NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

September 2017

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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
ECOCD	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
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
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 September 2017, there were eight Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP), one annex of the Detail Work Program (DWP), and one DWP were active for EMO review. Out of these, five SS-ESMMPs and an annex of the DWP were cleared, three SS-ESMMPs and DWP including will be carried over to next month.

On 20 September 2017, the Environmental Management Unit (EMU) of Bolikhamxay Province conducted a mission to the main construction sites, camps and Houay Soup Resettlement Area (HSRA). A mission report was submitted for EMO review, where feedback has been provided on 27 September 2017, the final mission report is pending to be submitted.

The camp effluent monitoring was conducted fortnightly, the results for September 2017 indicate significantly improvement for key parameters (BOD, total coliform and faecal coliform), all complied with effluent standards.

Extensive water quality monitoring was conducted at the Nam Ngiep River during 11-15 September 2017 due to the breach of Nam Ao Dam, the surface water quality monitoring program was conducted in a daily basis during this period for two stations (Nam Ngiep upstream main dam [NNG09] and Nam Ngiep downstream of re-regulation dam [NNG05]). The peak of TSS values for the stations of NNG09 and NNG05 were 125,172 mg/l and 19,447 mg/l respectively on 12 September 2017.

Construction of slope stabilisation and erosion control at the Houay Soup Landfill was completed, a final inspection was confirmed 29 September 2017. The selection of a contractor to operate the landfill is being finalised and the selected contractor. The work is expected to be commenced by late October 2017 under a one-year contract.

The technical workshop to discuss NNP1 Watershed Management Plan (WMP) with relevant GOL's counterparts was conducted from 26-27 September 2017. Minor suggestions and recommendations for further improvement to the plan. Next discussion for the plan approval is expected sometime in December 2017. A detail annual working plan for 2018 will be prepare and expected to commence from January 2018.

NNP1 and ADB discussed in late September the NNL hierarchy of NNP1, as result, NNP1PC proposal "the No Net Loss Forecast" will be further finalized instead of commenting and finalizing the Biodiversity Offset Option Paper (BOOP) prepared by ADB. The proposal is expected to be finalized in October 2017 before BOMP development.

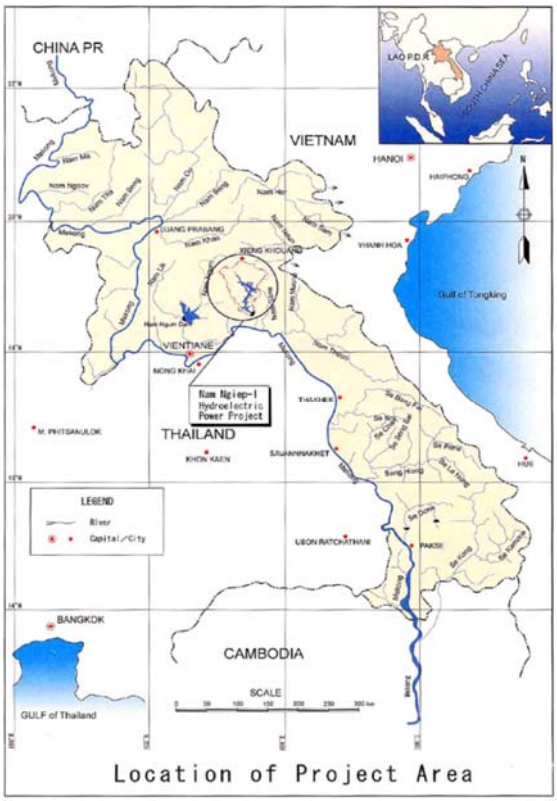
While the biomass clearance continues to progress for stockpiling and burning, a total area of 149.95 ha was reported as fully completed clearance, the area will be further certified by NNP1PC.

The fishery monitoring programme is continued as planned, in addition, assessed the fish kill due to the breach of Nam Ao dam was carried out during the reported month, where the report will be produced in October 2017. The gathered information is being put into the database. The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 2.0 kg/household/day in August 2017. The estimated total fish catch in Nam Ngiep basin for August 2017 is 58,800 kg. Around 25 % of the catch was sold, 68% was consumed fresh, 5% processed and approximately 2% was used for other purposes.

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. 1-1).

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 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 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.

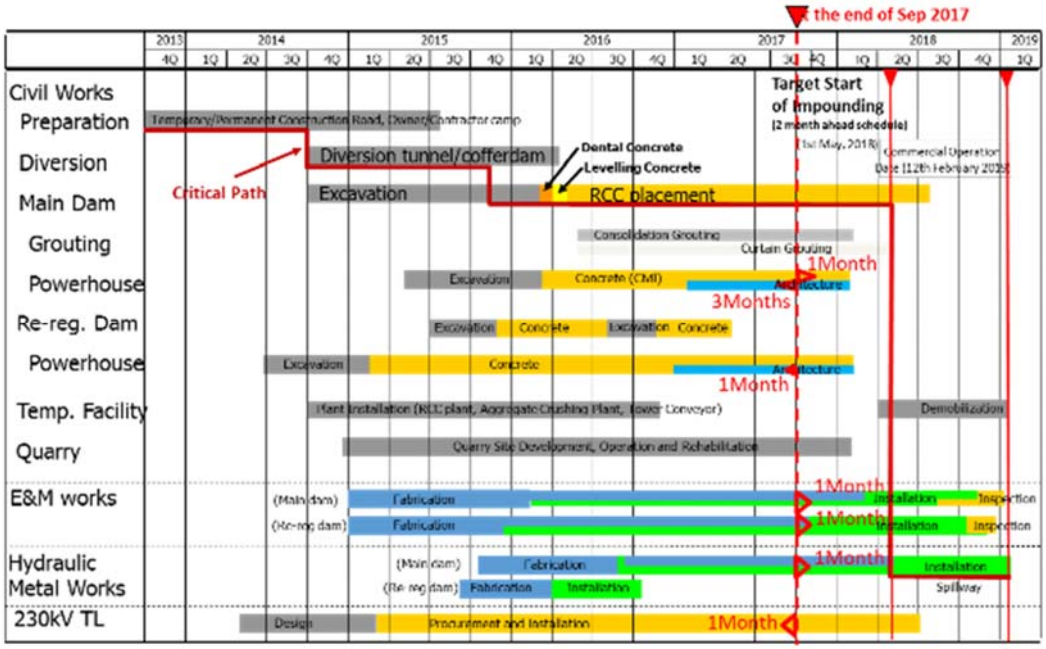
2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

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

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

The overall construction schedule and progress curve (by achieved Milestone Payments) are shown in **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 were commenced in October 2014 and completed in February 2016, following which the concreting works were commenced.

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

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 93 % by achievement of total anticipated drilled length as of the end of August 2017 as a proportion of the total expected drilling

Table 2-1: Progress of consolidation and curtain drilling for grouting at the end of September 2017

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

*The linear metres 'completed' are 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. Overhead travelling crane runway beam was installed in December 2016. Progress of the powerhouse concreting works is still proceeding well and is shown in **Error! Reference source not found.** below

Table 2-2: Progress of Main Powerhouse Sub-Structure Concrete Works to August 2017.

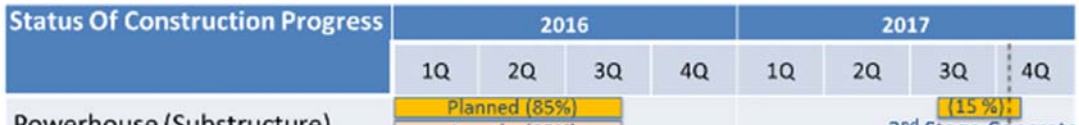
Location	Total Anticipated Volume (m^3)	Completed (m^3)	Progress (%)
Main Powerhouse	32,600	27,495	84
Penstock Embedment	10,257	8,185	79

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 **Error! Reference source not found.** below

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



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

The powerhouse concreting has advanced well and secondary concrete embedment for the draft tube liner was completed at the end of April 2016. The left bank structure was re-designed as roller compacted concrete (RCC) and was completed on 18 March 2016.

Installation of the re-regulation waterway gate and stop log and re-regulation intake gate and structural concrete works for the retaining wall to support the substation yard were completed in October 2016. Building superstructure work continued for the powerhouse with the commencement of construction of concrete columns.

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 September 2017 was 88.2 % (compared to planned progress of 95.1 %).

Figure 2-4: Preparation for installation of stay ring OHTC for unit 1 at the main powerhouse

Figure 2-5: Preparation for Installation of Stay Cone at the re-regulation powerhouse


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 September 2017 was 48.7 % (compared to planned progress of 54.3 %).
The latest progress of penstock pipe fabrication at IHI field shop and erection at main dam as of the end of July 2017 ***in Table*** 2-3 below

Table 2-3: Progress of the penstock pipe fabrication at the IHI field shop as at the end of September 2017

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 September 2017 was 94.6 % (compared to planned progress of 98.3 %).

In respect of the delay to commencement of most works the Contractor is studying its programme to ensure that sufficient resources are committed as the works progress to ensure that completion is achieved in good time. Onset of daily rains has made access to all areas difficult but the Contractor follows its revised acceleration schedule, after the progress for the construction of tower foundations slowed after May, 2016 (See **Error! Reference source not found.**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)

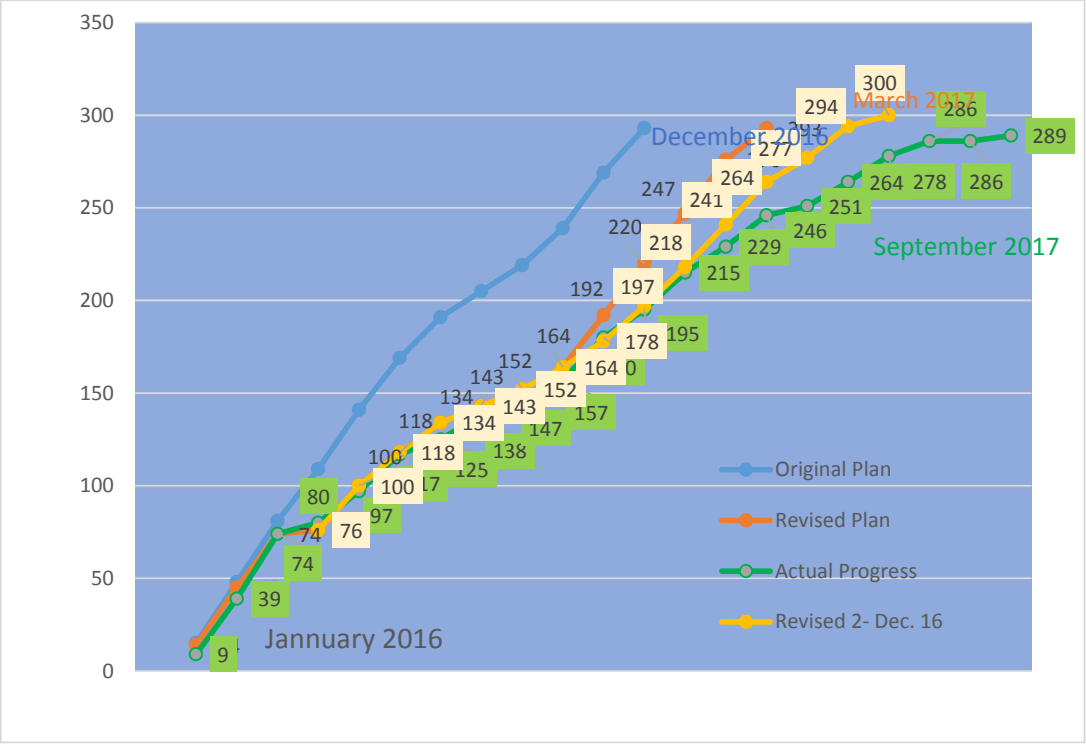


Figure 2-8: Revised Cumulative Works Progress of Tower Erection (Planned & Actual)

3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 Compliance Management

3.1.1 Site Specific Environmental and Social Management and Monitoring Plans

During September 2017, there were eight Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP), one annex of the Detail Work Program (DWP), and one DWP were active for EMO review. Out of these, five SS-ESMMPs and an annex of the DWP were cleared, three SS-ESMMPs and DWP including will be carried over to next month.

Table 3-1: SS-ESMMP review status in September 2017

Title	Date Received	Response Status	Comments
SS-ESMMP for Building Construction at the Main Powerhouse	22 February 2017 (4th submission)	Under Review	A location layout of the Waste Water Treatment System (WWTS) is under review by TD. EMO expects to clear this SS-ESMMP after a receipt of final drawings of the WWTS.
SS-ESMMP for RCC Operation and Maintenance Work	08 March 2017 (4th submission)	Under Review	EMO will clear this SS-ESMMP in October 2017 after the improvement to the sediment control system and effluent water quality results are justified.

Title	Date Received	Response Status	Comments
DWP & Appendix for Aggregate Crushing Plant	05 July 2017 (5th submission)	Under Review	EMO will clear this SS-ESMMP in October 2017 after the improvement of sediment control system and effluent water quality results are justified.
SS-ESMMP for Construction of 03 Bus Stop Station, 01 Market Building, 01 Waste Storage and 01 Toilet at 2UR Zone	25 August 2017 (2nd submission)	No objection with comments on 07 September 2017	To provide scope of vegetation clearance and earthwork, construction drawings and specifications.
SS-ESMMP for Construction of Irrigation Dam, 01 spillway & 01 Outlet Pipe Culvert at HSRA	31 August 2017 (3rd submission)	No objection with No further comments on 10 September 2017	
SS-ESMMP for Construction of a Tractor Road 3.18 km at HSRA	31 August 2017 (1st submission)	No objection with No further comments on 10 September 2017	
SS-ESMMP for Construction of a Tractor Road 4.05 km at HSRA	07 September 2017 (1st submission)	No objection with No further comments on 11 September 2017	
SS-ESMMP for Installation of Turbine for Main Power	18 September 2017 (1st submission)	Under review	To be cleared in October 2017
Annex of the DWP for Re-regulation Power Station, Closing of Borrow Pit Area at Corner of P1 & P1A Road Beside the Re-Regulation Dam	19 September 2017 (3rd submission)	No objection with comments on 29 September 2017	Incorporate the closure plan for a borrow pit area behind the existing borrow pit at Corner of P1 & P1A Road.
SS-ESMMP for Construction of 4 Houses Lot No:7 at HSRA.	22 September 2017	No objection with No further comments on	

Title	Date Received	Response Status	Comments
	(1st submission)	25 September 2017	

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 the Last Month (August 2017)	7	2	2	0
Newly Opened in this Month (September 2017)	5	0	0	0
Total in this Month (September 2017)	**12**	**2**	**2**	
Resolved in this Month (September 2017)	6	2	0	0
Carried over into Next Month (September 2017)	6	0	2	0
Unsolved Exceeding Deadlines	**4**	**0**	**2**	**0**

Figure 3-1: Summary of ONC and NCR

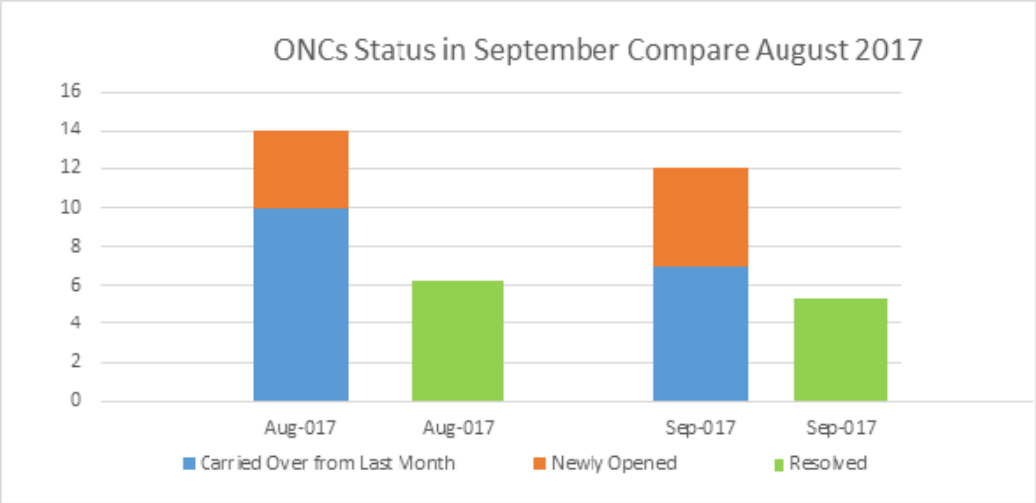


Table 3-3: Carried-Over ONC and NCR from September 2017 into October 2017

Site ID	Issues	Reporting	Actions
Re-Regulation Dam (Borrow Pit Area pit at Corner of P1 & P1A Road)	The borrow pit was operated without adequate environmental management actions: - The slope of the cut had no berm and cut-off drains; - The information and management measures on the operation and closure of this borrow pit were excluded in the SS-ESMMP for the Re-Regulating Dam (ON_OC-0232). First inspection: 30 August 2016 Latest inspection: 26 September 2017	ONC (Closure Pending)	- On 29 September 2017, EMO had commented to the third submission of Annex of the DWP. The contractor was requested to include a closure plan for a borrow pit area behind the existing borrow pit at Corner of P1 & P1A Road; - An official letter to close this ONC will be issued when required actions are completed.
Aggregate Crushing Plant	- Inadequate maintenance and implementation of agreed corrective actions. - The sediment pond at the Aggregate Plant below the Spoil Disposal Area No. 7 was not properly controlled and monitored; - A leakage of turbid water from the sediment pond into Nam Ngiep River was observed. This is a non-compliance with CA Annex C and ESMMP-CP 2014 (NCR_OC-0013). First inspection: 08 November 2016 Latest inspection: 26 September 2017	NCR-2 (Closure Pending)	- The Detailed DWP and SS-ESMMP for Foundation Installation and Operation of Aggregate Crushing Plant (PLC-03348) was submitted on 05 July 2017 as a response to the NCR level 2; - Additional information was requested to support the submitted DWP and SS-ESMMP. - The DWP & SS-ESMMP were under review of NNP1PC-EMO.

Site ID	Issues	Reporting	Actions
Main Dam's WWTS No. 1	Turbid water with high pH was discharged from a sediment pond next to the Main Dam Powerhouse into the Nam Ngiep River via a 100-mm submerged black pipe (NCR_OC-0020). First inspection: 18 July 2017 Latest inspection: 26 September 2017	NCR2 (Closure pending)	The NCR2 was issue by EMO with following recommendations: - If an emergency discharge is needed, it should only be done after pH is checked at the sediment ponds and approval of NNP1PC; - Training shall be provided to workers and/or designate staff who operate the WWTS. A response Ref: NNP1-PCR-03463 was submitted on 27 September 2017 and is under review and by EMO.
Sino Hydro Workshop	Used tires were placed along the edge of vehicle parking platform next to Sino Hydro workshop were exposed to rain. They become a breeding ground of mosquitos that are transmitters of infectious diseases (ON_OC-0265). These tires considered as hazardous waste where proper disposed at designated area is required. First inspection: 01 August 2017 Latest inspection: 26 September 2017	ONC (Closure pending)	- A disposal plan for these used tires should be submitted to NNP1PC for review and approval; - The EMU suggested in their September mission report that the contractor needs to remove these tires to designated area with proper cover before next EMU mission in October 2017; - NCR level 1 will be triggered if no action is carried by 10 October 2017.
Building Concept Construction SOLE (HSRA)	The leakage of black water from the septic tank into a grey water pond was observed. It is a risk of bacterial rich waste water overflows or seeps into outside environment, consequently it may cause serious issue to public health (ON_BC-0001). First inspection: 07 September 2017 Latest inspection: 19 September 2017	ONC (New)	- Identify the cause of the septic tank leakage, and fix the system accordingly; - The contractor was instructed to check regularly a level of each septic tank (in %), if the tank is about 80% filled, the contractor is advised to follow a Sewage and Black Water Disposal Procedure approved by owner.

Site ID	Issues	Reporting	Actions
Temporary Accommodation for 44 HH from 2LR at HSRA	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: 19 September 2017	ONC (New)	- As stated in the DWP & SS-ESMMP, the ESD-Infrastructure Team shall be responsible for decommissioning of this temporary accommodation. - A Site Decommissioning Plan which includes timeline and disposal methods is required to be officially submitted and for EMO review and approval. The proposed plan shall be implemented accordingly.
Vieng Oudom Sup Construction Co., Ltd (HSRA)	The Contractor will finish all construction activities at the middle of October 2017, however, the submission of a revised DWP & SS-ESMMP and Site Decommissioning Plan for EMO review and clearance is pending (ON_VDC-0002). First inspection: 19 September 2017 Latest inspection: not available	ONC (New)	The contractor was instructed to revise and resubmit the DWP & SS-ESMMP to include the Site Decommissioning Plan at least 07 days before final Inspection.
Vannavong Construction Co., Ltd (HSRA)	The Contractor will finish all construction activities by the end of September 2017, the existing DWP & SS-ESMMP was pending revision. (ON_VNV-0002). First inspection: 19 September 2017 Latest inspection: not available	ONC (New)	The Contractor was recommended to revise and submit a DWP & SS-ESMMP to include the Site Decommissioning Plan for EMO review and approval at least 07 days prior to Final Inspection

Figure 3-2: Site Inspection Locations

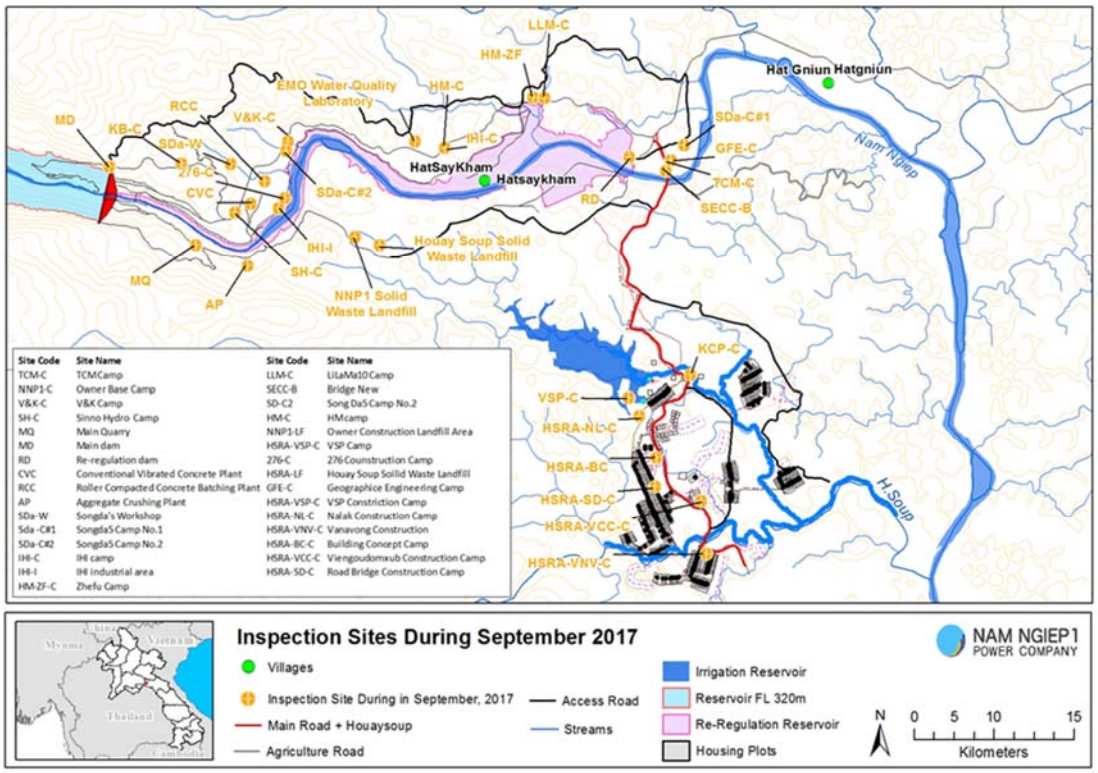
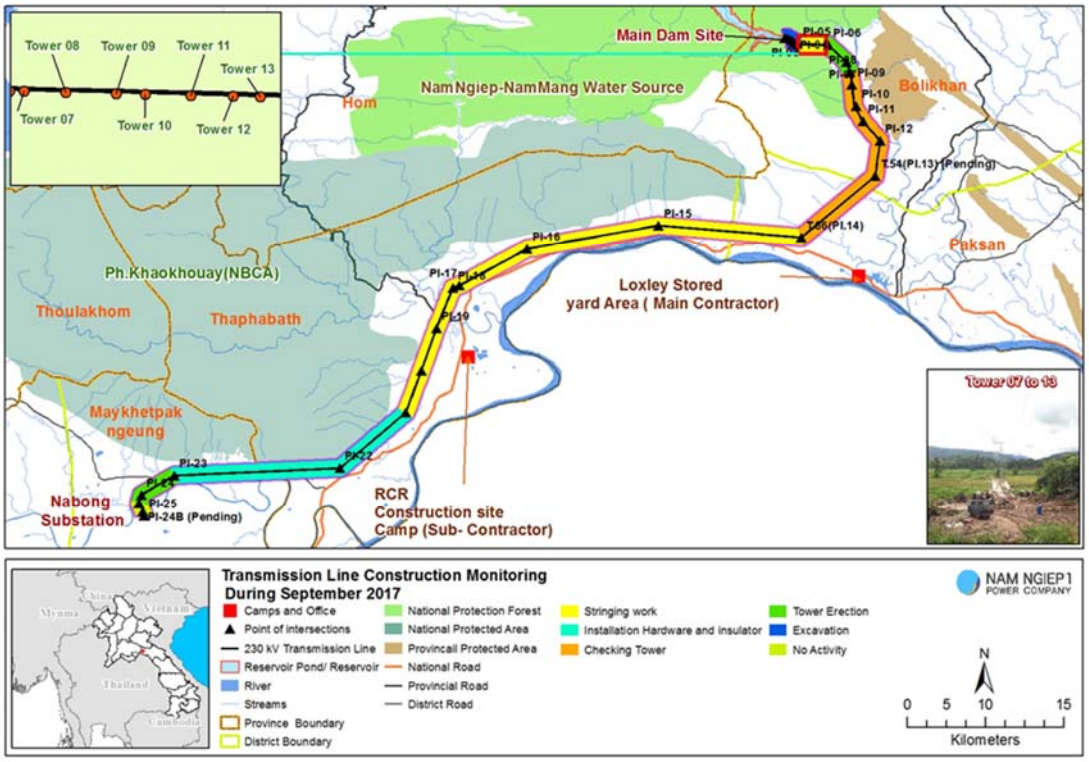


Figure 3-3: 230 kV Transmission Line Construction Monitoring



3.1.3 Environment Management Unit Monitoring

The Environmental Management Unit (EMU) of Bolikhamxay Province conducted their monthly mission on 20 September 2017, a wrap-up meeting was held at ESD office on the following day, a mission report was submitted, and a feedback to the report was provided by EMO on 27 September 2017.

Issues highlighted during this mission are:

- The collapsed of wall at the second wetland pond of the Waste Water Treatment System at LILAMA10 Camp, recommendation was to be fixed this urgently to handle waste water generated from the camp operation.
- Used tires were placed along the edge of vehicle parking platform next to Sino Hydro workshop were exposed to rain. The contractor needs to remove these tires into designated area with proper cover before next EMU mission in October 2017.

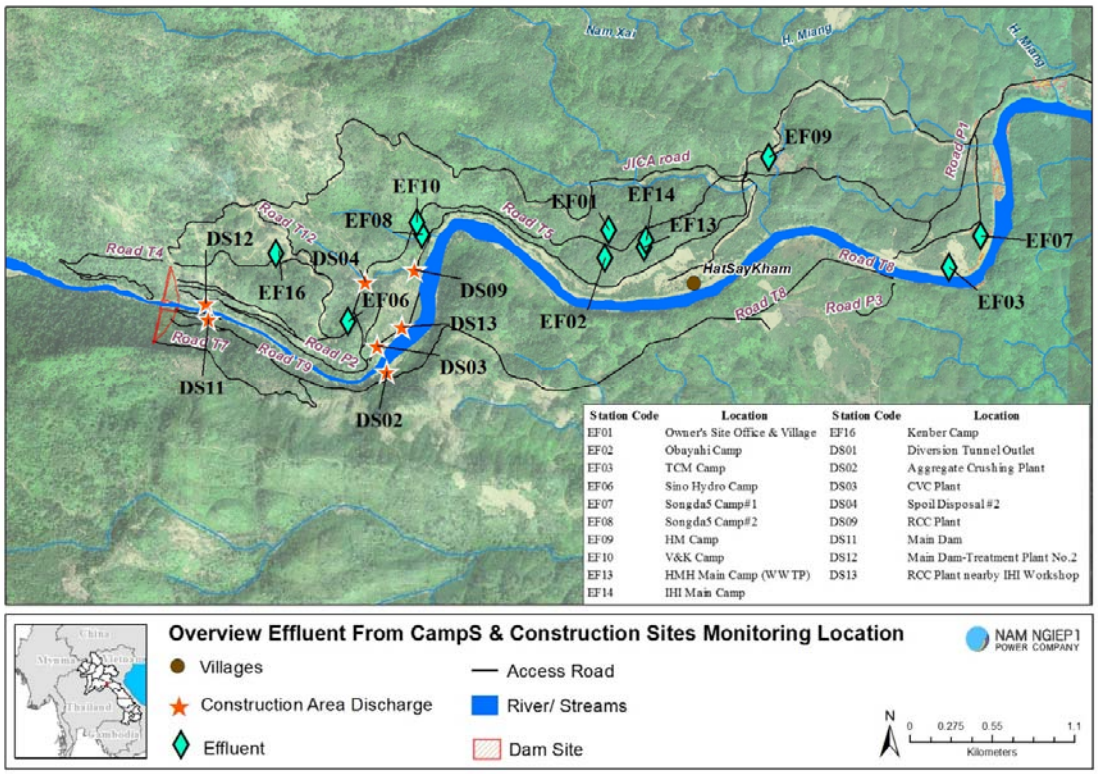
NNP1PC is working with the contractor to address these issues and official response with report on the progress will be submitted to EMU by the middle of October 2017.

3.2 Environmental Quality Monitoring

3.2.1 Effluent Discharge from Camps and Construction Sites

During September 2017, all camp effluents regardless of the discharge condition were monitored. Results of effluent monitoring from the camps and construction sites are presented 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 camp effluent monitoring results for September 2017 indicate significantly improvement on key parameters (BOD, total coliform and faecal coliform) and complied with the effluent standards for the second fortnightly mission. The turbidity and TSS result at the Aggregate Crushing Plant and RCC Plant has significantly improved during the reported month.

Progress on implementation of the corrective actions for the non-compliant camps and key construction areas is summarized below.

Table 3-4: Assessment of the Effluent Discharge from the Camps and Construction Sites against the Effluent Discharge Standards

Site	Sampling ID	Non-Compliance with Applicable Effluent Standards	Corrective Actions
Owner's Site Office and Village (OSOV)	EF01	Minor non-compliances for total nitrogen.	No corrective actions are needed.
Obayashi Corporation Camp	EF02	Minor non-compliances for ammonia nitrogen (NH_3-N), total nitrogen and residual chlorine.	The Contractor was suggested to reduce chlorination dosing rate. In addition, the effluent monitoring results from NNP1PC will be shared to Contractor as soon as possible for their improvement purpose.
Sino Hydro Camp	EF06	Minor non-compliances for ammonia nitrogen (NH_3-N), total nitrogen, total phosphorus and residual chlorine.	As above.
Song Da5 Camp No. 1	EF07	Minor non-compliances for TSS, ammonia nitrogen (NH_3-N), total nitrogen and residual chlorine.	As above.
Song Da5 Camp No. 2	EF08	Minor non-compliance for total nitrogen.	No corrective action was required.
Zhefu Camp (Subcontractor of Hitachi-Mitsubishi Hydro)	EF09	Minor non-compliance of pH.	Investigation for pH will be taken in October 2017. In addition, the effluent monitoring results from NNP1PC will be shared to Contractor as soon as possible for their improvement purpose.
V&K Camp	EF10	All monitored parameters	No corrective actions are needed.

Site	Sampling ID	Non-Compliance with Applicable Effluent Standards	Corrective Actions
		complied with the Standard.	
H-MH Main Camp (WWTS)	EF13	Non-compliance for BOD, COD, NH_3-N, total nitrogen and residual chlorine.	The Contractor was agreed to install air circulation into the chlorination tank for BOD removal purpose. In addition, the effluent monitoring results from NNP1PC will be shared to Contractor as soon as possible for their improvement purpose.
IHI Main Camp	EF14	Minor non-compliance for NH_3-N, COD, and total nitrogen.	The effluent monitoring results from NNP1PC will be shared to Contractor as soon as possible for their improvement purpose.
Kenber Camp	EF16	Non-compliance for pH.	As above.
Main Dam Construction Area (Waste Water Treatment Plant No.1)	DS11	Non-compliance for pH.	The Contractor was instructed to ensure effluent quality met with the Standard prior to discharge.
Main Dam Construction Area (Waste Water Treatment Plant No.2)	DS12	No construction effluent discharged during the mission.	
Spoil Disposal Area No.2 (Song Da5 Workshop)	DS04	Minor non-compliance for pH.	No action is needed. The low pH is common for the surface and ground water in this area.
CVC Plant	DS03	No discharge during the missions	
RCC Plant (discharge point at the weirs)	DS09	All monitored parameters complied with the Standard.	A weekly monitoring of the water quality was carried out jointly by NNP1PC and contractor to identify further improvement.
RCC Plant (Discharged nearby IHI Workshop)	DS13	All monitored parameters complied with the Standard.	
Aggregate Crushing Plant	DS02	Minor non-compliance for pH	As above. In addition, the contractor added lime to adjust pH. The pH level was complied with the Standard for the last two weeks in September 2017

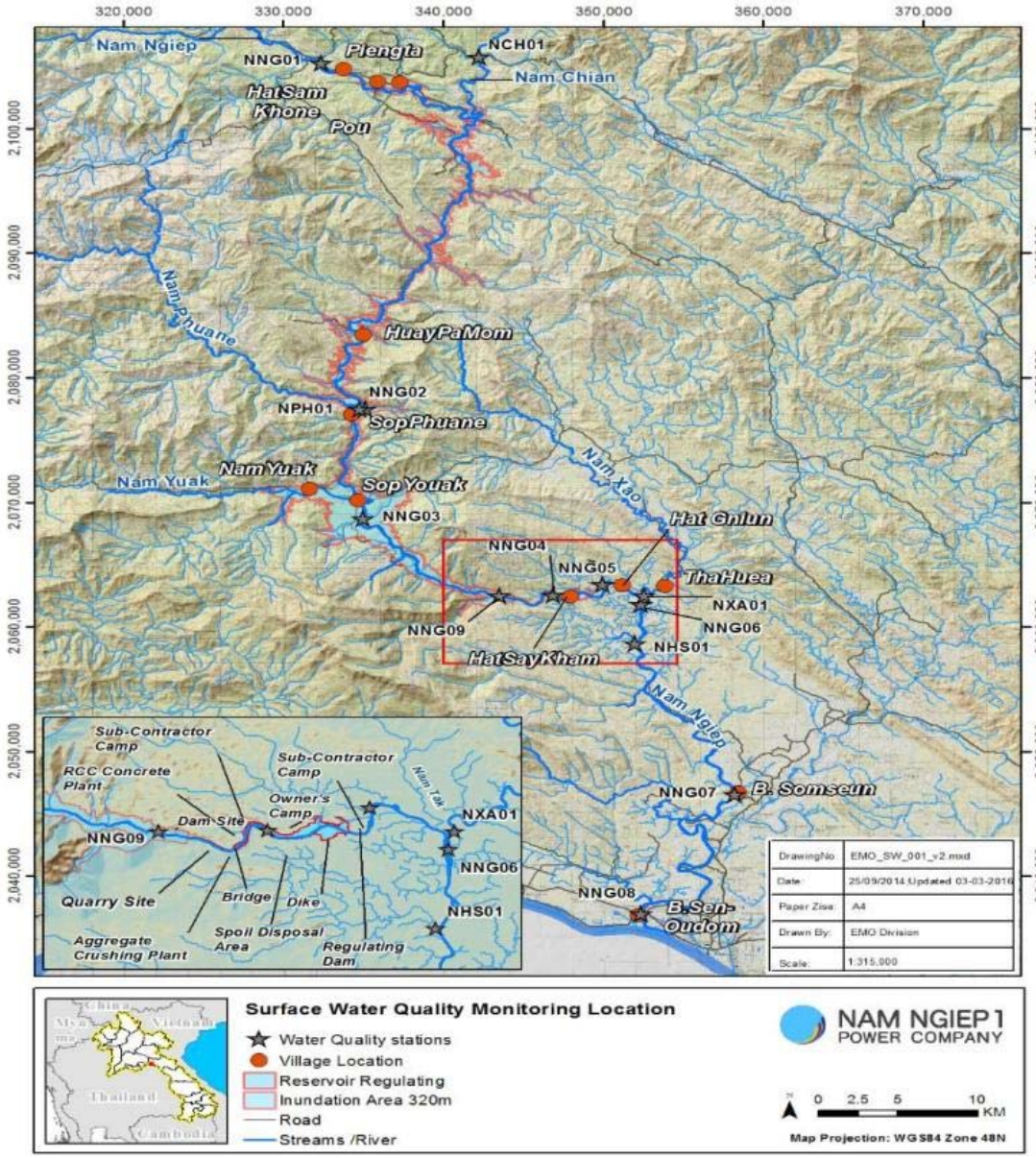
3.2.2 Ambient Surface Water Quality Monitoring

Surface water samples are collected and analysed twice a month[1] 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 thirteen stations shown in ***Figure 3-5*** below

During 11-15 September 2017, a daily emergency monitoring was carried out at the upstream of main dam (NNG09 and downstream of re-regulation dam (NNG05) to monitor the water quality and impact do to the breach of Nam Ao Dam. The emergency monitoring result is shown in

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

1 Monthly for chemical parameters and fortnightly for physical parameters



Key findings for surface and re-regulation reservoir water quality monitoring in August 2017 are shown in ***Table 3-5*** to ***Table 3-10*** below.

Table 3-5: 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	5-Sep-17	6-Sep-17	6-Sep-17	7-Sep-17	7-Sep-17	7-Sep-17	7-Sep-17	7-Sep-17	7-Sep-17	7-Sep-17
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	6.63	6.73	6.66	6.64	7.31	7.54	6.86	6.96	7.56	7.27
Sat. DO (%)		93.3	90.6	97.6	98.8	104.8	96.6	99.2	96.7	99.4	96.7
DO (mg/l)	>6.0	7.29	7.01	7.3	7.8	8.35	7.59	7.69	7.47	7.48	7.28
Conductivity (µs/cm)		83.7	58.1	64	68.1	73	70	67.6	67.7	62.7	52.6
TDS (mg/l)		41	29	32	34	36	35	33	33	31	26
Temperature (°C)		24.6	26.7	27.5	25.9	25.48	26.04	27.1	27.3	28.4	28.4
Turbidity (NTU)		51.3	3,531	2,152	55.7	49.31	42.37	49.8	51.8	58.8	610
TSS (mg/l)		212	2,550	1,610	221.72	178.66	143.64	148.92	127.41	173.91	313.15
BOD_5 (mg/l)	<1.5	1.84	<1.5	1.81	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
COD (mg/l)	<5	11.5	136	49.7	13.3	12.5	5.6	6.9	7.7	7.7	12.9
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
NO3-N (mg/l)	<5	0.14	0.16	0.51	0.15	0.15	0.17	0.15	0.14	0.15	0.15
Faecal coliform (MPN/100ml)	<1,000	1,600	1,600	920	1,600	1,700	1,600	1,600	920	1,700	920
Total Coliform (MPN/100ml)	<5,000	1,600	3,500	1,600	3,500	5,400	1,600	1,600	1,600	3,500	1,600
Arsenic (mg/l)	<0.01	0.0024	0.0089	0.0069	0.0024	0.0022	0.0014	0.002	0.0018	0.0021	0.0036
Total Iron (mg/l)		6.13	47	30.9	10.2	7.6	4.76	6.84	5.38	7.61	15.2

Since Nam Ngiep surface water quality monitoring programme commenced in September 2014, EMO has frequently found elevated levels of COD and faecal coliform with concentrations exceeding the surface water quality standards.

Table 3-6: Results of Physical Parameters of Nam Ngiep Surface Water Quality Monitoring – Daily Emergency Monitoring response to Nam Au Dam Broken (11-15 Sept 2017)

	River Name	Nam Ngiep							
	Zone	Location Refer to Construction Sites							
		Upstream				Downstream			
	Station Code	NNG09				NNG05			
	Date	11-Sep-17	12-Sep-17	13-Sep-17	15-Sep-17	11-Sep-17	12-Sep-17	13-Sep-17	15-Sep-17
Parameters (Unit)	**Guideline**								
pH	5.0 - 9.0	7.08	6.51	7.55	6.54	7.2	6.66	6.79	6.74
Sat. DO (%)		100.6	76.15	100.6	98	102	94.6	99.8	98
DO (mg/l)	>6.0	7.69	**4.93**	7.65	7.72	8.01	7.22	7.56	7.48
Conductivity (µs/cm)		83.7	23.6	56.2	59.6	73.7	51.8	49.7	55.2
TDS (mg/l)		41.85	12	28.9	29	36.85	25	24.85	27
Temperature (°C)		27.5	30.7	27.9	25.6	26.7	28	28.3	27.3

	River Name	Nam Ngiep							
	Zone	Location Refer to Construction Sites							
		Upstream				Downstream			
	Station Code	NNG09				NNG05			
	Date	11-Sep-17	12-Sep-17	13-Sep-17	15-Sep-17	11-Sep-17	12-Sep-17	13-Sep-17	15-Sep-17
Parameters (Unit)	**Guideline**								
Turbidity (NTU)		46.5	**115,800**	3,240	1,832	37.9	**30,770**	3,812	2,840
TSS (mg/l)		68.3	**125,172**	1,715	1,465	35.7	**19,447**	26,168	1,573
COD (mg/l)	<5		**1,882**				**380**		

Table 3-7 *Results of Physical Parameters of Nam Ngiep Surface Water Quality Monitoring – Weekly and Fortnightly*

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	14-Sep-17	14-Sep-17	14-Sep-17	14-Sep-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.19	6.75	7.29	6.57
Sat. DO (%)		111	118.6	122.4	110.8
DO (mg/l)	>6.0	8.62	9.23	9.62	8.67
Conductivity (µs/cm)		99	216	111	130
TDS (mg/l)		49	108	55	65
Temperature (°C)		26.7	26.29	26.91	27.07
Turbidity (NTU)		2,207	1,607	1,139	3,566
TSS (mg/l)		1,697	923	475	2,082
BOD_5 (mg/l)	<1.5	<1.5	<1.5	<1.5	<1.5
Faecal coliform (MPN/100ml)	<1,000	1,600	1,600	1,600	1,600
Total Coliform (MPN/100ml)	<5,000	3,500	3,500	1,600	1,600

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	19-Sep-17			20-Sep-17	20-Sep-17	20-Sep-17	20-Sep-17	20-Sep-17	20-Sep-17	20-Sep-17
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	6.61	No accessible to the sampling site due to the road eroded.		6.71	7.16	7.45	6.39	6.47	6.77	6.62
Sat. DO (%)		93.3			100	107.4	107.5	101.8	98.3	97.5	89.8
DO (mg/l)	>6.0	7.35			7.83	8.51	8.53	8.01	7.56	7.32	6.93
Conductivity (µs/cm)		89.1			68.6	188	127	68.4	66.5	61.7	55.1
TDS (mg/l)		45			34.3	94	63	34	33	30	27
Temperature (°C)		25.3			26.3	25.81	25.92	26.4	27.5	28.4	27.9
Turbidity (NTU)		61			52.1	50.91	40.22	52.7	36.6	44.2	39.2
TSS (mg/l)					191.85	149.58	96	140			
BOD_5 (mg/l)	<1.5				<1.5	<1.5	<1.5	<1.5			
Faecal coliform (MPN/100ml)	<1,000				1,600	3,500	1,600	1,600			
Total Coliform (MPN/100ml)	<5,000				1,700	3,500	1,600	1,600			

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

Nam Chiane (NCH01) is located about 66 km upstream of the main dam. The COD and BOD_5 slightly exceeded the Surface Water Quality Standard with values recorded as 9.5 mg/l and 1.68 mg/l respectively.

Nam Phouan is located about 24 km upstream of NNP1 Project construction site. Faecal coliform exceeded the Surface Water Quality Standard with values recorded at 1,600 MPN/100 ml.

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

Nam Xao has a confluence with the Nam Ngiep downstream of the NNP1 Project construction site. The COD and faecal coliform exceeded the Surface Water Quality Standard with values recorded at 8.1 mg/l and 1,700 MPN/100 ml respectively.

Houay Soup Nyai has a confluence with the Nam Ngiep River downstream of NNP1 Project construction site. The COD and faecal coliform exceeded the Surface Water Quality Standard with values recorded at 8.5 mg/l and 1,600 MPN/100 ml respectively.

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 Phouan	Nam Xao	Nam Houay Soup
Zone	Location Refer to Construction Sites			
	Tributaries Upstream		Tributaries Downstream	
Station Code	NCH01	NPH01	NXA01	NHS01
Date	5-Sep-17	6-Sep-17	7-Sep-17	7-Sep-17
Parameters (Unit)	**Guideline**			
pH	5.0 - 9.0	7.79	6.82	6.97	7.47
Sat. DO (%)		98.4	97	93.7	86.3
DO (mg/l)	>6.0	7.83	7.66	7.23	6.71
Conductivity (µs/cm)		26.4	85.8	70.9	13.68
TDS (mg/l)		13	43	35	6
Temperature (°C)		24.3	25.5	27.4	27
Turbidity (NTU)		18.6	15.9	16.7	14.39
TSS (mg/l)		48	43.2	27.2	13.2
BOD_5 (mg/l)	<1.5	1.68	<1.5	<1.5	<1.5
COD (mg/l)	<5	9.5	<5.0	8.1	8.5
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2
NO3-N (mg/l)	<5	0.1	0.14	0.09	0.11
Faecal coliform (MPN/100ml)	<1,000	920	1,600	1,700	1,600
Total Coliform (MPN/100ml)	<5,000	1,600	1,600	3,500	1,600
Arsenic (mg/l)	<0.01	0.0005	0.0009	0.0004	<0.0003
Total Iron (mg/l)		3.1	1.77	1.81	1.18

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 Phouan	Nam Xao	Nam Houay Soup
Zone	Location Refer to Construction Sites			
	Tributaries Upstream		Tributaries Downstream	
Station Code	NCH01	NPH01	NXA01	NHS01
Date	19-Sep-17		20-Sep-17	20-Sep-17
Parameters (Unit)	**Guideline**			
pH	5.0 - 9.0	8.14	No accessible to the sampling	6.47	6.05
Sat. DO (%)		97.1		91.8	80.9
DO (mg/l)	>6.0	7.66		6.95	6.29
Conductivity (µs/cm)		27.4		66.7	13.35

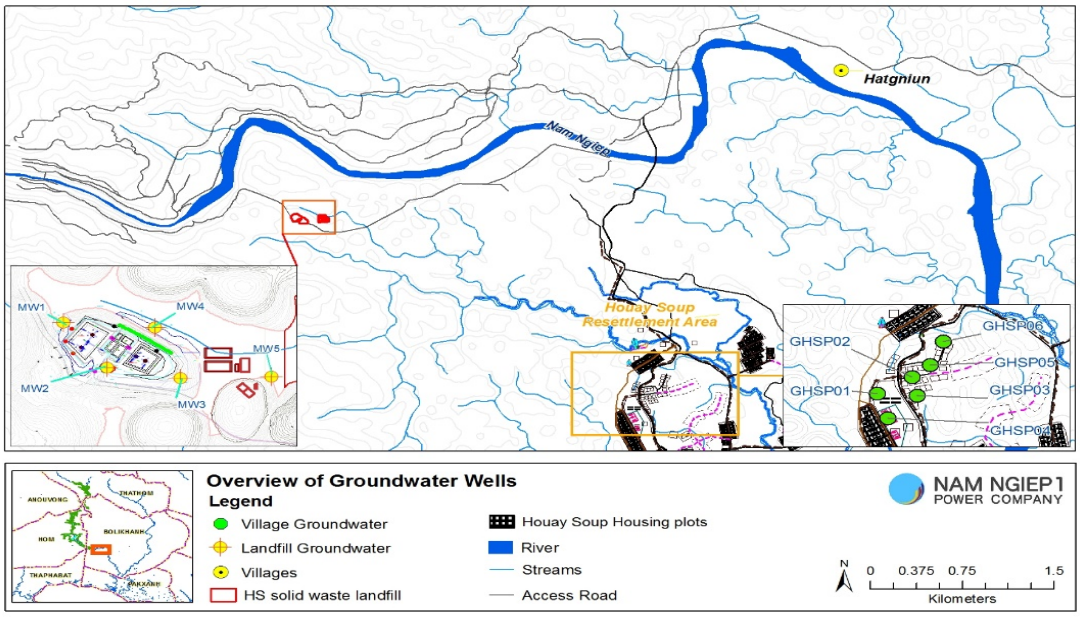
TDS (mg/l)		16	site due to the road eroded.	33	6
Temperature (°C)		25		28.4	27
Turbidity (NTU)		10.72		9.53	7.52

3.2.3 Groundwater Quality Monitoring

During September 2017, analysis was carried out for six boreholes built by the Project for resettlers at Houay Soup Resettlement Area (HSRA), and five built at the landfills.

A result of community's groundwater quality is reported regularly to the villagers and local health centres.

Figure 3-6: Groundwater Quality Monitoring Locations



Houay Soup Resettlement Area (HSRA)

Most of the parameters monitored at the six boreholes complied with the relevant standards, except lead at the borehole No.4 (GHSP04). This exceedance will be confirmed by October 2017

Table 3-10: Groundwater Quality Monitoring Results for Houay Soup Resettlement Area

	Site Name	Houay Soup Resettlement Area					
	Station Code	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
	Date	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17
Parameter (Unit)	**Guideline**						
pH	6.5-9.2	6.84	7.04	6.99	6.94	7.02	7.06
DO (%)		88.7	83.8	64.5	65.0	77.6	89.8
DO (mg/l)		6.69	6.35	4.90	4.92	5.88	6.73
Conductivity (µs/cm)	<1,200	392	262	390	119.3	276	370
TDS (mg/l)		195	131	195	59	138	185
Temperature (°C)		27.5	27.7	27.7	27.9	27.7	28.4

	Site Name	Houay Soup Resettlement Area					
	Station Code	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
	Date	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17
Parameter (Unit)	**Guideline**						
Turbidity (NTU)	<20	1.91	1.34	1.49	1.70	1.51	1.58
Nitrate (mg/l)	<45	0.23	0.21	0.21	<0.02	0.2	0.23
Total Hardness (mg/l)	<500	247	160	240	125	179	253
Nitrite (mg/l)		<0.02	<0.02	<0.02	<0.02	<0.002	<0.002
Fluoride (mg/l)		0.04	0.03	0.03	<0.02	0.02	0.03
Arsenic (mg/l)	<0.05	0.0004	<0.0003	0.0004	<0.0003	0.0004	0.0006
Manganese (mg/l)	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium (mg/l)	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	<0.01	<0.008	<0.008	<0.008	0.209	<0.008	<0.008
Iron (mg/l)	<1	<0.01	<0.01	0.013	0.022	0.014	<0.01
Faecal coliform (MPN/100 ml)	0	0	0	0	0	0	0
E. Coli Bacteria (MPN/100 ml)	0	0	0	0	0	0	0

Landfill Groundwater Monitoring

Lead was detected in three of four boreholes at NNP1 Project Landfill (at MW1 and MW3) and one borehole at Houay Soup Landfill (MW5), higher than the standard, with range values recorded between 0.017 – 0.106 mg/l. In addition, the total coliform and faecal coliform contamination were found in the (MW1, MW3 and MW5). These lead results are similar to the levels found in the previous months. It is unlikely that the levels of lead found in those boreholes are caused by seepage of leachate pond from the landfills - not least because lead has not been detected in the leachate.

Table 3-11 *Landfill Groundwater Quality Monitoring Results*

	Site Name	NNP1PC Landfill				Houay Soup Landfill
	Station	MW1	MW2	MW3	MW4	MW5
	Date	18-Sep-17	18-Sep-17	18-Sep-17	18-Sep-17	18-Sep-17
Parameter (Unit)	**Guideline**					
pH		6.12	5.48	5.92	5.84	5.78
Sat. DO (%)		35.2	49.4	36.6	42.4	77.7
DO (mg/l)		2.64	3.62	2.76	3.17	5.65
Conductivity (µS/cm)		213	21.38	75.2	36.2	89.8
TDS (mg/l)		106	10	36.5	18	45
Temperature (°C)		28.8	28.8	28.2	28.7	28.9
Turbidity (NTU)		2.67	3.19	15.29	3.14	3.23
Total Nitrogen (mg/l)		1.22	0.41	0.36	1	0.94
Lead (mg/l)	<0.01	0.017	<0.010	0.019	<0.010	0.106
Total Phosphorus (mg/l)		0.07	<0.010	0.08	0.05	<0.010
Faecal Coliform (MPN/100ml)		0	0	0	0	0
Total Coliform (MPN/100ml)		0	0	0	0	0
NH_3-N (mg/l)		<0.2	<0.2	<0.2	<0.2	<0.2

Parameter (Unit)	Site Name	NNP1PC Landfill				Houay Soup Landfill
	Station	MW1	MW2	MW3	MW4	MW5
	Date	18-Sep-17	18-Sep-17	18-Sep-17	18-Sep-17	18-Sep-17
	Guideline					
Copper (mg/l)		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Total Petroleum (mg/l)		<1.0	<1.0	<1.0	<1.0	<1.0

3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Water quality monitoring for GFWS systems is conducted on a monthly basis with the aim to alert the users in case of health risks when using the water for bathing or washing. During August 2017, water samples were taken from the taps at Thaheua and Hat Gniun Villages.

Results of the assessment for GFWS of both Thaheua and Hat Gniun Villages are shown and summarised as below:

Thahuea Village (WTHH02): All parameters complied with the National Drinking Water Standards except for faecal coliforms and E. Coli which were found to be 49 MPN/100 ml for both parameters.

Ban Hat Gnuin (WHGN2): All parameters complied with the National Drinking Water Standards except for faecal coliforms and E. Coli, which were found to be 130 MPN/100 ml for both parameters.

The presence of the E.Coli found in the GFWS system is a normal situation during rainy season where the surface water is likely to be contaminated by run-off from grazing land in the source area. The local villagers were informed about the results and encouraged to boil their drinking water.

Table 3-12: Results of the Gravity Fed Water Supply Quality Monitoring

	Site Name	Thaheua Village	Hat Gnuin Village
	Station Code	WTHH02	WHGN02
	Date	15-Sep-17	15-Sep-17
	Guideline		
pH	6.5-9.2	6.62	6.64
DO (%)		93.5	96.5
DO (mg/l)		6.95	7.17
Conductivity (µs/cm)	<1,200	34.6	50.9
TDS (mg/l)		17	25
Temperature (°C)		28.8	28.8
Turbidity (NTU)	<20	2.70	2.67
Nitrate (mg/l)	<45	0.27	0.31
Total Hardness (mg/l)	<500	25.9	36.8
Fluoride (mg/l)	<1.0	<0.02	<0.02
Nitrite (mg/l)		<0.07	<0.07
Arsenic (mg/l)	<0.05	<0.0003	0.0003
Lead (mg/l)		<0.010	<0.010
Faecal coliform (MPN/100 ml)	0	13	22
Ecoli Bacteria (MPN/100 ml)	0	13	22

3.2.5 Landfill Leachate Monitoring

During September 2017, water samples were taken from the NNP1 Project Landfill's final leachate pond (LL4), and from the Houay Soup Landfill's final leachate pond (LL6) due to there was no discharge during the mission, the results indicate compliance with the relevant standards. The location of landfill leachate monitoring is displayed below.

Figure 3-7: Landfill Leachate Monitoring Location

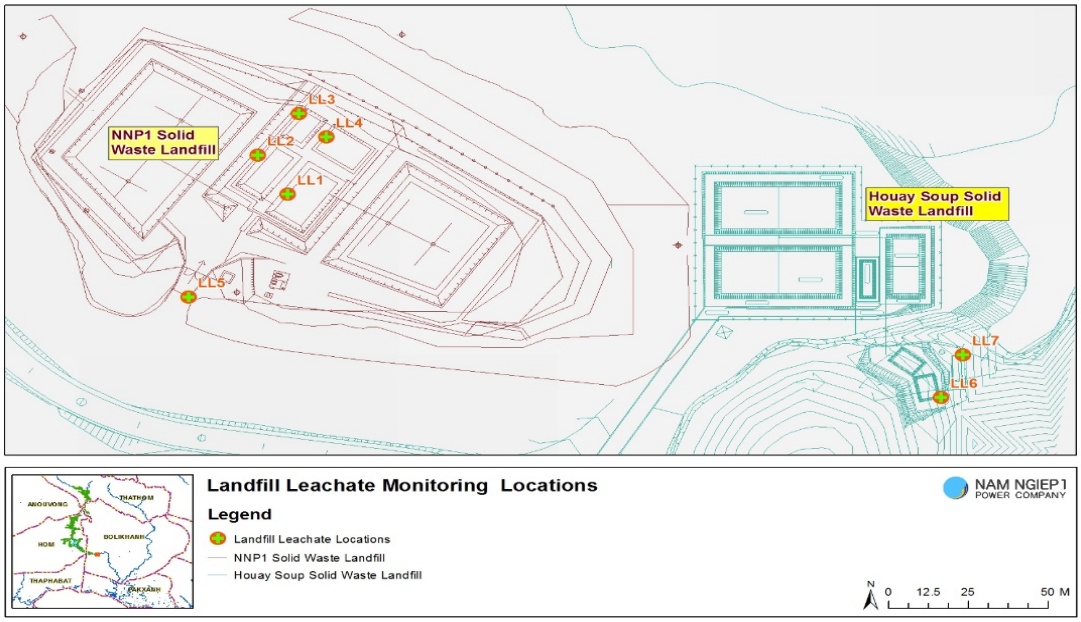


Table 3-13: Landfill Leachate Monitoring Results

	Site Name	NNP1 Project Landfill Leachate		Houay Soup Landfill	
	Location	Pond No.04	Discharge Point	Last pond	Discharged Point
	Station	LL4	LL5	LL6	LL7
	Date	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17
Parameter (Unit)	Guideline				
pH	6.0-9.0	7.44		8.42	
Sat. DO (%)		118.3	No	95.9	No
DO (mg/l)		9.06	Discharge	7.15	Discharge
Conductivity (µS/cm)		284		28.6	
TDS (mg/l)		142		14	
Temperature (°C)		27		28.3	
Turbidity (NTU)		13.84		10.74	
BOD_5 (mg/l)	<30	20		15	
COD (mg/l)	<125	104		<25	
Mercury (mg/l)		<0.0002		<0.0002	
Total nitrogen (mg/l)	<10	8		1	
Arsenic (mg/l)		0.002		0.0004	
Manganese (mg/l)		0.141		0.018	
Lead (mg/l)	<0.2	<0.010		<0.010	

Parameter (Unit)	Site Name	NNP1 Project Landfill Leachate		Houay Soup Landfill	
	Location	Pond No.04	Discharge Point	Last pond	Discharged Point
	Station	LL4	LL5	LL6	LL7
	Date	15-Sep-17	15-Sep-17	15-Sep-17	15-Sep-17
	Guideline				
Iron (mg/l)		0.518		0.17	
Faecal Coliform (MPN/100ml)		170		79	
Total Coliform (MPN/100ml)	<400	170		130	
Total Petroleum Hydrocarbons (mg/l)		<1		<1	

3.2.6 Dust Monitoring

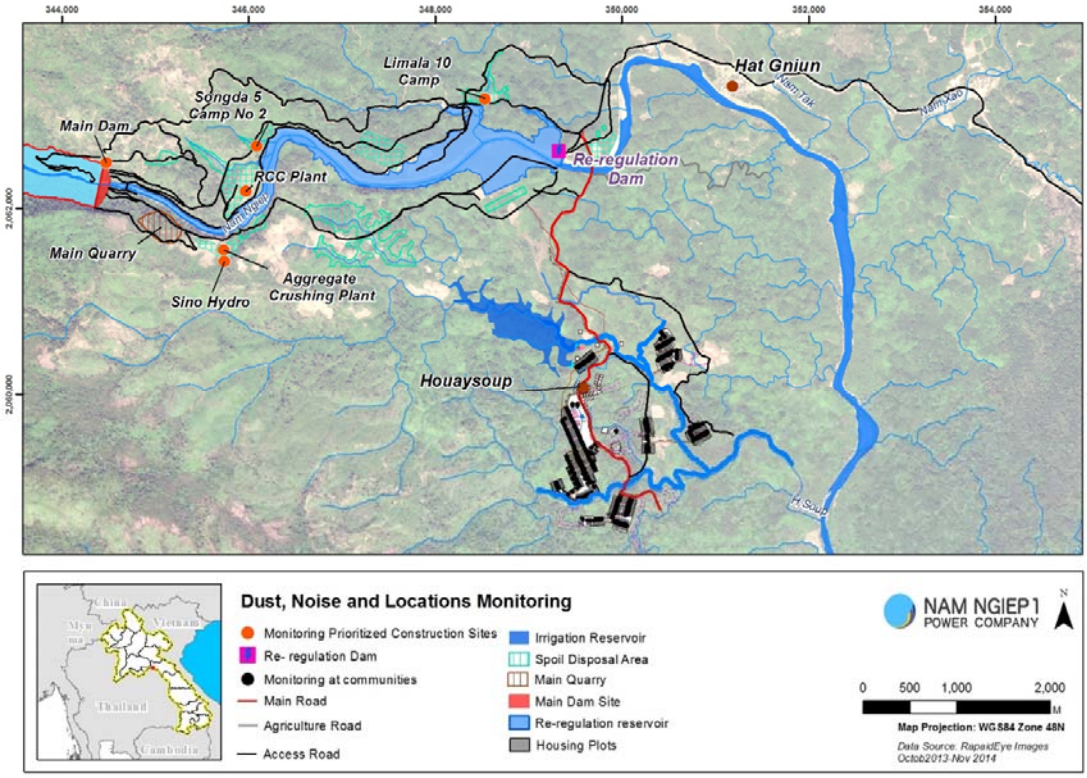
The monitoring points are indicated on the map in ***Figure 3-8***. Most of dust measurements complied with the National Standard. However, staff have been advised to wear dust masks while working in the areas at risk. The results are presented in ***Annex 2***.

3.2.7 Noise Monitoring

During August 2017, noise monitoring was conducted in Hat Gniun and Houay Soup Resettlement Area (HSRA) for at least 72 consecutive hours. Noise monitoring was also conducted at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Temporary Worker Camp, Main Dam and Lilama10 Camp to assess possible impact on workers' health for 24 consecutive hours.

The noise monitoring location are described in *Error! Reference source not found.* below:

Figure 3-8: Noise and Dust Emission Monitoring Locations



The noise levels recorded at those monitoring stations indicated full compliance with the National Standard for the period of 06:01-22:00. The noise levels during the period of 22:01-06:00 were slightly higher than the Standard at the Aggregate Crushing Plant, RCC Plant, Song Da 5 Camp No. 2, and Sino Hydro Temporary Worker Camp [between 50.92 – 63.49 dB(A) compared to the Standard of 50 dB(A)], and at Hat Gnuin Village and Houay Soup Resettlement Area [45.64 – 47.40 dB(A) compared to the Standard of 45 dB(A)].

3.3 PROJECT WASTE MANAGEMENT

3.3.1 Solid Waste Management

In September 2017, an approximately 154 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 32.9 m^3 compared to August 2017. A waste bag check was conducted in a daily basis at the camps before disposing, there was no mixed waste found during the reported month.

A total of 720 kg of recyclable waste was sold to Khounmixay Processing Factory by the Contractors as shown in *Error! Reference source not found.*.

Table 3-14: Amounts of Recyclable Waste Sold

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by September 2017
Construction activity				
1	Scrap metal	kg	271	29,091
	Sub-Total 1	**kg**	**271**	**29,091**
Operation camp				
2	Glass bottles	kg	193	472

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by September 2017
3	Plastic bottles	kg	144	202.5
4	Paper/Cardboard	kg	100	142.5
5	Aluminium can	kg	12	142
Sub-Total 2		**kg**	**449**	**959**
Grand Total 1+2		**kg**	**720**	**30,050**
Sub-Total 2		**kg**	**449**	**959**
Grand Total 1+2		**kg**	**720**	**30,050**

The food waste generated from the Owner's Site Office and Village (OSOV), selected contractor's camps was collected by Hatsaykham Villagers for use as animal feed (pig and poultry). A total of 6,609 kg was collected in September 2017, an increasing of 1,556 kg from August 2017 as shown in ***Table 3-15*** below.

Table 3-15 Amounts of Food Waste Collected by Villagers

NO.	SITE NAME	UNIT	TOTAL
1	SongDa5 Camp No. 2	kg	2,666
2	SongDa5 Camp No. 1	kg	2,210
3	Obayashi Corporation Camp	kg	1,006
4	Owner's Village and Site Office (OSOV)	kg	491
5	LILAMA 10 Camp	kg	130
6	Kenber Camp	kg	106
Total		**kg**	**6,609**

3.3.2 Hazardous Materials and Waste Management

In September 2017, a total of 1,924 empty containers of sulphuric acid from contractors were sold to Khounmixay Factory. A total of 237 empty spray cans and 279 ink cartridges from OSOV and Paksan ESD office were given to the same vendor as free of charge. A record of waste inventories is shown in ***Table 3-16***.

Table 3-16: Results of Hazardous Material Inventory

No.	Hazardous Waste Type	Unit	Total in September 2017 (A)	Disposal by Selling (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre (l)	9,540	3,200	6,340
2	Used oil filters	No.	846	310	536
3	Empty paint and spray cans	can	561	237	524
4	Empty used chemical drum/container	Drum (20 litre)	2,119	1,924	195
5	Used tyre	No.	546	124	422
6	Ink cartridge	No.	390	279	111
7	Cement bag	bag	300	0	300
8	Acid and caustic cleaners	bottle	172	0	172

No.	Hazardous Waste Type	Unit	Total in September 2017 (A)	Disposal by Selling (B)	Remainder (A - B)
9	Empty used oil drum/container	drum (20 l)	154	53	101
10	Empty used chemical drum/container	drum (200 l)	36	0	36
11	Empty used oil drum/container	drum (200 l)	93	16	77
12	Halogen/fluorescent bulbs	No.	56	0	56
13	Contaminated soil, sawdust and concrete	kg	1,277	220	1,057
14	Contaminated textile and material	kg	231	119	112
15	Lithium-ion batteries	No.	6	0	6
16	Lead acid batteries	No.	20	0	20
17	Clinical waste	kg	5	0	5
18	Empty contaminated bitumen drum/container	drum (200 l)	0	0	0
19	Used oil mixed with water	liter (l)	0	0	0

A total of 54 m^3 of sewage sludge & black water from contractor's camps was disposed at Spoil Disposal Area No. 6 following NNP1PC's Procedure for Sewage and Black Water Disposal.

3.4 Community Waste Management

3.4.1 Community Recycling Programme

In September 2017, a total of 112 kg of recyclable waste was recorded, a decrease of 350 kg compared to August 2017.

The types and amounts of waste recycled and remained in the Community Recycle Waste Bank in September 2017 are presented in ***Table 3-17***.

Table 3-17: Types and amounts of waste traded

Types of Waste	Unit	Remaining in August 2017	Additions in September 2017	Sold	Remaining in September 2017
Scrap metal	Kg	718	19	524	213
Glass bottles	Kg	262	40	0	302
Paper/cardboard	Kg	31	35	31	35
Aluminium cans	Kg	39	2	35	6
Plastic bottles	Kg	39	16	34	21

Total	**Kg**	**1,098**	**112**	**624**	**577**

3.4.2 Houay Soup Resettlement Area Waste Management

The PKC Contractor completed the slope stabilisation and erosion control at Houay Soup Land fill. A joined inspection was successfully completed on 29 September 2017.

An approximate of 1.7 m^3 of solid waste from the local contractors and residents at HSRA was disposed at the Houay Soup Landfill for the reported month.

3.5 Watershed and Biodiversity Management

3.5.1 Watershed Management

3.5.1.1 PREPARATION OF THE NAM NGIEP 1 WATERSHED MANAGEMENT PLAN

The technical workshop for NNP1 Watershed Management Plan with relevant GOL counterparts was conducted from 26-27 September 2017. The workshop was attended by 39 participants (5 women) from Watershed and Reservoir Protection Offices (DFRM, XSB PoNRE, BLK PAFO), Department of Forest Resource Management (DFRM), Department of Water Resource Management, Department of Livestock and Fishery, Provincial Department of Natural Resource and Environment of Bolikhamxay and Xaysomboun Provinces, Provincial Department of Agriculture and Forestry of Bolikhamxay and Xaysomboun Provinces, relevant government line agencies at district level of Bolikhamxay and Xaysomboun Provinces, and NNP1PC.

Most of participants agreed with the proposed activity package, there were only minor suggestions and recommendations received for further improvement. Next discussion for GOL approval was planned for December 2017.

3.5.1.2 PREPARATION OF PROVINCIAL REGULATION FOR THE WATERSHED MANAGEMENT

The draft provincial regulation was discussed with representatives of WRPOs on 27 September 2017. The meeting agreed with the regulation and planned for village consultation during 16-31 October 2017. The meeting recommended that all villages within 15km from NNP1 watershed boundary to include in the consultation of the regulation.

3.5.2 Biodiversity Offset Management

3.5.2.1 PREPARATION OF BIODIVERSITY OFFSET MANAGEMENT PLAN

NNP1 and ADB discussed the NNP1 proposal “No Net Loss Forecast” on 25 September 2017 in response to the Biodiversity Offset Option Paper (BOOP) prepared by ADB. It was agreed that the proposal continue to be developed and it is expected to be finalized in October 2017. Once the proposal is agreed between ADB and NNP1, it will serve as one of the key references for BOMP development.

3.5.2.2 IMPLEMENTATION OF PRE-BIODIVERSITY OFFSET MANAGEMENT PLAN

The pre-Biodiversity Offset Management Plan (pre-BOMP) covering the period of January to December 2017 was implemented since March 2017 by Bolikhamxay province at Nam Chouan Nam Xang primary Biodiversity Offset site. During September 2017, patrolling

activity is initiated at site. The patrolling team was set up, training was completed, and detail patrolling plan approved by Biodiversity Offset Management Committee (BOMC) on 18 September 2017. Two patrolling teams have started the field work from 19 September 2017 in both Viengthong and Xaychamphone Districts' area.

It is foreseen that the development of BOMP will continue to be delayed, therefore, pre-BOMP2 is being discussed and developed to cover the period of January to December 2018.

3.5.3 Biomass Clearance

There was a continuous raining during the month of September, therefore, there was no vegetation cutting during the reported period; however, some phases of biomass clearance were in progress in the field. As of September 2017, a total of 149.95 ha out of 1,641 ha was counted as 100% completed area for biomass clearance, while 1017.32 ha are in progress for stock piling and burning. *Error! Reference source not found.* below summarizes cumulative progress of biomass clearance by block up to the end of September 2017.

It was clear that the progress of biomass clearance under the current contractor is very slow, five new local contractors are being recruited during the reported period to support the clearance. Their contract is being finalized and it is expected that the five new contractors will be on board and start the clearance work during October 2017.

Table 3-18 *Biomass Clearance Progress in Each Priority Area as of 30 September 2017.*

Target biomass clearance area		Biomass clearance area progress in Ha as of 30 September 2017	
Block	**Total in Ha**	**Total biomass clearance in progress area in Ha**	**Completed biomass clearance area in Ha**
B1	109.24	54.43	
B2	158.63	92.79	8.54
B3	80.35	38.94	
B4	163.74	153.67	111.11
B5	340.14	128.07	5.62
B6	31.92	4.41	
B7	39.65	2.26	
B8	37.61	8.97	
B9	52.75	6.44	
B10	269.1	169.71	
B11	89.98	89.98	
B12	64.11	64.11	

Target biomass clearance area		Biomass clearance area progress in Ha as of 30 September 2017	
Block	**Total in Ha**	**Total biomass clearance in progress area in Ha**	**Completed biomass clearance area in Ha**
B13	101.24	101.24	
B14	43.33	43.33	
B15	43.73	43.73	22.71
B16	3.32	3.32	
B17	7.96	7.96	1.97
B18	3.95	3.95	
Total	**1,640.75**	**1,017.32**	**149.95**

4. FISHERY MONITORING

In addition to the fishery monitoring program that usually carry out, the NNP1 has assessed the situation of fish kill due to the Nam Ao dam breach in the upstream of NNP1 watershed area during the second week of September. The gathered information is being put into the database and a report is being prepared for concerned stakeholders.

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

The overall progress of fish monitoring programme is illustrated in *Error! Reference source not found.* below.

Figure 4-1: Gantt Chart of Fish Monitoring Programme as of 30 September 2017

(a) S-Curve of fish catch monitoring programme

	Task List / Steps of work		Weight (%)	YEAR 2017												% S-Curve	Assigned to
				Q1			Q2			Q3			Q4				
				01	02	03	04	05	06	07	08	09	10	11	12		
1	**Daily catch logbook and Verification Survey**	Planed	-													100	
		Actual	-													97	
1.1	Daily catch logbook data collection on 108 HHs in 25 villages	Planed	24	2	2	2	2	2	2	2	2	2	2	2	2	94	NNP1 EMO Fish Monitoring Team
		Actual	17.5	1.5	2.0	3.0	2.0	1.5	2.0	2.0	1.5	2.0				91	
1.2	Daily catch logbook verification survey for Q2 2016 to Q1 2017 on 144 HHs	Planed	4	2		2										88	NNP1 EMO Fish Monitoring Team
		Actual	4	2		2										85	
1.3	GPS for Fishing location cover 25 villages	Planed	8				2	2	2	2						82	NNP1 EMO Fish Monitoring Team
		Actual	8								8					79	
1.4	Make the posters for fish species and fishing gear composition along Nam Ngiep River	Planed	2											2		76	NNP1 EMO Fish Monitoring Team
		Actual	-													74	
2	**Species Veification Survey**	Planed	-													71	
		Actual	-													68	
2.1	Survey design, interview form design, test and development	Planed	2		2											65	Consultant and NNP1 EMO Fish Monitoring Team
		Actual	2						2							62	
2.2	Data collection and validation on 108 HHs	Planed	8		2	3	3									59	NNP1 EMO Fish Monitoring Team
		Actual	8						6	2						56	
3	**Fish Migration and Spawning Survey**															53	
																50	
3.1	Survey design, interview form design, test and development	Planed	2	2												47	Consultant and NNP1 EMO Fish Monitoring Team
		Actual	2	2												44	
3.2	Data collection and validation on 88 experience fishers	Planed	12	6	6											41	NNP1 EMO Fish Monitoring Team
		Actual	12	2		3										38	
4	**Data management and report**															35	
																32	
4.1	Data input to database system	Planed	24	2	2	2	2	2	2	2	2	2	2	2	2	29	NNP1 EMO Fish Monitoring Team / NNP1 ESD Database Team
		Actual	17.5	1.0	2.0	2.0	1.5	3.0	2.0	2.0	1.5	2.5				26	
4.2	Annual Data analysis and draft annual report for 2016-2017	Planed	5							5						24	Consultant
		Actual	5						2	3						21	
4.3	Disemination/presentation the report for 2016-2017	Planed	5							5						18	Consultant
		Actual	5							5						15	
4.4	Final Annual Report for 2016-2017	Planed	4								4					12	Consultant
		Actual	4								4					9	
	Total	Planed	**100**													6	
		Actual	**85**													3	
		Planned Progress	monthly	14	14	9	9	6	6	16	8	4	4	6	4		
			Cumulative	14	28	37	46	52	58	74	82	86	90	96	100		
		Actual Progress	monthly	9	11	10	4	5	14	14	15	5	-	-	-		
			Cumulative	9	20	30	33	38	52	66	81	85	85	85	85		
	Budget Code EL4.03	Approved	USD	9,180	3,250	4,020	5,060	6,410	7,040	9,520	2,100	1,370	3,930	3,930	5,850		61,660
		Actual Paid	USD														-

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

(a) S-Curve gillnet sampling

	Task List / Steps of work		Weight (%)	YEAR 2017												% S-Curve	Assigned to
				Q1			Q2			Q3			Q4				
				01	02	03	04	05	06	07	08	09	10	11	12		
1	Conduct quarterly gillnet survey	Planed	52	-	3	5	5	-	10	3	10	3	-	10	5	100	NNP1 EMO Fish Monitoring Team
		Actual	26	-	2	-	3	8	-	-	10	3	-	-	-	95	
2	Survey report	Planed	30	-	-	-	-	6	-	6	-	6	-	6	6	90	NNP1 EMO Fish Monitoring Team
		Actual	9	-	-	-	-	-	6	-	-	3	-	-	-	85	
3	Data analysis	Planed	12	-	-	-	-	-	-	-	-	-	-	-	12	80	NNP1 EMO Fish Monitoring Team
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	75	
4	Final report	Planed	12	-	-	-	-	-	-	-	-	-	-	-	12	70	NNP1 EMO Fish Monitoring Team
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	65	
5		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	60	0
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	55	
6		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	50	0
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	45	
7		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	40	0
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	35	
8		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	25	
9		Planed	-	-	-	-	-	-	-	-	-	-	-	-	-	20	0
		Actual	-	-	-	-	-	-	-	-	-	-	-	-	-	15	
	Total	Planed	**106**													10	
		Actual	**35**													5	
		Planned Progress	monthly	-	3	5	5	6	10	9	10	9	-	16	33		
			Cumulative	-	3	8	13	19	29	38	48	57	57	73	106		
		Actual Progress	monthly	-	2	-	3	8	6	-	10	6	-	-	-		
			Cumulative	-	2	2	5	13	19	19	29	35	35	35	35		
	Budget Code EW1.02	Approved	USD	-	-	-	6,000	2,031	-	-	550	800	1,000	800	-		11,181
		Actual Paid	USD	-	-	-	-	-	-	-	-	-	-	-	-		-

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

5. OTHER SUPPORT PROGRAMMES

5.1 Biodiversity Advisory Committee

The 6th BAC mission was completed as scheduled from 4-9 September 2017 with the main objective to discuss the Biodiversity Offset Option Paper (BOOP) prepared by ADB. The discussion between BAC with NNP1 Management, NNP1 EMO, and NNP1 Consultants (Biodiversity and Watershed) came up with the NNP1 Proposal to focus on biodiversity mitigation in NNP1 Watershed and offset in Nam Chouan Nam Xang.

Two of BAC members were assigned to have discussion with Biodiversity Offset Management Committee (BOMC) on the progress of first pre-BOMP activities as well as on the preparation of second pre-BOMP proposal anticipating the delay of BOMP which is expected to be ready in the middle of 2018. BAC recommended that the proposed activities to be further clarified and some of it need to be revisited because it is more suitable under BOMP. BAC also recommended that the estimated budget should have more detail breakdown and better justification.

Two BAC members have been assigned to have further discussion with BOMC and GOL Consultant on 9 September 2017 particularly on the clarification of proposed activities. The draft proposal will be further improved in coordination with NNP1 EMO team before official submission to NNP1 and BAC which is expected in October 2017.

ANNEXES

ANNEX A: RESULTS OF EFFLUENT ANALYSES

Table A- 1: Results of Camp Effluents in September 2017

Parameters (Unit)	Site Name	Owner's Site Office and Village		Obayashi Camp		Sino Hydro Camp	
	Station Code	EF01		EF02		EF06	
	Date	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17
	Effluent Guideline in the CA						
pH	6.0 - 9.0	6.45	6.81	7.18	6.93	6.64	6.85
Sat. DO (%)		39.1	53	75	79	67.5	64.2
DO (mg/l)		2.78	3.97	5.41	5.74	4.68	4.77
Conductivity (µs/cm)		369	392	531	613	621	639
TDS (mg/l)		184	196	265.5	306	310	319
Temperature (°C)		31.6	28.4	30.8	30.3	32.9	29
Turbidity (NTU)		1.22	0.82	14.7	7.57	8.94	15.8
TSS (mg/l)	<50	<5	<5	7.14	16.44	10.1	8.43
BOD (mg/l)	<30	<18	<6	<18	<6	<18	<6
COD (mg/l)	<125	<25	<25	37.4	105	45.4	45.1
NH_3-N (mg/l)	<10.0	<2	3	11	14	26	33
Total Nitrogen (mg/l)	<10	13.5	10	17	19.1	35.6	33.5
Total Phosphorus (mg/l)	<2	1.02	1.13	0.99	1.28	2.08	1.77
Oil & Grease (mg/)	<10.0	<1		<1		<1	
Total coliform (MPN/100 ml	<400	280	79	0	0	0	0
Fecal Coliform (MPN/100 ml)		79	49	0	0	0	0
Effluent Discharge Volume (L/mn)		20	20	20	60	10	30
Chlorination Dosing Rate (ml/mn)		n/a	n/a	61	420	61	110
Residual Chlorine (mg/l)	<1.0	n/a	n/a	0.11	2.2	0.15	1.56

Parameters (Unit)	Site Name	Song Da5 Camp No.1		Song Da5 Camp No.2		Zhefu Camp	
	Station Code	EF07		EF08		EF09	
	Date	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17
	Effluent Guideline in the CA						
pH	6.0 - 9.0	6.56	6.69	7.13	6.89	10.4	9.47
Sat. DO (%)		83.3	68.1	82.6	59	159.9	124.4
DO (mg/l)		5.72	5.16	6.02	4.42	11.2	9.65
Conductivity (µs/cm)		911	928	501	476	267	226
TDS (mg/l)		455	464	250	238	134	113
Temperature (°C)		33.8	28.1	30.3	28.7	33	26.6
Turbidity (NTU)		56.9	19.7	15.86	16.1	2.94	3.55
TSS (mg/l)	<50	54.4	41.66	24.46	13.79	10.33	23.33
BOD (mg/l)	<30	<18	<6	<18	<6	<18	8.64

Parameters (Unit)	Site Name	Song Da5 Camp No.1		Song Da5 Camp No.2		Zhefu Camp	
	Station Code	EF07		EF08		EF09	
	Date	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17
	Effluent Guideline in the CA						
COD (mg/l)	<125	122	118	69.4	72.2	28.9	49
NH_3-N (mg/l)	<10.0	9	14	6	8	<2	<2
Total Nitrogen (mg/l)	<10	19.1	19.1	11.2	10.5	4.31	7.33
Total Phosphorus (mg/l)	<2	0.69	1.42	1.04	0.74	0.11	0.77
Oil & Grease (mg/)	<10.0	2		1		<1	
Total coliform (MPN/100 ml	<400	0	0	0	0	0	23
Fecal Coliform (MPN/100 ml)		0	0	0	0	0	23
Effluent Discharge Volume (L/mn)		12		20	60	n/a	n/a
Chlorination Dosing Rate (ml/mn)		65		260	110	n/a	n/a
Residual Chlorine (mg/l)	<1.0	0.28	2.16	0.07	0.42	n/a	n/a

Parameters (Unit)	Site Name	V&K Camp		HM Hydro Camp		IHI Camp	
	Station Code	EF10		EF13		EF14	
	Date	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17
	Effluent Guideline in the CA						
pH	6.0 - 9.0	6.82	6.93	6.62	7.91	6.5	7.61
Sat. DO (%)		70.8	85	24.6	62.5	39.7	33
DO (mg/l)		5.14	6.37	1.65	4.77	2.79	2.48
Conductivity (µs/cm)		376	359	783	881	750	1246
TDS (mg/l)		188	161	392	440	375	773
Temperature (°C)		30.6	28.7	33.5	27.7	32.3	28.4
Turbidity (NTU)		8.79	10.65	29	34.6	26.5	20.5
TSS (mg/l)	<50	8.66	13.33	26.4	16.29	20.7	17.95
BOD (mg/l)	<30	<18	<6	44.5	<6	<18	<6
COD (mg/l)	<125	27.3	30.4	165	pending	186	178
NH_3-N (mg/l)	<10.0	7	3	21	15	12	4
Total Nitrogen (mg/l)	<10	8.92	5.18	22.1	18.5	13.8	7.06
Total Phosphorus (mg/l)	<2	0.67	0.32	1.53	1.29	0.96	0.65
Oil & Grease (mg/)	<10.0	<1		6		7	
Total coliform (MPN/100 ml	<400	0	0	9200	0	0	0
Fecal Coliform (MPN/100 ml)		0	0	2800	0	0	0
Effluent Discharge Volume (L/mn)		4		4.2	4.2	4	4

Parameters (Unit)	Site Name	V&K Camp		HM Hydro Camp		IHI Camp	
	Station Code	EF10		EF13		EF14	
	Date	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17	11-Sep-17	25-Sep-17
	Effluent Guideline in the CA						
Chlorination Dosing Rate (ml/mn)		300	345	2	3.1	5	5
Residual Chlorine (mg/l)	<1.0	0.04	0.89	0	1.35	0.04	0.85

Parameters (Unit)	Site Name	Kenber Camp	
	Station Code	EF16	
	Date	11-Sep-17	25-Sep-17
	Effluent Guideline in the CA		
pH	6.0 - 9.0	10.01	6.57
Sat. DO (%)		89.8	68
DO (mg/l)		6.05	5.07
Conductivity (µs/cm)		512	646
TDS (mg/l)		256	323
Temperature (°C)		34.1	28.3
Turbidity (NTU)		17.1	9.44
TSS (mg/l)	<50	38.5	21.3
BOD (mg/l)	<30	<18	<6
COD (mg/l)	<125	73.7	38.9
NH_3-N (mg/l)	<10.0	<2	6
Total Nitrogen (mg/l)	<10	5.43	8.44
Total Phosphorus (mg/l)	<2	0.35	0.1
Oil & Grease (mg/)	<10.0	<1	
Total coliform (MPN/100 ml	<400	0	0
Fecal Coliform (MPN/100 ml)		0	0
Effluent Discharge Volume (L/mn)		0	6
Chlorination Dosing Rate (ml/mn)		50	35
Residual Chlorine (mg/l)	<1.0	0.5	0.56

Table A- 2: Results of the Construction Area Discharge in September 2017

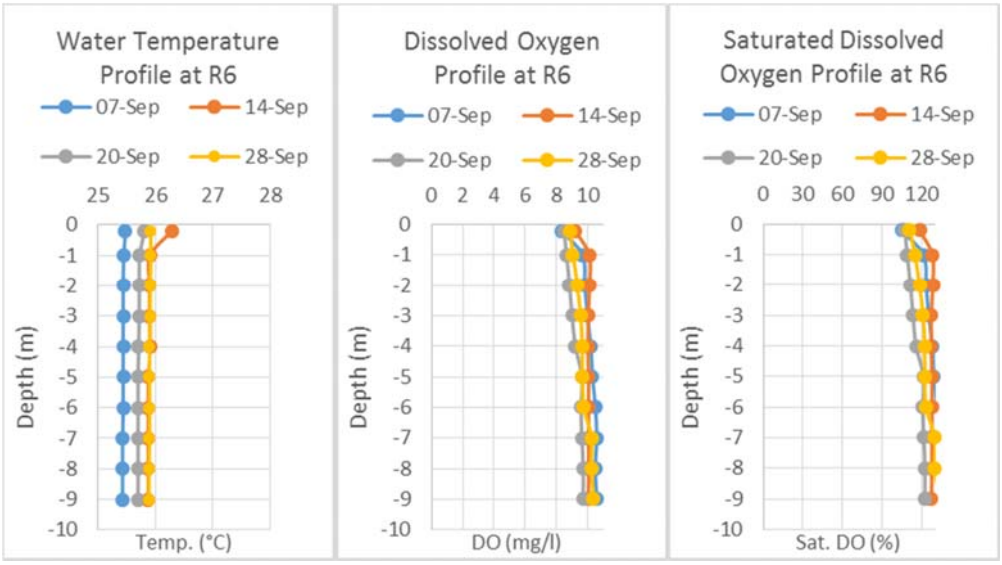
	Site Name	Aggregate Crushing Plant				CVC Plant			
	Station Code	DS02				DS03			
	Date	07-Sep-17	14-Sep-17	21-Sep-17	28-Sep-17	07-Sep-17	14-Sep-17	21-Sep-17	28-Sep-17
Parameter (Unit)	**Guideline**								
pH	6.0 - 9.0	6.51	9.39	6.54	6.33	No Discharge	No Discharge	No Discharge	No Discharge
Sat. DO (%)		89.6	98	98.4	103.8				
DO (mg/l)		6.48	6.65	6.82	7.16				
Conductivity (µs/cm)		185	189.3	56.8	231				
TDS (mg/l)		92	94.65	28	115				
Temperature (°C)		30.7	34.2	33	33.3				
Turbidity (NTU)		18.8	20.8	21	8.53				
TSS (mg/l)	<50	35.19	27.2	49.69	28				
Oil & Grease (mg/l)	<10	<1							

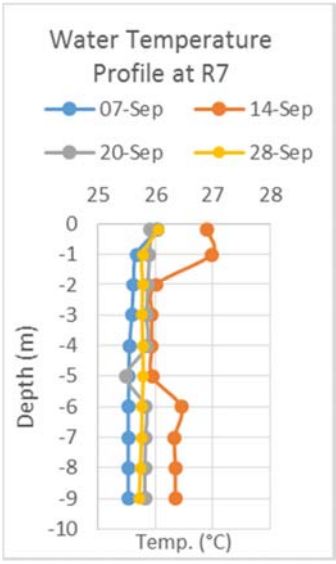
	Site Name	Spoil Disposal No.2			
	Station Code	DS04			
	Date	07-Sep-17	14-Sep-17	21-Sep-17	28-Sep-17
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0	6.64	6.00	6.55	6.01
Sat. DO (%)		79.6	78.0	82.3	74.9
DO (mg/l)		5.86	6.15	6.20	5.47
Conductivity (µs/cm)		16	17.42	15.98	15.71
TDS (mg/l)		8	9	8	8
Temperature (°C)		28.3	25.6	27.9	29.9
Turbidity (NTU)		15.27	11.45	24.4	9.74
TSS (mg/l)	<50	10.81	10.43	41.79	9.28
Oil & Grease (mg/l)	<10	<1.0			

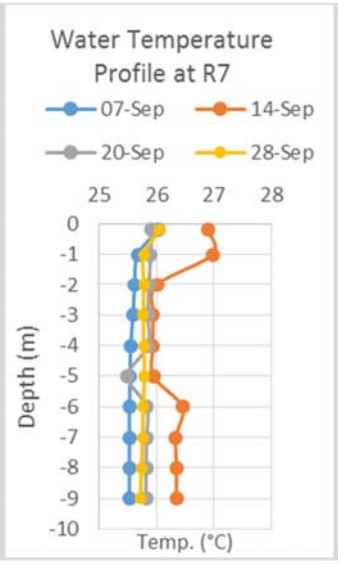
	Site Name	RCC Plant Discharge at lower ponds				RCC Plant Discharge nearby IHI Workshop			
	Station Code	DS09				DS13			
	Date	07-Sep-17	14-Sep-17	21-Sep-17	28-Sep-17	07-Sep-17	14-Sep-17	21-Sep-17	28-Sep-17
Parameter (Unit)	**Guideline**								
pH	6.0 - 9.0	7.8	6.57	6.47	6.48	6.91	6.2	7.13	6.71
Sat. DO (%)		97.5	92.4	93.7	93.5	95.9	94.9	94.4	100.7
DO (mg/l)		7.15	6.49	6.47	6.8	7.16	6.49	6.51	7.01
Conductivity (µs/cm)		146.4	293	269	257	77.3	96.5	65.8	86.9
TDS (mg/l)		73	146.5	134	128	38	48.25	33	43
Temperature (°C)		29.9	32.1	33.1	30.3	28.9	33.7	33.2	30.6
Turbidity (NTU)		17.8	11.4	14.4	17.2	22.0	15.5	18.2	10.3
TSS (mg/l)	<50	45.44	14.76	21.6	23.79	32.04	6.36	27.2	7.14
Oil & Grease (mg/l)	<10	<1.0				<1.0			

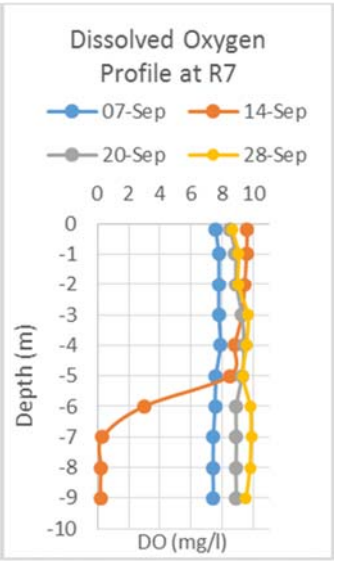
	Site Name	Main Dam's Waste Water Treatment Plant No.1				Main Dam's Waste Water Treatment Plant No.2			
	Station Code	DS11				DS12			
	Date	07-Sep-17	14-Sep-17	21-Sep-17	28-Sep-17	07-Sep-17	14-Sep-17	21-Sep-17	28-Sep-17
Parameter (Unit)	**Guideline**								
pH	6.0 - 9.0	6.49	6.02	3.34	9.45				
Sat. DO (%)		97.2	95.2	94.5	100.3				
DO (mg/l)		7.67	7.04	6.63	6.87				
Conductivity (µs/cm)		826	565	748	1186				
TDS (mg/l)		413	282.5	374	593				
Temperature (°C)		26.1	29.1	32.1	33.7				
Turbidity (NTU)		12.61	14.66	13.39	8.61				
TSS (mg/l)	<50	37.79	16.58	30.48	37.69				
Oil & Grease (mg/l)	<10	<1.0							

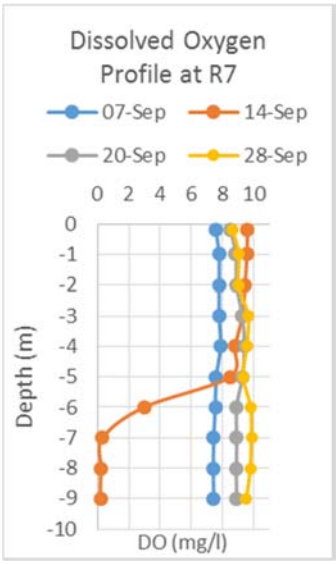
Table A- 3: *Temperature and Dissolved Oxygen Depth Profile Results of the Re-regulation Reservoir Monitoring in September 2017*

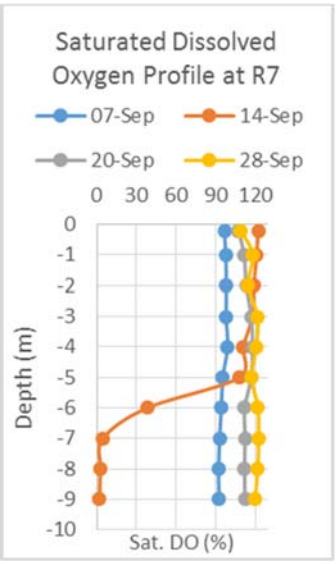



Water Temperature Profile at R7
07-Sep
14-Sep
20-Sep
28-Sep
25 26 27 28
0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10
Depth (m)
Temp. (°C)


Water Temperature Profile at R7
07-Sep
14-Sep
20-Sep
28-Sep
25 26 27 28
0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10
Depth (m)
Temp. (°C)


Dissolved Oxygen Profile at R7
07-Sep
14-Sep
20-Sep
28-Sep
0 2 4 6 8 10
0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10
Depth (m)
DO (mg/l)


Dissolved Oxygen Profile at R7
07-Sep
14-Sep
20-Sep
28-Sep
0 2 4 6 8 10
0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10
Depth (m)
DO (mg/l)


Saturated Dissolved Oxygen Profile at R7
07-Sep
14-Sep
20-Sep
28-Sep
0 30 60 90 120
0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10
Depth (m)
Sat. DO (%)

ANNEX B: AMBIENT DUST QUALITY

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

Hat Gnuin Village - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	11-Sept-17 18:00	12-Sept-17 18:00	13-Sept-17 18:00
End Time	12-Sept-17 18:00	13-Sept-17 18:00	14-Sept-17 18:00
Average Data Record in 24h (mg/m^3)	0.029	0.024	0.019
Guideline Average in 24h (mg/m^3)	***0.12***	***0.12***	***0.12***

Figure B- 1: Dust Monitoring Results at Ban Hat Gniun in September 2017

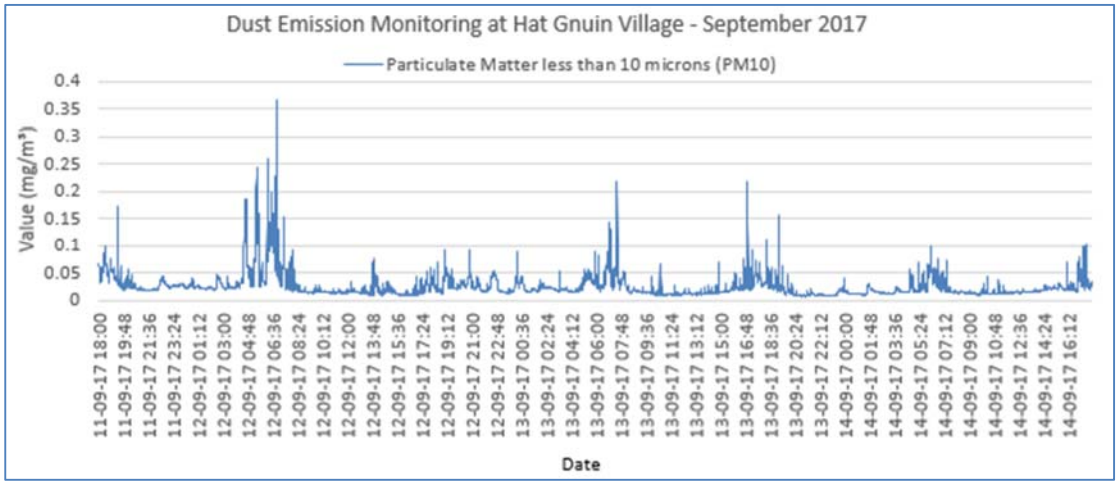


Table B- 2: 24-hour Average Dust Concentrations Measured in Houay Soup Resettlement Area

Houay Soup Resettlement Area - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	01-Sept-17 18:00	02-Sept-17 18:00	03-Sept-17 18:00
End Time	02-Sept-17 18:00	03-Sept-17 18:00	04-Sept-17 18:00
Average Data Record in 24h (mg/m^3)	0.041	0.065	0.071
Guideline Average in 24h (mg/m^3)	***0.12***	***0.12***	***0.12***

Figure B- 2: Dust Monitoring Results at Houay Soup Resettlement Village in September 2017

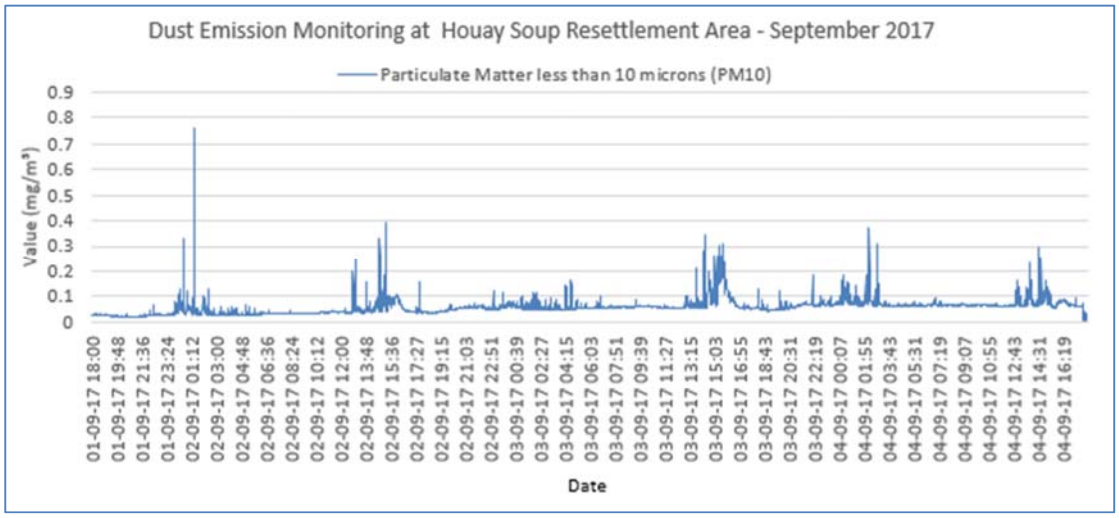


Figure B- 3: Dust Monitoring Results at the Aggregate Crushing Plant in September 2017

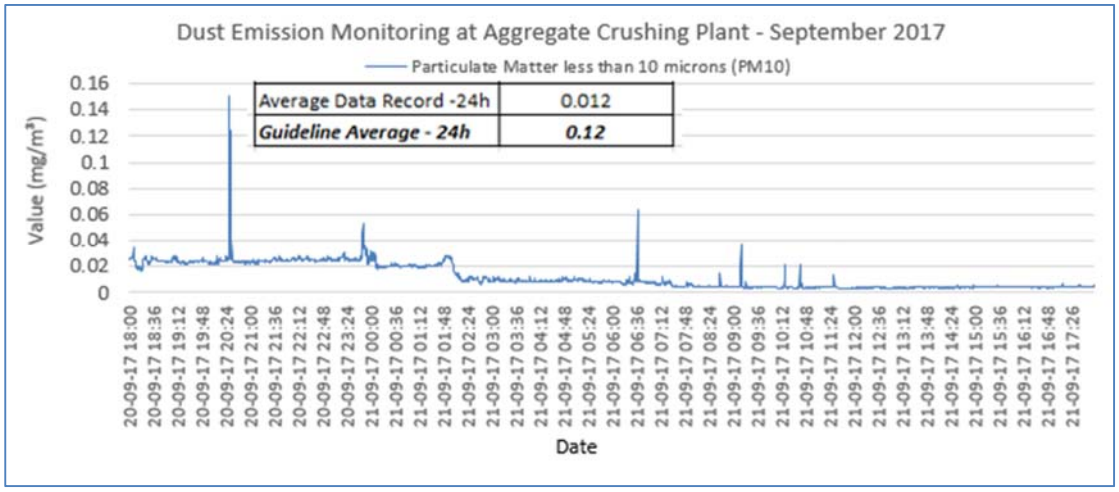


Figure B- 4: Dust Monitoring Results at the RCC Plant in September 2017

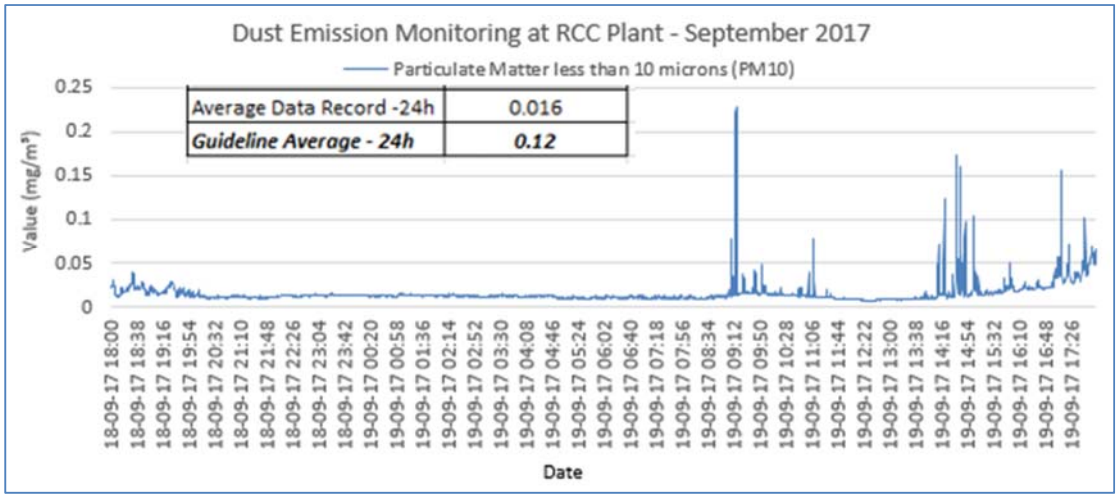


Figure B- 5: Dust Monitoring Results at the Sino Hydro Temporary Camp in September 2017

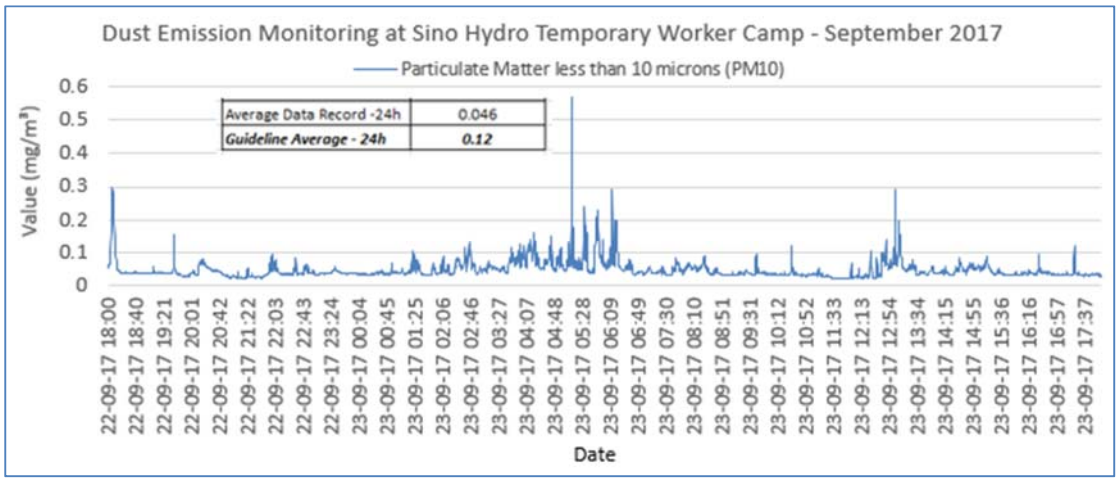


Figure B- 6: Dust Monitoring Results at the SongDa5 No.2 Camp in *September 2017*

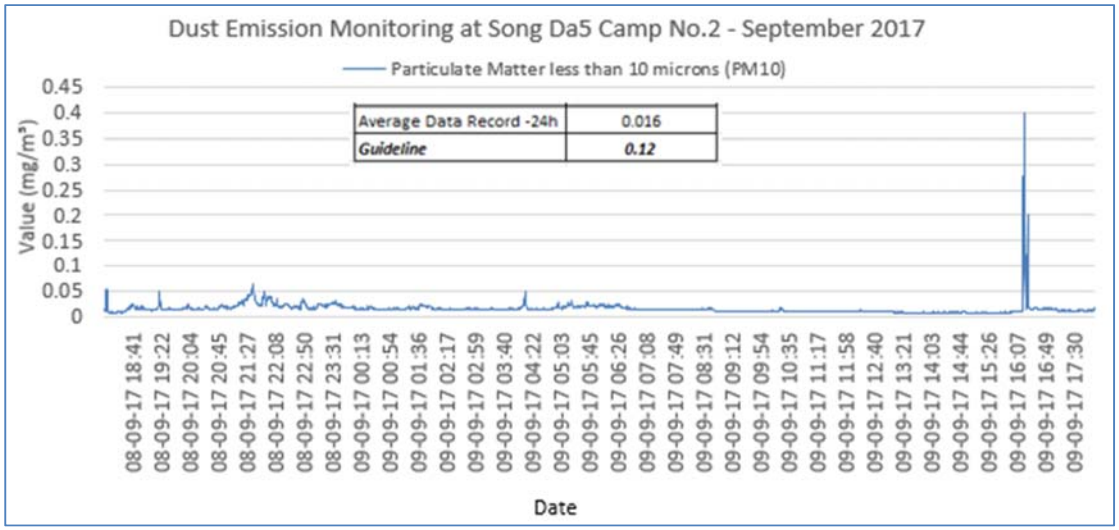


Figure B- 8: Dust Monitoring Results at Main Dam (Top View Left Bank) in September 2017

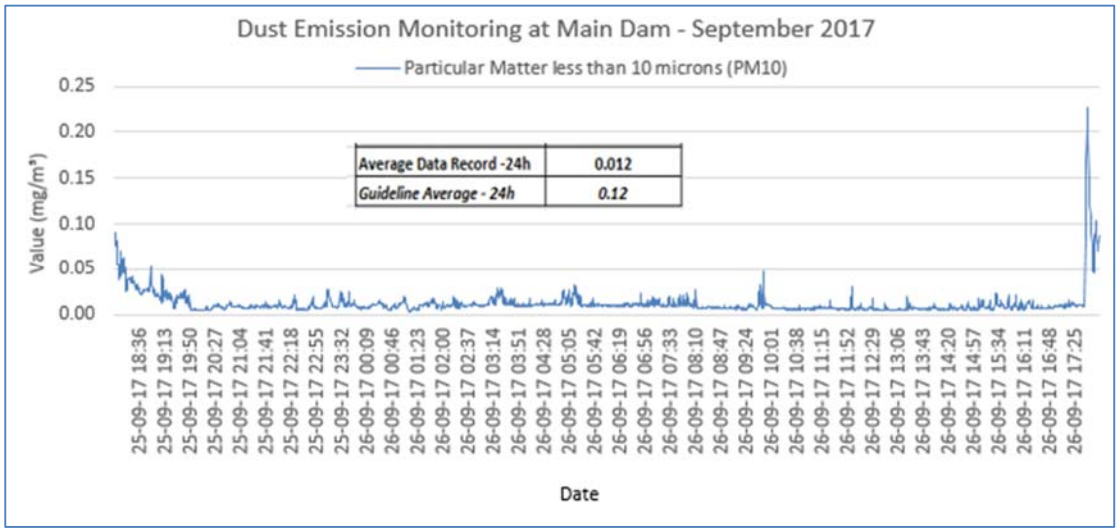
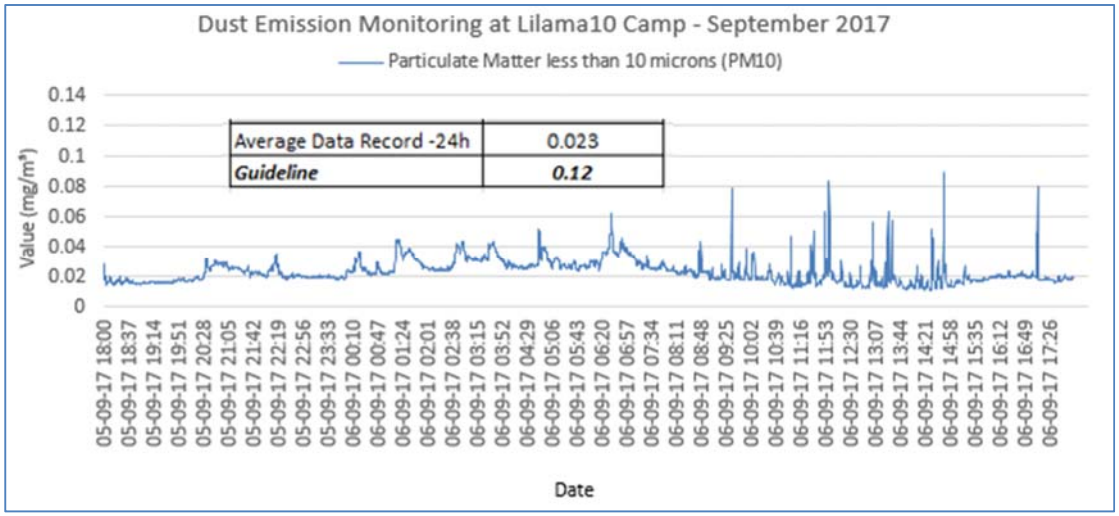


Figure B- 9: Dust Monitoring Results at the Lilama10 Camp in September 2017



ANNEX C: AMBIENT NOISE DATA

Table C- 1: Average Results of Noise Monitoring at Ban Hat Gnuin in September2017

Noise Level (dB)	11-12/September/17			12-13/September/17			13-14/September/17		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	67.30	61.40	66.50	64.20	56.90	68.60	64.50	59.90	68.10
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	51.76	45.64	44.78	49.01	45.97	44.29	48.22	43.35	43.14
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Figure C- 1: Result of Noise Level Monitoring at Ban Hat Gnuin in September 2017

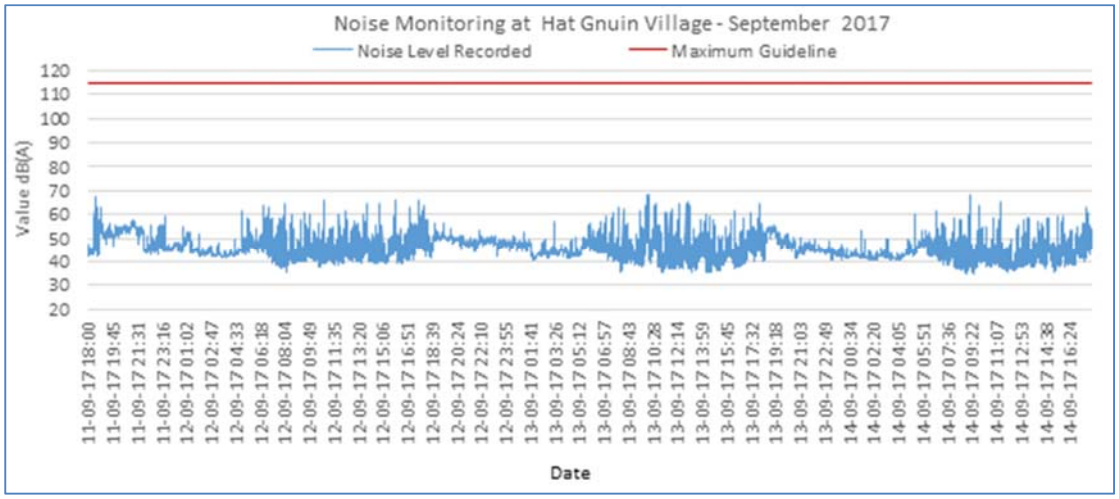


Table C- 2: Average Results of Noise Monitoring at Houay Soup Resettlement Area in September 2017

Noise Level (dB)	01-02/September/17			02-03/September/17			03-04/September/17		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	64.90	68.30	73.20	67.00	71.00	73.60	72.30	71.60	71.00
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	46.45	47.40	43.67	48.79	40.56	42.37	46.81	44.19	39.19
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Figure C- 2: Result of Noise Level Monitoring at Houay Soup Resettlement Village in September 2017

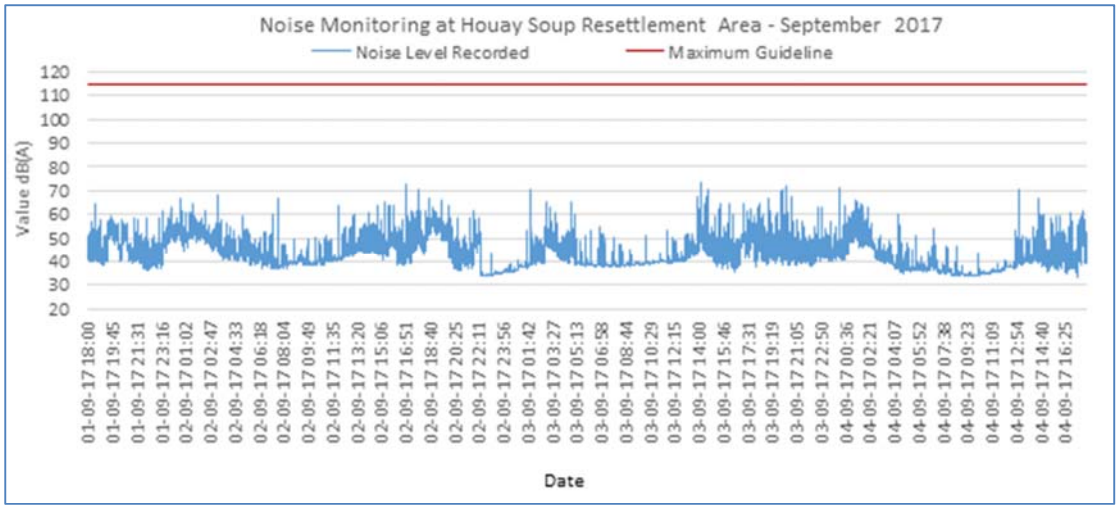


Table C- 2 and Table C-3: Average Results of Noise Monitoring at Aggregate Crushing Plant and RCC Plant in September 2017

Aggregate Crushing Plant

Noise Level (dB)	20-21/Sept/17		21/Sept/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	77.8	77.8	76.3
Guideline Max	***115***	***115***	***115***
Average Data Recorded	59.62	63.49	64.74
Guideline Averaged	***70***	***50***	***70***

RCC Plant

Noise Level (dB)	18-19/Sept/17		19/Sept/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	65	69.4	69
Guideline Max	***115***	***115***	***115***
Average Data Recorded	57.61	58.08	58.55
Guideline Averaged	***70***	***50***	***70***

Figure C- 3: Results of Noise Level Monitoring at the Aggregate Crushing Plant in September 2017

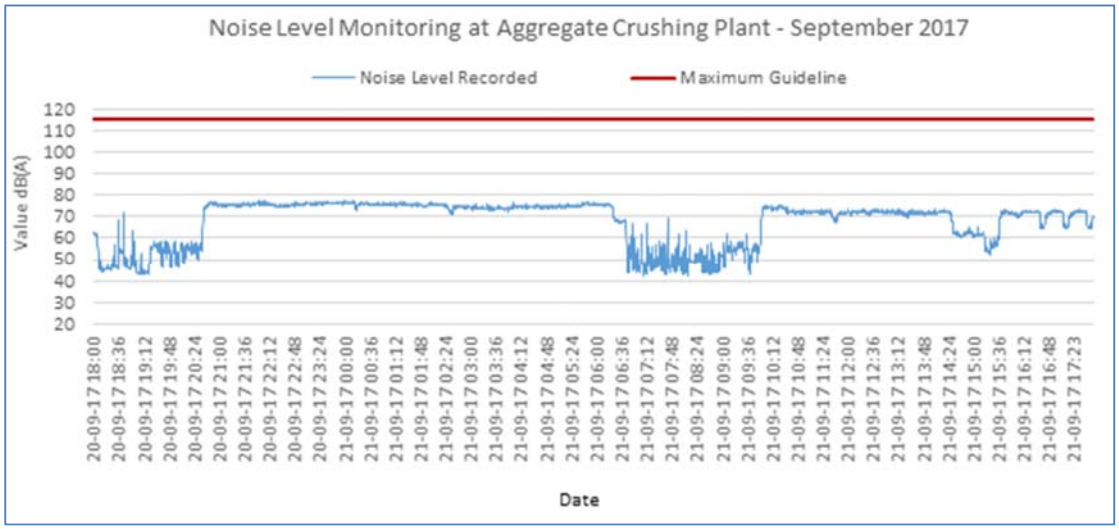


Figure C- 4: Results of Noise Level Monitoring at the RCC Plant in September 2017

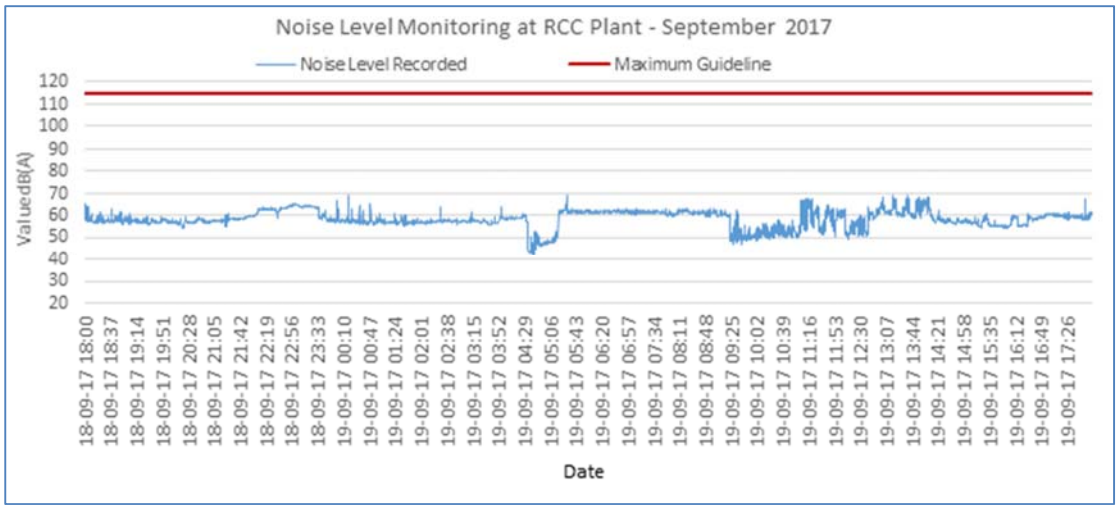


Table C- 5 and Table C- 6*:* ***Average Results of Noise Monitoring at SongDa Camp#2 and Sino Hydro Camp in September2017***

Song Da5 Camp No.2

Sino Hydro Temporary Worker Camp

Noise Level (dB)	08-09/Sept/17		09/Sept/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	67.3	56	68.3
Guideline Max	***115***	***115***	***115***
Average Data Recorded	51.65	50.92	47.35
Guideline Averaged	***70***	***50***	***70***

Noise Level (dB)	22-23/Sept/17		23/Sept/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	63.9	63	62.8
Guideline Max	***115***	***115***	***115***
Average Data Recorded	52.98	54.75	50.82
Guideline Averaged	***70***	***50***	***70***

Figure C- 5: Results of Noise Level Monitoring at SongDa5 Camp#2 in September 2017

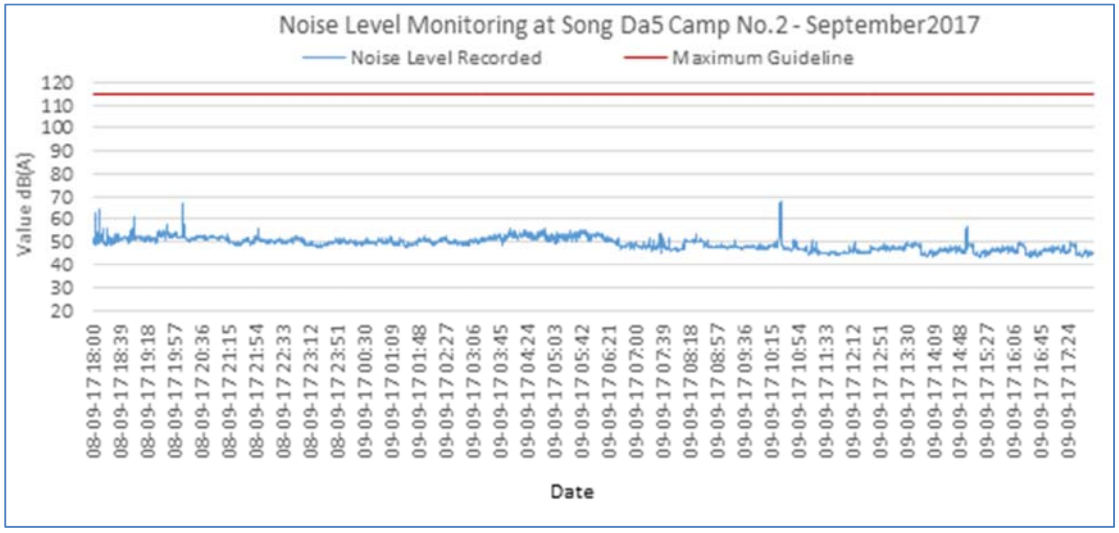


Figure C- 6: Results of Noise Level Monitoring at Sino Hydro Temporary Worker Camp in September 2017

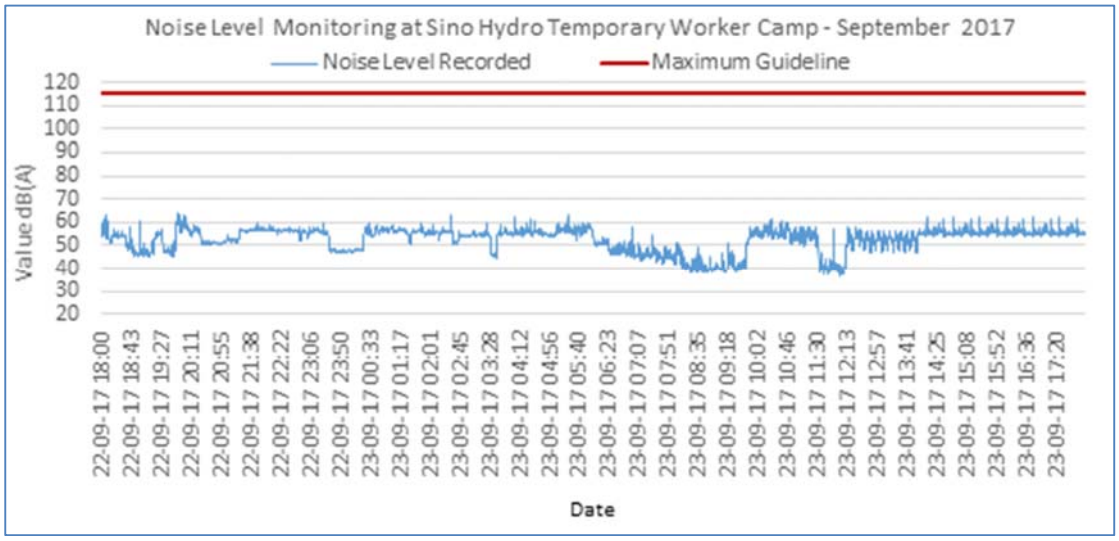


Table C- 7 and Table C- ***8: Average Results of Noise Monitoring at Main Dam, and Lilama 10 Camp in September 2017***

Main Dam

Noise Level (dB)	25-26/Sept/17		26/Sept/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	65.9	71	71.2
Guideline Max	***115***	***115***	***115***
Data Record Average	57.81	56.72	57.47
Guideline Averaged	***70***	***50***	***70***

Lilama 10 Camp

Noise Level (dB)	05-06/Sept/17		06/Sept/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	64	64.9	88.9
Guideline Max	***115***	***115***	***115***
Average Data Recorded	45.32	44.67	43.14
Guideline Averaged	***70***	***50***	***70***

Figure C-7: Results of Noise Level Monitoring at Main Dam in September 2017

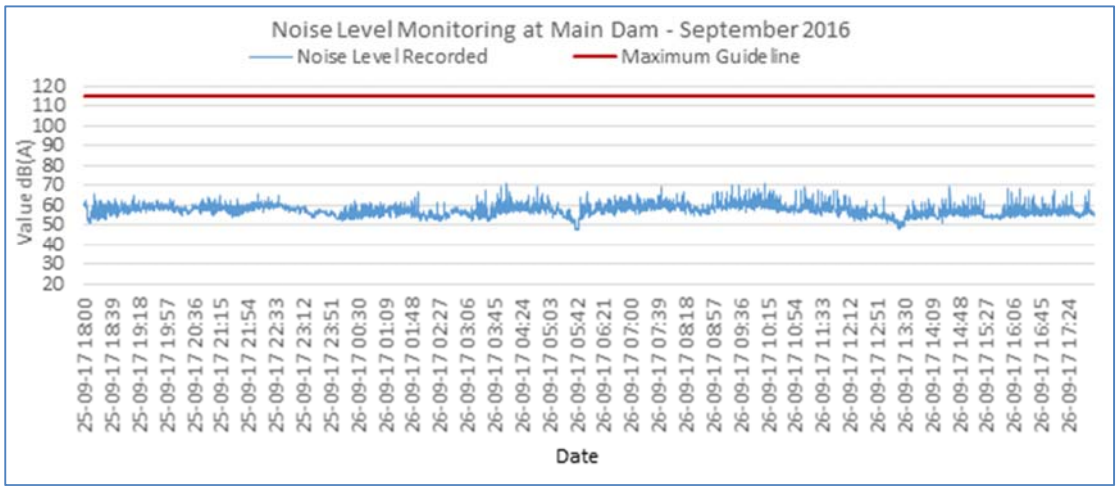


***Figure C- 8: Results of Noise Level Monitoring at Lilama10 Camp* in September 2017**