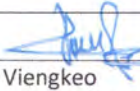

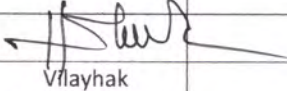


## Nam Ngiep 1 Hydropower Project

# Environmental Management Monthly Monitoring Report

January 2018

A	20 February 2018	 Viengkeo Phetnavongxay	 Peter G. Jensen	 Vlayhak Somsoulivong	
REV	DATE	AUTHOR	CHECKED	APPROVED	MODIFICATION DETAILS
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**TABLE OF CONTENTS**

<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>1. INTRODUCTION</b>	<b>- 2 -</b>
<b>2. WORK PROGRESS OF PRINCIPAL CONTRACTORS</b>	<b>- 2 -</b>
<b>2.1 Civil Work</b>	<b>- 3 -</b>
2.1.1 Main dam and power house	- 4 -
2.1.2 Re-regulation dam and powerhouse	- 5 -
2.1.3 Temporary work facility	- 6 -
<b>2.2 Electrical and Mechanical Works</b>	<b>- 6 -</b>
<b>2.3 Hydro-Mechanical Works</b>	<b>- 7 -</b>
<b>2.4 230kV Transmission Line Works</b>	<b>- 8 -</b>
<b>3. ENVIRONMENTAL MANAGEMENT MONITORING</b>	<b>- 10 -</b>
<b>3.1 Compliance Management</b>	<b>- 10 -</b>
3.1.1 Site Specific Environmental and Social Management and Monitoring Plans	- 10 -
3.1.2 Compliance Report	- 10 -
3.1.3 Inspection by Environment Management Unit	- 15 -
<b>3.2 Environmental Quality Monitoring</b>	<b>- 15 -</b>
3.2.1 Effluent Discharge from Camps and Construction Sites	- 15 -
3.2.2 Ambient Surface Water Quality Monitoring	- 18 -
3.2.3 Groundwater Quality Monitoring	- 24 -
3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring	- 27 -
3.2.5 Landfill Groundwater Monitoring	- 28 -
3.2.6 Dust Monitoring	- 29 -
3.2.7 Noise Monitoring	- 29 -
<b>3.3 PROJECT WASTE MANAGEMENT</b>	<b>- 30 -</b>
3.3.1 Solid Waste Management	- 30 -
3.3.2 Hazardous Materials and Waste Management	- 31 -
<b>3.4 Community Waste Management</b>	<b>- 32 -</b>
3.4.1 Community Recycling Programme	- 32 -
3.4.2 Houay Soup Resettlement Area Waste Management	- 32 -
3.4.3 Waste Clean-up in Four Villages at 2LR	- 32 -
<b>3.5 Watershed and Biodiversity Management</b>	<b>- 33 -</b>
3.5.1 Watershed Management	- 33 -

3.5.2	Biodiversity Offset Management	- 33 -
3.5.3	Biomass Clearance	- 33 -
<b>4.</b>	<b>FISHERY MONITORING</b>	<b>- 34 -</b>
	<b>ANNEX A: RESULTS OF EFFLUENT ANALYSES</b>	<b>- 36 -</b>
	<b>ANNEX B: AMBIENT DUST QUALITY</b>	<b>- 40 -</b>
	<b>ANNEX C: AMBIENT NOISE DATA</b>	<b>- 44 -</b>

**BBREVIATIONS / ACRONYMS**

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BBS	Biodiversity Baseline Survey
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
CA	Concession Agreement between the NNP1PC and GOL,
CAP	Corrective Action Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
CTA	Common Terms Agreement
DEB	Department of Energy Business, MEM
DEPP	Department of Energy Policy and Planning, MEM
DEQP	Department of Environment and Quality Promotion, MONRE
DESIA	Department of Environmental and Social Impact Assessment, MONRE
DFRM	Department of Forest Resources Management, MONRE
DLA	Department of Land Administration, MONRE
DSRP	Dam Safety Review Panel
EC	Electrolytic Conductivity
EC OCD	EGAT Construction Obligation Commencement Date
EDL	Electricite du Laos
EDL PPA	Power Purchase Agreement between NNP1PC and EDL
EGAT	Electricity Generating Authority of Thailand
EGATi	EGAT International Company Limited
EIA	Environmental Impact Assessment
EMMR	Environmental Management and Monitoring Reports
EMO	Environmental Management Office of ESD within NNP1PC
EMU	Environmental Monitoring Unit
EMWC	Electrical-Mechanical Works Contract
EPF	Environmental Protection Fund
ERIC	Environmental Research Institute Chulalongkhorn University

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ERM	Environmental Resource Management
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
FY	Fiscal Year
GOL	Government of Lao PDR
GIS	Geographic Information Systems
HH	Household
HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Intergraded Spatial Planning
km	kilometre
kV	kilo-Volt
LEPTS	Lao Electric Power Technical Standard
LHSE	Lao Holding State Enterprise
LTA	Lender's Technical Advisor
M	million
m	metre
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines, Lao PDR
MOF	Ministry of Finance, Lao PDR
MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
NBCA	National Biodiversity Conservation Area
NCI	Non-Compliance Issue
NCR	Non-Compliance Report
NN2	Nam Ngum 2 Power Company Limited
NNP1PC	Nam Ngiep 1 Power Company Limited
NPF	National Protection Forest
NTFP	Non-Timber Forest Products
NT2	Nam Theun 2 Hydropower Project
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
PAFO	Provincial Department of Agriculture and Forestry

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PAP	Project Affected People
PD	Property Damage
PONRE	Provincial Department of Natural Resource and Environment, MONRE
PvPA	Provincial Protection Area
RCC	Roller Compacted Concrete
SIR	Site Inspection Report
SLBMP	Salvage Logging Biomass Management Plan
SOP	Standard Operating Procedure
SMO	Social Management Office of ESD within NNP1PC
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TD	Technical Division of NNP1PC
TOR	Terms of Reference
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
UXO	Unexploded Ordinance
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Waste Water Treatment System

## EXECUTIVE SUMMARY

During January 2018, only two Details Work Program and Site Specific Environmental and Social Monitoring Plans (DWP&SS-ESMMP) were active for EMO review. Some clarification was required; therefore, they will be carried over to February 2018.

The PKC Contractor started the operation of Houay Soup Landfill on 01 December 2017. In January 2018, approximate of 40 m3 of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed at the landfill.

The Environmental Management Unit (EMU) of Bolikhamxay Province visited the NNP1 project site on 31 January 2018. Detailed discussions and findings will be incorporated in the next monthly report.

The camps' effluent monitoring results for January 2018 indicate that all key parameters (BOD5, total coliform and faecal coliform) at all monitored camps are in compliance with the relevant effluent standards, except at HMH Main Camp (on 08 January 2018) and at IHI Main Camp (on 22 January 2018).

Surface water samples were collected during the reported month at 10 stations in the Nam Ngiep River and four stations in the main tributaries including the lower Nam Chian, Nam Phouane, Nam Xao and Houay Soup.

The Nam Ngiep 1 Watershed and Reservoir Protection Committee (WRPC) and its secretariat (WRPO) are expected to be reconstituted, and discussion is ongoing during the reporting period. The meeting for plan approval has been postponed and is now planned for February 2018. The final draft of Provincial Regulation was improved by the special committee and the meeting between the special committee, the Provincial Assembly, the Provincial Justice Department, and NNP1PC was held on 25 January 2017. The draft will be further improved based on the comments during the meeting and the approval process was suggested to be concluded at National Level.

The Biodiversity Impact Mitigation and Offset Proposal (No Net Loss Forecast) was presented to the Vice-Governor of Bolikhamxay, the Vice-Governor of Xaysomboun Province, and NNP1 Watershed and Reservoir Protection Committee (WRPC) at the end of January 2018. The Vice-Governors of both Provinces and the WRPC have agreed with the proposal. The presentation of the proposal to the Biodiversity Offset Management Committee in Bolikhamxay Province is planned for the second week of February 2018.

As of 31 January 2018, a total of 702.35 ha out of 1,640 ha, is accepted as fully cleared and another 922.38 ha remain to be fully completed.

The fishery monitoring programme has continued according to the plan. The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 1.5 kg/household/day in December 2017. The estimated total fish catch in Nam Ngiep basin for December 2017 is 26,000 kg. Around 34 % of the catch was sold, 59% was consumed fresh, 5% processed and approximately 2% was used for other purposes.

## 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 Bolikham District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province (Fig. 1-1).

**Figure 1-1: Location Map**

The project will consist of two dams. The main dam which is located 9.0 km upstream of Hat Gnuin Village in Bolikham 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 January 2017. 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 publicly 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

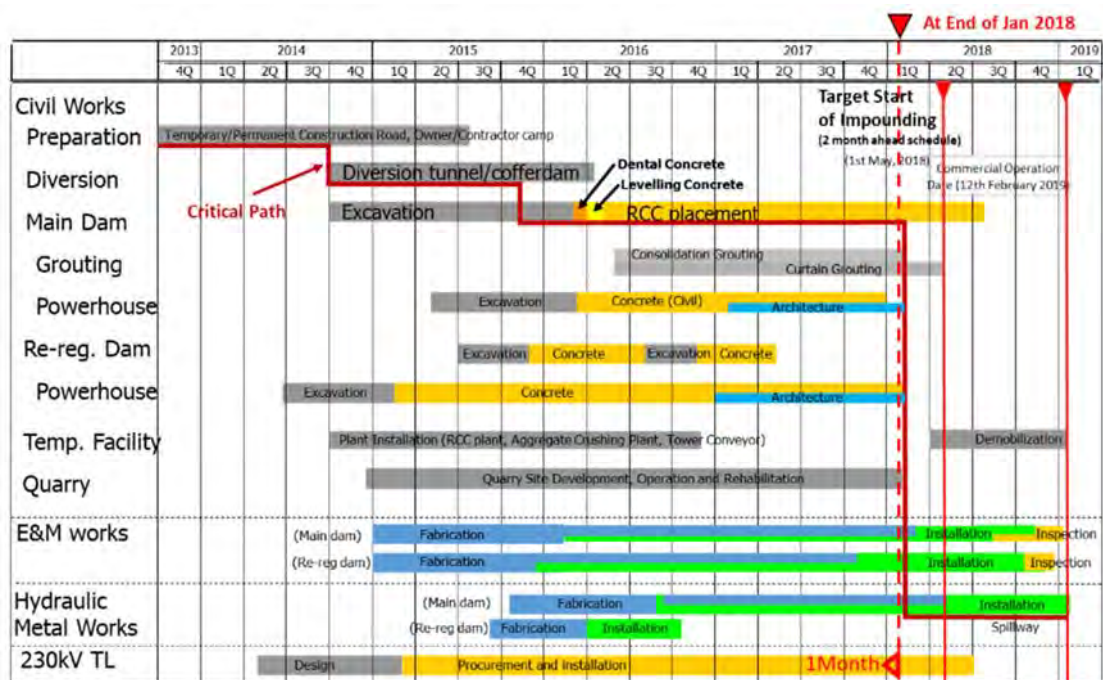
Construction Works for the Project are being carried out through four separate main construction contracts under the supervision of the Technical Division of NNP1PC. The four contracts are the Civil Works, the Electrical and Mechanical Works, the Hydraulic Metal or Hydro-mechanical Works and the 230 kV Transmission Line Works. Actual overall



cumulative work progress until the end of January 2018 was 91.2 %<sup>1</sup> (compared to planned progress of 91.5 %), based on achieved Interim Milestone Payments for all Contracts excluding the value of Advance Payments, varied works and other adjustments allowed under each Contract. In terms of the value of actual work done the percentage is understated since work completed, but not paid, is not included.

The overall construction schedule and progress curve (by achieved Milestone Payments) are shown in *Error! Reference source not found.*

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



## 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

<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.

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

were commenced in October 2014 and completed in February 2016, following which the concreting works were commenced.

The cumulative actual work progress of the Civil Works until the end of January 2018 was 92.4 % (compared to planned progress of 92.6 %) 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.

*Figure 2-2: Main Dam and Powerhouse from Overhead Looking Upstream*



The consolidation drilling and grouting for the main dam started in May 2016 and is ongoing. The progress is 97 % by achievement of total anticipated drilled length as of the end of December 2017 as a proportion of the total expected drilling

*Table 2-1: Progress of consolidation and curtain drilling for grouting at the end of January 2018*

Item	Description	Total Drilling (m)	Completed (m)	Progress (%)
Consolidation Grouting	Anticipated Quantity	17,769	17,244	97
Curtain Grouting	Original Design Quantity	27,945	35,120	126
	Anticipated Final Quantity	58,400	35,120	60

\*The linear metres 'completed' are drilled and grouted.

Main powerhouse sub-structure excavation works were completed in January 2016 and levelling concrete works were started in coordination with installation of the grounding system and the penstock concrete encasement. Major concrete of the main powerhouse

was substantially completed in December 2017 and is shown in **Error! Reference source not found.** below

*Table 2-2: Progress of Main Powerhouse Sub-Structure Concrete Works to as of the end of January 2018.*

Location	Total Anticipated Volume (m <sup>3</sup> )	Completed (m <sup>3</sup> )	Progress (%)
Main Powerhouse	34,800	34,500	99
Penstock Embedment	11,885	9,861	83
Spillway	35,500	15,815	45

### 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 **Figure 2-3** below

*Figure 2-3: Progress of Re-regulation Dam Powerhouse Works to 30 November 2017*



Status Of Construction Progress	2018											
	1	2	3	4	5	6	7	8	9	10	11	12
Powerhouse (Substation)	Planned											
Powerhouse (Punch List Items)												
Powerhouse Building Works		Painting Inside and Outside		Lighting Fixtures		Water Supply		Electrical Conduit and Wire		Fence		
		(m <sup>2</sup> )		(Unit)		(%)		(m)		(m)		
Designed		6,135		311		100		2,510		117		
Completed		6,090		309		60		2,490		117		
Progress		99 %		99 %		80 %		99 %		100 %		

The powerhouse concreting has advanced well and secondary concrete embedment for the draft tube liner was completed at the end of April 2016. The left bank structure was re-designed as roller compacted concrete (RCC) and was completed on 18 March 2016. Installation of the re-regulation waterway gate and stop log and re-regulation intake gate and structural concrete works for the retaining wall to support the substation yard were

completed in October 2016. Building superstructure work continued for the powerhouse with the commencement of construction of concrete columns.

### **2.1.3 Temporary work facility**

#### **2.1.3.1 DIVERSION TUNNEL INLET AND OUTLET**

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

#### **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 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 was completed in early April 2016.

#### **2.1.3.4 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.

#### **2.1.3.5 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 by value at the end of January 2018 was 95.1 % (compared to planned progress of 95.1 %).



**Figure 2-4: Preparation for installation of stay ring of Stay Cone at the re-regulation powerhouse**



*Figure 4.2-1: Placement of Stator for Unit 1 at the Main Power Station*



*Figure 4.2-2: Placement of Runner for Unit 2 at the Main Power Station*



*Figure 4.2-3: Steel structure and Aluminium Pipe Bus at Main Power Station (from upstream)*



*Figure 4.2-4: Commissioning Test for Main Transformer for Unit 1 at Main Power Station*



*regulation Power Station*



*regulation Power Station*

## 2.3 Hydro-Mechanical Works

The HMWC was executed between IHI Infrastructure Systems (IIS) and NNP1PC on 18 April 2014 and the NTP was issued to the Contractor on 03 October 2014. The actual cumulative work progress of the Hydro-Mechanical Works until the end of January 2018 was 56.5 % (compared to planned progress of 60.4 %).

The latest progress of penstock pipe fabrication at IHI field shop and erection at main dam as of the end of November 2017 *in*

*Figure 2-5 below:*

*Figure 2-5: Progress of the penstock pipe fabrication at the IHI field shop as at the end of January 2018*

Progress of MD-Steel Penstock	2017			2018											
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Remove The Spider Support at Main Dam															

## 2.4 230kV Transmission Line Works

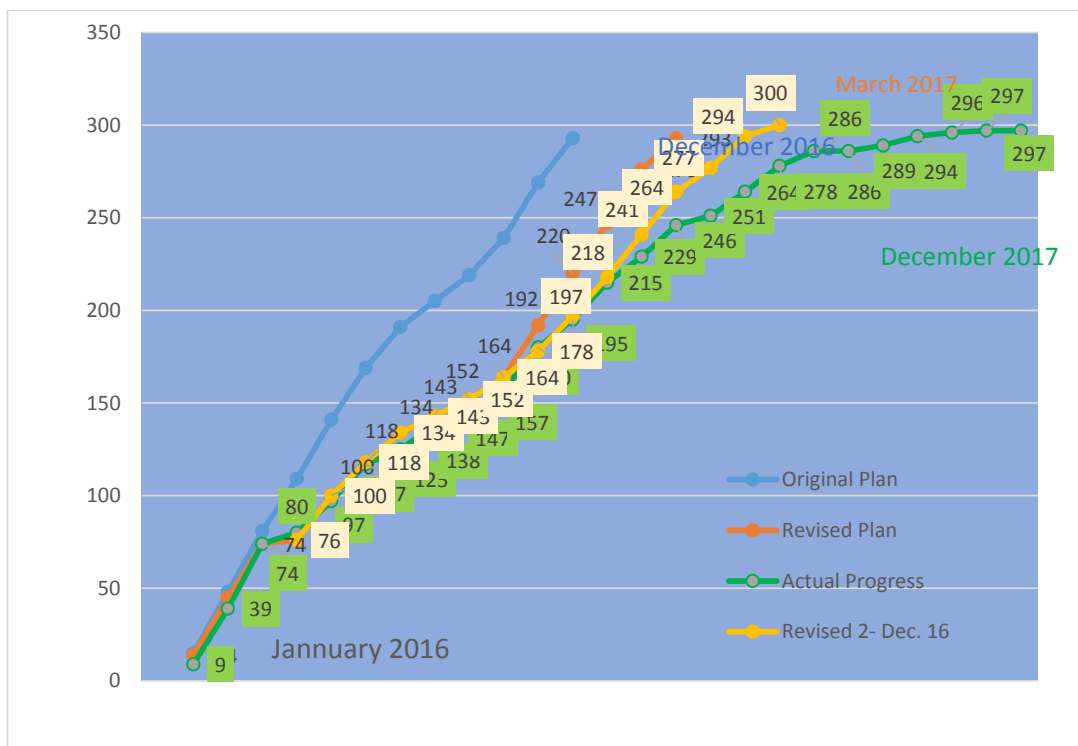
The TLW Contract was executed between Loxley-Sri Consortium and NNP1PC on 11 July 2014 and the NTP was issued to the 230 kV TL Contractor on 03 October 2014. The cumulative work progress of the Transmission Line Works until the end of January 2018 was 98.8 % (compared to planned progress of 99.0 %).

In respect of the delay to commencement of most works the Contractor is studying its programme to ensure that sufficient resources are committed as the works progress to ensure that completion is achieved in good time. Onset of daily rains has made access to all areas difficult but the Contractor follows its revised acceleration schedule, after the progress for the construction of tower foundations slowed after May, 2016 (See **Figure 2-6** below)

*Figure 2-6: Cumulative Work Progress of Tower Foundation (Original Planned and Actual)*



Figure 2-7: Cumulative Works Progress of tower foundation (Revised Planned & Actual)



**Figure 2-8: Revised Cumulative Works Progress of Tower Erection (Planned & Actual)**

### 3. ENVIRONMENTAL MANAGEMENT MONITORING

#### 3.1 Compliance Management

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

During January 2018, no Site Specific Environmental and Social Management and Monitoring Plans (DWP&SS-ESMMP) was cleared, however, there were two DWP&SS-ESMMPs under EMO review.

**Table 3-1: SS-ESMMP review status in January 2018**

Title	Date Received	Status
<b>DWP &amp; SS-ESMMP for 2nd River Diversion &amp; Diversion Tunnel Closure</b>	25 December 2017 (1 <sup>st</sup> submission)	On hold, because, only a cover letter was received and the Contractor was requested to send a soft copy of the document to TD/ESD as soon as possible.
<b>DWP &amp; SSESMP for Monitoring Equipment Installation for Main Dam</b>	24 January 2017 (1 <sup>st</sup> submission)	Under review.

##### 3.1.2 Compliance Report

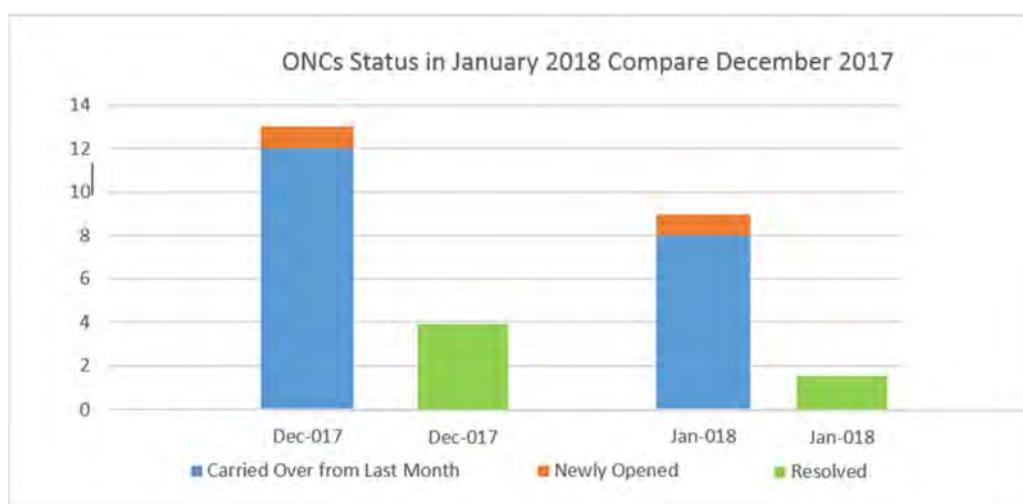
The Observation of Non-Compliance (ONC) and Non-Compliance Report (NCR) are summarized in **Table 3-2**, **Table 3-3** and **Figure 3-1** below.

**Table 3-2: Summary of ONC and NCR**



Items	ONC	NCR-1	NCR-2	NCR-3
Carried Over from December 2017	08	0	0	0
Newly Opened in January 2018	01	0	0	0
<b>Total in December 2017</b>	<b>09</b>	<b>0</b>	<b>0</b>	<b>0</b>
Resolved in December 2017	02	0	0	0
Carried over into January 2018	07	0	0	0
Unsolved Exceeding Deadlines	<b>07</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Figure 3-1: Summary of ONC and NCR**



**Table 3-3: Carried-Over ONC and NCR from January 2018 into February 2018**

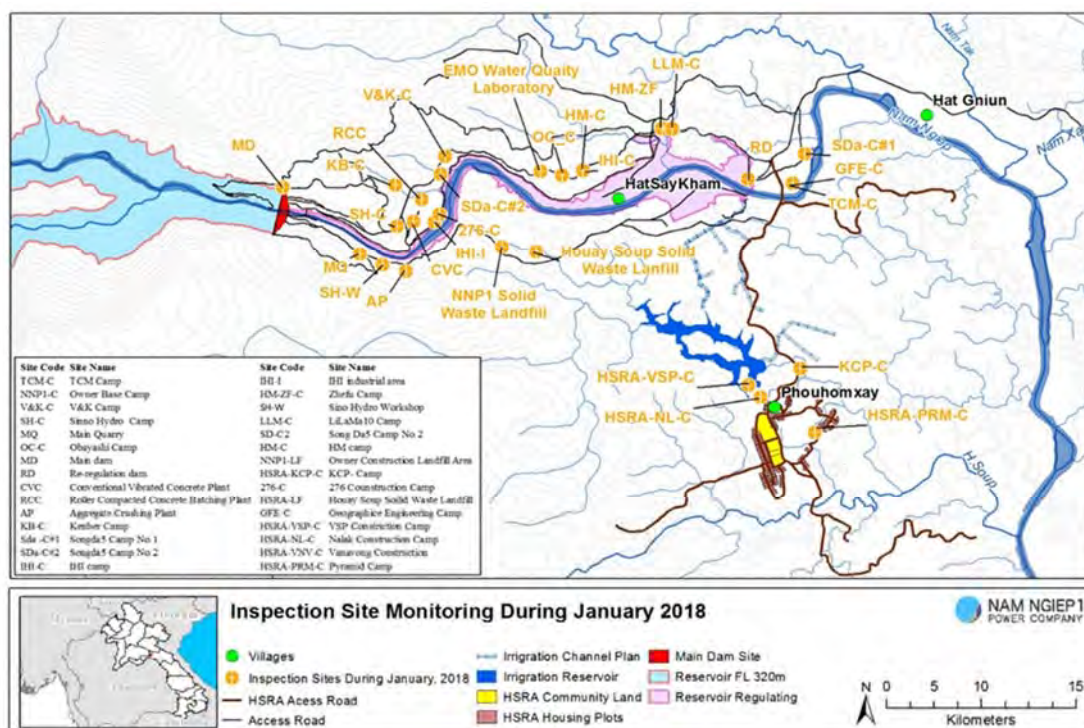
Site ID	Issues	Reporting	Actions
Re-regulation Dam (Borrow Pit Area at Corner of P1 & P1A Road)	<p>The borrow pit was operated without adequate environmental management actions:</p> <ul style="list-style-type: none"> <li>- The slope of the cut had no berm and cut-off drains;</li> </ul>	ONC (Closure Pending)	The contractor was instructed to submit a closure plan for the borrow pit by addressing EMO comments, however, a specific submission deadline was not confirmed by the contractor.

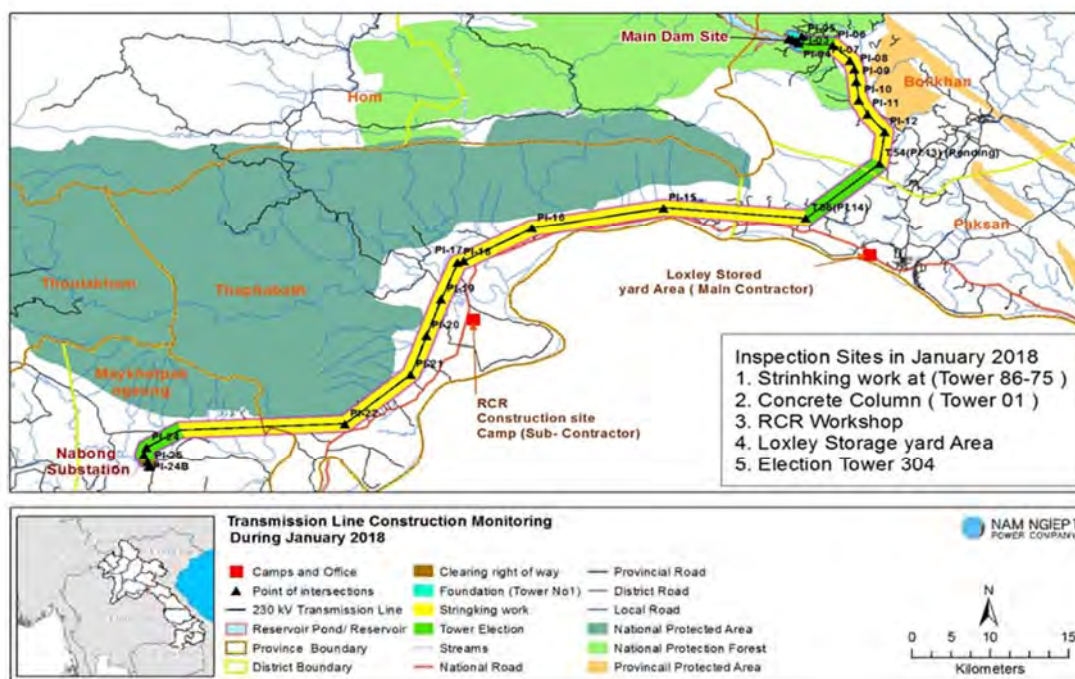
Site ID	Issues	Reporting	Actions
	<ul style="list-style-type: none"> <li>- Lack of closure plan for the borrow pit</li> </ul> First inspection: 30 August 2016 Latest inspection: 16 January 2018		
Temporary Accommodation for 44 HH from 2LR at Phouhomxay Village	The decommissioning of a temporary accommodation at HSRA was not completed. The bamboo building structure, toilet septic tanks and waste water ponds were not removed and sanitised (ON_INFRA-0001).  First inspection: 07 September 2017 Latest inspection: 23 January 2018	ONC (Closure pending)	Most of accommodation structures were decommissioned. The decommissioning is expected to be completed by the end of February 2018 after all families have moved to their permanent houses.
SXN Camp	<ul style="list-style-type: none"> <li>- Insecure camp and facilities. Plastic sheet was used as the camp roofing and wall material;</li> <li>- Grey water from cooking area was discharged directly to Nam Ngiep river;</li> <li>- No waste collection which resulted in disposing of waste around camp areas (ONC_SXN-0001)</li> </ul> First inspection: 10 November 2017 Latest inspection: 25 January 2018	ONC (Closure pending)	The contractor was instructed to implement the following corrective actions by 15 February 2018 (first extension): <ul style="list-style-type: none"> <li>- Collect and segregate the waste properly;</li> <li>- Improve the camp and facilities as per proposed Appendix 4 of the contractor DWP &amp; SSESMP; and</li> <li>- Move cooking and washing areas at least 30 m away from the Nam Ngiep River bank, all waste water from cooking and washing needs to be drained to the waste water pond for treatment.</li> </ul>
VSP Camp	Poor housekeeping was observed. Solid waste was disposed around camp (ONC_VSP-0006) First inspection: 28 November 2017 Latest inspection: 23 January 2018	ONC (Closure pending)	The contractor was instructed to implement the following corrective actions by 15 February 2018: <ul style="list-style-type: none"> <li>- Clean up the camp premises on a daily basis; and</li> </ul>

Site ID	Issues	Reporting	Actions
			<ul style="list-style-type: none"> <li>- Dispose of general waste at Houay Soup Landfill on a regular basis to avoid waste accumulation and vector attraction.</li> </ul>
Pyramid's Sub-contractor	<p>Pyramid's sub-contractors set up two sleeping huts at the construction site within Phouhomxay Village without a management plan, no waste bins, toilet and other appropriate camp facilities provided at the camp; (ONC_PRMC-0001)</p> <p>First inspection: 28 November 2017</p> <p>Latest inspection: 23 January 2018</p>	ONC (Closure pending)	A second reminder was issued to the Pyramid contractor to provide a secure camp and proper camp facilities for their sub-contractor including waste bins, toilet, cooking and washing areas by 10 February 2018. Failure to implementing corrective action by the specified deadline, this ONC will be escalated to NCR Level 1.
Vannavong's Sub-contractor	<p>Vanavong's sub-contractors set up a sleeping hut at the construction site within Phouhomxay Village without a management plan, no waste bins, toilet and other appropriate camp facilities provided at the camp; (ONC_VNV-0002)</p> <p>First inspection: 28 November 2017</p> <p>Latest inspection: 23 January 2018</p>	ONC (Closure pending)	The contractor failed to implement corrective action by the second extension deadline, this ONC was escalated to NCR Level 1. The contractor was instructed to provide a secure camp and proper camp facilities for their sub-contractor including waste bins, toilet, cooking and washing areas; submit the camp operation and management as well as decommissioning plan for EMO review and approval by 10 February 2018.
VSP Camp	<p>During this Bi-weekly Joint Site Inspection, it was observed that electricity generator was placed on the bare ground without oil spill protection tray. As a result, oil spillage has occurred during refuelling which caused soil contamination. (ONC_VSP-0009)</p> <p>First inspection: 09 January 2018</p>	ONC (Closure pending)	<p>The Contractor is required to implement the following corrective actions by the agreed deadline:</p> <ul style="list-style-type: none"> <li>- Clean-up contaminated soil from the refuelling area immediately and store in the hazardous material storage area at VSP camp for proper disposal/ elimination;</li> </ul>

Site ID	Issues	Reporting	Actions
	Latest inspection: 23 January 2018		- Provide oil spill protection tray and the tray must be always used during the operation of electricity generator.

Figure 3-2: Site Inspection Locations



**Figure 3-3: 230 kV Transmission Line Construction Monitoring**

### 3.1.3 Inspection by Environment Management Unit

The Environmental Management Unit (EMU) of Bolikhamxay Province carried out a site visit to NNP1 on 31 January 2018. Detail discussions and findings will be incorporated in the next monthly report.

## 3.2 Environmental Quality Monitoring

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD<sub>5</sub>), faecal coliform, E. Coli bacteria and total coliform have been carried out by NNP1PC Environmental Laboratory since August 2017.

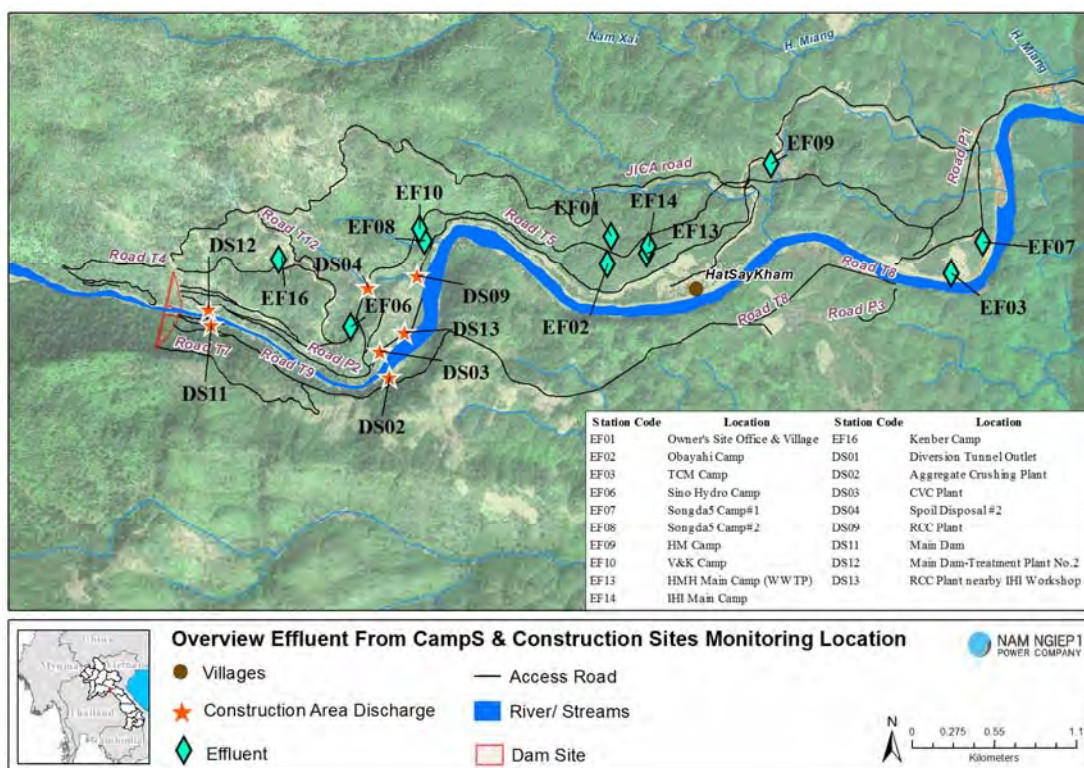
All data are reported to the Ministry of Natural Resources and Environment (MONRE) and the Project Leaders on a monthly and quarterly basis and published on the Company website <https://namngiep1.com/resources/monitoring-reports/>.

### 3.2.1 Effluent Discharge from Camps and Construction Sites

During January 2018, all camp effluents were monitored. Results of effluent monitoring from the camps and construction sites are presented and the monitoring locations are displayed in *Error! Reference source not found.*, and the monitoring locations are displayed **Figure 3-4** below.

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





Detailed monitoring results are provided in **Annex 1** of this Report. The camps' effluent monitoring results for December 2017 indicate that all key parameters (BOD<sub>5</sub>, total coliform and faecal coliform) are compliance with the relevant effluent standards, except at HMH Main Camp (for 08 January 2018) and at IHI Main Camp (for 22 January 2018).

The sediment control at the Aggregate Crushing Plant and RCC Plant continues to improve by application of a coagulant (Ammonium aluminium sulphate).

**Table 3-4: Status of Corrective Actions at Camps and Construction Sites**

Site	Sampling ID	Status	Corrective Actions
Owner's Site Office and Village (OSOV)	EF01	Non-compliances for total nitrogen.	No corrective action is required.
Obayashi Corporation Camp	EF02	Non-compliances for ammonia nitrogen (NH <sub>3</sub> -N) and total nitrogen.	The effluent monitoring result is being shared with Contractor to improve the operation of the WWTS.
Sino Hydro Camp	EF06	Non-compliances for ammonia nitrogen (NH <sub>3</sub> -N) and total nitrogen.	As above.

Site	Sampling ID	Status	Corrective Actions
<b>Song Da 5 Camp No. 1</b>	EF07	Non-compliances for ammonia nitrogen (NH <sub>3</sub> -N) and total nitrogen.	As above.
<b>Song Da 5 Camp No. 2</b>	EF08	Non-compliance for COD, ammonia nitrogen, total nitrogen and total phosphorus.	As above.
<b>Zhefu Camp (Subcontractor of Hitachi-Mitsubishi Hydro)</b>	EF09	No sampling due to no discharged.	
<b>V&amp;K Camp</b>	EF10	Non-compliances for residual chlorine	As above.
<b>H-MH Main Camp (WWTS)</b>	EF13	Non-compliance for total coliform (8 Jan 2018), COD, NH <sub>3</sub> -N and total nitrogen	As above.
<b>IHI Main Camp</b>	EF14	Non-compliance for total coliform (22 Jan 2018), TSS, residual chlorine, COD, NH <sub>3</sub> -N and total nitrogen.	As above.
<b>Kenber Camp</b>	EF16	Non-compliance for residual chlorine.	As above.
<b>Main Dam Construction Area (Waste Water Treatment Plant No.1)</b>	DS11	Fully compliance	
<b>Main Dam Construction Area (Waste Water Treatment Plant No.2)</b>	DS12	No discharge during the missions.	
<b>Spoil Disposal Area No.2 (Song Da5 Workshop)</b>	DS04	Minor non-compliance for pH on 4 Jan 18.	As above.
<b>CVC Plant</b>	DS03	No discharge during the missions.	
<b>RCC Plant (discharge point at the weirs)</b>	DS09	Fully compliance	

Site	Sampling ID	Status	Corrective Actions
RCC Plant (Discharged nearby IHI Workshop)	DS13	No sampling at this point. The DS13 was joined with DS09.	
Aggregate Crushing Plant	DS02	No discharge during the missions.	

### 3.2.2 Ambient Surface Water Quality Monitoring

The surface water quality monitoring programme comprises 14 monitoring stations. The January 2018 programme is summarized in **Table 3-5** and the location of the monitoring stations are shown in **Table 3-5: Monitoring Frequency for Surface Water Quality Parameters**

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/l), Conductivity ( $\mu\text{S}/\text{cm}$ ), TDS (mg/l), Temperature ( $^{\circ}\text{C}$ ), Turbidity (NTU), TSS (mg/l), BOD5 (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	<ul style="list-style-type: none"> <li>- NNG09, Nam Ngiep Upstream Main Dam (NNG09),</li> <li>- R6, Re-regulation Reservoir</li> <li>- R7, Re-regulation Reservoir 0.3 km Upstream the Re-Regulation Dam</li> <li>- NNG05, Nam Ngiep Downstream the Re-regulation Dam at Ban Hat Gniun</li> </ul>
Fortnightly	pH, DO (%), DO (mg/l), Conductivity ( $\mu\text{S}/\text{cm}$ ), TDS (mg/l), Temperature ( $^{\circ}\text{C}$ ), Turbidity (NTU)	All 14 stations
Monthly	TSS (mg/l), BOD5 (mg/l), COD (mg/l), $\text{NH}_3\text{-N}$ (mg/l), $\text{NO}_3\text{-N}$ (mg/l), total coliform (MPN/100 ml), faecal coliform (MPN/100 ml)	All 14 stations

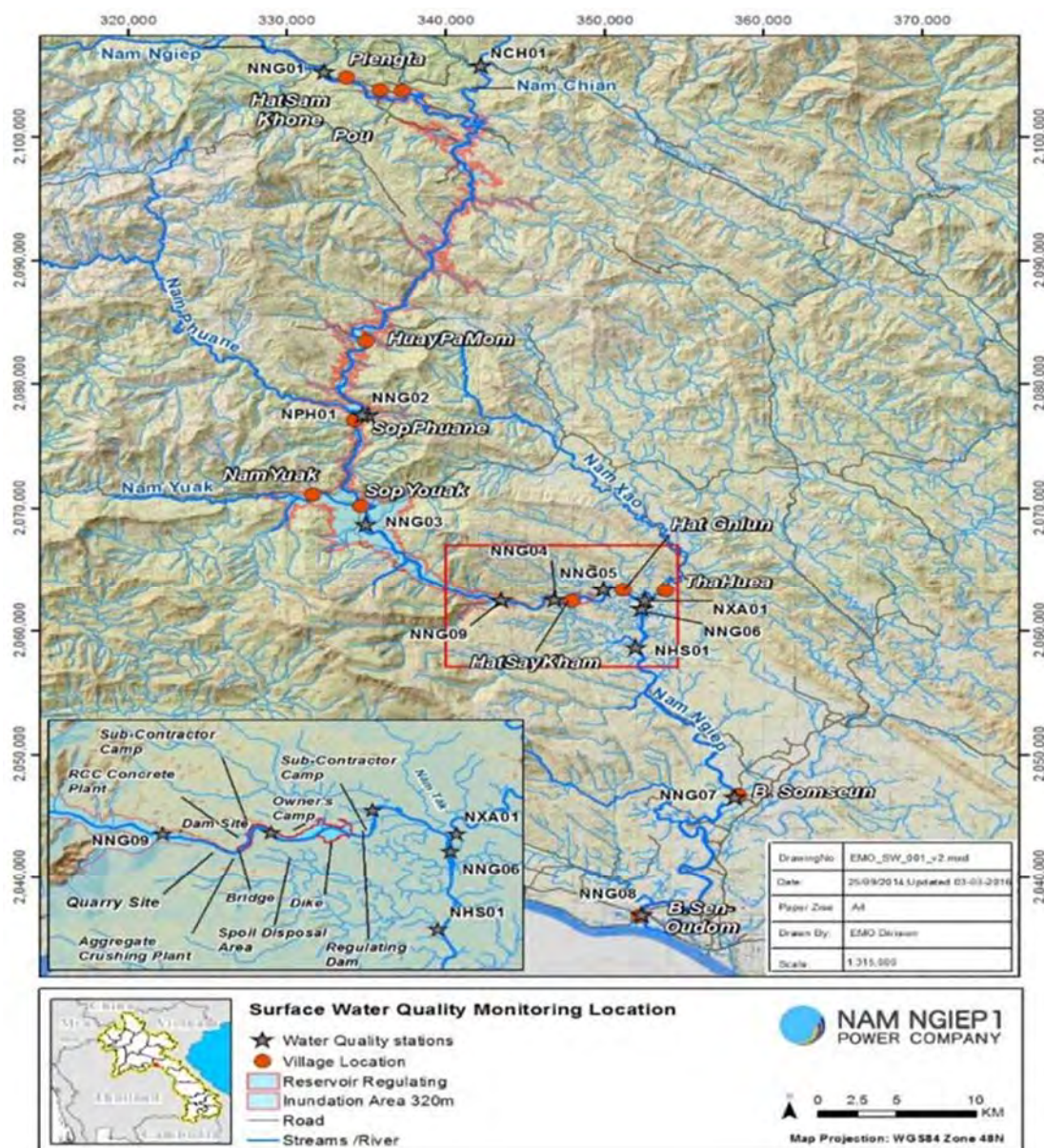
Figure 3-5 below.

**Table 3-5: Monitoring Frequency for Surface Water Quality Parameters**



Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/l), Conductivity ( $\mu\text{S}/\text{cm}$ ), TDS (mg/l), Temperature ( $^{\circ}\text{C}$ ), Turbidity (NTU), TSS (mg/l), BOD <sub>5</sub> (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	<ul style="list-style-type: none"> <li>- NNG09, Nam Ngiep Upstream Main Dam (NNG09),</li> <li>- R6, Re-regulation Reservoir</li> <li>- R7, Re-regulation Reservoir 0.3 km Upstream the Re-Regulation Dam</li> <li>- NNG05, Nam Ngiep Downstream the Re-regulation Dam at Ban Hat Gniun</li> </ul>
Fortnightly	pH, DO (%), DO (mg/l), Conductivity ( $\mu\text{S}/\text{cm}$ ), TDS (mg/l), Temperature ( $^{\circ}\text{C}$ ), Turbidity (NTU)	All 14 stations
Monthly	TSS (mg/l), BOD <sub>5</sub> (mg/l), COD (mg/l), NH <sub>3</sub> -N (mg/l), NO <sub>3</sub> -N (mg/l), total coliform (MPN/100 ml), faecal coliform (MPN/100 ml)	All 14 stations

**Figure 3-5:** Surface Water and Re-Regulation Reservoir Water Quality Monitoring Stations



Key findings for surface water quality monitoring (including the re-regulation reservoir) in January 2018 are shown below. The surface water quality data for January 2018 are all within the normal ranges as compared with previous data and there are no unusual or abnormal results.

**Table 3-6: Results of the Physical and Chemical Parameters of Nam Ngiep Surface Water Quality Monitoring**

	River Name	Nam Ngiep									
	Zone	Location Refer to Construction Sites									
		Upstream				Within / Re-regulation Reservoir		Downstream			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08
	Date	16-Jan-18	17-Jan-18	17-Jan-18	18-Jan-18	18-Jan-18	18-Jan-18	18-Jan-18	18-Jan-18	18-Jan-18	18-Jan-18
Parameters (Unit)	Guideline										
pH	5.0 - 9.0	8.96	8.57	8.8	7.97	7.93	8.79	8.64	8.51	7.15	7.12
Sat. DO (%)		95.8	99	103.5	100	99.6	99.7	102.3	102.7	105.4	103.1
DO (mg/l)	>6.0	8.62	8.67	8.97	8.89	8.92	8.99	8.91	8.92	8.79	8.67
Conductivity (µs/cm)		78.9	75	68	71.4	111	112	77.5	75.7	75.8	74.6
TDS (mg/l)		39	37.5	34	35.5	56	56	38.75	37.85	38	37.3
Temperature (°C)		18.6	20.5	20.9	20.6	21.08	21.56	21.2	21.3	22	22.3
Turbidity (NTU)		4.64	6.12	5.37	5.74	6.47	5.95	7.37	7.33	7.01	8.58
TSS (mg/l)		7.31	6.36	7.42	6	8.52	8.46	10.19	19.44	10.35	20.35
BOD <sub>5</sub> (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
COD (mg/l)	<5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
NH <sub>3</sub> -N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
NO <sub>3</sub> -N (mg/l)	<5	0.07	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.04	0.03
Faecal coliform (MPN/100ml)	<1,000	130	110	79	79	11	49	110	170	79	170
Total Coliform (MPN/100ml)	<5,000	350	280	220	79	240	540	220	540	350	540

**Table 3-7: Results of Nam Ngiep Surface Water Quality Monitoring on 05,11 and 25 January 2018**

	River Name	Nam Ngiep									
	Zone	Location Refer to Construction Sites									
		Upstream				Within / Re-regulation Reservoir		Downstream			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08
	Date	03-Jan-18	04-Jan-18	04-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18
Parameters (Unit)	Guideline										
pH	5.0 - 9.0	7.51	8.03	8.28	8.09	7.03	7.08	8.05	7.89	8.13	8.04
Sat. DO (%)		96.8	100.5	104.1	101.1	93	96.5	104.2	104.9	103.5	101.6
DO (mg/l)	>6.0	8.61	8.42	8.7	8.39	7.89	8.45	8.61	8.86	8.37	8.2

	River Name	Nam Ngiep									
	Zone	Location Refer to Construction Sites									
		Upstream				Within / Re-regulation Reservoir		Downstream			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08
	Date	03-Jan-18	04-Jan-18	04-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18	05-Jan-18
Parameters (Unit)	Guideline										
Conductivity (µs/cm)		79.1	72.8	70.8	69.9	102	103	71.3	72.9	75.2	71.6
TDS (mg/l)		39	36.4	35.4	35	53	53	35.5	36.4	37.5	35.8
Temperature (°C)		19.2	22.5	22.9	23.3	22.42	23.57	23.8	22.6	24.8	24.9
Turbidity (NTU)		7.53	9.3	7.2	8.03	5.87	4.73	6.08	6.19	6.41	8.6
TSS (mg/l)					10.9	6.96	6.39	<5			
BOD <sub>5</sub> (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0			
Faecal coliform (MPN/100ml)	<1,000				22	130	49	49			
Total Coliform (MPN/100ml)	<5,000				27	240	130	170			

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	11-Jan-18	11-Jan-18	11-Jan-18	11-Jan-18
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	7.97	7.93	8.79	8.64
Sat. DO (%)		99.5	100.3	95.5	101.1
DO (mg/l)	>6.0	9.29	9.06	8.29	9
Conductivity (µs/cm)		89	73	73.7	74.1
TDS (mg/l)		44	36	37	37
Temperature (°C)		18.1	19.78	21.7	20.5
Turbidity (NTU)		6.43	8.79	5.84	6.29
TSS (mg/l)		11.47	9.9	5.43	6.86
BOD <sub>5</sub> (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	170	79	79	34
Total Coliform (MPN/100ml)	<5,000	170	110	350	170

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	25-Jan-18	25-Jan-18	25-Jan-18	25-Jan-18
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	8.01	8.04	8.19	8.16
Sat. DO (%)		100.3	101.1	99.7	106.1
DO (mg/l)	>6.0	8.77	8.57	8.27	8.84
Conductivity (µs/cm)		75.1	73.8	73.8	72.4
TDS (mg/l)		37.5	36.5	36.5	36.2
Temperature (°C)		20.6	22.4	22.25	23.5
Turbidity (NTU)		5.08	5.4	4.08	4.31
TSS (mg/l)		5.56	6.92	3.05	3.5
BOD <sub>5</sub> (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	170	34	13	70
Total Coliform (MPN/100ml)	<5,000	280	130	22	110

**Table 3-8** Results of Physical and Chemical Parameters of Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup

	River Name	Nam Chain	Nam Phouane	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites			
		Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
Date	16-Jan-18	17-Jan-18	18-Jan-18	18-Jan-18	
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	8.99	8.07	8.59	8.58
Sat. DO (%)		100.8	103	97.6	85.7
DO (mg/l)	>6.0	9.29	9.38	8.31	7.53
Conductivity (µs/cm)		29.3	56.1	114.2	51.5
TDS (mg/l)		15	28	57.1	25.55
Temperature (°C)		17.3	18.6	22.3	20.8
Turbidity (NTU)		5.85	2.29	3.04	3.65
TSS (mg/l)		11.08	<5	<5	<5
BOD <sub>5</sub> (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
COD (mg/l)	<5	<5.0	<5.0	<5.0	<5.0
NH <sub>3</sub> -N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2
NO3-N (mg/l)	<5	0.08	0.07	0.02	0.08
Faecal coliform (MPN/100ml)	<1,000	47	79	140	240
Total Coliform (MPN/100ml)	<5,000	920	350	140	240

*Table 3-9: Physical Parameters Results of Surface Water Quality – Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup (measured Every Fortnight)*

	River Name	Nam Chain	Nam Phouane	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites			
		Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	03-Jan-18	04-Jan-18	05-Jan-18	05-Jan-18
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	8.12	8.09	7.12	7.6
Sat. DO (%)		100.9	106.1	92.1	84

	River Name	Nam Chain	Nam Phouane	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites			
		Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	03-Jan-18	04-Jan-18	05-Jan-18	05-Jan-18
Parameters (Unit)	Guideline				
DO (mg/l)	>6.0	9.2	9.11	7.52	7.1
Conductivity (µs/cm)		30.3	56.4	113.4	50.2
TDS (mg/l)		15	28.2	56.2	25.1
Temperature (°C)		17.6	21.3	24.4	22.6
Turbidity (NTU)		3.9	1.58	2.7	4.39

### 3.2.3 Groundwater Quality Monitoring

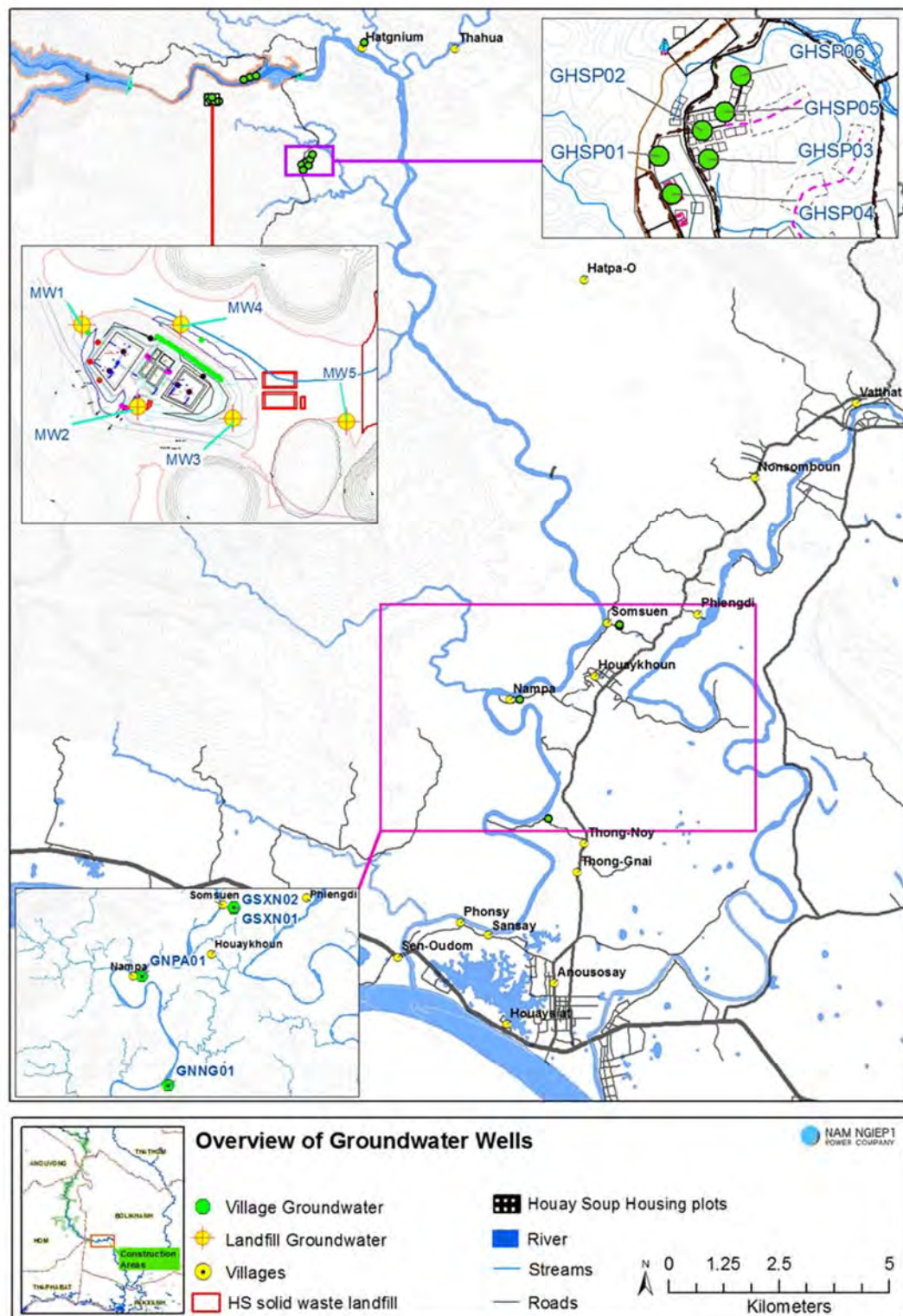
During January 2018, groundwater quality was monitored at the three out of six boreholes built for Phouhomxay Village. In addition, two new boreholes in Somsuen village, a new borehole in Nam Pa village, and a new borehole in Thong Noi village were monitored.

The results of Phouhomxay's groundwater were informed to the villagers and local health centre as part of the public health programme. The groundwater monitoring results for Somsuen, Nam Pa and Thong Noi villages were reported to SMO for prior notification before using of those new boreholes.

All parameters at the monitored boreholes complied with the groundwater quality standards.

*Figure 3-6: Groundwater Quality Monitoring Locations*





**Table 3-10: Groundwater Quality Monitoring Results in Phouhomxay Village, Somsuen, Nam Pa and Songkhone Villages**



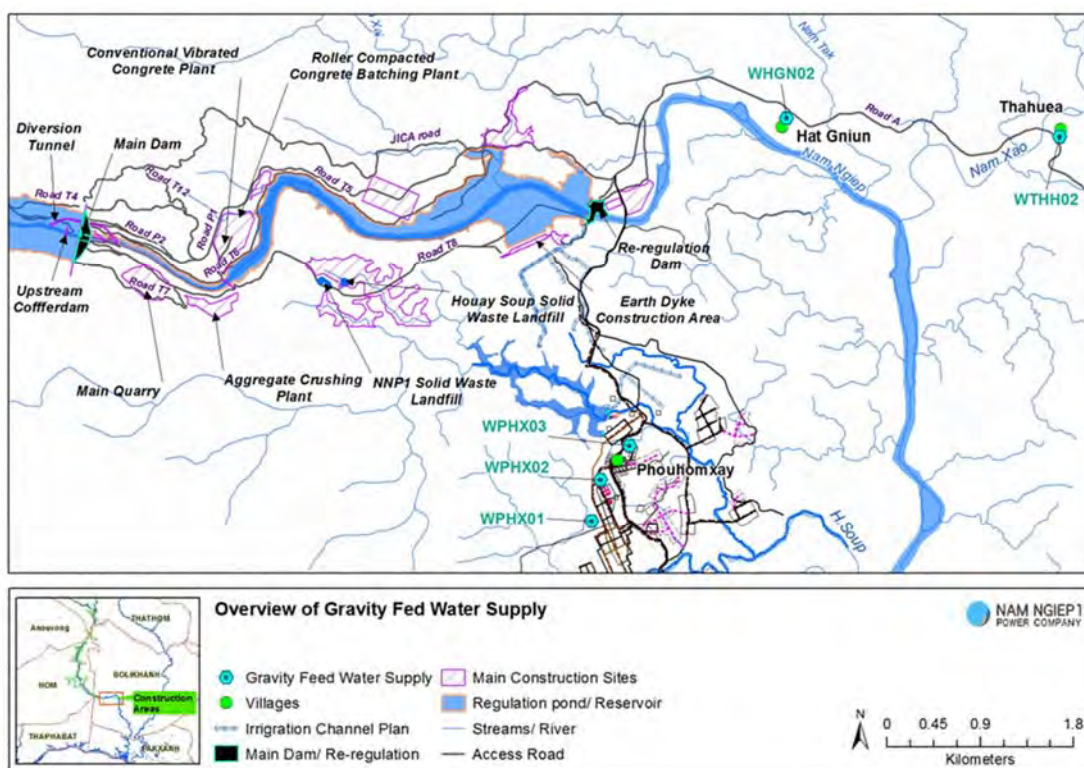
	Site Name	Phouhomxay Village					
	Station Code	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
	Date	09-Jan-18	09-Jan-18	09-Jan-18	09-Jan-18	09-Jan-18	09-Jan-18
Parameter (Unit)	Guideline						
pH	6.5 - 9.2	The water pump broken and will be replace with gravity fed water supply system.	The water pump broken and will be replace with gravity fed water supply system.	7.83	The water pump broken and will be replace with gravity fed water supply system.	7.23	7.63
Sat. DO (%)				89.8		83.8	70.9
DO (mg/l)				7.23		6.72	5.7
Conductivity (µS/cm)				380		291	356
TDS (mg/l)	1200			190		145	178
Temperature (°C)				25.1		25.3	25.1
Turbidity (NTU)	<20			1.6		1.01	1.01
Fecal coliform (MPN/100ml)	0			0		0	0
E.coli Bacteria (MPN/100ml)	0			0		0	0

	Village Name	Somseun Village		NamPa Village	ThongNoi Village
	Station	GSXN01	GSXN02	GNPA01	GTHN01
	Date	24-Jan-18	24-Jan-18	24-Jan-18	24-Jan-18
Parameter (Unit)	Guideline				
pH	6.5 - 8.6	7.07	7.94	7.61	7.84
Sat. DO (%)		45.8	43.1	33.1	40.9
DO (mg/l)		3.59	3.38	2.59	3.13
Conductivity (µS/cm)	<1,000	156.8	268	353	366
TDS (mg/l)	<600	78.4	134	176.5	183
Temperature (°C)	<35	26.7	26.6	26.7	27.7
Turbidity (NTU)	<10	7.19	0.79	1.05	1.52
Faecal Coliform (MPN/100ml)	0	0	0	0	0
E.coli Bacteria (MPN/100ml)	0	0	0	0	0
Arsenic (mg/l)	<0.05	<0.0003	0.0005	0.0005	0.0008
Iron (mg/l)		0.978	<0.01	0.08	0.278
Magnesium (mg/l)		1.75	3.14	2.51	3.89
Manganese (mg/l)	<0.5	<0.005	<0.005	<0.005	0.036
Fluoride (mg/l)	<1.5	0.12	0.23	0.24	0.05
Nitrate (mg/l)	<50	0.2	0.42	0.06	0.29
Nitrite (mg/l)	<3	<0.02	<0.02	<0.02	<0.02
Total hardness (mg/l)	<300	86.9	161	191	210
Lead (mg/)	0.05	0.009	<0.008	0.014	<0.008

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

During January 2018, water samples were taken from the taps at Thahuea, Hat Gniun and Phouhomxay villages.

*Figure 3-7 Gravity Fed Monitoring Locations*



All parameters complied with the National Drinking Water Standards for Thahuea, Hat Gniun and Phouhomxay villages except for faecal coliforms and E.Coli. Presence of E.Coli in the GFWS system is a normal situation, however, local villagers were informed about the results and encouraged to boil the water before drinking.

**Table 3-11: Result Gravity Fed Water Supply (GFWS) Quality Monitoring**

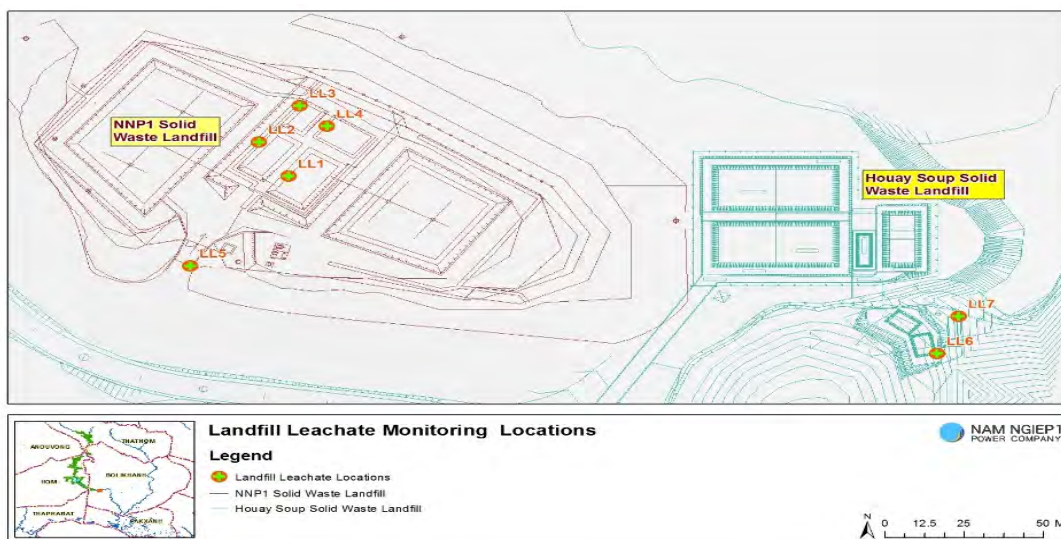
	Village Name	Thahuea	Hat Gniun	Phouhomxai		
	Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
	Date	09-Jan-18	09-Jan-18	09-Jan-18	09-Jan-18	09-Jan-18
Parameter (Unit)	Guideline					
pH	6.5 - 8.6	8.19	7.94	8.25	8.12	There is no water at the tap during the mission.
Sat. DO (%)		98.1	87.8	99.8	103.2	
DO (mg/l)		8.01	6.72	8.22	8.47	
Conductivity (µS/cm)	<1,000	53.1	67.4	11.17	10.94	
TDS (mg/l)	<600	26	33	5	5	
Temperature (°C)	<35	24.5	25.3	23.9	24.1	
Turbidity (NTU)	<10	1.07	3.21	1.03	0.9	
Faecal Coliform (MPN/100ml)	0	79	79	13	49	
E.coli Bacteria (MPN/100ml)	0	79	79	13	49	

### 3.2.5 Landfill Groundwater Monitoring

During January 2018, no discharge of treated leachate from neither the NNP1 Project Landfill nor the Houay Soup Landfill has been observed, and water samples were therefore taken from the NNP1 Project Landfill's final leachate pond (LL4), and from the Houay Soup

Landfill's final leachate pond (LL6). All results indicated compliance with the relevant standards at all final ponds of both Landfills.

**Figure 3-8 Landfill Leachate Monitoring Location**



**Table 3-12 Landfill Leachate Monitoring Results**

Parameters (Unit)	Site Name		NNP1 Landfill Leachate		Houay Soup Landfill Leachate	
	Location	Pond No. 4	Discharge Point		Last Pond	Discharge Point
	Station Code	LL4	LL5		LL6	LL7
	Date	08/Jan/18	08/Jan/18		08/Jan/18	08/Jan/18
	Guideline					
pH	6.0 - 9.0	8.62	No water discharged.		8.95	No water discharged.
Sat. DO (%)		132.8			106.6	
DO (mg/l)		9.48			7.81	
Conductivity (µs/cm)		360			17.12	
TDS (mg/l)		180			8	
Temperature (°C)		31.4			30	
Turbidity (NTU)		9.99			1.6	
BOD <sub>5</sub> (mg/l)	<30	<6			<6	
COD (mg/l)	<125	116			<25	
Total Coliform (MPN/100ml)	<400	0			4.5	
Faecal Coliform (MPN/100ml)		2			4.5	

### 3.2.6 Dust Monitoring

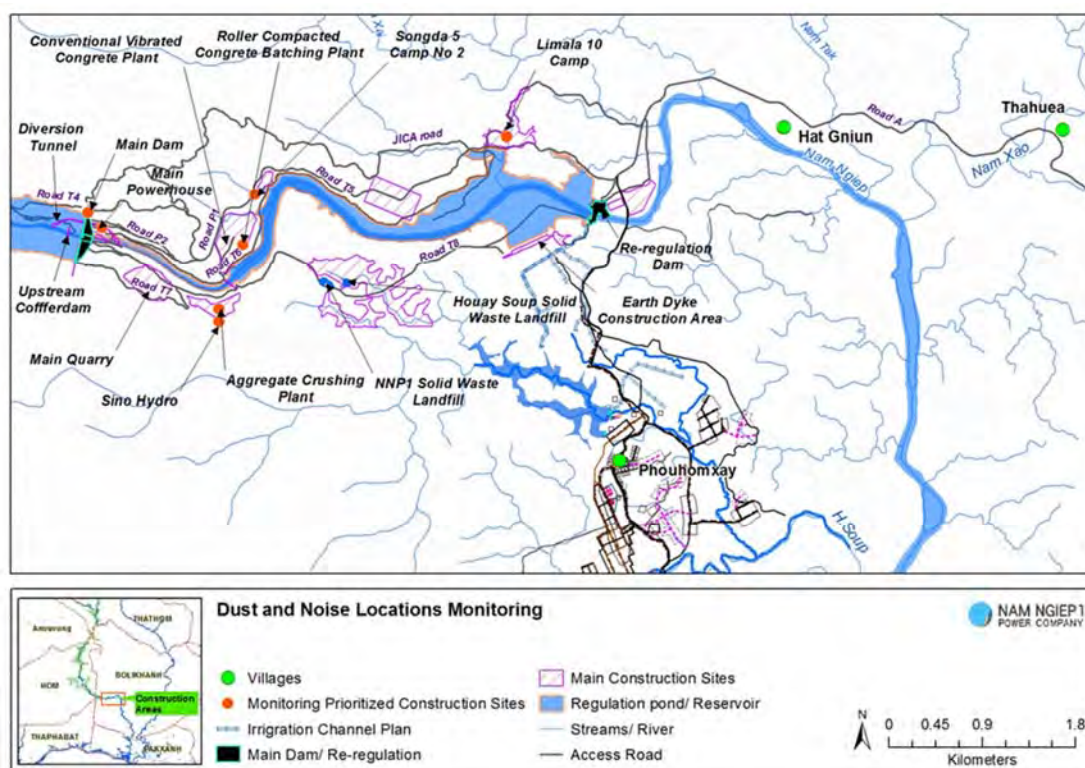
The monitoring points are indicated on the map in **Figure 1-9**. The results indicate compliance with the National Standard at all monitored stations, except at the Main Powerhouse. All staff were advised to wear dust masks while working in the area. The results are presented in **Annex 2**.

### 3.2.7 Noise Monitoring

During January 2018, noise monitoring was conducted for 72 consecutive hours at Hat Gniun; and 24 consecutive hours at the Aggregate Crushing Plant, RCC Plant, Sino Hydro

Main Camp, Sino Hydro Temporary Worker Camp, Main Dam, Lilama10 Camp, and Main Powerhouse.

**Figure 3-9: Noise and Dust Emission Monitoring Locations**



The results at all stations (except Hat Gniun Village and Main Powerhouse) indicated compliance with National Standard for the period of 06:01-22:00. The noise levels during 06:01-18:00 were higher than the Standard at the Main Powerhouse.

### 3.3 PROJECT WASTE MANAGEMENT

#### 3.3.1 Solid Waste Management

In January 2018, an approximate 131.1 m<sup>3</sup> of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 31.4 m<sup>3</sup> compared to December 2017. Spot checks of waste bags were conducted on a daily basis before the disposal.

A total of 756 kg of recyclable waste was sold to Khounmixay Processing Factory by the Contractors as shown in **Table 3-13**.

**Table 3-13: Amounts of Recyclable Waste Sold**

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by January 2018
<b>Construction activity</b>				
1	Scrap metal	kg	303	33,487
<b>Sub-Total 1</b>		<b>kg</b>	<b>303</b>	<b>33,487</b>
<b>Operation camp</b>				
2	Glass bottles	kg	317	925
3	Plastic bottles	kg	31	167.5



Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by January 2018
4	Paper/Cardboard	kg	62	149
5	Aluminium can	kg	42.5	49
Sub-Total 2		kg	452.5	1,290.5
Grand Total 1+2		kg	756	34,777.5

A total of 6,764 kg food waste was collected in January 2018 from selected camps by villagers of Phouhomxay for use as animal feed – an increase of 1,886 kg compares to December 2017.

**Table 3-14 Amounts of Food Waste Collected by Villagers**

NO.	SITE NAME	UNIT	TOTAL
1	Song Da 5 Camp No. 2	kg	2,528
2	Song Da 5 Camp No. 1	kg	2,159
3	Obayashi Corporation Camp	kg	1,121
4	Owner's Village and Site Office (OSOV)	kg	591
5	LILAMA 10 Camp	kg	220
6	Kenber Camp	kg	145
Total		kg	6,764

### 3.3.2 Hazardous Materials and Waste Management

The types and amounts of hazardous waste collected and transported for offsite treatment and final disposal at Khounmixay Processing Factory in January 2018 are shown in **Table 3-15**.

**Table 3-15: Results of Hazardous Material Inventory**

No.	Hazardous Waste Type	Unit	Total in January 2018 (A)	Disposed (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre (l)	9,890	5,990	4,250
2	Contaminated soil, sawdust and concrete	kg	646	139	514
3	Used tyre	No.	298	29	290
4	Empty contaminated bitumen drum/container	drum (200 l)	240	0	240
5	Used oil filters	No.	476	309	167
6	Empty paint and spray cans	can	316	176	140
7	Empty used chemical drum/container	Drum (20 litre)	518	410	108
8	Empty used oil drum/container	drum (20 l)	123	34	101
9	Empty used oil drum/container	drum (200 l)	90	19	83
10	Ink cartridge	No.	81	0	81
11	Empty used chemical drum/container	drum (200 l)	74	0	74

No.	Hazardous Waste Type	Unit	Total in January 2018 (A)	Disposed (B)	Remainder (A - B)
12	Halogen/fluorescent bulbs	No.	63	0	63
13	Lead acid batteries	No.	22	0	22
14	Contaminated textile and material	kg	77	68	11
15	Lithium-ion batteries	No.	7	0	7
16	Clinical waste	kg	5.5	0.0	5.5
17	Acid and caustic cleaners	Bottle	8	6	2
18	Cement bag	bag	0	0	0
19	Used oil mixed with water	liter (l)	0	0	0

### 3.4 Community Waste Management

#### 3.4.1 Community Recycling Programme

In January 2018, a total of 264.5 kg of recyclable waste was recorded at the Community Waste Bank, an increasing of 114.5 kg compared to December 2018 show in **Table 3-16**.

**Table 3-16: Types and Amounts of Recyclable Waste Traded at the Community Waste Bank**

Types of Waste	Unit	Remaining in December 2017	Additions in January 2018	Sold	Remaining in January 2018
Scrap metal	kg	410	2	0	412
Glass bottles	kg	1,078	128.5	0	1,206.5
Paper/cardboard	kg	173	83	0	256
Aluminium cans	kg	147	5.5	0	152.5
Plastic bottles	kg	452	45.5	0	497.5
<b>Total</b>	<b>kg</b>	<b>2,260</b>	<b>264.5</b>		<b>2,524.5</b>

#### 3.4.2 Houay Soup Resettlement Area Waste Management

On 01 December 2017, the Phoukham Chanvong (PKC Co. Ltd) started operation of Houay Soup Landfill under a one-year contract. The works include solid waste collection and transportation from Phouhomxay, Thahuea, Hat Gniun villages to Houay Soup Landfill for three days/week (Mondays, Wednesdays and Fridays), waste segregation, waste compaction and waste covering at the Houay Soup Landfill.

January 2018, approximate of 40 m<sup>3</sup> of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed at the Houay Soup Landfill.

#### 3.4.3 Waste Clean-up in Four Villages at 2LR

The waste clean-up in four villages at zone 2LR namely Houaypamom, Sopphoune, Sopyouk (Nong) and Namyouk villages, HomDdistrict, Xaysomboun Province was commenced on 29 November 2017, the work progress was 63.25 % as of 24 January 2018. The waste clean-

up activities including combustible waste collection and stockpiling before burning, waste segregation, and toilet waste treatment using lime 15 kg/m<sup>3</sup> – 20 kg/m<sup>3</sup>.

### **3.5 Watershed and Biodiversity Management**

#### **3.5.1 Watershed Management**

##### **3.5.1.1 PREPARATION OF THE WATERSHED MANAGEMENT PLAN**

The Nam Ngiep 1 Watershed and Reservoir Protection Committee (WRPC) and its secretariat (WRPO) are expected to be reconstituted, therefore, the meeting for plan approval was not confirmed and planned for the end of February 2018.

##### **3.5.1.2 PREPARATION OF PROVINCIAL REGULATION FOR THE WATERSHED MANAGEMENT**

The final draft of Provincial Regulation was improved by the special committee and the meeting between the special committee, the Provincial Assembly, the Provincial Justice Department, and NNP1PC was held on 25 January 2017. The draft will be further improved based on the comments during the meeting and the approval process was suggested to be concluded at National Level at the end of February 2018.

#### **3.5.2 Biodiversity Offset Management**

##### **3.5.2.1 PREPARATION OF BIODIVERSITY OFFSET MANAGEMENT PLAN**

The Biodiversity Impact Mitigation and Offset Proposal (No Net Loss Forecast) was presented to Vice Governor of Bolikhamxay, Vice Governor of Xaysomboun Province, and NNP1 Watershed and Reservoir Protection Committee (WRPC) at the end of January 2018. The vice governor of both provinces and the WRPC agreed with the proposal. The presentation of the proposal to the Biodiversity Offset Management Committee in Bolikhamxay Province is planned for the second week of February 2018.

The additional land use and socio-economic studies was started from the third week of January and will be completed in early February 2018.

##### **3.5.2.2 IMPLEMENTATION OF PRE-BIODIVERSITY OFFSET MANAGEMENT PLAN**

The second pre-BOMP was reviewed by NNP1PC, IAP and BAC in December 2017, and further improvements were made by BOMC and the plan was then resubmitted to NNP1PC for submission to ADB. ADB provided the comments in the third week of January 2018 and NNP1PC will officially inform Biodiversity Offset Management Committee (BOMC) for the disbursement of some of the activity for the period of 6 months implementation until BOMP is ready.

#### **3.5.3 Biomass Clearance**

As of 31 January 2018, the field verification confirmed that total of 702.35 ha out of 1,640 ha is accepted as fully cleared and another 922.38 ha is to be fully completed.

**Table 3-17** *Biomass Clearance Progress in Each Priority Area as of 31 January 2018.*

Target Area		Progress as of 31 January 2018	
Block	Total area to be cleared (Ha)	Total area in progress (Ha)	100% completed within the total area in progress (Ha)
B1	109.24	109.24	14.37
B2	158.63	158.63	67.84
B3	80.35	80.35	72.31
B4	163.74	163.74	157.89
B5	340.14	328.81	118.86
B6	31.92	31.92	14.62
B7	39.65	39.67	7.14
B8	37.61	37.61	11.19
B9	52.75	52.75	8.24
B10	269.10	264.37	41.55
B11	89.98	89.98	89.98
B12	64.11	64.11	0.00
B13	101.24	101.24	0.00
B14	43.33	43.34	43.34
B15	43.73	43.74	43.74
B16	3.32	3.32	3.32
B17	7.96	7.96	7.96
B18	3.95	3.95	0.00
<b>Total</b>	<b>1,640.75</b>	<b>1,624.73</b>	<b>702.35</b>

#### 4. FISHERY MONITORING

The fishery monitoring programme is a continuous activity by daily fish catch logbook monitoring and gillnet survey. However, only daily catch logbook was conducted for January 2018. The gathered information is being put into the database system.

The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 1.5 kg/household/day in December 2017. The estimated total fish catch in Nam Ngiep basin for December 2017 is 26,000 kg. Around 34 % of the catch was sold, 59% was consumed fresh, 5% processed and approximately 2% was used for other purposes.



# ANNEXES

## ANNEX A: RESULTS OF EFFLUENT ANALYSES

Table A- 1: Results of Camp Effluents in January 2018

	Site Name	Owner's Site Office and Village		Obayashi Camp		Sino Hydro Camp	
	Station Code	EF01		EF02		EF06	
		08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.38	7.93	7.79	8.24	7.44	8.11
Sat. DO (%)		55.4	63.4	74.8	73.7	50.5	64.4
DO (mg/l)		4.16	4.9	5.63	5.74	3.87	5.15
Conductivity (µS/cm)		341	374	802	787	585	529
TDS (mg/l)		170	187	401	393	292	264
Temperature (°C)		28.6	26.8	28.6	26.6	27.5	25.4
Turbidity (NTU)		1.07	1.2	11.9	32.3	11.68	10.25
TSS (mg/l)	<50	<5	1.37	8.37	10.76	6.38	3.89
BOD <sub>5</sub> (mg/l)	<30	<6	<6	<6	<6	<6	<6
COD (mg/l)	<125	<25	<25	57.6	65.5	58.1	48
NH <sub>3</sub> -N (mg/l)	<10	3.2	3.7	70.5	31.6	71.5	38.5
Total Nitrogen (mg/l)	<10	11.8	13.8	72.2	32.2	73	39.5
Total Phosphorus (mg/l)	<2.0	0.43	0.62	0.73	1.33	1.31	0.96
Faecal Coliform (MPN/100 ml)		13	0	350	23	0	0
Total Coliform (MPN/100 ml)	<400	13	0	350	23	0	2
Oil & Grease (mg/l)	<10	<1	n/a	<1	n/a	<1	n/a
Residual Chlorine (mg/l)	<1.0	n/a	n/a	0.09	0.13	0.47	0.07
Chlorination Dosing Rate (ml/mn)		n/a	n/a	135	340	430	365
Effluent Discharge Volume (l/mn)		20	6	20	6	6	6

	Site Name	Song Da5 Camp No.1		Song Da5 Camp No.2		V & K Camp	
	Station Code	EF07		EF08		EF10	
		08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.54	7.9	7.62	8.14	7.01	8.15
Sat. DO (%)		65.8	71.2	65.6	59.2	76.5	89.7
DO (mg/l)		4.71	5.22	5.05	4.68	5.73	6.99
Conductivity (µS/cm)		1,538	1,752	833	692	349	198.6
TDS (mg/l)		769	871	416	346	174	94.3
Temperature (°C)		31.5	30	28.3	25.9	28.9	26.8
Turbidity (NTU)		19.9	16.8	53.3	54.3	7.65	4.37
TSS (mg/l)	<50	40.12	44.38	40.3	25.88	<5	4.1
BOD <sub>5</sub> (mg/l)	<30	<6	<6	<6	<6	<6	<6
COD (mg/l)	<125	120	122	172	155	<25	<25
NH <sub>3</sub> -N (mg/l)	<10	52.3	28.6	58.9	30.6	<2	<2
Total Nitrogen (mg/l)	<10	53.2	29	60	31.2	2.68	1.33
Total Phosphorus (mg/l)	<2.0	0.96	0.37	2.04	1.9	0.12	0.17
Faecal Coliform (MPN/100 ml)		0	0	7.8	17	0	0
Total Coliform (MPN/100 ml)	<400	0	0	13	17	0	0

Final- 20 February 2018

	Site Name	Song Da5 Camp No.1		Song Da5 Camp No.2		V & K Camp	
	Station Code	EF07		EF08		EF10	
		08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18
	Guideline in the CA						
Parameter (Unit)							
Oil & Grease (mg/l)	<10	<1	n/a	3	n/a	<1	n/a
Residual Chlorine (mg/l)	<1.0	1.27	0.58	1	0.2	1.8	6.9
Chlorination Dosing Rate (ml/mn)		120	160	260	900	52	12
Effluent Discharge Volume (l/mn)		60	20	30	60	6	4

	Site Name	HM Main Camp		IHI Camp		Kenber Camp	
	Station Code	EF13		EF14		EF16	
		08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18	08-Jan-18	22-Jan-18
	Guideline in the CA						
Parameter (Unit)							
pH	6.0-9.0	7.33	8	7.21	7.9	8.61	8.92
Sat. DO (%)		68.7	80.01	44.8	10.2	97	96.9
DO (mg/l)		5.22	6.2	3.39	0.78	7.38	7.73
Conductivity (µS/cm)		658	869	1,042	636	185.1	357
TDS (mg/l)		329	434	521	118	92	185
Temperature (°C)		27.8	26.8	28.1	27.6	27.5	24.9
Turbidity (NTU)		18.8	28.1	19	24	10.17	11.35
TSS (mg/l)	<50	34.34	19.39	74.66	36.6	13.85	30.26
BOD <sub>5</sub> (mg/l)	<30	<6	<6	<6	64.9	<6	<6
COD (mg/l)	<125	229	198	262	186	<25.0	50.5
NH <sub>3</sub> -N (mg/l)	<10	22.7	27.2	15.5	20.7	<0.2	8.9
Total Nitrogen (mg/l)	<10	25.9	28.8	20.6	22	1.15	9.42
Total Phosphorus (mg/l)	<2.0	0.76	0.5	1.61	0.55	0.33	0.95
Faecal Coliform (MPN/100 ml)		1,600	0	0	9,200	0	0
Total Coliform (MPN/100 ml)	<400	1,600	0	0	9,200	0	0
Oil & Grease (mg/l)	<10	<1	n/a	9	n/a	<1	n/a
Residual Chlorine (mg/l)	<1.0	0	0.92	1.86	0	2.2	0.74
Chlorination Dosing Rate (ml/mn)		3.1	3.1	6	0	162	14
Effluent Discharge Volume (l/mn)		4.2	4.2	6	3	3	3

**Table A- 2: Results of the Construction Area Discharge in January 2018**

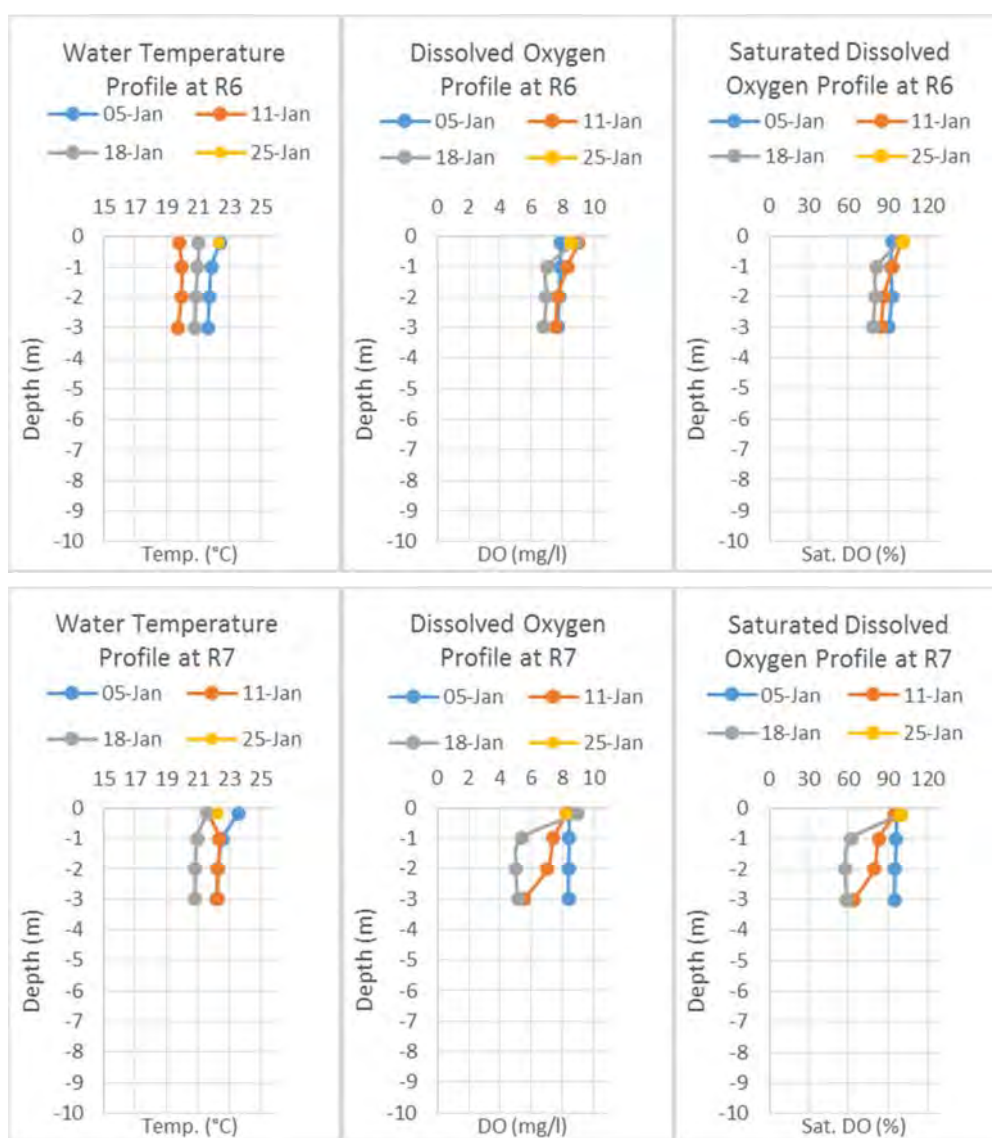
	Site Name	Spoil Disposal No.2			
	Station Code	DS04			
	Date	04-Jan-18	11-Jan-18	18-Jan-18	25-Jan-18
	Guideline				
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	5.68	7.56	7.09	7.51
Sat. DO (%)		24.6	40	43.1	45.4
DO (mg/l)		2.51	3.34	3.45	3.58
Conductivity (µs/cm)		37	33.6	36.4	40.4
TDS (mg/l)		18.5	17	18	20.2
Temperature (°C)		26.5	22.8	25	25.6
Turbidity (NTU)		4.74	4.34	3.77	3.7
TSS (mg/l)	<50	4.5	3.9	2.79	3.47
Oil & Grease (mg/l)	<10			<1	

	Site Name	RCC Plant Discharge at lower ponds			
	Station Code	DS09			
	Date	04-Jan-18	11-Jan-18	18-Jan-18	25-Jan-18
	Guideline				
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	6.65	8.45	8.39	8.63
Sat. DO (%)		79.2	80.5	113.4	95.7
DO (mg/l)		6.22	7.09	8.68	7.44
Conductivity (µs/cm)		435	318	251	293
TDS (mg/l)		217.5	159	125	146.5
Temperature (°C)		26.3	20.8	27.7	26.6
Turbidity (NTU)		11.2	11.7	26.8	15.5
TSS (mg/l)	<50	18.4	26.02	41.96	40.17
Oil & Grease (mg/l)	<10			<1	

	Site Name	Main Dam's Waste Water Treatment Plant No.1				Main Dam's Waste Water Treatment Plant No.2
	Station Code	DS11				DS12
	Date	04-Jan-18	11-Jan-18	18-Jan-18	25-Jan-18	
	Guideline					
Parameter (Unit)	Guideline					
pH	6.0 - 9.0	6.12	8.22	7.84	8.22	No Discharged
Sat. DO (%)		101.3	95.4	102.2	102.9	
DO (mg/l)		7.68	8.36	8.17	8.1	
Conductivity (µs/cm)		875	999	1,273	934	
TDS (mg/l)		437.5	499	636	467	
Temperature (°C)		27.4	20.9	25.2	26.5	
Turbidity (NTU)		6.16	2.97	5.5	3.98	

	Site Name	Main Dam's Waste Water Treatment Plant No.1				Main Dam's Waste Water Treatment Plant No.2
	Station Code	DS11				DS12
	Date	04-Jan-18	11-Jan-18	18-Jan-18	25-Jan-18	
Parameter (Unit)	Guideline					
TSS (mg/l)	<50	8.53	5.33	13.47	10.78	
Oil & Grease (mg/l)	<10			<1		

**Table A- 3: Temperature and Dissolved Oxygen Depth Profile Results of the Re-regulation Reservoir Monitoring in December 2017**

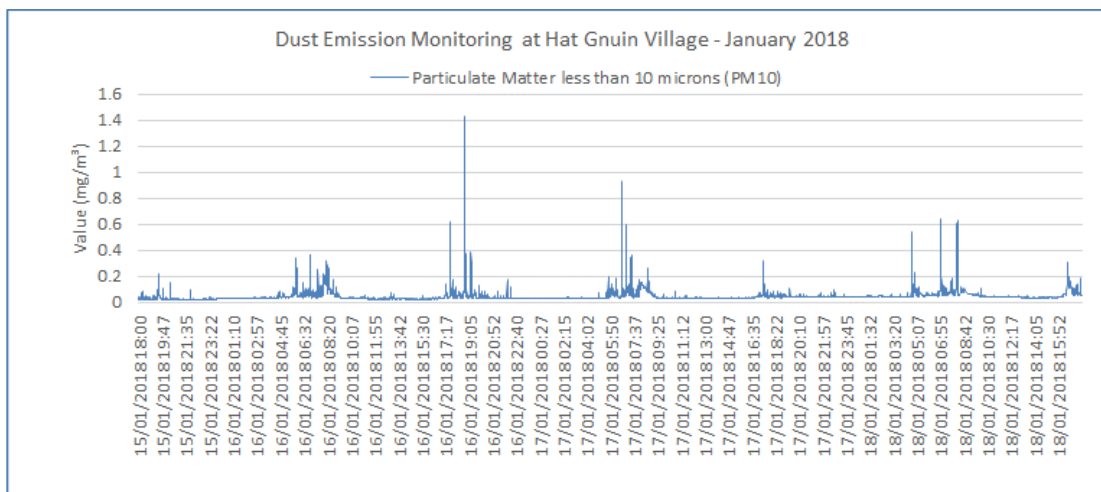


## ANNEX B: AMBIENT DUST QUALITY

**Table B- 1: 24-hour Average Dust Concentrations Measured in Hat Gniun Village**

<b>Ban Hat Gnuin - 24 Hours Average Particulate Matter (PM10) Concentration</b>			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	15/01/2018 18:00	16/01/2018 18:01	17/01/2018 18:01
End Time	16/01/2018 18:00	17/01/2018 18:00	18/01/2018 18:00
Average Data Record in 24h (mg/m <sup>3</sup> )	0.039	0.047	0.055
<b>Guideline Average in 24h (mg/m<sup>3</sup>)</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>

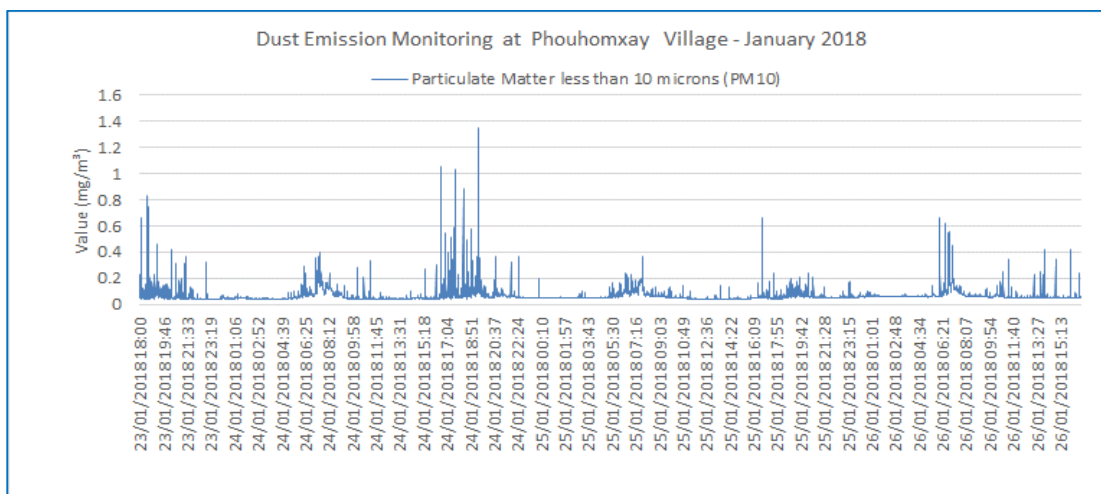
**Figure B- 1: Dust Monitoring Results at Ban Hat Gniun in January 2018**



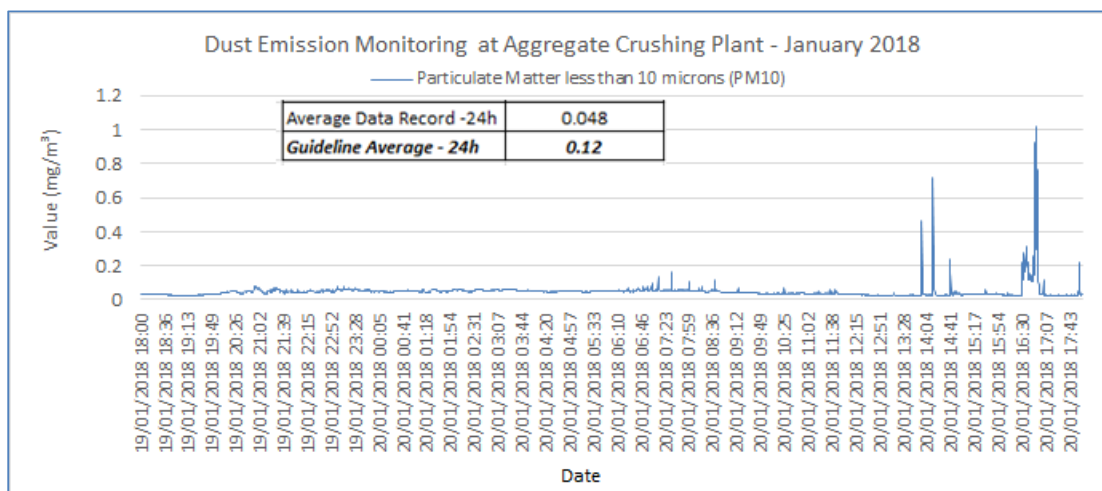
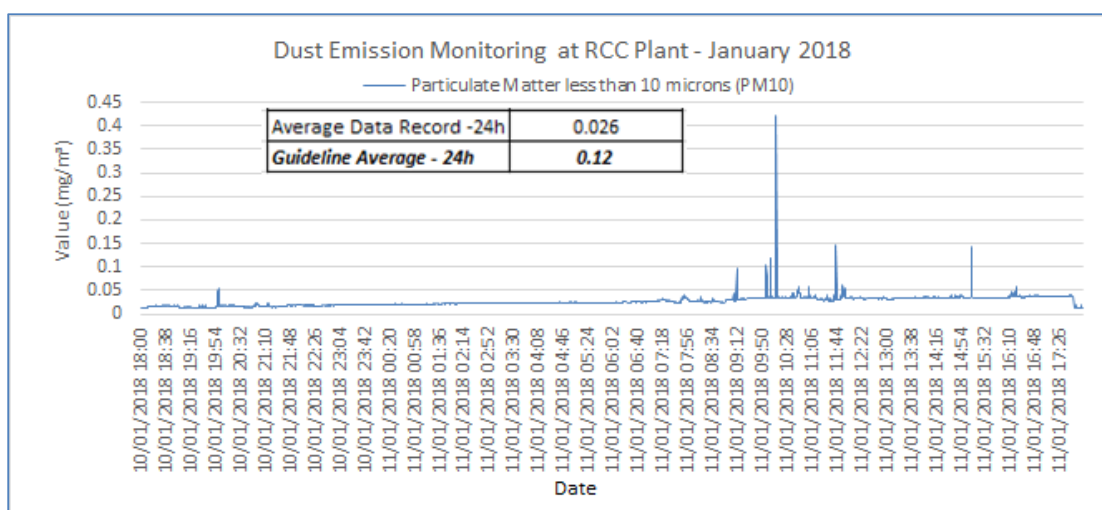
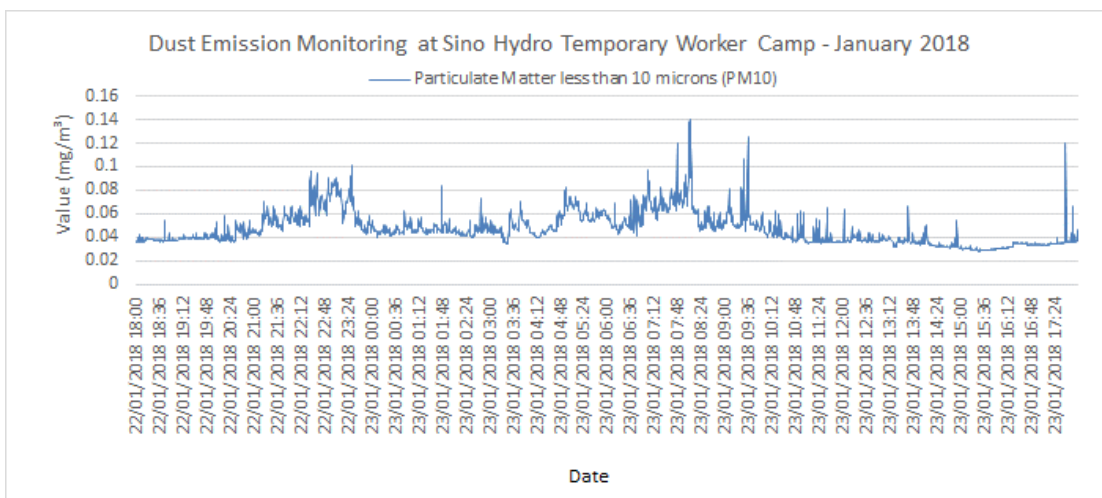
**Table B- 2: 24-hour Average Dust Concentrations Measured in Phouhomxay Village**

<b>Phouhomxay village - 24 Hours Average Particulate Matter (PM10) Concentration</b>			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	23/01/2018 18:00	24/01/2018 18:00	25/01/2018 18:00
End Time	24/01/2018 18:00	25/01/2018 18:00	26/01/2018 18:00
Average Data Record in 24h (mg/m <sup>3</sup> )	0.066	0.065	0.067
<b>Guideline Average in 24h (mg/m<sup>3</sup>)</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>

**Figure B- 2: Dust Monitoring at Phouhomxay Village in January 2018**





**Figure B- 3: Dust Monitoring Results at the Aggregate Crushing Plant in January 2018****Figure B- 4: Dust Monitoring Results at the RCC Plant in January 2018****Figure B- 5: Dust Monitoring Results at the Sino Hydro Temporary Camp in January 2018**

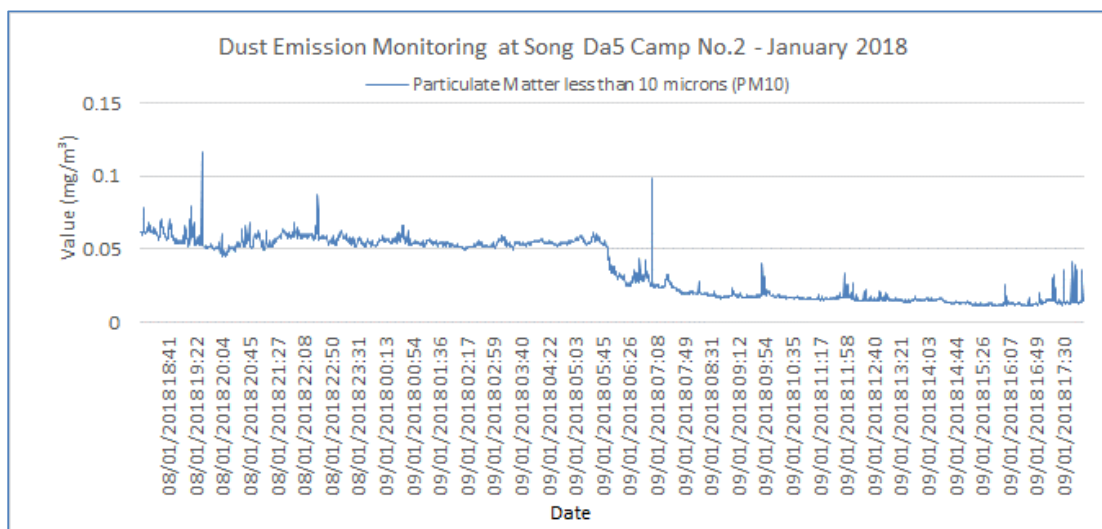
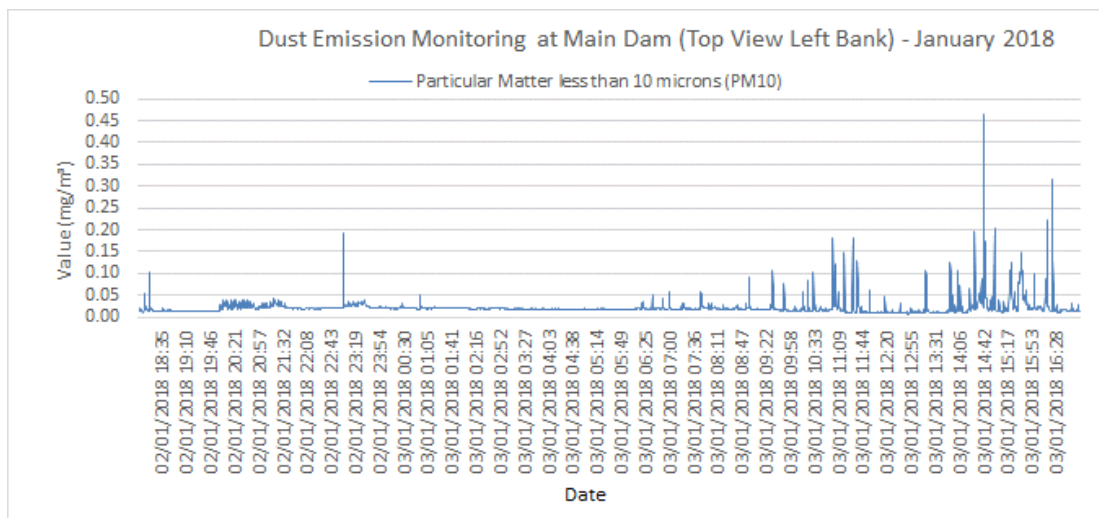
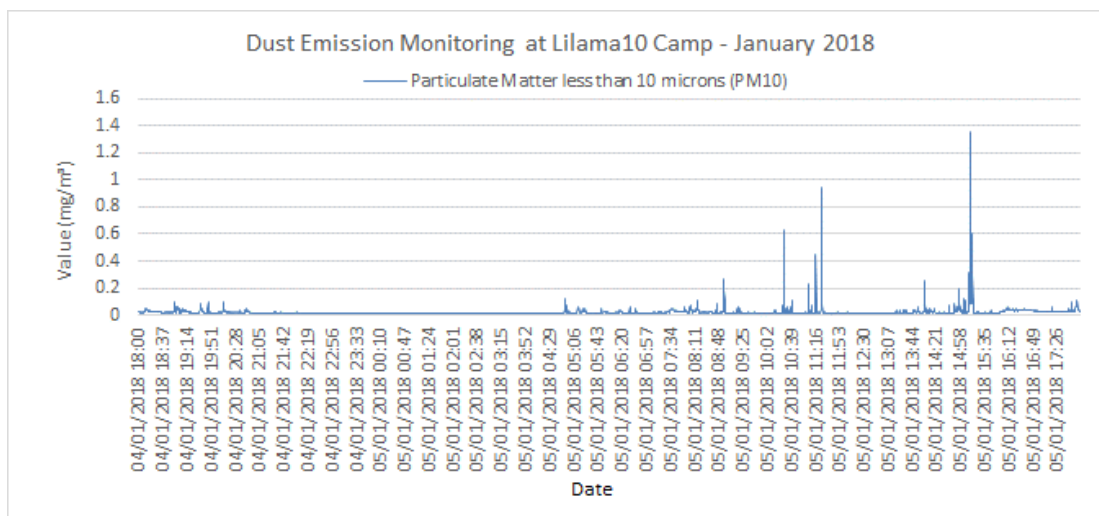
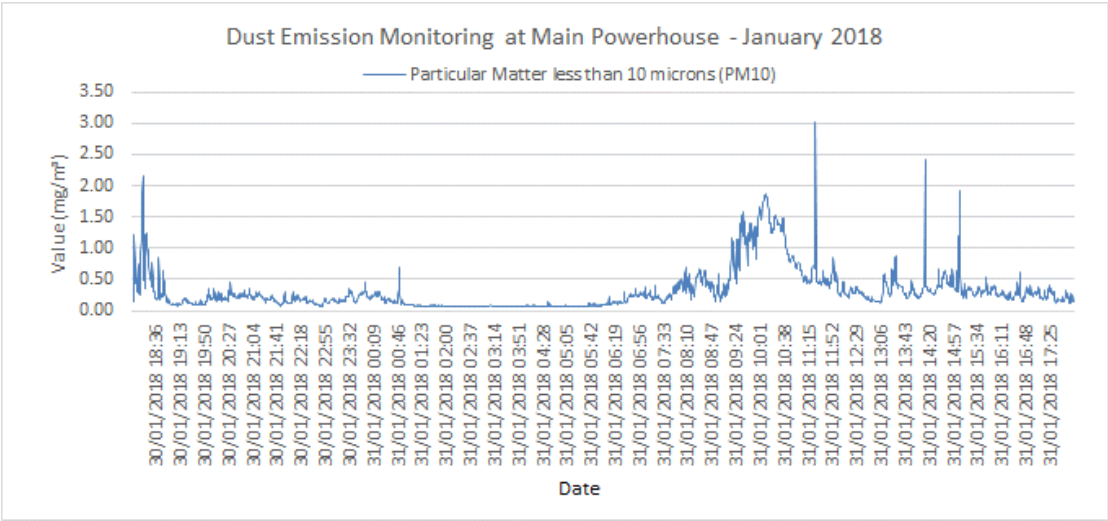
**Figure B- 6: Dust Monitoring Results at the SongDa5 No.2 Camp in January 2018****Figure B- 7: Dust Monitoring Results at Main Dam (Top View Left Bank) in January 2018****Figure B- 8: Dust Monitoring Results at the Lilama10 Camp in January 2018**

Figure B- 9: Dust Monitoring Results at the Main Powerhouse in January 2018

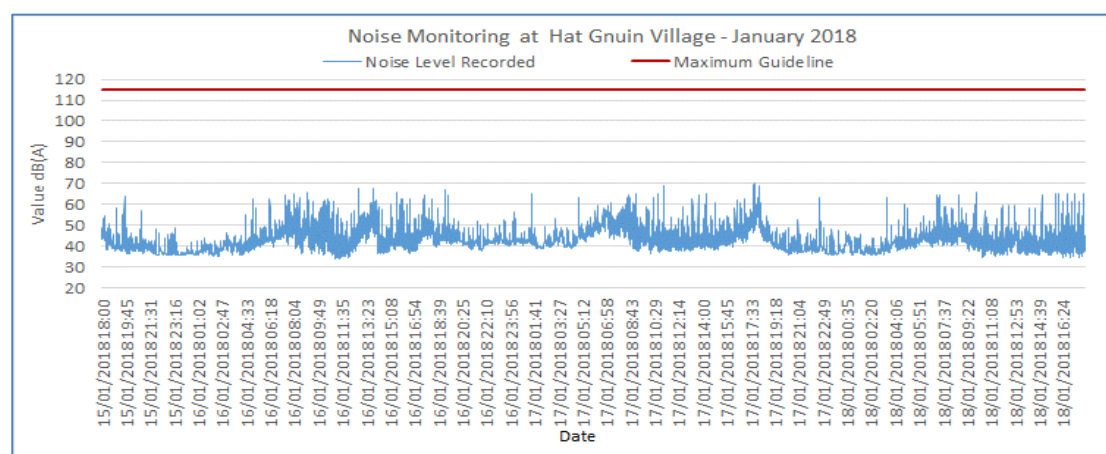


## ANNEX C: AMBIENT NOISE DATA

**Table C- 1: Average Results of Noise Monitoring at Ban Hat Gniun in January 2018**

Noise Level (dB)	15-16/January/18			16-17/January/18			17-18/January/18		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	64.00	62.40	67.60	66.90	65.10	70.20	68.70	63.40	65.90
<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>
Average Data Recorded	40.43	38.65	44.50	42.96	42.84	45.31	41.63	39.33	42.19
<b>Guideline Averaged</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>

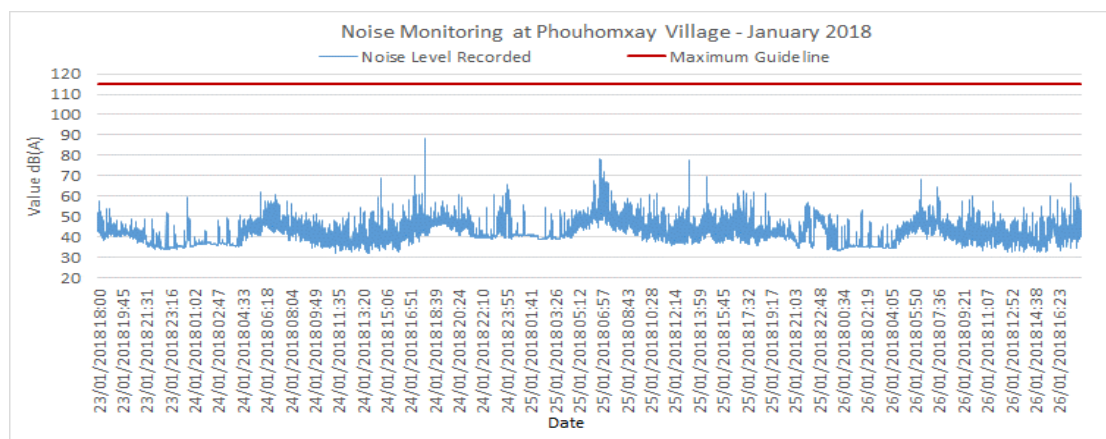
**Figure C- 1: Result of Noise Level Monitoring at Ban Hat Gniun in January 2018**



**Table C- 2 Average Results of Noise Monitoring at Phouhomxay Village in January 2018**

Noise Level (dB)	23-24/January/18			24-25/January/18			25-26/January/18		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	57.30	62.00	88.20	60.70	65.50	78.40	62.30	62.30	68.30
<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>
Average Data Recorded	41.16	38.23	42.03	45.55	42.52	45.12	41.16	40.11	41.05
<b>Guideline Averaged</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: Result of Noise Level Monitoring at Phouhomxay Village in January 2018**



**Table C-3 and Table C-4: Average Results of Noise Monitoring at Aggregate Crushing Plant and RCC Plant in January 2018**

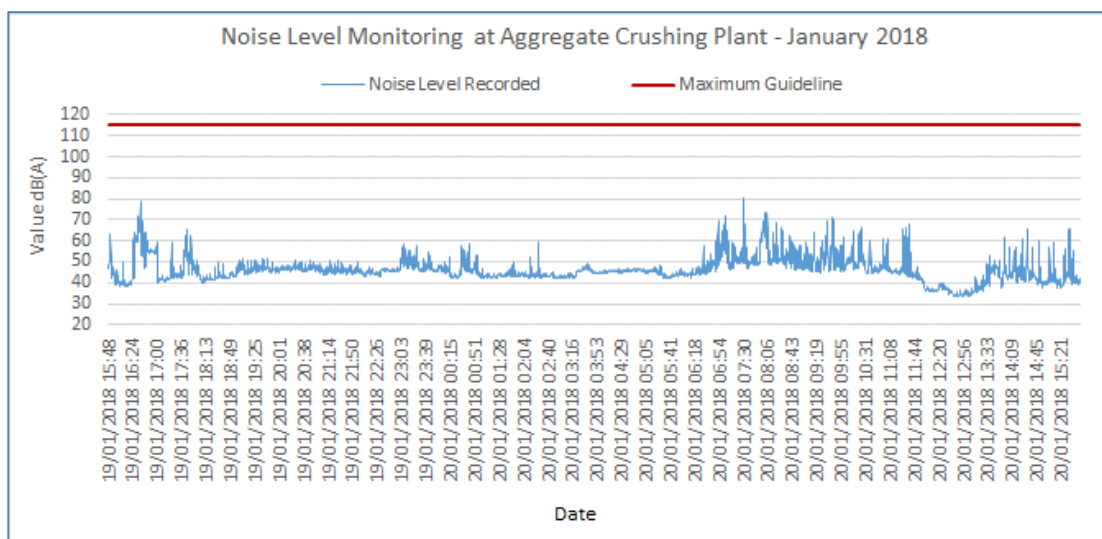
**Aggregate Crushing Plant**

**RCC Plant**

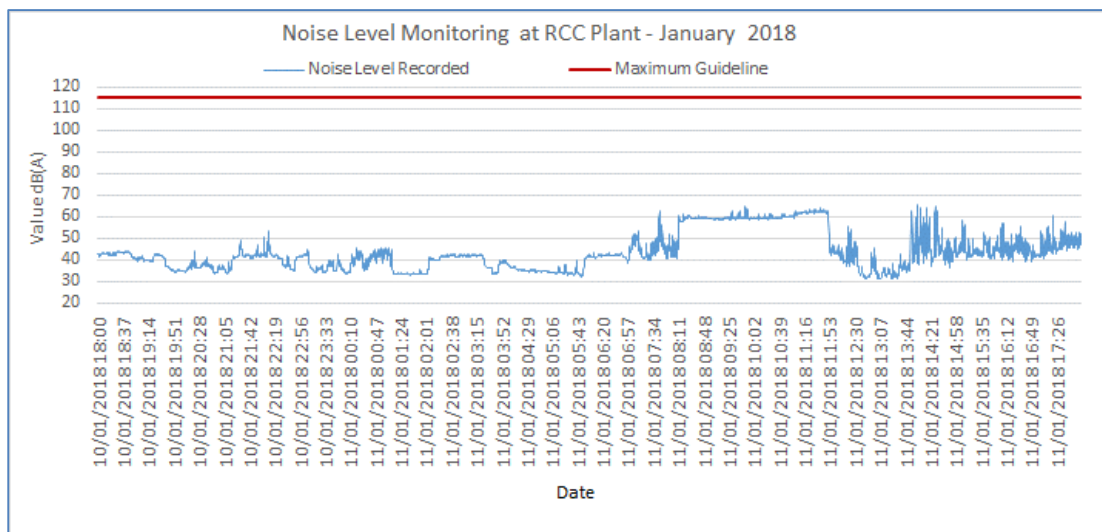
Final- 20 February 2018

Noise Level (dB)	19-20/January/18		20/January/18	Noise Level (dB)	10-11/January/18		11/January/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00		18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	79.2	59.6	80.1	Maximum Value Recorded	49.4	53.6	65.7
Guideline Max	115	115	115	Guideline Max	115	115	115
Average Data Recorded	46.51	45.60	46.3	Average Data Recorded	39.72	37.98	48.45
Guideline Averaged	70	70	70	Guideline Averaged	70	70	70

**Figure C- 3: Results of Noise Level Monitoring at the Aggregate Crushing Plant in January 2018**



**Figure C- 4: Results of Noise Level Monitoring at the RCC Plant in January 2018**

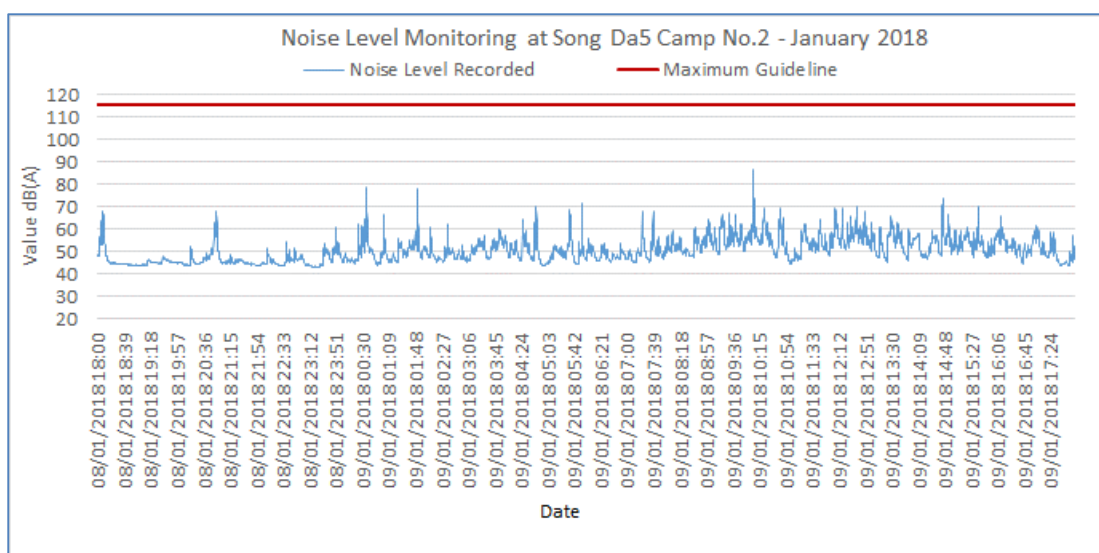


**Table C- 5 and Table C- 6: Average Results of Noise Monitoring at Song Da5 Camp No. 2 and Sino Hydro Camp in January 2018**

**Song Da5 Camp No.2****Sino Hydro Temporary Worker Camp**

Noise Level (dB)	08-09/January/18		09/January/18	Noise Level (dB)	22-23/January/18		23/January/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:		18:00 – 22:00	22:01 – 06:00	06:01-17:30
Maximum Value Recorded	68.1	78.8	86	Maximum Value Recorded	75.6	53.8	60.1
Guideline Max	115	115	115	Guideline Max	115	115	115
Average Data Recorded	46.02	48.96	52.1	Average Data Recorded	46.72	41.18	42.5
Guideline Averaged	70	70	70	Guideline Averaged	70	70	70

**Figure C- 5: Results of Noise Level Monitoring at Song Da5 Camp No.2 in January 2018**



**Figure C- 6: Results of Noise Level Monitoring at Sino Hydro Temporary Worker Camp in January 2018**

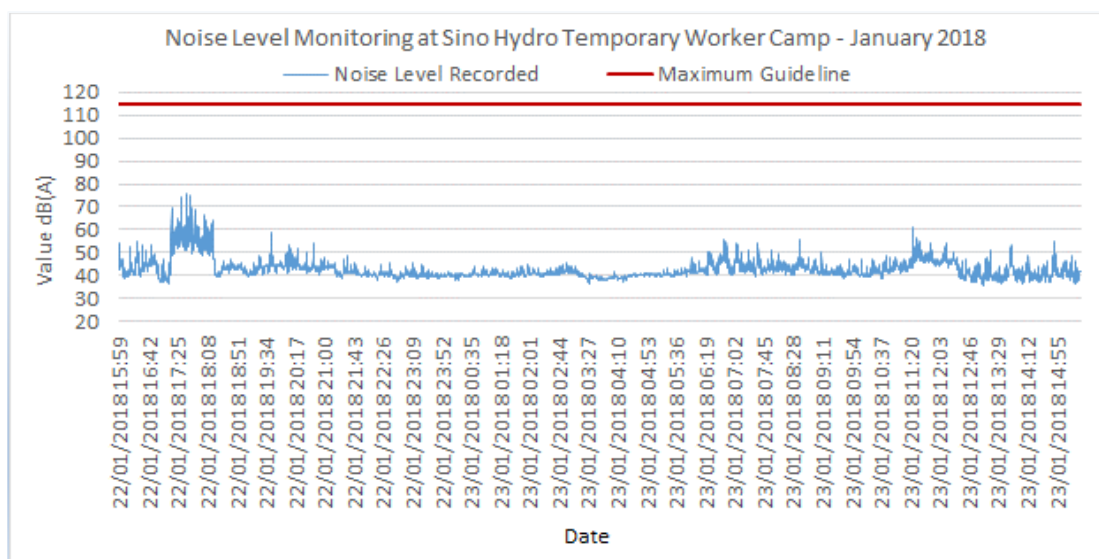




Table C- 8 and Table C- 9: *Average Results of Noise Monitoring at Main Dam, and Lilama 10 Camp in January 2018*

**Main Dam****Lilama 10 Camp**

Noise Level (dB)	02-03/January/18		03/January/18	Noise Level (dB)	04-05/January/2018		05/January/2018
	18:00 – 22:00	22:01 – 06:00	06:01-18:00		18:00 – 22:00	22:01 – 06:00	06:00-18:00
Data Record Max	57.3	60.1		(Maximum Value Recorded)	57.3	54.9	69.1
<b>Guideline Max</b>	<b>115</b>	<b>115</b>		<b>115 Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	50.59	49.43	50.5	Average Data Recorded	38.91	36.02	41.6
<b>Guideline Averaged</b>	<b>70</b>	<b>70</b>		<b>70 Guideline Averaged</b>	<b>70</b>	<b>70</b>	<b>70</b>

Figure C-7: *Results of Noise Level Monitoring at Main Dam (Top View Left Bank) in January 2018*

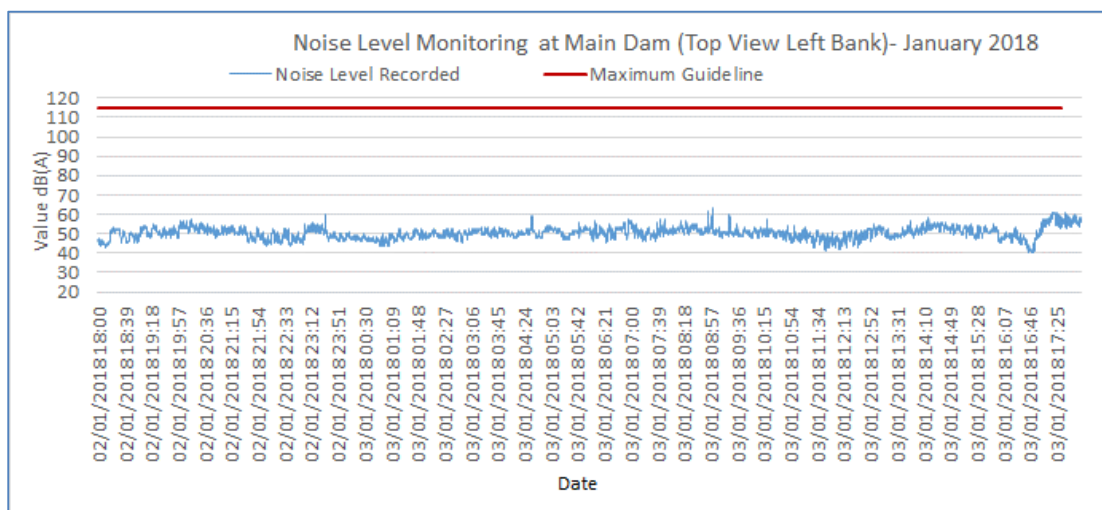
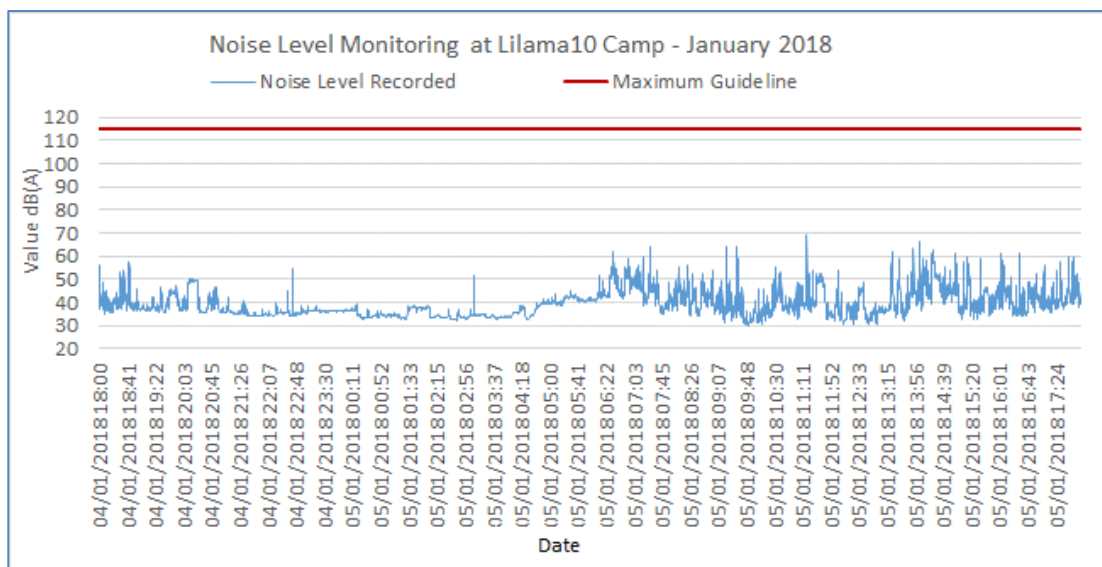


Figure C- 8: *Results of Noise Level Monitoring at Lilama10 Camp in January 2018*



**Table C- 9: Average Results of Noise Monitoring at Main Powerhouse in January 2018****Main Powerhouse**

Noise Level (dB)	30-31/January/18		31/January/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	89	89	85.5
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	69.49	69.29	72.45
<b>Guideline Averaged</b>	<b>70</b>	<b>70</b>	<b>70</b>

**Figure C- 9: Results of Noise Level Monitoring at Main Powerhouse in January 2018**