NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environment Monitoring Report

Third Quarter of 2017

July to September 2017

REV	DATE	PREPARED	REVIEWED	APPROVED	MODIFICATION DETAILS
A	06 February 2018				Final
A1	27 December 2017				ADB Review
A0	16 December 2017	Viengkeo Phetnavongxay	Peter G. Jensen	Vilayhak Somsoulivong	LTA Review

Accessibility	
☑	Public
☐	Internal
☐	Confidential

Document No.

NNP1-C-J0905-RP-011-A

Table of Contents

Tables

Figures

ABBREVIATIONS / ACRONYMS

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
DEQP	Department of Environment and Quality Promotion, MONRE
DESIA	Department of Environmental and Social Impact Assessment, MONRE
DFRM	Department of Forest Resources Management, MONRE
EC	Electrolytic Conductivity
EDL	Electricite du Laos
EGAT	Electricity Generating Authority of Thailand
EGATi	EGAT International Company Limited
EIA	Environmental Impact Assessment
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
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
ISP	Intergraded Spatial Planning
kV	kilo-Volt
LTA	Lender's Technical Advisor

MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines, Lao PDR
MOF	Ministry of Finance, Lao PDR
MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
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
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Waste Water Treatment System

1 EXECUTIVE SUMMARY

The quarterly environment monitoring reports of Nam Ngiep 1 Hydropower Project provide information and analysis of compliance with the Project's environmental and social obligations stipulated in the Concession Agreement between the Nam Ngiep 1 Power Company and the Government of Lao PDR, 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).

The ESMMP-CP was completed and submitted to the Ministry of Natural Resources and Environment (MONRE) at the end of May 2017. MONRE has confirmed that they have no further comments and that no additional actions are required from NNP1PC. MONRE will issue an official letter of approval.

During Q3 2017, NNP1PC-EMO received 22 SS-ESMMPs, two annexes of Detailed Work Plans and four as-built drawings of the wastewater treatment system improvements at selected contractor camps. Out of these, 19 SS-ESMMPs, four as-built drawings and one annex of DWP were approved, three SS-ESMMPs and one annex of DWP are under review and will be carried over to Q4 2017.

During Q3 2017, EMO conducted bi-weekly and weekly follow-up inspections of 34 construction sites and camps including temporary camps at Phouhomxay Village (previously called Houay Soup Resettlement Area) and the 230 kV Transmission Line. A total of 24 Observations of Non-Compliances (ONC), three Non-Compliance Level-1 (NCR1), two Non-Compliance level-2 (NCR2), one Non-Compliance level-3 (NCR3) were active during the reported period. Out of these, 10 ONCs, two NCR1, one NCR2 and one NCR3 were carried over from the previous Quarter; 14 ONC, two NCR1 and one NCR2 were newly issued. A total of six ONCs and two NCR2 could not be resolved in this Quarter and will be carried forward into Q4 2017.

During Q3 2017, significant improvements were made to the wastewater treatment plants at the camps in the construction area resulting in compliance with the most critical pollutants at the end of the Quarter. NNP1PC will continue to supervise and monitor the performance of the treatment plants in Q4 2017 and onwards to ensure that the plants stay in compliance.

Following a lengthy and effortful period gradually designing, testing and implementing measures to reduce the content of suspended solids in the discharges from the aggregate crushing plant and the RCC batching plant, the improvements have finally resulted in sustained compliance with the relevant standard.

During Q3 2017, an approximate 491.4 m^3 of solid waste was disposed of at the Houay Soup Landfill. A contractor is being hired to collect waste at Phouhomxay Village and two host villages and to operate the Houay Soup Landfill. The procurement is expected to be completed in October 2017.

Immediately after the failure of the Nam Ao Dam located in the upper Nam Ngiep catchment, NNP1PC undertook additional monitoring of water quality and fisheries in the Nam Ngiep River at the construction area. The dam break resulted in extremely high concentrations of suspended solids and widespread fish kill.

A technical workshop to discuss the draft NNP1 Watershed Management Plan (WMP) with relevant GOL counterparts was conducted from 26-27 September 2017. The workshop provided

minor suggestions and recommendations for further improvements to the plan. The presentation of the revised plan for final approval is expected to take place in December 2017. Following the approval, a detailed annual work plan for 2018 will be prepared.

NNP1PC and ADB held a technical workshop on the draft No Net Loss Proposal prepared by NNP1PC on 25-26 September 2017. It was agreed that NNP1PC should further improve the proposal based on the discussions at the meeting and additional technical comments from ADB's biodiversity experts. The proposal is expected to be finalized in December 2017.

While the biomass clearance continues to progress for stockpiling and burning, a total area of 149.95 ha was reported as fully completed, the area will be further certified by NNP1PC.

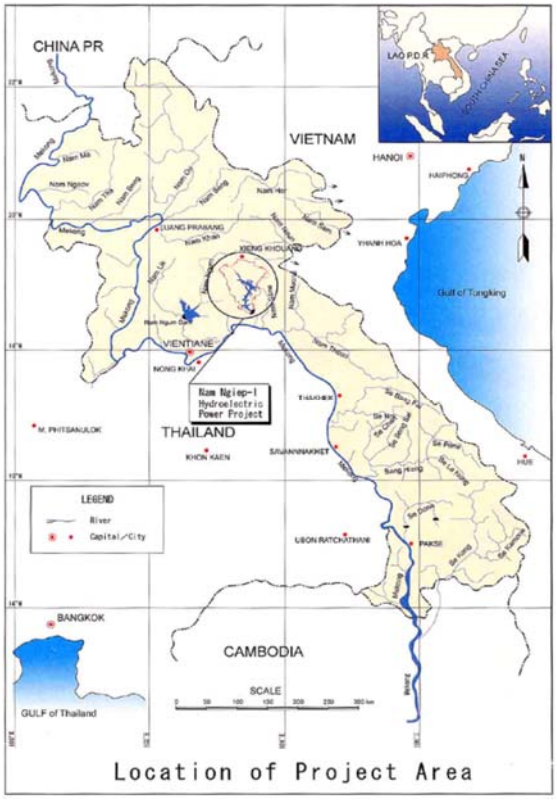
The fishery monitoring programme has continued as planned, and in addition, a rapid data field inspection was undertaken immediately following the Nam Ao Dam break to assess the fish kill that ensued. NNP1PC will prepare a separate report about the impacts on water quality, fish and properties of Project Affected Persons.

The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 2.0 kg/household/day in August 2017. The estimated total fish catch in Nam Ngiep basin for August 2017 is 58,800 kg. Around 25 % of the catch was sold, 68% was consumed fresh, 5% processed and approximately 2% was used for other purposes.

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 district in Bolikhamxay Province ***(Figure. 2-1)***.

FIGURE 2-1: LOCATION MAP



The project will consist of two dams. The main dam which is located 9.0 km upstream of Hat Gniun Village in Bolikhan District, will create a 67-km-long, narrow reservoir that extends up the Ngiep Valley as far as Thathom District. At almost 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 and about 19 MW at the Re-Regulation dam for domestic use. With a combined capacity of 290 MW, Nam Ngiep 1 will generate around 1,620 GWh of electricity annually. Two transmission lines will be required to transport the electricity generated by the project. From the main power station, a 230-kV line will run for 125 km to the Nabong outside Vientiane Capital. A 115-kV transmission line will be constructed by EDL from the Re-regulation Power Station to Pakxan substation over a distance of 40 km.

The Q3 2017 Environment Report provides a summary of environmental monitoring activities and mitigation actions during 01 July to 30 September 2017. It is prepared by the Environmental Management Office (EMO) and reviewed and cleared by senior technical staff and management, follow by the review of the Lender's Technical Adviser prior to publishing on the Company website (https://namngiep1.com/) and submitting the report to the Government of Lao PDR (GOL), its lenders and all monitoring agencies.

All construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are also publicly disclosed on the Company website in line with the ADB and GOL Public Disclosure Policies.

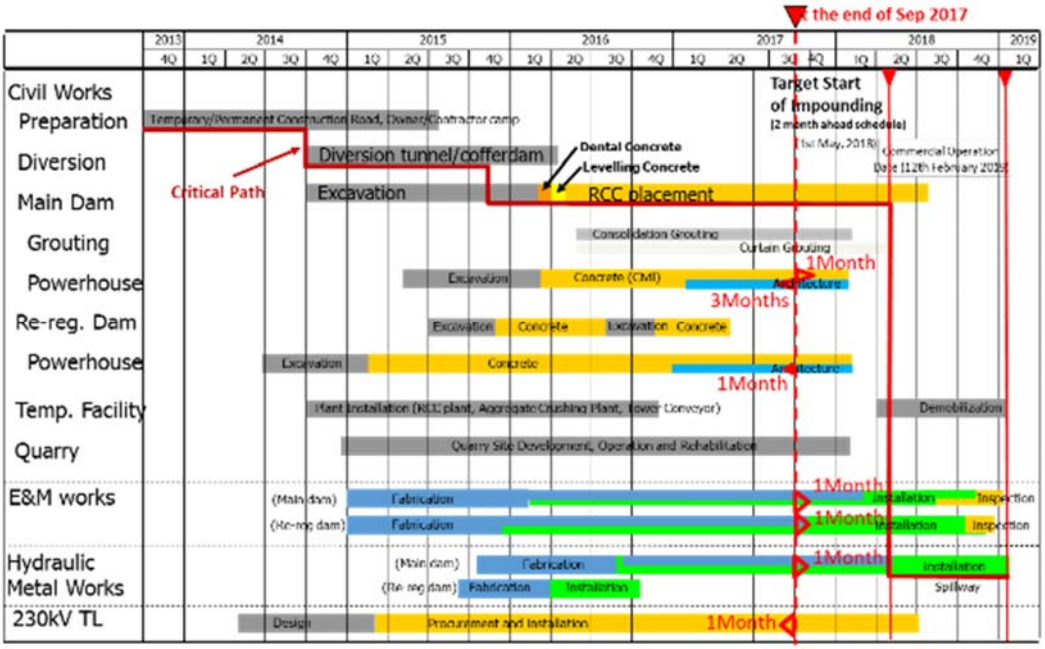
3 CONSTRUCTION PROGRESS

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 September 2017 was 84.1 % (compared to planned progress of 85.5 %), based on achieved Interim Milestone Payments for all Contracts excluding the

value of Advance Payments, varied works and other adjustments allowed under each Contract. In terms of the value of actual work done the percentage is understated since work completed, but not paid, is not included.

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

The cumulative actual work progress of the Civil Works until the end of September 2017 was 85.3 % (compared to planned progress of 84.0 %) calculated in the same manner as described above for the value of achieved Interim Milestone Payments excluding advance payment.

3.2 MAIN DAM AND POWER HOUSE

After starting the main dam excavation works in October 2014 on the left bank, the works were about one month advanced when diversion of the Nam Ngiep River was achieved at the end of October 2015. However, excavated volumes were 20% greater than expected and part of this additional work is necessary to construct a 'shear key' structure due to the weak layers of rock encountered in the dam foundation. Following the efforts on Site, the additional excavation work was completed at the end of February 2016.

FIGURE 3-2: MAIN DAM AND POWERHOUSE FROM OVERHEAD LOOKING UPSTREAM

The consolidation drilling and grouting for the main dam started in May 2016 and is ongoing. The progress is 93 % by achievement of total anticipated drilled length as of the end of June 2017 as a proportion of the total expected drilling.

TABLE 3-1: PROGRESS OF CONSOLIDATION AND CURTAIN DRILLING FOR GROUTING AS OF 30 SEPTEMBER 2017

Item	Description	Total Drilling (m)	Completed (m)	Progress (%)
Consolidation Grouting	Anticipated Quantity	17,769	16,554	93
Curtain Grouting	Original Design Quantity	27,945	17,691	63
	Anticipated Final Quantity	58,400	17,691	30

* The linear metres 'completed' are drilling only and exclude grouting

Main powerhouse sub-structure excavation works were completed in January 2016 and levelling concrete works were started in coordination with installation of the grounding system. Overhead travelling crane runway beam was installed in December 2016. Progress of the powerhouse concreting works is still proceeding well and is shown in ***Table 3-2*** below:

TABLE 3-2: PROGRESS OF MAIN POWERHOUSE SUB-STRUCTURE CONCRETE WORKS TO 30 SEPTEMBER 2017

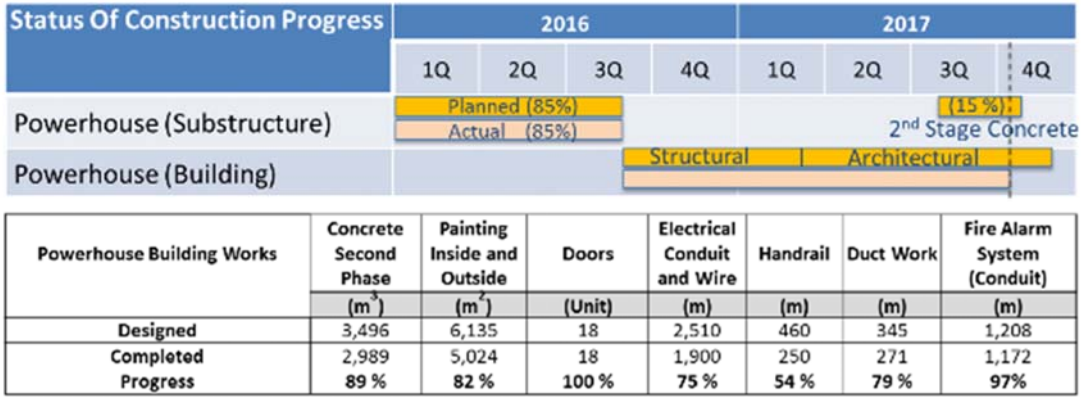
Location	Total Anticipated Volume (m^3)	Completed (m^3)	Progress (%)
Main Powerhouse	32,600	27,495	84
Penstock Embedment	10,257	8,185	79

3.2.1 Re-regulation dam and powerhouse

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

Structural concrete works were commenced in March 2015, in coordination with installation of the grounding system. The progress of structural concrete works is shown in ***Figure 3-3***

FIGURE 3-3: PROGRESS OF RE-REGULATION DAM POWERHOUSE WORKS TO 30 SEPTEMBER 2017



Powerhouse Building Works	Concrete Second Phase (m^3)	Painting Inside and Outside (m^2)	Doors (Unit)	Electrical Conduit and Wire (m)	Handrail (m)	Duct Work (m)	Fire Alarm System (Conduit) (m)
Designed	3,496	6,135	18	2,510	460	345	1,208
Completed	2,989	5,024	18	1,900	250	271	1,172
Progress	89 %	82 %	100 %	75 %	54 %	79 %	97%

The powerhouse concreting has advanced well and secondary concrete embedment for the draft tube liner was completed at the end of April 2016. The left bank structure was re-

designed as roller compacted concrete (RCC) and was completed on 18 March 2016. Installation of the re-regulation waterway gate and stop log and re-regulation intake gate and structural concrete works for the retaining wall to support the substation yard were completed in October 2016. Building superstructure work continued for the powerhouse with the commencement of construction of concrete columns.

3.3 TEMPORARY WORK FACILITY

3.3.1 Diversion tunnel inlet and outlet

The diversion tunnel works which is over 600 m in length and 10 m in diameter were commenced in October 2014 by drill and blast techniques and completed in late September 2015. The river diversion took place on 31 October 2015 together with construction of earth-fill cofferdams upstream and downstream.

3.3.2 Secondary upstream cofferdam

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

3.3.3 Quarry

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

3.3.4 Disposal Areas

The disposal area on the right bank has been available for operation since January 2015, as was the adjacent waste disposal area. The Disposal Area No.9 along Road P1 near the entrance of Road T5 started operation in April 2015. Unsuitable material from the quarry continues to be hauled to Disposal Area No.6 and Disposal Area No.9 is being developed by the E&M Contractor as stated above.

3.4 ELECTRICAL AND MECHANICAL WORKS

The EMWC was executed between Hitachi-Mitsubishi Hydro Corporation and NNP1PC on 13 June 2014 and the NTP was issued on 03 October 2014. The cumulative work progress of the Electrical and Mechanical Works by value at the end of September 2017 was 88.2 % (compared to planned progress of 95.1 %).

3.5 HYDRO-MECHANICAL WORKS

The HMWC was executed between IHI Infrastructure Systems (IIS) and NNP1PC on 18 April 2014 and the NTP was issued to the Contractor on 03 October 2014. The actual cumulative work progress of the Hydro-Mechanical Works until the end of September 2017 was 48.7 % (compared to planned progress of 54.3 %).

The latest progress of penstock pipe fabrication at IHI field shop and erection at main dam as of the end of September 2017 in ***Table 3-3*** below

TABLE 3-3: PROGRESS OF THE PENSTOCK PIPE FABRICATION AT THE IHI FIELD SHOP AS AT THE END OF SEPTEMBER 2017

3.6 230 KV TRANSMISSION LINE WORKS

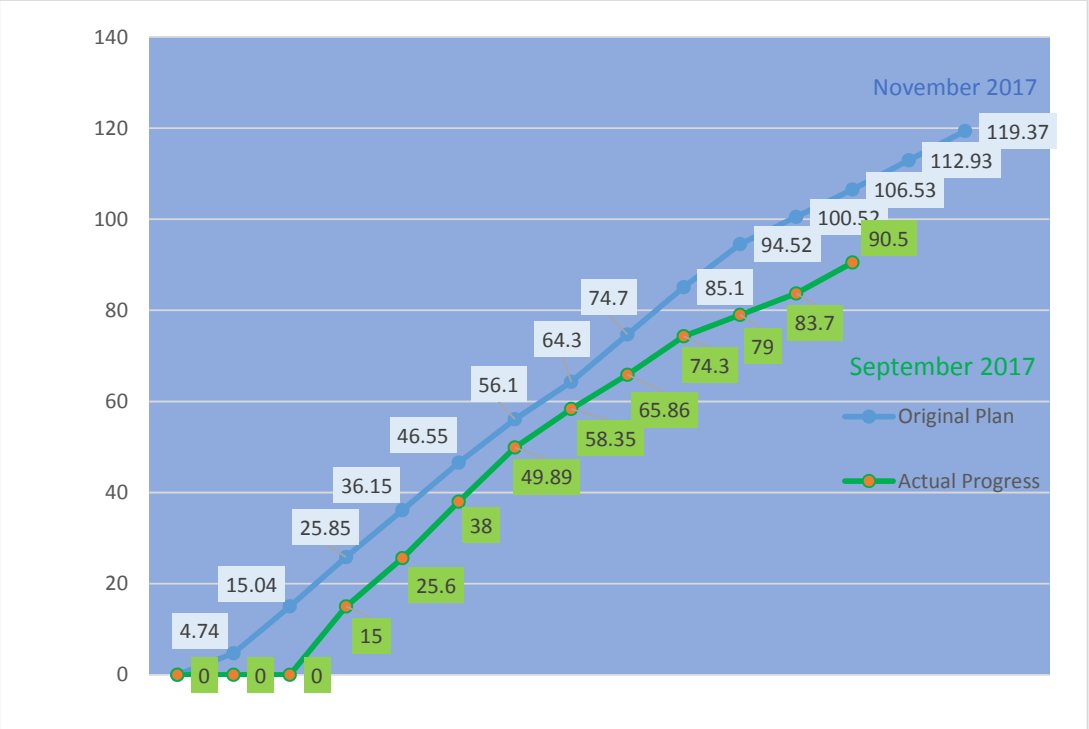
The TLW Contract was executed between Loxley-Sri Consortium and NNP1PC on 11 July 2014 and the NTP was issued to the 230 kV TL Contractor on 03 October 2014. The cumulative work progress of the Transmission Line Works until the end of September 2017 was 94.6 % (compared to planned progress of 98.3 %).

In respect of the delay to commencement of most works, the Contractor is studying its programme to ensure that sufficient resources are committed as the works progress to ensure that completion is achieved in good time. Onset of daily rains has made access to all areas difficult, but the Contractor follows its revised acceleration schedule, after the progress for the construction of tower foundations slowed after May 2016 (See ***Figure 3-4*** below).

FIGURE 3-4: CUMULATIVE WORK PROGRESS OF TOWER FOUNDATION (ORIGINAL PLANNED AND ACTUAL)

FIGURE 3-5: CUMULATIVE WORKS PROGRESS OF TOWER FOUNDATION (REVISED PLANNED & ACTUAL)

FIGURE 3-6: REVISED CUMULATIVE WORKS PROGRESS OF TOWER ERECTION (PLANNED & ACTUAL)



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, 2017.

4.1 ESMMP-CP

The updated Environmental and Social Management and Monitoring Plan for the Construction Phase (ESMMP-CP) was completed and submitted to the Ministry of Natural Resources and Environment (MONRE) at the end of May 2017. MONRE has confirmed that they have no further comments and will issue an official letter of approval, and therefore, no additional actions are required from NNP1PC.

4.2 Contractor SS-ESMMPs

During Q3 2017, NNP1PC-EMO received 22 SS-ESMMPs, two annexes of Detailed Work Programmes (DWPs) and four as-built drawings. Out of these, 19 SS-ESMMPs, four as-built drawings and one annex of a DWP were approved, three SS-ESMMPs and one annex of a DWP are under review and will be carried over to Q4 2017.

All SS-ESMMP and Working Drawing of WWTS improvement status are shown in ***Table 4-1*** and details are provided in Appendix 1.

TABLE 4-1: SS-ESMMP AND WORKING DRAWINGS REVIEWED DURING Q3 2017

Name of SS-ESMMP Document/ Working Drawings	Rev. 1	Rev. 2	Rev. 3	Approved
SS-ESMMP for Building Construction at Main Powerhouse (4th submission)	√	√	√	Under review
SS-ESMMP for Operation and Maintenance Works of RCC Plant (4th submission)	√	√	√	Under review
Annex of the DWP for Aggregate Crushing Plant (5th submission)	√	√	√	Under review
SS-ESMMP for Construction of 3.1 Km Internal Road in HSRA	√	√	√	√
As-built drawing of V&K Camp's WWTS Improvement	√	√		√
SS-ESMMP for Suspension Bridge Construction at 2UR	√			√
SS-ESMMP for Construction of 5 Houses in 2UR Zone, Thathom District, Xaysomboun province	√	√		√
SS-ESMMP for Filling Residential Land and Lift up 3 Houses at Ban Pou,	√			√

Name of SS-ESMMP Document/ Working Drawings	Rev. 1	Rev. 2	Rev. 3	Approved
Dismantling of One House at Ban Hatsamkhone, 2UR Zone				
SS-ESMMP for Installation Work of Stay Cone, Front Channel Liner and Hat Cover for Re-regulation Power Station	√			√
SS-ESMMP for Construction of Domestic Water Supply	√	√		√
As-built drawing of the Waste Water Treatment System Improvement at TCM & GFE Camp	√	√	√	√
As-Built drawing of WWTS at ZHEFU Camp	√	√		√
SS-ESMMP for Construction Road to the Right Bank of Re-Regulation Dam	√			√
As-built drawing of Kenber Camp's WWTS improvement	√			√
SS-ESMMP for Supply and Installation of 22 kV Transmission Line and 0.4 kV Distribution Line for 63 Households at HSRA	√			√
SS-ESMMP for HM's Zhefu Camp (5th submission)	√	√	√	√
SS-ESMMP for Installation of Inlet Valve & Servomotor for Main Power Station	√			√
SS-ESMMP for Construction of 03 Bus Stop Stations, 01 Market Building, 01 Waste Storage and 01 Toilet at 2UR Zone, Thathom District, Xaysomboun Province	√			√
SS-ESMMP for Urgent Aid Work for Resettlement Households at HSRA	√			√
SS-ESMMP for Construction of Market Building and Bus Station Building at HSRA	√	√		√
SS-ESMMP for Construction of Outlet canal and four sub canals at HSRA	√			√
SS-ESMMP for Houay Soup Landfill Slope Protection	√			√
SS-ESMMP for Construction of Irrigation Dam, 01 spillway & 01 Outlet Pipe Culvert at HSRA	√	√	√	√

Name of SS-ESMMP Document/ Working Drawings	Rev. 1	Rev. 2	Rev. 3	Approved
SS-ESMMP for Construction of a Tractor Road 3.18 km at HSRA	√	√		√
SS-ESMMP for Construction of a Tractor Road 4.05 km at HSRA	√			√
SS-ESMMP for Installation of Turbine for Main Power	Under review			
Annex of the DWP for Re-regulation Power Station, Closing of Borrow Pit Area at Corner of P1 & P1A Road Beside the Re-Regulation Dam	√	√	√	√
SS-ESMMP for Construction of 4 Houses Lot No:7 at HSRA.	√			√

4.3 Results of Compliance Inspections at Construction Sites

During Q3 2017, NNP1PC EMO conducted bi-weekly and weekly follow-up inspections at 34 construction sites and camps including temporary camps at Phouhomxay Village (previously called Houay Soup Resettlement Area) and the 230 kV Transmission Line as listed in ***Figure 4-1*** and ***Figure 4-2***.

FIGURE 4-1: SITE INSPECTION LOCATION

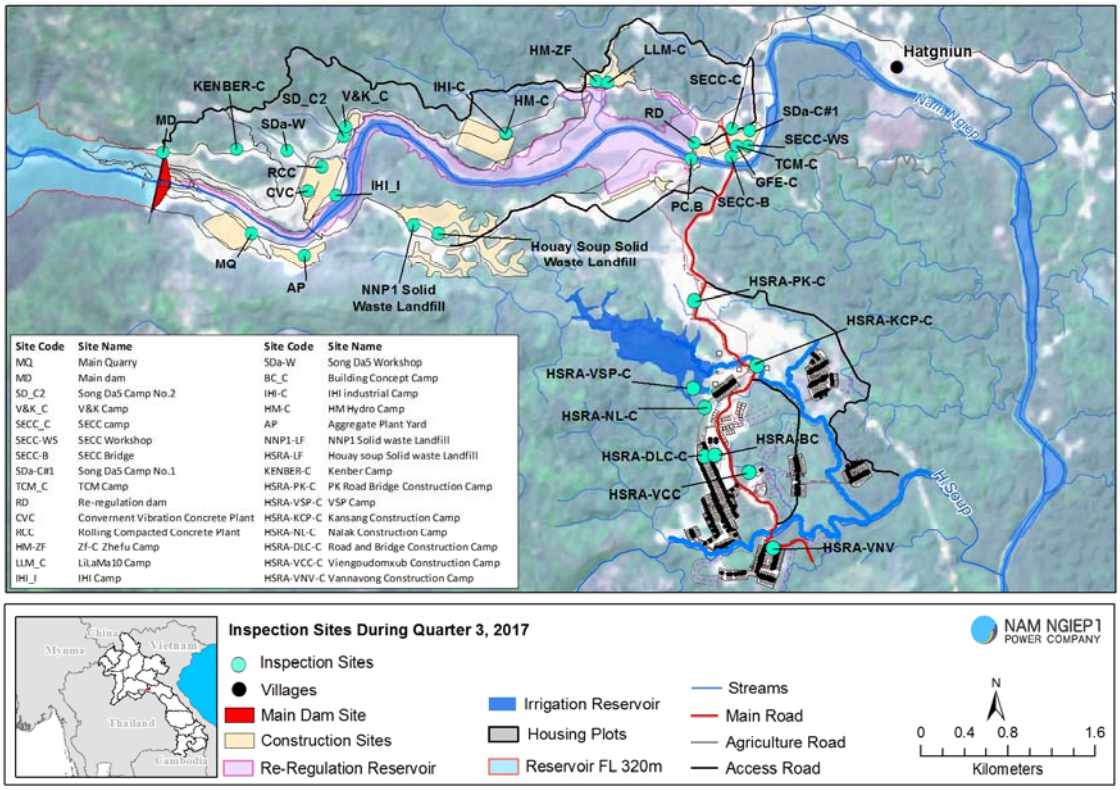
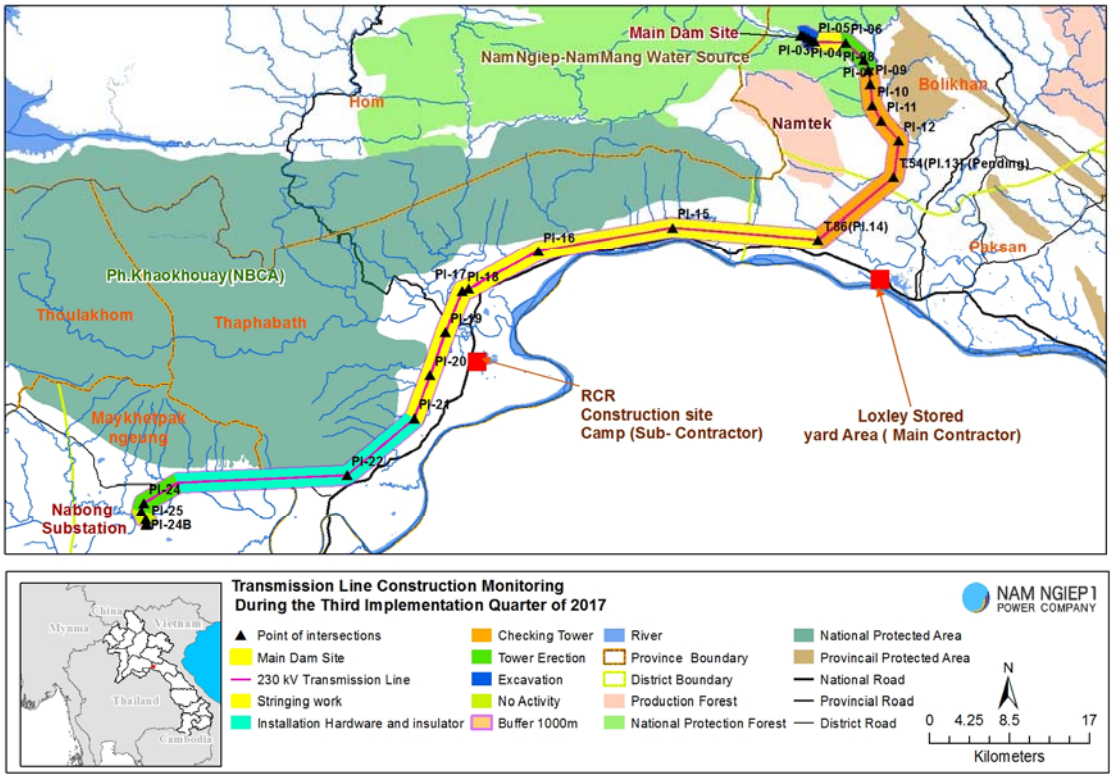


FIGURE 4-2: 230 KV TRANSMISSION LINE CONSTRUCTION MONITORING

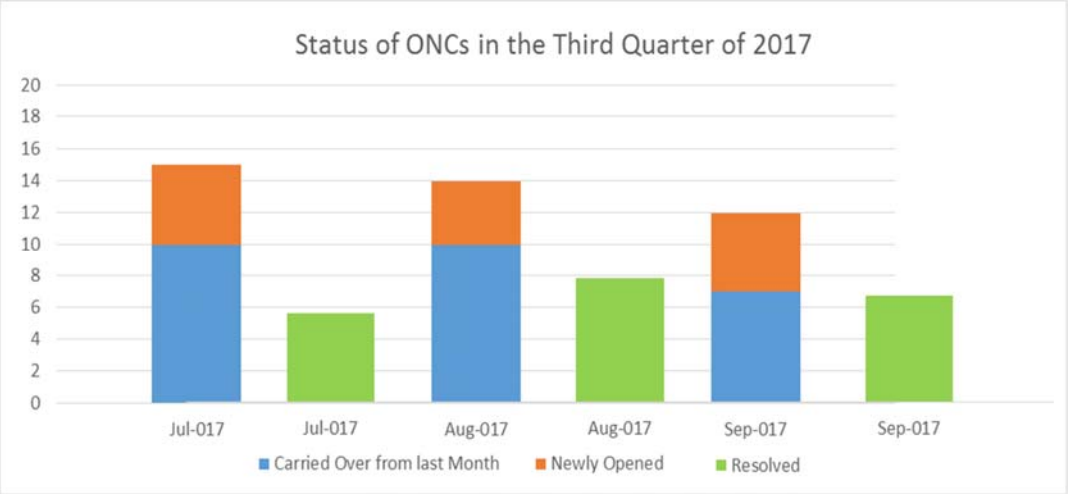


A total of 24 Observations of Non-Compliances (ONC), three Non-Compliance Level-1 (NCR1), two Non-Compliance level-2 (NCR2), and one Non-Compliance level-3 (NCR3) were active during the reported period. Out of these, 10 ONCs, two NCR1, one NCR2 and one NCR3 were carried over from the previous Quarter; 14 ONCs, two NCR1 and one NCR2 were newly issued. A total of six ONCs and two NCR2 could not be resolved in this Quarter and will be carried forward into Q4 2017. Details on the active ONCs, NCRs and IRs, and the corrective actions can be found in the ***Table 4-2*** and in the ***Figure 4-3*** with details provided in Appendix 2.

TABLE 4-2: NON-COMPLIANCE STATUS DURING Q3 2017

Environmental Non-Compliance Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR	10	1	1	1	**0**
Newly opened ONC/NCR	14	2	1	0	**0**
Total ONC/NCR	24	3	2	1	0
Resolved ONC/NCR	18	3	0	1	**0**
Unresolved ONC/NCR carried forward to the next Quarter	6	0	2	0	0

FIGURE 4-3: STATUS OF ONC DURING Q3 2017



PHOTOGRAPH 1: MONTHLY MONITORING AND INSPECTION CARRIED OUT BY THE ENVIRONMENTAL MANAGEMENT UNIT (EMU)

PHOTOGRAPH 2: DAILY SEDIMENT CONTROL BY APPLYING ALUMINIUM SULPHATE AT AGGREGATE PLANT SEDIMENT POND

PHOTOGRAPH 3: THE EFFLUENT DISCHARGE MONITORING AT THE MAIN DAM'S WASTE WATER TREATMENT PLANT

PHOTOGRAPH 4: BI-WEEKLY JOINT SITE INSPECTIONS FOR BORROW PIT CLOSURE

4.4 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

4.4.1 General Waste Management

During Q3 2017, a total of 491.4 m^3 of solid waste was disposed at the NNP1 Project Landfill. Due to continuous rain on site and accumulation of water in the waste pit, the contractor could not perform waste compaction and cover with soil as planned. The waste bags were checked on a daily basis at the camps before disposing at the landfill. In some cases, mixed waste was found at Song Da 5 camp No.1 and 2, LILAMA10 Camp, ZHEFU Camp, V&K Camp, Kenber Camp, Sino-Hydro Camp and the Sino-Hydro workshop near the quarry. In order to improve the waste management of the contractors, NNP1PC has carried out waste management training of the contractors and subcontractors on a weekly basis.

During September 2017, waste separation was improved in all camps.

A total of 21,544.5 kg of recyclable waste was collected by Khounmixay Processing Factory and transported offsite to its facilities for treatment and final disposal as shown in ***Table 4-3***.

TABLE 4-3: AMOUNTS OF RECYCLABLE WASTE SOLD DURING Q3 2017

Source and Type of Recycled Waste		Unit	Total in Q3 2017 (A)	Sold (B)	Remaining Amount (A - B)
Construction activity					
1	Scrap metal	kg	48,914	19,823	29,091
Sub-Total 1		**kg**	**48,914**	**19,823**	**29,091**
Operation camp					
2	Glass bottles	kg	1,017	545	472
3	Plastic bottles	kg	627.5	425	202.5
4	Aluminium cans	kg	320.5	178.5	142
5	Paper/Cardboard	kg	715.5	573	142.5
Sub-Total 2		**kg**	**2,680.5**	**1,721.5**	**959**
Grand Total 1+2		**kg**	**51,594.5**	**21,544.5**	**30,050**

4.4.2 Hazardous Waste Management

In Q3 2017, joint hazardous materials and waste inventories were carried out at the main construction sites and subcontractors' camps. The amounts of hazardous waste collected, stored and disposed during Q3 2017 are shown in ***Table 4-4.*** The treatment and final disposal of hazardous waste is outsourced to Khounmixay Processing Factory.

TABLE 4-4: HAZARDOUS WASTE RECORDED DURING Q3 2017

No.	Hazardous Waste Type	Unit	Total in Q3 2017	Disposal	Remaining
1	Used Oil (Hydraulic and Engine)	Litre	11,540	5,200	6,340
2	Contaminated soil, sawdust and concrete	kg	1,277	220	1,057
3	Used oil filters	Piece	846	310	536
4	Used tyre	Piece	569	147	422

No.	Hazardous Waste Type	Unit	Total in Q3 2017	Disposal	Remaining
5	Empty paint and spray cans	Can	731	407	324
6	Cement bag	Bag	300	0	300
7	Empty used chemical drum/container	Drum (20 l)	2,119	1,924	195
8	Acid and caustic cleaners	Bottle	172	0	172
9	Ink cartridge	Unit	393	279	114
10	Contaminated textile and material	kg	231	119	112
11	Empty used oil drum/container	Drum (20 l)	165	64	101
12	Empty used oil drum/container	Drum (200 l)	106	29	77
13	Halogen/fluorescent bulbs	Unit	56	0	56
14	Empty used chemical drum/container	Drum (200 l)	72	36	36
15	Lead acid batteries	Unit	20	0	20
16	Lithium-ion batteries	Unit	6	0	6
17	Clinical Waste	kg	57	52	5
18	Empty contaminated bitumen drum/container	Drum (200 l)	0	0	0
19	Used oil mixed with water	Litre	0	0	0

4.5 COMMUNITY WASTE MANAGEMENT SUPPORT

4.5.1 Animal Fodder (Pig Feed) Collection Programme

During Q3 2017, local villagers collected a total of 21,540 kg of food waste from the Owner's Site Office and Village (OSOV) and the contractors' camps for feeding their animals. This is a decrease of 1,506 kg compared to Q2 2017, details are shown in ***Table 4-5***.

TABLE 4-5: AMOUNT OF FOOD WASTE COLLECTED BY LOCAL VILLAGERS FOR USE AS PIG FEED DURING THE Q3 2017

NO.	SITE NAME	UNIT	TOTAL
1	SongDa5 Camp No. 2	kg	8,950
2	SongDa5 Camp No. 1	kg	7,045
3	Obayashi Corporation Camp	kg	3,253
4	Owner's Village and Site Office (OSOV)	kg	1,511
5	LILAMA 10 Camp	kg	425
6	Kenber Camp	kg	356
Total		**kg**	**21,540**

4.5.2 Community Waste Awareness

During August and September 2017, eight local contractors, teachers, students, healthcare staffs and villagers from Phouhomxay received training on waste generation reduction, and waste segregation for disposing at Houay Soup landfill (see photographs below)

PHOTOGRAPH 5 & 6: WASTE MANAGEMENT TRAINING FOR 8 LOCAL CONTRACTORS, TEACHERS, STUDENTS, HEALTHCARE STAFFS AND RESIDENTS IN PHOUHOMXAY

4.5.2 Community Recycling Programme

The Community Recycle Waste Bank collected a total of 3,474 kg of recyclables from villagers and 2,897 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 Q3 2017 (A)	Sold (B)	Remaining Amount (A - B)
Scrap metal	kg	1,656	1,443	213
Glass	kg	1,122	820	302
Paper/cardboards	kg	396	361	35
Plastic bottles	kg	202	181	21
Aluminium	kg	98	92	6
Total	**kg**	**3,474**	**2,897**	**577**

4.5.3 Houay Soup Landfill

In August 2017, slope protection work for Houay Soup Landfill was started. The work includes slope stabilisation, drainage control and grass planting. The work was successfully completed in September 2017. The selection of a contractor to operate the landfill is being finalised.

During Q3 2017, approximately 7 m^3 of solid waste from the local contractors and Phouhomxay was disposed of at Houay Soup Landfill.

4.6 ENVIRONMENTAL MONITORING

The environmental quality monitoring has 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[1] 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 Quality

The regular surface water quality monitoring programme includes 14 stations in the Nam Ngiep 1 watershed area:

i. six stations located upstream of NNP1 Main Dam, including four stations in the Nam Ngiep main stream, one at the lower Nam Phouan, and one at the lower Nam Chian;

ii. eight stations located downstream of NNP1 Main Dam, including four stations in the Nam Ngiep main stream, two in the re-regulation reservoir, one at the lower Nam Xao and one at the lower Nam Houay Soup.

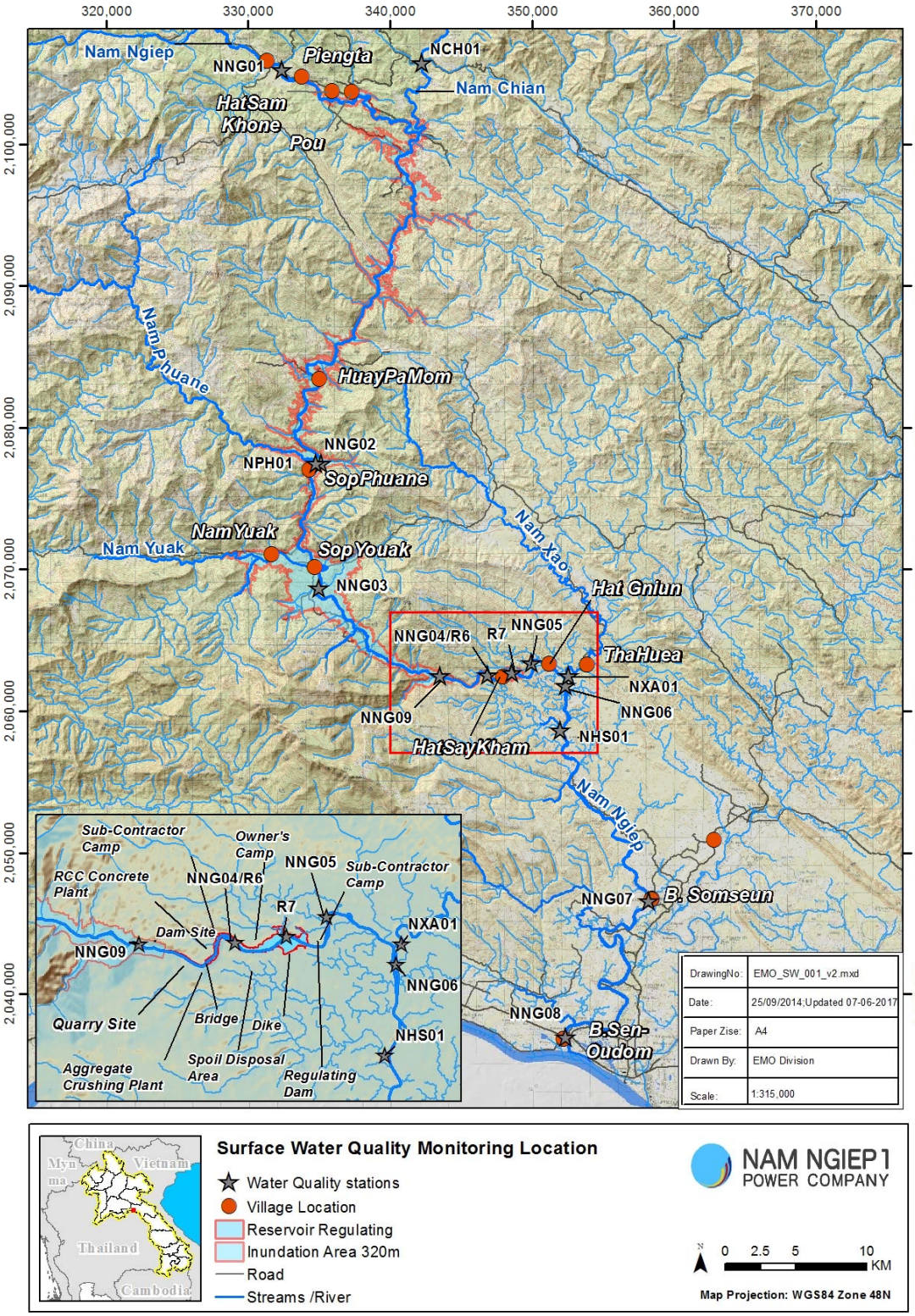
Weekly surface water quality monitoring has been carried out for selected stations since the third week of May 2017. The frequency of monitoring is presented in the ***Table 4-7*** and the locations of the monitoring stations are shown in the ***Figure 4-4*****.**

[1] 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

TABLE 4-7: MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS, BOD_5, faecal coliform and total coliform.	For 4 stations: Nam Ngiep Upstream of the Main Dam (NNG09), Nam Ngiep Downstream of RT Camp (NNG04 / R6), Re-Regulation Reservoir (Upstream Re-Regulation Dam (R7)) and Nam Ngiep Upstream Hat Gniun Village (NNG05).
Fortnightly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS (mg/l),	All 14 stations.
Monthly	TSS (mg/l), BOD_5 (mg/l), COD (mg/l), NH_3-N (mg/l), NO_3-N (mg/l), Total Iron (mg/l), Manganese (mg/l), total coliform (MPN/100 ml), faecal coliform (MPN/100 ml)	All 14 stations
Quarterly	Total Kjeldahl Nitrogen (mg/l), Chloride (mg/l), Sulphate (mg/l), Alkalinity (mg/l), Lead (mg/l), Arsenic (mg/l), Mercury (mg/l), Calcium (mg/l), Magnesium (mg/l), Potassium (mg/l), Sodium (mg/l)	All 14 stations

FIGURE 4-4: SURFACE WATER QUALITY MONITORING LOCATIONS



Descriptions of each monitoring station and surface water quality monitoring parameters can be found in Appendix 3.

4.6.2 Nam Ao Dam Break

On 11 September 2017 at 13:45 hours, an earth-fill dam of the Nam Ao Hydropower Project on the Nam Ao stream in Phaxai District, Xieng Khuang Province failed and sent a flood wave of mud, water, and debris down a three-kilometre reach of Nam Ao, into Nam Siem and continued into Nam Ngiep – see overview map in ***Figure 4-5***. The dam failure site is located about 92 km upstream of the main dam of Nam Ngiep 1 Hydropower Project.

There has been no reports of loss of human life or serious injuries as a consequence of the dam break, but according to a report from the secretariat of the Nam Ngiep 1 Watershed and Reservoir Protection Office in Xaysomboun Province dated 14 September 2017, damages to property has been reported in the following eight villages downstream of the dam: Siengkhong, Viengthong, Nasong, Thaviengxay, Phiengta, Nahong, Hatsamkhone, and Pou (see Overview Map in ***Figure 4-5***).

Immediately after becoming aware of the Nam Ao Dam failure, NNP1PC-EMO intensified the water quality monitoring with daily sampling upstream and downstream the construction area up until 20 September 2017. The results for Total Suspended Solids are presented in ***Table 4-8***.

TABLE 4-8 WATER QUALITY MONITORING DATA FOR TOTAL SUSPENDED SOLIDS

Date	NNG09 Upstream the Main Dam TSS (mg/L)	NNG04/R6 In the Re-regulation Reservoir TSS (mg/L)	R7 In the Re-regulation Reservoir TSS (mg/L)	NNG05 Downstream the Re-regulation Dam TSS (mg/L)
07-Sep-2017	221.7	178.7	143.6	148.9
11-Sep-2017	68.3			35.7
12-Sep-2017	125,172.0			19,447.0
13-Sep-2017	1,715.0			26,168.0
14-Sep-2017	1,697.0	923.0	475.0	2,082.0
15-Sep-2017	1,465.0			1,573.0
16-Sep-2017	520.0			1,250.0
20-Sep-2017	191.9	149.6	96.0	140.0

The dissolved oxygen levels measured in the days following the dam break were all within the normal range except for a drop to 4.93 mg/L at NNG09 on 12 September 2017, which is below the water quality standard of minimum 6 mg/L. The dissolved oxygen levels at NNG09 recovered to normal levels a day later.

The basic statistics for TSS from June 2017 up until the dam break are presented in ***Table 4-9***. When comparing the data with the TSS levels immediately after the dam break from 12-15 September 2017 with a peak level in NNG09 on 12 September 2017 of 125,172 mg/L TSS, about 100 times greater than the maximum TSS levels recorded during the high flow season June to September 2017, it is clear that the dam break had a dramatic effect on the water quality of Nam Ngiep. The TSS levels measured in NNG09 and NNG05 on 20 September 2017 are within the interquartile range.

TABLE 4-9 BASIC STATISTICS FOR TOTAL SUSPENDED SOLIDS UP UNTIL THE DAM BREAK

Statistics for the High Flow Season 08/06 2017 – 11/09 2017	NNG09 TSS (mg/L)	NNG05 TSS (mg/L)
Mean	241.9	147.2
Maximum	1,341.0	963.0
75th Percentile	294.3	139.2
Median	90.6	89.4
25th Percentile	69.9	43.6
Minimum	14.2	19.2
Range	1,326.8	943.8

FIGURE 4-5 OVERVIEW MAP WITH LOCATION OF NAM AO DAM BREAK

The EMO also conducted a survey of the immediate effects on fisheries in Nam Ngiep from 12 to 15 September 2017. The survey included site visits, interviews and collection of data from 187 households in 12 villages from Siengkhon 12 km upstream the NNP1 reservoir to Thong Noi 35 km downstream of the re-regulation dam.

The total weight of dead fish collected by 187 households from 12 to 14 September 2017 is around 8,000 kg or about 2 times higher than the estimated maximum 3-day fish-catch (4,000 kg) for the entire Nam Ngiep basin (estimated based on fish-catch records between July 2015 and May 2017).

The EMO carried out forensic examinations on eight specimens from six species. The examinations focused on physical observation such as skin, fins, eyes, mouth, gills and stomach. All the species had a normal outer physical appearance (skin, fins, eyes, and mouth). The dissection of the fish clearly indicated that mud, debris and grass had clogged the gills and opercula cavity which had obstructed the respiration system of the fish. This examination is consistent with the measurements of water quality in which turbidity and sediment values were significantly above normal values during the period of observation.

The difference in TSS concentrations measured in NNG09 upstream the main dam and in NNG05 downstream of the re-regulation dam on 12 September 2017 is roughly 100,000 mg/L. This indicates that large amounts of sediments are likely to have been trapped in the re-regulation reservoir behind the re-regulation dam since it is the first cross-river barrier of the Nam Ngiep.

In order to minimize environmental risks and reduce the impacts on water quality and aquatic life that might otherwise arise during the impounding of the main reservoir in May 2018 when the discharge from the re-regulation dam is only 5.5 m^3/s, NNP1PC plans to undertake a controlled flushing of sediments in the beginning of November 2017 while the discharge rate is still relatively high.

NNP1 will consolidate all relevant information and impact assessments in a separate report after completion of the controlled flushing of sediments.

4.6.3 Regular Surface Water Quality Monitoring

4.6.3.1 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 Q3 2017 are shown in ***Table 4-10*** and these measurements are within the normal ranges previously measured. See also graphic presentation of the measurements from April 2016 to September 2017 in Appendix 4.

TABLE 4-10: BOD5 RESULTS OF SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED FROM JULY TO SEPTEMBER 2017 (NATIONAL SURFACE WATER QUALITY STANDARD FOR BOD5: <1.5 MG/L)

Station Code	NNG 01	NNG 02	NNG 03	NNG 09	NNG 04 / R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
5-Jul-17	<1.0	<1.0	<1.0	1.3	1	1.02	<1.0	<1.0	<1.0	<1.0	<1.0	1.01	<1.0	1.05
13-Jul-17				2.42	<1.0	1.4	<1.0							

Station Code	NNG 01	NNG 02	NNG 03	NNG 09	NNG 04 / R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
18-Jul-17				1.1	1.22	<1.0	1.1							
26-Jul-17				<1.0	<1.0	<1.0	<1.0							
2-Aug-17	<1.0			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.12		<1.0	<1.0
11-Aug-17				<1.0	<1.0	<1.0	<1.0							
17-Aug-17				<1.0	<1.0	<1.0	<1.0							
24-Aug-17				<1.0	<1.0	<1.0	<1.0							
30-Aug-17				<1.0	<1.0	<1.0	2							
7-Sep-17	1.84	<1.0	1.81	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.68	<1.0	<1.0	<1.0
14-Sep-17				<1.0	<1.0	<1.0	<1.0							
20-Sep-17				<1.0	<1.0	<1.0	<1.0							
28-Sep-17				<1.0	<1.0	<1.0	<1.0							

4.6.3.2 Chemical Oxygen Demand (COD)

The COD measurements in Q3 2017 are presented in ***Table 4-11*** and a graphic presentation of the measurements from April 2016 to September 2017 are included in Appendix 4. The extremely high COD values of 12 September 2017 can likely be attributed to high loads of woody debris caused by the Nam Ao Dam break the day before.

TABLE 4-11: **COD RESULTS OF SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED FROM JULY TO SEPTEMBER 2017 (NATIONAL SURFACE WATER QUALITY STANDARD FOR COD: < 5 MG/L)**

	NNG 01	NNG 02	NNG 03	NNG 09	NNG 04/R 6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date														
5-Jul-17	6.2	6.5	5.0	39.7	17.9	9	9.1	10.7	10.7	9.7	5.4	14.5	10.3	20.2
2-Aug-17	5.8			7.3	6.7	<5.0	<5.0	<5.0	5	5.8	6.5		7.5	10.9
7-Sep-17	11.5	136	49.7	13.3	12.5	5.6	6.9	7.7	7.7	12.9	9.5	<5.0	8.1	8.5
12-Sep-17				1,882			380							

Selected basic statistics for COD disregarding the anomalies of 12 September 2017 are presented in ***Table 4-12***. The table presents measurements in Nam Ngiep upstream the main dam, measurements in the re-regulation reservoir and measurements in Nam Ngiep downstream the re-regulation dam.

Overall, the interquartile ranges of the measurements from the three groups of stations over the course of the construction period are very similar, with similar medians and arithmetic means. This supports a basic assumption that there are no significant differences in mean COD levels upstream and downstream the construction area.

When comparing the mean COD value of the upstream measurements for Q3-2017 with the upstream measurements since start of construction, it appears that the Q3-2017 mean lies in the 4th quartile of all upstream measurements. This is due to one very high COD value (136 mg/L) on 07 September 2017 in NNG02. The mean COD values for Q3-2017 in the re-regulation reservoir as well as in the downstream stations both lie within the 3rd quartile for their respective measurements over the course of the construction period.

Furthermore, a statistical hypothesis test using Excel's TTEST function (unpaired, two-tailed, different variances, level of significance: 0.05) comparing the upstream sample for Q3 2017 with the downstream sample for Q3-2017 gives a p-value[2] of 0.2 which supports that the observed data are compatible with a basic assumption[3] that the true COD means of the two samples are identical.

The data also shows that the COD measurements are generally above the surface water quality standard (both mean and median are above the standard, upstream, in the re-regulation reservoir and downstream).

Further statistical tests will be carried out to check for seasonal trends.

TABLE 4-12 BASIC STATISTICS FOR COD UPSTREAM THE MAIN DAM, IN THE RE-REGULATION RESERVOIR AND DOWNSTREAM THE RE-REGULATION DAM

Statistics[4]	Nam Ngiep Upstream the Main Dam COD (mg/L)	Nam Ngiep/Re-regulation Reservoir COD (mg/L)	Nam Ngiep Downstream the Re-regulation Dam COD (mg/L)
Mean (2014-2017)	10.6	10.7	9.0
75th Percentile (2014-2017)	12.4	11.4	10.0
Median (2014-2017)	7.0	6.8	6.4
25th Percentile (2014-2017)	3.5	3.5	3.5
Mean Q3-2017	28.0	9.2	7.7

4.6.3.3 Faecal Coliforms

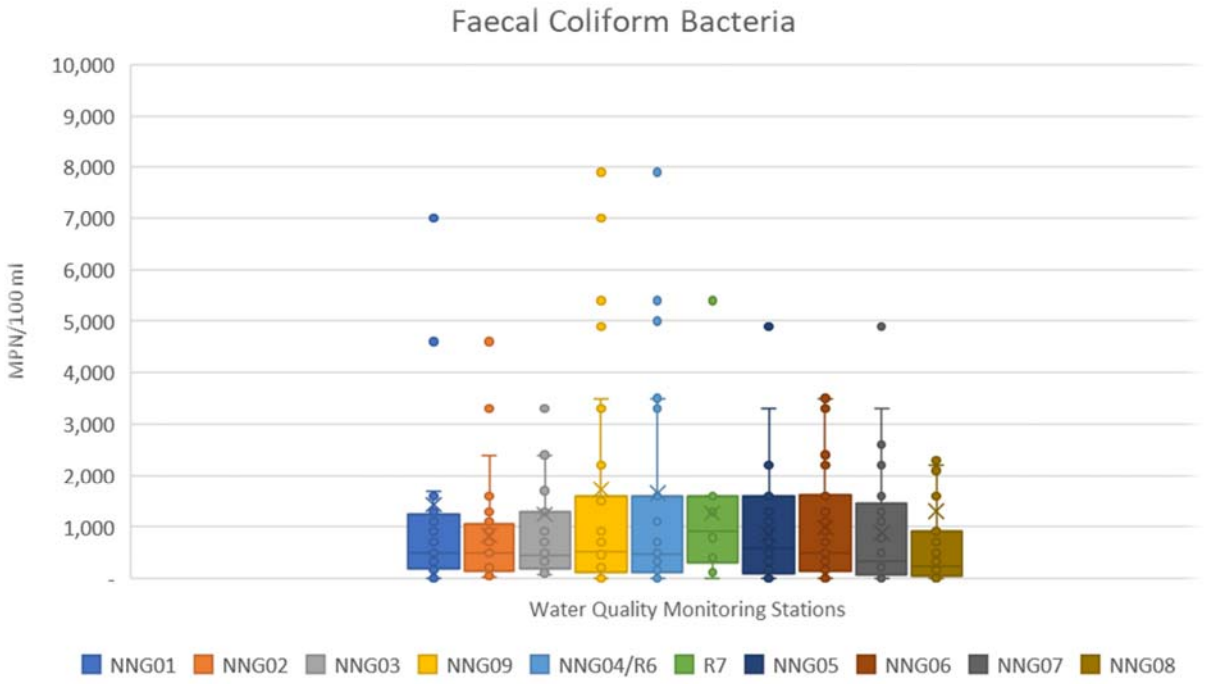
The results of the faecal coliform analyses in Q3-2017 are presented in ***Table 4-13*** and a graphic presentation of the measurements from April 2016 to September 2017 are included in Appendix 4. During the reported period, the peak of faecal coliform was measured at

[2] The p-value is defined as the probability of obtaining a result equal to or "more extreme" than what was actually observed, when the null hypothesis is true.
[3] In statistics this is known as the null-hypothesis – a hypothesis of no difference.
[4] Results reported as below the Limit of Detection, for COD < 5 mg/L, have been substituted with a value of 5/square root of 2

16,000 MPN/100 ml at NNG09 (Nam Ngiep Upstream Project Construction Area) on 11 August 2017.

The basic statistics of the faecal coliform measurements from September 2014 until October 2017 are displayed in the box and whisker diagrams in ***Figure 4-6***. Note that in order to visually be able to compare the boxes only measurements below 10,000 MPN/100 ml are displayed. The boxes have rather similar interquartile ranges with right skewed data and similar medians. This points towards there being no significant difference in measurements upstream and downstream the Project.

FIGURE 4-6 BOX AND WHISKER DIAGRAMS OF FAECAL COLIFORM MEASUREMENTS 09/2014- 10/2017



A statistical hypothesis test using Excel's TTEST function (unpaired, two-tailed, different variances, level of significance: 0.05) comparing the upstream sample for Q3 2017 with the downstream sample for Q3-2017 gives a p-value of 0.5, which indicates that the observed data are compatible with a basic assumption that the true faecal coliform means of the two samples are identical. The same test using observations since the start of construction gives a similar outcome.

TABLE 4-13: **RESULTS OF FAECAL COLIFORMS IN NAM NGIEP AND ITS MAIN TRIBUTARIES FROM APRIL TO JUNE 2017(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: < 1,000 MPN/100 ML)**

Station Code	NNG 01	NNG 02	NNG 03	NNG 09	NNG 04 / R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS0 1
5-Jul-17	170	700	1,700	7,000	5,000	1,300	1,300	1,400	2,300	790	790	3,500	330	330
18-Jul-17				700	5,400	5,400	920							
26-Jul-17				7	14	6	6							

Station Code	NNG 01	NNG 02	NNG 03	NNG 09	NNG 04 / R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS0 1
2-Aug-17	1,600			3,500	1,600	920	1,600	1,600	1,600	1,600	350		1,600	240
11-Aug-17				16,000	1,600	1,600	1,600							
17-Aug-17				920	540	920	920							
24-Aug-17				130	430	790	240							
30-Aug-17				1,600	3,500	400	1,600							
7-Sep-17	1,600	1,600	920	1,600	1,700	1,600	1,600	920	1,700	920	920	1,600	1,700	1,600
14-Sep-17				1,600	1,600	1,600	1,600							
20-Sep-17				1,600	3,500	1,600	1,600							
28-Sep-17				220	170	220	350							

Table 4-14 presents seasonal (high flow season and low flow season) means of faecal coliform bacteria upstream the main dam and downstream the re-regulation dam. The data indicates that there may be a tendency towards higher values in the high flow season. Further statistical tests will be carried out to check this inference.

TABLE 4-14 SEASONAL MEANS FOR FAECAL COLIFORMS UPSTREAM THE MAIN DAM AND DOWNSTREAM THE RE-REGULATION DAM

	Upstream Low Flow Season Mean (Dec-May) (MPN/100 ml)	Upstream High Flow Season Mean (Jun-Nov) (MPN/100 ml)	Downstream Low Flow Season Mean (Dec-May) (MPN/100 ml)	Downstream High Flow Season Mean (Jun-Nov) (MPN/100 ml)
Hydrological Year[5] 2015	659		399[6]	
Hydrological Year 2016	529	2,285	570	2,092
Hydrological Year 2017	452	1,286	171	939
Hydrological Year 2018		2,798		1,418

[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.
[6] This mean excludes an anomaly of 92000 MPN/100 ml reported for NNG07 in January 2015.

4.6.3.4 Total Coliforms

The results of measurements for total coliform bacteria are presented in ***Table 4-15*** and a graphic presentation of the measurements from April 2016 to September 2017 are included in Appendix 4. The results indicate a similar pattern and same tendency as for faecal coliform bacteria.

TABLE 4-15 RESULTS OF TOTAL COLIFORMS IN NAM NGIEP AND ITS MAIN TRIBUTARIES FROM JULY TO SEPTEMBER 2017 (NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: < 5,000 MPN/100 ML)

Station Code	NNG 01	NNG 02	NNG 03	NNG 09	NNG 04/ R6	R7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
5-Jul-17	2,300	2,200	2,200	11,000	10,000	3,300	4,900	4,800	4,600	2300	7,900	4,900	7,900	3,300
18-Jul-17				1,100	5,400	5,400	1,600							
26-Jul-17				140	48	24	15							
2-Aug-17	1,600			3,500	1,600	1,600	920	1,600	1,600	1600	350		3,500	920
11-Aug-17				16,000	1,600	1,600	1,600							
17-Aug-17				1,600	1,600	1,600	1,600							
24-Aug-17				790		1,100	580							
30-Aug-17				1,600	16,000	1,700	1,600							
7-Sep-17	1,600	3,500	1,600	3,500	5,400	1,600	1,600	1,600	3,500	1,600	1,600	1,600	3,500	1,600
14-Sep-17				3,500	3,500	1,600	1,600							
20-Sep-17				1,700	3,500	1,600	1,600							
28-Sep-17				1,100	1,600	1,600	540							

4.6.4 Compliance Monitoring of Effluents from Camps

A total of 12 camps including OSOV were in use during Q3-2017 and the effluents were monitored in 10 camps (10 sampling sites) as indicated on the map in ***Figure 4-7.*** The results are described in ***Table 4-16*** and graphic presentation of the measurements of key parameters from April 2016 to September 2017 are included in Appendix 4.

The two camps that were not monitored are the TCM Camp and the Lilama10 Camp. The Wastewater Treatment Plant (WWTP) at the TCM Camp had no discharge due to small number of workers and was therefore not sampled.

The Wastewater Treatment Plant (WWTP) at Lilama10 Camp has been out of operation and was redesigned in September 2017 in accordance with recommendations of the Independent Advisory Panel. It is expected that the Lilama10 Camp WWTP will be completed by the end of October 2017.

Based on a history of non-compliance with key parameters, notably total coliform bacteria, NNP1PC carried out a detailed review of the design and operation of the plants and advised the contractors to make specific improvements including installation of chlorination systems

with proper retention time, contact time and mixing of chlorine with the wastewater. The contractors carried out these improvements over the course of Q3 2017 and the monitoring results for September 2017 show significant improvements with total coliform bacteria levels in compliance with the relevant standard.

The status of compliance as of 30 September 2027 can be summarized as follows:

- Latest measurements in Compliance with the most critical pollutant Total Coliform Bacteria for all camps monitored;
- Latest measurements in compliance with BOD_5 for all camps monitored;
- Minor non-compliances with COD in 2 camps (EF13, EF14);
- Minor non-compliance with ammonia in 4 camps (EF02, EF06, EF07, EF13);
- Unusual high pH in one camp (EF09)

The compliance situation for each camp is described in more detail in ***Table 4-17***.

FIGURE 4-7: MAP OF EFFLUENT MONITORING LOCATIONS DURING Q3 2017

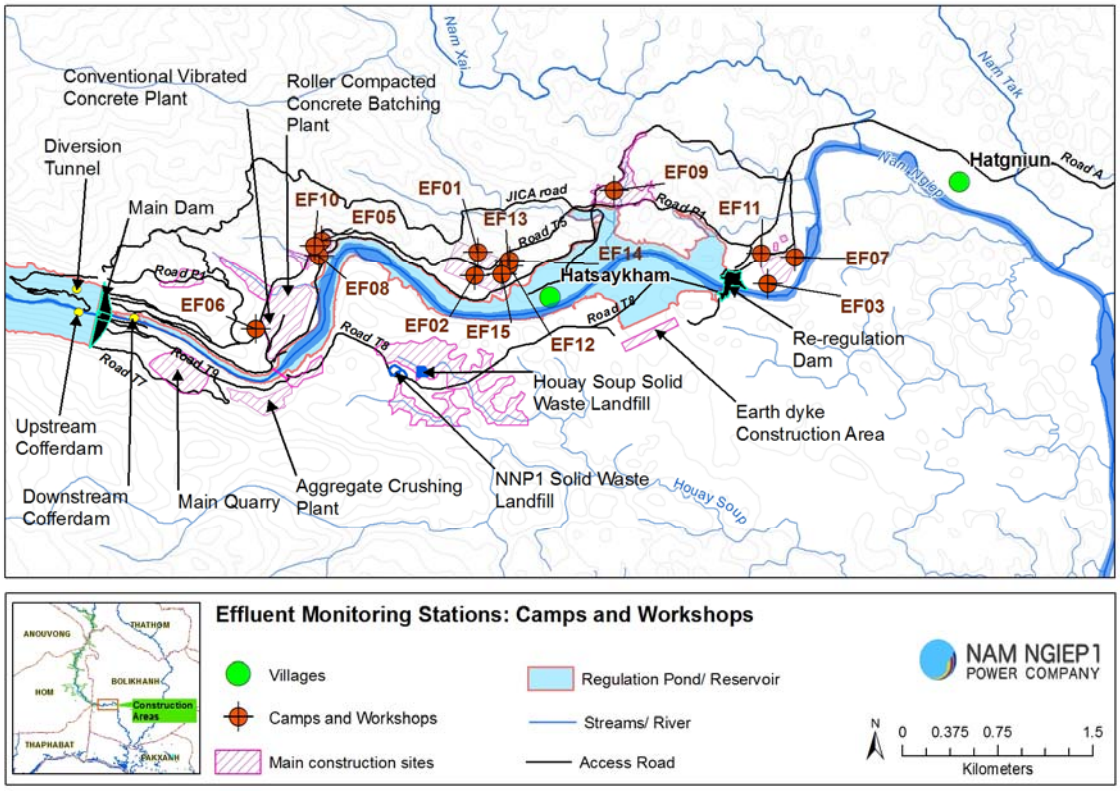


TABLE 4-16: *RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS FROM APRIL TO JUNE 2017*

		Site Name	Owner's Site Office and Village	Obayashi Camp WWTS1	Sino Hydro Camp	Songda 5 Camp No.1	Songda 5 Camp No.2
		Station Code	EF01	EF02	EF06	EF07	EF08
Date	Parameter Unit)	Guideline in the CA					
07-Jul-17	pH	6.0-9.0	7	7	7	6	7.37
19-Jul-17	pH	6.0-9.0	6.77	7.46	7.27	7.3	7.34
14-Aug-17	pH	6.0-9.0	6.29	7.55	7.5	7.46	7.07
23-Aug-17	pH	6.0-9.0	6.79	6.73	7.35	7.13	7.17
11-Sep-17	pH	6.0-9.0	6.45	7.18	6.64	6.56	7.13
25-Sep-17	pH	6.0-9.0	6.81	6.93	6.85	6.69	6.89
07-Jul-17	TSS (mg/l)	<50	<5	15.25	12.25	15.75	29.42
19-Jul-17	TSS (mg/l)	<50	<5	17.31	9.47	14.62	23.85
14-Aug-17	TSS (mg/l)	<50	<5	9.6	7	13.25	8.99
23-Aug-17	TSS (mg/l)	<50	<5	41.67	18.12	20.28	20.17
11-Sep-17	TSS (mg/l)	<50	<5	7.14	10.1	54.4	24.46
25-Sep-17	TSS (mg/l)	<50	<5	16.44	8.43	41.66	13.79
07-Jul-17	BOD_5 (mg/l)	<30	<1	<1	19.6	<1	8.4
19-Jul-17	BOD_5 (mg/l)	<30	29.7	48.45	61.35	30.45	80.1
14-Aug-17	BOD_5 (mg/l)	<30	31.95	75	54.9	80.25	58.65
23-Aug-17	BOD_5 (mg/l)	<30	13.8	66.6	40.65	51	60
11-Sep-17	BOD_5 (mg/l)	<30	<18	<18	<18	<18	<18
25-Sep-17	BOD_5 (mg/l)	<30	<6	<6	<6	<6	<6
07-Jul-17	COD (mg/l)	<125	<25	71.8	50.3	49.7	182
19-Jul-17	COD (mg/l)	<125	<25	41.1	31.8	31.6	77.6
14-Aug-17	COD (mg/l)	<125	<25	80.8	42.4	91.9	95.2
23-Aug-17	COD (mg/l)	<125	<25	137	56.4	77.8	90.3
11-Sep-17	COD (mg/l)	<125	<25	37.4	45.4	122	69.4
25-Sep-17	COD (mg/l)	<125	<25	105	45.1	118	72.2
07-Jul-17	NH3-N (mg/l)	<10	4	19	22	14	42
19-Jul-17	NH3-N (mg/l)	<10	<0.2	11	18	12	36
14-Aug-17	NH3-N (mg/l)	<10	3	20	32	24	17
23-Aug-17	NH3-N (mg/l)	<10	4	17	30	27	15
11-Sep-17	NH3-N (mg/l)	<10	<2	11	26	9	6
25-Sep-17	NH3-N (mg/l)	<10	3	14	33	14	8
07-Jul-17	Total Nitrogen (mg/l)	<10	14	26.7	29.7	19.4	58
19-Jul-17	Total Nitrogen (mg/l)	<10	8.98	16.1	23.7	16.1	44.9
14-Aug-17	Total Nitrogen (mg/l)	<10	12.6	26	35.3	31	23.2
23-Aug-17	Total Nitrogen (mg/l)	<10	13	25.3	38	35.4	19
11-Sep-17	Total Nitrogen (mg/l)	<10	13.5	17	35.6	19.1	11.2
25-Sep-17	Total Nitrogen (mg/l)	<10	10	19.1	33.5	19.1	10.5
07-Jul-17	Total Phosphorus (mg/l)	<2.0	0.58	0.61	1.09	1	0.73
19-Jul-17	Total Phosphorus (mg/l)	<2.0	1.13	0.78	1.61	0.87	2.46
14-Aug-17	Total Phosphorus (mg/l)	<2.0	0.95	1.3	2.06	1.74	1.28
23-Aug-17	Total Phosphorus (mg/l)	<2.0	1.42	1.49	2.19	2.05	1.15
11-Sep-17	Total Phosphorus (mg/l)	<2.0	1.02	0.99	2.08	0.69	1.04

		Site Name	Owner's Site Office and Village	Obayashi Camp WWTS1	Sino Hydro Camp	Songda 5 Camp No.1	Songda 5 Camp No.2
		Station Code	EF01	EF02	EF06	EF07	EF08
Date	Parameter Unit)	Guideline in the CA					
25-Sep-17	Total Phosphorus (mg/l)	<2.0	1.13	1.28	1.77	1.42	0.74
07-Jul-17	Faecal Coliform (MPN/100 ml)		490	0	160,000	14,000	4.5
19-Jul-17	Faecal Coliform (MPN/100 ml)		13	3,500	1700	47	17,000
14-Aug-17	Faecal Coliform (MPN/100 ml)		49	2,400	1,400	1,600	0
23-Aug-17	Faecal Coliform (MPN/100 ml)		49	24,000	24,000	1,600	1,600
11-Sep-17	Faecal Coliform (MPN/100 ml)		79	0	0	0	0
25-Sep-17	Faecal Coliform (MPN/100 ml)		49	0	0	0	0
07-Jul-17	Total Coliform (MPN/100 ml)	<400	490	0	160,000	14,000	4.5
19-Jul-17	Total Coliform (MPN/100 ml)	<400	130	3,500	2,200	47	17,000
14-Aug-17	Total Coliform (MPN/100 ml)	<400	130	3,500	3,400	17,000	0
23-Aug-17	Total Coliform (MPN/100 ml)	<400	330	35,000	24,000	9,200	9,200
11-Sep-17	Total Coliform (MPN/100 ml)	<400	280	0	0	0	0
25-Sep-17	Total Coliform (MPN/100 ml)	<400	79	0	0	0	0
14-Aug-17	Residual Chlorine (mg/l)		n/a	0	0.08	0	0.55
23-Aug-17	Residual Chlorine (mg/l)		n/a	0	0	0.09	0.01
11-Sep-17	Residual Chlorine (mg/l)		n/a	0.11	0.15	0.28	0.07
25-Sep-17	Residual Chlorine (mg/l)		n/a	2.2	1.56	2.16	0.42

		Site Name	Zhefu Camp	V & K Camp	HM Main Camp WWTP	IHI Camp	Kenber Camp
		Station Code	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA					
07-Jul-17	pH	6.0-9.0	6.8	7.46	7	7.13	7.73
19-Jul-17	pH	6.0-9.0	7.13	7.51	7.33	7.39	7.37
14-Aug-17	pH	6.0-9.0	8.28	7.56	7.32	7.61	9.54
23-Aug-17	pH	6.0-9.0	10.66	7.33	7.25	6.87	
11-Sep-17	pH	6.0-9.0	10.4	6.82	6.62	6.5	10.01
25-Sep-17	pH	6.0-9.0	9.47	6.93	7.91	7.61	6.57
07-Jul-17	TSS (mg/l)	<50	50	8.63	11	<5	10.4
19-Jul-17	TSS (mg/l)	<50	74.12	14.68	11.76	<5	104.55
14-Aug-17	TSS (mg/l)	<50	14.05	<5	20.67	<5	124
23-Aug-17	TSS (mg/l)	<50	57.41	12.29	22.04	14.21	
11-Sep-17	TSS (mg/l)	<50	10.33	8.66	26.4	20.7	38.5
25-Sep-17	TSS (mg/l)	<50	23.33	13.33	16.29	17.95	21.3
07-Jul-17	BOD_5 (mg/l)	<30	24.5	19.4	<1	40.5	67.4
19-Jul-17	BOD_5 (mg/l)	<30	50.4	40.8	28.2	36.75	85.65

Date	Parameter (Unit)	Site Name	Zhefu Camp	V & K Camp	HM Main Camp WWTP	IHI Camp	Kenber Camp
		Station Code	EF09	EF10	EF13	EF14	EF16
		Guideline in the CA					
14-Aug-17	BOD_5 (mg/l)	<30	43.35	55.95	120	44.7	94.65
23-Aug-17	BOD_5 (mg/l)	<30	16.65	34.95	<1	65.85	
11-Sep-17	BOD_5 (mg/l)	<30	<18	<18	44.5	<18	<18
25-Sep-17	BOD_5 (mg/l)	<30	8.64	<6	<6	<6	<6
07-Jul-17	COD (mg/l)	<125	72.6	<25	67.2	63.4	108
19-Jul-17	COD (mg/l)	<125	53.5	<25	72.2	25.8	124
14-Aug-17	COD (mg/l)	<125	95.2	<25	182	43.6	203
23-Aug-17	COD (mg/l)	<125	116	31.6	132	102	
11-Sep-17	COD (mg/l)	<125	28.9	27.3	165	186	73.7
25-Sep-17	COD (mg/l)	<125	49	30.4	146	178	38.9
07-Jul-17	NH_3-N (mg/l)	<10	18	9	17	14	24
19-Jul-17	NH_3-N (mg/l)	<10	16	4	10	<0.2	20
14-Aug-17	NH_3-N (mg/l)	<10	10	7	21	14	3
23-Aug-17	NH_3-N (mg/l)	<10	<2	9	19	7	
11-Sep-17	NH_3-N (mg/l)	<10	<2	7	21	12	<2
25-Sep-17	NH_3-N (mg/l)	<10	<2	3	15	4	6
07-Jul-17	Total Nitrogen (mg/l)	<10	32.6	11.2	22.4	21.7	25.2
19-Jul-17	Total Nitrogen (mg/l)	<10	21.6	4.85	11.8	11.7	22.2
14-Aug-17	Total Nitrogen (mg/l)	<10	19.4	7.81	19.4	14.6	9.05
23-Aug-17	Total Nitrogen (mg/l)	<10	4.79	9.28	19.3	7.42	
11-Sep-17	Total Nitrogen (mg/l)	<10	4.31	8.92	22.1	13.8	5.43
25-Sep-17	Total Nitrogen (mg/l)	<10	7.33	5.18	18.5	7.06	8.44
07-Jul-17	Total Phosphorus (mg/l)	<2.0	1.11	0.48	1.03	0.59	0.61
19-Jul-17	Total Phosphorus (mg/l)	<2.0	1.34	0.29	0.76	0.85	1.02
14-Aug-17	Total Phosphorus (mg/l)	<2.0	1.38	0.62	1.12	1.21	0.78
23-Aug-17	Total Phosphorus (mg/l)	<2.0	0.66	0.66	1.84	0.7	
11-Sep-17	Total Phosphorus (mg/l)	<2.0	0.11	0.67	1.53	0.96	0.35
25-Sep-17	Total Phosphorus (mg/l)	<2.0	0.77	0.32	1.29	0.65	0.1
07-Jul-17	Faecal Coliform (MPN/100 ml)		160,000	2,400	0	24,000	1,700
19-Jul-17	Faecal Coliform (MPN/100 ml)		3,500	700	130	33	270
14-Aug-17	Faecal Coliform (MPN/100 ml)		350	1600	0	1,100	790
23-Aug-17	Faecal Coliform (MPN/100 ml)		0	1600	0	580	
11-Sep-17	Faecal Coliform (MPN/100 ml)		0	0	2,800	0	0

Date	Parameter (Unit)	Site Name	Zhefu Camp	V & K Camp	HM Main Camp WWTP	IHI Camp	Kenber Camp
		Station Code	EF09	EF10	EF13	EF14	EF16
		Guideline in the CA					
25-Sep-17	Faecal Coliform (MPN/100 ml)		23	0	0	0	0
07-Jul-17	Total Coliform (MPN/100 ml)	<400	160,000	3,300	0	24,000	16,000
19-Jul-17	Total Coliform (MPN/100 ml)	<400	5,400	1,100	130	22	1,100
14-Aug-17	Total Coliform (MPN/100 ml)	<400	350	1,600	0	2,200	1,700
23-Aug-17	Total Coliform (MPN/100 ml)	<400	0	1,600	0	3,500	
11-Sep-17	Total Coliform (MPN/100 ml)	<400	0	0	9,200	0	0
25-Sep-17	Total Coliform (MPN/100 ml)	<400	23	0	0	0	0
14-Aug-17	Residual Chlorine (mg/l)	<1.0		0.04	0	0.44	0
23-Aug-17	Residual Chlorine (mg/l)	<1.0		0.03	2.7	0.02	
11-Sep-17	Residual Chlorine (mg/l)	<1.0		0.04	0	0.04	0.5
25-Sep-17	Residual Chlorine (mg/l)	<1.0		0.89	1.35	0.85	0.56

TABLE 4-17: COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q3 2017

Site	ID	WWTS	Key Non-Compliance Issues[7] in Q3-2017	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): Q3 mean 12 mg/L. Latest result 10 mg/L.	- EMO continues to monitor and corrective action will be suggested (if required).
OC Camp – WWTS01	EF02	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD_5 (<30 mg/L): Q3 mean 33 mg/L. Latest result 4.2 mg/L. - Ammonia (<10 mg/L): Q3 mean 16 mg/L. - Total coliforms: Back in compliance by September 2017.	- Chlorine mixing system installed - Adjustment of chlorine dosing rate. - Total coliform and BOD_5 significantly decreased and back in compliance
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 Q3 2017
Sino Hydro Camp	EF06	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD_5 (<30 mg/L): Q3 mean 32 mg/L. Back in compliance in September 2017. - Ammonia (<10 mg/L): Q3 mean 27 mg/L. - Total coliforms: Back in compliance by September 2017.	- Chlorine mixing system installed - Adjustment of chlorine dosing rate

[7] The values in brackets indicate the applicable standard

Site	ID	WWTS	Key Non-Compliance Issues[7] in Q3-2017	Corrective Actions
				- Total coliform and BOD_5 significantly decreased and back in compliance
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 with 2 out of 6 measurements. Q3 mean 27 mg/L. Back in compliance in September 2017. - Ammonia (<10 mg/L): Back in compliance by August 2017. - Total coliforms: Back in compliance by August 2017.	- As above.
V&K Camp	EF10	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD5 (<30 mg/L): Q3 mean 30 mg/L. Non-compliance with 3 out of 5 measurements. Back in compliance by September 2017. - Total coliforms: Back in compliance by September 2017.	- As above.
HMH Main Camp – WWTS01	EF13	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD5 (<30 mg/L): Q3 mean 33 mg/L. Back in compliance end of September 2017. - Ammonia (<10 mg/L): Q3 mean 17.2 mg/L. - Total coliforms: Non-compliance with 1 out of 6 measurements. Back in compliance by end of September 2017.	- As above.
IHI Camp	EF14	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD5 (<30 mg/L): Q3 mean 37 mg/L. Back in compliance by September 2017. - Ammonia (<10 mg/L): Q3 mean 7.4 mg/L. Non-compliance with 2 out of 5 measurements. - COD (<125 mg/L): Q3 mean 107 mg/L. Non-compliance in September 2017. - Total coliforms: Non-compliance with 2 out of 5 measurements. Back in compliance by September 2017.	- As above.

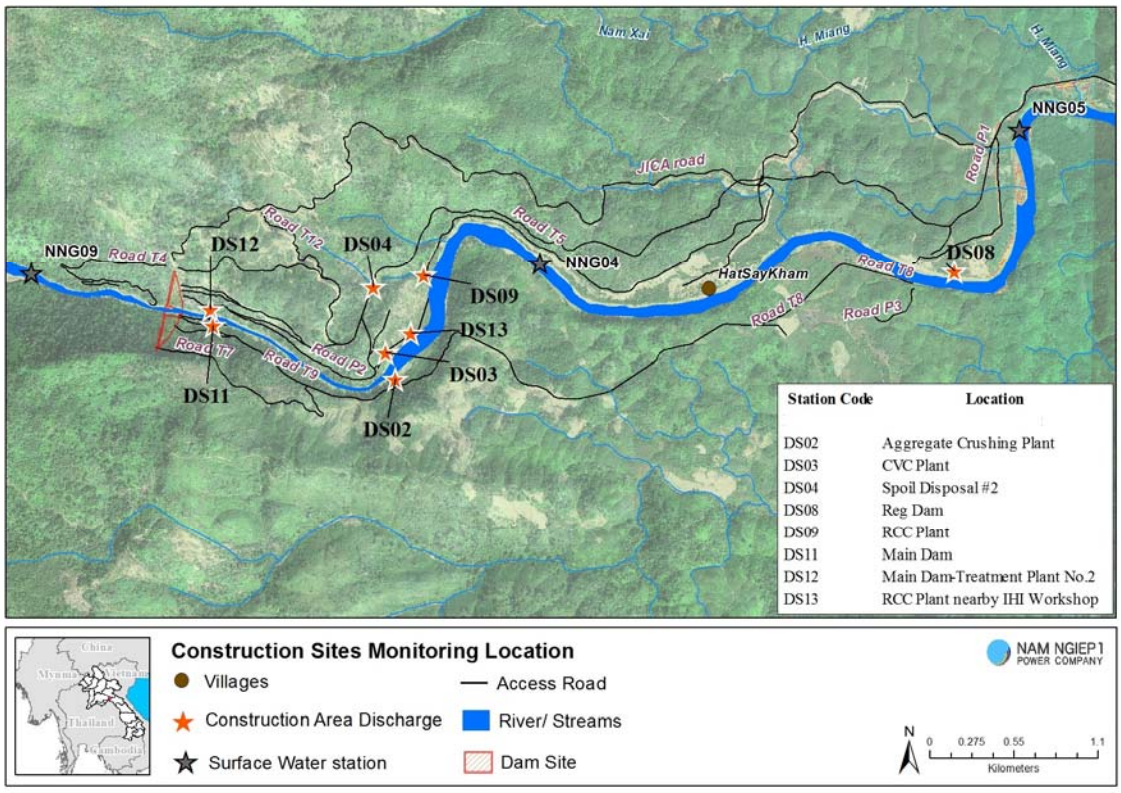
Site	ID	WWTS	Key Non-Compliance Issues[7] in Q3-2017	Corrective Actions
Song Da 5 Camp No. 1	EF07	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD5 (<30 mg/L): Q3 mean 30 mg/L. Non-compliance with 2 out of 6 measurements. Back in compliance by September 2017. - Ammonia (<10 mg/L): Q3 mean 16.7 mg/L. Non-compliance with 5 out of 6 measurements. - Total coliforms: Non-compliance with 3 out of 6 measurements. Back in compliance by September 2017.	- As above.
Song Da 5 Camp No. 2	EF08	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD5 (<30 mg/L): Q3 mean 37 mg/L. Non-compliance with 3 out of 6 measurements. Back in compliance by September 2017. - Ammonia (<10 mg/L): Q3 mean 20.7 mg/L. Non-compliance with 4 out of 6 samples. Back in compliance by September 2017. - Total coliforms: Non-compliance with 2 out of 6 measurements. Back in compliance by September 2017.	- As above.
Kenber Camp	EF16	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- BOD5 (<30 mg/L): Q3 mean 53 mg/L. Non-compliance with 3 out of 5 measurements. Back in compliance by September 2017. - Ammonia (<10 mg/L): Q3 mean 10.9 mg/L. Back in compliance by August 2017. - Total coliforms: Back in compliance by September 2017.	- As above.
Lilama10 Camp		Design: Wetland with chlorination system	-	- The WWTP has been out of operation and was redesigned in September 2017 in accordance with recommendations of the Independent Advisory Panel. It is expected that the WWTP

Site	ID	WWTS	Key Non-Compliance Issues[7] in Q3-2017	Corrective Actions
				will be completed by the end of October 2017

4.6.5 Compliance Monitoring of Discharges from Construction Sites

Discharges from the key construction sites (see ***Figure 4-8***) were monitored during the reported period. The results are presented in ***Table 4-18.*** Results that are above the prescribed standards are highlighted in yellow.

FIGURE 4-8 LOCATION OF DISCHARGE POINTS OF KEY CONSTRUCTION SITES



During Q3 2017, NNP1PC worked closely with the contractor to bring the discharges from the sediment retention ponds at the aggregate crushing plant and the RCC batching Plant back into compliance, and during the course of Q3 2017 the following improvements were made:

Aggregate crushing plant:

- Sealing of the pond bottoms and embankments;
- Installation of a V-shaped weir between the two ponds and a V-shaped outfall. This increases the length of the weir/outfall, thereby decreasing the horizontal flow velocity and promoting sedimentation;
- Application of aluminium sulphate [Al2(SO4)3] for flocculation of suspended particles. The use of the flocculant started in August 2017 based on bench test performed by NNP1PC Environmental Laboratory in July 2017;
- Regular clean out of sediments;

RCC batching plant:

- Construction of additional ponds to increase the sediment retention capacity of the system;

- Daily clean out of sediments from the ponds;
- Application of aluminium sulphate [Al2(SO4)3] for flocculation of suspended particles. The use of the flocculant started in August 2017;

As illustrated in ***Figure 4-9*** and ***Figure 4-10***, these measures have brought the discharges from the aggregate crushing plant and the RCC batching plant back in compliance with the standard. See also the graphic presentations of the measurements from April-September 2017 in Appendix 4.

The compliance status for each of the key construction sites is summarized in ***Table 4-19***.

FIGURE 4-9 TOTAL SUSPENDED SOLIDS IN THE DISCHARGE FROM THE AGGREGATE CRUSHING PLANT

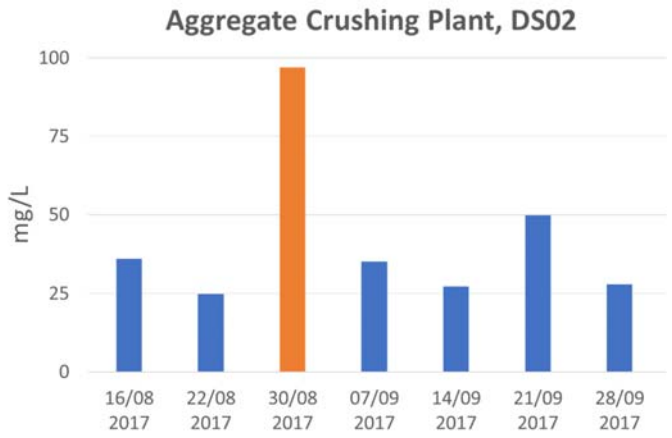


FIGURE 4-10 TOTAL SUSPENDED SOLIDS IN THE DISCHARGE FROM THE RCC BATCHING PLANT

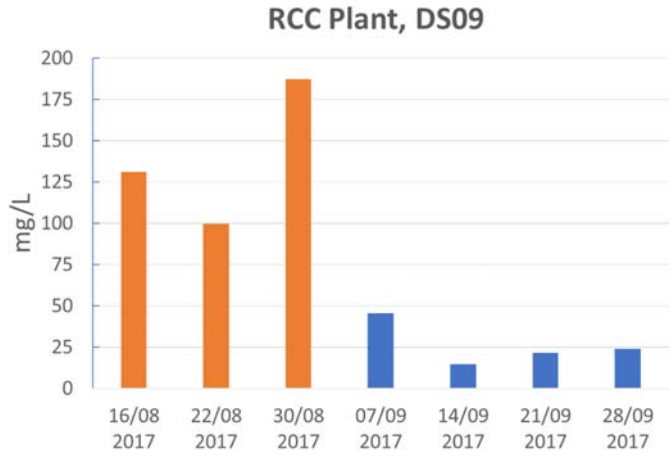


TABLE 4-18 RESULTS OF THE CONSTRUCTION AREA DISCHARGE MONITORING IN Q3 2017

Date	Parameter (Unit)	Site Name	Aggregate Crushing Plant	Spoil Disposal No.2	RCC Plant (Discharge at lower pond)	RCC Plant (Discharge Nearby IHI)	Main Dam (Treatment Plant - No.1)	Main Dam (Treatment Plant - No.2)
		Station Code	DS02	DS04	DS09	DS13	DS11	DS12
		Guideline						
6-Jul-17	pH	6.0 - 9.0	6.0	6.0	7.0	7.0	3.0	11.0
12-Jul-17	pH	6.0 - 9.0	6.37	6.08	8.01	7.66	2.86	4.82
20-Jul-17	pH	6.0 - 9.0	6.6	6.52	9.24	7.15	10.52	
26-Jul-17	pH	6.0 - 9.0	7.07	7.23	6.89	7.2	8.88	11.17
9-Aug-17	pH	6.0 - 9.0	6.32	6.45	7.13	6.83	2.82	
16-Aug-17	pH	6.0 - 9.0	4.43	6.06	7.69	7.99	7.7	11.64
22-Aug-17	pH	6.0 - 9.0	7.51	5.89	7.28	7.72	7.68	
30-Aug-17	pH	6.0 - 9.0	7.19	6.66	6.62	6.75	6.46	6.99
7-Sep-17	pH	6.0 - 9.0	6.51	6.64	7.8	6.91	6.49	
14-Sep-17	pH	6.0 - 9.0	9.39	6.0	6.57	6.2	6.02	
21-Sep-17	pH	6.0 - 9.0	6.5	6.6	6.5	7.1	3.3	
28-Sep-17	pH	6.0 - 9.0	6.3	6.0	6.5	6.7	9.5	
6-Jul-17	TSS (mg/l)	<50	46,470	13	191	113	29.6	222
12-Jul-17	TSS (mg/l)	<50	174	36	482.7	52.4	40.8	20.5
20-Jul-17	TSS (mg/l)	<50	1,477	45	132	46.49	59.8	
26-Jul-17	TSS (mg/l)	<50	3,282	34	237.7	841	38.8	159.3
9-Aug-17	TSS (mg/l)	<50	514.5	21	974.2	1,333	37.9	
16-Aug-17	TSS (mg/l)	<50	287.0	7	80.0	108.7	46.0	82.4
22-Aug-17	TSS (mg/l)	<50	8.2	9	33.8	10.71	17.9	
30-Aug-17	TSS (mg/l)	<50	97	150	187.1	55	11.3	23.3
7-Sep-17	TSS (mg/l)	<50	35.2	10.8	45.4	32.0	37.8	
14-Sep-17	TSS (mg/l)	<50	27.2	10.4	14.8	6.4	16.6	
21-Sep-17	TSS (mg/l)	<50	49.7	41.8	21.6	27.2	30.5	

Date	Parameter (Unit)	Site Name	Aggregate Crushing Plant	Spoil Disposal No.2	RCC Plant (Discharge at lower pond)	RCC Plant (Discharge Nearby IHI)	Main Dam (Treatment Plant - No.1)	Main Dam (Treatment Plant - No.2)
		Station Code	**DS02**	**DS04**	**DS09**	**DS13**	**DS11**	**DS12**
		Guideline						
28-Sep-17	TSS (mg/l)	<50	28.0	9.3	23.8	7.1	37.7	

TABLE 4-19: COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CONSTRUCTION SITES IN Q3 2017

Site	ID	Treatment System	Key Non-Compliance Issues[8] in Q3-2017	Corrective Actions
Aggregate Crushing Plant	DS02	Sediment ponds	- TSS (<50 mg/L): Long history of non-compliance brought back in compliance by September 2017.	- Aluminium sulfate was applied in the ponds to help settle sediments. Lime was added to adjust pH. These measures ensured compliance with the applicable standards
CVC Plant	DS03	Sediment ponds	- No discharge during Q3 2017	
Spoil Disposal No.2	DS04	Sediment pond	- TSS (<50 mg/L): Q3 mean 32 mg/L. Non-compliance in 1 out of 12 measurements.	-

[8] The values in brackets indicate the applicable standard

Site	ID	Treatment System	Key Non-Compliance Issues[8] in Q3-2017	Corrective Actions
RCC Plant (at Lower Ponds)	DS09	Sediment ponds	- TSS (<50 mg/L): Long history of non-compliance brought back in compliance by September 2017	- Aluminium sulfate was applied to help settle sediments. This measure ensured compliance with the applicable standards
RCC Plant (nearby IHI workshop)	DS13	Sediment ponds	- TSS (<50 mg/L): Long history of non-compliance brought back in compliance by September 2017	- Aluminium sulfate was applied to help settle sediments. This measure ensured compliance with the applicable standards.
Main Dam Construction Area (Treatment Plant No.1)	DS11	pH adjustment and chemical flocculation 6,000 m^3/day	- TSS (<50 mg/L): Q3 mean 34 mg/L. Non-compliance in 1 out of 12 measurements. - pH (>6 and <9): Non-compliance with 6 out of 12 measurements. Back in compliance end of August 2017.	- The Contractor was notified to ensure that the wastewater from the main dam is properly treated. EMO will continue to monitor.
Main Dam Construction Area (Treatment Plant No.2)	DS12	pH adjustment and chemical flocculation	- TSS (<50 mg/L): Q3 mean 102 mg/L. Non-compliance in 5 out of 6 measurements. - pH (>6 and <9): Non-compliance with 5 out of 6 measurements.	- The Contractor was notified to ensure that the wastewater from the main dam is properly treated. EMO will continue to monitor.

4.6.6 Groundwater Quality Monitoring

During Q3 2017, six boreholes at Phouhomxay (HSRA) have been monitored for the following 19 parameters:

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

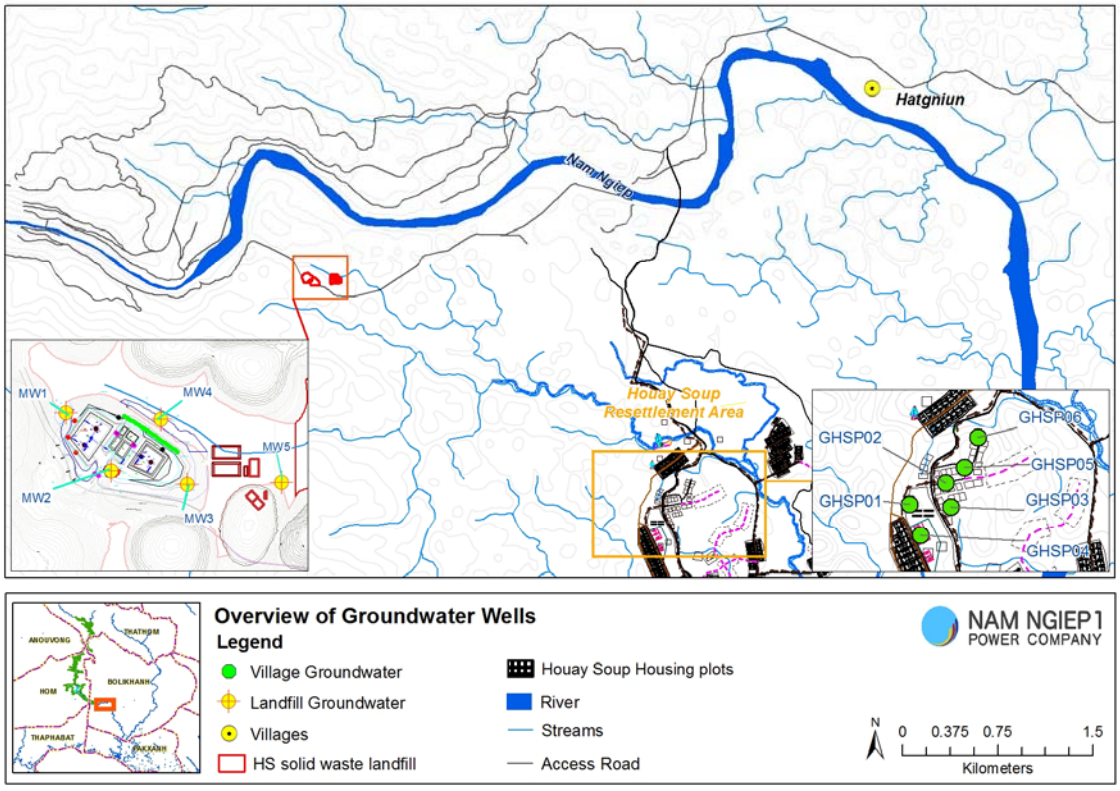
b. *Quarterly:* Arsenic (mg/l), Cadmium (mg/l), Iron (mg/l), Magnesium (mg/l), Manganese (mg/l), Fluoride (mg/l), Nitrate (mg/l), Nitrite (mg/l), Total Hardness (mg/l) Lead (mg/l).

Note that the three wells at the now inundated Ban Hatsaykham were dismantled and plugged in May 2017 prior to start of impounding the re-regulation reservoir.

The groundwater immediately upstream and downstream the NNP1 Project Landfill and Houay Soup Landfill was monitored in five wells in order to detect indications of seepage of leachate into the groundwater. The parameters monitored include:

Quarterly: pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), Faecal Coliform (MPN/100 ml), E. coli (MPN/100 ml), Lead (mg/l), Total Phosphorus (mg/l), Ammonia-nitrogen (mg/l), Copper (mg/l) and Total Petroleum (mg/l).

FIGURE 4-11: GROUNDWATER SAMPLING LOCATIONS



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

Phouhomxay: All of the parameters monitored complied with the relevant National Standard (the exceedance of the groundwater quality standard for lead in GHS04 is considered negligible). Although faecal coliform and Ecoli bacteria were not detected in this Quarter, the villagers were advised to boil the water before drinking due to past history of elevated levels of bacteria in the groundwater.

TABLE 4-20: RESULTS OF THE GROUNDWATER QUALITY MONITORING FROM JULY TO SEPTEMBER 2017

Date	Parameter (Unit)	Site Name	Phouhomxay					
		Station	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
		Guideline						
15-Sept-17	Lead (Pb)	<0.2	<0.008	<0.008	<0.008	0.209	<0.008	<0.008

NNP1 and Houay Soup Landfills' Groundwater: The pH levels were found to be slightly lower than the standard (see ***Table 4-21***). These levels are likely background levels as similar levels have been measured both upstream and downstream the landfill since the start of monitoring in July 2016. As shown in ***Table 4-22***, slightly elevated levels of lead have been measured in all wells in 4-6 occasions out of the 7 monitoring rounds carried out since the wells were established in July 2016. However, as reported in the Q1 2017 and Q2 2017 Environment Monitoring Reports, it is highly unlikely that the elevated levels of lead are caused by the landfills. Based on measurements of the groundwater table in MW1-MW4 in July 2016, the groundwater table is about 40 m below the bottom of the NNP1 Project Landfill pit and the flow direction is southwestern, which means that MW2 is located downstream pit no 1 and MW3 and MW4 are upstream the landfill. MW5 had elevated lead levels in all three measurements in Q4 2016 prior to start of waste disposal. Furthermore, lead has not been detected in the leachate from landfill treatment ponds and the waste pits and all ponds of both landfills are lined with a HDPE liner protecting the groundwater against infiltration of leachate.

TABLE 4-21: RESULTS OF PH MEASUREMENTS AT THE MONITORING WELLS OF NNP1 PROJECT LANDFILL AND HOUAY SOUP LANDFILL

Date	MW1	MW2	MW3	MW4	MW5
	Groundwater Standard: 6 < pH < 9				
09-Dec-16	5.75	5.05	5.85	4.76	5.7
10-Mar-17	6.14	5.36	6.34	5.36	-
02-Jun-17	6.18	5.38	6.05	5.7	6.46
18-Sep-2017	6.12	5.48	5.92	5.84	5.78

TABLE 4-22: RESULTS OF MEASUREMENTS FOR LEAD IN THE GROUNDWATER MONITORING WELLS OF NNP1 PROJECT LANDFILL AND HOUAY SOUP LANDFILL

Date	MW1 (mg/L)	MW2 (mg/L)	MW3 (mg/L)	MW4 (mg/L)	MW5 (mg/L)
	Groundwater Standard: < 0.01 mg/L lead				
02-Sep-2016	0.107	0.018	<0.008	0.081	

Date	MW1 (mg/L)	MW2 (mg/L)	MW3 (mg/L)	MW4 (mg/L)	MW5 (mg/L)
25-Oct-2016	0.126	0.038	0.404	0.12	0.022
10-Nov-2016	0.111	0.01	0.065	0.014	0.022
09-Dec-2016	0.017	<0.008	0.017	0.01	0.113
29-Mar-2017	0.097	0.014	0.039	0.023	
02-Jun-2017	0.113	1.73	0.076	0.017	0.137
01-Sep-2017	0.017	<0.008	0.019	<0.008	0.105

4.6.7 Gravity Fed Water Supply (GFWS) Monitoring

The monitoring programme in Q3 2017 for the Gravity Fed Water Supply includes the following parameters:

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

d. *Quarterly:* Arsenic (mg/L), Lead (mg/l), Fluoride (mg/L), Nitrate (mg/L), Nitrite (mg/L), Total Hardness (mg/L) and total hardness (mg/L).

The GFWS monitoring aims to assess the quality of water that is being used for bathing and washing by the villagers at Hat Gniun and Thahuea Villages. Water samples were taken from the tap for analysis during the reported period and the results are shown in ***Table 4-23*** below.

TABLE 4-23: THE GFWS MONITORING RESULT FROM JULY TO SEPTEMBER 2017

Date	Parameter (Unit)	Site Name	Tha Heua Village	Hat Gniun Village
		Station	WTHH02	WHGN02
		Guideline		
17-Jul-17	E. Coli Bacteria (MPN/100 ml)	0	49	79
04-Aug-17		0	49	130
15-Sept-17		0	13	22
17-Jul-17	Faecal coliform (MPN/100 ml)	0	49	79
04-Aug-17		0	49	130
15-Sept-17		0	13	22

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

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

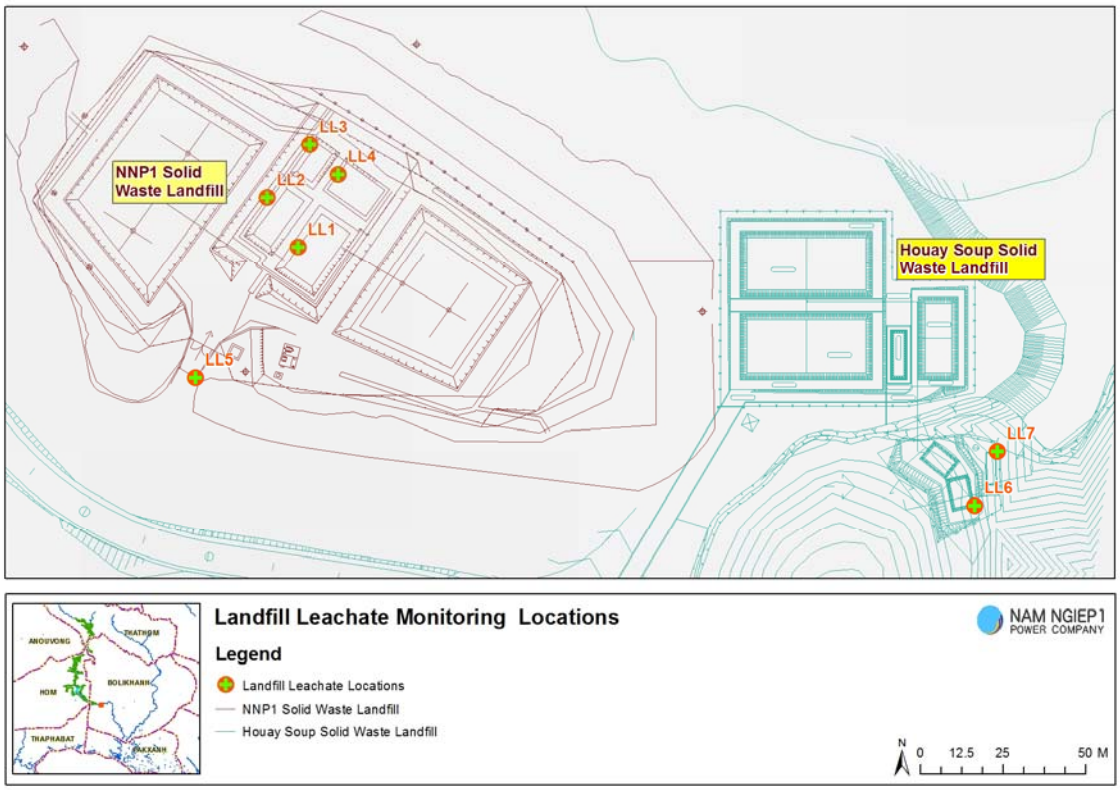
The villagers have been advised to boil the water before drinking.

4.6.8 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 4-12***.

FIGURE 4-12: LANDFILL LEACHATE MONITORING LOCATION



The monitoring results for Q3 2017 indicate compliance with the applicable standards for all parameters monitored. The monitoring data can be found in Appendix 5**.**

4.6.9 Air Quality (Dust) Monitoring

4.6.9.1 Ambient Air Quality in the Host Villages

The ambient air quality monitoring for dust (measured as PM_{10} – particulate matter with diameter of 10 micrometer or smaller) was carried out for 72 consecutive hours in Hat Gniun Village and Phouhomxay Village. Each monitoring included about 24 hours on a weekend. The main purpose of the dust monitoring in Hat Gniun Village and Phouhomxay Village is to assess if the project construction works and project related traffic cause any significant increase of dust in the ambient air.

The monitoring stations are displayed in ***Figure 4-13*** and the results are summarized in ***Table 4-24.*** The measured concentrations of PM_{10} in the ambient air complied with the standard for all time periods.

FIGURE 4-13: NOISE AND DUST MONITORING LOCATIONS AT THE CONSTRUCTION SITES AND NEARBY VILLAGES

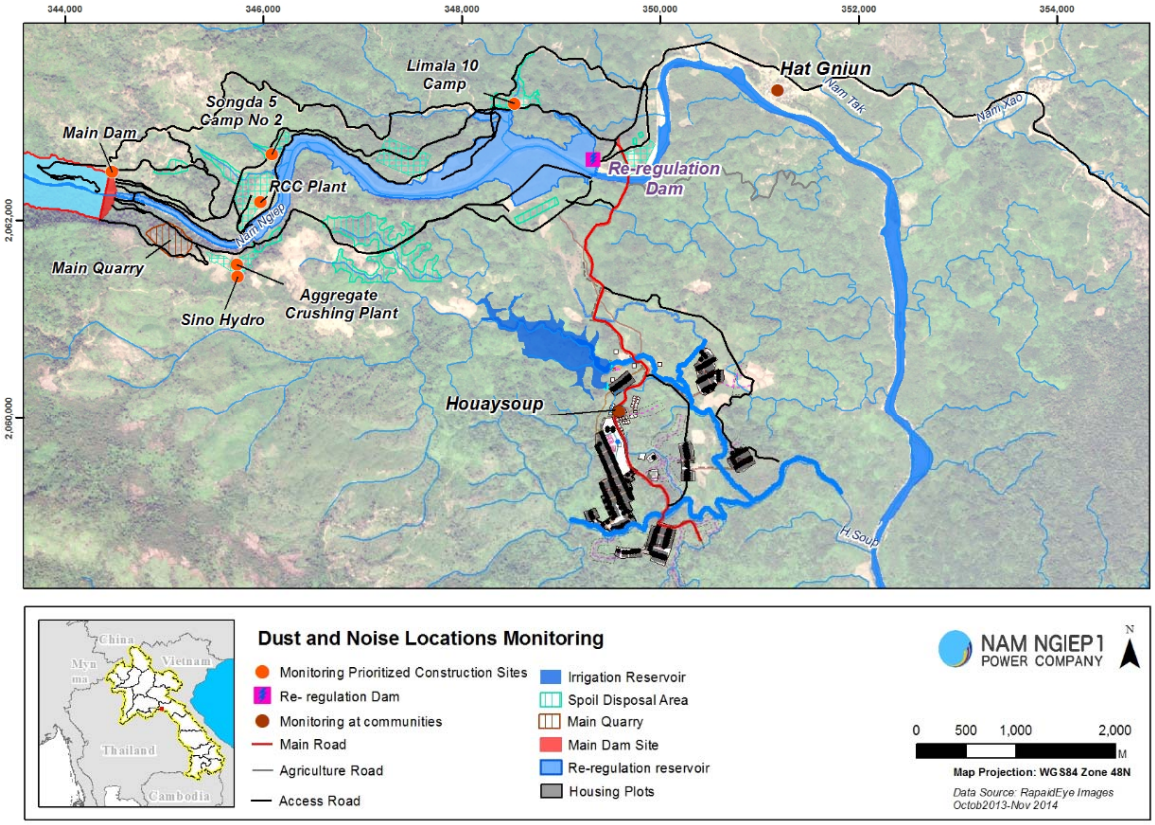


TABLE 4-24: RESULTS OF AIR QUALITY (DUST) MONITORING AT THE VILLAGES NEAR THE PROJECT CONSTRUCTION SITES DURING JULY TO SEPTEMBER 2017

Site Name	Hat Gniun Village								
Start Time	08-Jul-17 18:00	09-Jul-17 18:01	10-Jul-17 18:01	11-Aug-17 18:00	12-Aug-17 18:00	13-Aug-17 18:00	11-Sep-17 18:00	12-Sep-17 18:00	13-Sep-17 18:00
End Time	09-Jul-17 18:00	10-Jul-17 18:00	11-Jul-17 18:00	12-Aug-17 18:00	13-Aug-17 18:00	14-Aug-17 18:00	12-Sep-17 18:00	13-Sep-17 18:00	14-Sep-17 18:00
Average Data Record - 24 hours	0.02	0.02	0.01	0.02	0.02	0.03	0.03	0.02	0.02
Guideline	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***

Site Name	Phouhomxay								
Start Time	26-Jul-17 18:00	27-Jul-17 18:02	28-Jul-17 18:03	26-Aug-17 18:00	27-Aug-17 18:00	28-Aug-17 18:00	01-Sep-17 18:00	02-Sep-17 18:00	03-Sep-17 18:00
End Time	27-Jul-17 18:01	28-Jul-17 18:01	29-Jul-17 18:06	27-Aug-17 17:59	28-Aug-17 17:59	29-Aug-17 17:59	02-Sep-17 18:00	03-Sep-17 18:00	04-Sep-17 18:00
Average Data Record - 24 hours	0.01	0.01	0.02	0.02	0.03	0.02	0.041	0.065	0.071
Guideline	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***

4.6.9.2 Project Construction Sites

During Q3 2017, 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 4-25*** indicate compliance with the standard (0.12 mg/m^3 PM_{10}) for all construction sites.

TABLE 4-25: DUST MONITORING RESULTS AT THE CONSTRUCTION SITES DURING JULY TO SEPTEMBER 2017

Site Name	**Aggregate Crushing Plant**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	20-Jul-17 18:04	07-Aug-17 18:00	20-Sep-17 18:00
End Time	21-Jul-17 18:00	08-Aug-17 18:00	21-Sep-17 18:00
Average Data Record - 24h	0.011	0.011	0.012
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**RCC Plant**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	06-Jul-17 18:00	21-Aug-17 18:00	18-Sep-17 18:00
End Time	07-Jul-17 18:00	22-Aug-17 18:00	19-Sep-17 18:00
Average Data Record -24h	0.014	0.022	0.016
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**Main Dam**		
Period	00-24 Hours	24 Hours	24 Hours
Start Time	30-Jul-17 18:30	01-Aug-17 18:00	25-Sep-17 18:00
End Time	31-Jul-17 18:00	02-Aug-17 18:00	26-Sep-17 18:00
Average Data Record -24h	0.016	0.014	0.012
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**Sino Hydro Temporary Worker Camp**		
Period	00-24 Hours	00-24 Hours	24 Hours
Start Time	25-Jul-17 18:00	23-Aug-17 18:00	22-Sep-17 18:00
End Time	26-Jul-17 17:30	24-Aug-17 17:49	23-Sep-17 18:00
Average Data Record -24h	0.021	0.022	0.046
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	04-Jul-17 18:00	03-Aug-17 18:00	08-Sep-17 18:00
End Time	05-Jul-17 18:00	04-Aug-17 18:00	09-Sep-17 18:00
Average Data Record -24h	0.014	0.023	0.016
Guideline	***0.12***	***0.12***	**0.12**

Site Name	Lilama 10 Camp		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	19-Jul-17 18:00	16-Aug-17 17:39	05-Sep-17 18:00
End Time	20-Jul-17 17:30	17-Aug-17 17:09	06-Sep-17 18:00
Average Data Record - 24h	0.005	0.010	0.023
Guideline	***0.12***	***0.12***	**0.12**

4.6.10 Noise Monitoring

4.6.10.1 Nearby Communities

Noise monitoring was carried out in Hat Gniun and Phouhomxay 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 during 18:00-22:00 and night time during 22:00-06:00, and the maximum peak noise level.

The results (see ***Table 4-26***) show that the noise level at the villages was within the allowable maximum peak value of 115 dB(A); however, the average noise levels occasionally exceeded the relevant standard.

TABLE 4-26: NOISE MONITORING RESULTS FROM JULY TO SEPTEMBER 2017 AT THE NEARBY COMMUNITIES

Ban Hat Gnuin -Noise Monitoring 72 consecutive hours-July 2017									
	08-09/July/2017			09-10/July/2017			10-11/July/2017		
Noise Level (dB)	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	65.2	80.4	74.1	61.4	66.1	74.1	67.8	77.9	81.8
Guideline Max	115	115	115	115	115	115	115	115	115
Average Data Recorded	56.32	59.25	55.54	55.13	52.96	55.43	56.95	56.40	54.50
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Ban Hat Gnuin -Noise Monitoring 72 consecutive hours-August 2017									
	11-12/August/2017			12-13/August/2017			13-14/August/2017		
Noise Level (dB)	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	60.1	77.7	69.4	62.2	60.4	81.2	68.3	63	74.9
Guideline Max	115	115	115	115	115	115	115	115	115
Average Data Recorded	49.16	49.64	46.18	53.69	51.73	48.49	52.74	52.57	48.86
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Ban Hat Gnuin -Noise Monitoring 72 consecutive hours-September 2017									
	11-12/September/2017			12-13/September/2017			13-14/September/2017		
Noise Level (dB)	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	67.3	61.4	66.5	64.2	56.9	68.6	64.5	59.9	68.1
Guideline Max	115	115	115	115	115	115	115	115	115
Average Data Recorded	51.76	45.64	44.78	49.01	45.97	44.29	48.22	43.35	43.14
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Houay Soup Resettlement Area - Noise Monitoring 72 consecutive hours - July 2017									
	27-28/July/17			28-29/July/17			29-30/July/17		
Noise Level (dB)	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	63.60	68.00	88.20	63.40	61.90	86.40	73.70	60.90	77.40
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	48.26	48.07	48.83	46.37	43.11	44.33	46.50	46.78	45.83
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Houay Soup Resettlement Area - Noise Monitoring 72 consecutive hours - August 2017									
	26-27/August/17			27-28/August/17			28-29/August/17		
Noise Level (dB)	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	61.00	66.90	73.40	69.30	62.80	67.70	67.70	59.50	72.80
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	47.08	48.97	47.82	51.09	46.42	46.46	49.92	43.77	47.42
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Houay Soup Resettlement Area - Noise Monitoring 72 consecutive hours - September 2017									
	01-02/September/17			02-03/September/17			03-04/September/17		
Noise Level (dB)	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	64.90	68.30	73.20	67.00	71.00	73.60	72.30	71.60	71.00
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	46.45	47.40	43.67	48.79	40.56	42.37	46.81	44.19	39.19
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

4.6.10.2 Project Camps and Construction Sites

During Q3 2017, 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 mainly in order to assess possible impacts on workers' health as well as to estimate any potential impact on the ambient noise levels in nearby communities.

The results show that all maximum peak noise levels were within the National Standard. However, the average noise level during 22:00-06:00 at Sino Hydro Temporary Camp, Song Da 5 Camp No.2, and Lilama10 Camp were higher than the National standard (<50 dB(A)) during the reported period.

TABLE 4-27: NOISE MONITORING RESULTS FOR PROJECT CONSTRUCTION SITES FROM JULY TO SEPTEMBER 2017

Site Name	**Aggregate Crushing Plant - Noise Monitoring (dB (A))**								
Noise Level (dB)	**20-21/Jul/17**		**21/Jul/17**	**07-08/Aug/17**		**08/Aug/17**	**20-21/Sept/17**		**21/Sept/17**
	18:05 - 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	81.60	77.60	78.00	51.00	54.20	65.50	77.80	77.80	76.30
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	54.35	55.86	62.21	45.43	42.06	41.53	59.62	63.49	64.53
Guideline Averaged	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***

Site Name	**RCC Plant**								
Noise Level (dB)	06-07/Jul/17		07/Jul/17	21-22/Aug/17		22/Aug/17	18-19/Sept/17		19/Sept/17
	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	70.10	71.60	79.20	67.5	67.7	75.7	65.00	69.40	69.00
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	65.45	65.00	65.07	65.30	63.31	60.83	57.61	58.08	58.55
Guideline Averaged	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***	***70***

Site Name	Main Dam								
Noise Level (dB)	30-31/Jul/17		31/Jul/17	01-02/Aug/17		02/Aug/17	25-26/Sept/17		26/Sept/17
	18:30 - 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	56.2	52.5	58.9	65	56.2	59.3	65.9	71	71.2
Guideline Max	115	115	115	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	43.16	44.26	39.51	49.40	47.60	39.95	57.81	56.72	57.47
Guideline Averaged	70	70	70	***70***	***70***	***70***	***70***	***70***	***70***

Site Name	Sino Hydro Temporary Worker Camp								
Noise Level (dB)	25-26/July/17		26/July/17	24-25/Aug/17		25/Aug/17	22-23/Sept/17		23/Sept/17
	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	70.4	81.2	70.6	78.6	78.8	75.6	63.9	63	62.8
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	46.06	56.20	58.45	57.31	57.50	53.69	52.98	54.75	50.82
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Song Da5 Camp No.2								
Noise Level (dB)	04-05/Jul/17		05/Jul/17	03-04/Aug/17		04/Aug/17	08-09/Sep/17		09/Sep/17
	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	63.80	60.90	86.60	90.50	62.40	78.40	67.30	56.00	68.30
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	57.20	57.21	55.17	50.07	51.50	51.48	51.65	50.92	47.35
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Lilama10 Camp								
Noise Level (dB)	19-20/Jul/17		20/Jul/17	16-17/Jul/17		17/Jul/17	05-06/Sep/17		06/Sep/17
	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	65.5	67.5	87.4	57.6	77.1	76.4	64	64.9	88.9
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	52.51	55.79	57.61	46.45	48.47	47.54	45.32	44.67	43.14
Guideline Averaged	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

4.6.11 Vibration

Lao PDR does not have guidelines for vibration. Structural damage from road construction activity (e.g. vibratory rollers) and ancillary activity (e.g. blasting at the quarries) are unlikely to impact the human health and surrounded environment given the long distance between public infrastructure and construction areas.

5 WATERSHED AND BIODIVERSITY MANAGEMENT

5.1 WATERSHED MANAGEMENT

Activities in Q3 2017	Results
Preparation of NNP1 Watershed Management Plan (WMP)	• A technical workshop for NNP1 Watershed Management Plan with relevant GOL counterparts was conducted from 26-27 September 2017. The workshop was attended by 39 participants (5 women) from Watershed and Reservoir Protection Offices (DFRM, XSB PoNRE, BLK PAFO), Department of Forest Resource Management (DFRM), Department of Water Resource Management, Department of Livestock and Fishery, Provincial Department of Natural Resource and Environment of Bolikhamxay and Xaysomboun Provinces, Provincial Department of Agriculture and Forestry of Bolikhamxay and Xaysomboun Provinces, relevant government line agencies at district level of Bolikhamxay and Xaysomboun Provinces, and NNP1PC. • The participants generally agreed with the proposed activity packages, and there were only minor suggestions and recommendations. NNp1PC will make the required revisions to the NNP1 Watershed Management Plan, and present the final plan for GOL approval in December 2017.
Preparation of Provincial Watershed Management Regulations	• The draft provincial regulation was discussed with representatives of WRPOs on 27 September 2017. The meeting agreed with the regulation. Village consultations will be carried out in October and November 2017. The meeting recommended to include all villages within 15 km from NNP1 watershed boundary in the consultations of the regulation.
WRPO Activities	• The restructure of NNP1 WRPC and WRPO is still under consideration at central level between MAF and MONRE. • The current arrangement is that DFRM-WRPO (MAF), Bolikhamxay-WRPO (PAFO), and Xaysomboun-WRPO (PONRE) are the responsible agencies.

5.2 BIODIVERSITY MANAGEMENT

Activities in Q3 2017	Results
Preparation of NNP1 Biodiversity Offset Management Plan (BOMP)	• NNP1PC and ADB discussed the “No Net Loss Forecast” developed by NNP1PC on 25 September 2017. It was agreed that NNP1PC in close collaboration with ADB’s experts shall improve the proposal and finalize it in October 2017. Once the proposal is agreed between ADB

Activities in Q3 2017	Results
	and NNP1, it will serve as one of the key references for BOMP development.
Activities pre-BOMP period of 1 October 2016 – 31 September 2017	**Community Mapping of villages in Nam Chouane-Nam Xang Biodiversity Offset Site** • The maps produced from community mapping exercise have been shared with 6 NCNX villages. • It was further discussed between BOMC, NNP1PC EMO team and representatives of the villages that the maps should be regularly reviewed and updated based on the latest information obtained from relevant activities such as from the regular patrolling work in NCNX. **Communication System** • BOMC has installed 3 sets of Radio communication systems (Icom IC 718) at the end of September 2017: 1 system at BOMC Office in Viengthong, 1 at Phone Mueang semi-permanent sub-station in Xaychamphone District, and 1 at Nam San - Vangphieng semi-permanent sub-station in Viengthong District. **Community Relations Building** • The report of community relationship building has been shared by BOMC on 27 July 2017 and further discussed in August 2017. It was noted that BOMC needs to visit the NCNX villages in Q4 2017 to evaluate the effectiveness of community awareness activities within local communities. **Patrolling** • In July 2017, BOMC in coordination with NNP1PC EMO finalized the overall patrolling programme including the scope of work of the patrolling unit, training, and the schedule. The patrolling team was established at the end of July 2017. • In August 2017, BOMC recruited a consultant team to execute the training program. The training was completed at the end of August 2017 covering the following topics: 1) Patrolling objectives relevant to biodiversity protection and management; 2) Law enforcement; 3) Patrolling technique include first aid action; and 4) Introduction and exercise with SMART programme • In September 2017, a detailed proposal and activity plan were approved by BOMC Deputy Chair. Two patrolling teams commenced the patrolling in Viengthong and Xaychamphone Districts comprises. The staff include 4

Activities in Q3 2017	Results
	military personnel, 18 villagers, 6 DAFO staffs, and 7 BOMC staffs. The first activities of the first month aim for identification of key threats within NCNX while obtaining hands-on experience especially for the non-military members. BOMC in communication with NNP1PC EMO team will regularly monitor the activity

6 BIOMASS CLEARANCE

Activities in Q3 2017	Results
Perform biomass clearance	• There was continuous rainfall during the reported period, therefore, there was only little progress with vegetation cutting. As of September 2017, biomass clearance was fully completed in a total of 149.95 ha out of 1,641 ha, while 1017 ha are in progress for stock piling and burning. The overall progress is summarized in ***Table 6-1***. • It became clear that the progress of biomass clearance under the current contractor is very slow and therefore five new local contractors are being recruited to support the clearance. Their contracts are being finalized and it is expected that the five new contractors will be on board and start the clearance work in October 2017. • As of end of September 2017, there are only 45 ha within the biomass clearance area that remains to be compensated. NNP1PC EMO is confident that the compensation will be completed in October and November 2017 and therefore should not have any significant impact on the progress of biomass clearance work.

TABLE 6-1 BIOMASS CLEARANCE PROGRESS IN EACH PRIORITY AREA AS OF 30 SEPTEMBER 2017

Target biomass clearance area		Biomass clearance area progress in Ha as of 30 September 2017	
Block	**Total in Ha**	**Total biomass clearance in progress area in Ha**	**Completed biomass clearance area in Ha**
B1	109.24	54.43	
B2	158.63	92.79	8.54
B3	80.35	38.94	
B4	163.74	153.67	111.11

Target biomass clearance area		Biomass clearance area progress in Ha as of 30 September 2017	
Block	**Total in Ha**	**Total biomass clearance in progress area in Ha**	**Completed biomass clearance area in Ha**
B5	340.14	128.07	5.62
B6	31.92	4.41	
B7	39.65	2.26	
B8	37.61	8.97	
B9	52.75	6.44	
B10	269.1	169.71	
B11	89.98	89.98	
B12	64.11	64.11	
B13	101.24	101.24	
B14	43.33	43.33	
B15	43.73	43.73	22.71
B16	3.32	3.32	
B17	7.96	7.96	1.97
B18	3.95	3.95	
Total	**1,640.75**	**1,017.32**	**149.95**

7 FISHERY MONITORING PROGRAMME

In addition to the regular fishery monitoring programme, NNP1PC undertook a rapid field inspection and data collection to assessed the immediate impacts on fish from the Nam Ao dam break upstream of NNP1 reservoir in the second week of September 2017. The gathered information is being put into the database and a report is being prepared for concerned stakeholders.

The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 2.0 kg/household/day in August 2017. The estimated total fish catch in Nam Ngiep basin for August 2017 is 58,800 kg. Around 25 % of the catch was sold, 68% was consumed fresh, 5% processed and approximately 2% was used for other purposes

The delay in fish catch monitoring in Q2 2017 was closed up by the progress work in Q3 2017. The gap in progress for fill gill net survey was attributed by the adjustment of survey schedule since it was only started in Q2 2017. However, the overall progress work does not have impact on the integrity of the monitoring programme.

8 OTHER SUPPORT PROGRAMMES

8.1 BIODIVERSITY ADVISORY COMMITTEE

The 6th BAC mission was completed as scheduled from 4-9 September 2017 with the main objective to discuss the Biodiversity Offset Option Paper (BOOP) prepared by ADB and to help develop NNP1 No Net Loss Forecast. NNP1PC together with the Company's biodiversity and watershed management consultants and the BAC held a week-long workshop to outline the No Net Loss Forecast. The No Net Loss Forecast was subsequently prepared and then shared with ADB prior to the workshop with ADB held on 25-26 September 2017.

Two of the BAC members met with the Biodiversity Offset Management Committee (BOMC) and discussed the progress of first pre-BOMP activities as well as on the preparation of the second pre-BOMP anticipating that the BOMP will not be ready until April 2018. BAC recommended that the proposed activities should be further clarified and some of the activities should be included in the BOMP. BAC also recommended that the estimated budget should have more detailed breakdown and better justification.

APPENDICES

APPENDIX 1: STATUS OF SS-ESMMPS AND WORKING DRAWINGS OF THE CAMPS' WASTE WATER TREATMENT SYSTEMS REVIEW AND APPROVAL DURING JULY TO SEPTEMBER, 2017

No	Site name	List of ESMMP and SS-ESMMP	Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status
Electrical and Mechanical Works (Hitachi-Mitsubishi Hydro)						
1	Main dam and re-regulating dam	SS-ESMMP for Installation Work of Stay Cone, Front Channel Liner and Hat Cover for Re-regulation Power Station	LILAMA10 Contractor	No further comments on 11 July (1st Revision)	Stay Cone, Front Channel Liner and Hat Cover installation	On-going
2	Re-regulating dam	Working drawing of WWTS at ZHEFU Camp	Zhefu Contractor	No objection with comments on 27 July (2nd Revision)	Waste Water Treatment Improvement	Completed
3	Re-regulating dam	SS-ESMMP for HM's Labor Camp No#1 (Zhefu Camp)	Zhefu Contractor	No objection with comments on 21 August (5th Revision)	Warehouse construction	Completed
4	Main Dam	SS-ESMMP for Installation of Inlet Valve & Servomotor for Main Power Station	HPC and LILAMA10 Contractors	No objection with comments on 09 August (1st Revision)	Inlet Valve & Servomotor installation	On-going

5	Main Dam	SS-ESMMP for Installation of Turbine for Main Power	HPC and LILAMA10 Contractors	Under review	Turbine installation	On-going
Civil Works Contractor (Obayashi Corporation)						
6	Main Dam	SS-ESMMP for Building Construction at Main Powerhouse	Civil Works Contractor (Obayashi Corporation)	Under review	Building Construction at Main Powerhouse	On-going
7	RCC Plant	SS-ESMMP for Operation and Maintenance Works of RCC Plant	Song Da 5 Subcontractor	Under review	Operation and Maintenance Works RCC plant sand and aggregate washing sedimentation control and management	On-going
8	Aggregate Plant	DWP & Appendix for Aggregate Crushing Plant	Sino Hydro Contractor	Under review	Sediment control system improvement	Completed
9	V &K Camp	As-built drawing of V&K Camp's WWTS Improvement	V & K Contractor	No objection with comments on 10 August (2nd Revision)	WWTS improvement	Completed
10	TCM/GFE Camps	As built drawing of the Waste Water Treatment System Improvement at TCM & GFE Camp	TCM/GFE Contractors	No further comments on 05 September (3rd Revision)	WWTS improvement	Completed

11	Re-regulating dam	SS-ESMMP for Construction Road to the Right Bank of Re-Regulation Dam	PKCC Contractor	Returned with comments on 03 August (1st Revision)	Road construction	On-going
12	Kenber Camp	Working drawing of Kenber Camp's WWTS improvement	Kenber Contractor	No objection with comments on 28 July (1st Revision)	WWTS improvement	Completed
	Re-regulating dam	Annex of the DWP for Re-regulation Power Station, Closing of Borrow Pit Area at Corner of P1 & P1A Road Beside the Re-Regulation Dam	Civil Works Contractor (Obayashi Corporation)	No objection with comments on 29 September (3rd Revision)	Closing of Borrow Pit	Completed
Phouhomxay (NNP1PC-ESD Contractors)						
18	2UR Zone, Thathom District, Xaysomboun Province	SS-ESMMP for Suspension Bridge Construction at 2UR	Souksana Development Co., Ltd	No further comments on 07 July (1st Revision)	Nam Gniep crossing suspension bridge	On-going
	2UR Zone, Thathom District, Xaysomboun Province	SS-ESMMP for Construction of 5 Houses in 2UR Zone, Thathom District, Xaysomboun province	Soksaykham Construction Co., Ltd	No objection with comments on 03 August 2017 (2nd Revision)	House construction	On-going
	2UR Zone, Thathom District,	SS-ESMMP for Filling Residential Land and Lift up 3 Houses at	Phoukham Chanvong	No further comments on 17 July (1st Revision)	Lift up 3 Houses and Dismantle one House	On-going

	Xaysomboun Province	Ban Pou, Dismantling of One House at Ban Hatsamkhone, 2UR Zone	Construction Co., Ltd			
	2UR Zone, Thathom District, Xaysomboun Province	SS-ESMMP for construction of 3.1 Km Internal Road in HSRA	Soksaikham Construction Co. Ltd.,	No further comments on 07 July (1st Revision)	Internal road construction	On-going
	Phouhomxay	SS-ESMMP for Construction of Domestic Water Supply	KCP Construction Co., Ltd	No objection with comments on 28 July (1st Revision)	Water supply installation	On-going
	Phouhomxay	SS-ESMMP for Construction of Market Building and Bus Station Building at HSRA	Nalux Contractor	Returned with comments on 07 August (1st Revision) No further comments on 23 August (2nd Revision)	Construction of market and bus station	On-going
	Phouhomxay	SS-ESMMP for Supply and Installation of 22 kV Transmission Line and 0.4 kV Distribution Line for 63 Households at HSRA	SES Electrical Installation Co., Ltd	No objection with comments on 03 August (1st Revision)	22 kV Transmission Line and 0.4 kV Distribution Line installation	Completed

	2UR Zone, Thathom District, Xaysomboun Province	SS-ESMMP for Construction of 03 Bus Stop Stations, 01 Market Building, 01 Waste Storage and 01 Toilet at 2UR Zone, Thathom District, Xaysomboun Province	Savansai Construction and Trade Export-Import Sole Co., Ltd	No objection with comments on 07 September (2nd Revision)	Construction of Bus Stop Stations and Market Building	On-going
	Phouhomxay	SS-ESMMP for Construction of Outlet canal and four sub canals at HSRA	VSP Construction Co., Ltd	No further comments on 25 August (1st Revision)	Irrigation canal construction	Completed
	Phouhomxay	SS-ESMMP for Houay Soup Landfill Slope Protection	Phoukham Chanvong Construction Co., Ltd	No objection with comments on 30 August (1st Revision)	Local grass planting and drainage control construction	Completed
	Phouhomxay	SS-ESMMP for Urgent Aid Work for Resettlement Households at HSRA	Nalux Contractor	No further comments on 15 August (1st Revision)	Drainage control, water supply installation for temporary accommodation	Completed
	Phouhomxay	SS-ESMMP for Construction of Irrigation Dam, 01 spillway & 01 Outlet Pipe Culvert at HSRA	VSP Construction Co., Ltd	No further comments on 10 September (3rd Revision)	Construction of irrigation Dam	Completed
	Phouhomxay	SS-ESMMP for Construction of a	Phoukham Chanvong	No further comments on 10	Construction of tractor road to grazing land	Completed

		Tractor Road 3.18 km at HSRA	Construction Co., Ltd	September (1st Revision)		
	Phouhomxay	SS-ESMMP for Construction of a Tractor Road 4.05 km at HSRA	SD Road and Bridge Construction Co., Ltd	No further comments on 11 September (1st Revision)	Tractor road construction	Completed
	Phouhomxay	SS-ESMMP for Construction of 4 Houses Lot No:7 at HSRA.	Pyramid Group Construction Co., Ltd	No further comments on 25 September (1st Revision)	House construction	On-going

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q3-2017

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_OC-0087	02.06.2015	V&K Camp	Refer the previous site inspection report ref; NNP1-ESD-EMO-SIR-OC-0005 on SI-0036 dated 03 Mar 2015, the issue has been repeated. No improvement on the design of wastewater treatment system. The camp has insufficient facilities for the long-term operation. There is an evidence of grey water has been released from the septic tank to the open ditch. This is observed to be non-compliance to the project's environmental guideline.	Revise the submitted WWTS improvement plan on 31 Mar 2015 by incorporating environmental comments provided by EMO	16.06.2015	20.06.2017	Resolved
ONC_OC-0232	30.08.2016	Re-regulation Dam Borrow Pit	The Contractor started operating a borrow pit with inadequate		27.09.2016	20.06.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			environmental management practices as the following: Topsoil was stockpiled at sensitive erosion area; The cut slope area had no berm and cut-off drains. Spoil was disposed and stockpiled on the access road to the SECC waste disposal pit. No information and management measures on the excavation of this borrow pit was included in the two (02) approved SS-ESMMPs for the Re-Regulation Dam (i.e. the Re-Regulation Dam Left Bank Excavation and Re-Regulation Dam Power Station). EMO received a verbal complaint from a ESD's Contractor (SECC company) that the				

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			Contractor has pushed the spoil and blocked the access road to their temporary spoil disposal area. The Company has maintained this assess road twice, but it was damaged again so far.				
NCR_HM-0001	28.09.2016	LILAMA10 Camp	Referring to the EMO's recommendations provided in previous Site Inspection Reports (Ref. No.: SIR-HM-0003, dated 25/05/2016) on the need for improvement of grey water wetland ponds. Only minor issue left: incomplete construction of the greywater and wetland ponds	The Contractor is required to submit a revised SS-ESMMP to include this borrow pit and provide the following information: Biomass clearing and topsoil management; Spoil management and disposal (stockpiling, excavation, etc.); Detail design of slope stabilization including cut-off drains and berm; Site environmental rehabilitation and site closure plan	25.10.2016	20.06.2017	Resolved
ONC_OC-0236	11.10.2016	Re-regulation dam	During this inspection, it was observed that there was a land levelling	The Contractor has implemented the corrective action by the following:	11.10.2016	20.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			activity for permanent spoil disposal from the excavation of left bank coffer dam behind the SECC camp. The Contractor will check if this spoil disposal plan was previously included in the existing SS-ESMMP for the Re-regulation Dam Construction. If not, please refer to the Corrective Actions as below:	Complete the construction WWTS as per the EMO's recommendations in the SIR Reference No.: NNP1-ESD-EMO-SIR-HM-0003, 0007, 0008 and the 3rd revision of SS-ESMMP for HM Hydro Workers' Camp No.2 (LILAMA10 Camp). However, no official response to the NCR document. EMO will instruct the contractor to reply to the NCR by the next progress meeting held in July 2017.			
NCR_OC-0013	08.11.2016	Aggregate Plant Yard	Inadequate maintenance and implementation of agreed corrective actions on controlling the sediment pond at the Aggregate Plant below the spoil disposal area no.7. Improper monitor and maintenance of the said sediment pond resulted in	Repair sedimentation pond's embankment to stop turbid water discharge into to Nam Ngiep River completely. Clean up sediment in the sediment pond before it reaches 60% of sediment pond capacity and dispose at designated spoil disposal area no.6 on a daily basis.	25.11.2016	20.06.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			continuously discharging the turbid water from the sediment pond into the adjacent of Nam Ngiep River.	Provide the sediment clean up record to NNP1 including (1) daily clean up frequency and (2) amount of collected sediment on a Weekly basis.			
ONC_OC-0250	07.03.2017	Sand Stockpile	Another sand stockpile sourced from the RCC plant sediment pond (the first two sediment ponds) has been established at the former RT Camp without introducing or installing of erosion and sediment control devices/facilities. In absence of sound environmental practices in accordance to the ESMMP-CP SP01: Erosion and Sediment Control, this sand stockpile is likely to be washed into the adjacent Nam Ngiep River which is located about 50 m downstream (see	The Contractor shall immediately remove the sediment from this stockpile and stop using this area until appropriate erosion and sediment controls are applied and a confirmation from NNP1PC is received in writing as appropriate. In addition, all proposed temporary stockpiles with estimated volume of materials to be stockpiled, cleaning-up frequencies and mitigation measures for erosion and sediment controls shall be submitted to NNP1PC as these are not provided in the 4th submission of the DWP & SS-	28.03.2017	20.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			photos); The latest submitted DWP & SS-ESMMP (4th revision) for RCC Operation and Maintenance on 09 March 2017 did not incorporate NNP1PC-EMO's instructions stated in the NCR level 2 for RCC plant's slurry/sand disposal at area above CVC and spoil disposal area No. 8 (NCR2 Ref. No.: NNP1-ESD-EMO-NCR-OC-0015) dated 26 January 2017, for the CWC to submit the management plan for erodible construction material stockpile.	ESMMP for the RCC Plant Operation on 09 March 2017.			
ONC_PK-0002	19.04.2017	PK Camp	No proper hazardous material storage provided since January of 2017. Fuel drums were stored on bare ground without	The contractor is required to provide proper temporary hazardous material storage on site. Otherwise, completely remove any	02.05.2017	02.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			spillage protection facilities. This issue has been raised to the contractor for a couple of times since early March 2017, provision of proper temporary hazardous material storage on site was instructed. So far, no action has been undertaken by the contractor. During this inspection, the fuel drums were still stored on the ground and scattered at camp area without a corrective action, this has a potential risk of oil spills and incidence which consequently cause damage to surrounding environment.	hazardous material containers for alternative proper storage off-site			
ONC_OC-0257	09.05.2017	Spoil Disposal Area #8	During this Joint Bi-Weekly Site Inspection, NNP1PC-EMO followed up	The Contractor was instructed to repair existing wooden silt fences around	23.05.2017	20.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			on the corrective action implementation for Non-Compliance Report Level 2 (NCR2 Ref. No.: NNP1-ESD-EMO-RCR-OC-0015) issued on 26/01/2017 and closed on 28/03/2017 with conditions which was about sand stockpile at a former Spoil Disposal Area No. 8 and at a junction of Road P1&P2, Upper CVC Plant. The following issues were observed: Some sections of the wooden silt fences were broken which allow the transportation of sand from the stockpile area to the adjacent road side drainage. Some gaps between the wooden silt fences allowed the stockpiled sand to escape and	the sand stockpile area and place sand bags to close the gaps at the base and around wooden silt fences.			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			deposit in the adjacent drainage lines during the last few raining events.				
ONC_OC-0258	09.05.2017	Former Songda5 batching plant	During this Joint Bi-Weekly Site Inspection, it was observed that big piles of sand which dropped from the joint of the aggregate conveyor belt towers has not been completely removed after many verbal agreements since February 2017. If not being cleaned up in the next few weeks, the deposited sand is likely to be washed into the adjacent Nam Ngiep River during this rainy season.	The Contractor was required to completely clean up and regularly remove the deposited sand under the aggregate conveyor belts towers where evident from Aggregate Plant to RCC Plant, to a designated sand stockpile area or the Spoil Disposal Area no.6.	23.05.2017	20.06.2017	Resolved
ONC_UXO-0002	04.05.2017	Biomass clearance	During this Joint Inspection between the EMO's Compliance and Biomass Clearance teams in one of the biomass clearance	The Contractor is required to: • Completely remove the contaminated soil with hydrocarbon and store in the designated temporary	25.05.2017		Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			area of Block 04 (Nong Village), it was observed that a broken-down tractor was parked near a UXO temporary workers' camp without a rain protection and oil spill protection tray. As a result, oil has leaked from the broken engine/hydraulic parts of the tractor into the ground. This has a potential risk of rain washing contaminated soil and dripping oil into nearby natural creek if continued to be left unattended.	hazardous storage area for proper elimination; • If it is a small quantity (less than 5 kg), given that it is a remote site condition, the contaminated soil can be buried in a dug pit that is at least 30 m away from the water courses and sealed using clean compacted soil of at least 10 cm to prevent the rain from seeping into the contaminated soil; • Seal the broken part of the tractor and provide proper oil protective tray to ensure no oil spill into the ground. Regularly transferring the dripped oil in the tray into a proper used oil drum for proper disposal by a vendor.			
ONC_OC-0260	23.05.2017	KENBER Camp	During this Joint Bi-Weekly Site Inspection, EMO followed up of the operation of the Waste	The Contractor is required to take the following actions: Empty the waste water from all the ponds and dispose of	05.06.2017	20.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			Water Treatment System (WWTS) at the KEBER camp after the improvement works were completed in March 2017 as the following observation: Sequencing Flow and Filtration: the 1st and 2nd ponds were full of waste water and less amount was observed in the 3rd pond (there was no water in the last pond) Leakage: seeped water was identified at the sides of 1st and 2nd ponds; Maintenance: The planted reeds in the 2nd pond is dead due to waste water inundation.	at the designated spoil disposal no. 6 by following a Standard Operating Procedure on the Sewage and Sludge Disposal. After that replacing all the dead reeds to ensure that no inundation of the waste water; Check the concrete lining of all the ponds and manholes to stop waste water leakage. Check and flush the existing piping system to ensure a smooth sequencing flow and infiltration of the waste water from the first to the last ponds and the filtrated waste water is chlorinated prior to discharging to the outside.			
NCR-_OC-0018	29.05.2017	RCC Plant Yard	During the four days sedimentation control and waste water quality monitoring at the RCC	The Contractor shall implement the following remedial actions by the agreed deadline:	31.05.2017	31.07.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			plant, EMO staff observed unusual turbid water marks on an iron post and vegetation along the open ditch leading to the last two sediment ponds in two consecutive days (04-05 May 2017). The team decided to observe the operation of the Plant in the evening to identify the causes during 20:00-21.30 on 05 May 2017 and found - The release of the turbid water from the RCC Plant's sediment ponds on that night (and probably a night before based on the evidence found at the steel post and vegetation along the open ditches at lower slope ponds) breaches many agreements made with	- Stop the discharge of non-compliant waste water from the RCC Plant at all time without prior approval from NNP1PC; - Submit the long outstanding Sedimentation Control System Operation Manual to NNP1PC for concurrence and/or use as a reference as well as to clearly communicate it with the site operators; - Monitor/measure the sediment accumulation in the ponds and plan for daily cleaning up; and - Control the existing installed valves and discharge pipes to ensure that the operation follows best practice and achieve the water quality results that are satisfactory and close to the GOL Effluent Standard.			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			NNP1PC during meetings, joint site inspections Contractor's fourth submission of the SS-ESMMP for the RCC Plant Operation as well as the Annex C of CA signed with the GoL; - The night time discharge of turbid water found on 5 May 2017, regardless of the reason, also corresponded to the claim reported by villagers fishing downstream of the site in Hat Gniun Village to the GoL-EMU mission in February (dry season) that the Nam Ngiep was more turbid at dawn than in the day time (see attached EMU Mission Report in February 2017). It also affected the data collected as part of a study				

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			carried out by NNP1PC-EMO during 03-06 May 2017 to draw a conclusion on the existing sediment ponds' capacity. - According to the Environmental and Social Management and Monitoring Plan during the Construction Phase (ESMMP-CP) issued in 2014 and 2016, Volume II-Procedure, a prolonged outstanding environmental issue without being resolved by the deadline and a direct discharge of non-compliant waste water into natural water body will cause the issuance of a NCR3.				
ONC_KCP-0001	13.06.2017	KCP's Hazardous storage	Hazardous material storage (oil drums) were placed on the plastic sheet	The Contractor is required to implement the following	20.06.2017		Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			without protective bund and floor as per approved SS-ESMMP. It is estimated that a total of 1,000 litres of fuel are stored in this area for the next 3 months. This has a high potential risk of hazardous material contamination at the camp site and not in line with the document.	corrective actions by the agreed deadline: - Clean up the contaminated soil and store properly in designated hazardous material storage for proper disposal/elimination by an authorized vendor; - Build a 120% capacity hazardous material and waste storage with secure floor, bund and roof. The storage shall be equipped with oil trap and control valve; and - Provide proper work procedures for hazardous material handling and spills responses.			
NCR_OC-0021	04.07.2017	Main Dam Workshop (Spoil Disposal No:2)	Construction waste (contained in big plastic bags) and general waste were buried at site. The approximate quantity could not be ascertained	- Disposal of new spoil was stopped. New spoil generated is to be disposed of at the designated Spoil Disposal Area No. 6 as per	25.07.2017	31.07.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			because most of these were covered by spoil.	proposed DWP & SS-ESMMP for Main Dam Body; - Waste disposal on site to be stopped including hazardous waste, construction and general waste. Waste shall be segregated and disposed of in accordance to waste management policy and ESMMP-CP of NNP1PC; - Collect and segregate the disposed wastes on the slope for proper disposal at the landfill, Spoil Disposal Area No. 6 or authorized vender.			
ON_OC-0262	11.07.2017	Main Dam' WWTS	Non-compliant pH values (either too low or too high) of the waste water being discharged from the Main Dam's waste water	- Confirmation as to whether the plant is operational as well as delivery and use of the Sulphuric Acid, PAC and	25.07.2017	31.07.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			treatment plant (WWTP) during a number of previous weekly effluent monitoring.	Polymer to treat the waste water is made according to the operation manual of the WWTP; - It must be ensured that waste water quality meets the Lao National Standards prior to discharging into Nam Ngiep.			
NCR2_OC-0020	18.07.2017	Main Dam's WWTS No. 1	The turbid water was directly discharged from a sediment pond next to the Main Dam Powerhouse to the Nam Ngiep River via a 100-mm submerged black pipe.	The below response from the contractor is under verification by NNP1PC and will be cleared in November 2017 as the following - Stop direct discharge of the turbid water from the existing sediment pond within the Main Dam construction areas to downstream of Nam Ngiep if the waste water doesn't	01.08.2017	31.07.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				meet the required effluent discharging standards and without prior authorization from NNP1PC; - NNP1PC to be notified of any request for emergency discharge to ensure that the effluent is compliant with discharging standards; - Competent operators to be deployed with proper training and instructions to operate the Waste Water Treatment Plant with clear operational guidelines and procedures; - A key operator is to be assigned at the Waste Water Treatment Plant and closely supervise the			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				site during the sediment pond cleaning.			
ON_OC-0264	18.07.2017	TCM & GFE Camps' WWTS	A potential inundation of the newly completed WWTS by rain and gravity flow of the waste water through the chlorination system.	bund of the first wetland pond is to be increased by at least 20 cm to prevent inundation by the rain water and waste water causing overflowing during peak water use; and The submission date and version of the WWTS's as-built drawing is to be revised.	25.07.2017	25.07.2017	Resolved
ON_OC-0007	18.07.2017	IHI Worker Camp and Fuel Storage	There was an evidence of continuous burning of non-hazardous waste (general waste, recycle waste and plastic) on site.	The contractor was advised that all domestic waste shall be segregated and disposed of at NNP1 Project Landfill.	28.07.2017	25.07.2017	Resolved
NCR_HM-0003	21.07.2017	LILAMA 10 Subcontractor	A mixture of wastes, including construction waste (wood off-cut, cement bags), recycle	- The contractor (HM Hydro) has been instructed to take	05.08.2017	25.07.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			waste (glass, plastic bottles) and general waste (food waste, etc.), were disposed at the edge of spoil disposal No. 6.	immediate action to collect, separate and dispose the waste properly; - The contractor has to implement proper waste management measures to prevent/mitigate as per the contractor's obligation provided in the 4th submission DWP and SS-ESMMP for HM Hydro Worker Camp (Ref: PRD10-399007 dated 10 May 2017).			
ON_OC-0265	01.08.2017	Sino Hydro Workshop	Used tires placement along the edge of vehicle parking platform next to Sino Hydro workshop were exposed to rain. It has become a breeding ground of mosquitos that are transmitters of infectious diseases	- The contractor will consult with NNP1PC's Safety team for constructing a proper safety barrier made from used tires;	15.08.2017		Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				- A long-term waste management plan specifying the options for disposal of used tires should be submitted to NNP1PC for review and monitoring by 26 September 2017 (first extension).			
ON_BC-0001	07.09.2017	Building Concept Construction SOLE (HSRA)	There was an evidence of black water leakage from the underground toilet septic tank to a grey water pond. This has high potential for bacterial rich waste water to overflow off-site and seep into the underground water which consequently cause contamination and public health risk in Phouhomxay.	- Identify the cause of the septic tank leakage, and fix the system accordingly; - The contractor is also instructed to check a status of the fill level of each septic tank (in %) at the site. If the tank is about 80% full, the contractor is advised to implement owners' approved Sewage and	19.09.2017	19.09.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				Black Water Disposal Procedure.			
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.	- Based on the approved DWP & SS-ESMMP, the ESD-Infrastructure Team shall be responsible for decommissioning of the temporary accommodation after the resettlement households have moved out. Therefore; - Please submit a Site Decommissioning Plan which includes timeline and disposal methods as an official Corrective Action Plan for review and approval by EMO.	19.09.2017	19.09.2017	Pending
ON_VDC-0002	19.09.2017	Viengou Domsup	VDC Contractor will finish all construction activities by the middle of October	In order to ensure that VDC's site demolition is done properly, the contractor was	05.10.2017	Not available	Pending

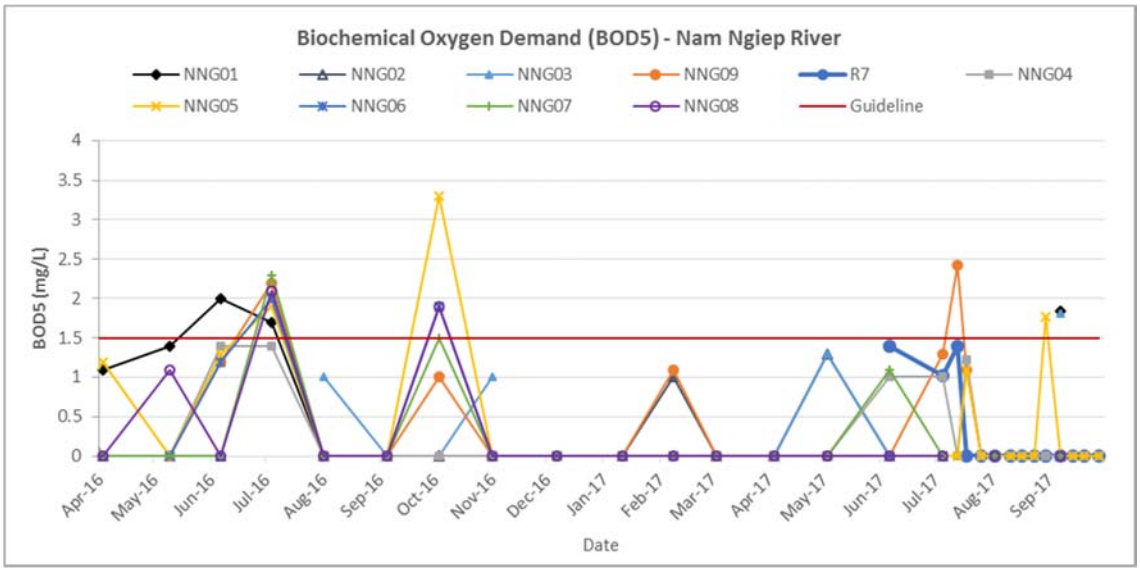
Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
		Construction Co., Ltd (HSRA)	2017, but now submission of a revised revise and resubmit the DWP & SS-ESMMP and the Site Decommissioning Plan for EMO review and clearance.	instructed to revise and resubmit the DWP & SS-ESMMP and the Site Decommissioning Plan by incorporating the EMO's Comments at least 07 days before applying for a final Inspection.			
ON_VNV-0002	19.09.2017	Vannavong Construction Co., Ltd (HSRA)	VNV Contractor will finish all construction activities by the end of September 2017, the existing DWP & SS-ESMMP was pending revise by the contractor.	The Contractor was recommended to revise and submit a DWP & SS-ESMMP and the Site Decommissioning Plan covering all VNV's sites (VNV Camp and facilities as well as site landscaping) to EMO for review and approval at least 07 days prior to applying for a Final Inspection.	04.10.2017	Not available	Pending

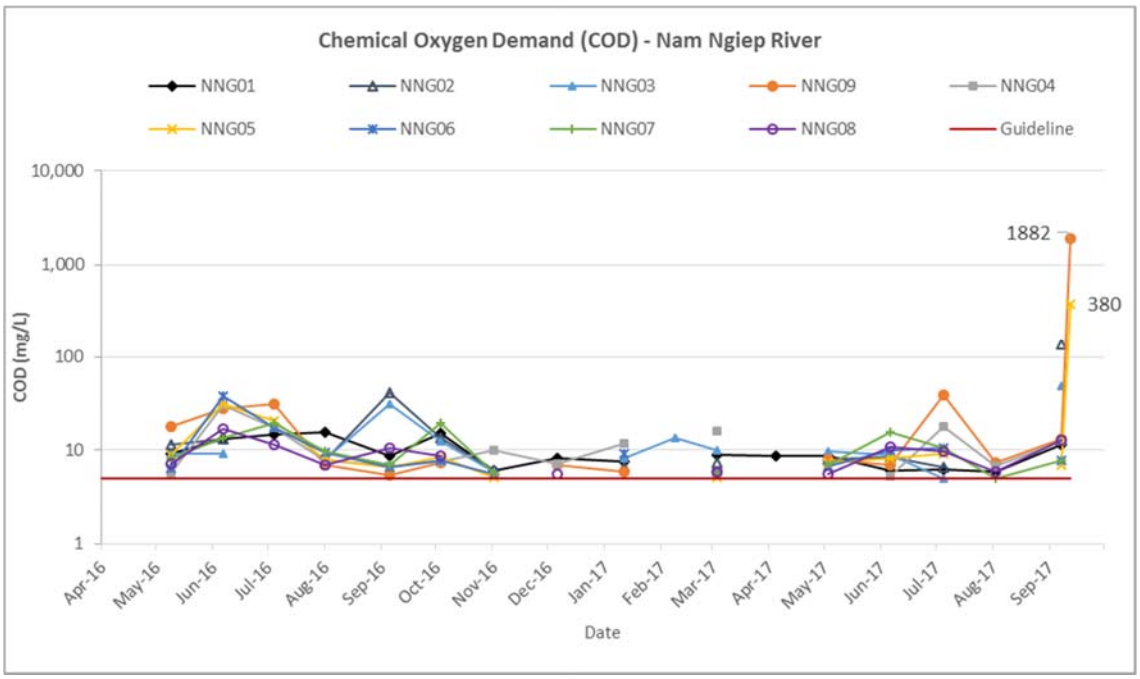
APPENDIX 3: CODES AND LOCATIONS OF THE SURFACE WATER QUALITY MONITORING STATIONS

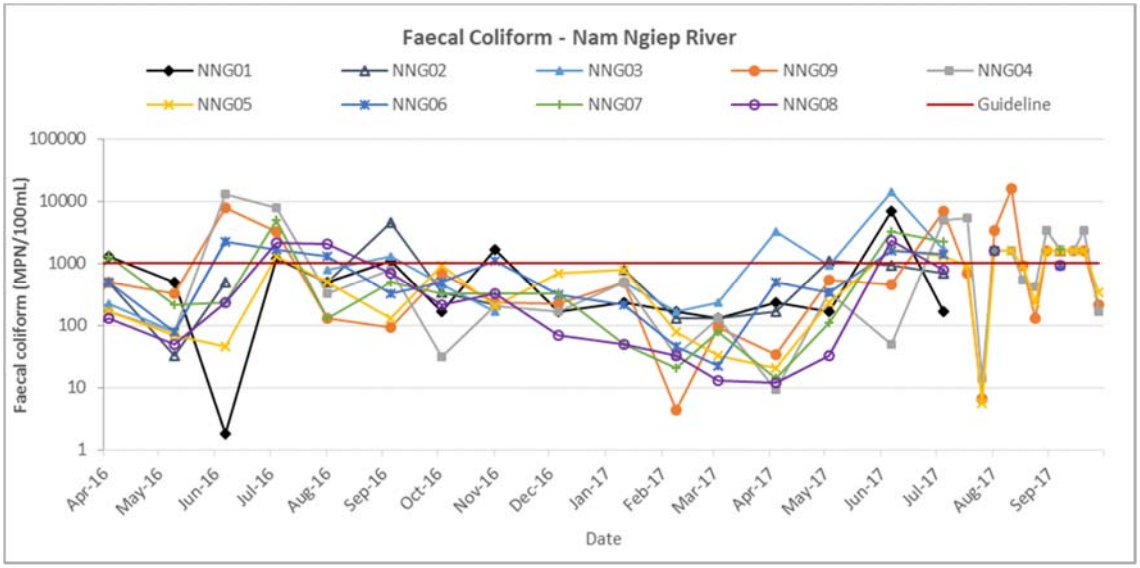
Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Ban Phiengta	Upstream Project Construction Site
NNG02	Nam Ngiep Upstream of Nam Phouan Confluence	
NNG03	Nam Ngiep Downstream of Ban Sop-Yuak	
NNG09	Nam Ngiep Upstream Main Dam	
NNG04 / R6	Nam Ngiep Downstream RT Camp (Middle Re-regulation Reservoir)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

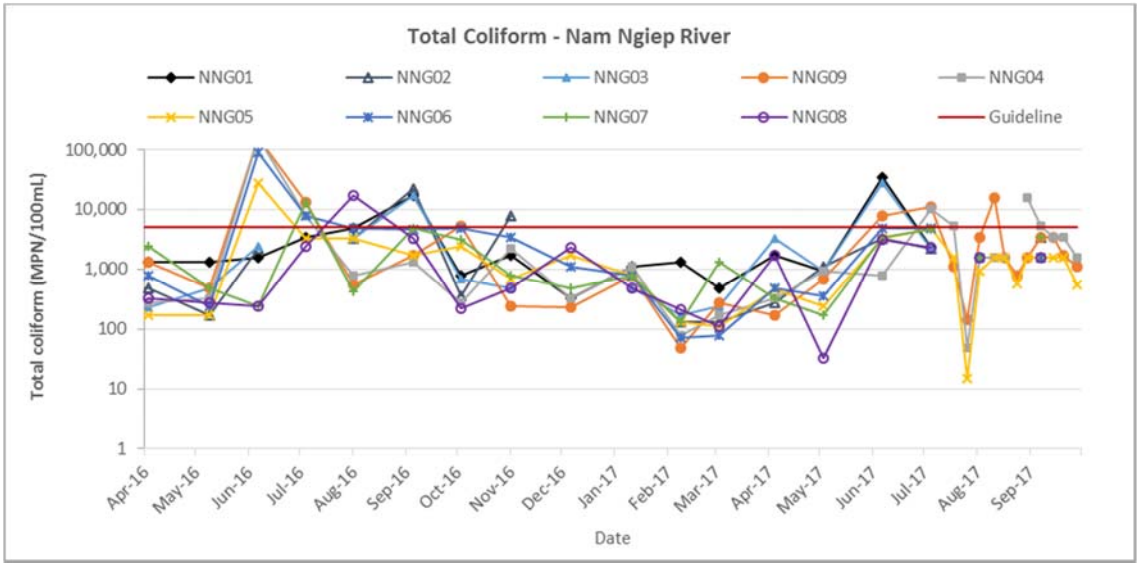
APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM APRIL 2016 TO END OF SEPTEMBER 2017 (ONLY PARAMETERS THAT EXCEEDED GUIDELINE STANDARDS)

Nam Ngiep Surface Water

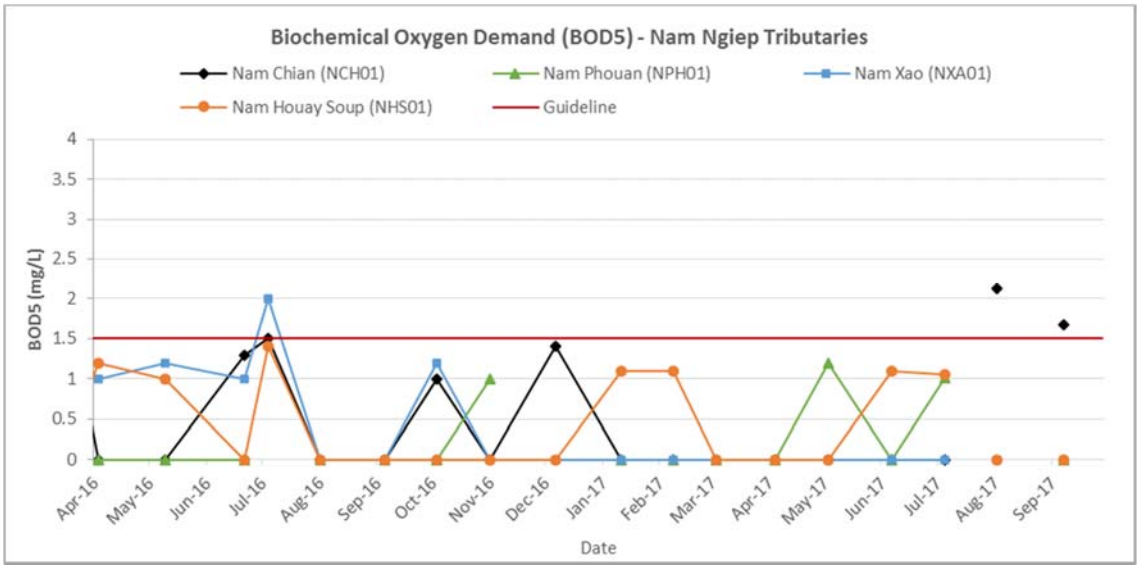


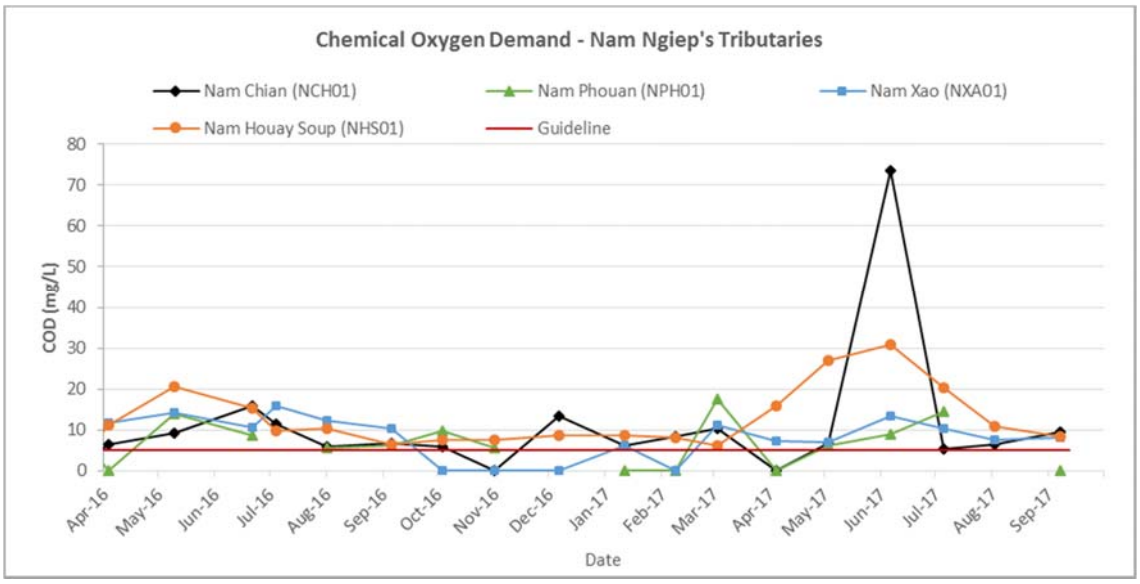


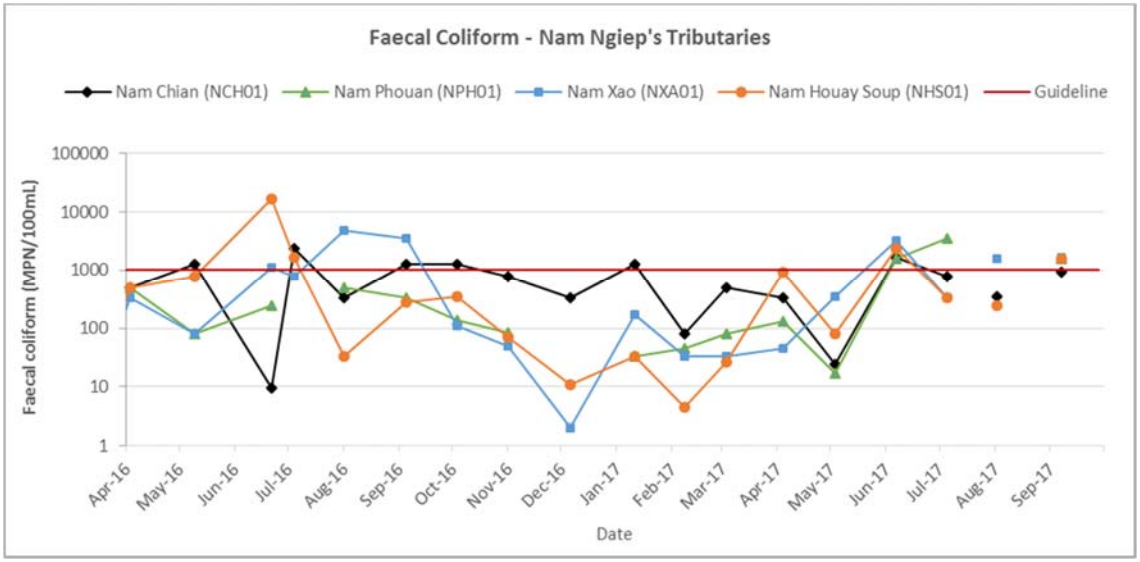

Faecal Coliform - Nam Ngiep River
NNG01
NNG02
NNG03
NNG09
NNG04
NNG05
NNG06
NNG07
NNG08
Guideline
Faecal coliform (MPN/100mL)
100000
10000
1000
100
10
1
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Date

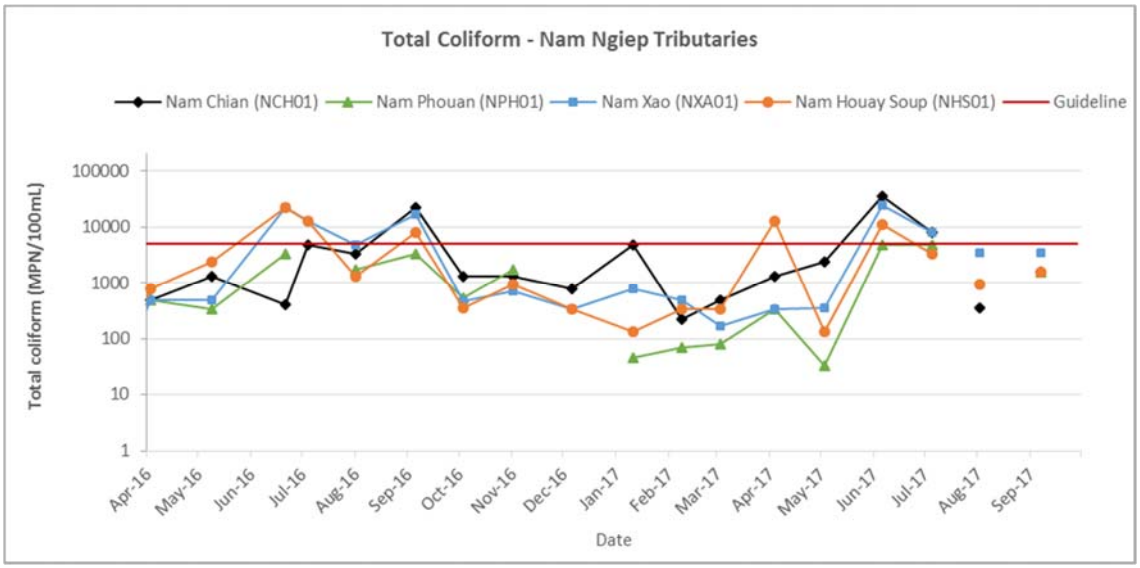

Total Coliform - Nam Ngiep River
NNG01
NNG02
NNG03
NNG09
NNG04
NNG05
NNG06
NNG07
NNG08
Guideline
Total coliform (MPN/100mL)
100,000
10,000
1,000
100
10
1
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Date

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

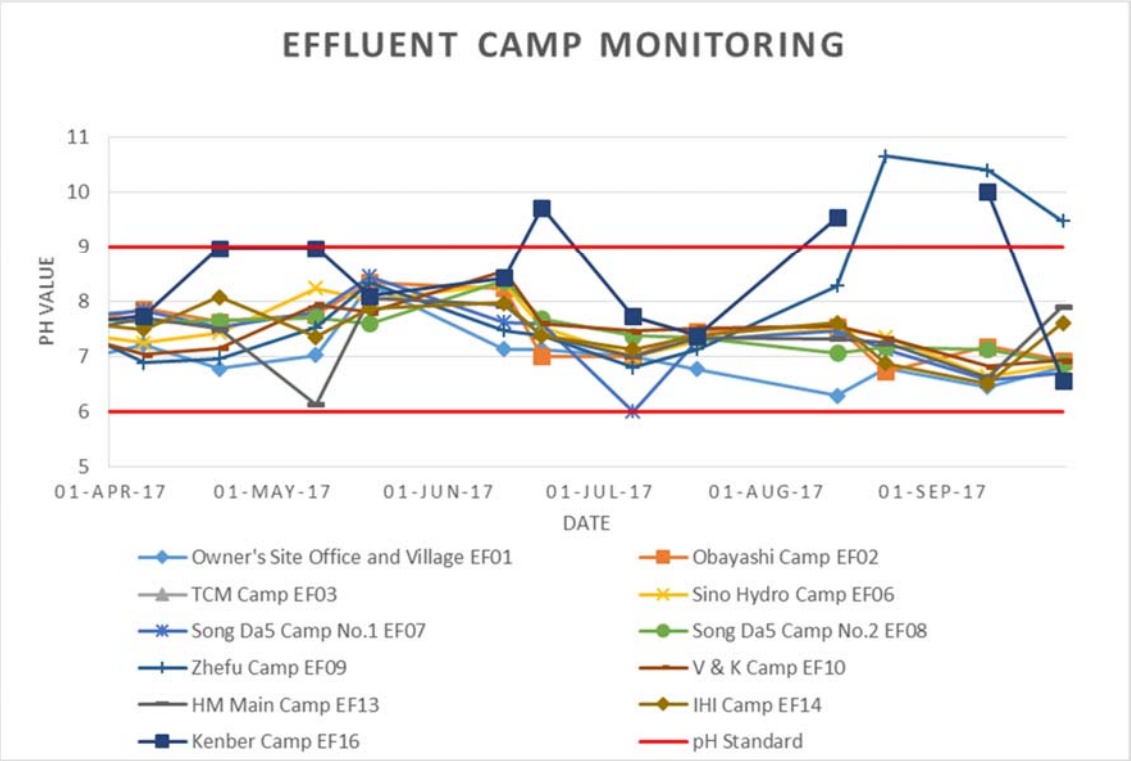


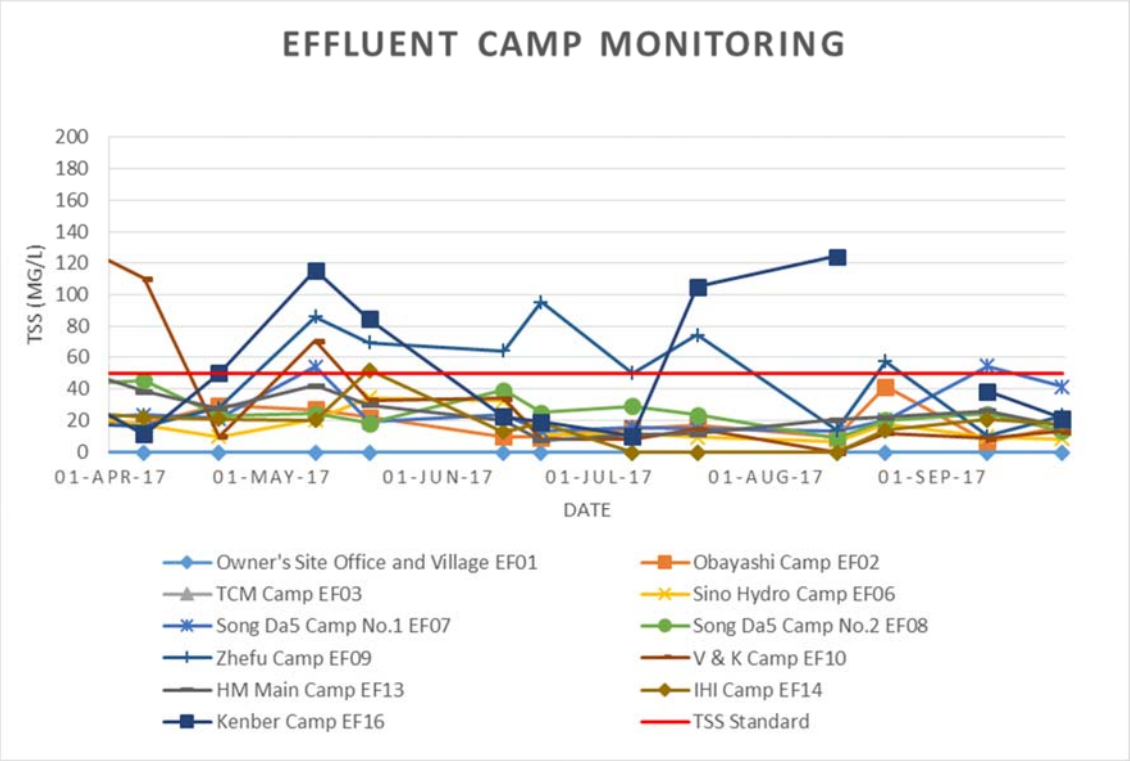


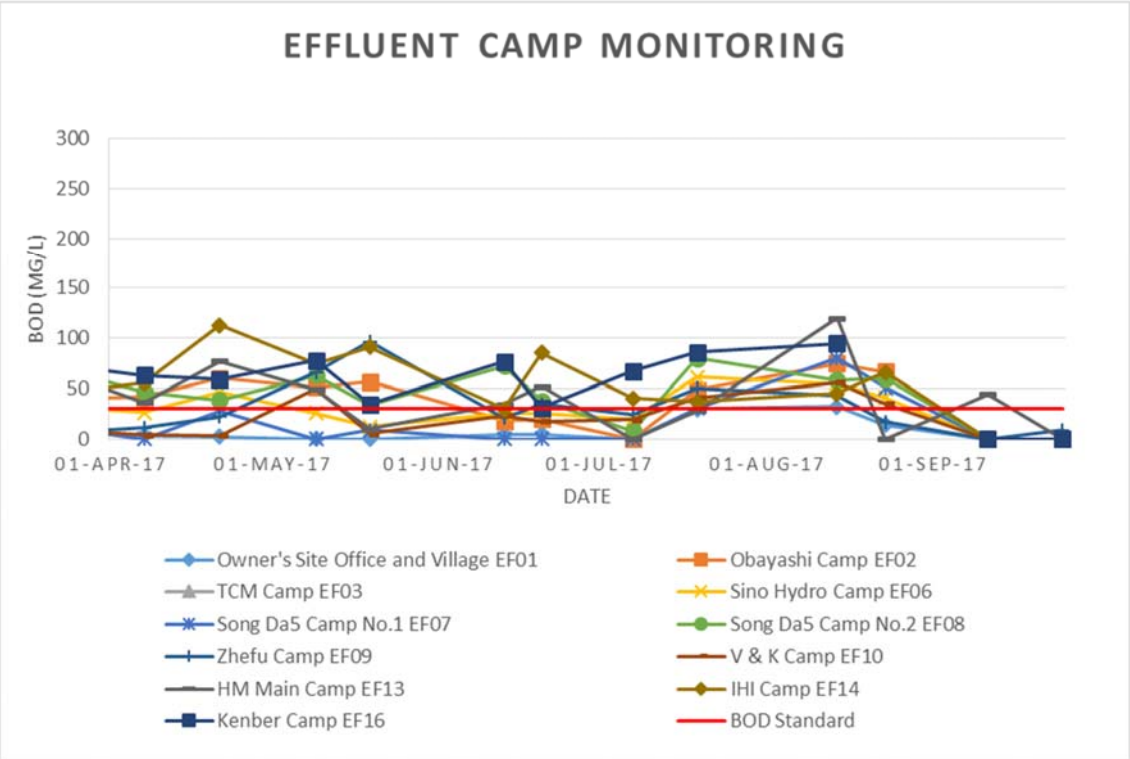

Faecal Coliform - Nam Ngiep's Tributaries
Nam Chian (NCH01)
Nam Phouan (NPH01)
Nam Xao (NXA01)
Nam Houay Soup (NHS01)
Guideline
Faecal coliform (MPN/100mL)
100000
10000
1000
100
10
1
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Date

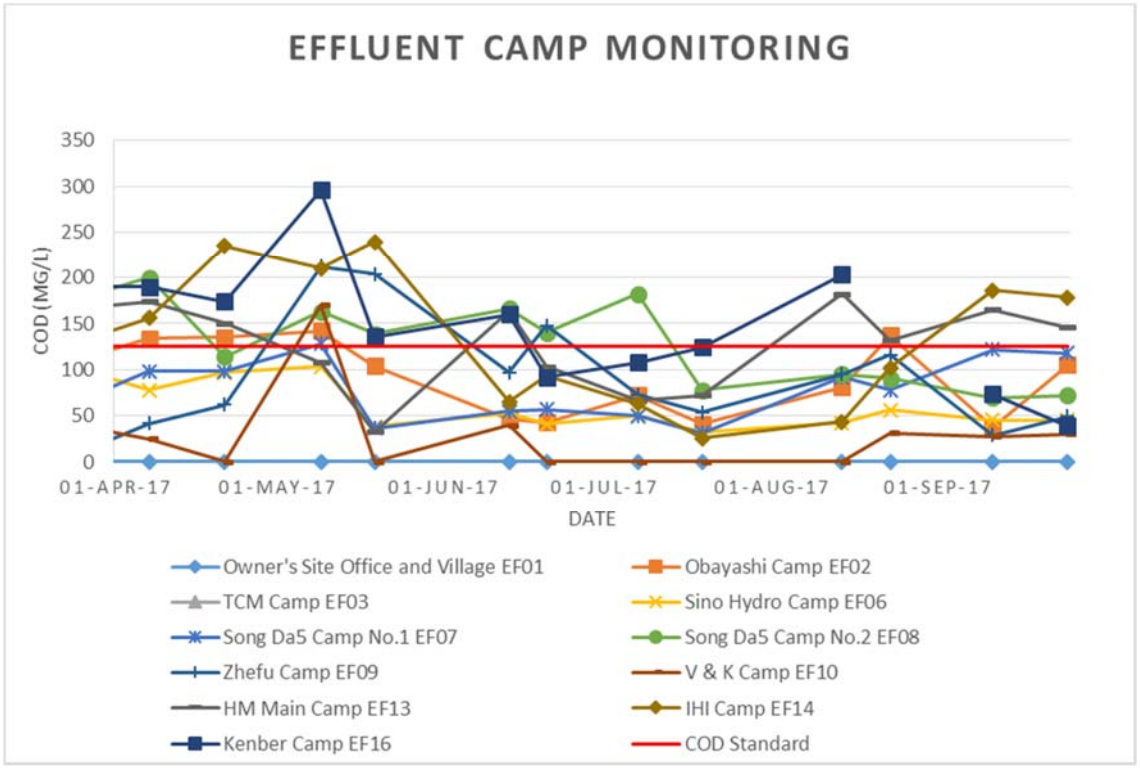

Total Coliform - Nam Ngiep Tributaries
Nam Chian (NCH01)
Nam Phouan (NPH01)
Nam Xao (NXA01)
Nam Houay Soup (NHS01)
Guideline
Total coliform (MPN/100mL)
100000
10000
1000
100
10
1
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Date

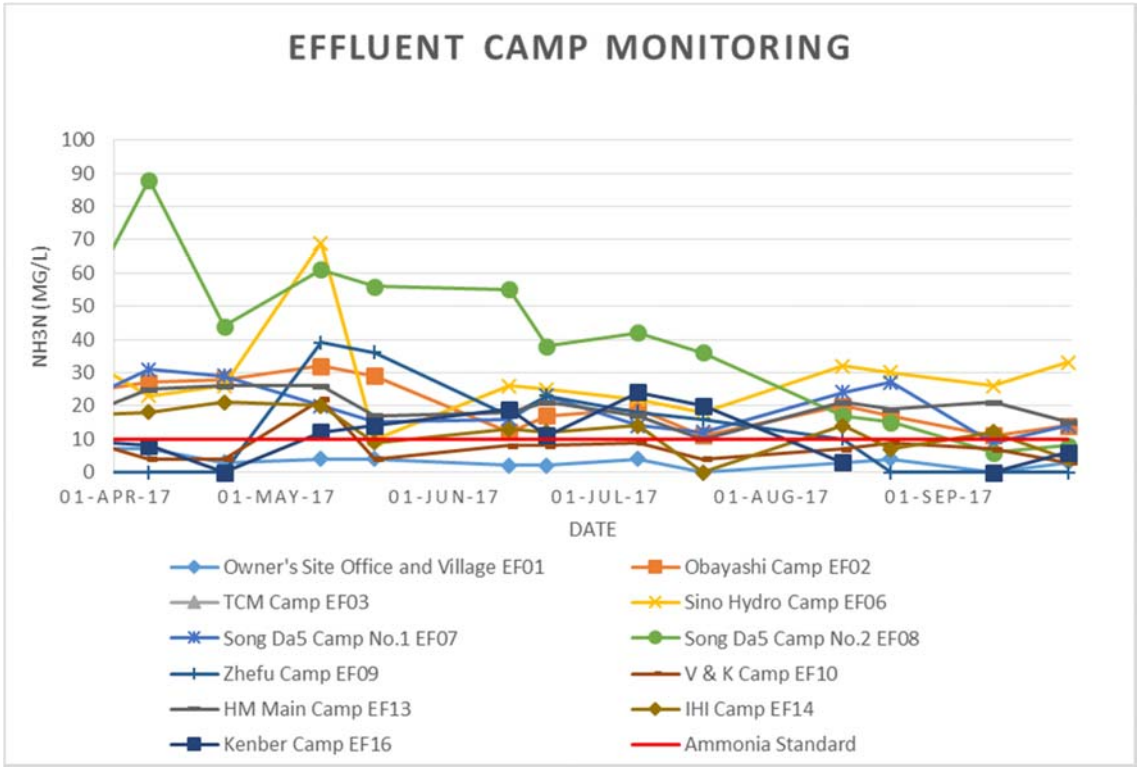
Camps' Effluent Water Quality Trends (Since April – September 2017)

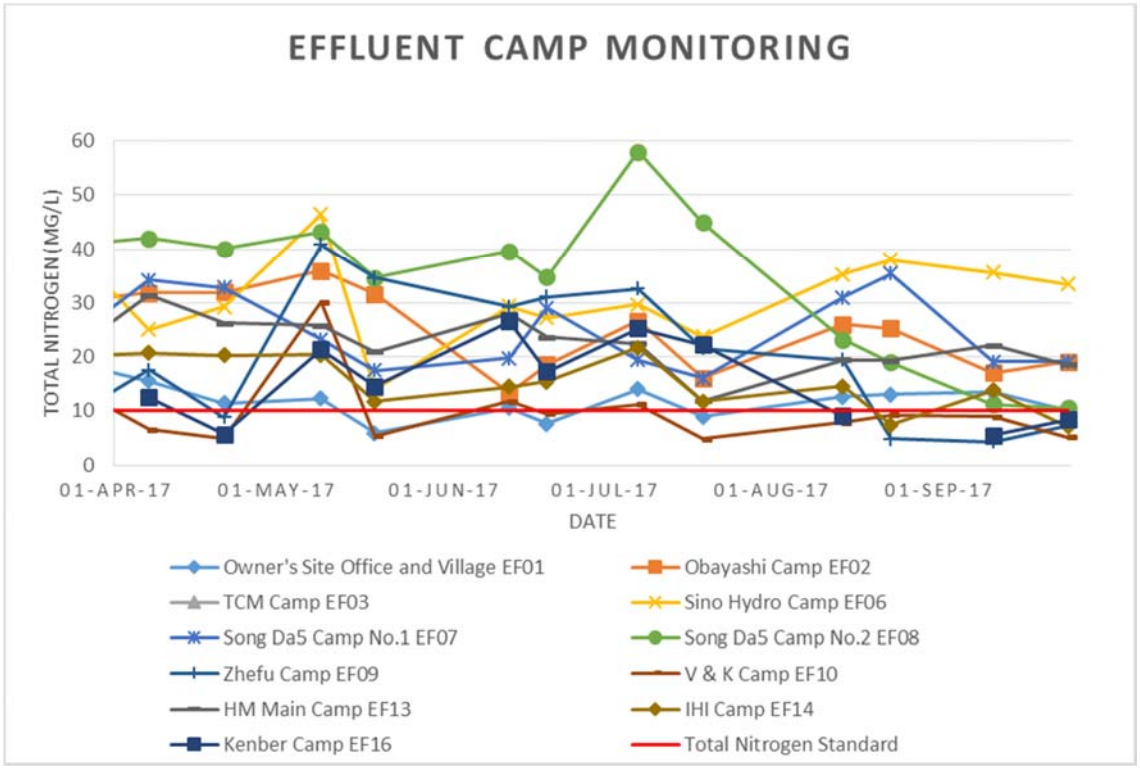


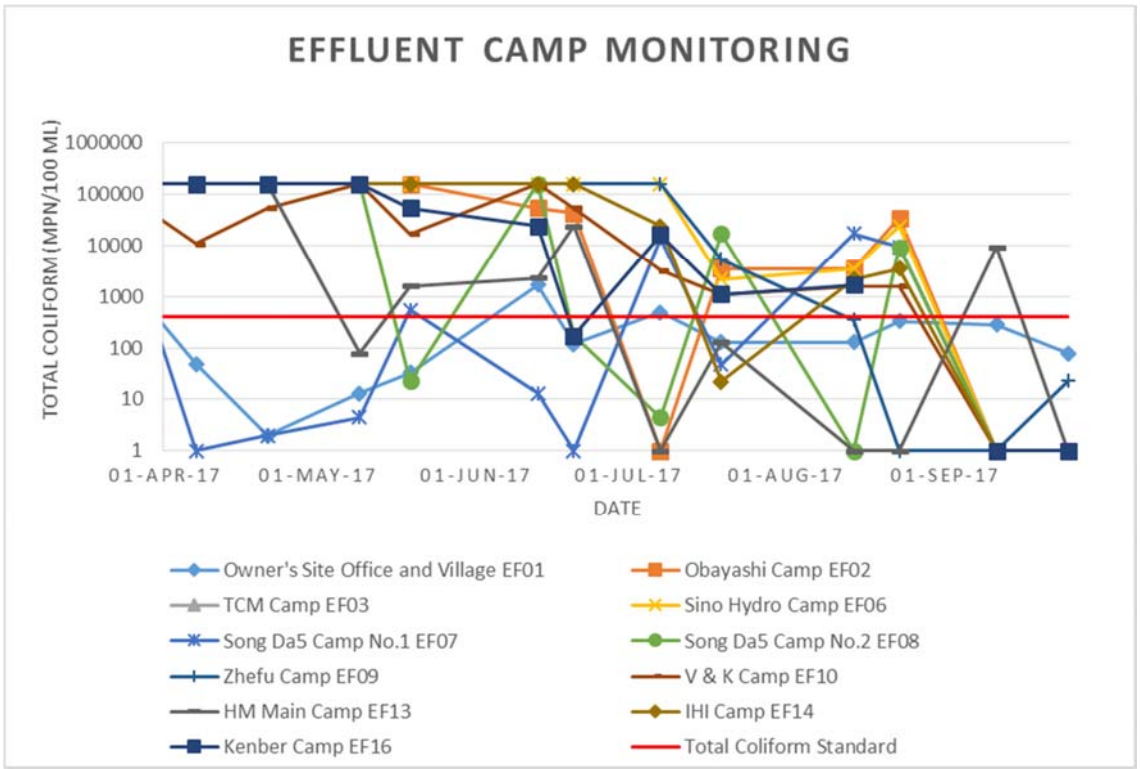

EFFLUENT CAMP MONITORING
TSS (MG/L)
200
180
160
140
120
100
80
60
40
20
0
01-APR-17
01-MAY-17
01-JUN-17
01-JUL-17
01-AUG-17
01-SEP-17
DATE
Owner's Site Office and Village EF01
Obayashi Camp EF02
TCM Camp EF03
Sino Hydro Camp EF06
Song Da5 Camp No.1 EF07
Song Da5 Camp No.2 EF08
Zhefu Camp EF09
V & K Camp EF10
HM Main Camp EF13
IHI Camp EF14
Kenber Camp EF16
TSS Standard


EFFLUENT CAMP MONITORING
BOD (MG/L)
300
250
200
150
100
50
0
01-APR-17
01-MAY-17
01-JUN-17
01-JUL-17
01-AUG-17
01-SEP-17
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
BOD Standard

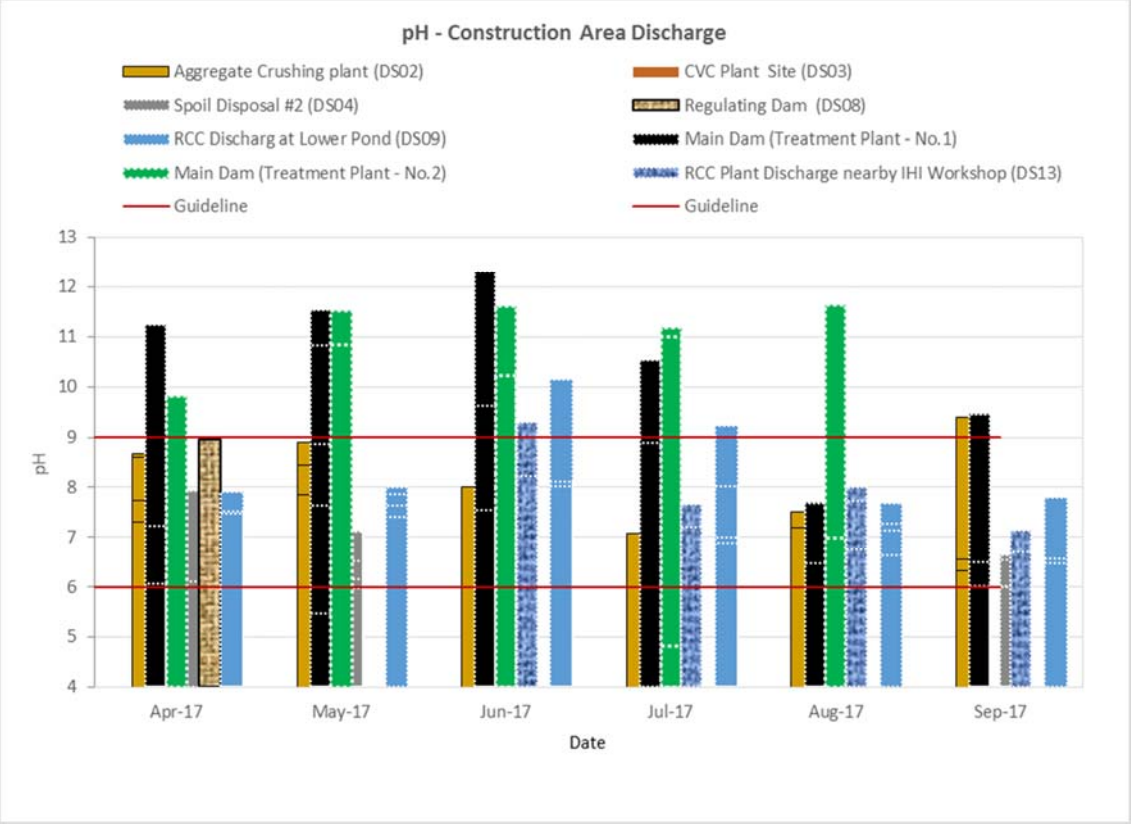

EFFLUENT CAMP MONITORING
COD (MG/L)
350
300
250
200
150
100
50
0
01-APR-17
01-MAY-17
01-JUN-17
01-JUL-17
01-AUG-17
01-SEP-17
DATE
Owner's Site Office and Village EF01
Obayashi Camp EF02
TCM Camp EF03
Sino Hydro Camp EF06
Song Da5 Camp No.1 EF07
Song Da5 Camp No.2 EF08
Zhefu Camp EF09
V & K Camp EF10
HM Main Camp EF13
IHI Camp EF14
Kenber Camp EF16
COD Standard

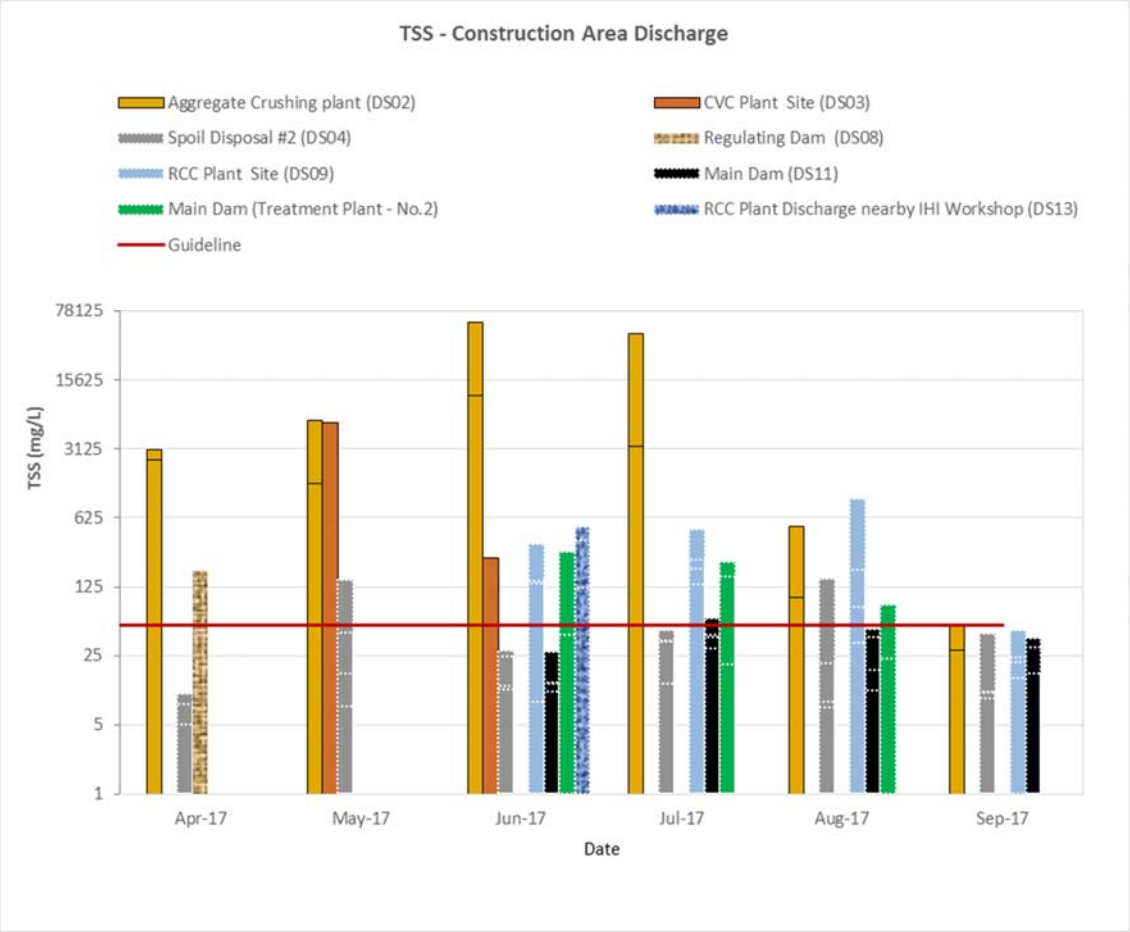

EFFLUENT CAMP MONITORING
NH3N (MG/L)
100
90
80
70
60
50
40
30
20
10
0
01-APR-17
01-MAY-17
01-JUN-17
01-JUL-17
01-AUG-17
01-SEP-17
DATE
Owner's Site Office and Village EF01
Obayashi Camp EF02
TCM Camp EF03
Sino Hydro Camp EF06
Song Da5 Camp No.1 EF07
Song Da5 Camp No.2 EF08
Zhefu Camp EF09
V & K Camp EF10
HM Main Camp EF13
IHI Camp EF14
Kenber Camp EF16
Ammonia Standard


EFFLUENT CAMP MONITORING
TOTAL NITROGEN (MG/L)
60
50
40
30
20
10
0
01-APR-17
01-MAY-17
01-JUN-17
01-JUL-17
01-AUG-17
01-SEP-17
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


EFFLUENT CAMP MONITORING
TOTAL COLIFORM (MPN/100 ML)
1000000
100000
10000
1000
100
10
1
01-APR-17
01-MAY-17
01-JUN-17
01-JUL-17
01-AUG-17
01-SEP-17
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

Construction Area Discharge Water Quality (Since April to September 2017)




TSS - Construction Area Discharge
Aggregate Crushing plant (DS02)
CVC Plant Site (DS03)
Spoil Disposal #2 (DS04)
Regulating Dam (DS08)
RCC Plant Site (DS09)
Main Dam (DS11)
Main Dam (Treatment Plant - No.2)
RCC Plant Discharge nearby IHI Workshop (DS13)
Guideline
78125
15625
3125
625
125
25
5
1
TSS (mg/L)
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Date

APPENDIX 5 WATER QUALITY MONITORING DATA

APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q3 2017

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline														
5-Jul-17	pH	5.0 - 9.0	7.3	7.77	7.81	8.35	8.23	8.2					7.62	8.13		
13-Jul-17	pH	5.0 - 9.0				7.42	7.45	7.39	7.37							
18-Jul-17	pH	5.0 - 9.0	7.19			7.05	7.16	7.23	7.23	7.21	7.18	7.1	7.34		7.15	6.03
26-Jul-17	pH	5.0 - 9.0				7.13	7.07	6.91	7.09							
2-Aug-17	pH	5.0 - 9.0	7.11			7.1	7.53	7.04	7.16	7.18	7.06	7.29	7.32		7.02	6.8
11-Aug-17	pH	5.0 - 9.0				7.27	7.4	7.05	7.15							
17-Aug-17	pH	5.0 - 9.0	6.96	7.24	7.13	7.22	7.38	7.4	7.33	7.38	7.05	7.14	7.13	6.82	7.42	7.39
24-Aug-17	pH	5.0 - 9.0				7.65	7.61	7.64	7.02							
30-Aug-17	pH	5.0 - 9.0				7.32	7.54	7.63	7.56							
7-Sep-17	pH	5.0 - 9.0	6.63	6.73	6.66	6.64	7.31	7.54	6.86	6.96	7.56	7.27	7.79	6.82	6.97	7.47
11-Sep-17	pH	5.0 - 9.0				7.08			7.2							
12-Sep-17	pH	5.0 - 9.0				6.51			6.66							
13-Sep-17	pH	5.0 - 9.0				7.55			6.79							
14-Sep-17	pH	5.0 - 9.0				7.19	6.75	7.29	6.57							
15-Sep-17	pH	5.0 - 9.0				6.54			6.74							
16-Sep-17	pH	5.0 - 9.0				6.72			6.65							
20-Sep-17	pH	5.0 - 9.0	6.61			6.71	7.16	7.45	6.39	6.47	6.77	6.62	8.14		6.47	6.05
28-Sep-17	pH	5.0 - 9.0				7.38	7.08	7.58	6.87							
5-Jul-17	Sat. DO (%)		95.8	92.7	91.6	111.6	107.3	104.7	109.5	105.5	107.9	86.3	110.7	99.7	98.2	86.1

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
13-Jul-17	Sat. DO (%)					101.7	100.3	99	102.1							
18-Jul-17	Sat. DO (%)		92.9			100.3	117.3	108.6	109.9	100.9	101.6	98.8	100.8		91.6	91.5
26-Jul-17	Sat. DO (%)					102.2	104.2	92.4	103							
2-Aug-17	Sat. DO (%)		98.1			101.8	105.2	93.2	102.4	99.3	99.8	90.8	99.9		95	84
11-Aug-17	Sat. DO (%)					103.7	102	88	95.5							
17-Aug-17	Sat. DO (%)		95.7	97.3	101.1	99.2	96.2	93.5	90.9	91.8	89.6	87.2	100.8	101.8	89.4	88.9
24-Aug-17	Sat. DO (%)					105	99.5	96.3	100.5							
30-Aug-17	Sat. DO (%)					114	120.9	117.7	113.5							
7-Sep-17	Sat. DO (%)		93.3	90.6	97.6	98.8	104.8	96.6	99.2	96.7	99.4	96.7	98.4	97	93.7	86.3
11-Sep-17	Sat. DO (%)					100.6			102							
12-Sep-17	Sat. DO (%)					76.15			94.6							
13-Sep-17	Sat. DO (%)					100.6			99.8							
14-Sep-17	Sat. DO (%)					111	118.6	122.4	110.8							
15-Sep-17	Sat. DO (%)					98			98							
16-Sep-17	Sat. DO (%)					99.1			103.5							
20-Sep-17	Sat. DO (%)		93.3			100	107.4	107.5	101.8	98.3	97.5	89.8	97.1		91.8	80.9
28-Sep-17	Sat. DO (%)					94	111.1	109.4	110							
5-Jul-17	DO (mg/l)	>6.0	7.82	7.42	7.27	8.94	8.56	8.5	8.81	8.43	8.63	6.95	8.91	7.95	7.65	6.91
13-Jul-17	DO (mg/l)	>6.0				8.21	8.18	7.94	7.83							
18-Jul-17	DO (mg/l)	>6.0	7.48			8.17	9.87	9.1	8.46	7.73	7.89	7.88	8.12		6.88	6.95
26-Jul-17	DO (mg/l)	>6.0				8.11	8.32	7.48	8.13							

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
2-Aug-17	DO (mg/l)	>6.0	7.56			7.89	8.42	7.36	7.51	7.47	7.61	7.09	7.69		7.15	6.37
11-Aug-17	DO (mg/l)	>6.0				8.72	8.16	7.08	7.58							
17-Aug-17	DO (mg/l)	>6.0	7.53	7.81	7.9	8.06	7.8	7.47	7.2	7.24	7.16	7.12	7.98	8.26	7.03	7
24-Aug-17	DO (mg/l)	>6.0				7.89	7.73	7.28	7.65							
30-Aug-17	DO (mg/l)	>6.0				9.19	9.77	9.46	9.09							
7-Sep-17	DO (mg/l)	>6.0	7.29	7.01	7.3	7.8	8.35	7.59	7.69	7.47	7.48	7.28	7.83	7.66	7.23	6.71
11-Sep-17	DO (mg/l)	>6.0				7.69			8.01							
12-Sep-17	DO (mg/l)	>6.0				4.93			7.22							
13-Sep-17	DO (mg/l)	>6.0				7.65			7.56							
14-Sep-17	DO (mg/l)	>6.0				8.62	9.23	9.62	8.67							
15-Sep-17	DO (mg/l)	>6.0				7.72			7.48							
16-Sep-17	DO (mg/l)	>6.0				8.14			8.6							
20-Sep-17	DO (mg/l)	>6.0	7.35			7.83	8.51	8.53	8.01	7.56	7.32	6.93	7.66		6.95	6.29
28-Sep-17	DO (mg/l)	>6.0				7.31	8.88	8.64	8.64							
5-Jul-17	Conductivity (µs/cm)		126	120	113	93	93	104	86	92	83	67	52	95	104	20
13-Jul-17	Conductivity (µs/cm)					66.7	113	97	62.4							
18-Jul-17	Conductivity (µs/cm)		71.2			49.3	80	81	46.6	40.5	42.4	43.8	21.63		34.9	8.01
26-Jul-17	Conductivity (µs/cm)					60.2	98	95	60							
2-Aug-17	Conductivity (µs/cm)		82.3			65.9	78	107	62.8	61.6	64.4	44.8	28		66.6	18.46

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
11-Aug-17	Conductivity (µs/cm)					83	84	188	160							
17-Aug-17	Conductivity (µs/cm)		79.9	69	66.7	188	94	109	138	136	96	114	28	63	153	29
24-Aug-17	Conductivity (µs/cm)					67.9	80.6	71.1	71.4							
30-Aug-17	Conductivity (µs/cm)					124	104	120	128							
7-Sep-17	Conductivity (µs/cm)		83.7	58.1	64	68.1	73	70	67.6	67.7	62.7	52.6	26.4	85.8	70.9	13.68
11-Sep-17	Conductivity (µs/cm)					83.7			73.7							
12-Sep-17	Conductivity (µs/cm)					23.6			51.8							
13-Sep-17	Conductivity (µs/cm)					56.2			49.7							
14-Sep-17	Conductivity (µs/cm)					99	216	111	130							
15-Sep-17	Conductivity (µs/cm)					59.6			55.2							
16-Sep-17	Conductivity (µs/cm)					48.3			48.9							
20-Sep-17	Conductivity (µs/cm)		89.1			68.6	188	127	68.4	66.5	61.7	55.1	27.4		66.7	13.35
28-Sep-17	Conductivity (µs/cm)					128	148	142	185							
5-Jul-17	TDS (mg/l)		63	60	56	47	46	51	43	46	41	34	26	48	52	10
13-Jul-17	TDS (mg/l)					33	56	48	31							

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
18-Jul-17	TDS (mg/l)		35			25	40	41	23	20	21	22	11		17	4
26-Jul-17	TDS (mg/l)					30	49	48	30							
2-Aug-17	TDS (mg/l)		41			33	39	57	31	30	32	22	14		33	9
11-Aug-17	TDS (mg/l)					41	42	94	80							
17-Aug-17	TDS (mg/l)		40	35	33	94	47	55	69	68	48	57	14	32	75	14
24-Aug-17	TDS (mg/l)					35	40	35	35							
30-Aug-17	TDS (mg/l)					62	58	60	64							
7-Sep-17	TDS (mg/l)		41	29	32	34	36	35	33	33	31	26	13	43	35	6
11-Sep-17	TDS (mg/l)					41.85			36.85							
12-Sep-17	TDS (mg/l)					12			25							
13-Sep-17	TDS (mg/l)					28.9			24.85							
14-Sep-17	TDS (mg/l)					49	108	55	65							
15-Sep-17	TDS (mg/l)					29			27							
16-Sep-17	TDS (mg/l)					24.15			24.45							
20-Sep-17	TDS (mg/l)		45			34.3	94	63	34	33	30	27	16		33	6
28-Sep-17	TDS (mg/l)					64	78	71	92							
5-Jul-17	Temperature (°C)		25.1	25.2	25.07	24.58	24.29	24.42	25	24.5	25.5	26.03	23.63	24.02	26.7	25.2
13-Jul-17	Temperature (°C)					24.6	24.52	24.66								
18-Jul-17	Temperature (°C)		23.6			24	23.18	23.26	27.2	27.6	26.5	25.5	23.3		28.4	27.9

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
26-Jul-17	Temperature (°C)					25.2	24.71	24.85	25.7							
2-Aug-17	Temperature (°C)		26.1			26.7	25.42	26.15	27.1	28.5	27.6	27.5	26		28.5	21.8
11-Aug-17	Temperature (°C)					25.49	25.04	25.34	26.21							
17-Aug-17	Temperature (°C)		25.4	24.6	26	24.4	24.41	24.69	25	25.1	26.18	26.29	24.7	23.9	25.6	25.7
24-Aug-17	Temperature (°C)					26.23	26.61	27.94	27.4							
30-Aug-17	Temperature (°C)					24.67	24.67	25.14	25.9							
7-Sep-17	Temperature (°C)		24.6	26.7	27.5	25.9	25.48	26.04	27.1	27.3	28.4	28.4	24.3	25.5	27.4	27
11-Sep-17	Temperature (°C)					27.5			26.7							
12-Sep-17	Temperature (°C)					30.7			28							
13-Sep-17	Temperature (°C)					27.9			28.3							
14-Sep-17	Temperature (°C)					26.7	26.29	26.91	27.07							
15-Sep-17	Temperature (°C)					25.6			27.3							
16-Sep-17	Temperature (°C)					23.8			22.7							
20-Sep-17	Temperature (°C)		25.3			26.3	25.81	25.92	26.4	27.5	28.4	27.9	25		28.4	27

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
28-Sep-17	Temperature (°C)					26.66	25.92	26.05	29.2							
5-Jul-17	Turbidity (NTU)		33.03	29.81	23.98	1,288	1,255	390	68	70.8	53.94	35.62	18.54	25.68	60.7	11.6
13-Jul-17	Turbidity (NTU)					59.1	59.8	66.7	68.7							
18-Jul-17	Turbidity (NTU)		3346			1692	1803	1323	1515	917	1287	1554	2030		75	71.6
26-Jul-17	Turbidity (NTU)					31.1	26.7	31.2	34.4							
2-Aug-17	Turbidity (NTU)		32.4			33.1	57.8	34.16	19	20.2	22.5	19.1	13.8		26.3	8.01
11-Aug-17	Turbidity (NTU)					56.46	48.97	46.45	45.3							
17-Aug-17	Turbidity (NTU)		1,267	30.2	24	52.98	42.28	56.31	84.57	68.93	77.48	38.55	71.8	6.83	26.96	41.51
24-Aug-17	Turbidity (NTU)					27.5	23.15	12.23	16.9							
30-Aug-17	Turbidity (NTU)					756	737	46.88	39.98							
7-Sep-17	Turbidity (NTU)		51.3	3,531	2,152	55.7	49.31	42.37	49.8	51.8	58.8	610	18.6	15.9	16.7	14.39
11-Sep-17	Turbidity (NTU)					46.5			37.9							
12-Sep-17	Turbidity (NTU)					115,800			30,770							
13-Sep-17	Turbidity (NTU)					3,240			3,812							
14-Sep-17	Turbidity (NTU)					2,207	1,607	1,139	3,566							
15-Sep-17	Turbidity (NTU)					1,832			2,840							
16-Sep-17	Turbidity (NTU)					58			3,789							
20-Sep-17	Turbidity (NTU)		61			52.1	50.91	40.22	52.7	36.6	44.2	39.2	10.72		9.53	7.52
28-Sep-17	Turbidity (NTU)					33	32.5	25	29.2							
5-Jul-17	TSS (mg/l)		62	66.2	44.69	1021	480	194.89	136	132.72	71.25	72.33	45.4	90.56	74	5.59

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
13-Jul-17	TSS (mg/l)					263.6	174.86	144.79	158.2							
18-Jul-17	TSS (mg/l)					1278	1341	849	963							
26-Jul-17	TSS (mg/l)					103.93	67.26	65.21	80.46							
2-Aug-17	TSS (mg/l)		70.47			123.38	110.55	48.17	39.36	46.8	44	40	92.8		39.04	59.91
11-Aug-17	TSS (mg/l)					165	84.71	62.84	65.59							
17-Aug-17	TSS (mg/l)					121.85	81.52	74.57	124.68							
24-Aug-17	TSS (mg/l)					61.03	38.3	17.41	19.21							
30-Aug-17	TSS (mg/l)					711.11	410	114.29	101.67							
7-Sep-17	TSS (mg/l)		212	2,550	1,610.27	221.72	178.66	143.64	148.92	127.41	173.91	313.15	48	43.2	27.2	13.2
11-Sep-17	TSS (mg/l)					68.3			35.7							
12-Sep-17	TSS (mg/l)					125,172			19,447							
13-Sep-17	TSS (mg/l)					1,715			26,168							
14-Sep-17	TSS (mg/l)					1,697	923	475	2,082							
15-Sep-17	TSS (mg/l)					1,465			1,573							
16-Sep-17	TSS (mg/l)					520			1250							
20-Sep-17	TSS (mg/l)					191.85	149.58	96	140							
28-Sep-17	TSS (mg/l)					78.33	75.65	44.8	52.68							
5-Jul-17	BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	1.3	1	1.02	<1.0	<1.0	<1.0	<1.0	<1.0	1.01	<1.0	1.05
13-Jul-17	BOD_5 (mg/l)	<1.5				2.42	<1.0	1.4	<1.0							
18-Jul-17	BOD_5 (mg/l)	<1.5				1.1	1.22	<1.0	1.1							

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
26-Jul-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
2-Aug-17	BOD_5 (mg/l)	<1.5	<1.0			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.12		<1.0	<1.0
11-Aug-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
17-Aug-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
24-Aug-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
30-Aug-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	1.77							
7-Sep-17	BOD_5 (mg/l)	<1.5	1.84	<1.0	1.81	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.68	<1.0	<1.0	<1.0
14-Sep-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
20-Sep-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
28-Sep-17	BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0							
5-Jul-17	COD (mg/l)	<5	6.2	6.5	5	39.7	17.9	9	9.1	10.7	10.7	9.7	5.4	14.5	10.3	20.2
2-Aug-17	COD (mg/l)	<5	5.8			7.3	6.7	<5.0	<5.0	<5.0	5	5.8	6.5		7.5	10.9
7-Sep-17	COD (mg/l)	<5	11.5	136	49.7	13.3	12.5	5.6	6.9	7.7	7.7	12.9	9.5	<5.0	8.1	8.5
12-Sep-17	COD (mg/l)	<5				1,882.0			380							
5-Jul-17	NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2-Aug-17	NH_3-N (mg/l)	<0.2	<0.2			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2
7-Sep-17	NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
5-Jul-17	NO3-N (mg/l)	<5	0.07	0.06	0.06	0.08	0.08		0.02	0.15	<0.02	<0.02	0.14	0.1	0.1	0.06

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
2-Aug-17	NO3-N (mg/l)	<5	0.17			0.14	0.14	0.13	0.14	0.13	0.15	0.11	0.17		0.09	0.07
7-Sep-17	NO3-N (mg/l)	<5	0.14	0.16	0.51	0.15	0.15	0.17	0.15	0.14	0.15	0.15	0.1	0.14	0.09	0.11
5-Jul-17	Faecal coliform (MPN/100ml)	<1,000	170	700	1,700	7,000	5,000	1,300	1,300	1,400	2,300	790	790	3500	330	330
13-Jul-17	Faecal coliform (MPN/100ml)	<1,000														
18-Jul-17	Faecal coliform (MPN/100ml)	<1,000				700	5,400	5,400	920							
26-Jul-17	Faecal coliform (MPN/100ml)	<1,000				7	14	6	6							
2-Aug-17	Faecal coliform (MPN/100ml)	<1,000	1,600			3,500	1,600	920	1,600	1,600	1,600	1,600	350		1,600	240
11-Aug-17	Faecal coliform (MPN/100ml)	<1,000				16,000	1,600	1,600	1,600							
17-Aug-17	Faecal coliform (MPN/100ml)	<1,000				920	540	920	920							
24-Aug-17	Faecal coliform (MPN/100ml)	<1,000				130	430	790	240							
30-Aug-17	Faecal coliform (MPN/100ml)	<1,000				1,600	3,500	400	1,600							
7-Sep-17	Faecal coliform (MPN/100ml)	<1,000	1,600	1,600	920	1,600	1,700	1,600	1,600	920	1,700	920	920	1,600	1,700	1,600
14-Sep-17	Faecal coliform (MPN/100ml)	<1,000				1,600	1,600	1,600	1,600							
20-Sep-17	Faecal coliform (MPN/100ml)	<1,000				1,600	3,500	1,600	1,600							
28-Sep-17	Faecal coliform (MPN/100ml)	<1,000				220	170	220	350							

		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
5-Jul-17	Total Coliform (MPN/100ml)	<5,000	2,300	2,200	2,200	11,000	10,000	3,300	4,900	4,800	4,600	2300	7,900	4,900	7,900	3,300
13-Jul-17	Total Coliform (MPN/100ml)	<5,000														
18-Jul-17	Total Coliform (MPN/100ml)	<5,000				1,100	5,400	5,400	1,600							
26-Jul-17	Total Coliform (MPN/100ml)	<5,000				140	48	24	15							
2-Aug-17	Total Coliform (MPN/100ml)	<5,000	1,600			3,500	1,600	1,600	920	1,600	1,600	1600	350		3,500	920
11-Aug-17	Total Coliform (MPN/100ml)	<5,000				16,000	1,600	1,600	1,600							
17-Aug-17	Total Coliform (MPN/100ml)	<5,000				1,600	1,600	1,600	1,600							
24-Aug-17	Total Coliform (MPN/100ml)	<5,000				790		1,100	580							
30-Aug-17	Total Coliform (MPN/100ml)	<5,000				1,600	16,000	1,700	1,600							
7-Sep-17	Total Coliform (MPN/100ml)	<5,000	1,600	3,500	1,600	3,500	5,400	1,600	1,600	1,600	3,500	1,600	1,600	1,600	3,500	1,600
14-Sep-17	Total Coliform (MPN/100ml)	<5,000				3,500	3,500	1,600	1,600							
20-Sep-17	Total Coliform (MPN/100ml)	<5,000				1,700	3,500	1,600	1,600							
28-Sep-17	Total Coliform (MPN/100ml)	<5,000				1,100	1,600	1,600	540							
7-Sep-17	Arsenic (mg/l)	<0.01	0.0024	0.0089	0.0069	0.0024	0.0022	0.0014	0.002	0.0018	0.0021	0.0036	0.0005	0.0009	0.0004	<0.0003
7-Sep-17	Total Iron (mg/l)		6.13	47	30.9	10.2	7.6	4.76	6.84	5.38	7.61	15.2	3.1	1.77	1.81	1.18

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q3 2017

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
07-Jul-17	pH	6.0-9.0	7	7	7	6	7.37	6.8	7.46	7	7.13	7.73
19-Jul-17	pH	6.0-9.0	6.77	7.46	7.27	7.3	7.34	7.13	7.51	7.33	7.39	7.37
14-Aug-17	pH	6.0-9.0	6.29	7.55	7.5	7.46	7.07	8.28	7.56	7.32	7.61	9.54
23-Aug-17	pH	6.0-9.0	6.79	6.73	7.35	7.13	7.17	10.66	7.33	7.25	6.87	
11-Sep-17	pH	6.0-9.0	6.45	7.18	6.64	6.56	7.13	10.4	6.82	6.62	6.5	10.01
25-Sep-17	pH	6.0-9.0	6.81	6.93	6.85	6.69	6.89	9.47	6.93	7.91	7.61	6.57
07-Jul-17	Sat. DO (%)		48.8	7.29	28.7	63.4	29	25.4	43.7	64.5	9	64.6
19-Jul-17	Sat. DO (%)		35	1.8	33.4	73.3	5.7	41.1	39.2	63.6	48.8	1.3
14-Aug-17	Sat. DO (%)		70.7	32.2	49.4	46	26.9	93.4	94.4	32.7	61.6	245.4
23-Aug-17	Sat. DO (%)		67.2	11.8	57.2	13	65.4	187	60.8	24.7	14	
11-Sep-17	Sat. DO (%)		39.1	75	67.5	83.3	82.6	159.9	70.8	24.6	39.7	89.8
25-Sep-17	Sat. DO (%)		53	79	64.2	68.1	59	124.4	85	62.5	33	68
07-Jul-17	DO (mg/l)		3.5	2.21	2.11	4.55	2.27	1.88	3.33	5.03	0.66	4.96

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
19-Jul-17	DO (mg/l)		2.62	0.14	2.53	5.44	0.43	3.07	2.95	4.81	3.65	0.1
14-Aug-17	DO (mg/l)		5.25	2.32	3.52	3.19	1.94	6.89	6.66	2.37	4.35	17.55
23-Aug-17	DO (mg/l)		4.69	0.08	4.08	0.91	4.54	13.28	4.3	1.81	0.9	
11-Sep-17	DO (mg/l)		2.78	5.41	4.68	5.72	6.02	11.2	5.14	1.65	2.79	6.05
25-Sep-17	DO (mg/l)		3.97	5.74	4.77	5.16	4.42	9.65	6.37	4.77	2.48	5.07
07-Jul-17	Conductivity (µS/cm)		382	663	580	499	852	362	328	750	463	461
19-Jul-17	Conductivity (µS/cm)		217.7	353	371	277	482	226	217.8	415	296	325
14-Aug-17	Conductivity (µS/cm)		373	640	663	740	480	308	360	590	598	241
23-Aug-17	Conductivity (µS/cm)		371	622	491	785	661	336	387	825	735	
11-Sep-17	Conductivity (µS/cm)		369	531	621	911	501	267	376	783	750	512
25-Sep-17	Conductivity (µS/cm)		392	613	639	928	476	226	359	881	1246	646
07-Jul-17	TDS (mg/l)		192	331	290	249	426	151	164	374	231	230
19-Jul-17	TDS (mg/l)		108.8	176	186	138.5	241	113	108.9	207.5	148	163

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
14-Aug-17	TDS (mg/l)		186	320	331	372	240	155	180	295	299	120
23-Aug-17	TDS (mg/l)		185	311	245	393	330	157	194	412	368	
11-Sep-17	TDS (mg/l)		184	265.5	310	455	250	134	188	392	375	256
25-Sep-17	TDS (mg/l)		196	306	319	464	238	113	161	440	773	323
07-Jul-17	Temperature (°C)		27.58	28.72	28.05	28.33	27.4	28.53	28	27.38	29	27.4
19-Jul-17	Temperature (°C)		28.6	29.1	28.1	29.1	27.8	29.2	28.6	28	28.6	26.8
14-Aug-17	Temperature (°C)		29.1	31.4	31.1	30.92	30.7	28.5	31.9	31	31.8	30.2
23-Aug-17	Temperature (°C)		30.5	31.4	31	30.1	32.4	31.6	31.7	29.7	29.3	
11-Sep-17	Temperature (°C)		31.6	30.8	32.9	33.8	30.3	33	30.6	33.5	32.3	34.1
25-Sep-17	Temperature (°C)		28.4	30.3	29	28.1	28.7	26.6	28.7	27.7	28.4	28.3
07-Jul-17	Turbidity (NTU)		1.69	15.59	10.03	18.06	25	28.32	5.36	24.92	6.61	6.62
19-Jul-17	Turbidity (NTU)		1.03	10.41	7.25	11.2	15.8	35.4	9.05	15.4	6.72	39.2
14-Aug-17	Turbidity (NTU)		0.81	12.9	3.89	21.78	9.94	10.59	4.43	23.8	7.37	10.77

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
23-Aug-17	Turbidity (NTU)		0.88	23.1	18.6	25.2	10.78	11.5	4.56	1.07	9.03	
11-Sep-17	Turbidity (NTU)		1.22	14.7	8.94	56.9	15.86	2.94	8.79	29	26.5	17.1
25-Sep-17	Turbidity (NTU)		0.82	7.57	15.8	19.7	16.1	3.55	10.65	34.6	20.5	9.44
07-Jul-17	TSS (mg/l)	<50	<5	15.25	12.25	15.75	29.42	50	8.63	11	<5	10.4
19-Jul-17	TSS (mg/l)	<50	<5	17.31	9.47	14.62	23.85	74.12	14.68	11.76	<5	104.55
14-Aug-17	TSS (mg/l)	<50	<5	9.6	7	13.25	8.99	14.05	<5	20.67	<5	124
23-Aug-17	TSS (mg/l)	<50	<5	41.67	18.12	20.28	20.17	57.41	12.29	22.04	14.21	
11-Sep-17	TSS (mg/l)	<50	<5	7.14	10.1	54.4	24.46	10.33	8.66	26.4	20.7	38.5
25-Sep-17	TSS (mg/l)	<50	<5	16.44	8.43	41.66	13.79	23.33	13.33	16.29	17.95	21.3
07-Jul-17	BOD_5 (mg/l)	<30	<1	<1	19.6	<1	8.4	24.5	19.4	<1	40.5	67.4
19-Jul-17	BOD_5 (mg/l)	<30	29.7	48.45	61.35	30.45	80.1	50.4	40.8	28.2	36.75	85.65
14-Aug-17	BOD_5 (mg/l)	<30	31.95	75	54.9	80.25	58.65	43.35	55.95	120	44.7	94.65
23-Aug-17	BOD_5 (mg/l)	<30	13.8	66.6	40.65	51	60	16.65	34.95	<1	65.85	

	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
	Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA									
11-Sep-17	BOD_5 (mg/l)	<30	<18	<18	<18	<18	<18	<18	<18	44.5	<18	<18
25-Sep-17	BOD_5 (mg/l)	<30	<6	<6	<6	<6	<6	8.64	<6	<6	<6	<6
07-Jul-17	COD (mg/l)	<125	<25	71.8	50.3	49.7	182	72.6	<25	67.2	63.4	108
19-Jul-17	COD (mg/l)	<125	<25	41.1	31.8	31.6	77.6	53.5	<25	72.2	25.8	124
14-Aug-17	COD (mg/l)	<125	<25	80.8	42.4	91.9	95.2	95.2	<25	182	43.6	203
23-Aug-17	COD (mg/l)	<125	<25	137	56.4	77.8	90.3	116	31.6	132	102	
11-Sep-17	COD (mg/l)	<125	<25	37.4	45.4	122	69.4	28.9	27.3	165	186	73.7
25-Sep-17	COD (mg/l)	<125	<25	105	45.1	118	72.2	49	30.4	146	178	38.9
07-Jul-17	NH_3-N (mg/l)	<10	4	19	22	14	42	18	9	17	14	24
19-Jul-17	NH_3-N (mg/l)	<10	<0.2	11	18	12	36	16	4	10	<0.2	20
14-Aug-17	NH_3-N (mg/l)	<10	3	20	32	24	17	10	7	21	14	3
23-Aug-17	NH_3-N (mg/l)	<10	4	17	30	27	15	<2	9	19	7	
11-Sep-17	NH_3-N (mg/l)	<10	<2	11	26	9	6	<2	7	21	12	<2
25-Sep-17	NH_3-N (mg/l)	<10	3	14	33	14	8	<2	3	15	4	6

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
07-Jul-17	Total Nitrogen (mg/l)	<10	14	26.7	29.7	19.4	58	32.6	11.2	22.4	21.7	25.2
19-Jul-17	Total Nitrogen (mg/l)	<10	8.98	16.1	23.7	16.1	44.9	21.6	4.85	11.8	11.7	22.2
14-Aug-17	Total Nitrogen (mg/l)	<10	12.6	26	35.3	31	23.2	19.4	7.81	19.4	14.6	9.05
23-Aug-17	Total Nitrogen (mg/l)	<10	13	25.3	38	35.4	19	4.79	9.28	19.3	7.42	
11-Sep-17	Total Nitrogen (mg/l)	<10	13.5	17	35.6	19.1	11.2	4.31	8.92	22.1	13.8	5.43
25-Sep-17	Total Nitrogen (mg/l)	<10	10	19.1	33.5	19.1	10.5	7.33	5.18	18.5	7.06	8.44
07-Jul-17	Total Phosphorus (mg/l)	<2.0	0.58	0.61	1.09	1	0.73	1.11	0.48	1.03	0.59	0.61
19-Jul-17	Total Phosphorus (mg/l)	<2.0	1.13	0.78	1.61	0.87	2.46	1.34	0.29	0.76	0.85	1.02
14-Aug-17	Total Phosphorus (mg/l)	<2.0	0.95	1.3	2.06	1.74	1.28	1.38	0.62	1.12	1.21	0.78
23-Aug-17	Total Phosphorus (mg/l)	<2.0	1.42	1.49	2.19	2.05	1.15	0.66	0.66	1.84	0.7	
11-Sep-17	Total Phosphorus (mg/l)		1.02	0.99	2.08	0.69	1.04	0.11	0.67	1.53	0.96	0.35
25-Sep-17	Total Phosphorus (mg/l)		1.13	1.28	1.77	1.42	0.74	0.77	0.32	1.29	0.65	0.1
07-Jul-17	Faecal Coliform (MPN/100 ml)		490	1	160000	14000	4.5	160000	2400	1	24000	1700

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
19-Jul-17	Faecal Coliform (MPN/100 ml)		13	3500	1700	47	17000	3500	700	130	33	270
14-Aug-17	Faecal Coliform (MPN/100 ml)		49	2400	1400	1600	1	350	1600	1	1100	790
23-Aug-17	Faecal Coliform (MPN/100 ml)		49	24000	24000	1600	1600	1	1600	1	580	
11-Sep-17	Faecal Coliform (MPN/100 ml)		79	1	1	1	1	1	1	2800	1	1
25-Sep-17	Faecal Coliform (MPN/100 ml)		49	1	1	1	1	23	1	1	1	1
07-Jul-17	Total Coliform (MPN/100 ml)	<400	490	1	160000	14000	4.5	160000	3300	1	24000	16000
19-Jul-17	Total Coliform (MPN/100 ml)	<400	130	3500	2200	47	17000	5400	1100	130	22	1100
14-Aug-17	Total Coliform (MPN/100 ml)	<400	130	3500	3400	17000	1	350	1600	1	2200	1700
23-Aug-17	Total Coliform (MPN/100 ml)	<400	330	35000	24000	9200	9200	1	1600	1	3500	
11-Sep-17	Total Coliform (MPN/100 ml)	<400	280	1	1	1	1	1	1	9200	1	1

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
25-Sep-17	Total Coliform (MPN/100 ml)	<400	79	1	1	1	1	23	1	1	1	1
07-Jul-17	Oil & Grease (mg/l)	<10	<1		1		3	1	1	1	2	<1
19-Jul-17	Oil & Grease (mg/l)	<10										
14-Aug-17	Oil & Grease (mg/l)	<10	<1	1	<1	1	2	<1	<1	<1	1	<1
23-Aug-17	Oil & Grease (mg/l)	<10										
11-Sep-17	Oil & Grease (mg/l)	<10	<1	<1	<1	2	1	<1	<1	6	7	<1
25-Sep-17	Oil & Grease (mg/l)	<10										
11-Sep-17	Total Iron (mg/l)	<2	0.028	0.118	0.315	7.71	0.843	0.074	0.322	0.406	0.285	0.389
25-Sep-17	Total Iron (mg/l)	<2										
14-Aug-17	Residual Chlorine (mg/l)	<1.0		0	0.08	0	0.55	n/a	0.04	0	0.44	0
23-Aug-17	Residual Chlorine (mg/l)	<1.0		0	0	0.09	0.01	n/a	0.03	2.7	0.02	
11-Sep-17	Residual Chlorine (mg/l)	<1.0		0.11	0.15	0.28	0.07	n/a	0.04	0	0.04	0.5
25-Sep-17	Residual Chlorine (mg/l)	<1.0		2.2	1.56	2.16	0.42	n/a	0.89	1.35	0.85	0.56

		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
		Station Code	EF01	EF02	EF06	EF07	EF08	EF09	EF10	EF13	EF14	EF16
Date	Parameter (Unit)	Guideline in the CA										
14-Aug-17	Chlorination Dosing Rate (ml/mn)			90	20	16	80	n/a	9	1.5 l	5	n/a
23-Aug-17	Chlorination Dosing Rate (ml/mn)			205	70	9	20	n/a	9	n/a	12	
11-Sep-17	Chlorination Dosing Rate (ml/mn)			61	61	65	260	n/a	300	1 l	5	50
25-Sep-17	Chlorination Dosing Rate (ml/mn)			420	110		110	n/a	345	3.1	5	35
14-Aug-17	Effluent Discharge Volume (L/mn)			20	10	12	20	n/a	4	2000 l	3	n/a
23-Aug-17	Effluent Discharge Volume (L/mn)		12	60	12	20	30	n/a	4	n/a	12	
11-Sep-17	Effluent Discharge Volume (L/mn)		20	20	10	12	20	n/a	4	2000	4	0
25-Sep-17	Effluent Discharge Volume (L/mn)		20	60	30		60	n/a		4.2	4	6

APPENDIX 5-3: EFFLUENT CONSTRUCTION AREA DISCHARGED MONITORING RESULTS – Q3 2017

			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**	**6.0 - 9.0**							**<50**	**<10**
6-Jul-17	Aggregate Crushing Plant	DS02	6	73.8	5.47	308	148	30.17	80700	46470	
12-Jul-17	Aggregate Crushing Plant	DS02	6.37	97.8	7.3	121.3	60	28.9	95.3	174	
20-Jul-17	Aggregate Crushing Plant	DS02	6.6	98.3	7.38	188	94	28.3	2574	1477	
26-Jul-17	Aggregate Crushing Plant	DS02	7.07	97.6	7.5	152.3	76	27	5385	3282	
9-Aug-17	Aggregate Crushing Plant	DS02	6.32	99.5	7.7	59.1	30	26.9	1,723	514.48	
16-Aug-17	Aggregate Crushing Plant	DS02	4.43	76.3	5.32	569	284	27.9	20.93	27.92	1
22-Aug-17	Aggregate Crushing Plant	DS02	7.51	99.4	6.42	184.7	92	35	6.73	8.24	
30-Aug-17	Aggregate Crushing Plant	DS02	7.19	96	7.5	186	93	26.5	52.7	97	
7-Sep-17	Aggregate Crushing Plant	DS02	6.51	89.6	6.48	185	92	30.7	18.8	35.19	<1.0
14-Sep-17	Aggregate Crushing Plant	DS02	9.39	98	6.65	189.3	94.65	34.2	20.8	27.2	
21-Sep-17	Aggregate Crushing Plant	DS02	6.54	98.4	6.82	56.8	28	33	21	49.69	

			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**	**6.0 - 9.0**							**<50**	**<10**
28-Sep-17	Aggregate Crushing Plant	DS02	6.33	103.8	7.16	231	115	33.3	8.53	28	
6-Jul-17	Spoil Disposal No.2	DS04	6	65.08	5.08	41	20	25.81	15.31	13	
12-Jul-17	Spoil Disposal No.2	DS04	6.08	84.8	6.53	23	11	26.9	15.1	36	
20-Jul-17	Spoil Disposal No.2	DS04	6.52	84.2	6.59	21.09	11	26.1	23.5	45	
26-Jul-17	Spoil Disposal No.2	DS04	7.23	75.3	5.86	23.9	12	26.1	18.7	34	
9-Aug-17	Spoil Disposal No.2	DS04	6.45	70.8	5.73	19.19	10	24.3	22.32	21	
16-Aug-17	Spoil Disposal No.2	DS04	6.06	75.5	5.93	60	30	25.73	13.23	7	<1
22-Aug-17	Spoil Disposal No.2	DS04	5.89	56.2	4.2	21.36	10	28.3	8.46	9	
30-Aug-17	Spoil Disposal No.2	DS04	6.66	72.1	5.61	25.2	12	26.5	53.7	150	
7-Sep-17	Spoil Disposal No.2	DS04	6.64	79.6	5.86	16	8	28.3	15.27	10.81	<1.0
14-Sep-17	Spoil Disposal No.2	DS04	6	78	6.15	17.42	9	25.6	11.45	10.43	
21-Sep-17	Spoil Disposal No.2	DS04	6.55	82.3	6.2	15.98	8	27.9	24.4	41.79	
28-Sep-17	Spoil Disposal No.2	DS04	6.01	74.9	5.47	15.71	8	29.9	9.74	9.28	

			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**	**6.0 - 9.0**							**<50**	**<10**
6-Jul-17	RCC Plant Discharged at lower ponds	DS09	7	81.1	6.12	242	121	32.76	99	191	
12-Jul-17	RCC Plant Discharged at lower ponds	DS09	8.01	97.5	7.23	208.1	104	29.2	750	482.66	
20-Jul-17	RCC Plant Discharged at lower ponds	DS09	9.24	96.9	7.32	178	89	28	64	132	
26-Jul-17	RCC Plant Discharged at lower ponds	DS09	6.89	92.6	7.1	165.3	82.65	27.2	25	237.69	
9-Aug-17	RCC Plant Discharged at lower ponds	DS09	7.13	97.7	7.35	98.7	49	27.9	2,051	974.23	
16-Aug-17	RCC Plant Discharged at lower ponds	DS09	7.69	67.1	5.18	414	209	26.07	55.22	77.96	4
22-Aug-17	RCC Plant Discharged at lower ponds	DS09	7.28	98.6	6.75	311	156	33.6	17.6	33.75	
30-Aug-17	RCC Plant Discharged at lower ponds	DS09	6.62	96.2	7.33	262	131	27.8	55.1	187.14	
7-Sep-17	RCC Plant Discharged at lower ponds	DS09	7.8	97.5	7.15	146.4	73	29.9	17.8	45.44	<1.0
14-Sep-17	RCC Plant Discharged at lower ponds	DS09	6.57	92.4	6.49	293	146.5	32.1	11.4	14.76	
21-Sep-17	RCC Plant Discharged at lower ponds	DS09	6.47	93.7	6.47	269	134	33.1	14.4	21.6	
28-Sep-17	RCC Plant Discharged at lower ponds	DS09	6.48	93.5	6.8	257	128	30.3	17.2	23.79	

			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**	**6.0 - 9.0**							**<50**	**<10**
6-Jul-17	RCC Plant Discharged nearby IHI Workshop	DS13	7	79.7	5.62	156	78	32.24	94.5	113	
12-Jul-17	RCC Plant Discharged nearby IHI Workshop	DS13	7.66	98.8	7.29	125.8	63	29.4	47.3	52.4	
20-Jul-17	RCC Plant Discharged nearby IHI Workshop	DS13	7.15	98.4	7.48	69	34	27.7	26.4	46.49	
26-Jul-17	RCC Plant Discharged nearby IHI Workshop	DS13	7.2	99.1	7.6	125.2	63	27.1	1782	841.17	
9-Aug-17	RCC Plant Discharged nearby IHI Workshop	DS13	6.83	99	7.5	60.4	30	28.1	2,357	1,333.33	
16-Aug-17	RCC Plant Discharged nearby IHI Workshop	DS13	7.99	62.1	4.73	316	156	27.4	85.38	108.7	<1
22-Aug-17	RCC Plant Discharged nearby IHI Workshop	DS13	7.72	103.3	6.89	88.4	44	35	11.3	10.71	
30-Aug-17	RCC Plant Discharged nearby IHI Workshop	DS13	6.75	96.3	7.3	59.6	30	27.6	31.3	55	
7-Sep-17	RCC Plant Discharged nearby IHI Workshop	DS13	6.91	95.9	7.16	77.3	38	28.9	22.0	32.04	<1.0
14-Sep-17	RCC Plant Discharged nearby IHI Workshop	DS13	6.2	94.9	6.49	96.5	48.25	33.7	15.5	6.36	<1.0
21-Sep-17	RCC Plant Discharged nearby IHI Workshop	DS13	7.13	94.4	6.51	65.8	33	33.2	18.2	27.2	
28-Sep-17	RCC Plant Discharged nearby IHI Workshop	DS13	6.71	100.7	7.01	86.9	43	30.6	10.3	7.14	

			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**	**6.0 - 9.0**							**<50**	**<10**
6-Jul-17	Main Dam's Treatment Plant No.1	DS11	3	82.3	5.83	2633	1316	30.92	15.2	29.6	
12-Jul-17	Main Dam's Treatment Plant No.1	DS11	2.86	98.7	7.42	1495	747	28.3	12.6	40.83	
20-Jul-17	Main Dam's Treatment Plant No.1	DS11	10.52	99.3	7.59	483	241	27.3	9.53	59.78	
26-Jul-17	Main Dam's Treatment Plant No.1	DS11	8.88	98.6	7.56	1056	528	27	9.99	38.81	
9-Aug-17	Main Dam's Treatment Plant No.1	DS11	2.82	99.6	7.58	1208	604	27.7	11.32	37.9	
16-Aug-17	Main Dam's Treatment Plant No.1	DS11	7.7	66.1	5.01	523	260	26.7	19.9	46.01	<1
22-Aug-17	Main Dam's Treatment Plant No.1	DS11	7.68	98.3	6.72	1099	550	33.6	5.67	17.9	
30-Aug-17	Main Dam's Treatment Plant No.1	DS11	6.46	98.1	7.6	391	195	26.7	2.66	11.25	
7-Sep-17	Main Dam's Treatment Plant No.1	DS11	6.49	97.2	7.67	826	413	26.1	12.61	37.79	<1.0
14-Sep-17	Main Dam's Treatment Plant No.1	DS11	6.02	95.2	7.04	565	282.5	29.1	14.66	16.58	
21-Sep-17	Main Dam's Treatment Plant No.1	DS11	3.34	94.5	6.63	748	374	32.1	13.39	30.48	
28-Sep-17	Main Dam's Treatment Plant No.1	DS11	9.45	100.3	6.87	1186	593	33.7	8.61	37.69	

			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**	**6.0 - 9.0**							**<50**	**<10**
6-Jul-17	Main Dam's Treatment Plant No.2	DS12	11	58.5	4.1	353	177	32.21	58.52	222	
12-Jul-17	Main Dam's Treatment Plant No.2	DS12	4.82	94.9	7.01	181.4	90	29.5	13.8	20.45	
20-Jul-17	Main Dam's Treatment Plant No.2	DS12									
26-Jul-17	Main Dam's Treatment Plant No.2	DS12	11.17	98.1	7.51	552	276	27.2	31.1	159.39	
9-Aug-17	Main Dam's Treatment Plant No.2	DS12									
16-Aug-17	Main Dam's Treatment Plant No.2	DS12	11.64	66.6	4.87	1,900	950	29.82	25.96	82.42	<1
22-Aug-17	Main Dam's Treatment Plant No.2	DS12									
30-Aug-17	Main Dam's Treatment Plant No.2	DS12	6.99	97.8	7.52	67.6	34	27.1	19.9	23.33	
7-Sep-17	Main Dam's Treatment Plant No.2	DS12									
14-Sep-17	Main Dam's Treatment Plant No.2	DS12									
21-Sep-17	Main Dam's Treatment Plant No.2	DS12									
28-Sep-17	Main Dam's Treatment Plant No.2	DS12									

APPENDIX 5-4: GROUNDWATER QUALITY MONITORING RESULTS – Q3 2017

		Site Name	Phouhomxay (HSRA)					
Month Year	**Parameter (Unit)**	**Station**	**GHSP01**	**GHSP02**	**GHSP03**	**GHSP04**	**GHSP05**	**GHSP06**
17-Jul-17	pH	6.5 - 9.2	7.05	6.86	7.07	6.8	7.08	7.2
04-Aug-17	pH	6.5 - 9.2	6.69	6.85	7.02	6.81	6.93	7.27
15-Sep-17	pH	6.5 - 9.2	6.84	7.04	6.99	6.94	7.02	7.06
17-Jul-17	Sat. DO (%)		76.3	86.1	81.7	66.4	77.9	83.5
04-Aug-17	Sat. DO (%)		67.8	72.7	65.2	65.2	70.2	77.5
15-Sep-17	Sat. DO (%)		88.7	83.8	64.5	65	77.6	89.8
17-Jul-17	DO (mg/l)		6.1	6.76	6.34	5.14	6.13	6.59
04-Aug-17	DO (mg/l)		5.32	5.61	4.92	4.98	5.48	5.97
15-Sep-17	DO (mg/l)		6.69	6.35	4.9	4.92	5.88	6.73
17-Jul-17	Conductivity (µS/cm)		413	230	404	204.4	331	335
04-Aug-17	Conductivity (µS/cm)		414	277	421	197	275	375
15-Sep-17	Conductivity (µS/cm)		392	262	390	119.3	276	370

		Site Name	Phouhomxay (HSRA)					
Month Year	**Parameter (Unit)**	**Station**	**GHSP01**	**GHSP02**	**GHSP03**	**GHSP04**	**GHSP05**	**GHSP06**
17-Jul-17	TDS (mg/l)	<1,200	206	115	202	102	165	168
04-Aug-17	TDS (mg/l)	<1,200	207	138	210	98	137	187
15-Sep-17	TDS (mg/l)	<1,200	195	131	195	59	138	185
17-Jul-17	Temperature (°C)		24.7	25.7	26.2	26.3	25.5	25.3
04-Aug-17	Temperature (°C)		25.9	26.8	28	27.9	26.2	26.8
15-Sep-17	Temperature (°C)		27.5	27.7	27.7	27.9	27.7	28.4
17-Jul-17	Turbidity (NTU)	<20	1.36	0.69	0.78	0.89	0.75	0.74
04-Aug-17	Turbidity (NTU)	<20	0.67	0.82	0.99	0.52	0.86	1.13
15-Sep-17	Turbidity (NTU)	<20	1.91	1.43	1.49	1.7	1.51	1.58
17-Jul-17	Fecal coliform (MPN/100ml)	0	0	0	0	0	0	0
04-Aug-17	Fecal coliform (MPN/100ml)	0	0	0	0	0	0	0
15-Sep-17	Fecal coliform (MPN/100ml)	0	0	0	0	0	0	0
17-Jul-17	E. coli Bacteria (MPN/100ml)	0	0	0	0	0	0	0
04-Aug-17	E. coli Bacteria (MPN/100ml)	0	0	0	0	0	0	0
15-Sep-17	E. coli Bacteria (MPN/100ml)	0	0	0	0	0	0	0
15-Sep-17	Arsenic (mg/)	<0.05	0.0004	<0.0003	0.0004	<0.0003	0.0004	0.0006
15-Sep-17	Cadmium (mg/l)	<0.01	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
15-Sep-17	Total Iron (mg/l)		<0.01	<0.01	0.013	0.022	0.014	<0.01
15-Sep-17	Manganese (mg/l)	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
15-Sep-17	Fluoride (mg/l)	<1	0.04	0.03	0.03	<0.02	0.02	0.03

		Site Name	Phouhomxay (HSRA)					
Month Year	**Parameter (Unit)**	**Station**	**GHSP01**	**GHSP02**	**GHSP03**	**GHSP04**	**GHSP05**	**GHSP06**
15-Sep-17	Total hardness (mg/l)	<500	247	160	240	125	179	253
15-Sep-17	Nitrate (mg/l)	<45	0.23	0.21	0.21	<0.02	0.2	0.23
15-Sep-17	Nitrite (mg/l)	<3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
15-Sep-17	Lead (mg/l)	<0.2	<0.008	<0.008	<0.008	0.209	<0.008	<0.008

APPENDIX 5-5: GRAVITY FED WATER SUPPLY MONITORING RESULTS – Q3 2017

		Site Name	Tha Heau Village	Hat Gnuin Village
		Station	WTHH02	WHGN02
Date	Parameter (Unit)	Guideline		
Jul-17	pH	6.5 - 8.6	6.82	7.21
Aug-17	pH	6.5 - 8.6	7.2	7.13
Sep-17	pH	6.5 - 8.6	6.62	6.64
Jul-17	*Sat.* DO (%)		94.9	97.3
Aug-17	*Sat.* DO (%)		98.7	95.6
Sep-17	*Sat.* DO (%)		93.5	96.5
Jul-17	DO (mg/l)		7.32	7.48
Aug-17	DO (mg/l)		7.8	7.28
Sep-17	DO (mg/l)		6.95	7.17
Jul-17	Conductivity (µS/cm)	<1,000	31.6	53.5
Aug-17	Conductivity (µS/cm)	<1,000	35.5	47.8
Sep-17	Conductivity (µS/cm)	<1,000	34.6	50.9
Jul-17	TDS (mg/l)	<600	16	27
Aug-17	TDS (mg/l)	<600	17	24
Sep-17	TDS (mg/l)	<600	17	25
Jul-17	Temperature (°C)	<35	26.4	27
Aug-17	Temperature (°C)	<35	25.7	27.6
Sep-17	Temperature (°C)	<35	28.8	28.8
Jul-17	Turbidity (NTU)	<10	1.92	2.84
Aug-17	Turbidity (NTU)	<10	1.84	1.32
Sep-17	Turbidity (NTU)	<10	2.7	2.67
Sep-17	Color (Pt-Co)	<5		
Jul-17	Faecal Coliform (MPN/100ml)	0	49	79
Aug-17	Faecal Coliform (MPN/100ml)	0	49	130
Sep-17	Faecal Coliform (MPN/100ml)	0	13	22
Jul-17	E. coli Bacteria (MPN/100ml)	0	49	79
Aug-17	E. coli Bacteria (MPN/100ml)	0	49	130
Sep-17	E. coli Bacteria (MPN/100ml)	0	13	22
Sep-17	Arsenic (mg/l)	<0.05	<0.0003	0.0003
Sep-17	Lead (mg/l)	<0.01	<0.008	<0.008
Sep-17	Fluoride (mg/l)	<1.5	<0.02	<0.02
Sep-17	Nitrate (mg/l)	<50	0.27	0.31
Sep-17	Nitrite (mg/l)	<3	<0.07	<0.07
Sep-17	Total hardness (mg/l)		25.9	36.8

APPENDIX 5-6: LANDFILL LEACHATE MONITORING RESULTS – Q3 2017

			NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge d Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Month Year	Parameter (Unit)	Guideline							
12-Jul-17	pH	6.0-9.0	6.99	7.49	7.75	8.35	7.21	6.71	6.99
18-Aug-17	pH	6.0-9.0				6.83		7.85	
15-Sep-17	pH	6.0-9.0				7.44		8.42	
12-Jul-17	*Sat.* DO (%)		21	78.2	84.8	120.8	95.2	93.8	74.3
18-Aug-17	*Sat.* DO (%)					113		102.6	
15-Sep-17	*Sat.* DO (%)					118.3		95.9	
12-Jul-17	DO (mg/l)		1.59	5.94	6.46	8.65	7.28	7.15	5.65
18-Aug-17	DO (mg/l)					7.79		6.83	
15-Sep-17	DO (mg/l)					9.06		7.15	
12-Jul-17	Conductivity (µS/cm)		521	470	435	284	13.27	16.52	16.6
18-Aug-17	Conductivity (µS/cm)					470		13.6	
15-Sep-17	Conductivity (µS/cm)					284		28.6	
12-Jul-17	TDS (mg/l)		260	235	217	142	6	8.2	8
18-Aug-17	TDS (mg/l)					235		6	

			NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge d Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Month Year	Parameter (Unit)	Guideline							
15-Sep-17	TDS (mg/l)					142		14	
12-Jul-17	Temperature (°C)		27.8	27.8	27.7	30.8	27.5	27.7	27.6
18-Aug-17	Temperature (°C)					33.3		25.4	
15-Sep-17	Temperature (°C)					27		28.3	
12-Jul-17	Turbidity (NTU)		22.6	13.5	13.2	4.55	53.7	18.9	19.4
18-Aug-17	Turbidity (NTU)					15.9		5.37	
15-Sep-17	Turbidity (NTU)					13.84		10.74	
12-Jul-17	BOD (mg/l)	<30					25.8		9.8
18-Aug-17	BOD (mg/l)	<30				28.2		27.6	
15-Sep-17	BOD (mg/l)	<30							
7-Jul-17	COD (mg/l)	<125							
18-Aug-17	COD (mg/l)	<125				60.4		<25	
15-Sep-17	COD (mg/l)	<125				104		<25	
15-Sep-17	Mercury (mg/l)					<0.0002		<0.0002	
15-Sep-17	Total nitrogen (mg/l)	<10				8		1	

			NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge d Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Month Year	Parameter (Unit)	Guideline							
15-Sep-17	Arsenic (mg/l)					0.002		0.0004	
15-Sep-17	Manganese (mg/l)					0.141		0.018	
15-Sep-17	Lead (mg/l)	<0.2				<0.01		<0.01	
15-Sep-17	Iron (mg/l)					0.518		0.17	
12-Jul-17	Faecal Coliform (MPN/100ml)						300		170
18-Aug-17	Faecal Coliform (MPN/100ml)					170		130	
15-Sep-17	Faecal Coliform (MPN/100ml)					170		79	
12-Jul-17	Total Coliform (MPN/100ml)	<400					330		170
18-Aug-17	Total Coliform (MPN/100ml)	<400				220		170	
15-Sep-17	Total Coliform (MPN/100ml)	<400				170		130	
15-Sep-17	Total Petroleum Hydrocarbons (mg/l)					<1.0		<1.0	

APPENDIX 5-7: LANDFILL GROUNDWATER OBSERVATION MONITORING RESULTS – Q3 2017

	Site Name	NNP1 Landfill				Houay Soup Landfill
	Station	MW1	MW2	MW3	MW4	MW5
	Date	18-Sep-17	18-Sep-17	18-Sep-17	18-Sep-17	18-Sep-17
Parameter (Unit)	Guideline					
pH		6.12	5.48	5.92	5.84	5.78
Sat. DO (%)		35.2	49.4	36.6	42.4	77.7
DO (mg/l)		2.64	3.62	2.76	3.17	5.65
Conductivity (µS/cm)		213	21.38	75.2	36.2	89.8
TDS (mg/l)		106	10	36.5	18	45
Temperature (°C)		28.8	28.8	28.2	28.7	28.9
Turbidity (NTU)		2.67	3.19	15.29	3.14	3.23
Total Nitrogen (mg/l)		1.22	0.41	0.36	1	0.94
Lead (mg/l)	<0.01	0.017	<0.01	0.019	<0.01	0.106
Total Phosphorus (mg/l)		0.07	<0.01	0.08	0.05	<0.01
Faecal Coliform (MPN/100ml)		0	0	0	0	0
Total Coliform (MPN/100ml)		0	0	0	0	0
NH_3-N (mg/l)		<0.2	<0.2	<0.2	<0.2	<0.2
Copper (mg/l)		<0.003	<0.003	<0.003	<0.003	<0.003
Total Petroleum (mg/l)		<1.0	<1.0	<1.0	<1.0	<1.0