

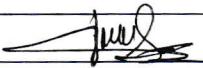
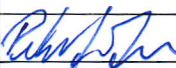
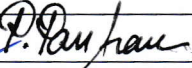


**NAM NGIEP 1**  
POWER COMPANY

## Nam Ngiep 1 Hydropower Project

# Environmental Management Monthly Monitoring Report

May 2016

					
A	23 May 2016	Viengkeo Phetnavongxay	Peter G. Jensen	Prapard PanARam	
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**BBREVIATIONS / ACRONYMS**

ADB	Asian Development Bank
BBS	Biodiversity Baseline Survey
BOD	Biochemical Oxygen Demand
BOF	Biodiversity Offset Framework
BODM	Board of Directors Meeting
BRP	Biomass Removal Plan
CA	Concession Agreement between the NNP1PC and GOL,
CAP	Corrective Action Plan
COD	Commercial Operation Date
CVC	Conventional Concrete
CWC	Civil Works Contract
DAS	Document Approval Sheet
DCC	District Coordination Committees
DEQP	Department of Environmental Quality Promotion, MONRE
DESIA	Department of Environmental and Social Impact Assessment, MONRE
DFRM	Department of Forest Resources Management, MONRE
ECZ	Elephant Conservation Zone
EdL	Electricite du Laos
EIA	Environmental Impact Assessment
EMO	Environmental Management Office of ESD within NNP1PC
EMU	Environmental Monitoring Unit
EMWC	Electrical-Mechanical Works Contract
EPF	Environmental Protection Fund
ERIC	Environmental Research Institute of Chulalongkhorn University
ERM	Environmental Resource Management
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
GOL	Government of Lao PDR
GIS	Geographic Information Systems
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Integrated Spatial Planning
LTA	Lender's Technical Advisor

MoM	Minutes of Meeting
MoNRE	Ministry of Natural Resource and Environment, Lao PDR
NCR	Non-Compliance Report
NNP1PC	Nam Ngiep 1 Power Company Limited
NPF	National Protection Forest
NTFP	Non-Timber Forest Products
NTP	Notice to Proceed (under each construction contract)
NVDI	Normalised Difference Vegetation Index
OC	Obayashi Corporation
ONC	Observation of Non-Compliances
PONRE	Provincial Department of Natural Resource and Environment, MONRE
PRLRC	Provincial Resettlement and Livelihood Restoration Committee
PvPA	Provincial Protection Area
RCC	Roller Compacted Concrete
ROW	Right of Way
SLBMP	Salvage Logging Biomass Management Plan
SMO	Social Management Office of ESD within NNP1PC
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TL	Transmission Line(s)
TLWC	Transmission Line Works Contract
ToR	Terms of Reference
TSS	Total Suspended Solids
USD	US Dollar
UXO	Unexploded Ordinance
WMC	Watershed Management Committee
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WWTS	Waste Water Treatment System

## EXECUTIVE SUMMARY

In May 2016, NNP1PC-EMO received five (5) SS-ESMMPs. Out of these, four (04) SS-ESMMPs were under review and one (01) SS-ESMMP was approved with comments. A total of 24 construction areas and camps including temporary camps at Houay Soup Resettlement Areas, and the 230 kV Transmission Line were inspected. Based on these site inspections, a total of fifteen (15) Observations of Non-Compliances (ONCs) and one (1) Non-Compliance Report Level 1 (NCR1) were issued in May 2016. The NCR1 was related to direct discharge of highly turbid water into the Nam Ngiep without prior treatment.

The procurement process to appoint a contractor to construct a small laboratory at the Owners' Site Office and Village has been delayed due to submission of incomplete proposals by the bidders. The potential bidders has been requested to submit the required information in order that the technical evaluation can be completed. The purchase of the laboratory equipment is being finalised. Quotations were negotiated with a supplier in Thailand and the Purchase Order is expected to be issued in June 2016. Meanwhile there are several options by which to provide a temporary room or rooms in which a laboratory can be accommodated and operated after delivery of equipment to Site.

The results of the monitoring of effluents from the camps carried out in May 2016 showed that all construction camps except the Owner's Village and Site Office, and the V&K Camp, had significantly higher concentrations of total coliforms than the effluent standards. Regarding the effluents of the construction sites, the values of Total Suspended Solids (TSS) and pH exceeded the effluent standards in samples from sampling mission on 23 May 2016 and random effluent sampling missions at the RCC Plant. An ONC was issued in May requiring the Contractor to provide regular maintenance of the sediment ponds by early June 2016. All parameters of the surface water monitored in May 2016 were found to be within the National Surface Water Quality Standards except with respect to COD, which showed a peak value of 17.9 mg/L at the station in Nam Ngiep upstream of the Main Dam and the lowest COD with a value of 5.7 mg/L was recorded at the station of Nam Ngiep within the construction area.

There were no Environmental Monitoring Unit (EMU) visits scheduled in May 2016.

Good progresses were achieved on the construction of stage 1 of the NNP1 Project landfill at Spoil Disposal Area No. 6 including excavation of one (01) waste disposal pit and four (04) treatment ponds. The bids for the construction of Houay Soup landfill were opened and being evaluated.

The development of the Nam Ngiep 1 Watershed Management Plan (WMP) has continued to progress. The progress and working draft WMP have been presented to ADB, IAP, BAC and LTA during their mission to the Project in May 2016 and the Mission acknowledged the positive progress. It was recommended to continue with the progress and to strengthen incorporation of the outcomes of Xaysomboun Integrated Spatial Planning (ISP) and further develop and integrate management of biodiversity, fishery and forest. NNP1 Watershed Management Office (WMO) has showed good progress on implementation of watershed management activities funded by NNP1PC, including completion of field confirmation of the watershed boundary, and land use planning in 11 priority villages in NNP1 watershed.

NNP1 continues to progress on the biodiversity offset site selection. During the joint mission of ADB, IAP, BAC and LTA, the results of the biodiversity ground truth survey of Nam Mouane Watershed located in Bolikhamxay Province were discussed, and the parties concluded that Nam Mouane Watershed is a suitable Biodiversity Offset Site for NNP1.

Good progress has also been made on the biomass clearance programme. By the time of reporting, the clearance work has covered 214 ha or around 20% of the area targeted for 2016. It is expected that the progress in the coming months will slow down due to rainy season.

## 1 INTRODUCTION

The Nam Ngiep originates in the mountains of Xieng Khouang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhan District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province (Fig. 1).

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

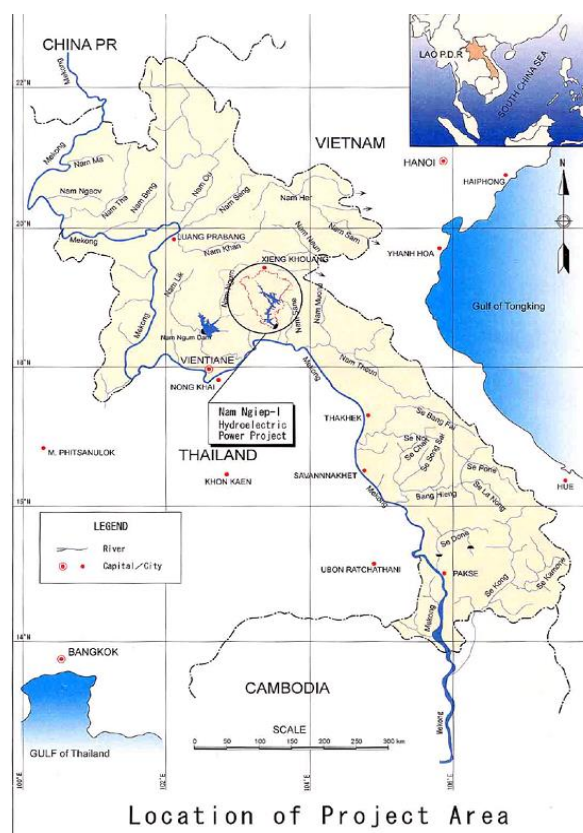
This Environmental Monthly Monitoring Report (EMMR) provides a summary of environmental monitoring activities and mitigation actions in February 2016. The EMMR was prepared by the Project's Environmental Management Office (EMO). It has been internally reviewed and cleared by EMO senior technical staff and management prior to submitting the report to the Government of Lao PDR (GoL) related agencies.

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

## 2 WORK PROGRESS OF PRINCIPAL CONTRACTORS

Construction Works for the Project 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 230kV Transmission Line Works. Actual overall cumulative work progress until the end of May 2016 was

Figure 1-1: Location Map

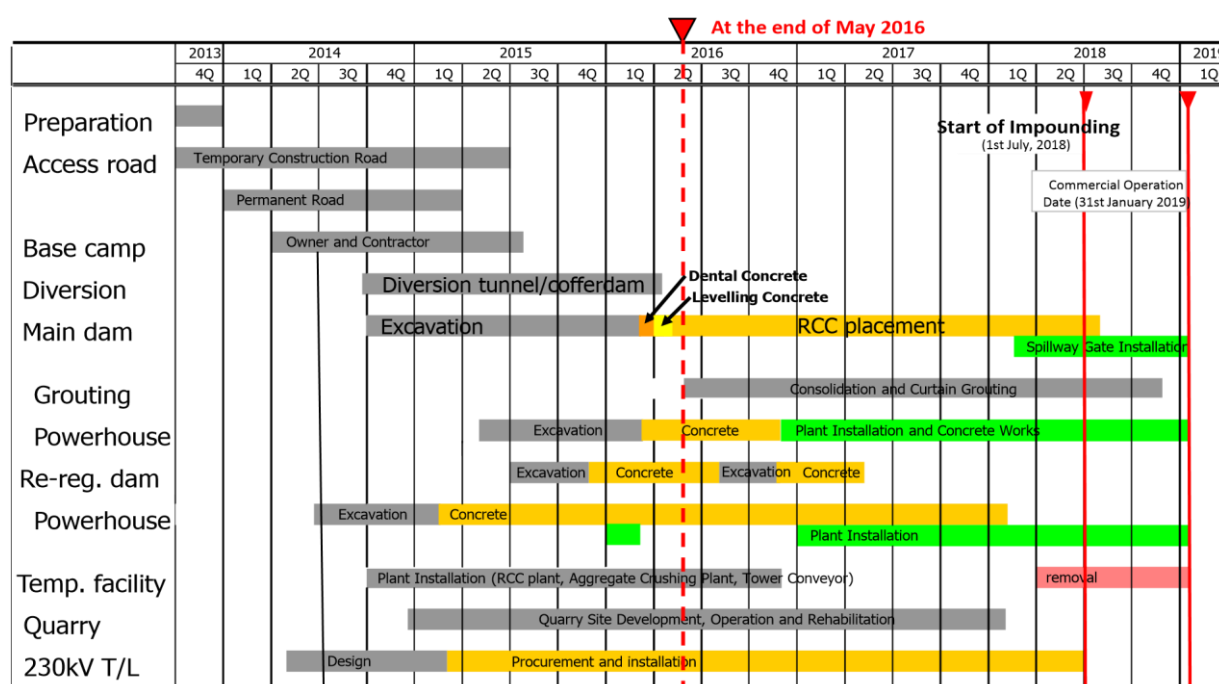




40.6%<sup>1</sup> (compared to planned progress of 44.0%), based on achieved Interim Milestone Payments for all Contracts excluding the value of Advance Payments, varied works and other adjustments allowed under each Contract. In terms of the value of actual work done the percentage is slightly understated since work completed, but not paid, is not included. It is shown in **Fig. 2-2** that the main reason for this 3.4% difference between actual and planned is because payment for 230 kV Transmission Line Works are later than expected as the works are being accelerated and fell behind target during April 2016 to get back onto the original schedule due to a design approval delay that caused a shortfall in materials required for tower erection. This delay is being managed to recover the lost time. Also, for the Electrical and Mechanical Works, the application for payment of stator material for Unit 1 of the main powerhouse (USD 22.4 million) has been postponed but it is not a critical path item. It should be noted that the actual value of the Civil Works completed includes payment for the greater-than-anticipated excavation volume carried out in the river bed to enable an acceptable foundation to be established for the main dam. Whilst the Civil Works Contractor was previously ahead of schedule for main dam excavation (which lies on the critical path), the additional excavation works that were required in the river bed has meant that this time has now been used for this purpose. However, it is considered that the Civil Works programme for RCC placement that started on 21 May 2016 and with the crushing, batching and placing capacity now provided, has more than enough capacity to achieve a position whereby the dam will be ready for impounding before the rainy season of 2018.

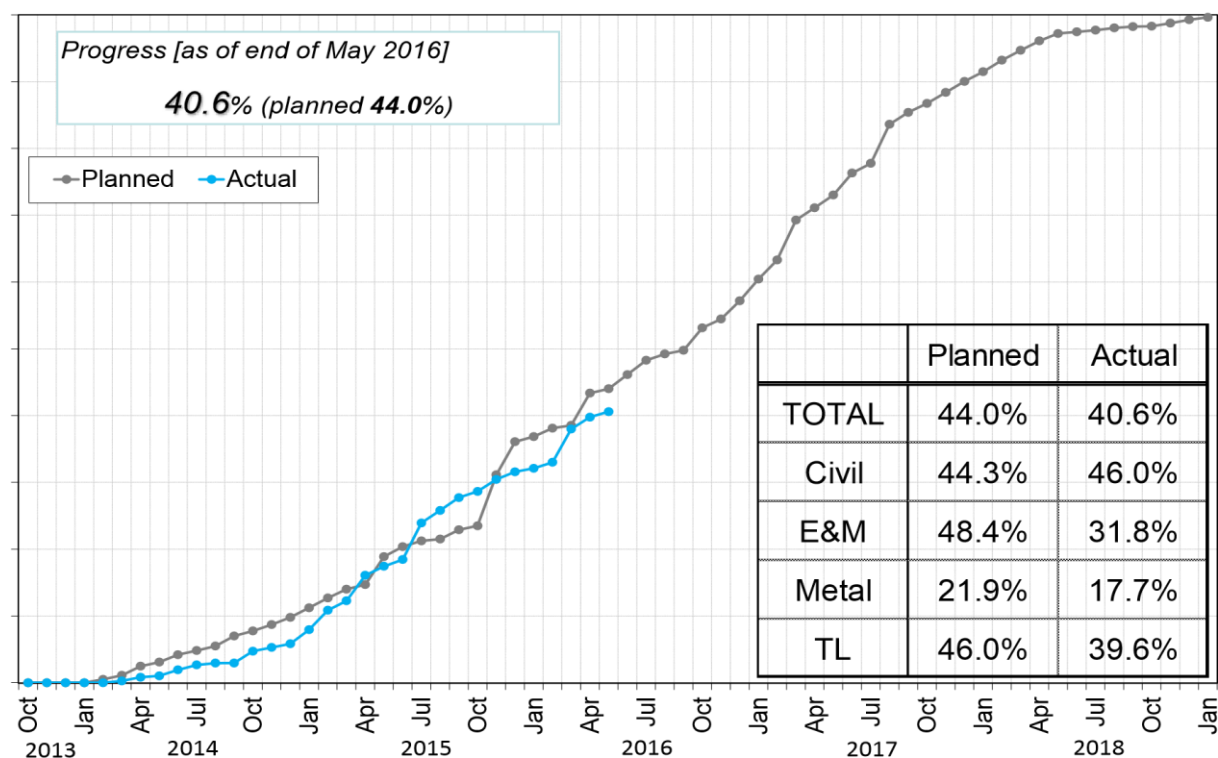
The overall construction schedule and progress curve (by achieved Milestone Payments) are shown in **Fig.2-1** and **Fig.2-2** respectively.

**Figure 2-1: Overall Construction Schedule**



<sup>1</sup> 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.



**Figure 2-2: Progress Curve (All Construction Works)**

## 2.1 Civil Work

The Civil Works Contract was executed between Obayashi Corporation and the Nam Ngiep 1 Power Company on 30 September 2013 and the 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. Accordingly, the concreting work was mainly commenced.

The cumulative actual work progress of the Civil Works until the end of May 2016 was 46.0% (Compared to planned progress of 44.3%) calculated in the same manner as described above for the value of achieved Interim Milestone Payments excluding advance payment.

### 2.1.1 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. The cost of the additional excavation and RCC concrete placement will necessitate use of contingency amounts provided for such eventualities. The dental concreting works were commenced in March 2016, and conventional RCC levelling concrete placement for the main dam in the 'shear key' structure up to El. 170.5 m was completed at the beginning of May. Consolidation grouting at the main dam area was commenced on 10 May 2016 and RCC concrete placement for the main dam body was commenced on 21 May 2016. Consolidation grouting covers the whole footprint of the main dam and RCC concrete placement and consolidation grouting are implemented in parallel, section by section.

Powerhouse excavation works was completed in January 2016 and levelling concreting works was started in coordination with installation of the grounding system accordingly. Progress of the concreting works is proceeding well and is shown in Table 2-1 below

**Table 2-1: Progress of Main Powerhouse structural Concrete Works to 31 April 2016.**

Total Anticipated Volume (m3)	Completed (m3)	Progress (%)
32,600	7,065	21.7

### 2.1.2 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 Table 2-2 below

Accordingly, at 31 May 2016 the actual total concrete volume is used to measure the progress against planned volume.

**Table 2-2: Progress of Re-regulation Dam Structural Concrete Works to 31 March 2016**

	Concrete (m <sup>3</sup> ) placed as at the end of April 2016					
Structure	Intake	Powerhouse	Tailrace	Spillway	Left Bank RCC	Total
Anticipated Qty.	26,549			23,500	13,200	63,249
Completed Qty.	11,536	9,431	1,681	3,758	13,228	39,634
Progress	<b>85%</b>			<b>16%</b>	<b>100%</b>	<b>64%</b>

The concrete volume placed already for both powerhouse and dam is 39,634m<sup>3</sup> being 63% of the revised total estimate of 63,249m<sup>3</sup> for both structures. 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 redesigned as roller compacted concrete (RCC) and was completed on 18 March 2016. Following installation of guide frames for re-regulation gate, re-regulation stop log and re-regulation intake gate in April 2016, secondary concrete embedment of the guide frames was completed in May 2016.

The Dyke (saddle dam) embankment works on the right bank near the Houay Soup Resettlement Area were also started in November 2015 and was completed on 30 April 2016.

### 2.1.3 Temporary work facility

#### 2.1.3.1 DIVERSION TUNNEL INLET AND OUTLET

The diversion tunnel works, excavated 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.

### 2.1.3.2 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.

### 2.1.3.3 TEMPORARY BRIDGE

The temporary bridge works for the main river crossing close to the RCC plant were completed and the bridge opened for traffic from 16 January 2015.

### 2.1.3.4 PLANT YARDS

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

Foundation work and installation of equipment were completed at all the plant yards and the belt conveyor system from the RCC plant to the main dam is virtually complete at 31 March 2016.

Accordingly, through the RCC trial mix and trial embankment in October and November 2015, RCC placement in the permanent structure at the re-regulation dam followed on, starting in November 2015 and finishing during March 2016.

### 2.1.3.5 QUARRY

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

### 2.1.3.6 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.

## 2.2 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 until the end of May 2016 was 31.8% (compared to planned progress of 48.4%). This delay is due to the change of schedule of delivery of stator material for Unit 1 of the main powerhouse at the Electrical and Mechanical Works Contractor's factory from April 2016 to August 2016. However, the stator will be shipped from the factory to the Site on schedule by coordination of the manufacturing schedule in the factory. Accordingly, it has no impact on the overall construction schedule. The main activities carried out during this month are described below:

- a) The following documents were submitted:
  - For the main power station, schematic diagram of generator neutral grounding cubicle, sequence diagram of 230 kV GIS local control panel, list of accessories and spare parts for generator, and shop test procedure for stator coil.
  - For the re-regulation power station, diagram of connection with external equipment of excitation transformer, sequence diagram of control circuit of 115 kV substation equipment, distribution diagram of 115 kV substation equipment, and list of spare parts and special tools for the 115 kV substation equipment.
- b) The installation work of embedded piping for the main powerhouse commenced on 17 February 2016 and continued in coordination with concrete casting work. The status of embedded pipe installation is shown in Figure 2-3.

- c) The grounding works for the main powerhouse and re-regulation power house are under way, also in coordination with concrete casting work.

*Figure 2-3: Embedded piping installation (Main powerhouse)*



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 cumulative work progress of the Hydraulic Metal Works until the end of May 2016 was 17.7% (compared to planned progress of 21.9%). The main activities carried out during this month are described below:

a) Main dam

- Witnessed inspection results for painting quality of the lower penstock pipes P1-38 & P2-38 and P1-37 & P2-37 approved by the Owner's Engineer on 03 May 2016 and 24 May 2016 respectively.
- Witnessed dimensional and visual inspection results for the lower penstock pipes P1- 37 & P2-37 and P2-36 was approved by the Owner's Engineer on 16 May 2016 and 27 May 2016 respectively.

b) Re-regulation dam

- Witnessed dimensional and visual inspection results for embedded guide frames for draft gate was approved by the Owner's Engineer on 19 May 2016.
- The block-out portion of draft gate for embedded guide frames was handed over to the Civil Works Contractor for second stage concrete placement on 23 May 2016. This followed the acceptance by witness inspection of the condition of the location to be concreted by the Owner's Engineer.
- On 31 May 2016, joint witness inspection was carried-out by the Owner, Owner's Engineer and Contractor of the intake gate, stop log, gate to confirm the condition of the embedded guide frames after the CW Contractor completed the second stage concrete placement, including concrete surface rectification and guide frame cleaning works. A Site inspection of materials delivered from Vietnam to Site was satisfactorily carried out on 27 May 2016 by the Owner's Engineer. The delivery comprised six segments of gate leaf for the intake gate, the lifting beam for the stop log and rubber seal materials for all gate works. Total weight of the imported material received at site was 85.788 tonnes.

- As 31 May 2016, IHI is carrying out Site preparation work for the installation of gate leaves at the intake gate.
- Latest progress of steel gate installation for each work item at the end of May 2016 is shown in Table 4.3-2 below.

Table. 2-3: progress of steel gate installation for each work item at the end of May 2016

Item No.	Work Item Description	Site Installation Progress (%)	Remarks
2.1	Re-regulation Gate	16.7%	
2.2	Re-regulation Stop log	14.2 %	
2.3	Re-regulation Intake Gate	16.7 %	6 segments of gate leaf material are at site, ready for installation.
2.4	Re-regulation Draft Gate	10.5%	

## 2.3 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 May 2016 was 39.6% (compared to planned progress of 46.0%). The difference is chiefly as a result of delay to commencement of construction works by approximately 7 months while awaiting compensation matters to be resolved by NNP1PC. The Contractor agreed to accelerate its Works and is about a month behind target to get back onto the original schedule for tower foundation excavation by May 2016, within 8 months from starting. During the rainy season and with further delays due to compensation virtually full access to most sections of alignment was achieved in 2015 following resolution of remaining environmental and social matters. In the last month there has been little progress with tower erection due to late confirmation of steel orders due to design review, and tower excavation also slowed down as stub angles became unavailable until factory production could be rescheduled after delayed design submission and approval and steel deliveries were received.

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

- All the line route survey works from the main power station to Nabong Substation have been substantially completed and the final alignment of the 230 kV Transmission Line route is now confirmed. The route survey for the final change of alignment, a straight-line offset of the TL over a 2.8 km distance from Tower 31 to Tower 38 to avoid encroachment into the protected forest is finished, while the revision plan and profile design of this section is approved by the Owner's Engineer.
- Plan and profile drawings, re-adjustment of tower spotting and soil tests for the entire route is complete in the approved section (PI 14 – PI 22) other than the section near to a private plantation area (Tower 54 to Tower 86) and between T31 and T38 are completed.
- Preparation and revision of the design documents have been progressed including:
  - Basic design of the 230 kV transmission line was approved by the Department of Energy Management in accordance with LEPTS on 22 January 2015, while the approval certificate of the 230 kV transmission line route had already issued and provided to NNP1 by DEPP for reference.
  - Adjustment of tower design and calculation according to approved basic design;



- Fabrication drawings of Tower type LDC are not submitted for approval yet, while foundation design for all other Tower types have already been approved
- The construction progress by the end of May 2016 is completion of 175 out of an expected total of 293 tower foundations, tower erection of 100 towers and the checking and tightening of bolts and nuts for 74 towers. The progress in May 2016 is behind schedule due to the delay to late importation of some construction materials and because preparatory work for construction in the mountainous areas is a more protracted process.

Construction materials deliveries continue as test report of each variety of materials are approved by the TLW Owner's Engineer. (See Table 2.4 and 2.5).

*Table. 2-4: Delivery of materials*

Item	Description	Delivery Quantity	Date Delivered
1.	Stub Angle	231 Towers (78 %)	20 April, 2016
2.	Ground Materials	293 Towers (100 %)	December 2015
3.	Steel Tower	150 Towers (51 %)	15 May, 2016
4.	Hardware Fitting	75 Towers (25 %)	03 May, 2016
5.	Insulator	147 Towers (50 %)	03 May, 2016
6.	Conductor and OHGW	30 km (25 %)	30 March, 2016

*Table. 2-5: Delivery Plan*

Items	Description	Delivery Plan	Delivery Date
1.	Stub Angle	62 Towers (22 %)	Aug. 2016
2.	Steel Tower	75 Towers (25 %)	July, 2016
3.	Hardware Fitting	75 Towers (25 %)	10 June, 2016
4.	Insulator	146 Towers (50 %)	Oct. 2016
5.	Conductor and OHGW	30 km (25 %)	20 June, 2016
6.	OPGW	60 km (50 %)	10 June, 2016

- d) The bush clearance works were started in May 2015 and progress was made between Tower 54 and Tower 38, while others sections (PI18 – PI22) were started in September 2015 after the compensation works has been completed. Almost 62 km out of a total of approximately 120 km for 139 No. towers has been finished by the end of March, 2016 and the work continues in the section between PI 1 and PI 18, PI 22 and PI 24 currently.

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. In addition, the Contractor has revised the

Acceleration schedule, after the progress for the construction of tower foundations slowed after April, 2016, See (See Figure 2:4 below)

Figure 2-4 Cumulative Work Progress of Tower Installation (Plan and Actual)

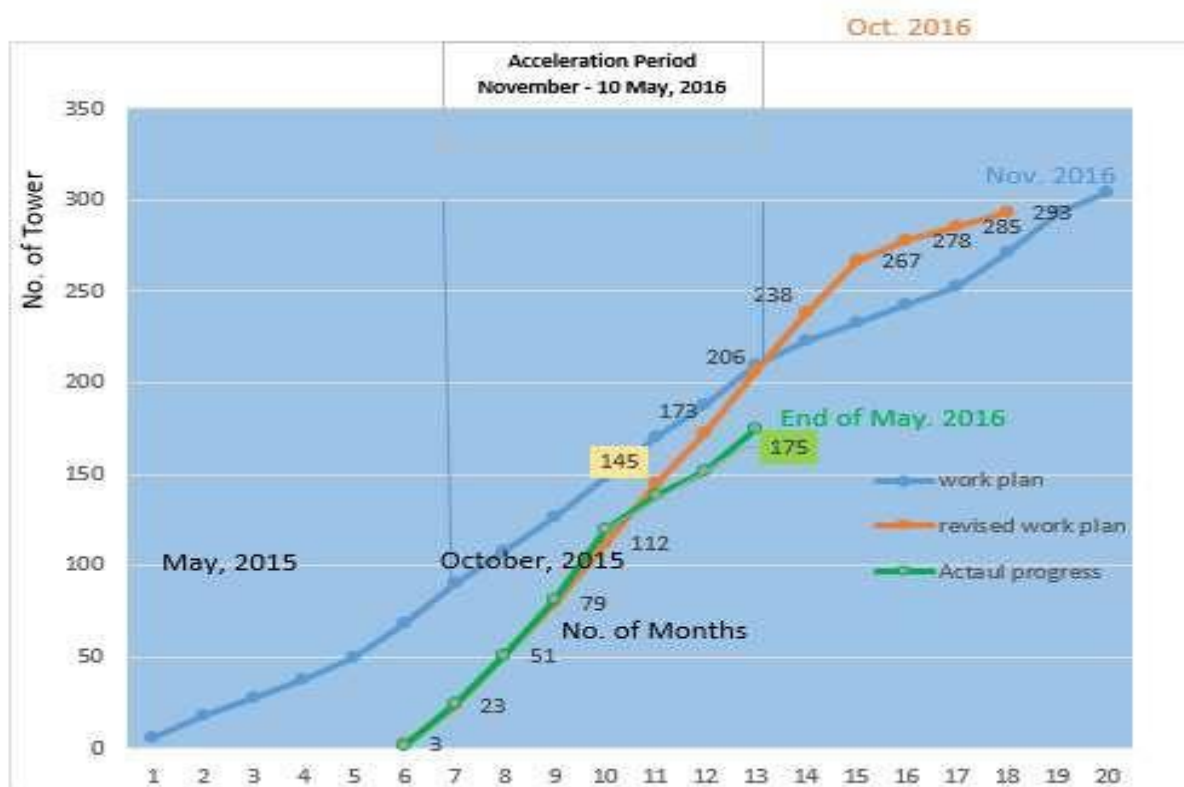


Figure 2-5: Revised Cumulative Works Progress (Planned & Actual)





### 3 ENVIRONMENTAL MANAGEMENT MONITORING

#### 3.1 Compliance Management

##### 3.1.1 Site Specific Environmental and Social Management and Monitoring Plans

In May 2016, NNP1PC-EMO received five (5) SS-ESMMPs, out of which, four (04) SS-ESMMPs are under review and one (01) SS-ESMMP was approved with comments as listed below.

**Table 3-1 SS-ESMMPs reviewed in May 2016**

Title	Date Received	Status	Comments
<b>SS-ESMMP for the Improvement of the Internal Road in 2UR (Upper Reservoir)</b>	18 March 2016 (1 <sup>st</sup> revision) and 10 May 2016 (2 <sup>nd</sup> revision)	Under review	
<b>SS-ESMMP for the Construction of the Main Road on HSRA</b>	31 March 2016 (1 <sup>st</sup> revision) and 13 May 2016 (2 <sup>nd</sup> revision)	Under review	
<b>SS-ESMMP for Dam Monitoring System at Main Dam</b>	25 May 2016 (1 <sup>st</sup> revision)	Under review	
<b>SS-ESMMP for the construction of NNP1 Project solid waste landfill</b>	30 March 2016 (1 <sup>st</sup> revision) and 26 May 2016 (2 <sup>nd</sup> revision)	Under review	
<b>SS-ESMMP for the Construction of irrigation canal at the HSRA</b>	04 May 2016 (1 <sup>st</sup> revision)	Approved on 11 May 2016 with comments	More information is required on erosion and sediment control measures for borrow pits, and for river diversion and embankment of the main weir. The site decommissioning plan needs to be included in the construction schedule

### 3.1.2 Compliance Report

In May 2016, a total of 24 construction areas and camps including temporary camps at Houay Soup Resettlement Areas, and the 230 kV transmission line

Site ID	Issues	Reporting	Actions
RT Camp	<p>Grey water seepage from existing sediment/retaining ponds (ON_OC-0028).</p> <p>1st inspection date: 17 Feb 2015 Latest follow up: 24 May 2016</p> <p>Water seepage testing results from January 2015 to present indicated a fluctuation of total coliforms from 450 MPN/100ml to more than 160,000 MPN/100ml.</p>	1 ONC (pending)	The Contractor has stopped the grey water seepage. A joint mission between the Owner (TD and EMO) and the Contractor (OC) was held on 11 May 2016 to carry out an assessment of the WWTS against the external consultant's recommendations as well as to demonstrate the camps' effluent sampling procedures. It was informed that this camp will close by June 2016 and in the process of preparing a site decommissioning plan for submission to the Owner for review and approval.
Song Da 5 Camp No.2	The WWTS construction was not consistent with the proposed design (ON_OC-0085).	1 ONC (pending)	A joint mission between the Owner (TD and EMO) and the Contractor (OC) was held on 11 May 2016 to carry out an assessment of the WWTS against the external consultant's recommendations as well as to demonstrate the camps' effluent sampling procedures. The results and corrective actions will be discussed in the next meeting in June 2016.
V&K Camp	<p>Inadequate capacity of waste water treatment ponds to handle the operation of V&amp;K camp (ON_OC-0087).</p> <p>1st inspection date: 02 June 2015 Latest follow up: 24 May 2016</p>	1 ONC (pending)	A joint mission between the Owner (TD and EMO) and the Contractor (OC) was held on 11 May 2016 to carry out an assessment of the WWTS against the external consultant's recommendations as well as to demonstrate the camps' effluent sampling procedures. The results and corrective actions will be discussed in the next meeting in June 2016.
NCC Camp	<p>No waste disposal pit was provided on site. Some garbage was observed to be disposed of on the ground outside the camp's boundary (ON_NCC-0001).</p> <p>1st inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to:</p> <ul style="list-style-type: none"> <li>- Provide a temporary waste disposal pit inside the camp boundary for non-recyclable waste disposal;</li> <li>- Collect and dispose waste in the designated waste pit;</li> <li>- Construct adequate waste water retention pond for 30 people over the</li> </ul>

			<p>eight months period to ensure a proper collection of grey water.</p> <p>Corrective action implementation exceeded the deadline on 19 May 2016. The First extension was given to 5 June 2016.</p>
VCC Worker Camp	<p>Temporary worker camp's facilities were not appropriately constructed as per the approved SS-ESMMP including the toilet septic tank, grey water retention pond, waste disposal pit and clean water supply (ON_VCC-0001).</p> <p>1st inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to ensure that the WWTS for grey and black water are built in accordance to the designs in the approved SS-ESMMP. Specifically, the mentioned issues should be addressed properly.</p> <p>Corrective action implementation exceeded the deadline on 19 May 2016. The First extension was given to 5 June 2016.</p>
VRC Camp	<p>Food waste and garbage were disposed into the existing wastewater retention pond (ON_VRC-0003).</p> <p>1st inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to provide a temporary waste disposal pit for non-recyclable waste disposal and appropriately separate recyclables.</p> <p>Corrective action implementation exceeded the deadline on 19 May 2016. The First extension was given to 5 June 2016.</p>
SECC Camp	<p>Wood offcut, plastic sheets, scrap metal and garbage were scattered around the bathing area and recycling centre (ON_SECC-0026).</p> <p>1st inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to collect, segregate and dispose of the scattered waste /scraps properly as per the Project's waste management hierarchy using the 4 'R's' (Reduce, Reuse, Recycle and Right disposal).</p> <p>Corrective action implementation exceeded the deadline on 18 May 2016. The First extension was given to 5 June 2016.</p>
SECC Workshop and Industrial Area	<p>A 30 kg contaminated soil/sand bag and four (04) full drums were stored on the concrete platform with a low bund. However, there were no roofing and oil trap for this storage (ON_SECC-0027).</p> <p>1st inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to move the contaminated soil/sandbag and fuel drums to designated hazardous storage area that have proper roofing, oil trap and bunding materials.</p> <p>Corrective action implementation exceeded the deadline on 18 May 2016. The First extension was given to 5 June 2016.</p>

Songda5 Workshop (at spoil disposal area #2)	<p>A hazardous storage facility was operated on site without proper bund, oil trap and spill response kits</p> <p>(ON_OC-0214).1st inspection date: 10 May 2016</p> <p>Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to provide a concrete bund around the existing storage that can retain at least 120% of the storage capacity, and to install an oil trap. Alternatively, all hazardous materials and waste shall be moved to a proper designated hazardous storage area with adequate bunding area and oil trap.</p> <p>Corrective action implementation exceeded the deadline on 24 May 2016. The First extension was given to 5 June 2016.</p>
HM Worker camp(LA LIMA Camp 10)	<p>The Contractor has commenced the construction of the WWTS without submitting revised detailed designs and updated SS-ESMMP responding to the Owner's comments (ON_HM-0004).</p> <p>1st inspection date: 25 May 2016</p> <p>Latest follow up: not applicable</p>	1 ONC (pending)	<p>The Contractor was required to temporarily halt the construction of the waste water treatment system until the final design has been discussed and agreed with the Owner. If significant adjustments are necessary, the revised design with detailed information on the adjustments shall be submitted to the NNP1PC for prior review and approval.</p> <p>Corrective action implementation deadline: 08 June 2016.</p>
IHI main camp & office	<p>The Contractor had installed an automatic pump to discharge waste water from the last pond into the drainage channel without checking if it met the effluent standards - causing unpleasant odour (ON_IHI-0003).</p> <p>1st inspection date: 25 May 2016</p> <p>Latest follow up: not applicable</p>	1 ONC (pending)	<p>The Contractor was instructed to stop discharging the waste water from any of the three retention ponds into the environment until it has been verified that the effluents meet the effluent standards specified in the ESMMP-CP Appendix 3. Discussions with the Owner on the temporary solutions will be organized once the effluent quality results from the camp are available.</p> <p>Corrective action implementation deadline: 08 June 2016.</p>
RCC plant yard	<p>The results of the discharged turbid water were constantly high as below:</p> <ul style="list-style-type: none"> <li>- 21/05/2016: 1,554 NTU</li> <li>- 23/05/2016: 2,693 NTU</li> <li>- 24/05/2016: 5,950 NTU</li> <li>- 26/05/2016: 2,782 NTU</li> </ul> <p>The Owner (EMO and TD) and OC representatives conducted a joint site inspection and followed up on the issue on 25/05/2016 and it was</p>	1 ONC (pending)	<p>The Contractor was required to:</p> <ul style="list-style-type: none"> <li>- Regularly remove the suspended solids/sediment from the sediment ponds when they are half full to maintain the full capacity of the ponds.</li> <li>- Repair the last sediment pond to solve the leakage to enable the clean surface water over-flow only.</li> <li>- Clean-up all the drainage canals around the site to remove the sediment and</li> </ul>

	found that the sediment was still not cleaned-up from the sediment ponds (ON_OC-0216). 1st inspection date: 25 May 2016 Latest follow up: not applicable		dispose this at the Spoil Disposal Area#6.  Corrective action implementation deadline: 03 June 2016.
SECC camp	Inadequate storage of an electricity generator (ON_SECC-0029) as below: <ul style="list-style-type: none"><li>- No rain-screen sheets to protect the storage area from having stagnant rain water</li><li>- No oil trap to collect oil contaminated water</li></ul> 1st inspection date: 25 May 2016 Latest follow up: not applicable	1 ONC (pending)	The Contractor was required to: <ul style="list-style-type: none"><li>- Use oil absorbent sheets to absorb oil film from the rain water;</li><li>- Clean up the storage facility including contaminated soil and sand;</li><li>- Store contaminated soil and sand properly within the designated hazardous storage area for proper treatment/disposal;</li><li>- Provide complete rain-screen sheets to protect the storage area from having stagnant rain water</li></ul> Corrective action implementation deadline: 14 June 2016.
SECC workshop	Oil contaminated water was observed inside the hazardous waste storage area representing a high potential risk of contaminated water overflowing into the environment (ON_SECC-0030) 1st inspection date: 25 May 2016 Latest follow up: not applicable	1 ONC (pending)	The Contractor was required to: <ul style="list-style-type: none"><li>- Use oil absorbent sheets to absorb the oil film completely and drain stagnant water from the storage area;</li><li>- Repair the roof to prevent the rain water from entering the storage area.</li></ul> Corrective action implementation deadline: 14 June 2016.
Borrow pit for HSRA Irrigation canal	A borrow pit was operated about 10 m from Houay Soup Noi (a small stream,) for irrigation construction without environmental protection measures as per the approval of the SS-ESMMP dated 11 May 2016 (ON_VSP-0001) 1st inspection date: 25 May 2016 Latest follow up: not applicable	1 ONC (pending)	The Contractor was required to: <ul style="list-style-type: none"><li>- Provide erosion and sediment control system for the borrow pit including adequate cut-off drain and sediment pond to prevent direct sediment runoff.</li><li>- Revise and resubmit the relevant SS-ESMMP appropriately reflecting the comments of EMO.</li></ul> Corrective action implementation deadline: 14 June 2016
Main Dam	Turbid water was pumped from a sediment pond into the powerhouse excavation area located about 10 metres from the Nam Ngiep without being treated by the turbid waste	1 NCR (pending)	The Contractor was required to: <ul style="list-style-type: none"><li>- Stop pumping turbid water directly into the Nam Ngiep without treatment by the Turbid Water Treatment Plant.</li><li>- Treat the turbid water generated at the Main Dam's RCC placement and</li></ul>

	water treatment plant (NCR_OC-0012). 1st inspection date: 17 May 2016 Latest follow up: 24 May 2016		Powerhouse excavation areas through the Turbid Water Treatment Plant prior to releasing it into the Nam Ngiep.  Corrective action deadline: 15 June 2016
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Figure 3-1 and Figure 3:2) were inspected through follow-up site inspections and joint bi-weekly inspections with the Contractors. The results of the environmental compliance inspections undertaken in May 2016 are summarized in Table 3-2.

**Table 3-2 Results of environmental compliance inspections in May 2016**

Site ID	Issues	Reporting	Actions
RT Camp	Grey water seepage from existing sediment/retaining ponds (ON_OC-0028).  1 <sup>st</sup> inspection date: 17 Feb 2015 Latest follow up: 24 May 2016  Water seepage testing results from January 2015 to present indicated a fluctuation of total coliforms from 450 MPN/100ml to more than 160,000 MPN/100ml.	1 ONC (pending)	The Contractor has stopped the grey water seepage. A joint mission between the Owner (TD and EMO) and the Contractor (OC) was held on 11 May 2016 to carry out an assessment of the WWTS against the external consultant's recommendations as well as to demonstrate the camps' effluent sampling procedures. It was informed that this camp will close by June 2016 and in the process of preparing a site decommissioning plan for submission to the Owner for review and approval.
Song Da 5 Camp No.2	The WWTS construction was not consistent with the proposed design (ON_OC-0085).	1 ONC (pending)	A joint mission between the Owner (TD and EMO) and the Contractor (OC) was held on 11 May 2016 to carry out an assessment of the WWTS against the external consultant's recommendations as well as to demonstrate the camps' effluent sampling procedures. The results and corrective actions will be discussed in the next meeting in June 2016.
V&K Camp	Inadequate capacity of waste water treatment ponds to handle the operation of V&K camp (ON_OC-0087).  1 <sup>st</sup> inspection date: 02 June 2015 Latest follow up: 24 May 2016	1 ONC (pending)	A joint mission between the Owner (TD and EMO) and the Contractor (OC) was held on 11 May 2016 to carry out an assessment of the WWTS against the external consultant's recommendations as well as to demonstrate the camps' effluent sampling procedures. The results and corrective actions will be discussed in the next meeting in June 2016.

NCC Camp	<p>No waste disposal pit was provided on site. Some garbage was observed to be disposed of on the ground outside the camp's boundary (ON_NCC-0001).</p> <p>1<sup>st</sup> inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to:</p> <ul style="list-style-type: none"> <li>- Provide a temporary waste disposal pit inside the camp boundary for non-recyclable waste disposal;</li> <li>- Collect and dispose waste in the designated waste pit;</li> <li>- Construct adequate waste water retention pond for 30 people over the eight months period to ensure a proper collection of grey water.</li> </ul> <p>Corrective action implementation exceeded the deadline on 19 May 2016. The First extension was given to 5 June 2016.</p>
VCC Worker Camp	<p>Temporary worker camp's facilities were not appropriately constructed as per the approved SS-ESMMP including the toilet septic tank, grey water retention pond, waste disposal pit and clean water supply (ON_VCC-0001).</p> <p>1<sup>st</sup> inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	1 ONC (pending)	<p>The Contractor was required to ensure that the WWTS for grey and black water are built in accordance to the designs in the approved SS-ESMMP. Specifically, the mentioned issues should be addressed properly.</p> <p>Corrective action implementation exceeded the deadline on 19 May 2016. The First extension was given to 5 June 2016.</p>
VRC Camp	<p>Food waste and garbage were disposed into the existing wastewater retention pond (ON_VRC-0003).</p> <p>1<sup>st</sup> inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	2 ONC (pending)	<p>The Contractor was required to provide a temporary waste disposal pit for non-recyclable waste disposal and appropriately separate recyclables.</p> <p>Corrective action implementation exceeded the deadline on 19 May 2016. The First extension was given to 5 June 2016.</p>
SECC Camp	<p>Wood offcut, plastic sheets, scrap metal and garbage were scattered around the bathing area and recycling centre (ON_SECC-0026).</p> <p>1<sup>st</sup> inspection date: 05 May 2016 Latest follow up: 31 May 2016</p>	2 ONC (pending)	<p>The Contractor was required to collect, segregate and dispose of the scattered waste /scraps properly as per the Project's waste management hierarchy using the 4 'R's' (Reduce, Reuse, Recycle and Right disposal).</p> <p>Corrective action implementation exceeded the deadline on 18 May 2016. The First extension was given to 5 June 2016.</p>



SECC Workshop and Industrial Area	A 30 kg contaminated soil/sand bag and four (04) full drums were stored on the concrete platform with a low bund. However, there were no roofing and oil trap for this storage (ON_SECC-0027).  1 <sup>st</sup> inspection date: 05 May 2016 Latest follow up: 31 May 2016	1 ONC (pending)	The Contractor was required to move the contaminated soil/sandbag and fuel drums to designated hazardous storage area that have proper roofing, oil trap and bunding materials.  Corrective action implementation exceeded the deadline on 18 May 2016. The First extension was given to 5 June 2016.
Songda5 Workshop (at spoil disposal area #2)	A hazardous storage facility was operated on site without proper bund, oil trap and spill response kits (ON_OC-0214).1 <sup>st</sup> inspection date: 10 May 2016 Latest follow up: 31 May 2016	1 ONC (pending)	The Contractor was required to provide a concrete bund around the existing storage that can retain at least 120% of the storage capacity, and to install an oil trap. Alternatively, all hazardous materials and waste shall be moved to a proper designated hazardous storage area with adequate bunding area and oil trap.  Corrective action implementation exceeded the deadline on 24 May 2016. The First extension was given to 5 June 2016.
HM Worker camp(LA LIMA Camp 10	The Contractor has commenced the construction of the WWTS without submitting revised detailed designs and updated SS-ESMMP responding to the Owner's comments (ON_HM-0004).  1 <sup>st</sup> inspection date: 25 May 2016 Latest follow up: not applicable	1 ONC (pending)	The Contractor was required to temporarily halt the construction of the waste water treatment system until the final design has been discussed and agreed with the Owner. If significant adjustments are necessary, the revised design with detailed information on the adjustments shall be submitted to the NNP1PC for prior review and approval.  Corrective action implementation deadline: 08 June 2016.
IHI main camp & office	The Contractor had installed an automatic pump to discharge waste water from the last pond into the drainage channel without checking if it met the effluent standards - causing unpleasant odour (ON_IHI-0003).  1 <sup>st</sup> inspection date: 25 May 2016 Latest follow up: not applicable	1 ONC (pending)	The Contractor was instructed to stop discharging the waste water from any of the three retention ponds into the environment until it has been verified that the effluents meet the effluent standards specified in the ESMMP-CP Appendix 3. Discussions with the Owner on the temporary solutions will be organized once the effluent quality results from the camp are available.  Corrective action implementation deadline: 08 June 2016.

RCC plant yard	<p>The results of the discharged turbid water were constantly high as below:</p> <ul style="list-style-type: none"> <li>- 21/05/2016: 1,554 NTU</li> <li>- 23/05/2016: 2,693 NTU</li> <li>- 24/05/2016: 5,950 NTU</li> <li>- 26/05/2016: 2,782 NTU</li> </ul> <p>The Owner (EMO and TD) and OC representatives conducted a joint site inspection and followed up on the issue on 25/05/2016 and it was found that the sediment was still not cleaned-up from the sediment ponds (ON_OC-0216).</p> <p>1<sup>st</sup> inspection date: 25 May 2016 Latest follow up: not applicable</p>	1 ONC (pending)	<p>The Contractor was required to:</p> <ul style="list-style-type: none"> <li>- Regularly remove the suspended solids/sediment from the sediment ponds when they are half full to maintain the full capacity of the ponds.</li> <li>- Repair the last sediment pond to solve the leakage to enable the clean surface water over-flow only.</li> <li>- Clean-up all the drainage canals around the site to remove the sediment and dispose this at the Spoil Disposal Area#6.</li> </ul> <p>Corrective action implementation deadline: 03 June 2016.</p>
SECC camp	<p>Inadequate storage of an electricity generator (ON_SECC-0029) as below:</p> <ul style="list-style-type: none"> <li>- No rain-screen sheets to protect the storage area from having stagnant rain water</li> <li>- No oil trap to collect oil contaminated water</li> </ul> <p>1<sup>st</sup> inspection date: 25 May 2016 Latest follow up: not applicable</p>	1 ONC (pending)	<p>The Contractor was required to:</p> <ul style="list-style-type: none"> <li>- Use oil absorbent sheets to absorb oil film from the rain water;</li> <li>- Clean up the storage facility including contaminated soil and sand;</li> <li>- Store contaminated soil and sand properly within the designated hazardous storage area for proper treatment/disposal;</li> <li>- Provide complete rain-screen sheets to protect the storage area from having stagnant rain water</li> </ul> <p>Corrective action implementation deadline: 14 June 2016.</p>
SECC workshop	<p>Oil contaminated water was observed inside the hazardous waste storage area representing a high potential risk of contaminated water overflowing into the environment (ON_SECC-0030)</p> <p>1<sup>st</sup> inspection date: 25 May 2016 Latest follow up: not applicable</p>	1 ONC (pending)	<p>The Contractor was required to:</p> <ul style="list-style-type: none"> <li>- Use oil absorbent sheets to absorb the oil film completely and drain stagnant water from the storage area;</li> <li>- Repair the roof to prevent the rain water from entering the storage area.</li> </ul> <p>Corrective action implementation deadline: 14 June 2016.</p>
Borrow pit for HSRA Irrigation canal	<p>A borrow pit was operated about 10 m from Houay Soup Noi (a small stream,) for irrigation construction without environmental protection measures as per the approval of the SS-ESMMP dated 11 May 2016 (ON_VSP-0001)</p>	1 ONC (pending)	<p>The Contractor was required to:</p> <ul style="list-style-type: none"> <li>- Provide erosion and sediment control system for the borrow pit including adequate cut-off drain and sediment pond to prevent direct sediment runoff.</li> </ul>

	1 <sup>st</sup> inspection date: 25 May 2016 Latest follow up: not applicable		- Revise and resubmit the relevant SS-ESMMP appropriately reflecting the comments of EMO.  Corrective action implementation deadline: 14 June 2016
Main Dam	Turbid water was pumped from a sediment pond into the powerhouse excavation area located about 10 metres from the Nam Ngiep without being treated by the turbid waste water treatment plant (NCR_OC-0012). 1 <sup>st</sup> inspection date: 17 May 2016 Latest follow up: 24 May 2016	1 NCR (pending)	The Contractor was required to:  - Stop pumping turbid water directly into the Nam Ngiep without treatment by the Turbid Water Treatment Plant. - Treat the turbid water generated at the Main Dam's RCC placement and Powerhouse excavation areas through the Turbid Water Treatment Plant prior to releasing it into the Nam Ngiep.  Corrective action deadline: 15 June 2016

Figure 3-1: Site Inspection Locations

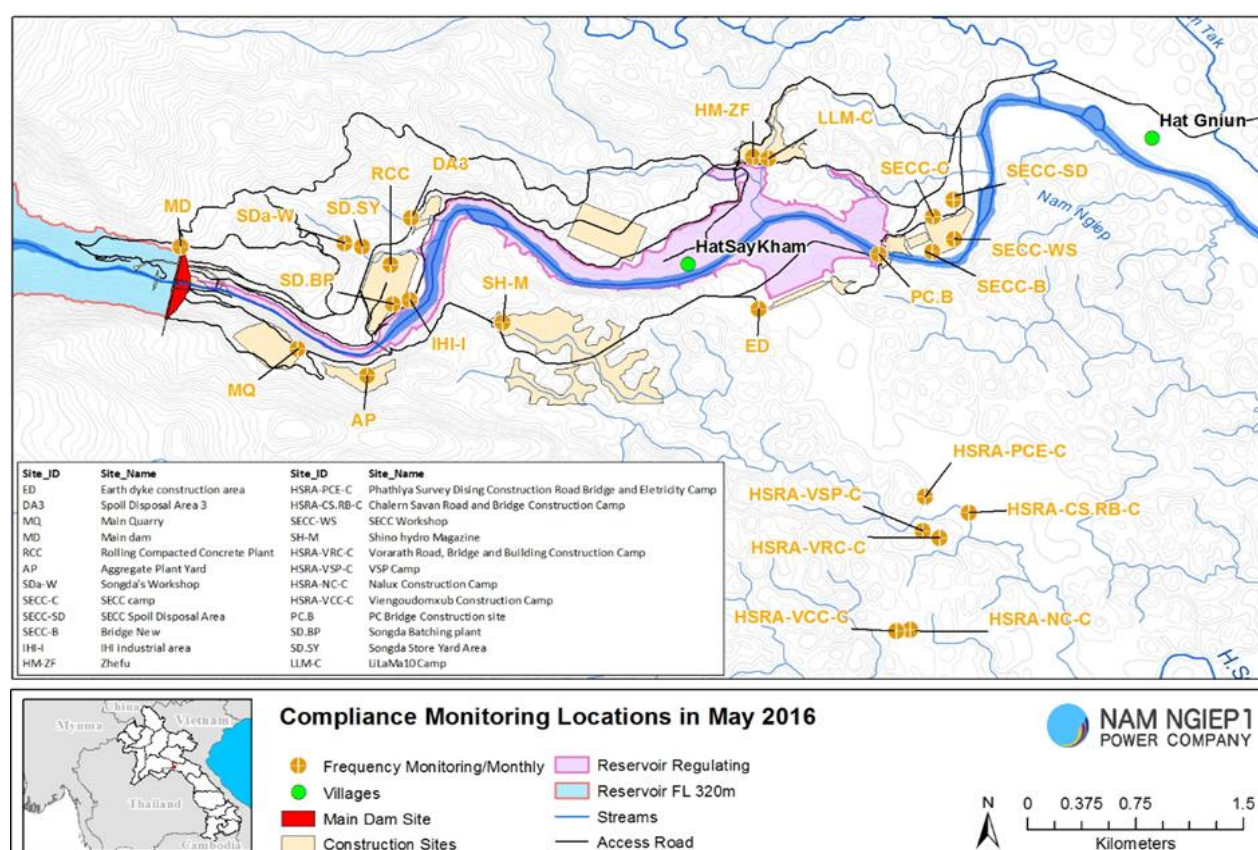




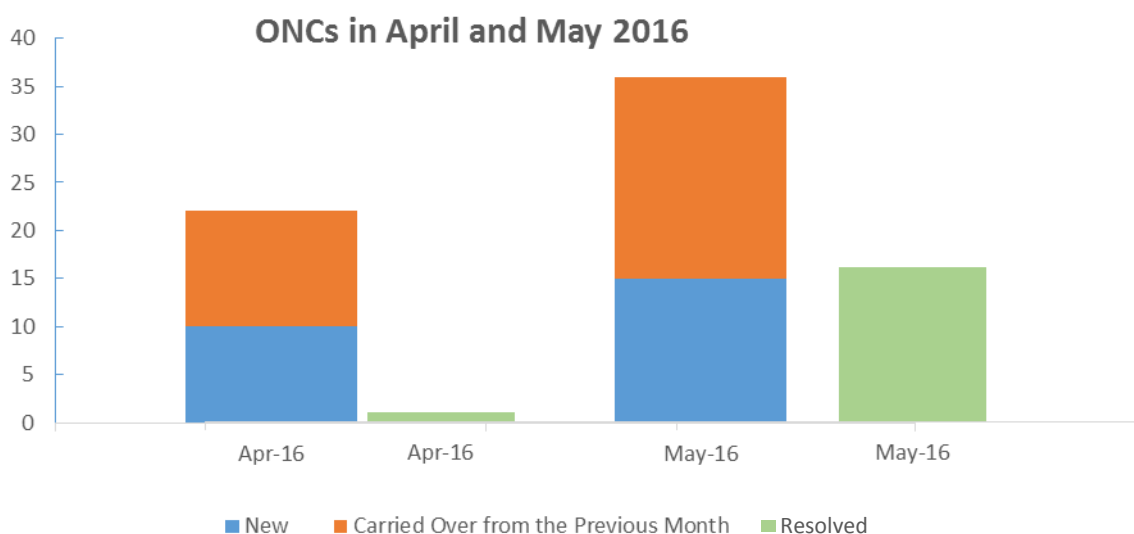
Figure 3-2: 230 kV Transmission Line Construction Monitoring



Through site inspections, a total of fifteen (15) Observations of non-compliances (ONCs) and one (1) non-compliance report Level 1(NCR1) were issued as summarized in Table 3-3. The NCR1 was related to a direct discharge of high turbid water into the Nam Ngiep without prior treatment.

Table 3-3: Summary of ONCs and NCRs

Reporting Period (1-31 May 2016)	ONC	NCR-1	NCR-2	NCR-3
Carried over from April 2016	21	0	0	0
New issues this month	15	1	0	0
Resolved this month	16	0	0	0
Carried forward into June 2016	20	1	0	0
Unresolved exceeding deadline	14	1	0	0

**Figure 3-3: Observations of non-compliance this month compared with previous month**

As shown in Table 3-33 and Figure 3-34, the number of new ONCs decreased from 21 in April to 15 in May 2016. With a carry-over from April 2016, a total of 36 ONCs were active in May 2016. Out of these, 16 ONCs were resolved, 14 ONCs were not resolved exceeding the deadlines<sup>2</sup> and a total of 20 ONCs will be carried over into June 2016. NNP1PC will follow up with the Contractors to resolve the remaining issues in June 2016.

### 3.1.3 Monitoring by the Environmental Monitoring Unit of the Government

No Environmental Monitoring Unit (EMU) visits were scheduled in May 2016.

## 3.2 Environmental Quality Monitoring

The procurement process to appoint a contractor to construct a small laboratory at the Owners' Site Office and Village was delayed due to submission of incomplete proposals by the bidders. The bidders have been requested to submit the required information in order that the technical evaluation can be completed. The purchase of the laboratory equipment is being finalised and quotations have been negotiated with a supplier in Thailand. The Purchase Order is expected to be issued in June 2016. Meanwhile there are several options by which to provide a temporary room or rooms in which a laboratory can be accommodated and operated after delivery of equipment to Site.

The environmental quality monitoring undertaken during May 2016 has followed the recommended environmental quality monitoring programme presented in the ESMMP-CP Volume III. The recommended programme consists of the following components:

- a) Effluent discharge from camps and construction sites;
- b) Ambient surface water quality monitoring;
- c) Ambient air quality monitoring (particulate matter of less than 10 PM);

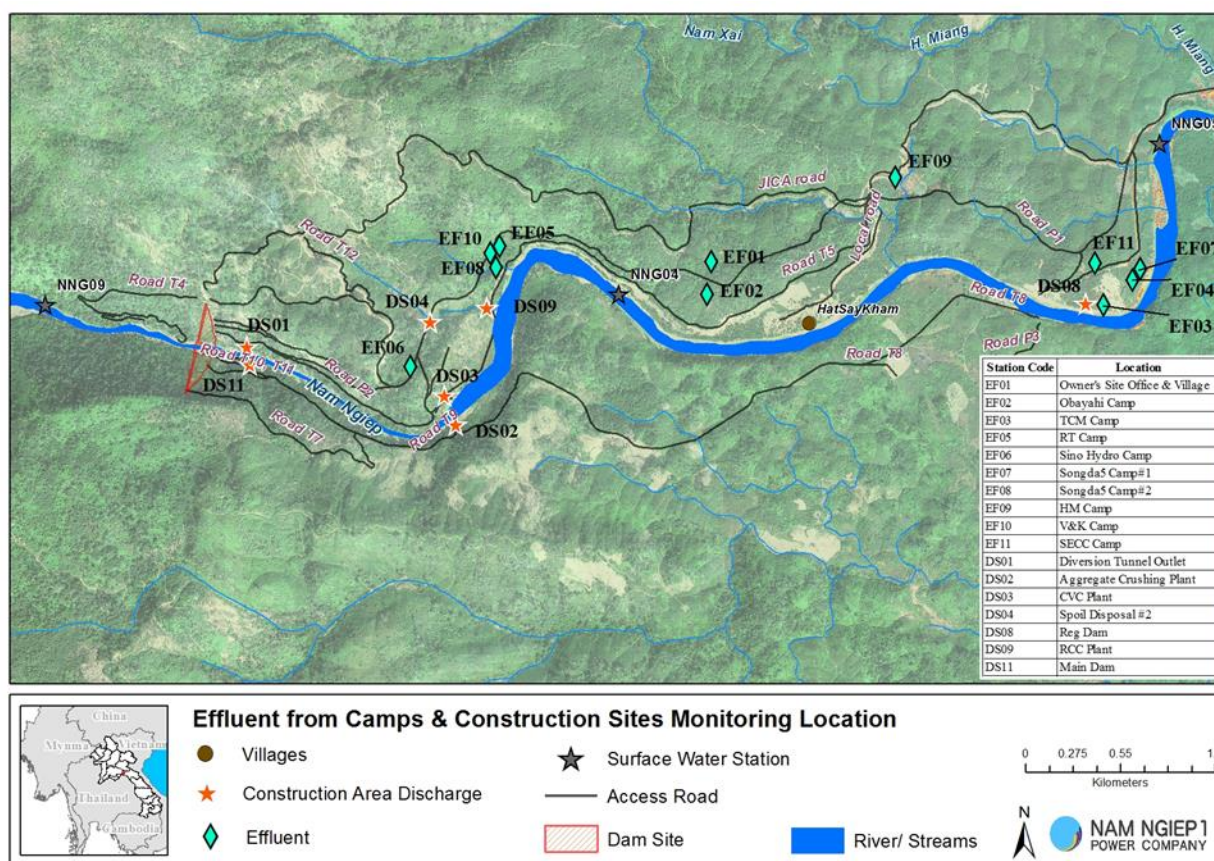
<sup>2</sup> Contractors are progressing slowly on the corrective actions implementation.

- d) Ambient noise and noise emission monitoring.

### 3.2.1 Effluent Discharge from Camps and Construction Sites

The monitoring of the effluents from the camps and construction sites is presented in *Table 3-4* and the monitoring points and the related sites are displayed on the map in Figure 3-4.

**Figure 3-4: Map of Effluent Discharge Monitoring Locations**



All parameters were assessed with reference to the Effluent Standards specified in the Project's Concession Agreement Annex C, Appendix 2 Clause 1.13. During May 2016, all construction camps, except the Owner's Site Office and Village and the V&K Camp, had significantly higher concentrations of total coliforms than the effluent standards. The results of the monitoring are included in Annex 1 and the assessment of compliance and corrective actions are summarized in Table 3-4.

**Table 3-4: Compliance assessment of the effluent discharge from the camps and construction sites in May 2016**

Site	Sampling ID	Non-Compliance	Corrective Actions
Owner's Site Office and Village	EF01	All parameters complied with the Standards	
OC Camp	EF02	Biochemical Oxygen Demand (BOD <sub>5</sub> ), Chemical Oxygen Demand (COD),	A meeting with the Contractors will be organised to take place in early June 2016 to discuss the effluent quality



Site	Sampling ID	Non-Compliance	Corrective Actions
		Ammonia nitrogen (NH <sub>3</sub> -N), and total coliforms exceeded the Standards (measured at 69,178 and 35 mg/l and, more than 160,000 MPN/100 ml respectively)	results and corrective actions. This issue will also be raised at the Weekly Coordination Meeting in June 2016 for following up by the Contractor.
TCM Camp	EF03	Total coliforms were higher than the Standards at 13,000 MPN/100 ml	A meeting will be organised early June 2016 with the Contractors to discuss the effluent quality results and corrective actions. This issue would also be raised at the Weekly Coordination Meeting in June 2016 for following up by the Contractor.
Right Tunnelling (RT) Camp	EF05	The total coliforms were significantly exceed the Effluent Standards with a measured value of 160,000 MPN/100 ml	This camp will be decommissioned in June 2016. A joint assessment (NNP1PC and OC) was carried out on 11 May 2016 to verify the proposed improvement plan submitted by the Contractor in November 2016 against the external consultant's recommendations.
Sino Hydro Camp	EF06	BOD <sub>5</sub> , NH <sub>3</sub> -N), and total coliforms were higher than the Standards (measured at 32.1 and 11 mg/l and, more than 160,000 MPN/100 ml respectively)	A meeting will be organised early June 2016 with the Contractors to discuss the effluent quality results and corrective actions. This issue will also be followed-up at the Weekly Coordination Meetings in June 2016.
Song Da 5 Camp No. 1	EF07	TSS, BOD <sub>5</sub> , NH <sub>3</sub> -N, and total coliforms did not comply with the Standards with recorded values of 68.3 mg/l, 34 mg/l, 13 mg/l, and >160,000 MPN/l respectively	A meeting will be organised early June 2016 with the Contractor to discuss the effluent quality results and corrective actions
Song Da 5 Camp No. 2	EF08	BOD <sub>5</sub> , NH <sub>3</sub> -N, and total coliforms did not comply with the Standards (measured values of 107 and 32 mg/l and, more than 160,000 MPN/100 ml respectively)	A joint assessment (NNP1PC and OC) was carried out on 11 May 2016 at this camp to verify the proposed improvement plan submitted by the Contractor in November 2016 against the external consultant's recommendations. The joint assessment and the water quality results would be discussed within the



Site	Sampling ID	Non-Compliance	Corrective Actions
			Owner incorporating the comments provided by the LTA and IAP in early June for corrective actions.
Hitachi-Mitsubishi Hydro (HMH) Worker Camp No.1	EF09	Total coliforms were higher than the Standards at greater than 160,000 MPN/100 ml	This issue was raised at the Weekly Coordination Meeting on 03 June 2016. The Owner will organise a site inspection with the Contractor to follow up on the implementation of proposed corrective actions.
V&K Camp	EF10	All parameters complied with the Standards	No action was required in May 2016.
SECC Camp	EF11	Total coliforms were higher than the Standards, i.e. greater than 160,000 MPN/100 ml	A meeting will be organised early June 2016 with the Contractors to discuss the effluent quality results and corrective actions.
HMH Main Camp	EF12	pH and Total coliform results were not complied with the standard as values recorded of 9.49 and 160,000 MPN/100 ml	A meeting will be organised early June 2016 with the Contractors to discuss the effluent quality results and corrective actions.
Main Dam Construction Area	DS11	All parameters complied with the Standards	No corrective actions required. NNP1PC will continue to monitor the effluents from the site
Re-regulation Dam	DS08	All parameters complied with the Standards	No corrective actions required. NNP1PC will continue to monitor the effluents from the site
Spoil Disposal Area No.2 (Song Da 5 Workshop)	DS04	The TSS was higher than the Standard with a value recorded of 76.7 mg/l compared to the Standards of less than 50 mg/l and pH were recorded as 5.92 and 5.62, slightly lower than the standard.	A meeting will be organised early June 2016 with the Contractor to discuss the effluent quality results and corrective actions
RCC Plant	DS09	The TSS result on 23 May 2016 was higher than the Standard (<50 mg/l) with a value of 1,001 mg/l and a pH level of 9.75 slightly higher than the standard	An ONC was issued on 30 May 2016 after the site inspection due to non-compliance with the relevant effluent standards found on 21, 23, 24 and 26 May 2016. The Contractor was required to: i) remove the sediments from the sediment ponds on a regular

Site	Sampling ID	Non-Compliance	Corrective Actions
			basis; ii) stop leakage from the final sediment pond; and iii) remove the sediment from the drainage canals by 3 June 2016
CVC Plant	DS03	The pH was recorded as 9.71 which was slightly higher than the standards (6.0-9.0).	A follow up site inspection will be carried out by the Owner (EMO) and the results and corrective actions will be discussed with the Contractor in early June 2016

At the time of sampling, no discharge was observed at the Obayashi Camp (EF02), TCM Camp (EF03), Sino Hydro Camp (EF06), Song Da 5 Camp No.1 (EF07), Song Da 5 Camp No. 2 (EF08), and SECC Camp (EF11). Thus, the samples were collected from the final sediment pond at these camps. Also, no sampling was conducted in May 2016 at the Aggregate Crushing Plant (DS02) as there was no waste water discharged from the sediment ponds.

### 3.2.2 Surface (Ambient) Water Quality Monitoring

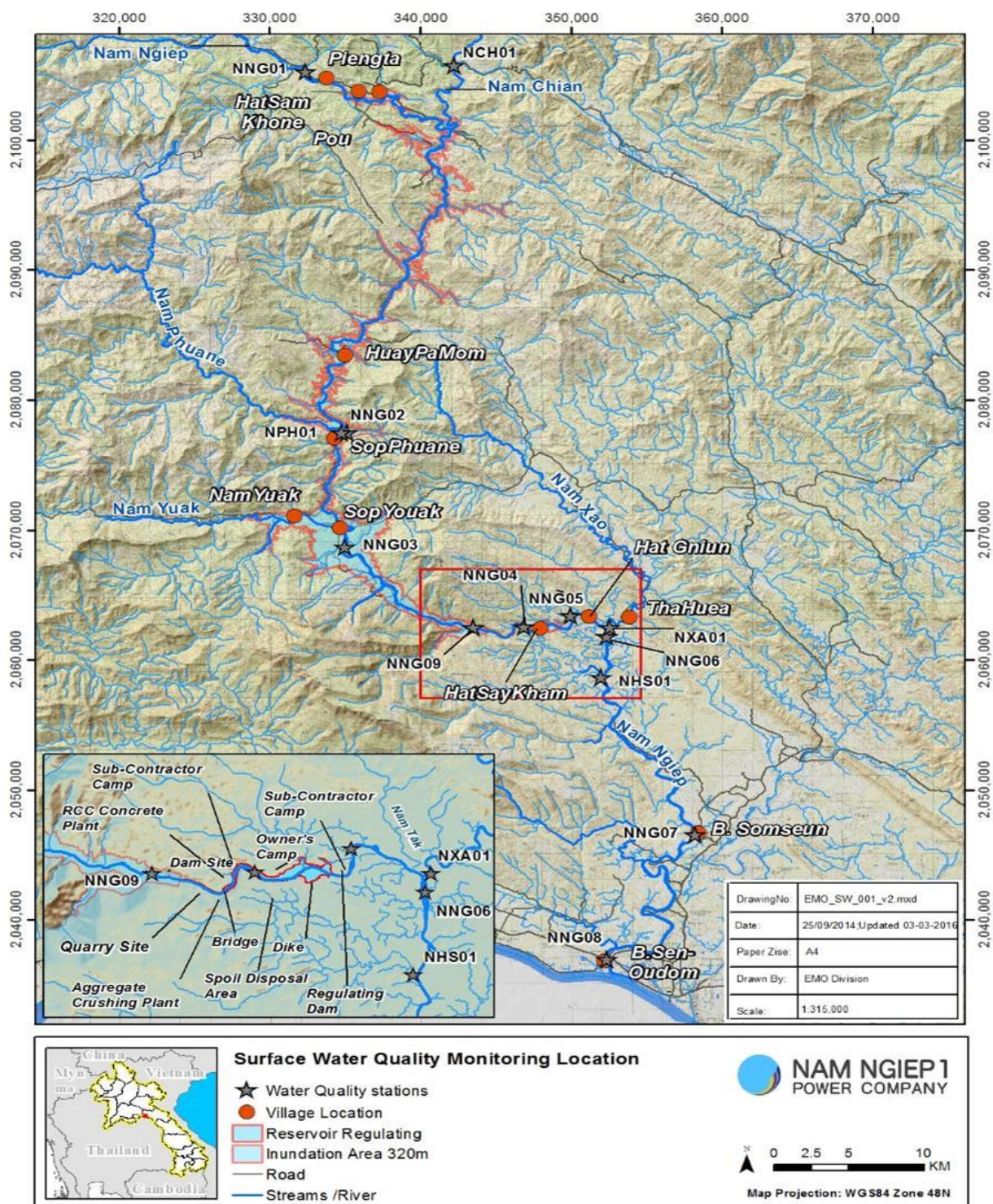
Surface water samples are collected and analysed twice a month<sup>3</sup> from nine stations in Nam Ngiep and four stations in the main tributaries including the lower Nam Chian, Nam Phouane, Nam Xao and Houay Soup (total 13 stations). The stations are indicated on the maps in Figure 3:5 and Figure 3:6.

All ambient water quality data are routinely reported to the Ministry of Natural Resources and Environment (MONRE) through the monthly Environmental Management and Monitoring Reports (EMMR) and to the Asian Development Bank (ADB) in Quarterly Report.

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<sup>3</sup> Monthly for chemical parameters and fortnightly for physical parameters

Figure 3-5: Surface Water Quality Monitoring Stations



Key findings for surface water quality monitoring in March 2016 are shown in, Table 3-7 and Table 3-8

### Nam Ngiep

All parameters monitored in May 2016 for the stations of Nam Ngiep upstream, within and downstream of the Project Construction Area were within the National Surface Water Quality Standards except with



respect to COD. The COD values exceeded the standard in all stations of Nam Ngiep with a peak value of 17.9 mg/l recorded at NNG09 upstream the Main Dam and the lowest COD at 5.7 mg/l at NNG04 located within the reach of the river that flows through the Construction Area.

The elevated levels of COD are considered unrelated to the Project activities.

**Table 3-5: Physical and Chemical Parameters of Nam Ngiep Surface Water Quality Monitoring in May 2016**

	River Name	Nam Ngiep								
	Zone	Upstream of Construction Sites				Within Construction Site	Downstream of Construction Sites			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04	NNG05	NNG06	NNG07	NNG08
	Date	09/05/2016	10/05/2016	10/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016
Parameters (Unit)	Guideline									
pH	5.0 – 9.0	7.14	7.1	7.26	7.67	7.57	7.59	7.44	7.44	7.61
DO (%)		94.8	93	103.6	99.1	102.8	102.4	102.3	107.8	110.2
DO (mg/L)	>6.0	7.4	6.95	7.63	7.35	7.56	7.47	7.38	7.56	7.61
Conductivity (µs/cm)		106.3	119.1	101.2	103.2	103.5	101.9	101.4	102.1	105
TDS (mg/l)		53	59	50	51	51	50	50	51	52
Temperature (°C)		25.8	28.6	29.6	29.8	30	30.5	31.1	32.6	33.5
Turbidity (NTU)		34.9	16.5	11.5	16.9	12.3	12.4	11.8	12.55	11.3
TSS (mg/l)		42	24	13.9	22.6	16.7	19.4	19.4	21.4	19.5
BOD <sub>5</sub> (mg/l)	<1.5	1.4	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	1.1
COD (mg/l)	<5.0	9.1	11.4	9.3	17.9	5.7	8.9	6.3	8.1	7.1
NH <sub>2</sub> -N (mg/l)	<0.2	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>
NO <sub>3</sub> -N (mg/l)	<5.0	0.09	0.23	0.13	0.1	0.08	0.07	0.06	0.06	0.07
Manganese (mg/L)	<1	0.136	0.053	0.048	0.046	0.05	0.052	0.06	0.046	0.039
Total Iron (mg/L)		3.06	1.31	1.01	1.15	1.25	1.1	1.16	0.756	0.818
Total coliform (MPN/100ml)	<5,000	1,300	170	490	490	330	170	240	490	280
Faecal coliform (MPN/100ml)	<1,000	490	33	79	330	79	70	79	220	49

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

**Table 3-6: Physical Parameter Results of Nam Ngiep Surface Water Quality (Fortnightly Measured) in May 2016**

	River Name	Nam Ngiep								
	Zone	Upstream of Construction Sites				Within Construction Site	Downstream of Construction Sites			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04	NNG05	NNG06	NNG07	NNG08
	Date	24/05/16	25/05/16	25/05/16	26/05/16	26/05/16	26/05/16	26/05/16	26/05/16	26/05/16
Parameters (Unit)	Guideline									
pH	5.0 – 9.0	7.39	7.16	7.3	7.47	7.53	7.21	7.4	6.99	6.96
DO (%)		91.5	92	96.4	98.5	101.3	98.4	97.2	87.3	88.6
DO (mg/L)	>6.0	7.15	7.23	7.55	7.75	7.94	7.55	7.41	7.67	6.78
Conductivity (µs/cm)		107.7	82.8	65.9	81.7	69.7	68.6	70.9	61.9	58.4
TDS (mg/l)		53	41	33	40	35	34	35	31	29
Temperature (°C)		25.6	26.1	26.1	25.9	26.5	27.4	27.6	27.7	27.5
Turbidity (NTU)		66.3	115	116	100.3	97.3	91.9	88	87.9	77.9

### Tributaries upstream the main dam: Nam Chiane (NCH01), Nam Phouan (NPH01)

Nam Chiane (NCH01) is located about 66 km upstream of the NNP1 Project construction site. The COD exceeded the National Surface Water Quality Standard set at less than 5.0 mg/l with a recorded value of 9.1 mg/l.

Nam Phouan is located about 24 km upstream of NNP1 Project construction site. The COD exceeded the National Surface Water Quality Standard set at less than 5.0 mg/l with a recorded value of 14 mg/l.

### Tributaries downstream the main dam: Nam Xao (NXA01), Nam Houay Soup (NHS01)

Nam Xao has confluence with the Nam Ngiep downstream of the NNP1 Project construction site. The COD was found to exceed the National Surface Water Quality Standard (less than 5.0 mg/l) with a recorded value of 14.2 mg/l. In addition, dissolved oxygen was slightly lower than the standard (greater than 6.0 mg/l) with a recorded value of 5.96 mg/l.

Houay Soup Njai has a confluence with the Nam Ngiep River downstream of NNP1 Project construction site. The COD was found to exceed the National Surface Water Quality Standard (less than 5.0 mg/l) with a recorded value of 11.1 mg/l. In addition, dissolved oxygen was slightly lower than the standard (greater than 6.0 mg/l) with a recorded value of 5.90 mg/l.

**Table 3-7: Results of Physical and Chemical Parameters of Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup in May 2016**

	Site Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houaysoup
	Zone	Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	09/05/2016	10/05/2016	11/05/2016	11/05/2016
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	7.23	7.32	7.3	6.93
DO (%)		103.2	104.3	83.8	103.3
DO (mg/L)	>6.0	8.03	8	5.96	7.5
Conductivity(μs/cm)		62	76.9	145.1	61
TDS (mg/L)		31	38	72	30
Temperature (°C)		25.7	27.1	32	30.8
Turbidity (NTU)		22.5	2.64	3.63	12.32
TSS (mg/l)		45.1	6.6	ND <sup>16</sup>	15.2
BOD <sub>5</sub> (mg/l)	<1.5	ND <sup>13</sup>	ND <sup>13</sup>	1.2	1
COD (mg/l)	<5.0	9.1	14	14.2	20.7
NH <sub>3</sub> -N (mg/l)	<0.2	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>	ND <sup>12</sup>
NO <sub>3</sub> -N (mg/l)	<5.0	0.13		0.09	0.14
Manganese (mg/L)	<1	0.09	0.043	0.141	0.076
Total Iron (mg/L)		2.12	0.308	0.387	0.895
Total coliform (MPN/100mL)	<5,000	1,300	330	490	2,400
Fecal coliform (MPN/100mL)	<1,000	1,300	79	79	790

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

**Table 3-8: Physical Parameters Results of Surface Water Quality – Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup (fortnightly measured) for May 2016**

	Site Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houaysoup
	Zone	Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	24/05/2016	25/05/2016	26/05/2016	26/05/2016
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	7.51	7.27	7.07	6.35
DO (%)		97	96.7	90.4	87.7
DO (mg/L)	>6.0	7.69	7.68	6.8	6.92
Conductivity(μs/cm)		68.4	49.9	88.5	14.21
TDS (mg/L)		34	25	44	7
Temperature (°C)		24.6	25.1	28.4	25.8
Turbidity (NTU)		1,201	88.3	35.5	20.9

### 3.2.3 Groundwater Quality Monitoring

NNP1PC sampled and analysed the groundwater quality in 4 boreholes. Three boreholes are community boreholes at Ban Hatsaykham and one is a private well at Ban Hat Gniun (see **Error! Reference source not found.**).

The water from the boreholes in Ban Hatsaykham is used by 42 households for drinking, bathing, washing and domestic use purposes. The water from the well in Ban Hat Gnuin is used by 6 households for bathing and washing purposes.

All groundwater quality data are routinely reported to the Social Management Office who regularly communicate the results to the village authorities and the local health centres as part of the Project's health programme.

### Ban Hatsaykham

The pH levels for all three boreholes (GHSK01, GHSK02 & GHSK03) were 5.44, 5.69 and 5.71 respectively. All are slightly lower than the National Groundwater Standard range (between 6.5 and 9.2). The instance of low pH will continue to be monitored. However, the recorded pH levels are not likely to pose any risks to the villagers' health. All other monitored parameters complied with the standards.

### Ban Hat Gnuin

The faecal coliforms and E.coli bacteria contamination were 110 MPN/100ml which exceed the standards. In addition, the pH level was measured at 5.05 which is slightly lower than the National Standard range of between 6.50 and 9.20. The increment of faecal coliforms and E.coli bacteria were caused by the seepage of the contaminated underground water with pollutants. Other monitored parameters complied with the standards.

**Figure 3-6: Groundwater Quality Monitoring Locations**

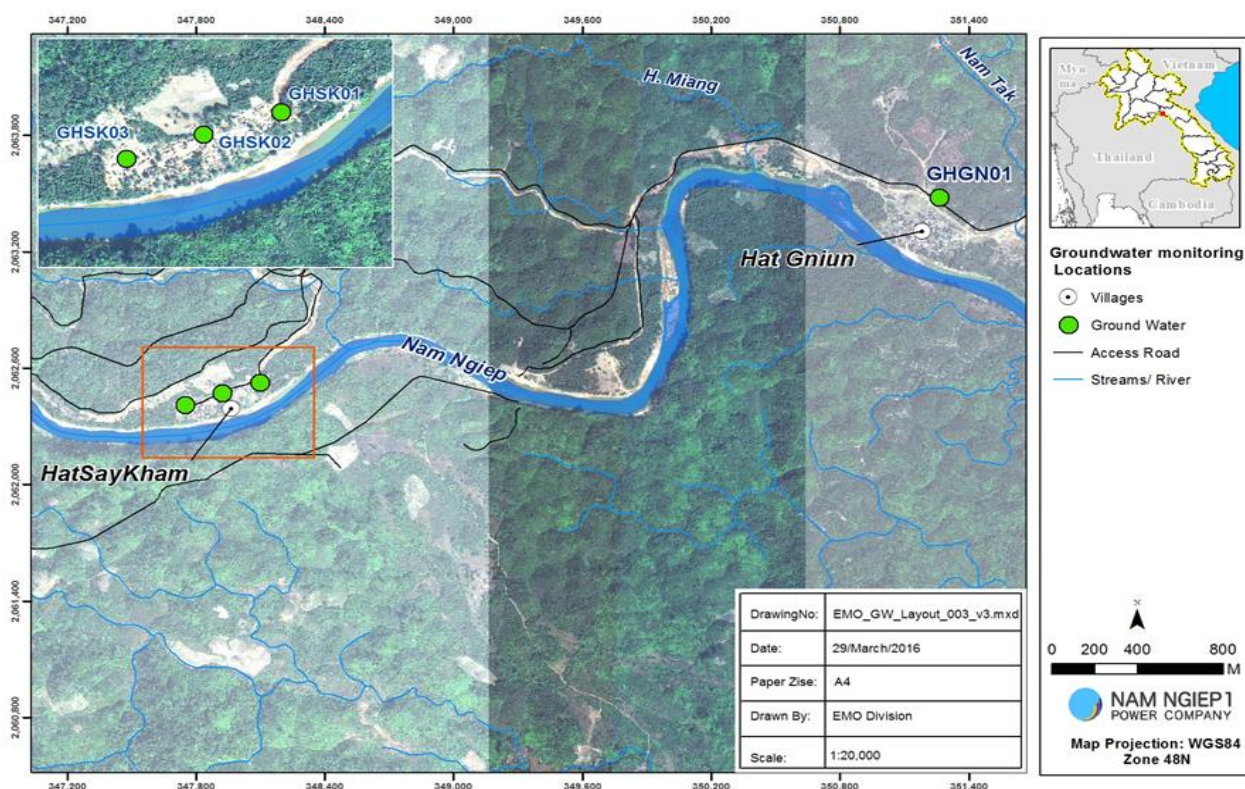


Table 3-9: Groundwater Quality Monitoring Results in May 2016

	Site Name	Ban Hatsaykham			Ban Hat Gnuin
	Station Code	GHSK01	GHSK02	GHSK03	GHGN01
	Date	12/05/2016	12/05/2016	12/05/2016	12/05/2016
Parameter (Unit)	Guideline				
pH	6.5-9.2	5.44	5.69	5.71	5.05
Sat. DO (%)		40.9	57.3	57.9	58.3
DO (mg/L)		3.09	4.31	4.49	4.49
Conductivity (µs/cm)		78.9	63.7	85.8	31
TDS (mg/L)	<1,200	39.5	32	43	16
Temperature (°C)		28.6	28.5	26.6	27.3
Turbidity (NTU)	<20	1.06	0.53	0.26	3.72
Faecal coliform (MPN/100ml)	0	0	0	0	110
Ecoli Bacteria (MPN/100ml)	0	0	0	0	110

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

### 3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Water quality monitoring for GFWS system is conducted on a monthly basis with the aim to provide necessary recommendations to the users of possible impacts caused by bathing and washing. During May 2016, water samples were taken from water taps at Ban Hat Gnuin and Ban Thaheua.

Results of the assessment for GFWS of Ban Hat Gnuin and Ban Thaheua are shown in Table 3-10 and summarised as follows:

**Ban Thahuea (WTHH02):** All parameters complied with the National Drinking Water Standards except for faecal coliforms and E.coli which were found to be 23 MPN/100 ml for both parameters.

**Ban Hat Gnuin (WHGN02):** All parameters complied with the National Drinking Water Standards except for faecal coliforms and E.coli which were found to be 23 MPN/100 ml for both parameters.

Table 3-10: Results of the Gravity Fed Water Supply Quality Monitoring in May 2016

	Site Name	Ban Thaheua	Ban Hat Gnuin
	Station Code	WTHH02	WHGN02
	Date	12/05/2016	12/05/2016
Parameter (Unit)	Guideline		
pH	6.5-8.5	6.97	7.22
Sat. DO (%)		102.9	102.2
DO (mg/L)		7.37	7.49
Conductivity (µs/cm)	<1,000	81.3	111.3
TDS (mg/L)	<600	40.5	56
Temperature (°C)	<35	31.4	30.7
Turbidity (NTU)	<10	1.14	1.69
Faecal coliform (MPN/100ml)	0	23	23
Ecoli Bacteria (MPN/100ml)	0	23	23

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

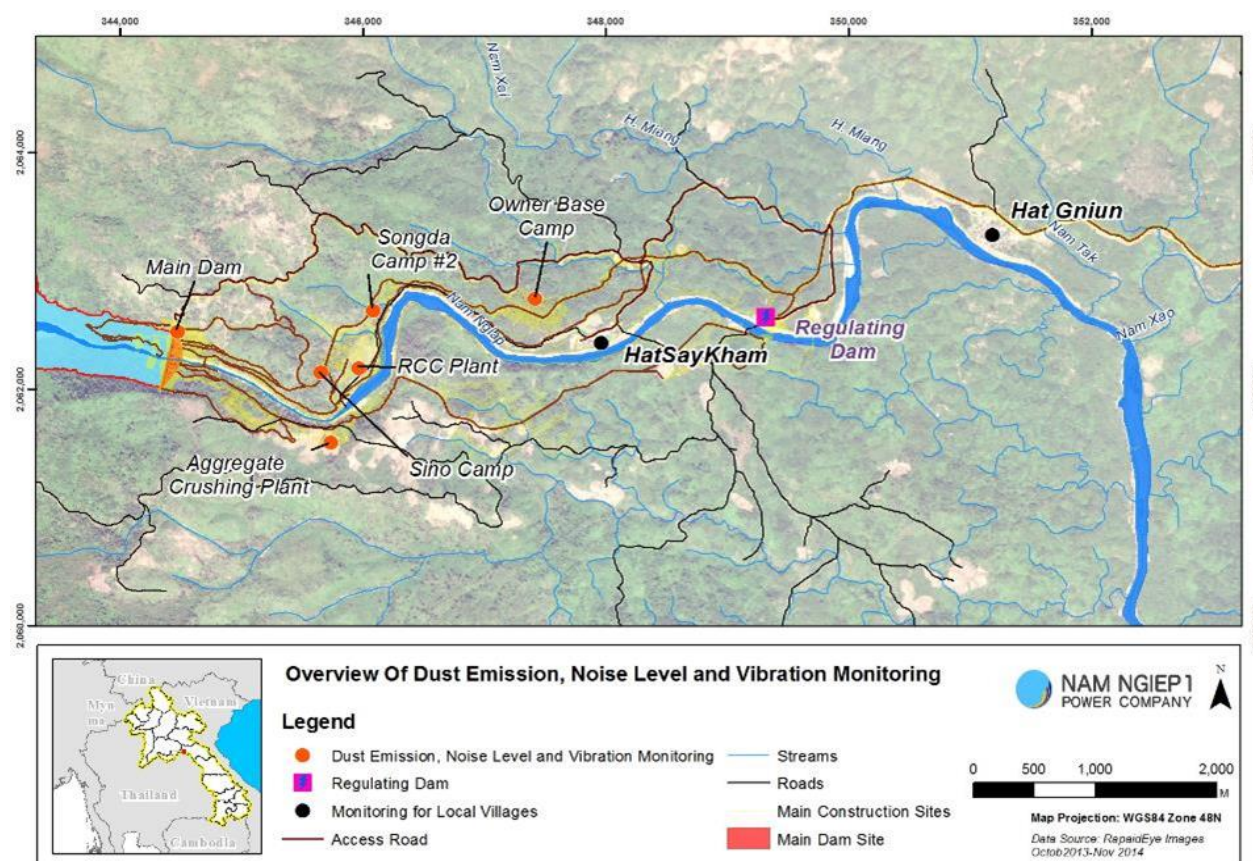


### 3.2.5 Dust Monitoring

Dust monitoring was conducted over a period of 72 consecutive hours in Ban Hat Gnuin and Ban Hatsaykham. In addition, dust monitoring was conducted for 24 consecutive hours at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Camp, Song Da 5 Camp No. 2 (to assess possible impact on workers' health) and Owner's Site Office and Village.

The monitoring points are indicated on the map in Figure 3-7 . All average dust results during the monitored period complied with the National Standard. The results are presented in Annex B.

**Figure 3-7: Noise and Dust Emission Monitoring Locations**



### 3.2.6 Noise Monitoring

During May 2016, noise monitoring was conducted in Ban Hatsaykham and Ban Hat Gnuin for at least 72 consecutive hours in each village. Noise monitoring was also conducted at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Camp, Son Da 5 Camp No. 2 (to assess possible impact on worker's health) and Owner's Site Office and Village (to monitor the ambient noise levels) for 24 of consecutive hours.

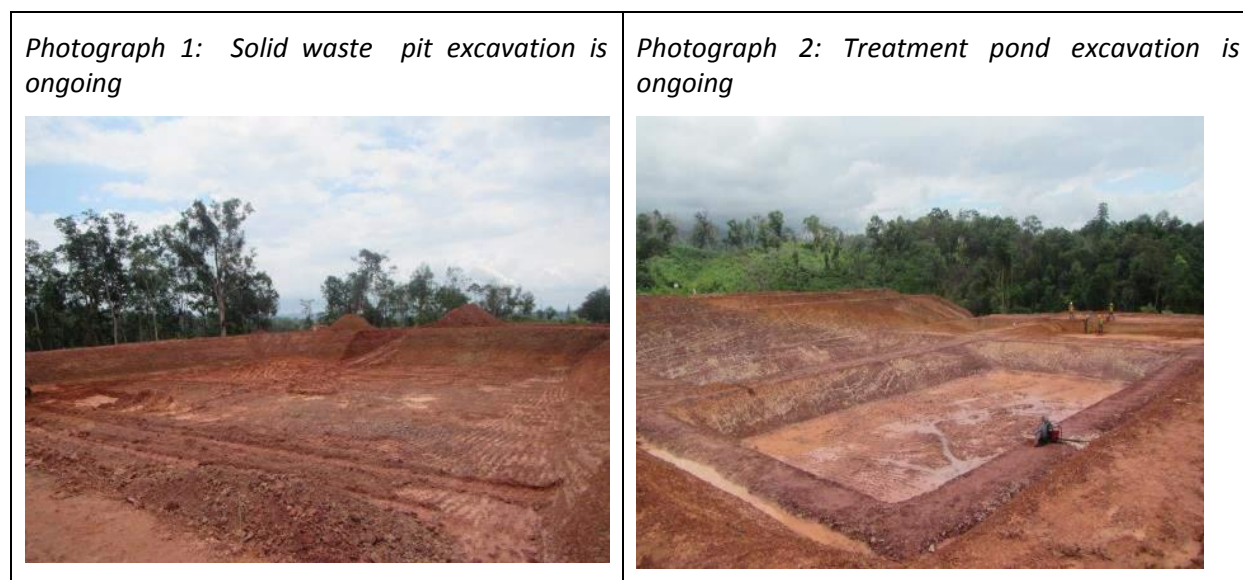
The recorded noise levels indicate full compliance with the National Standard for the period of 06:01-22:00 for all stations monitored. For the period of 22:01-06:00, slightly higher levels than the Standard were recorded at Ban Hat Gnuin and Ban Hatsaykham [between 46.20-47.39 dB(A) compared to the Standard of 45 dB(A)]; the RCC, Aggregate Crushing Plant, Sino Hydro Camp and the Main Dam [between 51.74-66.48 dB(A)] compared to the Standard of 50 dB(A)]. With reference to the investigation on this matter conducted in February 2016, the key causes of high noise levels are most likely the windy and rain conditions during the night time period.

Results of the noise monitoring for May 2016 are shown in Annex C.

### 3.3 Construction Site Waste Management

#### 3.3.1 Solid Waste Management at the Construction Site

The Construction of Stage 1 of the NNP1 Project Landfill at Spoil Disposal Area No. 6 has made good progress. Key achievements included the excavation of one waste disposal pit and four treatment ponds. On 26 May 2016, the EMO received the second revision of the Detailed Works Program (DWP) and Site Specific Environmental and Social Management and Monitoring Plan (SS-ESMMP) for the construction of the landfill. Review of this document is underway.



#### 3.3.2 Hazardous Materials and Waste Management

On 16 and 17 May 2016, a hazardous materials and waste inventory was jointly undertaken at the main construction sites and sub-contractors' camps including the TCM Camp, Right Tunnelling Workshop, V&K Camp, CVC Plant, Sino Hydro fuel station at their Camp, new Song Da 5 workshop at Spoil Disposal Area No. 2, H-M Hydro's Workers' Camp, IHI workers' camp and SECC workshop.

The types and amounts of hazardous materials stored at the different construction sites and camps are indicated in Table 3-11.

*Table 3-11 Results of hazardous material inventory*

NO.	HAZARDOUSE WASTE TYPE	UNIT	DISPOSED	TOTAL
1	Used Oil (hydraulic + engine)	Litre	0	1130
2	Empty used oil drum/container	Drum (20 litres)	0	21
3	Empty used oil drum/container	Drum (200 litres)	0	12
4	Empty contaminated bitumen drum/container	Drum (200 litres)	0	82
5	Used oil filter	Piece	0	62
6	Contaminated soil, sawdust and concrete	bag	0	33
7	Contaminated rags	bag	0	3
8	Used tyre	Piece	0	36
9	Empty used chemical drum/container	Drum (200 litres)	0	44

10	Battery	unit	0	6
11	Empty paint and spray cans	ca	0	2
12	Acid and caustic cleaners	Bottle	0	285

A small amount (about 5.3 kg) of clinical waste generated by NNP1PC was delivered and incinerated by an incinerator located at Vientiane Landfill



### 3.4 Community Waste Management Support

#### 3.4.1 Community Recycling Programme

During May 2016, a total of 6,683.6 kg of recyclables were received by the Community Recycle Bank, an increase of 199.4 kg from last month (see Table 3-122). By the end of May 2016, a total of 183 people (129 adults and 54 students) or 120 households held accounts at the Recycle Bank. The percentages of participation in the programme for each village are: Ban Hat Gniun- 80%, Ban Hatsaykham- 64% and Ban Thahuea- 64%. Only one new member joined programme households.

The types and amounts of waste recycled in May 2016 and in total are presented in Table 3-12.

**Table 3-12: Types and amounts of waste traded**

Types of Waste	Unit	Amount Recycled In May 2016	Accumulated Amount of Recyclables (July 2015 – May 2016)
<b>Recyclable waste</b>			
Glass	Kg	132	2,006
Scrap metal	Kg	23.7	2,021.7
Plastic bottle	Kg	23	1,091.5
Paper/cardboard	Kg	8	1,083
Aluminium cans	Kg	12.7	481.4
Tin cans	Kg	0	
<b>Total</b>	<b>Kg</b>	<b>199.4</b>	<b>6,683.6</b>
<b>Hazardous waste</b>			
Hydraulic/oil containers	Kg	0	11.5
Used batteries	Am	0	9



Photograph 5:

Buying recyclable waste at the waste bank



Photograph 5:

Buying recyclable waste at the recycle bank



### 3.4.2 Houay Soup Waste Management Area Waste Management

The bids for the construction of Houay Soup Resettlement Area landfill were opened and are being reviewed and evaluated.

## 3.5 Watershed Management

### 3.5.1 Preparation of the Nam Ngiep 1 Watershed Management Plan

Obligations	Status by May 2016
Prepare a draft Watershed Management Plan by 31 July 2016	50% completed The working draft of Watershed Management Plan (WMP) has been presented by NNP1 WMC-WMO to ADB Consultant during the joint mission of ADB, IAP, BAC and LTA on 17 May 2016.
Prepare draft Watershed Management Regulations by 31 July 2016	-
Final Watershed Management Plan by 31 October 2016	-
Final Watershed Management Regulations by 31 January 2017	-
<b>Activities in May 2016</b>	<b>Results</b>
Data and information collection and analysis for WMP	<ul style="list-style-type: none"> <li>A working draft Watershed Management Plan has been prepared. The plan was presented and discussed during the joint ADB, IAP, BAC and LTA mission.</li> <li>As recommended by the joint mission of ADB, IAP, BAC and LTA, the next step in the data analysis will involve integrated</li> </ul>

Obligations	Status by May 2016
	<p>analyses of biodiversity conservation issues, (particularly with respect to the identified Priority Biodiversity Area), fishery management, forest protection and conservation (Houay Ngoua Provincial Protected Area, Houay Soup Protection Forest) together with socioeconomic development and other relevant issues emerging from the ISP process.</p> <ul style="list-style-type: none"> <li>• To support the integrated analyses, baseline data collection and profiling will continue including developing GIS layers and maps, and displays of socioeconomic and environmental data.</li> <li>• A WMP workshop is scheduled in the middle of June 2016.</li> </ul>
GOL Consultant procurement	<ul style="list-style-type: none"> <li>• Two candidates for the position as National WMP Consultant have been interviewed. The consultant will be hired by DFRM and NNP1PC has encouraged DFRM to settle the procurement as soon as possible.</li> <li>• The WMP planning process will continue in parallel with the hiring of the National Consultant.</li> <li>• NNP1PC has received expression of interest from 3 candidates for the position as International WMP Consultant. The selection of candidates for interview is scheduled for June 2016.</li> </ul>
Watershed boundary survey	<ul style="list-style-type: none"> <li>• Bolikhamxay WMO conducted public consultation with villages along Nam Xao in regard to the watershed boundary and the expected local participation to involve in protection measures of NNP1 catchment protection. The consultation is also scheduled for 2-3 villages in June 2016.</li> </ul>
Land use planning activity	<ul style="list-style-type: none"> <li>• Both Xaysomboun and Bolikhamxay WMOs completed the land use planning at the priority villages as planned. The final report is being prepared and will serve as a model for similar planning to be conducted in other villages.</li> </ul>
<p>WMO Office Construction</p> <ul style="list-style-type: none"> <li>• 1 WMO Office in XSB with the dimension of 12.20 m x 25 m</li> <li>• 1 WMO Office in BLX with the dimension of 15 m x 20 m and repair of the coordination office in Pakxan District with the dimension of 8 m x 38.5 m</li> </ul>	<ul style="list-style-type: none"> <li>• Xaysomboun WMO has completed the construction of their office building. The remaining part is installation of water supply and electricity systems. The WMO staff plan to move to the new office in June 2016.</li> <li>• Bolikhamxay WMO has completed office construction including installation of water supply and electricity. The repair of the coordination office in Pakxan District has also been completed. Both of the offices are now in use.</li> </ul>
Xaysomboun ISP	<ul style="list-style-type: none"> <li>• Xaysomboun ISP Committee shared the working draft of Provincial ISP in early May 2016 with the updated data and information from 5 districts and relevant provincial GOL</li> </ul>



Obligations	Status by May 2016
	<p>authorities such from Health, Education, Energy and Mines, or Tourism authority.</p> <ul style="list-style-type: none"> <li>It was confirmed by MONRE/DEQP team that the draft will be further communicated with Xaysomboun ISP Technical Committee before final submission scheduled in June 2016.</li> </ul>

### 3.5.2 Biodiversity Offset Management

Obligations	Status by May 2016
Final Biodiversity Offset Survey Report by 30 June 2016	<p>80% completed</p> <p>The Consultant is working to finalize the draft and to be submitted to NNP1 in the early June 2016.</p>
Draft Offset Options Paper for the Biodiversity Offset Sites by 31 July 2016	
Consensus building and workshops among stakeholders for the offset site selection by 15 September 2016	
Final Offset Options Paper for the Biodiversity Offset Sites by 31 October 2016	

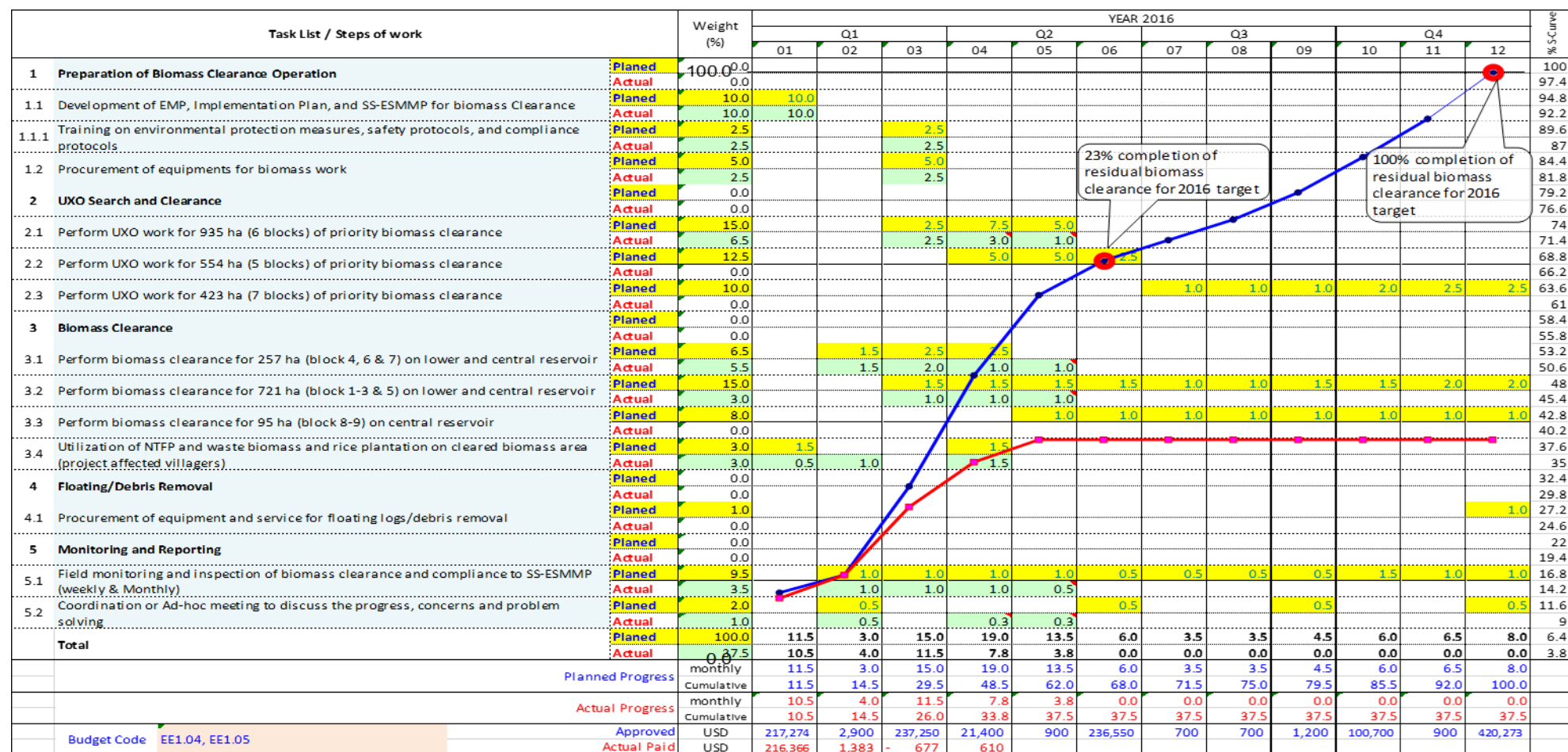
Activities in May 2016	Results
Ground truth survey	<ul style="list-style-type: none"> <li>The 2<sup>nd</sup> camera-trap data retrieval was completed on 30 May 2016. The results are expected to be elaborated in the final version of the survey report to be delivered by the end of June 2016.</li> <li>As recommended by ADB, a wet season (baseline) survey is under consideration. ADB has prepared a draft TOR for the survey and NNP1PC has initiated consultations with Bolikhamxay Province.</li> </ul>
Workshop on biodiversity offset related issue between NNP1PC, GOL and the representatives of the joint mission of ADB, IAP, BAC and LTA	<ul style="list-style-type: none"> <li>The highlights from discussion on 17 May 2016: <ul style="list-style-type: none"> <li>The rapid ground truth survey report needs to be finalized soon before proceeding for the next step</li> <li>It was recommended that representative of ADB, IAP, BAC together with NNP1 and Bolikhamxay PoNRE to conduct the site visit to Nam Mouane</li> <li>All parties agreed that there should be regulation for future offset management</li> </ul> </li> </ul>

Activities in May 2016	Results
	<ul style="list-style-type: none"><li>○ All parties agreed to involve concerned GOL representatives into every discussion, workshop and/ or meeting regarding NNP1 Offset Program.</li></ul>

### 3.5.3 Biomass Clearance

The overall progress of biomass clearance programme is demonstrated in Figure 3-8 below.

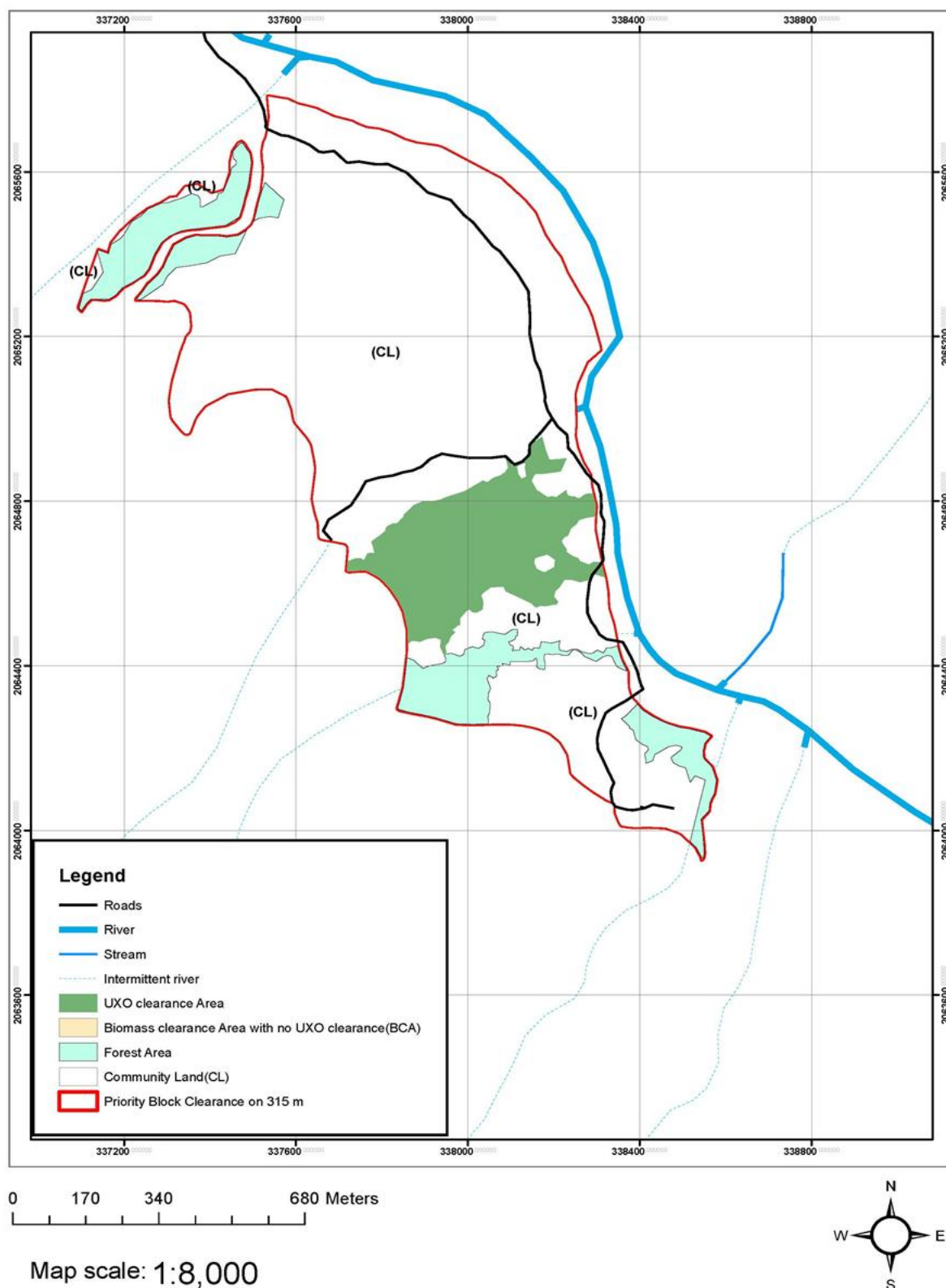
Figure 3-8: Gantt Chart of Biomass Clearance Programme in May 2016



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

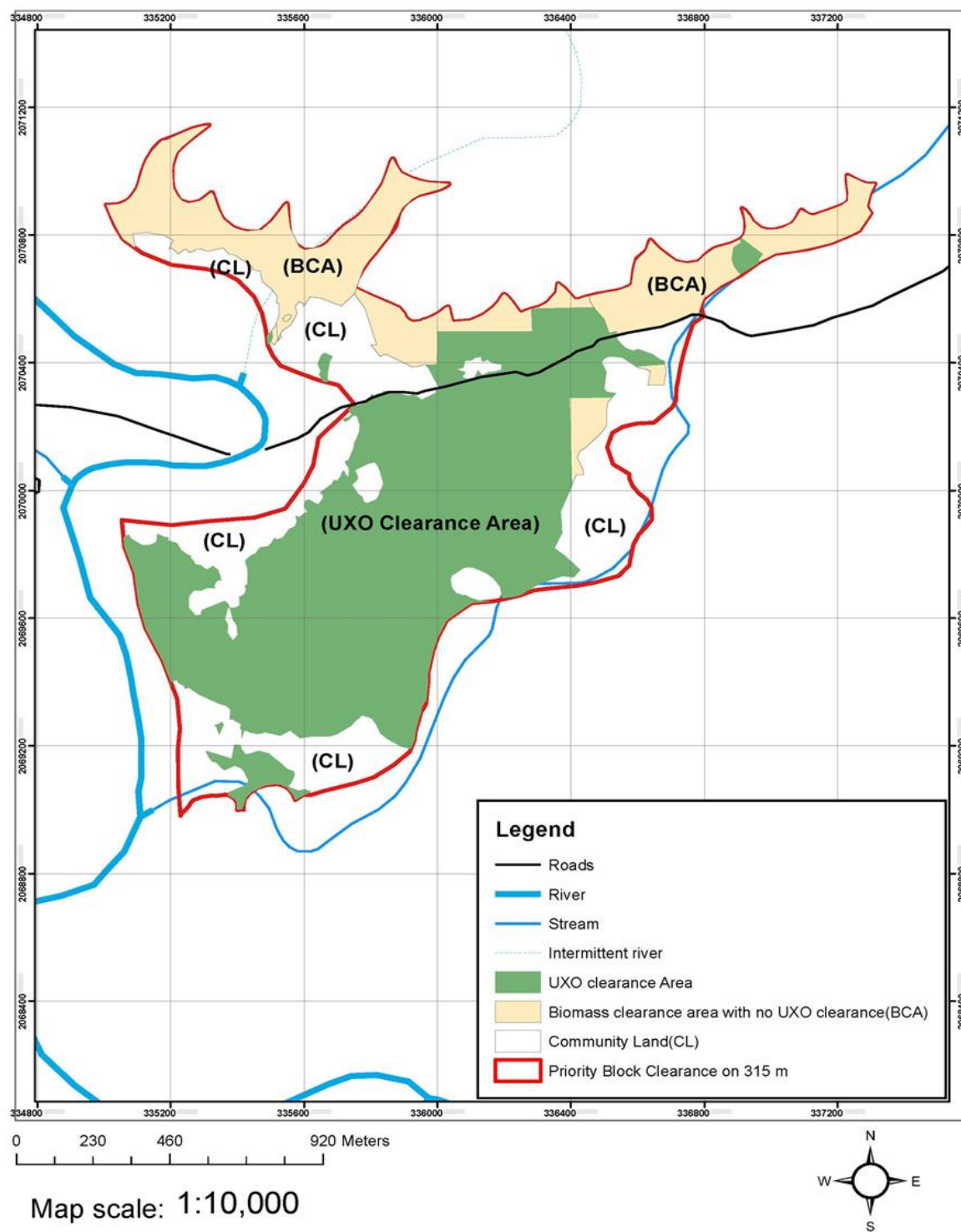
Activities in May 2016	Results
Labour recruitment	<ul style="list-style-type: none"> <li>• During the reporting period, Biomass Clearance Contractor-LAUNC has contracted additional 30 households (lump sum contract) in Ban Nong (Sop Youak) for the biomass clearing in block 4-5.</li> <li>• At the time of reporting, 83 individuals (daily contract) and 168 households (lump sum contract) have been hired by the Biomass Clearance Contractor</li> </ul>
Perform UXO work for 9 blocks of priority biomass clearance	<ul style="list-style-type: none"> <li>• The overall progress of UXO search and clearance work is behind the schedule. To-date, the work was only progressed in Block 1, Block 4 and Block 8. At the time of reporting, the completed area for UXO search and clearance in Block 1 and Block 4 is around 13.74 ha and 96.90 ha respectively.</li> <li>• The work could not be commenced in Block 5 and Block 7 because the villagers do not allow the contractor to access the area due to the concern that the activities will impact their crops and cattle.</li> </ul>
Perform biomass clearance of block 1-9 on lower and central reservoir	<ul style="list-style-type: none"> <li>• By the time of reporting period, the biomass clearance has been progressed within the total area of around 214 ha or around 20% from the total target in 2016.</li> <li>• The overall biomass priority area with the status as of May 2016 and shows the respective number of clearance progress compared to the target in 2016. It is expected that the work progress will be slowed down due to the rainy season.</li> </ul>
Utilization of NTFP and waste biomass	<ul style="list-style-type: none"> <li>• Following up the advice from Hom District authority, a joint inspection / inventory was conducted in Block 1, Block 4, Block 5, Block 6, Block 8 and Block 9 for the lesser value tree with the diameter of more than 20 cm particularly before further action of burning.</li> <li>• Hom District GOL has made contact with local entrepreneur for the sale of found lesser value tree in these area.</li> </ul>
Opportunity of short-term crop plantation on cleared biomass area for project affected villagers.	<ul style="list-style-type: none"> <li>• By the time of reporting period, 142 households registered for crops plantation on cleared biomass area. Land measurement and allocation are being finalised.</li> </ul>
Coordination or <i>ad hoc</i> meeting to discuss the progress, concerns and problem solving	<ul style="list-style-type: none"> <li>• Special Coordination Meeting was made on 05 May 2016 at Hom District Meeting Hall with the main topic to present the overall progress of NNP1 Biomass Clearance to the GOL. The meeting was attended by 17 participants (including 1 woman) consisting of representatives from NNP1 WMO at Borikhamxay, Xaysomboun, and Central levels.</li> </ul>

Figure 3-9: Map showing the progress UXO search and clearance areas in priority block 1



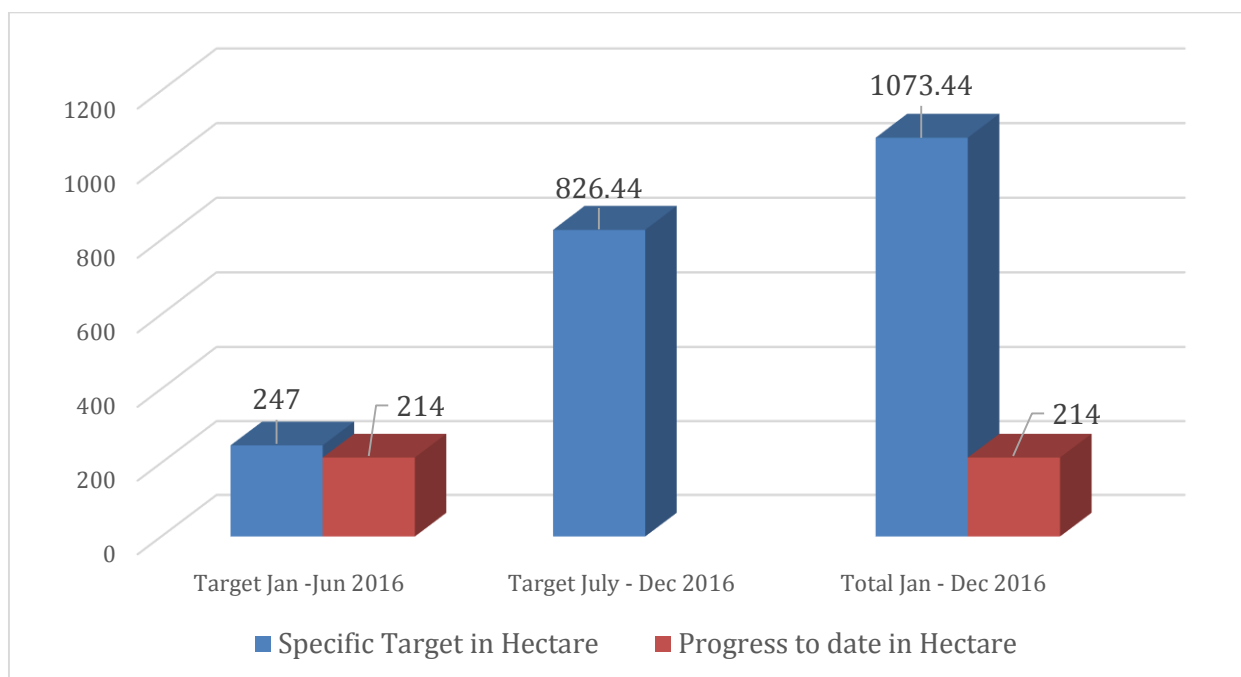


**Figure 3-10** Map showing the progress UXO search and clearance areas in priority block 4

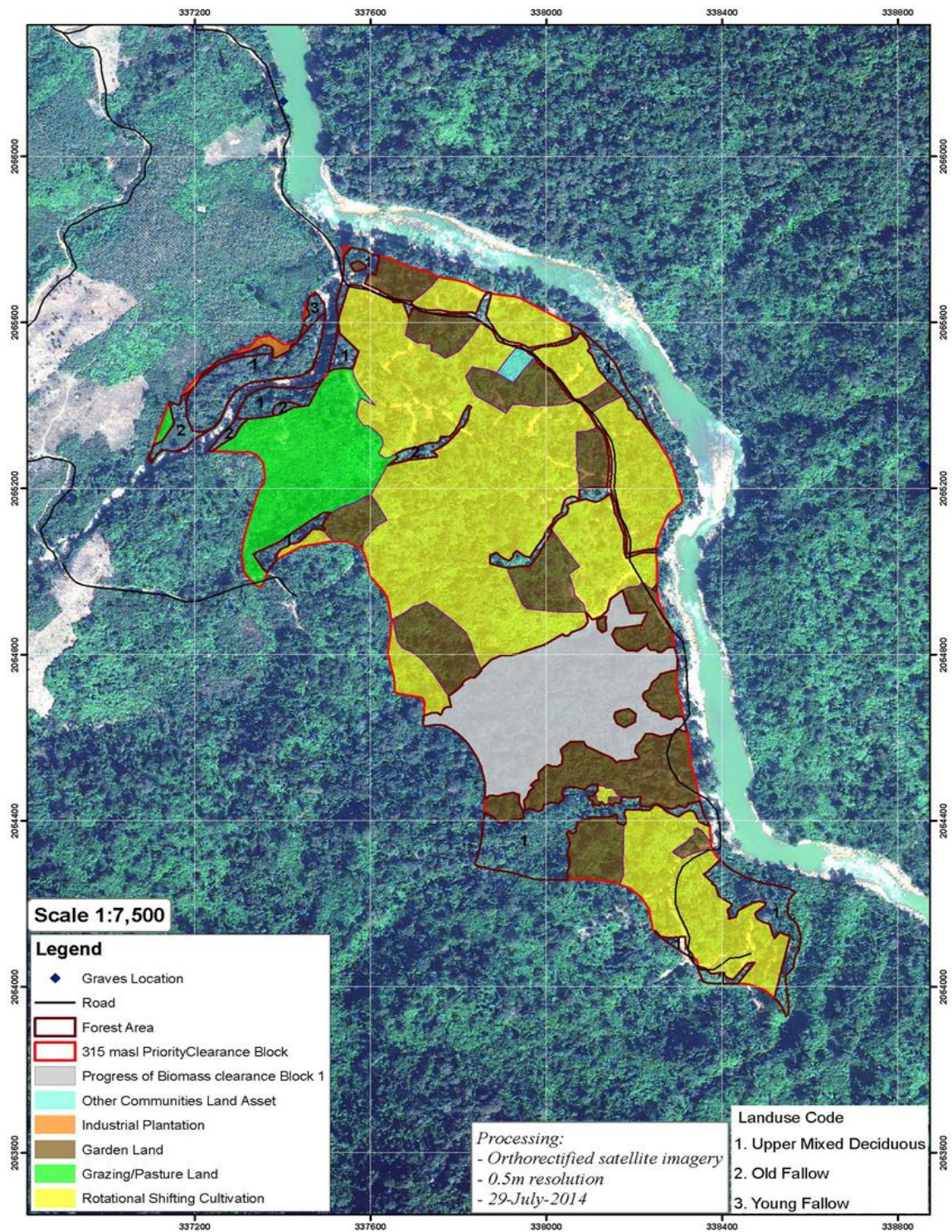


**Table 3-13 Priority biomass clearance area (updated in April 2016) and the status of clearance as of May 2016**

Block	Zone	Land Use Classification in Priority Biomass Clearance Area						Total area (ha)	Status of clearance as of May 2016 (ha)
		Rotational Shifting Cultivation	Garden Land	Industrial Plantation	Other Communities Land Asset	Maintained Vegetation (315-320 masl)	Forests		
1	1	50.53	20.18	0.31	10.29	6.11	27.96	<b>115.38</b>	30
2	1	10.79	5.68	7.86	108.82	7.3	25.47	<b>165.92</b>	
3	1	24.44	9.2	5.82	32.84	8.51	8.06	<b>88.86</b>	
4	1	14.76	20.86	10.21	13.95	3.94	103.96	<b>167.68</b>	130
5	1	41.62	17.51	38.25	215.14	8.79	29.4	<b>350.72</b>	40
6	1	-	2.15	0.56	11.9	0	32.09	<b>46.71</b>	10
7	2	5.51	9.38	0.25	0.18	3.39	24.32	<b>43.03</b>	
8	2	9.88	3.93	-	7.12	3.4	16.68	<b>41</b>	4
9	2	15.95	19.73	-	7.63	1.38	9.44	<b>54.13</b>	
10	2	71.09	26.74	1.72	60.1	39.09	118.64	<b>317.39</b>	
11	2	16.29	-	-	71.41	8.07	2.28	<b>98.05</b>	
12	3					20.13	64.11	<b>84.23</b>	
13	3	15.45	-	-	-	27.1	88.79	<b>131.35</b>	
14	3	8.88	0.71	-	29.43	9.66	4.32	<b>53</b>	
15	3	15.53	0.24	-	21.6	49.53	6.38	<b>93.27</b>	
16	3	2.02	-	-	-	6.53	1.3	<b>9.86</b>	
17	3	-	-	-	6.64	36.22	1.4	<b>44.25</b>	
18	3					3.23	3.95	<b>7.18</b>	
<b>Total</b>								<b>1,912.01</b>	<b>214</b>

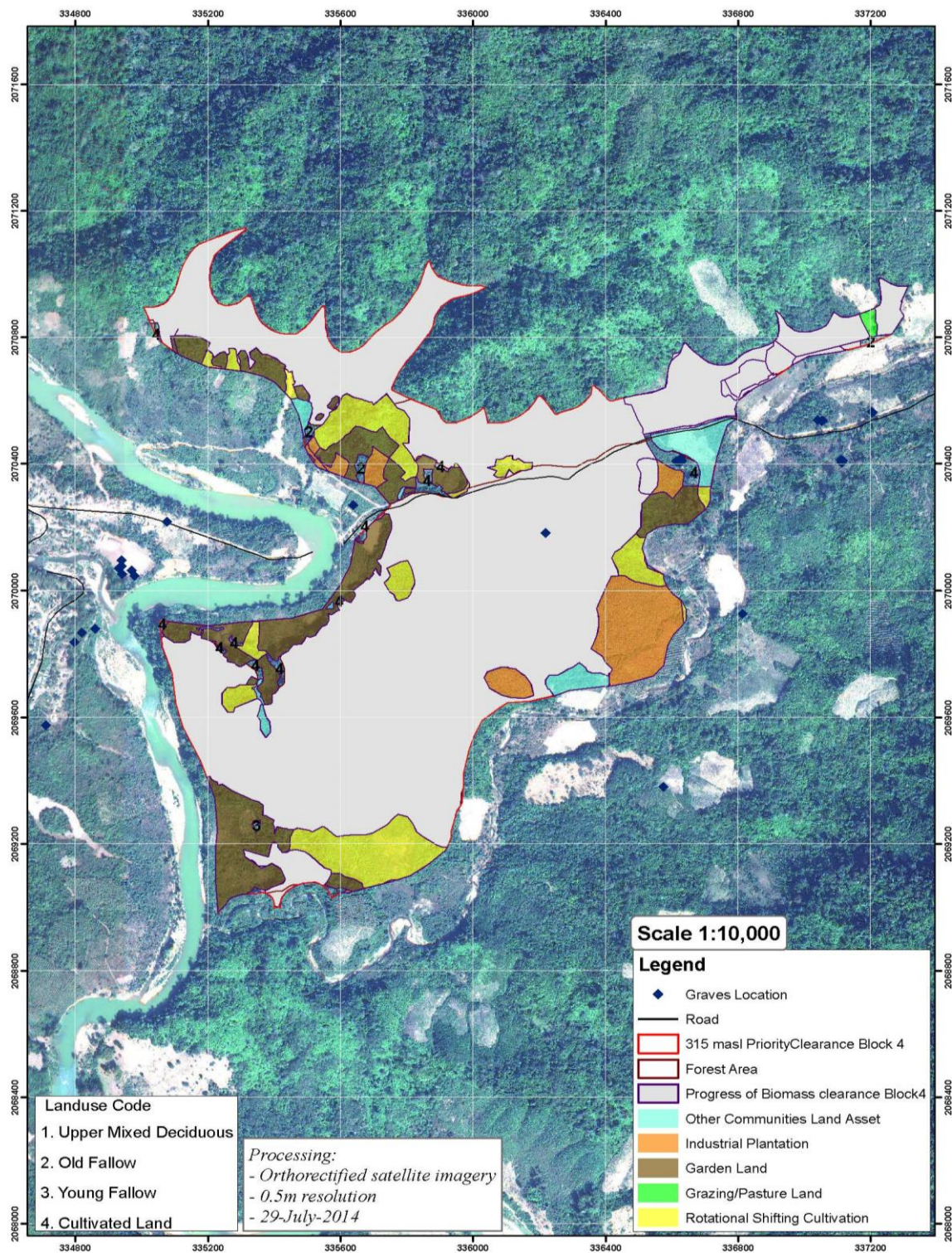
**Figure 3-11: Map showing the progress of biomass clearance in priority Block 1**



**Figure 3-12:** Map showing the progress of biomass clearance in priority block 1

As of May 2016, the cleared area in this block is around 30 ha out of target clearing of 115 ha. Biomass burning of area around 13.74 ha started late May 2016.



**Figure 3-13 Map Showing the progress of biomass clearance in priority block 5**

As of May 2016, the cleared area in this block is around 130 ha out of target clearing of 167.68 ha. Remaining wood is being stockpiled and re-burned.

### **3.6 Other Obligations and Support Programmes**

#### **3.6.1 Environmental Protection Fund (EPF)**

The sub-project proposal for the protection of Houy Ngoua Provincial Protected Area in Bolikhamxay province utilizing NNP1 fund has been approved by EPF technical committee and Board of Director. The grant agreement is expected to be signed in June 2016. There was no information for both Xaysomboun and Xiengkhuang sub-project proposals.

#### **3.6.2 115 kV Transmission Line IEE Due Diligence Assessment**

The IEE of 115 kV transmission line was received and being reviewed by NNP1, this is part of the DDA process.

#### **3.6.3 Nabong Substation Upgrade Due Diligence Assessment**

The Nabong Substation DDA was completed and submitted on 30 May 2016 to ADB. No comment was received.

### **3.7 External Monitoring**

#### **3.7.1 Independent Monitoring Agency**

The Independent Monitoring Agency (IMA) participated in the wrap up workshop of the join mission of ADB-IAP-BAC and LTA in May 2016. The event provided the opportunity for the IMA team to learn of the progress made by NNP1PC and concerns/issues observed during the mission. The first IMA introductory mission will be organized to take place in June 2016.

#### **3.7.2 Biodiversity Advisory Committee**

BAC Team Leader and IAP Biodiversity Specialist conducted a site visit to Nam Mouane Offset Site together with NNP1 management, NNP1 EMO and Bolikhamxay Provincial Authorities during the join mission of ADB, IAP, BAC and LTA. The recruitment of a third BAC member is in progress.



# ANNEXES

## ANNEX A: RESULTS OF EFFLUENT ANALYSES

*Table A- 1: Results of Camp Effluents in May 2016*

	Site Name	Owner Site Office and Village	Obayashi Camp	TCM Camp	RT Camp	Sino Hydro Camp	Songda5 Camp#1	Songda5 Camp#2	HM Camp	V & K Camp	SECC Camp	HM Main Camp
	Station code	EF01	EF02	EF03	EF05	EF06	EF07	EF08	EF09	EF10	EF11	EF12
	Date	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	11/05/2016	23/05/2016
Parameters (Unit)	Guideline											
pH	6.0 - 9.0	7.03	7.57	7.2	7.63	8.29	6.35	7.81	7.28	7.69	6.61	9.49
Sat. DO (%)	-	26.8	32.5	35.3	17.6	11.3	9.9	6	39.8	49	17.7	168.4
DO (mg/L)	-	1.98	2.32	2.64	1.28	0.83	0.72	0.44	2.72	3.57	1.32	11.79
Conductivity (µs/cm)	-	494	847	315	335	595	670	821	338	352	284	289
TDS (mg/L)	-	247	423	157	167	298	335	410	169	176	142	148.8
Temperature (°C)	-	29.76	31.4	29.14	31.04	30.55	30	29.55	34.2	30.74	29.06	32.5
Turbidity (NTU)	-	0.32	21	4.44	27.4	22.9	9.99	27.3	11.4	6.64	44.4	11.5
TSS (mg/L)	<50	ND <sup>16</sup>	26.2	10.4	16.2	39.3	68.3	32.2	24.3	7	35	6.8
BOD5 (mg/L)	<30	3.2	69	5.6	12.5	32.1	34	107	20.8	4.5	16.9	5.6
COD (mg/L)	<125	9.6	178	51	49	92	116	114	44.5	30.5	62	41.1
NH <sub>3</sub> -N (mg/L)	<10.0	6	35	ND <sup>12</sup>	6	11	13	32	4	5	3	3
Oil & Grease (mg/L)	<10.0	ND <sup>13</sup>	2	ND <sup>13</sup>	1	3	1	3	ND <sup>13</sup>	ND <sup>13</sup>	2	ND <sup>13</sup>
Total coliform (MPN/100ml)	<400	130	>160,000	13,000	>160,000	>160,000	>160,000	>160,000	>160,000	240	>160,000	160,000
Faecal Coliform (MPN/100ml)		79	>160,000	1,300	24,000	54,000	92,000	>160,000	92,000	240	17,000	330
Discharge Volume (m <sup>3</sup> /day)		15	0	0	0	0	0	0	1.5	0.5	0	0.3

*Table A- 2: Results of the Construction Area Discharge in May 2016*

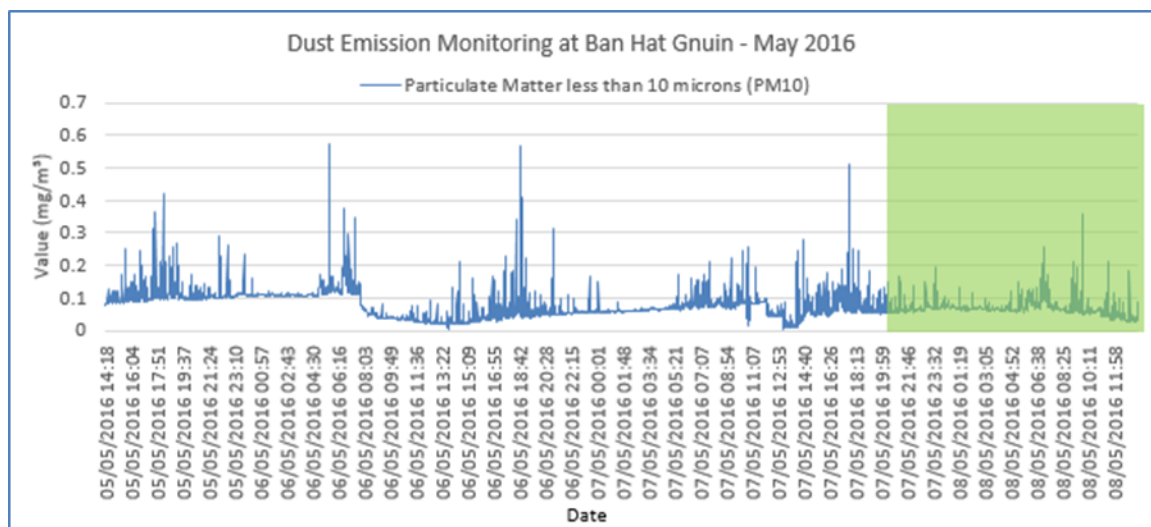
	Site Name	CVC Plant	Spoil Disposal #2				RCC Plant			Regulating Dam			Main Dam		
	Station Code	DS03	DS04				DS09			DS08			DS11		
	Date	26/05/2016	11/05/2016	23/05/2016	26/05/2016	11/05/2016	23/05/2016	26/05/2016	11/05/2016	23/05/2016	26/05/2016	11/05/2016	23/05/2016	26/05/2016	
Parameter (Unit)	Guideline														
pH	6.0 - 9.0	9.71	5.92	5.62	6.66	6.96	7.44	9.75	7.49	7.43	6.79	8.94	8.68	7.79	
Sat. DO (%)		93.9	38.1	32.2	63.6	92.7	92.45	90.4	74.6	101.2	96.5	69	92.9	94.8	
DO (mg/L)		7.27	2.9	2.49	5.04	6.73	7.2	7.08	5.59	7.3	7.08	5.27	7.14	7.39	
Conductivity (µs/cm)		136.2	148	81.7	42.7	208.3	181.8	137.3	427	292	311	255	529	311	
TDS (mg/L)		68	74	40.9	21	104.15	91	68	213	146	156	128	258	155	
Temperature (°C)		26.6	27.98	27	25.5	30.5	26.5	26.4	29.08	30.9	29.9	27.92	27.4	26.5	
Turbidity (NTU)		182	23.4	88.6	148	33.2	2,693	2,782	0.25	43.1	10	30.1	6.44	11.5	
TSS (mg/L)	<50	n/a	17.8	76.7	n/a	45.5	1,001	n/a	ND <sup>16</sup>	46.9	n/a	38.1	12.8	n/a	
Oil & Grease (mg/L)	<10	n/a	ND <sup>13</sup>	ND <sup>13</sup>	n/a	ND <sup>13</sup>	ND <sup>13</sup>	n/a	ND <sup>13</sup>	ND <sup>13</sup>	n/a	ND <sup>13</sup>	ND <sup>13</sup>	n/a	
Discharge Volume (m³/day)		22	18	86.5	4,320	3	43.2	864	9	173	43	6,000	6,000	6,000	

## ANNEX B: AMBIENT AIR QUALITY DATA

**Table B- 1:** 24-hour average dust concentrations measured in Ban Hat Gnuin

Ban Hat Gnuin - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	05/05/2016 14:18	06/05/2016 14:18	07/05/2016 14:18
End Time	06/05/2016 14:18	07/05/2016 14:18	08/05/2016 14:18
Average Data Record in 24 h (mg/m <sup>3</sup> )	0.09	0.06	0.07
Guideline Average in 24 h (mg/m <sup>3</sup> )	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>

**Figure B- 1:** Dust Monitoring Results at Ban Hat Gnuin in May 2016



**Table B- 2:** 24 hour average dust concentration measured in Ban Hatsaykham

Ban Hatsaykham - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 - 24 Hours	24 - 48 Hours	48 - 72 Hours
Start Time	08/05/2016 15:19	09/05/2016 15:19	10/05/2016 15:19
End Time	09/05/2016 15:19	10/05/2016 15:19	11/05/2016 15:19
Average Data Record in 24 h (mg/m <sup>3</sup> )	0.04	0.07	0.05
Guideline Average in 24 h (mg/m <sup>3</sup> )	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>

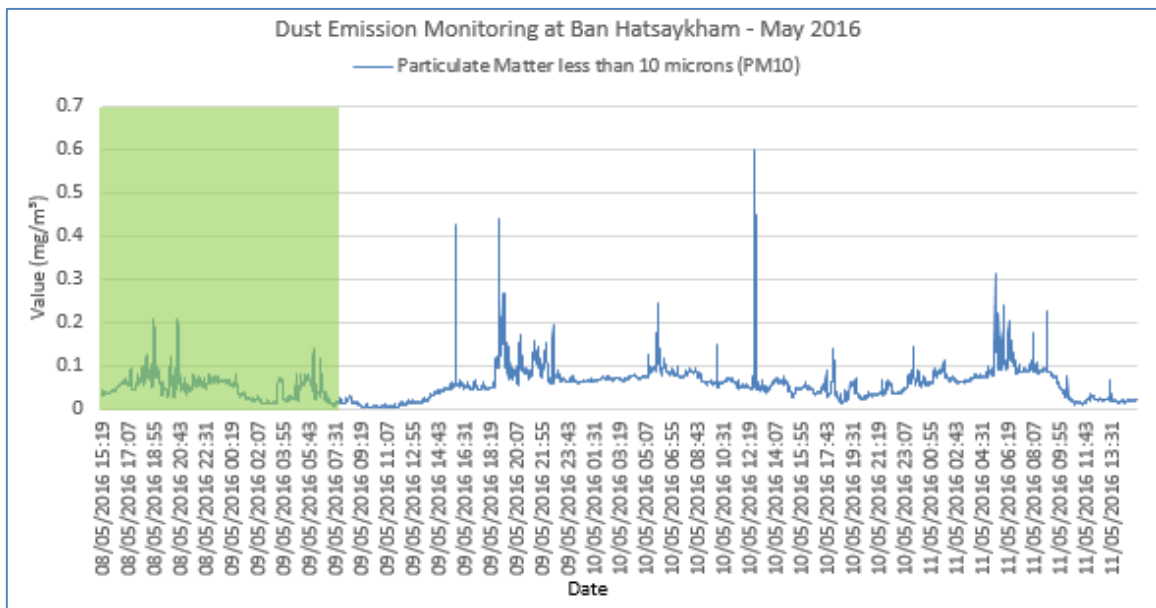
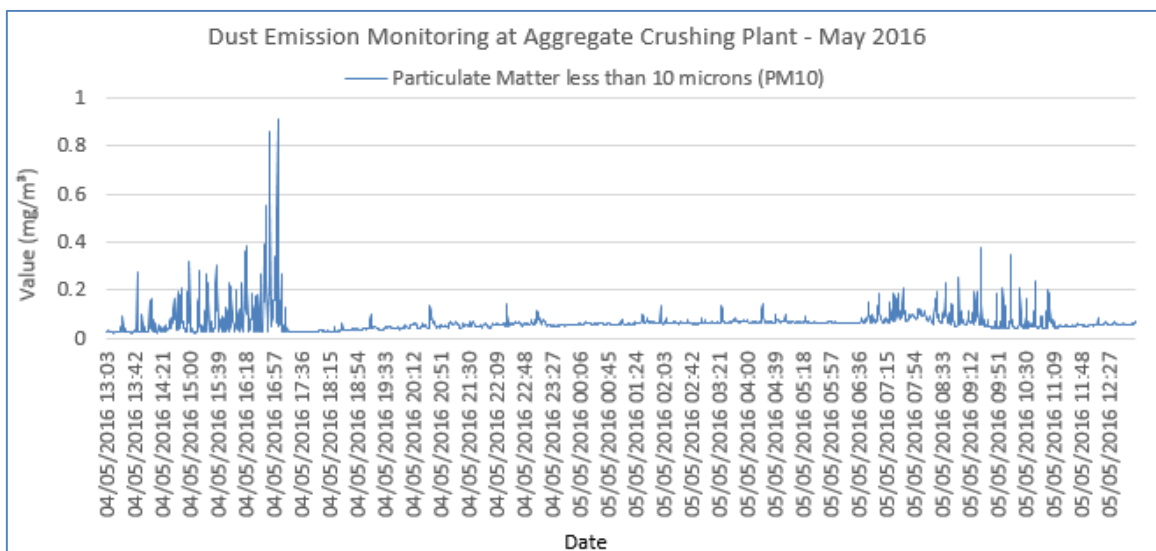
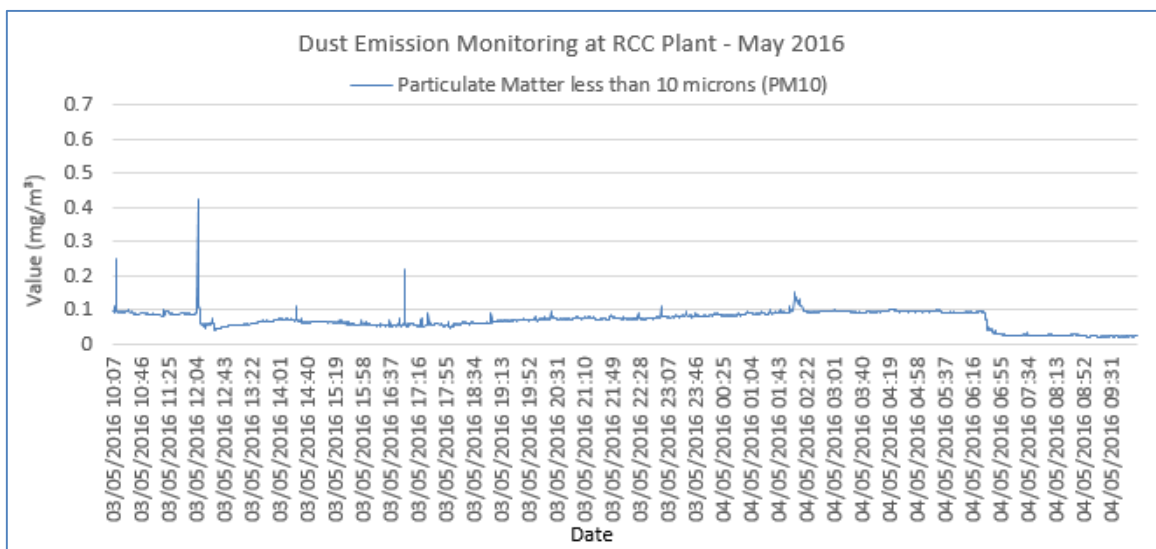
**Figure B- 2: Dust Monitoring Results at Ban Hatsaykham May 2016****Figure B- 3: Dust Monitoring Results at Aggregate Crushing Plant in May 2016****Figure B- 4: Dust Monitoring Results at RCC Plant in May 2016**

Figure B- 5: Dust Monitoring Results at SongDa 5 Camp#2 in May 2016

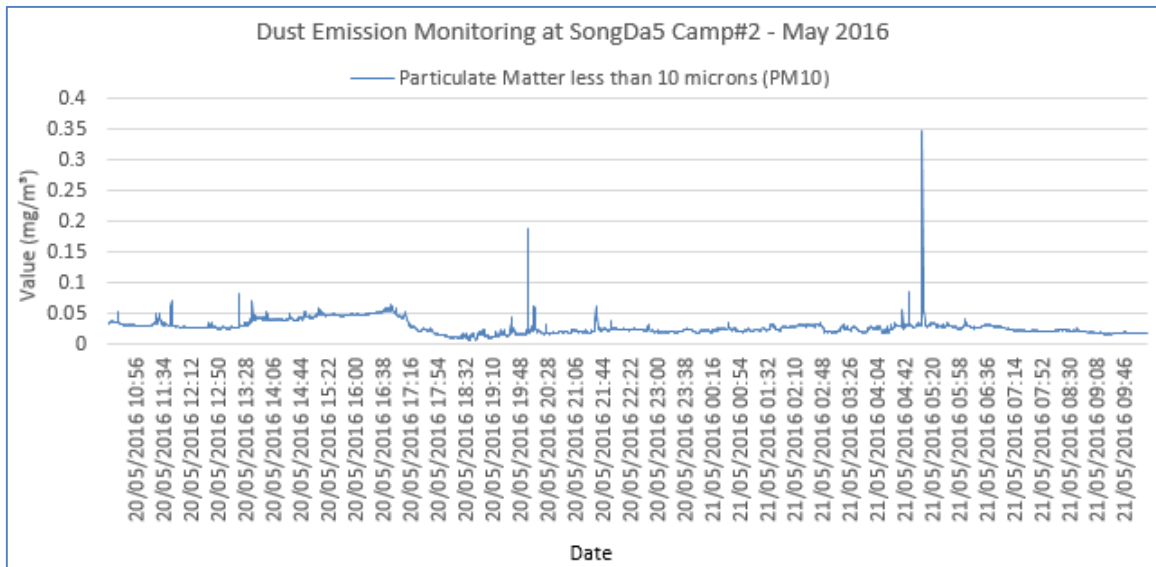


Figure B- 6: Dust Monitoring Results at Sino Hydro Camp in May 2016

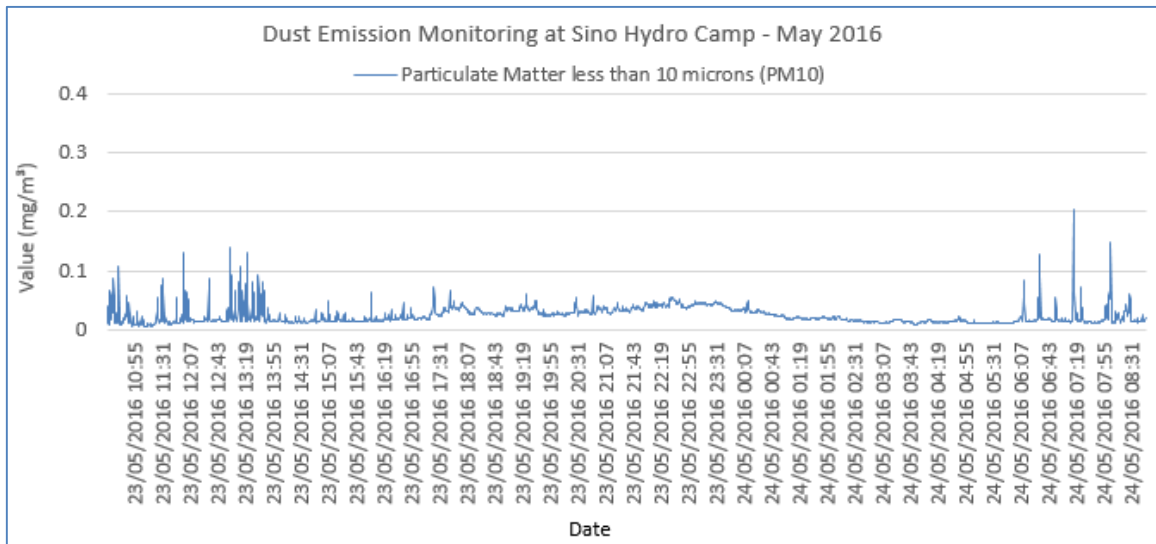


Figure B- 7: Dust Monitoring Results at Owner's Site Office and Village in May 2016

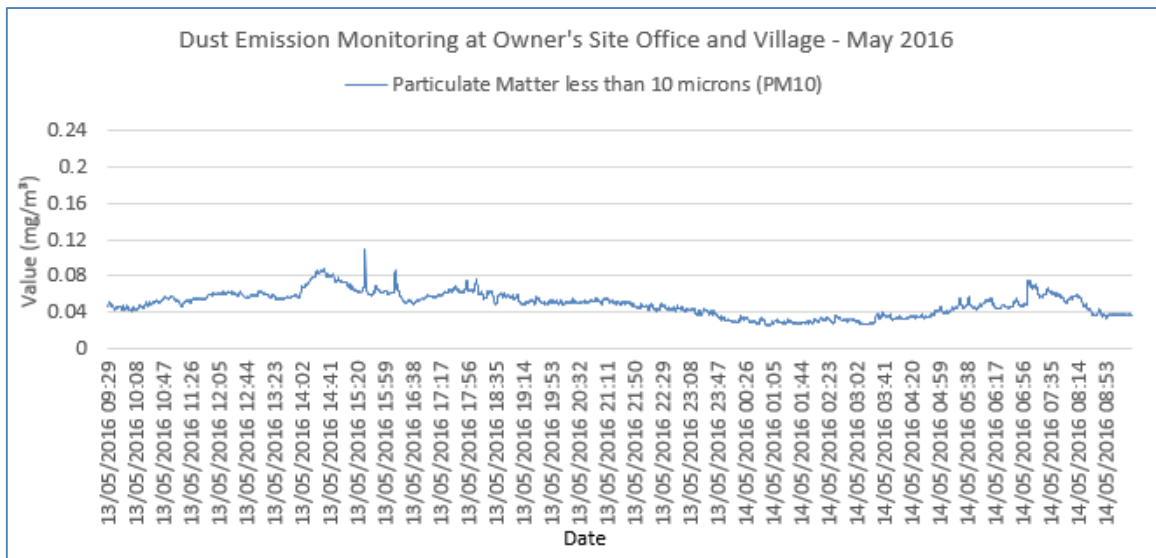
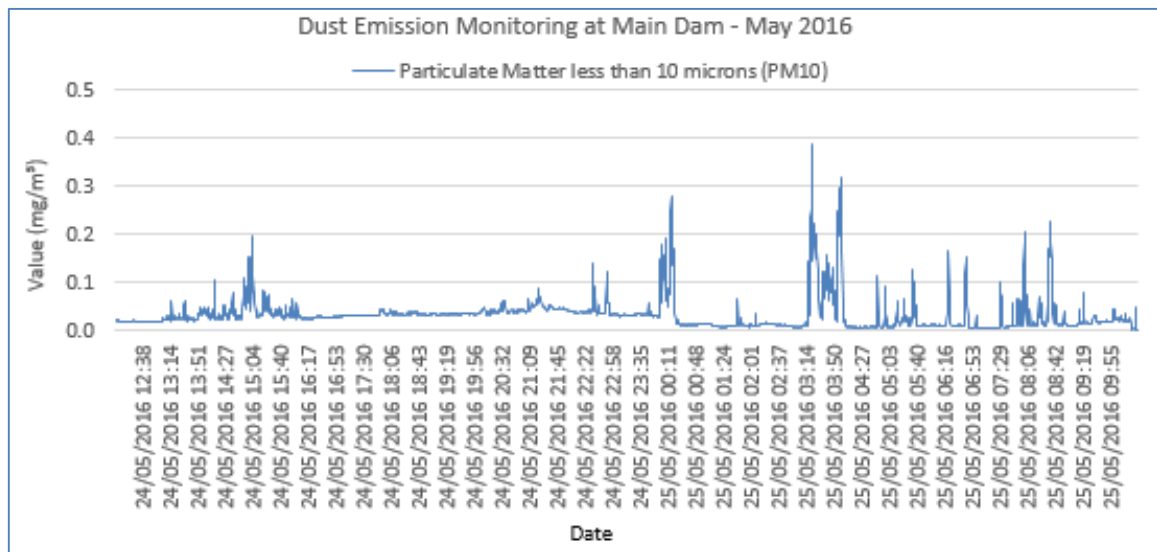




Figure B- 8: Dust Monitoring Results at Main Dam in May 2016

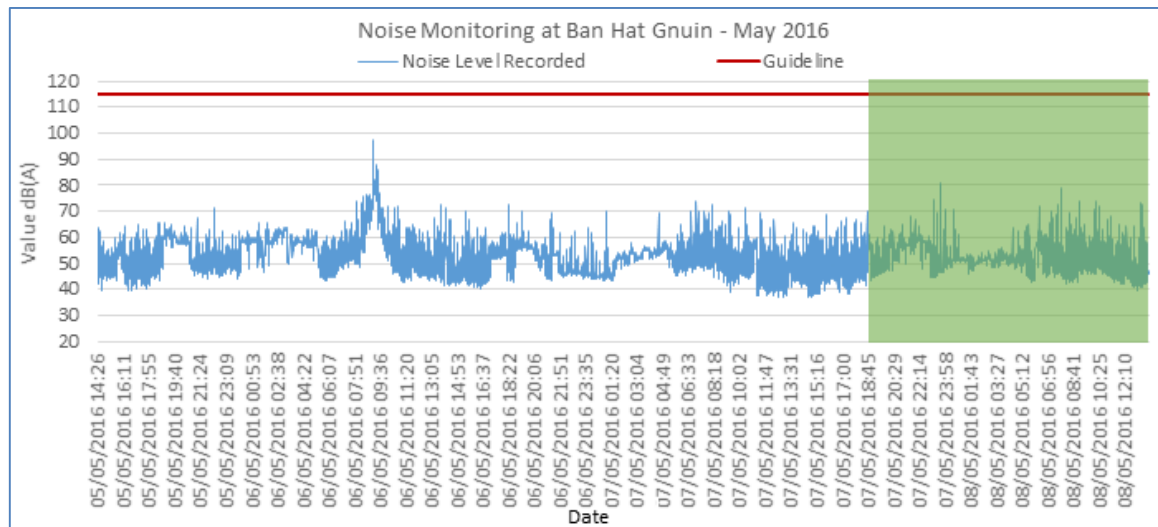


## ANNEX C: AMBIENT NOISE DATA

**Table C- 1: Average Results of Noise Monitoring at Ban Hat Gnuin in May 2016**

Noise Level (dB)	05-06/05/2016			06-07/05/2016			07-08/05/2016			08/05/2016
	14:26-18:00	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	06:01-14:26
Maximum Value Recorded	65.2	67.5	71.4	97.6	72.4	69.8	73.6	69.8	80.6	79.2
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	48.66	54.06	55.81	52.78	52.61	49.96	47.99	52.99	51.56	50.14
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>

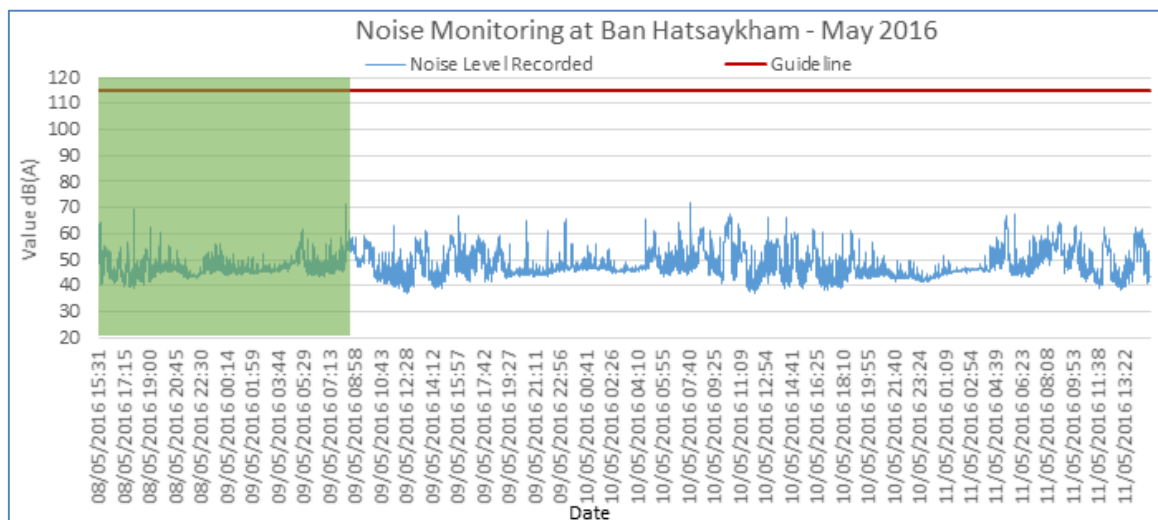
**Figure C- 1: Results of Noise Level Monitoring at Ban Gnuin in May 2016**



**Table C- 2: Noise Monitoring Average Results at Ban Hatsaykham in May 2016**

Noise Level (dB)	08-09/05/2016			09-10/05/2016			10-11/05/2016			11/05/2016
	15:31-18:00	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	06:01-15:31
Maximum Value Recorded	69.40	62.60	61.60	71.60	64.70	65.70	72.20	60.90	67.50	64.60
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	45.89	46.03	46.94	48.06	46.30	47.39	48.63	45.36	46.20	49.66
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>

**Figure C- 2: Results of Noise Level Monitoring at Ban Hatsaykham in May 2016**



**Table C- 3 and Table C- 4: Average Results of Noise Monitoring at Aggregate Crushing Plant and RCC Plant in May 2016**

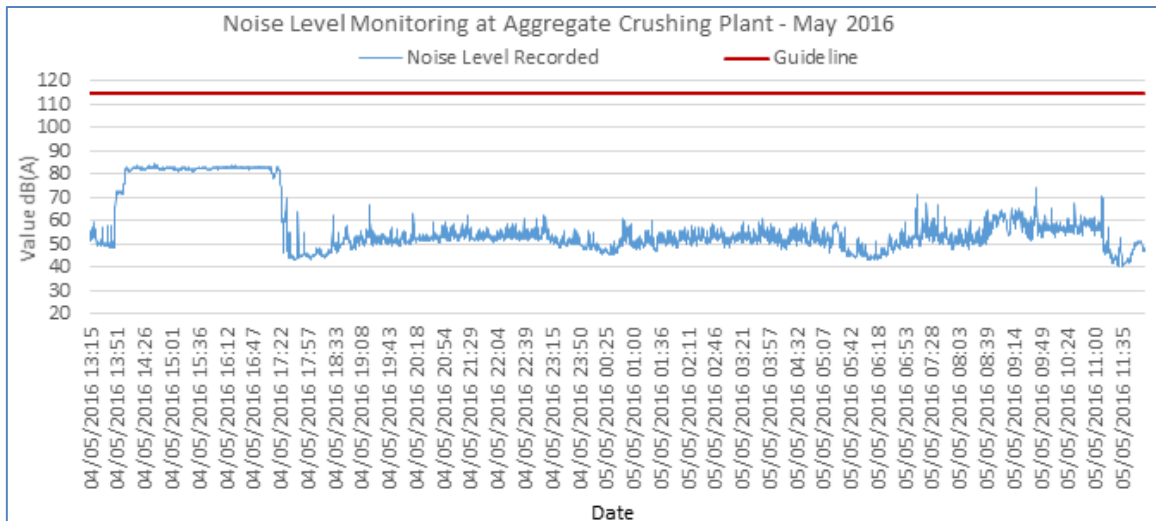
### Aggregate Crushing Plant

Noise Level (dB)	04-05/05/2016		05/05/2016
	13:15 – 22:00	22:01 – 06:00	06:01-13:15
Maximum Value Recorded	84.3	62	74.4
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	63.84	51.79	52.17
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>

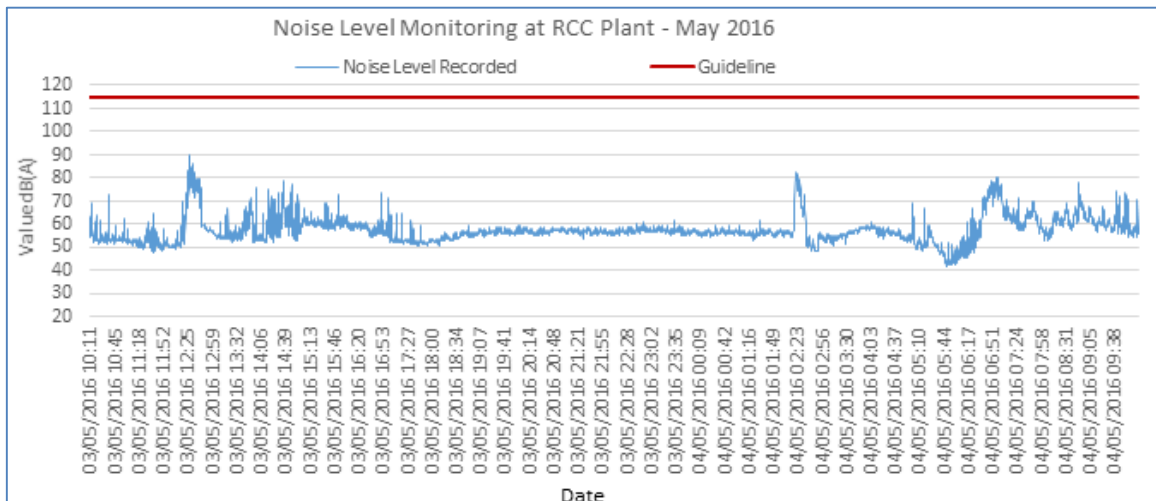
### RCC Plant

Noise Level (dB)	03-04/05/2016		04/05/2016
	10:11 – 22:00	22:01 – 06:00	06:01-10:11
Maximum Value Recorded	89.8	82.5	80.4
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	56.82	55.76	61.26
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>

**Figure C- 3: Results of Noise Level Monitoring at Aggregate Crushing Plant in May 2016**



**Figure C- 4: Results of Noise Level Monitoring at RCC Plant in May 2016**



**Table C- 5 and Table C- 6: Average Results of Noise Monitoring at Songda Camp#2 and Sino Hydro Camp in May 2016**

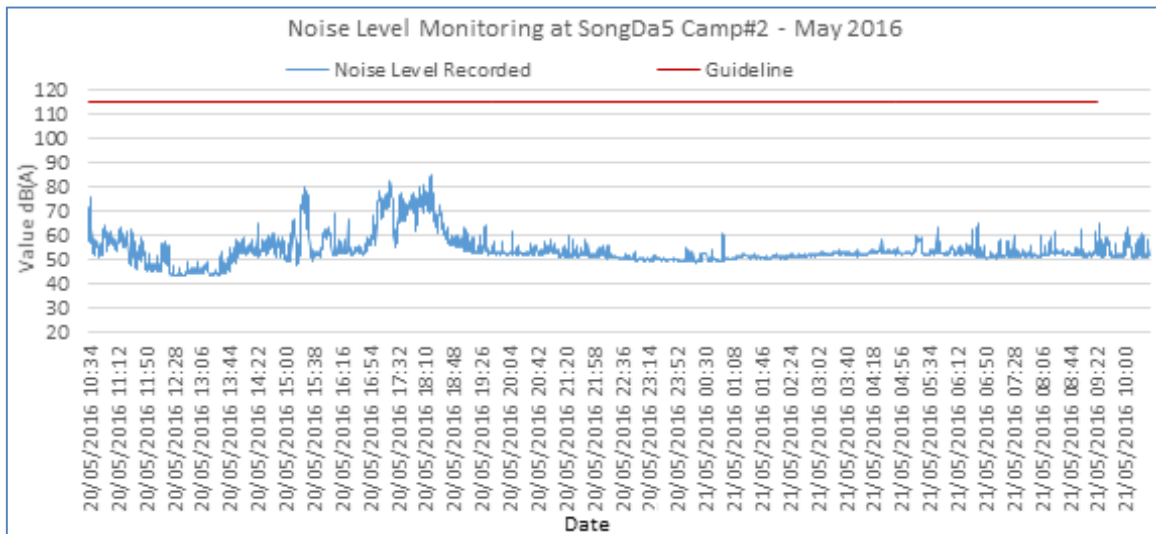
**Song Da 5 Camp No.2**

Noise Level (dB)	20-21/05/2016		21/05/2016
	10:34 – 22:00	22:01 – 06:00	06:01-10:34
Maximum Value Recorded	84.9	63.1	65.5
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	55.80	51.74	52.79
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>

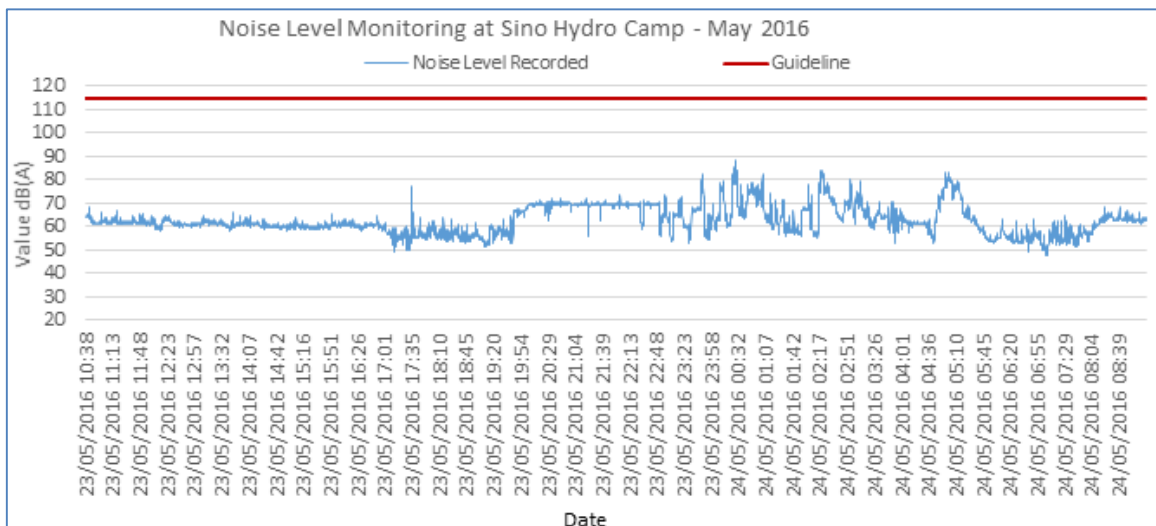
**Sino Hydro Camp**

Noise Level (dB)	23-24/05/2016		24/05/2016
	10:38 – 22:00	22:01 – 06:00	06:01-10:38
Maximum Value Recorded	77.2	88.5	83.5
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	60.56	66.48	60.86
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>

**Figure C- 5: Results of Noise Level Monitoring at Song Da 5 Camp No.2 in May 2016**



**Figure C- 6: Results of Noise Level Monitoring at Sino Hydro Camp in May 2016**



**Table C- 7 and Table C- 8: Average Results of Noise Monitoring at the Owner's Site Office and Village and, the Main Dam in May 2016**

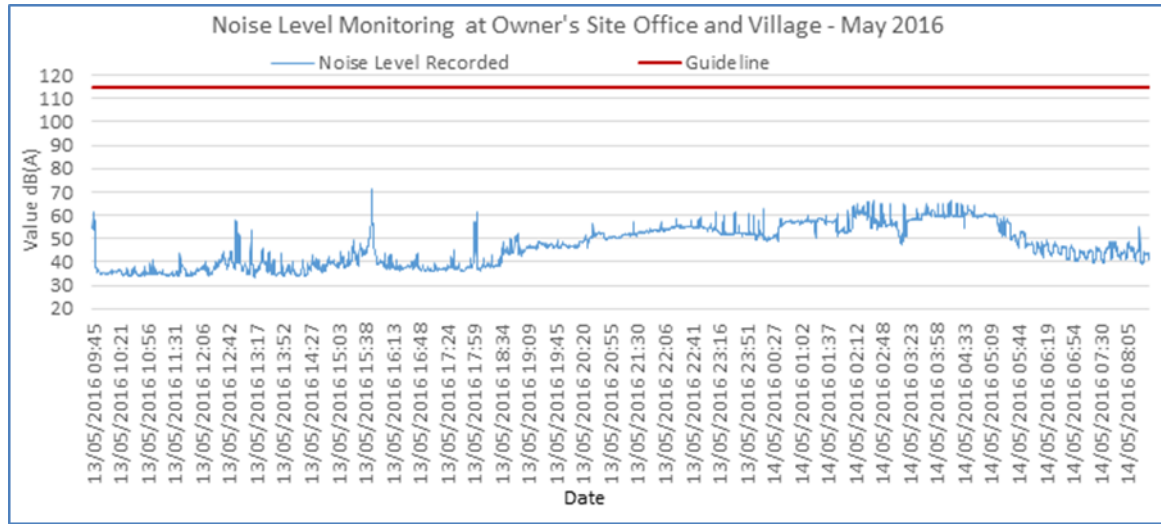
### Owner's Site Office and Village

Noise Level (dB)	27-28/05/2016		28/05/2016
	10:33 – 22:00	22:01 – 06:00	06:01-10:33
Data Record Max	60.5	89.4	76.5
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	53.30	59.52	57.00
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>

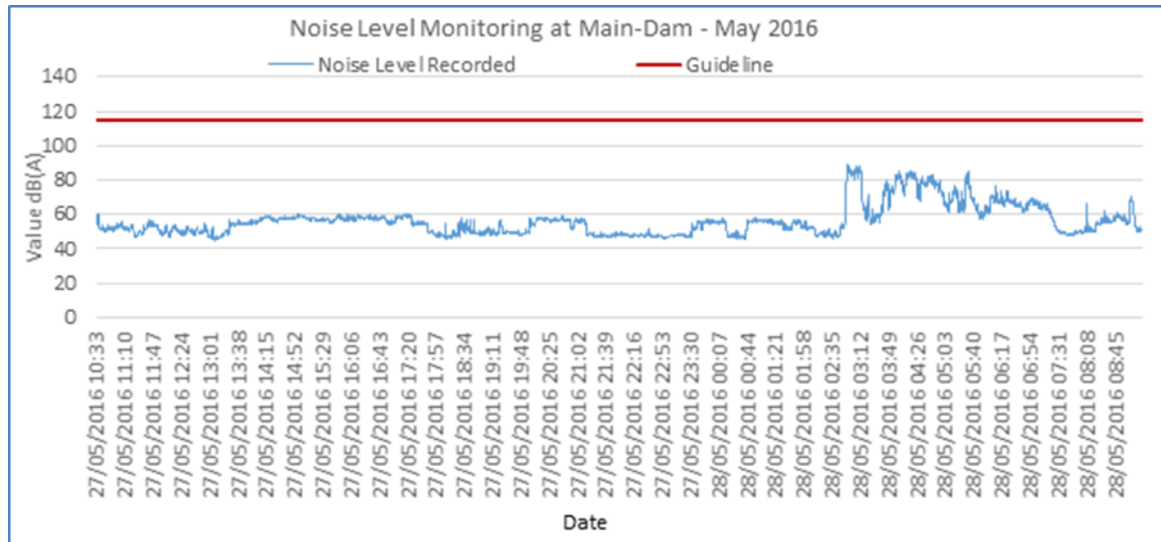
### Main Dam

Noise Level (dB)	27-28/05/2016		28/05/2016
	10:33 – 22:00	22:01 – 06:00	06:01-10:33
Data Record Max	60.5	89.4	76.5
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	53.30	59.52	57.00
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>

**Figure C- 7: Results of Noise Level Monitoring at Owner's Site Office and Village in May 2016**



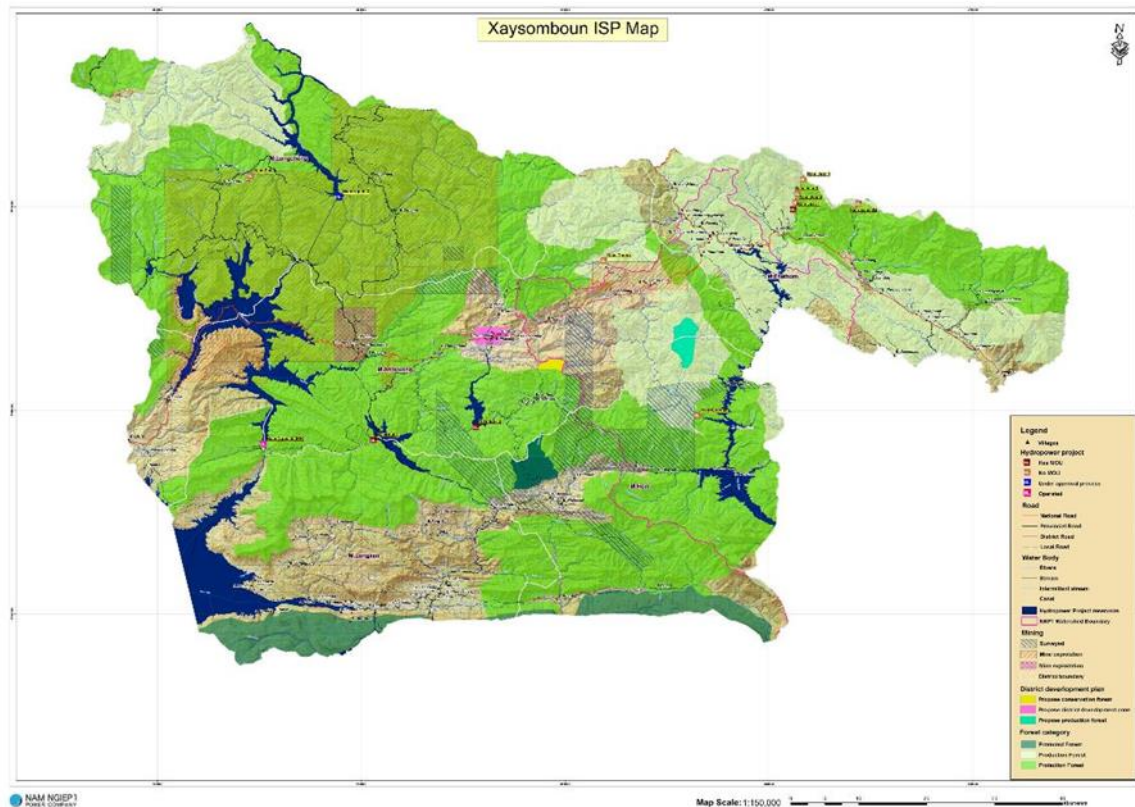
**Figure C- 8: Results of Noise Level Monitoring at Main Dam in May 2016**





## ANNEX D: XAYSOMBOUN INTEGRATED SPATIAL PLANNING (ISP) AND WATERSHED BOUNDARY SURVEY

### ANNEX D-1: XAYSOMBOUN INTEGRATED SPATIAL PLANNING (ISP) MAP





ANNEX D-2: Watershed Boundary Survey with GPS mark

NNP1 Wartershed Demacration map

