NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

October 2017

A	05 December 2017	Viengkeo Phetnavongxay	Peter G Jensen	Vilayhak Somsoulivong	
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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 October 2017, nine Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP) and one annex of a Detail Work Program (DWP) were active for EMO review. Out of these, seven SS-ESMMPs were cleared, two SS-ESMMPs and the annex of the Detail Work Program (DWP) were carried over to November 2017.

On 26 October 2017, the Environmental Management Unit (EMU) of Bolikhamxay Province visited to the main construction sites, camps and Houay Soup Resettlement Area (HSRA). A mission report will be submitted for EMO review by early November 2017.

The camps' effluents were monitored fortnightly, the result for October 2017 indicated significant improvement for key parameters (BOD, total coliform and faecal coliform), all complied with effluent standards.

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

A notice was issued by Bolikhan District Governor to carry out a village consultation in HSRA and host villages (Thaheua and Hat gnuen villages) on a waste management programme. The programme is expected to be started by late November 2017 by the selected contractor.

Following a technical workshop on the Nam Ngiep 1 Watershed Management Plan with relevant GOL counterparts conducted in September 2017, NNP1PC received comments from the government and the plan will be finalized in November 2017 where after it will be presented to GOL for official approval.

NNP1PC prepared and submitted a draft of "Biodiversity No Net Loss Forecast" to the ADB on 23 October 2017. The draft is expected to be discussed during the IAP and ADB mission from 13-18 November 2017 prior to proposing it for NNP1 Board of Directors' approval.

total area of 284.79 ha out of 1,641 ha was certified as fully completed for biomass clearance while stockpiling and burning continued to progress in October 2017. Four additional local contractors were contracted to accelerate the biomass clearance.

The fishery monitoring programme has continued as planned. The data from the daily fish catch logbook indicated that the mean daily fish catch in Nam Ngiep River was 2.3 kg/household/day in September 2017. The estimated total fish catch in Nam Ngiep basin for September 2017 is 42,800 kg. Around 18% of the catch was sold, 64% was consumed fresh, 16% 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).

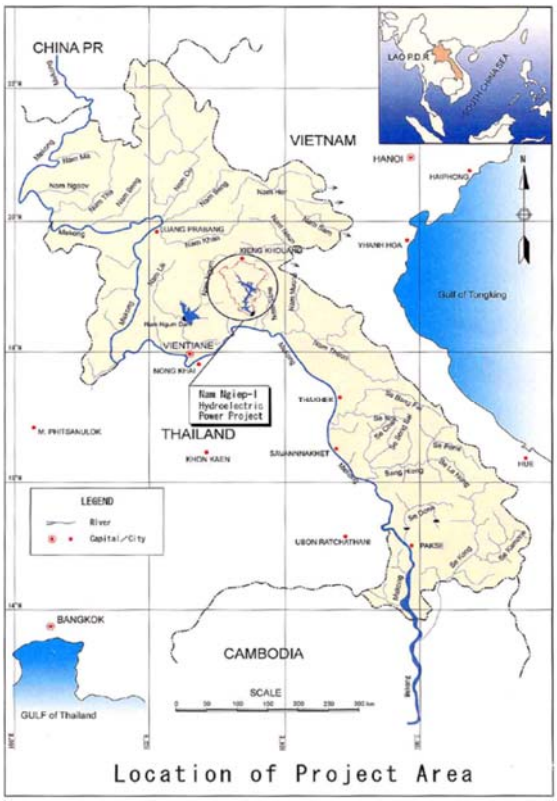


Figure 1-1: Location Map

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.

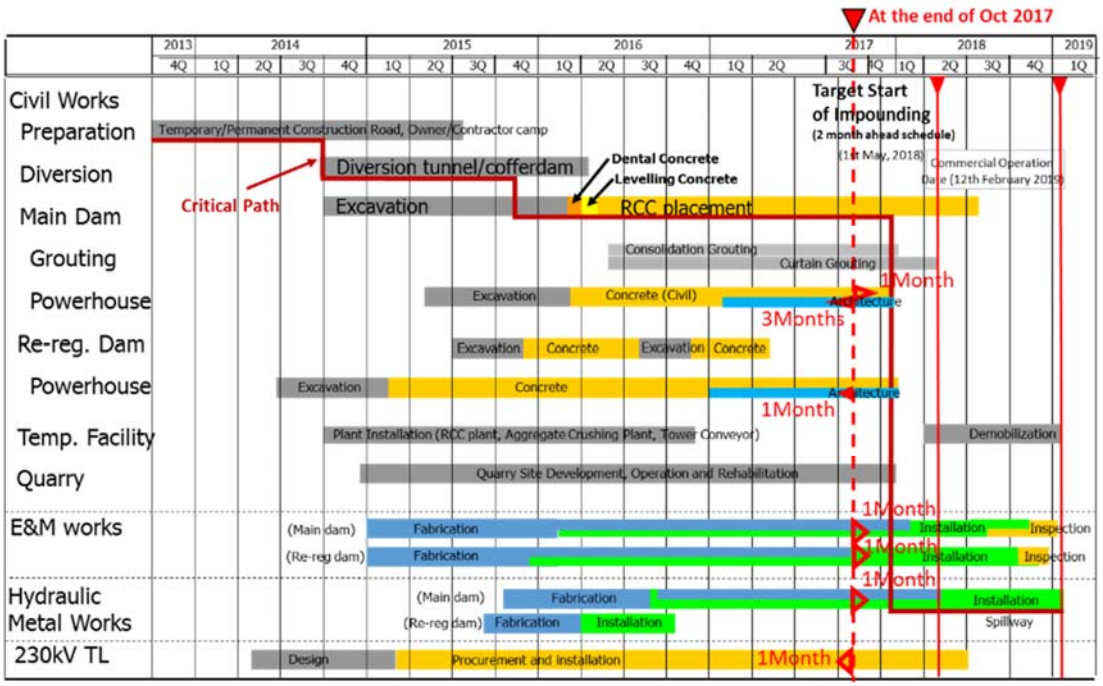
2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

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 October 2017 was 86.0 %[1] (compared to planned progress of 86.8 %), 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

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

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

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 October 2017 was 86.0 % (compared to planned progress of 86.8 %) 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 94 % 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 October 2017

Item	Description	Total Drilling (m)	Completed (m)	Progress (%)
Consolidation Grouting	Anticipated Quantity	17,769	16,687	94
Curtain Grouting	Original Design Quantity	27,945	23,617	84
	Anticipated Final Quantity	58,400	23,617	40

*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 October 2017.

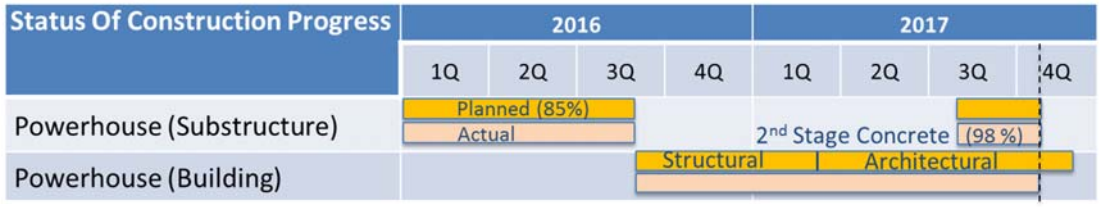
Location	Total Anticipated Volume (m^3)	Completed (m^3)	Progress (%)
Main Powerhouse	32,600	29,349	90
Penstock Embedment	10,257	8,293	81

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 October 2017



Powerhouse Building Works	Concrete Second Phase (m^3)	Painting Inside and Outside (m^2)	Lighting Fixture (nos)	Electrical Conduit and Wire (m)	Handrail (m)	Duct Work (m)	Fire Alarm System (Conduit) (m)	Epoxy Coating (Dust and Acid) (m^2)
Designed	3,496	6,135	311	2,510	460	345	1,208	1,476
Completed	3,496	5,024	275	2,180	270	275	1,172	563
Progress	100 %	82 %	88 %	87 %	59 %	80 %	97%	38%

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 October 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

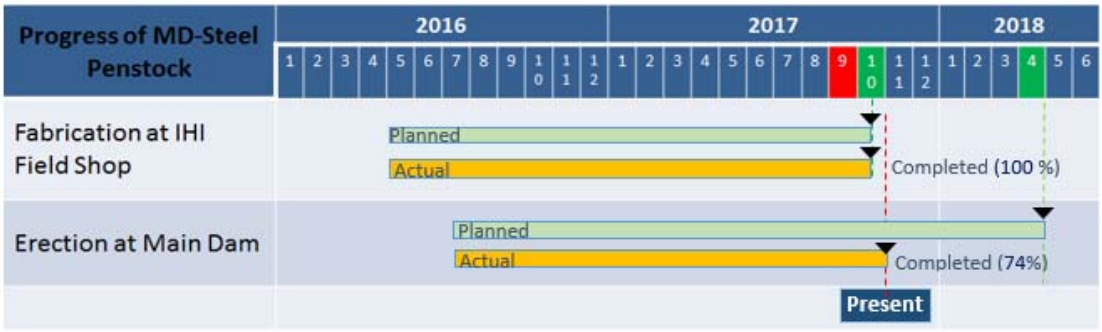
Figure 2-5: Preparation for Installation of Stay Cone at the re-regulation powerhouse

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 October 2017 was 51.1 % (compared to planned progress of 56.5 %).

The latest progress of penstock pipe fabrication at IHI field shop and erection at main dam as of the end of October 2017 ***in Figure 2-6*** below:

Figure 2-6: Progress of the penstock pipe fabrication at the IHI field shop as at the end of October 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 October 2017 was 97.4 % (compared to planned progress of 98.3 %).

In respect of the delay to commencement of most works the Contractor is studying its programme to ensure that sufficient resources are committed as the works progress to ensure that completion is achieved in good time. Onset of daily rains has made access to all areas difficult but the Contractor follows its revised acceleration schedule, after the progress for the construction of tower foundations slowed after May, 2016 (See ***Figure 2-7*** below)

Figure 2-7: Cumulative Work Progress of Tower Foundation (Original Planned and Actual)

Figure 2-8: Cumulative Works Progress of tower foundation (Revised Planned & Actual)

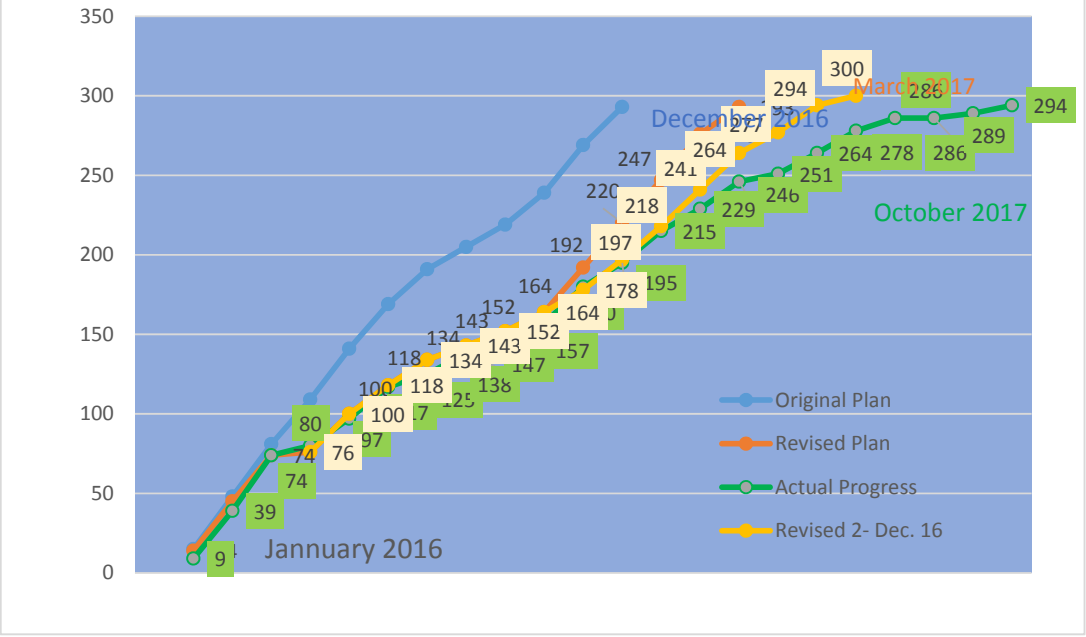


Figure 2-9: Revised Cumulative Works Progress of Tower Erection (Planned & Actual)

3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 Compliance Management

3.1.1 Site Specific Environmental and Social Management and Monitoring Plans

During October 2017, nine Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP) and one annex of a Detailed Work Programme (DWP) were active for EMO review. Out of these, seven SS-ESMMPs were cleared, two SS-ESMMPs and the annex of the Detailed Work Programme were carried over to November 2017.

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

Title	Date Received	Response Status
SS-ESMMP for Building Construction at the Main Powerhouse	22 February 2017 (4th submission)	No objection with no further comments on 04 October 2017
SS-ESMMP for RCC Operation and Maintenance Work	08 March 2017 (4th submission)	No objection with no further comments on 18 October 2017
DWP & Appendix for Aggregate Crushing Plant	05 July 2017 (5th submission)	Under Review
SS-ESMMP for Installation of Turbine for Main Power Station	18 September 2017 (1st submission)	No objection with no further comments on 17 October 2017

Title	Date Received	Response Status
SS-ESMMP for Construction of Tractor Road Nos. 4 and 5 Zone 2UR	16 October 2017 (1st submission)	No objection with no further comments on 17 October 2017
SS-ESMMP for Construction of Installation Work of 230 kV substation equipment for Main Power Station	11 October 2017 (1st submission)	No objection with no further comments on 17 October 2017
SS-ESMMP for Construction of Installation Work of 115 kV substation equipment for Re-regulation Power Station	09 October 2017 (1st submission)	No objection with no further comments on 17 October 2017
SS-ESMMP for Construction of Main Transformer for Main Power Station	05 October 2017 (1st submission)	No objection with no further comments on 17 October 2017
SS-ESMMP for Houay Soup Landfill Operation	08 October 2017 (1st submission)	Under review
SS-ESMMP for Construction of 3.1 km of Internal Road in HSRA	25 October 2017 (2nd 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 September 2017	6	0	2	0
Newly Opened in October 2017	2	0	0	0
Total in October 2017	**8**	**0**	**2**	**0**
Resolved in October 2017	1	0	0	0
Carried over into November 2017	7	0	2	0
Unsolved Exceeding Deadlines	**6**	**0**	**2**	**0**

Figure 3-1: Summary of ONC and NCR

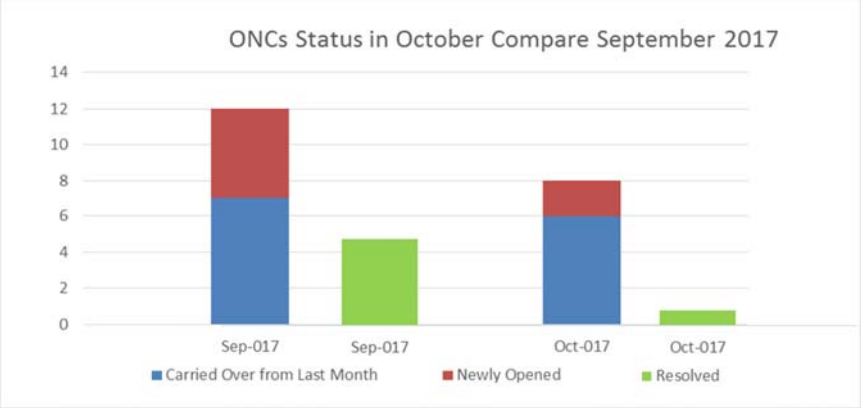


Table 3-3: Carried-Over ONC and NCR from October 2017 into November 2017

Site ID	Issues	Reporting	Actions
Re-Regulation Dam (Borrow Pit Area 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; - Lack of closure plan for the borrow pit First inspection: 30 August 2016 Latest inspection: 24 October 2017	ONC (Closure Pending)	- The Contractor was instructed to submit a closure plan for the borrow pit by November 2017
Aggregate Crushing Plant	- Inadequate 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: 24 October 2017	NCR-2 (Closure Pending)	A revised DWP and SS-ESMMP (PLC-03348) and associated actions addressing comments in the NCR2 is expected in November 2017.
Main Dam WWTS No. 1	Turbid water with high pH was discharged from a sediment pond next to the Main Dam Powerhouse into the Nam Ngiep (NCR_OC-0020). First inspection: 18 July 2017 Latest inspection: 24 October 2017	NCR2 (Closure pending)	The operation of the WWTS shall be improved and the effluent brought into compliance with standards by November 2017.

Site ID	Issues	Reporting	Actions
Sino Hydro Workshop	Used tyres were placed along the edge of vehicle parking platform next to Sino Hydro workshop were exposed to rain. They will become a breeding ground of mosquitos that are transmitters of infectious diseases (ON_OC-0265). These tyres considered as hazardous waste where proper disposal at a designated area is required. First inspection: 01 August 2017 Latest inspection: 24 October 2017	ONC (Closure pending)	A total of 110 out of 194 used tyres from Sino Hydro workshop were sold to Khounmixay Factory (licenced local vendor). The rest will be sold in November 2017.
Building Concept Construction SOLE (HSRA)	Leakage of black water from the septic tank into a grey water pond was observed. There is a risk of bacteria-rich wastewater overflowing or seeping into the outside environment. (ON_BC-0001). First inspection: 07 September 2017 Latest inspection: 17 October 2017	ONC (Closure pending)	- The leakage at the septic tank was fixed. However, standing wastewater in the pond has to be properly managed. - An NCR1 will be issued if corrective action is not taken by 14 November 2017.
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: 17 October 2017	ONC (Closure pending)	- The temporary accommodation has to be decommissioned as stated in the SS-ESMMP. - A Site Decommissioning Plan including timeline and disposal methods is required to be officially submitted and the plan shall be implemented accordingly.
Vieng Oudom Sup Construction Co., Ltd (HSRA)	The Contractor will finish all construction activities in the middle of October 2017. However, the submission of a revised DWP & SS-ESMMP and Site Decommissioning	ONC (Closure pending)	The Contractor was instructed to revise and resubmit the DWP & SS-ESMMP to include the Site Decommissioning Plan at least 7 days before final Inspection.

Site ID	Issues	Reporting	Actions
	Plan for EMO review and clearance is pending (ON_VDC-0002). First inspection: 19 September 2017 Latest inspection: 17 October 2017		
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: 17 October 2017	ONC (Closure pending)	The Contractor was recommended to revise and submit a DWP & SS-ESMMP to include the Site Decommissioning Plan and submitted at least 7 days prior to Final Inspection.
TL 230 kV Construction Site	Improper waste management at RCR Temporary Camp (Thapabat) and mobile camp of Tower 262. A mixture of waste (food waste, plastic, glass, and other construction waste were disposed on the ground (ON_LS-0026). First inspection: 20 October 2017 Latest inspection: Not available	ONC (New)	The Contractor is required to: - Collect and segregate the disposed waste from these two sites properly. - Provide sufficient waste bins and plastic waste bags at these sites.

Figure 3-2: Site Inspection Locations

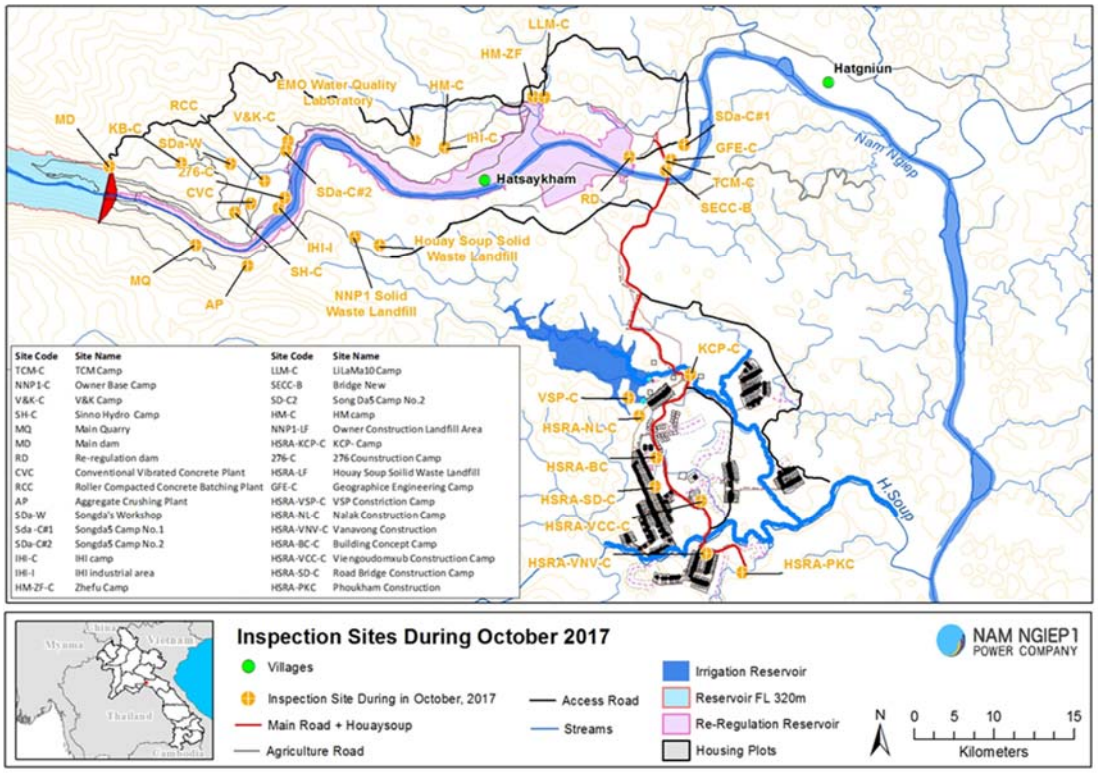
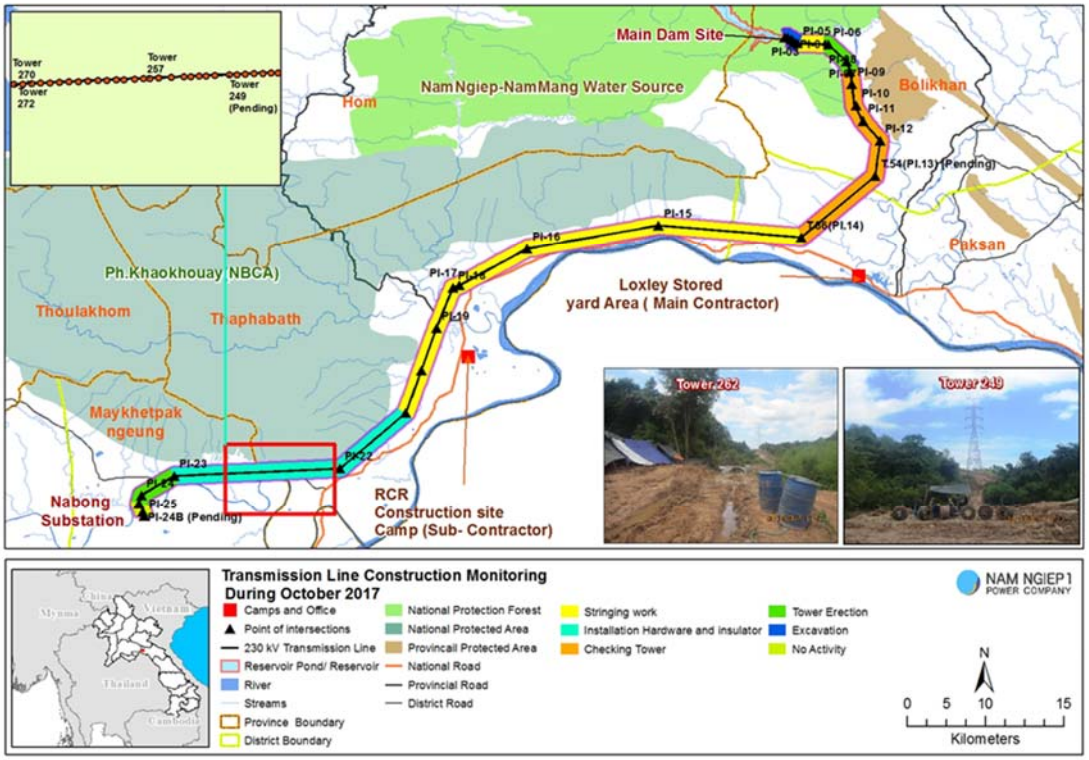


Figure 3-3: 230 kV Transmission Line Construction Monitoring



3.1.3 Environment Management Unit Monitoring

The Environmental Management Unit (EMU) of Bolikhamxay Province visited NNP1 on 26 October 2017, and a wrap-up meeting was held on the following day. A mission report will be submitted for EMO review by early November 2017.

Issues highlighted during this mission are:

- EMU appreciated NNP1PC's corrective action for the construct the WWTP at the LILAMA 10 Camp. The EMU reminded NNP1PC to ensure that the discharge from the WWTP does not impact the fishponds downstream of LILAMA 10 Camp;
- Grey water overflown from drainage ditch to Nam Ngiep river was observed and the contractor was instructed to connect a drainage to the WWTS, and clean up the ditch immediately;
- Poultry raising was observed next to the WWTS of Song Da 5 Camp No. 2 and the Contractor was strongly instructed to remove the poultry immediately;
- Incomplete decommissioning of the temporary accommodation for resettled people at HSRA. It is an unresolved issue identified in the previous EMU mission. Needs proper corrective action prior to the next EMU mission in November 2017.

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

3.2 Environmental Quality Monitoring

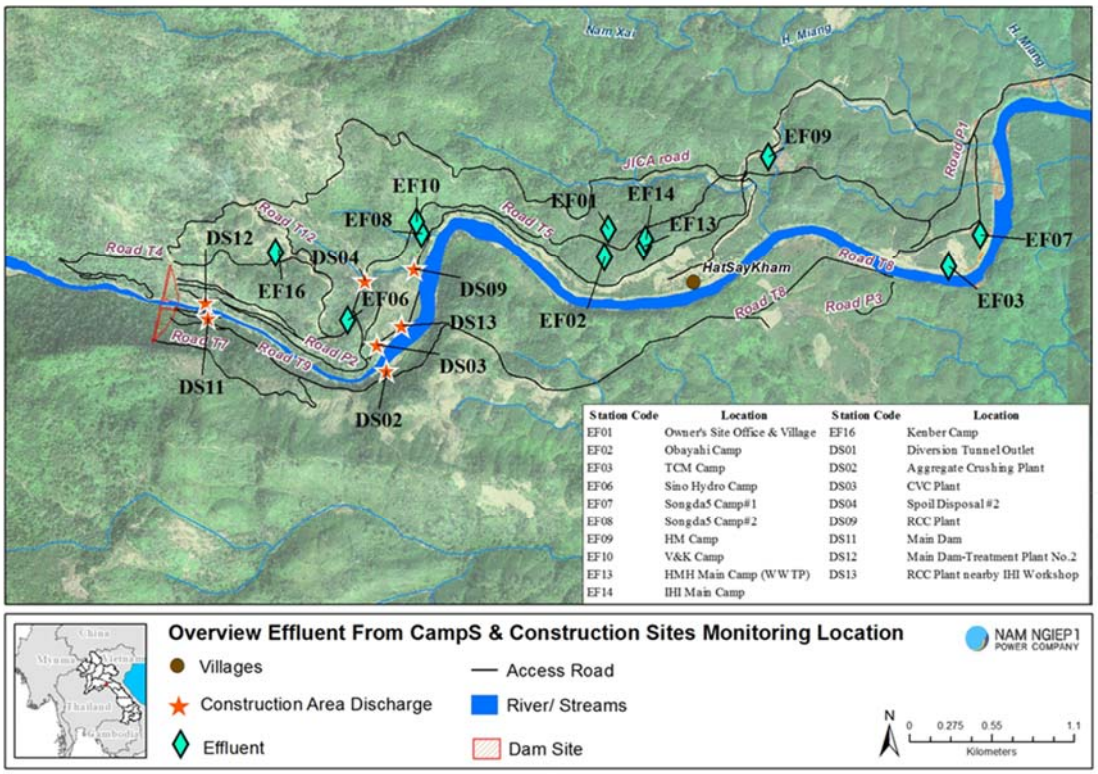
The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD5), faecal coliform, E. Coli bacteria and total coliform have been carried out by NNP1PC Environmental Laboratory since August 2017.

All data are reported to the Ministry of Natural Resources and Environment (MONRE) on a monthly basis and quarterly to the ADB. The reports are also published on the Company's website.

3.2.1 Effluent Discharge from Camps and Construction Sites

During October 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. Effluent monitoring results for October 2017 from the camps indicate that all key parameters (BOD5, total coliform and faecal coliform) are in compliance with the relevant effluent standards.

The sediment control at the Aggregate Crushing Plant and RCC Plant continues to improve by application of a coagulant (Ammonium aluminium sulfate). The parameters monitored at the construction sites, with the exception of the main dam complied with the standard during the reported month.

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	Non-compliances for total coliform during the first sampling but compliance during the second fortnightly mission.	No corrective action is required.
Obayashi Corporation Camp	EF02	Non-compliances for ammonia nitrogen (NH_3-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	As above.

Site	Sampling ID	Non-Compliance with Applicable Effluent Standards	Corrective Actions
		(NH_3-N), total nitrogen and total phosphorus.	
Song Da 5 Camp No. 1	EF07	Non-compliances for ammonia nitrogen (NH_3-N) and total nitrogen.	As above.
Song Da 5 Camp No. 2	EF08	Non-compliance for total nitrogen and residual chlorine.	As above.
Zhefu Camp (Subcontractor of Hitachi-Mitsubishi Hydro)	EF09	No sampling due to no discharged.	
V&K Camp	EF10	Non-compliance for total coliform.	As above.
H-MH Main Camp (WWTS)	EF13	Non-compliance for COD, NH_3-N, total nitrogen and residual chlorine.	As above.
IHI Main Camp	EF14	Non-compliance for COD, NH_3-N, total nitrogen.	As above.
Kenber Camp	EF16	Full compliance	
Main Dam Construction Area (Waste Water Treatment Plant No.1)	DS11	Non-compliance for pH and TSS for the first sampling but complied by the end of October 2017.	No corrective action is required.
Main Dam Construction Area (Waste Water Treatment Plant No.2)	DS12	No discharge during the missions	
Spoil Disposal Area No.2 (Song Da 5 Workshop)	DS04	Non-compliance for TSS	No action is needed. The non-complied of TSS was due to the rain prior to the sampling.
CVC Plant	DS03	No discharge during the missions.	
RCC Plant (Discharge Point at the Weirs)	DS09	All monitored parameters complied with the Standard.	

Site	Sampling ID	Non-Compliance with Applicable Effluent Standards	Corrective Actions
RCC Plant (Discharged nearby IHI Workshop)	DS13	No sampling at this point. The DS13 was joined with DS09.	
Aggregate Crushing Plant	DS02	All monitored parameters complied with the Standard.	

3.2.2 Ambient Surface Water Quality Monitoring

The surface water quality monitoring programme comprises 14 monitoring stations. The October 2017 programme is summarized in ***Table 3-5***: *Monitoring Frequency for Surface Water Quality Parameters*

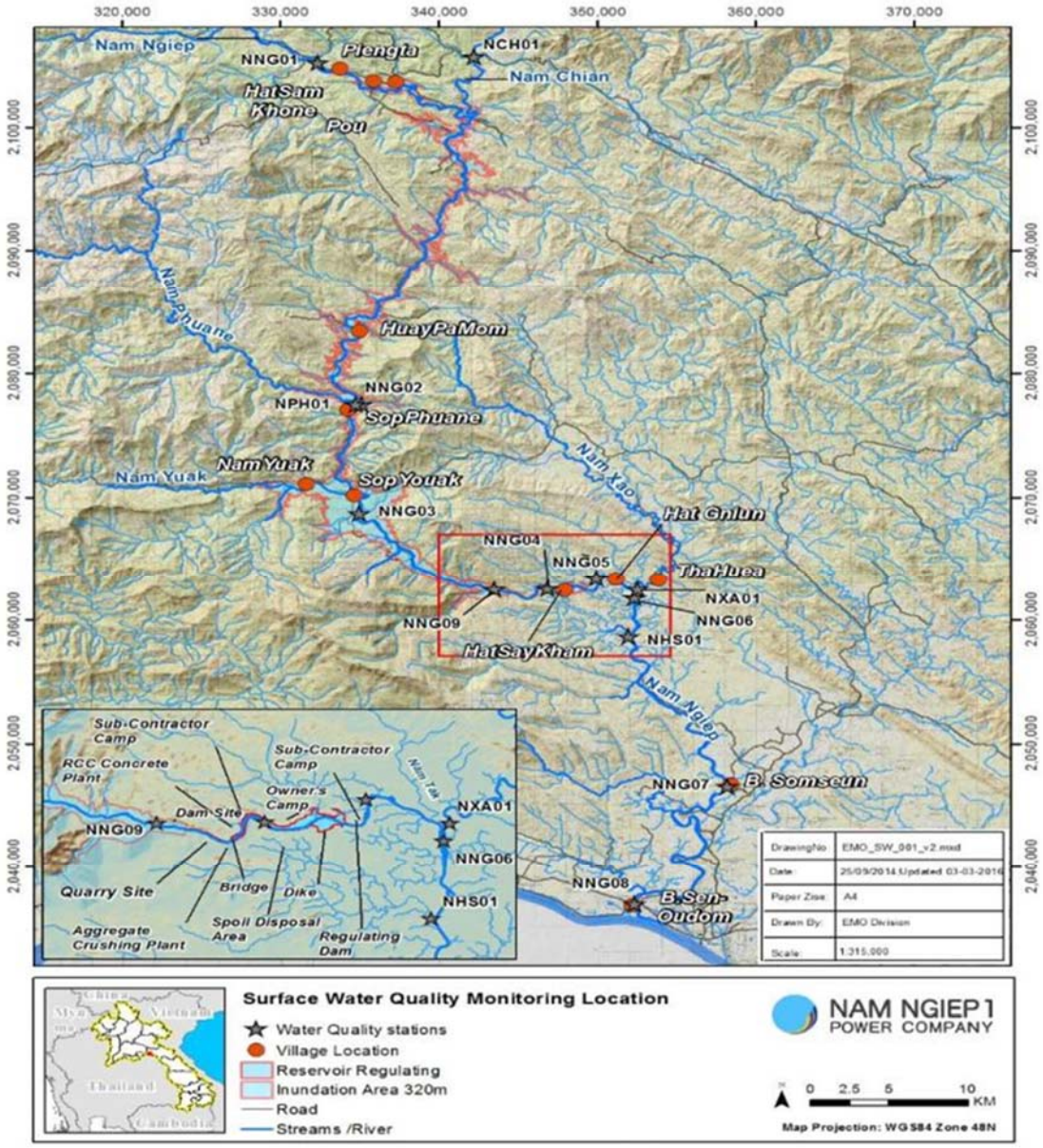
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	- NNG09, Nam Ngiep Upstream Main Dam (NNG09), - R6, Re-regulation Reservoir - R7, Re-regulation Reservoir 0.3 km Upstream the Re-Regulation Dam - NNG05, Nam Ngiep Downstream the Re-regulation Dam at Ban Hat Gniun
Fortnightly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	All 14 stations
Monthly	TSS (mg/l), BOD5 (mg/l), COD (mg/l), NH3-N (mg/l), NO3-N (mg/l), total 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 (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	- NNG09, Nam Ngiep Upstream Main Dam (NNG09), - R6, Re-regulation Reservoir - R7, Re-regulation Reservoir 0.3 km Upstream the Re-Regulation Dam - NNG05, Nam Ngiep Downstream the Re-regulation Dam at Ban Hat Gniun
Fortnightly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	All 14 stations
Monthly	TSS (mg/l), BOD_5 (mg/l), COD (mg/l), NH_3-N (mg/l), NO_3-N (mg/l), total 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 and re-regulation reservoir water quality monitoring in October 2017 are shown in ***Table 3-6*** to ***Table 3-10*** below.

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	12-Oct-17	12-Oct-17	12-Oct-17	12-Oct-17	12-Oct-17	12-Oct-17	12-Oct-17	12-Oct-17	12-Oct-17	12-Oct-17
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	7.26	7.22	7.17	7.2	7.44	7.68	7.25	7.71	7.65	7.44
Sat. DO (%)		97.4	95.8	101.4	102.8	109.4	98.4	104.6	102.9	94.4	96
DO (mg/l)	>6.0	7.89	7.79	8.21	8.22	8.8	7.9	8.46	8.24	7.74	7.45
Conductivity (µs/cm)		83.5	60.6	56.4	66.1	100	106	63.6	65	62.7	55
TDS (mg/l)		41	30	28.2	33	50	58	32	32	31	27
Temperature (°C)		23.5	24	24.2	25.2	24.9	25.21	24.8	25.3	24	26.9
Turbidity (NTU)		21.3	692	246	44	62.69	60.67	46.2	46.6	54.9	58.9
TSS (mg/l)		70.44	660.08	224	161.03	106.66	70.53	102.74	157.81	115.07	154.32
BOD_5 (mg/l)	<1.5	1.62	1.35	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
COD (mg/l)	<5	<5.0	<5.0	13	5.1	<5.0		<5.0	<5.0	<5.0	<5.0
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
NO_3-N (mg/l)	<5	0.1	0.18	0.18	0.13	0.12		0.15	0.13	0.15	0.16
Faecal coliform (MPN/100ml)	<1,000	920	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Total Coliform (MPN/100ml)	<5,000	1,600	3,500	3,500	1,600	1,600	1,600	1,600	1,600	1,600	1,600

Table 3-7: Results of Nam Ngiep Surface Water Quality Monitoring on 04, 18, 26 and 27 October 2017

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	04-Oct-17	04-Oct-17	04-Oct-17	04-Oct-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.47	7.63	7.69	7.4
Sat. DO (%)		105	112.3	111.4	109.1
DO (mg/l)	>6.0	8.31	8.95	8.88	8.59
Conductivity (µs/cm)		120	125	140	150
TDS (mg/l)		60	62	70	75
Temperature (°C)		25.77	25.43	25.61	26.36
Turbidity (NTU)		30.6	29.3	25.8	27.1
TSS (mg/l)		77.22	60.33	40	43.23

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	04-Oct-17	04-Oct-17	04-Oct-17	04-Oct-17
Parameters (Unit)	**Guideline**				
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	920	540	920	240
Total Coliform (MPN/100ml)	<5,000	920	920	920	350

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	18-Oct-17	18-Oct-17	18-Oct-17	18-Oct-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.69	7.45	7.79	6.96
Sat. DO (%)		102.5	119.3	129.9	131.2
DO (mg/l)	>6.0	8.5	8.35	7.94	8.15
Conductivity (µs/cm)		120	122	120	114
TDS (mg/l)		60	61	60	57
Temperature (°C)		25.08	24.58	24.98	25.7
Turbidity (NTU)		23	18	14	15

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	18-Oct-17	18-Oct-17	18-Oct-17	18-Oct-17
Parameters (Unit)	**Guideline**				
TSS (mg/l)		56.34	31.94	18.75	23.78
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	920	920	540	280
Total Coliform (MPN/100ml)	<5,000	1,600	1,700	1,600	920

	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	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	27-Oct-17	27-Oct-17
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	7.64	7.88	7.84	7.6	7.24	7.53	7.81	7.89	8.34	7.71
Sat. DO (%)		99.1	100.1	100	102.9	101.3	85.2	104.4	103.1	100.6	99.3
DO (mg/l)	>6.0	8.19	8.01	7.97	8.08	8.31	6.74	8.37	8.22	8.23	7.96
Conductivity (µs/cm)		71.3	68.1	67.4	72.3	107	100	70.2	72.4	72.3	72.1
TDS (mg/l)		35	34	33	36	53	50	35	36	36	36
Temperature (°C)		23.1	25	25.8	26.6	24.66	26.55	25.6	25.8	24.5	25.6

	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	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	26-Oct-17	27-Oct-17	27-Oct-17
Parameters (Unit)	**Guideline**										
Turbidity (NTU)		41.73	32.5	30.9	26.44	19.58	21.17	26.68	23.89	25.12	26.41
TSS (mg/l)					26.76	16.95	12.33	17.25			
BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0			
Faecal coliform (MPN/100ml)	<1,000				240	350	170	350			
Total Coliform (MPN/100ml)	<5,000				540	350	920	350			

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

The faecal coliform slightly exceeded the Surface Water Quality Standard with values recorded as 1,600 MPN/100 ml at the NCH01 and NPH01.

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

All monitored parameters at these sites complied with the Surface Water Quality Standard.

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	10-Oct-17	11-Oct-17	12-Oct-17	12-Oct-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	8.56	7.37	7.75	6.81
Sat. DO (%)		101.6	99.8	94	83.4
DO (mg/l)	>6.0	8.24	8.13	7.35	6.56
Conductivity (µs/cm)		30.5	65.6	83.2	17.29
TDS (mg/l)		15	32	41	8

	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	10-Oct-17	11-Oct-17	12-Oct-17	12-Oct-17
Parameters (Unit)	**Guideline**				
Temperature (°C)		23.1	23.9	26.7	26.4
Turbidity (NTU)		4.98	36.1	6.92	4.62
TSS (mg/l)		16.26	101.53	9.01	6.73
BOD_5 (mg/l)	<1.5	1.04	<1.0	<1.0	<1.0
COD (mg/l)	<5	<5.0	<5.0	<5.0	6.1
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2
NO_3-N (mg/l)	<5	0.07	0.13	0.16	0.07
Faecal coliform (MPN/100ml)	<1,000	1,600	1,600	540	920
Total Coliform (MPN/100ml)	<5,000	1,600	1,600	1,600	1,600

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	24-Oct-17	25-Oct-17	26-Oct-17	26-Oct-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	8.91	7.53	7.9	7.33
Sat. DO (%)		102.4	103	97	87.2
DO (mg/l)	>6.0	8.62	8.32	7.55	6.93
Conductivity (µs/cm)		29.2	71.9	92.4	23.6
TDS (mg/l)		14	36	46	12
Temperature (°C)		21.9	24.8	26.5	26
Turbidity (NTU)		9.8	7.47	6.53	8.18

3.2.3 Groundwater Quality Monitoring

During October 2017, groundwater quality was monitored at the six boreholes built for Houay Soup Resettlement Area (HSRA). The result was informed to the villagers and local health centre as part of public health programme. All parameters at the six boreholes complied with the standards.

Figure 3-6: Groundwater Quality Monitoring Locations

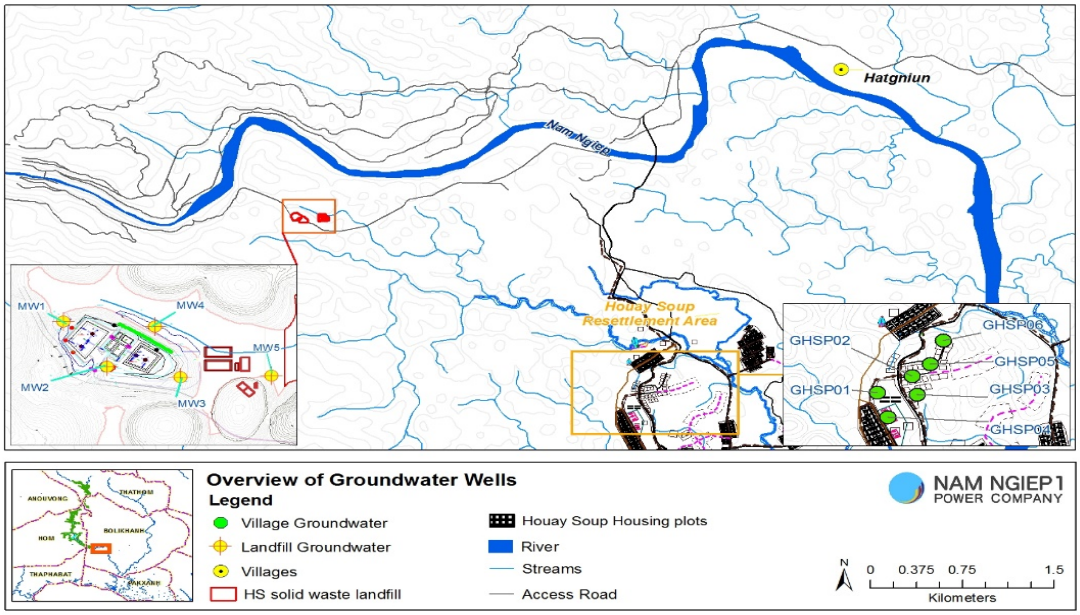


Table 3-10: Groundwater Quality Monitoring Results for Houay Soup Resettlement Area

	Site Name	Houay Soup Resettlement Area					
	Station Code	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
	Date	09-Oct-17	09-Oct-17	09-Oct-17	09-Oct-17	09-Oct-17	09-Oct-17
Parameter (Unit)	**Guideline**						
pH	6.5-9.2	7.03	6.85	6.67	6.62	6.84	6.93
DO (%)		92.1	87.2	70.6	97.1	86.2	90
DO (mg/l)		6.96	6.52	5.2	7.13	6.47	6.57
Conductivity (µs/cm)	<1,200	386	309	398	80.5	310	369
TDS (mg/l)		193	154	199	40	155	184
Temperature (°C)		29.1	28.7	29.6	28.9	28.5	30.1
Turbidity (NTU)	<20	0.93	0.7	0.87	1.24	0.85	0.6
Lead (mg/l)	<0.2				0.031		
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

3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

During October 2017, water samples were taken from the taps at Thaheua and Hat Gniun Villages.

All parameters complied with the National Drinking Water Standards for both Thaheua and Hat Gniun Villages except for faecal coliforms and E.Coli. Presence of E.Coli in the GFWS system is a normal situation during the rainy season, however, local villagers were informed about the results and encouraged to boil their drinking water.

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

	Site Name	Thaheua Village	Hat Gnuin Village
	Station Code	WTHH02	WHGN02
	Date	09-Oct-17	09-Oct-17
	Guideline		
pH	6.5-9.2	6.49	6.62
DO (%)		97.9	96.4
DO (mg/l)		7.04	6.89
Conductivity (µs/cm)	<1,200	38.5	55.6
TDS (mg/l)		19	27
Temperature (°C)		31.2	30.6
Turbidity (NTU)	<20	1.5	1.16
Faecal coliform (MPN/100 ml)	0	4.5	6.8
Ecoli Bacteria (MPN/100 ml)	0	4.5	4.5

3.2.5 Landfill Groundwater Monitoring

During October 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) and discharged point (LL7). All results indicated compliance with the relevant standards at all final ponds of both Landfills.

Figure 3-7 Landfill Leachate Monitoring Location

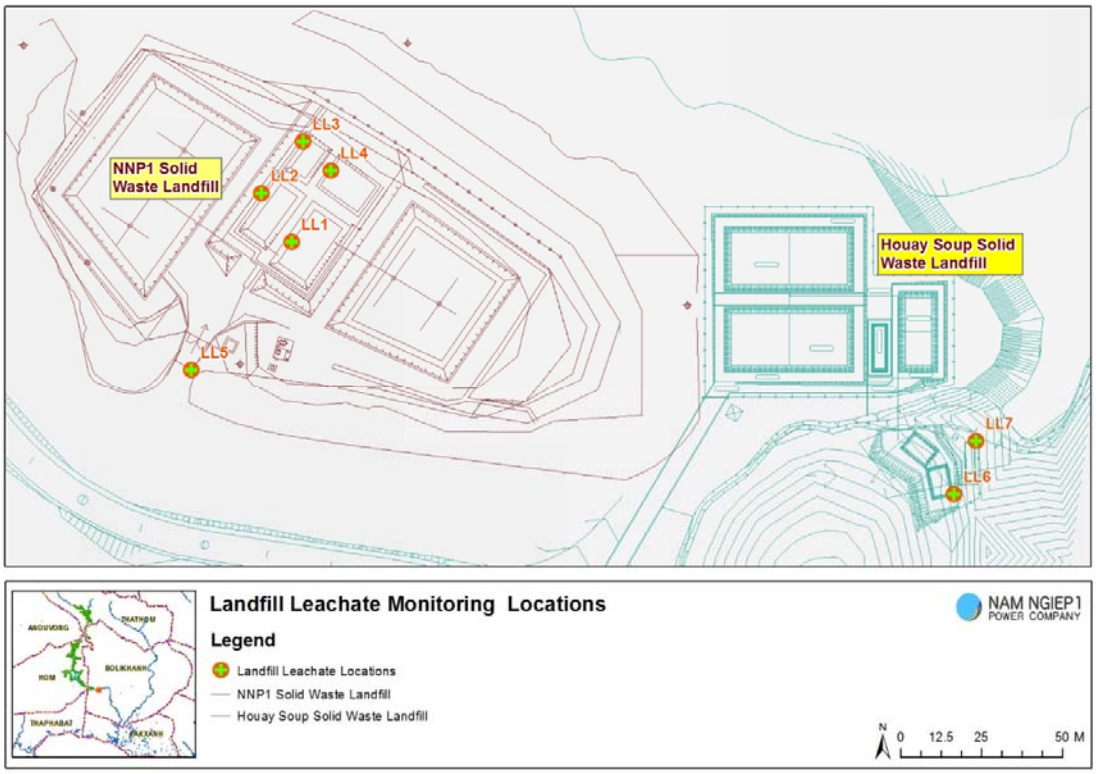


Table 3-12 Landfill Leachate Monitoring Results

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	17-Oct-17	17-Oct-17	17-Oct-17	17-Oct-17
	Guideline				
pH	6.0-9.0	8.1	No Discharge	8.9	8.48
Sat. DO (%)		102.3		100.4	53.8
DO (mg/l)		7.97		7.66	4.09
Conductivity (µS/cm)		201.9		14.15	24.2
TDS (mg/l)		100		7	12
Temperature (°C)		26.7		27.9	27.8
Turbidity (NTU)		6.13		8.79	4.72
TSS (mg/l)	<50	17.46		13.13	3.85
BOD_5 (mg/l)	<30	7.41		<5.0	<5.0
COD (mg/l)	<125	51		<25.0	<25.0
Faecal Coliform (MPN/100ml)		14		14	2
Total Coliform (MPN/100ml)	<400	22		14	6.8

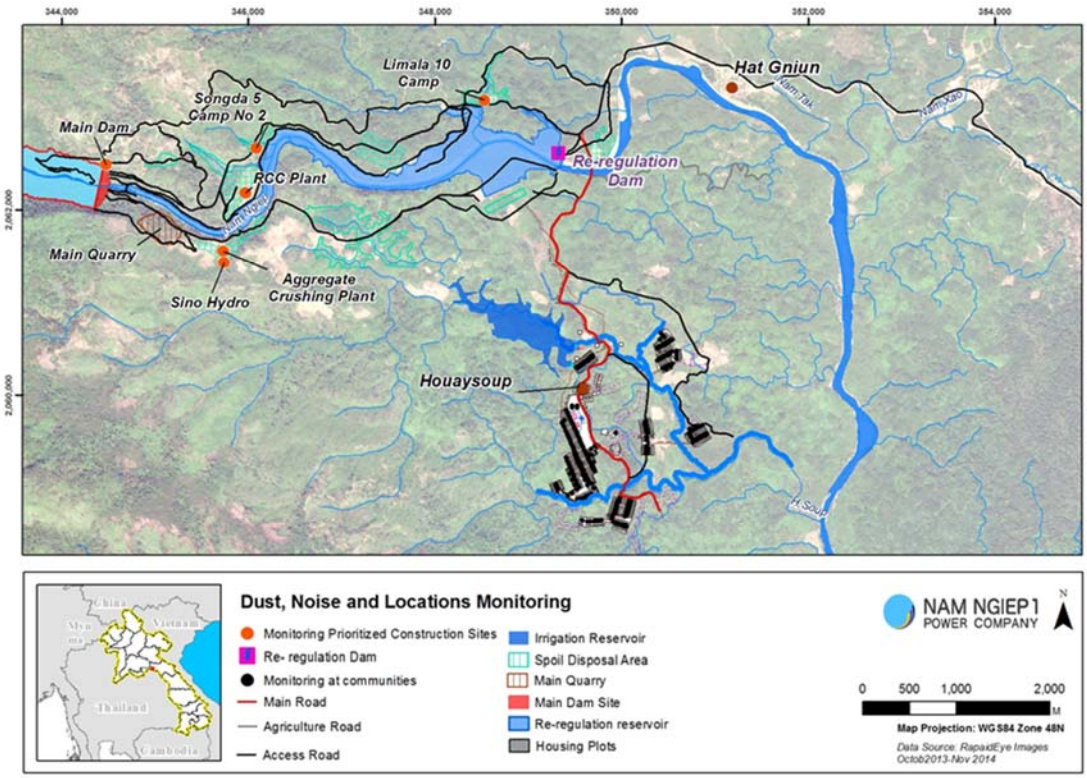
3.2.6 Dust Monitoring

The monitoring points are indicated on the map in ***Figure 3-8***. The results indicate compliance with the National Standard, except at the Aggregate Crushing Plant and at the Main Powerhouse. All staff were advised to wear dust masks while working in these areas. The results are presented in ***Annex 2***.

3.2.7 Noise Monitoring

During October 2017, noise monitoring was conducted for 72 consecutive hours at Hat Gniun and Houay Soup Resettlement villages; and 24 consecutive hours at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Temporary Worker Camp, Main Dam, Lilama10 Camp, and Main Powerhouse.

Figure 3-8: 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 the period of 22:01-06:00 were slightly higher than the Standard at the Aggregate Crushing Plant, Main Powerhouse, and at Hat Gnuin and Houay Soup Resettlement villages

3.3 PROJECT WASTE MANAGEMENT

3.3.1 Solid Waste Management

In October 2017, an approximately 148.2 m3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 5.8 m3 compared to September 2017. Spot checks of waste bags were conducted on a daily basis before disposal of the waste.

A total of 5,933 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 October 2017
Construction activity				
1	Scrap metal	kg	5,370	27,922
Sub-Total 1		**kg**	**5,370**	**27,922**
Operation camp				
2	Glass bottles	kg	167	446
3	Plastic bottles	kg	158	132.5
4	Paper/Cardboard	kg	116	116.5
5	Aluminium can	kg	122	62
Sub-Total 2		**kg**	**563**	**757**
Grand Total 1+2		**kg**	**5,933**	**28,679**

A total of 6,739 kg food waste was collected in October 2017 from the selected camps by Hatsaykham Villagers for the animal feed - an increase of 130 kg compared to September 2017.

Table 3-14 Amounts of Food Waste Collected by Villagers

NO.	SITE NAME	UNIT	TOTAL
1	SongDa 5 Camp No. 2	kg	2,664
2	SongDa 5 Camp No. 1	kg	2,253
3	Obayashi Corporation Camp	kg	1,033
4	Owner's Village and Site Office (OSOV)	kg	544
5	LILAMA 10 Camp	kg	125
6	Kenber Camp	kg	120
Total		**kg**	**6,739**

3.3.2 Hazardous Materials and Waste Management

In October 2017, a total of 1,200 litres of used oil, 160 empty caustic cleaners, 127 empty paints and 111 used tired from contractors were sold to Khounmixay Process Factory.

Table 3-15: Results of Hazardous Material Inventory

No.	Hazardous Waste Type	Unit	Total in October 2017 (A)	Disposal by Selling (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre (l)	9,360	1,200	8,160
2	Used oil filters	No.	603	0	603
3	Empty paint and spray cans	can	344	127	217
4	Empty used chemical drum/container	drum (20 litre)	800	0	800
5	Used tires	No.	452	111	341
6	Ink cartridge	No.	127	0	127
7	Cement bag	bag	300	0	300
8	Acid and caustic cleaners	bottle	178	160	18

No.	Hazardous Waste Type	Unit	Total in October 2017 (A)	Disposal by Selling (B)	Remainder (A - B)
9	Empty used oil drum/container	Drum (20 litre)	136	28	108
10	Empty used chemical drum/container	Drum (200 litre)	42	5	37
11	Empty used oil drum/container	drum (200 litre)	82	4	78
12	Halogen/fluorescent bulbs	No.	65	0	65
13	Contaminated soil, sawdust and concrete	kg	1,080	0	1,080
14	Contaminated textile and material	kg	127	0	127
15	Lithium-ion batteries	No.	7	0	7
16	Lead acid batteries	No.	22	0	22
17	Clinical waste	kg	8	0	8
18	Empty contaminated bitumen drum/container	drum (200 litre)	0	0	0
19	Used oil mixed with water	litre (l)	0	0	0

A total of 150 kg compost was produced from grass, cow dung, rice husks, molasses, bio-effect (BE) and leftover vegetables and fruits from the canteens and used by villagers who served as workers at the landfill and OSOV.

3.4 Community Waste Management

3.4.1 Community Recycling Programme

In October 2017, a total of 179 kg of recyclable waste was recorded at the Community's Waste Bank, an increase of 67 kg compared to September 2017.

Table 3-16: Types and amounts of waste traded

Types of Waste	Unit	Remaining in September 2017	Additions in October 2017	Sold	Remaining in October 2017
Scrap metal	kg	213	98	0	311
Glass bottles	kg	302	28	0	330
Paper/cardboard	kg	35	29	0	64
Aluminium cans	kg	6	10	0	16
Plastic bottles	kg	21	14	0	35
Total	**kg**	**577**	**179**	**0**	**756**

3.4.2 Houay Soup Resettlement Area Waste Management

The PKC Co., Ltd was selected for operating Houay Soup Landfill which includes waste collection and transportation from Houay Soup Resettlement Area (HSRA) and host villages to Houay Soup Landfill. The District Governor issued a notice to conduct a consultation with communities on the waste management programme. The consultation is expected to be implemented in cooperation with EMU Bolikhan District by November 2017 prior to commencement of Waste Landfill operation.

During October 2017, an approximate of 3.1 m3 of solid waste from the local contractors and residents at HSRA was disposed of at the Houay Soup Landfill.

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 on 26-27 September 2017. There was general agreement among the participants about the proposed activity packages, and some minor suggestions and recommendations were received. The Lao version was reviewed by relevant GOL counterparts in October 2017 and comments were sent to NNP1PC for further consolidation in the document. Next discussion for GOL approval is planned to take place in December 2017.

3.5.1.2 PREPARATION OF PROVINCIAL REGULATION FOR THE WATERSHED MANAGEMENT

Xaysomboun and Bolikhamxay WRPO in coordination with NNP1 EMO completed the preparation for consultation at village and district level in late October 2017. The actual consultation is expected to be completed in November 2017. The submission to Xaysomboun Provincial Assembly and Provincial Justice Department is expected in December 2017.

3.5.2 Biodiversity Offset Management

3.5.2.1 PREPARATION OF BIODIVERSITY OFFSET MANAGEMENT PLAN

NNP1 continues to develop the proposal “No Net Loss Forecast” and the final draft was submitted to ADB on 23 October 2017 for further review. The draft is also expected to be discussed during the upcoming IAP and ADB mission in the November 2017 prior to approval by NNP1 Board of Directors.

3.5.2.2 IMPLEMENTATION OF PRE-BIODIVERSITY OFFSET MANAGEMENT PLAN

The pre-Biodiversity Offset Management Plan (pre-BOMP) in Nam Chouane-Nam Xang offset site covering the period of January to December 2017 is being implemented since March 2017 by Bolikhamxay Province. During October 2017, two patrolling teams have completed their first month of field work at Xaychamphone and Viengthong Districts. The overall patrolling work were evaluated and the findings were discussed with NNP1PC at the end of October 2017 and the outcome was satisfied.

As the development of BOMP is expected to be further delayed, the BOMC together with NNP1PC initiated the development of a second pre-BOMP proposal covering the period of

January to December 2018 with the focus to continue the activities under the first pre-BOMP, such as, awareness program, community outreach, capacity building, and patrolling. The proposal was presented by BOMC and discussed with NNP1PC in late of October 2017 for further improvement. It is expected to have final draft for further review by NNP1PC and discuss with IAP and ADB during their incoming mission in the middle of November 2017.

3.5.3 Biomass Clearance

The clearance activity was resumed in October 2017. However, the work was influenced by rain during the first two weeks of October. Four new local contractors were contracted by NNP1PC to boost the progress. The contractors started work in last week of October 2017. Overall, the biomass clearance is in progress in 1,309 ha for re-stockpiling and burning of residual biomass left from the first burning before the 2017 rainy season. As of October 2017, a total of 284.79 ha out of 1,641 ha were confirmed as 100% completed for biomass clearance, while 1024.70 ha are in progress for stock piling and burning, and remaining 331 ha were fully allocated for four new local contractors.

Table 3-17 *Biomass Clearance Progress in Each Priority Area as of 31 October 2017.*

Target Area		Progress to 31 October 2017	
Block	**Total Area to be Cleared (ha)**	**Total Area in Progress (ha)**	**100% Completed (ha)**
B1	109.24	54.43	
B2	158.63	92.90	41.57
B3	80.35	40.44	38.69
B4	163.74	153.11	112.74
B5	340.14	134.77	47.56
B6	31.92	4.41	
B7	39.65	2.26	
B8	37.61	8.97	
B9	52.75	6.44	
B10	269.1	169.71	
B11	89.98	89.98	
B12	64.11	64.11	
B13	101.24	101.24	
B14	43.33	43.34	
B15	43.73	43.37	42.26
B16	3.32	3.32	
B17	7.96	7.96	1.97

Target Area		Progress to 31 October 2017	
Block	**Total Area to be Cleared (ha)**	**Total Area in Progress (ha)**	**100% Completed (ha)**
B18	3.95	3.95	
Total	**1,640.75**	**1,024.70**	**284.79**

4. FISHERY MONITORING

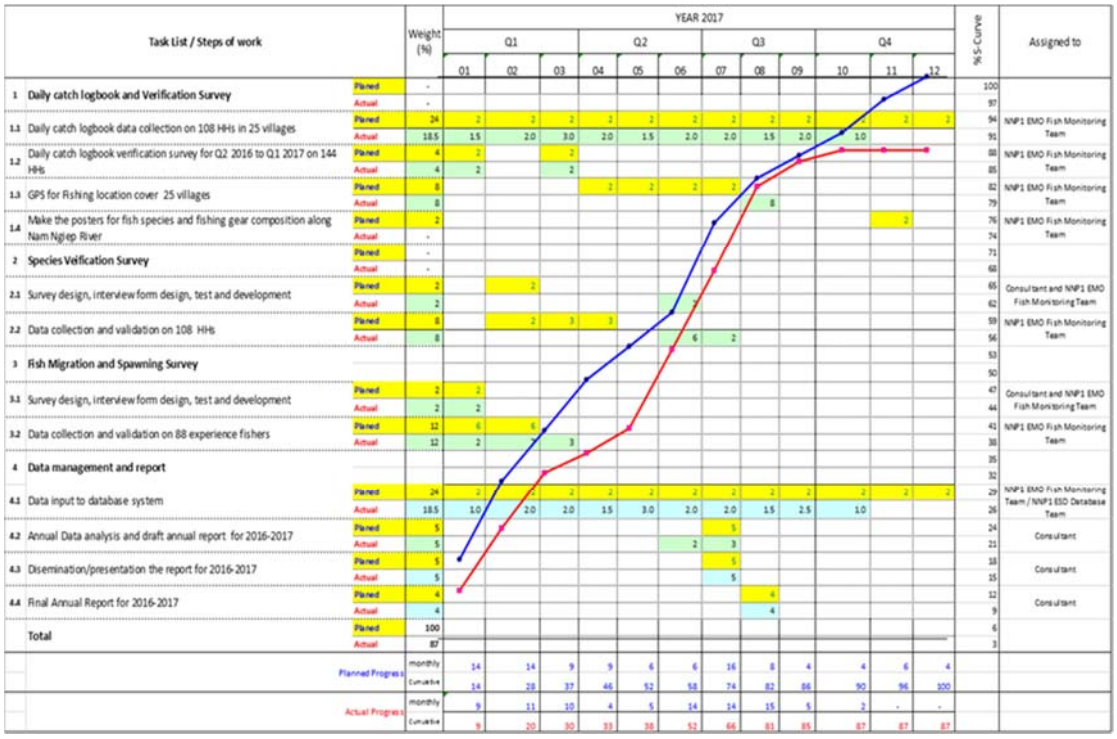
The fishery monitoring programme progressed according to plan in October 2017 with the third round of daily fish catch logbook monitoring and gillnet survey in 2017. The gathered information is being put into the database system.

The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 2.3 kg/household/day in September 2017. The estimated total fish catch in Nam Ngiep basin for September 2017 is 42,800 kg. Around 18 % of the catch was sold, 64% was consumed fresh, 16% 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 31 October 2017

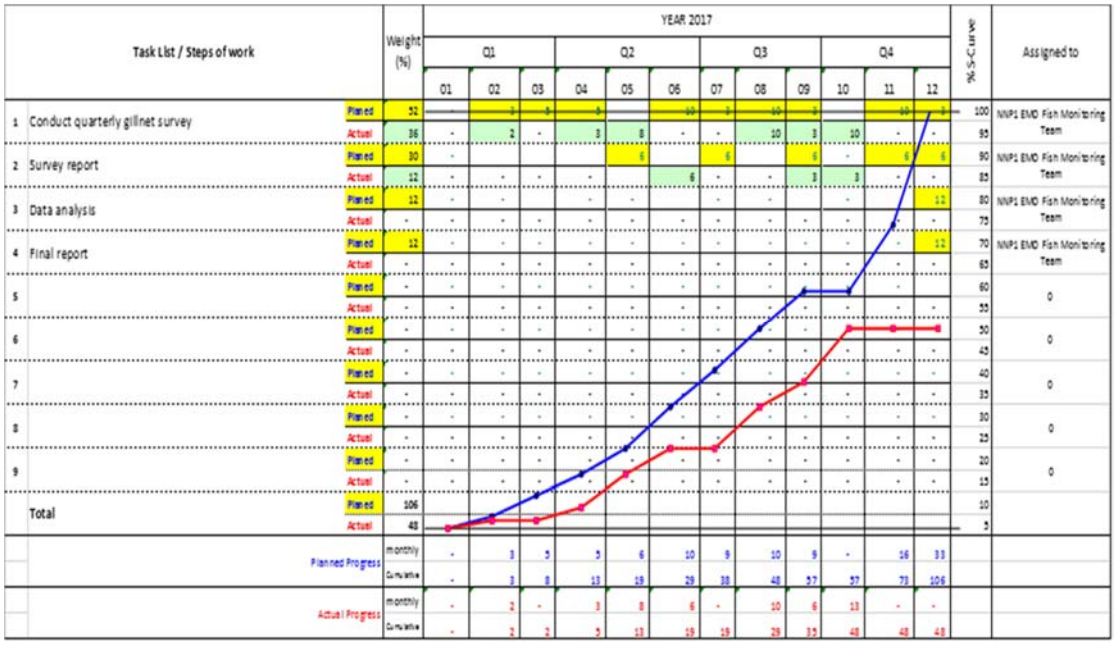
(a) S-Curve of fish catch monitoring programme



	Task List / Steps of work		Weight (%)	YEAR 2017 Q1 01	02	03	Q2 04	05	06	Q3 07	08	09	Q4 10	11	12	%S-Curve	Assigned to
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	18.5	1.5	2.0	3.0	2.0	1.5	2.0	2.0	1.5	2.0	1.0			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	6		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	18.5	1.0	2.0	2.0	1.5	3.0	2.0	2.0	1.5	2.5	1.0			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	87													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	2	-	-		
		Cumulative		9	20	30	33	38	52	66	81	85	87	87	87		

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 Q1 01	02	03	Q2 04	05	06	Q3 07	08	09	Q4 10	11	12	%S-Curve	Assigned to
1	Conduct quarterly gillnet survey	Planed	52	-	3	5	5	6	10	9	10	9	-	16	33	100	NNP1 EMO Fish Monitoring Team
		Actual	36	-	2	-	3	8	-	-	10	3	10	-	-	95	
2	Survey report	Planed	30	-				6		6		6	-	6	6	90	NNP1 EMO Fish Monitoring Team
		Actual	12	-	-	-	-		6	-	-	3	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	48													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	13	-	-		
		Cumulative		-	2	2	5	13	19	19	29	35	48	48	48		

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

ANNEXES

ANNEX A: RESULTS OF EFFLUENT ANALYSES

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

Parameters (Unit)	Site Name	Owner's Site Office and Village		Obayashi Camp		Sino Hydro Camp	
	Station Code	EF01		EF02		EF06	
	Date	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17
	Effluent Guideline in the CA						
pH	6.0 - 9.0	6.68	7.21	7.04	7.34	7.16	7.26
Sat. DO (%)		53.4	50.9	78.5	78.2	66.8	82.1
DO (mg/l)		3.8	3.68	5.51	5.56	4.75	5.95
Conductivity (µs/cm)		320	290	641	605	616	554
TDS (mg/l)		160	145	320	302	308	277
Temperature (°C)		31.3	30	32.3	31.5	31.5	30.3
Turbidity (NTU)		0.73	1.17	9.26	8.17	17.8	17
TSS (mg/l)	<50	<5	<5	17.98	12	5.17	6.31
BOD (mg/l)	<30	6.54	5.65	<6	14.18	<6	<5.0
COD (mg/l)	<125	<25	<25.0	107	75.8	37.4	39.2
NH_3-N (mg/l)	<10.0	3	3	19	12	31	22
Total Nitrogen (mg/l)	<10	9.34	7.62	24.3	21.5	34.4	23.5
Total Phosphorus (mg/l)	<2	1.54	1.39	1.4	1.39	2.01	2.31
Oil & Grease (mg/)	<10.0	<1.0	n/a	<1.0	n/a	<1.0	n/a
Total coliform (MPN/100 ml	<400	3,500	27	10	0	0	0
Fecal Coliform (MPN/100 ml)		110	14	0	0	0	0
Effluent Discharge Volume (l/mn)		20	20	30	20	20	12
Chlorination Dosing Rate (ml/mn)		n/a	n/a	325	95	75	23
Residual Chlorine (mg/l)	<1.0	n/a	n/a	0.63	0.24	0.46	0.35

Parameters (Unit)	Site Name	Song Da 5 Camp No.1		Song Da 5 Camp No.2		Zhefu Camp	
	Station Code	EF07		EF08		EF09	
	Date	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17
	Effluent Guideline in the CA						
pH	6.0 - 9.0	6.89	6.97	6.94	7.15		
Sat. DO (%)		95.8	74.3	74.4	73.3		
DO (mg/l)		6.52	5.19	5.25	5.37		
Conductivity (µs/cm)		792	891	476	510		

Parameters (Unit)	Site Name	Song Da 5 Camp No.1		Song Da 5 Camp No.2		Zhefu Camp	
	Station Code	EF07		EF08		EF09	
	Date	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17
	Effluent Guideline in the CA						
TDS (mg/l)		391	445	238	260	No samples due to no water	
Temperature (°C)		34.2	32.7	31.9	29.9		
Turbidity (NTU)		14.2	11.4	12.3	15.9		
TSS (mg/l)	<50	34.16	25.5	20.38	20.7		
BOD (mg/l)	<30	<6	14.84	<6	<6		
COD (mg/l)	<125	76.8	79.9	72.2	79.9		
NH_3-N (mg/l)	<10.0	15	16	8	7		
Total Nitrogen (mg/l)	<10	20.1	20.6	11	9.9		
Total Phosphorus (mg/l)	<2	1.24	1.38	1.02	0.71		
Oil & Grease (mg/)	<10.0	<1.0	n/a	<1.0	n/a		
Total coliform (MPN/100 ml	<400	0	0	0	0		
Fecal Coliform (MPN/100 ml)		0	0	0	0		
Effluent Discharge Volume (l/mn)		30	20	20	60		
Chlorination Dosing Rate (ml/mn)		85	65	140	65		
Residual Chlorine (mg/l)	<1.0	0.92	0.17	1.46	0.82		

Parameters (Unit)	Site Name	V&K Camp		HM Hydro Camp		IHI Camp	
	Station Code	EF10		EF13		EF14	
	Date	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17
	Effluent Guideline in the CA						
pH	6.0 - 9.0	7.05	7.43	7.02	7.45	6.94	7.16
Sat. DO (%)		67.8	70.2	31.2	80.7	60.4	58
DO (mg/l)		4.86	5.08	2.18	5.89	4.2	4.22
Conductivity (µs/cm)		356	272	639	889	883	876
TDS (mg/l)		178	136	319	444	441	438
Temperature (°C)		31.2	30.6	32.2	30	32.5	30.2
Turbidity (NTU)		5.68	6.98	27.2	33	24.7	32.9
TSS (mg/l)	<50	7.03	13.63	25.21	41.43	18.8	17.11
BOD (mg/l)	<30	<6	15.89	<6	<6	<6	<6
COD (mg/l)	<125	<25	<25	190	207	172	185
NH_3-N (mg/l)	<10.0	6	5	16	20	12	10

Parameters (Unit)	Site Name	V&K Camp		HM Hydro Camp		IHI Camp	
	Station Code	EF10		EF13		EF14	
	Date	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17	02-Oct-17	16-Oct-17
	Effluent Guideline in the CA						
Total Nitrogen (mg/l)	<10	7.95	7.77	20.5	22	17.3	14.1
Total Phosphorus (mg/l)	<2	0.63	0.39	1.57	1.89	1.37	0.95
Oil & Grease (mg/)	<10.0	<1.0	n/a	3	n/a	3	n/a
Total coliform (MPN/100 ml	<400	1,600	11	240	0	0	0
Fecal Coliform (MPN/100 ml)		350	11	240	0	0	0
Effluent Discharge Volume (l/mn)		7.5	10			6	4
Chlorination Dosing Rate (ml/mn)		85	63			5	0
Residual Chlorine (mg/l)	<1.0	0.28	0.1	0	1.78	1.12	1.99

Parameters (Unit)	Site Name	Kenber Camp	
	Station Code	EF16	
	Date	02-Oct-17	16-Oct-17
	Effluent Guideline in the CA		
pH	6.0 - 9.0	6.71	7.32
Sat. DO (%)		92.1	87.3
DO (mg/l)		6.69	6.44
Conductivity (µs/cm)		240	301
TDS (mg/l)		120	150
Temperature (°C)		29.9	28.9
Turbidity (NTU)		5.34	8.05
TSS (mg/l)	<50	8.5	21.02
BOD (mg/l)	<30	<6	<6
COD (mg/l)	<125	28.1	28.4
NH_3-N (mg/l)	<10.0	<0.2	<0.2
Total Nitrogen (mg/l)	<10	2.22	2.47
Total Phosphorus (mg/l)	<2	0.19	0.35
Oil & Grease (mg/)	<10.0	<1.0	n/a
Total coliform (MPN/100 ml	<400	0	0
Fecal Coliform (MPN/100 ml)		0	0
Effluent Discharge Volume (L/mn)		20	15

Parameters (Unit)	Site Name	Kenber Camp	
	Station Code	EF16	
	Date	02-Oct-17	16-Oct-17
	Effluent Guideline in the CA		
Chlorination Dosing Rate (ml/mn)		3	25
Residual Chlorine (mg/l)	<1.0	0.22	0.19

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

	Site Name	Aggregate Crushing Plant				CVC Plant			
	Station Code	DS02				DS03			
	Date	05-Oct 2017	12-Oct 2017	19-Oct 2017	26-Oct 2017	05-Oct 2017	12-Oct 2017	19-Oct 2017	26-Oct 2017
Parameter (Unit)	Guideline								
pH	6.0 - 9.0	6.91	7.06	7.51	7.36	No Discharge			
Sat. DO (%)		103.9	101.4	104.3	103.1				
DO (mg/l)		7.55	7.78	7.58	7.58				
Conductivity (µs/cm)		188.5	188.8	150	147.2				
TDS (mg/l)		94	94	75	73				
Temperature (°C)		30.5	27.4	30.6	30				
Turbidity (NTU)		7.96	11.7	19.8	15.72				
TSS (mg/l)	<50	2.04	25.82	36.36	5.26				
Oil & Grease (mg/l)	<10	<1.0	n/a	n/a	n/a				

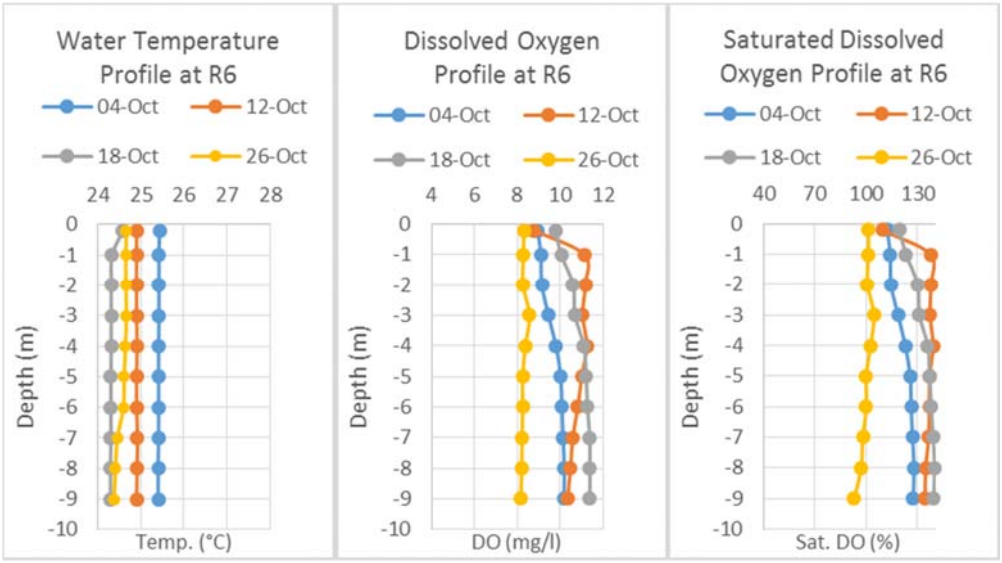
	Site Name	Spoil Disposal No.2			
	Station Code	DS04			
	Date	05-Oct 2017	12-Oct 2017	19-Oct 2017	26-Oct 2017
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	7.96	8.03	6.2	6.65
Sat. DO (%)		55.8	79.4	58	82.9
DO (mg/l)		4.35	6.17	4.45	6.18
Conductivity (µs/cm)		18	50	19.46	19.67
TDS (mg/l)		9	25	10	9
Temperature (°C)		27.3	26.5	27.3	29.1

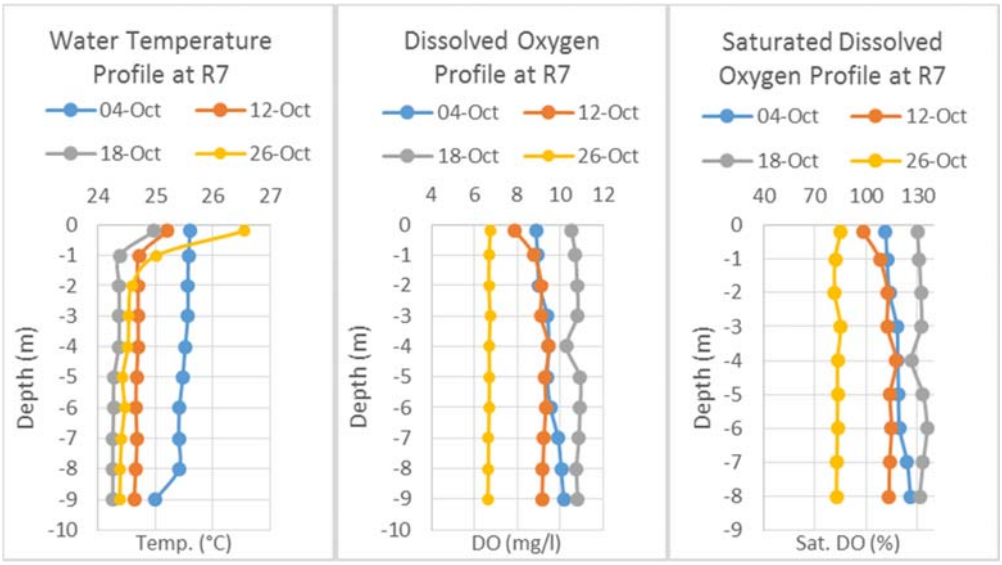
	Site Name	Spoil Disposal No.2			
	Station Code	DS04			
	Date	05-Oct 2017	12-Oct 2017	19-Oct 2017	26-Oct 2017
Parameter (Unit)	**Guideline**				
Turbidity (NTU)		10.49	130	9.18	10.21
TSS (mg/l)	<50	5.4	184.02	10	5
Oil & Grease (mg/l)	<10	<1.0	n/a	n/a	n/a

	Site Name	RCC Plant Discharge at Lower Ponds				RCC Plant Discharge nearby IHI Workshop			
	Station Code	DS09				DS13			
	Date	05-Oct-17	12-Oct-17	19-Oct-17	26-Oct-17	05-Oct-17	12-Oct-17	19-Oct-17	26-Oct-17
Parameter (Unit)	**Guideline**								
pH	6.0 - 9.0	7.0	7.23	6.87	7.71	No water sampling. The effluent construction at this location was integrated into the lower ponds (DS09).			
Sat. DO (%)		96.8	90.7	81.5	97.8				
DO (mg/l)		7.14	6.93	6.09	7.32				
Conductivity (µs/cm)		343	257	333	257				
TDS (mg/l)		171	128	166	127				
Temperature (°C)		29.8	27.7	29	29.1				
Turbidity (NTU)		25.6	13.3	5.22	17.57				
TSS (mg/l)	<50	17.83	26.8	11.22	3.6				
Oil & Grease (mg/l)	<10	<1.0	n/a	n/a	n/a				

	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	05-Oct 2017	12-Oct 2017	19-Oct 2017	26-Oct 2017	05-Oct 2017	12-Oct 2017	19-Oct 2017	26-Oct 2017
Parameter (Unit)	**Guideline**								
pH	6.0 - 9.0	5.44	9.33	6.61	7.33	No Discharge			
Sat. DO (%)		99.1	100.1	102	100.8				
DO (mg/l)		7.32	7.7	7.46	7.31				
Conductivity (µs/cm)		1,195	668	944	440				
TDS (mg/l)		596	334	472	220				
Temperature (°C)		29.7	27.1	30	30.8				
Turbidity (NTU)		59.2	6.63	80	2.99				
TSS (mg/l)	<50	47.09	19.23	79.37	4.21				
Oil & Grease (mg/l)	<10	<1.0	n/a	n/a	n/a				

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





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	09-Oct-17 at 18:00	10-Oct-17 at 18:00	11-Oct-17 at 18:01
End Time	10-Oct-17 at 18:00	11-Oct-17 at 18:00	12- Oct- 17 at 18:00
Average Data Record in 24h (mg/m^3)	0.019	0.015	0.017
Guideline Average in 24h (mg/m^3)	0.12	0.12	0.12

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

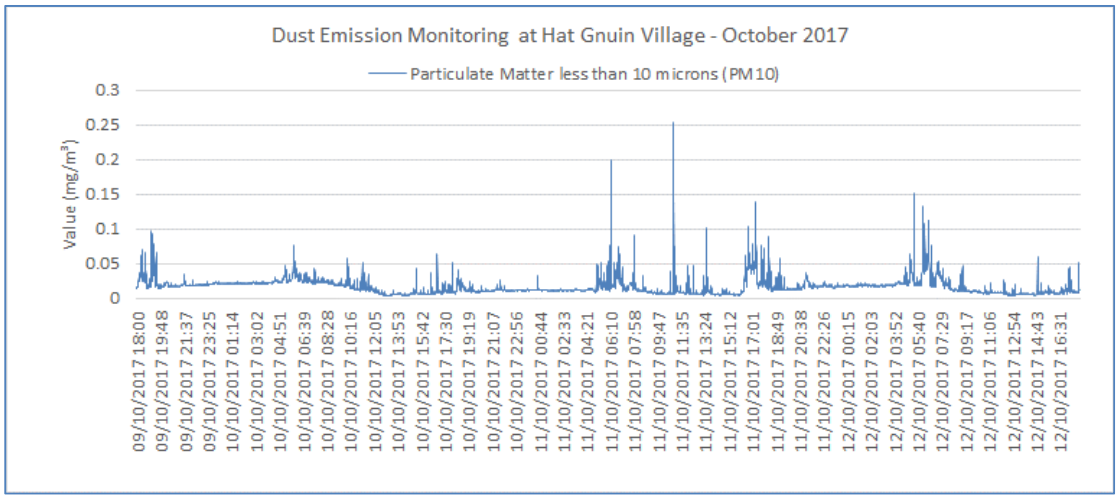


Table B- 2: 24-hour Average Dust Concentrations Measured in Houay Soup Resettlement Area

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	06-Oct-17 at 18:00	07-Oct/17 at 18:02	08-Oct-17 at 18:01
End Time	07-Oct-17 at 18:01	08-Oct-17 at 18:01	09-Oct-17 at 17:00
Average Data Record in 24h (mg/m^3)	0.043	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 October 2017

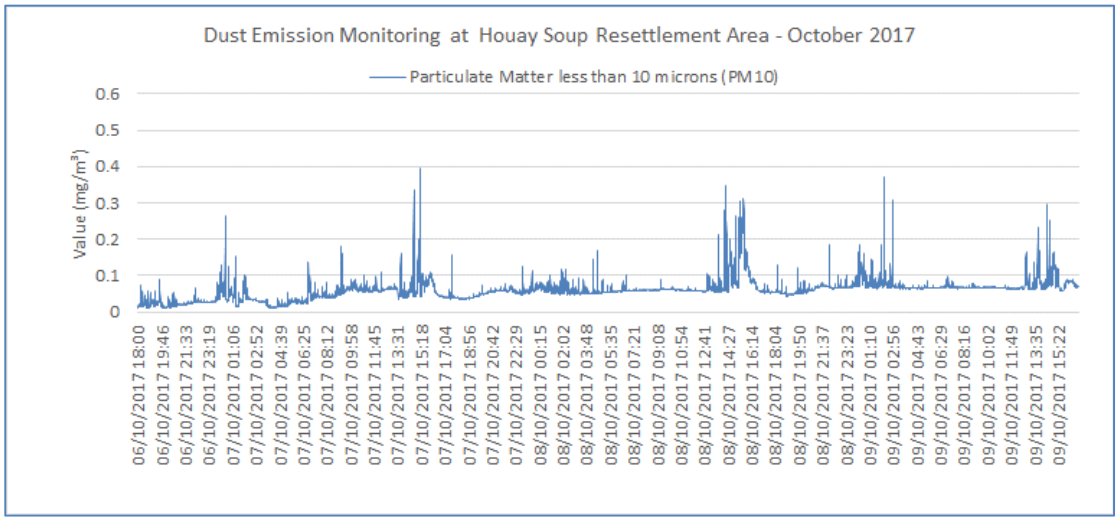


Figure B- 3: Dust Monitoring Results at the Aggregate Crushing Plant in October 2017

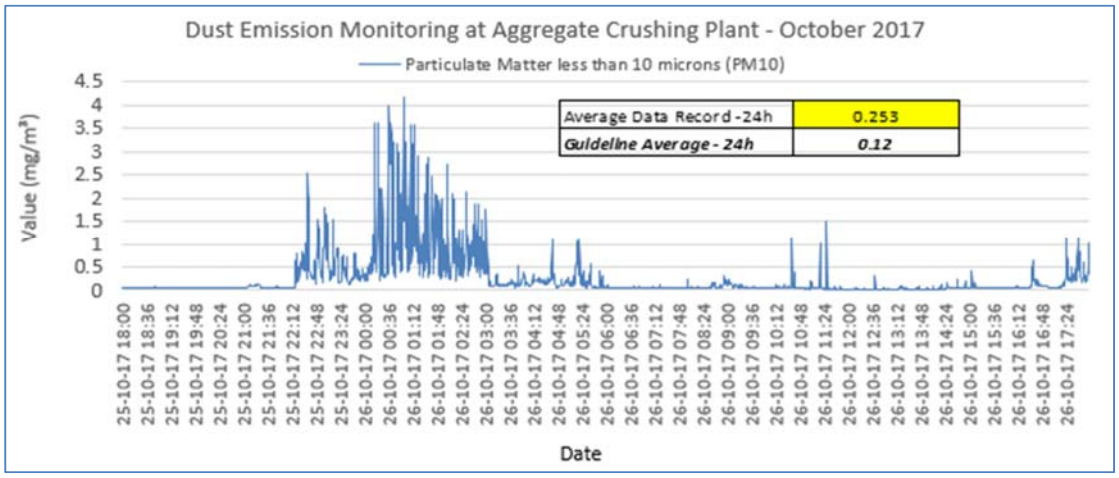


Figure B- 4: Dust Monitoring Results at the RCC Plant in October 2017

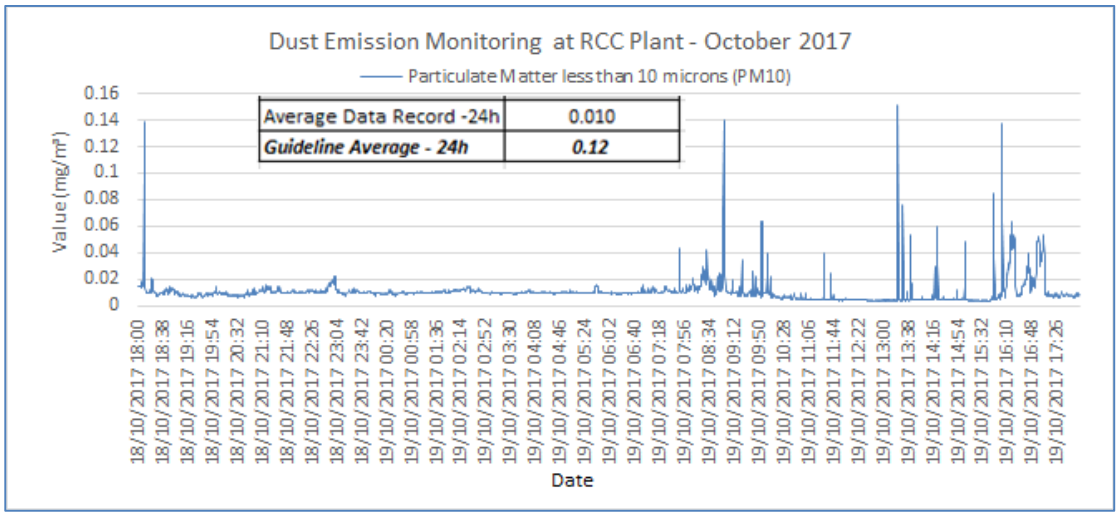


Figure B- 5: Dust Monitoring Results at the Sino Hydro Temporary Camp in October 2017

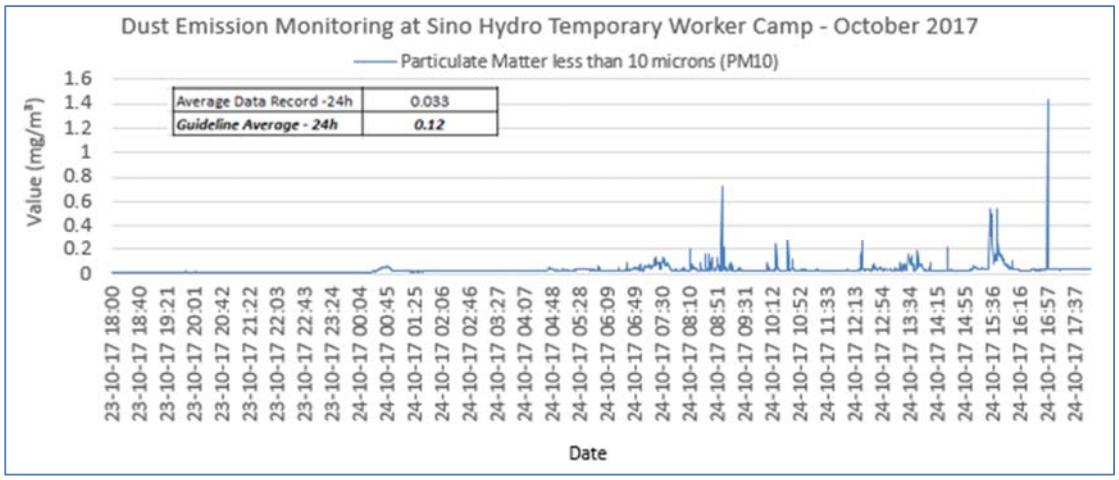


Figure B- 6: Dust Monitoring Results at the SongDa5 No.2 Camp in *October 2017*

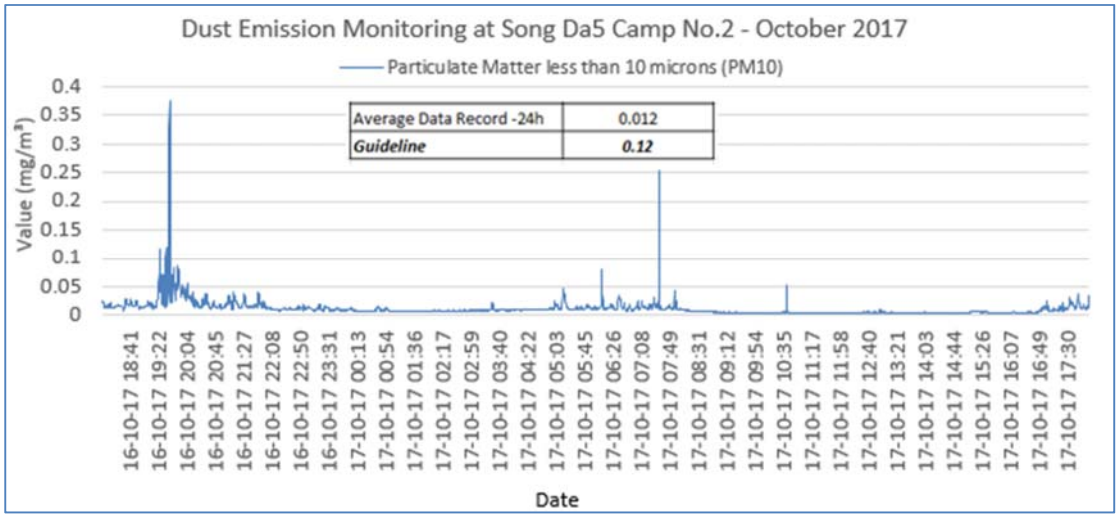


Figure B- 8: Dust Monitoring Results at Main Dam (Top View Left Bank) in October 2017

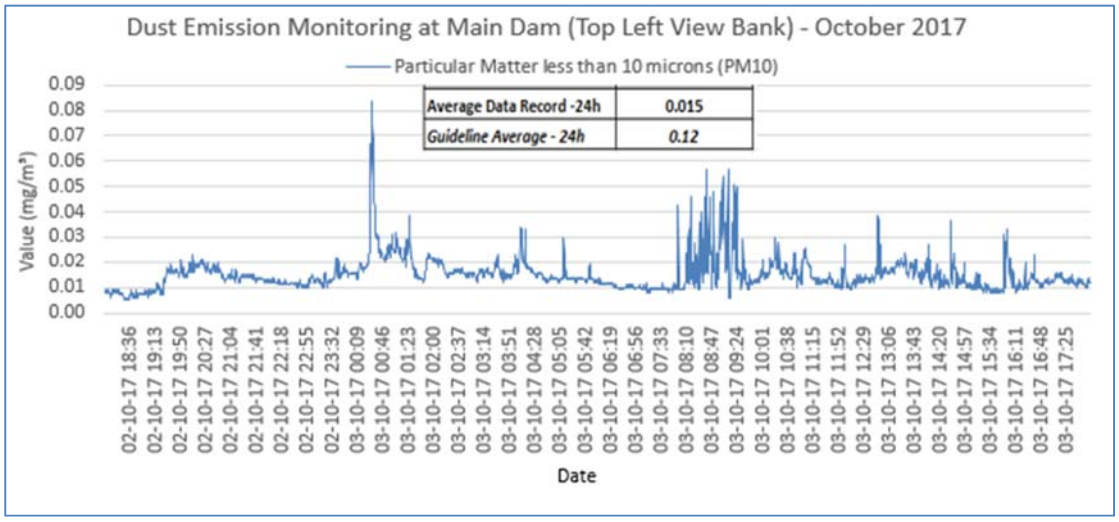


Figure B- 9: Dust Monitoring Results at the Lilama10 Camp in October 2017

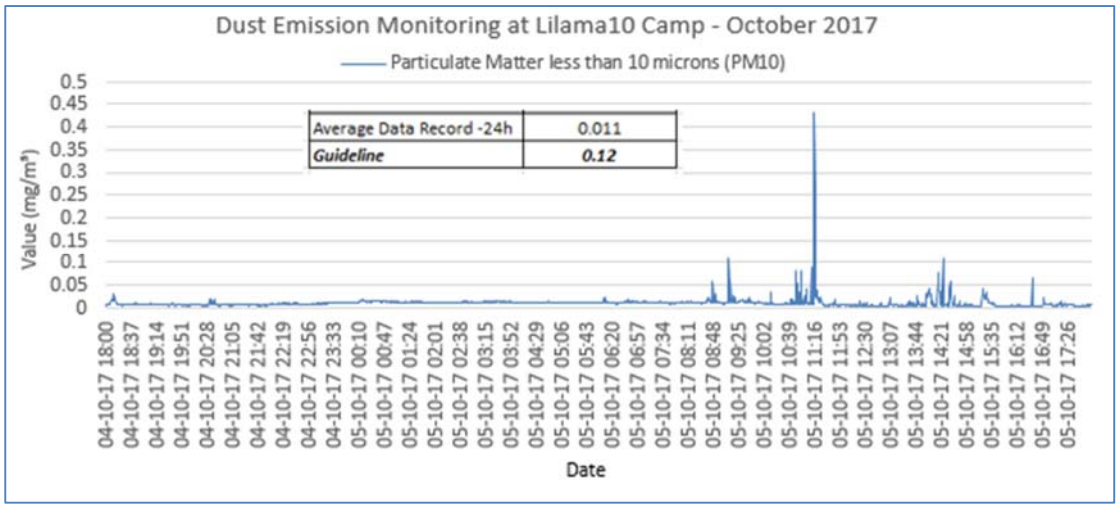
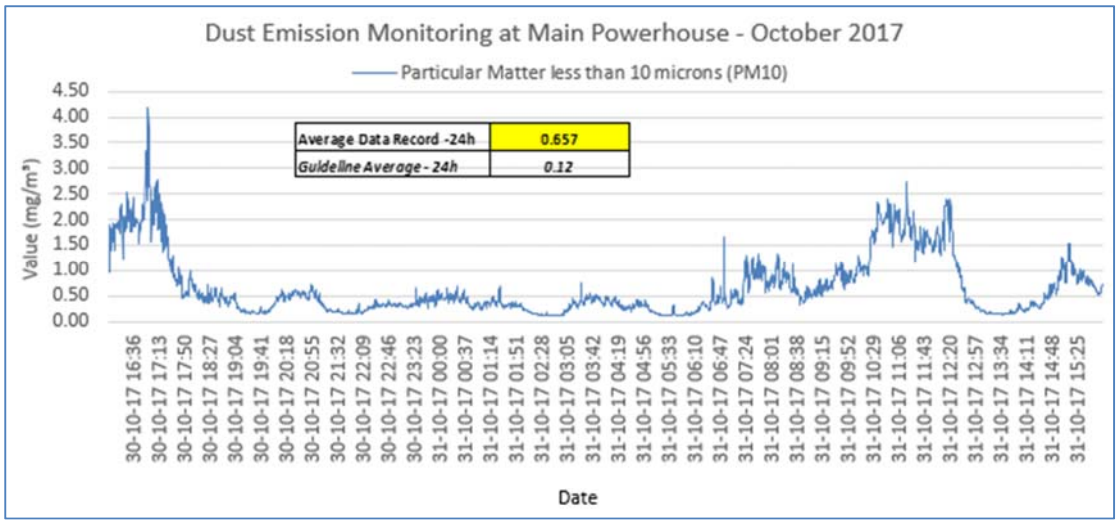


Figure B- 9: Dust Monitoring Results at the Main Powerhouse in October 2017



ANNEX C: AMBIENT NOISE DATA

Table C- 1: Average Results of Noise Monitoring at Ban Hat Gnuin in October 2017

Noise Level (dB)	09-10/October/17			10-11/October/17			11-12/October/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	64.80	64.50	72.80	65.10	58.90	73.70	68.50	68.50	82.90
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	55.12	52.46	59.42	49.45	46.55	48.25	51.61	48.73	53.72
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

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

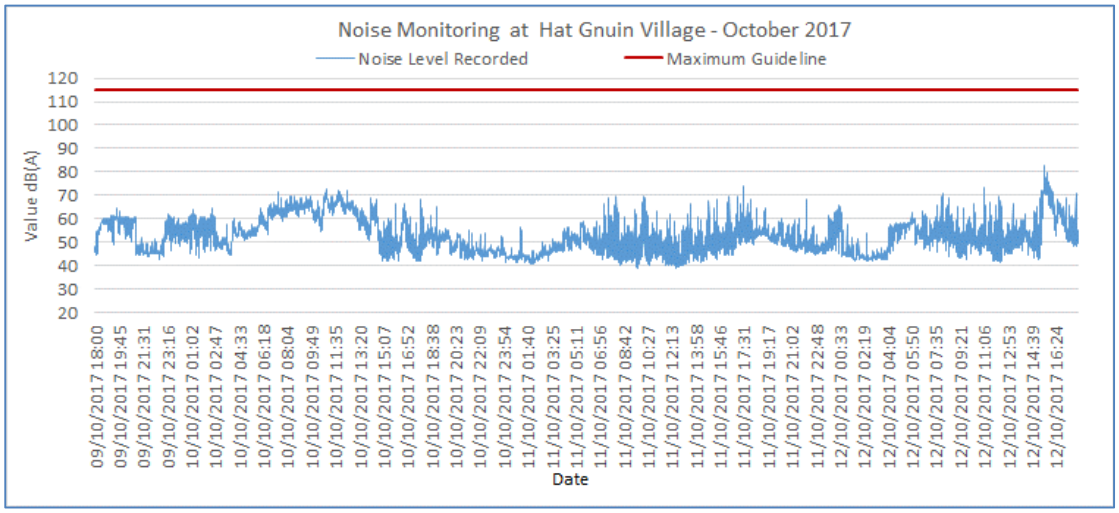


Table C- 2: Average Results of Noise Monitoring at Houay Soup Resettlement Area in October 2017

Noise Level (dB)	06-07/October/17			07-08/October/17			08-09/October/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 – 17:00
Maximum Value Recorded	65.40	68.30	73.20	67.00	71.00	77.30	63.60	66.90	73.60
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	42.09	42.22	43.68	48.81	40.50	42.89	47.28	45.14	44.82
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 October 2017

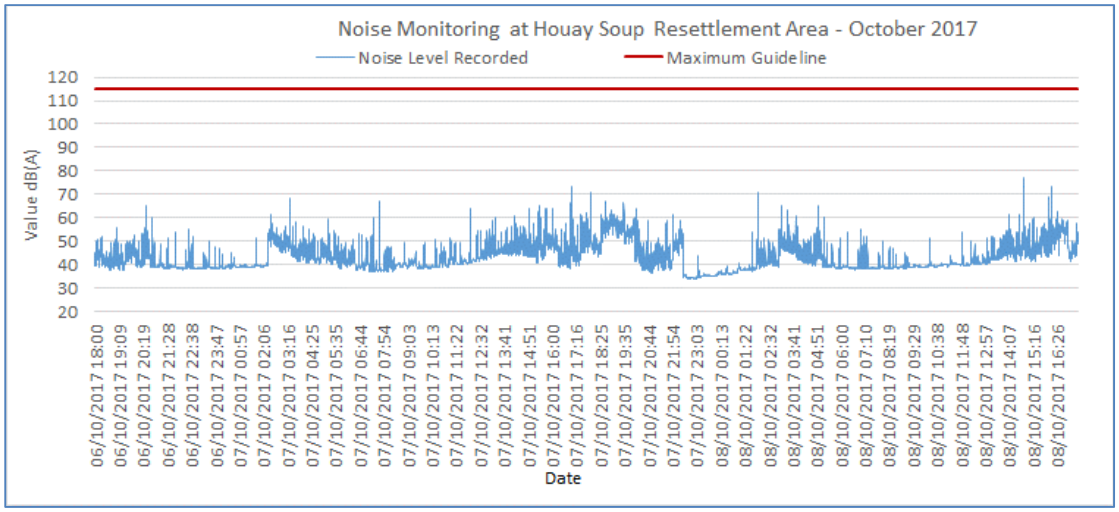


Table C- 2 and Table C-3: Average Results of Noise Monitoring at Aggregate Crushing Plant and RCC Plant in October 2017

Aggregate Crushing Plant

Noise Level (dB)	25-26/October/17		26/October/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	72.4	79.8	77.8
Guideline Max	***115***	***115***	***115***
Average Data Recorded	47.55	74.42	51.38
Guideline Averaged	***70***	***70***	***70***

RCC Plant

Noise Level (dB)	18-19/October/17		19/October/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	72.6	67.1	72.8
Guideline Max	***115***	***115***	***115***
Average Data Recorded	55.20	60.26	54.90
Guideline Averaged	***70***	***70***	***70***

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

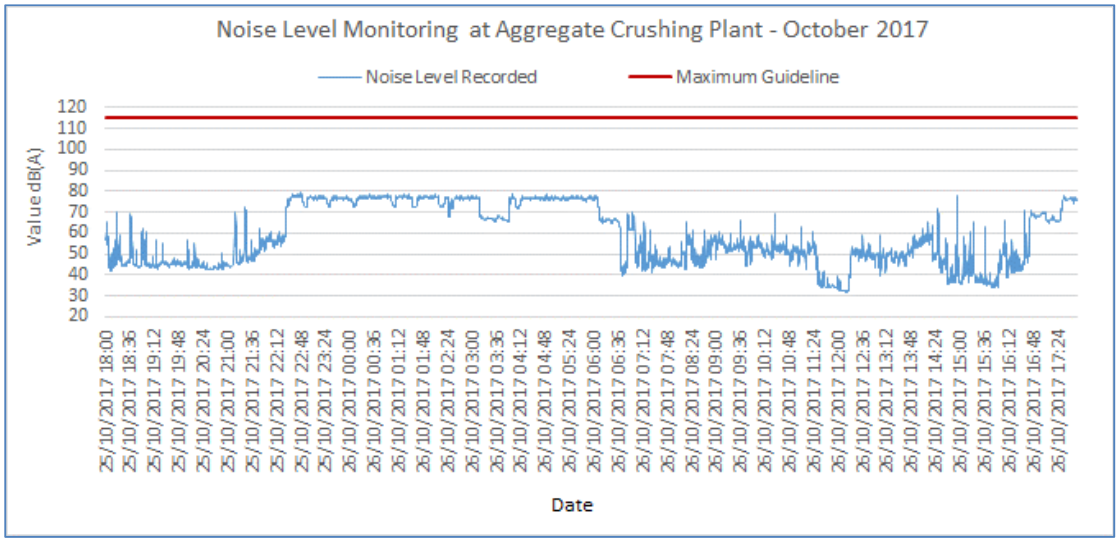


Figure C- 4: Results of Noise Level Monitoring at the RCC Plant in October 2017

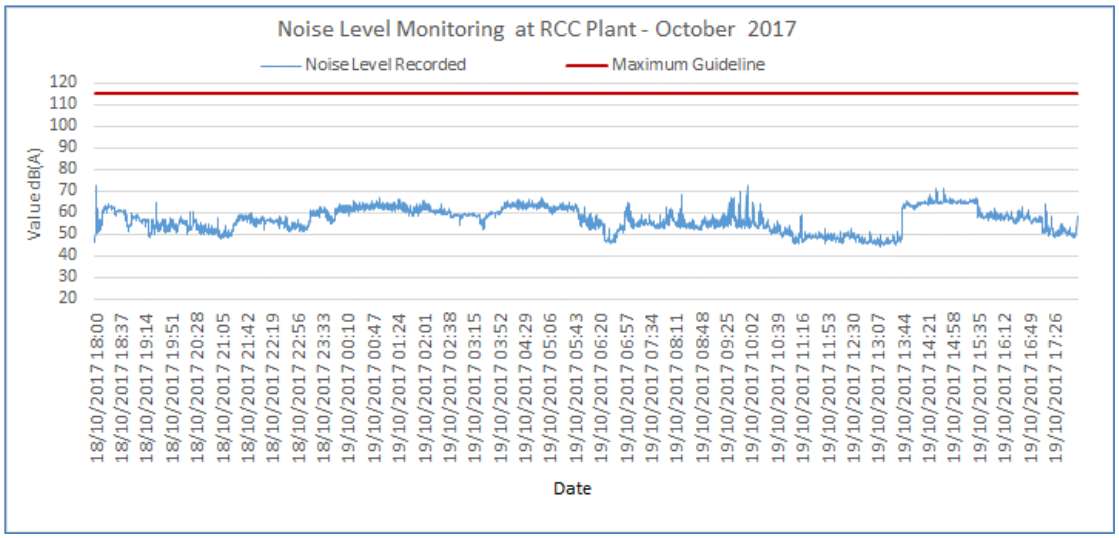


Table C- 5 and Table C- 6*: Average Results of Noise Monitoring at SongDa Camp#2 and Sino Hydro Camp in October2017*

Song Da5 Camp No.2

Sino Hydro Temporary Worker Camp

Noise Level (dB)	16-17/October/17		17/October/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	82.7	62.4	82.7
Guideline Max	***115***	***115***	***115***
Average Data Recorded	59.09	56.88	54.11
Guideline Averaged	***70***	***70***	***70***

Noise Level (dB)	23-24/October/17		24/October/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	69.1	69	67.1
Guideline Max	***115***	***115***	***115***
Average Data Recorded	56.28	62.87	54.04
Guideline Averaged	***70***	***70***	***70***

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

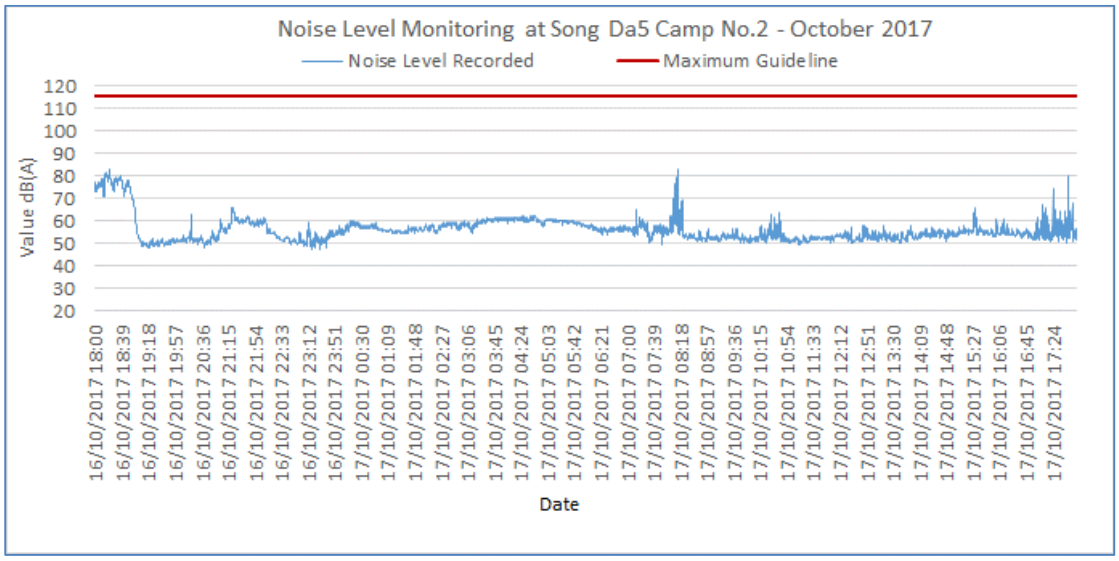


Figure C- 6: Results of Noise Level Monitoring at Sino Hydro Temporary Worker Camp in October 2017

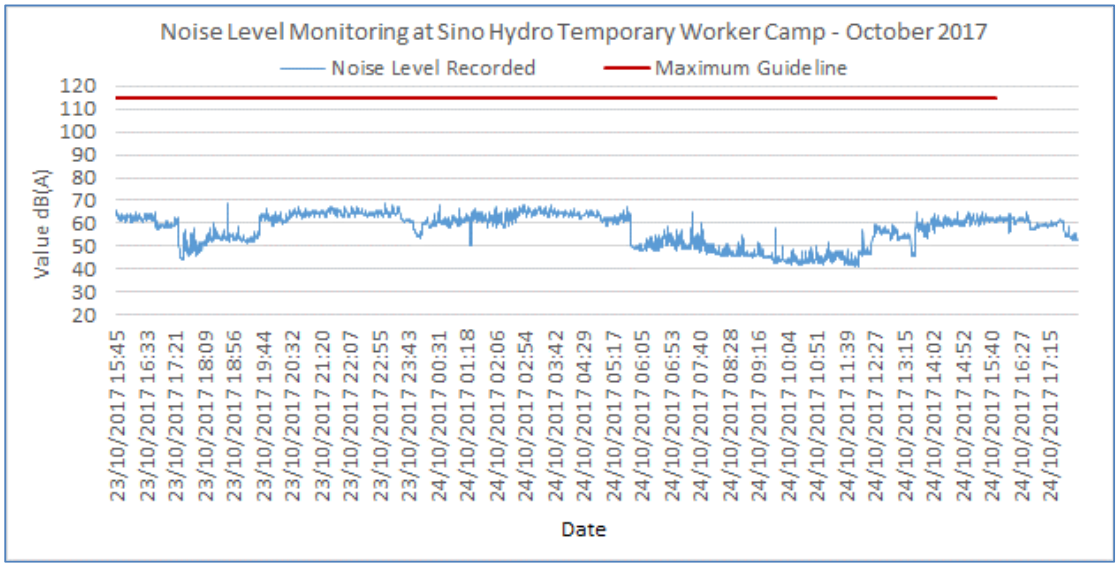


Table C- 7 and Table C- ***8: Average Results of Noise Monitoring at Main Dam, and Lilama 10 Camp in October 2017***

Main Dam

Noise Level (dB)	02-03/October/17		03/October/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	73.2	72.2	74.1
Guideline Max	***115***	***115***	***115***
Data Record Average	59.40	60.27	59.56
Guideline Averaged	***70***	***70***	***70***

Lilama 10 Camp

Noise Level (dB)	04-05/October/2017		05/October/2017
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	69.4	53.3	66.7
Guideline Max	***115***	***115***	***115***
Average Data Recorded	52.46	43.48	47.16
Guideline Averaged	***70***	***70***	***70***

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

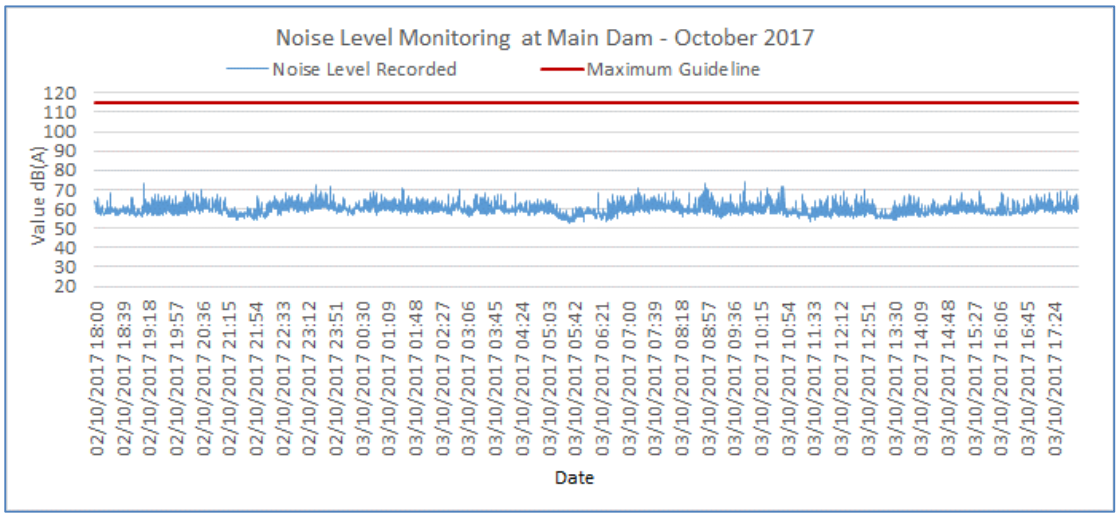


***Figure C- 8: Results of Noise Level Monitoring at Lilama10 Camp* in October 2017**

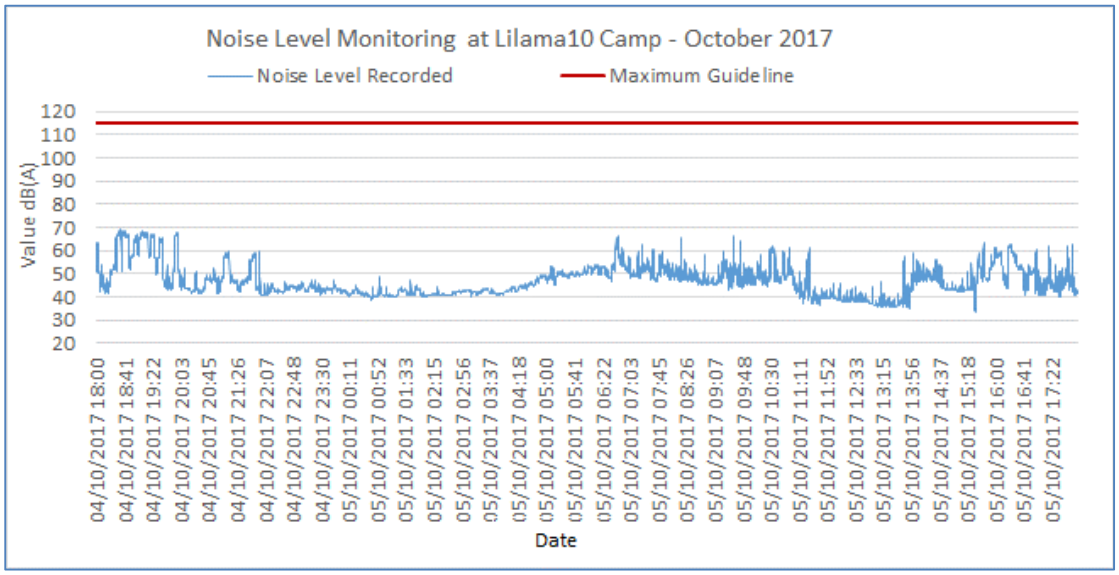


Table C- 9: Average Results of Noise Monitoring at Main Powerhouse in October 2017

Main Powerhouse

Noise Level (dB)	30-31/October/17		31/October/17
	16:00 – 22:00	22:01 – 06:00	06:01-14:04
Data Record Max	96	93.1	92.1
Guideline Max	***115***	***115***	***115***
Data Record Average	82.99	82.40	77.20
Guideline Averaged	***70***	***70***	***70***

Figure C- 9: Results of Noise Level Monitoring at Main Powerhouse in October 2017