

# Initial Environmental Examination

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April 2018

## LAO: Additional Financing of Water Supply and Sanitation Sector Project (Sopbao Subproject)

Prepared by the Department of Water Supply, Ministry of Public Works and Transport for the Asian Development Bank.

## CURRENCY EQUIVALENTS

(as of 27 February 2018)

Currency unit	–	kip (KN)
KN1.00	=	\$0.0001205
\$1.00	=	KN8,294

## ABBREVIATIONS

ADB	–	Asian Development Bank
AP	–	affected persons
CAP	–	community actions and participation
CAT	–	community action team
CIPP	–	community information and participation program
CDP	–	capacity development program
CPI	–	Committee for Planning and Investment
DAFEO	–	District Agriculture and Forestry Extension Office
DCTPC	–	Department of Communication, Transport, Post and Construction
DWS	–	Department of Water Supply
DPACS	–	Department of Public Administration and Civil Service (of the PMO)
DPWT	–	Department of Public Works and Transport
DRC	–	District Resettlement Committee
EARF	–	environmental assessment and review framework
EG	–	executing agency
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EMoP	–	environmental monitoring plan
GAP	–	gender action plan
HRD	–	human resources development
HSE	–	health, safety and environment
ICB	–	international competitive bidding
IEE	–	initial environmental examination
IEM	–	independent external monitoring
IPSA	–	initial poverty and social assessment
LAR	–	land acquisition and resettlement
LACF	–	land acquisition and compensation framework
M&E	–	monitoring and evaluation
MDGs	–	Millennium Development Goals
MOH	–	Ministry of Health
MONRE	–	Ministry of Natural Resources and Environment (previous WREA)
Nam Saat	–	The National Center of Environmental Health and Water Supply
NBCA	–	National Biodiversity Conservation Area
NCB	–	national competitive bidding
NCRWSSP	–	Northern and Central Regions Water Supply and Sanitation Sector Project
NGO	–	non-government organization
NGPES	–	National Growth and Poverty Elimination Strategy
NSEDP	–	National Socio-Economic Development Plan

OHUP	–	Office of Housing and Urban Planning (of DPWT at provincial level)
OOE	–	Office of Education
OOH	–	Office of Health
OPW	–	Office of Public Works
OMM	–	Operation and Maintenance Manual
O&M	–	Operation and Maintenance
PAFO	–	Provincial Agriculture and Forestry Office
PCU	–	project coordination unit
PDR	–	People's Democratic Republic
PIA	–	project implementation assistance
PIU	–	project implementation unit
PMO	–	Prime Minister's Office
PPP	–	public-private partnership
PPME	–	project performance monitoring and evaluation
PPSC	–	Provincial Project Steering Committee
PRA	–	participatory rapid appraisal
PRC	–	Provincial Resettlement Committee
PSA	–	poverty and social analysis
PSC	–	Project Steering Committee
PSP	–	private sector participation
RC	–	Resettlement Committee
RCS	–	replacement cost survey
RF	–	resettlement framework
ROW	–	right-of-way
RP	–	resettlement plan
SES	–	socio-economic survey
STDSP	–	Small Towns Development Sector Project
STEA	–	Science Technology and Environment Agency
STWSSP	–	Small Towns Water Supply and Sanitation Sector Project
UDAA	–	Urban Development Administration Authority
UXO	–	unexploded ordinance
VEI	–	village environmental improvements
VRC	–	village resettlement Committee
WASA	–	Water Supply Authority
WATSAN	–	Water and Sanitation Unit
WREA	–	Water Resources and Environmental Agency
WSARC	–	Water Supply Authority Regulatory Committee
WSD	–	Water Supply Division
WSIP	–	water supply investment plan
WSSP	–	Water Supply and Sanitation Sector Project
WTP	–	water treatment plant

#### **WEIGHTS AND MEASURES**

ha	–	Hectare
lpcd	–	liters per capita per day
l/s	–	liters per second
m	–	Meter
m <sup>2</sup>	–	square meter
mg/l	–	milligrams per liter

mm	–	Millimeter
m <sup>3</sup> /day	–	cubic meters per day
sqm	–	square meter

#### LAO TERMS

ban	–	village
nam	–	river

#### NOTE

- (i) In this report, "\$" refers to United States dollars.

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# 1 EXECUTIVE SUMMARY

## 1.1 Introduction

1. The Water Supply and Sanitation Sector Project (WSSP) of the Ministry of Public Works and Transport (Executing Agency) supports the development of small district towns in the Lao People's Democratic Republic (PDR) through the improvement of water supply and sanitation services. Consistent with the Government's urban water supply and sanitation sector policy and investment plan, the project aims to improve the performance of the provincial nam papas (PNPs<sup>1</sup>) and expand access to safe piped water supply and sanitation for urban residents in small towns in the Lao PDR. The project will comprise: (i) improvements to the water supply system; and (ii) enhanced community action in urban water supply and sanitation.

2. The WSSP will be implemented through a sector loan from the Asian Development Bank (ADB). The Ministry of Public Works and Transport (MPWT) and the Provincial Department of Public Works and Transport together with PNPs or provincial water utilities (implementing agencies) will be responsible for identifying, prioritizing, appraising, selecting and approving subprojects in accordance with the government's and ADB's policies and procedures.

3. The original scope of the Small Towns Water Supply and Sanitation Sector Project (STWSP) is now essentially complete, with the thirteenth (13<sup>th</sup>) subproject currently under implementation and due for completion by June 2018. The STWSP design was essentially built on previous work in the sector by the Asian Development Bank (ADB) and the Government of the Lao PDR, with a strong policy dialogue and sector reform approach closely linked to the capital investment activities. It included the development and rehabilitation of piped water supply systems and complementary drainage and environmental sanitation works. The thirteen towns are located in eight provinces throughout the country. They include nine towns for new water supply systems and four towns with existing water supply systems that required rehabilitation to improve service levels. All nominated districts were among the 47 districts classed as priority poor and one town was among the 72 districts classed as poor by the government.<sup>2</sup>

4. Under the current project, two subprojects per province are selected, one being the provincial capital Xamneua (rehabilitation and expansion) and the other a small district town Sopbao (new development) in the same province. The rationale being that the focus on the provincial capital would help build a stronger PNP, while the development of a water supply system in a small district town would help the government move toward its target of 80 per cent coverage of the urban population by 2020.

5. Using Grant savings realized under STWSP, it was agreed by ADB and the government to provide a contract variation to the incumbent project implementation assistance consultant (PIA) to conduct feasibility studies and carry out detailed engineering designs for a further two subprojects, which would be designed such that they would form sample subprojects to be covered under Additional Financing to the current project. All stakeholders have expressed a wish for the design and approach of the Additional Financing to be generally consistent with the current project, but taking into account the revisions to the Project Administration Manual (PAM) as well as incorporating any lessons learned with a view to making the approach more effective and innovative. Sopbao subproject will be designed and implemented in parallel with the subproject

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<sup>1</sup> Provincial Water Supply State Enterprises managing the water supply system in each Province.

<sup>2</sup> Eighth Round Table Meeting, "The National Poverty Eradication Program (NPEP): A Comprehensive Approach to Growth and Development", September 2003.

initiatives in the provincial capital of Xamneua; this follows the approach developed under the current project.

6. The Sopbao District subproject will provide direct and indirect benefits for all people living and working in the five (5) core villages of B. Sopbao, B. Soplong, B. Phienxay, B. Muanghom and B. Hadsane with a total population of 2,653. Principal benefits include a secure and continuous supply of safe, clean water. The water supply will also enable commercial establishments which in turn will provide employment.

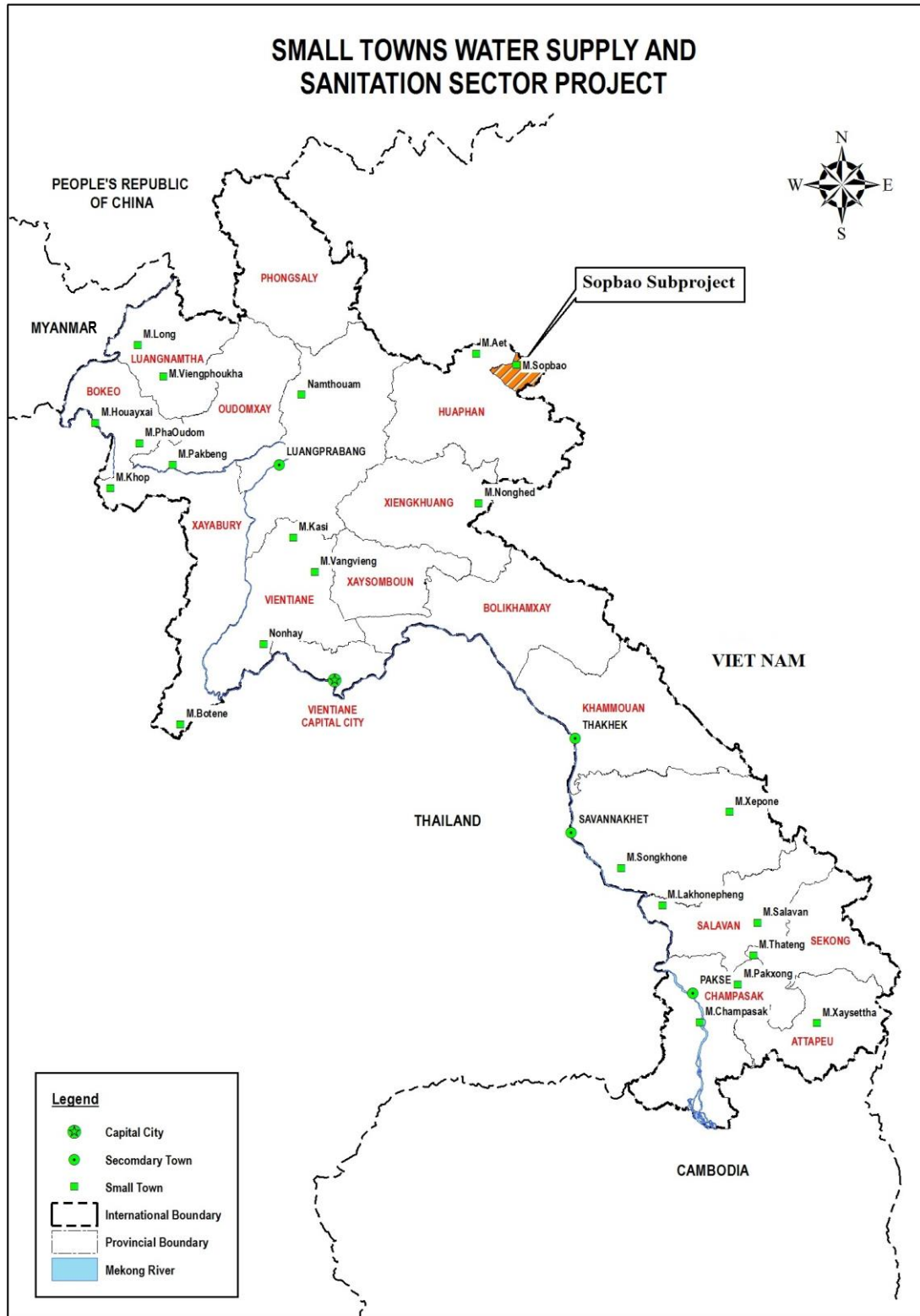
7. The sub-project will involve establishing an intake on the right bank of the Nam Ma River upstream of Sopbao village. The water quality of the Nam Ma was found to be suitable for the proposed conventional water treatment system, but with some closer monitoring for potential pesticide contamination. A maximum output 800 m<sup>3</sup> per day will be drawn from the river and pumped to a newly constructed water treatment plant (WTP) at the back of the town, reaching homes via a main holding tank and gravity fed through a new domestic distribution pipe network.

8. The subproject will also provide investment to improve local village drainage systems, improve capacity of villagers' household sanitation practices, and improve government capacity to manage and maintain their new water treatment and supply system.

9. The subproject will not require any land acquisition. Most of the adverse impacts will be nuisance level, and are expected to occur during the construction phase and can be mitigated through implementation of appropriate mitigating measures.

10. This Initial Environmental Examination (IEE) for the Sopbao District (five villages) presents an assessment of the environmental impacts and the detailed Environmental Management Plan (EMP) for the subproject. The preparation of this IEE is guided by the Environmental Assessment and Review Framework (EARF) of the WSSP, ADB Safeguard Policy Statement (SPS, 2009), ADB Operational Manual Section F1/BP (2013), Public Communications Policy (ADB PCP, 2011), IFC-World Bank Environment, Health and Safety (EHS) Guidelines, the Government of the Lao PDR's Environmental Protection Law (2009), and other Government environmental laws, policies, rules and regulations applicable for water supply projects. The Rapid Environmental Assessment (REA) checklist is presented in Appendix A.

Figure 1: Location of WSSP Towns



## 1.2 Description of Sopbao Subproject

11. **Water Supply.** The sub-project will involve establishing an intake on the right bank of the Nam Ma River upstream of Sopbao village. A maximum output 800 m<sup>3</sup> per day will be drawn from the Nam Ma and pumped to a newly constructed WTP at the back of the town, reaching homes via the clearwater reservoir and gravity fed through a new domestic distribution pipe network. An existing road to the WTP and clearwater reservoir will be upgraded.

12. The system will also supply the nearby villages of B. Soplong, B. Phienxay, B. Muanghom and B. Hadsane via a new supply pipeline that will follow National Road 6A right of way (ROW). Figure 2 shows the layout of the sub-project. Equipment for operation and maintenance (O&M) of the water supply system will be provided, including basic tools, laboratory and office equipment. The WTP and all other ancillary structures will be located on state owned land at the back of Sopbao village.

13. Households that apply to connect during the construction period will not be required to pay any up-front connection charges. This measure will assist poor and low income groups to participate in the piped water supply system, encourage new connections and enhance PNP financial sustainability. Community development activities will inform communities about the Project's connection policy and the benefits of connecting to PNP piped water supply.

14. Further components of the subproject are: (i) training of Sopbao District PNP staff on water supply operation and maintenance, and (ii) support village-level activities through the Village Development Committees (VDCs) for a range of activities to be agreed with the VDC. These activities will include: (i) village environmental improvements (VEIs), consisting of household and community level sanitation and drainage facilities, (ii) stakeholder consultation and public participation to raise awareness and provide organizational support required to implement the VEIs, and (iii) public sanitation facilities.

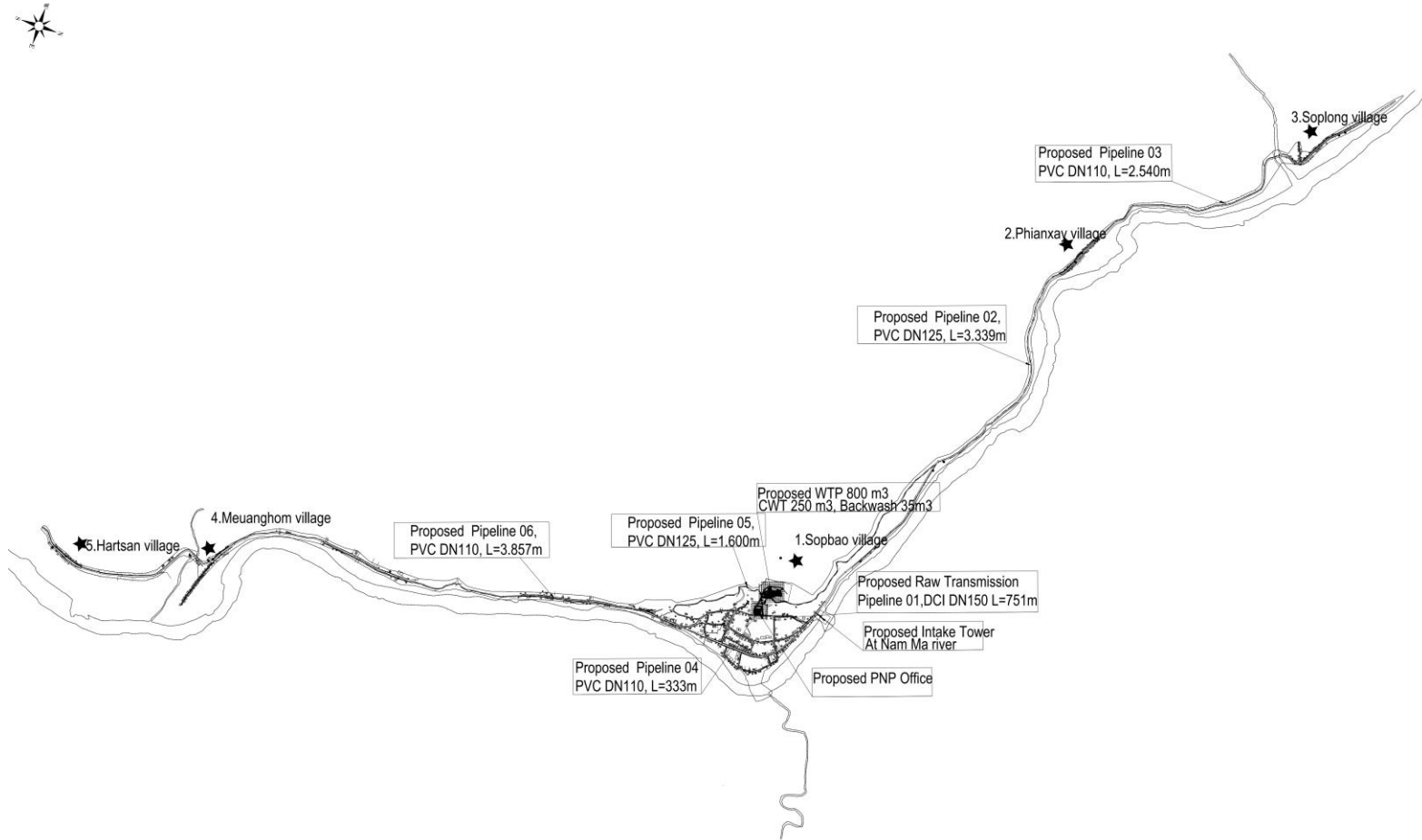
15. **Drainage.** Investment in drainage in Sopbao subproject villages will focus on the dense residential areas which have the highest priority for environmental improvement, according to local stakeholders. The subproject will upgrade the existing unlined drain to open/cover stone lined drains.


16. **Enhanced Community Action (ECA)** output is designed to increase and sustain the benefits from investments in Sopbao's water supply system. It comprises complementary activities that aim to:

- (i). facilitate the implementation of the water supply system; and
- (ii). enhance the sustainability of water supply benefits with activities targeted at improved household sanitation (for the poor especially), public sanitation, village-level environmental improvements (VEI) and subproject and hygiene awareness.

17. **Improved Capacity for Project Implementation, Operation and Maintenance:** With assistance from on-the-job training by PIA, and building on the efforts under the Small Towns Water Supply and Sanitation Sector Project (STWSP) and the current project, PCU and PIU will further develop capacity to implement the subproject. On-the-job training by PIA, PNP, OPWT and the VDCs will also develop capacity to operate and maintain the subproject works. Capacity development initiatives for strengthening operation and maintenance (O&M) of the new and upgraded town water supply infrastructure.

**Figure 2: General layout of the proposed Sopbao villages water supply system**



<b>Ministry of Public Works and Transport</b>  Department of Water Supply	 LAO CONSULTING GROUP in association with <b>NIPONKOEI and SK Consultants</b>	<b>Small Towns Water Supply and Sanitation Sector Project (STWSP)</b>	<b>Project Implementation Assistant (PIA) Team</b>	<b>Date:</b>	<b>Revision No:</b>	<b>Rev. Date:</b>	<b>Drwg. Name:</b>
		<b>Water Supply, Drainage and Public Sanitation, Sopbao</b>	Approved by: Graham JACKSON				BS-WS-GL
		GENERAL	Drawings checked by: Kongchanh LEUANVILAY Design reviewed by: Vannalard SOURINPHOUMY Designed by: Alexandre Bui Drafted by: Oudomsouk PHOMMACHAK				Drwg. No.: GL-01
		GENERAL LAYOUT		6 Feb 2018			Scale: NTS

Environmental Policy, Legal and Administrative Framework

18. The law governing the protection of the environment, including the assessment and management of projects in the Lao PDR is the Environmental Protection Law (EPL), which was issued in 1999 and amended in 2013. The Ministerial Instructions on Environmental and Social Impact Assessments (ESIAs) of Investment Projects and Activities (No. 8030 – December 2013) outline the updated format and procedural requirements of this process. Section 2.2 of this instruction states projects of Category 1, or small-scale projects, an initial environmental examination (IEE) is required and for Category 2 or large-scale projects, an environmental impact assessment (EIA) report is prepared. Under the schedule in the EIA Decree, water supply facilities (Item 3.52) fall under Category 1 so an IEE is required by the government. Ministerial Instruction on the Process of Initial Environment Examination of Investment Projects and Activities, No. 8029/MONRE 2013 outlines how to conduct an IEE and the process for approval.

### **1.3 Description of the Environment**

#### **1.3.1 Physical Resources**

19. The core villages are all located on Road No. 6A, which runs along the valley floor of the Nam Ma river at an elevation of 233 masl at Sopbao. The river valley is relatively narrow, bounded on either bank by relatively steep mountainsides that rise up to an elevation of over 1,000 masl. The core area sits along the right bank with Sopbao village itself located in wide low-lying sand bar area around which the river meanders. The Laeng Nam Ma Protection Forest Area occupies 1,665 km<sup>2</sup> along the left bank of the Nam Ma opposite Sopbao and the four other subproject service villages.

20. The district capital Sopbao is located about 80km from Xamneua on Road 6A, approximately 20km to the closest Vietnamese border by road. The physical distance between the service villages, with Sopbao center, is approximately 11km along (sealed) National Road 6A. The majority of the district villages have rural characteristics with small population densities in dispersed village settlements.

#### **1.3.2 Water Resources**

21. Sopbao town center sits on the right bank of the Nam Ma, which is a major river in the northeastern area of the country with very substantial perennial flow, flowing from Son La Province in Viet Nam and flowing back into it after passing through the three Lao districts of Add, Xiengkhor and Sopbao, all in Houaphan province. About 40% of Nam Ma catchment area lies within the Lao PDR. Houay Bao feeds into the left bank of the Nam Ma at Sopbao. The other significant water resource in the area is the Houay Bao, which is a small houay (stream) that enters the Nam Ma on the left bank just opposite of Sopbao village.

22. The Nam Ma flow varies greatly over hydrological years and spatially. In general, the distribution of flow of large and medium rivers follows a one-peak pattern with the highest flow rate occurring in August or September. There are no existing hydrologic data sets for the Nam Ma, so a pragmatic approach is considered relevant, as used for almost all other subprojects addressed over the past twenty years; this comprises taking contemporary measurements (wet and dry) and putting these data into some historical perspective by comparing to anecdotal evidence provided by local stakeholders. In November 2016, PNP measured the flow (wet season) using cross-sectional areas and average velocities, and estimated that the average flow in the river was about 200m<sup>3</sup>/sec. Using a similar approach, the flow was measured again in March 2018 (dry season), and it was estimated to be about 37m<sup>3</sup>/sec.

23. Results of water quality tests on samples taken during May and July 2017 are typical of surface waters under wet season conditions.

24. Suspicion that gold mining was releasing cyanide and arsenic to the river was tested but results were non-detectable. Fish kills have been reported in the river by Sopbao villagers, but the causes have not been defined. Fish kills can be caused by a range of factors, including low oxygen levels, high pH, high temperatures, and low flows coupled with algal blooms.

25. Good practice 'pesticides use' is a real issue in the area, including upstream Viet Nam. There is a risk when banned chemicals are used but these mainly show up in soils, vegetation and food crops. Water solubility, denaturing of the pesticide etc all determine the fate of the pesticide. For water supply, pesticides are measured in parts per billion not parts per million as for the other contaminants measured. Detecting a pesticide is therefore difficult and expensive even if the Brand Name of the pesticide is known because chemical active ingredients in the pesticide often change when they are in the environment.

26. By the time a fish-kill is notified affected water is probably in the reservoir and the cause of the fish-kill still has to be investigated. The conventionally designed WTP will cope with all the circumstances outlined under the heading 'fish-kill' and even extraordinary events such as mining related events, but some knowledge when such an event occurs is required so treatment can be adjusted. Coagulation will remove some or all of pesticides especially if they are at about non – detectable concentrations but the efficiency of the process depends on managing many variables, particularly plant operations.

27. Commissioning and training of WTP operations will ensure that the Standard Operating Procedures reflect the identified risks, including pesticides. Staff will have ongoing liaison with the Department of Agriculture and Forestry, and DONRE to ascertain possible risks from upstream pesticides and by doing so identify which specific pesticides might be of concern. Should risks arise the water treatment plant operations can be adjusted. The water treatment plant will be capable of treating pesticides in low dosages.

28. As a safeguard, pesticide monitoring for a range of organochloride pesticides (17 in total) is ongoing through construction to commissioning. During operation, PNP will collect a sample for testing for the presence of pesticide and other standard toxic compounds such as arsenic, cyanide and mercury. If elevated pesticides are identified through monitoring then protection measures will be applied. The operational and maintenance manual will incorporate guidelines for environmental management in line with EHS Guidelines for Water and Sanitation.

29. Further, standard practice (overseas) for circumstances such as these is to set up a fish tank in a prominent location at the WTP. The tank is set up so that it does not change the characteristics of the raw water which will continuously flow through the tank. Fish in the tank, if they are sensitive to the contaminants, will die or become ill if subjected to 'an event'. This gives PNP the opportunity to shut down the WTP and carry out investigations. Fish soft tissue analysis can also be used as one option to assess potentially bioaccumulated pesticides.

### **1.3.3 Geology and Natural Hazards**

30. The geological structure of the Lao PDR is known only in broad outline. Houaphan province is dominated by the Truongson belt, one of four which dissects the Lao PDR, and contains some of the country's oldest geological formations, dating back to the Neoproterozoic period (1000-545Ma). The Nam Ma valley bordering Viet Nam, including Xamneua area, have

Cambrian aged rocks comprised of metamorphized limestone, shales, sandstones and conglomerates that are marine in origin and are widely distributed.<sup>3</sup>

31. The sub project area is hilly to mountainous. Small to moderate earthquakes have occurred within the Lao PDR over recorded history, however Houaphan Province is considered to have low vulnerability to damaging earthquakes but can experience quakes up to *Mercalli* Scale VI in intensity.

32. The Lao PDR is prone to flooding, mainly associated with the presence of large river basins coupled with the prevalence of strong monsoon influences. There are two causes of heavy rains in the Lao PDR: the enhanced southwest monsoon caused by typhoons close to the Philippines and Viet Nam and the lasting southwest monsoon accompanied by the stagnation of tropical storms in neighboring Viet Nam. There are steep hills in the nearby project area footprint which are prone to landslides during heavy rain events, particularly along sections of road that are currently being upgraded.

#### 1.3.4 Ecological Resources

33. The Nam Ma is a large currently unregulated river that drains from Viet Nam approximately 83 km upstream from Ban Sopbao and is an essential fishery for villages. At Sopbao village there is a fishery conservation zone (FCZ), basically a village declared fishing exclusion zone, along the Nam Ma that runs the length of the residential area, extending from the Houay Bao stream confluence (right bank) to 500 m downstream. It was reported that FCZ also occur in upstream and downstream villages. This will be investigated further through public consultations and update of the IEE and EMP carried out during detailed engineering design.

34. Rotational shifting cultivation remains the dominant agricultural practice in Houaphan Province and was used by 84% of the farmers in 2013<sup>4</sup>. Forests are generally cut, burned and cultivated after fallow cycles of 3 to 20 years depending on population density and land availability. Degraded forests dominate the hilly landscape of the Sopbao District. Swathes of riparian lands along the banks of the Nam Ma have long since been converted to rain fed rice terrace development, with bamboo forest in the hinterlands behind the rice.

35. The Laeng Nam Ma Protection Forest Area (PFA) occupies 1,665 km<sup>2</sup> on the left bank of the Nam Ma opposite Sopbao and project service villages. All construction activities will be on the right bank. Workers will not be permitted to enter the PFA. The Nam Et National Biodiversity Conservation Area is located about 55 km west of the project site and will not impacted by subproject activities.

#### 1.3.5 Historical and Archaeological Sites

36. There are no sites that are considered as historically or archaeologically significant within the sites of the project components.

#### 1.3.6 Unexploded Ordnance

37. The proposed water treatment plant and main holding tank site is located on already developed (excavated) land, as is its access roads, therefore the site presents a low UXO risk. The Sopbao drainage upgrades are proposed for already developed roadways and urban areas so they too are considered to have low UXO risk. The topographic survey related to the

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<sup>3</sup> [http://www.explo-Lao PDR.com/Geologie/General\\_geology.html](http://www.explo-Lao PDR.com/Geologie/General_geology.html)

<sup>4</sup> In The Second-5 Year Bamboo Development Strategy 2016-2020, Houaphan Province.



development of the treatment plant design included a pathfinder exercise to ensure the safety of the survey personnel.

### 1.3.7 Socio-Economic Condition

38. Sopbao District (population 25,527) in Houaphan Province borders with Viet Nam to the east and Viengxay and Xiengkhor districts to the west and north. The Sopbao sub-project has five (5) core villages (i.e. villages that have urban characteristics and population densities that would enable a financially sustainable water supply system to operate), with a total population of 2,653. There is an existing Nam Papa water supply to two of the villages, but the other three are un-serviced.

39. Houaphan is the second-least urbanized province in the country having the slowest population growth in the country at 0.3% annually (2005-2015 inter-censal period), compared with the national rate of 1.45%.

40. The district administration center for Sopbao District is located within the village of Sopbao. The distance to the provincial capital, Xamneua, is about 80km by road which at the time of writing is being upgraded and sealed. The town is situated along road 6A which follows the river valley of the Nam Ma river.

41. The local economy is based on services, agriculture and trade. The main income is from rice cropping, animal breeding (cows, pigs and poultry), and trade. A higher percentage of women worked as traders or small business operators, and a higher percentage of men described themselves as retired. More men were government officials, and more women were farmers.

## 1.4 Environmental Impacts

### 1.4.1 Benefits of the Subproject

42. The Sopbao District subproject will provide direct and indirect benefits for all people living and working in the five (5) core villages of the district. As of August 2017, there were 586 households with a total population of 2,653 standing to benefit from the project. The principal benefits deriving from the rehabilitation and expansion of the existing piped water supply system will be (i) a secure and continuous supply of safe, clean water; (ii) good water pressure to serve two-story premises; (iii) adequate quantities of safe and clean water to meet all their needs; and (iv) high level of convenience. The water supply will also enable commercial establishments and light industry to sustain their business models and grow the economy, which in turn will provide employment.

### 1.4.2 Adverse Environmental Impacts

43. In general, the benefits of the subproject outweigh the anticipated negative environmental impacts. Most of the adverse impacts are expected to occur during the construction phase and can be mitigated through implementation of appropriate measures. The following paragraphs describe the expected adverse impacts that have to be considered during subproject design and implementation.

### 1.4.3 Environmental Impacts Related to Location

44. **Impact on land acquisition and community assets.** There will be no land acquisition required for any of the infrastructure development proposed. The new intake is located on government-owned land, as is the expansion of the WTP. All pipelines will be laid in public rights of way (footpaths/roads). There will be temporary disruption to some communities during pipe-

laying. A Land Acquisition and Compensation Plan (LACP) for the subproject has been prepared separately to ensure that any loss of land or damage to property is properly addressed.

45. **Impact of WTP and Clearwater Storage Reservoir.** The proposed 800 m<sup>3</sup>/d capacity WTP will be constructed on hill-slope land at the back of Sopbao village. Secondary (destocked) forest typically with bushes and bamboo characterize the vegetation on the site. The development works for the WTP and reservoir will not require significant slope protection, which will be addressed in the engineering design. The available lot is District (state) owned. The water supply intake is on the right bank of the Nam Ma upstream of Sopbao village. This site was chosen due to its availability and proximity to adequate water. The distance between the WTP and the intake is approximately 800 m.

46. **Impact of location of raw water intake on other water users.** In the proposed system, the water supply intake is on the right bank of the Nam Ma upstream of Sopbao village. This site was chosen due to its availability, proximity to adequate water. The intake will have public access controlled throughout the construction and operational phase restricting access to the river at that site. However, the public will still enjoy access to the river foreshore within the village and surrounds.

47. Houay Bao feeds into the left bank of the Nam Ma just downstream of Sopbao village. It is understood that this small houay has a highly variable flow between the dry and wets seasons. It is used by the adjacent communities, although to a varying extent depending on the season and quality at that time; these will not be impacted by the subproject. There are no data sets on this houay and the flow is very variable, and will be subject to climate change risk. These factors must be taken into consideration if this houay is to be adopted as the preferred source.

48. The Nam Ma flow rate has a minimum of around 37m<sup>3</sup>/sec during the dry season rising up to around 200m<sup>3</sup>/sec in the wet season. The river is approximately 60m across and depth varies up to 6.0m in depth, with velocities varying between 0.17m/s to 4m/s. The volume of water required to service the subproject area villages through the WTP is 800m<sup>3</sup>/day or around 37m<sup>3</sup>/hr. Other uses, such as fisheries and local agriculture will not be affected by the comparatively small volume of WTP drawdown.

49. Water abstraction for the proposed subproject during the estimated flow in the dry season month of March would be about 0.011m<sup>3</sup>/s, which would be about 0.03% of the total flow in the river at that time. This is a very insignificant abstraction rate and would offer no adverse impacts on other water users. In addition, and in consultation with local stakeholders, it was established there are no other significant water demands on the river either upstream or downstream. As a risk mitigation measure however, the Provincial Governor will be required to issue a decree proclaiming that drinking water supply must always be given highest priority over all other uses in extreme dry conditions.

50. **Impact on natural resources and protected areas.**

51. At Sopbao village there is a fishery conservation zone (FCZ), basically a village declared fishing exclusion zone, along the Nam Ma that runs the length of the residential area, extending from the Houay Bao stream confluence (right bank) to 500 m downstream. The intake will not impact on the FCZ which is about 400m downstream as only a comparatively small volume of water will be drawn from the river and there will be no obstruction of flow because no weir is included in the design. As a further precaution, fish screens will be fitted to the intake pipes. Pipes will have bell ends to reduce velocity. This conservation zone might experience minor increases in turbidity caused by construction of the intake works which is located about one kilometer upstream, however these impacts are temporary and can be mitigated by employing mitigation

measures specified in the EMP. Other FCZ are located on the Nam Ma upstream and downstream villages and these too will not be impacted by the intake.

52. The Laeng Nam Ma Protection Forest Area on the left bank of the Nam Ma opposite Sopbao and project service villages will also not be impacted by the project if access restrictions are applied to construction workers.

53. The location of the proposed water supply system and its components will have no impact on the Nam Et Biodiversity and Conservation Area which is 55 km from the project area.

54. **Impact on historical and archaeological sites.** The proposed development will have no impact on any historical and archaeological sites.

55. **Unexploded ordnance.** Data on bombs dropped by US forces between 1968 and 1972 during the Indochina War is available from the National Mines Regulatory Authority and has been thoroughly reviewed. There is a potential for the intake works area to contain UXO as this is located on the outskirts of town in the upper main drainage line of the Nam Ma, which may have been contaminated by mobilized UXO from the upstream catchment.

56. The proposed water treatment plant and main holding tank site are to be constructed on already developed (excavated) land, as is its access road, therefore the site presents a low UXO risk. The Sopbao drainage upgrades and domestic pipeline connections are proposed for already developed roadways and urban areas so they too are considered to have low UXO risk. The distribution pipe connecting the subproject villages will follow Road 6A right of way, and therefore in areas that have been extensively developed, and are unlikely to be high UXO contamination risks. However, a clearance certificate has been obtained from the provincial state enterprise for UXO survey and clearance to confirm all construction areas are free of any UXO.

#### 1.4.4 Environmental Impacts During Construction

57. Most of the anticipated impacts are related to nuisances which may occur during the construction of the subproject components. Nuisances include temporary disruption of access to community facilities, noise, and release of dust and pollutant and greenhouse gas emissions. The EMP, which is summarized in Chapter 10, includes mitigating measures and will be included as part of the bidding and contract documents. The effective implementation of the EMP will reduce these risks to an acceptable level.

58. **Temporary disruption of community roads, pathways, and access to properties.** During trench excavation and pipe laying works, temporary disruption of access to residential and commercial establishments, schools, and community facilities will occur. To mitigate this, temporary accesses to houses and other establishments will be built using sturdy materials. The contractor will restore any damaged sections to properties. The contractor will be required to provide warning signs and barriers/fence at work sites.

59. Temporary closure or blockage of roads will occur during the excavation and pipe laying activities at pipe and road intersections. Information boards will be posted to provide information to the community about the temporary closure of roads, the schedule of works, and the traffic-rerouting plan. During nighttime, the excavated area should be covered with plates and provided with adequate lighting to warn villagers about the open excavation. Following completion of pipe laying, good quality permanent access will be restored by the contractor on any damaged road and path sections.

60. **Air pollution.** The main sources of air pollution are operation of machines, excavation works, and materials and equipment transportation. An increase in dust concentration near

construction areas is expected within about 50m around the subproject sites. Winds may carry fugitive dust to nearby areas, if no preventative measures are applied. The contractor will be required to implement measures to control air emissions and dust from the affected sensitive receptors like residential areas, schools, clinics and offices.

61. **Noise.** The operation of equipment such as jackhammer for the installation of water supply distribution network may cause noise nuisance to nearby residential houses and commercial buildings. As at least 95% of the five village residences and businesses will be connected to the new WTP, sensitive receptors such as schools, clinics and temples will be temporarily impacted by pipe laying only. There are no sensitive receptors near the intake or WTP site. There may also be a need to utilize diesel generators during the construction period. Noise levels may reach 88dBA at a distance of about 15m away from the source or operation of construction equipment. Along roads used for material transport, the average noise level will also rise because of increased truck traffic. To avoid noise nuisance, construction operations will only take place during daytime hours from 0700H to 1800H.

62. **Impact of borrow materials.** The construction activities will require aggregates like sand and gravel. Quarrying of these materials directly from the Nam Ma and other nearby waterways will be prohibited to avoid causing impacts on the ecological condition of the waterway. The contractor will be required to secure these materials only from Government-permitted sources or suppliers. Some cut soils will be used to backfill and level the WTP site.

63. **Clearing of vegetation.** Vegetation cover at the proposed intake and access roads will have to be removed for construction. Impact of vegetation clearing will be minimal because the current vegetation cover at these sites only consists of bushes and shrubs.

64. Vegetation cover at the proposed WTP, clear water reservoir, proposed office and laboratory and access roads will have to be removed for construction. Impact of vegetation clearing will be minimal because the current vegetation cover at these sites only consists of bushes, shrubs and bamboo. The site where the WTP and storage tank is situated is hilly and require excavation and cutting of slopes. This activity will contribute to erosion in the area and may require land stabilization works and sediment containment structures.

65. Water supply distribution network will affect some trees that have been planted by communities in front of their houses. As per the LACP, some private trees may need to be removed for the installation of the pipelines and related works. Affected trees in private land will be compensated in cash in accordance with the Updated LACP.

66. **Sediment runoff.** When construction activities (particularly earthworks) are undertaken during the rainy season, sediments may erode and cause the runoff of silt into the river. To minimize the impacts of soil runoff, the contractor will be required to implement proper measures, such as the provision of silt traps, ditches, and sump pits to block the flow of silt into village drains and the river. In addition, earthworks will be scheduled during the dry season to the extent practicable to avoid silt runoff.

67. **Domestic wastewater from worker's camp.** If domestic wastewater is disposed untreated, the wastewater could lead to the contamination of surface and groundwater and lead to the spread of water-borne diseases. Therefore, appropriate wastewater management measures should be implemented during the construction phase to prevent sanitation problems through the provision of adequate water supply and latrines at the worker's camp.

68. **Residual chlorine during pipeline and reservoir disinfection.** Chlorinated water is retained in the completed pipe works and reservoirs for a designated period to develop sanitary

conditions. The standards require 25–50 g/m<sup>3</sup> chlorine residual held for a period of time, normally 12–24 hours. Extra caution is needed in disposing water with excessive chlorine residual since this is toxic to fish and other aquatic life. When the chlorine concentration of the water in the pipelines and storage tank has been reduced to less than 2 mg/l, it will be discharged into the nearest water body. The allowable limit for Chlorine (free residual) as per the Ministry of Public Health Drinking Water Quality Standards of 2014 is 0.1-2.0 mg/l. (Appendix B).

69. **Generation of construction wastes.** The construction of the proposed WTP and reservoir will require earthworks and leveling of the area. The excavation for the pipe laying will also generate material. The excavated material will be utilized to backfill the trench once the pipes have been laid out. Excavated material from the foundation of the WTP tanks will be utilized to backfill other work sites where required.

70. Domestic solid waste at the construction camp is not anticipated to be of a significant volume because only small temporary camps will be provided at the sites of the WTP and tank, and none at the sites for the bore-field intake, transmission and distribution pipes. However, proper waste disposal methods should be employed to avoid pollution of land and adjacent water resources. Solid waste will be collected and properly disposed in the local disposal site of the District.

71. Hazardous wastes such as paint containers and solvents and spent batteries are generated by construction activities, but in specific sites such as the bore field intake, WTP and holding tank, no such waste is projected to be generated. Although the quantities are anticipated to be minimal, this type of waste is detrimental to the environment and public health and as such will be segregated from the general solid waste, collected and disposed for appropriate treatment.

72. **Occupational health and safety.** The contractor through a site safety plan will address hazards during civil works. The contractor will be required to appoint a safety supervisor who will ensure that safety measures during civil works are implemented. These safety measures include the use of personnel protective clothing and equipment (PPE), installation of the requisite hazard warning signs, and excavation covers and barriers. Arrangements for prompt medical attention in the event of accidents will also be made.

73. The contractor will be required to: (i) undertake priority hiring of qualified construction workers from the villages, (ii) consult with local people to avoid conflict if migrant workers will be brought to the site, (iii) install suitable toilets such as pit latrines and grey water drainage facilities such as soakage pits, (iv) arrange for the proper disposal of solid wastes, (v) brief workers and the villagers on the dangers of communicable diseases, and (vi) assign a senior member of his staff to be responsible for the workers and local peoples' welfare.

74. In addition, during the disinfection of water distribution lines, only staff who have had experience and proper training and are aware of the potential health hazards associated with chlorinating agents will be involved in such activity.

#### 1.4.5 Environmental Impacts During Operation

75. **Incremental wastewater generation and increased burden on drainage systems.** Households receiving new water supply connections are likely to use more water for cooking and washing. The current condition and lack of well-designed drainage system in the villages will result in small quantities of grey water or sullage forming ponds of dirty water which may provide habitats for mosquitoes and pose health hazard to the communities. This impact will be primarily addressed through the drainage improvement and public awareness raising initiatives under the Village Environmental Improvements (VEIs) component of WSSP. As a project policy, households

will have free water connection if the household has an approved sanitation facility to cope with the increased wastewater generated.

76. **Deterioration of water quality.** The quality of the Nam Ma raw water could deteriorate if there are substantial human activities in the upstream catchment area that are of sufficient magnitude to cause contamination of the river water. However, given the large size of the river and the treatment process proposed, including disinfection, any such contamination is extremely low risk. Additional pesticide monitoring will be conducted in the Nam Ma prior to construction. However, it should be noted that the water treatment plant will be capable to treat pesticides at levels close to “not detectable”.

77. The Project Implementation Unit (PIU) and PNP will continuously coordinate with the villages and Sopbao/Xamneua authorities regarding community activities in the upstream catchment area, particularly on the issue of pesticides. Laboratory testing equipment and training will also be provided to allow the PNP to conduct regular monitoring of raw and treated water quality parameters.

78. In addition, grant covenants will require: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and applying good practices to treat water to acceptable Ministry of Health standards. The operations and maintenance manuals will cover operational environmental mitigation and monitoring measures in line with EHS Guidelines for Water and Sanitation.

79. **High pressure and leaks on the pipeline.** Some of the network is located on low elevation, potentially exposed to high water pressure and leaks. This risk is minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) designing and operating pressure zones within the network (20-40m), (iii) careful construction supervision by the PIA to ensure that pipe laying and jointing is done with the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.

80. **Generation of backwash water and sediments at the WTP.** During the operation of the WTP, back wash water and sludge removed from the sedimentation tanks contains sediments and other pollutants that have been removed from the raw water during treatment. Discharging the sediment directly into land or river may result in deterioration of the condition of the receiving environment. As mitigation to eliminate this adverse impact, detention ponds have been included in the design of the WTP.

81. **Occupational health and safety.** Water treatment will involve the use of coagulants/flocculants and chlorine that will expose WTP personnel to hazards during chemical handling. Risks associated with these chemicals will be minimized by: (i) providing secure, dry and appropriately ventilated storage facilities for hazardous chemicals, (ii) use of chemicals in powder, rather than in gaseous form, which is safer to store and handle, (iii) posting of the Materials Safety and Data Sheets (MSDS) of these chemicals in the chemical storage area and chemical mixing tank area for information of workers, and (iv) training of staff and designation of responsible person on the handling of these chemicals.

82. **Generation of inorganic sludge from detention ponds.** The inorganic sludge that is generated from the detention ponds will be dredged and disposed as backfill material in low-lying areas to be identified by the village leaders. The residual coagulants and flocculants from water treatment are bound in the sludge are inert and will not cause health or environmental impacts.

83. **Community health and safety.** The facilities that will be constructed will be properly fenced off and secured to restrict access and intrusion of unauthorized personnel.

Watchmen/security personnel will be hired to secure the facilities on a 24-hour basis. This would eliminate the safety risks to the community and the school children near the proposed WTP and reservoir.

### **1.5 Information Disclosure, Consultation, and Participation**

84. Public/Stakeholder consultations were held in October 2017 with the PNP Xamneua, the Project Implementation Unit (PIU), the five subproject villagers, local government officers and staff. The consultations were conducted to discuss with the stakeholders the proposed subproject and to elicit the environmental concerns/issues of the community on the proposed subproject. Appendix C provides the details of the public/stakeholders consultations.

85. Discussions were also undertaken with the Provincial Natural Resources and Environment Department (DONRE) of Sopbao District to present the proposed subproject and validate the environmental requirements for the proposed project.

86. In general, consultees were of the view that the subproject would result in more benefits than negative impacts. The people are willing to connect to the water supply subproject because of the improvement in their living conditions. During subproject implementation, communities within the subproject impact areas should be appropriately and in a timely manner, informed of the construction activities particularly those which are likely to cause noise and dust nuisance, disruption to roads and pathways.

### **1.6 Grievance Redress Mechanism**

87. A Grievance Redress Mechanism (GRM) was developed in compliance with the National regulations of the Government and with ADB Safeguards Policy Statement (2009). The GRM will provide the means to resolve grievance and complaints in a timely and satisfactory manner.

88. Essential features of the GRM are: (i) resolution takes place as quickly as possible, (ii) all affected persons will be made fully aware of their rights, (iii) all persons with concerns about the environmental impacts of the project are also entitled to lodge their complaints and seek redress, (iv) the community will be informed about the detailed grievance redress procedures through public information campaigns, (v) complaints can be made verbally or in written form, (vi) complainants will not incur administrative fees or costs of legal representation, (vii) the GRM uses existing village arbitration units, namely, the village chief and/or deputy chief, village elders and village representatives of the Lao Women's Union, Lao Front for National Construction, and the police, (viii) the arbitration unit is responsible for settling disputes between villagers through conciliation and negotiation and will be supported at district level, (ix) all complaints and resolutions will be properly documented and will be available for public review and monitoring and will be incorporated into safeguard monitoring reports.

89. The details of the PIU, GRM Focal Contact Persons and Construction Manager will be prominently displayed in the respective construction areas for the reference of the affected communities/persons. Complaints and grievances can be directly filed, both written and verbal, to the concerned entities. This will provide alternative entry points to the village complaint system. The procedures for the GRM are outlined in Section 9 of this IEE.

### **1.7 Environmental Management Plan (EMP)**

90. An EMP has been prepared, outlining the institutional responsibilities and management arrangements to ensure effective implementation and monitoring of mitigation measures. Throughout the construction period, the contractor will submit monthly environmental compliance

progress reports to the PNP with a copy furnished to the PIU. The contractor should be able to highlight the summary of the progress of construction, activities undertaken to implement the measures outlined in the environmental management and monitoring plan, record any community complaints received and how the complaint was eventually resolved.

91. The PIU will consolidate the results of the monthly environmental monitoring through a quarterly progress report that will be submitted to the Project Coordination Unit (PCU) which is based at the Department of Water Supply and Sanitation of the MPWT. The quarterly report will (i) summarize the significant findings and measures undertaken to address identified adverse environmental impacts during the works, (ii) discuss any unanticipated environmental impacts encountered during the subject monitoring period and (iii) recommend remedial actions to address these unanticipated environmental impacts. Copies of the quarterly progress report prepared by the PIU will be given to the members of the Provincial Project Steering Committee and the District Governor. PCU will consolidate information from quarterly progress reports, compile and submit integrated safeguards monitoring report semi-annually to ADB. Appendix D presents the Template for the Project Environmental Safeguards Monitoring Report.

92. The implementation of the EMP during the operational phase of the subproject will be undertaken by the PNP, with verification by the PCU who will report to ADB the project's adherence to the EMP, information on subproject implementation, and environmental compliance through semi-annual integrated safeguards monitoring reports. (Appendix D). The monitoring parameter during the operational phase, as outlined in the EMP, includes monitoring of water quality at the inlet of the WTP and of the treated water. Monitoring of backwater discharged from the WTP will include TSS to ensure it is within agreed standard requirements.

93. **Conclusion and Recommendation.** This IEE for the Sopbao district subproject was undertaken to determine the environmental issues and concerns of proposed works. This assessment confirms that the subproject is classified as Category B for environment based on ADB Safeguards Policy Statement (SPS, 2009). In addition, an Environmental Compliance Certificate has been provided by the provincial department of natural resources and environment with regard to the IEE and EMP, and it is appended to this document.

94. In general, the subproject will result in beneficial impacts on health and well-being of the people because of improved accessibility to potable and reliable water supply. There are also health benefits in the form of reduced incidences of water-related diseases as a result of hygiene awareness activities and improved access to safe water for the community.

95. Most of the adverse environmental impacts are expected to occur during the construction phase of the implementation of the subproject. However, these environmental impacts are not projected to cause irreversible and significant adverse environmental impacts and can be readily managed by the establishment of appropriate and conventional mitigation measures. Based on the assessment of environmental impacts, the anticipated impacts during project implementation are related to nuisances which may occur during the construction of the subproject components such as temporary disruption of access, and community facilities, noise, sediment runoff, generation of excavated/surplus material and release of dust and engine gas emission. The EMP will be in the bid and contract requirements of the contractor. Effective implementation of the EMP and monitoring and inspection of construction work sites and during operation will reduce potential environmental risks to an acceptable level.

96. The EMP also presents the institutional responsibilities for implementing the mitigation and monitoring measures during construction and operation. The IEE concludes that the subproject combined with available information on affected environment is sufficient to identify



the scope of environmental impacts of the subproject and that no significant impacts will result from it. In the event there are significant changes to the scope and location of the subproject components during detailed design, then the IEE will be updated. If there are no significant changes, then only the EMP will be updated prior to construction.

97. An environmental monitoring plan has been provided to ensure water quality is maintained according to the prevailing Lao standards. In addition, grant covenants will require: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and applying good practices to treat water to Ministry of Health standards. The operations and maintenance manuals will include mitigation and monitoring measures in line with EHS Guidelines for Water and Sanitation to address key environment, health and safety risks during operation.



## **2. INTRODUCTION**

98. The original scope of the Small Towns Water Supply and Sanitation Sector Project (STWSP) is now essentially complete, with the thirteenth (13<sup>th</sup>) subproject currently under implementation and due for completion by June 2018. The STWSP design was essentially built on previous work in the sector by the Asian Development Bank (ADB) and the Government of the Lao PDR with a strong policy dialogue and sector reform approach closely linked to the capital investment activities. It included the development and rehabilitation of piped water supply systems and complementary drainage and environmental sanitation works. The thirteen towns are located in eight provinces throughout the country. They include nine towns for new water supply systems and four towns with existing water supply systems that required rehabilitation to improve service levels. All nominated districts were among the 47 districts classed as priority poor and one town was among the 72 districts classed as poor by the government.<sup>5</sup>

99. In 2013, a further project was approved by ADB and government, the Water Supply and Sanitation Sector Project (the current project), which continued the approach developed under STWSP, but shifted the focus a little with a stronger emphasis on the rehabilitation of provincial capitals. The impact is expanded access to quality and reliable piped water supply and sanitation services for the urban population in the Lao PDR. The outcome is improved performance of participating provincial nampapa (PNP) in delivering sustainable water supply and sanitation services for urban residents in eleven (11) of the Lao PDR's provincial and district towns. It aims to (a) strengthen PNP capacity in corporate planning, business and financial management and operation and maintenance; (b) rehabilitate and/or expand piped water supply systems; and (iii) improve environmental sanitation in priority towns. It also aims to continue to improve the financial sustainability of PNPs through support for financial management sector reform.

100. Using Grant savings realized under STWSP, it was agreed by ADB and government to provide a contract variation to the incumbent project implementation assistance consultant (PIA) to conduct feasibility studies and carry out detailed engineering designs for a further two (2) subprojects, which would be designed such that they would form sample subprojects to be covered under Additional Financing to the current project. All stakeholders have expressed a wish for the design and approach of the Additional Financing to be generally consistent to the current project, but taking into account the proposed revisions to the Project Administration Memorandum (PAM), as well as incorporating any lessons learned with a view to making the approach more effective and innovative. Sopbao subproject will be designed and implemented in parallel with the subproject initiatives in the provincial capital of Xamneua; this follows the approach developed under the current project.

101. An initial environmental examination (IEE) of the Sopbao District subproject was undertaken in compliance with the ADB Safeguards Policy Statement (SPS, 2009) and the EIA Decree of April 2010. An Environmental Management Plan is also included in this document.

## **3. METHODOLOGY**

102. Although this Initial IEE is funded under STWSP for Additional Financing to WSSP, it was prepared according to the Environmental Assessment and Review Framework (EARF) of the WSSP, ADB Safeguard Policy Statement (SPS, 2009), ADB Operations Manual Section F1/P, Public Communications Policy (ADB PCP, 2011), International Finance Corporation - World Bank Environment, Health and Safety (EHS) Guidelines, and the government's Environmental

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<sup>5</sup> Eighth Round Table Meeting, "The National Poverty Eradication Program (NPEP): A Comprehensive Approach to Growth and Development", September 2003.

Protection Law (2009), and other environmental laws, policies, rules and regulations applicable for water supply projects. The potential impacts have been analyzed and mitigation measures identified following site visits to the locations of the subproject component facilities and service area in July 2017. The visits included an assessment of the proposed sites, discussions with Provincial and District officials and village representatives.

### **3.1 Project Category**

103. The requisite screening was carried out during the preparation phase of the feasibility study using the ADB Rapid Environmental Assessment (REA) checklist, and accordingly, the subproject was classified as Environment Category B requiring the preparation of IEE and EMP only. This IEE confirms the subproject remains Category B. The potential adverse environmental impacts are site-specific, reversible, and can be readily mitigated via an environmental management and monitoring plan (EMP). An Environmental Compliance Certificate has been provided by the provincial department of natural resources and environment with regard to the IEE and EMP, and it is appended to this document

## **4. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK**

### **4.1 Environmental Safeguards Policies, ADB**

104. The environment safeguards requirements of ADB are presented in the following guidelines:

- Safeguard Policy Statement (2009);
- Operations Manual Section F1/P<sup>6</sup>; and
- Public Communications Policy (2011).

105. The Safeguards Policy Statement (SPS, 2009) of ADB governs the environmental and social safeguards of its operations. When a project/subproject has been identified for ADB financing, it is screened and categorized to determine the following:

- Significance of potential impacts or risks of the project/subproject to the environment;
- Level of assessment and institutional resources required to address the safeguard issues; and
- Information disclosure and consultation requirements.

106. The SPS outlines the environmental safeguards requirements for borrowers/clients. These requirements include assessing impacts, planning and managing impact mitigations, preparing environmental assessment reports, disclosing information and undertaking stakeholder consultations, establishing a grievance redress mechanism, and monitoring and reporting. It also includes specific environmental safeguard requirements pertaining to biodiversity conservation and sustainable management of natural resources, pollution prevention and abatement, occupational and community health and safety, and conservation of physical cultural resources. Consideration of associated facilities, that are not funded as part of the project/subproject, and whose viability and existence on the project/subproject is also required.

107. The SPS requires meaningful consultation with affected persons and concerned stakeholders and public information disclosure for Category A and B projects. For Category B, the draft IEE report should be available to interested stakeholders before project/subproject

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<sup>6</sup> Operations Manual Bank Policies (BP) issued on 1 October 2013, based on ADB Safeguard Policy Statement, 2009.

approval and posted on the ADB website upon Board approval of a project in accordance with the Operations Manual and Public Communications Policy (2012).

## **4.2 Legal and Institutional Framework on Environmental Management in the Lao People's Democratic Republic**

### **4.2.1 Environmental Impact Assessment**

108. The law governing the protection of the environment, including the assessment and management of projects in the Lao PDR is the Environmental Protection Law (EPL), which was issued in 1999 and amended in 2013. The Ministerial Instructions for the Conduct of ESIA's (No. 8030 – December 2013) outline the updated format and procedural requirements of this process. Section 2.2 of this instruction states projects of Category 1, or small-scale projects, an IEE is required and for Category 2 or large-scale projects, an EIA report is prepared. Under the schedule in the EIA Decree, water supply facilities (Item 3.52) fall under Category 1 so an IEE is required by government.

109. The Ministerial Instruction No. 8029 2013 on the Process for IEE Investment Project and Activities states that all investment projects that may create adverse environmental and social impacts are to be designed with the correct and appropriate environmental and social impact prevention and mitigation measures or environmental management and monitoring plans (EMP) and social management and monitoring plans (SMMP). According to the decree, the primary responsibility for undertaking environmental assessment of projects is with the project developer, which for this subproject, is the Department of Water Supply (DWS).

110. The Ministry of Natural Resources and Environment (MONRE), acting through the Department of Natural Resources and Environment (DONRE), is responsible for the review and approval of environmental assessment reports, coordination of monitoring and evaluation, and issuance of the requisite environmental compliance certificates (ECC). Public participation and discussion with local administrations is required throughout the environmental assessment process.

### **4.2.2 Drinking Water Quality and Discharge Standards**

111. The Ministry of Public Health (MOH) has issued the Water Quality Standard for Management for Drinking and Domestic Use in March 2014 in accordance with Decision 561/MOH, 2014. The standard is based on the World Health Organization Guidelines for Drinking Water Quality, which is recommended by IFC's EHS Guidelines for Water and Sanitation. The MOH has the institutional mandate for overseeing and monitoring drinking water quality in the Lao PDR, while the PNP's (operators) are responsible for ensuring compliance with the standard. The MOH Drinking Water Quality Standards, 2014, stipulate that PNP's are required to conduct regular water quality monitoring and testing of 23 water quality parameters. The standards specify that up to 7 parameters must be tested weekly and an additional two parameters tested on a monthly basis, with an additional 14 parameters to be tested on an annual basis. The list of monitoring parameters is listed in Table 3 of the said water quality standards. Refer to Appendix B.

112. At this stage of the Lao PDR's socio-economic development however, the laboratory infrastructure necessary to conduct this level of testing across the country does not exist. There are two known laboratories, but both have produced suspect results in the past. Consequently, most of the samples under ADB-funded projects over the past couple of decades have been tested in Thailand, which is logistically quite difficult. Consequently, at this time DWS has agreed with the PNP's to focus on three parameters for routine testing of treated water – pH, turbidity and residual chlorine at the extremity of the distribution network to keep the water supply safe for

consumption. To supplement this testing, PNPs will take samples once or twice per year for testing for a full range of parameters as set out in the MOH standard, as well as pesticides, arsenic, cyanide and mercury. It would be wise for the PNPs to have these samples tested in Thailand until such time as the laboratory infrastructure in the Lao PDR is sufficiently developed.

113. National Wastewater Quality Standards have been adopted based on the Environmental Protection Law No.29/NA, dated December 18, 2012 and the Decree on National Environment Standard dated 81/GV, dated 21 Feb. 2017 and 0832/MONRE. The standards relate to drinking water quality (groundwater); surface water quality; and wastewater effluent discharge from industrial activities. This includes biochemical oxygen demand (BOD) of 40 mg/l and total suspended solids (TSS) of 40 mg/l. Detention ponds are incorporated into the design to ensure backwash water is discharged into the environment at much lower levels.

#### 4.2.3 Other relevant legislation to the subproject.

- **Environmental Protection Law (2012).** Environmental Protection Law (National Law 29/NA) (EPL) dated December 18, 2012. The revised Environmental Protection Law has included 13 parts and 99 articles. This Environmental Protection law defines principles, regulations and measures related to environmental management, monitoring of protection, control, preservation and rehabilitation, in order to ensure environmental quality, reduction of impacts and pollution created by human activities or by nature, aiming to provide balance between social and natural environment, to sustain and to protect natural resources and public health; and contribution to the national socio-economic development and reduction of global warming.
- **Law on Water and Water Resources (2017).** The Law on Water and Water Resources (No.23/NA) dates May 11, 2017. This Law on Water and Water Resources defines principles, regulations, and measures relating to the protection, administration, exploitation, use and development of water and water resources, protection damage to water or water resources, rehabilitation of the effect areas to assure the quality, quantity of water and sustainable water resources, to respond for the people's living requirements, to promote agriculture and industry, to ensure that natural environment, social environment are protection, to develop the nation sustainable and to the socio-economic development.
- **Forestry Law (2007).** The Amended Forestry Law, No. 06/NA (Dec. 2007) stipulates the basic principles, regulations and measures concerning forest conservation, management, and use. It aims to make the forests and forestland a stable source of livelihood and use for the people, by ensuring sustainable preservation of water sources, preventing soil erosion and maintaining soil quality, conserving plant and tree species and wildlife species, preserving the environment, and contributing to national socioeconomic development.
- **Wildlife and Aquatic Law (2008).** The Wildlife and Aquatic Law restricts and regulates the management, monitoring, conservation, and protection of wildlife and aquatic species in their natural habitats to promote the sustainable regeneration and utilization of wildlife and aquatic life, without any harmful impact on natural resources or habitats and decreasing species and the extinction of wildlife and aquatic life. Wildlife and aquatic species living within the territory of the Lao PDR are considered property of the national community, with the State representing the national community in managing those species throughout the country. If an individual or organization has permission to raise and

reproduce any of these species, it is then considered their own property so long as they abide by the laws and regulations.

- **Land Law (2003)**. The Land Law was enacted on October 23, 2003. The law determines the management, protection and use of land to ensure its efficient use and to conform with land-use objectives, with other laws and regulations, to contribute to national socio-economic development, and to contribute to the protection of the environment.
- **Decree #84 on Compensation and Resettlement of People Affected by Development Projects (2016) 36**. Decree on Compensation and Resettlement of People Affected by Development Projects No.84/gov, dated April 5, 2016. This Decree provides principles, regulations and standards on the management, monitoring of compensation of losses and the management of resettlement activities in order to properly and effectively implement development projects with the aims to ensure that the affected people are compensated, resettled and are assisted with permanent livelihood alternatives leading to improving of living conditions to be better off or to be at the same level as they were before as well as to ensure that the projects can contribute to the socio-economic development of the nation in sustainable manners.
- **Technical Guidelines on Compensation and Resettlement of People Affected by Development Project (2005)**. Pursuant to Prime Ministerial Decree No. 192/PM, the government endorsed the Technical Guidelines on Compensation and Resettlement of People Affected by Development Projects, first issued in November 2005. These guidelines adopted under the Decree 192 are currently under review and revision to be in line with the new Decree 84 and expected to be approved in June 2018. In the meantime, the guidelines prepared under the Decree 192 remain applicable. Any discrepancies and gaps identified between the government legislation and the World Bank's policy on Involuntary Resettlement (OP/BP4.12), the later will overwrite. This legislation provides procedure for the assessment, planning, and mitigation of environmental as well as social impacts from development projects. 39. These guidelines include detailed procedures for the conduct of public consultation and other participatory processes, to inform affected people of the environmental and social impacts, and to assure their involvement in all aspects of the mitigation and compensation process, from planning to implementation.
- **Decree on the Preservation of Cultural, Historical and Natural Heritage (1997)**. This decree outlines the regulations and measures for the management, conservation and use of the national heritage, including for upgrading of movable and immovable assets with historical or cultural or natural value into national heritage with the view of raising the spirit of patriotism, people's democracy, awareness and ownership of the fine national and ethnic cultures. 42. This decree requires that in order to prevent exploitation of relics and antiquities, any person who discovers archaeological relics or a cultural site must inform the provincial and district offices within three days.
- **Guideline on Consultation with Ethnic Groups (2013)**. The guideline on Consultation with Ethnic Group launched by the LFNC in 2013 aims to a) ensure that the implementation of consultation with ethnic groups follows an effective principles and process in line with the relevant national Laws and regulations, b) ensure that the right and lost assets of the ethnic people affected by development projects are fairly compensated by development projects, and c) to prevent or mitigate the potential environmental and social impacts on ethnic groups generated by development project and ensure that the project is properly designed for the sustainability.

- **Decree 333 on Protection Forest (2010).** This Decree defines the principles, the procedures, and the measures on the management, the protection and conversation, the development, and the sustainable use of the protection forest, with the aims of bringing the richness to the protection forests and the protection forestry lands, ensuring the protection of the environment, the water sources, the soil erosion, and safeguarding the soil quality the strategic national defense and public security forests, including the restoration, the encouragement, the monitoring and assessment of the laws in order to contribute to the improvement of the living standards of the people and the national socio-economic development.
- **IFC Environment Health and Safety Guidelines for Water and Sanitation (2007).** The Environmental, Health, and Safety (EHS) Guidelines for Water and Sanitation are technical reference documents with general and industry-specific examples of Good International Industry Practice for the water supply and sanitation projects. The Sopbao WTP subproject is required to comply with these guidelines regarding impacts and management, performance indicators and monitoring.

## 5. DESCRIPTION OF THE PROJECT

114. The Sopbao subproject covers four (4) outputs:

- (i) Output 1. Improved Sector Coordination and Policy Implementation
- (ii) Output 3. Developed Water Supply Systems and **Drainage** in Small Towns
- (iii) Output 4. Enhanced Community Action in Water Supply and Sanitation
- (iv) Output 5. Strengthened Capacity for Project Implementation, and Operation and Maintenance (O&M)

### 5.1 Output 1: Improved Sector Coordination and Policy Implementation

115. Under this output, a province-wide service agreement will be introduced, as will an updated corporate plan, tariff adjustments and district sanitation regulations. Residential premises that apply to connect to the new water supply system during the construction period will not be required to pay any up-front charges for the connection.

116. All of the above reform measures will be introduced and established for Sopbao as a condition of contract award for the civil works for the water supply system (Grant covenant), and this has been agreed through a letter of commitment with the Provincial Government of Houaphan and the provincial nam papa (PNP) Houaphan.

117. With respect to nonrevenue water (NRW) management initiatives, and following agreed changes to the Project Administration Manual (PAM), NRW will now be considered as a part of an overall asset management approach. NRW management will comprise the introduction of “good practice” protocol, which will eventually enable PNP to conduct an accurate water balance, better measure NRW and prioritize initiatives in the future.

### 5.2 Output 3: Developed Water Supply Systems and Drainage in Small Towns

118. The Sopbao subproject aims to provide safe, affordable, reliable, piped water supply with individual household connections to over 95% of the population in the five (5) core villages of Sopbao, Muanghom, Hadsan, Phiengxay and Soplong. Within the five villages there is combined population of 2,653 in 586 households. For water supply the households currently rely on a combination of Nam Saat, rain-fed water tanks, groundwater bores and imported bottled water.



**Table 1: Demographic summary of proposed service villages, Sopbao District 2017**

	Village Name	Households	Male	Female	Total	M:F ratio	HH size
1	Sopbao	320	655	634	1,289	1.02	4.03
2	Muang Hom	70	193	189	382	1.10	5.46
3	Hadsan	29	101	77	178	1.13	6.14
4	Phiengxay	61	139	121	260	1.07	4.26
5	Soplong <sup>7</sup>	106	318	226	544	1.17	5.13
	<b>TOTAL</b>	<b>586</b>	<b>1,406</b>	<b>1,247</b>	<b>2,653</b>	<b>1.06</b>	<b>5.06</b>

Source: Subproject socio-economic assessment, August 2017.

119. Following least cost analysis, it is decided that raw water will be drawn from the Nam Ma at a new intake located upstream of the residential area of Sopbao village. The water will be pumped to a new conventional rapid sand filtration facility to be constructed on a natural terrace in the side of a hill to the west of the town.

120. There will be two submersible pumps (duty/standby) at the intake, which pump the raw water along a 800m transmission main to the pre-sedimentation tank at the water treatment plant.

121. The new conventional rapid sand filtration facility (800m<sup>3</sup>/day) will be constructed within the compound of an existing government compound on state owned land. The proposed works will include pre-sedimentation, coagulation, flocculation, sedimentation, rapid sand filtration and disinfection (chlorine).<sup>8</sup> Treated water will be pumped or fed under gravity to a new 250m<sup>3</sup> clearwater reservoir, from where it will be distributed under gravity into the distribution network. Backwashing will be supported by an air blower, chlorine dosing will be used to disinfect the treated water, polyaluminum chloride (PAC) dosing will be used to assist with settling, and detention ponds will be used to protect the environment.

### 5.2.1 Distribution Network

122. After treatment, the distribution network will be supplied by gravity to the five core villages from a new elevated storage reservoir from the proposed water treatment plant site. A service coverage of 95% is sought immediately after commissioning. All connections will be provided to any domestic premise free of charge, provided the application is made during the construction period. Institutional and commercial connections will be charged at the PNP's normal rate.

### 5.2.2 Proposed Drainage Works

123. Investment in drainage in Sopbao will focus on the area of market and residential area which has highest priority for environmental improvement according to local stakeholders. The subproject will upgrade the existing unlined drain to open/cover stone lined drains.

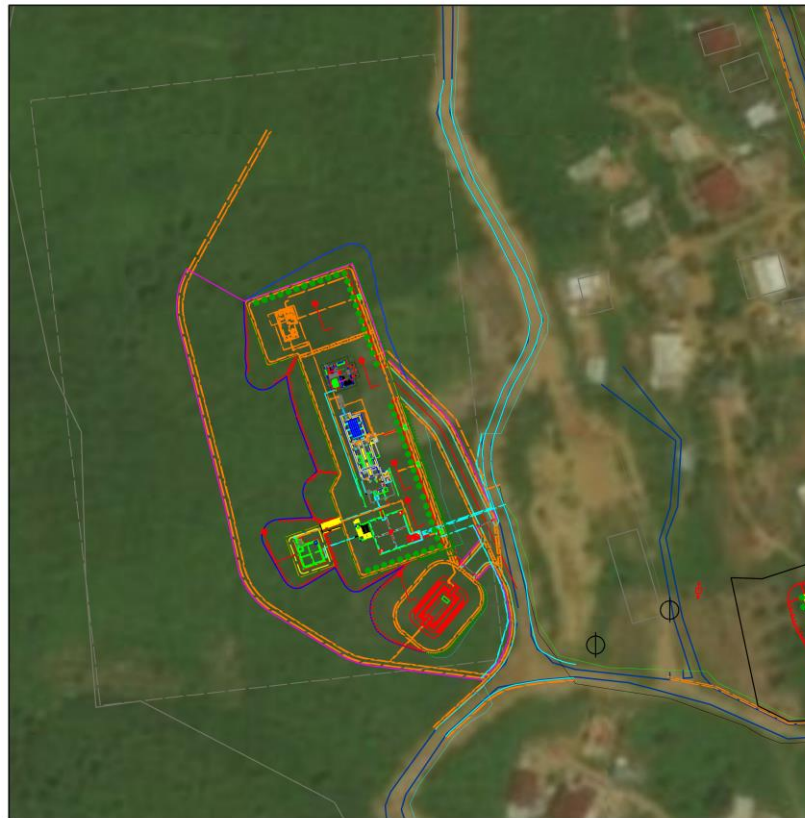
<sup>7</sup> Soplong is actually in Xiengkhor District but included in Sopbao water supply sub-project as it is contiguous with Phiengxay village.

<sup>8</sup> Pre-sedimentation will take place adjacent to the intake.

**Plate 1: Existing Conditions at Proposed Sites of Subproject Components**



**Figure 3: Sopbao WTP Layout**



1:1,250

**5.2.3 Access Roads**

124. Access to the treatment plant will be via an existing public track from Road No. 6, which will be upgraded. The length of the road is 150 m and 7 m wide, although this may vary once final

detailed design is completed and construction plans are developed. The access road will be gravel surface through the construction period and maybe upgraded to hard surface at operation.

### 5.3 Water Source

125. Sopbao town sits on the right bank of the Nam Ma, which is a major river in the northeastern area of the country with very substantial perennial flow, flowing from Son La Province in Viet Nam and flowing back into it after passing through the three districts of Add, Xiengkhor and Sopbao, all in Houaphan province. About 38% of the total Nam Ma catchment area (28,400 km<sup>2</sup>) lies within the Lao PDR. Houay Bao feeds into the left bank of the Nam Ma at Sopbao. It is understood that this small houay has a highly variable flow between the dry and wets seasons.

126. Annual rainfall of the Nam Ma is substantial with 80% of the rainfall occurring during the monsoon (May to September) season. The historical data recorded in the Ma River basin (1961-2007) show some special variability in climatic conditions in annual rainfall of 1,165-1,966 millimeters (mm) The average annual rainfall ranges from 1,200 to 1,700 mm per year (mm/year) in the upstream area, 1,500-1,600 mm/year in the middle stream area, 2,000-2,200 mm/year in the upstream area of Xam River, and 1,600-1,800 mm/year in the lowland area<sup>9</sup>.

127. The Nam Ma flow rate has a minimum of around 37m<sup>3</sup>/sec during the dry season rising up to around 200m<sup>3</sup>/sec in the wet season. The river is approximately 60m across and depth varies up to 6.0m in depth, with velocities varying between 0.17m/s to 4m/s. The volume of water required to service the subproject area villages through the WTP is 800m<sup>3</sup>/day or around 37m<sup>3</sup>/hr. Other uses, such as fisheries and local agriculture will not be affected by the comparatively small volume of WTP drawdown.

128. <sup>10</sup>Water abstraction for the proposed subproject during the estimated flow in the dry season month of March would be about 0.011m<sup>3</sup>/s, which would be about 0.03% of the total flow in the <sup>11</sup>river at that time. This is a very insignificant abstraction rate, and would offer no adverse impacts on other water users. In addition and in consultation with local stakeholders, it was established there are no other significant water demands on the river either upstream or downstream. As a risk mitigation measure however, the provincial Governor will be required to issue a decree proclaiming that drinking water supply must always be given highest priority over all other uses in extreme dry conditions.

129. The proposed intake tower on the Nam Ma will be located at the base of the river bank in the river. Since there are no hydrologic data, it will be designed such that the top of the tower and footbridge will be set at a level one metre above the highest water level ever recalled by locals and local officials; this will provide a considerable degree of safety as the water in the top one meter of the river in a flood would represent a considerable return period. The inlet is set below the lowest water level ever recalled by locals and local officials.

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<sup>9</sup> World Bank (undated), Environmental Assessment of the Nam Ma, Viet Nam Managing Natural Hazards Project (VN-Haz/WB5)

**Figure 4: Sopbao Intake**

1:1,200

#### **5.4 Output 4: Enhanced Community Action in Water Supply and Sanitation**

130. Support will be provided to communities, through elected Village Development Committees (VDCs) for a range of activities to be agreed with the VDC. This will include among others (i) village environmental improvements (VEIs), consisting of household and community level sanitation and drainage facilities, (ii) stakeholder consultation/town hall gatherings and public participation to raise awareness and provide organization support required to implement the VEIs, (iii) household sanitation, and (iv) public sanitation facilities.

## **5.5 Output 5: Improved Capacity for Project Implementation and Operation and Maintenance**

131. This output will be achieved through support from the project implementation assistance (PIA), capacity development initiatives, and incremental administration support. With assistance from and on-the-job training by PIA, and building on the efforts under STWSP and the current project, PCU and PIU will further develop capacity to implement the subproject.

## **6. DESCRIPTION OF THE ENVIRONMENT**

### **6.1 Physical Resources**

132. Sopbao is the main town and seat of Sopbao district government in Xamneua Province. The majority of the district villages are dispersed and have rural characteristics with small population densities. The district capital Sopbao is located about 80km from Xamneua on Road 6, approximately 25km to the closest Vietnamese border by road.

133. The subproject area service villages lie in a confined valley landscape with few areas of flat land. The physical distance between the service villages with Sopbao center is approximately 11km along (sealed) National Road 6. The Laeng Nam Ma Protection Forest Area occupies approximately 1,665 km<sup>2</sup> on the left bank of the Nam Ma opposite Sopbao village and the other four subproject villages. A District Protection Area is located about 1.0 km to the southeast of the WTP.

### **6.2 Geology and Natural Hazards**

134. The Department of Mines Geological Map shows that the Sopbao area to be rocks of the Paleozoic of the lower Silurian period. These mainly comprise of sandstone, conglomerate, siltstone, grey/green limestone, marl and coaly shale. Phoukham hill, where the water treatment plant is to be located shows soft yellow clay for the first 4.5m and hard red clays with fragmented rocks at deeper depths.

135. The subproject area is hilly to mountainous. Small to moderate earthquakes have occurred within the Lao PDR over recorded history, however Houaphan Province is considered to have low vulnerability to damaging earthquakes but can experience quakes up to *Mercalli* Scale VI in intensity.

136. The Lao PDR is prone to flooding, mainly associated with the presence of large river basins coupled with the prevalence of strong monsoon influences. There are two causes of heavy rains in the Lao PDR: the enhanced southwest monsoon caused by typhoons close to the Philippines and Viet Nam and the lasting southwest monsoon accompanied by the stagnation of tropical storms in neighboring Viet Nam. There are steep hills in the subproject areas footprint which are prone to landslides during heavy rain events, particularly along road ways currently being upgraded. The WTP is located on a hill at the back of Sopbao village and the intake pumping station is designed as a submersible facility able to operate under any flood conditions. The intake itself is located at the base of the river bank within the river channel and designed to withstand floods and inundations.

### **6.3 Air Quality and Noise**

137. Air quality in the Sopbao District is generally good. There are no industries producing discharges/emissions which result in atmospheric pollution and pollution from vehicular exhaust emissions are not significant given the low levels of traffic and absence of any traffic congestion.

The only detrimental effect on air quality is the dust arising from the passage of vehicles over unsealed local roads when the roads are dry, and smoke haze from swidden agriculture vegetation burn-off in the dry season.

138. The locations of the subproject components are relatively far from noise generating activities. There are no industries within the proposed sites so ambient noise levels can be considered very well. There are no sensitive receptors within in proximity of the proposed sites of the other components.

#### 6.4 Climate

139. The average temperature in the Ma River basin is relatively high throughout the year. The average temperature recorded at the 14 meteorological stations within the Ma River basin varies spatially ranging from 20.9-23.°C, reflecting the topographical characteristics and altitudes of the locations. Humid sub-tropical temperature does vary according to the altitude, there is an average drop of 1.7 C for every 300 meters.

140. The climate in the Sopbao District is characterized by two seasons; dry and wet seasons. For Houaphan Province, based on data averages collected from Xamneua airport met station provided by the Lao Department of Meteorology and Hydrology, the coolest months are December and January with an approximate minimum average of 9.4 °C and the warmest months being June and July with a monthly maximum average of 29.3 °C. Refer to Table 2 to **Table 4**.

**Table 2: Minimum Temperatures in Houaphan Province, 2006-2016**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2006	8.6	13.2	14.1	16.6	18.1	20.6	20.9	20.5	18.1	17.8	13.0	10.3	16.0
2007	9.2	9.5	14.0	16.0	18.2	20.7	20.4	20.2	18.5	16.6	10.5	11.8	15.5
2008	9.2	7.8	13.7	17.6	18.6	20.4	20.6	20.4	19.5	18.3	13.1	9.6	15.7
2009	7.5	12.3	13.8	16.9	19.4	20.3	20.8	20.3	19.2	18.2	11.7	10.2	15.9
2010	11.6	8.9	12.1	17.3	20.0	20.7	20.9	20.6	19.7	16.8	12.4	11.8	16.1
2011	9.0	10.6	11.6	16.6	18.3	20.8	20.6	20.2	20.0	17.1	13.8	9.8	15.7
2012	10.1	10.6	12.8	16.5	20.0	21.8	20.6	20.2	19.5	17.8	16.5	12.5	16.6
2013	11.4	13.8	12.7	17.0	19.3	19.9	20.8	20.2	19.0	15.8	15.4	8.3	16.1
2014	8.2	9.1	13.8	18.1	19.7	21.3	21.0	20.8	19.9	16.9	15.4	10.8	16.2
2015	8.6	11.0	14.6	15.5	19.5	20.6	20.6	20.6	20.2	17.5	16.9	12.0	16.5
2016	10.3	8.2	12.7	17.1	19.4	20.7	21.0	20.7	20.0	18.7	15.8	11.9	16.4

**Table 3: Maximum Temperatures in Houaphan Province, 2006–2016**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2006	21.4	22.8	26.3	28.9	28.7	29.7	28.2	27.3	26.7	25.6	26.4	20.5	26.0
2007	19.1	26.6	28.0	26.6	27.7	30.0	29.1	28.4	26.7	23.3	20.4	22.1	25.7
2008	21.0	13.5	24.6	28.2	28.2	28.1	28.0	28.4	27.7	24.4	21.8	19.2	24.4
2009	18.1	26.8	27.0	26.8	28.2	29.0	28.2	29.2	27.6	25.9	23.1	22.0	26.0
2010	21.6	25.7	26.7	29.3	31.1	29.9	29.6	27.8	28.6	23.5	22.6	21.6	26.5
2011	14.6	23.8	19.6	26.3	27.9	28.8	28.8	28.1	26.8	23.5	22.5	17.2	24.0
2012	19.5	23.5	26.7	29.9	30.0	28.5	28.4	28.3	26.7	26.0	25.8	22.4	26.3
2013	19.3	25.0	27.9	27.9	29.8	28.7	28.4	28.3	25.5	23.6	21.4	17.2	25.2
2014	20.1	23.4	27.9	29.9	30.5	29.4	28.9	27.6	28.0	25.4	24.1	18.5	26.1
2015	20.9	22.7	27.9	27.9	32.1	30.3	28.2	28.7	27.7	26.0	24.6	19.9	26.4
2016	20.9	17.5	25.9	31.2	30.3	30.0	29.2	28.2	27.1	26.1	23.2	21.2	25.9

**Table 4: Average Temperatures in Houaphan Province, 2006–2016**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2006	15.2	18.3	20.6	23.6	24.3	25.6	24.9	23.9	23.1	22.1	20.5	15.9	21.5
2007	14.4	18.8	21.4	22.1	23.7	25.9	25.5	24.7	23.2	20.1	15.7	16.8	21.0
2008	14.8	10.5	19.4	23.3	23.8	24.5	24.4	24.8	23.7	21.4	17.4	14.4	20.2
2009	12.7	20.1	20.9	22.4	24.1	25.2	24.9	24.6	23.8	22.2	17.4	16.0	21.2
2010	16.6	18.1	20.0	23.8	26.6	26.1	26.0	24.1	24.1	20.3	17.7	16.7	21.7
2011	11.4	17.3	15.7	21.7	23.6	25.2	24.8	24.4	23.5	20.4	18.3	13.6	20.0
2012	14.6	17.3	20.3	24.1	25.5	25.2	24.7	24.3	22.9	21.9	21.4	17.2	21.6
2013	15.2	19.4	21.1	22.6	24.8	24.6	24.6	24.3	22.5	19.9	18.4	12.2	20.8
2014	14.3	17.1	21.3	24.2	25.8	25.6	25.1	24.3	23.5	21.3	19.8	14.3	21.4
2015	14.6	17.3	21.9	22.6	27.1	26.0	24.8	24.7	24.2	21.9	20.7	15.7	21.8
2016	15.6	13.2	19.6	25.1	25.5	25.8	25.6	24.8	23.9	22.8	19.7	16.4	21.5

141. Annual rainfall for the Ma Basin is substantial with dominant winds from south and southeast during May to October months, and the time of greatest flood potential. The historical data recorded in the Ma River basin (1961-2007) show some special variability in climatic conditions in annual rainfall of 1,165-1,966 millimeters (mm) with 80% of the rainfall occurring during the monsoon (May to September) season. The average annual rainfall ranges from 1,200 to 1,700 mm per year (mm/year) in the upstream area.

**For Houaphan the dry season occurs between November and February while the wet season occurs between May and October. August is typically the wettest month with an average rainfall of 322.5 mm compared to December the driest month with only 17.4 mm. Refer to**

142. Table 5 to Table 7.

**Table 5: Average Monthly Rainfalls (mm) in Houaphan Province, 2006–2016**

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	1.1	4.9	28.4	113.9	142.9	127.1	169.1	389.0	81.4	64.6	0.0	0.0
2007	1.9	70.3	27.4	137.2	163.6	187.7	278.5	223.0	340.6	428.5	16.0	5.2
2008	21.5	37.7	80.4	184.6	183.0	196.9	331.0	160.4	170.0	232.3	155.4	19.6
2009	12.2	7.8	22.2	111.6	284.9	98.8	234.2	218.9	217.9	44.2	4.9	2.6
2010	48.8	8.8	38.6	94.3	251.5	92.3	107.2	396.8	166.6	99.7	1.2	12.7
2011	30.6	5.7	154.3	85.2	109.5	292.7	274.1	273.0	219.2	55.6	27.2	11.8
2012	17.2	11.1	3.8	73.4	200.2	184.4	284.0	326.2	279.5	89.0	78.1	10.3
2013	10.2	2.9	26.8	75.5	162.6	212.7	314.6	328.7	130.0	50.1	19.4	29.2
2014	1.6	3.1	31.4	101.7	115.3	427.2	449.1	396.1	169.4	28.4	48.5	14.5
2015	33.3	9.4	28.3	132.3	10.5	236.2	230.1	285.9	141.6	50.0	108.3	75.7
2016	75.5	11.7	10.2	103.4	153.3	84.2	120.3	548.0	124.5	0.0	32.3	9.8

**Table 6: Daily Average Rainfalls (mm) in Houaphan Province, 2006–2016**

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	0.0	0.2	0.9	3.8	4.6	4.2	5.5	12.5	2.7	2.1	0.0	0.0
2007	0.1	2.5	0.9	4.6	5.3	6.3	9.0	7.2	11.4	13.8	0.5	0.2
2008	0.7	1.3	2.6	6.2	5.9	6.6	10.7	5.2	5.7	7.5	5.2	0.6
2009	0.4	0.3	0.7	3.7	9.2	3.3	7.6	7.1	7.3	1.4	0.2	0.1
2010	1.6	0.3	1.2	3.1	8.1	3.1	3.5	12.8	5.6	3.2	0.0	0.4
2011	1.0	0.2	5.0	2.8	3.5	9.8	8.8	8.8	7.3	1.8	0.9	0.4
2012	0.6	0.4	0.1	2.4	6.5	6.1	9.2	10.5	9.3	2.9	2.6	0.3
2013	0.3	0.1	0.9	2.5	5.2	7.1	10.1	10.6	4.3	1.6	0.6	0.9
2014	0.1	0.1	1.0	3.4	3.7	14.2	14.5	12.8	5.6	0.9	1.6	0.5
2015	1.1	0.3	0.9	4.4	0.3	7.9	7.4	9.2	4.7	1.6	3.6	2.4
2016	2.4	0.4	0.3	3.4	4.9	2.8	3.9	17.7	4.2	0.0	1.1	0.3

**Table 7: Average Maximum Rainfalls (mm) in Houaphan Province, 2006-2016**

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	0.6	1.6	12.8	27.5	37.5	46.9	50.7	65.9	27.8	18.9	0.0	0.0
2007	1.3	39.5	9.5	32.5	38.2	29.6	70.6	37.1	89.3	176.0	12.1	4.4
2008	16.9	15.8	13.4	66.2	49.3	28.0	57.5	54.6	60.3	71.5	80.3	8.5
2009	1.8	5.2	8.7	23.1	45.0	37.0	54.0	55.7	83.9	18.0	2.1	1.2
2010	27.3	6.5	21.8	15.9	57.5	23.5	28.1	71.0	31.6	17.0	0.5	2.4
2011	9.0	1.5	55.3	30.3	23.3	110.5	37.1	68.7	46.5	22.9	17.1	5.3
2012	4.8	3.4	1.5	20.0	70.1	55.6	57.6	46.9	83.6	27.0	55.8	3.3
2013	2.7	0.9	9.6	19.6	36.7	35.9	47.5	69.2	22.9	13.4	9.9	20.3
2014	1.1	1.4	19.8	22.9	25.0	122.0	62.9	110.8	44.7	8.8	35.0	3.6
2015	16.4	2.6	16.0	47.0	7.9	87.0	37.3	81.0	65.8	25.1	29.8	25.2
2016	43.7	3.0	8.9	45.6	33.0	29.6	27.9	119.2	38.0	0.0	10.6	3.2

#### 6.4.1 Climate Change

143. Primary evidence for the nature and magnitude of future climate change is provided by General Circulation Models (GCMs), which are mathematical models of the coupled earth-ocean-atmosphere system. GCMs resolve the earth spatially at between 100 and 300 km; and do not fully represent many features important in shaping local climate, such as topography. They are



useful primarily in assessing broad regional and seasonal trends in climatic variables such as temperature and precipitation.

144. Model projections for Southeast Asia suggest the current rainy season (May – October) is projected to get wetter, and the dry season (November – April) dryer. Projections of daily rainfall intensity (not pictured) suggest increases in the maximum 1-day precipitation by 10 to 15 mm/day by the 2090's. Higher precipitation intensities result in higher runoff ratios, all other factors equal. Impacts on basin runoff are more uncertain, with many recent studies projecting changes in discharge of between -15% and +15% of current annual discharge<sup>12</sup>.

145. A review of recent global and regional climate modeling, and recent studies of climate change impacts on the Lower Mekong Basin indicate that the region may become up to 2 °C warmer by mid-century; and will most likely experience moderate increases in precipitation. While most monsoon regions are projected to experience decreases in monsoon precipitation relative to historical climate because of climate change, the South Asian, and to a greater extent the Southeast Asian monsoons are projected to experience increases in total precipitation.<sup>12</sup>

## 6.5 Water Resources

146. The Nam Ma is an unregulated river that originates in Viet Nam entering in the Lao PDR at Et (Ad) District and flows in a south-east direction through XiangKhor District and then Sopbao District before reentering Viet Nam. The Nam Ma river flows for about 83km in the Lao PDR, entirely within Xamneua Province. The Nam Ma other main tributaries in the Lao PDR includes the Nam Xam which runs through Xamneua town. About 38% (10,792 km<sup>2</sup>) of its catchment area lies within the Lao PDR. The Nam Ma enters the South China Sea near the Vietnamese city of Thanh Hao. Large floods were recorded in 1996 and 1975 and these have guided the location of infrastructure sites.

147. Sopbao town sits on the right bank of the Nam Ma. Houay Bao feeds into the left bank of the Nam Ma at Sopbao. It is understood that this small houay has a highly variable flow between the dry and wets seasons. All of these sources are used by the adjacent communities, although to a varying extent depending on the season and quality at that time.

148. The main water source for Sopbao subproject villages is the Nam Ma River, with a proposed river intake upstream of Sopbao village on the right bank. The intake will extract up to 800m<sup>3</sup>/day to supply the five villages. Table 7 presents water quality test results for local Sopbao water sources, including the Nam Ma.

149. There have been no official groundwater investigations in the area according to the local district government, and consequently there are no existing records of groundwater availability or potential aquifer characteristics.

150. The town is drained through the Houay Hao which is a natural channel that flows through the center of town towards the Nam Ma River. In general, storm water runoff from the town is not a serious problem because of the good natural fall of the terrain which slopes gently towards the Nam Ma River. However, in several areas such as the area close to the daily market and residential area of Ban Sopbao, inadequate drainage systems and lack of drain interconnections result in ponding of polluted water which persists for months during the wet season, causing unhygienic and water-logged conditions, which serve as breeding grounds for mosquitoes. Improved lined drains are necessary to provide faster runoff to the final outlet, and minimize local flooding and stagnant water in the market and residential areas.

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<sup>12</sup> ICEM 2015, Draft Climate Change Impact Assessment of the proposed Nam Ngiep 1 Hydropower Project, Lao PDR.

### 6.5.1 Water Quality Results

151. The main water source for Sopbao subproject villages is the Nam Ma River, with a proposed river intake upstream of Sopbao village on the right bank. The intake will extract up to 800m<sup>3</sup>/day to supply the five villages. Turbidity varied between the three samples taken in the vicinity of the village. Turbidity is an important parameter for water treatment because it indicates the amount of coagulants required to settle out sediments, and the volume of sludge to be removed. The optimum dosage level of chemicals, such as coagulants is governed by the reduction of turbidity.

152. Results for samples taken during May and July 2017 are typical of surface water under wet season conditions. Refer to Tables 8 to 10. Turbidity for the Nam Ma sampled on 10th May 2017 was 1030 NTU and 500 NTU on the 25<sup>th</sup> July. May and June are usually considered 'first flush' events that transport sediments made available during the dry season. Despite the high turbidity readings color was low.

153. August 2017 operational data from the Xiengkhor water treatment plant on the Nam Ma approximately 50 km upstream from Sopbao indicates that the raw water turbidity can range from about 175 NTU to about 1700 NTU and on one occasion 6000 NTU was recorded. In each case, treated water turbidity was less than 1 NTU. The validity of the low turbidity readings for clear water could be questioned but regardless, the Xiengkhor water treatment plant appears to have produced clear drinking water when treating a wide raw of water turbidity.

154. Iron concentration for Nam Ma was exceptionally to moderately high (43mg/l and 9.82 mg/l) which is not consistent with previous data from the Add/Xiengkhor subproject. The unexpected high iron content is matched to high turbidity and this is indicative of the laboratory digesting unfiltered water samples. Laboratory digestion breaks down inorganic soil and sediment releasing minerals such as iron and manganese. The laboratory will be asked to filter water samples before doing total iron and manganese analyses on future samples. Similarly high manganese concentrations (0.39 – 0.710 mg/l). It is highly unlikely that exceptionally high iron and manganese concentrations actually exist in the Nam Ma, but even if this was the case, conventional surface water treatment will precipitate these minerals in the sedimentation tank.

155. Suspicion that gold mining was releasing cyanide and arsenic to the river was tested but results were non-detectable from samples collected in July 2017. Fish kills have been reported in the river by Sopbao villagers, but the causes have not been defined. Fish kills can be caused by a range of factors, including low oxygen levels, high pH, high temperatures, and low flows coupled with algal blooms. The earliest fish-kills reported by DONRE were said to occur 2009, however the Sopbao village chief claimed fish-kills also occurred on 2014 and 2015.

156. After the fish kills in 2015, Provincial Department of Forestry and Agriculture enforced regulations on pesticide controls and stopped mining on the Lao side and MONRE established three water quality monitoring stations on Nam Ma River, one near Sopbao village that are part of the national monitoring network. DONRE conduct water quality sampling on these stations two times per year in dry and wet season. The May 2017 results are presented in Table 8 and Table 9. However, only basic parameters are tested. DONRE also conducted sampling on cyanide a few times. .

157. Good practice 'pesticides use' is a real issue in the area, including upstream in Viet Nam. There is a risk when banned chemicals are used but these mainly show up in soils, vegetation and food crops. Water solubility, denaturing of the pesticide etc all determine the fate of the pesticide. For water supply, pesticides are measured in parts per billion not parts per million as for the other contaminants measured. Detecting a pesticide is therefore difficult and expensive

even if the Brand Name of the pesticide is known because chemical active ingredients in the pesticide often change when they are in the environment.

158. By the time a fish-kill is notified affected water is probably in the reservoir and the cause of the fish-kill still has to be investigated. The conventionally designed WTP will cope with all the circumstances outlined under the heading 'fish-kill' and even extraordinary events such as mining related events, but some knowledge when such an event occurs is required so treatment can be adjusted. Coagulation will remove some or all of pesticides especially if they are at or about non-detectable concentrations but the efficiency of the process depends on managing many variables, particularly plant operations.

159. Commissioning and training of WTP operations will ensure that the Standard Operating Procedures reflect the identified risks, including pesticides.

160. Additionally, standard practice overseas for circumstances such as these is to set up a fish tank in a prominent location at the WTP. The tank is set up so that it does not change the characteristics of the raw water which will continuously flow through the tank. Fish in the tank, if they are sensitive to the contaminants, will die or become ill if subjected to 'an event'. This gives PNP the opportunity to shut down the WTP and carry out investigations.

161. The Nam Ma is currently used as a source of water for residents of Sopbao, Add/Xiengkhor and other riparian communities. The water quality of Nam Ma is suitable for conventional water treatment as is standard practice in the Lao PDR. The water quality evidence supports the case for conventional water treatment i.e. hydraulic mixing sedimentation tank followed by rapid sand filtration and powdered chlorine for disinfection.

162. **Transboundary water quality.** Villagers and DONRE believe that upstream activities such as mining and agriculture in Viet Nam have significant impacts on water quality. DONRE confirmed that over the last few years there have been several meetings held between Houaphan provincial government and Son La provincial government (neighboring province in Viet Nam) to discuss Nam Ma co-management issues. A high level meeting between Houaphan and Son La provincial delegates was held 28-30 March 2018 to discuss and reach consensus on these issues, and an Agreement on Mutual Cooperation was signed. Key articles related to transboundary Nam Ma water resources management that are provided in the Agreement are: 1) pollution control and the use of chemicals on Nam Ma watercourse; 2) water quality monitoring; 3) Nam Ma watershed management; and 4) land use. Following the Agreement, concerned departments of both provinces will work together to identify and develop specific projects that will be mutually implemented.

**Table 8: Nam Ma (Sopbao) water quality data from MONRE (10 May 2017)**

PARAMETER	PERMISSIBLE LIMIT*	UNIT	VALUES
Color	<5	Platinum-Cobalt	10.8
Turbidity	<5	NTU	1,030
Manganese	<0.1	mg/L Mn	<0.02
Iron	<0.3	mg/L Fe	<0.10

\* Minister's Decision on Water Quality Standard Management for Drinking and Domestic Use, Lao PDR, March 2014

**Table 9: Nam Ma (Sopbao) water quality data from MONRE (27 May 2017)**

<b>PARAMETER</b>	<b>PERMISSIBLE LIMIT*</b>	<b>UNIT</b>	<b>VALUES</b>
Color	<5	Platinum-Cobalt	3.87
Turbidity	<5	NTU	183
Total dissolved solids	-	mg/L	149
Total hardness	<300	mg/L CaCO <sub>3</sub>	100
Nitrate	<50	mg/L NO <sub>3</sub> -	1.72
Chloride	<250	mg/L Cl-	<5.0
Sulfate	<250	mg/L SO <sub>4</sub> <sup>2-</sup>	5.19
Permanganate value	-	mg/L CaCO <sub>3</sub>	4.10
M-alkalinity	-	mg/L	115
Manganese	<0.1	mg/L Mn	0.21
Iron	<0.3	mg/L Fe	9.82

\* Minister's Decision on Water Quality Standard Management for Drinking and Domestic Use, Lao PDR, March 2014

Table 10: Baseline water quality test results for water sources near Sopbao Subproject Area

SOPBAO			RESOURCE						
Parameter	UNIT	Standard	NAM BAO		NAM MA		NAM LONG	NAM KHONG KHUN (SOPLONG)	
			SAMPLING DATE						
			10-May-17	27-May-17	10-May-17	27-May-17	25-Jul-17	27-May-17	10-May-17
Cyanide	mg/l CN <sup>-</sup>	0.07					ND		
Alkalinity	mg/l	na					70.5		
Arsenic	mg/l As	0.05					0.0009		
Aluminum	mg/l	0.2		0.2		7.15		3.27	
Ammonium	mg/l as NH <sub>4</sub> <sup>+</sup>	≤ 1.5		ND		ND		ND	
Bicarbonate Alkalinity	mg/l as CaCO <sub>3</sub>	na		157		122		55.9	
Calcium	mg/l	na		40		28.9		8.75	
Conductivity	10 <sup>-6</sup> s/cm	≤ 1000	304	284	192.9	236		114.5	96.9
Color	Pt. Co	na	1.82	<1.00	10.8	3.87	30	8.72	32.2
Iron	mg/l	<1	2.88	0.27	43	9.82	4.14	3.84	36.9
Magnesium	mg/l	na		10.7		7.84		2.86	
Manganese	mg/l	<0.5	0.1	0.02	0.39	0.21	0.710	0.07	0.25
Nitrate	mg/l as NO <sub>3</sub>	50		<0.44		1.72		0.45	
pH		6 to 8	7.9	8.2	7.4	8		7.4	7.2
Permanganate Valve	mg/l	na		1.28		4.1		4.14	
Phosphorus	mg/l as P	na		<0.15		< 0.15		< 0.15	
Turbidity	NTU	<10	89.8	5.32	1,030	183	500	82.9	2,270
Sodium (as NaCl)	mg/l	<350		3.9		7.07		7.14	
Sulfate	mg/l as SO <sub>4</sub> <sup>-2</sup>	250		<5.00		5.19		ND	
Biochemical Oxygen Demand	mg/l	na		< 1		< 1		1.6	
Chemical Oxygen Demand	mg/l	na		< 40		< 40		< 40	
Chloride (as a treatment residual)	mg/l as Cl	0.2		ND		< 5	ND	ND	
Hardness	mg/l as CaCO <sub>3</sub>	300		138		100	95	36	
M-Alkalinity	mg/l as CaCO <sub>3</sub>	na		148		115		48.3	
Total Dissolved Solids	mg/l	600		161		149		98	

## 6.6 Ecological Resources

163. Degraded forests dominate the hilly landscape of Sopbao District. Swathes of riparian lands along the banks of the Nam Ma have long since been converted to rain fed rice terrace development, with bamboo forest in the hinterlands behind the rice. Large areas of bamboo land indicate the history of swidden technique practices in the areas.

164. The Laeng Nam Ma (National) Protection Forest Area (PFA), occupies 1,665 km<sup>2</sup> on the left bank of the Nam Ma opposite Sopbao and project service villages. The PFA<sup>13</sup> vegetation which consist of mixed deciduous forest, evergreen forest and bamboo stands has been exposed to several threats which have led to a decline in most of its original native forest, particularly by the influences of swidden agriculture, particularly pioneer clearing, and logging. Logging also includes wood taken for charcoal production, firewood and building materials. Overhunting and over-harvesting have also contributed greatly to the loss of the PFAs biodiversity. The same threats have been responsible for forest quality decline on the left bank forests behind the subproject villages. During site visits the Environment Team witnessed trade of wildlife products occurring at local markets.

165. The Nam Et National Biodiversity Conservation Area is 55 km west of the subproject area and will not be impacted. It contains IUCN Redlist animal species and vegetation communities but none are identified in the PFA, although no studies have been undertaken to determine their presence or absence.

166. The village head of Sopbao had indicated that the PFA boundary extended across the river to the right bank, but this is contrary to MONRE data which indicates the boundary is on the left bank and the WTP and intake on the right bank. In any event, should the village be using the area claimed by the village head for a specified purpose then their permission will be required to utilize the site for subproject. Written authorization to use any village land will be required prior to construction.

167. A District Protected Area is located about 1 km to the west of the subproject site.

168. At Sopbao there is a village fishery conservation zone along the Nam Ma directly opposite the town extending from the Houay Bao stream confluence (left bank) to 500 m downstream. The FCZ is located about 400 downstream from the intake and about 600 m to the WTP which is located at the back of the Sopbao village. Refer to Figure 5. The Nam Ma is a large river that drains from Viet Nam approximately 83 km upstream and is an essential fishery for local villages.

169. Environmental pollutants from pesticides and agro-chemicals can have a negative impact on water quality and can generate various toxicities that can prevent normal growth of biological organisms and their reproductive and survival capabilities. During IEE consultations it was reported by DONRE that large fish-kills were observed during the wet seasons of 2005, 2007 and 2009. During these times captured fish appeared to be drunk (Lao term is 'mo'). According to DONRE it was common to see spent chemicals drums floating on the Nam Ma from neighboring Viet Nam, but none were retained for evidence. The claim was made that pollution, particularly cyanide from agricultural activities from Viet Nam was the cause of the fish deaths. Fish-kill events were also reported by the Sopbao village Chief in 2014 and 2015. Cyanide was not detected in

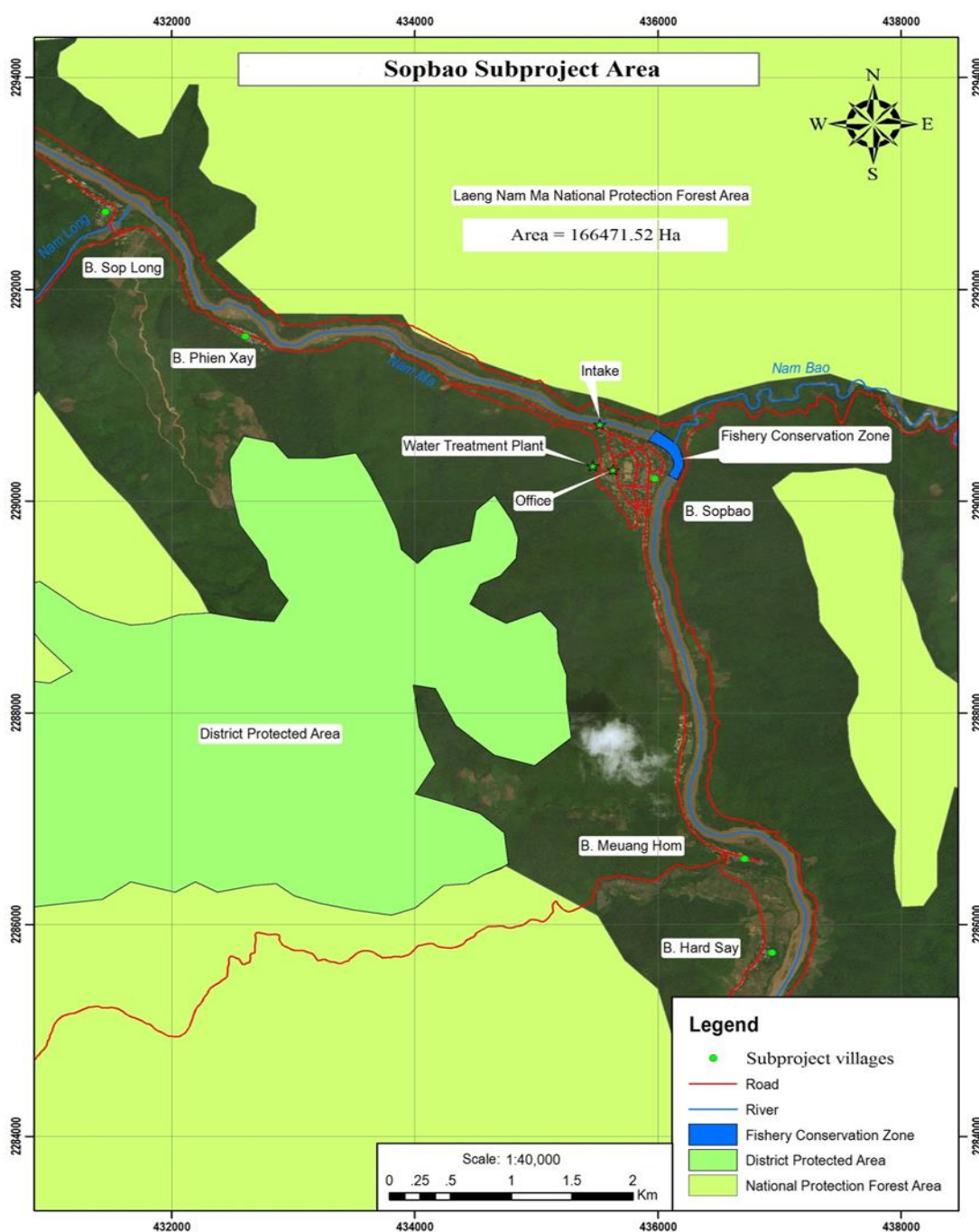
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<sup>13</sup> Decree 333 Article 2. "The Protection Forests are the forests and the forestry lands which are located in the areas of the water sources, watershed areas, wetland forest, and river bank's forest, road side forest, including the forest in and around the town, Municipality or outskirts of city, village's sacred forests and cemeteries. The protection forests are determined for the purpose of protection of the watershed areas, the natural environments, the soil erosion, natural disasters, strategic points for the national defense-public security and other types of forests as determination."

Nam Ma river water samples collected in July 2017 and arsenic levels were well below accepted safe standards.

170. Since 2012 farmers of Sopbao District are required to order and purchase agro-chemicals and pesticides through the local office of the Department of Agriculture and Forestry. This has stemmed overuse and controlled banned pesticides, however it was reported that merchants still sell chemicals without notifying authorities.

**Figure 5: Sopbao Subproject Land Use**



## 6.7 Historical and Archaeological Sites

171. There are no sites of archaeological significance within and around the sub project area footprints. The project components (Intake, WTP, storage tank and laboratory, raw transmission and distribution lines, office and access roads) will not affect any historical and archaeological sites such as temples and burial sites.

## 6.8 Unexploded Ordnance

172. Data on bombs dropped by US forces between 1968 and 1972 is available from the National Mines Regulatory Authority and has been thoroughly reviewed. Sopbao sub project area's unexploded ordnance (UXO) contamination is not known. The proposed water treatment plant and main holding tank site are located on already developed (excavated) land, as is its access roads, therefore the site presented a low UXO risk. The Sopbao drainage upgrades are proposed for already developed roadways and urban areas so they too were considered to have low UXO risk. However, a clearance certificate has been obtained from the provincial state enterprise for UXO survey and clearance to confirm all construction areas are free of any UXO; the certificate is appended to this document.

## 6.9 Socio-Economic Conditions

173. Sopbao District (population 25,527) in Houaphan Province borders with Viet Nam to the east and Viengxay and Xiengkhor districts to the west and north. The Sopbao sub-project has five (5) core villages (i.e. villages that have urban characteristics and population densities that would enable a financially sustainable water supply system to operate), with a total population of 2,653. There is an existing Nam Saat water supply to two of the villages, but the other three are unserved. The district administration center for Sopbao is also located within the village called Sopbao. The distance to the provincial capital, Xamneua, is about 80km, over a road which at the time of writing is being upgraded and sealed.

174. The population of the core villages in the proposed Sopbao water supply system is shown in the table below. The data were gathered from Sopbao District government sources, and, where possible directly from the villages listed.

**Table 11: Subproject Villages Population Summary**

	Village Name	Households	Male	Female	Total Population	M:F ratio	HH size
1	Sopbao	320	655	634	1,289	1.02	4.03
2	Muang Hom	70	193	189	382	1.10	5.46
3	Hadsan	29	101	77	178	1.13	6.14
4	Phiengxay	61	139	121	260	1.07	4.26
5	Soplong <sup>14</sup>	106	318	226	544	1.17	5.13
	<b>TOTAL</b>	<b>586</b>	<b>1,406</b>	<b>1,247</b>	<b>2,653</b>	<b>1.06</b>	<b>5.06</b>

<sup>14</sup> Soplong is actually in Xiengkhor District but included in Sopbao water supply sub-project as it is contiguous with Phiengxay village.



175. The local economy is based on services, agriculture and trade. The main income is from rice cropping, animal breeding (cows, pigs and poultry), and trade. Occupation distribution has differences between male and female occupation patterns, as well as differences between new and existing service villages. A higher percentage of women in both new and existing service villages worked as traders or small business operators, and a higher percentage of men worked as laborers. More men were government officials, and more women were farmers. More than a third of women in both samples, and more than half the women in women-headed households, worked as home-makers.

### 6.9.1 Income and Expenditure

176. The household survey asked respondents about their household income from all sources over the past year. These data were averaged to obtain monthly income per person and per household. The data provide a good picture of income and capacity to pay of the poorer groups within the core villages.

177. The median monthly HH income was LAK3,000,000, which, when compared with the mean monthly income of over LAK4,400,000, demonstrates that the distribution is skewed towards higher income households. However, the kurtosis (index of skewedness) showed that household incomes varied much more in Sopbao (the main business village) than in the other four villages.

178. The results appear in the table below. The average income per person and per household was highest in Sopbao (LAK 1,147,000, and 5,517,000), the lowest in Muang Hom (LAK 636,000 and 2,868,000).

**Table 12: Household Income and Expenditure**

Village Name	Mean household income	Median HH income	Mean Income per person	Mean Expenditure per Person	Mean Gap between income and expenditure per person
Sopbao	5,517,000	4,000,000	1,147,000	481,000	369,000
Muang Hom	2,868,000	2,650,000	636,000	253,000	527,000
Hadsan	3,671,000	3,500,000	777,000	306,000	406,000
Phiengxay	4,367,000	3,250,000	1,092,000	330,000	523,000
Soplong	3,373,000	2,500,000	706,000	417,000	452,000
<b>Total ave. villages</b>	<b>4,402,000</b>	<b>3,000,000</b>	<b>948,000</b>	<b>403,000</b>	<b>582,000</b>

### 6.9.2 Sanitation

179. The survey results for '*incidence of water-related disease by HH*' showed that 1.1% of children under 5 and 4.5% of adults and children over 5 had diarrheal disease requiring treatment during the 2-week period before the survey date. District government health data showed an

average of 17 cases of diarrhea per month for the five villages, which is about one-third the rate indicated in the survey.

180. Toilet provision in Sopbao is very high – around 99% of survey HHs reported having a septic system or pour flush to pit toilet, with only one HH having no facility. About half the households surveyed have this facility in their houses and half in their house yards. Only 3% reported sharing their toilet with neighbors or relatives.

**Table 13: Household Toilet Facilities Used**

Type	% of sample respondents	% in house	% in yard
Pour flush or septic	98.9	50.6	48.3
No toilet (use river or bush)	1.1		

*Source: Socio-economic survey, Jun 2017*

181. Most respondents had never emptied their pits/septic tanks, suggesting that owning a pour flush to pit/septic facility in Sopbao is a fairly recent phenomenon. Over 78% of HHs with septic tanks had soak pits, the remainder let the overflow go to the street or rice fields.

182. There are no public toilets, and the town needs several, especially in the daily market and bus station. Shop owners and customers share private toilets nearby the market. Some of the cores villages have no public toilets at the village meeting hall, and where they do exist, the condition is poor. The Sanitation component of the sub-project would consist of the construction of six (6) units of two-room public toilets at the Village Meeting Halls of Ban Sopbao, Ban Muanghom, Ban Hadsan, Ban Phiengxay and Ban Soplong. There is also one planned for the village market of Sopbao.

183. The town's solid waste management is carried out by a private sector operator who disposes of the waste at a designated location where it is burned. The collection is carried out with an 8m<sup>3</sup> truck and 4 staff.

### 6.9.3 Water Supply

184. **Domestic:** the primary sources of water for purposes other than drinking, in both dry and wet seasons for respondents (HH), was the Nam Saat supply, at 54%-52% (wet and dry seasons). About 20% of HH mostly use covered wells, and 1%8-24% use river or lake water. All respondents stored water in jerry cans or buckets in their houses. A significant number (44%) of respondents reported water shortages in the dry season, and 5% reported frequent shortages. Half of river users and 41% of Nam Saat users reported dry season shortages.

185. **Drinking Water:** 68% of respondents used bottled water in the dry for drinking and cooking, and about 58% in the wet. Almost all of the others used the Nam Saat supply for their drinking water, with a couple of houses using wells or the river. Almost every household in the five villages also had access to a covered or uncovered well or a borehole. There is one drinking water supplier in Sopbao town area, and another one located in a town about 30 km towards Xamneua. Several respondents felt that the one from out of town offered better quality water.

## **7. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

186. All the subproject activities will occur in both residential and non-residential areas. The environmental impacts from the activities were evaluated in the specific areas of influence at the subproject component sites.

187. At the raw water intake, the area of influence includes the upstream and downstream sections from the intake considering the potential effects to water quality, sustainability of the water supply source, and potential conflict on river water use. At the locations of the main transmission line and distribution lines, the affected area may extend to an average of 1-50 meters along the excavated area of the pipelines. At the proposed sites for the WTP and storage tank, office and laboratory, temporary disruption and nuisance impacts may be experienced, mainly during the construction period. These affected areas may experience direct impacts associated with temporary disturbance from construction activities. The potential environmental impacts were identified based on the project activities that may occur in each component and evaluation of the environmental and social baseline situation at the subproject area. The identification of environmental impacts was mainly based on the technical information related to project component design and operation, field visits, information from stakeholders, and feasibility study.

### **7.1 Anticipated Benefits from the Project**

188. There are expected beneficial impacts on health and well-being of people because of the proposed water supply subproject for the five Sopbao district villages. The principal benefits deriving from the rehabilitation and expansion of the existing piped water supply system will be (i) a secure and continuous supply of safe, clean water; (ii) good water pressure to serve two-story premises; (iii) adequate quantities of safe and clean water to meet all their needs; and (iv) high level of convenience. The water supply will also enable commercial establishments and light industry to sustain their business models and grow the economy, which in turn will provide employment.

189. In general, the provision of sustainable, sufficient and safe piped water supply is expected to result to improved health conditions and consequently economic development to the community. Health benefits will result from the provision of safe water and improved household sanitation conditions that reduce the incidence of diarrhea, dysentery, kidney stones and other water-related illnesses. Drainage works in core villages will improve living and business conditions and help to eliminate disease vectors such as mosquitoes. Other health benefits will include reduced costs for health care and a reduction in work time lost.

### **7.2 Environmental Impacts Related to Project Location (Pre-Construction Phase)**

#### **7.2.1 Impact on Land Acquisition and Community Assets**

190. There will be no land acquisition required for the development of the requisite subproject component facilities namely the construction of the WTP and laboratory, intake, reservoir, office and access roads. It is anticipated that there will be minimal and temporary disruption during pipe laying.

191. PNP Xamneua has provided/acquired the land for the Intake, WTP and laboratory, storage tank and office. The Land Acquisition and Compensation Plan (LACP) for the subproject has been prepared separately to ensure that any loss of land, trees or damage to property will be subject to compensation in accordance with the Resettlement Framework of the WSSP.

### 7.2.2 Impact of Location of Raw Water Intake on other Water Users

192. The raw water intake will be located on the right bank of Nam Ma in Sopbao Village, just upstream of the village center on state owned land. Being upstream of any urban runoff from Sopbao will not impact water quality, and its location will not affect nor impact other water users of the sub-project area.

193. Water abstraction for the proposed subproject during the estimated flow in the dry season month of March would be about 0.011m<sup>3</sup>/s, which would be about 0.03% of the total flow in the river at that time. This is a very insignificant abstraction rate, and would offer no adverse impacts on other water users. In addition and in consultation with local stakeholders, it was established there are no other significant water demands on the river either upstream or downstream. As a risk mitigation measure however, the Provincial Governor will be required to issue a decree proclaiming that drinking water supply must always be given highest priority over all other uses in extreme dry conditions.

194. Nam Ma water is not being drawn in downstream reaches for irrigation, although small houays (tributaries) are being utilized.

### 7.2.3 Impact on Natural Resources and Protected Areas

195. The Laeng Nam Ma Protection Forest Area on the left bank of the Nam Ma opposite Sopbao and project service villages will not be impacted by the project. At Sopbao there is a village fishery conservation zone along the Nam Ma directly extending from the Houay Bao stream confluence (right bank) to 500 m downstream. As a further precaution, fish screens will be fitted to the intake pipes which will have bell ends to reduce velocity. This conservation zone might experience minor increases in turbidity caused by intake works located about one kilometer upstream, however these impacts are temporary and can be mitigated by employing recommendations of the EMP.

196. The location of the proposed water supply system and its components will have no impact on the Nam Et Biodiversity and Conservation Area which is 55 km from the project area.

197. The village head of Sopbao had indicated that the PFA boundary extended across the river to the right bank, but this is contrary to MONRE data which indicates the boundary closest to the WTP and intake is the left bank. In any event, should the village be using the area for a specified purpose then their permission will be required to utilize the site for subproject.

198. A District Protected Area is located about 1km to the west of the subproject site and will not be impacted by subproject activities.

199. The contractors will be required to prohibit activities such as cutting wood for cooking, hunting, or wildlife trade. In addition, no aggregate for concrete will be sourced at Nam Ma project site.

### 7.2.4 Impact on Historical and Archaeological Sites

200. There are no sites of archaeological significance within and around the subproject area footprint. The project components (Intake WTP, storage tank and laboratory, raw transmission and distribution lines, office and access roads) will not affect any historical and archaeological sites such as temples and burial sites.

### 7.3 Environmental Impacts During Construction

201. Construction activities that may be undertaken for the proposed subproject would include land clearing, excavation and grading, filling, disposal of excavated soil, road construction/rehabilitation, intake construction, and movement of construction vehicles, operation of heavy equipment, and operation of worker camps. The works for the proposed subproject are expected to generate the following adverse impacts:

- Loss of vegetation as a result of clearing and grubbing
- Generation of excavated material
- Runoff of silt
- Temporary loss of access to houses and establishments
- Occurrence of acute increase in ambient Noise
- Acute increase in generation of Dust
- Generation of wastes, i.e. domestic wastewater, solid wastes and hazardous wastes
- Community hazards as a result of open excavations
- Hazards to occupational health and safety.

202. The mitigation measures to address the adverse environmental impacts during the construction phase of the subproject implementation are presented in the following sections. The Subproject will conform to the Environmental, Health, and Safety General Guidelines of 30 April 2007 (IFC-WB).

#### 7.3.1 Temporary Disruption of Community Roads, Pathways and Access to Properties

203. In general, pipe laying for the water supply distribution network will be undertaken along the existing road right-of-way. The pipe lines will be laid out in the 2.5 – 4.0 m wide footpath or road shoulder from the edge of the road for arterial, sub-arterial and collector roads and about 2.0m wide road shoulder for distributor roads<sup>15</sup>. During trench excavation and pipe laying works, temporary loss of access to residential and commercial establishments, schools, and community facilities may occur. As mitigation for this impact, temporary accesses to houses and other establishments affected by the works will be provided. Particular attention will be given to ensuring safety along roads and paths normally traversed by pedestrians. The contractor will restore and reinstate any damaged sections to properties immediately.

#### 7.3.2 Air Pollution

204. The potential sources of air pollution during the construction stage include dust from earth works concentrated within a 50-meter radius of the work site; emissions from the operation of construction equipment and machineries; fugitive emissions from vehicles plying the area; fugitive emissions during the transport of construction materials; and localized increased traffic congestion in work areas. Most of the emissions will be in the form of coarse particulate matter and will settle down in close vicinity of the work sites. The impacts will be minor, local, short-term,

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<sup>15</sup> In accordance with MPWT Regulation No. 205 on Town Planning (2004), services may be installed in the 2.5-4.0m wide road shoulder for arterial, sub-arterial and collector roads in the following order from the road edge: drainage, tree planting, water supply pipeline, electricity, telecommunications wires. The drain must not be closer to the road edge than 0.3m and telecommunications must not be closer than 0.5m from the outer edge. For distributor roads having only 2.0m wide footpaths, the facilities may be divided between the two sides of the road, with drainage, tree planting, electricity, and telecommunications on one side and drainage, tree planting and water supply pipeline on the other side.

direct and reversible. The best management practices will be adopted during conduct of the works to minimize dust and release of combustion emissions from operation of the requisite heavy equipment and machineries. Excavated material and stockpiles will be kept moist while transport vehicles will be required to install tarpaulin covers or other suitable material to prevent spillage of the hauled materials. Furthermore, construction equipment and vehicles will, at all times, be well maintained and in good working condition to reduce fugitive emissions. Speed limits on areas will be imposed to minimize dust emission and to reduce the risk of traffic accidents in the work sites. Information about planned construction activities will be provided to residents in the area and will be planned to minimize public disturbance and nuisance.

### 7.3.3 Noise

205. Up to 95% of the five villages residences and business will connect to the new water supply systems. This includes markets, temples, clinics and schools. Construction activities may cause noise and vibration impacts for a short duration. The operation of equipment such as jackhammer for the installation of water supply distribution network may cause nuisance to adjacent buildings. Excavation works in pipe road crossing sections on paved roads would require the use of jackhammer to break the concrete. Diesel generators will also be required during the works. Ambient Noise levels in these areas may reach 88dBA at a distance of about 15m away from the source or operation of equipment. Along the haul roads, the average ambient noise level will also experience an acute increase because of increased vehicular traffic. As mitigation for the adverse impacts identified, work at the sites will be limited only during the daytime from 0700H to 1800H. There will no works that will be permitted beyond this period. Furthermore, the community will be provided with updated information about the schedule of the construction activities through billboards/sign. Stationary equipment like the diesel generators will be installed as far as practical from sensitive receptors. Buffers will also be established as further mitigation.

206. No sensitive receptors are located near the proposed WTP or intake.

### 7.3.4 Impact of Borrow Materials

207. The construction activities for all components of the project, including the access roads will require material, specifically sand and aggregate for the works. The sourcing of these materials from the Nam Ma River will not be permitted as the mining/quarrying activities may irreversibly impact the ecology and hydraulic characteristics of the waterway. The contractor will be required to secure these materials from Government permitted/licensed suppliers.

### 7.3.5 Impact on Ecological Resources

208. During the implementation of the construction activities, workers and laborers of the contractor may undertake hunting of wildlife and cutting of wood upstream of the intake. The contractor will be instructed to orient their workers and staff that such activities are strictly prohibited. The contractor is responsible for the provision of the requisite kitchen facilities, food and cooking fuel for their workers and staff.

### 7.3.6 Clearing of Vegetation

209. The construction of the WTP and laboratory, clear water storage tank, intake, office, access roads and contractor camps and facilities will require the removal of the existing vegetative cover in the sites. The impact of the clearing and grubbing works will be minimal because the existing vegetative cover at the sites consists only of bushes and bamboo. The rollout of the distribution network may affect trees that have been planted by communities in front of their

houses. The clearing/removal of trees required for the works will only be undertaken based on an inventory contained in the approved LACP for the subproject and upon securing of the requisite permits for tree cutting from the the Government. In accordance with the approved LACP, trees and improvements within private land that will be affected by the proposed subproject will be properly, and in a timely manner, compensated in cash. The precise location and number of trees impacted will be identified at the detailed design stage.

210. The requisite roads and paths to the intake, WTP, and reservoir will be constructed with a limited width enough only to accommodate construction vehicles and equipment. This is to minimize the impact on the receiving environment. In sloping terrain, such as at the reservoir and WTP site, manual labor will be utilized as the utilization of heavy equipment would cause irreversible and unnecessary damage to the area. Upon completion of works, the exposed surfaces will be planted with the appropriate vegetation to prevent soil erosion. Landscaping and planting of trees/vegetation at the WTP site will be undertaken.

### **7.3.7 Water Pollution**

#### **7.3.7.1 Impacts of Sediment Runoff**

211. The construction of the facilities such as the intake, WTP, storage tank, distribution line and office, may result in erosion of unstable areas during earthworks, especially during heavy rainfall events. Sedimentation of nearby watercourses and channels from runoff heavily laden with material from the work sites may occur because of the works. These impacts are transient, short-term and insignificant. As mitigation, the contractor will be required to implement proper measures which would include the provision of silt traps, ditches, and sump pits to intercept the flow silt laden runoff from the worksites into the nearby channels and watercourses. Moreover, activities, especially earthworks, will be scheduled during the dry season or be stopped during heavy rainfall.

#### **7.3.7.2 Domestic Wastewater from Contractors Facilities and Worker's Camps**

212. The contractor and workers' camps will generate domestic wastewater. Contamination of surface and groundwater sources and surrounding land is a potential risk that should be addressed accordingly by the contractor. Potential adverse impacts are minimal and temporal in duration and can be readily mitigated through measures established in the EMP. Proper management of the domestic wastewater from the contractor's facilities and workers' camps should be undertaken at all times. Appropriate latrines shall be installed in the camps and facilities of the Contractor.

#### **7.3.7.3 Residual Chlorine During Pipeline and Reservoir Disinfection**

213. Chlorinated water is retained in the completed pipe works and reservoirs for a pre-determined period to effectively sanitize the system. This is typically done after the completion of the leakage and pressure tests. The chlorinated water is then drained as the system is filled with potable water. Consequently, residual chlorine is inadvertently discharged. Extra caution is needed to avoid discharge of water with excessive chlorine residuals as this is toxic to fish and other aquatic life. Flushed water from the system during commissioning of the pipelines and reservoirs will only be discharged to the nearest water body when the chlorine concentration of the water has been reduced to less than 2 mg/l. The allowable limit for Chlorine (free residual) as per the Ministry of Public Health Drinking Water Quality Standards of 2014 is 0.1-2.0 mg/l.

214. The established protocol is that when the piped system has been assessed to be reasonably clean, the effluents from the flushing of the system will take well over a week to reduce to a residual level (less than 2 mg/l) fit for discharge. Discharge to soil will allow for further

reduction through the combined effect of soil contact and sunlight. However, discharge at pipe ends will have to be monitored to minimize soil erosion. The normal chlorine residual test kit will give a NIL chlorine residual if the chlorine residual is above 10 mg/l. Options are (i) use a normal chlorine test kit and use 10x15x dilution with distilled water and calculate the final result or (ii) purchase and use a high range chlorine test kit.

### **7.3.8 Generation of Construction Wastes**

#### **7.3.8.1 Excavated Soil**

215. The construction of the proposed WTP and reservoir will require excavation and leveling works. Excavated materials during pipe laying will also be generated. The excavated materials from the foundation of the WTP tanks and reservoir will be utilized as backfill in the other work sites where required. Material during trench excavation will be utilized to backfill the trench after the pipes have been laid out. Any surplus material will be disposed properly and given for free to interested villagers as backfill materials in coordination with the village authority. There is no anticipated need for spoil disposal sites.

#### **7.3.8.2 Domestic Waste**

216. Solid waste will be generated at the work sites and the worker's camp. Wastes may include domestic solid waste, inert construction waste, and hazardous waste. Domestic waste is not anticipated to be a significant volume as only small temporary camps will be established at the sites of the WTP and reservoir. There will not be camps for the worksites for the intake, transmission and distribution pipelines. It is projected that the temporary camps will generate an estimated 0.4 to 0.5 kg/person/day and would consist mainly of plastic and glass bottles, paper, cardboard, food wastes, and packaging wastes. This will be collected and properly disposed in the approved disposal facility of the District.

#### **7.3.8.3 Inert Construction Waste**

217. The inert waste that will be generated during the works will consist mainly of scrap wood and metal, cement bags, aggregates and concrete debris. These wastes are generally disposed of and/or land filled in appropriate sites and represent no direct danger to health. The scrap metal and wood can be collected for recycling.

#### **7.3.8.4 Hazardous Waste**

218. Hazardous wastes such as containers of paint and solvents and spent batteries are projected to be generated during the works, especially at the worksites for the intake, WTP and reservoir. Although the volume is anticipated to be small, this type of waste is highly detrimental to the environment and public health. As mitigation, these materials will be segregated from the general solid waste, collected and disposed appropriately, mainly by encapsulation.

### **7.3.9 Impact on Community Health and Safety**

219. During the works, the community may be exposed to the health and safety risks from increased vehicular movements in the area, open excavation, and operation of heavy equipment. As mitigation and to prevent accidents and hazards to motorists, pedestrians, and residents around the worksites, barricades and wood/steel plate covers will be provided in open excavations during non-working time. The worksites will be properly secured with fences and access to the area restricted. The contractor is to ensure that all vehicles and transport equipment and materials that may be required to pass through villages are operated safely without endangering these communities. All loads are to be secured and all loads with fugitive materials (e.g. excavated soil and sand) are to be covered with tarpaulins. The contractor is to immediately remove any



drivers that ignore any of the community safety requirements. The required warning signage will be installed in all the worksites.

#### 7.3.10 Occupational Health and Safety

220. During the construction phase, the implementation of the works may result in hazards to the safety of workers such as tripping, falling from height, slippery surfaces, carrying heavy loads, and during operation of machines and equipment. The contractor will be required to prepare a site safety plan and designate a safety supervisor who will ensure that safety measures during construction are implemented. These safety measures include the use of personnel protective clothing and equipment, placing of hazard warning signs, and excavation covers and barriers. Arrangements for prompt medical attention in the event of accidents will also be made.

221. The contractor will be required to: (i) provide priority hiring of qualified skilled and 100% unskilled workers from the villages, (ii) consult with local people to avoid conflict if migrant workers will be brought to the site, (iii) installation of suitable toilets such as pit latrines and grey water drainage facilities such as soakage pits, (iv) arrangement for the proper disposal of solid wastes, (v) briefing of workers and the villagers on the dangers of communicable diseases, and (vi) assignment of responsibility to workers and local peoples' welfare to a senior member of the contractor's staff.

222. In addition, during the disinfection of water distribution lines, only crews who have had experience with chlorinating agents and who are trained and aware of the potential health hazards associated with these chemicals will be involved in such activity.

### 7.4 Environmental Impacts During Operation

223. The potential long-term or permanent impacts of subproject development are most important and generally determine the magnitude of impact. The potential long-term impacts include:

- Incremental wastewater generation and increased burden on drainage systems;
- Conflict with other water users of Nam Ma;
- Deterioration of water quality;
- Generation of backwash water and sediments from operation of the WTP;
- Exposure of workers to chemicals for water treatment;
- Generation of sludge from the detention ponds;
- Occupational health and safety; and
- Community health and safety.

The Environmental, Health, and Safety Guidelines for Water and Sanitation Projects (IFC, 2007) outline a range of safeguard measures including management requirements, monitoring regimes and performance evaluations that will be adopted within the operations and maintenance manual, where possible.

#### 7.4.1 Incremental Wastewater Generation and Increased Burden on Drainage Systems

224. Households receiving new water supply connections are likely to use more water for bathing, cooking and washing. This may lead to more grey water or sullage as the standard of living improves, the population increases and more people have access to water supply. The current condition and lack of well-designed drainage system in the villages will result in an

increase in the volume of grey water or sullage. The potential for the ponding of dirty water because of the absence of proper drainage systems may, consequently result to the formation of habitats for mosquitoes and other pests and pose health hazards to the communities. In most of the households in the District, the domestic wastewater drains into irrigation canals and on their yard. Under the subproject, key elements of the drainage system within the town will be upgraded to help address this problem.

225. As project policy, water connection will only be provided to a household once an approved sanitation facility is present to cope with the increased wastewater that will be generated with improved water supply services. Public awareness raising initiatives have been undertaken under the feasibility study about drainage improvement and VEIs component. Villagers have been informed about the need to provide latrines before a water connection service can be made.

#### **7.4.2 Deterioration of Water Quality**

226. The quality of the Nam Ma raw water could potentially deteriorate if there were substantial human activities in the upstream catchment area that are of sufficient magnitude to cause contamination of the river water. However, this is unlikely to be the case given the fact that the upstream catchment lies in a rural mountain area, with parts used for agriculture, as well as the large dilution capacity. However, mitigation measures in place are (i) surveillance of catchment activities through the provincial governmental system (village, district and provincial dialogue and meetings); (ii) design and operation of the water treatment plant and distribution system to national standards; and (iii) disinfection of the treated water. Additionally, the raw and treated water will be tested in accordance with MOH's standard, as well as for pesticides, arsenic, cyanide and mercury. As such, it is considered that deterioration of water quality can be identified and addressed if it should occur, as set out in IFC's EHS Water and Sanitation Guidelines. Monitoring and testing will commence prior to construction. It should be noted that the water treatment plant/process proposed will be capable of treating pesticides at levels close to or at "not detectable".

227. Nevertheless, the Project Implementation Unit (PIU) and PNP will continuously coordinate with the villages, Sopbao District and Xamneua Provincial authorities regarding community activities in the upstream catchment area. Laboratory testing equipment and training will also be provided to allow the PNP to conduct regular monitoring of raw and treated water quality parameters.

#### **7.4.3 High Pressure and Leaks on the Pipeline**

228. The proposed distribution network will have sections located at low elevations. These sections experience higher water pressure that may potentially result in leakages in the line and ultimately water loss. This risk will be minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) use of pressure reducing valves for the rider mains, (iii) careful construction supervision by the Project Implementation Assistance Consultants PIA to ensure that pipe laying and jointing is done to the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.

#### **7.4.4 Generation of Backwash Water and Sediments in the WTP**

229. During the operation of the WTP, the cleaning of filters generates backwash water which contains sediments and other pollutants that have been removed from the raw water during treatment. Discharging the backwash water and sludge from the sedimentation tanks directly into the adjacent land or river may result in the deterioration of the condition of the receiving environment. As mitigation, sediment will be collected and conveyed to a detention pond to

separate the concentrated waste sludge or sediments. In the design of the WTP, discharge of sludge from the WTP will be into the detention pond and not directly into the adjoining land.

#### **7.4.5 Occupational Health and Safety**

230. Water treatment will involve the use of coagulants/flocculants and chlorine that will expose WTP personnel to hazards during chemical handling. The risk is particularly present during chlorination because chlorine is a reactive chemical that is hazardous to skin and eyes in case of accidental spill or leak. Risks associated with these chemicals will be minimized by (i) providing secure, dry and well-ventilated storage facilities for these chemicals, (ii) application of chlorine and coagulants/flocculants by automatic dosing instead of manual dosing (iii) use of chemicals in powder rather than in gaseous form which is safer to store and handle (iv) posting of the Materials Safety and Data Sheets (MSDS) of these chemicals in the chemical storage area and chemical mixing tank area for information of workers, and (v) training of staff and designation of responsible person on the handling of these chemicals.

#### **7.4.6 Generation of Sludge from Detention Ponds**

231. The inorganic sludge that will be generated from the detention ponds will be dredged and disposed as backfill material in low-lying areas to be identified by the village leaders. There will be no land application of the generated sludge without the required approval by the village authorities.

232. The WTPs coagulation process binds all the removed contaminants and the turbidity (mainly clay particles) into high aluminium content settleable solids when naturally dewatered. These solids are inert so there is no need for laboratory testing before the solids are used for leveling ground and filling depressions or being disposed off to wasteland. The high aluminium content arises from the predominate contaminant (turbidity) or clay particles and to some extent from the coagulant itself (aluminium sulphate).

#### **7.4.7 Community Health and Safety**

233. The facilities that will be constructed will be properly fenced off and secured to restrict access and intrusion of unauthorized personnel. Watchmen/security personnel will be hired to secure the facilities on a 24-hour basis. This would minimize the safety risks to the community near the intake, WTP and storage tank.

## **8. ANALYSIS OF ALTERNATIVES**

### **8.1 Alternatives to the Subproject**

234. The beneficiary villages in and around Sopbao District center have been selected as the site of the subproject. The selection process adopted involves screening and prioritizations, following which candidate projects are selected for the feasibility study. The feasibility study then confirms subproject eligibility. Prioritization was based on a set of criteria aimed primarily at ensuring alignment with Government priority, maximizing impact in terms of number of population to be served, and also maximizing the contribution to economic development and poverty alleviation.

### **8.2 Alternatives Within the Subproject**

235. Alternatives considered for the preliminary design included: (i) alternative water sources, and (ii) village areas to be included. The two principal water sources considered for the subproject

were the Houay Bao and the Nam Ma. The least cost analysis clearly shows that Nam Ma has a much lower capital cost, with a slightly higher operating costs. Considered over a period of 20 years, it is clear that the net present value of the Na Ma option is much less than the Houay Bao option. In addition, the Nam Ma offers sufficient dry season flows to meet demands without significantly limiting downstream flows required for the maintenance of aquatic ecosystems.

236. The villages for inclusion in the core area were selected on the basis of contiguity and population density; the inclusion of other more remote villages would undermine the financial viability of the system. During the evaluation of possible service areas, the most populated and easily accessible villages were selected to be included in the water supply improvement project.

### **8.3 “No Project” Alternative**

237. The “No Project” alternative would mean, inter alia, (i) that the opportunity to provide potable water supply to a significant urban population toward meeting Government goals and priorities would not be realized, (ii) that strengthening of the PNP and BNP would not take place, and (iii) that drainage, sanitation, and general urban environmental improvements from the VEI works would not be realized.

## **9. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION**

### **9.1 Consultations and Information Disclosure**

238. **Initial environmental assessment.** Initial consultations for the Feasibility Study and IEE of Sopbao District were held between the 25<sup>th</sup> and 26<sup>th</sup> July 2017. Over the course of the site visit PIA met with district and provincial departments of DPWT, PNP, MONRE, Provincial State Enterprise (UXO) and the Department of Irrigation. Some informal consultations were also held with local residents of Sopboa. The intention of the consultations was to inform the government representatives of the environmental assessment process and be updated on potential environmental risks the subproject may cause during construction and operations phase. The consultations allowed PIA to be informed of local conditions that might influence final design, and to gather information and data on local environmental aspects, such as water quality, vegetation and hazards (land stability, UXO etc.), and current water uses and issues.

239. Presentations were made on the general introduction of the project, specific description of the WTP for Sopbao, ADB policy and the Lao PDR policy on entitlement and eligibility, introduction on the IEE and FS process, explanation on the data to be collected and locations, and briefing on possible environmental impacts (temporary and permanent). The consultation meetings were attended by DPWT, PNP, PIU/PNP, LCG, and DONRE.

240. During the meetings, the representative from the Governor’s office stressed the importance of the WTP. In general, the participants understood the project’s environmental impacts and benefits. The consultations identified overwhelming public support for the project, but some concerns were raised about inconvenience caused by construction activities, and compensation for lost trees and gardens. It was stated that all lost trees, gardens and other assets would be fully compensated and or rehabilitated. A comment was raised about historical fish-kills and that perhaps cyanide may have been responsible. (Cyanide was tested with results showing undetectable amounts.) In addition, according to the stakeholders who were consulted, UXO is unlikely to be an issue because all sites are already modified environments. Summaries of the consultations held on 25<sup>th</sup> – 26<sup>th</sup> July 2017 are provided in Appendix C.

241. A second round of consultations with a focus on meeting the Village Development Committees (VDCs) and affected villagers was conducted between the 23<sup>rd</sup> and 24<sup>th</sup> October

2017 in Ban Sopbao, Ban Soplong, Ban Phiengxay, Ban Mounghome, and Ban Hatsane. The consultations were facilitated by the PIU, District, and the PIA. Table 14 lists the profile of the participants in each village consultation meeting.

**Table 14: Sopbao Consultations Summary**

No.	Name of village	Participants		Ethnic				
		No.Total	Female	Lao loum	Tai Deng	Tai Dum	khmer	Hmong
1	B. Soplong	43	15	2	41	0	0	0
2	B. Phiengxai	49	27	3	44	0	1	1
3	B. Sopbow	171	84	93	48	17	1	12
4	B. Muanghom	50	18	50	0	0	0	0
5	B. Hatsan	24	4	2	22	0	0	0
Grand Total		337	148	150	155	17	2	13

242. The consultations set out information on the IEE and EMP by way of the distribution of a Environmental Impact Assessment Public Information Brochure (PIB) and a PowerPoint presentation to inform them of what was being proposed. Consultations were conducted in all five subproject villages. Feedback from these consultations was highly favorable toward the project with no dissent registered. All comments received will be considered within the final design of the new water supply system and drainage works upgrades. The following are the comments that were raised during the village consultation meetings:

Comments	Responses of PIU/PIA
When will the project start?	It will start about the end of 2018.
What will the villagers give or pay for the project?	During the construction phase, villagers just need to give access. The contractor will be in-charge of all the tasks.
What will be the impacts to houses during laying of pipes? Will there be compensation of affected assets like fence, tree or crops?	The pipe laying will not be inside any house. If there is a fence in the right of way, the project will not remove the fence. If the impact is on a tree or crop, the Government will compensate based on current market rate. During construction, the contractor may dig under the private fence but will give access to villagers.
In case the project will affect high value assets like tree, garden, etc, will the project compensate or not?	The Government will compensate based on current market rate.
The villagers expressed their satisfaction in getting water supply. They agree with the project.	Noted.
In Ban Hatsane, the village head said that this will be the first time that the village will have a water supply system. Previously, the village was affected by diseases from poor water.	Noted,

## 10. GRIEVANCE REDRESS MECHANISM

243. Article 13 of Decree 192/PM requires the subproject to establish an effective mechanism for grievance resolution. Government legal requirements for this mechanism are further described in Part VI of the Decree's implementing regulations, and in detail in the Technical Guidelines. The loan covenants stipulate the GRM requirements of the ADB for the project. The mechanism to address any grievances on environmental issues is the same as that designed to address grievances related to land acquisition and compensation. The objective of the grievance redress mechanism is to resolve complaints as quickly as possible at the local level through a process of conciliation, and if that is not possible, to provide clear and transparent procedures for appeal. All affected persons will be made fully aware of their rights, and the detailed grievance redress procedures will be publicized through an effective public information campaign.

244. This will also consist of notice boards being placed at each construction site that provides contact information of the contractors allocated safeguards staff. Information will also be provided on notice boards of affected village and the Nam papa Offices. Again, each of these will have contact information of the person(s) responsible from their organization who will assist with managing public grievance.

245. An aggrieved affected person (AP) or affected household (AH) will be free from any fees in connection with the lodging and resolution of complaints, as the costs will be borne by the Executing Agency and the appointed contractors.

### 10.1 Type of Grievances

246. Complainants are entitled to lodge complaints regarding any aspect of the project. Any affected person will be able to submit a grievance if they believe a practice is having a detrimental impact on the community, the environment, or on their quality of life. Eligible grievances or complaints include:

- Negative impacts on a person or a community (e.g. financial loss such as from loss of water, loss of roadside trees, health and safety issues, nuisances, etc.).
- Dangers to health and safety or pollution of the environment.
- Hazards due to construction activities (e.g. noise, dust, disruption of access, etc.)
- Impacts on social infrastructure.
- Failure to comply with standards or legal obligations.
- Improper conduct or unethical behaviour of contractor leading to nuisance of affected person(s).
- Misuse of funds and other irregularities.
- Grievances due to land acquisition, resettlement, compensation, relocation and unaddressed losses.
- Complaints related to gender issues.

### 10.2 Grievance Resolution Process

247. Complaints can be made verbally or in written form. It is recognized that in many cases, complainants do not have the writing skills or ability to express their grievances verbally, however, complainants are encouraged to seek assistance from family members or village heads, to have their grievances recorded in writing and to ensure that where disputes do occur and all the details have been recorded accurately enabling all parties to be treated fairly. In the case of verbal

complaints, a written record of the complaint will be made during the first meeting with the complainant. Complainants who present their complaints within the prescribed procedures will be exempt from all administrative fees incurred. In addition, complainants who lodge complaints and appeals to district courts will be provided with free legal representation.

#### 10.2.1 Arbitration Committees

248. The subproject's GRM will rely on the existing village arbitration procedures that already exist in the villages. The Village Development Committee (VDC) generally consists of the village chief, deputy chief, village secretary, and village representative of the Lao Women's Union, Lao Front for National Construction, village elders, youth, and village land taxation unit. The VDC is responsible for settling disputes between villagers through conciliation and negotiation. In the absence of these units, the members of the village committee (if formed) or the village leaders will act as grievance officers.

249. Moreover, the details of the PIU, GRM Focal Contact Persons and Construction Manager will be prominently displayed in the respective construction areas for the reference of the affected communities/persons. Complaints and grievances can be directly filed, both written and verbal, to the concerned entities. This will provide alternative entry points to the village complaint system.

250. The affected households (AHs) may present their complaints to the concerned local administrative officials and resettlement committees. The complaint can be filed first at the village level and can be elevated to the highest or provincial level if the affected persons (APs) are not satisfied with the decisions made by the VDC at village level.

251. At the district and provincial levels, the district and provincial steering committees of the project will act on grievances or complaints that have not been resolved at the VDC. The District Project Steering Committee (DPSC) are composed of the Vice District Governor, Director of the DPWT, and representatives of the District Natural Resources and Environment Office, health office, police office, education office, Lao Women's Union, Lao Front for National Construction, and youth office. A representative of the PIU of the subproject is a member of the district project steering committee.

252. The Provincial Project Steering Committee (PPSC) is headed by the Vice Provincial Governor and is composed of representatives of provincial departments such as the DPWT, DONRE, health department, police department, and education department, Lao Women's Union, Lao Front for National Construction, and provincial youth department. The representatives of the PIU and the PNP Xamneua / Sopbao are members of the Provincial Project Steering Committee.

#### 10.2.2 Grievance Redress Procedures

253. All complaints and resolutions will be properly documented by the concerned committee and be available for public review and for monitoring purposes. As a general policy, the PNP and PIU will work proactively toward preventing grievances through the implementation of impact mitigation measures and community liaison activities that anticipate and address potential issues before they become grievances. Nonetheless, during construction and operation it is possible that unanticipated impacts may occur if the mitigation measures are not properly implemented, or unforeseen issues occur. The procedures for the grievance resolution process for the subproject are detailed in Table 15.

**Table 15: Grievance Redress Procedure**

NO.	STAGES
1	<b>Stage 1 (Village – Subproject Area).</b> In the first instance, complainants will raise complaints or grievances to the PIU, GRM Focal or Construction Manager via the Village Development Committee or other designated village grievance officers. The committee will organize a meeting with the complainants and the PIU, GRM Focal or Construction Manager to resolve the issue using its traditional methods of conciliation and negotiation. The meeting will be held in a public place and will be open to other members of the community to ensure transparency. The VDC aims at clarifications and amicable solution with the complainant. This mediation aims at a village internal immediate solution agreed with the subproject. If the complaint cannot be solved at this stage, the next step will apply.
2	<b>Stage 2 (District Implementing Level).</b> If within 5 days of lodging the complaint and no understanding or amicable solution can be reached or no response is received from the Village Development Committee, the complainant can bring the complaint to the District Project Steering Committee (DPSC). The DPSC will meet with the complainant to discuss the complaint and provide a decision within 10 days of receiving the appeal.
3	<b>Stage 3 (Provincial Implementing Level).</b> If the complainant is not satisfied with the decision of the DPSC or in the absence of any response, the complainant can appeal to the Provincial Project Steering Committee (PPSC) with contribution of authorities and village representative/s. The PPSC will meet the complainant to clarify the complaint and will inform the complainant about its decision aiming to solve the complaint. The PPSC will provide a decision on the complaint within 10 days.
4	<b>Stage 4 (Ministerial Project Executive Level).</b> If the AP is still not satisfied with the decision of the PPSC, or in the absence of any response within the stipulated time, the complainant can submit his/her grievance to Department of Water Supply (DWS). The DWSS acting on behalf of the MPWT will verify with the PPSC and DPSC. DWS might consider an independent external opinion in this matter. The DWS will render a decision within 10 days of receiving the complaint. Before the next stage is applied additional efforts should be made to find an agreement with the AP.
5	<b>Stage 5 (Country Level).</b> As a last resort, the complainant may submit his/her case to the Court of Law. The complaint will be lodged with the Court of Law. The Court will take note and register the case and will provide the final juristic decision. The DWS will be responsible for forwarding the complaint and ensuring its process in the courts.

254. Normally complaints related to construction and environmental issues are resolved at the level of the VDC wherein the conciliation and negotiation are promptly attended to by the PIU and contractors. Complaints related to resettlement and land disputes are normally the ones that are elevated to the district and provincial levels, and at times up to the Court.

255. At each stage of the grievance redress process, careful written records will be maintained. The VDC will submit reports to the DPSC documenting the following: (i) the complaints received; (ii) the names and other pertinent information about complainants; (iii) the dates of the original complaint, meetings and any other actions; and (iv) the outcomes and/or resolution. The DPSC, PPSC, and DWSS will each maintain similar records for appeals that are submitted to them. The records of grievances will be included in regular progress reporting on the subproject. Table 16 presents the individuals at Stage 1 (Subproject Village Level) who will be responsible for receiving and recording the complaints from the affected persons (APs).



**Table 16: Individuals at Stage 1 (subproject village level)**

<b>Name</b>	<b>Designation</b>	<b>Contact detail</b>
Mr. Imphone	Vice Head of Soplong Village, Head of VDC	020 9823 0228
Mrs. Loonthong	Vice Head of Sopbao Village, Head of VDC	020 5940 0480
Mr. Akood	Phiengxai Village Youth Secretary Unit, Water Unit of VDC	020 9595 5973
Mr. Sangthong	Vice Head of Muanghom Village, Head of VDC	030 9128 560
Mr. Lienthong	Vice Head of Hatsan Village, Head of VDC	020 5576 7380

If efforts to resolve complaints or disputes are still unresolved and unsatisfactory following the Government grievance redress mechanism, the affected persons/households have the right to send their concerns or problems directly to ADB's Operations Department, i.e., Urban and Water Division, Southeast Asia Department (SERD) or through ADB Lao PDR Resident Mission. If the AP is still not satisfied with the responses of SERD, he/she can directly contact the ADB's Office of the Special Project Facilitator (OSPF) as outlined in the "Information Guide to the Consultation Phase of the ADB Accountability Mechanism". The Information Guide can be downloaded through this link: <https://www.adb.org/documents/information-guide-consultation-phase-adb-accountability-mechanism>. Those who want to make a complaint with the ADB can refer to the sample letter of complaint adapted from the Information Guide as shown in


Figure 6: Sample Complaint Letter

Date:

Office of the Special Project Facilitator  
Asian Development Bank  
6 ADB Avenue, 1550 Mandaluyong City  
Metro Manila, Philippines

Tel: (+632) 632-4825  
Fax: (+632) 636-2490  
Email: spf@adb.org

Dear Special Project Facilitator,



We, \_\_\_\_\_ *[(name of your group) or name of representative authorized by your group]* \_\_\_\_\_, whose names and addresses are attached, live in \_\_\_\_\_ *[location and country]* \_\_\_\_\_

We hereby present this complaint to the Special Project Facilitator. *[(If the complaint is filed through a representative, please provide the names of the project-affected people with their addresses and evidence of authority to represent them.)]*

1. We are currently experiencing problems due to an ADB-assisted project *[specify name and description of project, and specify the site and country where it is located].*
2. The direct harm we experience is/are the following: *[describe the problem].*
3. We seek the following outcomes and remedies through the help of the Special Project Facilitator: *[describe what you would like to happen, how the harm or problem can be resolved].*
4. We have previously made efforts to address our problem with the EMI and ADB Operations

## 11. ENVIRONMENTAL MANAGEMENT AND MONITORING

257. The matrix of mitigation measures in **Table 17** presents all the required measures and monitoring responsibilities corresponding to the impacts as assessed that are considered necessary through the environmental assessment process. The mitigation measures required cover all stages of the contract and are separated into pre-construction, construction and operation phases. This EMP is based on the type, extent and duration of the environmental impacts identified at the design stage, and is based on the IFC EHS Guidelines for Water and Sanitation. In the event that unexpected impacts occur during implementation, the EMP will be amended to take into account of unexpected impacts and mitigation measures will be amended as necessary.

**Table 17: Environmental Management and Monitoring Plan**

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
<b>I. PRE-CONSTRUCTION PHASE</b>				
<u>Impact on land acquisition and community assets</u>  Loss of community assets due to land acquisition and damage to properties.	Implement the land acquisition and compensation plan that was approved by the ADB for the subproject.  Design access roads to minimum necessary width and installation of pipelines within the Right-of-Way when feasible.	External LACP monitoring report	c/o PNP operations cost	PIU
<u>Baseline Water Quality Monitoring</u>	Identify baseline water quality conditions at the intake location. Samples should be taken at least once during the dry season and once in the wet season	pH, turbidity, E.Coli, chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO <sub>3</sub> heavy metals. Pesticides will also be monitored if identified. Organochloride pesticide risk monitoring will be undertaken on the following additional parameters through the pre construction and construction phase: alpha BHC; beta BHC; Lindane gamma BHC; delta BHC; Heptochlor; Endosulfan 1; Aldrin; Heptochlor epoxide; p.p – DDD; Endrin Alderhyde;	c/o PNP operations cost	PIU

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
		Endosulphan Sulphate; p.p – DDT; methoxychlor.		
<p><u>Impact of location of raw water intake on other water users</u></p> <p>Downstream river uses such as irrigation, bathing, washing, and fishing will be affected if excessive water abstraction will occur.</p>	<p>The abstraction rate for the water supply subproject will be limited to the 800 m<sup>3</sup>/day capacity of the WTP. There is minimal conflict with other water users of Nam Ma because there is still enough water in the river that will meet the irrigation demand and other river uses at the downstream. Fish screens will be fitted to the intake pipes. Pipes will have bell ends to reduce velocity.</p>	<p>River level assessments at the intake on a monthly basis River flow rate measurement on a monthly basis. Monitoring of inlet site and fish screens.</p>	c/o PNP operations cost	PIU, PNP Xamneua
<p><u>Impact to Natural resources and protected areas</u></p> <p>Impact on natural resources and protected areas from cutting/clearing of trees and other vegetation.</p> <p>Impact on Laeng Nam Ma Protection Forest.</p>	<p>Cutting of trees will be undertaken as per approved design and only upon approval. Avoid cutting of trees as much as possible and minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash in accordance with the approved Land Acquisition and Compensation Plan.</p> <p>Orient workers about restrictions and prohibitions on harvesting of natural resources from the Laeng Nam Ma Protection Forest.</p>	Conduct inventory of trees to be affected.	N/A	N/A
<p><u>Impact on Historical and Archaeological Sites</u></p> <p>Damage to relics and artifacts during the conduct of the works.</p>	<p>The Contractor will ensure that the workforce are briefed that in the event of accidental finds relics they should immediately cease any works in the area and promptly report the find to their supervisor.</p>	Accidental finds	c/o PNP operations cost	PNP Xamneua
<p><u>Environmental compliance</u></p>	<p>Submit the IEE to DONRE and secure an Environmental Compliance Certificate (ECC) prior to subproject implementation.</p>	Approved ECC secured from DONRE	c/o PNP operations cost	DPWT, PNP Xamneua
<p><u>UXO contamination</u></p>	<p>Secure UXO clearance following detail design</p>	UXO clearance	c/o PNP operations cost	PNP Xamneua

<b>II. CONSTRUCTION PHASE</b>				
<p><u>Temporary disruption of existing community roads, pathways, and accesses</u></p> <p>Pipe laying will cause temporary disruption of community services and access to properties.</p> <p>Particularly at pipe road crossings, construction activities along narrow roads may lead to temporary blockage or closure of roads and hamper movement of vehicles and people in the community.</p> <p>Community access to areas in the vicinity of the WTP, pump station, reservoir, and intake will be affected.</p> <p>Community access to areas in the vicinity of schools, temples, village offices, market places and meeting halls will be affected during construction of public latrines.</p>	<p>Walking access will be maintained to affected properties and access routes will be temporarily lined with timber or similar material. Particular attention will be given to ensuring safety along roads and paths used by school children.</p> <p>Side street parking of construction vehicles on prolonged basis will not be allowed.</p> <p>Install barriers and safety warning signs on road sections and if necessary deploy traffic aides/ flag persons at affected locations. Information boards at blocked roads will provide information about the temporary closure of roads, schedule of works and the traffic-rerouting plan.</p> <p>Require the contractor to immediately rehabilitate the excavated areas and any damaged road and path sections.</p> <p>Enclose the WTP; pump station, reservoir, and intake perimeters so that pathway use and stream access remains unimpeded.</p> <p>Enclose the latrine construction site to prevent access and limit disruption for the use of the schools and public buildings.</p>	<p>Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports.</p> <p>Report any complaint received from the community to PIU.</p>	<p>Included in civil works cost</p>	<p>PIU</p>
<p><u>Air pollution</u></p> <p>Dust and air emissions from earthworks and movement of vehicles can pose</p>	<p>Require the contractor to cover materials with tarpaulin or other suitable materials while in transit to avoid spillage of materials.</p> <p>Moisten earthen roads during dry and dusty conditions, particularly</p>	<p>Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports.</p>	<p>Included in civil works cost</p>	<p>PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations,</p>

nuisance to nearby communities	<p>roads near residences and through the town core area.</p> <p>Impose speed limits on construction vehicles.</p> <p>Conduct regular maintenance on construction equipment and vehicles to control air emissions during vehicle operation.</p>	Report any complaint received from the community to PIU.		including rehabilitation
<p><u>Noise</u></p> <p>Operation of construction equipment such as jackhammer will cause excessive noise resulting in nuisance to communities.</p>	<p>Limit construction activities, particularly operation of noise generating equipment at night.</p> <p>Position any stationary equipment that produce high noise levels such as diesel generators as far as practical from sensitive receptors.</p> <p>Erect temporary barriers around construction sites especially near schools, hospitals, and houses.</p> <p>Install noise suppression devices to noise generating equipment.</p> <p>Require drivers to minimize blowing of horn and to comply with speed limits.</p> <p>Provide information to community on schedule of construction activities through billboard/signs.</p>	<p>Include EMP in bid documents and contract.</p> <p>Report any complaint received from the community to PIU.</p>	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<p><u>Impact of borrow materials</u></p> <p>Quarrying of aggregates on Nam Ma river will cause siltation and affect the ecological condition of the river.</p>	<p>The contractor will be prohibited from quarrying materials directly from Nam Ma.</p> <p>Construction materials will be procured from Government-permitted sources / suppliers only.</p>	<p>Include EMP in bid documents and contract.</p> <p>Report any complaint received from the community to PIU.</p>	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<p><u>Impact on ecological resources</u></p> <p>Construction workers may undertake hunting of wildlife and cutting of wood</p>	The contractors will prohibit activities such as cutting wood for cooking, hunting, or wildlife trade.	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation

upstream of the intake.				
<p><u>Clearing of vegetation</u></p> <p>Poor planning and execution of tree clearing/vegetation removal at project facilities and along pipeline alignments can result in loss of vegetation and general landscape</p>	<p>Cutting of trees will be undertaken as per approved design and only upon approval of relevant authorities. Avoid cutting of trees as much as possible and minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash accordance with the approved Land Acquisition and Compensation Plan.</p> <p>Roads and paths to the intake, WTP, and reservoir will only be sufficiently wide to accommodate construction vehicles/equipment to minimize land take.</p> <p>Manual labor will be utilized in sloping terrain where use of heavy equipment would cause unnecessary damage. Steep exposed slopes will be graded and covered with bush and grass to minimize erosion.</p> <p>Implement landscaping and planting of trees/vegetation at WTP site.</p>	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<p><u>Water pollution - Sediment runoff</u></p> <p>Sediment runoff undertaken during excavation, earthworks and grading in the rainy season will cause siltation of rivers</p>	Construct silt traps, deviation channels, mounting barriers or trenches around the stockpiles of materials.	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community PIU.</p>	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<p><u>Water Pollution - Worker's camp</u></p> <p>Domestic wastewater from worker's camp would result to the discharge of sewage into drainage canals.</p> <p>Unsanitary conditions at the worker's camp will</p>	Provide adequate water supply and temporary toilet facilities at the worker's camp.	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation

occur without the provision of necessary sanitation arrangements.				
<u>Water pollution - Generation of residual chlorine during pipeline and reservoir disinfection</u>  Prior to commissioning, disinfection will be undertaken on the pipeline and reservoir.  Discharge of residual chlorine above the allowable limits is toxic to fish and other aquatic life.	Follow the recommended dosage of chlorine during the disinfection of pipes and reservoir. Discharge of water with high chlorine concentration to soil at the end of pipelines to be controlled to minimize soil erosion.  Use chlorine test kit and use 10x15x dilution with distilled water or use high range chlorine test kit with high range tablets to detect chlorine residual before flushing.	Include EMP in bid documents and contract	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<u>Generation of construction waste - Generation of excavated soil</u>  Generation of excavated materials during pipe laying and foundation works for WTP tanks and reservoirs.	During pipe laying, excavated material will be utilized to backfill the trench. The contractor will be required to properly reinstate the excavated trench after completion of pipe laying.  Surplus excavated material/cut soil from construction of the WTP and reservoir will be used as backfill material for low-lying areas that have been identified by the village authority.	Include EMP in bid documents and contract  Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<u>Generation of construction wastes – Solid, Inert and Hazardous Wastes</u>  Solid wastes, inert construction wastes, and hazardous wastes during construction will result to pollution of land and receiving water bodies.	Provide appropriate segregation bins or areas for construction wastes.  Secure and control storage of all hazardous materials including fuels.  Reuse recyclable construction wastes such as wood, steel, and scaffoldings or sell to junk shops.  Solid waste to be collected and disposed in approved disposal site of the District.	Include EMP in bid documents and contract  Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<u>Community health and safety</u>	Install barricades/barriers and sturdy plate covers in open	Include EMP in bid documents and contract	Included in civil works cost	PIU is responsible for monitoring all contract work



Community may be exposed to dangers of open excavation	excavations during non-working time.  Install warning signs in the area.	Report any complaint received from the community to PIU.		activities, while the contractor is responsible for implementing mitigations, including rehabilitation
<p><u>Occupational health and safety</u></p> <p>Construction activities may pose hazards to workers because of the use of heavy equipment, lifting of heavy loads, and exposure to open excavations and chemicals.</p> <p>Potential conflict with local people will occur if migrant workers will be brought to the site.</p>	<p>Require the contractor to implement the construction health and safety plan in accordance with the World Bank EHS Guidelines (<a href="http://www.ifc.org/ehsguidelines">http://www.ifc.org/ehsguidelines</a>) as a minimum standard. The contractor will appoint an environment, health and safety officer to ensure implementation of the plan. The plan will at minimum include:</p> <ul style="list-style-type: none"> <li>• Provision of first-aid facilities readily accessible by workers.</li> <li>• Provision of personal protective equipment (PPEs) such as hard hats, gloves, rubber boots, etc.,</li> <li>• Wearing of PPEs while working onsite will be a mandatory requirement for workers.</li> <li>• Posting of safety signs/reminders in strategic areas within the construction area.</li> <li>• Installation of sufficient lighting at night.</li> <li>• Employ only trained personnel in handling chlorine during the line disinfection process.</li> <li>• Ensure that vehicle and equipment operators are properly licensed and trained.</li> <li>• Provide staff with communicable disease and HIV-related awareness training.</li> </ul> <p>The contractor will be required to provide priority hiring of qualified construction workers from the villages and to consult with the local to avoid conflict if migrant</p>	<p>Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports.</p> <p>Report any complaint received from the community to PIU.</p>	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations.

	workers will be brought to the site.			
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<b>III. OPERATION PHASE</b>				
<p><u>Generation of incremental wastewater and increased burden on drainage systems</u></p> <p>Increased water supply to public buildings and households will generate additional quantities of wastewater.</p>	<p>As project policy, water connection will be provided only if the household has an approved sanitation facility to cope with the increased wastewater generated. This policy and the public awareness raising initiatives was presented to the villages under the Village Environmental Improvements (VEI) component.</p> <p>The public institution shall sign a service and management agreement before construction and have sufficient funds to maintain the facility.</p>	<p>Monitor the number of households with latrines and with water connections, population served, and billed water volume.</p> <p>Monitor that the service and management agreements are followed and facilities are properly maintained.</p>	<p>Part of PNP operations cost</p> <p>To be arranged public institution</p>	<p>PNP</p>
<p><u>Deterioration of water quality</u></p> <p>Potential deterioration in quality of raw water supply and of treated water</p> <p>Potential risk on public health in deterioration of treated water quality due to use of poor quality treatment chemicals</p>	<p>Monitor community activities in the catchment area to check activities at the upstream that may cause contamination of raw water quality.</p> <p>Provide laboratory test equipment and training to allow the PNP to conduct regular monitoring of raw and treated water quality parameters.</p> <p>Follow O&amp;M standard operating procedures in accordance with the water treatment plant manuals.</p> <p>Use of potable grade chemicals, especially PAC, and request a Supplier product specification data sheet signed off by a reputable external laboratory.</p> <p>Grant covenants on: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and applying good practices to treat water to acceptable Ministry of Health standards to be included.</p>	<p>Monitor the following parameters:</p> <p>Daily at the inlet to the treatment plant: turbidity, pH</p> <p>Daily after the reservoir: pH, turbidity, residual chlorine, temperature</p> <p>Weekly at several locations in the network: residual chlorine, pH, turbidity</p> <p>Annually after Clearwater tank: chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO<sub>3</sub>. Organochloride pesticide risk monitoring will be undertaken on the following additional parameters through the pre construction</p>	<p>Part of PNP operations cost</p>	<p>PNP</p>

		<p>and construction phase: alpha BHC; beta BHC; Lindane gamma BHC; delta BHC; Heptochlor; Endosulfan 1; Aldrin; Heptochlor epoxide; p.p – DDD; Endrin Alderhyde; Endosulphan Sulphate; p.p – DDT; methoxychlor.</p> <p>Fish tissue can also be analyzed for the degree of bioaccumulated pesticide residue if they are found in the raw water supply.</p>		
<p><u>High Pressure and Leaks on the Pipeline</u></p> <p>The proposed distribution network will have sections located at low elevations which may experience high water pressure which may potentially result in leakages in the line and ultimately water loss</p>	<p>This risk will be minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) use of pressure reducing valves for the rider mains, (iii) careful construction supervision by the Project Implementation Assistance Consultants PIA to ensure that pipe laying and jointing is done to the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.</p>	<p>Daily visual monitoring of pipelines. Occasional pressure monitoring will also be applied.</p>	<p>Part of PNP operations cost</p>	<p>PNP</p>
<p><u>Disposal of backwash water and sediments from WTP</u></p> <p>Backwash water and sludge from the sedimentation tanks will be generated from the cleaning of filters and tanks. Backwash water and sludge contain high total suspended solids.</p>	<p>Filter backwash water and periodic discharges from the sedimentation tanks will be collected to a detention pond to separate the concentrated waste sludge or sediments. Land application of wastes with high dissolved solids concentrations from the detention pond is preferred over discharge to a landfill.</p>	<p>Check condition of detention ponds; report frequency/schedule of backwashing</p>	<p>Part of PNP operations cost</p>	<p>PNP</p>
<p><u>Occupational health and safety</u></p>	<p>Provide secure, dry and well ventilated storage facilities for</p>	<p>Training undertaken for staff on chemicals</p>	<p>Part of PNP</p>	<p>PNP</p>

Potential hazards to WTP workers due to accidental release of chlorine	chlorine and other hazardous chemicals.  Use chlorine compounds in power form, which is safer than gas.  Training of staff and allocation of responsibility to ensure that materials are properly handled..	handling and monitoring and reporting of incidents	operations cost	
<u>Generation of Sludge from Detention Ponds</u>  Increased volume of sludge in detention ponds.	The sludge that will be generated from the detention ponds will be dredged and disposed as backfill material in low-lying areas to be identified by the village leaders. No land application of the generated sludge without the required approval by the village authorities.	Quarterly check on the volume of sludge in the detention ponds.	Part of PNP operations cost	PNP
<u>Community health and safety</u>  Potential hazards to residents and school children near the WTP site.	Facilities (Intake, WTP and Laboratory, Office and Reservoir) properly fenced and secured and watchmen/security personnel to be employed on a 24 hour basis.	Daily log of security personnel	Part of PNP operations cost	PNP

### 11.1 Reporting

258. **Pre-construction Phase.** The EMP monitoring during the pre-construction phase of the subproject will be undertaken by PIU with support from the PIA consultant. Semi-annual Integrated Safeguards Monitoring Reports will be prepared by the PCU with support of the PIA and submitted to ADB for review and disclosed on the ADB project website.

259. **Construction Phase.** Throughout the construction period, the contractor will submit monthly environmental compliance progress reports to the PNP, with a copy furnished to the PIU. The contractor should be able to highlight the summary of the progress of construction, activities undertaken within the reporting period to implement the measures outlined in the EMP, record any community complaints received and how the complaint was resolved.

260. The PIU will consolidate the results of the monthly environmental monitoring through a quarterly progress report that will be submitted to the PCU which is based at the Department of Water Supply of the MPWT. The quarterly report will summarize the significant findings and measures undertaken to address any adverse environmental impacts during construction and also present any unforeseen environmental impacts and suggested remedial actions for the next monitoring period. Copies of the quarterly progress report prepared by the PIU will be given to the members of the Provincial Project Steering Committee and the District Governor. PCU will consolidate information from quarterly progress reports, compile and submit integrated safeguards monitoring report semi-annually to ADB.

261. Once the reports are received by the PCU, these will be reviewed relative to subproject compliance with the indicators defined in the EMP. The PCU will submit the quarterly reports to the Department of Water Supply of MPWT and other national agencies (MONRE, MOF, MOPC,

etc.), and to ADB. The PCU will also prepare the quarterly Project Progress Reports including the main points of environmental monitoring and Semi-annual Integrated Safeguards Monitoring Reports in English to be submitted to ADB.

262. **Operational Phase.** The EMP monitoring during the operational phase will be undertaken by the PNP. Semi-annual reports will be submitted by the PIU to the PCU. The PCU will review the report and check the project's adherence to the EMP and then submit the Semi-annual Integrated Safeguards Monitoring Reports to ADB until the Project Completion Report (PCR) is prepared. The monitoring parameters during the operational phase, as outlined in the EMP, include monitoring of water quality at the inlet of the WTP and of treated water. **Table 18** presents the EMP Reporting Plan.

**Table 18: EMP Reporting Plan**

TYPE OF REPORT	BASIC CONTENT	PREPARED BY	SUBMITTED TO	FREQUENCY
<b>PRE-CONSTRUCTION THROUGH OPERATIONAL PHASE</b>				
Progress report	Integrated Safeguards Monitoring Report including EMP implementation and monitoring	PCU, Department of Water Supply	MPWT ADB	Semi-annual until project completion report (PCR)
<b>CONSTRUCTION PHASE</b>				
Construction Progress Report	Progress of construction, including EMP monitoring results, complaints received and actions taken	Contractor	PCU and copy furnished to PIU	Monthly
Progress Report	Progress of construction, EMP implementation, complaints received and actions taken	PIU	PCU, District Governor, Provincial Project Steering Committee	Quarterly
Progress Report	Progress of construction, safeguards (EMP and LACP) implementation, complaints received and actions taken	PCU, Department of Water Supply	MPWT, MONRE, and other national agencies ADB	Quarterly
<b>OPERATIONAL PHASE</b>				
Progress Report	Subproject progress report including EMP implementation and monitoring	PNP	PCU	Semi-annual until project completion report (PCR)
Integrated Safeguards Monitoring Report	Subproject progress report including EMP/LACP implementation and compliance with ADB's policies and regulations	PCU, Department of Water Supply	MPWT ADB	Semi-annual until project completion report (PCR)

TYPE OF REPORT	BASIC CONTENT	PREPARED BY	SUBMITTED TO	FREQUENCY
Project Completion Report	Project evaluation, lessons learnt and recommendations	PCU	MPWT ADB	After physical completion of the sub-project and before end of contract of PIA

## 11.2 Implementation Arrangements

263. **Table 19** sets out the Institutional Responsibilities for Environmental Management. The Ministry of Public Works and Transport - Department of Water Supply and the PNP are the key institutions that will play crucial roles in the implementation of the subproject as well as in ensuring the proper and timely implementation of the requisite environment safeguard reports. The succeeding sections details the administrative and environmental management responsibilities of the concerned institutions.

### 11.2.1 Department of Water Supply - Ministry of Public Works and Transport

264. The Department of Water Supply of the MPWT as Executing Agency (EA) will house the Project Coordination Unit (PCU) and will be the primary point of contact with ADB. The Department of Water Supply will head the PCU. The PCU will receive overall direction and policy guidance from a Project Steering Committee (PSC), which includes representatives of the main central level agencies, including MONRE.

### 11.2.2 Project Implementation Unit (PIU)

265. The Project Implementation Unit (PIU) at the provincial level, will be responsible to the day-to-day coordination and supervision of project implementation. The PIU is headed by the Director of the PNP. The PIU will receive support in coordinating the provincial and district agencies including the DONRE offices and take decisions on behalf of the provincial government from a Provincial Project Steering Committee (PPSC), chaired by the Provincial Vice Governor. At the district level, the District Government or Vice Governor will oversee the subproject, monitor progress, review quality of work, coordinate the subproject with the PIU and local communities and report on the progress to the PPSC.

**Table 19: Institutional Responsibilities for Environmental Management**

AGENCY	ROLE	CONSTRUCTION	OPERATION
MONRE	Overall central level supervision and guidance related to natural resources and environment	✓	✓
PCU	Overall supervision IEE preparation and implementation: Review of IEE and coordination of approvals from ADB Uploading of the IEE on MPWT website Ensuring EMP is included in contract documentation. Check the project's adherence to the EMP Review the quarterly environmental monitoring reports prepared by the PIU during the construction phase and submit the report to ADB.	✓	✓ (prior to PCR)

AGENCY	ROLE	CONSTRUCTION	OPERATION
	Review the semi-annual progress report prepared by the PNP during the operational phase and submit the report to ADB.		
PIU	Principal responsibility for EMP implementation Preparation of IEE and contract documentation Submission of IEE to ADB for approval Submission of IEE to PPSC and DONRE for reference during monitoring Conduct consultations with local residents in respect of specific sites where the proposed works will include excavation, determine the need for any further investigation and/or clearance services and submit to the PCU Monitor compliance of the contractor with the EMP Consolidate monthly environmental monitoring reports prepared by contractor through a quarterly progress report to be submitted to the PCU. Provide members of the Provincial Project Steering Committee and the District Governor with copies of the quarterly progress report	✓	✓
PIA	Advice on issues arising with EMP implementation and overall technical support	✓	✓
PPSC	Coordination of provincial and district agencies for EMP implementation during construction and operation, and ensuring compliance monitoring.	✓	✓
PNP	Participation in PIU	✓	
	Implementation of operational aspects related to water supply output in the EMP  Conduct water quality monitoring at WTP inlet, treated water, and distribution lines		✓
OPWT	Participation in PPSC	✓	
	Implementation of operational aspects related to drainage and public sanitation output in the EMP		✓
DOH	Participation in PPSC	✓	
	Participation in environmental monitoring and awareness raising		✓

Notes: PIA – Project implementation assistance; OPWT – Office of Public Works and Transport (District); DOH – District Health Office

### 11.2.3 Environmental Monitoring

266. Table 20 presents the environmental monitoring plan and performance indicators during the construction and operational phases of the subproject based on the EMP.

**Table 20: Performance Indicators for Environmental Monitoring Plan**

PARAMETERS	LOCATION	ENVIRONMENTAL PERFORMANCE INDICATOR	FREQUENCY	MEANS OF MONITORING
<b>CONSTRUCTION PHASE</b>				
Adherence to provisions in the EMP to mitigate	All subproject sites (intake, WTP, reservoir, access	Compliance with EMP	Daily	Compliance monitoring by contractor and PIU

PARAMETERS	LOCATION	ENVIRONMENTAL PERFORMANCE INDICATOR	FREQUENCY	MEANS OF MONITORING
construction impacts	roads, main and distribution network)			
Direct effects on communities from impacts such as damage to properties, dust generation, noise, and safety	All subproject sites (intake, WTP, reservoir, access roads, main and distribution network)	Views and opinions of communities and complaints received via GRM	Weekly	Through community feedback and grievance redress mechanism
Monitoring of EMP during construction/excavation, including compliance with traffic management requirements	All roads, particularly at road pipe crossings	Compliance with EMP	Daily	Compliance monitoring by contractor and PIU
Residual chlorine during pipeline and reservoir disinfection prior to commissioning	Pipeline and reservoir	Residual chlorine should be less than 2 mg/l before flushing	Prior to decommissioning	Residual chlorine testing or report on dilution activity
<b>OPERATIONAL PHASE</b>				
Wastewater management	Villages	Number of households with latrines and with water connections, population served, and billed water volume	Monthly	PNP records
Raw water source	Intake	Water abstraction rate at intake	Monthly	PNP records
Water quality of raw and treated water	Inlet of WTP	pH, turbidity	Daily	In-situ test kits
Water quality of treated water and at the distribution networks	WTP and sampling stations strategically scattered around the distribution area	After the reservoir: pH, turbidity, residual chlorine, and temperature  At locations in the distribution system: Residual chlorine, pH, turbidity  After the Clearwater tank: Chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO <sub>3</sub>	Daily  Weekly  Annually	Using portable test kits and/or analysis in laboratory
Backwash water and sediments from WTP	WTP	Schedule of backwashing and	Monthly	PNP records and site observation



PARAMETERS	LOCATION	ENVIRONMENTAL PERFORMANCE INDICATOR	FREQUENCY	MEANS OF MONITORING
		condition of detention ponds		
Occupational health and safety	WTP	Staff training on chemicals handling and monitoring of incidents	Before the start of WTP operation and throughout operation	PNP records

#### 11.2.4 Capacity Building

267. The PNP Xamneua lacks the capacity for environmental management and monitoring and water quality testing. The subproject will include equipment for a small water testing laboratory at the proposed WTP site. Regular water quality tests on the raw and treated water will help determine appropriate dosing of chemicals to be applied at the WTP as well as ensure potable water quality at the distribution lines. The PNP will receive training on the operation, calibration, and maintenance of the laboratory equipment. At the minimum, the laboratory will include portable equipment for testing of turbidity, temperature, residual chlorine and pH.. The PNP staff will also be trained on the proper and correct sampling and preservation methods for water samples that will be brought to external laboratories for analysis.

#### 11.2.5 Environmental Management and Monitoring Costs

268. The cost for the environmental safeguard activities during construction, i.e. environmental management, review, and monitoring, for the subproject will be primarily included in the civil works cost. The cost of environmental management and monitoring activities during the operational phase will be borne by the PNP, as part of operation and maintenance activities.

## 12. CONCLUSION AND RECOMMENDATIONS

269. This IEE for the Sopbao water supply and sanitation subproject was undertaken to determine the environmental issues and concerns associated with the proposed water supply system subproject. The assessment confirms that the subproject remains classified as Category B for environment based on ADB Safeguards Policy Statement (SPS, 2009). In addition, an Environmental Compliance Certificate has been provided by the provincial department of natural resources and environment with regard to the IEE and EMP, and it is appended to this document.

270. The subproject will have beneficial impacts on health and well-being of the people because of improved accessibility to potable and reliable water supply. There are also health benefits in the form of reduced incidence of diarrhea, dysentery, skin rashes, and other water-borne diseases as a result of hygiene promotion activities and improved access to safe water for the community.

271. Most of the environmental impacts are expected to occur during the construction phase. The environmental impacts are not expected to cause irreversible and significant adverse environmental impacts and are easily controllable by appropriate and conventional mitigation measures. Based on the assessment of environmental impacts, the anticipated adverse impacts during project implementation are related to nuisances which may happen during the construction of the subproject components such as temporary alienation of access, temporary disruption of community facilities, noise, and sediment runoff, release of dust and engine gas emissions. Recommendations formulated in the EMP, its inclusion in the contractual framework, and an effective inspection of construction sites will reduce these risks to an acceptable level.

272. Environmental mitigation measures have been designed as outlined in the subproject EMP to address any adverse impacts during the various phases of subproject implementation. The EMP also presents the institutional responsibilities for implementing the mitigation measures. All Subproject activities prior to construction, during construction and during operation will be managed as provided in the EMP and the Contractor's compliance and implementation of the mitigation measures shall be monitored. An environmental monitoring plan has been provided to ensure water quality is maintained according to the prevailing Lao PDR drinking water standards. In addition, grant covenants will require: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and applying good practices to treat water to acceptable Ministry of Health standards. The operations and maintenance manuals will cover operational environmental mitigation and monitoring measures in line with EHS Guidelines for Water and Sanitation.

273. The IEE concludes that the subproject combined with available information on affected environment is sufficient to identify the scope of environmental impacts of the subproject. No further environmental assessment is required if there are no significant changes in project scope and location

# APPENDICES

## Appendix 1: Rapid Environmental Assessment (REA) Checklist

**Instructions:**

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: LAO PDR: Water Supply and Sanitation Sector Project (Sopbao District Subproject)  
Sector Division: SEUW

SCREENING QUESTIONS	YES	NO	REMARKS
A. Project Siting Is the project area...			
Densely populated?		X	The service area and locations of project components are in urban town centers. These areas are not densely populated.
Heavy with development activities?		X	Development activities in the service area are limited to small sized commercial activities. Most of the area is used for residential purposes.
Adjacent to or within any environmentally sensitive areas?		X	A fisheries conservation zone (fishing exclusion) exists along the Nam Ma for the extent of the village residential area (approx. 500m) of Sopbao. No impact is expected on this zone.
Cultural heritage site		X	Not applicable
Protected Area		X	The Laeng Nam Ma Protection Forest Area occupies land on the immediate left bank of the Nam Ma river opposite the sub project villages.
Wetland		X	Not applicable
Mangrove		X	Not applicable
Estuarine		X	Not applicable
Buffer zone of protected area		X	Not applicable
Special area for protecting biodiversity		X	The Nam Et National Biodiversity Conservation Area is located 55km from the project area.
Bay		X	Not applicable
B. Potential Environmental Impacts Will the Project cause...			

SCREENING QUESTIONS	YES	NO	REMARKS
<ul style="list-style-type: none"> <li>▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?</li> </ul>	X		The Nam Ma enters the Lao PDR from Viet Nam 63km upstream from B. Sobao flowing through agricultural and rural urban areas. Historic fish-kills have been observed and said to have been caused by upstream agricultural chemical use. PNP will need to periodically monitor for potential agricultural pollutants.
<ul style="list-style-type: none"> <li>▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?</li> </ul>		X	There are no historical/cultural sites that will be affected by the project.
<ul style="list-style-type: none"> <li>▪ hazard of land subsidence caused by excessive ground water pumping?</li> </ul>		X	Not applicable.
<ul style="list-style-type: none"> <li>▪ social conflicts arising from displacement of communities ?</li> </ul>		X	Not applicable.
<ul style="list-style-type: none"> <li>▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?</li> </ul>		X	The volume extracted from the Nam Ma will not impact on water availability to other users.
<ul style="list-style-type: none"> <li>▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?</li> </ul>		X	The current condition of the raw water in Nam Ma is satisfactory.
<ul style="list-style-type: none"> <li>▪ delivery of unsafe water to distribution system?</li> </ul>		X	The subproject will ensure delivery of safe and potable water.
<ul style="list-style-type: none"> <li>▪ inadequate protection of intake works or wells, leading to pollution of water supply?</li> </ul>		X	Measures are included in the EMP to protect intake works against contamination.
<ul style="list-style-type: none"> <li>▪ over pumping of ground water, leading to salinization and ground subsidence?</li> </ul>		X	Groundwater abstraction is not proposed for this project.
<ul style="list-style-type: none"> <li>▪ excessive algal growth in storage reservoir?</li> </ul>		X	Disinfection will be undertaken to prevent algal growth.
<ul style="list-style-type: none"> <li>▪ increase in production of sewage beyond capabilities of community facilities?</li> </ul>		X	The project policy will ensure that households have pit latrines before connecting to the water supply system. The drainage and sanitation concerns will be addressed in the VEI component of WSSP.
<ul style="list-style-type: none"> <li>▪ inadequate disposal of sludge from water treatment plants?</li> </ul>		X	Back wash water from sand filters and sludge resulting from the WTP process will be piped into detention pond and clarified water discharged into a drainage pipe. Sludge will be removed from the retention pond periodically and disposed off to agricultural land as soil conditioner.
<ul style="list-style-type: none"> <li>▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?</li> </ul>		X	Noise control measures are included in the EMP.
<ul style="list-style-type: none"> <li>▪ impairments associated with transmission lines and access roads?</li> </ul>		X	Installation of pipelines will affect access of vehicles and passersby. A management plan is included in the EMP.
<ul style="list-style-type: none"> <li>▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.</li> </ul>		X	The WTP will include a chlorination and coagulation which needs proper chemical storage and handling system to avoid health hazards.
<ul style="list-style-type: none"> <li>▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological</li> </ul>		X	Workers and staff of the WTP will be oriented on the proper handling of coagulants and chlorine.

SCREENING QUESTIONS	YES	NO	REMARKS
and physical hazards during project construction and operation?			
▪ dislocation or involuntary resettlement of people?		X	Not applicable
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Not applicable
▪ noise and dust from construction activities?		X	Noise and dust may be generated during the construction of the subproject components (intake, WTP, and secondary mains). Mitigating measures are incorporated in the EMP.
▪ increased road traffic due to interference of construction activities?		X	Some roads may be blocked during construction of drainage and pipe laying. Also, the movement of vehicles carrying construction materials along the narrow roads to the subproject component sites may cause disturbances. Appropriate management of traffic are incorporated in the EMP.
▪ continuing soil erosion/silt runoff from construction operations?		X	Temporary silt runoff from excavation activities may be generated. Silt traps and other measures to control sediment flow into rivers are included in the EMP.
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		X	O&M training will be provided to the operators of the WTP and water distribution system resulting preventing delivering of unsafe water.
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		X	Polyaluminium Chloride (PAC) will be used as primary coagulant to maintain pH above 7.2.
▪ accidental leakage of chlorine gas?		X	Powder chlorine will be used.
▪ excessive abstraction of water affecting downstream water users?		X	Abstraction will be limited to the capacity of the WTP.
▪ competing uses of water?		X	The Nam Ma has generous all year round flow and the extracted maximum volume (800m <sup>3</sup> /day) to service the towns will not impact on water availability for other users.
▪ increased sewage flow due to increased water supply		X	Improvement in water supply may result to increased water consumption and therefore increase the volume of sewage. Households will be required to have a pit latrine with soakaways if needed for connecting to the water supply system.
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	X		There is potential increase in sullage with improvement in water supply. Drainage improvement measures will be provided as part of the VEI activities.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Not applicable

SCREENING QUESTIONS	YES	NO	REMARKS
<ul style="list-style-type: none"> <li>▪ social conflicts if workers from other regions or countries are hired?</li> </ul>		X	PIU and contractor will be required to hire qualified locals during construction and operation.
<ul style="list-style-type: none"> <li>▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?</li> </ul>		X	Not applicable
<ul style="list-style-type: none"> <li>▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?</li> </ul>		X	Not applicable

## A CHECKLIST FOR PRELIMINARY CLIMATE RISK SCREENING

Country/Project Title: LAO PDR: WATER SUPPLY AND SANITATION SECTOR PROJECT  
 SUBPROJECT: SOPBAO DISTRICT

Sector : WATER SUPPLY

Subsector:

Division/Department: SEUW

SCREENING QUESTIONS		SCORE	REMARKS <sup>16</sup>
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	The Nam Ma river has not dried up even during the dry months. The WTP and tank are located in elevated areas and will not be affected by extreme floods.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Design of intake needs to consider highest and lowest flows of the river and rainfall intensity. River level assessments will be undertaken as part of the monitoring plan.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	

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Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	
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Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Total score is 1 thus LOW RISK

Other Comments:

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Prepared by: \_\_\_\_\_

## Appendix 2: Ministry of Public Health Drinking Water Quality Standards (2014)


PARAMETER	UNIT	PERMISSIBLE LIMITS	EXCEPTIONS	MONITORING FREQUENCY		
				WEEKLY	MONTHLY	YEARLY
<b>MICROBIAL</b>						
E. Coli	Units / 100 mL	<0	-		✓	
<b>CHEMICAL</b>						
Aluminium (Al)	mg/l	<0.2	There is no exception if aluminum-based coagulants are used		✓	
Arsenic (As)	mg/l	<0.01	There is no exception if source is groundwater			✓
Chloride Cl <sup>-</sup>	mg/l	<250				✓
Chlorine Cl <sub>2</sub> (free residual)	mg/l	0.1 – 2	There is no exception if chlorine is used for disinfection	✓		
Copper (Cu)	mg/l	<2	There is no exception if copper pipe work is used			✓
Cyanide (Cn)	mg/l	<0.5	There is no exception if source is surface water and catchment includes gold mining / processing			✓
Fluoride (F)	mg/l	<1.5	There is no exception if source is groundwater or fluoride is added to water in the treatment process			✓
Iron (Fe)	mg/l	<0.3				✓
Lead (Pb)	mg/l	<0.01				✓
Manganese (Mn)	mg/l	<0.1				✓
Mercury (Hg)	mg/l	<0.006				✓
Nitrate (NO <sub>3</sub> <sup>-</sup> )	mg/l	<50		✓		
Nitrite (NO <sub>2</sub> <sup>-</sup> )	mg/l	<3		✓		
Sodium (Na)	mg/l	<200				✓
Sulfate ion (SO <sub>4</sub> <sup>2-</sup> )	mg/l	<250				✓
Zinc (Zn)	mg/l	<3				✓
<b>PHYSICAL</b>						
Colour	TCU	<5		✓		
Taste		Acceptable		✓		
pH		6.5-8.5		✓		
Conductivity	uS/cm	<1000				✓
Turbidity	NTU	<5		✓		
Total hardness as CaCO <sub>3</sub>	mg/l	<300				✓


### Appendix 3: Sopbao Consultations Summary

#### Summary on FS and IEE during feasibility implementing phase (1<sup>st</sup> Round Consultations)

Consultations for the Feasibility Study and Initial Environmental Examination were held between the 24<sup>th</sup> and 26<sup>th</sup> July 2017. The team was led by the Environmental Specialist, Mr Cliff Massey with Mr. Thanongsith Pathoumthong (Mr. Sith), Environmental Engineer from Lao Consulting Group (LCG) and supported by Mr. Somnouk Sangthong, Deputy Head of PNP, Xamneua Province. Over the course of the site visit the Environmental Team met with district and provincial departments of DPWT, PNP, MONRE, Provincial State Enterprise (UXO) and the Department of Irrigation. Some informal consultations were also held with local residents of Sopbao village and Xamneua.


The intention of the consultations was to inform the government representatives of the FS and IEE process and be updated on potential environmental risks the project may cause during construction and operations phase. The consultations allowed the Environmental Team to be informed of local conditions that might influence final design, and to gather information and data on local environmental aspects, such as protected areas, water quality, vegetation and hazards (land stability, UXO etc.), and current water uses and issues. The outcomes from the consultations and along with data collected have been shared with the town water supply design team who have factored this information into design options.


FS and IEE Development Phase: Environmental Examination related Consultation for Water Supply Component				
DATE	TYPE OF MEETING AND LOCATION	AGENCY	PARTICIPANTS	DISCUSSION / RESPONSES / OUTCOMES FOLLOW-UP ACTIONS WITH RESPONSIBILITY
24 July 2017	IEE Kick Off Meeting Xamneua Department of Public Works and Transport 08.30-10.30 	<ul style="list-style-type: none"> <li>▪ DPWT</li> <li>▪ PNP</li> </ul>	<ul style="list-style-type: none"> <li>▪ PIU/PNP;</li> <li>▪ DPWT;</li> <li>▪ LCG</li> <li>▪ DONRE</li> </ul>	Participants By sex: - 0 female - 7 male  <b>Presentation:</b> <ul style="list-style-type: none"> <li>• General introductions</li> <li>• Specific description on WTP for Xamneua and Sopbao;</li> <li>• Explanation of ADB policy and Lao policy on entitlement and eligibility;</li> <li>• Introducing of IEE and FS process</li> <li>• Explanation on data to be collected and locations</li> <li>• Subproject related briefing on possible environmental impacts, temporary / permanent.</li> </ul> <b>Comments – Questions – Answers:</b> <ul style="list-style-type: none"> <li>• Gov. staff stressed the importance of WTP;</li> <li>• Participants well understood the project environmental impacts and benefits</li> </ul>
25 July 2017	IEE Kick Off Meeting Sopbao District Department of Public Works and Transport 9.30 – 11.00	<ul style="list-style-type: none"> <li>▪ DPWT</li> <li>▪ PNP</li> </ul>	<ul style="list-style-type: none"> <li>▪ PIU/PNP;</li> <li>▪ LCG</li> <li>▪ DONRE</li> </ul>	Participants By sex: - 0 female - 6 male  <b>Presentation:</b> <ul style="list-style-type: none"> <li>• General introduction into topic;</li> <li>• Specific description on WTP for Sopbao;</li> <li>• Explanation of ADB policy and Lao policy on entitlement and eligibility;</li> <li>• Introducing of IEE and FS process</li> <li>• Explanation on data to be collected and locations</li> <li>• Subproject related briefing on possible environmental impacts, temporary / permanent.</li> </ul>



FS and IEE Development Phase: Environmental Examination related Consultation for Water Supply Component					
DATE	TYPE OF MEETING AND LOCATION	AGENCY	PARTICIPANTS		DISCUSSION / RESPONSES / OUTCOMES FOLLOW-UP ACTIONS WITH RESPONSIBILITY
					<p><b>Comments – Questions – Answers:</b></p> <ul style="list-style-type: none"> <li>• Gov. staff stressed the importance of WTP;</li> <li>• Participants well understood the project environmental impacts and benefits</li> <li>• Discussion on historical fish kills and issues on water quality. Cyanide to be tested in water samples</li> </ul>
26 July 2017	<p>IEE assessment of potential UXO risks of the two sub projects. PNP Office, Xamneua</p> <p>9.00 – 10.00</p> 	<ul style="list-style-type: none"> <li>▪ UXO</li> </ul>	<ul style="list-style-type: none"> <li>▪ PNP</li> <li>▪ LCG</li> <li>▪ UXO</li> </ul>	<p>Participants</p> <p>By sex:</p> <ul style="list-style-type: none"> <li>- 1 female</li> <li>- 6 male</li> </ul>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• General introduction into topic;</li> <li>• Specific description on WTP for Xamneua and Sopbao;</li> <li>• Explanation of ADB policy and Lao policy on entitlement and eligibility;</li> <li>• Introducing of IEE and FS process</li> <li>• Explanation on data to be collected and locations</li> <li>• Subproject related briefing on possible UXO</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <ul style="list-style-type: none"> <li>• UXO unlikely to be an issue because all sites are already in modified environments.</li> </ul>

### Summary of the Land Acquisition and Environmental Impact Assessment 2<sup>nd</sup> Round Consultations



- Between the 16<sup>th</sup> and 23<sup>rd</sup> October 2017 meetings took place in Xamneua District Natural resource and Environmental Office with project affected people of the Xamneua subproject .
- All twelve villages of sub project were engaged. These include Xamneua, Nathong, Phoukham, Navieng, Phanxay, Naliew, Nanongboua, Thadmouang, Phoxay, Nathongjong, Nasakang, and Misouk.
- Between the 23<sup>rd</sup> and the 24<sup>th</sup> October 2017 meetings were held in the Sopbao District subproject villages of in Ban. Sopba ; Ban. Phiengxay; Ban. Mouanghome; Ban. Hatsane and Ban. Soplong.
- Land acquisition and environmental impact issues were combined in the consultations process. Public Information Brochures on both subjects were provided to all participants as part of the consultation process.
- Topics discussed included: project scope, timing, environmental issues, cut-off date, water supply system, connection policy, installation of meters, pipe laying, temporary impacts, intake sites, water quality, protection of forests and water sources.



SUMMARY OF CONSULTATIONS OUTCOMES				
DATE	TYPE OF MEETING AND LOCATION	FACILITATOR	PARTICIPANTS	DISCUSSION / RESPONSES / OUTCOMES FOLLOW-UP ACTIONS WITH RESPONSIBILITY
16 Oct 2017	<p>District coordination and consultation meeting on LARC and Environmental (Assets loss, etc.)</p> <p>at Natural Resource and Environmental District Office</p> <p>08.30 -9.:25 AM</p> 	<ul style="list-style-type: none"> <li>PIU</li> <li>District</li> <li>PIA</li> </ul>	<ul style="list-style-type: none"> <li>PIU</li> <li>District authorities</li> <li>PIA</li> </ul> <p>7 participants</p> <p>By sex:</p> <p>- 7 female</p> <p>By Ethnic Group:</p> <p>- Lao: 6</p> <p>- Hmong: 1</p> <p>Male 7</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>General introduction into topic, specific description on LAC, Environmental and explanation on surveys;</li> <li>Handing out Lao Public Information Booklets ;</li> <li>Subproject related briefing on severe affectedness and impacts, temporary / permanent loss of assets, vulnerable groups, entitlement; no loss of land.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>Clarifying and agreeing on coordination and public consultation concerning dissemination of information and surveys</li> <li>Gov. staff stressed the importance of STWSP;</li> </ul> <p><b>Specific:</b></p> <ol style="list-style-type: none"> <li>1.1 Mr. Khamphouay Thipdavong/ Deputy of Natural resource and Environment Office. : we are understanding about project policy and people need enough for water , and how the project calculate for compensation to Aps who will be impact ?.</li> <li>1.2 Mr. Kanda Keosopha / National Resettlement Specialist: we will be following for compensation by ADB policy and Lao regulation as Degree No. 84, after detail design have done, resettlement team will be survey again focussing to APs in each subproject. and the cost to be compensation it is depend on current market price. and we are need unit rate in each subproject.</li> <li>1.3 Mr. Kanda / National Social Development Specialist &amp; Resettlement Specialist: The policy of STWSP try to avoided or reduce impact for the private land or private assets, for the</li> </ol>



					lay out pipe line it is inside the right of way, and for the Intake and WTP / Reservoirs also try to build in public land.
16 Oct 2017	<p>Village consultation meeting at Xamnuea village, Time: 9.30 -12.PM</p> 	▪ same	▪ same	<p>103 participants</p> <p>By sex: - 52 female</p> <p>By Ethnic Group: Lao : 93 Hmong: 10</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• General introduction of project features and project phases;</li> <li>• Specific description on LAC and Environmental during project construction;</li> <li>• Handing out Lao Public Information Booklets ;</li> <li>• Describing Grievance Redress Mechanism;</li> <li>• Subproject related briefing on severe affectedness and impacts, temporary / permanent loss of assets, vulnerable groups;</li> <li>• Explaining entitlement and eligibility; and Environmental will be affects during project construction phase.</li> <li>• Providing selected environmental aspects.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their willingness to cooperate with the subproject.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Mr Phonekham: Will the project use the old or new pipe?</p> <p>1.2 A. Mr. Kanda: First, the project will inspect the existing pipe. If any damage pipe, we will change the new ones.</p> <p>1.3 Q. Mr. Khambone: Is there any compensations when it finishes?</p> <p>1.4 Q. Mr. Lowheng; we would like the project give the compensation. Is case, there is the impact to people's asset along the road.</p> <p>1.5 A. Mr. Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.</p>


<p>16 Oct 2017</p>	<p>Village consultation meeting at Nathong village Time: 13.30-16.30 pm</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>57 participants By sex: - 30 female  By Ethnic Group: Lao Loum: 50 Tai Deng: 7</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers welcomed the project in their community.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Is there any water supply meter to change? 1.2 A. Mr Khanda: Yes, there is. In case, the old one is not in good condition. 1.3 Head of village: We would like the project extend the connection of pipe to 4 Km Gas Station. 2.1 Mr. Kanda: We will keep considering.</p>
<p>17 Oct 2017</p>	<p>Village consultation meeting At Ban. Phonkham Time: 08.30-12.00 pm</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>26 participants By sex: - 18 female By Ethnic Group: Lao Loum: 19 Hmong: 7</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their happiness of getting the water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Ms Manivaone: I am agreed. I would like to suggest anybody who has joined this public consultation meeting to distribute the message to other. Will the project use the local labour or not? 2.1 A. Mr Kanda: It depends on the company that win the bid, they will use or not. 2.2 Q. Mr Singthong (Head of village): we would like to relocate the old basin to other location because we need the villagers live there. But the new land is still state owner. 2.3 A. Mr Khamphuery: We will consider, but you should submit the letter to DONRE to get the permission and land tittle. 2.4 Q. Mr Boonma (Village committee) : we are totally to be a part of this project especially tree. We expect this project will run quickly because the volume of water is not enough. 2.5 A. Mr Somnouk: we will keep your opinion considering.</p>





<p>17 Oct 2017</p>	<p>Village consultation meeting At Ban Navieng Time: 13.30-16.30 pm</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>36 participants By sex: - 15 female  By Ethnic Group: Lao : 31 Tai Deng: 5</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers mentioned their hope for a good and reliable water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Mr Boontee: Will the project keep the old pipe or take it out? 1.2 A. Mr Kanda: We will not take it out. But we will inspect it first that it is good condition or not; then, we will connect the new one. 1.3 Q. Mr Phoonsin: In case, the fence is impacted from project? How can we do? 1.4 Q. Ms Phaengchan: Will pipe impact to the house? 1.5 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.</p>
<p>18 Oct 2017</p>	<p>Village consultation meeting At Phanxay village Time 09:00-11:30 PM</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>9 participants By sex: - 1 female By Ethnic Group: Lao : 9</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their need for a good water supply provision.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Mr Phonchid (Head of village): Could you explain the duty of village committee? 2.1 A. Mr Kanda: the village committee is the part of project to inspect and facility to run quickly and smoothly. 2.2 Q. Mr Thongmee: I am agreed, is there any the detail of pipe lay out done yet? 2.3 A. Mr Kanda: Right now, we are surveying and designing. 2.4 Q. Mr Singkham: Is there any compensation? In case, it is affected to restaurant? 2.5 A. Mr Kanda: the restaurant can still open, it is temporally impacted. 2.6 Q. Mr Phonchid (Head of village): And we need to know the detail the pipe layout to inform the impact household. 2.7 A. Mr Kanda: when we finish/ finalize the design, we will inform you later.</p>



<p>18 Oct 2017</p>	<p>Village consultation meeting at Naliew village Time 13.30-16.30 pm</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>39 participants By sex: - 20 female By Ethnic Group: Lao : 19 Tai Deng: 1 Tai Dum: 1 Khmer: 12 Hmong: 6</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers welcomed the project in their community.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Mr Senglaphone : Can the old water supply usage connect the new one ?</p> <p>2.1 A. Mr Somnouk: It depends on the meter and pipe's condition. If it is not in good condition, we will change the new one for you.</p> <p>2.2 Q. Ms Pee. Will the main pipe be connected to the north of village because there is not enough volume water?</p> <p>2.3 A. Mr Kanda: Now, we are surveying and designing the pipe layout. We expect all villagers can use the water supply service.</p>
<p>19 Oct 2017</p>	<p>Village consultation meeting at Ban Nanongboua Time 09:00-11:30 PM</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>39 participants By sex: - 17 female By Ethnic Group: Lao : 27 Hmong: 12</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers welcomed the project in their community.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Head of village: After they finish the construction, will they will fix the damage or not?</p> <p>1.2 A. Mr Kanda: Sure, they will fix it. But it will spend few days to check the quality of new pipe.</p> <p>1.3 Q. Ms Sengngen: we hope the project construction will avoid the impact to our slop construction and belong the road especially Khoumsabieng Zone.</p> <p>1.4 A. Mr kanda: For this issue, we will pay more attention to avoid the impact. So the coordination is very important between village committee and survey team.</p>
<p>19 Oct</p>	<p>Village consultation meeting</p>	<p>▪ same</p>	<p>▪ same</p>	<p>114 participants</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul>



2017	at Ban Thadmouang Time 13.30-16.30 pm 			By sex: - 51 female By Ethnic Group: Lao : 88 Tai Deng: 11 Tai Dum: Khmer: 5 Hmong: 10	<b>Comments – Questions – Answers:</b> <b>General:</b> <ul style="list-style-type: none"> <li>• Villagers welcomed the project in their community.</li> </ul> <b>Specific:</b> 1.1 Q. Mr Vanhsy: 2% of compensation will be paid to affected persons or not? In case, it is high value. 1.2 Q. Mr Viengphet: In case, how will the project do if the lay out pipe line inside the villager's garden? 1.3 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you. 1.4 Q. Mr Phien Lattanavong: Do you have any suggestions? In case, I bought a house after the project has closed and I have not installed the water supply meter in AT District. 1.5 A. Mr Kanda: you can contact with AT Water Supply District, will they still have free policy for you or not. But for this new project, village will receive the free installation as one meter per one family book, so all of villagers should prepare yourself by having own family book.
20 Oct 2017	Village consultation meeting At Phoxay vllage Time 9:15-11:30 AM 	▪ same	▪ same	26 participants By sex: - 15 female By Ethnic Group: Lao : 23 Hmong: 3	<b>Presentation:</b> 2 Same as above. <b>Comments – Questions – Answers:</b> <b>General:</b> 3 Villagers showed their happiness of getting the water supply. <b>Specific:</b> 3.1 Q. Ms Aieng: How will the project do? In case, it is impacted type of erosion control, concrete, etc.. 3.2 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you. 3.3 A. Mr Phommathone: we have spent the old pipe long time ago. Will it be changed the new one or not? 3.4 A. Mr Kanda: we will inspect it first that it is good condition or not; then, we will connect the new one.


					<p>3.5 Mr Vongekham: now volume of water supply is not enough. So I am totally agreed with this project and need it start the construction quickly.</p> <p>3.6 Ms Phouangchai: No problem, thank you for this good project.</p>
20 Oct 2017	<p>Village consultation meeting At Ban Nathongjong Time 13:45-16:00 PM</p> 	▪ same	▪ same	<p>21 participants</p> <p>By sex:</p> <p>- 12 female</p> <p>By Ethnic Group:</p> <p>Lao : 21</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their satisfaction of getting the water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Ms Phaungvanh : if the lay out pipe line passes any household, we would like the developer project coordinate with the own land.</p> <p>1.2 Q. Mr Salee: For cutting tree, I do not have any problem. I am interesting that “will villagers connect to their house by themselves or not?”</p> <p>1.3 A. Mr Kanda: the project will connect only from the main pipe to the meter in your house. But you need to connect by yourself from meter to your apart of building.</p> <p>1.4 Q. Mr Singkham: Will project give the compensation to tree, asset, etc. or not?</p> <p>1.5 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.</p> <p>1.6 Q. Ms Khamphout: when completed the project, will it be the PIU or not?</p> <p>1.7 Mr Did: I need to remove my water supply meter. How can I do?</p> <p>1.8 A. Mr Somnouk: Yes, it is one project. You can contact PIU directly, then, we will inspect and remove for you.</p>
21 Oct 2017	<p>Village consultation meeting At Ban Nasakang</p>	▪ same	▪ same	<p>112 participants</p> <p>By sex:</p> <p>- 49 female</p> <p>By Ethnic Group:</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their satisfaction of getting the water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Ms Bunsy: Will upper land house be able to use water supply or not?</p>

				<p>Lao : 74</p> <p>Tai Deng: 4</p> <p>Tai Dum: 3</p> <p>Khmer: 25</p> <p>Hmong: 6</p>	<p>1.2 A: Mr Kanda: Now we are designing and surveying. We hope every zone will be able receive the water supply.</p> <p>1.3 Q. Mr New: When will the project start the construction?</p> <p>1.4 A. Mr Kanda: the end of 2018.</p> <p>1.5 Q. Mr Thongsawat; Will this new project be as same as the old one?</p> <p>1.6 A. Mr Kanda: this one will be able to produce more water supply than the old one.</p> <p>1.7 Q Ms Fongseng: Will villager pay to pipe installation or not?</p> <p>1.8 A. Mr kanda: No, villagers do not pay because it is the project's policy.</p>
21 Oct 2017	<p>Village consultation meeting</p> <p>At Ban Misouk</p> 	▪ same	▪ same	<p>108 participants</p> <p>By sex:</p> <p>- 49 female</p> <p>By Ethnic Group:</p> <p>Lao : 100</p> <p>Tai Deng: 2</p> <p>Khmer: 4</p> <p>Hmong: 2</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their satisfaction of getting the water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q. Mr Singtham: Will villager pay to pipe installation or not? And how will the project do when it impacts to fence or other asset?</p> <p>1.2 A. Mr kanda: No, villagers do not to pay because it is the project's policy. For the lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.</p> <p>1.3 Q. Mr Sonechan: if villagers install the pipe before the project construction, will we have to pay or not?</p> <p>1.4 A. Mr Kanda: yes, you have to pay. But it is free while the project starts the construction phase.</p> <p>1.5 Q. Mr Phuiy Inthala: can I remove the location of water supply meter?</p> <p>1.6 A. Mr Somnouk: Yes, you can contact PIU any time. They will inspect and calculation for you.</p> <p>1.7 Mr Maichan; I would like to share my opinion that: the developer project should follow up closely for standard</p>



					construction especially the equipment and pay attend about the asset data collection.
23 Oct 2017	Village consultation meeting At Ban Sopbao 	▪ same	▪ same	171 participants By sex: - 84 female By Ethnic Group: Lao : 93 Tai Deng: 48 Tai Dum: 17 Khmer: 1 Hmong: 12	<b>Presentation:</b> • Same as above. <b>Comments – Questions – Answers:</b> <b>General:</b> • Villagers expressed their satisfaction of getting the water supply. <b>Specific:</b> 1.1 Q. Mr Khammon: I am very agreed with this project. I will give collaboration with this project for quickly construction. 1.2 Q. Ms Xieng: How long will the project start? 1.3 A. Mr Kanda: it will start about the end of 2018.
23 Oct 2017	Village consultation meeting At Ban Soplong 	▪ same	▪ same	43 participants By sex: - 15 female By Ethnic Group: Lao : 2 Tai Deng: 41	<b>Presentation:</b> • Same as above. <b>Comments – Questions – Answers:</b> <b>General:</b> • Villagers expressed their satisfaction of getting the water supply. <b>Specific:</b> 1.1 Q. Mr Buaphone: we would like you explain what villagers has to give or pay ? For example: clear the area of water supply location. 1.2 Q. Mr Syvone: we are worry about the impact to our house. 1.3 A. Mr Kanda: When it is in construction phase, villagers just give convenience. The contractor will work all tasks. For the second question, the lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.

<p>23 Oct 2017</p>	<p>Village consultation meeting At Ban Phiengxay</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>49 participants By sex: - 27 female By Ethnic Group:  Lao : 3 Tai Deng: 44 Khmer: 1 Hmong: 1</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their satisfaction of getting the water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Q.Mr Viengsavath: In case, it is high value such as tree, garden, etc. Will the project compensate or not? 1.2 A. Mr Kanda: the lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.</p>
<p>24 Oct 2017</p>	<p>Village consultation meeting At Ban Mouanghome</p> 	<p>▪ same</p>	<p>▪ same</p>	<p>50 participants By sex: - 18 female By Ethnic Group:  Lao : 50</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their satisfaction of getting the water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 We are totally agreed in this project. We do not have any problem.</p>
<p>24 Oct 2017</p>	<p>Village consultation meeting</p>	<p>▪ same</p>	<p>▪ same</p>	<p>24 participants By sex: - 4 female By Ethnic Group:  Lao : 2</p>	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>• Same as above.</li> </ul> <p><b>Comments – Questions – Answers:</b></p> <p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Villagers expressed their satisfaction of getting the water supply.</li> </ul> <p><b>Specific:</b></p> <p>1.1 Head of village said that this will be our first time to have the</p>

	<p>At Ban Hatsane</p> 			<p>Tai Deng: 22 Tai Dum: 3</p>	<p>Water supply system. For previously, we were affected from disease in water. So we are totally agreed.</p>
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**CONDUCTE WORKSHOP ON IEE (JULY 2017)**

**SOPBAO DISTRICT DPWT OFFICE**

**TIME 09.30 – 11.00, PARTICIPANTS 6 MALES**



ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ  
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ລ/ດ	ຊື່ ແລະ ນາມສະກຸນ	ມາຈາກພາກສ່ວນ	ຕໍາແໜ່ງ	ລາຍເຊັນ	ເບີໂທ	ໝາຍເຫດ
1	Thamongsith Rithoumlong	WOSP	NES	<i>[Signature]</i>	5460 3579	
2	ທ. ພິດສາວ ພິດສາ	ເອ/ວ/ວັດຖຸ	ໜ/ໜ PTU	<i>[Signature]</i>	92 3267227	
3	ທ. ວິໄລ ງິດວິໄລ	ອຮ/ອຮ ມີຕີ	ອຮ/ PTU	<i>[Signature]</i>	8240888 3	
4	ທ. ສິລິນທະ	ວັດຖຸ	ອຮ/ວັດຖຸ PTU	<i>[Signature]</i>	55333228	
5	ທ. ສິລິນທະ ສິລິນທະ	ອຮ/ ອຮ ມີຕີ	ອຮ PTU	<i>[Signature]</i>	58887370	
6	Chiff Massey	Environ. Special	LCG	<i>[Signature]</i>	23686355	
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ວັນທີ: 25/07/2017  
 ຜູ້ປຸ້ມທຶກ

**CONDUCTED WORKSHOP ON FS AND IEE – UXO RISK (JULY 2017)**

**XAMNEUA PROVINCE PNP OFFICE**

**TIME 09.00 – 10.00, PARTICIPANTS 6 MALES 1 FEMALE**

ບັນທຶກລາຍຊື່ຜູ້ເຂົ້າຮ່ວມ ກອງປະຊຸມວຽກງານສິ່ງແວດລ້ອມ, ມ້າປະປາ ແລະ ສຸຂະພິບານຕົວເມືອງນ້ອຍ

ຄັ້ງວັນທີ 26/07/2017

ລ/ດ	ຊື່ ແລະ ນາມສະກຸນ	ມາຈາກພາກສ່ວນ	ໜ້າທີ່ຮັບຜິດຊອບ	ເບີໂທ	ລາຍເຊັນ
1	Mr. Thanongsith (Sith)	WSSP	NES-LEG	5460 3679	
2	Cliff Massey	Environ. Specialist	LEG	23686355	
3	Mr. Sangkane WAI	NPP HP	o WSP	29225247	
4	ວ. ພິດ ຊິງຊິງ	ປັກ ລວມ	ຮຽນລວມ	23851982	
5	ທ. ສິມມາ ຊິງກຸງ	ຊັກ ມ ປປ	S PIU	5288 0370	
6	ທ. ເກີດສິວ ພິງສິງ	ພ/ພ ຍາກ	ເກ/ພ PIU	223247227	
7	ທ. ລາຍພິດ ພິງສິງ	ໄຮ້ປັງ	ຊັງ ຊັງ	55665043	
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ຜູ້ບັນທຶກ

## Appendix 4: Checklist for Project Environmental Safeguards Monitoring

### 1. INTRODUCTION AND PROJECT OVERVIEW

<b>PROJECT NUMBER AND TITLE:</b>	
<b>REPORTING PERIOD:</b>	<p>This section can include, among others, the following:</p> <ul style="list-style-type: none"> <li>• Activities of Proponent</li> <li>• Progress of Work (% physical completion)</li> <li>• Changes of Surrounding Environment</li> <li>• Status of Permits</li> </ul>
<b>MONITORING PERIOD COVERED</b>	
<b>KEY SUB-PROJECT ACTIVITIES IMPLEMENTED SINCE LAST REPORT:</b>	
<b>REPORT PREPARED BY:</b>	

### 2. ENVIRONMENTAL PERFORMANCE MONITORING

#### A. STATUS OF COMPLIANCE WITH EMP REQUIREMENTS (ENVIRONMENTAL PERFORMANCE)

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
<b>I. PRE-CONSTRUCTION PHASE</b>			
<p><u>Impact on land acquisition and community assets</u></p> <p>Loss of community assets due to land acquisition and damage to properties.</p>	<p>Implement the land acquisition and compensation plan that was approved by the ADB for the subproject.</p> <p>Design access roads to minimum necessary width and installation of pipelines within the Right-of-Way when feasible.</p>	<p>External LACP monitoring report</p>	
<p><u>Impact of location of raw water intake on other water users</u></p> <p>Downstream river uses such as irrigation, bathing, washing, and fishing will be affected if excessive water abstraction will occur.</p>	<p>The abstraction rate for the water supply subproject will be limited to the 800 m<sup>3</sup>/day capacity of the WTP. There is minimal conflict with other water users of Nam Ma because there is still enough water in the river that will meet the irrigation demand and other river uses at the downstream.</p>	<p>River level assessments at the intake on a monthly basis</p>	
<p><u>Impact to Natural resources and protected areas</u></p> <p>Impact on natural resources and protected areas from cutting/clearing of trees and other vegetation.</p>	<p>Cutting of trees will be undertaken as per approved design and only upon approval. Avoid cutting of trees as much as possible and minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash in accordance with the approved Land Acquisition and Compensation Plan</p>	<p>N/A</p>	
<p><u>Impact on Historical and Archaeological Sites</u></p>	<p>The Contractor will ensure that the workforce are briefed that in the event</p>	<p>Accidental finds</p>	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
<p>Damage to relics and artifacts during the conduct of the works.</p>	<p>of accidental finds relics they should immediately cease any works in the area and promptly report the find to their supervisor.</p>		
<b>II. CONSTRUCTION PHASE</b>			
<p><u>Temporary disruption of existing community roads, pathways, and accesses</u></p> <p>Pipe laying will cause temporary disruption of community services and access to properties.</p> <p>Particularly at pipe road crossings, construction activities along narrow roads may lead to temporary blockage or closure of roads and hamper movement of vehicles and people in the community.</p> <p>Community access to areas in the vicinity of the WTP, pump station, reservoir, and intake will be affected.</p> <p>Community access to areas in the vicinity of schools, temples, village offices, market places and meeting halls will be affected during construction of public latrines.</p>	<p>Walking access will be maintained to affected properties and access routes will be temporarily lined with timber or similar material. Particular attention will be given to ensuring safety along roads and paths used by school children.</p> <p>Side street parking of construction vehicles on prolonged basis will not be allowed.</p> <p>Install barriers and safety warning signs on road sections and if necessary deploy traffic aides/ flag persons at affected locations. Information boards at blocked roads will provide information about the temporary closure of roads, schedule of works and the traffic-rerouting plan.</p> <p>Require the contractor to immediately rehabilitate the excavated areas and any damaged road and path sections.</p> <p>Enclose the WTP; pump station, reservoir, and intake perimeters so that pathway use and stream access remains unimpeded.</p> <p>Enclose the latrine construction site to prevent access and limit disruption for the use of the schools and public buildings.</p>	<p>Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports.</p> <p>Report any complaint received from the community to PIU.</p>	
<p><u>Air pollution</u></p> <p>Dust and air emissions from earthworks and movement of vehicles can pose nuisance to nearby communities</p>	<p>Require the contractor to cover materials with tarpaulin or other suitable materials while in transit to avoid spillage of materials.</p> <p>Moisten earthen roads during dry and dusty conditions, particularly roads near residences and through the town core area.</p> <p>Impose speed limits on construction vehicles.</p> <p>Conduct regular maintenance on construction equipment and vehicles to control air emissions during vehicle operation.</p>	<p>Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports.</p> <p>Report any complaint received from the community to PIU.</p>	
<p><u>Noise</u></p> <p>Operation of construction equipment such as jackhammer</p>	<p>Limit construction activities, particularly operation of noise generating equipment at night.</p>	<p>Include EMP in bid documents and contract.</p>	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
will cause excessive noise resulting in nuisance to communities.	<p>Position any stationary equipment that produce high noise levels such as diesel generators as far as practical from sensitive receptors.</p> <p>Erect temporary barriers around construction sites especially near schools, hospitals, and houses.</p> <p>Install noise suppression devices to noise generating equipment.</p> <p>Require drivers to minimize blowing of horn and to comply with speed limits.</p> <p>Provide information to community on schedule of construction activities through billboard/signs.</p>	Report any complaint received from the community to PIU.	
<p><u>Impact of borrow materials</u></p> <p>Quarrying of aggregates on Nam Ma river will cause siltation and affect the ecological condition of the river.</p>	<p>The contractor will be prohibited from quarrying materials directly from Nam Ngiep.</p> <p>Construction materials will be procured from Government-permitted sources / suppliers only.</p>	<p>Include EMP in bid documents and contract.</p> <p>Report any complaint received from the community to PIU.</p>	
<p><u>Impact on ecological resources</u></p> <p>Construction workers may undertake hunting of wildlife and cutting of wood upstream of the intake.</p>	The contractors will prohibit activities such as cutting wood for cooking, hunting, or wildlife trade.	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	
<p><u>Clearing of vegetation</u></p> <p>Poor planning and execution of tree clearing/vegetation removal at project facilities and along pipeline alignments can result in loss of vegetation and general landscape</p>	<p>Cutting of trees will be undertaken as per approved design and only upon approval of relevant authorities. Avoid cutting of trees as much as possible and minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash accordance with the approved Land Acquisition and Compensation Plan.</p> <p>Roads and paths to the intake, WTP, and reservoir will only be sufficiently wide to accommodate construction vehicles/equipment to minimize land take.</p> <p>Manual labor will be utilized in sloping terrain where use of heavy equipment would cause unnecessary damage. Steep exposed slopes will be graded and covered with bush and grass to minimize erosion.</p> <p>Implement landscaping and planting of trees/vegetation at WTP site.</p>	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
<p><u>Water pollution - Sediment runoff</u></p> <p>Sediment runoff undertaken during excavation, earthworks and grading in the rainy season will cause siltation of rivers</p>	<p>Construct silt traps, deviation channels, mounting barriers or trenches around the stockpiles of materials.</p>	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community PIU.</p>	
<p><u>Water Pollution - Worker's camp</u></p> <p>Domestic wastewater from worker's camp would result to the discharge of sewage into drainage canals.</p> <p>Unsanitary conditions at the worker's camp will occur without the provision of necessary sanitation arrangements.</p>	<p>Provide adequate water supply and temporary toilet facilities at the worker's camp.</p>	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	
<p><u>Water pollution - Generation of residual chlorine during pipeline and reservoir disinfection</u></p> <p>Prior to commissioning, disinfection will be undertaken on the pipeline and reservoir.</p> <p>Discharge of residual chlorine above the allowable limits is toxic to fish and other aquatic life.</p>	<p>Follow the recommended dosage of chlorine during the disinfection of pipes and reservoir. Discharge of water with high chlorine concentration to soil at the end of pipelines to be controlled to minimize soil erosion.</p> <p>Use chlorine test kit and use 10x15x dilution with distilled water or use high range chlorine test kit with high range tablets to detect chlorine residual before flushing.</p>	<p>Include EMP in bid documents and contract</p>	
<p><u>Generation of construction waste - Generation of excavated soil</u></p> <p>Generation of excavated materials during pipe laying and foundation works for WTP tanks and reservoirs.</p>	<p>During pipe laying, excavated material will be utilized to backfill the trench. The contractor will be required to properly reinstate the excavated trench after completion of pipe laying.</p> <p>Surplus excavated material/cut soil from construction of the WTP and reservoir will be used as backfill material for low-lying areas that have been identified by the village authority.</p>	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	
<p><u>Generation of construction wastes – Solid, Inert and Hazardous Wastes</u></p> <p>Solid wastes, inert construction wastes, and hazardous wastes during construction will result to pollution of land and receiving water bodies.</p>	<p>Provide appropriate segregation bins or areas for construction wastes.</p> <p>Secure and control storage of all hazardous materials including fuels.</p> <p>Reuse recyclable construction wastes such as wood, steel, and scaffoldings or sell to junk shops.</p> <p>Solid waste to be collected and disposed in approved disposal site of the District.</p>	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received from the community to PIU.</p>	
<p><u>Community health and safety</u></p> <p>Community may be exposed to dangers of open excavation</p>	<p>Install barricades/barriers and sturdy plate covers in open excavations during non-working time.</p> <p>Install warning signs in the area.</p>	<p>Include EMP in bid documents and contract</p> <p>Report any complaint received</p>	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
<p><u>Occupational health and safety</u></p> <p>Construction activities may pose hazards to workers because of the use of heavy equipment, lifting of heavy loads, and exposure to open excavations and chemicals.</p> <p>Potential conflict with local people will occur if migrant workers will be brought to the site.</p>	<p>Require the contractor to implement the construction health and safety plan in accordance with the World Bank EHS Guidelines (<a href="http://www.ifc.org/ehsguidelines">http://www.ifc.org/ehsguidelines</a>) as a minimum standard. The contractor will appoint an environment, health and safety officer to ensure implementation of the plan. The plan will at minimum include:</p> <ul style="list-style-type: none"> <li>• Provision of first-aid facilities readily accessible by workers.</li> <li>• Provision of personal protective equipment (PPEs) such as hard hats, gloves, rubber boots, etc.,</li> <li>• Wearing of PPEs while working onsite will be a mandatory requirement for workers.</li> <li>• Posting of safety signs/reminders in strategic areas within the construction area.</li> <li>• Installation of sufficient lighting at night.</li> <li>• Employ only trained personnel in handling chlorine during the line disinfection process.</li> <li>• Ensure that vehicle and equipment operators are properly licensed and trained.</li> <li>• Provide staff with communicable disease and HIV-related awareness training.</li> </ul> <p>The contractor will be required to provide priority hiring of qualified construction workers from the villages and to consult with the local to avoid conflict if migrant workers will be brought to the site.</p>	<p>from the community to PIU.</p> <p>Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports.</p> <p>Report any complaint received from the community to PIU.</p>	
<b>III. OPERATION PHASE</b>			
<p><u>Generation of incremental wastewater and increased burden on drainage systems</u></p> <p>Increased water supply to public buildings and households will generate additional quantities of wastewater.</p>	<p>As project policy, water connection will be provided only if the household has an approved sanitation facility to cope with the increased wastewater generated. This policy and the public awareness raising initiatives was presented to the villages under the Village Environmental Improvements (VEI) component.</p> <p>The public institution shall sign a service and management agreement before construction and have sufficient funds to maintain the facility.</p>	<p>Monitor the number of households with latrines and with water connections, population served, and billed water volume.</p> <p>Monitor that the service and management agreements are followed and facilities are properly maintained.</p>	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
<p><u>Deterioration of water quality</u></p> <p>Potential deterioration in quality of raw water supply and of treated water</p> <p>Potential risk on public health in deterioration of treated water quality due to use of poor quality treatment chemicals</p>	<p>Monitor community activities in the catchment area to check activities at the upstream that may cause contamination of raw water quality.</p> <p>Provide laboratory test equipment and training to allow the PNP to conduct regular monitoring of raw and treated water quality parameters.</p> <p>Follow O&amp;M standard operating procedures in accordance with the water treatment plant manuals.</p> <p>Use of potable grade chemicals, especially PAC, and request a Supplier product specification data sheet signed off by a reputable external laboratory.</p>	<p>Monitor the following parameters:</p> <p>Daily at the inlet to the treatment plant: turbidity, pH</p> <p>Daily after the reservoir: pH, turbidity, residual chlorine, temperature</p> <p>Weekly at several locations in the network: residual chlorine, pH, turbidity</p> <p>Annually after Clearwater tank: chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO<sub>3</sub></p>	
<p><u>High Pressure and Leaks on the Pipeline</u></p> <p>The proposed distribution network will have sections located at low elevations which may experience high water pressure which may potentially result in leakages in the line and ultimately water loss</p>	<p>This risk will be minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) use of pressure reducing valves for the rider mains, (iii) careful construction supervision by the Project Implementation Assistance Consultants PIA to ensure that pipe laying and jointing is done to the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.</p>	<p>Daily visual monitoring of pipelines.</p>	
<p><u>Disposal of backwash water and sediments from WTP</u></p> <p>Backwash water and sludge from the sedimentation tanks will be generated from the cleaning of filters and tanks. Backwash water and sludge contain high total suspended solids.</p>	<p>Filter backwash water and periodic discharges from the sedimentation tanks will be collected to a detention pond to separate the concentrated waste sludge or sediments. Land application of wastes with high dissolved solids concentrations from the detention pond is preferred over discharge to a landfill.</p>	<p>Check condition of detention ponds; report frequency/schedule of backwashing</p>	
<p><u>Occupational health and safety</u></p>	<p>Provide secure, dry and well ventilated storage facilities for chlorine and other hazardous chemicals.</p> <p>Use chlorine compounds in power form, which is safer than gas.</p>	<p>Training undertaken for staff on chemicals handling and monitoring and reporting of incidents</p>	



ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
Potential hazards to WTP workers due to accidental release of chlorine	Training of staff and allocation of responsibility to ensure that materials are properly handled..		
<u>Generation of Sludge from Detention Ponds</u>  Increased volume of sludge in detention ponds.	The sludge that will be generated from the detention ponds will be dredged and disposed as backfill material in low-lying areas to be identified by the village leaders. No land application of the generated sludge without the required approval by the village authorities.	Quarterly check on the volume of sludge in the detention ponds.	
<u>Community health and safety</u>  Potential hazards to residents and school children near the WTP site.	Facilities (Intake, WTP and Laboratory, Office and Reservoir) properly fenced and secured and watchmen/security personnel to be employed on a 24 hour basis.	Daily log of security personnel	

Summary of EMP Compliance Status: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**B. RESULTS OF ENVIRONMENTAL MONITORING**

- PNP operational report
- Complaints resolution
- EMP implementation
- Water quality
- River level
- Backwashing activities
- Training/capacity building

**C. ISSUES FOR FURTHER ACTION**

ISSUE	REQUIRED ACTION	RESPONSIBILITY AND TIMING	RESOLUTION
<b>OLD ISSUES FROM PREVIOUS REPORTS</b>			
List of EMP measures or activities not completed (last column of previous table)			
<b>NEW ISSUES FROM THIS REPORT</b>			

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### **3. CONCLUSION**

- Important results from the implementation of EMP monitoring
- Recommendations to improve EMP management, implementation, and monitoring

### **4. ATTACHMENTS**

- Permits
- Monitoring data (water quality, etc.)
- Photographs
- Maps

## Appendix 5: Semi-Annual Integrated Safeguards Monitoring Report Template

# Safeguards Monitoring Report

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# Semiannual Report

xxx {month} 20xx

Lao PDR: xxx {Project name}, xxx {sub-project name, if report covers only one sub-project}

Prepared by the Project Management Unit of {complete name of Implementing Agency} for the {complete name of the borrower} and the Asian Development Bank.

## **NOTE**

- (ii) In this report, "\$" refers to United States dollars.

This safeguards monitoring report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

# 1. EXECUTIVE SUMMARY

1. *{Read and delete: Provide short summary of the following items:*

2.

- **Summary of EMP/RP Implementation**
- **Description of monitoring activities** carried out (e.g. field visits, environment effect monitoring, survey questionnaire, public consultation meetings, focus group discussions, etc)
- **Key issues**, any **corrective actions** already taken, and any **grievances**
- Key activities planned in the next reporting period
- Recommendations

Use the paragraph numbering format provided below throughout the report}

1. xxx

2. xxx

## 2. PROJECT OVERVIEW, GENERAL SAFEGUARD MATTERS

### 2.1 PROJECT OVERVIEW

*{Read and delete: Briefly describe project objectives, scope and components – can be taken from PAM or other relevant document}*

3. xxx

4. xxx

### 2.2 PROJECT PROGRESS

*{Read and delete: Using most recent project progress report, describe status of project implementation, including full list of contracts, status of contract awarding and implementation, name of contractor, Engineer, Project Supervision Consultant.}*

5. xxx

6. xxx

**Table 1: Project Overview, Snapshot of Project Progress**

<b>Project Number and Title:</b>		
<b>Safeguards Category</b>	Environment	
	Indigenous Peoples	
	Involuntary Resettlement	
<b>Reporting period:</b>		
<b>Last report date:</b>		
<b>Key sub-project activities since last report:</b>	<p><i>{Read and delete: This section should include, among others, the following:}</i></p> <ul style="list-style-type: none"> <li>• Contract awarding</li> <li>• Progress of Work (% physical completion)</li> <li>• Status of Safeguard Approvals / Permits / Consents</li> </ul>	
<b>Report prepared by:</b>		

### **2.3 SAFEGUARD PLANS IMPLEMENTATION ARRANGEMENTS**

*{Read and delete: Describe institutional arrangements and responsibilities for EMP and RP implementation, internal and external monitoring, and reporting, defining roles of PMU, Engineer, Implementation Consultant, Contractors. (Table format as needed)}*

7. xxx

8. xxx

### **2.4 UPDATED EMPs AND RPs, INCORPORATION OF SAFEGUARDS REQUIREMENTS INTO PROJECT CONTRACTUAL ARRANGEMENTS**

*{Read and delete: Define manner by which EMP and RP requirements are incorporated into bidding documents, contracts.*

*Indicate when updated EMPs and RPs were submitted for approval to ADB (Table format appropriate).}*

9. xxx

10. xxx

### 3. ENVIRONMENTAL PERFORMANCE MONITORING

#### 3.1 STATUS OF EMP IMPLEMENTATION (MITIGATION MEASURES)

*{Read and delete: Summarize main mitigation/protection measures implemented in the reporting period (narrative section). Structure in accordance to phases (detailed design, construction preparation, construction, and operation).}*

11. xxx

12. xxx

*{Read and delete: Include EMP table or updated EMP table if applicable. Assess compliance of environmental management activities with the original or updated EMP. For that purpose, include additional columns entitled "Compliance Status", "Comment or Reasons for Non-Compliance", and "Issues for Further Action". Example is provided below.}*

**Table 2: Compliance with EMP Requirements (Environmental Performance)**

EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
Use environmental impact as main heading and EMP as listing (see example below)	Use EMP list as basis for rating/evaluating compliance (see example below)		
Rise of employment opportunities: <ul style="list-style-type: none"> <li>Job openings of the project should give priority to local communities.</li> <li>Recruitment of local laborers should be stipulated in the contract for construction</li> </ul>	<ul style="list-style-type: none"> <li>Field inspections and interviews with communities - DONE</li> <li>Note each complaint case in the field – 3 COMPLAINTS RECEIVED</li> <li>Set up grievance centre and report as part of monitoring action plan – NOT DONE</li> </ul>		

**Table 3: Issues for Further Action**

Issue	Required Action	Responsibility and Timing	Resolution

Old Issues from Previous Reports			
List of EMP measures or activities not completed (last column of previous table)			
New Issues from This Report			

### 3.2 HEALTH AND SAFETY

*{Read and delete: Provide narrative of occupational and community health and safety issues that occurred during the reporting period. Any accident involving injury or death of workers or community members must be reported. Include investigation report of DOLISA as attachment to the report. Provide details in the Table below}.*

13. xxx

14. xxx

**Table 4: Health and Safety Issues**

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			



### 3.3 ENVIRONMENT EFFECT MONITORING

15. **Monitoring plan.** xxx *{Read and delete: Present the environment effect monitoring plan as defined in the EMP or the updated monitoring plan. Refer to Table 4. Describe monitoring responsibilities}*

16. **Monitoring activities in the reporting period.** Xxx *{Read and delete: Describe the environment effect monitoring activities in the reporting period, including number of monitoring campaigns, number of samples, etc. Confirm compliance with the monitoring plan, or justify any deviation from the plan}*

**Table 4: Environment Effect Monitoring Results in the Reporting Period**

*{Read and delete: Present monitoring result in a Table (see example below, adjust as needed). Any non-compliance should be highlighted for attention and follow-up.}*

Location	Parameter	Date	Monitoring value	Relevant government standard, standard value

17. **Assessment.** Xxx *{Read and delete: Compare monitoring results with baseline conditions (if baseline data is available) and relevant government standards in qualitative terms. Additional explanatory comments should be provided as necessary. Possible reasons for non-compliance should be identified.}*

## 4. INVOLUNTARY RESETTLEMENT PERFORMANCE MONITORING

*{Read and delete: Provide narrative of status of implementation of the RP(s), including but not limited to: status of RP or Resettlement Framework updating; number of households relocated during the reporting period; outstanding resettlement activities; etc.}*

18. xxx

19. xxx

**Table 6: Summary of Compliance with RP Requirements**

RP Requirements	Compliance status Yes/No/Partial	Comment or Reasons for Compliance, Partial Compliance/Non- Compliance	Issues for Further Action <sup>17</sup>
Establishment of personnel in PMU/PIU			
Public consultation and socialization process		<p><i>Provide information on:</i></p> <ul style="list-style-type: none"> <li>• <i>Public consultation, participation activities carried out</i></li> <li>• <i>Inclusive dates of these activities</i></li> </ul> <p><i>To be elaborated on in Item 5</i></p>	
Land area to be acquired is identified and finalized			
Resettlement plan(s) updated after detailed design			
Land acquisition completed			
Establishment of Resettlement Site(s)		<p><i>Please state:</i></p> <ul style="list-style-type: none"> <li>• <i>Number of AHs to be relocated as per agreed RP</i></li> <li>• <i>Number of AHs already relocated</i></li> <li>• <i>Number of houses built</i></li> <li>• <i>Status of installation of community facilities to be provided as per agreed RP</i></li> </ul>	
Compensation payments for affected assets is completed		<p><i>Please state:</i></p> <ul style="list-style-type: none"> <li>• <i>Total Number of Eligible AHs and APs (as per agreed RP)</i></li> <li>• <i>Number of AHs and APs compensated as</i></li> </ul>	

<sup>17</sup> To be elaborated further in table 3.b (Issues for Further Action)

		<p><i>of this monitoring period</i></p> <ul style="list-style-type: none"> <li>• <i>Total Budget allocation as per agreed RP</i></li> <li>• <i>Total budget disbursed to AHs as of this monitoring period</i></li> </ul>	
Transport assistance for relocating affected households		<i>As above</i>	
Additional assistance to vulnerable affected household		<p><i>Please state:</i></p> <ul style="list-style-type: none"> <li>• <i>Total Number of vulnerable AHs and APs (as per agreed RP)</i></li> <li>• <i>Agreed forms of assistance as per RP</i></li> <li>• <i>Number of AHs and APs assisted as of this monitoring period</i></li> </ul>	
Income Restoration Program		<i>Please state progress per income restoration feature/activity and actual period of implementation</i>	
Temporary impacts have been addressed (affected properties restored to at least pre-project conditions)		<p><i>Please state:</i></p> <ul style="list-style-type: none"> <li>• <i>Total Number of AHs affected by temporary impacts as per agreed RP</i></li> <li>• <i>Actual Number of AHs and total area affected by temporary impacts (if this differs from the projected number, such as in cases of unforeseen project impacts)</i></li> <li>• <i>Status of restoring affected property</i></li> </ul>	
Capacity building activities			

**Table 7: Issues for Further Action**

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of RP activities not completed (last column of previous table)			
New Issues from This Report			

## 5. COMPLIANCE WITH SAFEGUARDS RELATED PROJECT COVENANTS

*{Read and delete: List all environment and resettlement related loan covenants, and assess project's compliance with the covenants (Table format is appropriate, with concluding statement on compliance, partial compliance or non-compliance, and corrective actions as needed)}*

Schedule	Para No.	Covenant	Remarks/Issues (Status of Compliance)
Schedule 5	xxx		Complied with / Partially complied with / Not complied with. <i>{Identify reason for partial or non-compliance}</i>

## 6. PUBLIC CONSULTATION, INFORMATION DISCLOSURE, CAPABILITY BUILDING

*{Read and delete: Describe public consultation activities during the reporting period. Confirm compliance with consultation plan defined in the IEE/EMP and the RP(s), or justify deviation from these plans. Present planned consultation activities in next reporting period. Use Tables as appropriate.}*

- Field Visits (sites visited, dates, persons met)

- Public Consultations and meetings (Date; time; location; agenda; number of participants disaggregated by sex and ethnic group, not including project staff; Issues raised by participants and how these were addressed by the project team)
- Training (Nature of training, number of participants disaggregated by gender and ethnicity, date, location, etc.)
- Press/Media Releases
- Material development/production (e.g., brochure, leaflet, posters)
- Information disclosure

## 7. GRIEVANCE REDRESS MECHANISM

*{Read and delete: Describe mechanisms established to address and redress public complaints and grievances related to social and environment safeguards. Summarize grievances received, if any, and measures implemented to redress them.}*

- Number of new grievances, if any, since last monitoring period: \_\_\_\_\_
  - Number of grievances resolved: \_\_\_\_\_
  - Number of outstanding grievances: \_\_\_\_\_
- 3.

Type of Grievance	Details (Date, person, address, contact details, etc.)	Required Action, Responsibility and Timing	Resolution
<b>Old Issues from Previous Reports</b>			
<b>New Issues from This Report</b>			

## 8. CONCLUSION

*{Read and delete: Highlight important results from the implementation of EMP and RP monitoring; recommendations to improve EMP and RP management, implementation, and monitoring; key activities planned in next reporting period}.*

20. xxx

21. xxx

## **9. ATTACHMENTS**

- Consents / permits
- Monitoring data (water quality, air quality, etc.)
- Inspection checklists
- Photographs
- Others

## Appendix 6: District IEE Environmental Compliance Certificate



Lao People Democratic Republic  
Peace Independence Democratic Unity Prosperity

Huaphan Province  
Department of Natural Resources and Environment

No: 1597/DONRE.HP  
Huaphan; Date: 5.. December 2017

### Certificate

#### Compliance On IEE, EMP, LACP for WSSP of Sopbao district

- Based on Law on Environment Protection, No. 29/NA, dated 18 December 2012.
- Based on Decree on Compensation and Resettlement of People Affected by Development Projects No. 84/PO, dated 05 April 2016.
- Based on Decree on the Environmental Impact Assessment of Lao PDR, No. 112/ PO, dated 16 February 2010.
- Based on Request Letter of Department of Public Work and Transport (DPWT) of Huaphan Province (Provincial Nam Papa, PNP) No2454/dpwt. HP, dated 05 December 2017
- Based on the Updated Initial Environment Examination (IEE) and Environmental Management Plan (EMP) for the proposed subproject works in Sopbao district town, Huaphan Province, under the Small Towns Water Supply and Sanitation Sector Project, October 2017.
- Based on the Updated Land Acquisition and Compensation Plan (LACP) for the proposed subproject works in Sopbao district town, Huaphan Province, under the Water Supply and Sanitation Sector Project, October 2017.

#### Department of Natural Resources and Environment of Huaphan Province:

1. Agree to approve the Updated Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) for the proposed subproject works in Sopbao district town, Huaphan Province, under the Water Supply and Sanitation Sector Project, October 2016.
2. Agree to approve the Updated Land Acquisition and Compensation Plan (LACP) for the proposed subproject works in Sopbao district town, Huaphan Province, under the Water Supply and Sanitation Sector Project, October 2016.
3. The subproject must be implemented in accordance with the following:
  - Take up responsibility on the study and information indicated in the study for the initial environmental examination impact and implement all solution to solve the impacts as indicated in the environmental management plan. In case of environmental problems that were not studied in the report, the subproject must take up additional responsibility to improve the EMP and provide solutions to solve these problems and ensure the budget is sufficient.
  - Take up responsibility on the study and information indicated in the study for the LACP and implement all solutions to solve all issues indicated in LACP. In case of LACP issues that were not studied in the report, the subproject must take up additional

responsibility to improve the LACP and provide solutions to solve these problems and ensure the budget is sufficient.

- More attention of waste removal from site clearance, building construction and other facilities such as: machine oil, vehicles, dust generation, erosion, natural water resources and forest protection on project area. For clearing, cleaning after construction and other activities is needed to comply to the technical specification and as approved on project boundary to avoid negative affect.
- After clearance and site working is done that should be improved and rehabilitated situation of the area to existing condition.
- In case of people affected by the subproject, they must receive reasonable and adequate compensation, based on strong community awareness and participation with regulation before implementing the subproject.
- Establish monitoring system for environmental and social impact with highly efficient reporting to project management and official management.
- Establish quarterly report concerning the environment and social impacts throughout the implementation period of the subproject, and submit the finding to the Department of Natural Resource and environment and other concerned agencies in Huaphan Province.
- The department of natural resource and environmental Huaphan Province should cooperate with other concerned agencies of Sopbao district administration to follow up on the monitoring and implementation of the EMP and LACP for Sopbao subproject works in Huaphan Province. The Project Coordination Unit shall determine the amount and source of the budget fund for monitoring and implementation of the plans, in accordance with the regulations.

This certificate is used only during project implementation of the subproject from the date of signing, will remain valid during implementation period.

**Director of DONRE  
of Huaphan Province**

Signed and Steam



**ສະຖຽນ ວັນນະສຸກີ**

CC: DONRE 2 sets  
Sopbao NREO 1 set  
DPWT 1 set  
Other related offices 1 set