature (°C)					27.9			27.6							
12-Jun-18	Temperature (°C)			27.4	26.9	26.6			26.5					25.7		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
14-Jun-18	Temperature (°C)					26.6	28.5	28.3	27.7							
16-Jun-18	Temperature (°C)					27.1			27.7							
19-Jun-18	Temperature (°C)		25.2	27.1	28.7	23.9			25.4				24.1	25.3		
21-Jun-18	Temperature (°C)					26.6	25.9	28.2	27.1	26.4	25.6	25.1			26.7	26.1
23-Jun-18	Temperature (°C)					30.2			29.5							
26-Jun-18	Temperature (°C)			24.3	27.9	26.8			25.3					23.3		
29-Jun-18	Temperature (°C)					27.3	27.5	29	27.3							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
30-Jun-18	Temperature (°C)					27.7			27.7							
3-Apr-18	Turbidity (NTU)		12.77										3.84			
4-Apr-18	Turbidity (NTU)			12.87	10.91									2.09		
5-Apr-18	Turbidity (NTU)					13.34	10.76	9.65	9.15	9.42	11.75	13.75			2.37	7.35
12-Apr-18	Turbidity (NTU)					12.18	10.06	10.93	13.86							
12-Apr-18	Turbidity (NTU)															
19-Apr-18	Turbidity (NTU)					38.7	65.2	8.55	52.6							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
24-Apr-18	Turbidity (NTU)		15.5										56.9			
26-Apr-18	Turbidity (NTU)					32.7	14.12	8.14	12.1	14.3	12.1	15.5			4.21	13.49
1-May-18	Turbidity (NTU)		52.4										12			
2-May-18	Turbidity (NTU)				27									16.5		
3-May-18	Turbidity (NTU)					23.3	23.63	16.86	17.8	16.6	17.9	15.7			4.43	70.9
10-May-18	Turbidity (NTU)					1007	41	21.9	34.8							
11-May-18	Turbidity (NTU)		26			42.32	56.81		61.45				8.27			

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
15-May-18	Turbidity (NTU)			38.4	35.8									33.1		
16-May-18	Turbidity (NTU)		787										9.7			
17-May-18	Turbidity (NTU)					34.6	19.79	19.13	25.8	20.3	21.9	14.4			4.64	
24-May-18	Turbidity (NTU)					6.54	12.3	8.6	17.7							
29-May-18	Turbidity (NTU)					3.79			37.3							
31-May-18	Turbidity (NTU)					2.25	11.6	15.1	29.6							
2-Jun-18	Turbidity (NTU)					2.74			12.6							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
5-Jun-18	Turbidity (NTU)		40.8			1.68			8.34				8.61			
7-Jun-18	Turbidity (NTU)					1.05	5.78	6.86	7.79	7.02	12.9	9.00			4.02	5.58
9-Jun-18	Turbidity (NTU)					2.23			18.11							
12-Jun-18	Turbidity (NTU)			51.8	5.2	3.29			32					207		
14-Jun-18	Turbidity (NTU)					2.48	27.74	41.16	76.31							
16-Jun-18	Turbidity (NTU)					4.18			29.53							
19-Jun-18	Turbidity (NTU)		45.68	69.82	4.4	1.52			121.64				53.24	76.55		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
21-Jun-18	Turbidity (NTU)					2.27	74.75	85.45	230	61.8	64.88	78.66			37.65	10.53
23-Jun-18	Turbidity (NTU)					1.46			54.95							
26-Jun-18	Turbidity (NTU)			833	2.08	1.08			55.8					181		
29-Jun-18	Turbidity (NTU)					1.23	22.88	36.14	42.68							
30-Jun-18	Turbidity (NTU)					1.33			31.7							
3-Apr-18	TSS (mg/l)		35.75										8.26			
4-Apr-18	TSS (mg/l)			33.03	27.61									5.6		
5-Apr-18	TSS (mg/l)					36.16	11	10.14	15.95	17.28	19.39	26.83			2.58	6.37

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	National Surface Water Quality Guideline														
12-Apr-18	TSS (mg/l)					21.27	14.16	4.93	10.57							
19-Apr-18	TSS (mg/l)					179.52	124.38	9.36	122.64							
26-Apr-18	TSS (mg/l)					72.36	24.66	8.54	14.24							
1-May-18	TSS (mg/l)		208.57									37.07				
2-May-18	TSS (mg/l)				67.03								45			
3-May-18	TSS (mg/l)					54.65	31.35	21.27	34.72	31.82	34.98	26.58			3.55	114.66
10-May-18	TSS (mg/l)					448.28	83.78	24.32	51.53							
11-May-18	TSS (mg/l)															
15-May-18	TSS (mg/l)															

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
16-May-18	TSS (mg/l)		600.96										50.6			
17-May-18	TSS (mg/l)					58.42	25.86	22.12	43.19							
24-May-18	TSS (mg/l)					8.51	12.35	8.99	8.99							
31-May-18	TSS (mg/l)					<5.0	20.86	24.13	56.6							
5-Jun-18	TSS (mg/l)		242.48										26.72			
7-Jun-18	TSS (mg/l)					<5.0	6.36	7.52	14.2	12.2	43.03	18.43			7.14	14.14
12-Jun-18	TSS (mg/l)			102.78	10.34									282.26		
14-Jun-18	TSS (mg/l)					6.08	20.13	29.05	49.32							

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline													
21-Jun-18	TSS (mg/l)					<5.0	127.32	68.27	143.5							
29-Jun-18	TSS (mg/l)					<5.0	15.48	23.44	36.1							
3-Apr-18	BOD5 (mg/l)	<1.5	<1.0									<1.0			
4-Apr-18	BOD5 (mg/l)	<1.5		<1.0	<1.0								<1.0		
5-Apr-18	BOD5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			1	<1.0
12-Apr-18	BOD5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
19-Apr-18	BOD5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
26-Apr-18	BOD5 (mg/l)	<1.5				3.47	<1.0	<1.0	<1.0							
1-May-18	BOD5 (mg/l)	<1.5	<1.0									<1.0				
2-May-18	BOD5 (mg/l)	<1.5			<1.0								<1.0			
3-May-18	BOD5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0	1.31

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
10-May-18	BOD5 (mg/l)	<1.5				<1.0	<1.0	1.31	<1.0							
17-May-18	BOD5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
24-May-18	BOD5 (mg/l)	<1.5				1.36	<1.0	<1.0	<1.0							
31-May-18	BOD5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
5-Jun-18	BOD5 (mg/l)	<1.5	<1.0										<1.0			
7-Jun-18	BOD5 (mg/l)	<1.5				1.75	1.02	1.08	<1.0	1.07	1.06	<1.0			1.01	1.8
12-Jun-18	BOD5 (mg/l)	<1.5		<1.0	3.64									<1.0		
14-Jun-18	BOD5 (mg/l)	<1.5				2.03	1.01	<1.0	<1.0							
21-Jun-18	BOD5 (mg/l)	<1.5				1.89	<1.0	1.27	<1.0							
29-Jun-18	BOD5 (mg/l)	<1.5														

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline													
3-Apr-18	COD (mg/l)	<5	<5.0									<5.0			
4-Apr-18	COD (mg/l)	<5		<5.0	<5.0								<5.0		
5-Apr-18	COD (mg/l)	<5				<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		<5.0	<5.0
1-May-18	COD (mg/l)	<5	11.3									9.6			
2-May-18	COD (mg/l)	<5			9								21.2		
3-May-18	COD (mg/l)	<5				12.6	15.5	6.9	7.3	6.5	16.3	12		11.4	30.4
5-Jun-18	COD (mg/l)	<5	12.9									5.3			
7-Jun-18	COD (mg/l)	<5				8.9	6.7	6.1	12.8	11.5	14.2	12.2		4.9	19
12-Jun-18	COD (mg/l)	<5		6.6	13.3								25.2		
3-Apr-18	NH3-N (mg/l)	<0.2	<0.2									0.37			
4-Apr-18	NH3-N (mg/l)	<0.2		<0.2	<0.2								<0.2		

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	National Surface Water Quality Guideline														
5-Apr-18	NH3-N (mg/l)	<0.2				<0.2	0.02	0.2	<0.2	<0.2	<0.2	<0.2			<0.2	<0.2
1-May-18	NH3-N (mg/l)	<0.2	0.27										0.3			
2-May-18	NH3-N (mg/l)	<0.2			0.37									0.48		
3-May-18	NH3-N (mg/l)	<0.2				0.37	0.25	0.26	0.37	0.35	0.27	0.25			0.32	0.28
5-Jun-18	NH3-N (mg/l)	<0.2	1.68										2.13			
7-Jun-18	NH3-N (mg/l)	<0.2				0.99	3.4	0.83	4.97	1.6	1.57	2.96			1.59	0.73
12-Jun-18	NH3-N (mg/l)	<0.2		0.39	2.5									0.74		
3-Apr-18	NO3-N (mg/l)	<5	0.09										0.08			
4-Apr-18	NO3-N (mg/l)	<5		<0.02	0.02									0.02		
5-Apr-18	NO3-N (mg/l)	<5				0.05	0.02	0.02	0.02	0.03	0.04	0.04			0.05	0.03

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
1-May-18	NO3-N (mg/l)	<5	0.07										0.09			
2-May-18	NO3-N (mg/l)	<5			0.13									0.17		
3-May-18	NO3-N (mg/l)	<5				0.08	0.09	0.08	0.1	0.08	0.1	0.08			0.04	0.31
5-Jun-18	NO3-N (mg/l)	<5	0.1										0.14			
7-Jun-18	NO3-N (mg/l)	<5				0.18	0.41	0.28	0.49	0.1	0.11	0.12			0.11	0.07
12-Jun-18	NO3-N (mg/l)	<5		0.07	<0.02									0.09		
3-Apr-18	Faecal coliform (MPN/100ml)	<1,000	280										110			
4-Apr-18	Faecal coliform (MPN/100ml)	<1,000		280	33									2		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
5-Apr-18	Faecal coliform (MPN/100ml)	<1,000				130	130	27	41	12	41	11			33	130
12-Apr-18	Faecal coliform (MPN/100ml)	<1,000				79	79	27	130							
19-Apr-18	Faecal coliform (MPN/100ml)	<1,000				1,100	350	33	350							
26-Apr-18	Faecal coliform (MPN/100ml)	<1,000				390	330	22	140							
1-May-18	Faecal coliform (MPN/100ml)	<1,000	540										240			

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
2-May-18	Faecal coliform (MPN/100ml)	<1,000			920									350		
3-May-18	Faecal coliform (MPN/100ml)	<1,000				1,600	350	170	920	1,600	1,600	1,600			540	1,600
10-May-18	Faecal coliform (MPN/100ml)	<1,000				1,700	920	540	350							
17-May-18	Faecal coliform (MPN/100ml)	<1,000				350	22	22	22							
24-May-18	Faecal coliform (MPN/100ml)	<1,000				22	26	8	920							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
31-May-18	Faecal coliform (MPN/100ml)	<1,000				13	23	13	350							
5-Jun-18	Faecal coliform (MPN/100ml)	<1,000	410										1,600			
7-Jun-18	Faecal coliform (MPN/100ml)	<1,000				350	49	33	920	49	1,600	920			790	170
12-Jun-18	Faecal coliform (MPN/100ml)	<1,000		1,600	23									1,600		
14-Jun-18	Faecal coliform (MPN/100ml)	<1,000				920	49	33	280							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
21-Jun-18	Faecal coliform (MPN/100ml)	<1,000				11	170	1,600	170							
29-Jun-18	Faecal coliform (MPN/100ml)	<1,000														
3-Apr-18	Total Coliform (MPN/100ml)	<5,000	1,600										110			
4-Apr-18	Total Coliform (MPN/100ml)	<5,000		1,600	280									540		
5-Apr-18	Total Coliform (MPN/100ml)	<5,000				920	540	540	540	540	1,600	1,600			220	540
12-Apr-18	Total Coliform (MPN/100ml)	<5,000				350	170	170	350							
19-Apr-18	Total Coliform (MPN/100ml)	<5,000				2,200	400	49	1,600							

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
26-Apr-18	Total Coliform (MPN/100ml)	<5,000				2,200	1,100	49	280							
1-May-18	Total Coliform (MPN/100ml)	<5,000	1,100										450			
2-May-18	Total Coliform (MPN/100ml)	<5,000			1,600									920		
3-May-18	Total Coliform (MPN/100ml)	<5,000				1,600	920	350	1,600	1,600	1,600	1,600			3,500	3,500
10-May-18	Total Coliform (MPN/100ml)	<5,000				5,400	1,600	920	920							
17-May-18	Total Coliform (MPN/100ml)	<5,000				1,100	350	170	280							
24-May-18	Total Coliform (MPN/100ml)	<5,000				1600	170	49	3500							

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	National Surface Water Quality Guideline														
31-May-18	Total Coliform (MPN/100ml)	<5,000				16,000	540	33	5,400							
5-Jun-18	Total Coliform (MPN/100ml)	<5,000	480									1,600				
7-Jun-18	Total Coliform (MPN/100ml)	<5,000				1,600	130	79	1,600	1,600	1,600	1,600			3,500	1,600
12-Jun-18	Total Coliform (MPN/100ml)	<5,000		1,600	240								1,600		
14-Jun-18	Total Coliform (MPN/100ml)	<5,000				1,600	79	79	920						
21-Jun-18	Total Coliform (MPN/100ml)	<5,000				1,600	1,600	1,600	1,600						
29-Jun-18	Total Coliform (MPN/100ml)	<5,000													
5-Jun-18	TKN		<1.5									<1.5			

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline													
7-Jun-18	TKN					<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5			<1.5	<1.5
12-Jun-18	TKN			<2.0	<2.0								<2.0		
5-Jun-18	Chloride (mg/l)		<2.0									<2.0			
7-Jun-18	Chloride (mg/l)					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		3.9	<2.0
12-Jun-18	Chloride (mg/l)			<2.0	<2.0								<2.0		
5-Jun-18	Sulphate(mg/l)	<500	8.2									6			
7-Jun-18	Sulphate(mg/l)	<500				10.7	12.4	7.8	27.6	20.5	16.6	11.7		7.5	1.7
12-Jun-18	Sulphate(mg/l)	<500		8.5	11.5								13.9		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
5-Jun-18	Alkalinity (mg/l)		65.3										25.2			
7-Jun-18	Alkalinity (mg/l)					51.5	53.8	59.5	41.2	66.4	44.7	36.6			82.4	13.7
12-Jun-18	Alkalinity (mg/l)			50.4	57.2									36.6		
5-Jun-18	Arsenic (mg/l)	<0.01	0.0015										0.0005			
7-Jun-18	Arsenic (mg/l)	<0.01				<0.0003	0.0006	0.0004	0.0005	0.001	0.0009	0.0007			0.0006	<0.0003
12-Jun-18	Arsenic (mg/l)	<0.01		0.0009	0.0008									0.0015		
5-Jun-18	Calcium (mg/l)		8.1										2.32			

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
7-Jun-18	Calcium (mg/l)					6.37	6.27	7.11	5.33	6.48	3.96	3.67			8.84	8.03
12-Jun-18	Calcium (mg/l)			8.43	7.6									6.18		
5-Jun-18	Manganese (mg/l)	<1.0	0.188										0.056			
7-Jun-18	Manganese (mg/l)	<1.0				0.017	0.105	0.079	0.126	0.099	0.056	0.032			0.062	0.046
12-Jun-18	Manganese (mg/l)	<1.0		0.117	0.018									0.25		
5-Jun-18	Mercury (mg/l)	<0.002	0.0002										0.0002			
7-Jun-18	Mercury (mg/l)	<0.002				<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
12-Jun-18	Mercury (mg/l)	<0.002		<0.00002	<0.00002									<0.0002		
5-Jun-18	Potassium (mg/l)		1.16										0.725			
7-Jun-18	Potassium (mg/l)					1.31	0.713	0.75	0.783	0.781	0.747	0.57			0.821	0.369
12-Jun-18	Potassium (mg/l)			0.794	1.49									1.52		
5-Jun-18	Sodium (mg/l)		2.3										0.826			
7-Jun-18	Sodium (mg/l)					1.29	0.928	1.06	0.915	1.35	0.929	1.01			2.55	0.38
12-Jun-18	Sodium (mg/l)			1.09	1.09									0.751		
5-Jun-18	Total Iron (mg/l)		7.08										1.38			

	Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline													
7-Jun-18	Total Iron (mg/l)					0.064	0.792	0.665	1.07	1.02	0.721	1.75			0.712	1.41
12-Jun-18	Total Iron (mg/l)			2.85	0.057								5.38		
5-Jun-18	Phytoplankton Biomass (g dry wt/m3)		99.1									21			
7-Jun-18	Phytoplankton Biomass (g dry wt/m3)					0.82			11.4						
12-Jun-18	Phytoplankton Biomass (g dry wt/m3)			46.2	3								118		
5-Jun-18	Total Phosphorus (mg/l)		0.01									0.01			

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
7-Jun-18	Total Phosphorus (mg/l)					<0.01			<0.01							
12-Jun-18	Total Phosphorus (mg/l)			<0.01	<0.01									<0.01		
5-Jun-18	Total Dissolved Phosphorus (mg/l)		<0.01										<0.01			
7-Jun-18	Total Dissolved Phosphorus (mg/l)					<0.01			<0.01							
12-Jun-18	Total Dissolved			<0.01	<0.01									<0.01		

		Station Code	NNG01	NNG02	NNG03	NNG09	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
		Date														
Date	Parameters (Unit)	National Surface Water Quality Guideline														
	Phosphorus (mg/l)															
5-Jun-18	TOC (mg/l)		2.82										1.94			
7-Jun-18	TOC (mg/l)					2.63			4.19							
12-Jun	TOC (mg/l)			2.39	3.21									3.7		

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q2 2018

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
09-Apr-18	pH	6.0-9.0	6.94	7.61	7.55	7.44	7.52	7.47	7.46	7.12	7.15	7.97	
23-Apr-18	pH	6.0-9.0	7.03	7.48	7.58	7.25	7.44	7.27	6.99	6.91	6.84	7.18	
09-May-18	pH	6.0-9.0	7.28	7.55	7.38	7.37	7.25	7.56	7.45	7	7.15	6.84	6.95
21-May-18	pH	6.0-9.0	6.87	7.48	7.45	7.46	7.48	7.67	7.36	7.22	6.99	7.07	7.03
04-Jun-18	pH	6.0-9.0	7.15	7.71	7.7	7.46	7.48	7.32	7.63	7.08	6.78	7.55	6.72
18-Jun-18	pH	6.0-9.0	6.91	7.15	7.05	6.87	6.92	7.23	7.16	6.93	6.97	6.9	6.67
09-Apr-18	Sat. DO (%)		59.8	85.5	109.8	77.8	50.8	59.5	65.4	61.6	58.8	91.1	
23-Apr-18	Sat. DO (%)		52.6	82.2	135	57.9	41	54.2	72.3	15.3	80.9	87.5	
09-May-18	Sat. DO (%)		72.6	73.9	113.3	48.1	40.4	49.9	74.9	64.6	25.7	88.3	27.6
21-May-18	Sat. DO (%)		43	70.8	132	58.7	24.3	51	77.4	39	19.5	95.2	55.6
04-Jun-18	Sat. DO (%)		70.1	91.2	90	57.5	38.9	43.7	79	29.3	17.6	100.6	22.1
18-Jun-18	Sat. DO (%)		39.1	71.2	56.5	49.9	33.4	30.2	55.8	33	26.1	89.6	26.6
09-Apr-18	DO (mg/l)		4.61	6.49	8.6	5.67	3.98	4.36	5.08	4.7	4.42	7.17	
23-Apr-18	DO (mg/l)		3.86	5.87	10.08	4.13	3.07	3.76	5.26	1.11	5.89	6.37	
09-May-18	DO (mg/l)		5.03	5.25	8.3	3.42	2.93	3.49	5.5	4.67	1.87	6.19	1.91
21-May-18	DO (mg/l)		3.63	5.11	9.6	4.23	1.8	3.44	5.61	2.83	1.42	6.74	3.88
04-Jun-18	DO (mg/l)		5.05	6.45	6.5	3.66	2.85	2.93	5.7	2.1	1.26	7.26	1.5
18-Jun-18	DO (mg/l)		2.98	5.31	4.21	3.67	2.53	2.24	4.22	2.5	1.95	6.7	1.98
09-Apr-18	Conductivity (µS/cm)		412	672	508	1,998	850	649	350	765	502	441	
23-Apr-18	Conductivity (µS/cm)		375	652	475	1,935	774	347	276	496	912	508	
09-May-18	Conductivity (µS/cm)		312	604	401	1,737	835	709	338	1042	761	271	570
21-May-18	Conductivity (µS/cm)		386	620	432	1,761	722	709	335	837	692	255	570

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
04-Jun-18	Conductivity (µS/cm)		366	563	344	1,278	779	451	372	609	496	190.6	456
18-Jun-18	Conductivity (µS/cm)		235	307	216.3	503	302	662	216.7	490	796	105.1	340
09-Apr-18	TDS (mg/l)		206	336	254	999	425	324.5	175	382.5	251	220.5	
23-Apr-18	TDS (mg/l)		187.5	326	237.5	967.5	387	173.5	138	248	456	254	
09-May-18	TDS (mg/l)		156	302	200	868.5	417.5	354.5	169	521	380	135.5	275
21-May-18	TDS (mg/l)		193	315	216	880	361	354	167	418	346	127	285
04-Jun-18	TDS (mg/l)		183	281	172	638	389	225	186	305	248	95.3	228
18-Jun-18	TDS (mg/l)		118	158	108	251	151	331	108	295	398	52	170
09-Apr-18	Temperature (°C)		27.1	29.1	26.5	30.6	26.6	30.2	27	27.8	28.3	25.9	
23-Apr-18	Temperature (°C)		29.5	31.3	28.7	31.7	28.8	32.9	30.3	30.1	30.1	29.8	
09-May-18	Temperature (°C)		31.5	31.6	29.9	31.8	30.8	32.6	29.9	30.6	30.3	32.2	32.4
21-May-18	Temperature (°C)		27.9	30.3	30.3	31.2	29.1	34.9	30.6	30.4	30.8	31.6	33
04-Jun-18	Temperature (°C)		30.6	31	30.6	31.8	29.9	35	30.8	30.8	30.9	30.2	34.9
18-Jun-18	Temperature (°C)		27.5	28.6	28.6	28.4	28	29	27.9	27.7	28.5	28	29
09-Apr-18	Turbidity (NTU)		0.57	9.18	8.88	11.5	35.9	21.4	3.59	17	14	8.63	
23-Apr-18	Turbidity (NTU)		1.01	14.4	9.19	26.8	54.1	21.5	7.66	33	15.4	5.66	
09-May-18	Turbidity (NTU)		1.18	10.08	9.97	36.8	30.9	22.8	5.4	22.9	9.68	6.39	13.4
21-May-18	Turbidity (NTU)		0.58	5.58	3.29	33.7	34.7	15.1	4.9	30.6	37.6	6.59	38.5
04-Jun-18	Turbidity (NTU)		0.66	17	7.08	22.6	30.9	8.56	3.59	22	18.3	11.7	12.7
18-Jun-18	Turbidity (NTU)		1.45	19.19	51.82	35.79	30.74	35.9	9.86	36.41	66	58.98	29.14
09-Apr-18	TSS (mg/l)	<50	<5	6.03	14.61	33.15	25.88	79.34	<5	38.75	23.22	19.1	
23-Apr-18	TSS (mg/l)	<50	<5	5.24	23.65	35.25	25.76	68.61	<5	23.48	30	7.78	
09-May-18	TSS (mg/l)	<50	<5	6.34	6.75	26.11	20.18	58.94	7.23	46.1	14.24	8.24	17.88
21-May-18	TSS (mg/l)	<50	<5	7.17	16.15	39.02	18.92	41.8	10.68	31.63	44.02	7.69	31.6
04-Jun-18	TSS (mg/l)	<50	<5	7.96	27.61	31.4	29.14	26.54	10.66	46.02	31.51	20.81	21.26

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
18-Jun-18	TSS (mg/l)	<50	<5	5.85	38.72	33.53	20.23	54.49	6.96	23.48	35.19	67.37	25
09-Apr-18	BOD5 (mg/l)	<30	6.48	<6	<6	<6	<6	<6	<6	156.3	79.65	<6	
23-Apr-18	BOD5 (mg/l)	<30	7.2	<6	17.46	<6	18.72	43.05	48	124.8	<6	<6	
09-May-18	BOD5 (mg/l)	<30	<6	<6	<6	<6	<6	<6	7.08	<6	<6	<6	<6
21-May-18	BOD5 (mg/l)	<30	<6	<6	<6	<6	47.88	<6	27	48.7	45.06	<6	<6
04-Jun-18	BOD5 (mg/l)	<30	8.61	7.68	15.18	<6	<6	<6	<6	112.35	112.95	<6	34.44
18-Jun-18	BOD5 (mg/l)	<30	<6	<6	11.94	<6	<6	<6	6.57	94.28	111.75	<6	26.16
09-Apr-18	COD (mg/l)	<125	<25	39.4	42.4	102	116	163	<25	290	139	50.8	
23-Apr-18	COD (mg/l)	<125	<25	35.9	54.6	98.4	122	116	<25	194	158	<25	
09-May-18	COD (mg/l)	<125	<25	38.1	32.5	96.8	80.7	100	27.9	160	53	<25	33.8
21-May-18	COD (mg/l)	<125	<25	32.6	38.6	113	95.2	103	28.4	276	242	<25	34
04-Jun-18	COD (mg/l)	<125	<25	39	38.2	76	95.2	62.4	31.4	263	177	<25	25.6
18-Jun-18	COD (mg/l)	<125	<25	<25	<25	49.8	46.2	95.2	<25	180	171	25.2	<25
09-Apr-18	NH3-N (mg/l)	<10	11.1	10.5	6.5	29.8	45.9	27.1	5.9	24.5	25	12.6	
23-Apr-18	NH3-N (mg/l)	<10	8.2	17.5	13.3	23.9	48	25.9	3.5	25.4	1.6	17.6	
09-May-18	NH3-N (mg/l)	<10	3.2	5.6	19.4	19.2	34.3	21.6	5.2	19.4	6.6	10.8	6.6
21-May-18	NH3-N (mg/l)	<10	10.2	18	10.7	42.9	43.6	36.2	7.3	30.2	19.5	2.6	8.5
04-Jun-18	NH3-N (mg/l)	<10	5.7	16.9	7.7	18.3	32.9	20	5.8	20.8	10.5	5.1	9.2
18-Jun-18	NH3-N (mg/l)	<10	5.2	13.6	5.5	7.4	11.5	14.7	11.4	16.6	11.6	1.4	9.4
09-Apr-18	Total Nitrogen (mg/l)	<10	15.9	13	11.5	30.8	46.6	27.5	6.18	25.3	25.5	13.5	
23-Apr-18	Total Nitrogen (mg/l)	<10	16.9	20.7	16.6	26.5	49.1	26.4	14.5	30.4	17.9	19.2	
09-May-18	Total Nitrogen (mg/l)	<10	13.4	19.3	21.6	20.3	34.9	22.2	7.67	22.9	16	11.5	23.2
21-May-18	Total Nitrogen (mg/l)	<10	15.8	19.1	12.6	43.6	44.8	37.4	9.84	30.9	20.8	8.29	25

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
04-Jun-18	Total Nitrogen (mg/l)	<10	12.7	17	8.89	22.6	33.8	35.1	8.37	21.1	10.8	8.28	25.2
18-Jun-18	Total Nitrogen (mg/l)	<10	14.1	17.3	11.8	16.3	21	15.2	12.1	30.8	19.5	7.12	24
09-Apr-18	Total Phosphorus (mg/l)	<2.0	0.96	0.61	0.82	0.5	0.8	0.79	0.53	0.58	0.46	0.74	
23-Apr-18	Total Phosphorus (mg/l)	<2.0	1.08	1.11	1.08	0.05	0.74	1.19	0.3	0.91	0.98	0.11	
09-May-18	Total Phosphorus (mg/l)	<2.0	0.65	0.95	0.78	0.74	1.2	1	0.51	0.94	0.8	0.52	0.1
21-May-18	Total Phosphorus (mg/l)	<2.0	0.83	0.86	0.85	0.83	1.19	1.08	0.69	1.15	0.81	0.45	0.1
04-Jun-18	Total Phosphorus (mg/l)	<2.0	0.77	0.96	0.74	0.68	1.28	0.81	0.65	1.05	0.78	0.44	0.14
18-Jun-18	Total Phosphorus (mg/l)	<2.0	0.54	0.62	0.57	0.27	0.47	0.66	0.39	0.8	0.69	0.21	0.14
09-Apr-18	Faecal Coliform (MPN/100 ml)		27	0	0	0	0	0	0	5400	14000	0	
23-Apr-18	Faecal Coliform (MPN/100 ml)		2	0	0	0	4.5	1600	0	16000	0	2	
09-May-18	Faecal Coliform (MPN/100 ml)		17	0	0	0	0	0	4.5	0	0	0	0
21-May-18	Faecal Coliform (MPN/100 ml)		4.5	4.5	17	0	1600	0	22	49	23	0	0
04-Jun-18	Faecal Coliform (MPN/100 ml)		33	0	4	0	0	0	0	5400	3500	0	130
18-Jun-18	Faecal Coliform (MPN/100 ml)		33	0	920	0	0	0	920	0	23	4.5	0
09-Apr-18	Total Coliform (MPN/100 ml)	<400	79	0	0	0	0	0	0	16000	22000	0	
23-Apr-18	Total Coliform (MPN/100 ml)	<400	110	0	11	0	23	1600	0	16000	0	4.5	
09-May-18	Total Coliform (MPN/100 ml)	<400	110	0	0	0	0	0	11	0	0	0	0

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
21-May-18	Total Coliform (MPN/100 ml)	<400	33	7.8	130	0	1600	0	240	49	23	0	0
04-Jun-18	Total Coliform (MPN/100 ml)	<400	94	4	14	0	0	0	0	5400	9200	0	170
18-Jun-18	Total Coliform (MPN/100 ml)	<400	350	0	1600	0	0	0	1600	0	23	9.3	9.2
09-Apr-18	Oil & Grease (mg/l)	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
09-Apr-18	Residual Chlorine (mg/l)	<1.0		1.22	1.99	1.22	0.64	0	0.25	0	0	1.71	
23-Apr-18	Residual Chlorine (mg/l)	<1.0		1.58	0.18	1.98	0.6	0	0.5	0	0.92	0.24	
09-May-18	Residual Chlorine (mg/l)	<1.0		0.5	0.23	0.54	0.74	1.53	0.14	1.24	0.83	0.34	0.73
21-May-18	Residual Chlorine (mg/l)	<1.0		0.32	0.21	1.82	0.1	2.1	0.11	0.56	0.88	1.07	1.32
04-Jun-18	Residual Chlorine (mg/l)	<1.0		0.18	0.07	1.06	0.76	1.06	0.28	0	0	0.32	0.08
18-Jun-18	Residual Chlorine (mg/l)	<1.0		0.61	0.07	0.4	1.7	2.1	0.11	0.12	0.5	0.31	0.07
09-Apr-18	Chlorination Dosing Rate (ml/mn)			230	98	150	320	3.1	320	3.1			
23-Apr-18	Chlorination Dosing Rate (ml/mn)			370	80	360	130	3.1	40	3.1		45	
09-May-18	Chlorination Dosing Rate (ml/mn)			290	195	125	480	3.1	54	3.1		85	3.1
21-May-18	Chlorination Dosing Rate (ml/mn)			135	33	76	835	3.1	76	3.1		12	3.1
04-Jun-18	Chlorination Dosing Rate (ml/mn)			280	290	180	70	3.1	47	3.1	2	20	3.1
18-Jun-18	Chlorination Dosing Rate (ml/mn)			555	183	83	1000	3.1	60	3.1	23	70	3.1
09-Apr-18	Effluent Discharge Volume (L/mn)		12	20	2.4	30	60	4.2	12	4.2	2		

		Site Name	Owner's Site Office and Village	Obayashi Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	HM Main Camp	IHI Camp	Kenber Camp	Lilama10 Camp
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16	EF17
Date	Parameter (Unit)	Guideline in the CA											
23-Apr-18	Effluent Discharge Volume (L/mn)		12	20	4	20	60	4.2	6	4.2	12	1	
09-May-18	Effluent Discharge Volume (L/mn)		30	20	12	20	30	4.2	0	4.2		0	4.2
21-May-18	Effluent Discharge Volume (L/mn)		12	30	3	30	30	4.2	6	4.2	3	4	4.2
04-Jun-18	Effluent Discharge Volume (L/mn)		25	12	0	30	30	4.2	0	4.2	3	0	4.2
18-Jun-18	Effluent Discharge Volume (L/mn)		30	12	6	20	12	4.2	6	4.2	7.5	3	4.2

APPENDIX 5-3: EFFLUENT CONSTRUCTION AREA DISCHARGED MONITORING RESULTS – Q2 2018

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	**Site Name**	**Station Code**	**CA Guideline**	**6.0 - 9.0**							**<50**	**<10**
6-Apr-18	Aggregate Crushing Plant	DS02		8.46	100	7.53	123	62	28.3	12.54	38.73	<1
12-Apr-18	Aggregate Crushing Plant	DS02										
19-Apr-18	Aggregate Crushing Plant	DS02										
26-Apr-18	Aggregate Crushing Plant	DS02										
3-May-18	Aggregate Crushing Plant	DS02		6.65	115.3	7.93	267	133.5	33.8	14.1	27.98	
6-Apr-18	Spoil Disposal No.2	DS04		6.31	62.7	4.92	93.3	46.5	26.7	25.5	51.68	<1
12-Apr-18	Spoil Disposal No.2	DS04		6.9	69.3	5.22	70.2	35	28.1	13.6	9.3	
19-Apr-18	Spoil Disposal No.2	DS04		6.31	63.1	4.93	117.3	57.5	26.4	89	536.25	
26-Apr-18	Spoil Disposal No.2	DS04		6.25	48.6	3.6	86.2	43	29.1	19.1	26.29	
3-May-18	Spoil Disposal No.2	DS04		6.06	49.8	3.77	58.4	28.8	28	48.2	72.64	
10-May-18	Spoil Disposal No.2	DS04		6.21	48.8	3.66	72.9	36	28.5	20.3	34.02	

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	**Site Name**	**Station Code**	**CA Guideline**	**6.0 - 9.0**							**<50**	**<10**
17-May-18	Spoil Disposal No.2	DS04		6.38	37.6	2.91	50.9	25	26.8	17.8	40.38	
24-May-18	Spoil Disposal No.2	DS04		6.18	41.4	3.13	67	33	28.1	18.3	24.41	
31-May-18	Spoil Disposal No.2	DS04		6.92	60.1	4.78	33	16	25.4	16.9	23.57	
8-Jun-18	Spoil Disposal No.2	DS04		6.63	64.3	4.9	29.4	14	27.6	19.1	42.09	
14-Jun-18	Spoil Disposal No.2	DS04		6.7	100.5	7.42	226	113	29.1	105.12	74.73	
21-Jun-18	Spoil Disposal No.2	DS04		7.51	86.9	6.55	18.34	9	28.1	34.17	19.36	
29-Jun-18	Spoil Disposal No.2	DS04		7.85	80.3	6.2	17.96	8.5	27	64.6	40	
6-Apr-18	RCC Plant Discharged at lower ponds	DS09		6.5	59	4.6	287	148.5	26.9	54.3	109.62	<1
19-Apr-18	RCC Plant Discharged at lower ponds	DS09		7.54	80.5	6.08	277	138	28.5	17.9	50.25	
26-Apr-18	RCC Plant Discharged at lower ponds	DS09		7.7	92.9	7.15	379	189.5	27.4	19.5	38.49	

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	**Site Name**	**Station Code**	**CA Guideline**	**6.0 - 9.0**							**<50**	**<10**
3-May-18	RCC Plant Discharged at lower ponds	DS09		8.8	167.2	10.97	216.1	108	30.7	36.6	73.53	
6-Apr-18	Main Dam's Treatment Plant No.2	DS12		6.79	99.4	7.28	948	474	30.3	12.3	44.5	
12-Apr-18	Main Dam's Treatment Plant No.2	DS12		7.42	100.1	7.28	1188	594	30.2	2.6	24.71	
19-Apr-18	Main Dam's Treatment Plant No.2	DS12		6.97	99.2	7.31	2620	1310	29.7	8	167.65	
26-Apr-18	Main Dam's Treatment Plant No.2	DS12		8.73	101.5	7.3	439	219	31.1	10.13	95.55	
3-May-18	Main Dam's Treatment Plant No.2	DS12		7.04	100.7	7.05	593	296.5	32.8	9.66	47.8	
10-May-18	Main Dam's Treatment Plant No.2	DS12		6.42	98.3	6.95	850	425	32	11.07	24.05	
12-Apr-18	Main Dam's Treatment Plant No.3	DS14		7.59	100.4	7.39	504	252	29.6	13.5	29.8	

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	**Site Name**	**Station Code**	**CA Guideline**	**6.0 - 9.0**							**<50**	**<10**
19-Apr-18	Main Dam's Treatment Plant No.3	DS14		8.03	94.6	7.03	846	423	29.3	27.5	69.94	
26-Apr-18	Main Dam's Treatment Plant No.3	DS14		7.38	97.9	7.12	1,124	562	30.5	1.76	6.34	
10-May-18	Main Dam's Treatment Plant No.3	DS14		7.65	94.6	6.76	223	111	31.4	12.87	7.41	<1
17-May-18	Main Dam's Treatment Plant No.3	DS14		7.55	95.9	7.09	983	491	29.4	20.8	64.48	
24-May-18	Main Dam's Treatment Plant No.3	DS14		8.01	109.3	7.74	164.5	82	31.9	5.41	7.58	
31-May-18	Main Dam's Treatment Plant No.3	DS14		7.59	101.6	7.47	249	124.5	29.9	6.84	15.9	
8-Jun-18	Main Dam's Treatment Plant No.3	DS14		8.97	102.6	7.81	157.9	79	27.8	31.7	97	
14-Jun-18	Main Dam's Treatment Plant No.3	DS14		6.7	80.4	6.49	29.9	15	26.4	78.55	127.37	

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	**Site Name**	**Station Code**	**CA Guideline**	**6.0 - 9.0**							**<50**	**<10**
21-Jun-18	Main Dam's Treatment Plant No.3	DS14		6.61	100.9	7.13	140.6	70	32	29.4	34.5	
29-Jun-18	Main Dam's Treatment Plant No.3	DS14		7.9	99.4	7.77	36.7	18.3	26.4	10.42	9.51	

APPENDIX 5-4: GROUNDWATER QUALITY MONITORING RESULTS – QUARTER -Q2 2018

Month Year	Parameter (Unit)	Site Name	Somseun Village		NamPa Village	ThongNoy Village	Pou Village
		Station	GSXN01	GSXN02	GNPA01	GTHN01	GPOU01
		National Groundwater Quality Guideline					
25-Apr-18	pH	6.5 - 9.2	6.99	6.87	6.94	7.02	
14-May-18	pH	6.5 - 9.2	6.99	6.9	7.73	6.9	
05-Jun-18	pH	6.5 - 9.2					6.23
20-Jun-18	pH	6.5 - 9.2	7.36		7.15	7.14	
25-Apr-18	Sat. DO (%)		50.4	29.5	38	18.5	
14-May-18	Sat. DO (%)		40.3	27.3	87.6	25.5	
05-Jun-18	Sat. DO (%)						88.3
20-Jun-18	Sat. DO (%)		82.4		92.6	83.4	
25-Apr-18	DO (mg/l)		3.78	2.21	2.84	1.38	
14-May-18	DO (mg/l)		3.02	2.03	6.51	1.92	
05-Jun-18	DO (mg/l)						6.71
20-Jun-18	DO (mg/l)		6.37		7.11	6.27	
25-Apr-18	Conductivity (µS/cm)		156.3	288	214.8	325	
14-May-18	Conductivity (µS/cm)		106	255	323	226	
05-Jun-18	Conductivity (µS/cm)						22.2
20-Jun-18	Conductivity (µS/cm)		304		303	312	
25-Apr-18	TDS (mg/l)		78	144	107	162	
14-May-18	TDS (mg/l)		53	127	161	113	
05-Jun-18	TDS (mg/l)						11.1
20-Jun-18	TDS (mg/l)		152		151.5	156	

Month Year	Parameter (Unit)	Site Name	Somseun Village		NamPa Village	ThongNoy Village	Pou Village
		Station	GSXN01	GSXN02	GNPA01	GTHN01	GPOU01
		National Groundwater Quality Guideline					
25-Apr-18	Temperature (°C)		29.1	29.2	29.3	29.2	
14-May-18	Temperature (°C)		29	29.3	29.3	28.8	
05-Jun-18	Temperature (°C)						27.1
20-Jun-18	Temperature (°C)		27.3		27.6	28.8	
25-Apr-18	Turbidity (NTU)	<20	1.66	3.47	1.8	9.18	
14-May-18	Turbidity (NTU)	<20	0.9	1.86	0.75	0.46	
05-Jun-18	Turbidity (NTU)	<20					3.48
20-Jun-18	Turbidity (NTU)	<20	2.41		0.95	3.53	
25-Apr-18	Fecal coliform (MPN/100ml)	0	0	0	0	4.5	
14-May-18	Fecal coliform (MPN/100ml)	0	0	0	0	79	
05-Jun-18	Fecal coliform (MPN/100ml)	0					0
20-Jun-18	Fecal coliform (MPN/100ml)	0	0		350	280	
25-Apr-18	E.coli Bacteria (MPN/100ml)	0	0	0	0	4.5	
14-May-18	E.coli Bacteria (MPN/100ml)	0	0	0	0	22	
05-Jun-18	E.coli Bacteria (MPN/100ml)	0					0
20-Jun-18	E.coli Bacteria (MPN/100ml)	0	0		350	280	
20-Jun-18	Arsenic (mg/)	<0.05	<0.0003		<0.0003	<0.0003	
20-Jun-18	Total Iron (mg/l)		<0.010		<0.010	0.104	
20-Jun-18	Magnesium (mg/l)		3.14		2.28	3.23	
20-Jun-18	Manganese (mg/l)	<0.5	<0.005		<0.005	<0.005	
20-Jun-18	Fluoride (mg/l)	<1	<0.02		<0.02	0.06	
20-Jun-18	Total hardness (mg/l)	<500	184		163	179	

Month Year	Parameter (Unit)	Site Name	Somseun Village		NamPa Village	ThongNoy Village	Pou Village
		Station	GSXN01	GSXN02	GNPA01	GTHN01	GPOU01
		National Groundwater Quality Guideline					
20-Jun-18	Nitrate (mg/l)	<45	0.93		0.84	1.15	
20-Jun-18	Nitrite (mg/l)	<3	<0.02		<0.02	<0.02	
20-Jun-18	Lead (mg/l)	<0.05	<0.008		<0.008	<0.008	

APPENDIX 5-5: GRAVITY FED WATER SUPPLY MONITORING RESULTS – Q2 2018

		Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	National Drinking Water Quality Standard					
25-Apr-18	pH	6.5 - 8.6	7.59	7.6	8.1	7.94	7.95
14-May-18	pH	6.5 - 8.6	7.73	7.58	7.9	7.52	7.81
20-Jun-18	pH	6.5 - 8.6	6.78	7.32	7.31	7.04	7.5
25-Apr-18	Sat. DO (%)		91.3	99.9	94	91.7	94.7
14-May-18	Sat. DO (%)		93.4	87	99.5	99.2	100.6
20-Jun-18	Sat. DO (%)		90.1	95.3	99.5	89.4	84.9
25-Apr-18	DO (mg/l)		6.81	7.39	7.54	7.04	7.11
14-May-18	DO (mg/l)		6.57	6.03	7.21	7.15	7.25
20-Jun-18	DO (mg/l)		7.00	7.45	7.84	7.08	6.69
25-Apr-18	Conductivity (µS/cm)	<1,000	57.3	79.2	20.72	23.6	23.34
14-May-18	Conductivity (µS/cm)	<1,000	55.9	81.6	23.1	17	14.07
20-Jun-18	Conductivity (µS/cm)	<1,000	30.8	44.9	17.24	33.3	11.28
25-Apr-18	TDS (mg/l)	<600	28	39	11	12	11
14-May-18	TDS (mg/l)	<600	22.5	40	11	8.5	7
20-Jun-18	TDS (mg/l)	<600	15	22	9	17	6
25-Apr-18	Temperature (°C)	<35	29.3	29.9	25.1	27.6	28.8

		Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	National Drinking Water Quality Standard					
14-May-18	Temperature (°C)	<35	32.6	30.6	30.8	31.2	31.1
20-Jun-18	Temperature (°C)	<35	27	26.6	26.1	25.8	26.2
25-Apr-18	Turbidity (NTU)	<10	12.2	4.82	0.91	1.17	1.54
14-May-18	Turbidity (NTU)	<10	0.75	0.8	0.49	0.5	0.52
20-Jun-18	Turbidity (NTU)	<10	9.94	14	1.46	5.52	6.17
25-Apr-18	Faecal Coliform (MPN/100ml)	0	9.3	79	33	79	33
14-May-18	Faecal Coliform (MPN/100ml)	0	33	240	170	11	13
20-Jun-18	Faecal Coliform (MPN/100ml)	0	240	1,600	39	1,600	1,600
25-Apr-18	E.coli Bacteria (MPN/100ml)	0	9.3	79	33	49	33
14-May-18	E.coli Bacteria (MPN/100ml)	0	22	27	33	7.8	11
20-Jun-18	E.coli Bacteria (MPN/100ml)	0	240	1,600	39	1,600	1,600

		Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	National Drinking Water Quality Standard					
20-Jun-18	Arsenic (mg/l)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
20-Jun-18	Cadmium (mg/l)	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002
20-Jun-18	Iron (mg/l)		0.161	0.127	0.0565	0.183	0.137
20-Jun-18	Lead (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20-Jun-18	Magnesium (mg/l)		0.756	1.09	0.271	0.394	0.372
20-Jun-18	Manganese (mg/l)	<0.5	0.0661	<0.005	<0.005	<0.005	<0.005
20-Jun-18	Fluoride (mg/l)	<1.5	<0.02	0.18	0.04	0.04	<0.02
20-Jun-18	Nitrate (mg/l)	<50	0.49	0.18	0.35	0.53	0.44
20-Jun-18	Nitrite (mg/l)	<3	<0.02	<0.02	<0.02	<0.02	<0.02
20-Jun-18	Total hardness (mg/l)	<300	32.5	36.6	22.8	21.1	19.4
20-Jun-18	Selenium (mg/l)	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
20-Jun-18	Mercury (mg/l)	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

APPENDIX 5-6: LANDFILL LEACHATE MONITORING RESULTS – Q2 2018

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Effluent Standards (CA)							
30-May-18	pH	6.0-9.0				8.41			
15-Jun-18	pH	6.0-9.0				7.34			6.81
30-May-18	Sat. DO (%)					134.7			
15-Jun-18	Sat. DO (%)					118			65
30-May-18	DO (mg/l)					9.30			
15-Jun-18	DO (mg/l)					8.74			4.85
30-May-18	Conductivity (µS/cm)					196.7			
15-Jun-18	Conductivity (µS/cm)					218.2			83.3
30-May-18	TDS (mg/l)					98			
15-Jun-18	TDS (mg/l)					109			41.5
30-May-18	Temperature (°C)					33.1			
15-Jun-18	Temperature (°C)					29			28.8
30-May-18	Turbidity (NTU)					5.18			

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Effluent Standards (CA)							
15-Jun-18	Turbidity (NTU)					12.14			1.39
30-May-18	BOD (mg/l)	<30				3.81			
15-Jun-18	BOD (mg/l)	<30				4.29			1.54
30-May-18	COD (mg/l)	<125							
15-Jun-18	COD (mg/l)	<125				66			<25
30-May-18	Faecal Coliform (MPN/100ml)					2			
15-Jun-18	Faecal Coliform (MPN/100ml)					79			33
30-May-18	Total Coliform (MPN/100ml)	<400				49			
15-Jun-18	Total Coliform (MPN/100ml)	<400				350			49
15-Jun-18	Mercury (mg/l)					<0.0005			<0.0005
15-Jun-18	Total nitrogen (mg/l)	<10				3.65			0.71
15-Jun-18	Arsenic (mg/l)					0.0016			<0.0003
15-Jun-18	Manganese (mg/l)					0.252			0.142

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Effluent Standards (CA)							
15-Jun-18	Lead (mg/l)	<0.2				<0.010			<0.010
15-Jun-18	Iron (mg/l)					0.524			0.166
15-Jun-18	Total Petroleum Hydrocarbons (mg/l)					<1			<1

APPENDIX 5-7: LANDFILL GROUNDWATER QUALITY MONITORING RESULTS – Q2 2018

Parameter (Unit)	Groundwater Quality Standard (mg/L)	NNP1PC Landfill				Houay Soup Landfill
		MW1	MW2	MW3	MW4	MW5
		15-Jun-18	15-Jun-18	15-Jun-18	15-Jun-18	15-Jun-18
pH		5.63	6.47	6.19	5.22	6.14
Sat. DO (%)		23.5	47.1	14.3	25.8	48.4
DO (mg/l)		1.82	3.55	1.11	2.03	3.74
Conductivity (µS/cm)		107	126.3	156.9	28.2	68.4
TDS (mg/l)		53.5	63	78.4	41.1	34.2
Temperature (°C)		26.5	28.5	26.6	25.9	26.9
Turbidity (NTU)		6.7	5.59	2.90	20.12	14.64
Total Nitrogen (mg/l)		3.06	1.87	2.66	4.56	1.68
Lead (mg/l)	0.01	0.226	0.062	0.072	0.118	0.190
Total Phosphorus (mg/l)		0.02	0.03	0.10	0.02	0.03
Faecal Coliform (MPN/100ml)		0	0	2	0	0
Total Coliform (MPN/100ml)		0	0	2	0	0
NH_3-N (mg/l)		2.90	1.76	2.52	4.34	1.43
Copper (mg/l)	1.0	0.005	0.008	0.006	<0.003	<0.003
Total Petroleum (mg/l)		<1.0	<1.0	<1.0	<1.0	<1.0
Water level (m)		28	30	18	15	15