NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

December 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 December 2017, seven Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP) were active for EMO review. Out of these, six SS-ESMMPs were cleared, one SS-ESMMP was on hold and will be carried over to January 2018.

On 20 December 2017, the Environmental Management Unit (EMU) of Bolikhamxay Province inspected the main construction sites, camps and Phouhomxay (the resettlement village, previously called Houay Soup Resettlement Area). The EMU will submit a mission report to EMO for review by early January 2018.

On 27-28 December 2017, the Environmental Management Unit (EMU) of Xaysomboun Province inspected waste clean-up of four villages of Zone 2LR and biomass clearance. There was no comment by the Xaysomboun Provincial EMU during the field visit.

Effluents from camps were monitored fortnightly, and the results for December 2017 indicated significant improvement for key parameters (BOD, total coliform and faecal coliform), all of which complied with the relevant effluent standards.

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

The Phoukham Chanvong (PKC Co., Ltd) was awarded a one-year contract for operating Houay Soup Landfill including waste collection and transportation from Phouhomxay, Thahuea, Hat Gniun villages to Houay Soup Landfill. The operation of Houay Soup Landfill by the PKC contractor started on 01 December 2017.

The Nam Ngiep 1 Watershed Management Plan (NNP1 WMP) was revised based on comments from Government organizations in November 2017 and the Lao version was finalized in the last week of December 2017 after series of discussion with the Watershed and Reservoir Protection Office (WRPO). The meeting for approval of the NNP1 WMP is tentatively scheduled to be held on 24 January 2017 based on the discussion with Xaysomboun WRPO on 19 December 2017.

The Biodiversity Impact Mitigation and Offset Proposal (No Net Loss Forecast) prepared by NNP1PC in November 2017 was further revised and approved by ADB on 22 December 2017. The next step is that NNP1PC will consult with relevant Government organizations to obtain their agreement to the proposal.

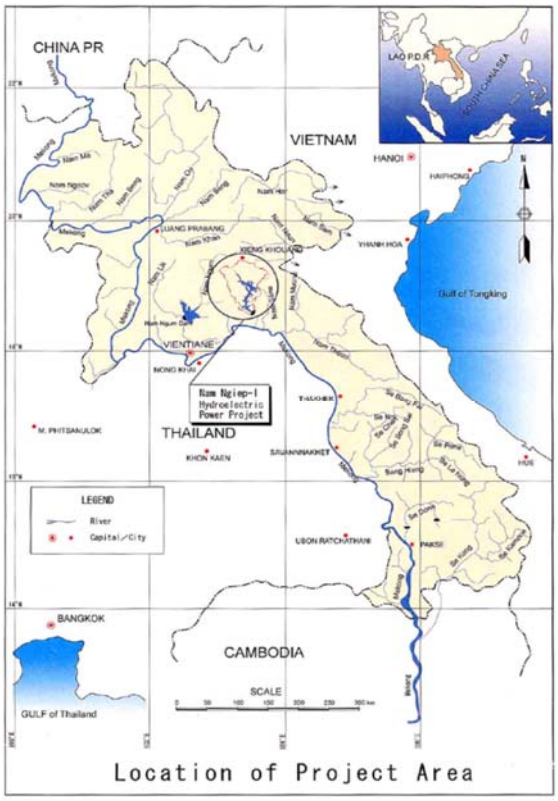
As of 31 December 2017, out of the total biomass clearance area of 1,640 ha, 846 ha have been fully cleared and vegetation cutting has been completed in another 709-ha making the area ready for burning of the cut biomass.

The fishery monitoring programme has continued as planned. The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 1.5 kg/household/day in November 2017. The estimated total fish catch in Nam Ngiep basin for November 2017 is 45,300 kg. Around 31 % of the catch was sold, 62% was consumed fresh, 4% processed and approximately 4% 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.

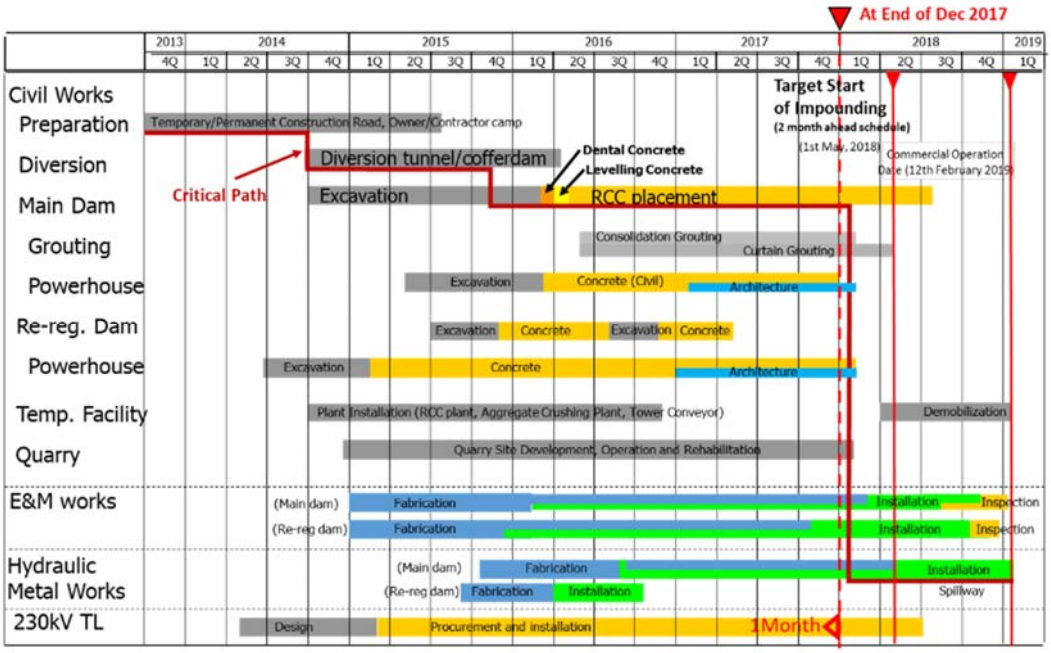
2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

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 December 2017 was 90.0 %[1] (compared to planned progress of 90.1 %), 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 December 2017 was 91.8 % (compared to planned progress of 90.7 %) calculated in the same manner as described above for the value of achieved Interim Milestone Payments excluding advance payment.

2.1.1 Main dam and power house

After starting the main dam excavation works in October 2014 on the left bank, the works were about one month advanced when diversion of the Nam Ngiep River was achieved at the end of October 2015. However, excavated volumes were 20% greater than expected and part of this additional work is necessary to construct a 'shear key' structure due to the weak layers of rock encountered in the dam foundation. Following the efforts on Site, the additional excavation work was completed at the end of February 2016.

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

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

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

Item	Description	Total Drilling (m)	Completed (m)	Progress (%)
Consolidation Grouting	Anticipated Quantity	17,769	17,157	97
Curtain Grouting	Original Design Quantity	27,945	33,384	119
	Anticipated Final Quantity	58,400	33,384	57

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

Main powerhouse sub-structure excavation works were completed in January 2016 and levelling concrete works were started in coordination with installation of the grounding system and the penstock concrete encasement. Major concrete of the main powerhouse was substantially completed in December 2017and is shown in **Error! Reference source not found.** below

Table 2-2: Progress of Main Powerhouse Sub-Structure Concrete Works to as of the end of December 2017.

Location	Total Anticipated Volume (m^3)	Completed (m^3)	Progress (%)
Main Powerhouse	35,000	34,500	98
Penstock Embedment	11,885	9,130	76
Spillway	35,500	12,300	35

2.1.2 Re-regulation dam and powerhouse

The re-regulation powerhouse excavation and cofferdam works for river diversion were commenced in early October 2014. The excavation works for the powerhouse on the left bank were fully completed down to El. 146.7 m at the end of February 2015.

Structural concrete works were commenced in March 2015, in coordination with installation of the grounding system. The progress of structural concrete works is shown in

*Figure **2-3*** below

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

Fencing Work

Powerhouse Building Works	Painting Inside and Outside	Lighting Fixtures	Water Supply	Electrical Conduit and Wire	Fence
	(m^2)	(Unit)	(%)	(m)	(m)
Designed	6,135	311	100	2,510	117
Completed	6,035	309	20	2,490	47
Progress	98 %	99 %	20 %	99 %	40 %

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 December 2017 was 91.6 % (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

Figure 4.2-1: Assembly work of Stator for Unit 1 at the Main Power station

Figure 4.2-2: Placement work of Runner for Unit 1 at the Main Power station

Figure 4.2-3: Installation work of 230kV Substation Equipment at Main Power station

Figure 4.2-4: Installation work of Transformer for Unit 1 at Main Power Station

Figure 4.2-5: Assembly of Stator and Distributor at Re-regulation Power Station

Figure 4.2-6: The Current Status of the Substation Area at Re-regulation Power Station

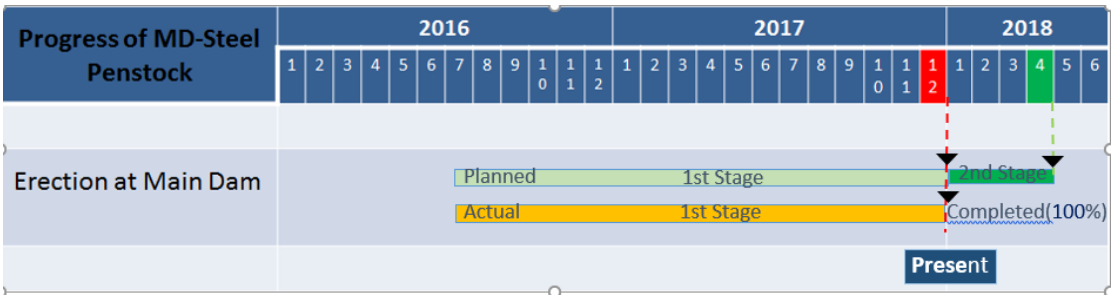
2.3 Hydro-Mechanical Works

The HMWC was executed between IHI Infrastructure Systems (IIS) and NNP1PC on 18 April 2014 and the NTP was issued to the Contractor on 03 October 2014. The actual cumulative work progress of the Hydro-Mechanical Works until the end of December 2017 was 56.5% (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 November 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 December 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 December 2017 was 98.8 % (compared to planned progress of 99.0 %).

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

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

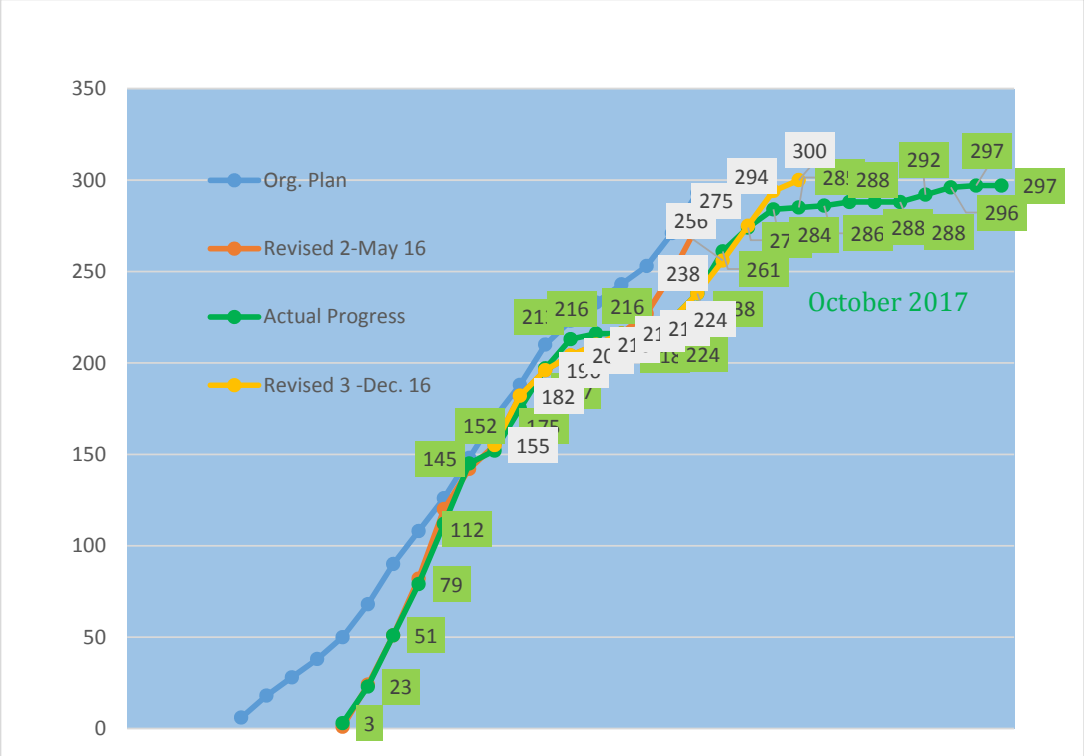


Figure 2-8: Cumulative Works Progress of tower foundation (Revised Planned & Actual)

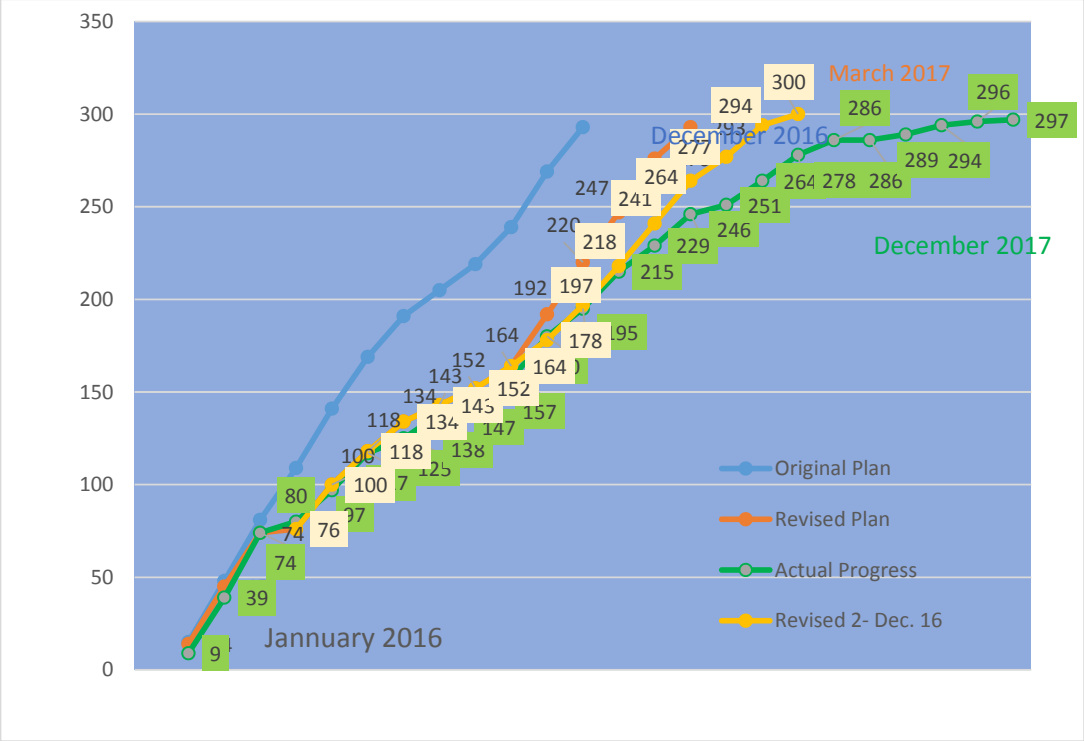
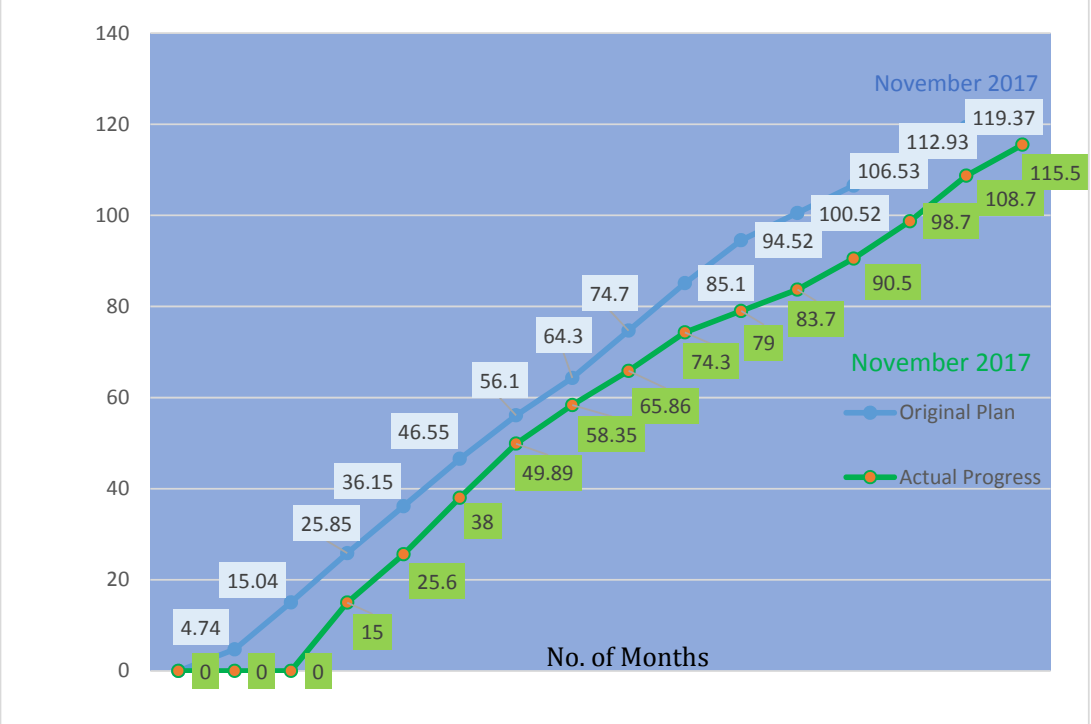


Figure 2-9: Revised Cumulative Works Progress of Tower Erection (Planned & Actual)



3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 Compliance Management

3.1.1 Site Specific Environmental and Social Management and Monitoring Plans

During December 2017, seven Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP) were active for EMO review. Out of these, six SS-ESMMPs were cleared, one SS-ESMMP was on hold waiting for submission of the full set of documents.

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

Title	Date Received	Status
SS-ESMMP for Assembly of Stator in Re-regulation Power Station.	24 November 2017 (1st submission)	No objection with no further comments on 11 December 2017
SS-ESMMP for Construction of Water Supply System in Three Villages (Zone 4)	27 November 2017 (1st submission)	No objection with no further comments on 05 December 2017
SS-ESMMP for Construction of Tractor Road 2.7 km at HSRA	27 November 2017 (1st submission)	No objection with no further comments on 05 December 2017
SS-ESMMP for Assembly and Installation of Distributor for in Re-regulation Power Station.	29 November 2017 (1st submission)	No objection with no further comments on 11 December 2017
SS-ESMMP for Construction of Access Road No.3 & No.6 to Agricultural Land at Zone 2UR	09 December 2017 (1st submission)	No objection with no further comments on 15 December 2017
SS-ESMMP for Supply and Installation of 22kV Transmission Line to Conduct Electricity from the Re-regulation Power Station to the Main Power Station and Construction of the Foundation for the Diesel Generator	21 December 2017 (1st submission)	No objection with no further comments on 26 December 2017
DWP & SS-ESMMP for 2nd River Diversion & Diversion Tunnel Closure	25 December 2017 (1st submission)	On hold Only a cover letter was received and the Contractor is to send a soft copy document to TD/ESD sooner

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 November 2017	12	0	1	0
Newly Opened in December 2017	1	0	0	0
Total in December 2017	**13**	**0**	**1**	**0**
Resolved in December 2017	5	0	1	0
Carried over into January 2018	8	0	0	0
Unsolved Exceeding Deadlines	**7**	**0**	**0**	**0**

Figure 3-1: Summary of ONC and NCR

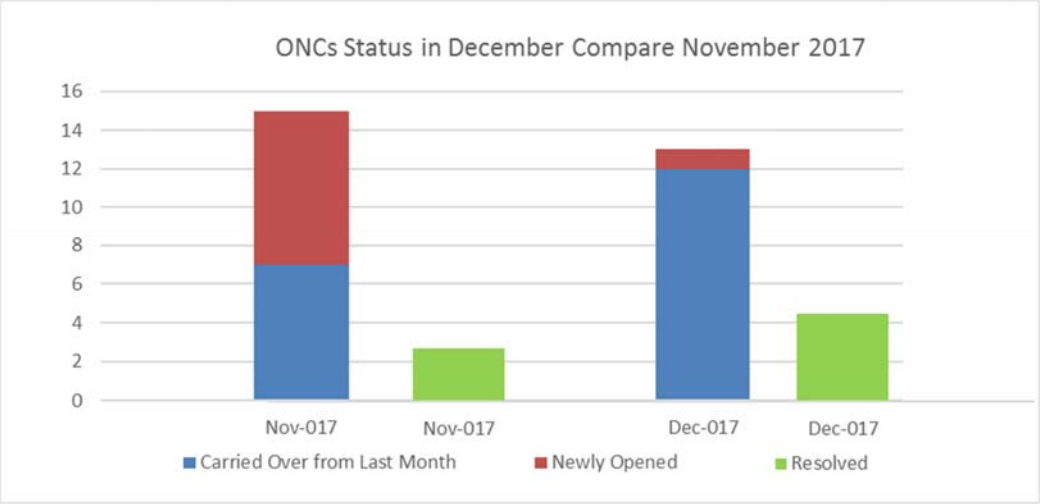


Table 3-3: Carried-Over ONC and NCR from December 2017 into January 2018

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: 19 December 2017	ONC (Closure Pending)	During the bi-weekly joint site inspection in December 2017, the contractor was instructed to submit a closure plan for the borrow pit by addressing EMO comments, however, the contractor has not yet confirmed a specific submission deadline.
Temporary Accommodation for 44 HH from 2LR at Phouhomxay Village	The decommissioning of a temporary accommodation at HSRA was not completed. The bamboo building structure, toilet septic tanks and waste water ponds were	ONC (Closure pending)	Most of accommodation structures were decommissioned. A complete decommissioning activity is expected to be done by the end of January 2018 after all families move to their permanent houses.

Site ID	Issues	Reporting	Actions
	not removed and sanitised (ON_INFRA-0001). First inspection: 07 September 2017 Latest inspection: 26 December 2017		
SXN Camp	- Unsecure camp and facilities. Plastic sheet was used as the camp roofing and wall material; - Grey water from cooking area was discharged directly to Nam Ngiep river; - No waste collection which resulted in disposing of waste around camp areas (ONC_SXN-0001) First inspection: 10 November 2017 Latest inspection: 21 December 2017	ONC (Closure pending)	The contractor was instructed to implement the following corrective actions by 19 January 2018: - Collect and segregate the waste properly by following the waste management sub-plan as proposed in the contractor SS-ESMMP; - Improve the camp and facilities as per proposed Appendix 4 of the contractor DWP & SSESMMP; and - Move cooking and washing areas at least 30 m away from the Nam Ngiep River bank, all waste water from cooking and washing needs to be drained to the waste water pond for treatment.
VSP Camp	Poor housekeeping was observed. Solid waste was disposed around camp (ONC_VSP-0006) First inspection: 28 November 2017 Latest inspection: 26 December 2017	ONC (Closure pending)	- Clean up the camp premises on a daily basis; and - Dispose of general waste at Houay Soup Landfill on a regular basis to avoid waste accumulation and vector attraction.
Vannavong Construction Co., Ltd (HSRA)	The Contractor finished all construction activities in December 2017, while the existing DWP & SS-ESMMP was pending revision. (ON_VNV-0001). First inspection: 19 September 2017	ONC (Closure pending)	The Contractor was recommended to revise and submit a DWP & SS-ESMMP to include the Site Decommissioning Plan by the end of January 2018.

Site ID	Issues	Reporting	Actions
	Latest inspection: 26 December 2017		
Pyramid's Sub-contractor	Pyramid's sub-contractors set up two sleeping huts at the construction site within Phouhomxay Village without a management plan, no waste bins, toilet and other appropriate camp facilities provided at the camp; (ONC_PRMC-0001) First inspection: 28 November 2017 Latest inspection: 26 December 2017	ONC (Closure pending)	As a second reminder, the Pyramid contractor was instructed to provide a secure camp and proper camp facilities for their sub-contractor including waste bins, toilet, cooking and washing areas by 10 January 2018. Failure to implementing corrective action by the specified deadline, this ONC will be escalated to NCR Level 1.
Vannavong's Sub-contractor	Vanavong's sub-contractors set up a sleeping hut at the construction site within Phouhomxay Village without a management plan, no waste bins, toilet and other appropriate camp facilities provided at the camp; (ONC_VNV-0002) First inspection: 28 November 2017 Latest inspection: 26 December 2017	ONC (Closure pending)	As a second reminder, the Vannavong contractor was instructed to: - Provide a secure camp and proper camp facilities for their sub-contractor including waste bins, toilet, cooking and washing areas; - Submit the camp operation and management as well as decommissioning plan for EMO review and approval by 10 January 2018. Failure to implementing corrective action by the specified deadline, this ONC will be escalated to NCR Level 1.
VSP Camp	Inappropriate management of hazardous material. Oil drums were placed on the bare ground without any protection device to prevent oil spillage. Oil contaminated soil was left without containing or clean-up (ONC_VSP-0007)	ONC (New)	- The contractor was instructed to remove oil drums to the hazardous storage and collect contaminated soil for proper elimination; - It was recommended that refuelling and maintaining of heavy equipment and machinery need to be

Site ID	Issues	Reporting	Actions
	First inspection: 26 December 2017 Latest inspection: Not available		conducted within appropriate protection facility with suitable spill response kits.

Figure 3-2: Site Inspection Locations

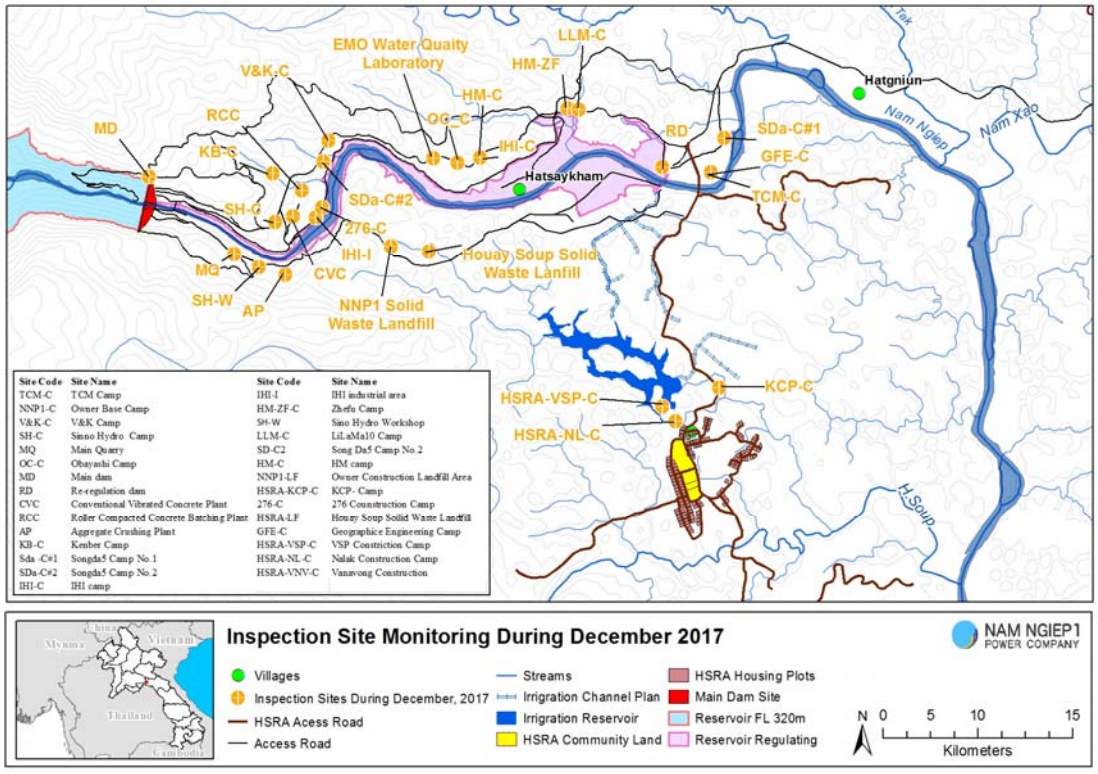
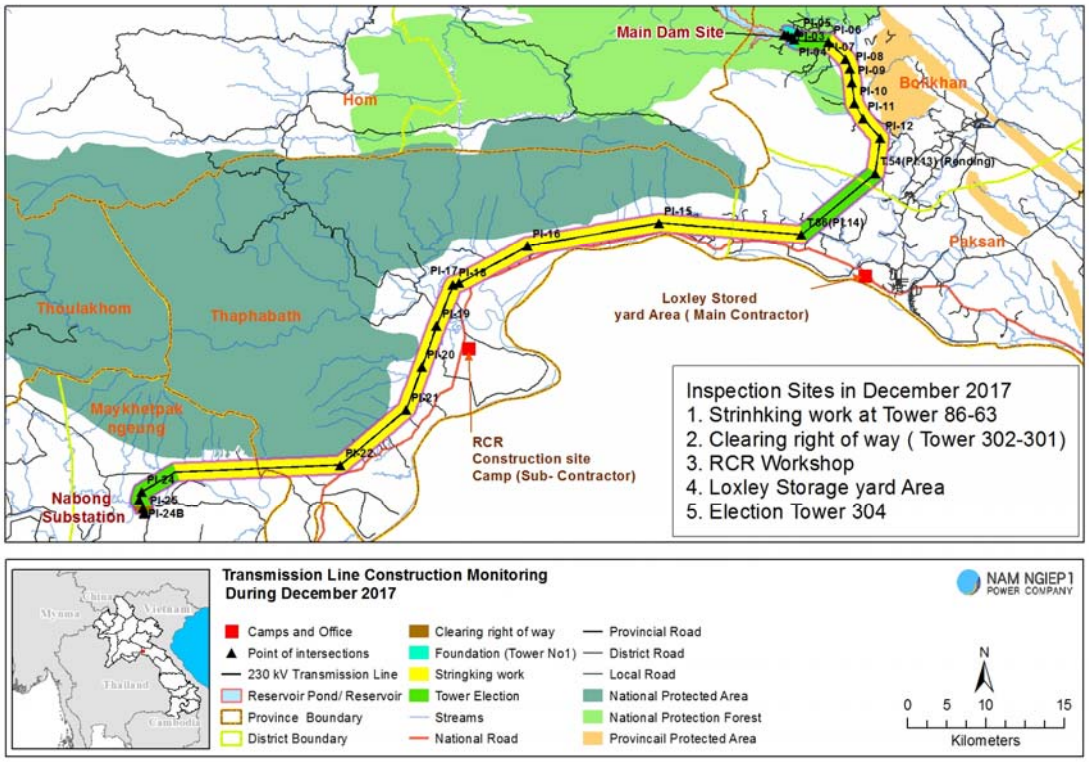


Figure 3-3: 230 kV Transmission Line Construction Monitoring



3.1.3 Inspection by Environment Management Unit

On 20 December 2017, the Environmental Management Unit (EMU) of Bolikhamxay Province visited NNP1. On the following day, a wrap-up meeting was conducted at Paksan Office and the following findings were discussed:

- Improve the hazardous storage located at of LILAMA 10 Camp;
- Implement proper dust generation mitigation measures at the aggregate and RCC plants;
- Improve workshop area for Sinohydro sub-contractor
- Prepare site decommissioning and quarry closure plans.

The Bolikhamxay Provincial EMU will submit a mission report to EMO for review by early January 2018.

During 27-28 December 2017, the Environmental Management Unit (EMU) of Xaysomboun Province inspected waste clean-up of four villages at Zone 2LR and the biomass clearance activity. There was no comment by the Xaysomboun Provincial EMU during this field visit.

NNP1PC is working with the contractors to address these findings and recommendations and an official response with progress report addressing EMU's comments by middle of January 2018.

3.2 Environmental Quality Monitoring

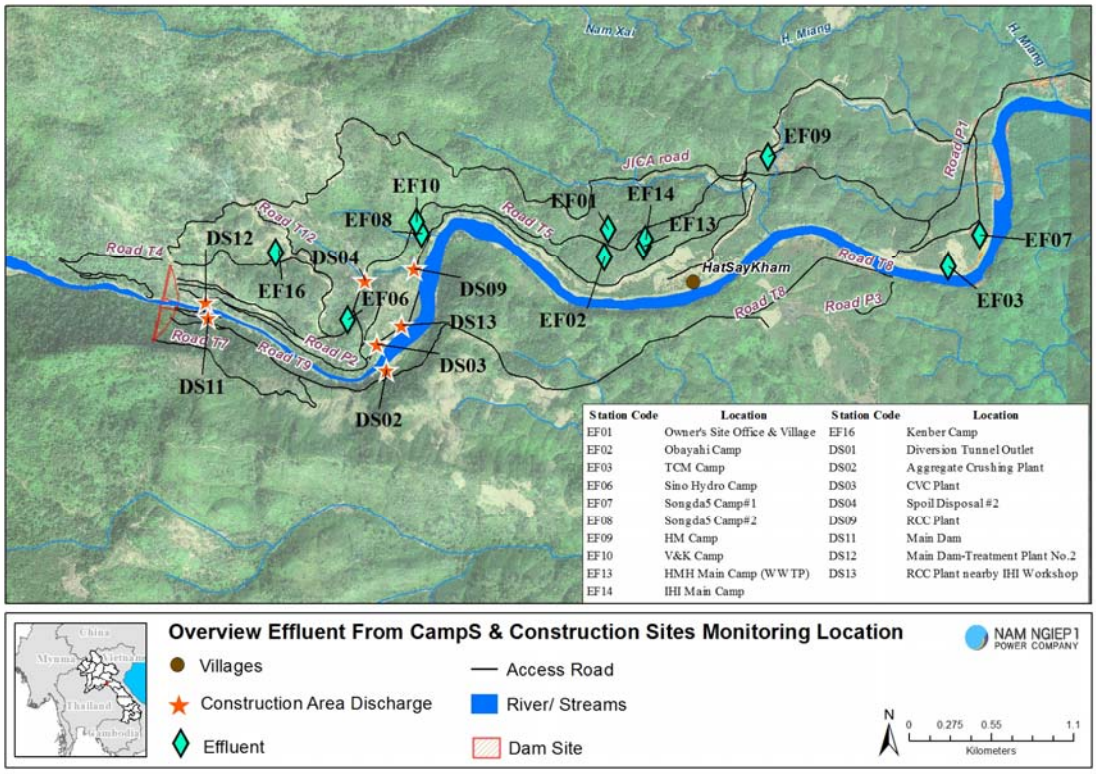
The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD_5), faecal coliform, E. Coli bacteria and total coliform have been carried out by NNP1PC Environmental Laboratory since August 2017.

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

3.2.1 Effluent Discharge from Camps and Construction Sites

During December 2017, effluents from wastewater treatment plants at the camps and discharges from sediment retention facilities at the construction sites were monitored. The results of the 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 camps' effluent monitoring results for December 2017 indicate that all key parameters (BOD_5, total coliform and faecal coliform) complied with the relevant effluent standards.

The sediment retention facilities at the Aggregate Crushing Plant and the RCC Plant continue to provide a high degree of sediment removal through application of a coagulant (Ammonium aluminium sulphate) in full compliance with the standard for Total Suspended Solids.

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

Site	Sampling ID	Status	Corrective Actions
Owner's Site Office and Village (OSOV)	EF01	Non-compliances for total nitrogen.	No corrective action is required.

Site	Sampling ID	Status	Corrective Actions
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 (NH_3-N) and total nitrogen.	As above.
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 COD, ammonia nitrogen and total nitrogen.	As above.
Zhefu Camp (Subcontractor of Hitachi-Mitsubishi Hydro)	EF09	No sampling due to no discharged.	
V&K Camp	EF10	Full compliance	
H-MH Main Camp (WWTS)	EF13	Non-compliance for COD, NH_3-N and total nitrogen	As above.
IHI Main Camp	EF14	Non-compliance for COD, NH_3-N and total nitrogen.	As above.
Kenber Camp	EF16	Non-compliance for NH_3-N and total nitrogen.	As above.
Main Dam Construction Area (Waste Water Treatment Plant No.1)	DS11	Full compliance	
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	Full compliance	
CVC Plant	DS03	No discharge during the missions.	

Site	Sampling ID	Status	Corrective Actions
RCC Plant (discharge point at the weirs)	DS09	Full compliance	As above.
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.	As above.

3.2.2 Ambient Surface Water Quality Monitoring

The surface water quality monitoring programme comprises 14 monitoring stations. The December 2017 programme is summarized in ***Table 3-5*** and the location of the monitoring stations are shown in ***Table 3-5***: *Monitoring Frequency for Surface Water Quality Parameters*

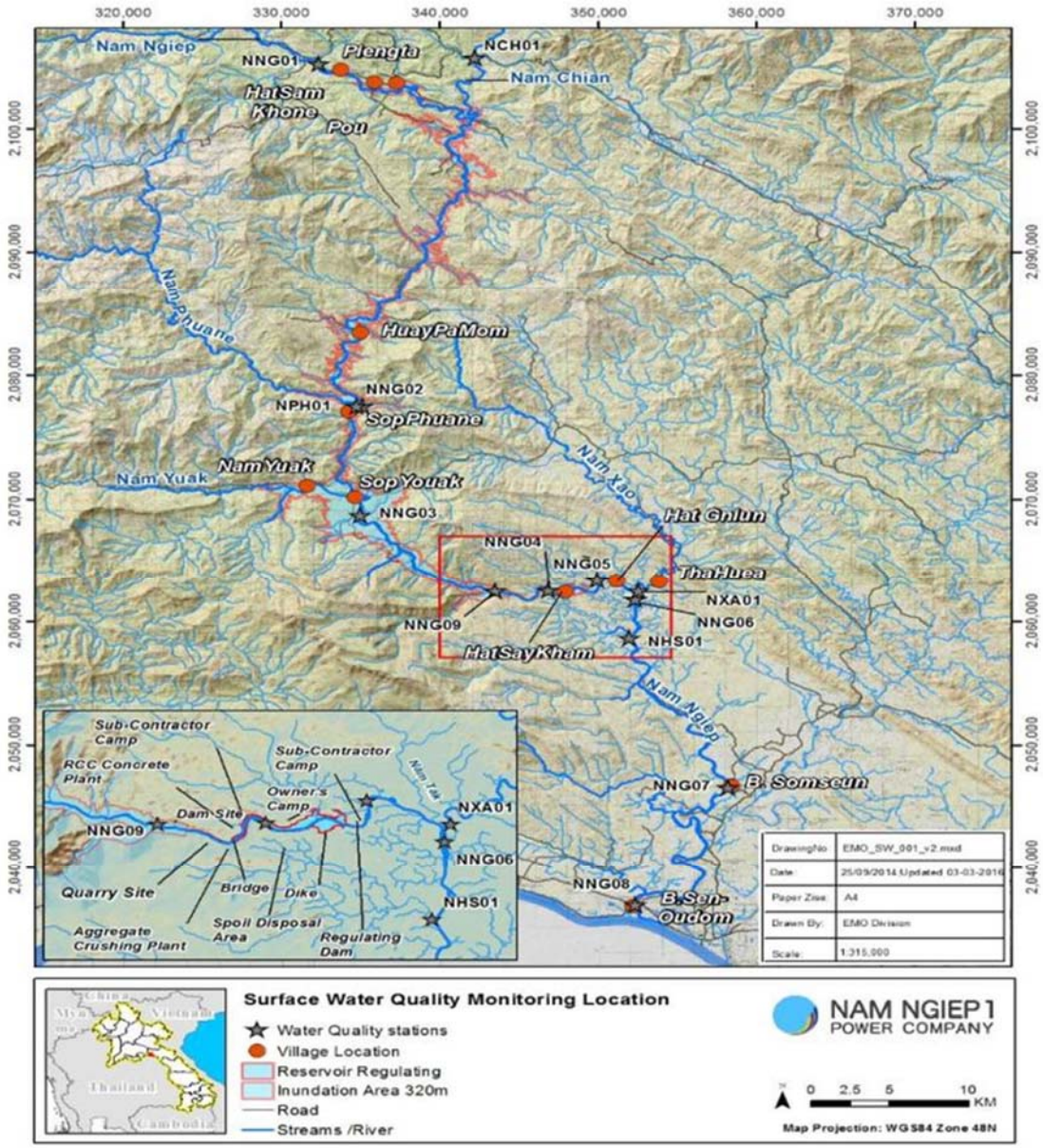
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS (mg/l), BOD5 (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	- NNG09, Nam Ngiep Upstream Main Dam (NNG09), - R6, Re-regulation 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
Quarterly	Total Iron (mg/l) and Manganese (mg/l)	All 14 stations
Bi-annually	TKN (mg/l), Chloride (mg/l), Sulphate(mg/l), Alkalinity (mg/l), Arsenic (mg/l), Calcium (mg/l), Mercury (mg/l), Magnesium (mg/l), Lead (mg/l), Potassium (mg/l), Sodium (mg/l)	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), TSS (mg/l), BOD5 (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	- 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
Quarterly	Total Iron (mg/l) and Manganese (mg/l)	All 14 stations
Bi-annually	TKN (mg/l), Chloride (mg/l), Sulphate(mg/l), Alkalinity (mg/l), Arsenic (mg/l), Calcium (mg/l), Mercury (mg/l), Magnesium (mg/l), Lead (mg/l), Potassium (mg/l), Sodium (mg/l)	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 (including the re-regulation reservoir) in December 2017 are shown in ***Table 3-6*** to *Error! Reference source not found.* below. The surface water quality data for December 2017 are all within the normal ranges as compared with previous data and there are no unusual or abnormal results.

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

	River Name	Nam Ngiep									
	Zone	Location Refer to Construction Sites									
		Upstream				Within Re-regulation Reservoir		Downstream			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08
	Date	06-Dec-17	07-Dec-17	07-Dec-17	08-Dec-17	08-Dec-17	08-Dec-17	08-Dec-17	08-Dec-17	08-Dec-17	08-Dec-17
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	7.89	7.69	7.95	8.05	7.37	7.98	8.18	8.27	7.77	7.81
Sat. DO (%)		95.3	99.1	101	99.8	104	88.3	101.4	99.9	101.5	99.2
DO (mg/l)	>6.0	8.68	8.63	8.21	8.43	8.39	6.72	8.52	8.33	8.31	8.18
Conductivity (µs/cm)		100	83.4	76.9	78.3	116	93	77.2	78.9	79.9	79.7
TDS (mg/l)		50	41	38	39.1	57	47	38	40	39.4	39.2
Temperature (°C)		18.2	20.7	24.2	22.8	22.29	23.81	23.3	23.2	23.6	23.9
Turbidity (NTU)		6.06	5.38	5.35	4.54	6.23	3.79	4.25	4.25	4.99	4.78
TSS (mg/l)		11.19	5	7.09	9.11	8	4.93	5.5	7.65	16.66	16
BOD_5 (mg/l)	<1.5	1.51	<1	<1	<1	<1	<1	<1	<1	<1	<1
COD (mg/l)	<5	<5.0	<5.0	6.9	5.3	<5.0	9.5	6.5	<5.0	6.3	6.5
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	<0.2
NO_3-N (mg/l)	<5	0.08	0.07	0.07	0.06	0.07	0.04	0.06	0.05	0.05	0.05
Faecal coliform (MPN/100ml)	<1,000	1,600	280	280	130	280	79	140	170	130	170
Total Coliform (MPN/100ml)	<5,000	1,600	1,600	1,600	350	920	170	350	350	280	350
TKN (mg/l)		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Chloride (mg/l)		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulphate(mg/l)	<500	6.2	6.1	5	5	5.5	4.9	4.9	4.3	5.9	6
Alkalinity (mg/l)		60.4	49.5	46.5	48.5	47.5	44.6	46.5	50.5	48.5	47.5
Arsenic (mg/l)	<0.01	0.0012	<0.0003	0.0004	<0.0003	0.0004	<0.0003	0.0005	0.0003	0.0005	0.0003
Calcium (mg/l)		9.18	8.18	6.71	7.66	7.35	8.4	7.54	7.43	8.1	6.74
Manganese (mg/l)	<1.0	0.03	0.026	0.026	0.025	0.029	0.015	0.025	0.022	0.022	0.03
Mercury (mg/l)	<0.002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Magnesium (mg/l)		2.08	1.84	1.47	1.63	1.63	1.7	1.65	1.6	1.73	1.46
Lead (mg/l)	<0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Potassium (mg/l)		0.752	0.744	0.632	0.737	0.779	0.787	0.74	0.692	1.14	0.678
Sodium (mg/l)		1.54	1.72	1.54	1.66	1.62	1.76	1.76	1.67	1.89	1.6
Total Iron (mg/l)		1.02	0.976	0.849	0.78	0.735	0.341	0.742	0.446	0.655	0.766

Table 3-7: Results of Nam Ngiep Surface Water Quality Monitoring in 27 December 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	14-Dec-17	14-Dec-17	14-Dec-17	14-Dec-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.89	7.15	7.7	8.06
Sat. DO (%)		102.6	86	77.7	103.2
DO (mg/l)	>6.0	8.3	7.15	6.21	8.21
Conductivity (µs/cm)		67.5	93	81	77.9
TDS (mg/l)		33.75	48	40	39
Temperature (°C)		24.8	23.24	25.3	25.9
Turbidity (NTU)		14.1	11.3	2.81	6.41
TSS (mg/l)		34.49	18.91	3.1	10.05
BOD_5 (mg/l)	<1.5	<1	<1	<1	<1
Faecal coliform (MPN/100ml)	<1,000	33	40	8	33
Total Coliform (MPN/100ml)	<5,000	47	220	13	40

	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-Dec-17	20-Dec-17	21-Dec-17	21-Dec-17	21-Dec-17	21-Dec-17	21-Dec-17	21-Dec-17	21-Dec-17	21-Dec-17
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	7.88	8.46	8.43	8.6	8.24	8.03	8.35	8.49	8.28	8.26
Sat. DO (%)		97.4	96.6	100.5	99.5	80.4	75.6	100.7	101.9	99.8	99.4
DO (mg/l)	>6.0	9.51	8.94	9.33	9.55	7.83	7.94	9.22	9.22	8.85	8.46
Conductivity (µs/cm)		89.5	80.1	75.8	76.8	100	102	76.7	77.1	77.9	78.2
TDS (mg/l)		45	40	37.6	38	50	51	38.35	38.55	39	39
Temperature (°C)		15.3	18.3	18.1	16.7	16.66	18.66	19.1	19.7	20.4	22.5
Turbidity (NTU)		6.12	7.37	6.06	5.3	6.52	5.59	5	5.31	5.88	15.9
TSS (mg/l)					12.58	13.5	6.92	9.84			
BOD_5 (mg/l)	<1.5				<1	<1	<1	<1			

		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-Dec-17	14-Dec-17		14-Dec-17			14-Dec-17			
Parameters (Unit)		Guideline										
Faecal coliform (MPN/100ml)	<1,000					26		27	22	11		
Total Coliform (MPN/100ml)	<5,000					40		34	130	140		

River Name	Nam Ngiep			
Zone	Location Refer to Construction Sites			
	Upstream	Within Re-regulation Reservoir		Downstream
Station Code	NNG09	NNG04 / R6	R7	NNG05
Date	27-Dec-17	27-Dec-17	27-Dec-17	27-Dec-17
Parameters (Unit)	**Guideline**			
pH	5.0 - 9.0	8.3	8.02	8.03	8.16
Sat. DO (%)		90.4	100	97.3	97.2
DO (mg/l)	>6.0	8.23	9.23	8.91	8.57
Conductivity (µs/cm)		111	107	106	109
TDS (mg/l)		55	54	53	54
Temperature (°C)		18	18.27	19.72	18.24
Turbidity (NTU)		9.62	9.6	5.55	8.07
TSS (mg/l)		8.84	9.65	15.5	7.17

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	06-Dec-17	07-Dec-17	08-Dec-17	08-Dec-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.79	7.37	8.22	8.08
Sat. DO (%)		99	100.7	91.1	86.9
DO (mg/l)	>6.0	9.13	8.91	7.62	7.28
Conductivity (µs/cm)		34.5	57.9	106.2	48.1
TDS (mg/l)		17	29	53	24
Temperature (°C)		17.2	19.9	23.4	23.4
Turbidity (NTU)		2.99	1.61	1.77	3.13
TSS (mg/l)		7.32	1	0.79	2.43
BOD_5 (mg/l)	<1.5	1.54	<1	<1	6.9
COD (mg/l)	<5	5.4	6.1	<5.0	7.7
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2
NO3-N (mg/l)	<5	0.11	0.9	0.04	0.12
Faecal coliform (MPN/100ml)	<1,000	350	79	79	79
Total Coliform (MPN/100ml)	<5,000	1,600	170	170	79
TKN (mg/l)		<1.5	<1.5	<1.5	<1.5
Chloride (mg/l)		<2.0	<2.0	<2.0	3.4
Sulphate(mg/l)	<500	5.2	4.2	5.9	7.8
Alkalinity (mg/l)		23.8	38.6	60.4	24.8
Arsenic (mg/l)	<0.01	0.0007	<0.0003	<0.0003	<0.0003
Calcium (mg/l)		3.36	5.8	9.9	5.36
Manganese (mg/l)	<1.0	0.026	0.019	0.036	0.05
Mercury (mg/l)	<0.002	<0.0002	<0.0002	<0.0002	<0.0002
Magnesium (mg/l)		0.709	0.821	2.77	0.726
Lead (mg/l)	<0.05	<0.010	<0.010	<0.010	<0.010
Potassium (mg/l)		0.895	0.751	0.576	0.391
Sodium (mg/l)		1.24	1.42	2.94	1.26
Total Iron (mg/l)		0.622	0.266	0.44	1.59

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	19-Dec-17	20-Dec-17	21-Dec-17	21-Dec-17
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	8.29	8.34	8.56	8.4
Sat. DO (%)		100.6	102.8	93.4	90.4
DO (mg/l)	>6.0	10.36	10.13	8.56	8.75
Conductivity (µs/cm)		31.4	57.6	111.5	50.7
TDS (mg/l)		15	29	55.75	25.35
Temperature (°C)		12.7	15.3	19	16.4
Turbidity (NTU)		3.06	2.57	2.76	3.25

3.2.3 Groundwater Quality Monitoring

During December 2017, groundwater quality was monitored only at two out of six boreholes built for Phouhomxay Village (Houay Soup Resettlement Area) and the results were informed to the villagers and local health centre as part of the public health programme. All parameters at the two boreholes complied with the groundwater quality standards for water supply purposes.

Figure 3-6: Groundwater Quality Monitoring Locations

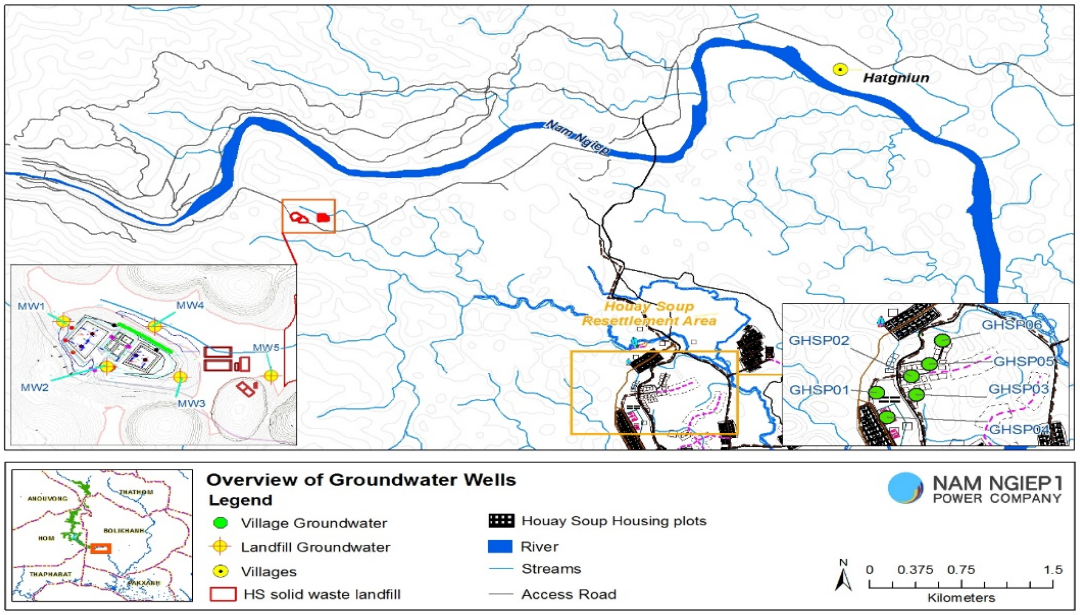


Table 3-10: Groundwater Quality Monitoring Results in Phouhomxay Village

	Site Name	Phouhomxay Village					
	Station Code	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
	Date	13-Dec-17	13-Dec-17	13-Dec-17	13-Dec-17	13-Dec-17	13-Dec-17
Parameter (Unit)	Guideline						
pH	6.5 - 9.2	No sample due to a broken pump.		7.14	No sample due to a broken pump.	8	No sample due to a broken pump.
Sat. DO (%)				82.9		81.8	
DO (mg/l)				6.41		6.3	
Conductivity (µS/cm)				409		297	
TDS (mg/l)	1200			204		148	
Temperature (°C)				27.3		27.5	
Turbidity (NTU)	<20			0.74		0.56	
Fecal coliform (MPN/100ml)				0		0	
E.coli Bacteria (MPN/100ml)	0			0		0	
Arsenic (mg/)	<0.05			0.0005		0.0008	
Cadmium (mg/l)	<0.01			<0.002		<0.002	
Total Iron (mg/l)				0.057		<0.010	
Maganesium (mg/l)				2.78		2.42	
Manganese (mg/l)	<0.5			<0.005		<0.005	
Fluoride (mg/l)	<1			0.05		0.06	
Total hardness (mg/l)	<500			247		169	
Nitrate (mg/l)	<45			0.22		0.23	
Nitrite (mg/l)	<3			<0.02		<0.02	

3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

During December 2017, water samples were taken from the taps at Thahuea, Hat Gniun and Phouhomxay Villages.

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

Figure 3-7 Gravity Fed Monitoring Locations

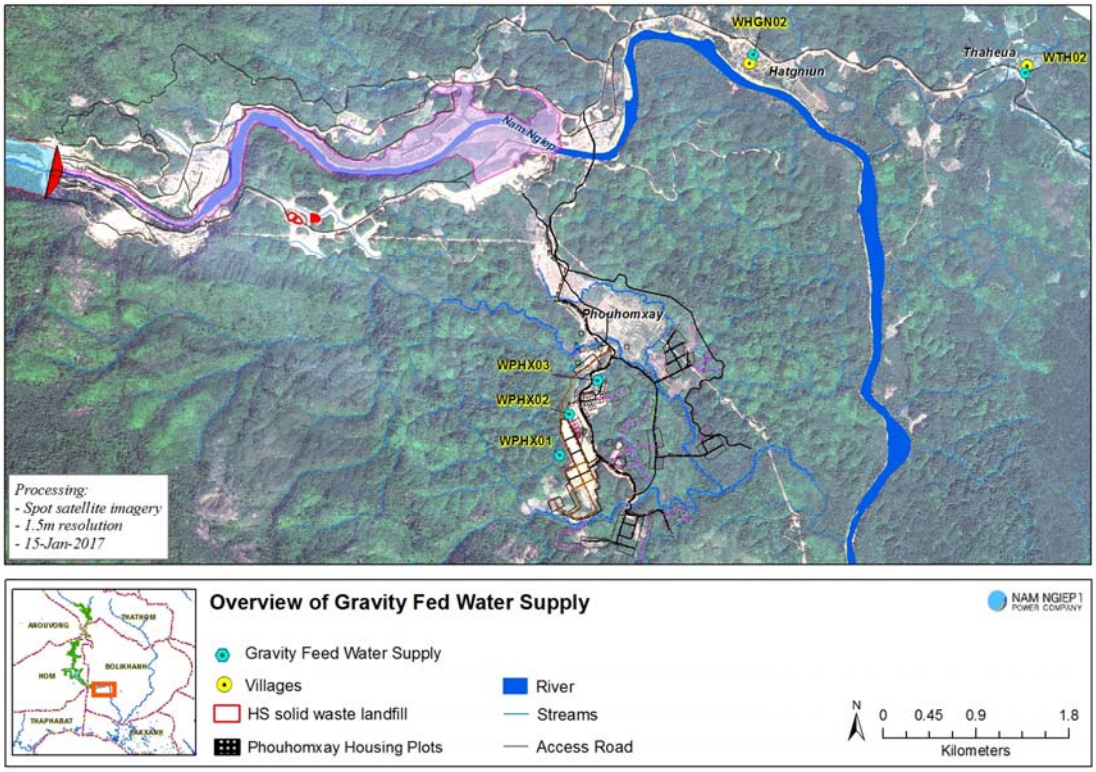


Table 3-11: Result Gravity Fed Water Supply (GFWS) Quality Monitoring

	Village Name	Thahuea	Hat Gniun	Phouhomxay		
	Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
	Date	13-Dec-17	13-Dec-17	13-Dec-17	13-Dec-17	13-Dec-17
Parameter (Unit)	**Guideline**					
pH	6.5 - 8.6	7.99	7.31	7.8	7.99	7.92
Sat. DO (%)		98.1	90.5	99.1	100	101.3
DO (mg/l)		7.89	7.18	8.1	7.95	7.76
Conductivity (µS/cm)	<1,000	50.6	72	8.4	9.1	8.3
TDS (mg/l)	<600	25	36	4	5	4
Temperature (°C)	<35	25.3	26	24.2	25.7	27.8
Turbidity (NTU)	<10	0.9	1.3	0.74	0.63	0.6
Faecal Coliform (MPN/100ml)	0	7.8	13	33	33	33
E.coli Bacteria (MPN/100ml)	0	7.8	7.8	33	33	33
Arsenic (mg/l)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cadmium (mg/l)	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002
Iron (mg/l)		0.024	0.023	0.119	0.098	0.11
Magnesium (mg/l)		1.16	1.49	0.382	0.363	0.393
Manganese (mg/l)	<0.5	<0.005	0.015	<0.005	<0.005	<0.005
Fluoride (mg/l)	<1.5	<0.02	0.02	<0.02	<0.02	<0.02
Nitrate (mg/l)	<50	0.31	0.35	0.16	0.16	0.17
Nitrite (mg/l)	<3	<0.02	<0.02	<0.02	<0.02	<0.02
Total hardness (mg/l)	<300	43	81.2	4.9	4.9	4.9

3.2.5 Landfill Groundwater Monitoring

During December 2017, no discharge of treated leachate from either the NNP1 Project Landfill or the Houay Soup Landfill has been observed, and water samples were therefore taken from the NNP1 Project Landfill's final leachate pond (LL4), and from the Houay Soup Landfill's final leachate pond (LL6). All results indicated compliance with the relevant standards at all final ponds of both Landfills.

Figure 3-8 Landfill Leachate Monitoring Location

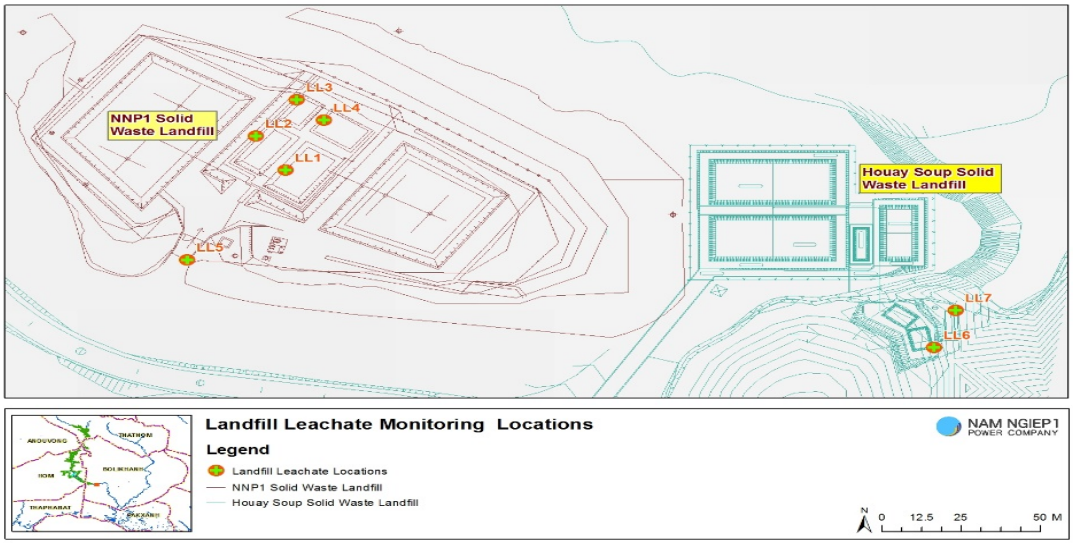


Table 3-12 Landfill Leachate Monitoring Results

	Site Name	NNP1 Landfill Leachate		Houay Soup Landfill Leachate	
	Location	Pond No. 4	Discharge Point	Last Pond	Discharge Point
	Station Code	LL4	LL5	LL6	LL7
	Date	05/Dec/17	05/Dec/17	05/Dec/17	05/Dec/17
Parameters (Unit)	**Guideline**				
pH	6.0 - 9.0	8.48	No water discharged.	7.88	No water discharged.
Sat. DO (%)		152.1		102.8	
DO (mg/l)		11.74		7.91	
Conductivity (µs/cm)		345		14.66	
TDS (mg/l)		172.5		7.33	
Temperature (°C)		27.2		27.4	
Turbidity (NTU)		8.26		1.15	
BOD_5 (mg/l)	<30	9.12		<6	
COD (mg/l)	<125	78.4		<25	
Total Nitrogen (mg/l)	<10	3.31		0.60	
Arsenic (mg/l)		0.002		0.0009	
Manganese (mg/L)		0.152		<0.006	
Mercury (mg/l)	<0.002	<0.0005		<0.0006	
Lead (mg/l)	<0.2	<0.031		<0.031	
Total Iron (mg/L)	<2	0.484		0.090	
Total Coliform (MPN/100ml)	<400	33		27	
Faecal Coliform (MPN/100ml)		22		17	

	Site Name	NNP1 Landfill Leachate		Houay Soup Landfill Leachate	
	Location	Pond No. 4	Discharge Point	Last Pond	Discharge Point
	Station Code	LL4	LL5	LL6	LL7
	Date	05/Dec/17	05/Dec/17	05/Dec/17	05/Dec/17
Parameters (Unit)	**Guideline**				
Total Petroleum Hydrocarbons (mg/l)		<1		<1	

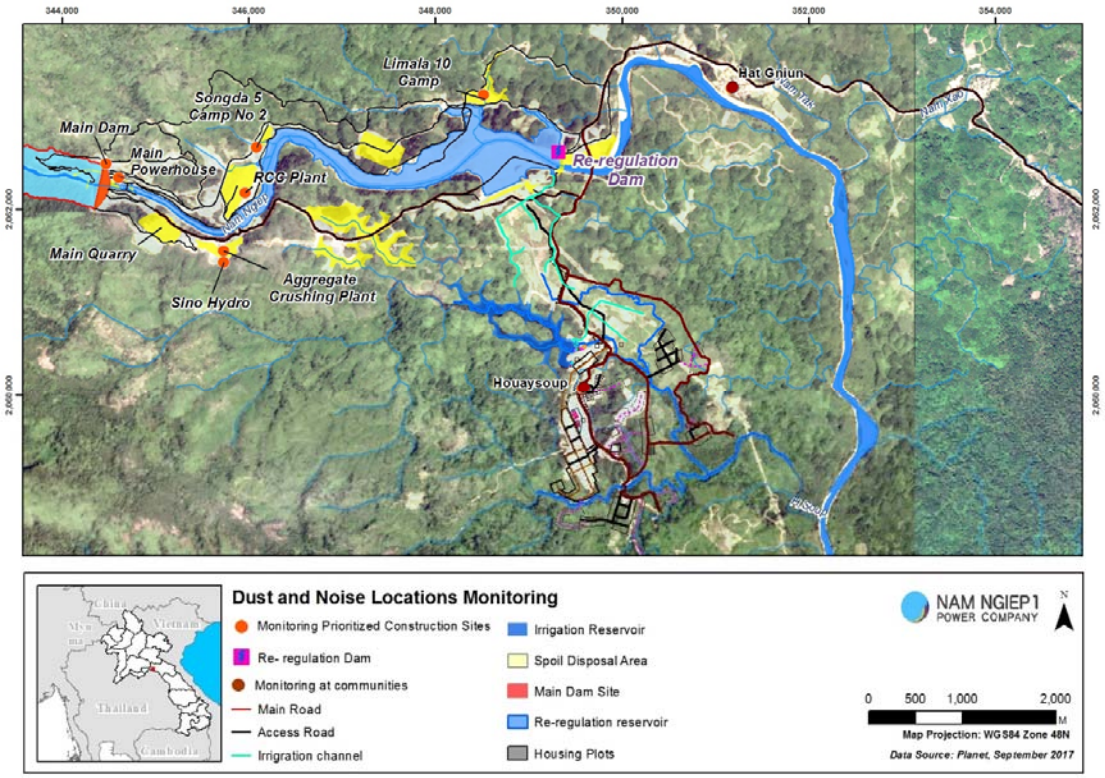
3.2.6 Dust Monitoring

The monitoring points are indicated on the map in ***Figure 3-9***. The results indicate compliance with the National Standard, at all monitored stations, except at the Main Powerhouse. All staff were advised to wear dust masks while working in these areas. The results are presented in ***Annex 2***.

3.2.7 Noise Monitoring

During December 2017, noise monitoring was conducted for 72 consecutive hours at Hat Gniun village and 24 consecutive hours at the Aggregate Crushing Plant, RCC Plant, Sinohydro Temporary Labour Camp, Main Dam, Lilama 10 Camp, and the Main Powerhouse.

Figure 3-9: Noise and Dust Emission Monitoring Locations



The results at all stations except at the Main Powerhouse indicate compliance with National Noise Standards.

3.3 PROJECT WASTE MANAGEMENT

3.3.1 Solid Waste Management

In December 2017, an approximate 162.5 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 2 m^3 compared to November 2017. Spot checks of waste bags were conducted on a daily basis before disposal.

A total of 3,244 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 December 2017
Construction activity				
1	Scrap metal	kg	2,350	28,720
Sub-Total 1		**kg**	**2,350**	**28,720**
Operation camp				
2	Glass bottles	kg	514	1,046
3	Plastic bottles	kg	159.5	110.5
4	Paper/Cardboard	kg	167	118
5	Aluminium can	kg	53	58
Sub-Total 2		**kg**	**893.5**	**1,332.5**
Grand Total 1+2		**kg**	**3,244**	**30,052.5**

A total of 4,878 kg food waste was collected in December 2017 from selected camps by villagers of Phouhomxay for use as animal feed – a decrease of 1,840 kg compared to November 2017.

Table 3-14 Amounts of Food Waste Collected by Villagers

NO.	SITE NAME	UNIT	TOTAL
1	Song Da 5 Camp No. 2	kg	1,843
2	Song Da 5 Camp No. 1	kg	1,553
3	Obayashi Corporation Camp	kg	825
4	Owner's Village and Site Office (OSOV)	kg	435
5	LILAMA 10 Camp	kg	110
6	Kenber Camp	kg	112
Total		**kg**	**4,878**

3.3.2 Hazardous Materials and Waste Management

The types and amounts of hazardous waste collected and transported for offsite treatment and final disposal at Khounmixay Processing Factory in December 2017 are shown in ***Table 3-15***.

Table 3-15: Results of Hazardous Material Inventory

No.	Hazardous Waste Type	Unit	Total in December 2017 (A)	Disposed (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre (l)	11,440	1,550	9,890
2	Contaminated soil, sawdust and concrete	kg	1,110	140	970
3	Used oil filters	No.	616	0	616
4	Empty used chemical drum/container	Drum (20 litre)	518	0	518
5	Empty paint and spray cans	can	352	36	316
6	Used tyre	No.	463	165	298
7	Empty used oil drum/container	drum (20 l)	165	42	123
8	Empty used oil drum/container	drum (200 l)	129	39	90
9	Contaminated textile and material	kg	97	20	77
10	Ink cartridge	No.	154	79	75
11	Halogen/fluorescent bulbs	No.	67	0	67
12	Empty used chemical drum/container	drum (200 l)	45	1	44
13	Lead acid batteries	No.	22	0	22
14	Lithium-ion batteries	No.	7	0	7
15	Empty contaminated bitumen drum/container	drum (200 l)	7	0	7
16	Acid and caustic cleaners	Bottle	20	14	6
17	Clinical waste	kg	4.5	0	4.5
18	Cement bag	bag	300	300	0
19	Used oil mixed with water	liter (l)	0	0	0

3.4 Community Waste Management

3.4.1 Community Recycling Programme

In December 2017, a total of 150 kg of recyclable waste was recorded at the Community Waste Bank, a decreasing of 103 kg compared to November 2017 show in ***Table 3-16***.

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

Types of Waste	Unit	Remaining in November 2017	Additions in December 2017	Sold	Remaining in December 2017
Scrap metal	kg	410	00	0	410

Glass bottles	kg	1,303	150	375	1,078
Paper/cardboard	kg	173	0	0	173
Aluminium cans	kg	147	0	0	147
Plastic bottles	kg	452	0	0	452
Total	**kg**	**2,485**	**150**	**375**	**2,260**

3.4.2 Houay Soup Resettlement Area Waste Management

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

Approximate of 30 m^3 of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed at the Houay Soup Landfill for the reported month.

3.4.3 Waste Clean-up in Four Villages at 2LR

The waste clean-up in four villages at zone 2LR namely Houaypamom, Sopphoune, Sopyouk (Nong) and Namyouk villages, HomDdistrict, Xaysomboun Province was commenced on 29 November 2017 with 38 % progress as of 20 December 2017. The waste clean-up activities including combustible waste collection and stockpiling before burning, waste segregation, and toilet waste treatment using lime 15 kg/m^3 – 20 kg/m^3.

3.5 Watershed and Biodiversity Management

3.5.1 Watershed Management

3.5.1.1 PREPARATION OF THE WATERSHED MANAGEMENT PLAN

The Nam Ngiep 1 Watershed Management Plan (NNP1 WMP) was revised based on comments from Government organizations in November 2017 and the Lao version was finalized in the last week of December 2017 after series of discussion with the Watershed and Reservoir Protection Office (WRPO). Based on the discussion with Xaysomboun WRPO on 19 December 2017, the meeting for approval of the NNP1 WMP is tentatively scheduled to be held on 24 January 2017.

3.5.1.2 PREPARATION OF PROVINCIAL REGULATION FOR THE WATERSHED MANAGEMENT

A special committee was established in Xaysomboun Province during the last week of December 2017 to further review and improve the final draft of Provincial Regulation as well as to coordinate the approval process with Xaysomboun Provincial Assembly and the Provincial Justice Department. A meeting between the special committee, the Provincial Assembly, the Provincial Justice Department, and NNP1PC has tentatively been scheduled to be held on 23 January 2017.

3.5.2 Biodiversity Offset Management

3.5.2.1 PREPARATION OF BIODIVERSITY OFFSET MANAGEMENT PLAN

The Biodiversity Impact Mitigation and Offset Proposal (No Net Loss Forecast) prepared by NNP1PC in November 2017 was further revised and approved by ADB on 22 December

2017. The next step is that NNP1PC will consult with relevant Government organizations to obtain their agreement to the proposal.

A detailed work plan for BOMP development was finalized in the second week of December 2017 and additional land use and socio-economic studies will be carried out by Consultant's Team of Expert from the second week of January 2018.

3.5.2.2 IMPLEMENTATION OF PRE-BIODIVERSITY OFFSET MANAGEMENT PLAN

Patrolling activities continued in Nam Chouane-Nam Xang in December 2017 under the pre-Biodiversity Offset Management Plan for 2017 (pre-BOMP); at the same time, a pre-BOMP proposal for 2018 is being finalized. The second pre-BOMP will focus on continuing the activities initiated in the first pre-BOMP, such as, awareness raising, community outreach, capacity building, and patrolling. The second pre-BOMP was reviewed by NNP1PC, IAP and BAC in December 2017, and further improvements were made by BOMC and the plan was then resubmitted to NNP1PC for submission to ADB for comments prior to fund disbursement.

3.5.3 Biomass Clearance

As of 31 December 2017, out of the total biomass clearance area of 1,640 ha, 846 ha have been fully cleared and vegetation cutting has been completed in another 709 ha making the area ready for burning. ***Table 3-17***

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

Target Area		Progress as of 31 December 2017	
Block	Total area to be cleared (Ha)	Total area in progress (Ha)	100% completed within the total area in progress (Ha)
B1	109.24	109.24	0.37
B2	158.63	158.63	109.08
B3	80.35	80.35	65.57
B4	163.74	156.21	156.62
B5	340.14	311.90	134.60
B6	31.92	31.92	1.07
B7	39.65	39.65	7.37
B8	37.61	37.61	2.38
B9	52.75	51.75	13.42
B10	269.10	220.22	121.43
B11	89.98	89.98	89.98
B12	64.11	64.11	0.00
B13	101.24	101.24	45.00
B14	43.33	43.34	43.34
B15	43.73	43.74	43.74
B16	3.32	3.32	3.32
B17	7.96	7.96	7.96
B18	3.95	3.95	1.00
Total	**1,640.75**	**1,555.13**	**846.25**

4. FISHERY MONITORING

The fishery monitoring programme is a continuous activity by daily fish catch logbook monitoring and gillnet survey. However, only daily catch logbook was conducted for December 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 1.5 kg/household/day in November 2017. The estimated total fish catch in Nam Ngiep basin for November 2017 is 45,300 kg. Around 31 % of the catch was sold, 62 % was consumed fresh, 4 % processed and approximately 4 % was used for other purposes.

ANNEXES

ANNEX A: RESULTS OF EFFLUENT ANALYSES

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

	Site Name	Owner's Site Office and Village		Obayashi Camp		Sino Hydro Camp	
	Station Code	EF01		EF02		EF06	
		5-Dec-17	18-Dec-17	5-Dec-17	18-Dec-17	5-Dec-17	18-Dec-17
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.34	7.47	7.71	7.64	7.51	7.38
Sat. DO (%)		56.6	62.3	89.9	82	78.7	52.8
DO (mg/l)		4.38	5	6.91	6.64	6.21	4.4
Conductivity (µS/cm)		360	349	773	781	528	535
TDS (mg/l)		180	174	386	390	264	267
Temperature (°C)		27.1	25.6	27.5	25.2	26.1	23.6
Turbidity (NTU)		0.77	1.01	13.4	12.7	9.34	5.41
TSS (mg/l)	<50	0.35	2.4	8.16	10.29	4.81	5.75
BOD_5 (mg/l)	<30	7.6	<6	<6	<6	<6	<6
COD (mg/l)	<125	<25	<25	60.8	56.6	39	38.2
NH_3-N (mg/l)	<10	7.2	5	30.5	27	24.4	29
Total Nitrogen (mg/l)	<10	13.6	12.8	31	27.5	24.6	29.8
Total Phosphorus (mg/l)		0.91	0.84	1.02	0.95	1.02	0.84
Faecal Coliform (MPN/100 ml)		4.5	2	0	0	0	4.5
Total Coliform (MPN/100 ml)	<400	17	6.8	0	0	0	4.5
Oil & Grease (mg/l)	<10	<1		<1		<1	
Manganese (mg/l)		0.252	0.132	0.385	0.256	0.186	0.146
Total Iron (mg/l)	<2	0.024	<0.01	0.189	0.089	0.328	0.442
Residual Chlorine (mg/l)	<1.0			1.47	1.09	0.44	0.12
Chlorination Dosing Rate (ml/mn)				246	685	42	86
Effluent Discharge Volume (l/mn)		30	12	20	6	12	3

	Site Name	Song Da5 Camp No.1		Song Da5 Camp No.2		V & K Camp	
	Station Code	EF07		EF08		EF10	
		5-Dec-17	18-Dec-17	5-Dec-17	18-Dec-17	5-Dec-17	18-Dec-17
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.5	7.47	7.68	7.41	6.32	6.69
Sat. DO (%)		75.5	68.9	75.1	69	71	81.4
DO (mg/l)		5.86	5.67	5.88	5.78	5.61	6.82
Conductivity (µS/cm)		1,448	1,513	845	650	361	311
TDS (mg/l)		724	756	422	325	180	155
Temperature (°C)		27.2	24.4	26.8	23.5	26.1	23.4
Turbidity (NTU)		13.7	13.4	35.6	22.7	3.2	3.47
TSS (mg/l)	<50	28.23	15.36	23.04	24.68	3.61	5.15
BOD_5 (mg/l)	<30	<6	<6	<6	<6	<6	<6
COD (mg/l)	<125	85.6	86.4	146	76.7	<25	<25
NH_3-N (mg/l)	<10	24.7	29	46.6	29	2.49	<2

	Site Name	Song Da5 Camp No.1		Song Da5 Camp No.2		V & K Camp	
	Station Code	EF07		EF08		EF10	
		5-Dec-17	18-Dec-17	5-Dec-17	18-Dec-17	5-Dec-17	18-Dec-17
Parameter (Unit)	Guideline in the CA						
Total Nitrogen (mg/l)	<10	25.2	30.7	47.1	31.1	<1	2.04
Total Phosphorus (mg/l)		0.9	0.78	1.27	0.93	0.38	0.16
Faecal Coliform (MPN/100 ml)		0	79	0	0	0	0
Total Coliform (MPN/100 ml)	<400	0	79	0	0	0	0
Oil & Grease (mg/l)	<10	<1		3		<1	
Manganese (mg/l)		0.111	0.085	0.119	0.128	0.176	0.121
Total Iron (mg/l)	<2	0.606	0.493	0.458	0.622	0.183	0.194
Residual Chlorine (mg/l)	<1.0	0.93	0.06	1.33	2.12	1.24	0
Chlorination Dosing Rate (ml/mn)		1000	675	84	78	214	60
Effluent Discharge Volume (l/mn)		60	20	60	4	6	0.5

	Site Name	HM Main Camp		IHI Camp		Kenber Camp	
	Station Code	EF13		EF14		EF16	
		5-Dec-17	18-Dec-17	18-Dec-17	5-Dec-17	5-Dec-17	18-Dec-17
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.63	7.31	6.97	7.68	7.53	7.81
Sat. DO (%)		65.4	69.5	39.6	64.6	78.4	94.6
DO (mg/l)		5.15	5.68	3.24	4.99	6.17	8.09
Conductivity (µS/cm)		1,104	888	1,171	988	791	738
TDS (mg/l)		552	444	585	494	395	369
Temperature (°C)		26.2	24.5	24.5	27.2	25.9	21.8
Turbidity (NTU)		26.8	24.1	27.1	42.3	12.3	17.9
TSS (mg/l)	<50	29.32	28.88	30	40.72	22.87	20
BOD_5 (mg/l)	<30	<6	<6	<6	<6	<6	<6
COD (mg/l)	<125	234	227	257	148	47	47.6
NH_3-N (mg/l)	<10	27.4	28	9	24.8	3	11
Total Nitrogen (mg/l)	<10	27.8	29	10.2	27.7	5.25	11.6
Total Phosphorus (mg/l)		1.11	0.83	0.87	1.06	0.87	0.6
Faecal Coliform (MPN/100 ml)		0	22	0	0	0	0
Total Coliform (MPN/100 ml)	<400	0	22	0	0	0	0
Oil & Grease (mg/l)	<10	7			10	<1	
Manganese (mg/l)		0.186	0.078	0.089	0.23	0.651	0.577
Total Iron (mg/l)	<2	0.766	0.32	0.178	0.703	0.727	1.2
Residual Chlorine (mg/l)	<1.0	1.88	0.15	2.2	1.79	1.41	2.2
Chlorination Dosing Rate (ml/mn)				5	0	125	189
Effluent Discharge Volume (l/mn)				3	3	4	3

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

	Site Name	Aggregate Crushing Plant			
	Station Code	DS02			
	Date	08-Dec-17	14-Dec-17	21-Dec-17	27-Dec-17
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	7.72	8.24	8.62	8.77
Sat. DO (%)		101.1	103.4	102.9	102.3
DO (mg/l)		8.16	7.73	8.73	8.9
Conductivity (µs/cm)		136.1	112.4	138.8	118.9
TDS (mg/l)		68	56	69	59
Temperature (°C)		25	29	22.5	21.1
Turbidity (NTU)		6.57	3.83	3.92	16.2
TSS (mg/l)	<50	12.8	5.67	10.17	7.6
Oil & Grease (mg/l)	<10	<1			

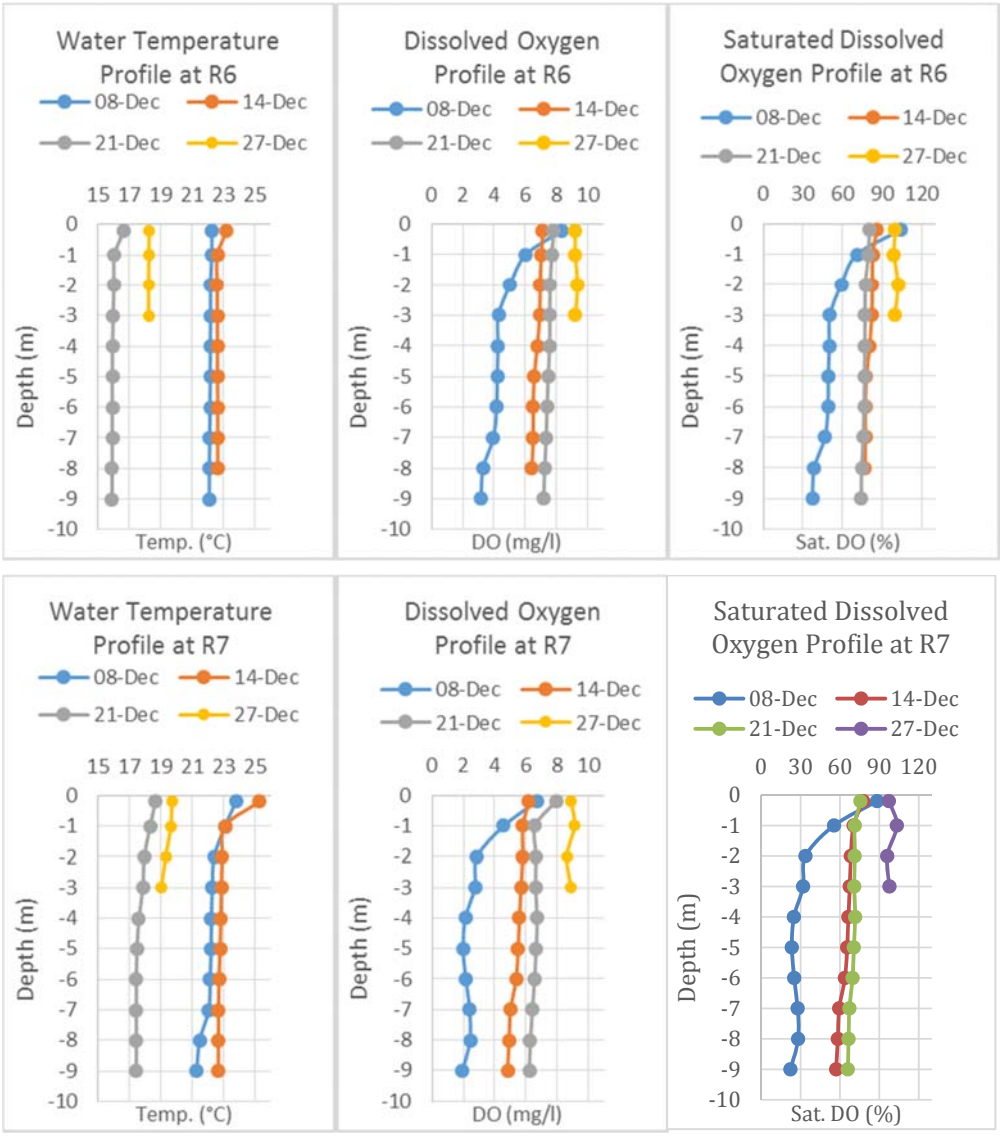
	Site Name	Spoil Disposal No.2			
	Station Code	DS04			
	Date	08-Dec-17	14-Dec-17	21-Dec-17	27-Dec-17
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	6.45	7.2	6.82	6.24
Sat. DO (%)		47.4	44.8	67.1	58
DO (mg/l)		3.84	3.5	5.56	4.96
Conductivity (µs/cm)		26	32.3	25.9	27.7
TDS (mg/l)		23	16	13	13.3
Temperature (°C)		24.7	26.3	23.6	23.2
Turbidity (NTU)		2.73	2.54	2.51	3.57
TSS (mg/l)	<50	2.65	3.2	4.41	4.42
Oil & Grease (mg/l)	<10	<1			

	Site Name	RCC Plant Discharge at Lower Ponds			
	Station Code	DS09			
	Date	08-Dec-17	14-Dec-17	21-Dec-17	27-Dec-17
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	7.8	7.63	8.26	No discharge
Sat. DO (%)		88.5	85.5	94.3	
DO (mg/l)		7.04	6.4	8.12	
Conductivity (µs/cm)		378	323	286	
TDS (mg/l)		189	161	143	
Temperature (°C)		25.8	28.9	21.8	
Turbidity (NTU)		13.3	5.4	8.9	
TSS (mg/l)	<50	10.46	10.56	20	
Oil & Grease (mg/l)	<10	<1			

	Site Name	RCC Plant Discharge at Lower Ponds			
	Station Code	DS09			
	Date	08-Dec-17	14-Dec-17	21-Dec-17	27-Dec-17
Parameter (Unit)	Guideline				

	Site Name	Main Dam Waste Water Treatment Plant No.1					Main Dam Waste Water Treatment Plant No.2
	Station Code	DS11					DS12
	Date	08-Dec-17	14-Dec-17	21-Dec-17	27-Dec-17	08-Dec-17	
Parameter (Unit)	Guideline						
pH	6.0 - 9.0	7.31	7.8	7.97	7.88	7.31	
Sat. DO (%)		98.60	98.7	99.2	100	98.6	
DO (mg/l)		7.84	7.54	8.3	8.56	7.84	
Conductivity (µs/cm)		1,380	411	276	328	1,380	
TDS (mg/l)		690	205	138	164	690	
Temperature (°C)		25.80	27.6	23.2	21.8	25.8	
Turbidity (NTU)		6.97	2.93	1.87	3.43	6.97	
TSS (mg/l)	<50	6.21	10.78	5.77	10.72	6.21	
Oil & Grease (mg/l)	<10	<1				<1	No Discharge

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



ANNEX B: AMBIENT DUST QUALITY

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

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	5/Dec/17 18:00	6/Dec/17 18:01	7/Dec/17 18:01
End Time	6/Dec/17 18:00	7/Dec/17 18:00	8/Dec/17 18:00
Average Data Record in 24h (mg/m³)	0.063	0.054	0.044
Guideline Average in 24h (mg/m³)	0.12	0.12	0.12

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

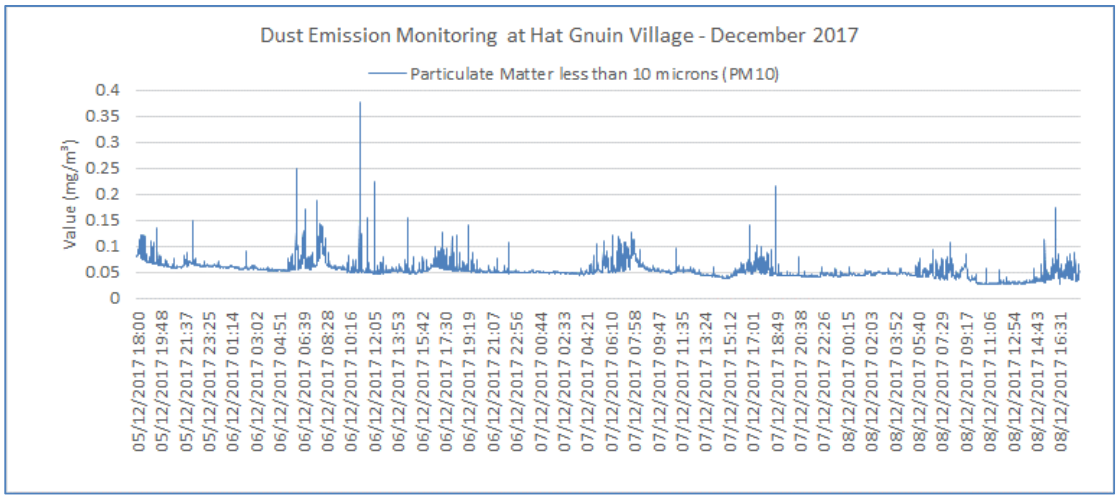


Figure B- 2: Dust Monitoring Results at the Aggregate Crushing Plant in December 2017

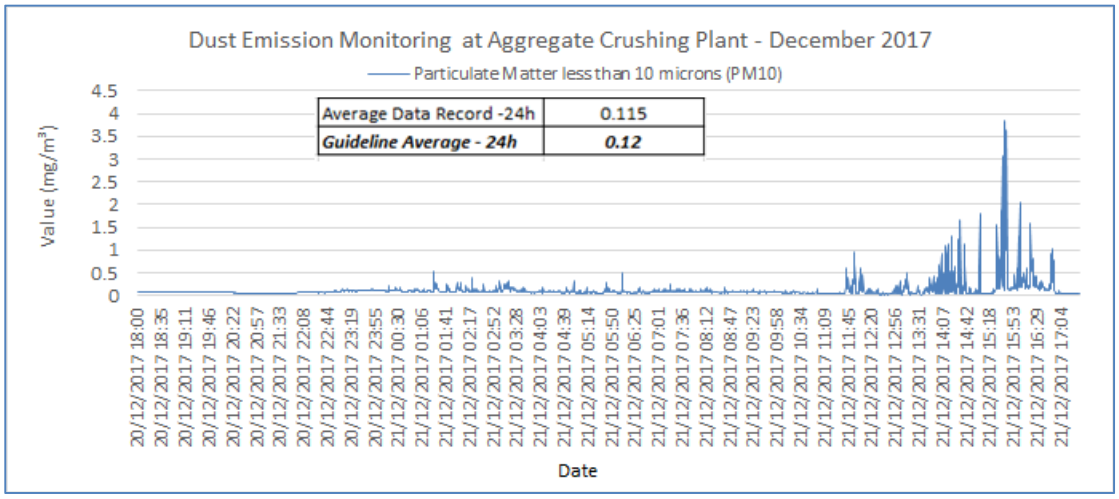


Figure B- 3: Dust Monitoring Results at the RCC Plant in December 2017

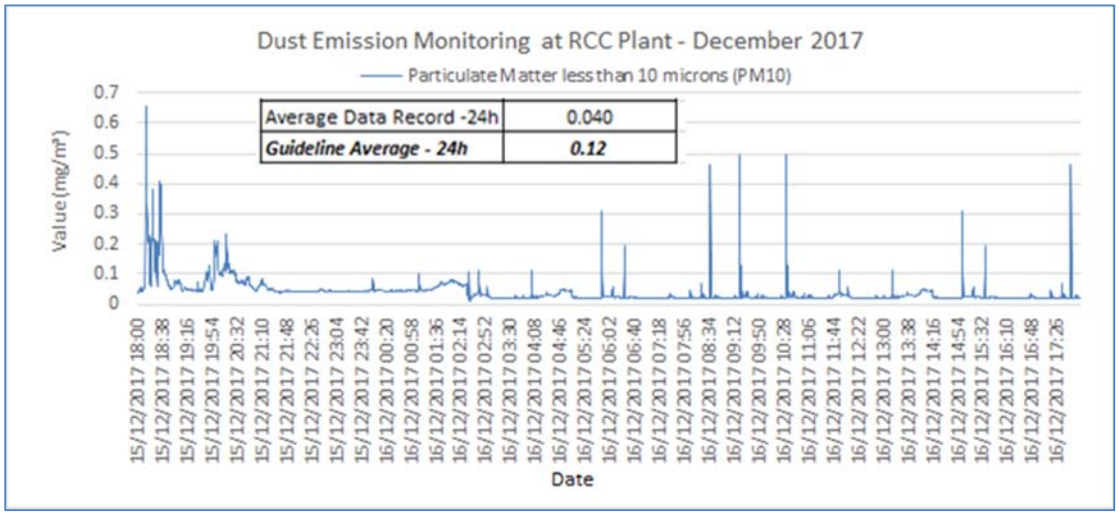


Figure B- 4: Dust Monitoring Results at the Sino Hydro Temporary Camp in December 2017

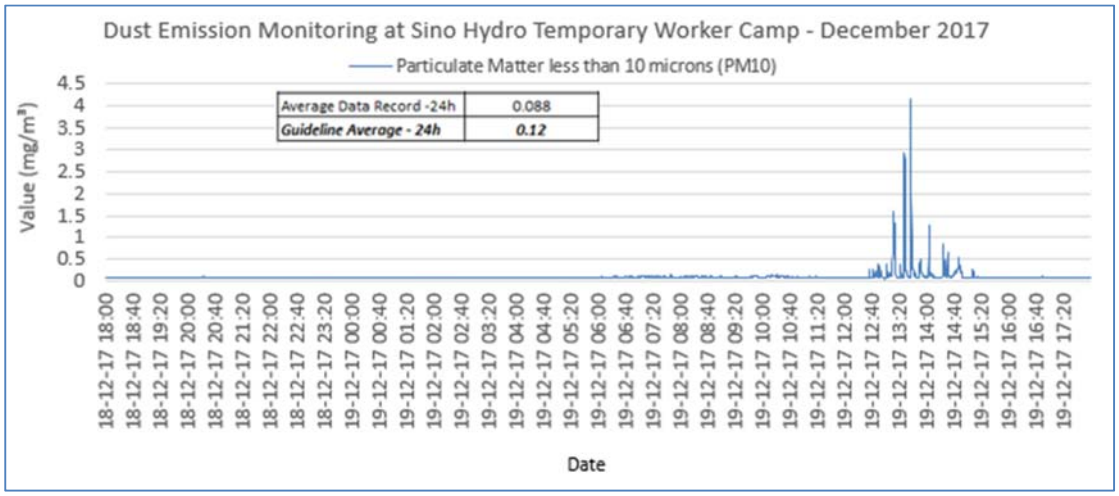


Figure B- 5: Dust Monitoring Results at the SongDa5 No.2 Camp in *December 2017*

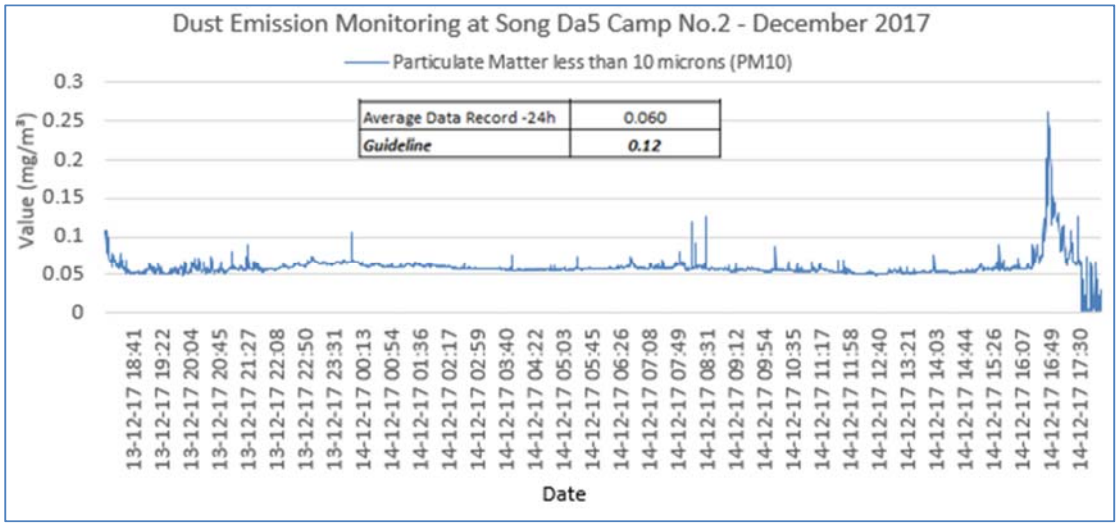


Figure B- 6: Dust Monitoring Results at Main Dam (Top View Left Bank) in December 2017

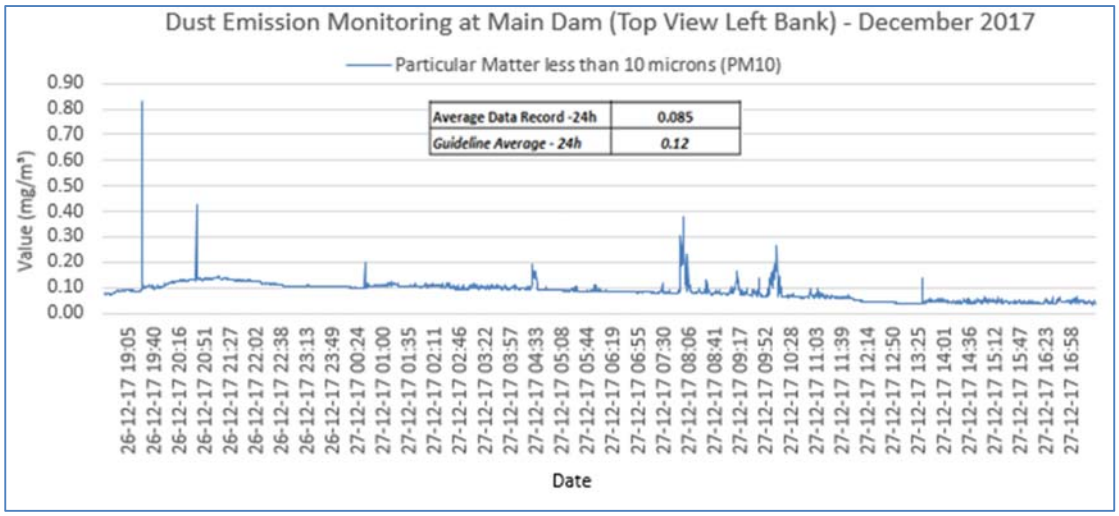


Figure B- 7: Dust Monitoring Results at the Lilama10 Camp in December 2017

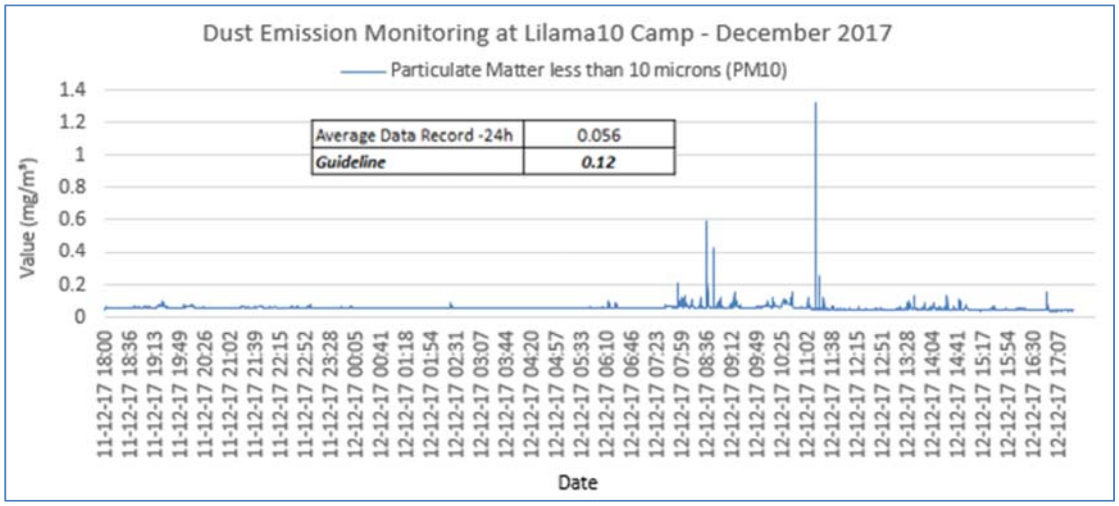
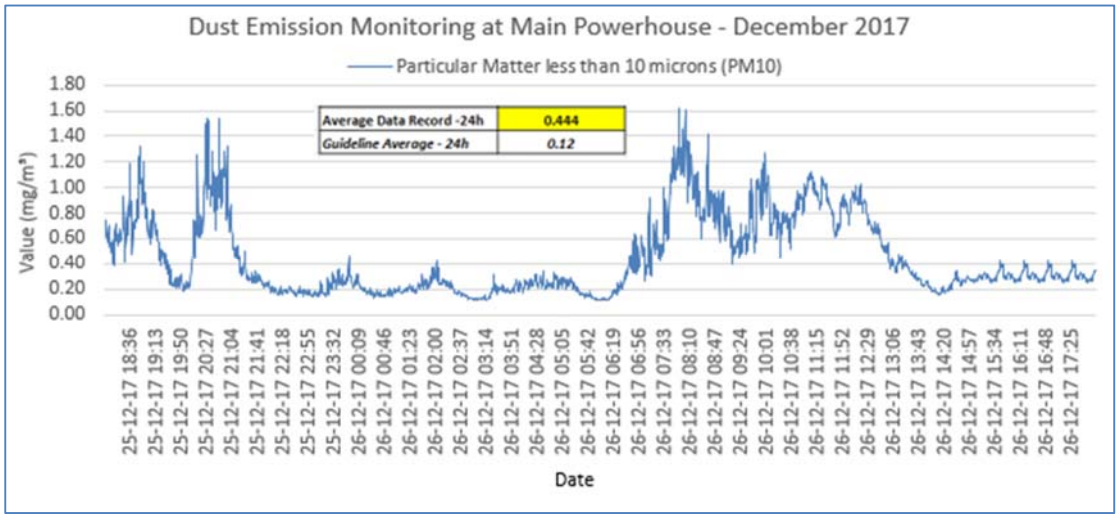


Figure B- 8: Dust Monitoring Results at the Main Powerhouse in December 2017



ANNEX C: AMBIENT NOISE DATA

Table C- 1: Average Results of Noise Monitoring at Ban Hat Gniun in December 2017

Noise Level (dB)	05-06/December/17			06-07/December/17			07-08/December/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	59.30	58.80	70.20	65.20	50.30	67.70	54.60	56.00	63.80
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	43.23	41.46	45.60	45.40	39.62	42.81	42.10	39.14	42.86
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Figure C- 1: Result of Noise Level Monitoring at Ban Hat Gniun in December 2017

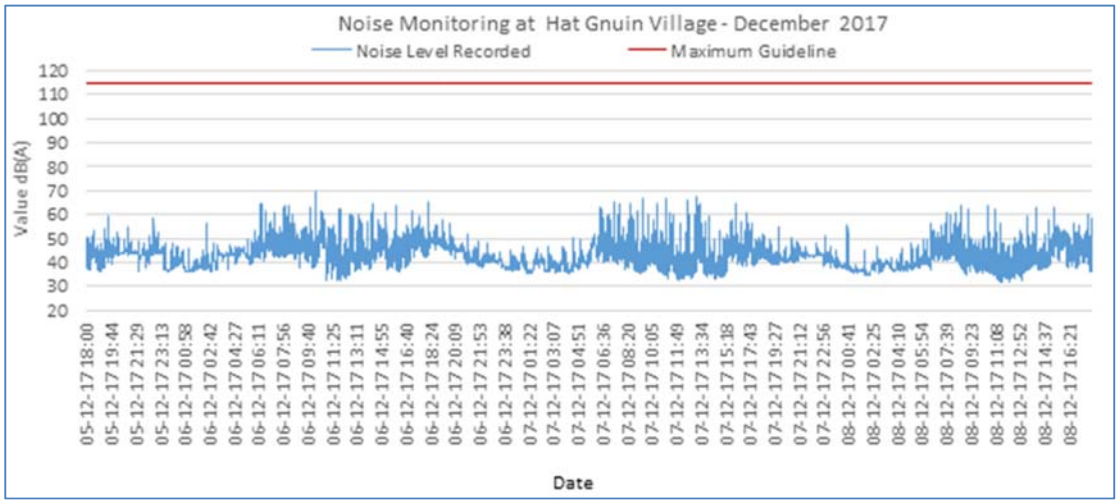


Table C- 2 and Table C-3: Average Results of Noise Monitoring at Aggregate Crushing Plant and RCC Plant in December 2017

Aggregate Crushing Plant

Noise Level (dB)	20-21/December/17		21/December/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	52.5	60.1	81.6
Guideline Max	***115***	***115***	***115***
Average Data Recorded	42.75	47.37	66.01
Guideline Averaged	***70***	***70***	***70***

RCC Plant

Noise Level (dB)	15-16/December/17		16/December/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	56.9	45.1	67.1
Guideline Max	***115***	***115***	***115***
Average Data Recorded	43.18	38.06	53.74
Guideline Averaged	***70***	***70***	***70***

Figure C- 2: Results of Noise Level Monitoring at the Aggregate Crushing Plant in December 2017

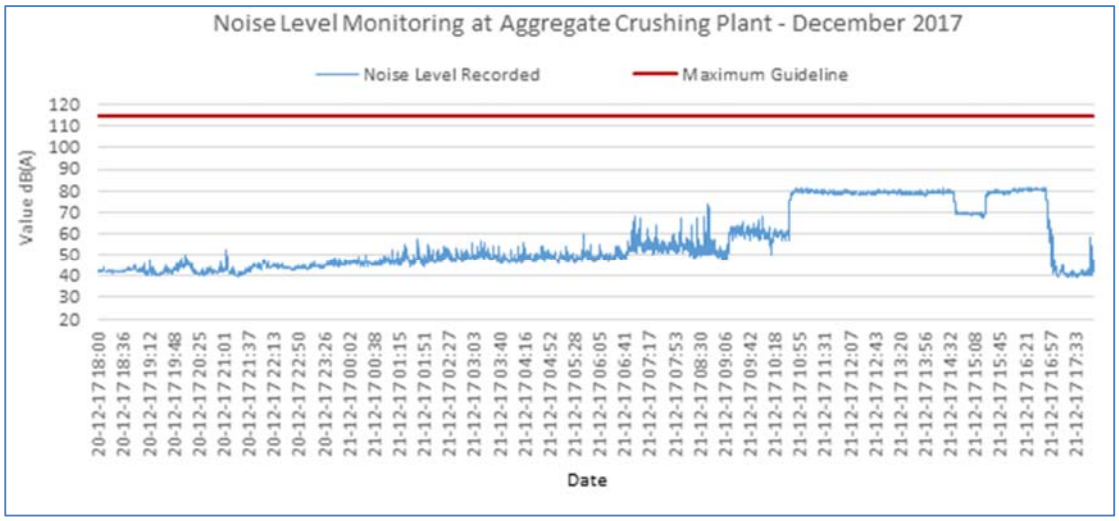


Figure C- 3: Results of Noise Level Monitoring at the RCC Plant in December 2017

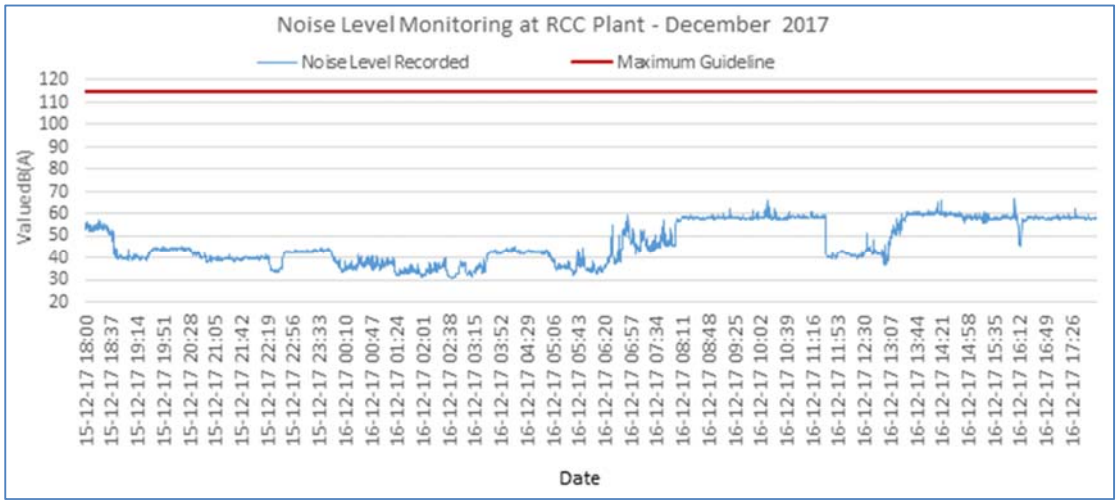


Table C- 4 and Table C- 5: ***Average Results of Noise Monitoring at SongDa Camp#2 and Sino Hydro Camp in December 2017***

Song Da 5 Camp No.2

Noise Level (dB)	13-14/December/17		14/December/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	73.2	59	62.4
Guideline Max	***115***	***115***	***115***
Average Data Recorded	47.03	50.62	45.39
Guideline Averaged	***70***	***70***	***70***

Sino Hydro Temporary Worker Camp

Noise Level (dB)	18-19/December/17		19/December/17
	18:00 – 22:00	22:01 – 06:00	06:01-17:59
Maximum Value Recorded	54.3	49	74.7
Guideline Max	***115***	***115***	***115***
Average Data Recorded	43.13	38.70	50.54
Guideline Averaged	***70***	***70***	***70***

Figure C- 4: Results of Noise Level Monitoring at SongDa5 Camp#2 in December 2017

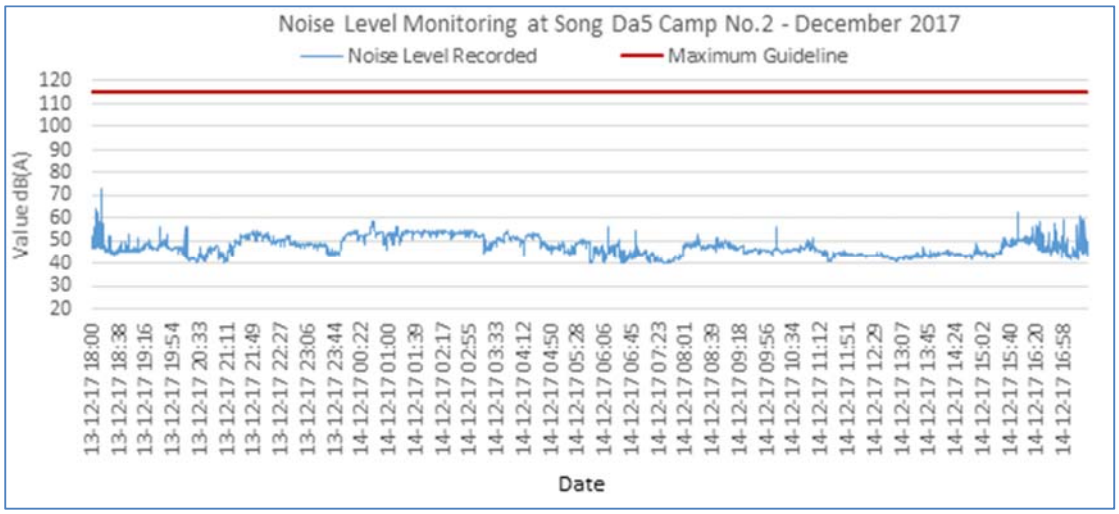


Figure C- 5: Results of Noise Level Monitoring at Sino Hydro Temporary Worker Camp in December 2017

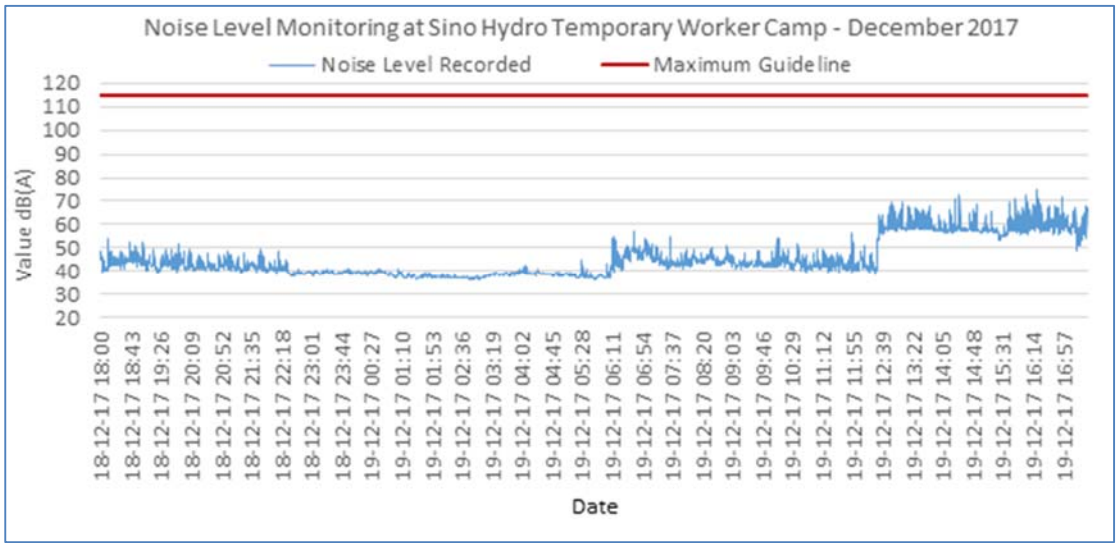


Table C- 7 and Table C- ***8: Average Results of Noise Monitoring at Main Dam, and Lilama 10 Camp in November 2017***

Main Dam

Noise Level (dB)	28-29/November/17		29/November/17
	18:00 – 22:00	22:01 – 06:00	06:01-17:17
Data Record Max	57.3	63.2	63
Guideline Max	***115***	***115***	***115***
Data Record Average	48.26	50.55	50.38
Guideline Averaged	***70***	***70***	***70***

Lilama 10 Camp

Noise Level (dB)	17-18/November/17		18/November/17
	18:00 – 22:00	22:01 – 06:00	06:00-18:00
Maximum Value Recorded	58.8	46.3	73.7
Guideline Max	***115***	***115***	***115***
Average Data Recorded	40.09	40.09	41.62
Guideline Averaged	***70***	***70***	***70***

Figure C-6: Results of Noise Level Monitoring at Main Dam (Top View Left Bank) in December 2017

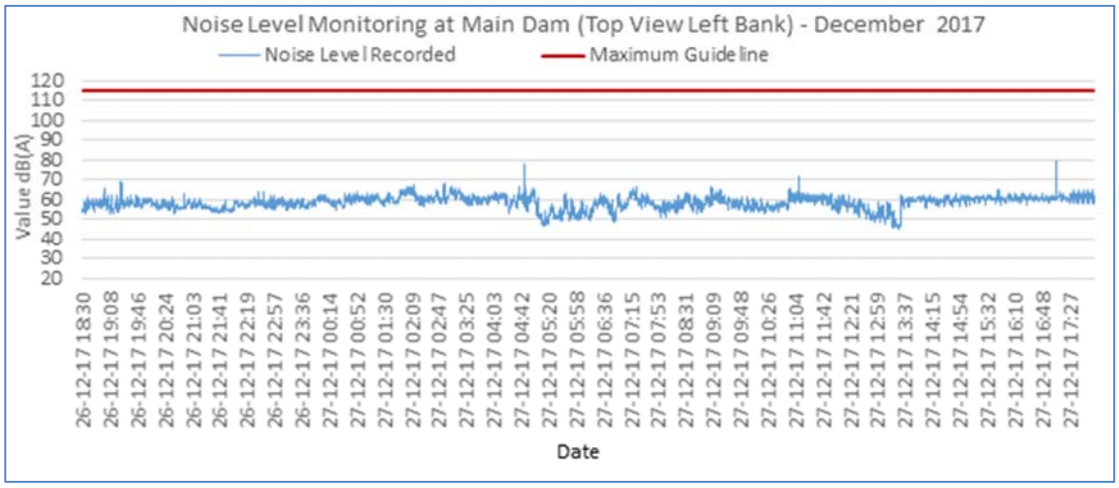


Figure C- 7: Results of Noise Level Monitoring at Lilama10 Camp* in *December 2017

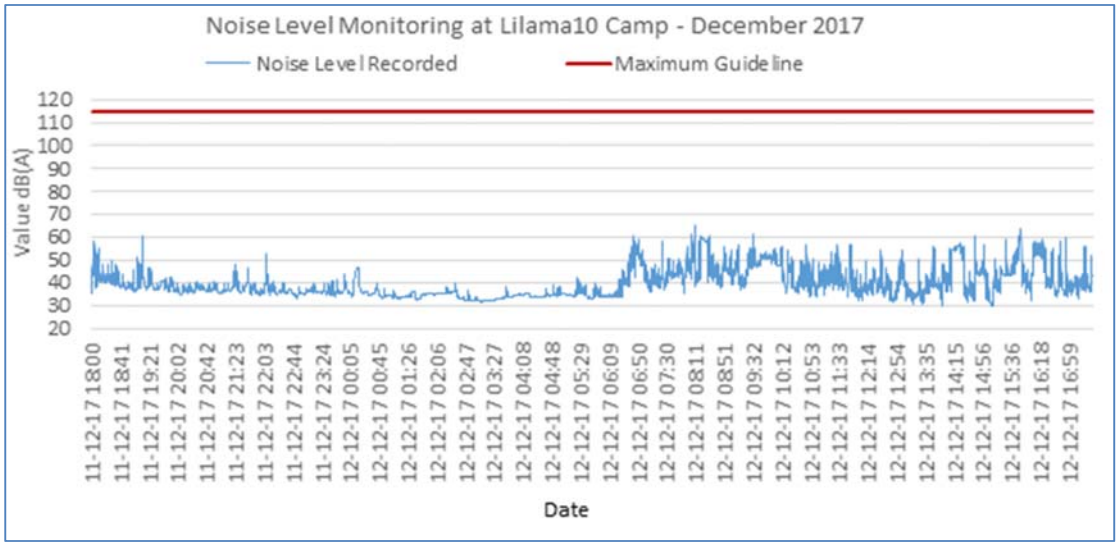


Table C- 8: Average Results of Noise Monitoring at Main Powerhouse in November 2017

Main Powerhouse

Noise Level (dB)	25-26/December/17		26/December/17
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	77.6	78.4	85.8
Guideline Max	***115***	***115***	***115***
Data Record Average	71.18	70.25	73.50
Guideline Averaged	***70***	***70***	***70***

Figure C- 8: Results of Noise Level Monitoring at Main Powerhouse in December 2017