NAM NGIEP1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environment Monitoring Report
Second Quarter of 2017

April to June 2017

REV	DATE	PREPARED	REVIEWED	APPROVED	MODIFICATION DETAILS
A	1 November 2017				Final
A1	8 September 2017				For review by ADB
A0	8 August 2017	Viengkeo Phetnavongxay	Peter G Jensen	Yoshihiro Yamabayash	For review by LTA

Accessibility	
☑	Public
☐	Internal
☐	Confidential

Document No.

NNP1-C-J0905-RP-010-A

Table of Contents

Tables

Figures

BBREVIATIONS / ACRONYMS

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

HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Intergraded Spatial Planning
kV	kilo-Volt
LEPTS	Lao Electric Power Technical Standard
LHSE	Lao Holding State Enterprise
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
NCI	Non-Compliance Issue
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
PvPA	Provincial Protection Area
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 finalisation of the 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.

During the Second Quarter of 2017, NNP1PC-EMO received 34 SS-ESMMPs and five Working Drawings of the waste water treatment system improvements at selected contractor camps. Out of these, 31 SS-ESMMPs and the five Working Drawings were approved, and three SS-ESMMPs were still under review at the end of the Quarter and will be carried over to the Third Quarter of 2017.

A total of 22 Observations of Non-Compliances (ONC), two Non-Compliance Level-1 (NCR1), two Non-Compliance level-2 (NCR2), one Non-Compliance level-3 (NCR3) and one Incident Report (IR) were active during the reported period. Out of these, 11 ONCs, two NCR1 and one NCR2 were carried over from the previous Quarter. A total of 10 ONC, one NCR1, one NCR2 and one NCR3 could not be resolved in this Quarter and will be carried forward into the Third Quarter of 2017.

During the Second Quarter of 2017, an approximate 19.6 m^3 of solid waste was disposed of at the Houay Soup Landfill. In addition, NNP1PC is in the process of hiring a contractor to work on the slope stabilisation and erosion control at the Houay Soup Landfill, and another contractor is being hired to collect waste at Houay Soup Resettlement Area and two host villages and to operate the Houay Soup Landfill. The procurement is expected to be completed in August 2017.

The development of the Nam Ngiep 1 Watershed Management Plan (WMP) has continued during the reporting period. After a series of reviews of the plan by ADB and subsequent revisions by NNP1PC, the WMP is close to finalization and ADB's approval is expected in July 2017. NNP1PC in cooperation with GOL plans to organize stakeholder workshops in September 2017.

NNP1PC is in the process of recruiting a consultant for development of a Biodiversity Offset Management Plan (BOMP). The technical review and interviews were concluded in May 2017. NNP1PC has selected a preferred candidate and started contract negotiations in June 2017 and expects to complete the process in July 2017.

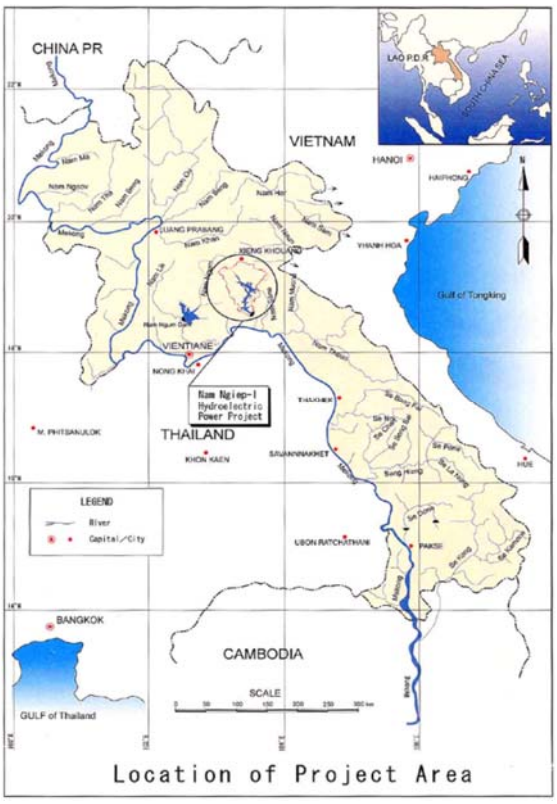
Biomass clearance continue to progress with some delay. The total progress of biomass clearance is around 974.99 ha in which around 32.37 ha are verified at the end of June 2017 as fully completed. The slow progress is mainly because the Contractor was not able to increase the labour capacity so that the work is behind the expected monthly targets of Q2 2017. An amendment to the current contract and additional contractors are being considered by NNP1PC to accelerate the biomass clearance during the last Quarter of 2017.

The fishery monitoring program is progressing, and a database has been developed to support the future fish management programme as part of the Nam Ngiep 1 Watershed Management Plan. Two types of surveys were conducted in the second quarter 2017 including daily fish catch logbook monitoring and gillnet survey. The gathered information is being entered into the database. The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 2.2 kg/household/day in May 2017. The estimated total fish catch in Nam Ngiep basin for April 2017 is 59,400 kg. Around 32% of the catch was sold, 57% was consumed fresh, 5% processed and approximately 6% 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 in Bolikhamxay Province ***FIGURE 2-1: LOCATION MAP (Figure. 2-1).***

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



This Quarterly Environment Report provides a summary of environmental monitoring activities and mitigation actions during 01 April to 30 June 2017. The report by the Project's Environmental Management Office (EMO). It has been internally reviewed and cleared by EMO senior technical staff and management followed by review by the Lender's Technical Adviser prior to publishing the report on the Company website (https://namngiep1.com/) and submitting the report to the Government of Lao PDR (GOL).

Related 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.

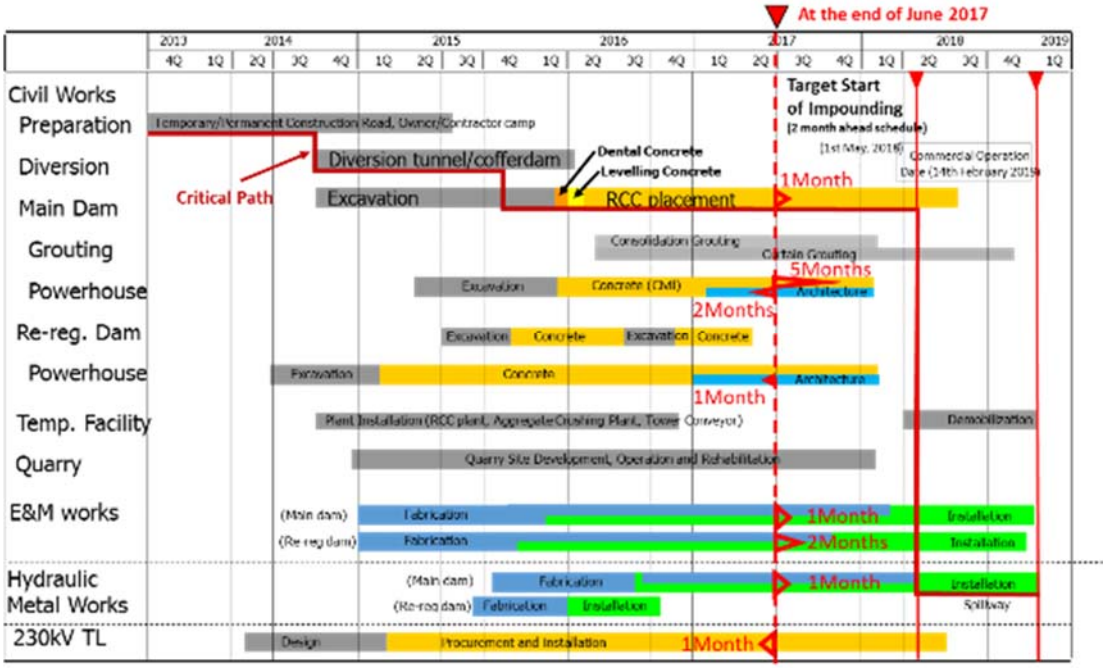
3 CONSTRUCTION PROGRESS

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 June 2017 was 73.6%[1] (compared to planned progress of 76.3%), 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.

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

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

The cumulative actual work progress of the Civil Works until the end of June 2017 was 79.1 % (compared to planned progress of 78.7 %) 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 88 % 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 JUNE 2017

Item	Description	Total Drilling (m)	Completed (m)	Progress (%)
Consolidation Grouting	Anticipated Quantity	17,769	15,638	88
Curtain Grouting	Original Design Quantity	27,945	9,097	32
	Anticipated Final Quantity	58,400	9,097	15

* 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 JUNE 2017

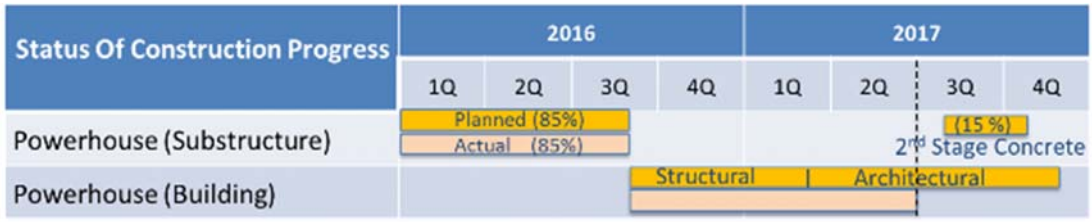
Location	Total Anticipated Volume (m^3)	Completed (m^3)	Progress (%)
Main Powerhouse	32,600	25,184	77
Penstock Embedment	10,257	7,870	76

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 JUNE 2017



Powerhouse Building Works	Concrete Block Wall above El. 177.0 m	Plastering Block Wall First Layer	Plastering Block Wall Second Layer	Windows	Painting Inside and Outside	Siding Sheets above El. 189.5 m	Roofing	Switch Yard
	(m^2)	(m^2)	(m^2)	(No.)	(m^2)	(m^2)	(m^2)	(m^2)
Designed	1576	3126	3126	27	6135	510	1022	45,000
Completed	1576	3126	3126	26	4588	510	1022	45,000
Progress	**100 %**	**100 %**	**100 %**	**96 %**	**75 %**	**100 %**	**100 %**	**100 %**

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 with no reported non-compliances this quarter.

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 until the end of June 2017 was 62.7 % (compared to planned progress of 75.1 %).

FIGURE 3-4: PREPARATION FOR INSTALLATION OF STAY RING INSTALLING OF UNIT 1 AT THE MAIN POWERHOUSE ON 30 JUNE 2017

FIGURE 3-5: PREPARATION FOR STAY CONE AT THE RE-REGULATION POWERHOUSE

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 June 2017 was 49 % (compared to planned progress of 49 %).

The latest progress of penstock pipe fabrication at IHI field shop and erection at main dam as of the end of June 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 MAY 2017

Item No.	Work Description	Work Progress (%)	Remarks
1.1	Assembly, Welding and Painting	89 %	Straight Pipes
1.1	Delivery to Main Dam Laydown Area	50 %	Straight Pipes
1.1	Site Erection at Main Dam	49 %	Inclined Part

3.6 230KV 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 June 2017 was 86.1% (compared to planned progress of 86.2%).

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 3-68*** below).

FIGURE 3-6: CUMULATIVE WORK PROGRESS OF TOWER FOUNDATION (ORIGINAL PLANNED AND ACTUAL)

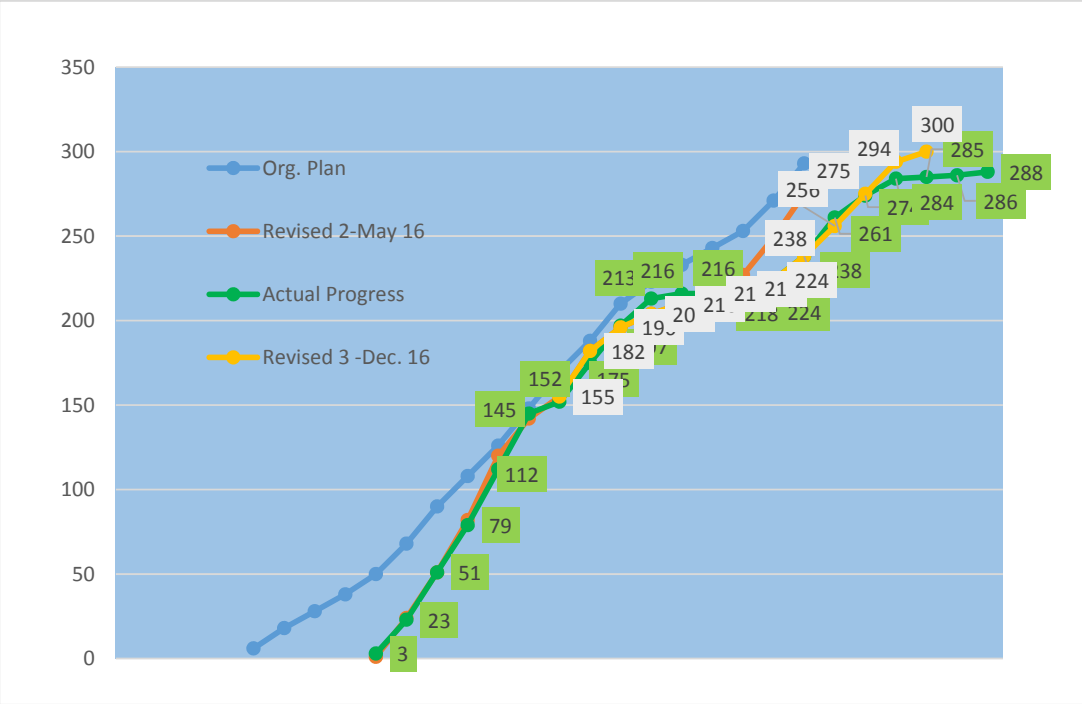


FIGURE 3-7: CUMULATIVE WORKS PROGRESS OF TOWER FOUNDATION (REVISED PLANNED & ACTUAL)

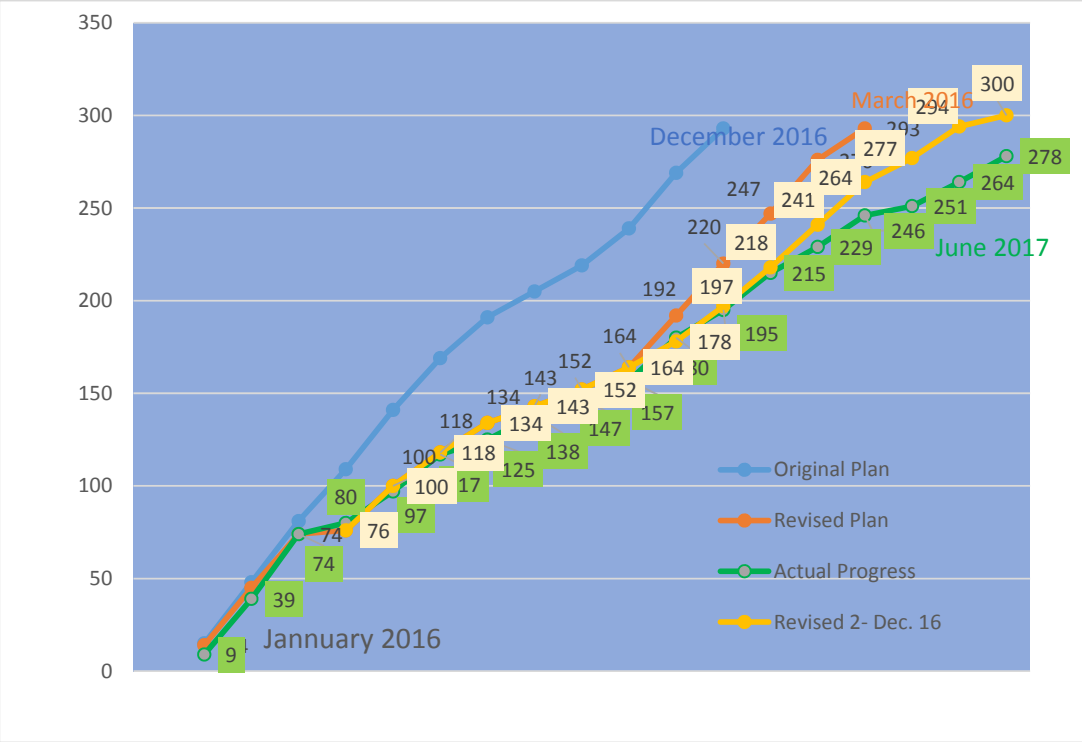
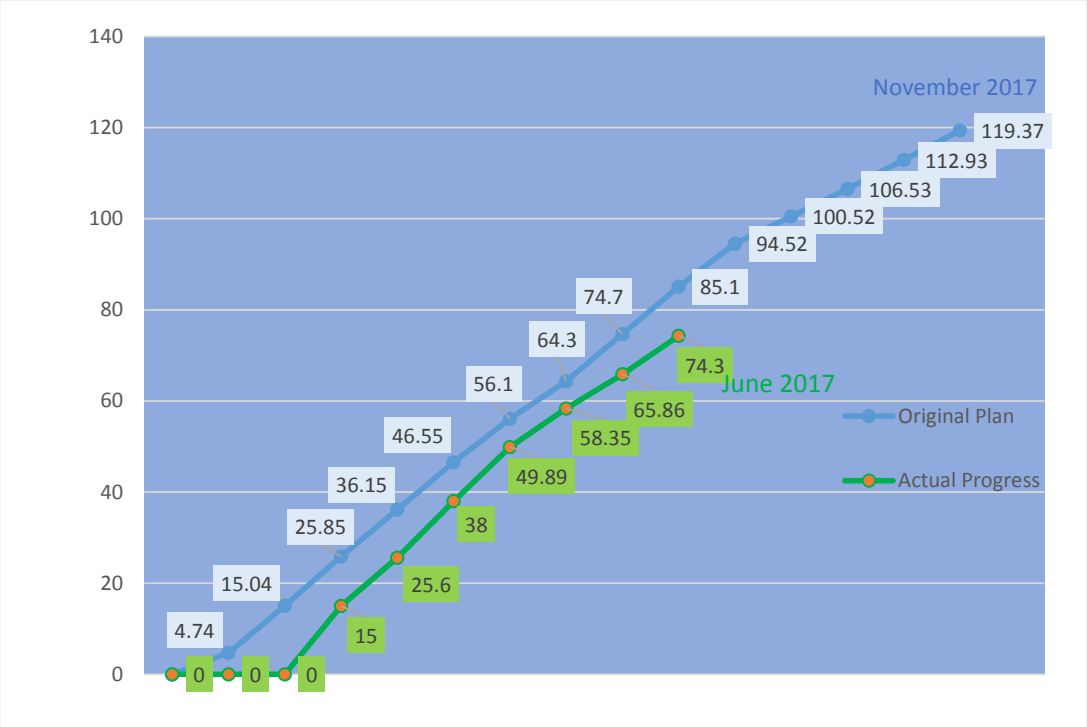


FIGURE 3-8: REVISED CUMULATIVE WORKS PROGRESS OF TOWER ERECTION (PLANNED & ACTUAL)



4 ENVIRONMENTAL MANAGEMENT AND MONITORING

4.1 ESMMP-CP

The finalisation of the revised 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 that no additional actions are required from NNP1. MONRE will issue an official letter of approval.

4.2 Contractor SS-ESMMPs

During the Second Quarter of 2017, NNP1PC-EMO received 34 SS-ESMMPs and five Working Drawings of the waste water treatment system improvements at selected contractor camps. Out of these, 31 SS-ESMMPs and and five Working Drawings were approved, and three SS-ESMMPs were still under review at the end of the Quarter and will be carried over to the Third Quarter.

The status of the review and approval of the SS-ESMMPs and the Working Drawings is shown in *Table 4-1*:

TABLE 4-1: SS-ESMMP AND WORKING DRAWINGS REVIEWED DURING THE SECOND QUARTER OF 2017

Name of SS-ESMMP Document/ Working Drawings	Rev. 1	Rev. 2	Rev. 3	Approved
SS-ESMMP for NNP1 Project Solid Waste Landfill Construction (Stage 2)	√	√		√
SS-ESMMP for supplemental information for Curtain Grouting Works at the Main Dam (9th submission)	√	√	√	√
SS-ESMMP for HM Hydro Worker Camp No. 2 (LILAMA10) (5th submission)	√	√	√	√
SS-ESMMP for Building Construction at Main Powerhouse (4th submission)	√	√	Under review	
SS-ESMMP for Installation Work of Stay Corn for Channel Liner and Hatch Cover for Re-regulation Power Station	√	√		√
SS-ESMMP for House Construction of Seven (07) Units for 2LR Resettlement Site	√	√	√	√
SS-ESMMP for House Construction of Lot No. 4 at HSRA	√	√		√
SS-ESMMP for House Construction of Lot No. 5 at HSRA	√	√		√

Name of SS-ESMMP Document/ Working Drawings	Rev. 1	Rev. 2	Rev. 3	Approved
SS-ESMMP for Construction of Resource Center and Pilot Plan Improvement at HSRA	√	√		√
SS-ESMMP for Operation and Maintenance Works of RCC Plant (4th submission)	√	√	Under review	
SS-ESMMP for Irrigation Dam Reservoir Land Clearance at HSRA	√	√	√	√
SS-ESMMP for Installation Work of Steel Structure for 115 kV Substation of Re-regulation Dam	√			√
SS-ESMMP for House Construction Lot 1 and 2 at HSRA	√			√
Working Drawing for Waste Water Treatment System Improvement of Contractor Camp (OC)	√			√
SS-ESMMP for Health Center at HSRA	√	√	√	√
SS-ESMMP for Village Office and Hall at HSRA	√	√	√	√
SS-ESMMP for HM's Labor Camp #1 (Zhefu camp) (5th submission)	√	√	√	√
SS-ESMMP for House Construction Lot 6 at HSRA	√			√
SS-ESMMP for Construction of Intake Mouth for Irrigation Canal at HSRA (4th submission)	√	√	√	√
Working Drawing for Wastewater Treatment System Improvement at GFE & TCM Camp	√	√		√
Working Drawing for Wastewater Treatment System Improvement at HM Main Camp and Office	√	√		√
Working Drawing for Wastewater Treatment System Improvement at V&K Camp	√			√
SS-ESMMP for Installation Work of Embedded Parts of 230 kV Substation for Main Power Station	√			√
SS-ESMMP for Main Intake, Inlet and Outlet of HSRA Irrigation Canal	√	√	√	√

Name of SS-ESMMP Document/ Working Drawings	Rev. 1	Rev. 2	Rev. 3	Approved
SS-ESMMP for Construction of Temporary Accommodation for 44 Households at HSRA	√			√
SS-ESMMP for Construction of Village Office and Hall at Zone 2UR	√			√
SS-ESMMP for Construction of Primary and Secondary School at HSRA	√			√
SS-ESMMP for House Construction Lot 3	√			√
SS-ESMMP for Biomass Clearing Works for Regulation Pond	√	√	√	√
SS-ESMMP for Installation Work of 630 kVA Transformer for Re-regulation Power Station	√	√		√
SS-ESMMP for Construction of Primary School 3 Units in zone 2UR	√			√
SS-ESMMP for 48 ha Paddy Field Development Project for 2LR People	√	√	√	√
SS-ESMMP for 84 Fish Ponds in HSRA	√			√
SS-ESMMP for Installation Work of Embedded Parts of Generator for Main Powerhouse Station	√			√
Working Drawing for Waste Water Treatment System Improvement at ZHEFU Camp	√			√
SS-ESMMP for Construction of 0.4 kV Distribution Line for 44 Temporary Households	√			√
SS-ESMMP for Construction of Domestic Water Supply	√			√
SS-ESMMP for Core Assembly	√			√
SS-ESMMP for Construction of 3.1 Km Internal Road in HSRA	Under review			

4.3 Results of Compliance Inspections at Construction Sites

During April to June 2017, EMO conducted bi-weekly and weekly follow-up inspections of 32 construction sites and camps including temporary camps at Houay Soup Resettlement Areas (HSRA) andthe 230 kV Transmission Line as listed below. The green legend represents sites that were inspected in April, May and June 2017 whereas the red legend represents sites that were inspected in June 2017 only.

FIGURE 4-1: SITE INSPECTION LOCATION

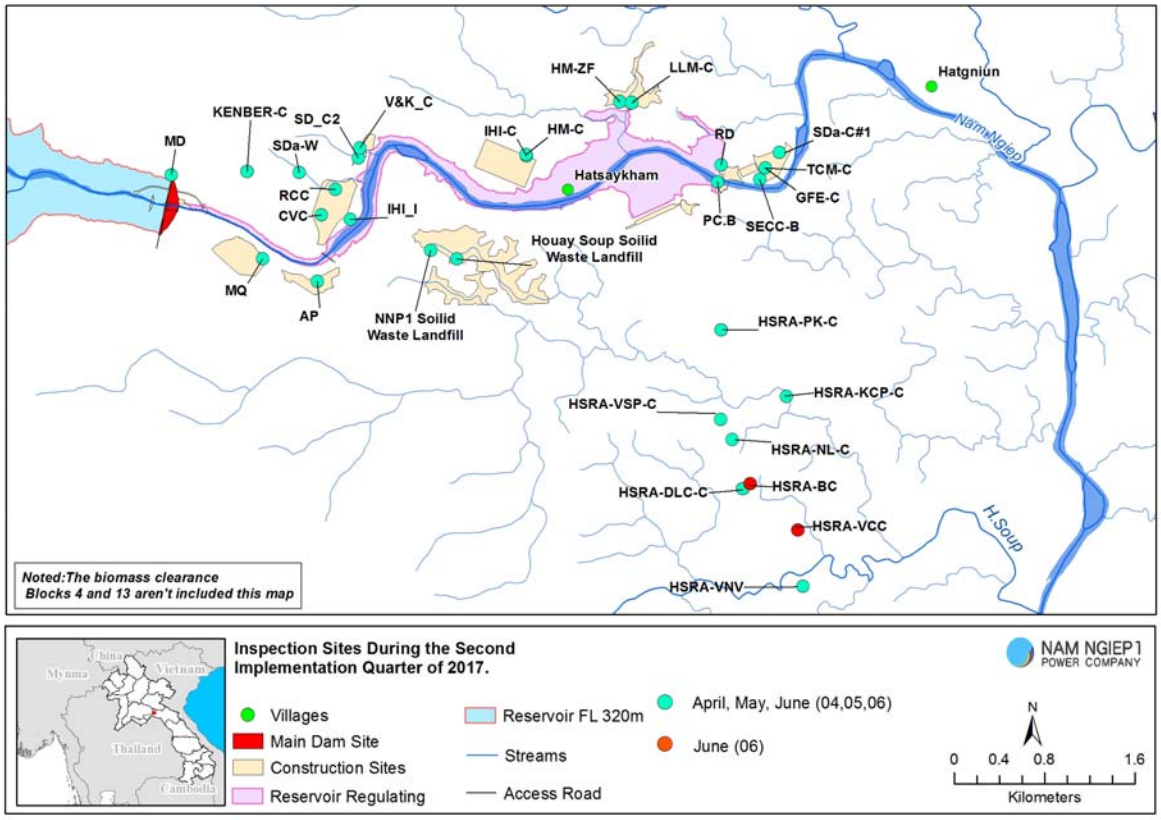
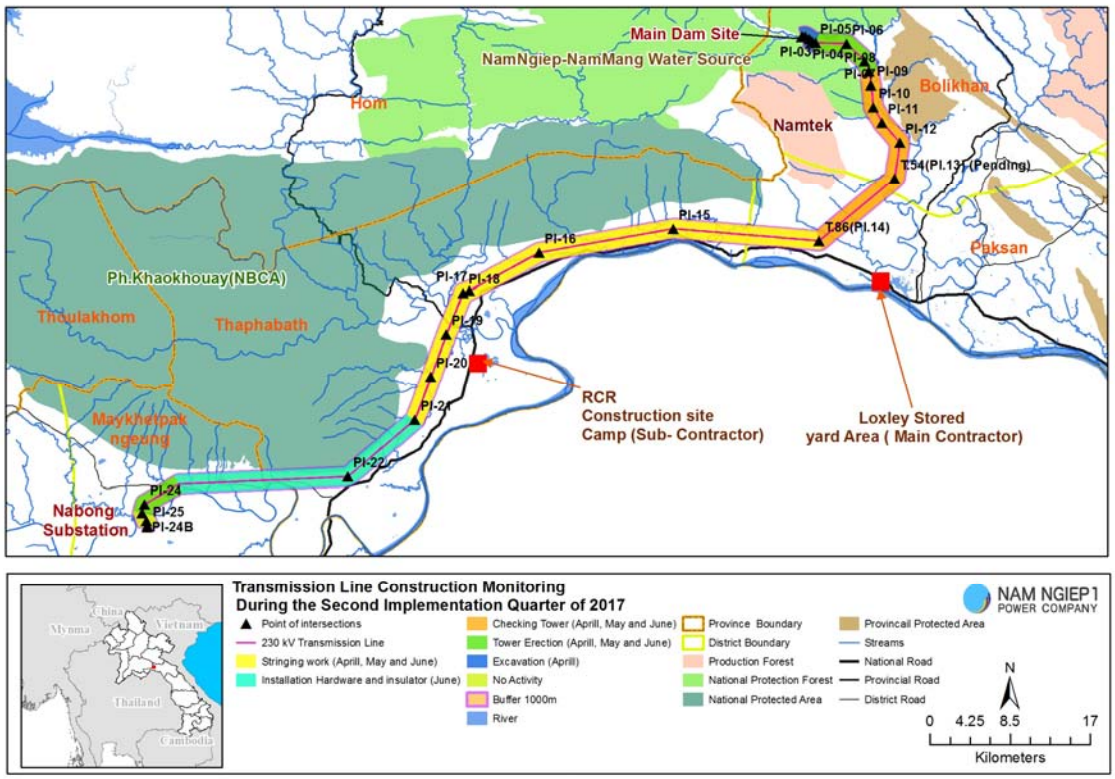


FIGURE 4-2: 230 KV TRANSMISSION LINE CONSTRUCTION MONITORING

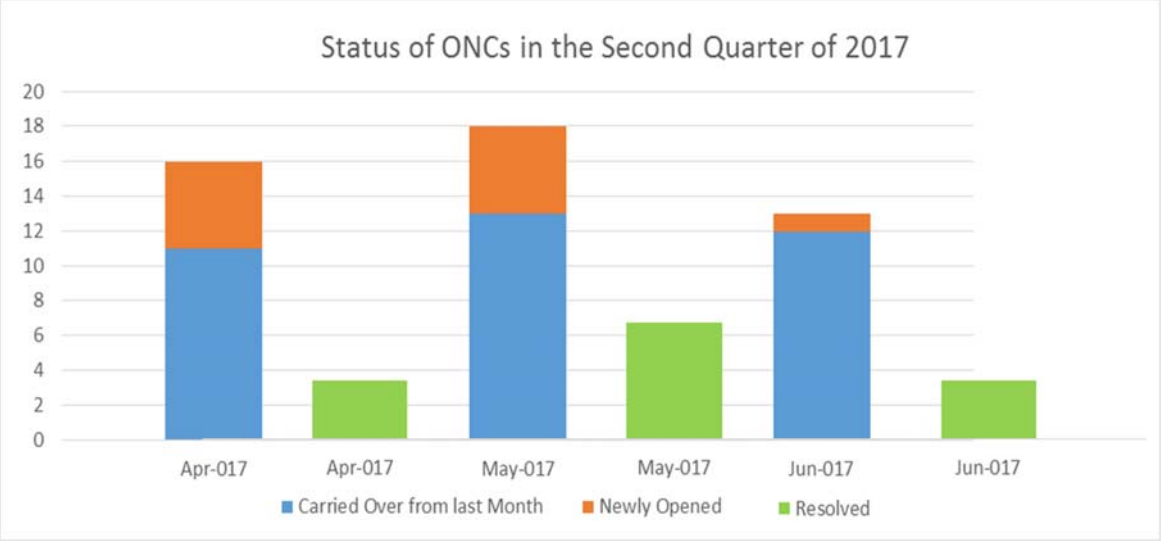


A total of 22 Observations of Non-Compliances (ONC), two Non-Compliance Level-1 (NCR1), two Non-Compliance level-2 (NCR2), one Non-Compliance level-3 (NCR3) and one Incident Report (IR) were active during the reported period. Out of these, 11 ONCs, two NCR1 and one NCR2 were carried over from the previous Quarter. A total of 10 ONC, one NCR1, one NCR2 and one NCR3 could not be resolved in this Quarter and will be carried forward into the Third Quarter of 2017. More details on the issued ONCs, NCRs and IR as well as the corrective actions can be found in ***Table 4-2*** and in ***Figure 4-3.***

TABLE 4-2: NON-COMPLIANCE STATUS DURING THE SECOND QUARTER OF 2017

Environmental Non-Compliance Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR	11	2	1	0	0
Newly opened ONC/NCR	11	0	1	1	1
Total ONC/NCR	22	2	2	1	1
Resolved ONC/NCR	12	1	1	0	1
Unresolved ONC/NCR carried forward to the next Quarter	10	1	1	1	0

FIGURE 4-3: STATUS OF ONC DURING THE SECOND QUARTER OF 2017



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

PHOTOGRAPH 2: DAILY SEDIMENT POND CLEANING-UP AT THE AGGREGATE PLANT ON 16 JUNE 2017

PHOTOGRAPH 3: WORKPLACE ENVIRONMENTAL MANAGEMENT INDUCTIONS FOR ALL CONTRACTORS AT HSRA

PHOTOGRAPH 4: BI-WEEKLY JOINT SITE INSPECTIONS AT HOUAY SOUP RESETTLEMENT AREA'S CONSTRUCTION SITES

4.4 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

4.4.1 General Waste Management

During the Second Quarter of 2017, approximately 440.2 m^3 of solid waste was disposed at the NNP1 Project landfill. The construction of NNP1 Landfill (stage 2) was completed including a waste pit, HDPE lined open ditch, internal road, slope re-vegetation and perimeter fencing.

A joint work completion inspection was carried out by NNP1PC and the landfill contractor on 08 June 2017.The contractor will revise the Detailed Work Plan & SS-ESMMP for the second stage of NNP1 Project landfill construction again which includes Site Decommissioning Plan and re-submission to NNP1PC for review and approval.

PHOTOGRAPH 5: CONTRACTION OF HSRA LANDFILL

PHOTOGRAPH 6: THE COMPLETED HSRA LANDFILL

PHOTOGRAPH 7: VEGETATION FOR SLOPE PROTECTION AT HSRA LANDFILL

PHOTOGRAPH 8: DRAINAGE AT HSRA LANDFILL

A total of 12,919.5 kg of recyclable waste was sold to Khounmixay Processing Factory by the Contractors as shown in ***Table 4-3*****.**

TABLE 4-3: AMOUNTS OF RECYCLABLE WASTE SOLD DURING THE SECOND QUARTER OF 2017

Source and Type of Recycled Waste		Unit	Total in Second Quarter of 2017 (A)	Sold (B)	Remaining Amount (A - B)
Construction activity					
1	Scrap metal	kg	26,290.5	11,790	14,500.5
Sub-Total 1		**kg**	**26,290.5**	**11,790**	**14,500.5**
Operation camp					
2	Glass bottles	kg	994.5	515	479.5
3	Plastic bottles	kg	565.7	220	345.7
4	Aluminium cans	kg	301.9	88.5	213.4
5	Paper/Cardboard	kg	466.5	286	180.5

Source and Type of Recycled Waste	Unit	Total in Second Quarter of 2017 (A)	Sold (B)	Remaining Amount (A - B)
Sub-Total 2	**kg**	**2,328.6**	**1,109.5**	**1,219.1**
Grand Total 1+2	**kg**	**28,619.1**	**12,919.5**	**15,719.6**

4.4.2 Hazardous Waste Management

In Q2 2017, joint hazardous materials and waste inventories were carried out at the main construction sites and subcontractors' camps. It was found that hazardous materials and waste were adequately stored. The amounts of hazardous waste collected, stored and disposed during Q2 2017 are shown in **Table 4-4.** NNP1PC-EMO conducted a refresher training on hazardous materials and waste management for the contractors. The training focused on proper handling, emergency response to oil spills, and spill control and clean-up procedures.

TABLE 4-4: HAZARDOUS WASTE RECORDED DURING THE SECOND QUARTER OF 2017

No.	Hazardous Waste Type	Unit	Total in Second Quarter 2017 (A)	Disposal by Selling (B)	Remaining (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	14,280	8,520	5,760
2	Cement bag	Bag	300	0	300
3	Empty used chemical drum/container	Drum (20 l)	3,336	2,300	1,036
4	Used oil filters	Piece	926	250	676
5	Used oil mixed with water	Litre	0	0	0
6	Ink cartridge	Unit	341	0	341
7	Used tyre	Piece	454	0	454
8	Empty contaminated bitumen drum/container	Drum (200 l)	82	82	0
9	Empty paint and spray cans	Can	592	0	592
10	Empty used oil drum/container	Drum (20 l)	147	63	84
11	Empty used chemical drum/container	Drum (200 l)	56	4	52
12	Empty used oil drum/container	Drum (200 l)	61	20	41
13	Contaminated soil, sawdust and concrete	Bag	28	0	28
14	Battery	Unit	13	0	13
15	Halogen/fluorescent bulbs	Unit	35	0	35
16	Contaminated textile and material	Bag	31	6	25

No.	Hazardous Waste Type	Unit	Total in Second Quarter 2017 (A)	Disposal by Selling (B)	Remaining (A - B)
17	Acid and caustic cleaners	Bottle	136	0	136
18	Clinical Waste	kg	14	0	14

4.4.3 Other Waste Management Activity

A total of 50 m^3 of construction waste, 13 m^3 of grey water and 7 m^3 of sewage sludge from SECC Contractor's site decommissioning activities were transported and disposed of at the Spoil Disposal Area No. 6 by following their Site Decommissioning Plan and Standard Operating Procedures (SOP) for Sewage/Black Water Disposal.

In addition, NNP1PC produced a total of 250 kg of compost made from cut grasses, cow dung, rice husks, molasses, bio-effect (BE), water and discarded vegetables and fruits from the canteens of Owner's Site Office and Village (OSOV), selected contractors and subcontractors. The compost will be used as organic fertilisers for fruit trees, plants and flowers in the OSOV and fruit trees at Houay Soup Resettlement Area (HSRA).

4.5 COMMUNITY WASTE MANAGEMENT SUPPORT

4.5.1 Animal Fodder (Pig Feed) Collection Programme

During the Second Quarter of 2017, villagers from the former Hatsaykham Village collected a total of 23,046 kg of food waste from the Owner's Site Office and Village and Contractors' camps to feed their animals. This is an increase of 6,787 kg compared to the First Quarter of 2017 as shown in ***Table 4-5*** below.

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

NO.	SITE NAME	UNIT	TOTAL
1	SongDa5 Camp No. 2	kg	9,415
2	SongDa5 Camp No. 1	kg	8,085
3	Obayashi Corporation Camp	kg	3,618
4	Owner's Village and Site Office (OSOV)	kg	1,336
5	LILAMA 10 Camp	kg	562
6	Kenber Camp	kg	30
Total		**kg**	**23,046**

4.5.2 Community Waste Awareness

During 11 – 14 May 2017, NNP1PC (Environmental and Social Division) carried out a final waste cleaning-up at Hatsaykham Village prior to start of impounding the re-regulating reservoir. A total of 13.5 m^3 of solid waste in the former Hatsaykham Village was disposed of at Houay Soup Landfill. In addition, approximately 160 kg of recyclable waste was separated and stored at a Community Recyclable Waste Bank at Hat Gniun Village; 145 m^3 of combustible waste was burned on site and 29 m^3 of sewage sludge from the septic tanks was

disposed of at the designated Spoil Disposal Area No. 6 following NNP1PC Standard Operating Procedures (SOP) for Sewage/Black Water Disposal. NNP1PC continued the cleaning-up after completion of impounding by collecting floating rubbish and debris from the shoreline and surface of the re-regulation reservoir during 24-27 May 2017. A total of 275 kg of floating rubbish was transported and disposed of at the NNP1 Project Landfill and 4.3 m^3 of floating debris was transported and disposed of at the designated Spoil Disposal Area No. 6.

On 28 April and 30 June 2017, the authorities of Borikan District, ESD staff and villagers of Thaheau, Hat Gniun and new residents at HSRA carried out a waste clean-up activity of the respective village areas. A total of 13 m^3 of solid waste was disposed of at Houay Soup Landfill and about 235 kg of recyclable waste was transported to the Community Waste Bank.

PHOTOGRAPH 09&10: ESD STAFF, AUTHORITIES OF BORIKHAN DISTRICT, ESD STAFF AND VILLAGERS OF THAHEAU, HATGNIUN AND NEW RESIDENTS AT HOUAY SOUP RESETTLEMENT AREA CARRIED OUT A WASTE CLEAN-UP ACTIVITIES OF THE VILLAGE AREAS

During 21 – 22 June 2017, NNP1PC-ESD carried out a joint waste inspection and assessment prior to relocation of four villages Houaypamom, Sopphouane, Sopyouak (Nong) and Namyouak in Zone 2LR (Lower Reservoir), Hom District, Xaysomboun Province. It was estimated that approximately 260 units of septic tanks will need to be treated by lime and backfilled after the dismantling is completed. The waste cleaning-up will be commenced as soon as the wet season ends in late October 2017.

4.5.2 Community Recycling Programme

A total of 3,693 kg was collected from villagers and 1,335 kg was sold to Khounmixay Processing Factory as presented below.

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

Types of Waste	Unit	Purchased Amount During the Second Quarter of 2017 (A)	Sold (B)	Remaining Amount (A - B)
Scrap metal	kg	1,285	0	1,285

Glass	kg	1,603	835	768
Paper/cardboards	kg	290	0	290
Plastic bottles	kg	317	317	0
Aluminium	kg	198	183	15
Total	**kg**	**3,693**	**1,335**	**2,358**

4.5.3 Environmental Management Training

On 25 May 2017, NNP1PC-EMO staff was carried out an environmental management induction for 12 contractors working at HSRA including SP01: Erosion and Sediment Control; SP02: Water Availability and Pollution Control; SP03: Emission and Dust Control and; SP04: Waste Management.

4.5.4 Houay Soup Resettlement Area Waste Management

During the Second Quarter of 2017, an approximate 19.6 m^3 of solid waste was disposed of at the Houay Soup Landfill. In addition, NNP1PC is in the process of hiring a contractor to work on the slope stabilisation and erosion control at the Houay Soup Landfill, and another contractor is being hired to collect waste at HSRA and two host Villages and operate the Houay Soup Landfill. The procurement is expected to be completed in August 2017.

4.6 ENVIRONMENTAL MONITORING

The environmental quality monitoring undertaken from April to June 2017 followed the environmental quality monitoring programme presented in the ESMMP-CP Volume III. The monitoring programme consists 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.

All the monitoring results have been assessed against the 2009 National Environmental Standards and the Effluent Standards specified in the Concession Agreement Annex C[2], as applicable. For the purpose of simplifying the report, this Section focuses on the key results that did not meet the mentioned Standards. However, all monitoring results also can be found in the ***Appendix 5***.

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

The NNP1PC Environmental Laboratory at the Owner's Site Office and Village performs TSS, BOD, total coliform, faecal coliform and E. Coli bacteria testing. The laboratory, in collaboration with the United Analysis and Engineering Consultant Company Limited (UAE) has completed a performance verification of its analyses for Total Suspended Solids (TSS) in May 2017. The TSS results from NNP1PC Environmental Laboratory are in acceptable range compared to the results of UAE Laboratory. NNP1PC Environmental Laboratory will take over the TSS analyses from July 2017 according to the water quality analysis service agreement between UAE Laboratory and NNP1PC.

During the impounding of the re-regulation reservoir from 15 to 25 May 2017, daily water quality monitoring for physical parameters (pH, dissolved oxygen, conductivity, Total Dissolved Solids (TDS), temperature and turbidity) were conducted followed by weekly monitoring after impounding. A part-time local consultant was recruited to provide training on laboratory operation including performance verification in collaboration with UAE laboratory, data analysis, Quality Assurance/Quality Control (QA/QC) and establish standard operation procedures for the laboratory.

PHOTOGRAPH 12 NNP1 PROJECT LABORATORY (EXTERNAL VIEW)

PHOTOGRAPH 13 WATER SAMPLE ANALYSIS CARRIED OUT BY NNP1 PROJECT LABORATORY

4.6.1 Surface Water (River) Quality

Water quality monitoring was conducted at the following 14 stations in the Nam Ngiep 1 watershed area:

i. six stations located in upstream of the NNP1 Main Dam, including four stations in the Nam Ngiep main stream, a station at lower Nam Phouan and a station at lower Nam Chian – both tributaries to Nam Ngiep;

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

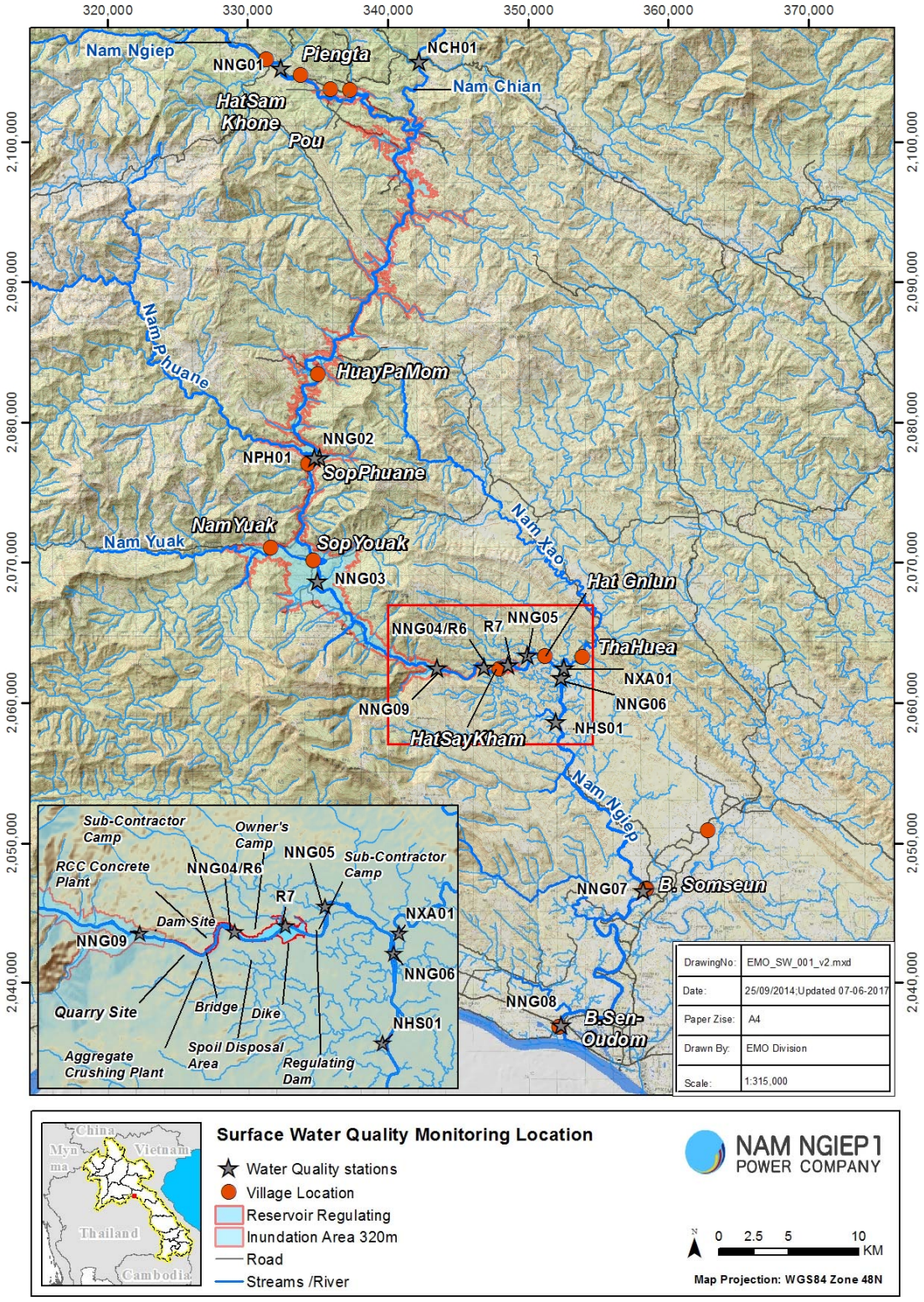
The frequency, group of parameters and locations of monitoring stations are shown in ***Table 4-7*****.**

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)	Four stations: Nam Ngiep Upstream Main Dam (NNG09), Nam Ngiep Downstream RT Camp (NNG04 / R6), Reservoir Upstream Re-Regulation Dam (R7) and Nam Ngiep Upstream Ban Hat Gniun (NNG05)
Fortnightly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	All 14 stations
Monthly	TSS (mg/l), BOD5 (mg/l), COD (mg/l), NH3-N (mg/l), NO3-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

Descriptions of each monitoring station and surface water quality monitoring parameters can be found in ***Figure 4-4***.

FIGURE 4-4: SURFACE WATER QUALITY MONITORING LOCATIONS



During the Second Quarter of 2017, the results of the monitoring programme indicated that Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), faecal coliform and total coliform

exceeded the Lao National Environmental Standard (Surface Water Quality Guideline) as presented below.

4.6.1.1 Dissolved Oxygen (DO)

The Dissolved Oxygen (DO) measurements for Q2 2017 are presented in *Table 4-8*. DO levels below the surface water quality guideline value of > 6 mg/l were measured in Nam Houay Soup – a right bank tributary to Nam Ngiep - on three occasions (two in April and one in early May 2017). The subsequent measurements in May and June 2017 are all within the standard and normal range for the stream. However, NNP1PC will continue to monitor the water quality and assess if there are any significant potential impacts from the resettlement site construction works. The measurements in Station R7 in the re-regulation reservoir from 24 May 2017 (at the end of the re-regulation reservoir impounding) to 21 June 2017 indicate slightly lower DO levels than in NNG09 immediately upstream the main dam during the same period, but only one measurement in R7 had a DO level below the standard. The DO levels in R6 (also located in the re-regulation reservoir) are not significantly different from the measurements in NNG09, and the measurements in NNG05 downstream the re-regulation dam also do not appear significantly different from the levels in NNG09. Albeit, these inferences are based on rather small sample sizes[3], it cannot be ruled out that the temporary drop in DO in R7 was caused by degradation of residual biomass in the re-regulation reservoir. However, the levels are back to normal and no adverse impacts in terms of fish kill have been observed, and the DO levels downstream the re-regulation dam were not affected.

[3] The inferences are partly based on simple comparisons on the results supported by statistical tests (Student t-tests). A Student t-test is a statistical hypothesis test and a common statistical method of testing whether water quality in two different monitoring stations is the same or alternatively, if there is a significant statistical difference

TABLE 4-8: DO RESULTS OF SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED FROM APRIL TO JUNE 2017 (NATIONAL SURFACE WATER QUALITY STANDARD FOR DO: > 6 MG/L)

	River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
		Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
	Date														
Date	Guideline														
06-04-17	>6.0	6.36	7.3	6.69	6.63	7.84		8.28	8.12	8.24	6.93	8.89	6.82	5.94	4.93
11-04-17	>6.0				6.68	7.29		7.13							
20-04-17	>6.0				6.46	6.88		6.86							
27-04-17	>6.0	6.92	6.83	6.11	6.24	6.19		7.93	7.7	6.72	6.58	6.19	6.18	6.21	5.43
04-05-17	>6.0	6.87	8.62	7.86	7.16	6.81		6.39	7.26	7.38	6.37	7.26	7.07	7.11	4.31
10-05-17	>6.0				6.29	6.32		6.96							
18-05-17	>6.0				9.91	9.12		11.59							
24-05-17	>6.0	7.41	7.74	7.72	8.16	7.1	6.76	7.86	7.87			7.96	7.83	6.47	7.25
08-06-17	>6.0	7.23	7.26	7.15	7.58	6.46	5.48	7.82	7.57	7.63	7.03	7.03	7.26	6.87	6.56
14-06-17	>6.0				7.75	7.9	6.29	7.95							
21-06-17	>6.0				8.88	7.48	6.24	7.05							
29-06-17	>6.0	7.84	8.93	6.89	8.22	8.02	8.34	8.25	7.84	6.96	6.86	7.99	9.09	7.43	7.76

4.6.1.2 Chemical Oxygen Demand (COD)

The COD levels measured in Nam Ngiep since the start of the monitoring programme in 2014 indicate substantial spatial and temporal variation from 'not detected' to double-digit mg/l.

It is unlikely that the current construction works of NNP1 would cause any significant increase of COD levels in Nam Ngiep. The purpose of the monitoring is therefore to establish a baseline for assessing any changes of water quality in Nam Ngiep downstream of the Project after the main reservoir has been impounded.

TABLE 4-9: COD RESULTS OF SURFACE WATER MONITORED FROM APRIL TO JUNE 2017

	River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soun
	Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
		Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Guideline														
06-04-17	<5	8.6	ND[16]	ND[16]	ND[16]	ND[16]	N/A	ND[16]	ND[16]	ND[16]	ND[16]	ND[16]	ND[16]	7.3	16.0
04-05-17	<5	8.7	8	9.8	8	ND[16]	N/A	7.3	6.7	6.9	5.5	6.7	6.3	7.1	26.9
08-06-17	<5	6.1	8.4	9	7	5.3	6.0	8.2	10	15.8	10.9	73.7	9	13.5	30.9

Note: ND[16] less than the detection limit (<5.0 mg/l)

4.6.1.3 Faecal Coliforms

The levels of faecal coliform bacteria measured in Nam Ngiep since the start of the monitoring programme in 2014 indicate substantial spatial and temporal variations. The elevated levels exceeding the relevant standard measured at stations both upstream and downstream the construction site during the Second Quarter of 2017 (see ***Table 4-10***) are not unusual and fall within the general pattern.

The levels of faecal coliform bacteria detected in NNG04/R6 within the construction site were all low and below the standard. There is no indication that effluents from the construction site have caused elevated levels of faecal coliform bacteria in Nam Ngiep.

.

TABLE 4-10: RESULTS OF THE SURFACE WATER FAECAL COLIFORMS FROM APRIL TO JUNE 2017

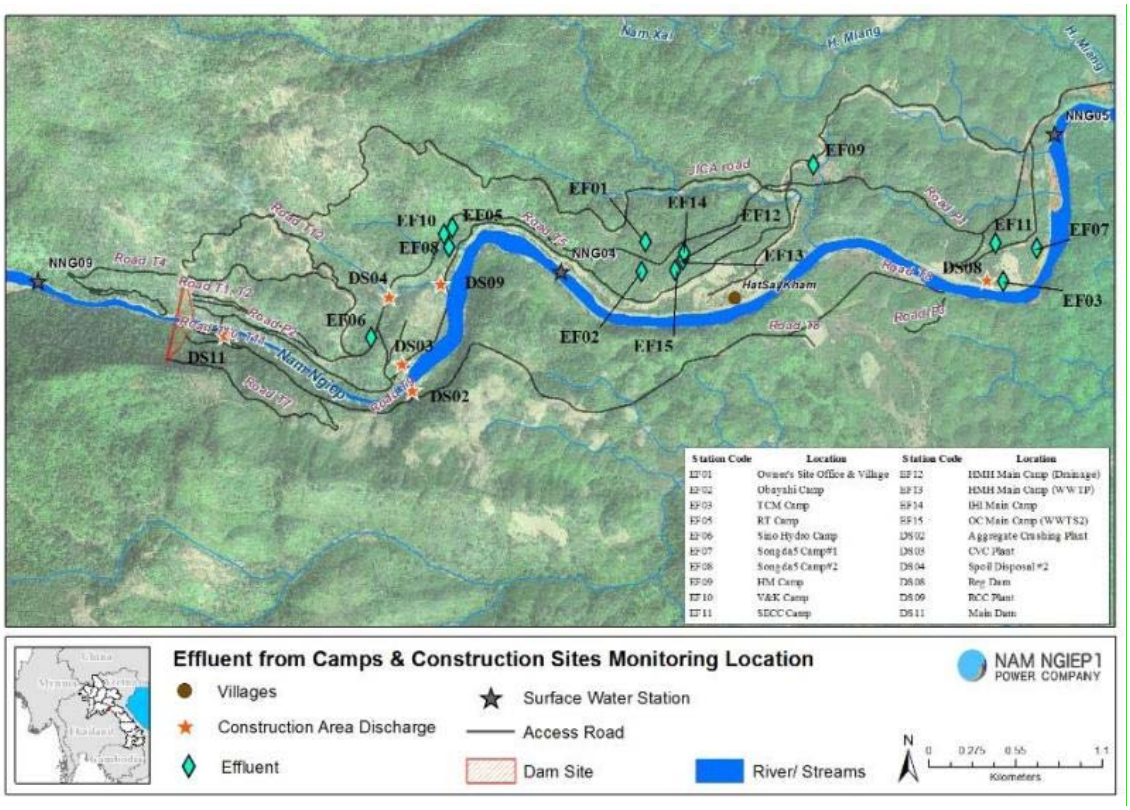
	River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
		Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/ R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Guideline														
06-04-17	<1,000	240	170	3,300	34	9	N/A	21	490	14	12	330	130	46	930
04-05-17	<1,000	170	1,100	920	540	350	N/A	240	350	110	33	24	17	350	79
08-06-17	<1,000	7,000	920	14,000	460	49	N/A	1,700	1,600	3,300	2,400	1,700	1,600	3,300	2,400

4.6.2 Effluent Discharge Quality Monitoring

All the camps' effluent water was sampled and analysed regardless of whether or not effluents were discharged at the time of sampling. In case of no discharge, the samples were collected from the downstream end of the final treatment pond.

During the Second Quarter of 2017, effluents were monitored in 12 camps (13 sampling sites) (see ***Figure 4-5***).

FIGURE 4-5: MAP OF EFFLUENT MONITORING LOCATIONS DURING THE SECOND QUARTER OF 2017



The results of the effluent water quality monitoring of selected camps during Q2 2017 are shown in ***Table 4-11***. The results show that - except for the Owner's Site Office and Village – no camp complied with the effluent standards. The non-compliances with effluent standards for coliform bacteria are believed to be a result of inadequate dosage of chlorine. In order to further improve the chlorination processes, NNP1PC-EMO undertook field inspections and laboratory testing on chlorination breakpoints during March to April 2017. The results were shared with the contractor. By the end of May 2017, three camps (Obayashi Corporation, V&K and Sinohydro) completed their WWTS improvements followed by TCM & GFE camp in early June 2017. Chlorination started in early June 2017 for all these recently completed camps and the amount of total coliforms dropped to less than 60,000 MPN/100 ml. NNP1PC-EMO will continue to monitor the chlorination process and provide training to the contractor on chlorination to ensure compliance with related standard.

The corrective actions are summarized in ***Table 4-12***.

TABLE 4-11: 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	TCM Camp	Sino Hydro Camp	Song Da 5 Camp No.1	Song Da 5 Camp No.2
	Station Code	EF01	EF02	EF03	EF06	EF07	EF08
Date	Parameter Unit)	Guideline in the CA					
07-Apr-17	pH	6.0-9.0	7.22	7.87	N/A	7.25	7.83	7.62
21-Apr-17	pH	6.0-9.0	6.78	7.63	N/A	7.43	7.54	7.65
09-May-17	pH	6.0-9.0	7.02	7.76	N/A	8.24	7.8	7.71
19-May-17	pH	6.0-9.0	8.3	8.34	N/A	8.01	8.45	7.6
13-Jun-17	pH	6.0-9.0	7.13	8.24	N/A	8.31	7.62	8.38
20-Jun-17	pH	6.0-9.0	7.13	7.0	N/A	7.54	7.59	7.68
07-Apr-17	TSS (mg/l)	<50	ND[16]	18	N/A	17.1	23.7	45.6
21-Apr-17	TSS (mg/l)	<50	ND[16]	29.6	N/A	10	21.3	23.2
09-May-17	TSS (mg/l)	<50	ND[16]	27.1	N/A	20.6	54.1	24.6
19-May-17	TSS (mg/l)	<50	ND[16]	22.3	N/A	34.4	19.4	18.6
13-Jun-17	TSS (mg/l)	<50	ND[16]	10.1	N/A	32.8	23.8	39.2
20-Jun-17	TSS (mg/l)	<50	ND[16]	9.6	N/A	11.1	13.8	25
07-Apr-17	BOD_5 (mg/l)	<30	3.6	41.6	N/A	26.5	ND[13]	46.5
21-Apr-17	BOD_5 (mg/l)	<30	2	60.2	N/A	46	28	38.7
09-May-17	BOD_5 (mg/l)	<30	ND[13]	51.4	N/A	25.4	ND[13]	63
19-May-17	BOD_5 (mg/l)	<30	ND[13]	56.4	N/A	12.5	8.8	34
13-Jun-17	BOD_5 (mg/l)	<30	4.1	17.8	N/A	25.7	ND[13]	72.2
20-Jun-17	BOD_5 (mg/l)	<30	4.8	19.8	N/A	25.4	ND[13]	37.7
07-Apr-17	COD (mg/l)	<125	ND[18]	134	N/A	77.6	98.4	200
21-Apr-17	COD (mg/l)	<125	ND[18]	135	N/A	96.8	98.4	114
09-May-17	COD (mg/l)	<125	ND[18]	142	N/A	103	128	163
19-May-17	COD (mg/l)	<125	ND[18]	104	N/A	38.3	36.2	139
13-Jun-17	COD (mg/l)	<125	ND[18]	46.9	N/A	53.1	55.2	166
20-Jun-17	COD (mg/l)	<125	ND[18]	42.8	N/A	40.7	56.7	140
07-Apr-17	NH_3-N (mg/l)	<10	7	27	N/A	23	31	88

		Site Name	Owner's Site Office and Village	Obayashi Camp	TCM Camp	Sino Hydro Camp	Song Da 5 Camp No.1	Song Da 5 Camp No.2
		Station Code	EF01	EF02	EF03	EF06	EF07	EF08
Date	Parameter Unit)	Guideline in the CA						
21-Apr-17	NH_3-N (mg/l)	<10	3	28	N/A	26	29	44
09-May-17	NH_3-N (mg/l)	<10	4	32	N/A	69	20	61
19-May-17	NH_3-N (mg/l)	<10	4	29	N/A	10	15	56
13-Jun-17	NH_3-N (mg/l)	<10	2	12	N/A	26	16	55
20-Jun-17	NH_3-N (mg/l)	<10	2	17	N/A	25	23	38
07-Apr-17	Total Nitrogen (mg/l)	<10	15.5	31.8	N/A	25	34.2	42
21-Apr-17	Total Nitrogen (mg/l)	<10	11.4	32	N/A	29.2	32.8	40.1
09-May-17	Total Nitrogen (mg/l)	<10	12.3	36	N/A	46.4	23.2	43.2
19-May-17	Total Nitrogen (mg/l)	<10	5.89	31.6	N/A	13.9	17.5	34.7
13-Jun-17	Total Nitrogen (mg/l)	<10	10.5	13.3	N/A	29.4	19.7	39.6
20-Jun-17	Total Nitrogen (mg/l)	<10	7.64	18.6	N/A	27.2	29	34.8
07-Apr-17	Total Phosphorus (mg/l)	<2	1.68	1.62	N/A	1.56	1.67	2.84
21-Apr-17	Total Phosphorus (mg/l)	<2	1.47	1.67	N/A	1.59	1.61	1.76
09-May-17	Total Phosphorus (mg/l)	<2	0.8	1.64	N/A	2.1	3.49	4.88
19-May-17	Total Phosphorus (mg/l)	<2	1.5	1.56	N/A	0.83	1.03	2.06
13-Jun-17	Total Phosphorus (mg/l)	<2	0.99	0.28	N/A	1.43	0.9	0.67
20-Jun-17	Total Phosphorus (mg/l)	<2	1.06	0.42	N/A	1.48	1.42	1.46
07-Apr-17	Faecal Coliform (MPN/100 ml)		0	160,000	N/A	160,000	0	160000
21-Apr-17	Faecal Coliform (MPN/100 ml)		2	160,000	N/A	160,000	0	160000
09-May-17	Faecal Coliform (MPN/100 ml)		13	160,000	N/A	160,000	4.5	160000
19-May-17	Faecal Coliform (MPN/100 ml)		33	160,000	N/A	160,000	540	4.5
13-Jun-17	Faecal Coliform (MPN/100 ml)		1700	1700	N/A	160,000	0	160000
20-Jun-17	Faecal Coliform (MPN/100 ml)		93	41000	N/A	160,000	0	17
07-Apr-17	Total Coliform (MPN/100 ml)	<400	49	160,000	N/A	160,000	0	160,000
21-Apr-17	Total Coliform (MPN/100 ml)	<400	2	160,000	N/A	160,000	2	160,000

	Site Name	Owner's Site Office and Village	Obayashi Camp	TCM Camp	Sino Hydro Camp	Song Da 5 Camp No.1	Song Da 5 Camp No.2
	Station Code	EF01	EF02	EF03	EF06	EF07	EF08
Date	Parameter Unit)	Guideline in the CA					
09-May-17	Total Coliform (MPN/100 ml)	<400	13	160,000	N/A	160,000	4.5	160,000
19-May-17	Total Coliform (MPN/100 ml)	<400	33	160,000	N/A	160,000	540	23
13-Jun-17	Total Coliform (MPN/100ml)	<400	1,700	54,000	N/A	160,000	13	160,000
20-Jun-17	Total Coliform (MPN/100ml)	<400	120	43,000	N/A	160,000	0	170

	Site Name	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp	IHI Camp	Obayashi Camp WWTP2	Kenber Camp
	Station Code	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA						
07-Apr-17	pH	6.0-9.0	6.89	7.03	7.59	7.69	7.49	8.57	7.74
21-Apr-17	pH	6.0-9.0	6.96	7.15	6.78	7.5	8.08	8.33	8.97
09-May-17	pH	6.0-9.0	7.52	7.94	6.62	6.13	7.35	8.26	8.97
19-May-17	pH	6.0-9.0	8.33	7.8	N/A	8.06	7.88	8.43	8.1
13-Jun-17	pH	6.0-9.0	7.47	8.55	N/A	7.93	7.97	N/A	8.43
20-Jun-17	pH	6.0-9.0	7.37	7.6	N/A	7.38	7.38	N/A	9.72
07-Apr-17	TSS (mg/l)	<50	16.2	110	31.5	38.7	22.1	20.9	11.4
21-Apr-17	TSS (mg/l)	<50	28.2	9.9	27.1	27.8	21.2	30.3	50
09-May-17	TSS (mg/l)	<50	85.6	70.7	16.7	42.2	20.4	27.4	115
19-May-17	TSS (mg/l)	<50	69.3	32.9	N/A	29.9	51.9	12.4	84.4
13-Jun-17	TSS (mg/l)	<50	64.3	34.2	N/A	20.4	12.8	N/A	22.7
20-Jun-17	TSS (mg/l)	<50	95.2	8.1	N/A	7.7	18.6	N/A	19.3
07-Apr-17	BOD_5 (mg/l)	<30	10.9	3.8	3.1	36.4	55.2	43.5	63
21-Apr-17	BOD_5 (mg/l)	<30	22	3.7	3.4	77.1	113	53	58.9
09-May-17	BOD_5 (mg/l)	<30	66.2	49.6	4.2	49.2	74.7	43	77.8

		Site Name	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp	IHI Camp	Obayashi Camp WWTP2	Kenber Camp
		Station Code	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA							
19-May-17	BOD_5 (mg/l)	<30	96.3	5.2	N/A	9.7	91.2	18.9	34.6
13-Jun-17	BOD_5 (mg/l)	<30	21.1	23.3	N/A	34.6	29.9	N/A	76.6
20-Jun-17	BOD_5 (mg/l)	<30	34.6	17.6	N/A	51.9	85.5	N/A	30.9
07-Apr-17	COD (mg/l)	<125	41.6	25	65.6	174	156	187	190
21-Apr-17	COD (mg/l)	<125	62.2	ND[18]	45.2	150	235	170	174
09-May-17	COD (mg/l)	<125	212	170	ND[18]	108	210	177	296
19-May-17	COD (mg/l)	<125	204	ND[18]	N/A	32.4	239	67.8	136
13-Jun-17	COD (mg/l)	<125	96.8	39.4	N/A	163	65	N/A	160
20-Jun-17	COD (mg/l)	<125	148	ND[18]	N/A	103	93.5	N/A	91.9
07-Apr-17	NH_3-N (mg/l)	<10	ND[12]	4	ND[12]	25	18	ND[12]	8
21-Apr-17	NH_3-N (mg/l)	<10	ND[12]	4	ND[12]	26	21	ND[12]	ND[12]
09-May-17	NH_3-N (mg/l)	<10	39	22	ND[12]	26	20	ND[12]	12
19-May-17	NH_3-N (mg/l)	<10	36	4	N/A	17	9	6	14
13-Jun-17	NH_3-N (mg/l)	<10	17	8	N/A	18	13	N/A	19
20-Jun-17	NH_3-N (mg/l)	<10	23	8	N/A	21	12	N/A	11
07-Apr-17	Total Nitrogen (mg/l)	<10	17.6	6.52	2.43	31.4	20.7	9.14	12.5
21-Apr-17	Total Nitrogen (mg/l)	<10	8.81	4.86	3.25	26.2	20.3	6.49	5.67
09-May-17	Total Nitrogen (mg/l)	<10	40.8	30.1	N/A^	25.8	20.4	7.81	21.4
19-May-17	Total Nitrogen (mg/l)	<10	34.6	5.31	N/A	20.9	11.7	7.88	14.6
13-Jun-17	Total Nitrogen (mg/l)	<10	29.3	11.7	N/A	28	14.4	N/A	26.5
20-Jun-17	Total Nitrogen (mg/l)	<10	31.1	9.52	N/A	23.6	15.4	N/A	17.3
07-Apr-17	Total Phosphorus (mg/l)		1.65	0.26	0.05	1.54	1.44	0.75	0.95
21-Apr-17	Total Phosphorus (mg/l)		1.75	0.18	0.13	1.57	1.61	0.82	0.28
09-May-17	Total Phosphorus (mg/l)		1.73	1.72	N/A	1.08	4.44	0.11	1.28
19-May-17	Total Phosphorus (mg/l)		1.67	0.24	N/A	0.45	0.98	0.54	0.82
13-Jun-17	Total Phosphorus (mg/l)		0.81	0.71	N/A	1.38	0.8	N/A	1.16
20-Jun-17	Total Phosphorus (mg/l)		1.51	0.74	N/A	1.39	1.27	N/A	0.81
07-Apr-17	Faecal Coliform (MPN/100ml)		160,000	3,300	33	160,000	4,600	160,000	160,000
21-Apr-17	Faecal Coliform (MPN/100ml)		92,000	17	140	160,000	160,000	160,000	160,000

		Site Name	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp	IHI Camp	Obayashi Camp WWTS2	Kenber Camp
		Station Code	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA							
09-May-17	Faecal Coliform (MPN/100ml)		160,000	160,000	70	79	160,000	160,000	160,000
19-May-17	Faecal Coliform (MPN/100 ml)		160,000	9,400	N/A	1600	160,000	2400	35,000
13-Jun-17	Faecal Coliform (MPN/100 ml)		160,000	160,000	N/A	1600	54,000	N/A	24,000
20-Jun-17	Faecal Coliform (MPN/100 ml)		160,000	24,000	N/A	700	2,400	N/A	70
07-Apr-17	Total Coliform (MPN/100 ml)	<400	160,000	11,000	920	160,000	160,000	160,000	160,000
21-Apr-17	Total Coliform (MPN/100 ml)	<400	160,000	54,000	140	160,000	160,000	160,000	160,000
09-May-17	Total Coliform (MPN/100 ml)	<400	160,000	160,000	130	79	160,000	160,000	160000
19-May-17	Total Coliform (MPN/100 ml)	<400	160,000	17,000	N/A	1,600	160,000	2,400	54,000
13-Jun-17	Total Coliform (MPN/100 ml)	<400	160,000	160,000	N/A	2,300	160,000	N/A	24,000
20-Jun-17	Total Coliform (MPN/100 ml)	<400	160,000	54,000	N/A	24,000	160,000	N/A	170

Note: *N/A no data available*.

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.04 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)			

TABLE 4-12: COMPLIANCE STATUS OF EFFLUENT DISCHARGE AND CORRECTIVE ACTION DURING THE SECOND QUARTER OF 2017

Site	ID	WWTS	Compliance Status	Corrective Actions
Owner's Site Office and Village (NNP1PC))	EF01	Septic tanks (kitchen and black water) and wetland (grey water), discharged 70 m3/day	Minor Non-compliance for total coliforms and total nitrogen.	EMO will continue to monitor the effluent discharge from this camp.
OC Camp – 01	EF02	Septic tanks (kitchen and black water)	Non-compliance for BOD_5, COD, Ammonia	The WWTS improvement was completed and chlorination started in June 2017. The

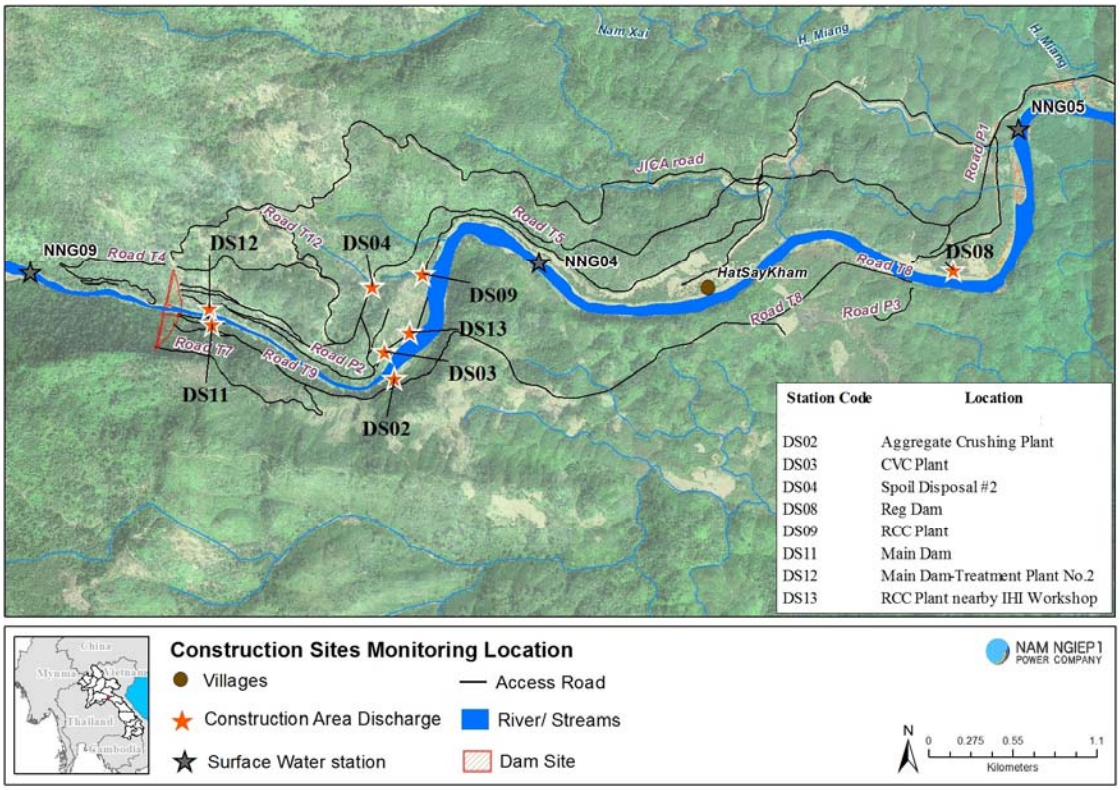
Site	ID	WWTS	Compliance Status	Corrective Actions
		and wetland with chlorination system (grey water)	Nitrogen, total nitrogen and total coliforms.	effluent monitoring for this camp will be continued and feedback provided to the contractor for further improvements.
OC Camp – WWTS02	EF15	Septic tanks (kitchen and black water) and wetland (grey water)	Non-compliance for BOD, COD and total coliforms.	This WWTS was connected with OC Camp's WWTS01 in June 2017 and monitoring will be merged to the WWTS number 1
TCM Camp	EF03	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	There is no effluent sample from this camp due to insufficient water for sampling during the Q2, 2017.	The WWTS improvement was completed and started operating in June 2017. The effluent monitoring for this camp will be continued and feedback provided to the contractor for further improvements on the chlorination dosage.
Sino Hydro Camp	EF06	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	Non-compliances for Total phosphorus, BOD, Ammonia nitrogen and total coliforms	As above.
Zhefu Camp (HMH Worker Camp No.1)	EF09	Septic tank (kitchen and black water), sediment ponds (grey water)	Non-compliance for TSS, BOD, COD, ammonia nitrogen, total nitrogen and total coliforms.	The Contractor needs to install an additional 1 m^3 chlorine contact tank and 1 m^3 chlorine monitoring tank according to Owner's instruction letter issued in November 2016.
V&K Camp	EF10	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	Non-compliance for TSS, BOD, COD, ammonia nitrogen, total nitrogen and total coliforms	The WWTS improvement was completed and chlorination started in June 2017. The effluent monitoring for this camp will be continued and feedback provided to the contractor for further improvements.
SECC Camp	EF11	Septic tank (kitchen and black water),	Non-compliance for total coliforms.	No action is required as this camp was decommissioned in mid-May 2017. The

Site	ID	WWTS	Compliance Status	Corrective Actions
		sediment ponds (grey water)		monitoring will be dropped in the next quarter.
HMH Main Camp – WWTS01	EF13	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	Non-compliance for BOD, COD, ammonia nitrogen, total nitrogen and total coliforms.	The effluent monitoring for this camp will be continued and feedback provided to the contractor for further improvements.
IHI Camp	EF14	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	Non-compliance for BOD, COD, NH_3-N, total nitrogen and total coliforms.	As above.
Song Da 5 Camp No. 1	EF07	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	Non-compliance for TSS, total phosphorus, COD, BOD, NH3-N and total coliform.	As above.
Song Da 5 Camp No. 2	EF08	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	Non-compliance for TSS, BOD, total phosphorus and NH_3 –N, total nitrogen and total coliforms.	As above.
Kenber Camp	EF16	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	Non-compliance for BOD, COD, total nitrogen and total coliforms.	As above.

Site	ID	WWTS	Compliance Status	Corrective Actions
Aggregate Crushing Plant	DS02	Sediment pond	Non-compliance for TSS.	A meeting was organized in April 2017 with the following agreement: • increase frequency of sediment cleaning up at the sediment ponds system, • slow down the turbid water flow within the sediment pond system, • clean up regularly the conveyor at the plant itself.
CVC Plant	DS03	Sediment ponds	Non-compliance for TSS.	The contractor was notified to check the system and ensure that the waste water treatment plant functions properly.
Spoil Disposal No.2	DS04	Sediment pond	Non-compliance for pH and TSS	
Re-regulating Dam	DS08	pH adjustment and chemical flocculation	Non-compliance: pH, TSS	No action required due to the construction in this site was completed.
RCC Plant (discharge from the weir)	DS09	Sediment ponds	Non-compliance for pH and TSS	The NCR level 3 was issued to Contractor instructing further improvements of the sediment pond systems by 31 July 2017.
Main Dam Construction Area (Treatment Plant No.1)	DS11	pH adjustment and chemical flocculation 6,000 m^3/day	Non-compliance: pH and TSS.	The treatment plant had been operated manually which caused the problems. The Contractor was notified to ensure that the automatic chemical dosing is activated and working properly
Main Dam Construction Area (Treatment Plant No.2)	DS12	pH adjustment and chemical flocculation	Non-compliance: pH and TSS.	The treatment plant had been operated manually which caused the problems. The Contractor was notified to ensure that the automatic chemical dosing is activated and working properly
RCC Plant (discharge	DS13		Non-compliance for pH and TSS.	The NCR level 3 was issued to Contractor instructing further

Site	ID	WWTS	Compliance Status	Corrective Actions
point opposite IHI workshop)				improvements of the sediment pond systems by 31 July 2017.

FIGURE 4-6: EFFLUENT MONITORING LOCATIONS AT CONSTRUCTION AREAS



Key results of the construction area discharge monitoring are described below. Parameters that are above the prescribed Standards are highlighted in yellow and presented in *Table 4-13*.

TABLE 4-13: RESULTS OF THE CONSTRUCTION AREA DISCHARGE MONITORING FROM APRIL TO JUNE 2017

Date	Parameter (Unit)	Site Name	Aggregate Crushing Plant	C VC Plant	Spoil Disposal No.2	Reg. Dam	RCC Plant (Discharge from the Weirs)	RCC Plant (Discharge Nearby IHI Workshop	Main Dam (Treatment Plant - No.1)	Main Dam (Treatment Plant - No.2)
		Station Code	**DS02**	**DS03**	**DS04**	**DS08**	**DS09**	**DS13**	**DS11**	**DS12**
		Guideline								
6-Apr-17	pH	6.0 – 9.0	8.67		6.11	8.95			3.23	
11-Apr-17	pH	6.0 – 9.0	8.60				7.90		7.23	
20-Apr-17	pH	6.0 – 9.0	7.74		7.94		7.52		6.07	9.82

Date	Parameter (Unit)	Site Name	Aggregate Crushing Plant	C VC Plant	Spoil Disposal No.2	Reg. Dam	RCC Plant (Discharge from the Weirs)	RCC Plant (Discharge Nearby IHI Workshop	Main Dam (Treatment Plant - No.1)	Main Dam (Treatment Plant - No.2)
		Station Code	DS02	DS03	DS04	DS08	DS09	DS13	DS11	DS12
		Guideline								
27-Apr-17	pH	6.0 – 9.0	7.31		7.93		7.48		11.53	
5-May-17	pH	6.0 – 9.0	8.89		5.98		7.64		5.46	
10-May-17	pH	6.0 – 9.0	8.44		6.16		N/A		7.63	10.83
18-May-17	pH	6.0 – 9.0	7.57	7.50	7.10		7.99		10.82	
24-May-17	pH	6.0 – 9.0	7.50		6.51		7.86		8.87	11.52
31-May-17	pH	6.0 – 9.0	7.86		7.13		7.41			
6-Jun-17	pH	6.0 – 9.0								
9-Jun-17	pH	6.0 – 9.0	7.97		5.84			7.19	9.61	10.21
15-Jun-17	pH	6.0 – 9.0	7.27		6.85		8.01	7.58	3.81	
22-Jun-17	pH	6.0 – 9.0	7.84		6.81		8.12	9.30	12.31	
29-Jun-17	pH	6.0 – 9.0	8	8.04	6.55		10.14	8.23	7.54	11.62
6-Apr-17	TSS (mg/l)	<50	4,134		189	1437			53.0	
11-Apr-17	TSS (mg/l)	<50	2,558			183	619		44.0	
20-Apr-17	TSS (mg/l)	<50	3100				49,682		27.0	31
27-Apr-17	TSS (mg/l)	<50	558		5		1,260		20.4	
5-May-17	TSS (mg/l)	<50	2,425		8.1		586		68.9	
10-May-17	TSS (mg/l)	<50	855		43		N/A		27.7	123
18-May-17	TSS (mg/l)	<50	932	5,755	16.7		1,714		23.2	
24-May-17	TSS (mg/l)	<50	6,035		147		85		84.6	
31-May-17	TSS (mg/l)	<50	1,377		7.6		84			
6-Jun-17	TSS (mg/l)	<50	4,365.7				142.5	511.2		
9-Jun-17	TSS (mg/l)	<50	11,431		27.7				13.2	285

Date	Parameter (Unit)	Site Name	Aggregate Crushing Plant	C VC Plant	Spoil Disposal No.2	Reg. Dam	RCC Plant (Discharge from the Weirs)	RCC Plant (Discharge Nearby IHI Workshop	Main Dam (Treatment Plant - No.1)	Main Dam (Treatment Plant - No.2)
		Station Code	DS02	DS03	DS04	DS08	DS09	DS13	DS11	DS12
		Guideline								
15-Jun-17	TSS (mg/l)	<50	33,556		11.3		8.6	294	10.7	
22-Jun-17	TSS (mg/l)	<50	60,687		12.2		337.2	372.2	13	
29-Jun-17	TSS (mg/l)	<50	10,977.8	243	24.3		134.4	121.6	27	40.3

4.6.3 Groundwater Quality Monitoring

The groundwater quality monitoring program includes groundwater for community water supply and since July 2016 also groundwater at the landfill sites.

During the Second Quarter 2017, the community groundwater quality was monitored in two boreholes at Hatsaykham Village installed by NNP1PC and six boreholes at Houay Soup Resettlement Area (HSRA). The boreholes of Hatsaykham Village and Houay Soup Resettlement Area (HSRA) are used for drinking, washing, cooking and bathing purposes. All the community groundwater samples were tested for 18 parameters including:

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

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

The landfill groundwater monitoring included four monitoring wells at the NNP1 Project Landfill (MW1-MW4) and one monitoring well at Houay Soup Landfill (MW5) for assessing the potential risk of leachate seepage and contamination of the groundwater below the landfills.

The location of the monitoring points are indicated in ***Figure 4-7*** and the results are displayed in ***Table 4-14*** (water supply) and ***Table 4-15*** (land fill monitoring wells).

FIGURE 4-7: GROUNDWATER SAMPLING LOCATIONS

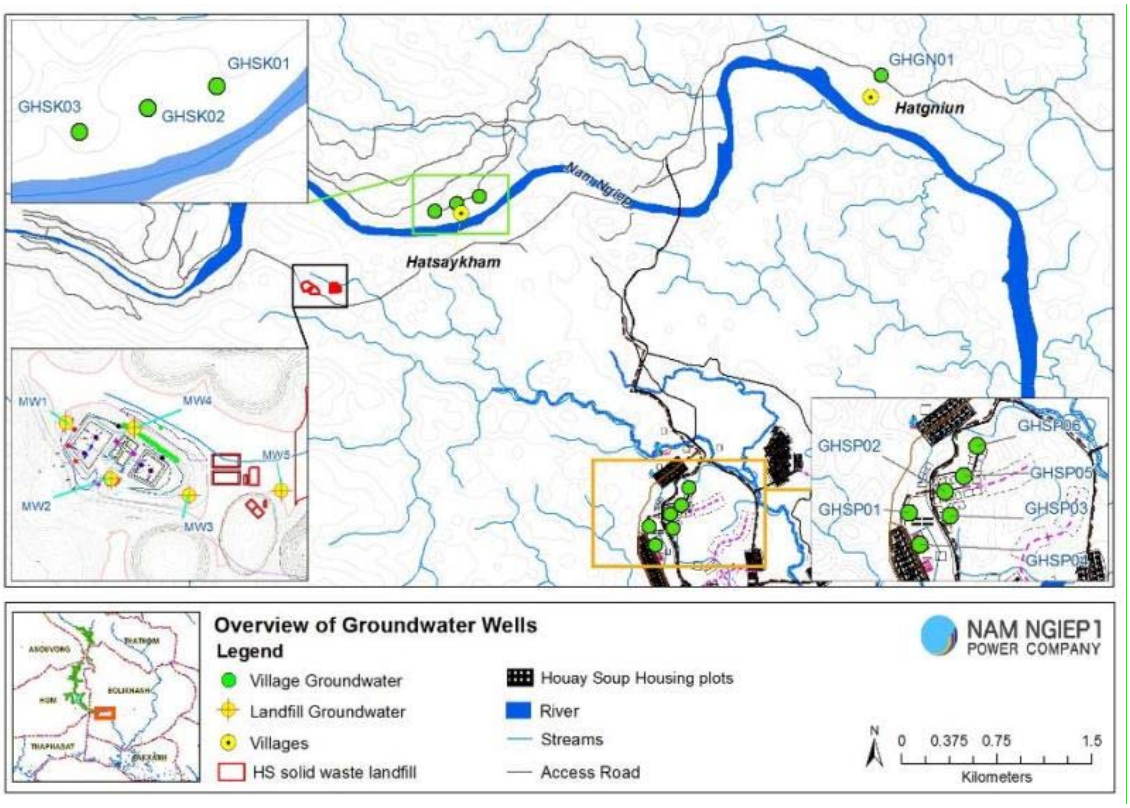


TABLE 4-14: RESULTS OF THE GROUNDWATER QUALITY MONITORING FROM APRIL TO JUNE 2017

Date	Parameter (Unit)	Site Name	Hatsaykham Village			Houay Soup Resettlement Area					
		Station	GHSK01	GHSK02	GHSK03	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
		Guideline									
20-Apr-17	pH	6.5-9.2	5.84	N/A	N/A	6.97	7.02	7.23	5.82	6.83	6.96
09-May-17		6.5-9.2	N/A	N/A	N/A	7.25	6.71	7.19	6.56	6.92	7.25
02-Jun-17		6.5-9.2	N/A	N/A	N/A	7.33	7.14	7.3	6.98	7.12	7.56
20-Apr-17	Faecal coliform (MPN/100 ml)	0	7.8	N/A	N/A	0	0	0	350	0	7.8
09-May-17		0	N/A	N/A	N/A	0	0	0	0	0	0
02-Jun-17		0	N/A	N/A	N/A	0	0	0	0	0	0
20-Apr-17	E. Coli Bacteria (MPN/100 ml)	0	7.8	N/A	N/A	0	0	0	350	0	7.8
09-May-17		0	N/A	N/A	N/A	0	0	0	0	0	0
02-Jun-17		0	N/A	N/A	N/A	0	0	0	0	0	0

Note: *N/A means no data available due to no water sampling as the water pump broken.*

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

Ban Hatsaykham: The borehole GHSK01 had a pH level lower than the standard in April 2017. In addition, both faecal coliform and E. Coli bacteria contamination were found in this borehole with a value recorded of 7.8 MPN/100 ml. The villagers were advised to boil the water before using it for drinking. All three wells at Ban Hatsaykham were dismantled and plugged in May 2017 prior to start of impounding the re-regulation reservoir.

Houay Soup Resettlement Area: Both faecal coliform and Ecoli bacteria contamination were found in the boreholes GHSP04 and GHSP06 during April 2017 mission. In addition, the pH level in GHSP04 was lower than the standard. The villagers were advised to boil the water before using it for drinking. The low pH does not pose any risk to human health. The groundwater based water supply system is temporary and will be replaced by a permanent system extracting water from the upper reach of Houay Soup Njay. The permanent system is planned to be completed and taken into use in Q4 2017.

NNP1PC and Houay Soup Landfills' Groundwater: Similar to previous measurements the concentration of lead at MW1, MW3, MW4 and MW5 exceeded the standard. As reported in the Q1 Environment Monitoring Report, 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 MW 4 are upstream the landfill. All monitoring wells at the NNP1 Project Landfill have in 5-6 out of 8 measurements had slightly elevated levels of lead. 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 4-15: RESULTS OF GROUNDWATER MONITORING AT THE NNP1 PROJECT AND HOUAY SOUP LANDFILLS

	Site Name	**NNP1 Project Landfill**				**Houay Soup Landfill**
	Station Code	**MW1**	**MW2**	**MW3**	**MW4**	**MW5**
	Date	**16-Jun-17**	**16-Jun-17**	**16-Jun-17**	**16-Jun-17**	**19-Jun-17**
Parameters (Unit)	**Guideline**					
pH		6.18	5.38	6.05	5.7	6.46
Sat. DO (%)		23.5	20.2	12	22.6	36.7
DO (mg/l)		1.79	1.57	0.95	1.73	2.87
Conductivity (µs/cm)		105	62	114	50	245
TDS (mg/l)		53	31	75	25	122
Temperature (°C)		26.17	26.11	26.34	26.6	25.82
Turbidity (NTU)		1.38	2.49	2.35	7.97	5.47
Biochemical Oxygen Demand (mg/l)		ND[13]	ND[13]	ND[13]	ND[13]	ND[13]
Ammonia-Nitrogen (mg/l)		ND[12]	ND[12]	ND[12]	ND[12]	ND[12]
Total Nitrogen (mg/l)		0.42	1.73	1.74	0.76	2.05
Cadmium (mg/l)	< 0.003	ND[5]	ND[5]	ND[5]	ND[5]	ND[5]
Lead (mg/l)	<0.01	0.113	0.009	0.076	0.017	0.137
Total Phosphorus (mg/l)		0.02	0.03	0.09	0.1	0.09
Total coliform (MPN/100 ml)		460	0	33	0	540
Faecal Coliform (MPN/100 ml)		100	0	0	0	79

	Site Name	NNP1 Project Landfill				Houay Soup Landfill
	Station Code	MW1	MW2	MW3	MW4	MW5
	Date	16-Jun-17	16-Jun-17	16-Jun-17	16-Jun-17	19-Jun-17
Parameters (Unit)	**Guideline**					
Total Petroleum Hydrocarbons (mg/l)		ND[13]	ND[13]	ND[13]	ND[13]	ND[13]

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.00004 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)	ND[18] (<25.0 mg/L)	ND[19] (<0.00002 mg/L)	

4.6.4 Gravity Fed Water Supply (GFWS) Monitoring

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. All the parameters meet the Standard except E.Coli bacteria and faecal coliforms as shown in *Error! Reference source not found.*. Complete results can be found in the Appendix.

TABLE 4-16: THE GFWS MONITORING RESULT FROM APRIL TO JUNE 2017

Date	Parameter (Unit)	Site Name	Tha Heua Village	Hat Gniun Village
		Station	WTHH02	WHGN02
		Guideline		
20-Apr-17	E. Coli Bacteria (MPN/100 ml)	0	49	79
09-May-17		0	23	130
02-Jun-17		0	17	79
20-Apr-17	Faecal coliform (MPN/100 ml)	0	49	79
09-May-17		0	23	130
02-Jun-17		0	17	79

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

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

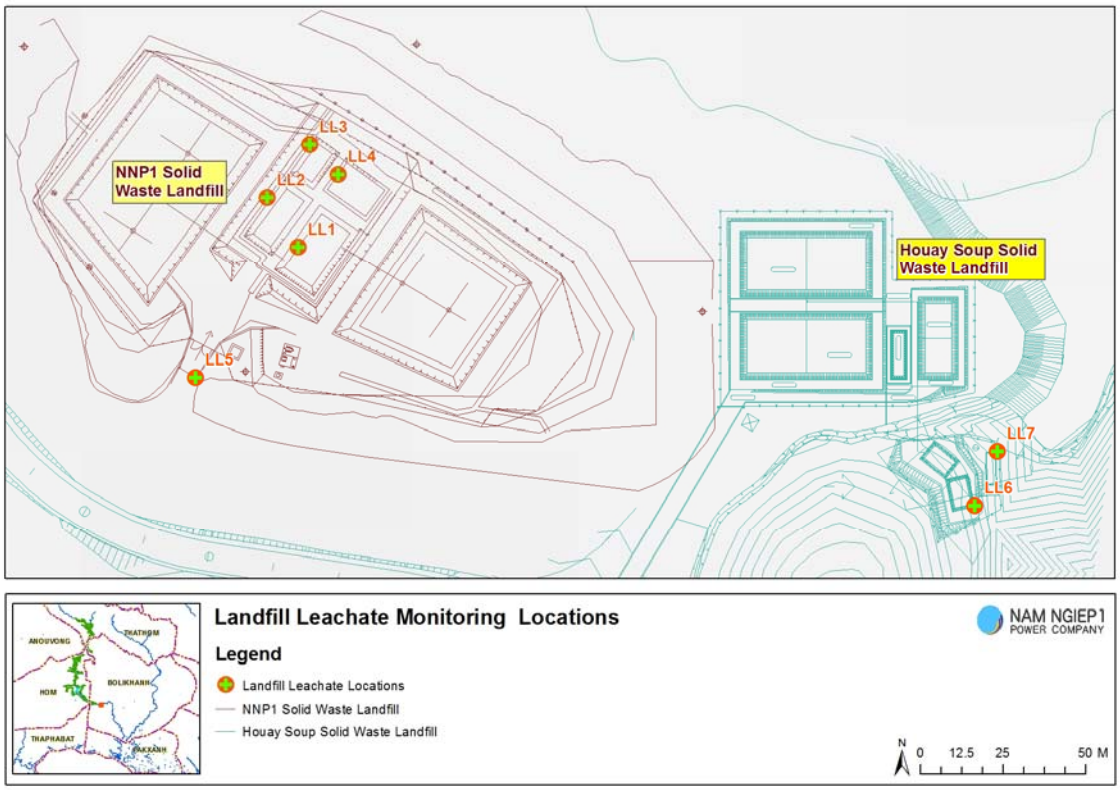
The villagers have been advised through NNP1PC-SMO to boil the water before drinking.

4.6.5 Landfill Leachate Monitoring

The landfill leachate monitoring was conducted to identify the water quality of the treatment systems at NNP1 Project landfill's leachate ponds (LL4 & LL5) and Houay Soup landfill (LL6 and LL7). There was no leachate discharged during April and May 2017 as it was still dry season.

The parameters monitoring for landfill leachate were carried out according to the ESMMP-CP Volume III update 2017. The monitoring locations are presented in the ***Figure 4-8***.

FIGURE 4-8: LANDFILL LEACHATE MONITORING LOCATION



The results of the landfill leachate monitoring are presented in ***Table 4-17.***

TABLE 4-17: RESULTS OF LANDFILLS' LEACHATE MONITORING DURING APRIL TO JUNE 2017

	Site Name	NNP1 Landfill (Leachate Pond)				NNP1 Landfill Leachate Discharge	Houay Soup Landfill (Last Leachate Pond)		Houay Soup Landfill Leachate Discharge
	Station Code	LL3	LL4			LL5	LL6		LL7
	Date	15-Jun-17	1-Apr-17	9-May-17	15-Jun-17	15-Jun-17	9-May-17	15-Jun-17	15-Jun-17
Parameters (Unit)	**Guideline**								
pH	6.0 - 9.0	8.28	7.38	8.82	8.06	6.01	6.86	6.96	6.97
Sat. DO (%)		31.2	3.56	91.5	42.3	72.3	72.5	62.1	27.4
DO (mg/l)		2.29	0.53	6.44	3.16	5.27	5.22	4.62	2.06
Conductivity (µs/cm)		674	386	296	583	171	80	33	48
TDS (mg/l)		337	193	148	292	85	40	17	24

	Site Name	NNP1 Landfill (Leachate Pond)				NNP1 Landfill Leachate Discharge	Houay Soup Landfill (Last Leachate Pond)		Houay Soup Landfill Leachate Discharge
	Station Code	LL3	LL4			LL5	LL6		LL7
	Date	15-Jun-17	1-Apr-17	9-May-17	15-Jun-17	15-Jun-17	9-May-17	15-Jun-17	15-Jun-17
Parameters (Unit)	Guideline								
Temperature (°C)		28.65	19.92	31.8	28.89	28.09	31.41	29.17	28.73
Turbidity (NTU)		18.41	0.27	4.72	12.98	60.43	6.34	17.14	14.56
BOD (mg/l)	<30	N/A	25.2	3	29.4	N/A	2.1	10.8	N/A
COD (mg/l)	<125	69.6	200	44.2	57.2	ND[18]	ND[18]	ND[18]	ND[18]
Total Nitrogen (mg/l)	<10	14	N/A	N/A	10.4	3.02	N/A	1.5	1.46
Arsenic (mg/l)		0.0028	N/A	N/A	0.0024	0.0011	N/A	ND[2]	ND[2]
Manganese (mg/l)		0.895	N/A	N/A	0.386	0.024	N/A	0.027	0.006
Mercury (mg/l)	<0.002	ND[3]	N/A	N/A	ND[3]	ND[3]	N/A	ND[3]	ND[3]
Lead (mg/l)	<0.2	ND[10]	N/A	N/A	ND[10]	ND[10]	N/A	ND[10]	ND[10]
Total Iron (mg/l)	<2	1.73	N/A	N/A	0.596	3.28	N/A	0.461	0.505
Total Petroleum Hydrocarbons (mg/l)		ND[13]	N/A	N/A	ND[13]	ND[13]	N/A	ND[13]	ND[13]
Total coliform (MPN/100 ml)	<400	N/A	350	79	79	N/A	350	170	N/A

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.00004 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)	ND[18] (<25.0 mg/L)	ND[19] (<0.00002 mg/L)	

During the reported Quarter, the monitoring results showed that all parameters monitored at the discharge points (LL5 and LL7) complied with the relevant standards.

4.6.6 Air Quality (Dust) Monitoring

4.6.6.1 Ambient Air Quality in the Host Villages

The ambient air quality monitoring for dust was carried out for 72 consecutive hours in the villages closest to the project construction sites (Hat Gniun Village and Houay Soup Resettlement Area). The monitoring stations are displayed in ***Figure 4-9.*** The monitoring was started on a weekend to obtain a record of at least 20 hours of background conditions. The

main purpose of the dust monitoring in Hat Gniun and Houay Soup Resettlement Area is to assess if the project construction works or the project related traffic passing through the villages have caused elevated levels of dust in the ambient air.

The records in villages were within the Lao National Environmental Standard for Air Quality of 0.12 mg/m^3. The 24-hour average ambient air dust concentrations measured during Q2 2017 are shown in ***Table 4-18.***

FIGURE 4-9: NOISE AND DUST MONITORING LOCATIONS AT THE CONSTRUCTION SITES AND NEARBY VILLAGES

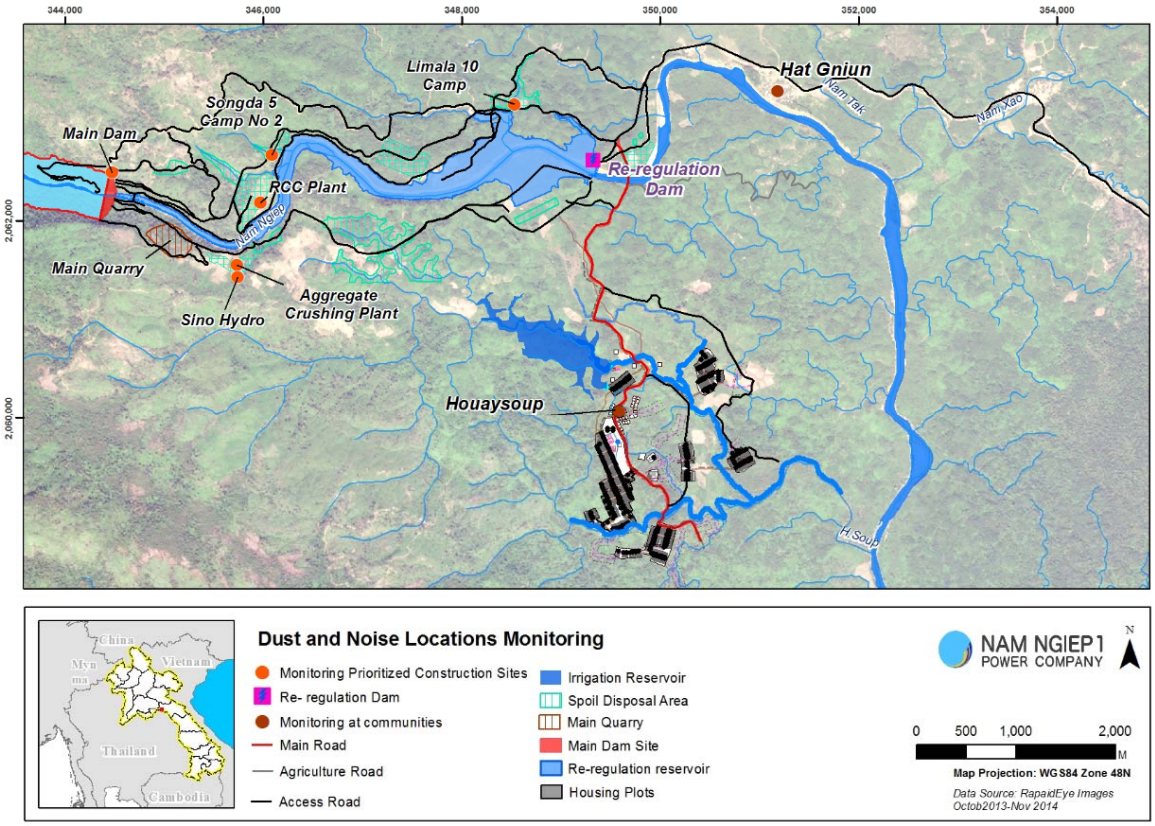


TABLE 4-18: RESULTS OF AIR QUALITY (DUST) MONITORING AT THE VILLAGES NEAR THE PROJECT CONSTRUCTION SITES DURING APRIL TO JUNE 2017

Site Name	**Hat Gnuin Village**								
Start Time	20-Apr-17 15:56	21-Apr-17 15:56	22-Apr-17 15:56	21-May-17 14:48	22-May-17 14:48	23-May-17 14:51	09-Jun-17 18:00	10-Jun-17 18:01	11-Jun-17 18:01
End Time	21-Apr-17 15:56	22-Apr-17 15:56	23-Apr-17 15:56	22-May-17 14:47	23-May-17 14:50	24-May-17 14:48	10-Jun-17 18:00	11-Jun-17 18:00	12-Jun-17 18:00
Average Data Record - 24 hours	0.08	0.09	0.10	0.05	0.05	0.04	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	**Houay Soup Resettlement Area**

Start Time	18-May-17 13:44	19-May-17 13:44	20-May-17 13:44	13-Jun-17 18:00	14-Jun-17 18:01	15-Jun-17 18:01
End Time	19-May-17 13:44	20-May-17 13:44	21-May-17 13:44	14-Jun-17 18:00	15-Jun-17 18:00	16-Jun-17 18:00
Average Data Record - 24 hours	0.01	0.03	0.04	0.02	0.02	0.03
Guideline	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***	***0.12***

4.6.6.2 Project Construction Sites

During Q2 2017, dust monitoring was carried out at priority project construction sites for 24 hours consecutively on a monthly basis at eight construction sites including the Aggregate Crushing Plant, RCC Plant, Main Dam, Sino Hydro Camp, Sino Hydro Temporary Work Camp, Lilama 10 Camp, Song Da 5 Camp No 2 (to assess possible impact on worker's health) and Owner's Site Office and Village (to monitor the ambient dust levels). The results of dust monitoring in these construction sites are summarized in *Error! Reference source not found.*. Most of the results complied with the Lao National Environmental Standard for Air Quality of 0.12 mg/m^3 (24-hour average), except Aggregate Crushing Plant (April and May 2017), Sino Hydro Camp (April 2017) and Sino Hydro Temporary Worker Camp (March 2017). Dust emissions from the aggregate crushing plant are expected to be within acceptable limits during the coming wet-season months of July, August and September 2017 - as indicated by the low dust levels detected in June 2017; in the meantime, the dust suppression system will be checked and upgraded to ensure that it is functioning properly.

TABLE 4-19: DUST MONITORING RESULTS AT THE CONSTRUCTION SITES DURING APRIL TO JUNE 2017

Site Name	**Aggregate Crushing Plant**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	10-Apr-17 11:00	11-May-17 09:38	19-Jun-17 18:00
End Time	11-Apr-17 11:00	12-May-17 08:16	20-Jun-17 18:00
Average Data Record -24h	0.212	0.275	0.046
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**RCC Plant**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	19-Apr-17 13:49	10-May-17 08:46	07-Jun-17 18:00
End Time	20-Apr-17 13:49	11-May-17 08:46	08-Jun-17 18:00
Average Data Record -24h	0.075	0.075	0.015
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**Main Dam**		
Period	00-24 Hours	24 Hours	24 Hours
Start Time	29-Apr-17 12:33	03-May-17 12:33	26-Jun-17 18:00
End Time	30-Apr-17 12:33	04-May-17 12:33	27-Jun-17 18:00
Average Data Record -24h	0.037	0.083	0.015
Guideline	***0.12***	***0.12***	***0.12***

Site Name	**Sino Hydro Camp**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	11-Apr-17 11:50	04-May-17 16:05	Jun-17
End Time	12-Apr-17 11:43	05-May-17 16:05	Jun-17
Average Data Record - 24h	0.147	0.087	***Abandoned***
Guideline	***0.12***	***0.12***	

Site Name	**Sino Hydro Temporary Worker Camp**		
Period	00-24 Hours	00-24 Hours	24 Hours
Start Time	27-Apr-17 16:21	12-May-17 08:42	21-Jun-17 18:00
End Time	27-Apr-17 16:21	13-May-17 08:42	22-Jun-17 18:00
Average Data Record - 24h	0.110	0.045	0.029
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	18-Apr-17 10:41	08-May-17 15:51	01-Jun-17 18:00
End Time	19-Apr-17 10:41	09-May-17 15:51	02-Jun-17 18:00
Average Data Record - 24h	0.034	0.039	0.035
Guideline	***0.12***	***0.12***	**0.12**

Site Name	**Owner's Site Office and Village**		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	25-Apr-17 12:18	15-May-17 11:06	Jun-17
End Time	26-Apr-17 12:18	16-May-17 11:00	Jun-17
Average Data Record - 24h	0.051	0.012	***Abandoned***
Guideline	***0.12***	***0.12***	**0.12**

Site Name	Lilama10 Camp		
Period	00-24 Hours	00-24 Hours	00-24 Hours
Start Time	24-Apr-17 11:39	16-May-17 11:33	28-Jun-17 18:00
End Time	25-Apr-17 11:39	17-May-17 11:33	29-Jun-17 18:00
Average Data Record - 24h	0.036	0.024	0.012
Guideline	***0.12***	***0.12***	**0.12**

4.6.7 Noise Monitoring

4.6.7.1 Host Villages

The noise monitoring was carried out in Hat Gniun Village and Houay Soup Resettlement Area for 72 consecutive hours on a monthly basis. Each monitoring mission was started on a non-working day (Sunday), to obtain a record of at least 20 hours of background conditions. The recorded values were measured against the relevant noise standards (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 revealed that all recorded results from the monitored villages were within the allowable maximum peak value of 115 dB(A). The average noise level occasionally exceeded the standard as demonstrated below.

TABLE 4-20: NOISE MONITORING RESULTS FROM APRIL TO JUNE 2017 HAT GNIUN VILLAGE AND HOUAY SOUP RESETTLEMENT AREA

Hat Gnuin Village- Noise Monitoring 72 Consecutive Hours - April 2017										
	20-21/Apr/17			**21-22/Apr/17**			**22-23/Apr/17**			**23/Apr/17**
Noise Level, dB(A)	16:49-18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 - 13:37
Maximum Value Recorded	63.2	67.8	67.7	67.9	62.6	69.3	70.4	64.3	62.4	69.3
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	46.25	45.91	41.39	43.72	46.32	43.31	43.85	45.21	41.11	45.07
Guideline Average	***55***	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Hat Gnuin Village- Noise Monitoring 72 Consecutive Hours - May 2017										
	21-22/May/17			**22-23/May/17**			**23-24/May/17**			**24/May/17**
Noise Level, dB(A)	15:43-18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 - 15:43
Maximum Value Recorded	72.2	68.2	63.2	72.9	69.3	76.5	70.1	62.7	62.4	78
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***

Hat Gnuin Village- Noise Monitoring 72 Consecutive Hours - April 2017										
	20-21/Apr/17			21-22/Apr/17			22-23/Apr/17			23/Apr/17
Noise Level, dB(A)	16:49-18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 - 13:37
Average Data Recorded	45.19	47.91	44.44	45.43	49.59	47.35	44.91	46.25	41.82	47.72
Guideline Average	***55***	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Hat Gnuin Village- Noise Monitoring 72 Consecutive Hours - June 2017										
	09-10/Jun/17			10-11/Jun/17			11-12/Jun/17			
Noise Level, dB(A)	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	61.6	63.9	68.7	63	67.5	69.4	54.6	60.6	71.5	
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	
Average Data Recorded	49.74	42.56	44.84	46.79	43.89	48.12	46.40	46.04	47.86	
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***	

Houay Soup Resettlement Area - Noise Monitoring 72 consecutive hours - May 2017										
	18-19/May/17			19-20/May/17			20-21/May/17			21/May/17
Noise Level, dB(A)	14:38 - 18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 - 14:38
Maximum Value Recorded	78.8	68.4	66.3	73.6	68.3	67.1	73.2	57.3	66.9	77.3
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	56.49	55.29	50.46	47.16	48.49	41.02	47.87	46.87	44.69	46.56
Guideline Average	***55***	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***
Houay Soup Resettlement Area - Noise Monitoring 72 consecutive hours - June 2017										
	13-14/Jun/17			14-15/Jun/17			15-16/Jun/17			
Noise Level, dB(A)	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	61.4	59.9	79.2	68.7	70.6	90.4	73	60	74.8	
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	

Houay Soup Resettlement Area - Noise Monitoring 72 consecutive hours - May 2017										
Average Data Recorded	46.79	48.83	48.58	51.69	54.46	52.40	50.73	46.71	43.38	
Guideline Average	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***	

4.6.7.2 Project Camps and Construction Sites

During Q2 2017, noise monitoring was conducted at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Camp and Song Da 5 Camp No. 2, the Main Dam, Sino Hydro Temporary Workers' Camp, and Owner's Site Office and Village (OSOV) mainly in order to assess possible impacts on workers' health as well as to estimate any potential impact on the ambient noise levels in the surrounding areas.

The noise measurements show that all maximum peak noise levels were within the National Noise Standard. The monitoring results indicate that the night-time (22:00-06:00) average noise level the Aggregate Crushing Plant, Sino Hydro Camp, Sino Hydro Temporary Camp, and Song Da 5 Camp No.2 were higher than the relevant National Noise Standard. In addition, the average noise level at the Aggregate Crushing Plant during 06:01-11:47 on 11 April 2017 and 06:01 – 09:09 on 12 May 2017 exceeded the standard (70 dB(A)). All average noise levels at Owner's Site Office & Village during April and May 2017 complied with the National Noise Standard.

As a general rule, the ESMMP-CP states that all workers must wear appropriate ear protection equipment if they are exposed to the noise levels that is greater than 80 dB(A). All workers at the Aggregate Crushing Plant are required to wear ear protection equipment. NNP1PC regularly checks that the ear protection devises are effective and so far, no problems have been found.

TABLE 4-21: NOISE MONITORING RESULTS FOR PROJECT CONSTRUCTION SITES FROM APRIL TO JUNE 2017

Site Name	**Aggregate Crushing Plant - Noise Monitoring (dB (A))**								
Noise Level, dB(A)	**10-11/Apr/17**		**11/Apr /17**	**11-12/May/17**		**12/May /17**	**19-20/Jun/17**		**20/Jun/ 17**
	11:47 – 22:00	22:01 – 06:00	06:01-11:47	10:31 – 22:00	22:01 – 06:00	06:01-09:09	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	76.7	78.4	78.3	78.80	80.30	79.60	84.00	83.90	83.70
Guideline Maximum	***115***	***115***	***115***	115	115	115	115	115	115
Average Data Recorded	52.92	60.20	71.43	64.91	75.01	71.11	66.93	59.13	62.08
Guideline Average	*70*	*70*	*70*	70	70	70	*70*	*70*	*70*

Site Name	**RCC Plant**								
Noise Level, dB(A)	**19-20/Apr/17**		**20/Apr/17**	**10-11/May/17**		**11/May/17**	**07-08/Jun/17**		**08/Jun/17**
	14:40 – 22:00	22:01 – 06:00	06:01-14:40	09:38 – 22:00	22:01 – 06:00	06:01-09:38	16:00 – 22:01	22:01 – 06:01	06:01-16:00
Maximum Value Recorded	65.20	69.40	69	80	73.40	65.30	65.70	77.90	81
Guideline Maximum	115	115	115	115	115	115	115	115	115
Average Data Recorded	59.63	61.92	57.49	60.11	64.13	54.69	62.21	61.57	59.82
Guideline Average	70	70	70	70	70	70	70	70	70

Site Name	**Main Dam**								
Noise Level (dB)	**29-30/Apr/17**		**30/Apr/17**	**03-04/May/17**		**04/May/17**	**26-27/Jun/17**		**27/Jun/17**
	16:21 – 22:00	22:01 – 06:00	06:01-16:21	12:49 – 22:00	22:01 – 06:00	06:01-12:34	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	58.8	63.8	63.1	65.4	66.3	67	73	86.4	83.1
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	50.52	54.79	55.56	54.10	57.96	55.66	61.57	59.05	58.85
Guideline Average	*70*	*70*	*70*	*70*	*70*	*70*	*70*	*70*	*70*

Site Name	**Sino Hydro Camp**					
Noise Level (dB)	**11-12/Apr/17**		**12/Apr/17**	**04-05/May/17**		**05/May/17**
	09:49 – 22:01	22:01 – 06:01	06:01-09:50	17:01 – 22:00	22:01 – 06:02	06:01-17:01
Maximum Value Recorded	66.5	71.4	76.5	60.7	62.1	63.1
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	53.30	57.61	55.26	51.78	55.95	53.53
Guideline Average	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Sino Hydro Temporary Worker Camp								
Noise Level (dB)	26-27/Apr/17		27/Apr/17	12-13/May/17		13/May/17	21-22/June/17		22/June/17
	17:07 – 22:00	22:01 – 06:00	06:01-17:07	09:37 – 22:00	22:01 – 06:00	06:01-09:37	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	80.4	68.7	77.7	75.7	82.5	65	76.5	81.8	79.1
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	58.44	58.47	53.58	56.25	63.26	53.00	56.86	62.65	55.74
Guideline Average	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Song Da 5 Camp No.2								
Noise Level (dB)	18-19/Apr/17		19/Apr/17	08-09/May/17		09/May/17	01-02/Jun/17		02/Jun/17
	11:31 – 22:00	22:01 – 06:00	06:01-11:31	16:35 – 22:00	22:01 – 06:00	06:01-16:35	16:00 – 22:01	22:01 – 06:01	06:01-16:00
Maximum Value Recorded	81.20	53.80	54.40	79.40	58.50	59.10	65.70	65.10	71.00
Guideline Maximum	115	115	115	115	115	115	115	115	115
Average Data Recorded	50.43	47.34	46.49	50.72	51.54	48.83	58.07	57.01	53.88
Guideline Average	***70***	***50***	***70***	***70***	***50***	***70***	***70***	***50***	***70***

Site Name	Owner's Site Office and Village (OSOV)					
Noise Level (dB)	25-26/Apr/17		26/Apr/17	15-16/May/17		16/May/17
	13:05– 22:02	22:01 – 06:00	06:01-13:05	12:02 – 22:00	22:01 – 06:00	06:01-11:54
Maximum Value Recorded	65	52.3	58.1	57.5	81.1	70.2
Guideline Maximum	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	39.87	39.57	38.26	41.08	49.80	45.21
Guideline Average	***70***	***50***	***70***	***70***	***50***	***70***

4.6.8 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 any significant impact on residences, public infrastructure or the surrounding environment given the distance between the construction areas and the nearest villages and public infrastructure.

5 WATERSHED AND BIODIVERSITY MANAGEMENT

5.1 WATERSHED MANAGEMENT

Targets	Status by end of the Second Quarter of 2017
Final NNP1 Watershed Management Plan by July 2017 Stakeholder workshop arrangements by 15 August 2017	• Final draft NNP1 Watershed Management Plan prepared and submitted to ADB for review • Translation of the Watershed Management Plan into Lao language is on-going • Stakeholder workshop planned to be held in September 2017
Start of Public hearing process for the provincial watershed management regulations	• The drafting of the provincial regulations is planned to start in July 2017

Activities in the Second Quarter of 2017	Results
Preparation for NNP1 Watershed Management Plan (WMP)	• During Q2 2017, the draft NNP1 Watershed Management Plan was reviewed and revised through a series of consecutive reviews both by ADB and internally in NNP1PC. • The emphasis of these reviews was on: (i) aligning the budget with the action plans and the committed budget in the Concession Agreement Budget, (ii) including cooperation with upstream hydropower projects and Xieng Khuang Province, (iii) improvements to the Action Plans to ensure consistency with identified issues. • The revised and final draft version of the Watershed Management Plan was submitted to ADB in June 2017.
Prepare draft Watershed Management Regulations	• The first draft Watershed Management Regulation was submitted to ADB on 13 January 2017. • The drafting of the regulations will be resumed after the watershed management plan has been substantially completed – expected to be in July 2017.
WRPO Activities	• Due to the recent restructuring of Ministry of Natural Resource and Environment (MONRE) and Ministry of Agriculture and Forestry (MAF), the Xaysomboun WRPO was restructured in June 2017 as follows: - Xaysomboun PONRE will remain as implementing agency of NNP1 Watershed Management within Xaysomboun administration (confirmed by the Minister of MONRE on 6 June 2017).

Activities in the Second Quarter of 2017	Results
	- The Deputy Head of Xaysomboun WRPO is assigned as Acting Head of Xaysomboun WRPO (informed by Xaysomboun Provincial Authority on 7 June 2017). • In May 2017, NNP1PC received a request for funding of pre-WMP activities from NNP1 Watershed and Reservoir Protection Committee (WRPC), but due to the imminent finalization of the NNP1 Watershed Management Plan NNP1PC, the WRPC agreed to reschedule these activities after the approval of the plan.
Xaysomboun ISP	• Xaysomboun ISP team confirmed in April 2017 that ISP is still being finalized and there was internal preparation for final review and approval by the provincial and district leaderships. • In May 2017, NNP1PC EMO followed up and collected the improved ISP from Xaysomboun ISP Team. The improved ISP was also submitted to MONRE DEQP for further review. • In June 2017, NNP1PC EMO completed the review of improved Xaysomboun ISP and noted that comments addressed by NNP1PC and MONRE DEQP in March 2017 were not completely addressed and clarified. NNP1PC EMO plans to have discussion with MONRE DEQP Team to improve the situation and conclude the plan as soon as possible.

5.2 BIODIVERSITY MANAGEMENT

Targets	Status by end of the Second Quarter of 2017
Recruitment of consultant for development of a Biodiversity Offset Management Plan (BOMP) for Nam Chouane-Nam Xang Biodiversity Offset Site (July 2017)	NNP1PC has completed the procurement process and selected a preferred candidate and started contract negotiations, which are expected to be completed in July 2017
Draft BOMP for Nam Chouane-Nam Xang Biodiversity Offset Site (December 2017)	The preparation of the BOMP is planned to start in August 2017
Consensus building workshop on the BOMP	Not relevant at this time
Final BOMP for Nam Chouane-Nam Xang Biodiversity Offset Site	Not relevant at this time

Start of public hearing process for the provincial regulations on biodiversity offset management in the Nam Chouane-Nam Xang Biodiversity Offset Site	Not relevant at this time

Activities in the Second Quarter of 2017	Results
Recruitment of consultant for development of a Biodiversity Offset Management Plan (BOMP) for Nam Chouane-Nam Xang Biodiversity Offset Site	• In April 2017, recruitment of a consultant for the development of the Biodiversity Offset Management Plan (BOMP) was delayed pending further discussions on funding, and institutional and partnership arrangements for the implementation of the BOMP. • The recruitment process was resumed in May 2017 and in June 2017, NNP1PC completed the procurement process and selected a preferred candidate. The consultant is planned to start working in August 2017.
Preparation of MOU between GOL and NNP1PC on biodiversity management in Nam Chouane – Nam Xang Offset Site	• In March 2017, the draft MOU was translated to Lao and reviewed by Bolikhamxay Provincial Authorities. • In May 2017, the draft MOU was accepted by the Province after series of review by BOMC and Bolikhamxay Provincial Authority. BOMC requested the English version to be revised in line with the Lao version. • In June 2017, BOMC informed that it is not necessary to have official signing ceremony and Vice Governor of Bolikhamxay Provincial will sign the document in Lao version but the official stamping will be completed once the English version is ready and signed by NNP1PC. The process is expected to be completed in July 2017.
Activities pre-BOMP period of 1 October 2016 – 31 September 2017	**GOL Biodiversity Consultant** • After the advertisement in March 2017, the BOMC continued the process of recruiting a GOL biodiversity consultant and in June 2017, the BOMC concluded the process and selected a consultant. The consultant will be officially on board starting from 01 July 2017. **Terms of Reference for BOMC and Local Coordination Unit** • BOMC and NNP1 EMO had technical discussion on 19 April 2017 to further refine the detailed Terms of References for BOMC and a Local Coordination Unit. The TOR was then circulated to BOMC members for further review and feedback before approval by BOMC Chairperson. **Community Mapping of villages in Nam Chouane-Nam Xang Biodiversity Offset Site**

Activities in the Second Quarter of 2017	Results
	• The BOMC and NNP1 EMO finalized an activity plan for community mapping targeting 6 villages within the Nam Chouane – Nam Xang Offset Site in April 2017. The activity plan was approved and carried out in May 2017, and the results were presented at a wrap-up workshop with BOMC on 23 May 2017. The workshop resulted in the following recommendations: - To summarize all data obtained from the village community mapping workshop and field visits - To produce maps showing infrastructure and land use status of each village - To coordinate with other relevant GOL offices and obtain information about the status and progress of development projects within or nearby Nam Chouan-Nam Xang Offset Site as well as information about settlement in Vangphieng and Na Gnang Village - To present the results of the community mapping to relevant provincial and district authorities and to the communities of each village. **BOMC Progress Report** • BOMC has prepared the first quarterly progress report (January – March 2017) including financial report. • BOMC has purchased some office equipment and vehicle. BOMC Secretariat Office in Viengthong District has started to use this equipment since March 2017. • BOMC finalize the second quarterly report (technical and financial) April – June 2017 including the report of community relationship building by middle of July 2017. **Communication System** • Bolikhamxay Provincial Military is responsible for setting-up a communication system in the Biodiversity Offset Site. On 23 May 2017, the Head of BOMC Secretariat informed that the setup is waiting for agreement on where to install the equipment and permission by Bolikhamxay Provincial Military. **Community Relations Building** • BOMC and NNP1 EMO Team conducted community relationship building activity from 19 June - 2 July 2017 at six villages within Nam Chouane-Nam Xang (NC-NX) Offset Site. The main objectives of the activity are:

Activities in the Second Quarter of 2017	Results
	- To inform the communities about the importance of NC-NX and the role and responsibilities of the Local Coordination Unit at community level for their awareness and participatory on the on-going and future implementation of the BOMP; - To increase community awareness on the sustainable use of natural resources in the offset site; - To present the status of land use within six villages in NC-NX Offset Site based on the recent information from the community mapping exercise. **Visit by ADB biodiversity consultant** • ADB's biodiversity consultant conducted a mission to NC-NX Offset Site from 22-27 June 2017 to understand the overall progress of pre-BOMP activities and to get an impression of the situation within villages inside NC-NX Offset Site. Some of the key notes during the wrap-up on 27 June 2017: - ADB Consultant is pleased with the progress of pre-BOMP activities managed by BOMC and recommended to focus on patrolling as soon as possible - ADB Consultant suggested BOMC to consider hiring an expert for designing, training, and supervising the implementation of patrolling programmes taking into account the lessons learned from other projects such as Phou Sithone, Nam Et-Phoulouey, and Nam Kang in Bokeo Province. - BOMC noted that BOMP development will be delayed and the pre-BOMP activities for 2018 should be developed in August 2017 to be ready for implementation by October 2017.

6 BIOMASS CLEARANCE

Activities in the Second Quarter of 2017	Results
Labour recruitment	April 2017:

Activities in the Second Quarter of 2017	Results
	- 11 workers from Longsan performed biomass clearance of a forest parcel land at Block 3. - 12 Contractor's field staff re-piling and re-burning the waste biomass in Block 4. - 1 self-loading log truck stockpiled waste wood and log with diameter >20 cm in Block 4. - 5 workers from Palavek performed biomass clearance of a fallow parcel land in Block 5. - 20 workers from Ban Nahong felling trees and piling waste biomass at Block 16 and 17. May 2017: - 3 Contractor staff mobilized to support the work at Zone 2UR - 5 Contractor staff working to cut down remaining trees, chop and pile logs/debris for burning at Block 2 - Bulldozer working intermittently to pile and burn the log/debris at Block 3. June 2017: - 8 workers from Longsan were recruited intermittently for cutting remaining trees and piling logs in Block 1. - 5 Contractor Staff and 11-17 intermittent-recruited workers from Ban Nam Youak and Longsan cut the remaining trees and piled logs/debris in Block 2. - 4 Contractor Staff re-stockpiled logs/debris in Block 3. 7-11 workers from Ban Hat Ngiun and Longsan were recruited intermittently for cutting remaining trees and piling logs/debris. In addition, one tractor and one bulldozer were mobilized in late June 2017 for stockpiling log/debris. - 12 Contractor Staff piled residual logs/debris in Block 4. 23-58 workers from Longsan, Hat Ngiun, and Ban Nahan were recruited intermittently for re-stockpiling residual logs/debris. In addition, two mini tractors and one tractor were used for stockpiling logs/debris. - 3 Contractor Staff piled residual log/debris in Block 5. In addition, one excavator was used for clearing and stockpiling logs/debris. - 7 Contractor Staff re-stockpiled and burnt residual log/debris in Block 16 and Block 17. 7-10 workers from Ban Phonhom were mobilized on 30 June 2017 for re-stockpiling and burning residual log/debris in Block 16.

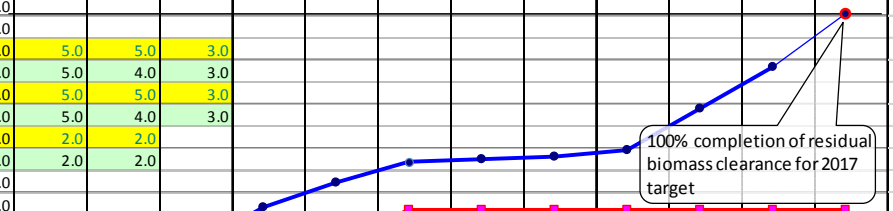
Activities in the Second Quarter of 2017	Results
Perform UXO work on priority biomass clearance areas	- The contractor submitted completion report and certificates of completed UXO search and clearance of 1,487.68 ha out of target area 1,500 ha (99% of the target area) on 17 April 2017. Invitation of The National Regulatory Authority (NRA) for inspection and QA/QC performance is being prepared by the contractor.
Perform biomass clearance	In April 2017: - The vegetation cutting was completed for around 47.26 ha out of the target 155 ha in April 2017. One of the main reasons for not achieving the target is that the contractor could not mobilize workers as planned. The total vegetation cutting to-date is around 946 ha. - The biomass burning have started within the area of around 322 ha. - There is no further update from local GOL authorities on the removal of the stockpiled logs from biomass clearance areas. In May 2017: - Vegetation cutting was completed for around 15 ha in May 2017 and in total vegetation cutting has been completed for around 961.36 ha. The small progress is mainly because the contractor could not mobilize workers as planned. - The biomass stock piling and burning (second burning) continue to progress and by the end of May 2017 the total progress of biomass burning is around 768.04 ha. - There is no further update from local GOL authorities on the removal of the stockpiled logs from biomass clearance areas. In June 2017: - The remaining trees within progress area for biomass burning of around 15 ha in Block 1 were cut and stockpiled. - Trees cutting and stockpiling of logs/debris of around 4.10 ha in Block 2 were completed. - Stockpiling log/debris of around 3 ha in Block 3 was completed. The burning of stockpiled log/debris is being progressed. - Stockpiling log/debris of around 21 ha in Block 4 was completed. The burning of stockpiled log/debris was carried out intermittently due to the rain. - Biomass cutting of around 1.5 ha and stockpiling log/debris of around 6 ha in Block 5 were completed.

Activities in the Second Quarter of 2017	Results
	- Stockpiling log/debris is being carried out in Block 16. - Stockpiling log/debris in Block 17 was completed while burning log/debris was carried out intermittently due to the rain. - The field monitoring and verification of biomass clearance progress were conducted since late June 2017. The biomass clearance progress to date can be seen in ***Figure 6-1***. The biomass clearance progress in map could be seen from ***Figure 6-2*** to ***Figure 6-20***.
Overall review	- The current contractor (LAUNC) was only able to progress around 974.99 ha or around 59% of total target area and within this progress only around 32.37 ha could be verified as fully completed clearance. The slow progress is mainly because the Contractor was not able to increase the labour capacity so that the work is behind the expected monthly targets of 2nd quarter 2017. An amendment to a current contract and additional contractors are being considered by NNP1PC to accelerate the biomass clearance during the last quarter of 2017. - NNP1PC has requested the contractor to revise the work plan and if the progress is still behind the expectation in July 2017, then contract amendment will be made that the current contractor to focus the work on achieving full clearance by December 2017 only within the area that have been progressed. The remaining area of around 660 ha will then be managed by newly recruited local contractors. - Detail discussions on this way forward will be initiated in July 2017.

THE OVERALL PROGRESS OF BIOMASS CLEARANCE PRORAMME IS ILLUSTRATED IN THE BELOW FIGURE.

FIGURE 6-1: BIOMASS AND UXO CLEARANCE PROGRESS IN EACH PRIORITY AREA AS OF 30 JUNE 2017

	Task List / Steps of work		Weight (%)	YEAR 2017 Q1 01	Q1 02	Q1 03	Q2 04	Q2 05	Q2 06	Q3 07	Q3 08	Q3 09	Q4 10	Q4 11	Q4 12	% S-Curve
1	**UXO Search and Clearance**	**Planed**	0.0													100
		Actual	0.0													96
1.1	Perform UXO work for 549.20 ha (6 blocks) of priority biomass clearance on lower and central reservoir	Planed	13.0	5.0	5.0	3.0										93
		Actual	12.0	5.0	4.0	3.0										89
1.2	Perform UXO work for 334.03 ha (5 blocks) of priority biomass clearance on lower and central reservoir	Planed	13.0	5.0	5.0	3.0										86
		Actual	12.0	5.0	4.0	3.0										82
1.3	Perform UXO work for 84.58 ha (2 blocks) of priority biomass clearance on upper reservoir	Planed	4.0	2.0	2.0											79
		Actual	4.0	2.0	2.0											75
2	**Biomass Clearance**	**Planed**	0.0													71
		Actual	0.0													68
2.1	Perform biomass clearance for 593.61 ha (6 blocks) on lower and central reservoir	Planed	18.0	3.0	3.0	3.0	2.0	1.0					2.0	2.0	2.0	64
		Actual	9.0	3.0	2.0	1.0	1.0	1.0	1.0							61
2.2	Perform biomass clearance for 462.09 ha (5 blocks) on lower and central reservoir	Planed	18.0	3.0	3.0	3.0	2.0	1.0					2.0	2.0	2.0	57
		Actual	10.0	3.0	2.0	2.0	1.0	1.0	1.0							54
2.3	Perform biomass clearance for 212.66 ha (7 blocks) on central and upper reservoir	Planed	17.0	3.0	3.0	3.0	2.0	1.0					2.0	2.0	1.0	50
		Actual	12.0	3.0	2.0	3.0	1.0	2.0	1.0							46
3	**Preparation of Floating/Debris Removal**	**Planed**	0.0													43
		Actual	0.0													39
3.1	Procurement of service for floating logs/debris removal	Planed	5.0						2.5						2.5	36
		Actual	2.0						2.0							32
4	**Monitoring and Reporting**	**Planed**	0.0													29
		Actual	0.0													25
4.1	Field monitoring and inspection of biomass clearance and compliance to SS-ESMMP (weekly & Monthly)	Planed	10.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	1.0	1.0	1.0	21
		Actual	5.5	1.0	1.0	1.0	1.0	1.0	0.5							18
4.2	Coordination or Ad-hoc meeting to discuss the progress, concerns and problem solving	Planed	2.0		0.5				0.5			0.5			0.5	14
		Actual	0.5		0.5											11
	Total	**Planed**	100.0	**22.0**	**22.5**	**16.0**	**7.0**	**4.0**	**3.5**	**0.5**	**0.5**	**1.0**	**7.0**	**7.0**	**9.0**	7
		Actual	67.0	**22.0**	**17.5**	**13.0**	**4.0**	**5.0**	**5.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	4
	Planned Progress	monthly		22.0	22.5	16.0	7.0	4.0	3.5	0.5	0.5	1.0	7.0	7.0	9.0	
		Cumulative		22.0	44.5	60.5	67.5	71.5	75.0	75.5	76.0	77.0	84.0	91.0	100.0	
	Actual Progress	monthly		22.0	17.5	13.0	4.0	5.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	
		Cumulative		22.0	39.5	52.5	56.5	61.5	67.0	67.0	67.0	67.0	67.0	67.0	67.0	



The blue graph and yellow highlight represent the planned activity, the red graph and green highlight represent the actual progress.

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

Target area		Biomass Clearance in Different Phases of Activity by Area (ha) as of Jun 2017							Remaining area (Ha) Plan Oct-Dec 2017)	Remark
Block	Total	Cutting in Progress	Burning in Progress	Completed Stockpiling	Re-stockpiling/ burning of residual log/debris	Cultivated land by villagers (April 2016 - April 2017)	Completed Clearance	Total Progress Area (Ha)		
B1	109.24	34.72	19.34					54.06	55.18	Verified on 30 June 2017
B2	158.63	8.77	38.11	28.71	3.06		8.54	87.19	71.45	Verified on 30 June 2017
B3	80.35	1.37	16.82	13.46	3.79			35.44	44.93	Verified on 30 June 2017
B4	163.74		35.73	43.6	48.17		10.33	137.83	25.92	Verified on 30 June 2017
B5	340.14	8.95	60.23	14.8		30.2	5.62	119.81	220.34	Verified on 30 June 2017
B6	31.92					3.33		3.33	28.59	To be verified
B7	39.65					2.03		2.03	37.61	Not yet start
B8	37.61					7.78		7.78	29.83	Not yet start
B9	52.75					1.26		1.26	51.49	Not yet start
B10	269.1		168.74					168.74	100.36	To be verified
B11	89.98		89.98					89.98	0	To be verified
B12	64.11	45.94	18.09					64.03	0.08	To be verified
B13	101.24		101.24					101.24	0	To be verified
B14	43.33		43.33					43.33	0	To be verified
B15	43.73		35.86				7.88	43.74	0	Verified as 30 June 2017
B16	3.32		3.32					3.32	0	To be verified
B17	7.96				7.96			7.96	0	Verified as 30 June 2017
B18	3.95		3.95					3.95	0	To be verified
Total	**1,640.76**	**99.75**	**634.74**	**100.57**	**62.98**	**44.6**	**32.37**	**974.99**	**665.78**	

Explanation notes

Cutting in progress: - Cut bush and small tree (Completed cutting/cutting in progress but not yet burn)
- Cut big trees and chopping for piling and burning (Completed cutting/cutting in progress but not yet burn)

Target area		Biomass Clearance in Different Phases of Activity by Area (ha) as of Jun 2017							Remaining area (Ha) Plan Oct-Dec 2017)	Remark
Block	Total	Cutting in Progress	Burning in Progress	Completed Stockpiling	Re-stockpiling/ burning of residual log/debris	Cultivated land by villagers (April 2016 - April 2017)	Completed Clearance	Total Progress Area (Ha)		

Burning in progress: - Burn dried bush and small trees (completed burning dried bush and small tree/burning in progress)
- Cut remaining big trees and chopping for piling and burning

Completed stockpiling: - Stockpile logs/debris for burning

Re-stockpiling and burning: - Re-stockpile and burn residual logs/debris

Completed clearance: - Complete burning residual logs/debris to ash and only stump remains

Verified / To be verified: - Verification by NNP1 and Biomass Contractor from field inspection plus areal drone record

FIGURE 6-2: BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 1

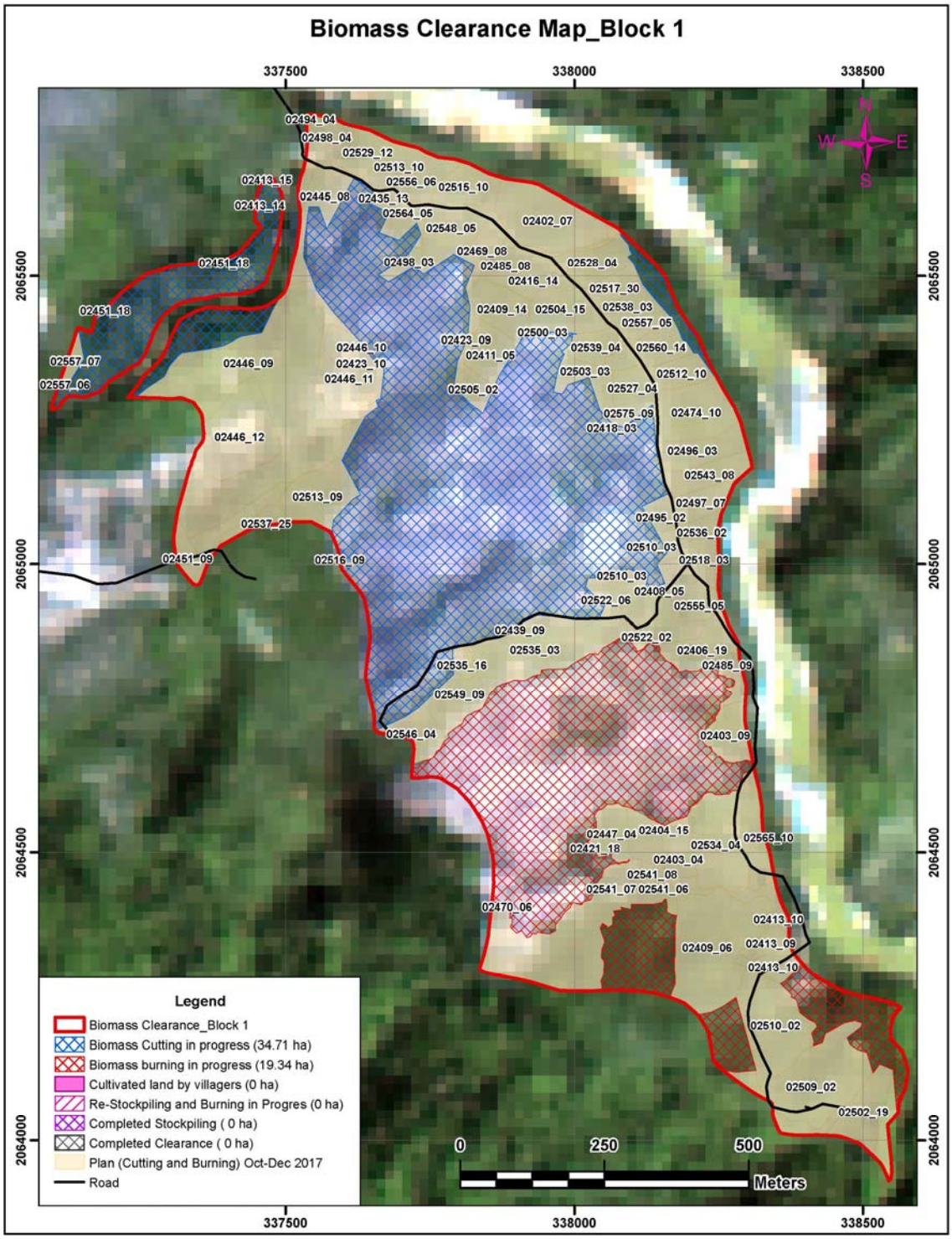


FIGURE 6-3: BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 2

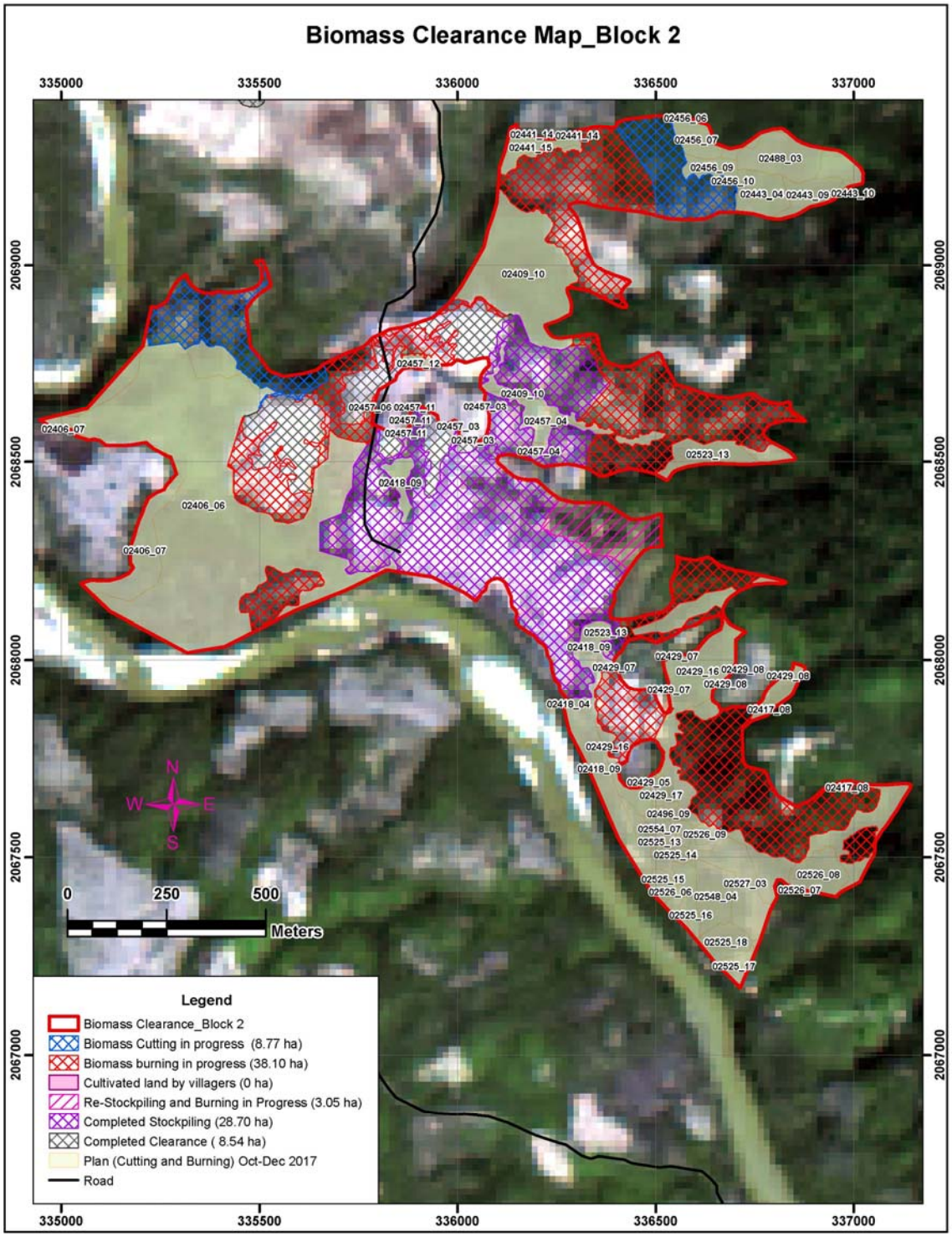


FIGURE 6-4: BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 3

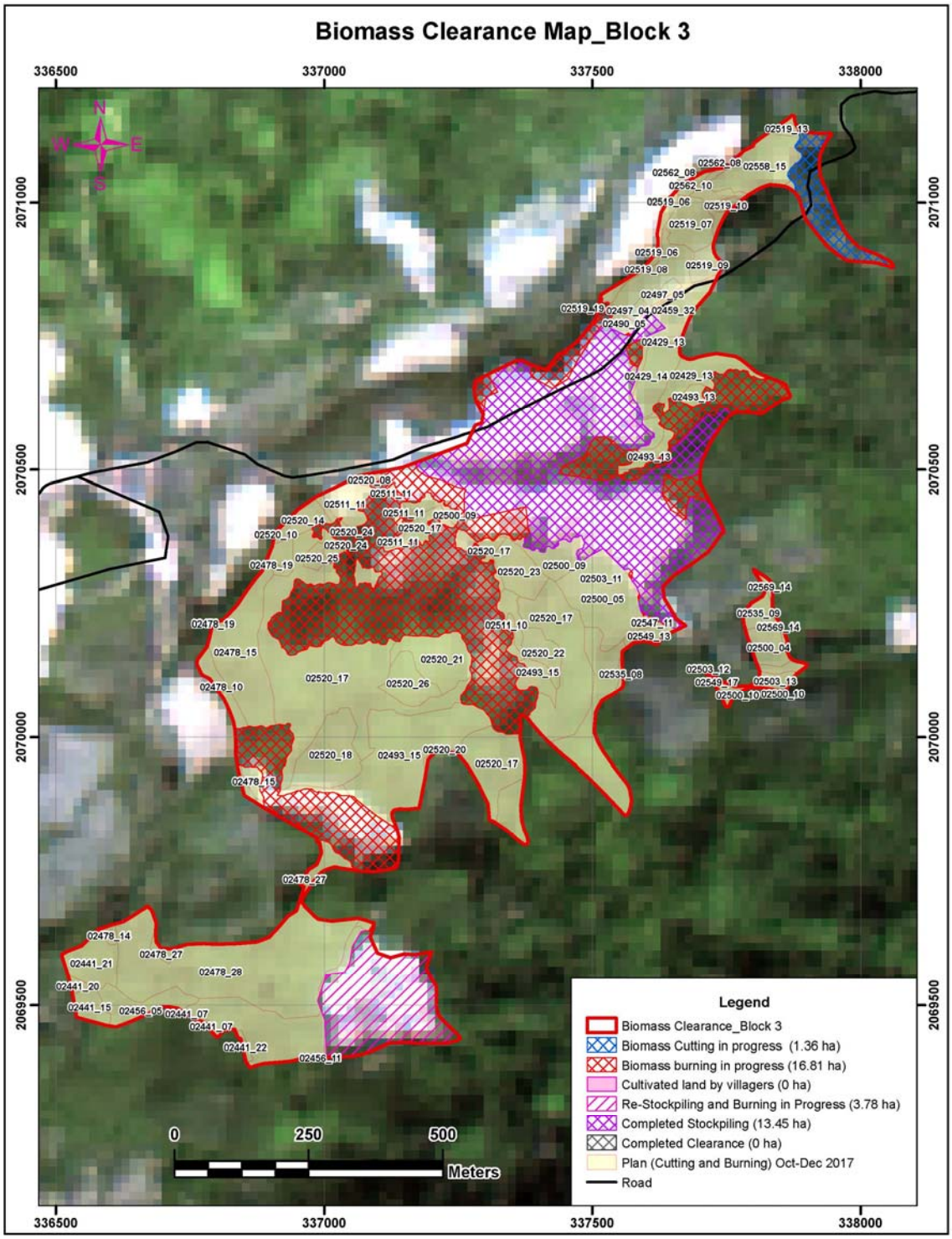


FIGURE 6-5 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 4

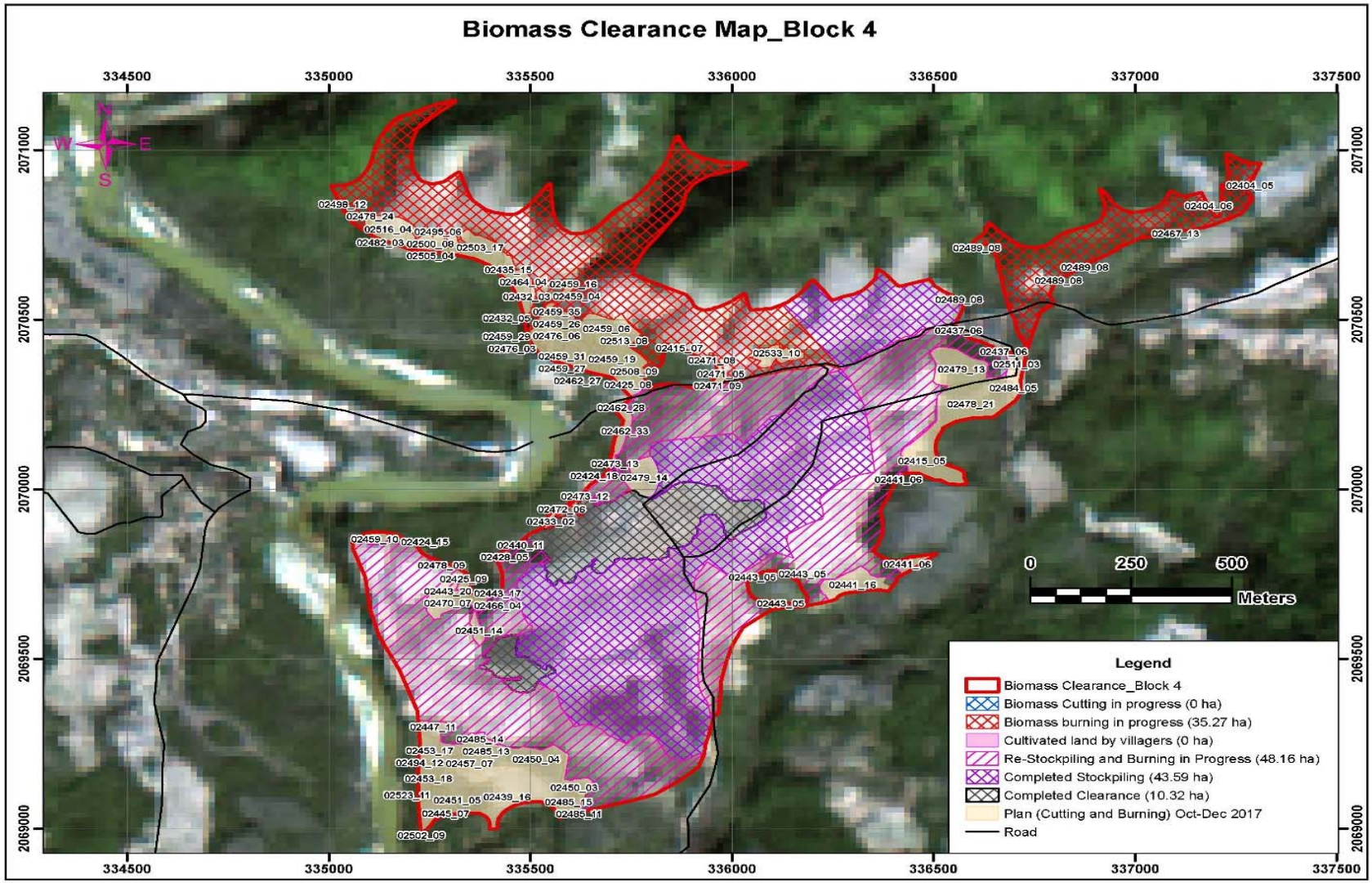


FIGURE 6-6 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 5

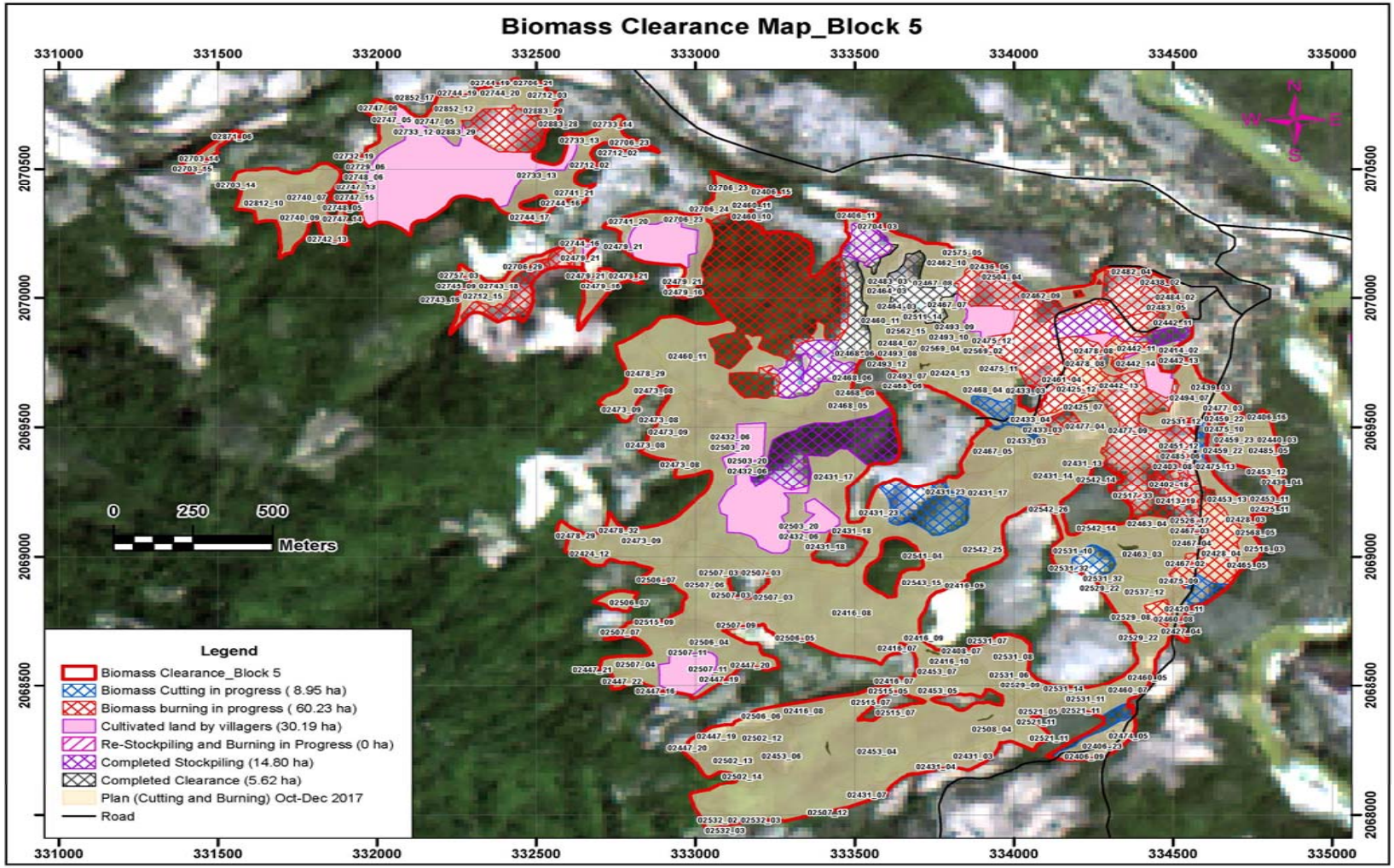


FIGURE 6-7 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 6

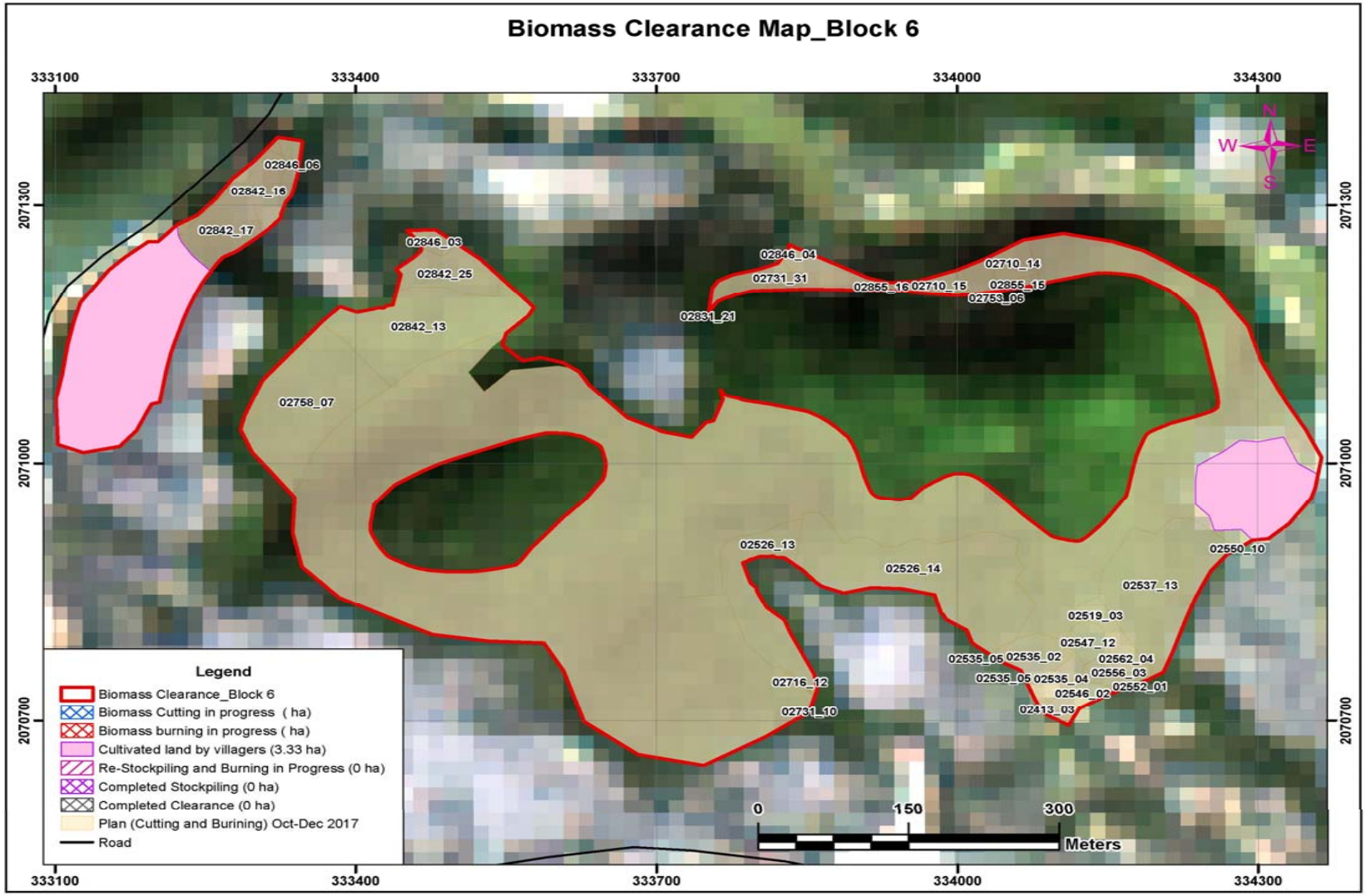


FIGURE 6-8 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 7

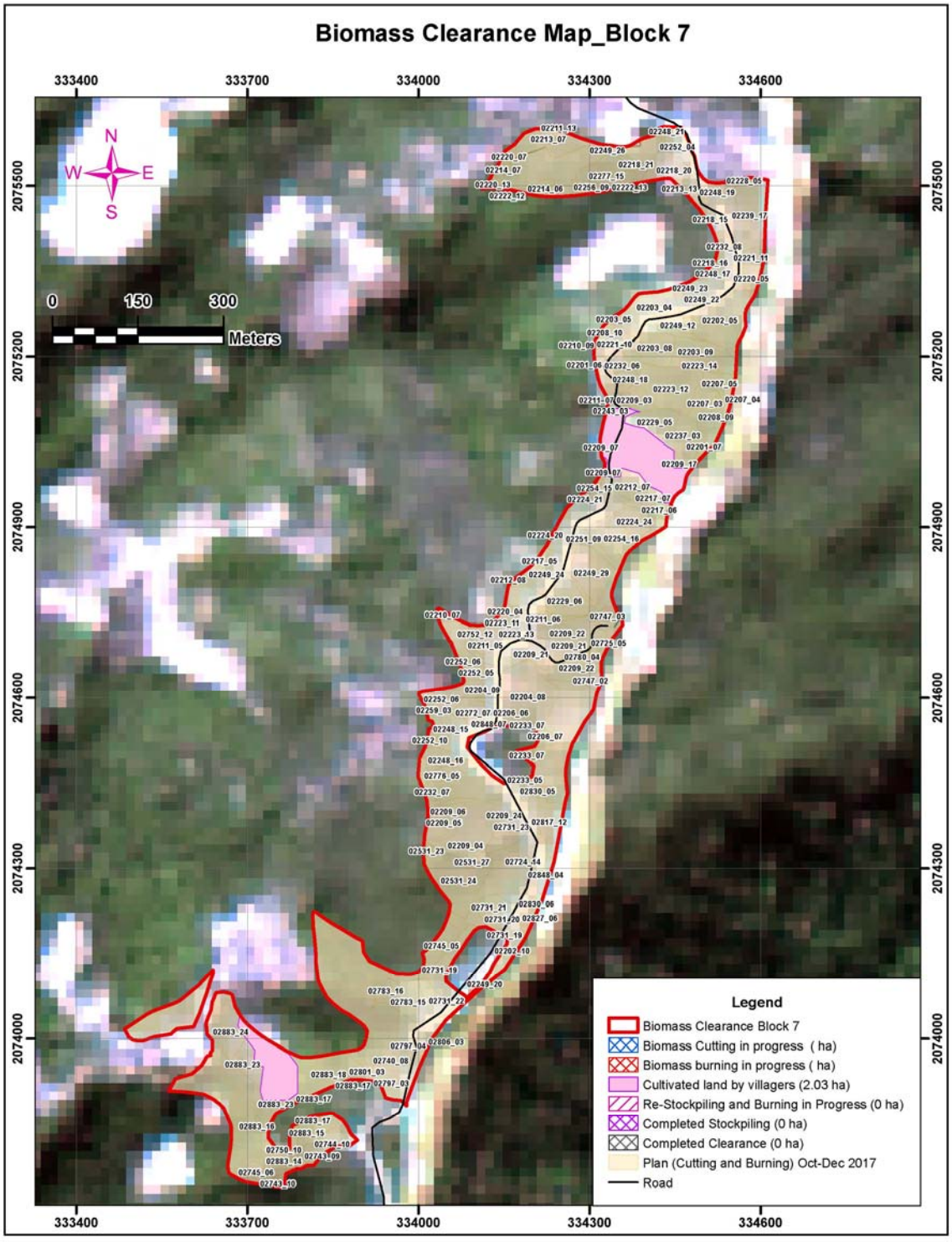


FIGURE 6-9 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 8

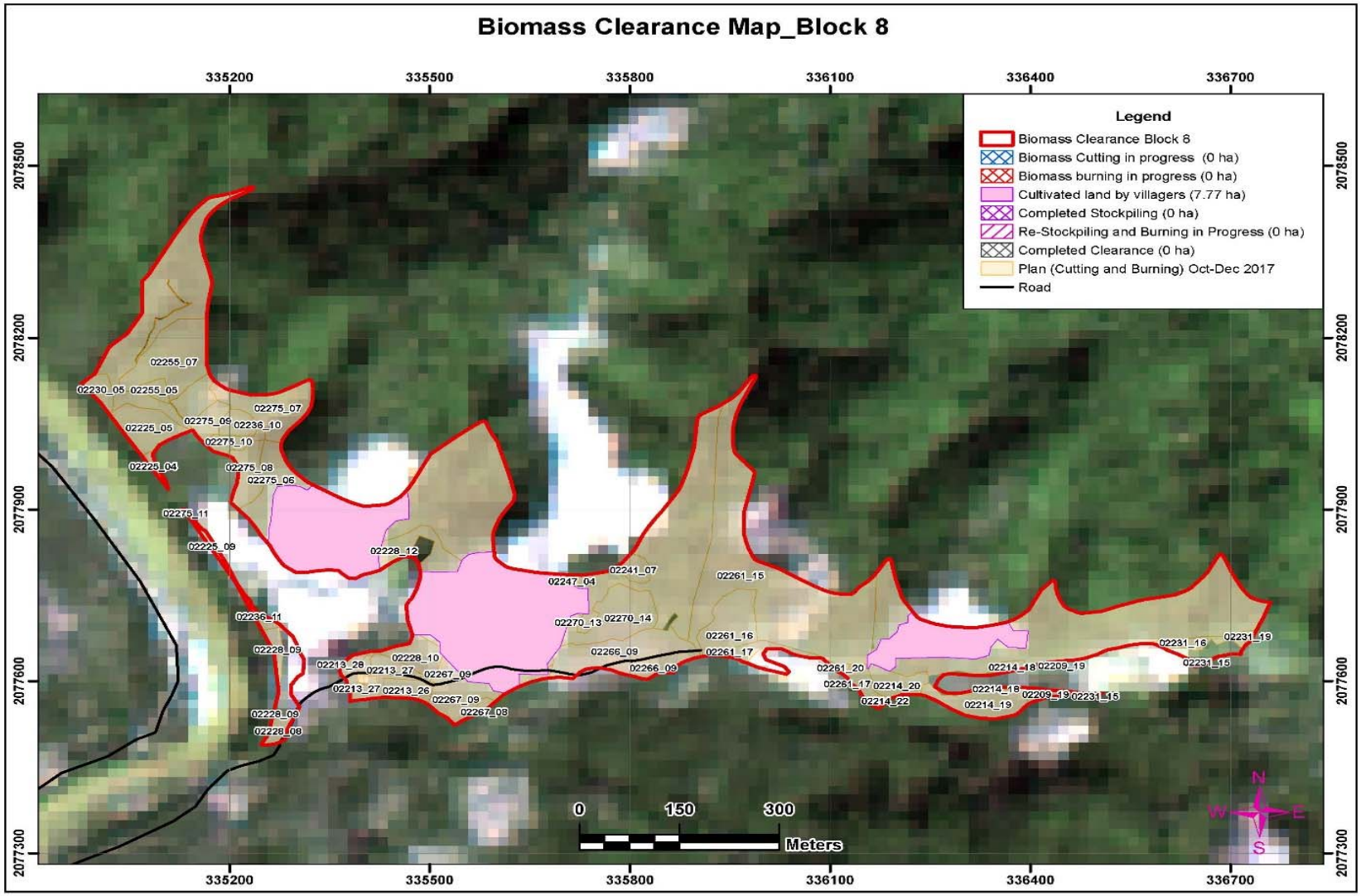


FIGURE 6-10 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 9

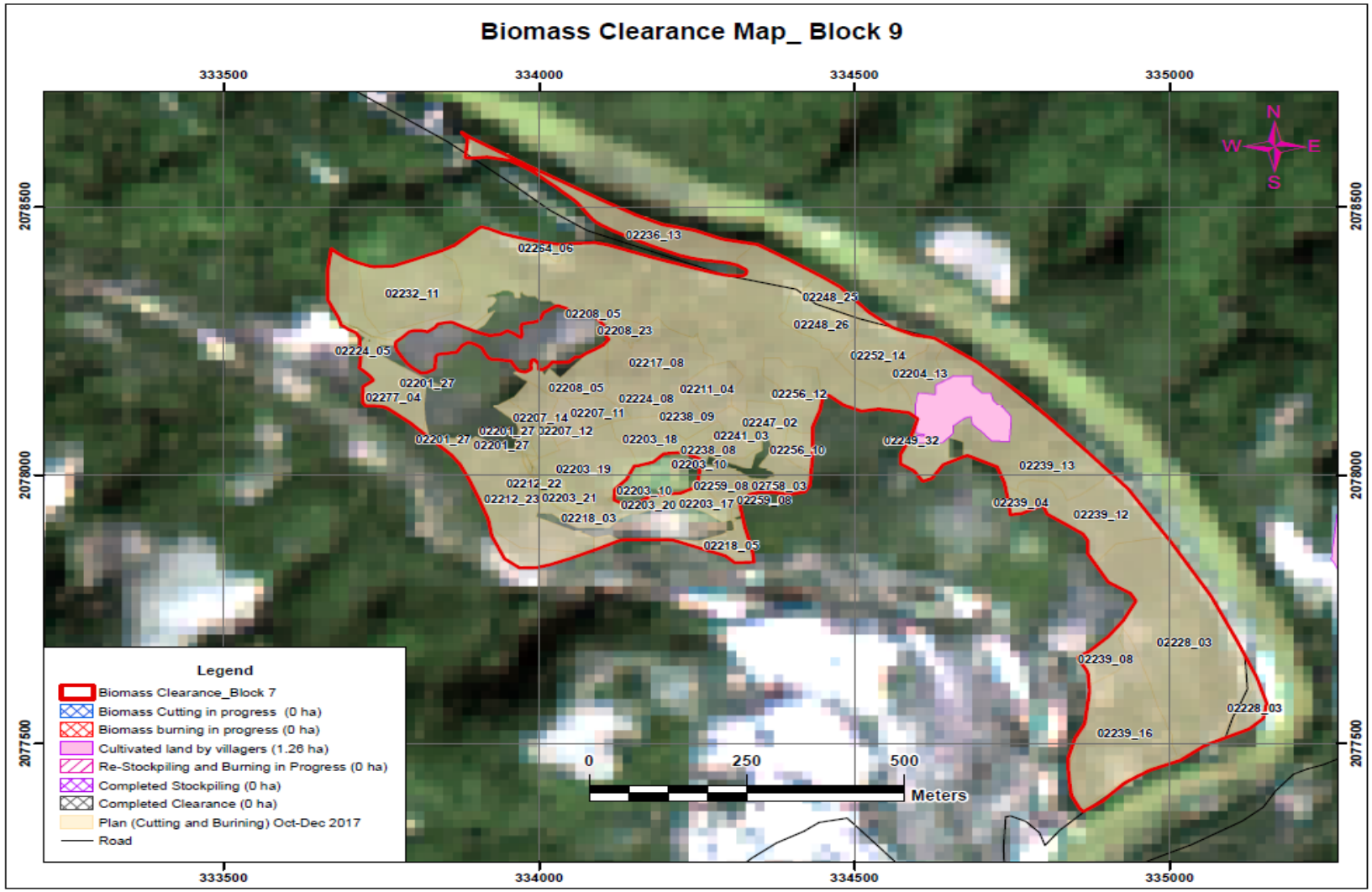


FIGURE 6-11 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 10

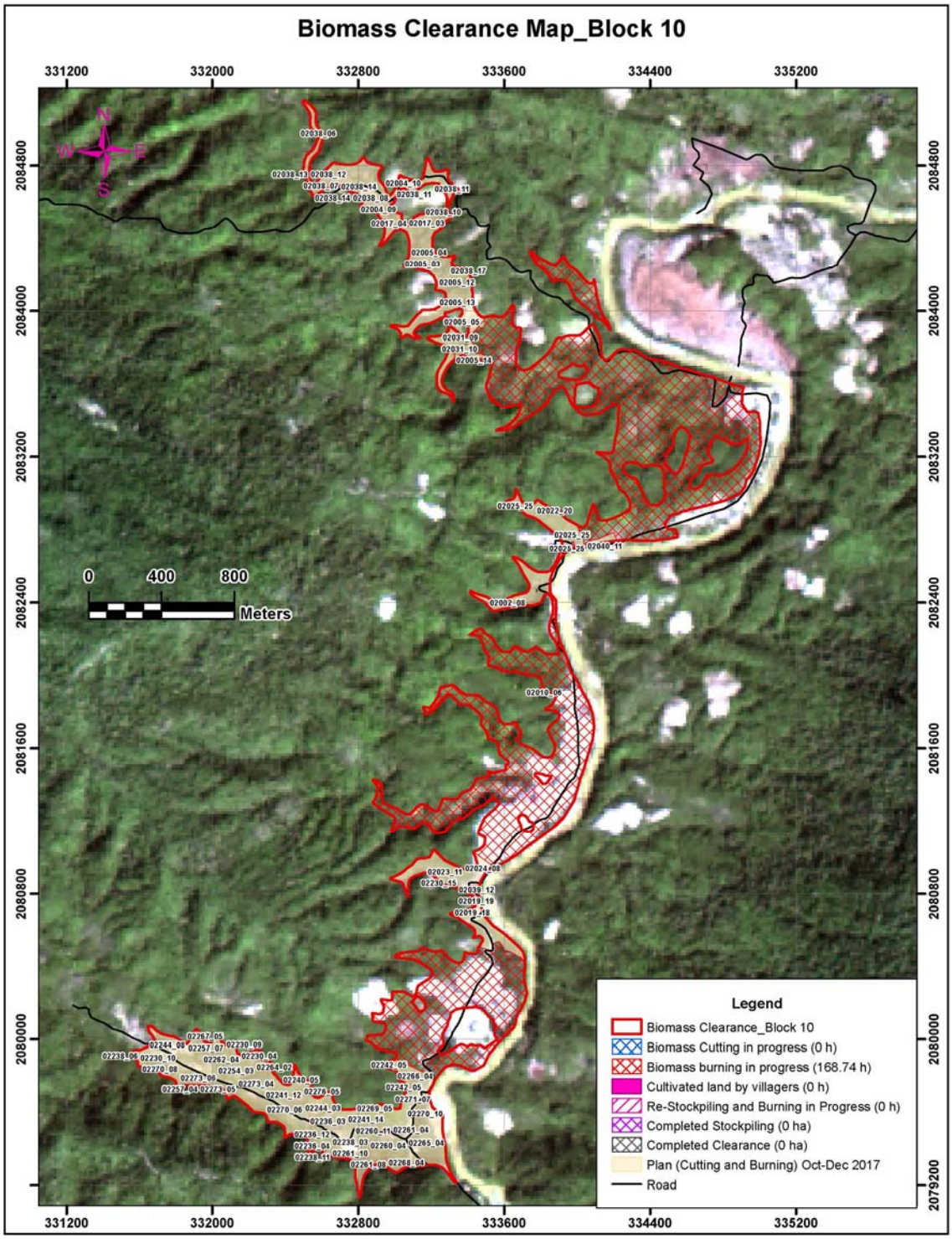


FIGURE 6-12 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 11

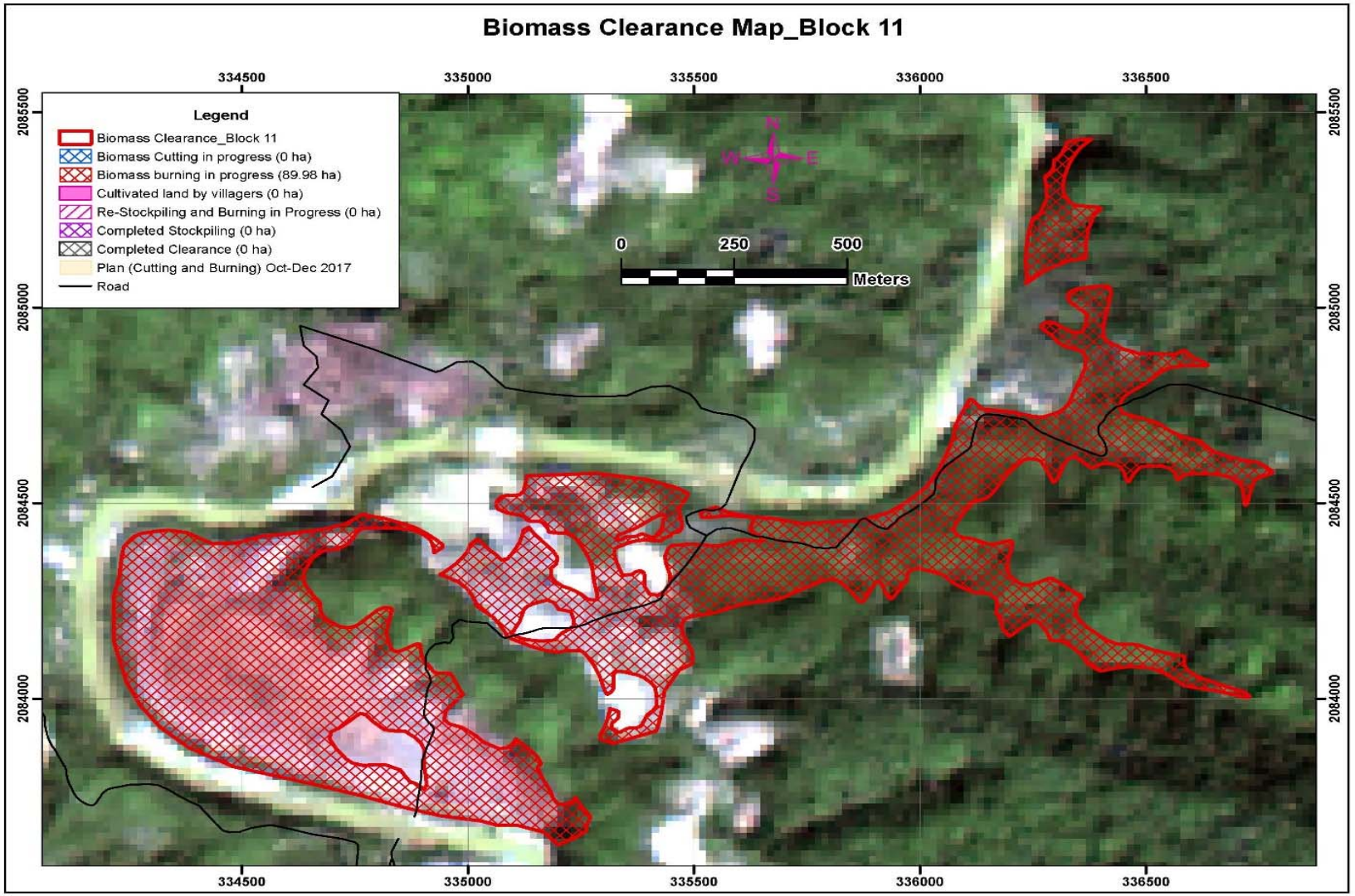


FIGURE 6-13 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 12

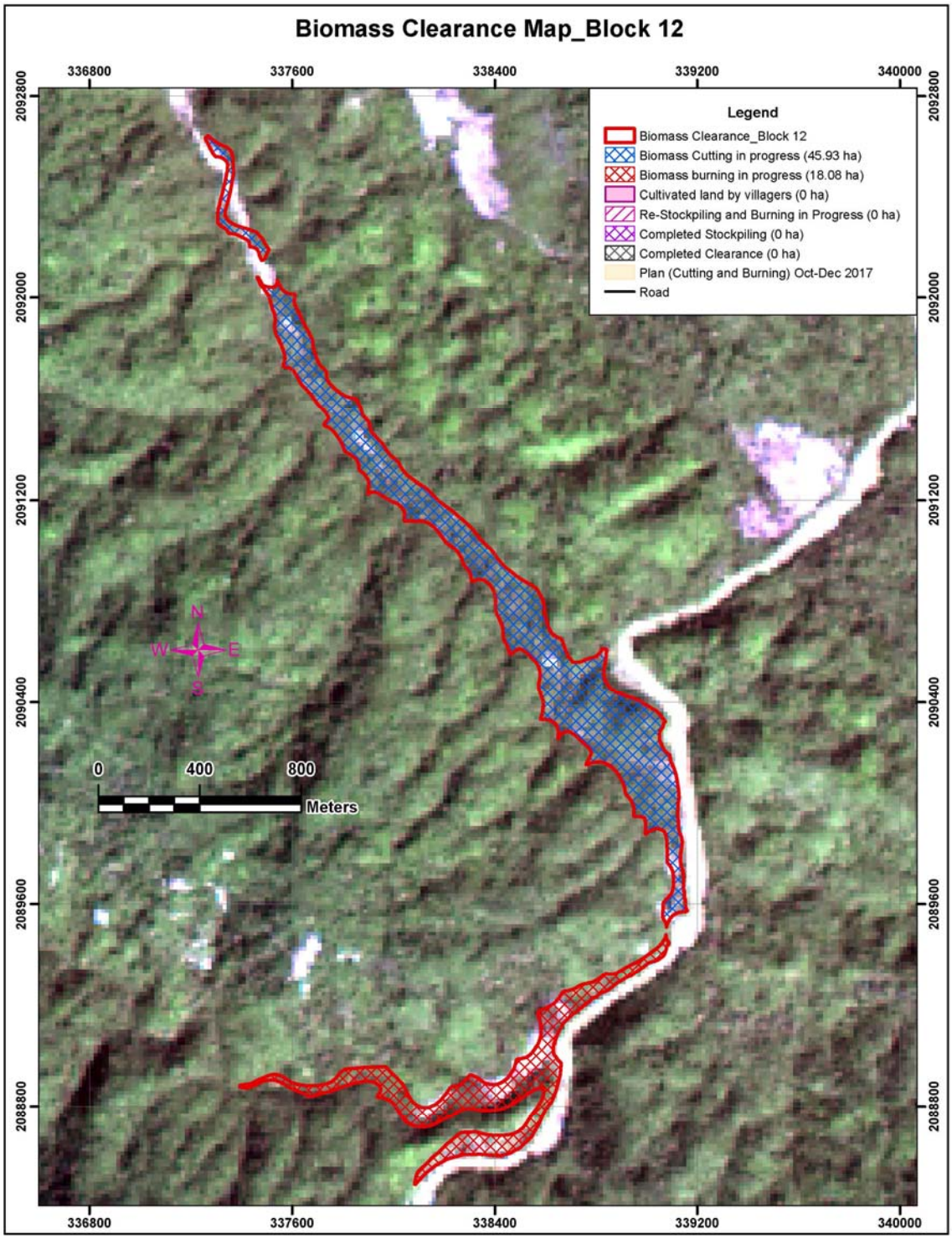


FIGURE 6-14 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 13

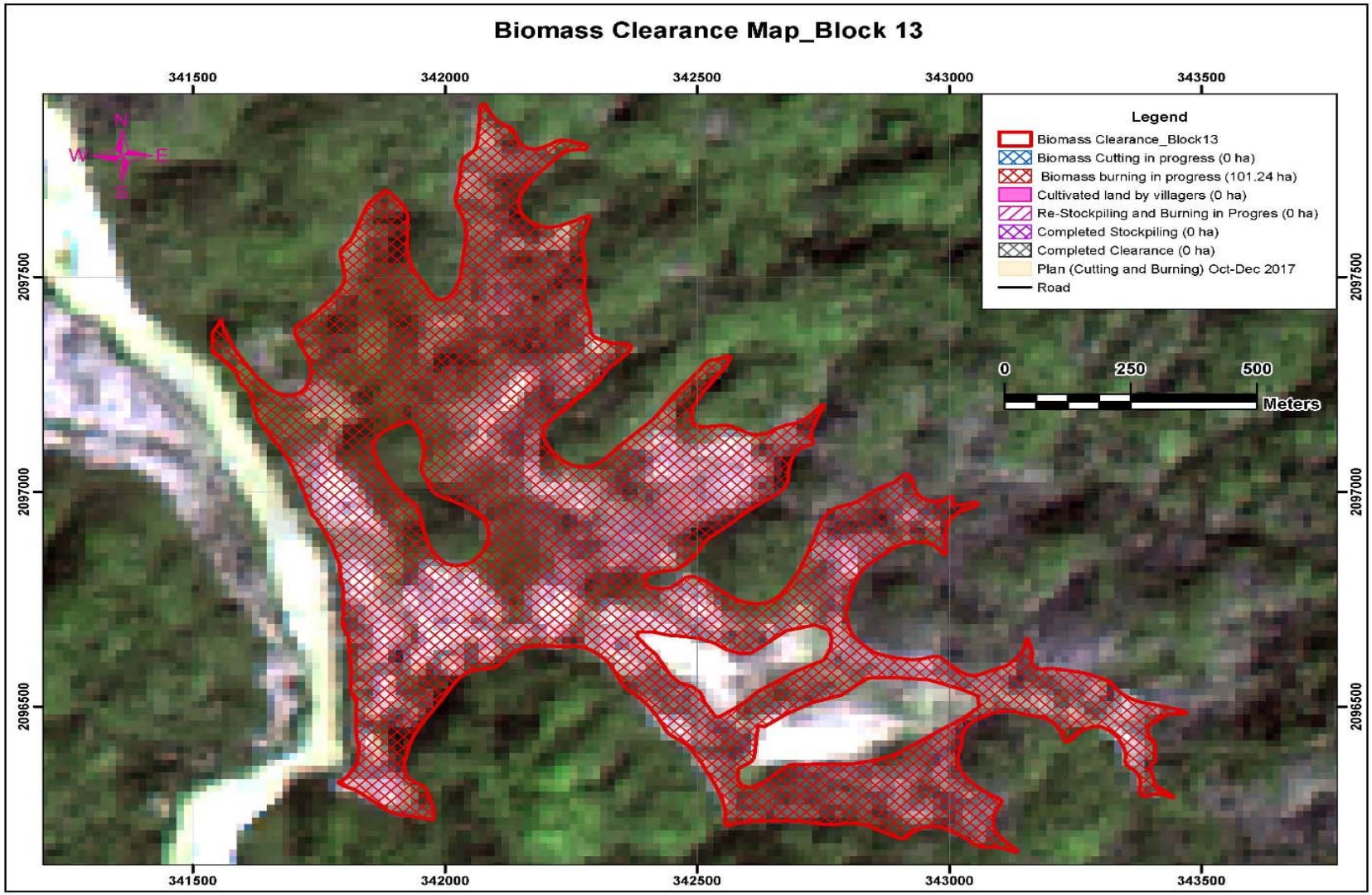


FIGURE 6-15 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 14

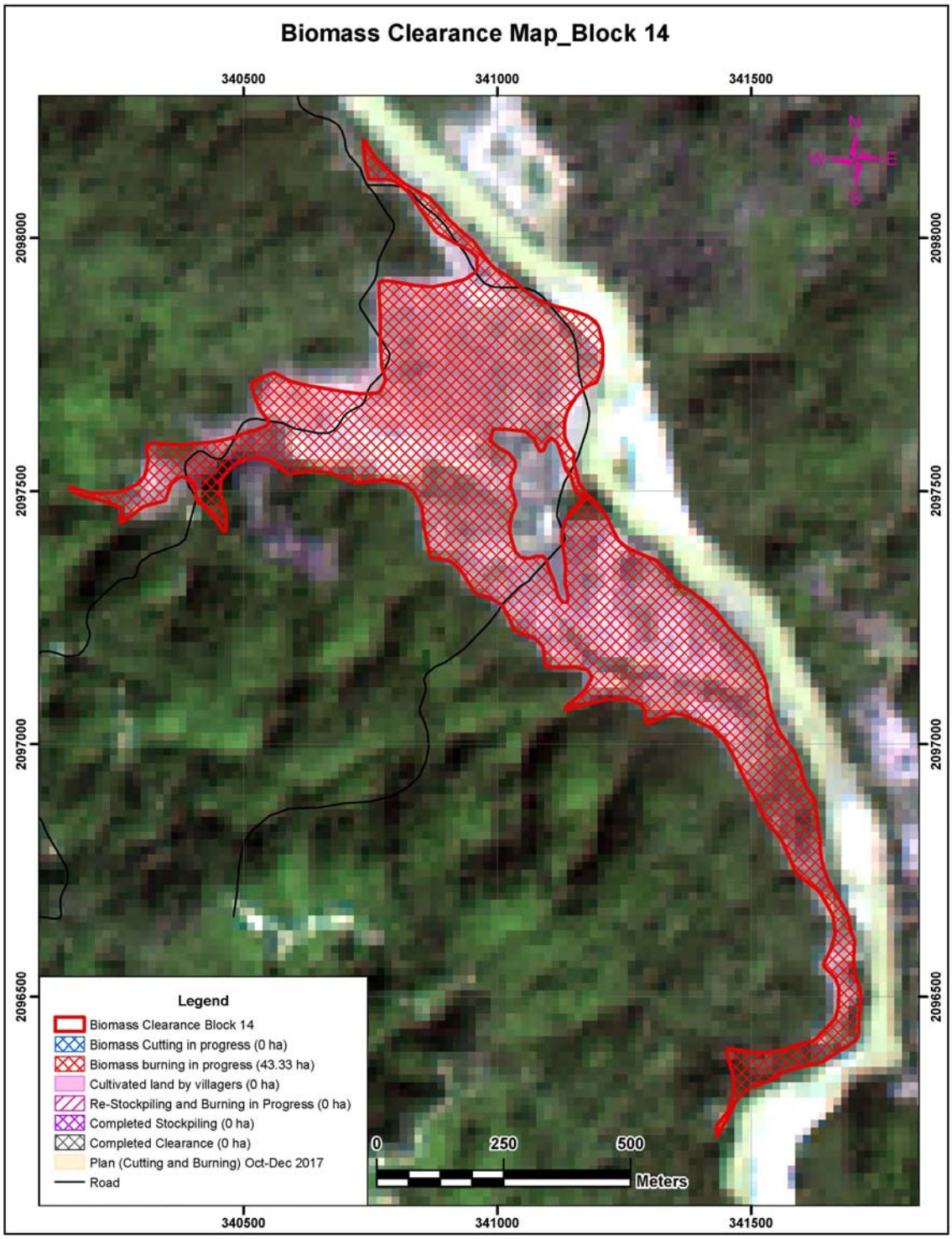


FIGURE 6-16 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 15-1

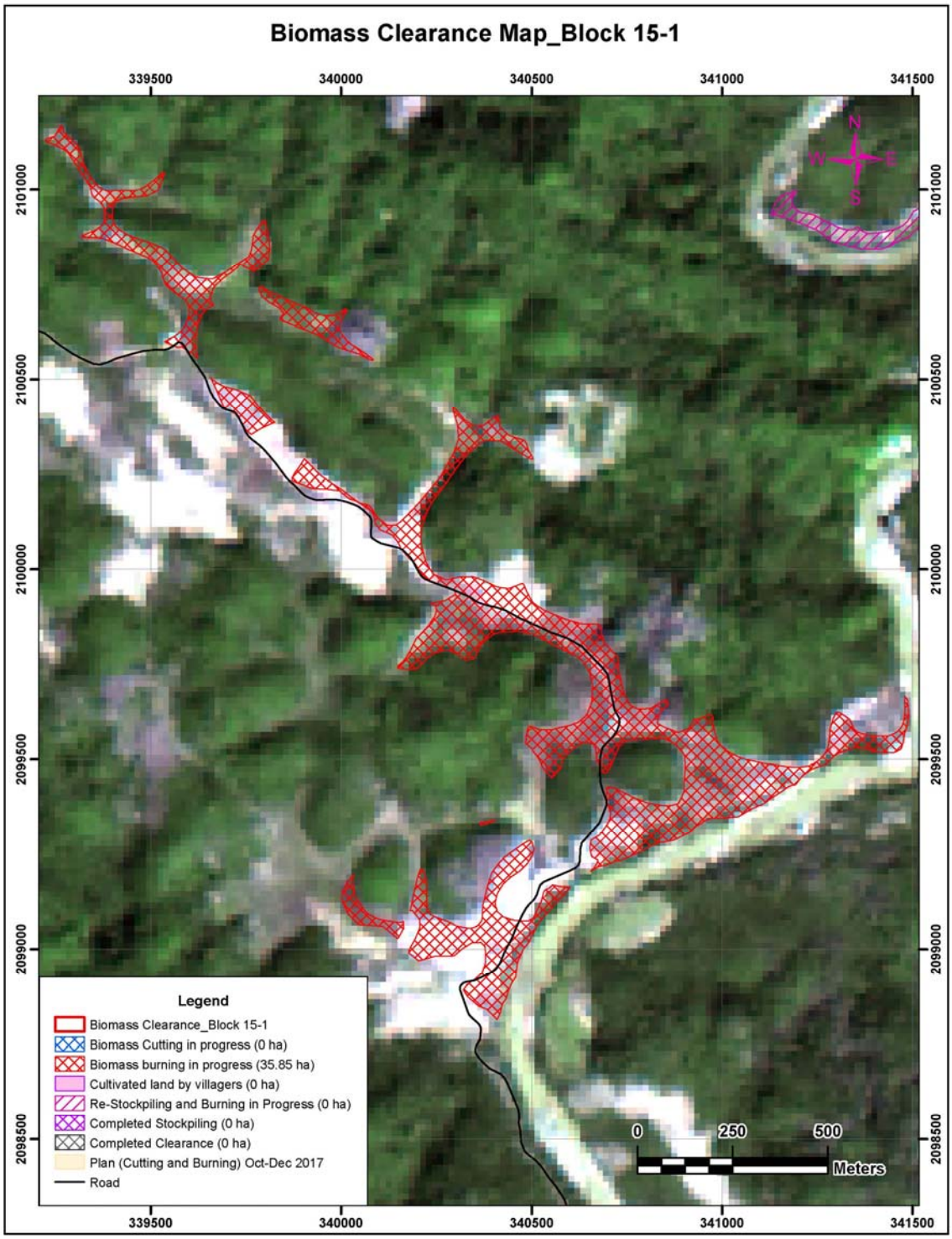


FIGURE 6-17 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 15-2

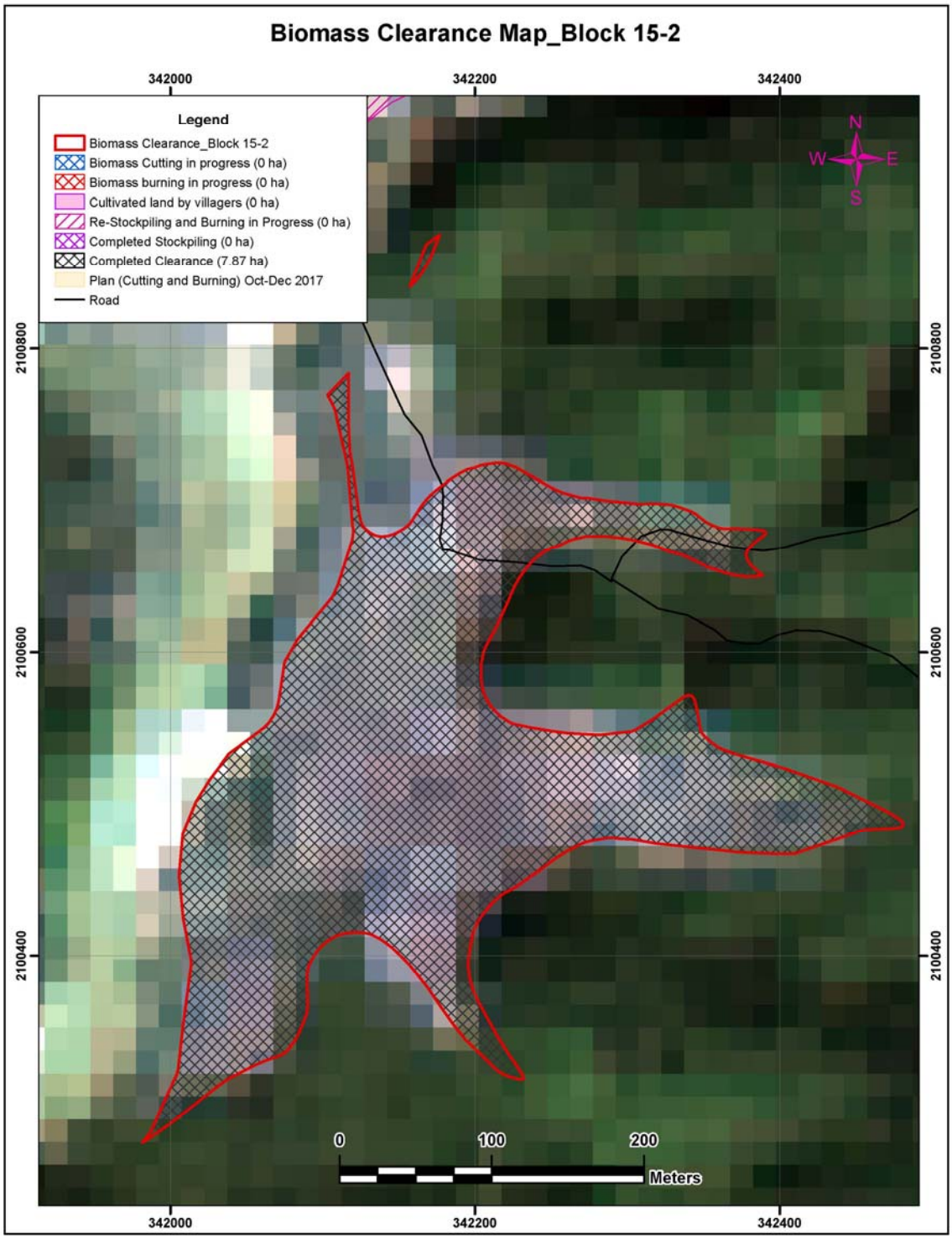


FIGURE 6-18 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 16

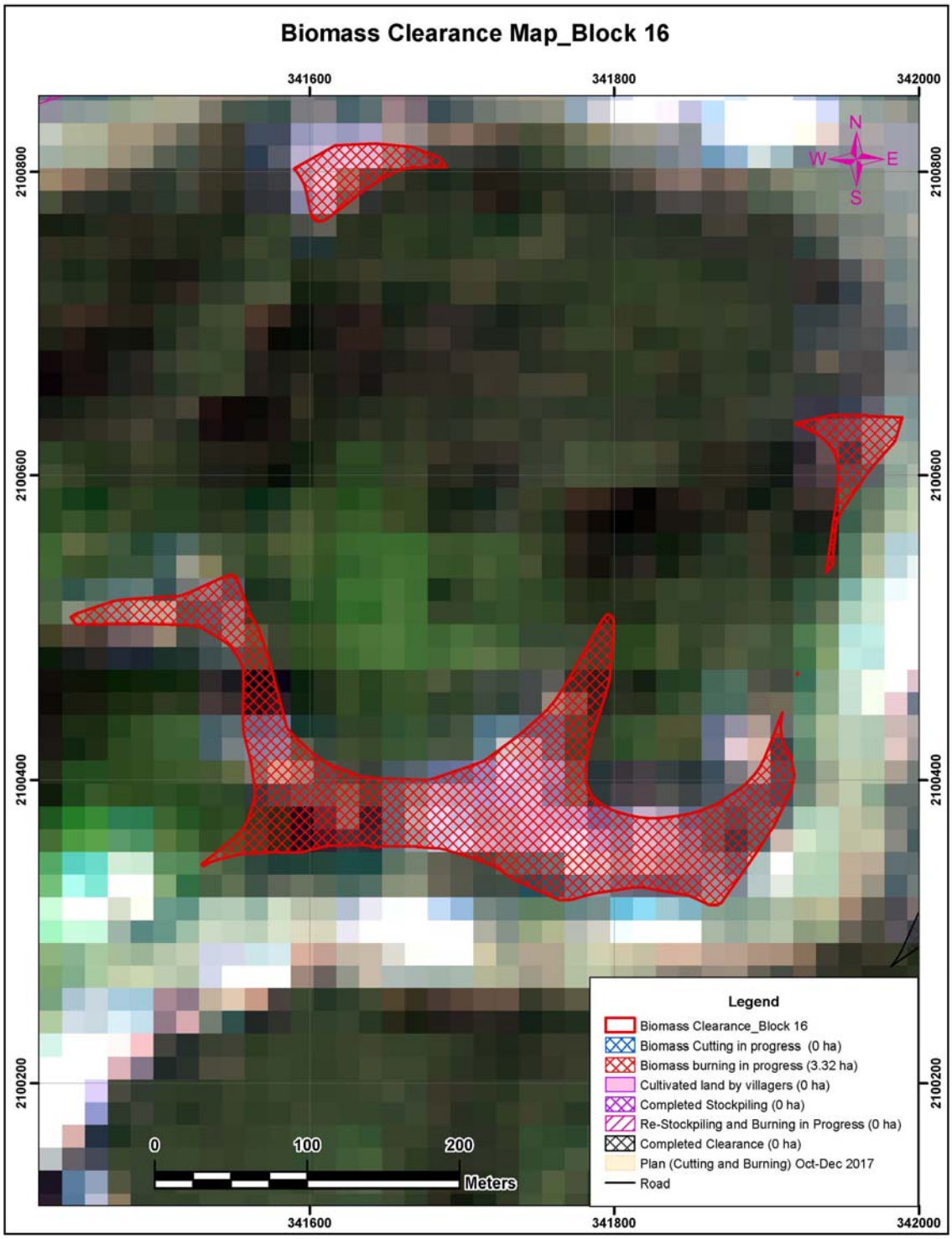


FIGURE 6-19 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 17

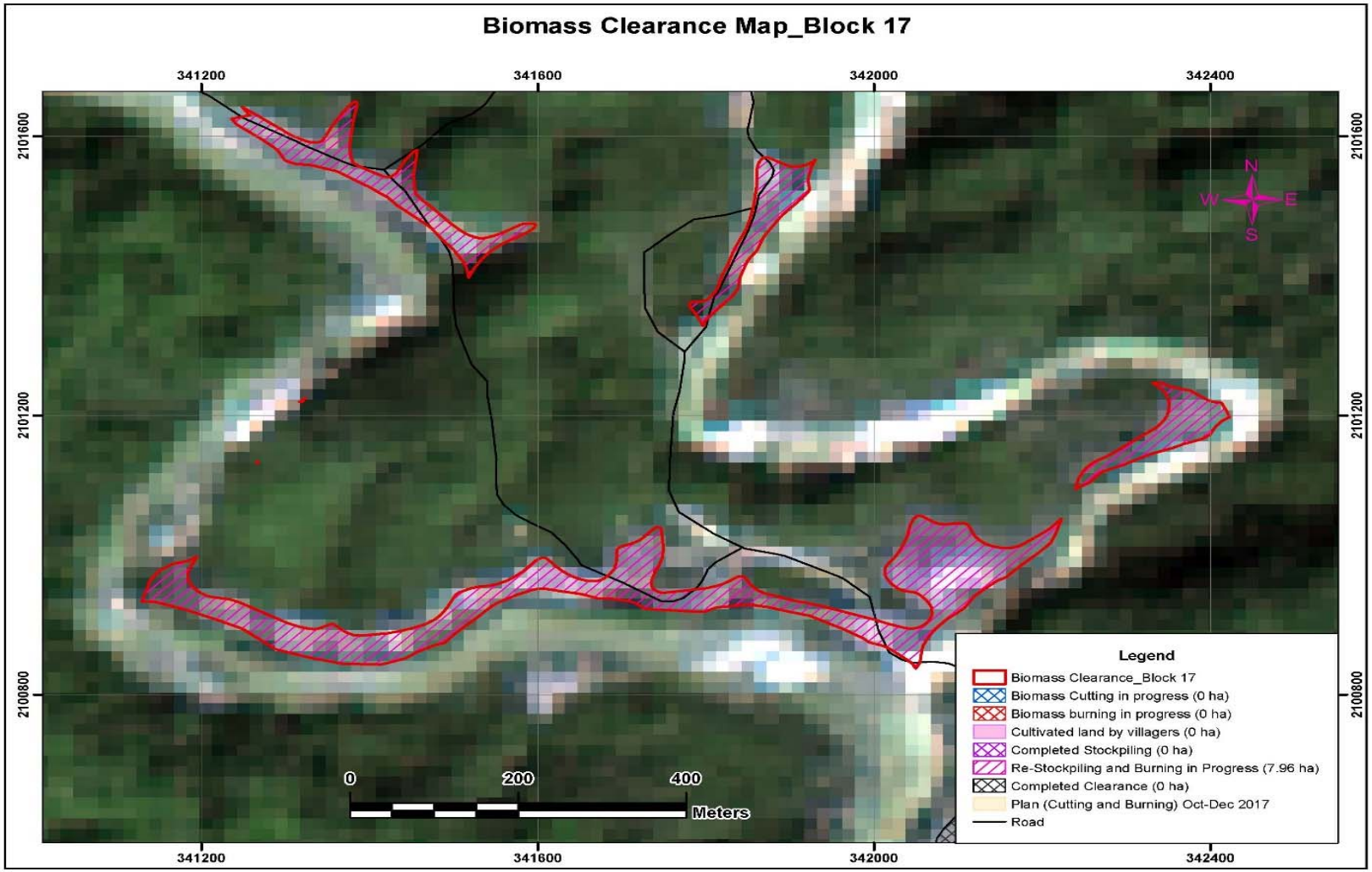
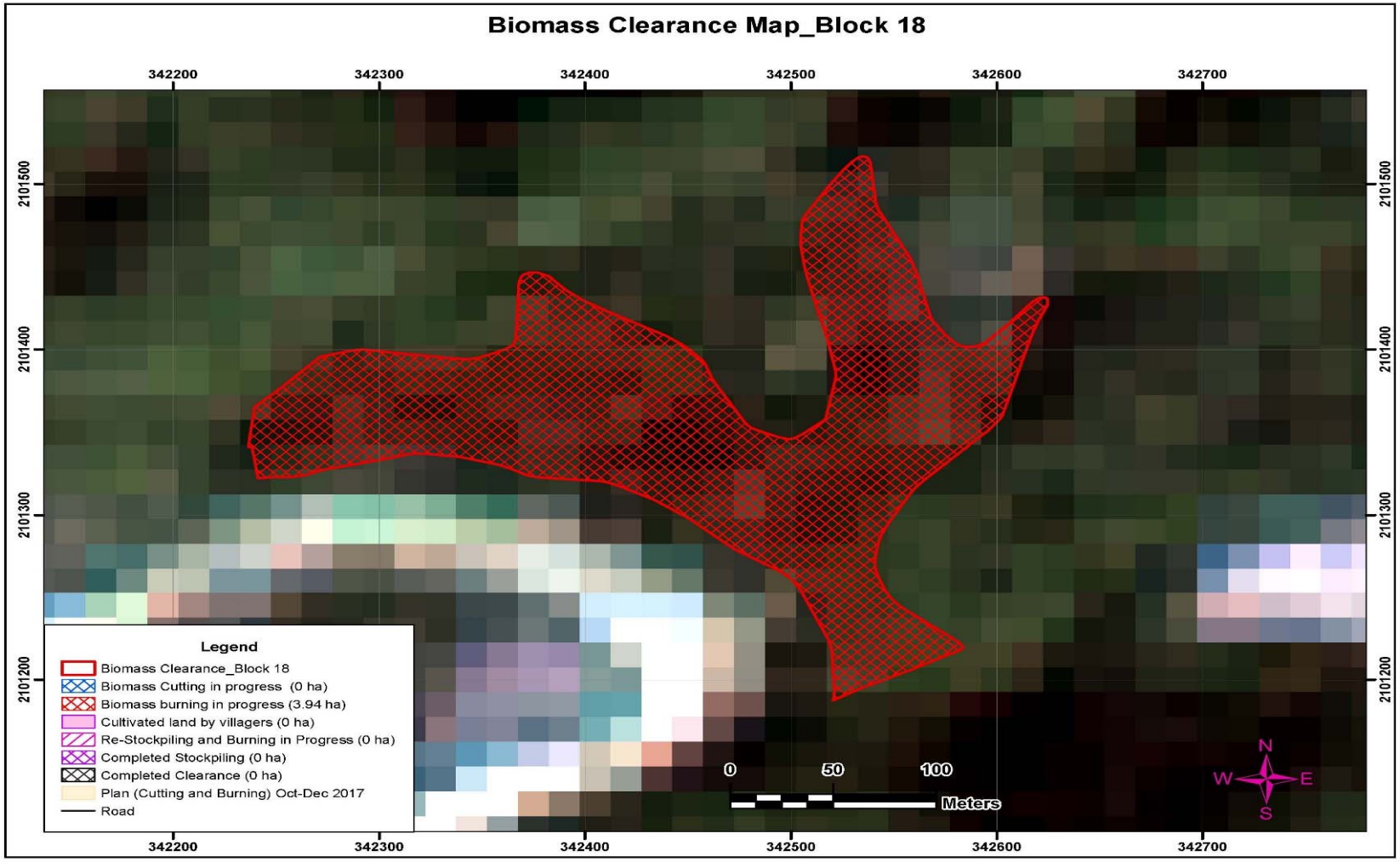


FIGURE 6-20 BIOMASS CLEARANCE PROGRESS MAP OF BLOCK 18



7 FISHERY MONITORING PROGRAMME

The fishery monitoring programme is progressing, and a database has been developed to support the future fish management program as part of the in Nam Ngiep 1 Watershed Management Plan. Two types of surveys were conducted in the second quarter 2017 including daily fish catch logbook monitoring and gillnet survey. The gathered information is being entered into the database.

The overall progress of fish monitoring programme is illustrated in **The overall** progress of fish monitoring programme is illustrated in Error! Not a valid bookmark self-reference. below.

Figure 7-1 below. There were some delays in the planned progress of the fish catch monitoring programme; however, this has not affected the integrity of the monitoring programme.

The overall progress of fish monitoring programme is illustrated in Error! Not a valid bookmark self-reference. below.

FIGURE 7-1: GANTT CHART OF FISH MONITORING PROGRAMME AS OF 31 JUNE 2017

(a) S-Curve of fish catch monitoring program

	Task List / Steps of work		Weight (%)	YEAR 2017												% S-Curve
				Q1			Q2			Q3			Q4			
				01	02	03	04	05	06	07	08	09	10	11	12	
1	**Daily catch logbook and Verification Survey**	Planed	-													100
		Actual	-													97
1.1	Daily catch logbook data collection on 108 HHs in 25 villages	Planed	24	2	2	2	2	2	2	2	2	2	2	2	2	94
		Actual	12.0	1.5	2.0	3.0	2.0	1.5	2.0							91
1.2	Daily catch logbook verification survey for Q2 2016 to Q1 2017 on 144 HHs	Planed	4	2		2										88
		Actual	4	2		2										85
1.3	GPS for Fishing location cover 25 villages	Planed	8				2	2	2	2						82
		Actual	-													79
1.4	Make the posters for fish species and fishing gear composition along Nam Ngiep River	Planed	2											2		76
		Actual	-													74
2	**Species Veification Survey**	Planed	-													71
		Actual	-													68
2.1	Survey design, interview form design, test and development	Planed	2		2											65
		Actual	2						2							62
2.2	Data collection and validation on 108 HHs	Planed	8		2	3	3									59
		Actual	6						6							56
3	**Fish Migration and Spawning Survey**															53
																50
3.1	Survey design, interview form design, test and development	Planed	2	2												47
		Actual	2	2												44
3.2	Data collection and validation on 88 experience fishers	Planed	12	6	6											41
		Actual	12	2	7	3										38
4	**Data management and report**															35
																32
4.1	Data input to database system	Planed	24	2	2	2	2	2	2	2	2	2	2	2	2	29
		Actual	11.5	1.0	2.0	2.0	1.5	3.0	2.0							26
4.2	Annual Data analysis and draft annual report for 2016-2017	Planed	5							5						24
		Actual	2						2							21
4.3	Disemination/presentation the report for 2016-2017	Planed	5							5						18
		Actual	-													15
4.4	Final Annual Report for 2016-2017	Planed	4								4					12
		Actual	-													9
	Total	Planed	100													6
		Actual	52													3
	Planned Progress	monthly		14	14	9	9	6	6	16	8	4	4	6	4	
		Cumulative		14	28	37	46	52	58	74	82	86	90	96	100	
	Actual Progress	monthly		9	11	10	4	5	14	-	-	-	-	-	-	
		Cumulative		9	20	30	33	38	52	52	52	52	52	52	52	

The blue line and yellow highlights represent the planned activity, and the red line and green highlight represent the actual progress

(b) S-Curve gillent sampling

	Task List / Steps of work		Weight (%)	YEAR 2017												% S-Curve
				Q1			Q2			Q3			Q4			
				01	02	03	04	05	06	07	08	09	10	11	12	
1	Conduct quarterly gillnet survey	Planed	52	-	3	5	5		10	3	10	3		10	3	100
		Actual	13	-	2	-	3	8	-	-		-		-	-	95
2	Survey report	Planed	30	-				6		6		6	-	6	6	90
		Actual	2	-	-	-	-		2	-	-		-	-	-	85
3	Data analysis	Planed	12	-	-		-	-		-	-		-		12	80
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	75
4	Final report	Planed	12	-	-	-	-	-	-	-	-	-	-	-	12	70
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	65
5		Planed	-	-	-	-	-	-	-	-	-	-	-	-		60
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	55
6		Planed	-	-	-	-	-	-	-	-	-	-	-	-		50
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	45
7		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	40
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	35
8		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	30
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	25
9		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	20
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	15
	Total	Planed	106													10
		Actual	15													5
	Planned Progress	monthly		-	3	5	5	6	10	9	10	9	-	16	33	
		Cumulative		-	3	8	13	19	29	38	48	57	57	73	106	
	Actual Progress	monthly		-	2	-	3	8	2	-	-	-	-	-	-	
		Cumulative		-	2	2	5	13	15	15	15	15	15	15	15	

*The blue line and yellow highlights represent the planned activity, and the red line and green highlight represent the actual progress

Activities in the Second Quarter of 2017	Results
Daily Catch Logbook and Verification Survey	In April 2017: - Completed the daily catch logbook survey in 108 target households and 2,676 forms were used in the survey. - The daily household catch on average for Nam Ngiep in March 2017 is 2.3 kg/household/day. - The estimated total catch for Nam Ngiep in March 2017 is approximately 49,300 kg. In May 2017: • Completed the daily catch logbook survey in 108 target households (3,014 forms were used in the survey). • The daily household catch on average for Nam Ngiep in April 2017 is 2.4 kg/household/day. • The estimated total catch for Nam Ngiep in April 2017 is approximately 64,300 kg. In June 2017: • Completed the daily fish catch logbook survey in 108 target households and. 2,852 forms were used in the survey. • The daily household fish catch on average for Nam Ngiep in May 2017 is 2.2 kg/household/day. • The estimated total fish catch for Nam Ngiep in May 2017 is approximately 59,400 kg.
Household Catch Assessment Survey	• The report was prepared by Fishery Consultant and submitted to NNP1 EMO in April 2017.
Village Community Interview	• On progress for data analysis and reporting by Fishery Consultant.
Gillnet Sampling Survey	• Conducted trial data collection in April 2017 at Thaheua and Nampa Villages included some water quality measurement, setting and retrieving gillnet and fish size measurement. • Completed data collection at 7 stations in May 2017. • The report is being prepared by Fishery Consultant in June 2017.

Activities in the Second Quarter of 2017	Results
Annual Fishery Monitoring Report	• The annual fishery monitoring report is being prepared by Fishery Consultant. This report will be the second annual fisheries report. • The reports provide an overview of the current state of the fisheries in the Nam Ngiep basin, covering all fisheries data collected from July 2015 until the end of May 2017 with some supporting data collected during 2014. It also takes into account linkages with other monitoring by NNP1, especially that implemented by EMO (hydrology and water quality) as well as the socio-economic monitoring. • The report contains the followings: a) the overall method and scope of data; b) migration and spawning information; c) fishery status in terms of other aquatic animals, fishery habitats, dependence on fisheries, fishing households, boat-gear use, effort, household catch, estimated catch, disposal, species importance, fish populations structure; and c) discussion and interpretation of the fish catch data in terms of importance for livelihoods (income, food source) and spatial and temporal patterns in terms of fishing locations, fish catch, and fish species. • The report will be available in Q3 2017.

8 OTHER SUPPORT PROGRAMMES

8.1 115 kV Transmission Line IEE Due Diligence Assessment

In late May 2017, the EDL visited NNP1PC ESD to discuss the alignment of the transmission line, and EMO explained to the EDL on the requirement for IEE revision.

The revised IEE was drafted by Dongfang Company (contractor of the 115kV TL) and sent for EDL, and it was shared with NNP1PC on 21 June 2017. The IEE has to be approved by PoNRE after EDL's review. NNP1PC was informed by EDL that the construction will be started on 01 October 2017, therefore, EMO will review the received draft IEE as part of DDA in the next quarter.

8.2 Independent Monitoring Agency (IMA) Mission

There was no external monitoring of the IMA during the reported period.

8.3 Environmental Protection Fund (EPF)

NNP1PC EMO completed a review of the revised EPF proposals prepared by Xaysomboun and Xieng Khuang provinces on 23 March 2017. After long lag, EPF Team confirmed that the proposals of Xaysomboun and Xieng Khuang Province have been signed by Department of Forestry (DOF) of Ministry of Agriculture and Forestry (MAF) and are being further processed for approval by EPF Committee.

Bolikhamxay Team (sub-project implementation team) submitted the February 2017 progress report of sub-project implementation work to EPF. EPF Bolikhamaxay Team has shared their monthly progress reports with NNP1 EMO regularly since then. NNP1 EMO also provided comments and requested to have discussion with EPF team on the overall implementation work from April June 2017 especially on the detail info / documentation on the progress report, to review the effectiveness of check point into Houay Ngoua Area, as well as to have aerial photographs of the area for the spatial analysis and further discussion.

Bolikhamxay Team (sub-project implementation team) have considered the comments from NNP1PC EMO on the detail info / documentation on the progress report and provided clarification notes on relevant topics such as detailed activities and updated GIS maps of the Houay Ngoua PPA boundary and village land use of the 5 villages within the PPA. The information will be updated in the next Monthly Progress Report and third Quarterly Report.

8.4 BIODIVERSITY ADVISORY COMMITTEE

BAC submitted the 5th BAC mission report in the first week of February 2016. NNP1PC EMO provided comments to 5th BAC mission report in the second week of March 2017. BAC Team Leader further revised the report in the last week of March 2017. Second feedback was provided by NNP1 EMO on 28 April 2017. The final version was concluded on 22 May 2017. The report was shared with ADB, IAP, and LTA on 25 May 2017.

APPENDICES

APPENDIX 1: STATUS OF SS-ESMMPS AND WORKING DRAWINGS OF THE CAMPS' WASTE WATER TREATMENT SYSTEMS REVIEW AND APPROVAL DURING APRIL TO JUNE, 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 HM's Sub-Contractor Labour Camp #2	Lilama10 Joint Stock Company (LILAMA)	No objection with no comments on 05 June 2017 (4th Revision)	Installing the camp for workers	On-going
2	Re-regulating dam	SS-ESMMP for Installation of Stay Corn, for Channel Liner and Hatch Cover for Re-regulation Power Station	Lilama10 Joint Stock Company LILAMA)	No objection with no comments on 23 June 2017 (2nd Revision)	Installation of stay corn, for channel liner and hatch cover for Re-regulation power station	On-going
3	Re-regulating dam	SS-ESMMP for Installation Work of Steel Structure for 115 kV substation of Re-regulation Dam	Lilama10 Joint Stock Company LILAMA)	No objection with comments on 07 April 2017 (1st Revision)	Installation Work of Steel Structure for 115 kV substation of Re-regulation Dam	On-going
4	Re-regulating dam	DWP & SS-ESMMP for Installation Work of 630 kVA Transformer for Re-regulation Power Station	Lilama10 Joint Stock Company LILAMA)	No objection with comments on 16 May 2017 (1st Revision) No further comments on 12 June 2017 (2nd Revision)	Installation Work of 630 kVA Transformer for Re-regulation Power Station	On-going
5	HM main camp & office	Working Drawing for WWTS improvement	Hitachi Mitsubishi Hydro	No further comment 12 May 2017 (2nd Revision)	Camp wastewater treatment	Completed
6	Main Dam	SS-ESMMP for Installation Work of Embedded Parts of 230 kV Substation for Main Power Station	Hitachi Mitsubishi Hydro	No further comment on 03 June 2017 (1st revision)	Installation Work of Embedded Parts of 230 kV Substation for Main Power Station	On-going

7	HM labour Camp	SS-ESMMP for HM's Labor Camp #1 (Zhefu)	ZHEJIANG FUCHANJIANG HYDROPOWER EQUIPMENT CO., LTD	No objection with comments on 12 June 2017 (4th Revision)	Contractor's construction labour camp	On-going
8	Main Dam	SS-ESMMP for Installation Work of Embedded Parts of Generator for Main Powerhouse Station	ZHEJIANG FUCHANJIANG HYDROPOWER EQUIPMENT CO., LTD	No objection with comments on 12 June 2017 (4th Revision)	Installation Work of Embedded Parts of Generator for Main Powerhouse Station	On-going
9	HM labour Camp	Working drawing of WWTS at ZHEFU Camp	ZHEJIANG FUCHANJIANG HYDROPOWER EQUIPMENT CO., LTD	No objection with comments on 16 June 2017 (1st revision)	WWTS	On-going
10	Main Dam	SS-ESMMP for Core Assembly	Lilama10 Joint Stock Company LILAMA)	No further comments on 29 June 2017 (1st revision)	Installation of Core Assembly	On-going
Civil Works Contractor (Obayashi Corporation)						
11	Main Dam	SS-ESMMP for Supplemental Information for Curtain Grouting Works at the Main Dam	Kenber Subcontractor	No further comments on 8 May 2017 (8th Revision)	Grouting Works at the Main Dam	On-going
12	Main Dam	SS-ESMMP for Building Construction at Main Powerhouse	Civil Works Contractor (Obayashi Corporation)	On hold (Waiting additional information on WWTS construction)	Building Construction at Main Powerhouse	On-going
13	RCC Plant	SS-ESMMP for Operation and Maintenance Works of RCC Plant	SongDa 5 Subcontractor	On hold (Waiting information on sand stockpile location map and a revised sedimentation control system)	RCC plant sand and aggregate washing sedimentation control and management	On-going
14	Contractor Camp (OC)	Working Drawing for WWTS improvement	OBAYASHI Corporation	No objection with comment on 28 April 2017 (1st Revision)	Installation of WWTS	Completed
15	TCM & GFE contractor Camps	Working Drawing for WWTS improvement	TCM and GFE	Returned with comments on 17 may 2017 (1st Revision)	Installation of WWTS	Completed

				No objection with comments on 12 June 2017 (2nd Revision)		
16	V&K Camp	Working Drawing for WWTS Improvement	V& K Concrete company	No objection with comments on 17 may 2017 (1st revision)	Installation of WWTS	Completed
17	Re-regulating Pond	SS-ESMMP for Biomass Clearing Works for Regulation pond	Lao UXO Clearance Co.,Ltd	No further comments on 23 June 2017 (3rd Revision)	Biomass clearing in the regulation pond	Completed
Houay Soup Resettlement Area (NNP1PC-ESD Contractors)						
18	Houay Soup Resettlement Area	SS-ESMMP for House Construction Lot 4 at HSRA	Vannavong Co., Ltd	No objection with comments on 08 May 2017 (2nd Revision)	House construction Lot 4 at HSRA	On-going
19	Houay Soup Resettlement Area	SS-ESMMP for House Construction Lot 5 at HSRA	Vannavong Co., Ltd	No objection with comments on 08 May 2017 (2nd Revision)	House construction Lot 5 at HSRA	On-going
20	Houay Soup Resettlement Area	SS-ESMMP for Construction of Resource Center and Pilot Plan Improvement at HSRA	ST Construction Co., Ltd	No objection with comments on 11 May 2017 (2nd Revision)	Resource Center and Pilot Plan improvement at HSRA	Completed
21	Houay Soup Resettlement Area	SS-ESMMP for House construction of seven (07) units for 2LR	Vannavong Construction Co., Ltd	No objection with comments on 06 June 2017 (2nd Revision) No objection with comments on 12 June 2017 (3rd Revision)	House construction at HSRA	Completed
22	Houay Soup Resettlement Area	SECC Contractor's Site Decommissioning Plan	SECC., Ltd	No objection with no comments on 23 May 2017 (3rd Revision)	Bridge construction	Site Closed
23	Houay Soup Resettlement Area	SS-ESMMP for Irrigation Dam Reservoir Land Clearance at HSRA	PK Road-Bridge Construction and Irrigation SOLE Co., Ltd	Returned with verbal discussed and comments 13 June 2017 (2nd revision)	Irrigation dam reservoir land clearance	On-going

				Returned hard copy with over-write comments 22 June 2017 (2nd revision)		
				No further comment 29 June 2017 (2nd revision)		
24	Houay Soup Resettlement Area	SS-ESMMP for Houses Construction Lot 1 & 2	Nalux Construction Co.,Ltd	No objection with comment on 09 May 2017 (1st revision)	Houses Construction Lot 1 & 2 in HSRA	On-going
25	Houay Soup Resettlement Area	SS-ESMMP for Health Center at HSRA	Nalux Construction Co.,Ltd	No further comment on 08 May 2017, (3rd Revision)	Construction of Health Canter in HSRA	On-going
26	Houay Soup Resettlement Area	SS-ESMMP for Village Office & Hall at HSRA	Nalux Construction Co.,Ltd	No further comment on 08 May 2017, (3rd Revision)	Construction of Village office and Hall in HSRA	On-going
27	Houay Soup Resettlement Area	SS-ESMMP for Houses Construction Lot 3	Viengoudomexup Co.,Ltd	No objection with comment on 16 May 2017 (1st Revision)	Construction of Houses Lot 3	On-going
28	Houay Soup Resettlement Area	SS-ESMMP for Houses Construction Lot 6	Viengoudomexup Co.,Ltd	No objection with comment on 11 May 2017 (1st Revision)	Construction of Houses Lot 6	On-going
29	Houay Soup Resettlement Area	ESMMP for Construction of Intake Mouth Canal at HSRA	KCP Road and Bridge Construction Co.,Ltd	No objection with comments on 24 May 2017 (2nd Revision)	Construction of Intake Mouth for irrigation Canal at HSRA	Completed
				No objection with comments on 21 June 2017 (2nd Revision)		
				No further comment on 29 June 2017 (3rd Revision)		
30	Houay Soup Resettlement Area	SS-ESMMP for Main Intake, Inlet and Outlet of HSRA Irrigation Dam	KCP Road and Bridge Construction Co.,Ltd	No objection with comments on 01 June 2017 (1st Revision)	Construction of Main Intake, Inlet and Outlet of HSRA Irrigation Dam	On-going

				No objection with comments on 14 June 2017 (2nd Revision) No further comment on 27 June 2017 (3rd Revision)		
31	Houay Soup Resettlement Area	SS-ESMMP for Construction of Temporary Accommodation for 44 Households at HSRA	Vannavong Construction Co., Ltd	No further comment on 07 June 2017 (1st revision)	Construction of temporary accommodation for PPAs resettled from 2UR	On-going
32	Houay Soup Resettlement Area	SS-ESMMP for Construction of Primary & Secondary School at HSRA	Building Concept Construction Company	No objection with comments on 31 May 2017 (1st Revision) No objection with comments on 08 June 2017 (2nd Revision)	Construction of primary & secondary school at HSRA	On-going
33	2UR Zone, Thathom District, Xaysomboun Province	SS-ESMMP for Construction of Village Office and Hall at Zone 2UR	Soksaikham Construction Company	No objection with comment on 09 June 2017 (1st revision)	Construction of Village office and hall at zone 2UR	On-going
34	2UR Zone, Thathom District, Xaysomboun Province	ESMMP for Construction of primary school 3 units in 2UR zone	Soksaikham Construction Company	No objection with comments on 08 June 2017 (1st Revision)	Construction of primary school 3 units in 2UR zone	On-going
35	Houay Soup Resettlement Area	ESMMP for 48 ha Paddy Field Development Project for 2LR people	PK company	No objection with comments on 13 June 2017 (2nd revision) No further comment on 19 June 2017 (3rd Revision)	Land paddy field development for PPAs of HSRA	Completed

36	Houay Soup Resettlement Area	SS-ESMMP for 84 fish ponds in HSRA	Phoukham Chanvong Company	No further comment on 09 June 2017 (1st Revision)	Construction of fish ponds for the PPAs of HSRA under Livelihood development plan	Waiting for construction
37	Houay Soup Resettlement Area	SS-ESMMP for Construction of 0.4 kV Distribution Line for 44 temporary HHs	Anoulak Electrical Co.,Ltd	No further comment on 15 June 2017 (1st Revision)	Construction of 0.4 kV Distribution Line for 44 temporary HHs	On-going
38	Houay Soup Resettlement Area	SS-ESMMP for Construction of Domestic water supply	KCP Road and Bridge Construction Co. Ltd.,	No objection with comments on 21 June 2017 (1st revision)	Construction of domestic water supply for PPAs of HSRA	On-going
39	2UR Zone, Thathom District, Xaysomboun Province	SS-ESMMP for construction of 3.1 Km Internal Road in HSRA	Soksaikham Construction Co. Ltd.,	Under review		
NNP1PC-TD Contractor						
40	NNP1PC's Landfill	SS-ESMMP for the Construction of NNP1 Solid Waste Landfill _ stage 2	PhouKham Chanvong Construction Co. Ltd., (PKC)	No objection with comments on 19 May 2017 (2nd Revision)	Construction of landfill phase 2 stated in January 2017	Completed

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q2-2017

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	Pending
ONC_OC-0217	28.06.2016	RCC Plant Yard	1). Referring to previous site inspection reports on turbid water at the RCC plant which have been issued: - SIR-0018, 18 /07/2015 - SIR- 0023, 06/10/2015 - SIR-0028, 15/12/2015 - SIR-0032, 09/02/2016 and - SIR-0040, 25/05/2016 2). Referring to the approved SS-ESMMP for the RCC Plant Foundation and Installation (note that this document does not cover the operation stage of the RCC Plant)	The Contractor is required to: Follow the agreed actions specified in earlier issued SIRs above. These include the frequency adjustment of the sediment clean-up from the sedimentation ponds when observed that they are 60% full; Regularly remove dried sediment from the drying yards to keep space for incoming sediment cleaning-up from the ponds; A Site Specific Environmental and Social Management Plan (SS-ESMMP) for the operation stage of the RCC plant was submitted to NNP1 for review and approval However, this document was on hold for a review due to a pending submission of additional information on sand stockpile	20.07.2016	21.05.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				location map and a revised drawing of sedimentation control system. After improvement of the sedimentation control system, effluent water quality has been improving. Therefore, this issue was closed with a condition for regular maintaining by the contractor and a joint monitoring between NNP1PC and the contractor.			
ONC_OC-0232	30.08.2016	Re-regulation Dam Borrow Pit	the Contractor started operating a borrow pit with inadequate 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 Contractor has pushed the spoil and blocked the access road to their temporary spoil disposal area. The		27.09.2016	20.06.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			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	Pending
ONC_OC-0236	11.10.2016	Re-regulation dam	During this inspection, it was observed that there was a land levelling 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:	The Contractor has implemented the corrective action by the following: 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.	11.10.2016	20.06.2017	Pending
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 continuously discharging the	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. Provide the sediment clean up record to NNP1 including (1) daily clean up	25.11.2016	20.06.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			turbid water from the sediment pond into the adjacent of Nam Ngiep River.	frequency and (2) amount of collected sediment on a Weekly basis.			
ONC_OC-0248	07.02.2017	KENBER Camp	The Waste Water Treatment System (WWTS) has been malfunctioned. The piping system was clogged and consequently caused the waste water to overflow from the first wetland pond to outside and the planted reeds were dead due to a lack of maintenance	The Contractor is required to: Check the elevation and piping system's connection to ensure smooth gravity feed of the waste water from the first to last wetland pond. Improve the wetland pond embankment (by increasing the bunds) and manholes to avoid waste water leakage/seepage. Regularly maintain the treatment materials (sand and gravel) to prevent from clogging/blocking the piping system	21.02.2017	20.06.2017	Resolved
ONC_UCC-0001	23.02.2017	Main Dam Reservoir	During the joint inspection between the EMO's Compliance and Biomass Clearance teams at the biomass clearance teams at the biomass clearance area (Block 04 at Ban Sophuane and Block 11 at Ban Houaypamom), the following environmental issues were observed: A 1,200 litres oil tank and some smaller oil containers were installed smaller oil containers were installed at a temporary workers camp without proper storage facility. This resulted in some minor oil spill and oil contaminated soil at handling point; The current storage facility for electricity generator is not	Provide an impermeable oil collective tray to prevent oil dripping into the ground during fuel handling. Provide impermeable storage area or material such as a steel tray for the electricity generator to prevent soil contamination; Clean up oil contaminated soil and store in the oil storage for proper elimination (such as incineration) by authorized NNP1PC vendor	15.03.2017	04.05.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			adequate. Roofing was provided but no impermeable bund and floor. As a result, a continuing oil dripping has occurred during fuel handling observed and contained by plastic sheet. This has a potential risk of soil and water contamination if not being cleaned up promptly should a rain event occurs.				
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 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	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-ESMMP for the RCC Plant Operation on 09 March 2017.	28.03.2017	20.06.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			2017, for the CWC to submit the management plan for erodible construction material stockpile.				
ONC_LS-0020	16.03.2017	RCR Temporary Camp	Poor housekeeping and improper management of hazardous material and wastes were observed at the workshop: A mixture of hazardous wastes (used oil filters, hydraulic hoses, and oily rags), scrap metal and other general waste were disposed on the ground beside the workshop area. Vehicle maintenance was not conducted properly inside the workshop area. This led to some oil spill on the ground. Both sides of the workshop were extended with plastic roof (point 1 & 2) with no permeable floor.	Collect and segregate hazardous waste from general waste for proper elimination; Clean up oil contaminated soil around the workshop area for proper incineration by an authorized vendor; Designate vehicle fixing and maintenance only inside the workshop area; Improve the extended parts of the workshop by providing proper roofing material, impermeable floor and bund. Noted: It was agreed that the requirement no. 1, 2 and 3 will be implemented immediately. The requirement no. 4 shall be proposed by the Contractor during next bi-weekly joint site inspection (EMO instructed the contractor to complete the workshop improvement before rainy season).	30.03.2017	31.05.2017	Resolved
ONC_OC-0251	21.03.2017	V&K Camp	The maintenance of the waste water treatment system was not undertaken at the V&K camp. The grey water pipeline was observed to be disconnected causing the grey water discharge into the open ditch which directly flow into Nam Ngiep (Photograph A). In addition, the ponds are not lined with concrete, weeds block the open ditches and take up spaces inside the wetlands, and dead reeds were not replaced (Photograph B).	The camp's wetland ponds (WWTS) were improved. by the following: Remove the weeds surrounding and inside the wetland pond to keep areas clear and tidy; and Collect and segregate the dead reeds in the wetland ponds and replace with new healthy reeds.	04.04.2017	04.04.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_OC-0252	21.03.2017	Song Da 5 Camp No.2	The waste water collection tanks from the kitchen are nearly full (about 10 cm left). This was due to the fact that the check bunds of waste water collection tanks (pre-wetland ponds) was lower than the surrounded surface level and the improved wetland ponds (at their full capacities).	The Contractor was instructed to increase the bunds of the waste water collection tank to at least 20 cm above the surrounding surface level.	04.04.2017	04.04.2017	Resolved
ONC_OC-0253	21.03.2017	Sino Hydro Worker Camp	The Contractor did not properly manage their waste on site as the following: Insufficient number of waste bins were provided- food waste was stored in thin plastic bags; Insufficient of frequency to transport and dispose waste off-site, resulting in fly and worm concentration. No specific location for temporary waste storage on site- food waste was stored around the washing and cooking areas which attracted flies and caused odor. Note: The food waste from this camp is not part of the Animal Fodder Programme run by Hatsaykham villagers because of the spices being added to food. These villagers claimed to NNP1PC-EMO that they were concerned on the health of their pigs when too much chili and spices were added.	The Contractor was instructed to: Provide 2-3 more waste bins with lids/covers; Schedule for waste collection, transportation and disposal to the landfill regularly (i.e. daily, bi-daily, etc.); and Provide specific temporary food waste storage on site away from the cooking area to prevent flies/mice/worms and odour.	28.03.2017	25.04.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			Therefore, the food waste from this camp is disposed of at the NNP1 Project landfill.				
NCR_OC-0017	21.03.2017	Sino Hydro Workshop	Poor housekeeping and some oil spills were still observed after finding was observed during the previous 2 joint site inspections, used oil and oily rags were stored in open areas and used types were not properly stacked away from hazardous materials (see below Photographs). These are likely to create hazards in the workshop should a fire accidentally occur during the dry season	Segregate used types and store properly at a designated area away from flammable materials. Perform machinery and equipment maintenance in a designated maintenance area that has permeable floor and rain protection or else drip trays and spillage protection facilities must be provided; Move the used oil drums to a designated hazardous material storage area; Completely clean up the contaminated ground with hydrocarbon by using absorbent pads/dry sand and store contaminated materials in designated hazardous storage area for proper elimination; - Regularly monitor and instruct the subcontractor to comply with the proposed and approved SS-ESMMP for Worker Camp. Note that failure to address the above corrective actions by agreed deadline may lead to an escalation of this NCR-1 to NCR-2.	28.03.2017	20.06.2017	Resolved
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 spillage protection facilities. This issue has been raised to the contractor for a couple of times since early March 2017, provision of proper	The contractor is required to provide proper temporary hazardous material storage on site. Otherwise, completely remove any hazardous material containers for alternative proper storage off-site	02.05.2017	02.06.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			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.				
ONC_PK-0003	19.04.2017	PK Camp	There was improper waste management implemented on site: An evidence of burning of non-segregated waste on site; A stockpile of emptied fertilizer plastic bags / used bags from paddy development activities was left behind without management practices	The contractor is required to: Dispose any general waste generated on site at Houay Soup Solid Waste Landfill located in spoil disposal No.6. Ensure that a stockpile of fertilizer bags is segregated and disposed properly. Note: Burning of waste at site is prohibited	02.05.2017	30.05.2017	Resolved
ONC_OC-0254	25.04.2017	Re-regulation dam	Spoil from downstream coffer dam removal was disposed at area below the existing Re-regulation dam borrow pit. This operation has been implemented without a provision of following information: Demarcation of spoil disposal boundary. Quantity of spoil to be disposed. Erosion and Sedimentation Control measures during the time of operation, especially in wet season; Spoil disposal management and site	The contractor was required to provide: Provide approval letter that has been issued by NNP1. Spoil disposal boundary map and estimate quantity of spoil to be disposed and ensure that spoil disposal is not over the designated boundary. Provide mitigation measures such as cut-off berm and cut-off drain including slope stabilization and sedimentation control. Incorporate the site closure plan into the existing site closure plan for borrow pit P1 and P1A, then submit to NNP1PC for review and approval. Note: During this inspection, the contractor	09.05.2017	20.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			closure plan, etc. Without an appropriate mitigation measures, the disposal site will have a potential risk of erosion and sediment run-off that may affect natural drainage systems and land use by local villagers.	representative confirmed that the existing borrow pit and spoil disposal area will be closed by following the proposed site closure plan P1 & P1A.			
ONC_OC-0255	25.04.2017	Aggregate Plant Yard	Sediment collected from muddy road and sediment transportation activities was stockpiled at the Junction of road T8 & T9 and nearby the Nam Ngiep river crossing bridge (close to the security hut). Some of sediment was already washed down to the Nam Ngiep River by rain water. Without and appropriated mitigation measures. This sediment stockpile may be completely washed into Nam Ngiep river during this wet season.	The contractor is required to clean up and remove the sand and sediment completely and dispose at designated spoil disposal area No.6.	02.05.2017	09.05.2017	Resolved
ONC_OC-0256	25.04.2017	Sino Hydro Workshop	Referring to EMO previous Non-Compliance Report (NNP1-ESD-EMO-NCR-OC-0017), dated 24 / 03 / 2017 about oil spill incidence that indicated inadequate hazardous material management by the contractor. During this bi-weekly joint site inspection it was continue to observe that a number of used oil and fuel drums were stored on the ground (at vehicle parking area in front of Sino hydro's workshop), without any spillage protection	The Contractor was instructed to: - Take an appropriate corrective action either provision of proper temporary hazardous material storage or complete removal of oil and fuel drums to designated hazardous storage in the workshop area; - Clean up contaminated soil and store properly in hazardous waste storage for proper disposal. Note: - No vehicle and machinery maintenance activities are allowed at vehicle parking area without and oil spill protective tray;	05.05.2017	23.05.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			facilities. As a result of an evidence of oil and hydrocarbon spills on the ground without cleaning up.	- The contractor needs to response to the pending NCR-1 and perform long term corrective action plan for this site operation.			
ONC_OC-0257	09.05.2017	Spoil Disposal Area #8	During this Joint Bi-Weekly Site Inspection, NNP1PC-EMO followed up 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 deposit in the adjacent drainage lines during the last few raining events.	The Contractor was instructed to repair existing wooden silt fences around the sand stockpile area and place sand bags to close the gaps at the base and around wooden silt fences.	23.05.2017	20.06.2017	Pending
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	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	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			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.				
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 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.	The Contractor is required to: • Completely remove the contaminated soil with hydrocarbon and store in the designated temporary 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.	25.05.2017		Pending
ONC_OC-0259	23.05.2017	KENBER Camp	Inadequate management of hazardous material and waste was observed at the site. Oil spills from the oil refuelling were left on site without cleaning up. This has a high potential risk of hazardous contaminated waste being accumulated on site.	The Contractor needs to implement the following corrective actions by the agreed deadline: Clean up the contaminated soil and store properly in designated hazardous material storage for proper disposal/ elimination; Provide a proper work procedure for hazardous material handling and refuelling activities including spills response /spills clean up.	05.06.2017	20.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				Hazardous Material and Waste Management Training needs to be provided to the operator of fuel storage			
ONC_OC-0260	23.05.2017	KENBER Camp	During this Joint Bi-Weekly Site Inspection, EMO followed up of the operation of the Waste 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.	The Contractor is required to take the following actions: Empty the waste water from all the ponds and dispose of 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.	05.06.2017	20.06.2017	Pending
NCR-OC-0019	24.05.2017	Re-regulation dam	On 24 May 2017, during a Joint Weekly Safety & Environmental Patrol at the Re-Regulation Dam on 24 May 2017, there was a dramatic drop of water in Nam Ngiep river downstream of the Re-regulation Dam after the Re-regulation gates were closed to allow water overflowing via the Labyrinth. As a result, some fish have stuck in the rocks and were vulnerable to	The Contractor was strongly required to strictly enforce the NNP1PC's policies especially the Code of Conduct and ESMMP-CP SP10: Biodiversity Management policy on environmental Management to its sub-contractors at least as following four (04) requirements as the following: 1. Ensure that the sub-contractors will not repeat the same environmental violations (SP10: Biodiversity Management) through providing regular trainings and applying	06.06.2017	19.06.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			catching. The contractor's staff was asked for bag checking which was found to contain two fishes caught with a weight about 10 kg from Nam Ngiep river. The fish species are Hemibagrus wyckioides or "pa kheung" and Glyptothorax harmandi or "pa khe" which are listed as LC (least concern) in the IUCN Red List Status but are important protein source and income for the local villagers, asked him to catch the fish; The Contractor responded to this incident by warning their staff while NNP1PC released those two fishes at the downstream of Nam Ngiep at the Houay Soup Bridge as they were still alive.	applicable penalties if found; and In the future, the Environmental & Safety Patrol Report needs to record discussed environmental issues, recommendations and corrective actions identified and agreed during the Patrol.			
NCR-_OC-0018	29.05.2017	RCC Plant Yard	During the four days sedimentation control and waste water quality monitoring at the RCC 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 Contractor shall implement the following remedial actions by the agreed deadline: - 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	31.05.2017	31.07.2017	Pending

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			- 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 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 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)	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
			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	During this Bi-weekly Joint Site Inspection, it was observed that hazardous material storage (oil drums) were placed on the plastic sheet 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	The Contractor is required to implement the following 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.	20.06.2017		Pending
SIR-OC-0005	06.04.2017	Sino Hydro's Workshop at the Aggregate Plant Yard	During a follow, up site inspection at Sino Hydro's Workshop located at the Aggregate Plant Yard on 06 April 2017, NN1PC-EMO was informed by a worker at the site that a 200 litres heavy fuel oil drum was hit by a truck last night between 8 to 9 p.m. causing that drum to be broken and heavy fuel oil leakage. Whilst on site, a broken drum with the remaining heavy fuel	The Contractor is advised to completely remove the contaminated sand at the lower slope of the Nam Ngiep River bank to avoid further washing into the river and continue removing the spills on the surface water of the sediment ponds by 07 April 2017. NNP1PC-EMO will deploy extra absorbent pads at the outlet of the second sediment pond where the blooms were deployed today to ensure that they are properly cleaned up. Also, the Contractor shall prepare its own	7. 04.2017	7.04.2017	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			oil of about 30 – 50 litres were found to be at the same place where the incident happened last night. An evidence of a large contaminated ground at the site, along the open ditches, in the sedimentation ponds located below spoil Disposal Area No.7 and on the bank of Nam Ngiep River were observed respectively. EMO investigated and identified that the Contactor did not take any immediate corrective action implementation after the incident occurred and had left the broken drum behind which has caused continuous releasing of heavy fuel oil into the surrounding environment since 8 p.m. last night (05/04/2017) until the morning of 06/04/2017. Instead, water was used to flush the heavy fuel oil spills without proper cleaning up using oil absorbent sheets or other spill response kits (witnessed by workers who worked on site (anonymous).	incident report and results of the investigation including corrective action implementation for future avoidance of similar incident for NNP1PC record and following-up. It shall revisit the working procedure and training on hazardous material management. Proper oil spill response kits which include absorbent pads and booms for petroleum products in the river and on land shall be purchased by the Contractor at its own costs to ensure a fast and complete response in case of there is any hydrocarbon related spills in the coming wet season.			

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

WATER QUALITY MONITORING STATIONS IN NAM NGIEP UPSTREAM THE CONSTRUCTION AREA

Station Code	Location
NNG01	Nam Ngiep immediately upstream the reservoir and Ban Phiengta
NNG02	Nam Ngiep upstream of Nam Phouan confluence
NNG03	Nam Ngiep downstream of Ban Sopyuak
NNG09	Nam Ngiep immediately upstream the main dam

WATER QUALITY MONITORING STATIONS IN NAM NGIEP/RE-REGULATION RESERVOIR WITHIN THE CONSTRUCTION AREA

Station Code	Location
NNG04/R6	Nam Ngiep within the Construction Area approx. 1.3 km downstream the main dam (ID R6 from the formation of the re-regulation reservoir by 24 May 2017)
R7	In the re-regulation reservoir approximately 0.3 km upstream the re-regulation dam

WATER QUALITY MONITORING STATIONS IN NAM NGIEP DOWNSTREAM THE CONSTRUCTION AREA

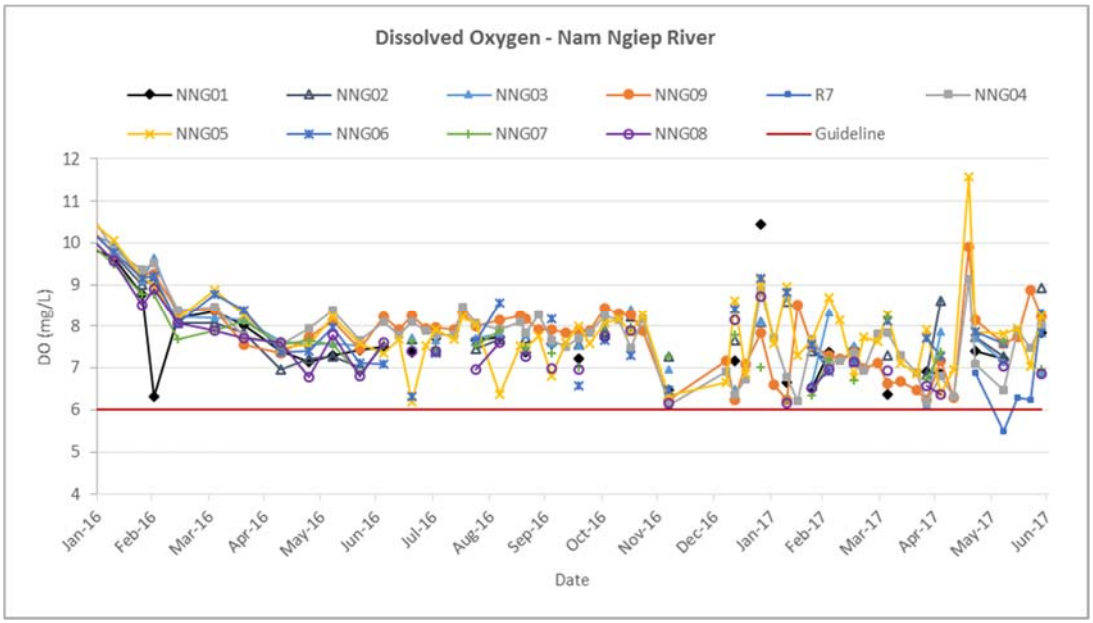
Station Code	Location
NNG05	Nam Ngiep approx. 1 km downstream the re-regulation dam and 1.2 km upstream of Ban Hat Gniun
NNG06	Nam Ngiep approx. 0.6 km downstream of Nam Xao confluence
NNG07	Nam Ngiep at Ban Somseun approx. 25 km downstream the re-regulation dam
NNG08	Nam Ngiep at the Bridge of Road 13 approx. 46 km downstream the re-regulation dam

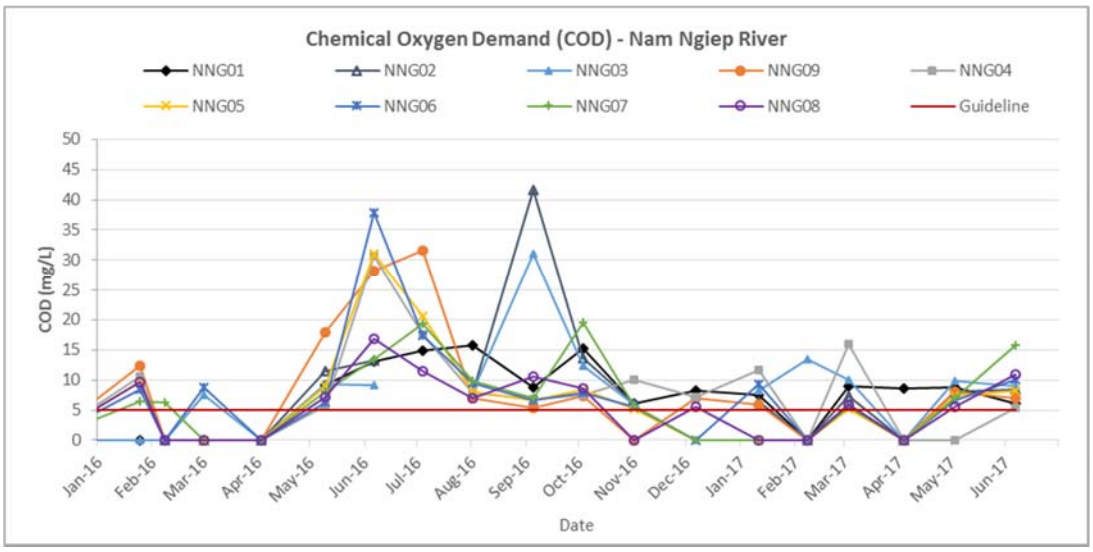
WATER QUALITY MONITORING STATIONS IN TRIBUTARIES TO NAM NGIEP

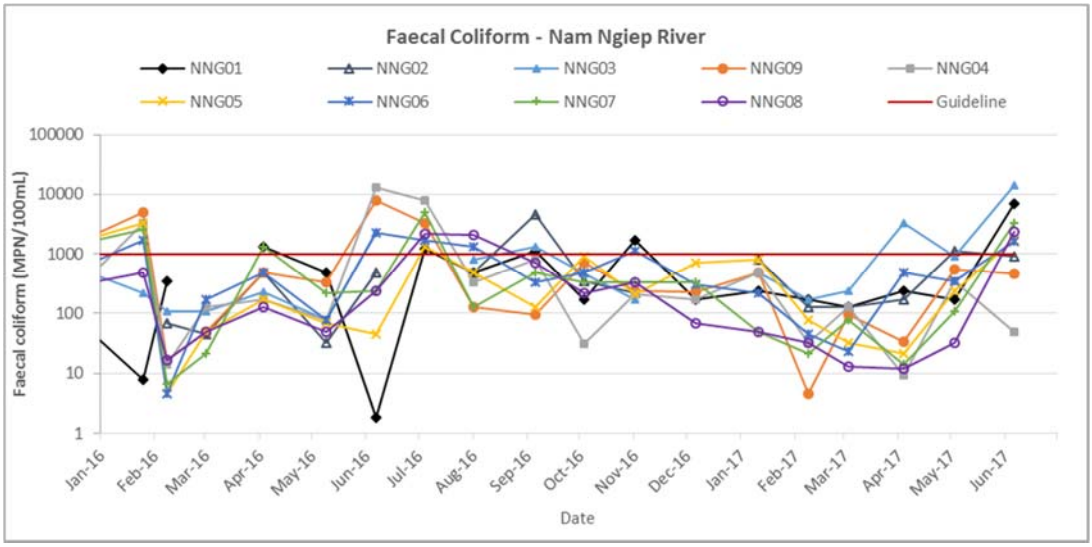
Station Code	Location
NCH01	Nam Chiane, a left bank tributary to Nam Ngiep/the Reservoir at the Bridge of Road 1D;
NPH01	Nam Phouan, a right bank tributary to Nam Ngiep/the Reservoir
NXA01	Nam Xao; a left bank tributary to Nam Ngiep downstream the Construction Area
NHS01	Nam Houay Soup Njai; a right bank tributary to Nam Ngiep downstream the Construction Area

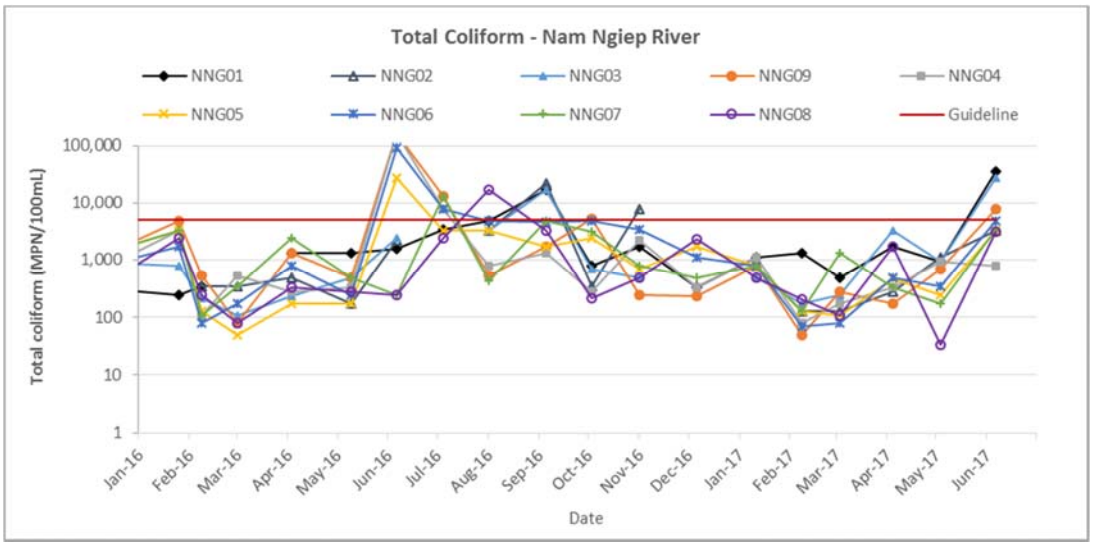
APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2016 TO END OF JUNE 2017 (ONLY PARAMETERS THAT EXCEEDED GUIDELINE STANDARDS)

Nam Ngiep Surface Water

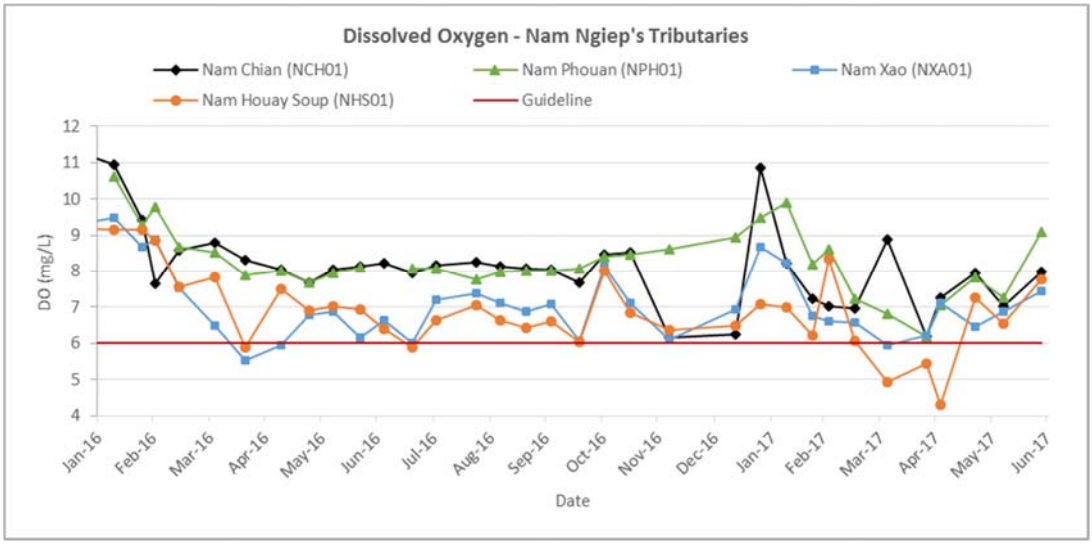


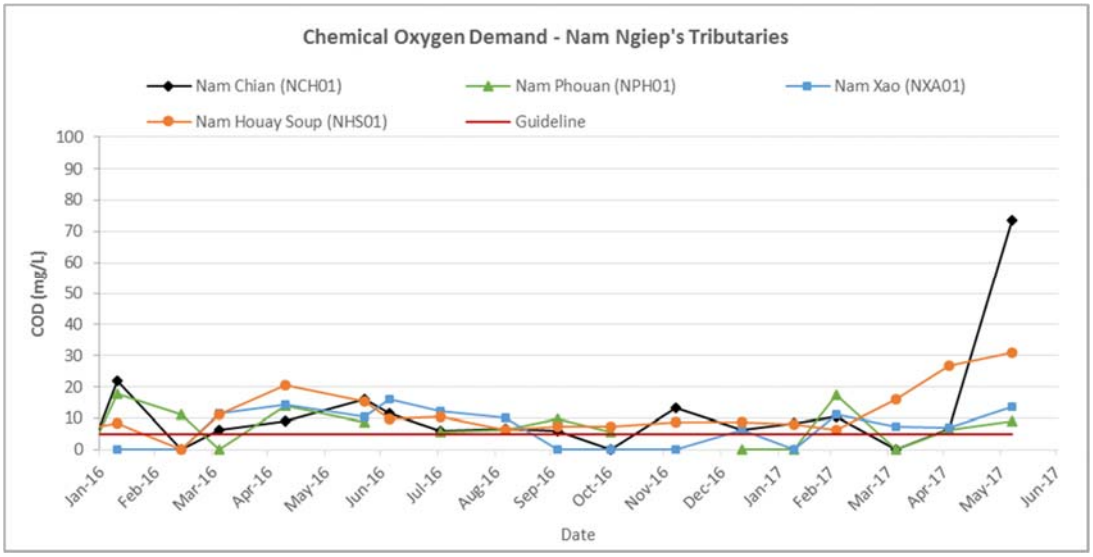


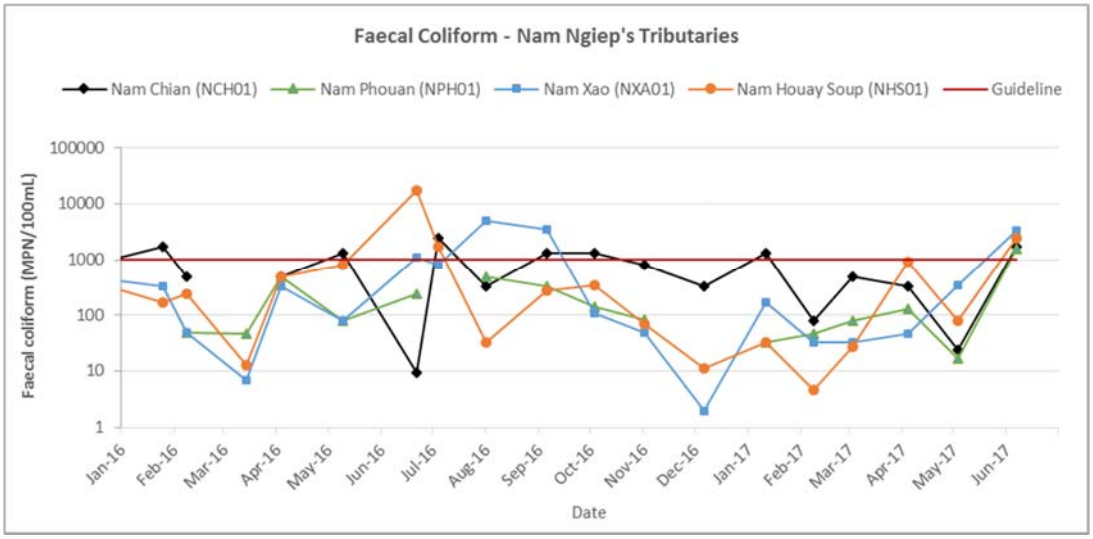

Faecal Coliform - Nam Ngiep River
NNG01
NNG02
NNG03
NNG09
NNG04
NNG05
NNG06
NNG07
NNG08
Guideline
Faecal coliform (MPN/100mL)
100000
10000
1000
100
10
1
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Date

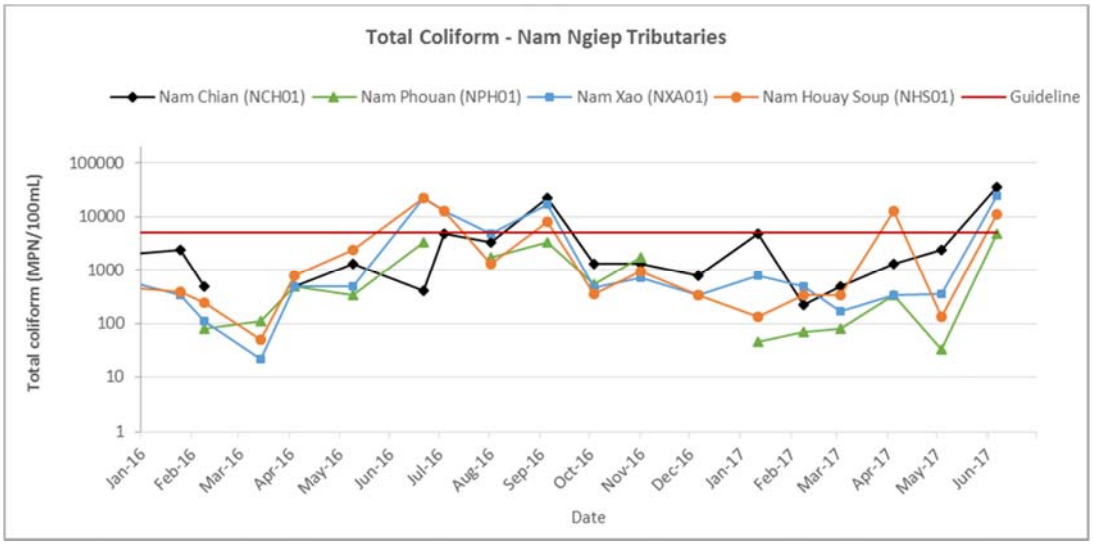

Total Coliform - Nam Ngiep River
NNG01
NNG02
NNG03
NNG09
NNG04
NNG05
NNG06
NNG07
NNG08
Guideline
Total coliform (MPN/100mL)
100,000
10,000
1,000
100
10
1
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Date

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

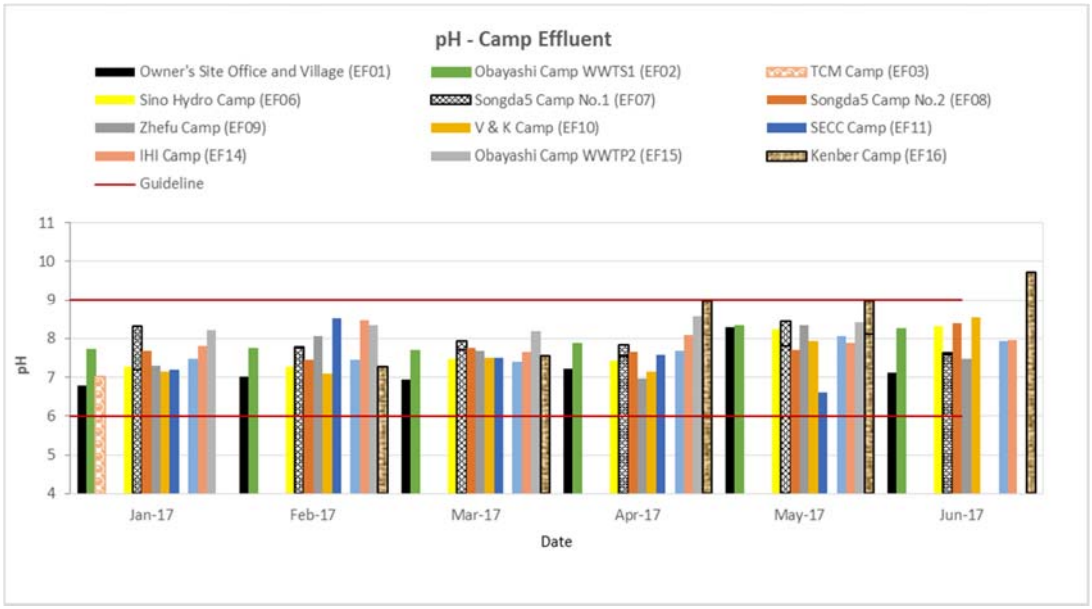


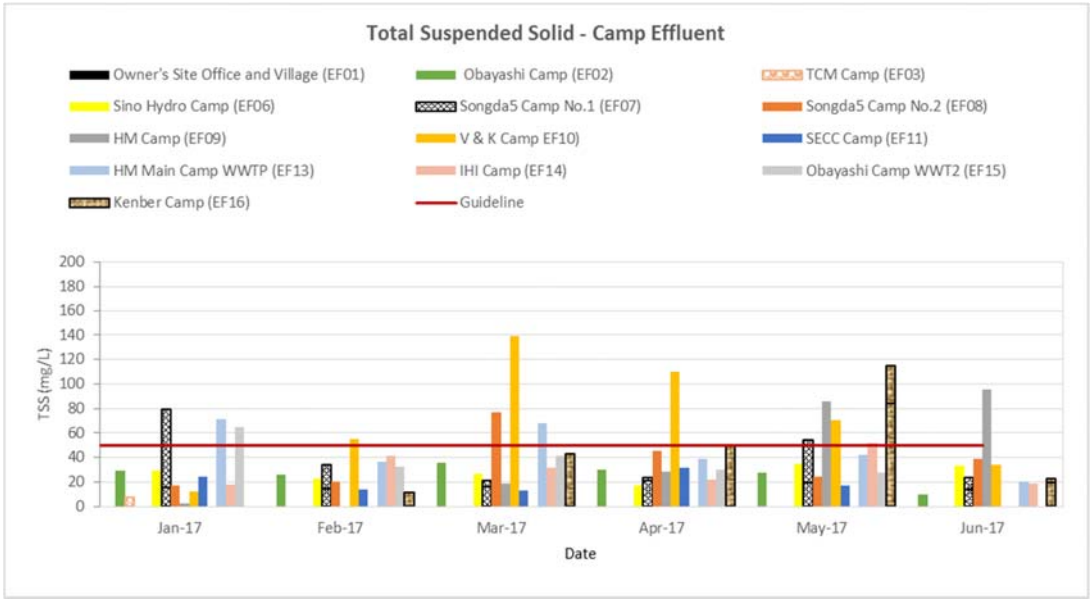


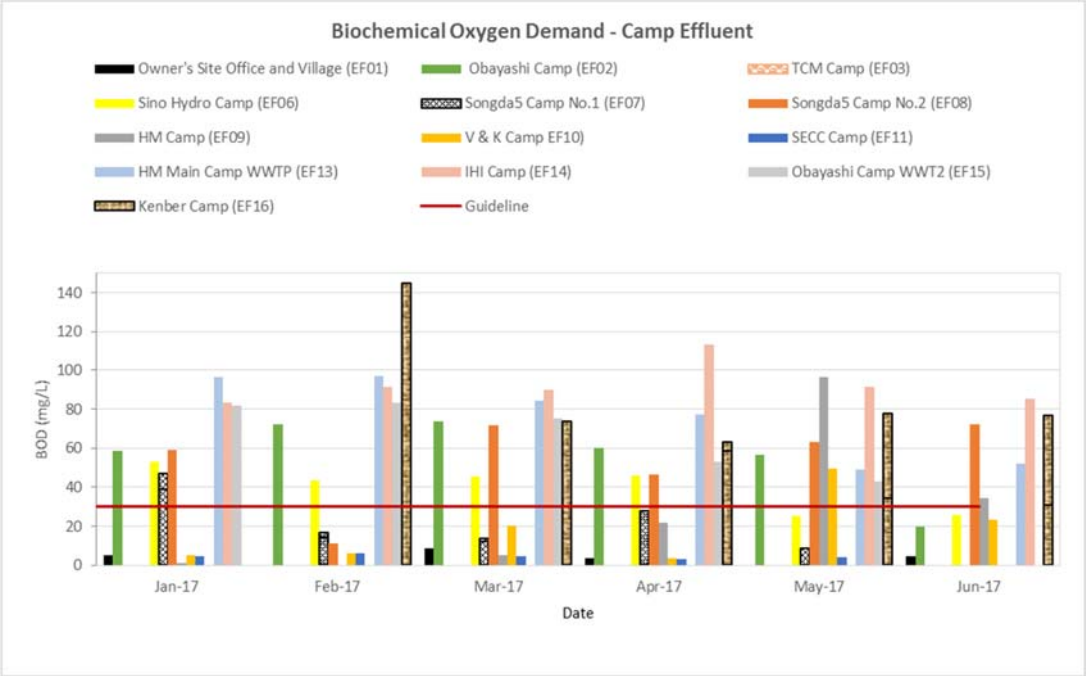

Faecal Coliform - Nam Ngiep's Tributaries
Nam Chian (NCH01)
Nam Phouan (NPH01)
Nam Xao (NXA01)
Nam Houay Soup (NHS01)
Guideline
Faecal coliform (MPN/100mL)
100000
10000
1000
100
10
1
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17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

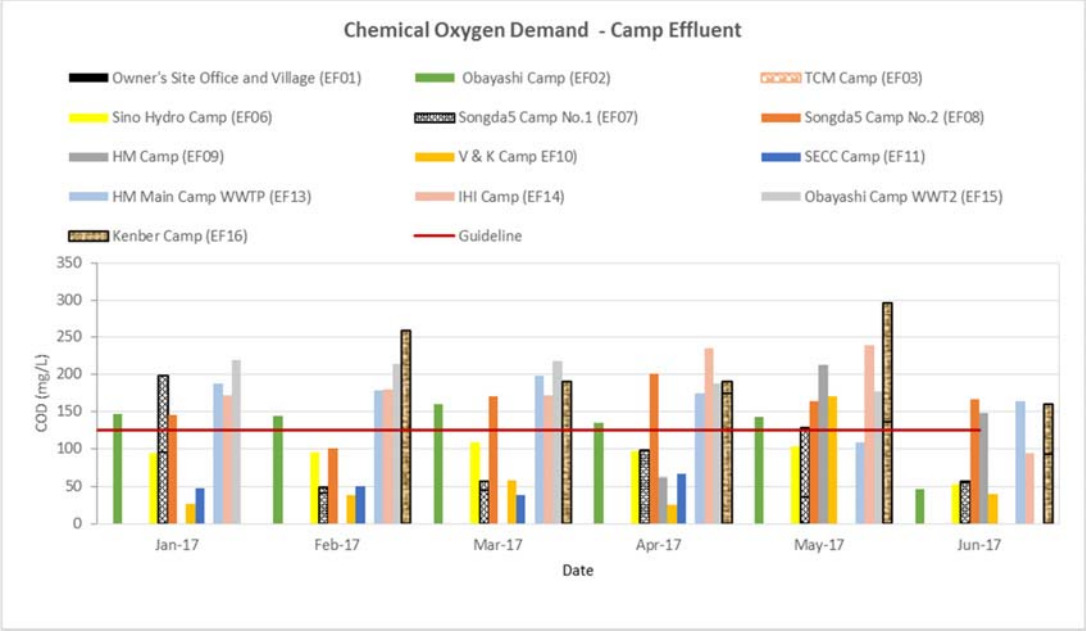

Total Coliform - Nam Ngiep Tributaries
Nam Chian (NCH01)
Nam Phouan (NPH01)
Nam Xao (NXA01)
Nam Houay Soup (NHS01)
Guideline
Total coliform (MPN/100mL)
100000
10000
1000
100
10
1
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17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

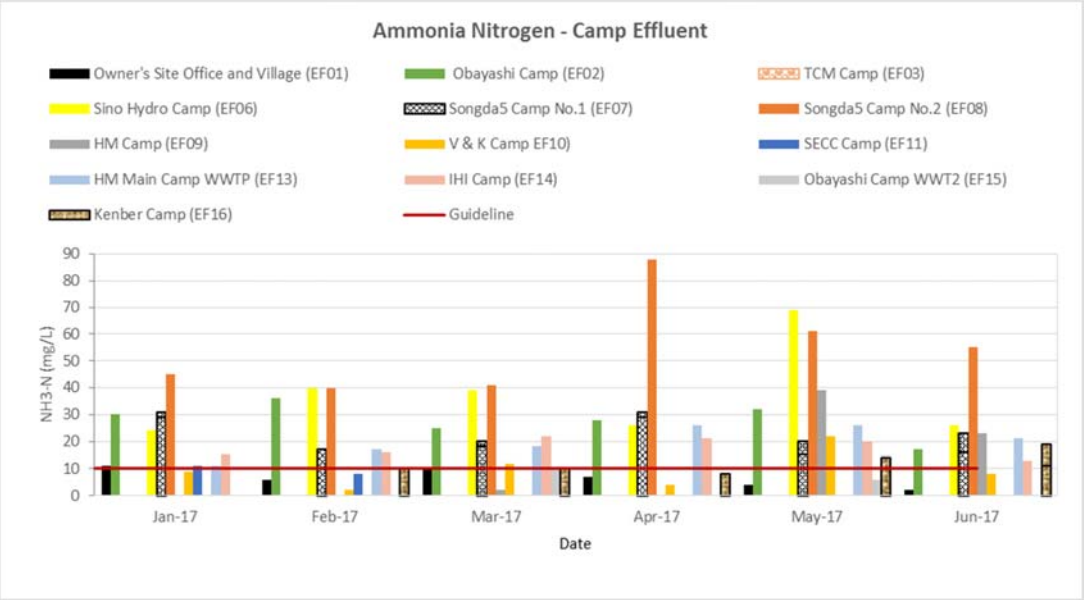
Camps' Effluent Water Quality Trends (Since January – June 2017)



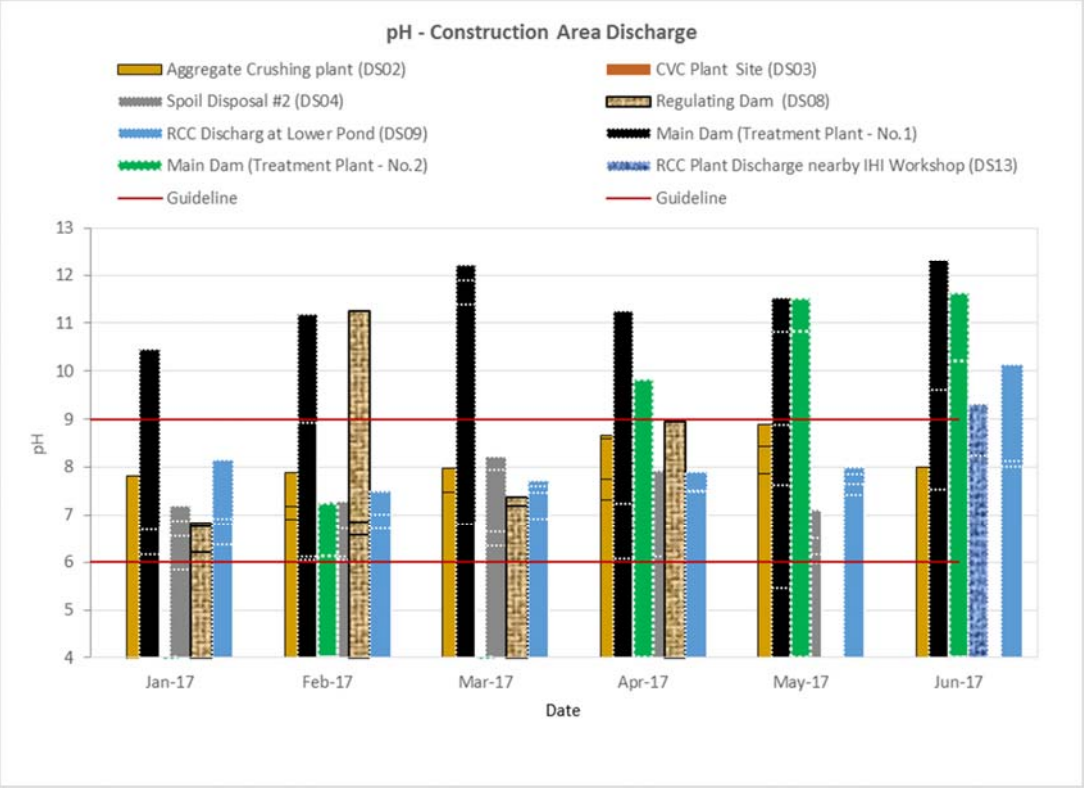


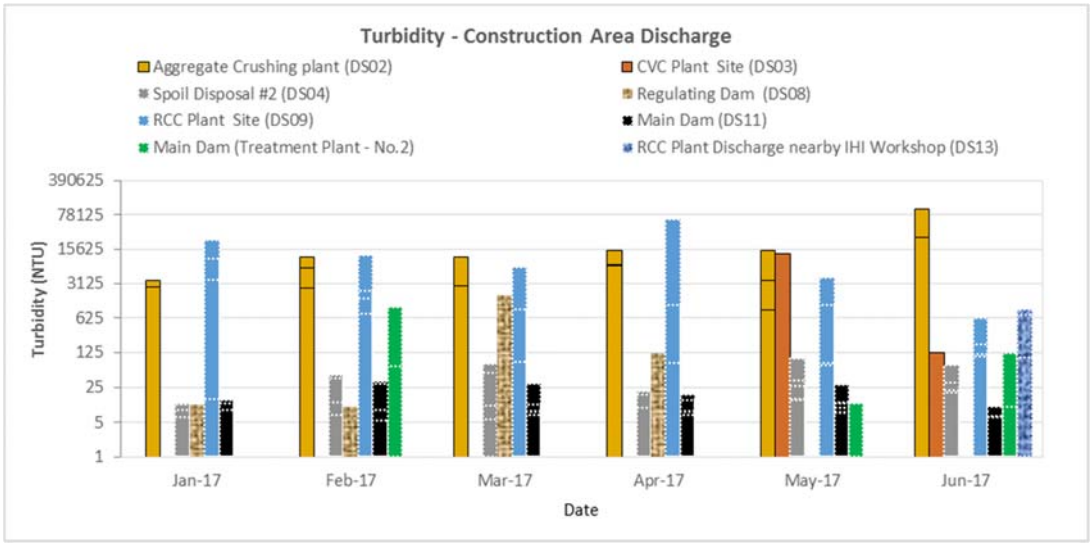

Biochemical Oxygen Demand - Camp Effluent
Owner's Site Office and Village (EF01)
Obayashi Camp (EF02)
TCM Camp (EF03)
Sino Hydro Camp (EF06)
Songda5 Camp No.1 (EF07)
Songda5 Camp No.2 (EF08)
HM Camp (EF09)
V & K Camp EF10)
SECC Camp (EF11)
HM Main Camp WWTP (EF13)
IHI Camp (EF14)
Obayashi Camp WWT2 (EF15)
Kenber Camp (EF16)
Guideline
BOD (mg/L)
0
20
40
60
80
100
120
140
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Date

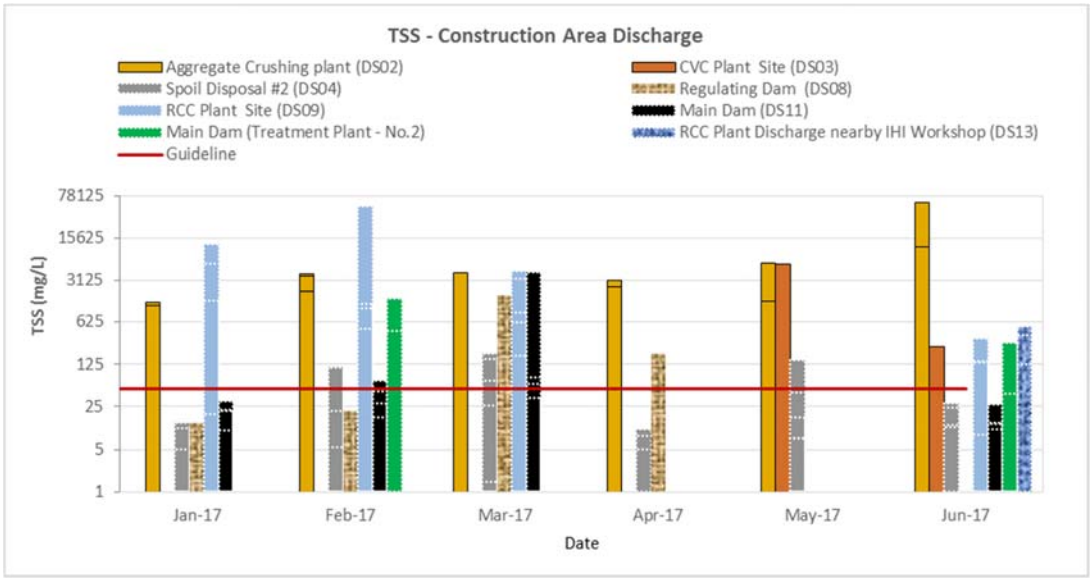

Chemical Oxygen Demand - Camp Effluent
Owner's Site Office and Village (EF01)
Obayashi Camp (EF02)
TCM Camp (EF03)
Sino Hydro Camp (EF06)
Songda5 Camp No.1 (EF07)
Songda5 Camp No.2 (EF08)
HM Camp (EF09)
V & K Camp EF10)
SECC Camp (EF11)
HM Main Camp WWTP (EF13)
IHI Camp (EF14)
Obayashi Camp WWT2 (EF15)
Kenber Camp (EF16)
Guideline
COD (mg/L)
0
50
100
150
200
250
300
350
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Date



Construction Area Discharge Water Quality (Since January to June 2017)




Turbidity - 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)
390625
78125
15625
3125
625
125
25
5
1
Turbidity (NTU)
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Date


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)
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Date

APPENDIX 5: WATER QUALITY MONITORING DATA

APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – QUARTER 2, 2017

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline														
6-Apr-17	pH	5.0 – 9.0	7.44	7.7	7.97	7.48	7.29	N/A	7.91	7.83	7.64	7.36	7.28	7.18	7.75	7.22
11-Apr-17	pH	5.0 – 9.0	N/A	N/A	N/A	7.78	8.48	N/A	8.61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	pH	5.0 – 9.0	N/A	N/A	N/A	8.05	7.69	N/A	7.89	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	pH	5.0 – 9.0	7.34	7.3	7.6	7.45	7.37	N/A	7.49	7.98	7.48	7.56	7.39	7.15	7.75	7.35
4-May-17	pH	5.0 – 9.0	7.51	7.52	7.27	7.35	7.28	N/A	8.05	8.19	7.87	8.07	7.04	6.88	7.53	7.08
10-May-17	pH	5.0 – 9.0	N/A	N/A	N/A	7.55	7.45	N/A	8.22	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	pH	5.0 – 9.0	N/A	N/A	N/A	7.42	7.53	N/A	7.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	pH	5.0 – 9.0	7.58	7.48	7.3	7.6	7.94	7.9	6.98	7.14	N/A	N/A	6.9	6.8	7.1	6.45
8-Jun-17	pH	5.0 - 9.0	7.32	7.21	7.58	7.3	7.2	7.78	7.48	7.49	7.35	7.69	7.19	7.72	7.23	6.99
14-Jun-17	pH	5.0 - 9.0	N/A	N/A	N/A	7.51	7.46	7.62	7.97	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	pH	5.0 - 9.0	N/A	N/A	N/A	7.58	7.8	7.83	7.91	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	pH	5.0 - 9.0	7.6	7.53	7.87	7.53	7.8	7.86	7.77	7.74	7.12	7.03	7.37	8.18	7.71	7.64
6-Apr-17	Sat. DO (%)		75.9	93	85.3	78.7	101	N/A	103.8	102.8	105	85.9	103.3	80.6	76.2	60
11-Apr-17	Sat. DO (%)		N/A	N/A	N/A	90.5	100.6	N/A	100.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	Sat. DO (%)		N/A	N/A	N/A	83.3	86.8	N/A	88.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	Sat. DO (%)		86.1	86.6	73.9	79.4	75	N/A	102.3	99.9	84.5	89.8	73.6	78.4	81.7	69.4

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
4-May-17	Sat. DO (%)		84.9	106.2	103.9	89.8	88.2	N/A	87.5	98.6	100.3	89.6	90.2	92	98.2	56.9
10-May-17	Sat. DO (%)		N/A	N/A	N/A	85.5	88.2	N/A	89.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	Sat. DO (%)	N/A	N/A	N/A	N/A	110.3	100.9	N/A	142.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	Sat. DO (%)		101.5	102.6	104.5	103.3	93	91.4	105.1	106.6	N/A	N/A	105.3	103.8	90.2	96.7
8-Jun-17	Sat. DO (%)		98.2	99.4	96.3	98.7	87.6	75.6	104	101.4	96.6	94	88.1	93.7	90.5	84.3
14-Jun-17	Sat. DO (%)		N/A	N/A	N/A	101.1	100.7	81.7	100.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	Sat. DO (%)		N/A	N/A	N/A	101.3	94.9	82.4	91.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	Sat. DO (%)		100.2	115.3	96.4	103.5	101.6	107.6	105.5	100.3	96.2	93.5	100.2	114	95	83.7
6-Apr-17	DO (mg/l)	>6.0	6.36	7.3	6.69	6.63	7.84	N/A	8.28	8.12	8.24	6.93	8.89	6.82	5.94	4.93
11-Apr-17	DO (mg/l)	>6.0	N/A	N/A	N/A	6.68	7.29	N/A	7.13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	DO (mg/l)	>6.0	N/A	N/A	N/A	6.46	6.88	N/A	6.86	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	DO (mg/l)	>6.0	6.92	6.83	6.11	6.24	6.19	N/A	7.93	7.7	6.72	6.58	6.19	6.18	6.21	5.43
4-May-17	DO (mg/l)	>6.0	6.87	8.62	7.86	7.16	6.81	N/A	6.39	7.26	7.38	6.37	7.26	7.07	7.11	4.31
10-May-17	DO (mg/l)	>6.0	N/A	N/A	N/A	6.29	6.32	N/A	6.96	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	DO (mg/l)	>6.0	N/A	N/A	N/A	9.91	9.12	N/A	11.59	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	DO (mg/l)	>6.0	7.41	7.74	7.72	8.16	7.1	6.76	7.86	7.87	N/A	N/A	7.96	7.83	6.47	7.25
8-Jun-17	DO (mg/l)	>6.0	7.23	7.26	7.15	7.58	6.46	5.48	7.82	7.57	7.63	7.03	7.03	7.26	6.87	6.56
14-Jun-17	DO (mg/l)	>6.0	N/A	N/A	N/A	7.75	7.9	6.29	7.95	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	DO (mg/l)	>6.0	N/A	N/A	N/A	8.88	7.48	6.24	7.05	N/A	N/A	N/A	N/A	N/A	N/A	N/A

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
29-Jun-17	DO (mg/l)	>6.0	7.84	8.93	6.89	8.22	8.02	8.34	8.25	7.84	6.96	6.86	7.99	9.09	7.43	7.76
6-Apr-17	Conductivity (µs/cm)		107	107	106	97	105	N/A	42.3	42.5	42.9	109	56	86	73.6	38.5
11-Apr-17	Conductivity (µs/cm)		N/A	N/A	N/A	120	113	N/A	115	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	Conductivity (µs/cm)		N/A	N/A	N/A	118	127	N/A	133	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	Conductivity (µs/cm)		115	113	108	108	111	N/A	36.7	37.3	111	104	70	92	51.1	19.48
4-May-17	Conductivity (µs/cm)		127	122	123	122	120	N/A	125	127	125	128	79	103	171	108
10-May-17	Conductivity (µs/cm)		N/A	N/A	N/A	122	123	N/A	123	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	Conductivity (µs/cm)		N/A	N/A	N/A	142	112	N/A	115	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	Conductivity (µs/cm)		39	120	125	100.1	120	333	108	110	N/A	N/A	80	80	130	84
8-Jun-17	Conductivity (µs/cm)		140	136	99	117	118	177	121	120	112	109	41	97	160	119
14-Jun-17	Conductivity (µs/cm)	N/A	N/A	N/A	N/A	87	145	166	86	N/A	N/A	N/A	N/A	N/A	N/A	N/A

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
21-Jun-17	Conductivity (µs/cm)		N/A	N/A	N/A	101	144	142	112	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	Conductivity (µs/cm)		114	98	96	96	96	95	98	96	57	57	51	102	106	20
6-Apr-17	TDS (mg/l)		53	53	53	48	52	N/A	21	21	21	55	28	43	36	19
11-Apr-17	TDS (mg/l)		N/A	N/A	N/A	60	57	N/A	58	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	TDS (mg/l)		N/A	N/A	N/A	59	64	N/A	67	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	TDS (mg/l)		57	57	54	54	56	N/A	18.35	18.65	55	52	35	46	25.5	9.74
4-May-17	TDS (mg/l)		63	61	61	61	60	N/A	62	63	63	64	39	51	86	54
10-May-17	TDS (mg/l)		N/A	N/A	N/A	61	62	N/A	62	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	TDS (mg/l)		N/A	N/A	N/A	71	56	N/A	57	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	TDS (mg/l)	N/A	19	60	62.5	50.05	60	162	54	55	N/A	N/A	40	40	65	42
8-Jun-17	TDS (mg/l)		70	68	50	58	59	88	61	60	56	54	20	48	80	59
14-Jun-17	TDS (mg/l)		N/A	N/A	N/A	44	73	83	43	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	TDS (mg/l)		N/A	N/A	N/A	51	72	71	56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	TDS (mg/l)		57	49	48	48	48	47	49	48	28	28	25	51	53	10
6-Apr-17	Temperature (°C)		22.01	25.34	26.24	24.81	26.35	N/A	25.7	26.2	26.6	26.23	20.56	23.31	27	24.2
11-Apr-17	Temperature (°C)	N/A	N/A	N/A	N/A	29.7	30.66	N/A	30.84	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	Temperature (°C)		N/A	N/A	N/A	27.92	26.5	N/A	27.83	N/A	N/A	N/A	N/A	N/A	N/A	N/A

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
27-Apr-17	Temperature (°C)		22.55	25.38	25.63	26.67	26.22	N/A	27	27.5	27.57	27.58	21.83	24.29	28	26.7
4-May-17	Temperature (°C)		24.2	26.97	28.24	28.28	28.11	N/A	27.78	26.92	28.82	29.37	24.35	26.08	28.92	27.7
10-May-17	Temperature (°C)		N/A	N/A	N/A	27.75	30.12	N/A	30.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	Temperature (°C)		N/A	N/A	N/A	24.8	24.7	N/A	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	Temperature (°C)		29	27.9	29	25.9	28.16	29.65	28.8	29.5	N/A	N/A	27.1	27.9	31.2	28.6
8-Jun-17	Temperature (°C)		27.12	27.05	27.15	27.56	30.1	30.76	28.8	28.8	28.26	28.15	24.2	25.78	28.2	26.8
14-Jun-17	Temperature (°C)		N/A	N/A	N/A	26.74	26.26	27.45	27.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	Temperature (°C)		N/A	N/A	N/A	25.99	26.83	27.7	27.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	Temperature (°C)		25.46	26	26.51	25.3	25.1	25	26.6	26.7	25.83	25.94	23.93	24.74	26.6	24.9
6-Apr-17	Turbidity (NTU)		11.19	6.51	6.5	5.63	18.05	N/A	16.6	8.19	6.34	9.22	12.44	2.26	2.09	4.93
11-Apr-17	Turbidity (NTU)		N/A	N/A	N/A	3.69	6.19	N/A	6.82	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	Turbidity (NTU)		N/A	N/A	N/A	79	62.05	N/A	46.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	Turbidity (NTU)		103.37	86.98	65.65	55.6	63.03	N/A	68.2	68	59.33	55.39	86.37	30.26	9.63	11.4
4-May-17	Turbidity (NTU)		60.76	44.13	29.9	44.17	44.31	N/A	39.2	37.27	30.89	29.93	16.21	5.37	3.39	14.11
10-May-17	Turbidity (NTU)		N/A	N/A	N/A	33.77	40.24	N/A	45.37	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	Turbidity (NTU)		N/A	N/A	N/A	63.7	66.8	N/A	47	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	Turbidity (NTU)		42.8	51.8	42.5	64	38.23	38.02	28.5	28.5	N/A	N/A	35.5	6.78	6.12	11.39
8-Jun-17	Turbidity (NTU)		67.5	56	75.61	42	16.08	8.31	32.5	N/A	38.2	31.6	3175	13.3	42.1	89

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
14-Jun-17	Turbidity (NTU)		N/A	N/A	N/A	65.79	55.21	41.37	77.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	Turbidity (NTU)		N/A	N/A	N/A	87	43.75	30.11	43.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	Turbidity (NTU)		66.22	47.02	36.97	19.3	32.95	24.52	19.8	25.7	37.61	32.47	22.84	8.7	37.7	61.8
6-Apr-17	TSS (mg/l)		18.6	9.9	9	7.5	28.8	N/A	38.8	22.1	13.5	14.4	25.1	6.2	ND[16]	5.1
4-May-17	TSS (mg/l)		79.2	66.8	46	55.2	46	N/A	56.3	62.5	44.6	36.8	24.6	6.3	ND[16]	9.5
8-Jun-17	TSS (mg/l)		146	176	126	65	14.2	ND[16]	45.3	45.9	139	80.2	1978	29.9	51.3	211
14-Jun-17	TSS (mg/l)		N/A	N/A	N/A	132.9	72.6	36.2	98.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	TSS (mg/l)		N/A	N/A	N/A	169.1	90.6	22	45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Apr-17	BOD_5 (mg/l)	<1.5	ND[13]	ND[13]	ND[13]	ND[13]	ND[13]	N/A	ND[13]	ND[13]	ND[13]	ND[13]	ND[13]	ND[13]	ND[13]	ND[13]
4-May-17	BOD_5 (mg/l)	<1.5	ND[13]	1.3	1.3	ND[13]	ND[13]	N/A	ND[13]	ND[13]	ND[13]	ND[13]	ND[13]	1.2	ND[13]	ND[13]
8-Jun-17	BOD_5 (mg/l)	<1.5	ND[13]	ND[13]	ND[13]	ND[13]	1	N/A	ND[13]	ND[13]	1.1	ND[13]	ND[13]	ND[13]	ND[13]	1.1
14-Jun-17	BOD_5 (mg/l)	<1.5	N/A	N/A	N/A	ND[13]	ND[13]	1.3	ND[13]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21-Jun-17	BOD_5 (mg/l)	<1.5	N/A	N/A	N/A	1.05	ND[13]	1.4	ND[13]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Apr-17	COD (mg/l)	<5	8.6	ND[16]	ND[16]	ND[16]	ND[16]	N/A	ND[16]	ND[16]	ND[16]	ND[16]	ND[16]	ND[16]	7.3	16
4-May-17	COD (mg/l)	<5	8.7	8	9.8	8	ND[16]	N/A	7.3	6.7	6.9	5.5	6.7	6.3	7.1	26.9
8-Jun-17	COD (mg/l)	<5	6.1	8.4	9	7	5.3	N/A	8.2	10	15.8	10.9	73.7	9	13.5	30.9
6-Apr-17	NH_3-N (mg/l)	<0.2	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	N/A	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
4-May-17	NH_3-N (mg/l)	<0.2	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	N/A	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]
8-Jun-17	NH_3-N (mg/l)	<0.2	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	N/A	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]	ND[12]
6-Apr-17	NO3-N (mg/l)	<5	0.05	0.02	0.02	0.02	0.02	N/A	0.02	ND6	0.02	0.02	0.05	0.02	ND6	0.07
4-May-17	NO3-N (mg/l)	<5	0.07	0.09	0.09	0.1	0.09	N/A	0.09	0.08	0.09	0.07	0.12	0.02	0.03	0.09
8-Jun-17	NO3-N (mg/l)	<5	0.07	0.1	0.15	0.08	0.03	N/A	0.11	0.11	0.13	0.12	0.18	0.08	0.18	0.12
6-Apr-17	Faecal Coliform (MPN/100 ml)	<1,000	240	170	3,300	34	9	N/A	21	490	14	12	330	130	46	930
4-May-17	Faecal coliform (MPN/100 ml)	<1,000	170	1,100	920	540	350	N/A	240	350	110	33	24	17	350	79
8-Jun-17	Faecal coliform (MPN/100 ml)	<1,000	7,000	920	14,000	460	49	N/A	1,700	1,600	3,300	2,400	1,700	1,600	3,300	2,400
14-Jun-17	Faecal coliform (MPN/100 ml)	<1,000	N/A	N/A	N/A	1,600	1,100	130	1,700	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Apr-17	Total Coliform (MPN/100 ml)	<5,000	1,700	280	3,300	170	330	N/A	460	490	330	1,700	1,300	330	330	13,000
4-May-17	Total Coliform (MPN/100 ml)	<5,000	940	1,100	920	700	920	N/A	240	350	170	33	2,400	33	350	130
8-Jun-17	Total Coliform (MPN/100 ml)	<5,000	35,000	3,300	28,000	7,900	780	N/A	3,300	4,900	3,500	3,100	35,000	4,900	24,000	11,000

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
14-Jun-17	Total Coliform (MPN/100 ml)	<5,000	N/A	N/A	N/A	3,300	7,900	2,600	3,300	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8-Jun-17	TKN		ND[14]	ND[14]	ND[14]	ND[14]	ND[14]	N/A	ND[14]	ND[14]	ND[14]	ND[14]	ND[14]	ND[14]	ND[14]	ND[14]
8-Jun-17	Chloride (mg/l)		ND[13]	ND[13]	ND[13]	ND[13]	ND[13]	N/A	ND[13]	ND[13]	ND[13]	ND[13]	9.2	ND[13]	5.3	ND[13]
8-Jun-17	Sulphate (mg/l)	<500	7.2	7.2	7.2	6.7	10.8	N/A	9	10.7	10.9	8.7	9.9	6	8.9	12.4
8-Jun-17	Alkalinity (mg/l)		70.9	50.8	44.6	47.7	41.9	N/A	42.6	44.6	32.6	36.1	19.6	44.6	45	13.8
8-Jun-17	Arsenic (mg/l)	<0.01	0.0017	0.0033	0.0021	0.0011	0.0007	N/A	0.0015	0.0013	0.0016	0.001	0.0147	0.0004	0.0006	0.0006
8-Jun-17	Calcium (mg/l)		15.3	10.4	10.2	11	10.4	N/A	9.88	10.5	7.72	7.61	6.65	11.3	10.2	3.19
8-Jun-17	Manganese (mg/l)	<1.0	0.106	0.105	0.09	0.061	ND[4]	N/A	0.04	0.053	0.106	0.082	0.582	0.06	0.096	0.036
8-Jun-17	Mercury (mg/l)	<0.002	ND3	0.0003	ND3	ND3	ND3	N/A	ND3	ND3	ND3	ND3	0.0008	ND3	ND3	ND3
8-Jun-17	Magnesium (mg/l)		3.52	1.95	1.82	1.9	1.62	N/A	1.64	1.8	1.74	1.48	2.73	1.29	1.94	1.45
8-Jun-17	Lead (mg/l)	<0.05	ND[10]	ND[10]	ND[10]	ND[10]	ND[10]	N/A	ND[10]	ND[10]	ND[10]	ND[10]	ND[10]	ND[10]	ND[10]	ND[10]
8-Jun-17	Potassium (mg/l)		1.66	1.65	1.75	1.36	1.07	N/A	1.22	1.35	1.53	1.22	8.28	1.29	1.83	1.84
8-Jun-17	Sodium (mg/l)		2.75	1.93	2.08	2.14	1.8	N/A	1.8	2.14	1.6	1.97	1.59	1.82	3.3	0.519
8-Jun-17	Total Iron (mg/l)		3.22	7.28	4.78	2.59	0.801	N/A	2.18	2.44	5.02	3.1	85	0.669	2.87	6.98
8-Jun-17	a-BHC (mg/l)	<0.02	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	b-BHC (mg/l)	<0.02	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]

		River Name	Nam Ngiep										Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites										Location Refer to Construction Sites			
			Upstream				Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	NNG02	NNG03	NNG09	NNG04/R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**														
8-Jun-17	g-BHC (mg/l)	<0.02	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	d-BHC (mg/l)	<0.02	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	HAPTACHLOR (mg/l)		ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	ALDRIN (mg/l)	<0.1	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	HAPTACHLOR EXPOXIDE (mg/l)	<0.2	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	ENDOSULFAN I (mg/l)		ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	p,p,-DDE (mg/l)		ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	N/A	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]
8-Jun-17	DIELDRIN (mg/l)	<0.1	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	N/A	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]	ND[19]
8-Jun-17	ENDRIN (mg/l)	0	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	N/A	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]
8-Jun-17	ENDOSULFAN II (mg/l)		ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	N/A	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]
8-Jun-17	p,p-DDD (mg/l)		ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	N/A	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]
8-Jun-17	ENDRIN ALDEHYDE (mg/l)		ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	N/A	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]
8-Jun-17	ENDOSULFAN SULFATE (mg/l)		ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	N/A	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]
8-Jun-17	p,p-DDT (mg/l)		ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	N/A	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]	ND[8]
8-Jun-17	METHOXYCHLOR (mg/l)		ND[3]	ND[3]	ND[3]	ND[3]	ND[3]	N/A	ND[3]	ND[3]	ND[3]	ND[3]	ND[3]	ND[3]	ND[3]	ND[3]

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.00004 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)	ND[18] (<25.0 mg/L)	ND[19] (<0.00002 mg/L)	

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – QUARTER 2, 2017

		Site Name	Owner's Site Office and Village	Obayashi Camp WWTS1	TCM Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp WWTP	IHI Camp	Obayashi Camp WWTP2	Kenber Camp
		Station Code	EF01	EF02	EF03	EF06	EF07	EF08	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA													
07-Apr-17	pH	6.0-9.0	7.22	7.87	N/A	7.25	7.83	7.62	6.89	7.03	7.59	7.69	7.49	8.57	7.74
21-Apr-17	pH	6.0-9.0	6.78	7.63	N/A	7.43	7.54	7.65	6.96	7.15	6.78	7.5	8.08	8.33	8.97
09-May-17	pH	6.0-9.0	7.02	7.76	N/A	8.24	7.8	7.71	7.52	7.94	6.62	6.13	7.35	8.26	8.97
19-May-17	pH	6.0-9.0	8.3	8.34	N/A	8.01	8.45	7.6	8.33	7.8	N/A	8.06	7.88	8.43	8.1
13-Jun-17	pH	6.0-9.0	7.13	8.24	N/A	8.31	7.62	8.38	7.47	8.55	N/A	7.93	7.97	N/A	8.43
20-Jun-17	pH	6.0-9.0	7.13	7	N/A	7.54	7.59	7.68	7.37	7.6	N/A	7.38	7.38	N/A	9.72
07-Apr-17	Sat. DO (%)		15	0	N/A	0	19.8	0	22.2	0	66.2	0		61.2	0
21-Apr-17	Sat. DO (%)		9.4	13.3	N/A	0	4.5	0	1	0	5.1	0	0	29.7	37.2
09-May-17	Sat. DO (%)		11.3	0	N/A	7	66.4	0	15.4	0	7.3	0	0	54.7	27.2
19-May-17	Sat. DO (%)		18.5	11.7	N/A	46.5	34.6	17.4	7.2	9.1	N/A	12.6	16	55.7	58.6
13-Jun-17	Sat. DO (%)		9.1	12.4	N/A	4.7	21.9	0	6.5	13.1	N/A	20.6	4.5	N/A	2.9
20-Jun-17	Sat. DO (%)		40.2	53	N/A	21.8	32.1	1.5	0	20.2	N/A	19.3	8.3	N/A	3
07-Apr-17	DO (mg/l)		1.43	0	N/A	0	1.47	0	1.58	0	4.94	0	0	4.84	0
21-Apr-17	DO (mg/l)		0.72	3.99	N/A	0	0.54	0	0.08	0	0.3	0	0	2.29	2.57
09-May-17	DO (mg/l)		0.82	0	N/A	0.52	4.56	0	1.16	0	0.55	0	0	4.02	1.92
19-May-17	DO (mg/l)		1.42	0.9	N/A	3.57	2.72	1.4	0.55	0.71	N/A	0.98	1.25	4.38	4.46
13-Jun-17	DO (mg/l)		0.67	0.88	N/A	0.35	1.55	0	0.47	0.98	N/A	1.5	0.31	N/A	0.21

		Site Name	Owner's Site Office and Village	Obayashi Camp WWTS1	TCM Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp WWTP	IHI Camp	Obayashi Camp WWTP2	Kenber Camp
		Station Code	EF01	EF02	EF03	EF06	EF07	EF08	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA													
20-Jun-17	DO (mg/l)		3.13	4.12	N/A	1.65	2.5	0.11	0	1.56	N/A	1.48	0.63	N/A	0.23
07-Apr-17	Conductivity (µS/cm)		460	797	N/A	614	826	585	310	382	284	627	497	826	184
21-Apr-17	Conductivity (µS/cm)		462	877	N/A	712	910	874	375	443	238	636	1323	853	292
09-May-17	Conductivity (µS/cm)		458	899	N/A	1118	779	1007	677	609	211	862	715	813	483
19-May-17	Conductivity (µS/cm)		360	500	N/A	564	478	840	632	259	N/A	551	968	422	376
13-Jun-17	Conductivity (µS/cm)		342	655	N/A	636	634	898	332	404	N/A	806	537	N/A	549
20-Jun-17	Conductivity (µS/cm)		361	718	N/A	653	744	772	422	425	N/A	696	980	N/A	475
07-Apr-17	TDS (mg/l)		230	398	N/A	307	413	294	155	191	142	314	248	413	92
21-Apr-17	TDS (mg/l)		231	438	N/A	356	455	437	187	221	119	318	662	427	146
09-May-17	TDS (mg/l)		229	450	N/A	559	390	504	335	304	106	431	359	406	241
19-May-17	TDS (mg/l)		180	250	N/A	282	238	420	316	130	N/A	275	484	211	188
13-Jun-17	TDS (mg/l)		171	328	N/A	318	314	449	166	202	N/A	403	268	N/A	275
20-Jun-17	TDS (mg/l)		180	359	N/A	327	372	386	211	213	N/A	348	490	N/A	237
07-Apr-17	Temperature (°C)		27.94	27.7	N/A	26.63	29.35	26.63	29.32	26.47	29.24	29.29	27.58	25.57	25.63
21-Apr-17	Temperature (°C)		28.72	29.82	N/A	29.38	27.61	29.29	30.39	28.46	26.9	29.33	27.79	26.66	31.74
09-May-17	Temperature (°C)		28.52	30.26	N/A	29.08	33.75	31.33	32.7	30.58	27	29.3	30.16	29.89	31.56
19-May-17	Temperature (°C)		29.95	27.25	N/A	27.11	26.31	27.85	27.22	25.67	N/A	26.29	28.17	25.9	27.66
13-Jun-17	Temperature (°C)		28.33	30.24	N/A	29.51	31.87	28.71	29.62	28.85	N/A	28.89	29.47	N/A	28.66
20-Jun-17	Temperature (°C)		26.04	27.15	N/A	28.09	26.27	27.55	28.54	27.03	N/A	27.22	27.71	N/A	27.05
07-Apr-17	Turbidity (NTU)		0.35	16.74	N/A	8.76	7.22	25.9	7.11	26	12.29	7.91	12.34	30.24	10.85
21-Apr-17	Turbidity (NTU)		0.66	26.27	N/A	12.09	23.47	6.29	13.17	5.1	14.71	14.6	26.13	23.35	34.97

		Site Name	Owner's Site Office and Village	Obayashi Camp WWTS1	TCM Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp WWTP	IHI Camp	Obayashi Camp WWTP2	Kenber Camp
		Station Code	EF01	EF02	EF03	EF06	EF07	EF08	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA													
09-May-17	Turbidity (NTU)		0.65	18.7	N/A	11.83	17.48	25.76	47.33	53	14.11	21.09	18.76	43.33	56.26
19-May-17	Turbidity (NTU)		1.02	13.9	N/A	34.2	15.6	14.2	35.6	26	N/A	7.72	33	12.41	49.8
13-Jun-17	Turbidity (NTU)		0.74	8.43	N/A	22.86	18.53	33.92	29.18	24	N/A	25.14	19.37	N/A	7.95
20-Jun-17	Turbidity (NTU)		1.64	6.22	N/A	13.9	30.94	41.93	38.9	7.77	N/A	32.7	22.18	N/A	15.76
07-Apr-17	TSS (mg/l)	<50	ND[16]	18	N/A	17.1	23.7	45.6	16.2	110	31.5	38.7	22.1	20.9	11.4
21-Apr-17	TSS (mg/l)	<50	ND[16]	29.6	N/A	10	21.3	23.2	28.2	9.9	27.1	27.8	21.2	30.3	50
09-May-17	TSS (mg/l)	<50	ND[16]	27.1	N/A	20.6	54.1	24.6	85.6	70.7	16.7	42.2	20.4	27.4	115
19-May-17	TSS (mg/l)	<50	ND[16]	22.3	N/A	34.4	19.4	18.6	69.3	32.9	N/A	29.9	51.9	12.4	84.4
13-Jun-17	TSS (mg/l)	<50	ND[16]	10.1	N/A	32.8	23.8	39.2	64.3	34.2	N/A	20.4	12.8	N/A	22.7
20-Jun-17	TSS (mg/l)	<50	ND[16]	9.6	N/A	11.1	13.8	25	95.2	8.1	N/A	7.7	18.6	N/A	19.3
07-Apr-17	BOD_5 (mg/l)	<30	3.6	41.6	N/A	26.5	ND[13]	46.5	10.9	3.8	3.1	36.4	55.2	43.5	63
21-Apr-17	BOD_5 (mg/l)	<30	2	60.2	N/A	46	28	38.7	22	3.7	3.4	77.1	113	53	58.9
09-May-17	BOD_5 (mg/l)	<30	ND[13]	51.4	N/A	25.4	ND[13]	63	66.2	49.6	4.2	49.2	74.7	43	77.8
19-May-17	BOD_5 (mg/l)	<30	ND[13]	56.4	N/A	12.5	8.8	34	96.3	5.2	N/A	9.7	91.2	18.9	34.6
13-Jun-17	BOD_5 (mg/l)	<30	4.1	17.8	N/A	25.7	ND[13]	72.2	21.1	23.3	N/A	34.6	29.9	N/A	76.6
20-Jun-17	BOD_5 (mg/l)	<30	4.8	19.8	N/A	25.4	ND[13]	37.7	34.6	17.6	N/A	51.9	85.5	N/A	30.9
07-Apr-17	COD (mg/l)	<125	ND[18]	134	N/A	77.6	98.4	200	41.6	25	65.6	174	156	187	190
21-Apr-17	COD (mg/l)	<125	ND[18]	135	N/A	96.8	98.4	114	62.2	ND[18]	45.2	150	235	170	174
09-May-17	COD (mg/l)	<125	ND[18]	142	N/A	103	128	163	212	170	ND[18]	108	210	177	296
19-May-17	COD (mg/l)	<125	ND[18]	104	N/A	38.3	36.2	139	204	ND[18]	N/A	32.4	239	67.8	136
13-Jun-17	COD (mg/l)	<125	ND[18]	46.9	N/A	53.1	55.2	166	96.8	39.4	N/A	163	65	N/A	160
20-Jun-17	COD (mg/l)	<125	ND[18]	42.8	N/A	40.7	56.7	140	148	ND[18]	N/A	103	93.5	N/A	91.9
07-Apr-17	NH_3-N (mg/l)	<10	7	27	N/A	23	31	88	ND[12]	4	ND[12]	25	18	ND[12]	8
21-Apr-17	NH_3-N (mg/l)	<10	3	28	N/A	26	29	44	ND[12]	4	ND[12]	26	21	ND[12]	ND[12]
09-May-17	NH_3-N (mg/l)	<10	4	32	N/A	69	20	61	39	22	ND[12]	26	20	ND[12]	12

		Site Name	Owner's Site Office and Village	Obayashi Camp WWTS1	TCM Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp WWTP	IHI Camp	Obayashi Camp WWTP2	Kenber Camp
		Station Code	EF01	EF02	EF03	EF06	EF07	EF08	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA													
19-May-17	NH_3-N (mg/l)	<10	4	29	N/A	10	15	56	36	4	N/A	17	9	6	14
13-Jun-17	NH_3-N (mg/l)	<10	2	12	N/A	26	16	55	17	8	N/A	18	13		19
20-Jun-17	NH_3-N (mg/l)	<10	2	17	N/A	25	23	38	23	8	N/A	21	12		11
07-Apr-17	Total Nitrogen (mg/l)	<10	15.5	31.8	N/A	25	34.2	42	17.6	6.52	N/A	31.4	20.7	9.14	12.5
21-Apr-17	Total Nitrogen (mg/l)	<10	11.4	32	N/A	29.2	32.8	40.1	8.81	4.86	N/A	26.2	20.3	6.49	5.67
09-May-17	Total Nitrogen (mg/l)	<10	12.3	36	N/A	46.4	23.2	43.2	40.8	30.1	N/A	25.8	20.4	7.81	21.4
19-May-17	Total Nitrogen (mg/l)	<10	5.89	31.6	N/A	13.9	17.5	34.7	34.6	5.31	N/A	20.9	11.7	7.88	14.6
13-Jun-17	Total Nitrogen (mg/l)	<10	10.5	13.3	N/A	29.4	19.7	39.6	29.3	11.7	N/A	28	14.4		26.5
20-Jun-17	Total Nitrogen (mg/l)	<10	7.64	18.6	N/A	27.2	29	34.8	31.1	9.52	N/A	23.6	15.4		17.3
07-Apr-17	Total Phosphorus (mg/l)		1.68	1.62	N/A	1.56	1.67	2.84	1.65	0.26	N/A	1.54	1.44	0.75	0.95
21-Apr-17	Total Phosphorus (mg/l)		1.47	1.67	N/A	1.59	1.61	1.76	1.75	0.18	N/A	1.57	1.61	0.82	0.28
09-May-17	Total Phosphorus (mg/l)		0.8	1.64	N/A	2.1	3.49	4.88	1.73	1.72	N/A	1.08	4.44	0.11	1.28
19-May-17	Total Phosphorus (mg/l)		1.5	1.56	N/A	0.83	1.03	2.06	1.67	0.24	N/A	0.45	0.98	0.54	0.82
13-Jun-17	Total Phosphorus (mg/l)		0.99	0.28	N/A	1.43	0.9	0.67	0.81	0.71	N/A	1.38	0.8		1.16
20-Jun-17	Total Phosphorus (mg/l)		1.06	0.42	N/A	1.48	1.42	1.46	1.51	0.74	N/A	1.39	1.27		0.81
07-Apr-17	Faecal Coliform (MPN/100ml)		0	160,000	N/A	160,000	0	160,000	160,000	3,300	33	160,000	4,600	160,000	160,000

		Site Name	Owner's Site Office and Village	Obayashi Camp WWTS1	TCM Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da5 Camp No.2	Zhefu Camp	V & K Camp	SECC Camp	HM Main Camp WWTP	IHI Camp	Obayashi Camp WWTP2	Kenber Camp
		Station Code	EF01	EF02	EF03	EF06	EF07	EF08	EF09	EF10	EF11	EF13	EF14	EF15	EF16
Date	Parameter (Unit)	Guideline in the CA													
21-Apr-17	Faecal Coliform (MPN/100ml)		2	160,000	N/A	160,000	0	160,000	92,000	17	140	160,000	160,000	160,000	160,000
09-May-17	Faecal Coliform (MPN/100 ml)		13	160,000	N/A	160,000	4.5	160,000	160,000	160,000	70	79	160,000	160,000	160,000
19-May-17	Faecal Coliform (MPN/100 ml)		33	160,000	N/A	160,000	540	4.5	160,000	9,400		1,600	160,000	2400	35,000
13-Jun-17	Faecal Coliform (MPN/100 ml)		1700	1,700	N/A	160,000	0	160,000	160,000	160,000		1,600	54,000		24,000
20-Jun-17	Faecal Coliform (MPN/100 ml)		93	41,000	N/A	160,000	0	17	160,000	24,000		700	2,400		70
07-Apr-17	Total Coliform (MPN/100 ml)	<400	49	160,000	N/A	160,000	0	160,000	160,000	11,000	920	160,000	160,000	160,000	160,000
21-Apr-17	Total Coliform (MPN/100 ml)	<400	2	160,000	N/A	160,000	2	160,000	160,000	54,000	140	160000	160,000	160,000	160,000
09-May-17	Total Coliform (MPN/100 ml)	<400	13	160,000	N/A	160,000	4.5	160,000	160,000	160,000	130	79	160,000	160,000	160,000
19-May-17	Total Coliform (MPN/100 ml)	<400	33	160,000	N/A	160,000	540	23	160,000	17,000		1,600	160,000	2,400	54,000
13-Jun-17	Total Coliform (MPN/100 ml)	<400	1,700	54,000	N/A	160,000	13	160,000	160,000	160,000	N/A	2,300	160,000		24,000
20-Jun-17	Total Coliform (MPN/100 ml)	<400	120	43,000	N/A	160,000	0	170	160,000	54,000		24,000	160,000		170
Apr-17	Oil & Grease (mg/l)	<10	ND[13]	2	N/A	3	2	1	ND[13]	1	ND[13]	3	2	1	ND[13]
May-17	Oil & Grease (mg/l)	<10	ND[13]	5	N/A	1	ND[13]	3	1	ND[13]	ND[13]	3	5	2	7
Jun-17	Oil & Grease (mg/l)	<10	ND[13]	ND[13]	N/A	ND[13]	ND[13]	ND[13]	3	ND[13]	N/A	8	1	N/A	ND[13]
Jun-17	Manganese (mg/l)		0.086	2.48	N/A	0.292	0.139	0.093	0.05	0.584	N/A	0.189	0.208	N/A	0.99
Jun-17	Manganese (mg/l)		0.068	1.46	N/A	0.245	0.129	0.071	0.081	0.65	N/A	0.189	0.252	N/A	0.327
Jun-17	Total Iron (mg/l)	<2	ND[10]	1.16	N/A	1.1	0.885	0.479	1.15	0.847	N/A	0.473	0.439	N/A	0.537
Jun-17	Total Iron (mg/l)	<2	ND[10]	0.701	N/A	0.936	0.796	0.336	1.74	0.731	N/A	0.554	0.502	N/A	0.38

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.00004 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)	ND[18] (<25.0 mg/L)	ND[19] (<0.00002 mg/L)	

APPENDIX 5-3: EFFLUENT CONSTRUCTION AREA DISCHARGED MONITORING RESULTS – QUARTER 2, 2017

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	Site Name	Station Code	Guideline	6.0 - 9.0							<50	<10
6-Apr-17	Aggregate Crushing Plant	DS02		8.67	51.1	4.21	136	68	23.23	15100	4134	ND[13]
11-Apr-17	Aggregate Crushing Plant	DS02		8.6	75.5	5.66	136	68	28.68	7820	2558	N/A
20-Apr-17	Aggregate Crushing Plant	DS02		7.74	36.7	2.49	148	74	29.26	2110	3100	N/A
27-Apr-17	Aggregate Crushing Plant	DS02		7.31	47.1	3.23	138	69	31.12	7160	558	N/A
5-May-17	Aggregate Crushing Plant	DS02		8.89	77.9	5.67	215	107	28.87	1331	2425	ND[13]
10-May-17	Aggregate Crushing Plant	DS02		8.44	57.3	4.41	170	85	27.35	2441	855	N/A
18-May-17	Aggregate Crushing Plant	DS02		7.57	120	10.13	139	69	23.29	15130	932	N/A
24-May-17	Aggregate Crushing Plant	DS02		7.5	100.9	6.79	88	44	29.5	3665	6035	N/A
31-May-17	Aggregate Crushing Plant	DS02		7.86	31	2.16	124	62	32.97	900	1377	N/A
6-Jun-17	Aggregate Crushing Plant	DS02		N/A	N/A	N/A	N/A	N/A	N/A	9260	4365.67	N/A
9-Jun-17	Aggregate Crushing Plant	DS02		7.97	31.4	2.4	125	63	27.59	28490	11431	ND[13]
15-Jun-17	Aggregate Crushing Plant	DS02		7.27	59.7	4.58	159	79	27.43	9400	33556	N/A
22-Jun-17	Aggregate Crushing Plant	DS02		7.84	58	4.07	103	51	33.01	104400	60687	N/A
29-Jun-17	Aggregate Crushing Plant	DS02		8	63.4	4.89	127	64	27.16	27530	10977.78	N/A
6-Apr-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Apr-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-May-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-May-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	CVC Plant	DS03		7.5	110.1	8.35	236	118	23.98	12670	5,755	ND[13]
24-May-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31-May-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Jun-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	Site Name	Station Code	Guideline	6.0 - 9.0							<50	<10
9-Jun-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-Jun-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22-Jun-17	CVC Plant	DS03		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	CVC Plant	DS03		8.04	93	6.64	213	106	28.85	126	243	ND[13]
6-Apr-17	Spoil Disposal No.2	DS04		6.11	73	5.36	110	55	25.51	9.59	189	ND[13]
11-Apr-17	Spoil Disposal No.2	DS04		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	Spoil Disposal No.2	DS04		7.94	41	2.98	118	59	29.4	17.89	N/A	N/A
27-Apr-17	Spoil Disposal No.2	DS04		7.93	58.7	4.18	85	42	31.84	20.08	5	N/A
5-May-17	Spoil Disposal No.2	DS04		5.98	54	4.18	121	61	26.72	33.8	8	ND[13]
10-May-17	Spoil Disposal No.2	DS04		6.16	38.5	2.44	122	61	27.99	26.63	43	N/A
18-May-17	Spoil Disposal No.2	DS04		7.1	110.9	8.98	213	106	24.22	94	17	N/A
24-May-17	Spoil Disposal No.2	DS04		6.51	76.3	5.95	160	80	26.5	13.8	147	N/A
31-May-17	Spoil Disposal No.2	DS04		7.13	16.4	1.26	86	43	27.18	14	8	N/A
6-Jun-17	Spoil Disposal No.2	DS04		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Jun-17	Spoil Disposal No.2	DS04		5.84	26	1.89	64	32	26.71	71.12	28	ND[13]
15-Jun-17	Spoil Disposal No.2	DS04		6.85	71.8	5.79	68	34	25.74	21.65	11	N/A
22-Jun-17	Spoil Disposal No.2	DS04		6.81	55.2	4.09	74	36	26.38	19.02	12	N/A
29-Jun-17	Spoil Disposal No.2	DS04		6.55	42.1	3.32	49	25	27.77	30.08	24	N/A
6-Apr-17	Re-regulation Dam	DS08		8.95	69.5	5.47	145	72	26.25	118.88	1,437	ND[13]
11-Apr-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	183	N/A
20-Apr-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-May-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-May-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	Site Name	Station Code	Guideline	6.0 - 9.0							<50	<10
24-May-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31-May-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Jun-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Jun-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-Jun-17	Re-regulation Dam	DS08		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Apr-17	RCC Plant Discharged at lower ponds	DS09		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Apr-17	RCC Plant Discharged at lower ponds	DS09		7.9	81.4	6.19	259	130	31.04	75.13	156	ND[13]
20-Apr-17	RCC Plant Discharged at lower ponds	DS09		7.52	41.6	3.11	242	121	29.12	62500	49,682	N/A
27-Apr-17	RCC Plant Discharged at lower ponds	DS09		7.48	49.7	3.18	259	128	34.74	1166	1,260	N/A
5-May-17	RCC Plant Discharged at lower ponds	DS09		7.64	84	6.78	200	100	34.5	1158	585.8	ND[13]
10-May-17	RCC Plant Discharged at lower ponds	DS09		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	RCC Plant Discharged at lower ponds	DS09		7.99	87.02	7.02	228	117	24.01	3962	1,492	N/A
24-May-17	RCC Plant Discharged at lower ponds	DS09		7.86	37.9	2.65	300	152	33.19	76.53	85	N/A
31-May-17	RCC Plant Discharged at lower ponds	DS09		7.41	28.7	1.91	264	132	35.48	69.24	84	N/A
6-Jun-17	RCC Plant Discharged at lower ponds	DS09		N/A	N/A	N/A	N/A	N/A	N/A	186	142.46	N/A
9-Jun-17	RCC Plant Discharged at lower ponds	DS09		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-Jun-17	RCC Plant Discharged at lower ponds	DS09		8.01	55.3	4.15	221	111	27.36	612	8.6	N/A
22-Jun-17	RCC Plant Discharged at lower ponds	DS09		8.12	49.1	3.63	284	142	28.54	118	337.2	N/A

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	Site Name	Station Code	Guideline	6.0 - 9.0							<50	<10
29-Jun-17	RCC Plant Discharged at lower ponds	DS09		10.14	77.5	5.67	234	114	28.47	105.06	134.37	N/A
6-Apr-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Apr-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27-Apr-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5-May-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-May-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18-May-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31-May-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6-Jun-17	RCC Plant Discharged nearby IHI Workshop	DS13		N/A	N/A	N/A	N/A	N/A	N/A	923	511.23	N/A
9-Jun-17	RCC Plant Discharged nearby IHI Workshop	DS13		7.19	42.5	3.2	219	110	28.57	156	N/A	N/A
15-Jun-17	RCC Plant Discharged nearby IHI Workshop	DS13		7.58	61.8	4.67	187	94	28.16	148	294	N/A
22-Jun-17	RCC Plant Discharged nearby IHI Workshop	DS13		9.3	67.9	4.58	180	90	33.39	720	372.2	N/A
29-Jun-17	RCC Plant Discharged nearby IHI Workshop	DS13		8.23	54.3	4.4	135	67	28.88	101.46	121.6	N/A
6-Apr-17	Main Dam's Treatment Plant No.1	DS11		3.23	63.3	4.76	966	483	28.45	17.96	53	ND[13]

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	Site Name	Station Code	Guideline	6.0 - 9.0							<50	<10
11-Apr-17	Main Dam's Treatment Plant No.1	DS11		7.23	54.6	4.04	1211	605	29.44	13.35	44	N/A
20-Apr-17	Main Dam's Treatment Plant No.1	DS11		6.07	57.8	4.39	1288	644	27.17	8.13	27	N/A
27-Apr-17	Main Dam's Treatment Plant No.1	DS11		11.53	68.2	5.21	2093	1047	27.72	27.28	20.4	N/A
5-May-17	Main Dam's Treatment Plant No.1	DS11		5.46	82.1	6.22	1064	532	28.22	11.75	68.9	ND[13]
10-May-17	Main Dam's Treatment Plant No.1	DS11		7.63	101.1	8.65	1600	800	23.98	9.35	27.7	N/A
18-May-17	Main Dam's Treatment Plant No.1	DS11		10.82	34.2	2.47	1480	740	30.1	7.92	23.2	N/A
24-May-17	Main Dam's Treatment Plant No.1	DS11		8.87	39.6	2.88	1712	857	30.96	12.45	84.6	N/A
6-Jun-17	Main Dam's Treatment Plant No.1	DS11		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Jun-17	Main Dam's Treatment Plant No.1	DS11		9.61	49.2	3.69	694	347	27.67	0.06	13.2	ND[13]
15-Jun-17	Main Dam's Treatment Plant No.1	DS11		3.81	56.1	4.29	891	446	27.36	6.68	10.7	N/A
22-Jun-17	Main Dam's Treatment Plant No.1	DS11		12.31	73.3	5.2	696	348	30.43	6.49	13	N/A
29-Jun-17	Main Dam's Treatment Plant No.1	DS11		7.54	55	4.26	413	207	27.45	10.2	27.01	N/A
6-Apr-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11-Apr-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20-Apr-17	Main Dam's Treatment Plant No.2	DS12		9.82	54.3	4.05	188	94	29.18	29.02	31	N/A
27-Apr-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

			Parameter (Unit)	pH	Sat. DO (%)	DO (mg/l)	Conductivity (µs/cm)	TDS (mg/l)	Temperature (°C)	Turbidity (NTU)	TSS (mg/l)	Oil & Grease (mg/l)
Date	Site Name	Station Code	Guideline	6.0 - 9.0							<50	<10
5-May-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-May-17	Main Dam's Treatment Plant No.2	DS12		10.83	74.3	5.16	505	253	33.46	103.43	123	ND[13]
18-May-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24-May-17	Main Dam's Treatment Plant No.2	DS12		11.52	37.5	2.56	787	394	34.25	11.73	N/A	N/A
6-Jun-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9-Jun-17	Main Dam's Treatment Plant No.2	DS12		10.21	55.1	4.1	191	95	27.66	120	285	ND[13]
15-Jun-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22-Jun-17	Main Dam's Treatment Plant No.2	DS12		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29-Jun-17	Main Dam's Treatment Plant No.2	DS12		11.62	65.7	4.92	415	207	28.46	10.08	40.3	N/A

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.00004 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)	ND[18] (<25.0 mg/L)	ND[19] (<0.00002 mg/L)	

APPENDIX 5-4: GROUNDWATER QUALITY MONITORING RESULTS, QUARTER 2, 2017

		Site Name	Hatsaykham Village			Houay Soup Resettlement Area (HSRA)					
		Station	GHSK01	GHSK02	GHSK03	GHSPO1	GHSPO2	GHSPO3	GHSPO4	GHSPO5	GHSPO6
Month Year	Parameter (Unit)	Guideline									
20-Apr-17	pH	6.5 - 9.2	5.84	N/A	N/A	6.97	7.02	7.23	5.82	6.83	6.96
09-May-17	pH	6.5 - 9.2	N/A*	N/A*	N/A*	7.25	6.71	7.19	6.56	6.92	7.25
02-Jun-17	pH	6.5 - 9.2	N/A*	N/A*	N/A*	7.33	7.14	7.3	6.98	7.12	7.56
20-Apr-17	Sat. DO (%)		19.5	N/A	N/A	46	60	55.5	27.4	51.8	62.3
09-May-17	Sat. DO (%)		N/A*	N/A*	N/A*	34.2	49.2	38.5	35.3	56.6	62.6
02-Jun-17	Sat. DO (%)		N/A*	N/A*	N/A*	30	28.2	25.7	24.2	31.6	37.2
20-Apr-17	DO (mg/l)		1.51	N/A	N/A	3.74	4.56	4.26	2	3.92	4.85
09-May-17	DO (mg/l)		N/A*	N/A*	N/A*	2.43	3.41	2.87	2.53	4	4.57
02-Jun-17	DO (mg/l)		N/A*	N/A*	N/A*	2.32	2.19	1.99	1.86	2.41	2.88
20-Apr-17	Conductivity (µS/cm)		106	N/A	N/A	467	256	510	116	317	307
09-May-17	Conductivity (µS/cm)		N/A*	N/A*	N/A*	268	290	513	271	312	390
02-Jun-17	Conductivity (µS/cm)		N/A*	N/A*	N/A*	465	409	481	228	326	429
20-Apr-17	TDS (mg/l)	1200	53	N/A	N/A	234	128	253	58	159	153
09-May-17	TDS (mg/l)	1200	N/A*	N/A*	N/A*	134	145	257	136	156	195
02-Jun-17	TDS (mg/l)	1200	N/A*	N/A*	N/A*	232	205	240	114	163	215
20-Apr-17	Temperature (°C)		26.9	N/A	N/A	27.49	26.68	27.56	30	20.15	26.74
09-May-17	Temperature (°C)		N/A*	N/A*	N/A*	29.28	31.33	29.14	31.36	30.26	27.96
02-Jun-17	Temperature (°C)		N/A*	N/A*	N/A*	26.47	27.38	27.38	27.28	27.73	26.85
20-Apr-17	Turbidity (NTU)	<20	0.39	N/A	N/A	0.23	0.32	0.18	0.64	0.23	0.4
09-May-17	Turbidity (NTU)	<20	N/A*	N/A*	N/A*	0.92	0.6	0.56	1.55	0.61	0.58
02-Jun-17	Turbidity (NTU)	<20	N/A*	N/A*	N/A*	0.67	0.38	0.3	1.72	0.24	0.43
20-Apr-17	Fecal coliform (MPN/100 ml)	0	7.8	N/A	N/A	0	0	0	350	0	7.8
09-May-17	Fecal coliform (MPN/100 ml)	0	N/A*	N/A*	N/A*	0	0	0	0	0	0

		Site Name	Hatsaykham Village			Houay Soup Resettlement Area (HSRA)					
		Station	GHSK01	GHSK02	GHSK03	GHSPO1	GHSPO2	GHSPO3	GHSPO4	GHSPO5	GHSPO6
Month Year	Parameter (Unit)	Guideline									
02-Jun-17	Fecal coliform (MPN/100 ml)	0	N/A*	N/A*	N/A*	0	0	0	0	0	0
20-Apr-17	E.coli Bacteria (MPN/100 ml)	0	7.8	N/A	N/A	0	0	0	350	0	7.8
09-May-17	E.coli Bacteria (MPN/100 ml)	0	N/A*	N/A*	N/A*	0	0	0	0	0	0
02-Jun-17	E.coli Bacteria (MPN/100 ml)	0	N/A*	N/A*	N/A*	0	0	0	0	0	0
02-Jun-17	Arsenic (mg/)	<0.05	N/A*	N/A*	N/A*	0.0004	0.0003	0.0004	ND2	ND2	0.0004
02-Jun-17	Cadmium (mg/l)	<0.01	N/A*	N/A*	N/A*	ND[5]	ND[5]	ND[5]	ND[5]	ND[5]	ND[5]
02-Jun-17	Total Iron (mg/l)		N/A*	N/A*	N/A*	ND10	0.062	0.178	ND10	ND10	ND10
02-Jun-17	Maganesium (mg/l)		N/A*	N/A*	N/A*	4.25	3.4	4.19	1.75	3.65	4.13
02-Jun-17	Manganese (mg/l)	<0.5	N/A*	N/A*	N/A*	ND4	ND4	ND4	ND4	ND4	ND4
02-Jun-17	Fluoride (mg/l)	<1	N/A*	N/A*	N/A*	0.38	0.31	0.29	0.34	0.31	0.22
02-Jun-17	Total hardness (mg/l)	<500	N/A*	N/A*	N/A*	219	171	230	114	153	181
02-Jun-17	Nitrate (mg/l)	<45	N/A*	N/A*	N/A*	0.24	0.18	0.22	ND7	0.19	0.17
02-Jun-17	Nitrite (mg/l)	<3	N/A*	N/A*	N/A*	ND[7]	ND[7]	ND[7]	ND[7]	ND[7]	ND[7]

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.00004 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)	ND[18] (<25.0 mg/L)	ND[19] (<0.00002 mg/L)	

APPENDIX 5-5: GRAVITY FED WATER SUPPLY MONITORING RESULTS – QUARTER 2, 2017.

Date	Parameter (Unit)	Site Name	ThaHeua Village	HatGnuin Village
		Station	WTHH02	WHGN02
		Guideline		
20-Apr-17	pH	6.5-8.5	7.11	7.46
09-May-17	pH	6.5-8.5	7.38	7.43
02-Jun-17	pH	6.5-8.5	7.21	7.3
20-Apr-17	Sat. DO (%)		62.8	67.7
09-May-17	Sat. DO (%)		59.8	73.3
02-Jun-17	Sat. DO (%)		30.4	37.2
20-Apr-17	DO (mg/l)		4.7	4.94
09-May-17	DO (mg/l)		4.44	5.59
02-Jun-17	DO (mg/l)		2.28	2.8
20-Apr-17	Conductivity (µs/cm)		90	123
09-May-17	Conductivity (µs/cm)		94	124
02-Jun-17	Conductivity (µs/cm)		88	122
20-Apr-17	TDS (mg/l)	<600	45	61
09-May-17	TDS (mg/l)	<600	47	62
02-Jun-17	TDS (mg/l)	<600	44	61
20-Apr-17	Temperature (°C)	<35	28.01	28.79
09-May-17	Temperature (°C)	<35	29.34	27.96
02-Jun-17	Temperature (°C)	<35	29.03	28.84
20-Apr-17	Turbidity (NTU)	<10	0.73	0.72
09-May-17	Turbidity (NTU)	<10	1.19	0.8
02-Jun-17	Turbidity (NTU)	<20	1.77	0.86
20-Apr-17	E. Coli Bacteria (MPN/100 ml)	0	49	79
09-May-17	E. Coli Bacteria (MPN/100 ml)	0	23	130
02-Jun-17	E. Coli Bacteria (MPN/100 ml)	0	17	79

Date	Parameter (Unit)	Site Name	ThaHeua Village	HatGnuin Village
		Station	WTHH02	WHGN02
		Guideline		
20-Apr-17	Faecal coliform (MPN/100 ml)	0	49	79
09-May-17	Faecal coliform (MPN/100 ml)	0	23	130
02-Jun-17	Faecal coliform (MPN/100 ml)	0	17	79
02-Jun-17	Arsenic (mg/l)	<0.05	ND[2]	ND[2]
02-Jun-17	Cadmium (mg/l)	<0.003	ND[5]	ND[5]
02-Jun-17	Fluoride (mg/l)	<1.5	0.23	0.25
02-Jun-17	Lead (mg/l)	<0.05	ND10	ND10
02-Jun-17	Nitrate (mg/l)	<50	0.32	0.15
02-Jun-17	Nitrite (mg/l)	<3	ND[7]	ND[7]
02-Jun-17	Total Hardness (mg/l)	<500	52.3	55.7
02-Jun-17	Total Iron (mg/l)		ND[2]	ND[2]
02-Jun-17	Selenium (mg/l)	<0.01	ND[1]	ND[1]
02-Jun-17	Manganese (mg/l)	<0.5	ND[4]	0.006
02-Jun-17	Magnesium (mg/l)		2.71	2.02
02-Jun-17	Mercury (mg/l)	<0.001	ND[3]	ND[3]

ND[1] (<0.0005 mg/L)	ND[2] (<0.0003 mg/L)	ND[3] (<0.0002 mg/L)	ND[4] (<0.005 mg/L)	ND[5] (<0.003 mg/L)
ND[6] (<0.09 mg/L)	ND[7] (<0.07 mg/L)	ND[8] (<0.00004 mg/L)	ND[9] (<0.02 mg/L)	ND[10] (<0.01 mg/L)
ND[11] (<0.3 mg/L)	ND[12] (<0.2 mg/L)	ND[13] (<1.0 mg/L)	ND[14] (<1.5 mg/L)	ND[15] (<4.0 mg/L)
ND[16] (<5.0 mg/L)	ND[17] (<2.7 mg/L)	ND[18] (<25.0 mg/L)	ND[19] (<0.00002 mg/L)	