Addendum to the Environmental and Social Impact Assessment (ESIA) for Improvement of Sikeut-Sikhai Section (Km 6 to Km 12) of National Road 13 North

Project Name: Lao PDR National Road 13 Improvement and Maintenance
Client: Department of Roads, Ministry of Public Works and Transport

Prepared by

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25 August 2022

BASIC PROJECT INFORMATION

Topic	Information
Project Name	Lao PDR National Road 13 Improvement and Maintenance
Title	Lao National Road 13 Improvement and Maintenance Project Addendum to the Environmental and Social Impact Assessment (ESIA) and the Resettlement Action Planning (RAP) for improvement of Sikeut-Sikhai Section (Km 6 to Km 12) of NR-13N Ministry of Public Works and Transport (MPWT) Government of Lao PDR
Executing Agency	Department of Roads, Ministry of Public Works and Transport

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AADT	Average Annual Daily Traffic
AIIB	Asian Infrastructure Investment Bank
AOI	Area of Influence
ASEAN	Association of Southeast Asian Nations
BAP	Borrow Pit Action Plan
BOD	Biological Oxygen Demand
BOQ	Bill of Quantities
CESMP	Contractors Environmental and Social Management Plan
CITES	Convention on International Trade in the Endangered Species of Fauna and Flora
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
COI	Corridor of Impact
CO_2	Carbon Dioxide
CR	Critical
DEQP	Department of Environmental Quality Promotion
DFRM	Department of Forest Resources Management
DD	Detailed Design
DoR	Department of Roads
DoT	Department of Transport
DPWT	Provincial Department of Public Works and Transport
EA	Environmental Assessment
ESIA	Environmental and Social Impact Assessment
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ELV	Emissions Limits Values
ESMP	Environmental and Social Management Plan
EN	Endangered
EPL	Environmental Protection Law
ERP	Emergency Response Plan
ESMMP	environmental and social management and mitigation plan
ESOM	Environmental and Social Operational Manual
ESD-PTI	Environmental and Social Division of the Public Works and Transport Institute
EU	European Union

Acronyms/Abbreviations	Definition
FAO	Food and Agriculture Organization
FS	Feasibility Study
GDP	Gross Domestic Product
GOL	Government of Laos
GRM	Grievance Redress Mechanism
HC	Hydrocarbons
IBA	Important Bird Area
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature and Natural Resources
LCF	Local Consulting Firm
LHS	Left Hand Side
MAC	Maximum Allowable Concentrations
MAF	Ministry of Agriculture and Forestry
MOF	Ministry of Finance
MONRE	Ministry of Natural Resources and the Environment
MPI	Ministry of Planning and Investment
MPWT	Ministry of Public Works and Transport
MSDS	Material Safety Data Sheet
NBCA	National Biodiversity Conservation Areas
NDF	Nordic Development Fund
NEC	National Environmental Committee
NES	National Environmental Specialist
NGO	Non-governmental Organization
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NSCC	National Strategy on Climate Change
NR13 North	National Road 13 North
NR13 South	National Road 13 South
OHS	Occupational Health and Safety
OP	Operational Policy
OPWT	Office of Public Works and Transport
O&M	Operation and Maintenance
PCR	Physical Cultural Resources
PDO	Project Development Objective
PDR	Peoples Democratic Republic
PMU	Project Management Unit
PM	Particulate Matter

Acronyms/Abbreviations	Definition
PM_{10}	Particulate Matter less than 10 Microns
PKK	Phou Khao Khoay
PONRE	Provincial Department of Natural Resources and Environment
PPE	Personal Protective Equipment
PPN	Phou Phanang
PPIAF	Public Private Infrastructure Advisory Facility
PPP	Public-private Partnership
PTI	Public Works and Transport Institute
RAP	Resettlement Action Plan
RHS	Right Hand Side
ROW	Right of Way
SO_2	Sulphur Dioxide
STD	Sexually Transmitted Disease
TMP	Traffic Management Plan
ToR	Terms of Reference
TSP	Total Suspended Particulate
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
UXO	Unexploded Ordnance
VU	Vulnerable
VUDAA	Vientiane Urban Development and Administration Authority
WB	World Bank
WHO	World Health Organization
WMP	Waste Management Plan

UNITS AND MEASUREMENTS

Unit	Definition
dBA	**Decibel, A-weighted**
Km	**Kilometer**
Km/h	**Kilometers per hour**
Laeq	**Equivalent Continuous Sound Pressure Level**
M	**Meter**
Mg/kg	**Milligrams per kilogram**

Unit	Definition
M3	Cubic Meter
m3/s	Cubic Meters per Second
Ppm	Parts per million
µg/m3	Micrograms per cubic meter

1.0 INTRODUCTION

1.1 PURPOSE OF THE REPORT

1. This Environmental and Social Impact Assessment (ESIA) is part of the process of compliance with the World Bank Safeguard Policies in relation to the Project.

2. The ESIA is prepared by a group of environmental and social specialists engaged by Ministry of Public Works and Transport (MPWT). The ESIA team lead by an experienced International Environmental Specialist and supported by a team of experts from Lao Consulting Group and Innogreen Engineering Ltd. The ESIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental and social effects associated with the project. More specifically, the ESIA:

- Describes the existing socio-environmental conditions within the Project area;
- Describes the extent, duration and severity of potential impacts;
- Identifies all significant impacts; and
- Formulates the mitigation actions and presents it all in the form of an Environmental and Social Management Plan (ESMP).

1.2 IDENTIFICATION OF THE PROJECT AND PROJECT PROPONENT

3. The Government of Lao Peoples Democratic Republic (GoL) through the MPWT and its Department of Roads (DoR) is implementing Lao National Road 13 (NR13) Improvement and Maintenance Project (the Original or Ongoing project) for a period, from 2018 to 2023.

4. The Original Project is jointly financed by the World Bank (WB), Asian Infrastructure Investment Bank (AIIB), and Nordic Development Fund (NDF). The Original Project primarily focuses on km 12 to km 70, a 58-km critical section of NR13 North (NR-13N).

5. During the project implementation, MPWT has requested additional support using the saved funds from the original project for rehabilitation and improvement of another critical road section (segment), namely the Sikeut-Sikhai section (about 6 km) which is an extended segment of the original NR-13N section. This 6km section is the subject of the ESIA in hand.

1.3 THE NATURE, SIZE, LOCATION, AND IMPORTANCE OF THE PROJECT

6. NR13 is the most important transport corridor in Lao PDR in terms of both domestic and regional connectivity and its upgrade, rehabilitation, and maintenance could result in significant benefits for the country. NR13 is a north-south corridor (1,500 km) and the backbone of the country that connects Lao PDR with China in the north and with Cambodia in the south. The road comprises NR13 South from Vientiane Capital to the Cambodian border (829 km) and NR13 North (671 km) from Vientiane Capital to Boten on the Chinese border. The main sections of the road were completed in 1997 and have not been rehabilitated since, receiving only periodic and emergency maintenance.

7. The MPWT is currently implementing the Lao National Road 13 Improvement and Maintenance Project (the On-going Project) with support from WB, AIIB, and NDF. This on-going project supports improvement works, and maintenance and operation of KM12 to KM70, a 58-km critical section of NR-13N. It also supports a preparation of studies, i.e., environmental, and social assessments, for future investments on other critical sections of NR13. Currently, the on-going project is under implementation, with civil works starting in January 2020. An ESIA including an ESMP and a Resettlement Action Plan (RAP) of the on-going project was prepared, cleared by the WB, and publicly disclosed in January 2018.

8. As noted above, this ESIA covers the Sikeut-Sikhai section (KM6 to KM12) of NR-13N, connecting to the road section under the ongoing project. This (approximate) 6 km section had not been included in the on-going project scope since the beginning due to budget limitation, time constraints, and government decision at time of the preparation of the ongoing project that this road section would be part of the urban transport development. However, it has now been determined that due to limited fiscal space, it is not feasible to improve this 6 km under the urban transport project. Therefore, the government has requested the financiers to consider financing improvement of this remaining 6 km under the on-going project.

1.4 SCOPE OF THE ESIA

9. The scope of the ESIA was determined initially by the Terms of Reference (ToR) for the ESIA (prepared by MPWT/DOR, developments partners provided technical advice, review and clear) and then crystalized by a scoping exercise undertaken during the Project inception phase. The main objective of ESIA is to identify and assess both Environmental and Social (E&S) risks and impacts of the proposed road extension and prepare risks and impacts management plans to be applied throughout the project life cycle in accordance with the national and WB Safeguards Policies requirements

10. Further, the on-going NR-13N works on section KM12 to KM70 provide several lessons learned to be applied to the project. Specifically, they include:

- The road design can cause flooding, efforts should be made to ensure that the designs correctly channel water away into appropriate drainage channels.
- The road must be designed to ensure adequate access to all properties and land.
- Ensure designs incorporate appropriate and adequate road crossings and road safety measures for crossings including both immediate and longer term measures with collective action taken by various parties involved (task force).
- Ensure all scarified roads are maintained during the rainy season prior to commencement of pavement works.
- Ensure traffic safety plans are comprehensive and include measures to manage the existing traffic in narrow corridors.
- Provide suitable and readable traffic safety signs and barriers. The signs should be visible day and night and sufficiently installed. Given that there is no by-pass road, installation of suitable physical demarcation between working areas and the carriageway open to traffic is a must.
- Ensure all potential community safety hazards are fenced and warning signs provided.
- Ensure Corridors of Impacts (CoIs) are clear and accurate; any changes to the CoIs required by the detailed design and design adjustments need to be clearly communicated and consulted with the PAPs/PAHs prior to beginning of the road work; this is to avoid or minimize multiple impact assessments and revisions of the RAP which could result in further delay in resettlement process and potential confusion as well as complaints to be addressed.

- Public utility relocation needs good coordination and contract preparation upfront to avoid delay of works and poor relocation planning;
- Detailed design should consider site-specific impacts to nearby residents such as accessibility, local drainage, and drainage outlet;
- The construction method used in some sensitive sections should be carefully reviewed (such as user manual work instead of the heavy machine at the location that works are carried out just adjacent to building structure);
- More stringent contractual penalties (in case of repeated non-compliance on key ES impacts that could lead to serious or severe E&S incident including road safety, community safety, and delay in work with construction materials left and excavated drainage left opened for several weeks and months due to coordination among concerns agencies) are needed.

11. The matrix below provides the initial project level scoping to identify the key significant project impacts resulting from the various project aspects based on the requirements of the ToR / Scoping and lessons learned.

Table 1: Preliminary Identification of Significant Impacts

Aspect	Physical Environment							Biological Environment			Socio-economic Environment												
	Geology	Soils	Topography	Air Quality	Climate Change	Hydrology	Geohazards	Flora	Fauna	Designated Sites	Economy and Employment	Ethnic Groups and Vulnerable People	Gender	Land Use	Social Infrastructure	Access	Infrastructure and Utilities	Cultural Heritage	Community Health and Safety	OHS	Waste Management	Noise	Vibration
Pre-construction Phase																							
Land Acquisition											**D/L**	**D/L**	**I/L**	**D/L**		**D/L**							
Construction Phase																							
Borrow Pits / Quarries		**D/S**		**D/S**				**D/L**	**D/S**	**D/S**				**D/L**			**D/S**		**D/S**	**D/S**		**D/S**	**D/S**
Batching Plants		**D/S**		**D/S**	**D/S**	**D/S**					**D/S**						**D/S**		**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
Construction Camp		**D/S**		**D/S**	**D/S**	**D/S**					**D/S**		**D/S**		**D/S**		**D/S**		**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
Storage / Laydown Areas		**D/S**		**D/S**		**D/S**											**D/S**		**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
Haul Routes				**D/S**	**D/S**											**D/S**	**D/S**		**D/S**			**D/S**	**D/S**
Site Clearance		**D/L**		**D/S**				**D/S**						**D/L**		**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
Pavement construction				**D/S**		**D/S**										**D/S**	**D/S**		**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
Relocation of Utilities																**D/S**	**D/S**			**D/S**			

Aspect	Physical Environment							Biological Environment			Socio-economic Environment												
	Geology	Soils	Topography	Air Quality	Climate Change	Hydrology	Geohazards	Flora	Fauna	Designated Sites	Economy and Employment	Ethnic Groups and Vulnerable People	Gender	Land Use	Social Infrastructure	Access	Infrastructure and Utilities	Cultural Heritage	Community Health and Safety	OHS	Waste Management	Noise	Vibration
Construction Traffic				**D/S**															**D/S**	**D/S**		**D/S**	**D/S**
Culverts & Side drains		**D/S**		**D/S**		**D/S**										**D/S**	**D/S**		**D/S**	**D/S**	**D/S**	**D/S**	
Operational Phase																							
Increased traffic				**D/L**	**D/L**						**D/L**								**D/L**			**D/L**	
Road Maintenance				**D/S**												**D/S**			**D/S**	**D/S**	**D/S**	**D/S**	

D = Direct Impact I = Indirect Impact	S = Short-term Impact L= Long term Impact		Positive Impact		Negative Impact Low Significance		Negative Impact Medium Significance		Negative Impact High Significance

1.4.1 Issues 'scoped in'

12. Based on the above matrix the following issues have been included for assessment in the ESIA:

- Soils – General construction activities could result in spills and leaks of hazardous liquids. In addition, discharge of effluents from camp sites, batching plants, etc. could impact upon soil quality. Opening of borrow pits could also impact upon productive soils, flora and fauna. Most of these impacts would be of low significance before mitigation is applied, except for borrow pits.
- Air quality – In general the key construction phase impact relating to air quality would be generation of dust through activities such as land clearance, movement of construction vehicles, rock crushing plant, etc. Combustion emissions are likely to be less significant during the construction phase but may become more of an issue in the operational phase as the number of vehicles on the road increases over the years.
- Climate Change – GHG emissions will be generated during both the construction and operational phases of the project. Climate change will have an impact on the Project itself, most likely in the form of increased frequency of extreme precipitation events. This could lead to localized flooding if the road drainage system is not designed and constructed correctly.
- Hydrology – Impacts to hydrology are likely to be relatively minor. The possibility of flooding could occur in the future if adequate drainage is not provided (as noted above).
- Flora – The main impacts to flora will be associated with any vegetation removal within the RoW, and this could include several trees. The potential does exist for impacts to flora if any new borrow pits are opened in areas where vegetation is present. The ESIA will include specific requirements to manage this issue and promote the use of existing, licensed borrow pits where possible.
- Fauna – Impacts to fauna are only anticipated in borrow pit locations and as mentioned above, the ESIA will include mitigation measures to manage this potential, but unlikely issue.
- Economy and Employment – In general impacts to the economy will be beneficial in the long term as the road increases traffic flow and the movement of people and goods around the city. During the construction phase jobs will be created, both directly and indirectly. However, some residents and businesses close to the roadside will be affected economically as access to businesses is interrupted and traffic delays occur. The RAP will outline compensation to be paid for disruption of commercial activity during construction and also the resettlement process and livelihood and transition support if required for PAPs/PAHs.
- Vulnerable People and Gender – Land acquisition has the potential to impact women and vulnerable people more significantly than others.
- Land Use – Land use within the corridor will undergo some changes as the road is widened. There will be less opportunity for informal selling on the roadside, for example.
- Infrastructure and Utilities – Water supply, electricity distribution, sewage networks, communications networks, etc., could all be present within the RoW and construction activities may lead to their temporary disruption.
- Cultural Heritage – Temples, cemeteries, and sacred trees, could be present within the RoW, and impacts to these sites must be minimized or avoided.
- Community Health and Safety – Construction zones and construction vehicles represent a significant risk to community safety. Further, the presence of construction workers could lead to the spread of infectious disease such as COVID and HIV/AIDS.
- Occupational Health and Safety – Construction of the road including site clearance and utilities relocation involves inherent health and safety risk for workers, especially at

roadside work sites and at facilities such as rock crushing plants and asphalt batching plants.
- Noise – Construction and operational noise will be a key issue for the ESIA. All types of construction activities have the potential to generate elevated noise levels in what is a densely populated area.
- Vibration – During the construction phase it is possible that buildings close to the construction zones, especially older ones, could be impacted by vibration. During the operational phase vibration impacts will not be significant.

1.4.2 Issues 'scoped out'

13. Likewise, the following topics have been screened out, meaning no further detailed study of these topics will be undertaken.

- Geology – No impacts to geology are anticipated. Borrow pits / quarries will be needed, but the report will specify the use of existing licensed borrow pits and quarries.
- Topography – The road is flat, no specific issues relating to topography are identified.
- Geohazards – Apart from the potential for floods no other geohazards, e.g., earthquakes, have been identified which would require specific assessment in the ESIA.
- Designated Sites – The ESIA will include mitigation measures prohibiting any borrow pits, camps, etc. from being located within nationally and internationally designated sites. As such there will be no detailed assessment of protected sites in the ESIA, but this condition will be included under the heading of 'biodiversity' within the ESIA.

1.5 SUMMARY OF ESIA METHODOLOGY APPLIED

14. The overarching ESIA methodology is based on the World Bank Safeguard Policies and the joint experience of the International and National environmental consultants involved in the ESIA. Background data and information was obtained from published and unpublished sources, e.g., on climate, topography, geology and soils, natural resources, agriculture, and socio-economic data.

15. Several site inspections were conducted by the International Environmental Specialist during 2021 and 2022. The existing roads were driven, and areas of potential environmental significance assessed carefully. Further, existing documents relating to the NR13-N project have been reviewed, e.g., ESIA and monitoring reports to help understand the project context.

16. In addition, several surveys were undertaken to collect additional baseline data, they include:

- Instrumental Noise Monitoring.
- Instrumental Air Quality Monitoring.
- Instrumental Water Quality Surveys.
- Physical and Cultural Resources Surveys.
- Socio-economic Surveys.

17. Formal discussions were held with numerous stakeholders (see **Section 8**) to determine their perceptions of the level of impact from road works. Data and information obtained have been included where appropriate in the ESIA Report, and as Appendices to this report.

18. A full description of the ESIA methodology is included in **Section 4** of this report.

1.6 STRUCTURE OF THE REPORT

19. The report is organized as follows:

Section 1: Introduction – The section in hand provides the introductory information.

Section 2: Legal, Policy and Administrative Framework - This section presents an overview of the policy/legislative framework as well as the environmental standards of Lao PDR that apply to the proposed project. The section also identifies relevant World Bank safeguard policies that will apply.

Section 3: Description of the Project – Section 3 describes the Category of the Project, the Project need, and its environmental and social setting. A limited scope of works is also provided indicating the type of engineering works required.

Section 4: Methodology – This portion of the report provides an outline of the methodology used to complete the report including the impact assessment methodology, i.e., the method to define the significance of impacts.

Section 5: Description of Environmental and Social Conditions – This section of the report discusses the regional and local environmental and social baseline conditions. This section is divided into subsections relating to physical environment, biological environment, and socio-economic conditions.

Section 6: Environmental and Social Impacts and Mitigation Measures – Section 5 outlines the potential environmental and social impacts and proposes mitigation measures to manage the impacts.

Section 7: Environmental and Social Management Plan – This section provides the ESMP for the design, construction, and operational phases of the Project.

Section 8: Stakeholder Engagement – Section 7 provides a summary of all the stakeholder consultation activities undertaken.

Section 9: Conclusions and Recommendations – The final section of the report provides the report conclusions and recommendations.

2.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 GENERAL

20. The Project will conform to the legal and administrative requirements of Lao PDR. The Project will also conform to international treaties to which the Lao PDR is signatory, and to standards and safeguard policies of the World Bank.

21. This chapter presents descriptions of:

- National Environmental Laws and Decrees;
- Institutional Framework for Environmental Management in Lao PDR;
- National Environmental Standards;
- World Bank Group (WBG) Environmental, Health and Safety Guidelines;
- International Environmental Agreements; and
- World Bank Safeguard Policies.

2.2 NATIONAL ENVIRONMENTAL LAWS AND SOCIAL SAFEGUARD RELATED LAWS & LEGISLATION

2.2.1 General

22. In Lao PDR, many laws and regulations governing the utilization and management of natural resources management (land, forest, water, aquatic and wildlife, etc.) were established in the late 1990's, and many of these have been updated and/or revised. On environment, the Environmental Protection Law (EPL) was first established in 1999 and then revised in 2012 to cope with the needs of socio-economic development. This law was the key law governing environmental protection and management describing the principles, regulations, and measures for managing, monitoring, restoring, and protecting the environment especially those related to protection of human health, natural resources, and the biodiversity as well as a reduction in global warming.

23. The inclusion of environmental considerations in road projects has been mandated since 1999. The Road Law requires road construction to be undertaken in accordance with public safety and environmental protection considerations, while the Environmental Protection Law (EPL-1999, 2012), supported by its Implementing Decree (2002), as the country's principal environmental legislation. An Environmental Impact Assessment (EIA) is required for roads and other development projects under the Environmental Protection Law.

24. The key laws and legislations relevant to environment and social impact assessment and mitigation for NR13 North are described below.

2.2.2 Environmental Protection Law (2012).

25. The revised Environmental Protection Law (National Law 29/NA) (EPL) is dated December 18, 2012. The revised Environmental Protection Law has 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; contribute to the national socio-economic development and reduce of global warming.

2.2.3 Decree on Environmental Impact Assessment (2019)

26. In general, this degree defines rules, regulations and measure on management and monitoring of environmental impact assessment activities to make sure that such activities are correctly proceeded with transparency and unity aiming to protect, mitigate and remedy environmental impacts and ensure, ensuring compensation is reasonable and livelihood restoration of affected people is better than before, making management and use of natural resources is efficient, contributing to the implementation of the National and Social Economic Development Plan with a green and sustainability.

27. It is required by the degree that any impacts caused by an investment project have to evaluate potential impacts on social and natural environment including consideration of all potential problems that may be caused by climate change. An environmental management and monitoring plan must be prepared together with the comprehensive environmental impact assessment report.

2.2.4 Regulation on EIA of Road Project in Lao PDR (2004)

28. This regulation clarifies the principles and methodologies for environmental impact assessment of road projects, including setting out necessary and appropriate mitigation measures to avoid or reduce negative environmental impacts on the natural environment and society resulting from the implementation of road projects in the Lao PDR.

2.2.5 Decree on Climate Change (2019)

29. This decree sets out the principles, regulations, and measures about management, monitoring on climate change in order to resist, prevent, reduce risks from climate change to ensure safety of life, health, property, environment, biodiversity, infrastructure that can connect with regions, international contributing to the national socio-economic development with a green and sustainable.

30. The degree also defines those relevant authorities need to identify measures to address climate change in relation to its own responsibilities in each period to build resilience in the relevant sectors, reduce greenhouse gas emissions such as land use, forestry, water resources, agriculture, health, energy, industry, urban development, creating the durability of infrastructure.

31. The degree encourages relevant authorities to adapt to climate change adaptation practices. Adaptation to climate change is an adapting of people, animals, plants, ecosystems, infrastructure, urban planning, etc. to be tolerant of climate change and to have the least impact by applying appropriate measures in reducing fragility, risks and potential damages.

2.2.6 Law on Water and Water Resources (2017)

32. The Law on Water and Water Resources (No.23/NA) is dated 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 and social

environments are protected, to sustainably develop the nation and contribute to socio-economic development.

2.2.7 Forestry Law (2019)

33. The revised Forestry Law, No. 64/NA (June 2019) determines the principles and regulations and regulates the management, protection, development, utilization and inspection of forests and forestland, promoting tree plantations, regenerating and increasing forest resources. It also aims to enrich forest resources, increase forest cover, enhance tourism and sustainable use in people's livelihoods; ensure the protection of soil quality, air quality, water sources, biodiversity, and environmental protection in a green and sustainable manner; and contribute to national socio-economic development.

34. The revised Forest Law states that "forests are invaluable national resources with a unique ecology, comprising biodiversity, water sources and land with various tree species growing naturally or planted in an area of at least zero point five (0.5) hectares and a crown cover of at least 20 percent (20%)".

35. Both natural forest and forested land are the property of the Lao Nation. The State is the designated authority to centrally manage forest and forested lands in a uniform manner throughout the country with the participation of all organizations and the people in the management, protection and utilization of forests and forested land in accordance with the law.

Box 1: Forest Categories

In general, forest is Lao PDR have been categorized in three types: Protection forests, Conservation Forests, and Production Forests. Each forest category may consist of areas of dense forest, dry dipterocarp forest, regeneration forest, and degraded forest.

- Protection Forests are forests classified for the function of maintaining water, riverbanks and roadsides, for preventing soil erosion and improving soil quality, strategic areas for national defence and security, safeguarding against natural disasters and providing environmental protection and other functions.
- Conservation Forests are forests classified for the purposes of conserving nature, preserving, and propagating plant species, aquatic animals and wildlife species, protecting forest ecosystems and others of natural, historical, cultural, touristic, environmental and educational value and for scientific research experiments. Conservation Forests are rich in biodiversity, have unique natural scenery, are of outstanding importance at national, regional, and global levels and may be proposed as wildlife conservation areas, national parks, regional or world heritage sites.
- Production Forests are forests including natural forests and planted forests designed for the supply of wood and NTFPs as commodities to fulfil the requirements of natural socio-economic development and people's livelihood.

2.2.8 Wildlife and Aquatic Law (2008)

36. 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.

37. Wildlife includes both terrestrial and aquatic life, and all forms of animal life, whether mammals, birds, reptiles, amphibians, or insects. Wildlife is classified into three categories for protection: 1) prohibition, 2) management, and 3) common or general. Whether any species are classified as prohibition or management depends upon the level of threat to them (endangered, threatened, rare), the condition of their habitat, and the condition of their regeneration and reproduction. The Ministry of Agriculture and Forestry recommends to the government for consideration and approval the list of species under the prohibition and management categories. The Ministry of Agriculture and Forestry has authority to include or remove species itself from the list of animals in the common or general category.

2.2.9 Land Law (2019)

38. The Land Law was amended on June 21, 2019. The law defines the principles, regulations and measures on the management and monitoring of land aiming to ensure the protection, development, and proper use of land for improving people's livelihood, ensuring peace, social order, social security, justice and contributing to national socio-economic development, and contributing to the protection of the environment**.**

2.2.10 Road Law (2016 – as updated from 1999 Law)

39. The Road Law (2016) states that any national road construction projects using either public or private funds can be implemented when the projects have completed Environmental and Social Impact Assessment and such projects have been included in the government's development plan with the National or Provincial Assembly's approval.

40. Under the Road Law, the Ministry of Public Works and Transport (MPWT) is the main agency responsible for management of the Road and cooperation with other concerned sectors and local administrations to manage works related to the roads.

2.2.11 Law on National Heritage (2014)

41. The National heritage Law defines that a man-made product or natural product of great cultural, historical, and natural value, a valuable asset and owned by the Lao National ethnics, which is a local, national heritage and may be recognized as regional or world heritage.

42. National heritage consists of tangible, and intangible cultural, historical, and natural heritage or real estate, living or non-living, which confirms the history of the Lao nation, the Lao people in each era.

2.2.12 Law on Hygiene and Health Promotion (2019)

43. The amended Hygiene and Health Promotion Law states that hhygiene is the cleanliness, removal of harmful substances and the creation of a conducive environment for living, practical practices that help people stay healthy and prevent disease.

44. Health promotion is the process of educating, informing, raising awareness in caring for and taking care of your own's health, keeping everyone in the family, community, and society healthy by changing perceptions, attitudes, behaviors, creating a conducive environment, following the principles and methods correctly, having a good lifestyle planning with focusing on communication for health and health education at the center

45. The law also sets out that hhealth impact assessment is the process of studying, surveying, researching data, using tools to measure and predict potential health hazards. Investment projects and activities such as infrastructure development projects, factories, dams, mining, pathogens laboratory, radioactivity, production, or use of chemicals that are expected to pose a health risk to workers and communities in the project area, the project area or other places that have a direct and / or indirect impact on health effect must be assessed in accordance with regulations

2.2.13 Labour Law (2013)

46. The Labour Law (National Law 43/NA) dated December 24, 2013. This law defines the principles, regulations and measures on administration, monitoring, labor skills development, recruitment, and labor protection in order to enhance the quality and productivity of work in society, so as to ensure the transformation to modernization and industrialization aimed at safeguarding the rights of employees and employers, as well as the legitimate interests and the continual improvement of their livelihoods, while contributing to the promotion of investment, national socio-economic development, and regional and international links.

47. This decree clarifies the Hours of work and hours of rest for the employee as part of its responsibilities in accordance with the location of labor units and the actual conditions of employment set out in Article 51 of all labor units will not exceed six days per week or one week not exceeding forty-eight hours and rest time to no less than 1 hour per day**.**

2.2.14 Decree #84 on Compensation and Resettlement of People Affected by Development Projects (2016)

48. 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.

49. This decree requires that to protect the rights, legitimate benefits, and compensation the affected households, consultations will be held between the project owner, state agencies and people who are directly affected by project activities. Appropriate approaches based on prices applied by the state for land, constructed facilities, crop products will be applied for compensation.

2.2.15 Technical Guidelines on Compensation and Resettlement of People Affected By Development Project (2005)

50. Pursuant to Prime Ministerial Decree No. 192/PM, GoL 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. If there are discrepancies and gaps identified between the GoL legislation and the World Bank's policy on Involuntary Resettlement (OP/BP4.12), the latter will prevail. This legislation provides procedure for the assessment, planning, and mitigation of environmental as well as social impacts from development projects.

51. 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.

2.2.16 Decree on the Preservation of Cultural, Historical and Natural Heritage (1997)

52. 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.

53. This decree requires that 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.

2.2.17 Decree on Occupational Safety and Health (2019)

54. This decree sets out the principles, regulations and measures on occupational safety and health to prevent occupational accidents and occupational diseases, create a good environment, and do not pose a health risk, promote valuable, fair, and productive work, aim to protect the rights and interests of workers and employers, improve the lives of workers, integrate regionally and internationally, contribute to the promotion of investment and socio-economic development of the nation.

55. It is defined that occupational safety and health is a joint activity between employers and workers to ensure occupational safety and health in the workplace, which includes risk assessment of the working environment, appropriate measures to reduce hazards and risks, how to prevent labor accidents, prevent injuries and prevent occupational diseases and create a culture of safety in the workplace step by step.

2.2.18 Law on Handling of Petitions (2015)

56. The Law on Handling of Petitions as revised and approved in 2015 provides objectives, principles and process of applying and handling different types of grievance, petitions and complaints that may be raised by PAPs or those who believe they are PAPs. The Law on Handling of Petitions divides grievances into three categories as follows:

- Proposals are to be resolved by concerned authorities.
- Grievances are to be resolved by judicial institutions and court
- Petitions are to be resolved by Provincial and National Assembly

57. The Law on Handling of Petitions, which has superseded the old f Law on Grievance dated November 5, 2005, applies and protects rights and interest of all citizens and entities, state organizations, community and individuals with the aim to ensure justice, social security and order. Detailed process of grievance redress mechanism is provided in Section 7.4.

2.2.19 Public Involvement Guideline (2012)

58. The Public Involvement Guideline approved by Minister of MONRE in 2012 provide principles and process of engaging and consulting with project stakeholders and PAPs in

project preparation and design and implementation. The public involvement aims to ensure that the stakeholders and PAPs are adequately consulted and provided with opportunity to articulate their feedback and suggestions on project design and implementation to avoid or mitigate potential impacts on their livelihood and environment.

2.2.20 Guideline on Consultation with Ethnic Groups (2013)

59. 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.

2.2.21 Environmental and Social Operation Manual

60. The overall purpose of the Environmental and Social Operations Manual (ESOM) is to present the procedures, instruments, and responsibilities for environmental and social management to be applied by the Ministry of Public Works and Transport (MPWT) throughout the planning and implementation of transport investments.

61. The ESOM provides the basis for compliance with national environmental and social decrees and regulations, as well as with the safeguard requirements of international donors such as World Bank (WB), Nordic Development Fund (NDF), Asian Infrastructure Investment Bank (AIIB), Asian Development Bank (ADB), United Nations Development Program (UNDP), and Swedish International Development Cooperation Agency (SIDA). The main objectives of the ESOM are to:

- Present, as context, an overview of the legal and institutional framework related to environmental and social management in the transport sector; and, additionally, present some of the important environmental and social characteristics of Lao PDR;

- Establish an environmental and social due diligence process, to establish procedures, instruments, and responsibilities for environmental and social management in transport development projects; and

- Develop environmental and social guidelines to assure the inclusion of environmental and social considerations at various stages of the project cycle and to comply with relevant environmental/social decrees and regulations as well as the safeguard policies of international donors.

62. The ESOM considers the following safeguard policies commonly triggered in road projects: Environmental Assessment; Natural Habitats; Forestry; Indigenous People [1]; Involuntary Resettlement; and Cultural Property.

[1] In the context of Lao PDR, “indigenous people” as defined by both World Bank and Asian Development Bank includes ethnic communities, which is the preferred term.

Table 2: Summary of Relevant Legislation and Guidelines

Law / Decree	Article	Relating to	Content
EPL (2012)	7	Commitment in Environmental Protection (revised)	All are responsible for protection, improving, rehabilitation, controlling, monitoring and inspecting
	14	Environmental Protection (revised)	Safeguarding and preventing environment from any natural or manmade events
	22	Environmental Impact Assessment (revised)	Process of addressing an issue in order to anticipate impacts that may affect the environment, society and nature, derived from investment project
	25	Limitation of Impacts Derived from Construction Activities and Others (revised)	Any construction of road which emit pollutants shall take measures environmental impacts as being stipulated by NEQS
	41	Environmental Certification	The Natural resources and environmental sector shall be the person, who provides environmental certification under its scopes of authority, by referring to impacts from invested construction projects.
	48	Public Participation (new)	Shall be participation by organization, local authorities and people, who are directly or indirectly affected from project activities.
Water and Water Resources Law (2017)	26	Water and water resource protection	All are obligation to protected water and water resources without damaged to water, restores forests and land in reservoirs according to management plans for allocation of water sources, forests and soils, especially in areas of water source or surrounding water sources.
	38	Permission for use	Stipulates that medium and large scale uses require feasibility studies, EIAs, and mitigation plans, before permission is granted for use of the resource
	57	Responsible for rehabilitation water and water resources (new)	Conducted the investment project or any constructions causes damage to water or water resources, should be improvement, rehabilitation, inspecting and monitoring by state agencies or line sectors.
Forestry Law (2007)	5	Policy of forest and forest land	The GoL has the policy to preserve, regenerate, and develop forests and forest land to help preserve the environment, water resources, biodiversity, and people's livelihoods.
	26	Preservation of water resources in forest zones	Stipulates the preservation of water resources in forest zones for those areas where waterways originate and flow, including strict management and regulations

Law / Decree	Article	Relating to	Content
			to control logging, shifting cultivation, and destructive forest uses
	70	Conversion of forest land	Stipulates that forestland can be converted to other land type if it brings a high level of benefits to the nation and to livelihoods of the people, and is included in the national development plan
	71	Types of converted forest land	Stipulates that for the timber and forest resources to be harvested in those areas are property of the State
Wildlife and aquatic law (2007)	52	Prohibitions	Prohibits taking of wildlife, including parts of the animals, from their habitats; tormenting wildlife and aquatic species; illegal catching, hunting, trading and possession; catching aquatic species and hunting in conservation zones, in breeding season, or when pregnant; devastation of habitats and feeding zones.
Land Law updated in 2019)	6	Protection of land and the environment	Declares that all individuals and organizations are obliged to protect the land from degradation,
	14	Changes in land category	Land use can be changed if it does not cause social or environmental harm and if prior approval is obtained from the authorities.
	130	Acknowledgement of customary us of land	Customary land use rights, defined as the acquisition of occupied and used lands through clearance, development, protection and regular use of the land for more than twenty years prior to implementation of this Law, and without document certifying the acquisition of the land but subjected to certification from the village authorities regarding the continuous land occupation.
Road Law (1999)	15	Public road construction	Construction of public roads must include protection of the environment
Law on handling of Petition (2015)		Project related grievance	Possible project related feedback and grievances raised by PAPs shall be addressed and incorporated into the project design and improved implementation.
Public Involvement Guideline (2013		Stakeholder and community engagement	Involvement of stakeholders and PAPs in the project preparation, design, implementation and monitoring to enhance transparency and accountability
Guideline on ethnic group consultation (2013)		Ethnic groups affected by development	Ensure that ethnic groups defined as IPs under Bank's policy are meaningfully consulted in a free, prior informed manner and engaged in project preparation, planning and implementation

Law / Decree	Article	Relating to	Content
Environmental and Social Management Operations Manual (ESOM) updated in 2015		Lao Road Sector	ESOM is regulatory requirement and guideline for all investment projects under the transport sector which have potential impact on the environment and people. It is a regulatory tool to be used to classify the impact and level of environmental and social assessment, identify the impact that may be caused to the environment and society, provide measurement to mitigate negative impacts as well as the monitoring and evaluation of the implementation of measures to reduce impacts during the construction, per- operation and after completion of the project.
Decree No 21 on Environmental Impacts Assessment (2019)	56	Information disclosure	PAPs have the rights to have access to the information on their benefits and the environmental impacts of the investment projects and other activities as well as are entitled to fair compensation of loss, resettlement and livelihood restoration according to the regulations.
	64		The natural resources and environmental sector and the project owner must disclose and facilitate the access to the ESIA as well as the project periodically in both Lao and English to the public through newspaper, television, loudspeaker, radio, website, social media and other media

2.3 LEGAL AND INSTITUTIONAL FRAMEWORK CONCERNING ETHNIC GROUPS

2.3.1 Country's constitution

63. The constitution of Lao PDR states that Lao has been a multi-ethnic country since the middle of the 14th century, and since the 1930's, the multi-ethnic Lao people have fought together for the liberation of the country leading to the establishment of the Lao People's Democratic Republic on 2 December 1975. The constitution, No. 25/NA, dated 06 May 2013 includes the specific articles relevant to the equality among all ethnic groups in the multi-ethnic state of the Lao PDR:

64. Article 8 states that *"The State pursues the policy of promoting unity and equality among all ethnic groups. All ethnic groups have the right to protect, preserve and promote the customs and cultures of their own tribes and of the nation. All acts of creating division and discrimination among ethnic groups are forbidden. The State implements every measure to gradually develop and upgrade the economic and social level of all ethnic groups."*

65. Article 13 states that *"The national economy of the Lao People's Democratic Republic relies on a stable multi-sectoral economy which is encouraged [by the government]; such economy shall expand manufacturing capacity, broaden production, businesses and services, transform the natural economy into a trading and manufacturing economy, and modernize;*

[while] combining with regional and global economies to stabilize and develop the national economy continuously and to improve the material and spiritual living conditions of the multi-ethnic people. All types of enterprises are equal before the laws and operate according to the principle of the market economy, competing and cooperating with each other to expand production and business while regulated by the State in the direction of socialism."

66. Article 22 states that: *"…The State and society attend to developing high quality national education, to create opportunities and [favorable] conditions in education for all people throughout the country, especially people in remote areas, ethnic groups, women and disadvantaged children. …"*

67. Article 23 states that ***"****The State promotes preservation of the national culture which is a representative of the fine tradition of the country and its ethnic people while accepting selected progressive cultures from around the world. …"*

68. Article 35 states that ***"****Lao citizens are all equal before the law irrespective of their gender, social status, education, beliefs and ethnic group."*

2.3.2 Local Administration Law of Lao PDR

69. The local administration law states that the role of the local administration is to represent the locality and be responsible to the government to administer political, socio-economic and cultural affairs, human resource management, natural resource and environment management, national and local defense and security; and others as assigned by the government. The 4 articles – 14, 27, 40 and 53 under the administrative law define the specific role and responsibility of the provincial governor, mayor, chief of district and head of the villages that are "To motivate, promote and facilitate the participation of the Lao Front for National Construction, mass organizations, social organizations and all economic entities and ethnic people in the socio-economic development of the village; and to preserve and promote good national traditions and cultures of the multi-ethnic Lao people; to discourage negative occurrences and superstitious beliefs; to promote education within the community; and to educate the community to be responsible for hygiene and sanitation."

2.3.3 Ethnic Minority Policy

70. In 1992, the government revised its Ethnic Groups policy and developed it into the resolution on Ethnic Affairs in the New Era, applying to all ethnic groups across the country. The ethnic policy was developed to (i) build national sentiment (national identity), (ii) realize equality between ethnic groups, (iii) increase the level of solidarity among ethnic groups as members of the greater Lao family, (iv) resolve problems of inflexible and vengeful thinking, and economic and cultural inequality, (v) improve the living conditions of the ethnic group step-by-step, and (vi) expand the good and beautiful heritage and ethnic identity of each group and their capacity to participate in the affairs of the nation.

2.3.4 Institutional Responsibility

71. In Lao PDR, overall development of ethnic groups lies with the Lao Front for National Development (LFND), formerly the Lao Front for National Construction (LFNC). Recently, MOHA has also promulgated a decree (Decree 207 on Ethnic Affairs 2020) outlining the provisions relevant to ethnic groups contained in other regulations laws and decrees and specifying the roles and responsibilities of Home Affairs officials at all levels in managing and monitoring these measures. According to the Law on Lao Front for National Construction, No. 01/NA, dated 08 July 2009, the main roles of the LFNC are:

- To construct and to improve forces of the entire people and act as an umbrella organization guarding the solidarity of Lao ethnic people.

- To educate, train and encourage all Lao ethnic people to participate in the mission to protect and develop the nation.

- To enhance the ownership, protect the culture and traditions, rights and legitimate interests of Lao ethnic people and races.

- To be a center for public awareness, desires and opinions of Lao ethnic people.

- To act as a central coordination body for all parties.

72. In addition, the LFND also has the responsibility to:

- Focus the solidarity of Lao ethnic people both domestic and international.

- Propose drafts of laws and legislation in according to its roles and responsibilities.

- Advertise, educate, encourage and enhance the ownership of Lao ethnic people in the implementation of guidelines, policies, the constitution and national socio-economic development plans.

- Act as a repository for proposals and ideas for the development of Lao ethnic people of all religions, genders, and ages and communicate these to the responsible organizations.

- Propose candidates for elections to political organizations, the National Assembly and other organizations according to regulations.

- Participate in improvement of the state power of People's Democratic Regime, monitor and inspect activities of the state administrative apparatus, the National Assembly and other organizations in line with the regulations.

- Protect the rights and legitimate interests of the party's organizations for the Lao ethnic people and participate in mediation of disputes in according to its roles.

- Contribute to the protection and enhancement of the traditions of patriotism and culture of the Lao ethnic people.

- Convey knowledge, lessons, experience, and fine traditions of the Lao ethnic peoples to new generations.

- Enhance friendly relations and cooperation between Lao Ethnic People and People of Nations in the region and internationally.

73. The LFND consists of seven departments and one center, including 1) General Administration, 2) Organization Department, 3) Inspection Department, 4) Class and Civil Society Department, 5) Ethnic Affairs Department, 6) Obligations of Religion Department, 7) Propaganda Department, and 8) Training Center. *It is important to note that the Ethnic Affairs Department (DEA) acts as the secretariat of LFND central Committee to mobilize, protect and promote the benefits of all ethnic groups, to advertise and disseminate the Party's policies, regulations and laws, and the national socio-economic development plan to all ethnic groups and to communicate the requirements, frustrations and real desires of all ethnic people to the*

higher officials, in order to strengthen the solidarity and equality of ethnic people across the country.[2]

2.4 INTERNATIONAL ENVIRONMENTAL AGREEMENTS

74. Lao PDR is a signatory to most international agreements and conventions relating to the environment, the most relevant are listed below. **Appendix A** Provides a list of all international agreements ratified by Lao PDR.

- ASEAN Agreement on the Conservation of Nature and Natural Resources (1985). Lao PDR as Party to this agreement has agreed on development planning, the sustainable use of species, conservation of genetic diversity, endangered species, forest resources, soil, water, air and address environmental degradation and pollution.

- United Nations Convention on Biodiversity (CBD 1996). Under this convention, Lao PDR has agreed to conduct an Environmental Assessment of proposed development projects to minimize harmful effects.

- United Nations Framework Convention on Climate Change (UNFCCC 1995). The Government of Lao PDR joined the global community to combat climate change by ratifying this Convention. As a developing country (non-Annex I), there is no requirement for Lao PDR to reduce its greenhouse gas emissions. The country also ratified the Kyoto Protocol in 2003 and thus may be eligible for involvement in carbon trading through a compliance market of the Clean Development Mechanism as well as the international voluntary greenhouse gas emission trading.

2.5 INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL & SOCIAL MANAGEMENT

75. The National Environmental Committee (NEC) established by the EPL is the highest decision-making body for environmental management. The NEC is chaired by the Deputy Prime Minister responsible for natural resources and environment and comprises representatives of key agencies from concern ministries. Key institutions related to the Project are highlighted as follows:

2.5.1 MoNRE

76. MoNRE was first established in 2011 and since mid-2012, MoNRE is the lead agency responsible for effective management of natural resources and environment including water resources, forest/biodiversity, land, minerals, and environmental quality including EIA process. Its latest ministerial restructure as of April 2022 comprises 12 agencies including Cabinet Office (CO), Department of Organisation and Administrative (DOA), Department of Inspection (DoI), Department of Financial and Planning (DFP), Department of Land (DoL), Department of Water Resources (DWR), Department of Environment (DoE), Department of Natural Resources and Environmental Inspection (DoNREI), Department of Disaster Management and Climate Change (DDMCC), Department of Meteorology and Hydrology (DMH), National Mekong River Commission Secretariat (NMRCS), and Natural Resources and Environmental Research Institute (NRERI). The role and responsibilities of MONRE are clearly defined by the Environment Protection Law (revised in 2013).

[2] http://www.lfnc.gov.la/lfncs/englishs/gov_ethnic.php

2.5.2 Ministry of Agriculture and Forestry (MAF):

77. MAF is responsible for ensuring effective management of agriculture, forests, and fisheries/aquaculture and it also went through a major reorganization during 2011-2012. It comprises many departments including the Department of Irrigation, the Department of Agriculture, the Department of Forest, the Department of Inspection, the Department of Fisheries, etc.

2.5.3 MPWT

78. Ministry of Public Works and Transport is responsible for management of public works, urban development, and land and water transport including management of domestic water supply and sanitation in urban areas. It is relatively large and stable ministry and key agencies including the Department of Road (DoR), the Department of Waterways Transport, the Department of Urban Development, and the Public Works and Transport Institute (PTI). DoR is responsible for road development and maintenance and technical divisions comprise the Project Management Division, 4 Regional Road Maintenance Projects, and the Technical Division which is also responsible for planning and supervision of safeguards for road related activities. At provincial level, the provincial Department of Public Works and Transport (DPWT) is responsible for planning and implementation at provincial and local level including road maintenance. The Environment and Social Division of PTI is responsible for establishment of safeguard procedures and guideline namely Environmental and Social Operations Manual (ESOM) for the Lao road sector, supervision, and training of safeguard for MPWT.

2.5.4 The provinces

79. In addition to the central agencies, provincial departments of MoNRE (PoNRE), MEM (PDEM), MAF (PAFO), and MPWT (DPWT) exist in each of the 17 provinces. A Provincial Environmental Committee (PEC) is also established for each province. According to the GoL policy on decentralization as instructed by the National Assembly, the provincial and district authorities have begun to play a key role in planning, decision making, and monitoring of investment activities. For the energy sector, provincial departments are responsible for approval and monitoring of energy generation projects equality or less than 15 megawatts while the central agencies remain responsible for approval and management of large-scale investments. For the mining sector, the provincial departments are responsible for approval and monitoring of investments of less than US$2 million. For natural resources and environment, PoNRE plays a key role in management of water, land, and forest resources as well as on environmental management including conducting review and monitoring of the IEE process and ECC issuance.

2.5.5 Provincial Resettlement Committee

80. The further planning and implementation of the Project will be undertaken through consultation with, and advice from, provincial and district government agencies, through the Resettlement Committee (RC) as per the Decree 84 on compensation and resettlement. The main function of the RC is to represent the interest of the APs and stakeholders in dealing with project impacts and mitigation measures. The details of the roles and responsibilities of the RC are provided in Decree 84, Articles 19-20. The RC will appoint a management and an operational unit to be responsible for the overall process of resettlement and compensation. The RC will meet regularly and will have an inaugural meeting at least one month before the start of the Project and will operate during the construction of the subprojects and for up to two years after completion of construction activities (to monitor impacts and take action where necessary). The minutes of meetings and activities of RC will be incorporated into overall Project internal and external monitoring. The responsibilities of RC will be as follows:

- Coordination of relevant Government organizations with ESMU to ensure that RP is properly implemented;
- Review and provide comments on valuation of land and assets (crops, production, market values, etc.) for compensation for Aps;
- Organization of provincial and district level meetings and consultations as required;
- Monitoring and auditing funds that are earmarked for RP implementation; and
- Participation in resolution of, and follow through, of claims or complaints lodged via the established grievance redress procedure.

2.6 ENVIRONMENTAL REGULATIONS, STANDARDS & PERMITS

81. The following summarizes the environmental regulations and standards that are applicable to the Project.

2.6.1 Air Quality

2.6.1.1 WBG Environmental, Health, and Safety General Guidelines (WBG EHS Guidelines)

82. WBG EHS Guidelines, which are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP), follows WHO Air Ambient Air Quality Guideline. The following table illustrates the guidelines.

Table 3: WHO Ambient Air Quality Guidelines [3]

Parameter	Averaging Period	Guideline Value	
		($\mu g/m^3$)	(mg/m^3)
Sulphur Dioxide (SO_2)	10 minute	500	0.5
	24 Hour	20	0.02
Nitrogen Dioxide (NO_2)	1 Hour	200	0.2
	1 Year	40	0.04
Particulate Matter PM_{10}	24 Hour	50	0.05
	1 Year	20	0.02
Particulate Matter $PM_{2.5}$	24 Hour	25	0.025
	1 Year	10	0.01

[3] Not including interim targets.

2.6.1.2 National Air Quality Standards

Table 4 tabulates the Lao PDR ambient air quality standards. Note that some of the standards are expressed in parts per million (ppm) and some are expressed in mg/m^3.

Table 4: National Ambient Air Quality Standards [4]

Parameter	Symbol	1 hour	8hour	24 hour	1 month	1 year	Unit
Carbon Monoxide	CO	30	9	-	-	-	ppm
Nitrogen Dioxide	NO_2	0.0.11	-	-	-	0.02	ppm
Sulphur Dioxide	SO_2	0.13	-	0.05	-	-	ppm
Total Suspended Particulate	TSP	-	-	0.33	-	0.10	mg/m^3
Particulate Matter less than 10 microns	PM-10	-	-	0.12	-	0.05	mg/m^3
Particulate Matter less than 2.5 microns	PM-2.5	-	-	0.05	-	0.015	mg/m^3
Ozone	0_3	0.20	0.14	-	-	-	mg/m^3
Lead	Pb	-	-	-	-	0.00015	mg/m^3

2.6.1.3 Project Air Quality Standards

83. WBG General EHS Guidelines (Air Emissions and Ambient Air Quality, 2007) note that project emissions should not result in exceedances of "relevant ambient quality guidelines and standards by applying **national legislated standards**, or in their absence, the current WHO Air Quality Guidelines". As indicated above, Lao PDR has national legislated standards and as such these will be applied to the project.

2.6.2 Noise

2.6.2.1 WBG Environmental, Health, and Safety General Guidelines (WBG EHS Guidelines)

84. According to the WBG General EHS Guidelines (Noise Management, 2007), noise impacts should not exceed the levels presented in Table 5, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

[4] Decree on National Environment Standard dated 81/GV, dated 21 Feb. 2017

Table 5: WBG Noise Level Guidelines, One Hour LAeq (dBA)

Receptor	Daytime (07.00 – 22.00)	Night-time (22.00 – 07.00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

2.6.2.2 National Noise Standards

85. Table 6 provides the national noise standards for Lao PDR. It can be noted that nighttime noise limits are particularly stringent with regards to sensitive receptors such as hospitals and schools.

Table 6: Noise Standards for Other Places (LAeq 24-hrs)

Area	dB(A): 06.00 – 18.00	dB(A): 18.00 – 22.00	dB(A): 22.00 – 06.00
Hospitals, libraries, kindergarten, schools	50	45	40
Residential areas	55	55	45
Commercial areas	70	70	50

2.6.2.3 Project Noise Standards

86. National standards are more stringent than IFC standards and will be used for the Project.

2.6.3 Vibration

2.6.3.1 International Standards

87. The German Standard DIN 4150-3 – Vibration in Buildings – Part 3: Effects on structures provides short term and long-term limits [5] for vibration at the foundation for various structures. This standard is considered international best practice for construction vibration.

[5] short-term vibrations are defined as those that do not occur often enough to cause structural fatigue and do not produce resonance in the structure being evaluated and long-term vibrations are all the other types of vibration.

Table 7: Guideline Values for Vibration Velocity to be Used When Evaluating the Effects of Short-term and Long-term Vibration on Structures

Group	Structure	Guideline Value for Velocity (mm/s)				
		Short-term				Long-term
		At Foundation			Uppermost Floor	Uppermost Floor
		Less than 10 Hz	10 Hz to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	10
2	Residential dwellings and buildings of similar design and/or use	5 (105 dB)	5 to 15	15 to 20	15	5 (105 dB)
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g., buildings that are under a preservation order)	3 (100.5 dB)	2 to 8	8 to 10	8	2.5 (99.0 dB)

Source: DIN 4150-3, Structural Vibration, Part 3: Effect of vibration on structures

88. DIN 4150-3 notes that “experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible. Exceeding the value in the table does not necessarily lead to damage”.

89. Regarding vibration from construction traffic, the maximum permissible limit of traffic vibration, Article 12 of Ministerial ordinance for the regulatory of vibration Japan, 1976 is considered to represent good international practice with a guideline limit of 65dB set for roadside residents in terms of vibration nuisance.

2.6.3.2 Project Vibration Standards

90. German Standard DIN 4150-3 will be followed during the construction phase relating to vibration from work sites. Japanese standards will be followed for construction traffic vibration of-site.

2.6.4 Water Quality

2.6.4.1 WBG Environmental, Health, and Safety General Guidelines (WBG EHS Guidelines)

91. The WBG provides guidelines values for treated sanitary sewage discharges. The following table provides these values with which the Project shall also comply, for example relating to any wastewater discharge from construction camps.

Table 8: WBG Indicative Values for Treated Sanitary Sewage Discharges

Pollutant	Unit	Guideline Value
pH	pH	6-9
Biological Oxygen Demand (BOD)	Mg/l	30
Chemical Oxygen Demand (COD)	Mg/l	125
Total Nitrogen	Mg/l	10
Total Phosphorus	Mg/l	2
Oil and Grease	Mg/l	10
Total Suspended Solids	Mg/l	50
Total Coliform Bacteria	MPN[A] / 100 ml	400

2.6.4.2 National Water Quality Standards

92. Table 9, Table 10 and Table 11 tabulates the national water standards for:

- Drinking water quality (groundwater);
- Surface Water Quality; and
- Wastewater effluent discharge from industrial activities.

Table 9: National Drinking Water Quality Standards - Groundwater[6]

Parameter	Symbol	Standard Value	Unit
Color	No defined	15	No defined
Turbidity	No defined	20	NTU
Potential of Hydrogen	pH	6.5-9.0	No defined
Iron	Fe	1.0	mg/L
Manganese	Mn	0.5	mg/L
Copper	Cu	1.5	mg/L
Chromium Hexavalent	Cr^{6+}	0.05	mg/L
Zinc	Zn	15.0	mg/L
Sulphate	SO_4^{2-}	250	mg/L
Chloride	Cl^-	600	mg/L
Fluoride	F	1.0	mg/L
Nitrate	NO_3^-	45	mg/L

[6] Decree on National Environment Standard dated 81/GV, dated 21 Feb. 2017

Parameter	Symbol	Standard Value	Unit
Total Hardness	as $CaCO_3$	500	mg/L
Hardness	Non-carbonate as $CaCO_3$	250	mg/L
Total Suspended Solid	TSS	1,200	mg/L
Arsenic	As	0.01	mg/L
Cyanide	CN^-	0.07	mg/L
Lead	Pb	0.01	mg/L
Mercury	Hg	0.001	mg/L
Cadmium	Cd	0.003	mg/L
Selenium	Se	0.01	mg/L
Bacteria (Standard Plate Count Method)	No defined	500	Colonies/cm^3
Coliform Bacteria	No defined	2.2	MPN/$100cm^3$
E. coli Bacteria	No defined	No	No defined

Table 10: National Surface Water Quality Standards[7]

Parameter	Symbol	Standard value					Unit	Analysis Method
		1	2	3	4	5		
Color, Order and Taste	None	n	n'	n'	n'	None	No defined	No defined
Temperature	t ºC	n	n'	n'	n'	No defined	ºC	Thermometer
Potential of Hydrogen	pH	6-8	6-8	5-9	5-9	No defined	No defined	Electrometric
Dissolved Oxygen	DO	>7.0	6.0	4.0	2.0	<2.0	mg/L	Azide Modification
Electro conductivity	Ec	<500	≤1000	≤2000	≤4000	>4000	µS/cm	Ec meter
Chemical Oxygen demand	COD	<5	5-7	7-10	10-12	>12	mg/L	Potassium Dichromate Digestion; Open Reflux or Closed Reflux
Total Coliform bacteria	No defined	n	5,000	20,000	No defined	No defined	MPN/ 100ml	Multiple Tube Fermentation Technique
Fecal coliform bacteria	No defined	n	1,000	4,000	No defined	No defined	MPN/ 100ml	Multiple Tube Fermentation Technique
Total Suspended Solid	TSS	<10	≤25	≤40	≤60	>60	mg/L	Glass Fiber Filter Disc

[7] Decree on National Environment Standard dated 81/GV, dated 21 Feb. 2017

Parameter	Symbol	Standard value					Unit	Analysis Method
		1	2	3	4	5		
Phosphate	PO_4	<0.1	0.5	1	2	>2	mg/L	Ascorbic acid
Ammonium ion	NH_4^+	<0.5	≤1.5	≤3	≤4	4	mg/L	Kjeldahl
Nitrate-Nitrogen	NO_3-N	n	5.0	5.0	5.0	No defined	mg/L	Cadmium Reduction
Ammonia Nitrogen	NH_3-N	n	0.5	0.5	0.5	No defined	mg/L	Distillation Nesslerization
Phenol	C_6H_5OH	n	0.005	0.005	0.005	No defined	mg/L	Distillation Amino antipyrine
Copper	Cu	n	1.5	1.5	1.5	No defined	mg/L	AA-Direct Aspiration
Nickel	Ni	n	0.1	0.1	0.1	No defined	mg/L	AA-Direct Aspiration
Manganese	Mn	n	1.0	1.0	1.0	No defined	mg/L	AA-Direct Aspiration
Zinc	Zn	n	1.0	1.0	1.0	No defined	mg/L	AA-Direct Aspiration
Cadmium	Cd	n	0.003	0.03	0.03	No defined	mg/L	AA-Direct Aspiration
Chromium 6	Cr^{+6}	n	0.05	0.05	0.05	No defined	mg/L	AA-Direct Aspiration
Lead	Pb	n	0.01	0.01	0.01	No defined	mg/L	AA-Direct Aspiration
Mercury	Hg	n	0.001	0.001	0.001	No defined	mg/L	AA-Cold Vapor Technique
Arsenic	As	n	0.01	0.01	0.01	No defined	mg/L	AA- Direct Aspiration, ICP
Cyanide	CN^-	n	0.01	0.01	0.01	No defined	mg/L	Pyridine Barbituric Acid
Radioactive -α -β	-α -β	n	0.07	0.07	0.07	No defined	Becq. urel/L	GC
Organochlorine pesticide		n	0.05	0.05	0.05	No defined	mg/L	GC
Dichlorodiphenyltrichloro ethane	DDT	n	1.0	1.0	1.0	No defined	µg/L	GC
Alpha Benzene hexachloride	α-BHC ($C_6H_6Cl_6$)	n	0.02	0.02	0.02	No defined	µg/L	GC
Dieldrin	$C_{12}H_8Cl_6O$	n	0.02	0.02	0.02	No defined	µg/L	GC
Heptachlor and Heptachlor epoxide	C10H5Cl7 And C10H5Cl7O	n	0.2	0.2	0.2	No defined	µg/L	GC

Parameter	Symbol	Standard value					Unit	Analysis Method
		1	2	3	4	5		
Endrin	C12H8Cl6O	n	None	None	None	No defined	µg/L	GC

Remark:

Class 01: water sources is from natural, no production or dilution

Class 02: water sources for consumption but need to be disinfected, this water sources aquatic conservation, fishery, water sport and other.

Class 03: water sources for consumption but need to be disinfected, this water sources agriculture, livestock and other

Class04: water resource for consumption, but need to be disinfected, this water sources for industry, colleting the effluent from urban area or community and other.

Class05: water resource for transportation, collecting the effluent from urban area or community and other.

n: natural water

n': natural water, but the temperature change is not more than ±3^{O}C

Table 11: Wastewater Effluent (General Industrial Wastewater Discharge)[8]

Parameter	Symbol	Standard Value	Unit	Analysis Method
Potential of Hydrogen	pH	6-8.5	No defined	pH Meter
Total Dissolved Solid	TDS	<2,500 mg/l depending on industrial activities and water body, but <5,000 mg/l	mg/L	Dry evaporation at temperature 103-105^{O}C, 1 hour
Total Suspended	TSS	<50 mg/l depending on industrial activities and water body, but <150 mg/l	mg/L	Glass Fiber Filter Disc
Temperature	t	<40	^{O}C	Temperature Meter
Color and Odor	No defined	No	No defined	General
Hydrogen Sulfide	H_2S	<1.0	mg/L	Titration
Cyanide	CN^-	<0.2	mg/L	Distillation and Pyridine Barbituric Acid
Fat, Oil and Grease	FOG	<5.0 mg/l depending on industrial activities and water body, but <15.0 mg/l	mg/L	Solvent Extraction by Weight

[8] Decree on National Environment Standard dated 81/GV, dated 21 Feb. 2017

Parameter	Symbol	Standard Value	Unit	Analysis Method
Formaldehyde	CH_2O	<1.0	mg/L	Spectrophotometry
Phenol	C_6H_5OH	<1.0	mg/L	Distillation and Aminoantipyrine Method 4
Chlorine	Cl^-	<1.0	mg/L	Lodometric Method
Pesticide	-	No	mg/L	GC
Biological Oxygen Demand 5 Days	BOD_5	<30 mg/l depending on industrial activities and water body, but <60 mg/l	mg/L	Azide Modification at 20^OC, 5days
Total Nitrogen	TKN	<100 mg/l depending on industrial activities and water body, but <200 mg/l	mg/L	Kjeldahl
Chemical Oxygen Demand	COD	<120 mg/l depending on industrial activities and water body, but <400 mg/l	mg/L	Potassium Dichromate Digestion; Open Reflux or Closed Reflux
(Heavy metals)				
Zinc	Zn	<5.0	mg/L	AA/AES; ICP
Chromium Hexavalent	Cr^{+6}	<0.25	mg/L	AA/AES; ICP
Chromium Trivalent	Cr^{+3}	<0.75	mg/L	AA/AES; ICP
Copper	Cu	<2.0	mg/L	AA/AES; ICP
Cadmium	Cd	<0.03	mg/L	AA/AES; ICP
Barium	Ba	<1.0	mg/L	AA/AES; ICP
Lead	Pb	<0.2	mg/L	AA/AES; ICP
Nickel	Ni	<1.0	mg/L	AA/AES; ICP
Manganese	Mn	<5.0	mg/L	AA/AES; ICP
Arsenic	As	<0.25	mg/L	AA-Hydride Generation or ICP
Selenium	Se	<0.02	mg/L	AA-Hydride Generation or ICP
Mercury	Hg	<0.005	mg/L	AA-Cold Vapour Technique

2.6.4.3 Project Water Quality Standards

The Project will follow national standards for water quality and wastewater effluent.

2.6.5 Permits

93. The following table indicates the permits that are required for various scales of Projects in Lao PDR.

Table 12: Permit Requirements

#	Description	Scale	Permitting Authority
1	Water extraction	Small project	Natural Resources and Environment Office, District
		Medium project	Department of Natural Resources and Environment, Province
		Large project	Ministry of Natural Resources and Environment
2	Borrow Pit	Small project	Energy and Mines Office, District
		Medium project	Department of Energy and Mines, Province
		Large project	Ministry of Energy and Mines
3	Removal of Trees	Development Project	Village authority & Agriculture and Forest Office

Note: The Contractor will be responsible for determining which of the relevant authorities he will obtain the permits from depending upon the volumes of water and borrow material required under the project.

2.7 WBG GENERAL EHS GUIDELINES

94. In addition to the above, the WBG General EHS guidelines also provide extensive guidance on a range of other EHS issues, such as occupational health and safety, community health and safety, etc. The mitigation measures that have been adopted for this Project have included all of the relevant WBG EHS guidelines, including:

- Air Emissions and Ambient Air Quality
- Wastewater and Ambient Water Quality
- Hazardous Materials Management
- Waste Management
- Noise
- Contaminated Land
- Community Health and Safety
- Occupational Health and Safety

2.8 WORLD BANK SAFEGUARDS POLICIES APPLICABLE TO THE PROJECT

2.8.1 General

95. The World Bank's environmental and social safeguard policies are regarded as a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for the World Bank and borrowers in the identification, preparation and implementation of programs and projects. The National Road 13 North (NR13 North) Improvement and Maintenance Project triggers the following environmental and social safeguard policies: Environmental Assessment (OP/BP 4.01), Natural Habitats (OP/BP 4.04), Indigenous Peoples (OP/BP 4.10), Physical Cultural Resources (OP/BP 4.11), and Involuntary Resettlement (OP/BP 4.12). Although Indigenous Peoples (OP/BP 4.10) is triggered for this additional 6 km due to the presence of three non-Lao/tai ethnic group households, an EGEP has not been prepared as the three are well integrated into the majority Lao/Tai community and speak Lao fluently.

96. The WB's Gender Based Violence Good Practice Note:

(https://documents1.worldbank.org/curated/en/399881538336159607/Environment-and-Social-Framework-ESF-Good-Practice-Note-on-Gender-based-Violence-English.pdf) is recommended to be used to assist the development of the C-ESMP.

2.8.2 Environmental Assessment

97. Environmental Assessment is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. In World Bank operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. The World Bank's environmental assessment policy and recommended processing are described in **Operational Policy (OP) 4.01: Environmental Assessment**. This policy is considered to be the umbrella policy for the Bank's environmental 'safeguard policies'.

98. Initially the Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

(a) *Category A*: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA. The Project has been classified as a Category A project due to the resettlement of affected peoples, not specifically due to its anticipated impacts on the environment. The Project herewith has been classified as a Category A Project.

(b) *Category B*: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation (Project Appraisal Document and Project Information Document).

(c) *Category C*: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

(d) *Category FI*: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

99. National Road 13 North (NR13 North) Improvement and Maintenance Project is classified as Category A Project.

2.8.3 Other World Bank Safeguard Policies

100. Table 13 lists other World Bank Safeguard policies and rationales for policies triggering or not triggering by the National Road 13 North (NR13 North) Improvement and Maintenance Project.

Table 13: Other World Bank Safeguard Policies

Safeguard Policies	Triggered?	Explanation
Natural Habitats OP/BP 4.04	Yes	This policy is triggered for the National Road 13 North (NR13 North) Improvement and Maintenance Project. However, this 6 km section is located within an urban area of Vientiane and is not considered to be a natural habitat. Specific provisions have been included in this report to ensure that natural habitats are not affected by the opening and operation of borrow pits.
Forests OP/BP 4.36	No	This policy is not triggered because the project does not pass through national parks or protected areas. It will pass through semi-urbanized areas. It is not anticipated that the project will affect the health and quality of forests or the rights and welfare of people and their level of dependence upon or interaction with forests.
Pest Management OP 4.09	No	The project will not lead to purchase or increase use of pesticides.
Physical Cultural Resources OP/BP 4.11	Yes	This policy is triggered due to the presence of village temples and graves observed near the road. Impacts assessment on physical cultural resources and measures, including chance

Safeguard Policies	Triggered?	Explanation
		finding procedure, necessary to minimize/mitigate impacts, have been included in the ESIA.
Indigenous Peoples OP/BP 4.10	Yes	This policy is triggered under the overall project but not relevant to this 6Km stretch of the road. Although, there are three non-Lao/tai (IP) households identified along the road segment that will likely be impacted by the road work, these IPs are well integrated into the mainstream community and able to speak Lao fluently. Thus, an ethnic development or IP plan is not required for these IPs. To ensure that they are engaged in the project design and implementation and that their voice or concern is heard, the three IP households were included in the ESIA and consultation process.
Involuntary Resettlement OP/BP 4.12	Yes	This policy is triggered as the works to be financed will result in land acquisition, the disruption of livelihood activities, and the displacement of residential and commercial structure.
Safety of Dams OP/BP 4.37	No	The project will not finance any activities related to the construction of dams nor affect operations of existing dams or affiliated reservoirs.
Projects on International Waterways OP/BP 7.50	No	The project will not affect international waterways.
Projects in Disputed Areas OP/BP 7.60	No	No activities are planned in any disputed areas.

3.0 PROJECT DESCRIPTION & ALTERNATIVES

3.1 GENERAL

101. This section of the report describes the proposed project including its location, scope, and activities associated with its design, construction, and operation. This section will also consider alternatives associated with the Project. Accordingly, this chapter is arranged as follows:

- Project Summary, including category of project and project need and location;
- Environmental Setting, providing an overview of the socio-environmental conditions within the Project Corridor; and
- Scope of Works, summarizing the works activities to be undertaken as part of the Project.
- Assessment of Alternatives, including the 'no project' scenario.

3.2 PROJECT BACKGROUND

102. National Road 13 (NR13) is the most important road in Lao PDR. It begins at Boten in Luang Namtha Province in the north of Lao PDR at the Chinese border. It connects the major cities from Vientiane Capital to Luang Prabang City in the north, and to the south roughly follows the line of the Mekong River passing through the cities of Savannakhet, Pakse City (Champasak Province) and down to the border with Cambodia. Its total length is 1534km approximately. It traverses 10 provinces out of 17 of Lao PDR. The road comprises NR13 North (699 km approx.) from Vientiane Capital to Boten at the border with China and NR13 South from Vientiane Capital to the border with Cambodia (835 km approx.). NR13 N is part of ASEAN Highway (AH) 12, and NR13 S is part of AH 11. The main sections of the road were completed in 1997 and have not been rehabilitated since, receiving only periodic and emergency maintenances. Its upgrade, rehabilitation and maintenance will result in better connectivity for the country and the region.

103. Over the past decades, traffic volume on NR13 has rapidly increased. Traffic in some sections is expected to reach full capacity in the next 5 years. from 2014 to 2015 the government of Lao PDR carried out a feasibility study (FS) on some sections of both NR13N and NR13S.

104. The section of road for this project is in Sikhottabong and Naxaythong Districts, Vientiane Capital which is in a flat zone (called Vientiane Plain) between Mekong River and Nam Ngum River. This road section is located entirely in urban areas. The existing road is 2-lane 2-way road, formation width varies 13.00 meters to 15.00 meters and DBST surface the latest improvement was done in the early 1990s under the Road 13N Improvement Project (Vientiane to Vang Vieng). The condition of existing road is fair. Side ditches are mainly filled by soil and vegetation, some of cross drains the stream is also blocked by soil and vegetation. Traffic signs, road marking, guideposts, guard rails are needed to improve traffic safety.

105. The Project Development Objective (PDO) is to improve the road conditions, safety, and climate resilience on critical sections of NR13. Further, the Project aims to enhance the efficiency of the road network and transport in Vientiane Capital. It will also improve traffic safety and traffic congestion reduction in this road section, and connectivity to road networks in Vientiane Capital for traffic flows smoothly, through the provision of improved ride quality,

widening of carriageway, pavement structures and the construction of drainage structures, improvement of traffic safety facilities, provision of parking bays.

106. The improvement of the Sikhai (KM6) to Sikeut (KM12) section will be implemented under the ongoing Improvement and Maintenance of NR13 project with financing support from the World Bank, AIIB, and NDF.The Project will be executed by the Ministry of Public Works and Transport (MPWT) through the Department of Roads (DoR) which are responsible for the direct supervision and project administration.

3.3 SUITABILITY OF THE PROJECT AREA FOR ROAD CONSTRUCTION

107. The project road is integral component in the Lao PDR road transport sector and provides connections to road networks, traffic in urban area, and transport between provinces.

108. When upgraded, the road will be contributed to improving the living standards of the population in the project area and vicinity area, to support policy of the Government of Lao PDR for the poverty alleviation of the population. It will also be improved connectivity of transport networks, reduction of traffic congestion in this area of Vientiane Capital and reduction of road traffic accidents.

3.4 SCOPE OF PROJECT

109. The scope of works recommended for this road section is summarized in following.

- Widening of pavement on crossed roads at intersections, especially increased turning radii, provision of channelization and traffic islands at major intersections to allow traffic to flow smoothly and reduce conflict points.

- Installation of traffic signals at major intersections with high traffic volume and pedestrian crossing (zebra), especially schools, hospitals and temples area.

- Provision of raised median to avoid head on collision accident, reduce crossing conflict and for the purpose of pedestrians crossing.

- Provision of U-Turn facility with minimum 1000 m spacing if there is no intersection in between.

110. It is envisaged that the improvement to an Urban Road standard located in level terrain, the road works involve bringing the existing roads to a formation width of 23.00 meters:

- traffic lanes: 3.50m x 4 = 14.00m

- slow lanes: 1.350m x 2 = 2.70m

- curb gutter: 0.35m x 2 = 0.70m

- raised median (included safety space) = 2.60m

- sidewalks: 1.50m x 2 = 3.00m

- Formation width = 23m

111. It will also include pavement strengthening by construction of cement concrete pavement, shoulder and sidewalk improvement, embankment improvement, provision and improvement of drainage structures and road safety facilities.

112. Following the principles established in the project's resettlement framework, effort will be made to restrict all improvement works within the existing right-of-way to minimize land acquisition and resettlement.

3.5 PROJECT LOCATION

113. The road section of this project is in Sikhottabong district, Vientiane Capital starts form Sikhai Y-Intersection (KM 6) to Sikeut Intersection (KM 12) length of 6 Km as shown in Figure 2, most of the length of project road is in the urban area and under the administration of Vientiane Capital.

114. Figure 1 provides a location map of the Project road within the context of Lao PDR. A schematic presentation of the road alignments is provided by Figure 2.

Figure 1: Project Location Map

Figure 2: Road Alignment

3.6 EXISTING GENERAL FEATURES

115. The right of way for new National Roads is defined under the Law on Public Roads 021/NA dated 08/11/2016 and is 50.0m width for the improvement of an existing road (25 metres from the centre line on each side). However, the width of this corridor of impact (COI)

for the project will vary according to the class of road, width of carriageway and shoulder, drainage, road safety considerations, construction requirements, diversion roads, etc.

116. The existing road comprises a 10m to 11m carriageway with 1.50 to 2.00m shoulders with DBST surface. The road surface conditions vary significantly from good to fair with most road sections being rated as low to medium deteriorated.

117. Generally, road section in the project has an alignment consisting of straight to sharp horizontal curves with minimum horizontal radius is 140 m, together with low vertical grades, with the maximum of vertical gradient is 1.96%.

118. The road alignment passes through flat terrain and urban areas which means that allowable speeds for light vehicles are reduced in most instances to speeds of 60 kph but are as low as 40 kph in crowded areas.

119. There is no existing bridge in this project, the drainage system consists of pipe culverts, box culverts, open unlined ditches, and reinforced concrete ditch with cover (rectangular shape) in some segments, current condition of an existing culverts is as described in the following paragraph.

120. Most of the existing culverts were constructed at the same time as the road was constructed during the late 1990s, and some of them have been improved during maintenance in the following years. In general, it is considered that almost all the culverts appear are adequately sized for their catchments. Drainage problems were observed resulting in flooding by storm water at lower points of the road during heavy rain. The main reason for this is blocked culverts caused by buildup of trash and lack of maintenance. In addition, natural drainage channels have been blocked.

121. The condition of culverts is summarized are shows in the below:

Table 14: List of Existing Culverts

No.	Location	Size / Type	Length (m)	Structures In Let / Outlet	Condition	Proposed Improvement
1	6+212	PC, Dia. 0.60m	25.00	DI/DI	Poor	To be replaced by new
2	7+658	PC, Dia. 0.60m	18.00	WW/WW	Poor	To be replaced by new
3	7+910	PC, Dia. 0.80m	19.00	WW/WW	Poor	To be replaced by new
4	10+060	PC, Dia. 1.00m	60.00	_	Good (but not enough capacity)	To be added one Dia. 1.00m
5	10+333	PC, Dia. 1.00m	19.00	WW/WW	Good (but not enough capacity)	To be added one Dia. 1.00m
6	11+390	2BC, Size 2.0x1.5m	15.00	WW/WW	Good	To be Extended

Notes: MH = Manhole, HW = Head Wall, WW = Wing Wall, DI = Drop Inlet

3.6.1 Environment of Roadside

122. The existing traffic facilities on the road is very poor, with inadequate road signs and lack of maintenance in general. One of the most obvious omissions and lack of consistency or uniformity is warning signs for horizontal curves. Up to 80% of the curves are without advance warning signs. Similarly, advisory speed limit signs have not been provided on the road. There are no speed signs along this road. Also, there is a lack of adequate information signs which could indicate distances and destinations. Another safety concern is that there is no delineation of the alignment and roadway. The concrete culvert walls and their head wall have not been painted to provide positive safety guidance to the road user. Guideposts have only one at each side and lack any retro-reflective material on them. Chevron signs have not been utilized on sharp curves to make night-time delineation more effective. There are locations where there is a need to provide crash barriers/ guard rails such as sharp curves, high embankments, and approaches. There is a lack of adequate timely warning for locations where there are communities/villages ahead, and children crossing.

Figure 3: Typical Existing Road Photos

Start Point, Y-Intersection KM 6.000

Sikhai Market (parking area is narrow – vehicles park on the road sides)


Sikhai Plaza (parking area is narrow – vehicles park on the road sides)


No existing ditch (pavement edges are severily deteriorated)


No existing ditches


Existing Irrigation Canal (no longer in use)

Hospital No Parking Lot, No Chevron Marking

T-Intersection KM 8.450


Signalised Intersection, KM 10.450


Signalised Intersection, KM 11.025


Nong Niew Market (parking area is narrow - vehicles park on the road sides)


Lao-Aussie Market


Existing Ditches


Existing Gully and Manhole (in the area of start point there is lack of maintenance, full of debris and sediment)

3.7 SCOPE OF WORKS

123. The scope of works for the Project road can typically be divided into design, pre-construction, construction and operational and maintenance (O&M) activities. The following section provides a summary of the potential activities that are anticipated to occur during each activity.

3.7.1 Design

3.7.1.1 Current Road Design Standards

124. The standard for road and bridge construction project in Lao PDR is referred to the Road Design Manual of the Ministry of Public Work and Transport (MPWT) officially issued in August 2018. This manual was developed following technical provisions and standards found in the American Association of State Highway and Transportation Officials (AASHTO) for highways and bridges of the United States. As required in ToR, ASEAN Highway standard is applied for this project road.

Table 15: Design Standards

Highway Classification	Class 1 (4 Lane)	Class II (2 lane)
Terrain Classification	Level	Level
Design Speed km/h	80-110	80-100
Width (m)	Right of Way	23
	Lane	3.50
	Shoulder	2.0
Min. horizontal curve radius (m)	220	200
Type of Pavement	Asphalt / cement concrete	Asphalt / cement concrete
Max. super elevation (%)	Rural: 8 Urban: 6	Rural: 10 Urban: 6
Max. vertical grade (%)	5	6
Min. vertical clearance	4.50	4.50
Structure loading (minimum)	HS20-44	HS20-44

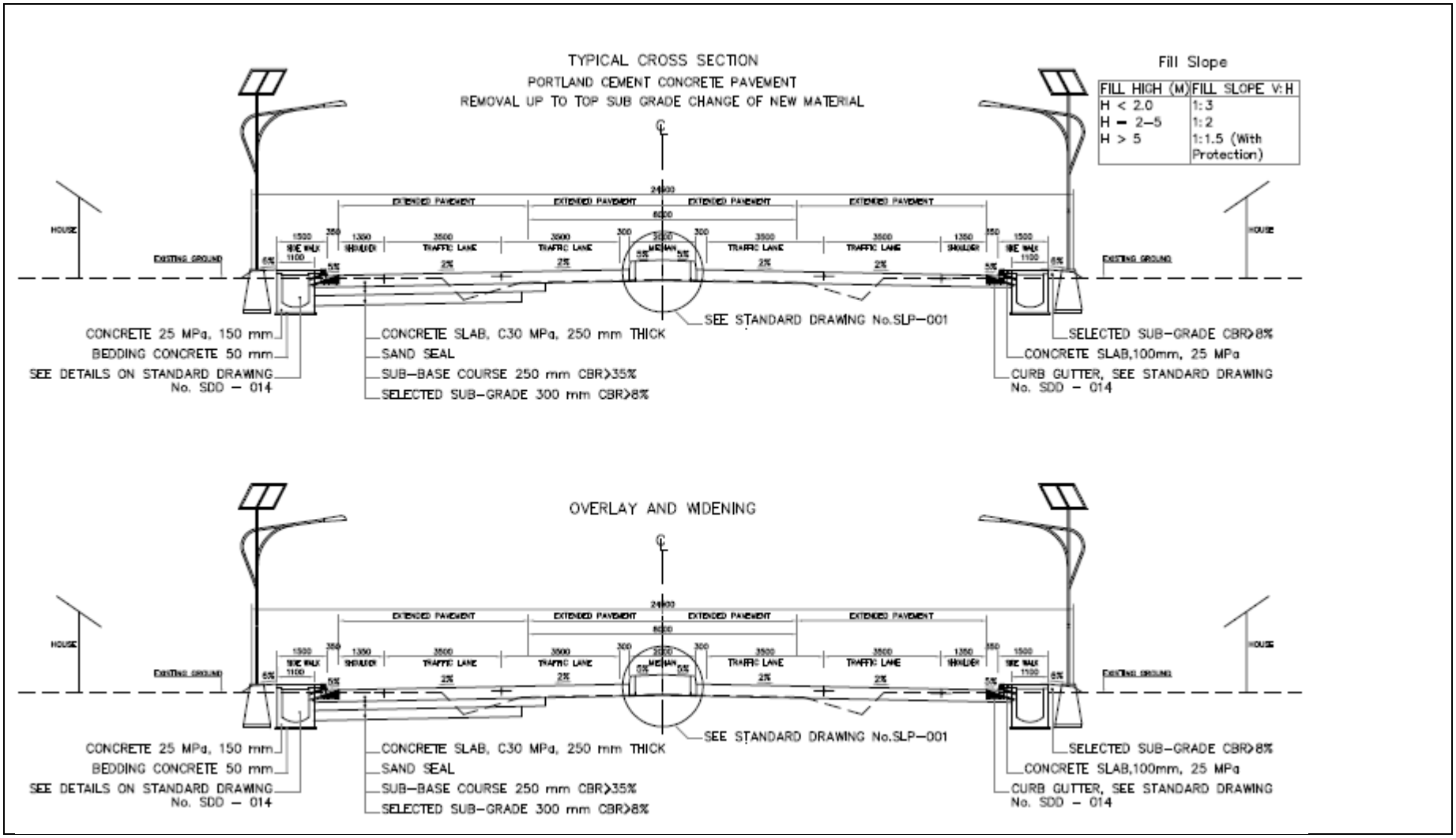
*Design speeds in urban areas will be 40 km/h.

3.7.1.2 Road Standards Adopted for the Project

125. According to the ToR as required by the DOR-MPWT, the design standard shall be the same as used in the first sub-section 19.40km length (Contract Package 1) of road section Sikeut (Vientiane Capital) to Phonehong (Vientiane Province), this sub- section is an urban road standard with 4-lane 2-way divided road will be applied, design speed is 80 kph but traffic regulation should not allow more than 60kph in urban areas.

126. Figure 4 illustrates the proposed cross sections of the road. It appears from these figures that embankments will be required in all instances, however, there will not be many areas where the road will be raised, except in areas identified as being flood prone. Design plans are presented in **Appendix B** of this ESIA.

Figure 4: Cross Section

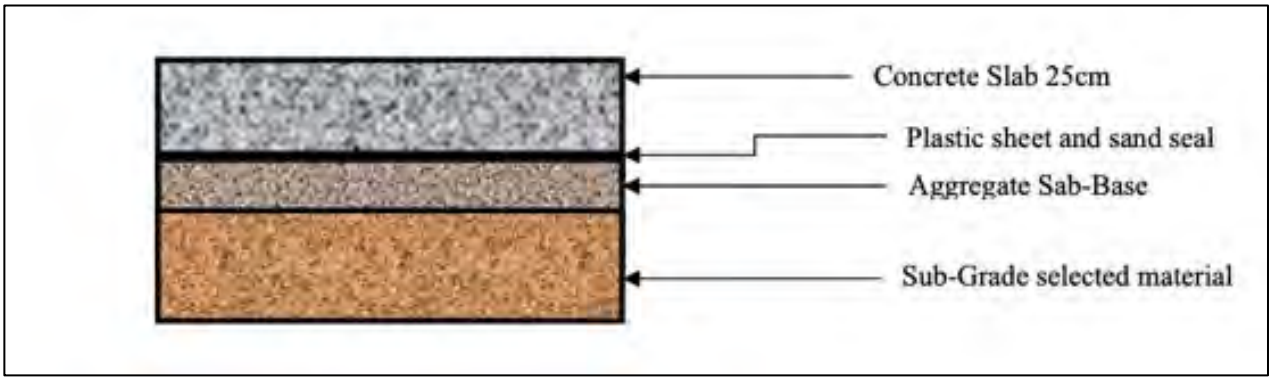


3.7.1.3 Pavement

127. The pavement design has proposed rigid Portland Cement Concrete surface (PCC) by Jointed Plain Concrete Pavement (JPCP) type, the pavement design is based on a 20-year design life, basic pavement structure presented below and shown in the following figure.

- Concrete Slab (30MPa), 25cm thick
- Sand Seal
- Sub-Base Course: Aggregate CBR>30%, 25cm thick
- Sub-Grade Selected Material CBR>8%, 30cm thick
- Embankment CBR>4%

Figure 5: Rigid Pavement Structure



3.7.1.4 Proposed Project Road Safety Road Features

128. Road safety should be considered in a comprehensive way through all aspects in the design of highways. The safety features that were used in the project road design are as follows:

a) Provision of a wider (0.5 to 2 meters depending on proposed road standard) sealed shoulder and sidewalk in community areas.

b) Provision of Bus Bay and public parking area at roadside where there is suitable space.

c) Improvement of poor sight distances.

d) Improved horizontal geometry by providing curve widening at on all sharp curves.

e) Design and installation raised median for separation of traffic direction to eliminate head on collision, and reduction of cross conflict

f) Traffic Calming, Amber flashing where these should be provided at people crossing points.

g) Road signs such as warning, information and direction signs, especially at curves less than 50 kph, and installation of chevron signs.

h) Raised pavement markers and provision of rumble bars on pavement at small radius curves.

i) Lane Markings consist of centerline, edge line and pedestrian crossing, and additional safety signs and zebra crossing where it is vulnerable/ black spots as recommended by local people as appropriate.

j) Speed bumps and/or rumble strip at the entrance of populated area and through the towns.

k) Chicanes, physical traffic islands constructed on the shoulders to reduce speeds to the desired level, where the road passes through communities.

l) Traffic islands and channelization at key intersection.

m) Guardrails provided on box culverts and area where sharp curves, and high embankments.

n) Provides chevron sign, traffic calming and rumble bars at hazardous curves.

3.7.1.5 Road Sign and Marking

129. Road signs used in the project roads are classified into four types such as (i) regulatory signs, (ii) warning signs, (iii) prohibitory signs, and (iv) guide signs.

- Regulatory and prohibitory signs give drivers notice of traffic laws and regulations.
- Warning signs direct attention to condition of the road on or adjacent to a street that are potentially hazardous to traffic operation.
- Guide signs indicate road designations, directions/distances, village name, points of interest, and other geographic or cultural information.
- Road markings placed on the pavement, curb, or object to convey traffic regulation and warnings to drivers. The types of road markings proposed for this project are:

  i. road centerlines, and lane lines

  ii. pavement edge markings to delineate separation of motor and bike traffic, and

  iii. pedestrian crossings.

3.7.1.6 Improvement of Black Spots

130. From traffic accident records there are five locations where accidents frequently occur that can be considered as black spots on this road section, four locations are T-Intersection (with minor roads, i.e., local roads) and one is market location, in this conceptual design proposed to improve these black spots as follows:

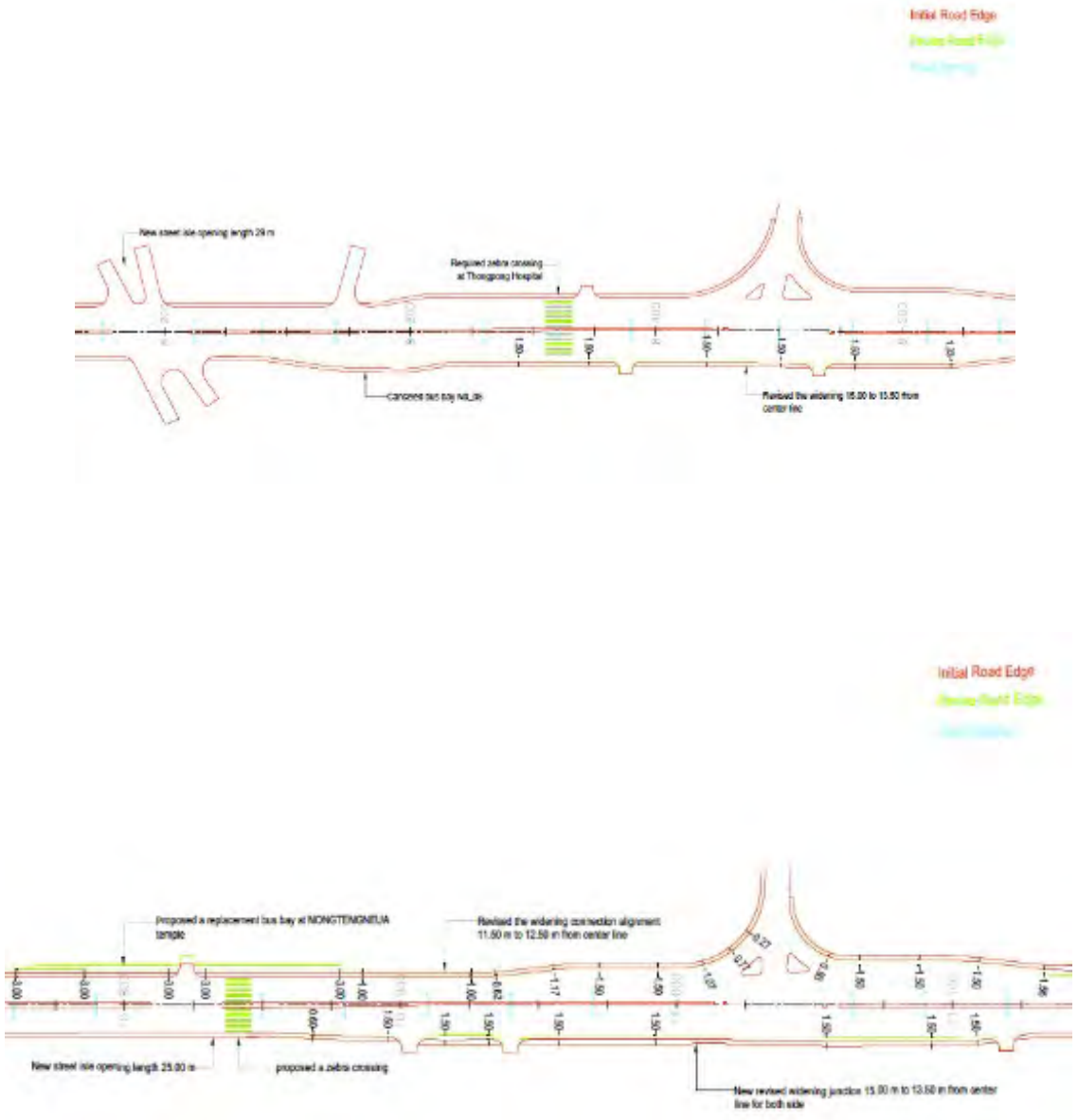
131. T-Intersections with access roads and minor roads (i.e., local roads) KM 7.000, KM 8.450, KM 10.450, KM 11.000: Widening of connection road at the area of intersection, increase turning radii at connecting corners, installation of traffic islands and channelization at key intersection for smooth traffic movement and reduction of conflicting points, improvement of visibility (sight distance)

132. Nong Niew Market area KM 9.100 to KM 9.400, market is located on a curve: Improve visibility (sight distance) in the curve especially inner curve side (right hand side), provide pedestrian crossing marking (zebra) with signalization.

3.7.1.7 Pedestrian Crossing

133. This project is designed to provide two at-grade pedestrian crossings at Lao-Aussie Market as per the figures below.

Figure 6: Pedestrian Crossings



3.7.2 Pre-construction

134. During this phase of the Project typical activities will include:

- Site Clearing Works – The following works may occur:
    i. Clearing and grubbing.
    ii. Demolition, removal and disposal of existing fences, structures/buildings or parts of structures or buildings.
    iii. Removal and disposal of traffic signs, signposts and their foundations.
    iv. Demolition, removal and disposal of existing culverts, inlet and outlet structures, headwalls, concrete drains, channel lining, and erosion protection works.
    v. Removal of and any other natural or artificial objects within the ROW.
    vi. Backfilling and compacting cavities remaining after the removal of trees, stumps, or any other incidental works.
    vii. Removal and disposal of all vegetation and debris within the designated limits of the Right-of-Way.
    viii. Any other works incidental to demolition, tree cutting and site clearance.
- Removal of Trees.
- Relocation of Existing Services - The Works include the relocation of all services affecting the construction of the Project Road within the ROW. The services include the following:
    i. Water mains.
    ii. Overhead electric supply lines.
    iii. Communications Lines
    iv. Sewer mains.
- Contractor Environmental and Social Management Plan (CESMP) - During this period the Contractor should prepare his own CESMP to conform to this ESIA and its ESMP. The CESMP should ideally be completed with 30 days of the signing of the Contract to ensure that all ESMP measures are included within the Pre-construction phase.

3.7.3 Construction Phase

3.7.3.1 Culverts

135. Project works will include construction of cross drainage structures (culverts), including inlet and outlet structures and associated works. A schedule of culverts is included in **Appendix C**. Cross drainage works may typically include:

- Replacement of existing culverts which are old, structurally deficient or undersized;
- Extension of existing culverts which are of adequate design and in good condition;

- Construction of new culverts at locations where no cross-drainage structure existed before;
- Cleaning of existing culverts which are partially or completely silted;
- Miscellaneous repair of the existing culvert joints, headwalls, wing walls, and scour and erosion protection works; and
- Construction of new scour protection and channel lining works.

136. Existing culverts and roadside ponds are currently used by the local population for a variety of uses. Prior to starting work at any culvert location, the Contractor shall consult with the village head and landlord/s and take steps to ensure the work has a minimum detrimental impact on the local population. The findings of each consultation shall be reported in writing to the Engineer. The proposed culvert locations/levels as shown in the detailed design are approximate only and may need to be adjusted to best suit the existing topographic conditions on site. At least 4 weeks before the Contractor proposes to commence construction at a culvert location (existing or proposed) he shall conduct a detailed topographical survey of the culvert location including the upstream and downstream stream channels. The Contractor shall document the survey as a plan with appropriate cross sections and submit the same to the Engineer who will instruct the exact levels/extents to which the culvert works are to be constructed.

3.7.3.2 Other Drainage Structures

137. Surface runoff from the carriageway and all other pavements, and embankment slopes will be discharged through longitudinal drains designed for adequate cross section, bed slopes, invert levels and the outfalls. The Works will include construction of the longitudinal/side drainage structures (open ditch, RC ditch or pipe) in urban and rural areas. All designs shall ensure that the drains discharge to existing drainage ditches of suitable capacity, or to streams without causing erosion of embankments, flooding, or damage to properties. Prior to discharge from the longitudinal drains, the water should pass through an oil / grease interceptor or control valves.

3.7.3.3 Earthworks

138. Typical earthworks may include the following:

- Removal of topsoil.
- Construction of embankments.
- Construction of subgrade.
- Excavation and removal of the existing pavement materials and the existing road embankment.
- Removal and replacement of unsuitable materials.
- Structural excavation.
- Excavation for the construction of side drainage and cross-drainage works.
- Excavation for the removal and relocation of the existing utilities.

- All backfilling necessary for the construction of retaining walls or other earth retaining structures, cross drainage structures and associated works, side drains and erosion protection work.

- Preparation of beddings and filters for all structural, cross drainage, side drains or pavement works.

- Excavation, filling or backfilling necessary for the execution of any other incidental works.

3.7.3.4 Embankments

139. There are no cases where high and steeper slopes have to be cut in widening the road. Even in cases where roadside slopes have to be cut, the cut slopes do not exceed 2 m and even in such cases are encountered in very short reaches only. As a safety measure, crash barriers will be installed in sections where embankment heights are higher. Advance warning signs will be posted to warn drivers of such sections. Fill slopes will also be turfed suitably to control erosion. Raised road profiles will be provided in identified flood prone zones.

3.7.3.5 Removal of Asphalt

140. The existing pavement will be scarified, and where the material meets the required specification, it will be compacted and re-used as sub-base material.

3.7.3.6 Key Construction Equipment

141. Table 16 provides indicative lists of the key equipment required in the construction phase (based upon equipment currently being used for Km12- Km70).

Table 16: Key Equipment

No.	Equipment Type and Characteristics	Minimum Number required
1	Motor Grader (12 feet)	4
2	Wheel Loader (3 m^3)	2
3	Excavator (1-1.4 m^3)	5
4	Vibratory Roller (20T)	4
5	Dump Truck	10
6	Concrete Mixing Truck (12 m^3)	6
7	Water Bowser (14,000L)	3
8	Tractor with Trailer (15-20T)	1
9	Truck Crane (8-25T)	1
10	Batching Plant (90 m^3/h)	1

Permanent Ancillary Features

142. The exact locations of bus stops have yet to be determined.

3.7.3.7 Quarries & Borrow Pits

143. Material used for road embankments and pavement layers will be procured from borrow pits. The material can be divided as soils, sands and silts, clay, and gravel. Depending on the application in road works, the following characteristics of these materials are considered important in obtaining them in their naturally occurring form:

- Particle Size and Particle Size Distribution.
- Moisture Content.
- Consistency Limits.
- Compaction.
- Strength.

144. Three borrow pits have been identified for the Project. Their locations and suitability are discussed as part of **Section 5.4.1**.

3.7.3.8 Water

145. The locations of the extraction points for non-potable water have yet to be determined, although they should be approved by the Engineer prior to the start of extraction. Potable water will also need to be sourced for construction camps, the requirements of which are discussed as part of the Projects ESMP.

3.7.3.9 Construction Camps

146. Camp sites will be selected keeping in view the availability of an adequate area for establishing campsites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Final locations will be selected by the Contractor after the approval from the Engineer. Environmental impacts of construction camps and proposed mitigation measures are discussed in **Section 6**.

147. The area requirement for construction camps will depend upon the workforce deployed and the type and quantity of machinery mobilized. In view of the area required, it will not be possible to locate campsites within the ROW and the contractors will have to acquire land on lease from private landowners. The construction camp will have facilities for site offices, workshop and storage yard, and other related facilities including fuel storage. The Contractor will provide the following basic facilities in the construction camps:

- Safe and reliable water supply.
- Hygienic sanitary facilities and sewerage system.
- Treatment facilities for sewerage of toilet and domestic wastes
- Storm water drainage facilities.
- Sickbay and first aid facilities.

148. Detailed criteria for siting of construction camps and establishment of facilities are given in the ESMP.

3.7.3.10 Storage Areas

149. Temporary storage areas will be required for certain activities, such as the storage of sand and gravels and construction equipment. These storage areas may range in size from anything between 50 m^2 to more than a hectare. The precise locations of these temporary facilities are not known at this stage, as such mitigation measures will be prepared to ensure that these areas are sited in approved locations.

3.7.3.11 Diversions

The road will be kept open throughout construction. Some diversions may potentially be required during the construction phase around key work zones. The exact scope of such diversions will be determined by the Contractor.

3.8 ANALYSIS OF ALTERNATIVES

3.8.1 The No Action Alternative

150. The “No Action” Alternative in this instance is defined as a decision not to undertake the proposed construction of the Project Road. The “No Action” Alternative would result in the continued deterioration of the road and drainage structures along the RoW, thereby impeding the economic development of the Project Area and the region. All positive benefits would be foregone. The relatively minor, less than significant environmental impacts (such as noise and short-term air quality impacts due to maintenance activities) and inconveniences (such as traffic diversions) would be avoided in the short run. In the long run, however, the steadily declining state of the roadway would severely hamper economic development in the area. Considering these aspects, the “No Action” Alternative is deemed to be neither prudent nor in the best interest of Lao PDR or those with an interest in, and attempting to assist restoration of, Lao PDR’s well-being.

3.8.2 Alignment / Corridor Alternatives

151. All rehabilitation works will take place within the RoW and according to the Project Feasibility Study (FS) the policy is to adhere to the existing alignment as much as possible. As such no alternative corridors have been proposed for the Project or are assessed in this ESIA.

3.8.3 Alternative design

152. Several comments were made during stakeholder consultations (Thongpong and Nalao) regarding moving the street lighting from the side of the road to the road median. This would reduce the impact to land on either side of the road. This recommendation was proposed for consideration by the Concept Design consultant and has now been adopted as part of the concept design.

3.8.4 Bus bays & Road crossings

153. Comments have been made by stakeholders regarding the locations of bus bays, specifically in NongNiew and the bus bay from Toyota to Lao-Japanese school’s area (Phosi). Stakeholders requested that these bus bays be relocated. Consultations throughout the ESIA and RAP preparation have led to changes in the locations of the bus bays to alternative points along the road. Further, stakeholder engagement has eliminated the requirement for two ‘sky bridges’ which have been replaced by pedestrian crossings.

4.0 ESIA APPROACH

4.1 GENERAL

This section of the report discusses:

- ESIA Boundaries – providing the areas of influence by topic.
- ESIA Methodology – including data collection methodology, impact assessment methodology and consultation procedures.

4.2 ASSESSMENT BOUNDARIES

154. The Project study area, its area of influence (AoI) is deemed to be a 500m buffer along the entire alignment (and its ancillary facilities, e.g., camps, borrow pits etc.). Within this AoI various direct impacts may occur within a 'corridor of impact' (CoI). The CoI will be different for the various topic studies within the ESIA as follows:

Table 17 Corridor of Impact by Topic

Topic	COI	Rationale
Air Quality	350m from the boundary of the work zones.	According to the screening guidance of the UK's Institute of Air Quality Management (IAQM) for construction dust, detailed assessment relating to dust generation is required where there is a 'human receptor' within 350m of the boundary of the site.
Noise	500m from the edge of the RoW and from construction camps and ancillary facilities	Noise levels beyond this limit are not anticipated to be above 55dBA. Nighttime works will be prohibited in residential areas. Operational noise is not anticipated to be above 55 dBA at this distance due to the screening provided by front row properties.
Soils	Within the RoW, Access roads limits and within camp and ancillary site boundaries.	No productive soils are likely to be impacted, therefore the analysis focuses on areas affected by spills and leaks of hazardous liquids, or areas potentially contaminated from on-going activities (e.g., gas stations). These areas would generally be in work zones and not beyond.
Hydrology	Within 10m of work zones and the RoW.	No major water courses are present with the corridor. Groundwater could be affected by spills or leaks, but this in not anticipated to be a significant issue.
Biodiversity	Within the RoW and 5m from the edge of access roads.	Within the RoW the only anticipated impacts to biodiversity will be tree cutting and some elements of vegetation clearance. Access roads to camps and borrow pits may require some vegetation clearance, but this would most likely not be required. Camps and ancillary facilities will be prohibited from being located within protected areas, or areas of natural or sensitive habitat (e.g., areas that would require cutting of trees and vegetation), thereby negating the potential for biodiversity impacts in these areas. Dust impacts are covered within the COI for air quality.

Topic	COI	Rationale
Cultural Heritage	Within 50m of the RoW	Impacts from noise and dust are covered within their specific topic COIs. A 50m AoI covers the potential for general construction impacts, e.g., encroachment to sites from construction vehicles and workers. Beyond this distance it is unlikely that construction vehicles and workers would affect such sites.
Occupational Health and Safety	Within work zones, camp sites and ancillary facilities	These are the areas where workers would be present.
Community Health and Safety	Within 50m of the RoW. Areas adjacent to access roads, camps, and ancillary facilities.	Within these areas the risk of accidents involving construction vehicles and construction equipment and work sites (e.g., excavated areas) is the highest.
Waste Management	Within 25 m of the RoW and a 50m buffer around camp sites and ancillary facilities	Beyond these distances it is unlikely that construction waste will occur.
Social Infrastructure	Within the RoW, and issues of access also will be considered.	Access to properties during construction has the been the subject of complaints from residents during the current construction form km 12.
Economic	Businesses along the road	The main impacts will be felt by the businesses located directly beside the road.
Land Use	Use details of all land plots along the road will be recorded in the census.	Land use
Structures	Structures affected by land acquisition	Effects on structures will be limited to those falling within the RoW.

4.3 ESIA METHODOLOGY

155. The overarching ESIA methodology is based on the World Bank Safeguard Policies and the joint experience of the International and National environmental consultants involved in the ESIA. Background data and information was obtained from published and unpublished sources, e.g., on climate, topography, geology and soils, natural resources, agriculture, and socio-economic data.

4.3.1 Desk-top Data

156. Background data and information collected by the team and the ESIA Team was obtained from published and unpublished sources, e.g., on climate, topography, geology and soils, natural resources, flora and fauna, agriculture, and socio-economic data. References to all sources used is made throughout the report.

4.3.2 Site Surveys

157. Several site inspections were conducted by the ESIA team in 2021. The potential areas of impact were inspected (where access is possible due to safety restrictions) and areas of potential environmental and social significance assessed carefully.

158. Baseline surveys and instrumental monitoring was also undertaken by the ESIA Team for noise, air quality, surface water quality and groundwater quality. The approach for each of the instrumental surveys are presented in **Appendix D.**

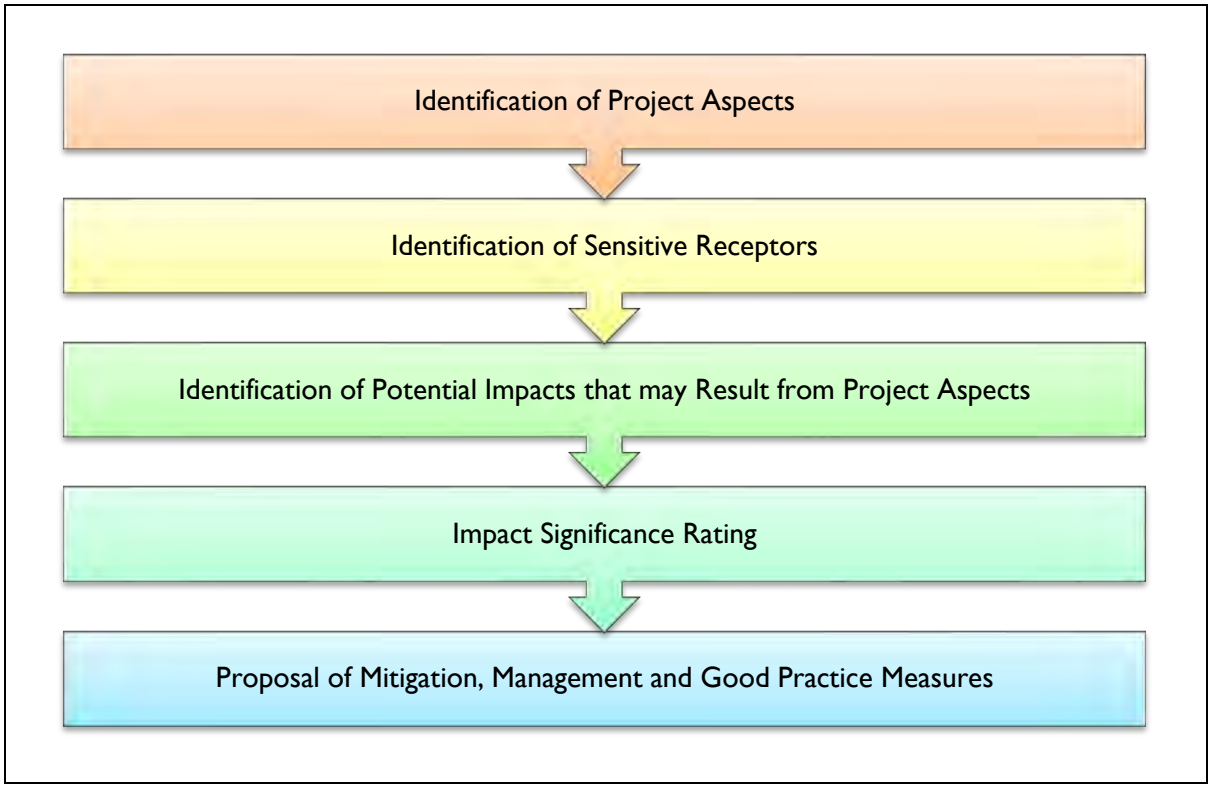
Table 18: Site Surveys

Site Surveys	Period
Noise Monitoring	November 2021
Air Quality Monitoring	November 2021
Surface Water Monitoring	November 2021
Ground water Monitoring	November 2021
Sensitive Receptor Survey	November 2021
Tree Survey	November 2021
Social Surveys	November / December 2021
Borrow Pit Surveys	February 2022
Gas Station Surveys	February 2022

4.3.3 Impact Assessment Methodology

159. This EIA follows a set format during the impact assessment process. As shown in the following flow chart and described further below.

Table 19: Impact Assessment Process



Project Aspects

160. Firstly, the main environmental aspects of the Project are noted. An environmental and social aspect is any activity of the Project that interacts with the environment (environment is taken to include physical, biological and human (social) environment). E.g., an aspect of the Project that may impact upon air quality will be the movement of vehicles on unpaved roads through rural settlements.

Identification of Sensitive Receptors

161. Once the main aspects of the Project have been identified any sensitive receptors within the Project area of influence are noted. Examples of sensitive receptors include residents, rivers, groundwater, birds, etc. Identification of receptors is a key part of the impact assessment process as without a receptor there will be no impact. For example, if a road generates significant noise but there are no sensitive receptors who can hear the noise, then there will be no noise impact.

Identification of Significant Environmental and Social Aspects

162. Thirdly, the potential impacts of the identified aspects are outlined and how they could impact upon the identified receptors, in the case above, this could be the movement of a construction vehicle creating dust on an unpaved road which impacts upon local villagers.

163. The significance of an impact is determined based on the product of the consequence of the impact and the probability of its occurrence. The consequence of an impact, in turn, is a function primarily of three impact characteristics:

- magnitude
- spatial scale
- timeframe

164. Magnitude is determined from quantitative or qualitative evaluation of a number of criteria including:

- Sensitivity of existing or reasonably foreseeable future receptors.
- Importance value of existing or reasonably foreseeable future receptors, described using the following:
    i. inclusion in government policy.
    ii. level of public concern.
    iii. number of receptors affected.
    iv. intrinsic or perceived value placed on the receiving environment by stakeholders.
    v. economic value to stakeholders.
- Severity or degree of change to the receptor due to impact, measured qualitatively or quantitatively, and through comparison with relevant thresholds:
    i. legal thresholds—established by law or regulation

ii. functional thresholds if exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably

iii. normative thresholds – established by social norms, usually at the local or regional level and often tied to social or economic concerns

iv. preference thresholds—preferences for individuals, groups, or organizations only, as distinct from society at large

v. reputational thresholds—the level of risk a company is willing to take when approaching or exceeding the above thresholds

165. Spatial scale is another impact characteristic affecting impact consequence. The spatial scale of impacts can range from localized (confined to the proposed Project Site) to extensive (national or international extent). They also may vary depending on the component being considered.

166. The impact timeframe is the third principal impact characteristic defining impact consequence and relates to either its duration or its frequency (when the impact is intermittent). Impact duration can range from relatively short (less than four years) to long (beyond the life of the Project). Frequency ranges from high (more than 10 times a year) to low (less than once a year). These timeframes will need to be established for each Project based on its specific characteristics and those of the surrounding environment.

167. Once the impact consequence is described based on the above impact characteristics, the probability of impact occurrence is factored in to derive the overall impact significance. The probability relates to the likelihood of the impact occurring, not the probability that the source of the impact occurs. For example, a continuous Project activity may have an unlikely probability of impact if there are no receptors within the area influenced by that activity. The characteristics are outlined in the table below.

Table 20: Characteristics Used to Describe Impact

Characteristic	Sub-components	Terms Used to Describe the Impact
Type		Positive (a benefit), negative (a cost) or neutral
Nature		Biophysical, social, cultural, health or economic Direct, indirect or cumulative or induced
Phase of the Project		Pre-construction, construction and operation.
Magnitude	Sensitivity of Receptor	High, medium or low capacity to accommodate change High, medium or low conservation importance Vulnerable or threatened Rare, common, unique, endemic
	Importance or value of receptor	High, medium or low concern to some or all stakeholders High, medium or low value to some or all

Characteristic	Sub-components	Terms Used to Describe the Impact
		stakeholders (for example, for cultural beliefs) Locally, nationally or internationally important Protected by legislation or policy
	Severity or degree of change to the receptor	Gravity or seriousness of the change to the environment Intensity, influence, power or strength of the change Never, occasionally or always exceeds relevant thresholds
Spatial Scale	Area affected by impact – boundaries at local and regional extents will be different for biophysical and social impacts	Area or Volume covered Distribution Local, regional, transboundary or global
Timeframe	Length of time over which an environmental impact occurs or frequency of impact when intermittent	Short term or long term Intermittent (what frequency) or continuous Temporary or permanent Immediate effect (impact experienced immediately after causative project aspect) or delayed effect (effect of the impact is delayed for a period following the causative project aspect)
Probability – likelihood or chance an impact will occur		Definite (impact will occur with high likelihood of probability) Possible (impact may occur but could be influenced by either natural or project related factors) Unlikely (impact unlikely unless specific natural or Project related circumstances occur)

Impact Significance Rating

168. The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the approval process; secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance. The impact significance rating system is presented in Table 21 and described as follows:

- **Part A**: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale and duration.
- **Part B**: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and

- **Part C**: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

169. Using the matrix, the significance of each described impact is rated.

Table 21: Method for Rating Significance

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE			
Definition		**Criteria**	
MAGNITUDE		Negative	Positive
	Major	• Large number of receptors affected • Receptors highly sensitive and/or are of conservation importance • Substantial deterioration, nuisance or harm to receptors expected • Relevant thresholds often exceeded • Significant public concern expressed during stakeholder consultation • Receiving environment has an inherent value to stakeholders	• Large number of receptors affected • Receptors highly amenable to positive change • Receptors likely to experience a big improvement in their situation • Relevant positive thresholds often exceeded
	Moderate	• Some receptors affected • Receptors slightly sensitive and/or of moderate conservation importance • Measurable deterioration, nuisance or harm to receptors • Relevant thresholds occasionally exceeded • Limited public concern expressed during stakeholder consultation • Limited value attached to the environment	• Some receptors affected • Receptors likely to experience some improvement in their situation • Relevant positive thresholds occasionally exceeded
	Minor	• No or limited receptors within the zone of impact • Receptors not sensitive to change • Minor deterioration, nuisance or harm to receptors • Change not measurable or relevant thresholds never exceeded • Stakeholders have not expressed concerns regarding the receiving environment	• No or limited receptors affected • Receptors not sensitive to change • Minor or no improvement in current situation • Change not measurable • Relevant positive thresholds never exceeded No stakeholder comment expected

TIMEFRAME		Duration of Continuous Aspects	Frequency of Intermittent Aspects
	Short term / low frequency	• Less than 4 years from onset of impact	• Occurs less than once a year
	Medium term / medium frequency	• More than 4 years from onset of impact up to end of life of project (approximately 30 years)	• Occurs less than 10 times a year but more than once a year
	Long term / high frequency	• Impact is experienced during and beyond the life of the project (greater than 30 years)	• Occurs more than 10 times a year
SPATIAL SCALE		Biophysical	Socio-economic
	Small	• Within the defined 'Project area'	• Within the defined 'Project area
	Intermediate	• Within the district in which is the facilities are located	• Within the municipality in which the activity occurs
	Extensive	• Beyond the district in which the facilities are located	• Beyond the municipality in which the activity occurs

PART B: DETERMINING CONSEQUENCE RATING

MAGNITUDE	TIMEFRAME	SPATIAL SCALE		
		Small	Intermediate	Extensive
Minor	Short term / low frequency	Low	Low	Medium
	Medium term / medium frequency	Low	Low	Medium
	Long term / high frequency	Medium	Medium	Medium
Moderate	Short term / low frequency	Low	Medium	Medium
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	Medium	High	High
Major	Short term / low frequency	Medium	Medium	High
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	High	High	High

PART C: DETERMINING SIGNIFICANCE RATING

		CONSEQUENCE			
		Negligible	Low	Medium	High
PROBABILITY (of exposure to impacts)	Definite	**Not Significant**	**Low**	**Medium**	**High**
	Possible	**Not Significant**	**Low**	**Medium**	**High**
	Unlikely	**Not Significant**	**Low**	**Low**	**Medium**
	Negligible	**Not Significant**	**Not Significant**	**Not Significant**	**Not Significant**

Mitigation, Management and Good Practice Measures

170. Wherever the Project is likely to result in unacceptable impact on the environment and social conditions, mitigation measures are proposed (over and above the inherent design measures included in the Project description). In addition, good practice measures may be proposed however these are unlikely to change the impact significance. In the case of positive impacts, management measures are suggested to optimize the benefits to be gained.

171. The following mitigation hierarchy will be utilized in selecting practical mitigation measures for unacceptable impacts as follows (in order of preference):

- Avoid the impact wherever possible by removing the cause(s).
- Reduce the impact as far as possible by limiting the cause(s).
- Ameliorate the impact by protecting the receptor from the cause(s) of the impact.

172. Providing compensatory measures to offset the impact, particularly where an impact is of high significance and none of the above are appropriate, e.g., for impacts to critical habitat.

Residual Impacts

173. Once mitigation measures are declared and committed to, the next step in the impact assessment process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional declared mitigation measures.

4.3.4 Stakeholder Consultations

174. Stakeholder engagement has been undertaken throughout the development of the Project, with the view to determining and responding to the views of interested and parties potentially affected by the Project throughout the life of the Project, and ensure open and transparent, two-way communication with stakeholders. The approach to engagement seeks to meet both national and international requirements.

175. The following general principles govern stakeholder engagement activities:

- The content of documents for public comment will provide accessible and adequate information on the Project, and not create undue fears (regarding potential negative impacts) or expectations (regarding potential positive impacts such as job creation, etc.);
- The information will be disclosed in the local language(s) where needed and in a manner that is accessible and culturally appropriate, considering any vulnerable people; and
- Efforts will be made to explain not only the proposed project and ESIA process, but also applicable national laws and legislations, international principles, and standards and how the Project will address compliance.

5.0 BASELINE DATA

5.1 INTRODUCTION

176. This section presents a description of the environmental baseline conditions in the Project area and covers the following topics and indicates where primary and secondary data were used:

Table 22: Data Types

#	Topic	Primary Data	Secondary Data
Physical Environment			
1	Climate & Climate Change	No	Yes
2	Air Quality	Yes	Yes
3	Hydrology	Yes	Yes
4	Soils	No	Yes
Biological Environment			
5	Fauna	No	Yes
6	Flora and Habitat	Yes	Yes
Socio-economic Resources			
7	Economy and Employment	Yes	Yes
8	Ethnic Groups, Vulnerable People and Gender	Yes	Yes
9	Land Use	Yes	Yes
10	Infrastructure and Utilities	Yes	Yes
11	Cultural Heritage	Yes	Yes
12	Health and Safety	No	Yes
13	Noise & Vibration	Yes	Yes

5.2 SENSITIVE RECEPTORS

177. Several sensitive receptors, other than residential receptors, have been identified in the Project corridor. They have been mapped and are illustrated in the figure below (Figure 7) to show their proximity to the alignment.

Figure 7: Sensitive Receptors


Legend
Sensitive receptor point
Tempie (3)
School (8)
Health care center (1)
Market (2)
Approximately 100m from CL
Approximately 100m from start point
Approximately 200m from CL
Approximately 100m from CL
Approximately 100m from CL
Meters
Scale: 1:12,500
Legend
Health care center
Market (3)
Cemetery (1)
Approximately 50 from CL
Approximately 50m from CL
Approximately 75m from CL
Approximately 75m from CL
Approximately 100m from CL
Approximately 500m from start point
Approximately 100m from CL
Approximately 75m from CL
Approximately 100m from CL
Approximately 100m from CL
Approximately 100m from start point
0 80 160 320 Meters

5.3 PHYSICAL RESOURCES

5.3.1 Climate & Climate Change

Climate

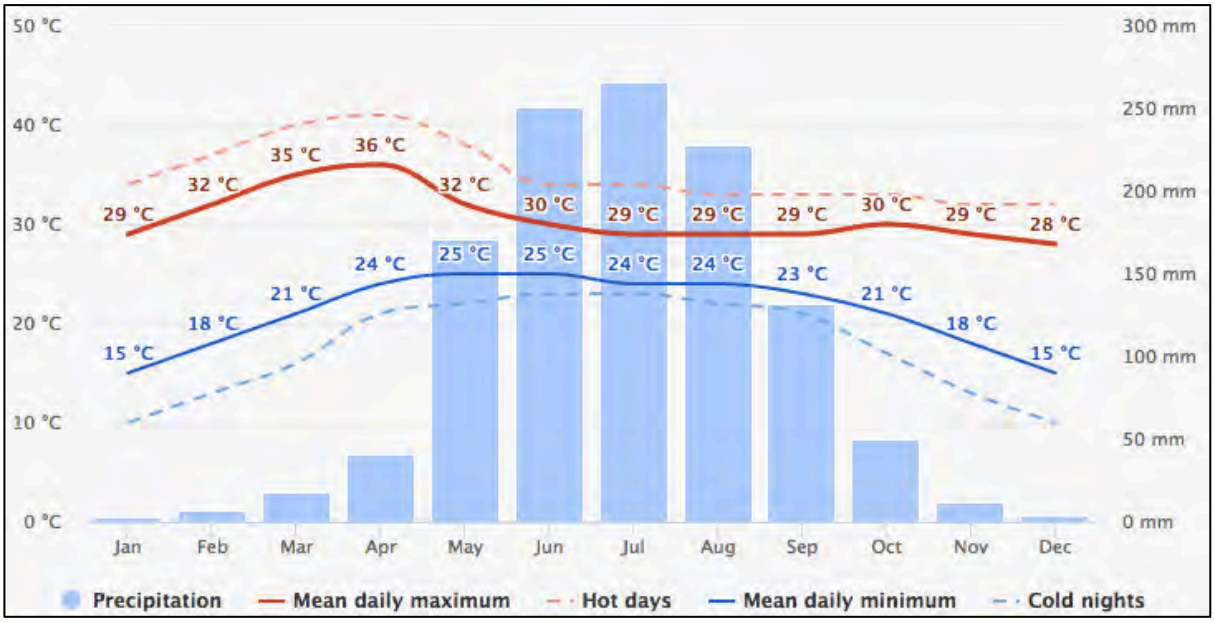
178. The Project area is in the Vientiane plain, a floodplain area bordering the Mekong River, and it features a tropical savanna climate with distinct wet season and dry seasons. The dry season usually starts late in October or very early in November and runs through the end of March or later. The wet season is characterized by a bi-modal monsoon, with the first monsoon usually starting in April or May and lasting well into June, and the second monsoon starting about mid-July and lasting into October, with several weeks of low rainfall in between. However, some years the first monsoon can be very weak or virtually disappear (possibly affected by a strong El Nino), and the total rainfall during a very wet year can be nearly double the total rainfall during a very dry year. For example, Mekong River Commission records show that Vientiane received only a little more than 1.0 m of rain during a very dry year in 1991 and in excess of 2.1 m during a very wet year in 1999.

179. Laos, including the Project area, is subject to occasional tropical depressions that typically start out as tropical storms or typhoons in the western Pacific Ocean or the South China Sea, and then move westward across the coast of Vietnam and into Laos; and less frequently, tropical depressions moving northeast from the Bay of Bengal also can affect Laos. These storms frequently deliver torrential rains that can last for several days and can result in flash floods and lead to landslides in mountainous areas. While the rainfall can be very heavy, the winds are rarely at typhoon strength after a storm crosses the Annamite Mountains and enters Laos. During a typical year, about 1-4 of these tropical depressions may reach Vientiane, usually between June and December.

180. The Project area tends to be hot and humid throughout much of the year, with the lowest temperatures generally occurring between November and February and the hottest temperatures between March and May.

181. Figure 8 shows the average precipitation levels over the last 30 years for Wattay International Airport in Vientiane (approximately 4km south of Sikeut Junction). Mean daily maximum and minimum temperatures are also recorded. Wind roses from Wattay International Airport are provided in **Appendix E**. The wind rose shows that the predominant winds are from the east / northeast.

Figure 8: Precipitation and Temperature, Wattay International Airport, Vientiane



Climate Change

182. An overall increase in the number of wet days across the southern area of the Mekong River is projected. Mean annual rainfall is projected to increase, with the most significant increases expected in the wet season. Potential increases in rainfall are projected to be +10-30% by 2100, in the eastern and southern part of Lao PDR.[9]

5.3.2 Air Quality

General

183. No large industrial facilities were noted within the Project corridor that may be a source of significant air emissions. Numerous light industrial properties line the corridor and may produce low levels of localized emissions, such as vehicle repair works shops. In addition, there large number of roadside restaurants within the corridor that use wood and charcoal as cooking fuel, thereby producing an element of air pollution. Dust is currently the most significant air quality pollutant within the corridor, especially during the dry season. The unpaved road shoulders and access roads that feed on to NR-13N are sources of dust as vehicle move to and from these areas.

Ambient Air Quality

Ambient Air Quality – Ambient air quality monitoring was carried out at five different locations during November 2021 to characterize the current air quality within the Project corridor. Weather data was collected using a portable weather meter during the duration of particulate matter sampling. A description of sampling locations and the rationale of selection is given in Table 2**3** and **Appendix D** provides the results in full along with photographs of the monitoring activity and the monitoring dates, times and climatic conditions. Figure 8, Figure 9 and Figure 10 provide maps indicating the approximate sampling locations. The ambient air quality data

[9] Consulting Services for Conceptual Engineering Design of National Road 13 North Improvement and Maintenance Project Sikhai Y-Intersection (KM 6) to Sikeuth Intersection (KM 12) VOLUME I CONCEPTUAL DESIGN REPORT PART 9 REPORT ON CLIMATE ADAPTATION IN THE CONCEPTUAL DESIGN (FINAL). MINISTRY OF PUBLIC WORKS AND TRANSPORT. DEPARTMENT OF ROADS. February 2021

was compared against applicable Lao PDR Standards (and WBG Ambient Air Quality guidelines or other internationally recognized sources for reference).

Table 23: Ambient Air Quality Monitoring Locations

Sample ID	Coordinates	Location	Rationale for Site Selection
AQ01	X - 240989.660896347 Y - 1989702.96105092	Phosy, Sikhottabong District	Adjacent to Keo Pa temple
AQ02	X - 240013.164657534 Y - 1991795.54812402	Nalao, Sikhottabong District	Adjacent to Na Lao temple
AQ03	X - 240297.999930325 Y - 1994544.99986073	Xaimoungkhoun, Naxaythong District	

Figure 9: AQ01 Monitoring Location

Figure 10: AQ02 Monitoring Location

Figure 11: AQ03 Monitoring Location

184. Carbon Monoxide (CO) – Table 24 shows that ambient carbon monoxide is well below Project standards as well as USEPA standards.

Table 24: Ambient CO Results

Time	Sample ID Result (PPM)			Project Standard (PPM)
	AQ01	AQ02	AQ03	
09:00	0.49	0.06	0.38	30
10:00	0.63	0.16	1.07	30
11:00	0.38	0.16	1.07	30
12:00	0.18	0.16	1.08	30
13:00	0.06	0.16	1.08	30
14:00	0.00	0.16	1.08	30
15:00	0.05	0.16	1.08	30
16:00	0.01	0.1644	1.08	30

185. Particulate Matter (PM_{10}) – Table 25 shows that two of the samples showed levels compliant with Project standards. However, sample site AQ03 showed levels exceeding Project standards by some margin, probably due to increased traffic levels in this part of the road generating dust on the degraded road surface (noise levels were also elevated above other sampling locations in this area indicating higher levels of traffic).

Table 25: Ambient PM10 Results

Sample ID	24-hour Average Result (m/m3)	Standard (mg/m3)		
		Lao PDR	USEPA	IFC
AQ01	0.1	0.12	0.15	0.05
AQ02	0.052	0.12	0.15	0.05
AQ03	0.44	0.12	0.15	0.05

186. Sulfur Dioxide (SO_2) –Table 26 shows that ambient SO_2 levels are within Lao PDR and European Union (EU) standard limits.

Table 26: Ambient SO2 Results

Sample ID	1-hour Average Result (ppm)	Lao PDR Standard (ppm) / EU Standard (ppm)*	Compliance
A1	0.08	0.13 / 0.13	Yes / Yes
A2	0.08	0.13 / 0.13	Yes / Yes
A3	0.01	0.13 / 0.13	Yes / Yes
A4	0.03	0.13 / 0.13	Yes / Yes
A5	0.01	0.13 / 0.13	Yes / Yes

Note: EU standard = 350 μg/m^3, the equivalent of 0.13 ppm of SO_2.

187. Nitrogen Dioxide (NO_2) – Table 27 shows that ambient levels of NO_2 are within the limits set by Lao PDR standards and WHO guidelines.

Table 27: Ambient NO2 Results

Sample ID	1-hour Average Result (ppm)	Lao PDR Standard (ppm) / WHO Guidelines	Compliance
A1	0.007	0.11 / 0.11	Yes / Yes
A2	0.021	0.11 / 0.11	Yes / Yes
A3	0.003	0.11 / 0.11	Yes / Yes
A4	0.007	0.11 / 0.11	Yes / Yes
A5	0.020	0.11 / 0.11	Yes / Yes

Note: WHO standard = 200 μg/m^3, the equivalent of 0.11 ppm of NO_2.

188. Total Suspended Particulate (TSP) – Table 28 shows that ambient levels of TSP are within the limits set by Lao PDR standards.

Table 28: Ambient TSP Results

Sample ID	24-hour Result (mg/m^3)	Lao Standard (mg/m^3)	Compliance
A1	0.18	0.33	Yes
A2	0.07	0.33	Yes
A3	0.07	0.33	Yes
A4	0.33	0.33	Yes
A5	0.05	0.33	Yes

5.3.3 Hydrology

Surface Water

189. There are no natural surface water crossings within the Project corridor, or any notable water bodies except for two man made drainage channels at KM8.20 and KM 11.40.

190. The roadside drainage condition has been surveyed by the DPWT. There are six key locations where water drains from the roadside into the local drainage network. The survey findings are provided in Appendix L. The general conclusions of the survey are that the drainage network is overgrown with vegetation, poorly maintained and in some cases too small. This ultimately impedes the flow of roadside run-off, potentially leading to flooding in areas close to the road.

Figure 12: Example of Poorly Maintained Local Drainage System

Surface Water Quality

191. Surface water monitoring was undertaken at the two drainage channels within the Project area during November 2021 to characterize the water quality within the Project corridor and to use as a baseline for any future construction phase monitoring. **Appendix D** provides the results in full along with photographs of the monitoring activity and the monitoring dates and times. Figure 13 and Figure 14 provide maps indicating the approximate sampling locations. The results have been compared against applicable Lao PDR Standards.

Figure 13: SW01 Monitoring Location

Figure 14: SW02 Monitoring Location

192. The results of the monitoring are shown in the table below. The results are for indicative purposes only and it should be noted that both channels contained garbage meaning that they are already polluted by the local population and not treated as a valued ecosystem component. However, the water is not impacted by heavy industrial activities.

Table 29: Surface Water Monitoring Results

Sampling Points	Sampling Points Name		SW01	SW02	National Environmental Standards No.81/MONRE 2017	
	Date		11/11/2021	11/11/2021		
	Time		12:10	11:30		
	Village		Thong pong	Nong teang		
Observations		Unit			Class 05-Surface Water	General Wastewater
1	Odour		have	have	Not specified	No
2	Color		Brown	Brown	Not specified	No
3	Solid		little	little	Not specified	No
On Site Parameters						
1	Temperature	°c	26	27.9	Not specified	< 40
2	pH		6.29	6.29	-	6-8.5
3	DO	mg/L	2.9	2.8	≥2	-
Laboratory Analysis						
1	Calcium (Ca)	mg/L	6.32	9.91	-	-
2	Cadmium (Cd)	mg/L	ND	ND	Not specified	< 0.03
3	Nitrate	mg/L	1.23	1.2	Not specified	-
4	Phosphate (PO4)	mg/L	< 0.46	< 0.46	> 2	-
5	Turbidity	NTU	10	24.9	-	-
6	Biochemical Oxygen Demand	mg/L	1.5	3.2	-	30
7	Chemical Oxygen Demand (COD)	mg/L	9.73	30.4	> 12	120
8	Dissolved Oxygen	mg/L	2.9	2.8	> 2	-
9	Oil and Grease	mg/L	2	ND	-	5
10	pH		7.4	7.5	-	-

Sampling Points	Sampling Points Name		SW01	SW02	National Standards 2017	Environmental No.81/MONRE
	Date		11/11/2021	11/11/2021		
	Time		12:10	11:30		
	Village		Thong pong	Nong teang		
11	Total Dissolved Solids	mg/L	86	106	-	1300

Flooding

193. According to the Design Report (February 2021), based on reconnaissance undertaken during the rainy season "*there is no flood on this road section, there is only standing water when the rain is heavy due to poor drainage system."*

194. Drainage problems were observed that *"flood by storm water happened only lower points during heavy rain cause of the existing ditches and channels are filled up by residents and lack of maintenance."*

195. Comments received from the public during stakeholder consultation sessions also indicate that there are issues with flooding in some areas close to portions of the road. They attribute this to poor connection between the existing roadside drains and culverts and the capacity of the general city drainage network to channel the water away from the road without flooding neighbouring roadside land.

Groundwater and Users

196. Residents and businesses in the Project area are provided with piped water supplies. Some groundwater wells are present in the Project area, but they are not replied upon as a source of potable water.

197. Groundwater monitoring was undertaken at two locations within the Project area during November 2021 to characterize the groundwater quality within the Project corridor. **Appendix D** provides the results in full along with photographs of the monitoring activity and the monitoring dates and times. Figure 14 and Figure 15 provide maps indicating the approximate sampling locations. The results have been compared against applicable Lao PDR Standards.

Figure 15: GW01 Monitoring Location

Figure 16: GW02 Monitoring Location

198. The results of the monitoring, shown below in Table 30 indicate that GW01 has levels of iron and magnesium higher than the national standard limits.

Table 30: Groundwater Quality Monitoring

Sampling points	Sampling Points Name		GW01	GW02	National Environmental Standards No.81/MONRE 2017
	Date		11/11/2021	11/11/2021	
	Time		12:20	11:45	
	Village		Na hae	Nong teang	
	Observations	**Unit**			
1	Odor		Non	Non	10
2	Color		light	Light	-
3	Solid		little	Little	-
On site Parameters					
1	Temperature	°c	33.3	28.2	-
2	pH		5.43	5.01	6.5-8.5
3	DO	mg/L	7.7	3.7	-
					Laboratory Analysis
1	Acidity	mg/L	68	36	-
2	Arsenic (As)	mg/L	0.0022	ND	0.01
3	Calcium Hardness	mg/L	45.3	< 10	-
4	Conductivity	ms/cm	276	88.2	-
5	Iron	mg/L	7.22	0.67	1.00
6	Lead	mg/L	ND	ND	0.01
7	Magnesium	mg/L	3.04	ND	0.5
8	Nitrate	mg/L	< 0.22	< 0.22	45
9	Potassium	mg/L	1.17	< 1	
10	Sodium	mg/L	22.4	12.8	
11	Sulphate	mg/L	15.9	5.72	250
12	Chloride	mg/L	21.1	12.6	600
13	Dissolved Oxygen	mg/L	7.7	3.7	
14	Hardness	mg/L	59.3	< 10	250
15	M-Alkalinity	mg/L	91.2	14.4	
16	pH		6.1	6	6.5-9
17	Temperature	°c	33.3	28.2	
18	Total Dissolved Solids	mg/L	164	57	
19	Total Suspended Solids	mg/L	6.4	5.2	1200

5.3.4 Soils

199. The Project area is dominated by commercial properties and only sparse patches of empty land exist within the corridor. No agriculturally productive land will be directly affected by the Project.

200. Four gas stations have been identified adjacent to the Project Road. As with any gas station, it is possible that spills and leaks of oil and fuel (from above and below ground storage tanks and via site run/off) may have been absorbed within the soils beneath these sites, or even migrated of the site via groundwater.

201. Surveys of all gas stations along the alignment have been undertaken. The surveys indicate that all of the below ground fuel tanks on site are set back more than 8 - 19 meters from the COI and none of these tanks will need to be excavated or impacted by Project works. The survey also indicated that only one of the gas stations has an on-site drainage system that captures all site run-off and drains through an interceptor tank to filter out oil and grease. Run-off from the three other sites discharges directly to the road and the surrounding environment, meaning that localised pollution around the fringes of the gas stations is likely. The full survey details are presented in Appendix F.

Figure 17: Gas Station 03 (KM11.1)

5.4 BIOLOGICAL RESOURCES

5.4.1 Fauna

202. The Project is in downtown Vientiane, the capital city of Lao PDR. No special status fauna has been identified or are known to exist in this part of the city.

203. Three potential borrow pit sites have been identified for the Project. One of the borrow pits has been used for the construction of the 1st phase of the Project (KM12-KM70). All borrow pits have obtained proper licenses from concern authorities (although not copies of the licenses have been provided for review as part of this ESIA).

Figure 18: Borrow Pit Locations

204. Screening of potential borrow pit sites indicates that none are within nationally or internationally designated sites. As noted above, the sites are also approved and open. No areas of natural habitat have been identified that would be affected by continued operation of the borrow pits (or by the haul routes linking the borrow pits to the Project road). Full details relating to the locations of the borrow pits is provided in **Appendix G**.

5.4.2 Flora and Habitat

205. No areas of notable habitat are present within the Project corridor which is within an urban setting.

206. A tree count undertaken for the Project identified 167 trees within the right of way, of which 87 are in the corridor of impact, i.e., mostly anticipated to be cut to make way for the road widening with exception of vulnerable trees listed below.

207. Seven of the trees in the corridor of impact (at the edge of COI) are special status species. They are all planted and not naturally occurring. Plantation of these species for ornamental or for shade along roadside, park, residential or agriculture areas are quite common in Southeast Asian countries including Lao PDR. These seven trees include:

- 5 Burma Padauk (*Pterocarpus macrocarpus*), 3-10 m in height and 0.06 – 0.20 m in diameter,– IUCN EN (also List I according to the agreement of classification of tree types on Lao PDR).

- 2 Dork Lueang India (*Handroanthus chrysanthus*), 10 m in height and 0.15 m in diameter, - IUCN (VU).

208. Four sacred trees (Ficus religiosa L.) are within the right of way, but not within the corridor of impact. Distance of the identified sacred trees from the edge of existing roadside range from 12 -15 m. Therefore, the four sacred trees will not be removed. These trees are not on the IUCN list of special status. Full details of the trees in the right of way and corridor of impact can be found in Appendix H.

5.5 SOCIO-ECONOMIC RESOURCES

5.5.1 Economy and Employment

209. The Project Road is densely populated with commercial buildings and residences. Agricultural work is less significant in this area, providing the main occupation for only 1.9% of the population. However about 37.5% of households reported some income from agriculture, mostly on land away from the project Road.

210. A total of 883 land plots were enumerated in the 6 km section. A total of 455 households were identified. Of these, only 426 could be interviewed as some refused, some could not be found. From these 426 households 870 male and female heads of households were interviewed. Their employment is shown below. The number of retired and home duties heads of households was relatively high at 32.6%.

211. The usual employment of both male and female heads of household was recorded and is shown in the table below.

Table 31: Employment of Male and Female heads of Households

#	Village	Govt employee		Private sector Employee		Self employed		Agriculture		homemaker/ unemployed/ retired etc	
		M	F	M	F	M	F	M	F	M	F
1	Xaymoungkhoun	4	2	3	3	8	9	1	1	4	5
2	Nongtaeng-Tai	6	2	21	22	9	11	1	1	16	17
3	Nongtaeng-Neua	1	1	12	7	16	19	3	2	19	14
4	Nongniao	11	3	22	32	22	20	3	1	32	34
5	Nalao	6	2	7	13	16	13	0	0	11	12
6	Thongpong	1	2	6	10	9	8	0	0	8	4
7	Nahae	1	0	16	21	15	10	1	1	18	19
8	Phosi	7	1	15	23	13	16	0	0	24	19
9	Sikhaithong	1	1	3	5	5	3	0	0	3	3
10	Sibounhueangthong	2	1	10	13	6	5	0	0	6	5
11	Sibounheuangtha	1	0	2	4	1	1	1	0	1	5
12	Yapha	0	0	0	1	1	1	0	0	1	0
13	**Total**	41	15	117	154	121	116	10	6	143	137

212. The survey enumerated and interviewed a total of 262 businesses attached to residences and another 235 independent free-standing businesses. The businesses attached to residences reported an average total monthly income of 26 million kip[10], while independent businesses reported average incomes of 359 million kip per month.

5.5.2 Ethnic Groups, Vulnerable People and Gender

213. The vast majority of landowners and occupiers along the Project Road are Laoloum ethnic group. There are small numbers of others, includers foreigners, as follows:

Table 32: Ethnic Groups

Ethnicity	Number	%	Mother tongue
Lao	407	95.6	Lao
Tai	2	0.5	Lao
Nyouan	1	0.2	Lao with different accent
Hmong	2	0.5	Hmong but the families are well integrated in the Lao society
Iu Mien	1	0.2	Iu-Mien but the family is well integrated in the Lao society

[10] Income less expenses

Ethnicity	Number	%	Mother tongue
Vietnamese	10	2.3	Vietnamese but operating businesses and can speak Lao
Chinese	3	0.7	Chinese but operating businesses and can speak Lao
Total	426	100.0	

214. Female headed households comprised 21% of the population, with male-headed at 79%.

215. One family was considered vulnerable to disturbance during the civil works, living on a 413 sq meter block in Yapha village. Husband and wife are aged 88 and 72 years respectively. This couple is independent from their children who live in Vientiane Capital, USA and Canada and who sometime send remittances to the parents. They are retired businesspeople who still run a small workshop with 3 workers for making bricks. Their production is about 390 pieces per day with the unit cost of 1700 Kip. They own a small truck to deliver the products and in addition, they also have a sedan and motorbike.

5.5.3 Land Use

216. The Project is located within an urban setting. The alignment is dominated by commercial and residential properties. The Projects social survey revealed the following data on the number and use-type of land plots along the road.

Table 33: Plot Area in Square Meters

Property type	Mean	N	% of total area
House without an attached business	1513	169	29.1
House with an attached business	1388	199	31.4
Empty House	895	43	4.4
Commercial premises	2709	87	26.8
empty land	3184	23	8.3
Sub-Total	**1688**	**521**	**100**
No data available		362	
Total number of plots		883	

217. A total of 883 plots of land were listed in the DMS, and complete documentation was obtained for 521 of these. The remaining 362 plots comprised a mixture of those with lost or missing documentation, reluctance on the part of landowners to provide details of landholdings, rented premises whose owners were unavailable and empty land or houses for which no owner could be interviewed.

5.5.4 Infrastructure and Utilities

218. The Project Road is the main roadway in the Project area providing access to the city center and Wattay international airport. A description of the current road condition is provided in Section 3. Various utilities can be observed along the alignment, the most important being

the low voltage electricity distribution network, telephone lines, TV cables and water supply network. Many of the utility poles and pipelines are located within the RoW.

5.5.5 Cultural Heritage

219. Five temples and two cemeteries have been identified within the Project area. The locations of these sites are indicated in Figure 7. The road design goes through two cemeteries, which belong to the Vietnamese Association and the Embassy of France. However, the impact will only be on the concrete slab on the access driveway; which will be compensated in cash, and during the construction period the contractor should provide a temporary access route as mentioned in the RAP as with access to houses in the Entitlement matrix)

220. As mentioned above, several Sacred Trees are also located close to the roadside within the Project ROW, but not in the corridor of impact. No other special cultural designations, such as cultural landscape, protected objects or archaeological artifacts have been identified within the ROW.

5.5.6 Health and Safety

221. Safety issues within the Project area mainly relate to road safety. COVID-19 continues to be a specific risk within the local community. Five locations have been identified on the alignment which are accident 'black-spots'. Four locations are T-Intersection (KM7.00, KM8.45, KM 10.45, KM 11.00 with minor roads, i.e., local roads) and one is a market location (KM 9.10 to KM 9.40). The conceptual design proposed to improve these black spots as by widening of connection road at the area of intersections, increase turning radii at connecting corners, installation of traffic islands and channelization at key intersection for smooth traffic movement and reduction of conflicting points, improvement of visibility (sight distance). At Nong Niew Market (KM 9.10 to KM 9.40) which is located on a curve, improve visibility (sight distance) in the curve especially inner curve side (right hand side), provide pedestrian crossing marking (zebra) with signalization.

222. Currently there are only one or two formal road crossing areas along the alignment. Crossing of the road by pedestrians occurs all along the road as there is no median, or barriers to prevent people crossing the road where they want. Several schools are located either adjacent to the road, or within proximity of the road, i.e., within 50m. Two health facilities, including an eye hospital are located adjacent to the road.

223. Lao PDR has the unwanted distinction of being per capita the most heavily bombed nation in the world. Unexploded ordnance (UXO) continues to remain in the ground, maiming and killing people, and hindering social-economic development and food security. It is possible that UXO could be uncovered during works.

5.5.7 Noise

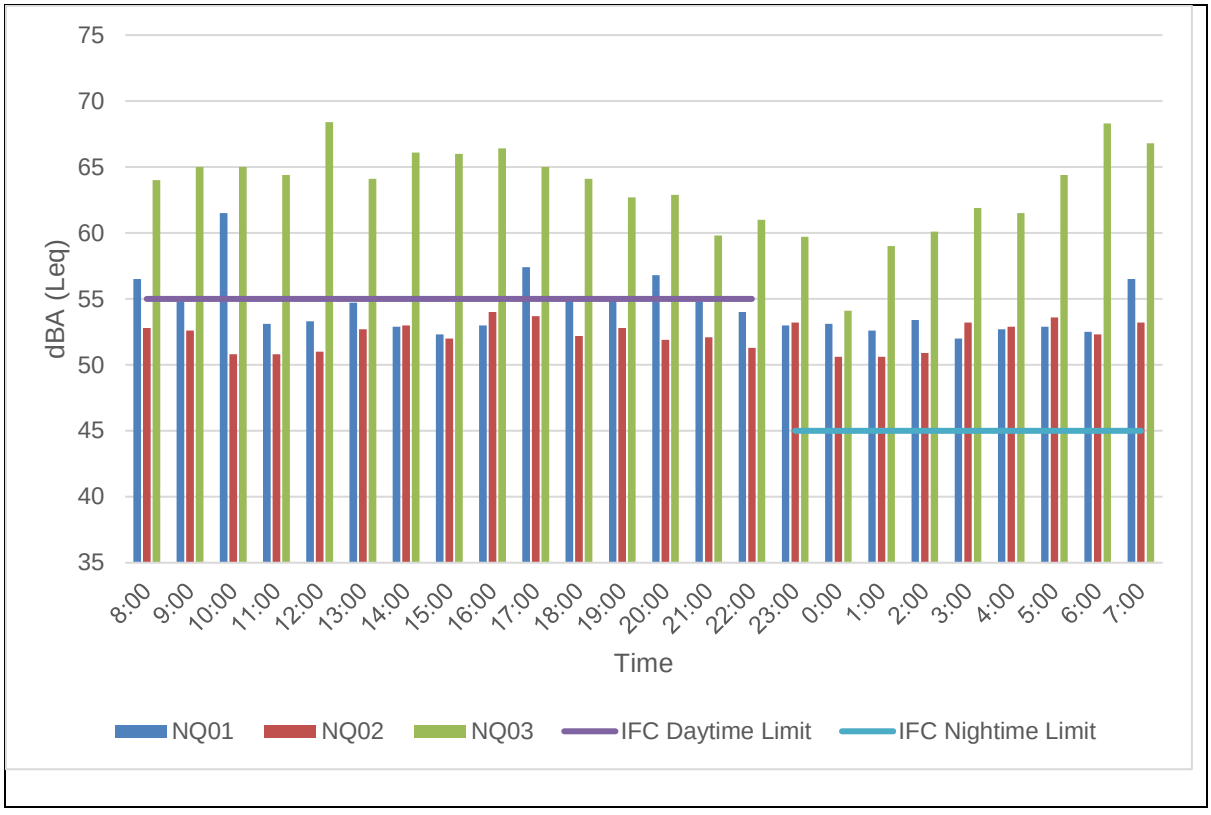
224. Baseline noise monitoring was undertaken at three locations within the Project corridor. At all three locations ambient noise levels were constant throughout the 24-hour monitoring period generally between 51 and 55 dBA (Leq 1-hr) at monitoring stations NQ01 and NQ02. Noise levels at NQ03 close to Sikeut Junction were higher with noise levels ranging between 60 and 68 dBA (Leq). Figure 20 illustrates the hourly noise levels against IFC guideline limits and shows night-time ambient noise levels exceed IFC guideline limits at all locations. Daytime limits are generally only exceeded at NQ03.

225. Road traffic is the main contributor to the noise levels in the Project corridor however, the light industrial / commercial nature of the Project area means that these activities will also

contribute to the ambient noise levels. Further, aircraft noise may also contribute to noise levels in the Project area, however levels are broadly consistent throughout the day. The following figure and tables provide the locations of the monitoring and the ambient monitoring results (the full monitoring results can be found in Appendix D).

Figure 19: Noise Monitoring Locations

Figure 20: Ambient Noise Monitoring Results



6.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 PREAMBLE

226. This portion of the report identifies the environmental and social impacts of the Project and proposes mitigation measures to eliminate the impacts, or where this is not possible, reduce their significance.

6.2 PHYSICAL RESOURCES

6.2.1 Air Quality

Aspects of the Project that have the potential to Emit Atmospheric Pollutants and Greenhouse Gases

227. Engines and processes that combust fuels, depending upon the nature of the fuel, may have the potential to emit atmospheric pollutants including nitrogen oxides [11] (NO_X), Sulphur dioxide (SO_2), carbon monoxide (CO) and particulate matter (PM) [12], greenhouse gas carbon dioxide (CO_2) and volatile organic compounds (VOCs) [13] that include both atmospheric pollutants and greenhouse gases.

228. The following planned Project activities involve fuel combustion:

- Operation of diesel-powered vehicles at work sites and camp sites (NOX, CO, SO2, VOC, PM10).
- Operation of asphalt plant.
- Operation of diesel-powered construction plant at work sites and camp sites (NOX, CO, SO2, VOC, PM10).
- Operation of diesel power generators at construction camps during the construction phase.

229. The following planned Project activities have the potential to raise nuisance dust:

- Soil removal and stockpiling.
- Construction of earth embankments.
- Vehicle movements within RoW and access roads.
- Concrete batching.

[11] NOx includes nitrogen dioxide (NO_2) and nitric oxide (NO).
[12] Particulate matter is used in this context to describe inhalable particles generally PM_{10} and below.
[13] The term VOC is loosely applied to a wide range of organic compounds but in this context, it is used as defined in the UNECE VOC Protocol (1991) as “all organic compounds of an anthropogenic nature, other than methane, that are capable of producing photochemical oxidants by reactions with nitrogen oxides in the presence of sunlight”.

Sensitive Receptors

230. Key sensitive air quality receptors are any residents living within the assessment boundary and people working in these areas. Some businesses along the road may also be sensitive to dust.

231. There are no designated sensitive ecological receptors within 50 m of construction activities and so ecological receptors are not considered further.

Potential Impacts

Construction Phase

232. Release of Exhaust Gases - During construction, the release of combustion gases will mostly be from vehicles transporting materials and equipment to site and potentially from mobile sources such as mobile generators in the construction camp site. These may increase concentrations of atmospheric pollutants (NO_X, PM, CO and SO_2) locally to a limited extent and over a short period.

233. Dust - The principal sources of dust and particulate emissions during construction will be:

- Excavations and earthworks, such as groundbreaking, cutting, filling and levelling;
- Particulate dispersion from operation of the batching plant;
- Vehicle movements on unpaved, or compacted surfaces; and
- Particulate dispersion from uncovered truckloads.

234. There is the potential for impacts relating to dust emissions because of construction works upon nearby receptors. However, the magnitude of dust impacts from construction works will depend on the wind speed and wind direction as well as levels of precipitation at the project site.

235. Emissions of Volatile Organic Compounds (VOC) - Small quantity of fuels, paints, solvents and other volatile substances are likely to be required during the construction phase, which will be stored in secure areas within the construction laydown areas. If not adequately contained, such substances have the potential to result in the dispersion of volatile emissions to the immediate air shed. Given that the storage of such volatile substances will be in small quantities, any potential impacts will be temporary and limited to the immediate surrounding area, likely to be within the Project site or near the construction boundaries. No significant impacts are anticipated.

236. Batching Plant, Asphalt Plant and Borrow Pit Emissions – Air emissions from these sources are discussed in separate sections below.

Operational Phase

237. The operational phase air quality assessment has been undertaken in accordance with the methodology set out in the UK Design Manual for Roads and Bridges guidance on air quality issued by Highways England[14] (the 'HE Guidance'). The impact descriptors for the operational assessment are also taken from guidance issued by the IAQM[15].

238. It is important to note from the perspective of air quality that the project itself is not considered to generate additional vehicle movements. Instead, the project will improve traffic flows, reduce journey times, and improve safety.

239. The HE Guidance sets out scoping criteria to determine whether the air quality impact of a road project can be scoped out of required assessment based on the changes between the 'do something' (with project) and 'do nothing' (without project) options for the opening year as follows:

- Annual average daily traffic (AADT) increases by more than 1,000;
- Heavy duty vehicles (AADT) increase by more than 200;
- Speed band of the road changes; and
- Carriageway alignment changes by more than 5 m.

240. If these criteria are not met than an air quality assessment is not required.

241. Assessment of these criteria indicates that:

- Both the AADT and heavy duty AADT will increase, but this is a direct result of the growth assumption used in traffic forecast modelling and not because of the project itself.
- This sub-section of road is an urban road standard with 4-lane 2-way divided road will be applied, design speed is 80kph, but traffic regulation will allow not more than 60kph in urban areas. As such no speed band changes to those already used for urban areas are anticipated.
- No changes in carriageway alignment are proposed.

242. In accordance with the HE guidance therefore, operational air quality impacts are not considered further in this assessment.

Impact summary and assessment of significance

243. Table 34 provides an assessment of the significance of potential air quality impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

[14] Highways England (2019). Design Manual for Roads and Bridges - Sustainability & Environment Appraisal LA 105 Air quality.
[15] Environmental Protection UK/IAQM (January 2017) Land-Use Planning & Development Control: Planning for Air Quality

Table 34: Potential Impacts to Air Quality

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Release of exhaust gases*	*Nearby communities and workers*	*M*	*M*	*L*	*M*	*MOD*	*ST*	*SMA*	*LOW*	*DEF*	***L***
C	*Dust*	*Nearby communities and workers*	*H*	*M*	*M*	*M*	*MOD*	*ST*	*SMA*	*LOW*	*DEF*	***L***
C	*VOCs*	*Nearby communities and workers*	*L*	*M*	*L*	*M*	*MOD*	*ST*	*SMA*	*LOW*	*DEF*	***L***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

244. Management Planning – The Contractor will, as part of his **Construction Environmental and Social Management Plan** (CESMP), prepare and implement a **Pollution Prevention Plan**. The Plan will include measures to limit air pollution during the construction phase of the Project. The plan will detail the actions to be taken to minimize dust generation (e.g., spraying un-surfaced roads with water (including the types of equipment, sources of water, locations for watering and schedule), covering stock-piles, etc.) and will identify the type, age and standard of equipment to be used and will also provide details of the air quality monitoring program for baseline and routine monitoring. The Plan will also include contingencies for the accidental release of toxic air pollutants. The Contractor is also responsible for the preparation of a **Health and Safety Plan**. The Plan, required as part of the CESMP, will include contingencies for the accidental release of toxic air pollutants.

245. Permits - any new borrow pits, concrete batching plant, rock crushing facility and asphalt mixing plant will be the subject of separate environmental application under the responsibility of the Contractor. The Engineer will ensure that no such facility becomes operational without the required permits.

246. Energy Supply – Consideration should be given to the use of energy from the following sources (in order of preference):

- Renewable (solar) – Energy requirements for construction camps should be supplied via renewable solar power energy. These can easily be placed on the roofs of camp facilities.

- Low Emissions (and low noise) Generators – Low emissions, energy efficient generators are now available on the market that comply with EU Stage V (Regulation 2016/1628) emissions standard for non-road mobile machinery (NRMM).

247. Siting of Facilities and Equipment – Locations for borrow pits, rock crushing facilities, concrete batching yards and asphalt plants will require approval from the Engineer, PONRES and DoR during the Pre-construction phase. Efforts will be made to ensure that these facilities are as near to the Project road as practical to avoid unnecessary journeys and potential dust issues from vehicle movements during construction works on unpaved roads in urban areas.

248. To prevent impacts arising from asphalt plants, construction camps, batching plants and rock crushing plants, they will be prohibited within 500 meters of any urban area or sensitive receptor (school, hospital, etc.) and at least two kilometers from protected areas where possible, to avoid impacts to protected areas. The locations of these facilities will be indicated within the Contractors CESMP.

249. Stationary emission sources, if used (e.g., portable generators, compressors, etc.) shall be positioned as far as is practical from sensitive receptors. At a minimum generator should be more than 50m from receptors.

250. Release of Exhaust Gases and Fugitive Emissions - Equipment and vehicles will be regularly maintained in accordance with the manufacturer's recommendations to maximize fuel efficiency and help minimize emissions. Preferentially the Project will use fuel that has low sulfur content of 0.1%, where practical and available within Lao PDR. Controlled or uncontrolled burning of waste will not be allowed. There will be pre-requisite requirements of site vehicles to ensure no black smoke before entering site and that any identified machinery or vehicles with black smoke will require maintenance and re-assessment before it is returned.

251. Dust - Measures that will be adopted to help prevent dust problems from occurring include:

- Dust control measures will be implemented on the main construction zones and haul routes and to 500 m from the camp and plant entrances.

- The Contractor will be required to have an adequate supply of bowsers and carry out watering for dust control at least once every two hours in these locations: in dry weather with temperatures of over 25°, or in windy weather. Avoid overwatering as this may make the surrounding muddy. The plan for watering will be adjusted based on areas identified during works as being significant dust areas.

- Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).

- A strict Project speed limit of 20km/hr. will be enforced for Project vehicles using unmade tracks and within Project construction zones.

- Vehicles carrying fine aggregate materials will be sheeted to help prevent dust blow and spillages.

- Earthwork operation will be suspended when the wind speed exceeds 20 km/h in areas.

252. VOCs

- Hazardous materials stored and used on site with potential gas emissions (e.g., Volatile Organic Compounds) will be in well-ventilated, but secure low-risk areas, away from major transport routes and away from the site boundary (where possible).

- Volatile fuels and chemicals (including hazardous wastes) will be stored in sealed containers. On site storage of large quantities of volatile fuels will be avoided, equally prolonged exposure to direct sun and heat will be avoided.

- Fires and material burning will not be allowed on the Project site.

- Chemical storage areas will be purpose built and well maintained. A data log of all chemicals with MSDSs will be provided at the storage facility within easy access.

Operational Phase

253. None required.

Residual Impacts

Table 35: Air Quality Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Release of exhaust gases*	***Low***	*Potential impacts are anticipated to be low. Generic mitigation measures will ensure residual impacts will not be significant.*	***Not Significant***
C	*Dust*	***Low***	*Potential impacts are anticipated to be low. Generic mitigation measures will ensure residual impacts will not be significant.*	***Not Significant***
C	*VOCs*	***Low***	*Potential impacts are anticipated to be low. Generic mitigation measures will ensure residual impacts will not be significant.*	***Not significant***

6.2.2 Climate Change

254. This section discusses potential impacts climate change may have on the Project during construction and operation phases and associated mitigation measures to be adopted.

Receptors

255. The key receptor identified is the Project Road itself which could be impacted significantly if adequate design measures are not included to counter climate change. Deterioration of the road may also lead to potential traffic safety issues which would impact upon road users. Indirectly, residents and businesses could be affected by flooding caused by inadequate drainage capacity.

Potential Impacts

Construction Phase

256. Key impacts identified by the Project Report on Climate Change Adaptation in the Conceptual Design include:

- Disruption due to overtopping during intense rain.

- Pavement cracking and early deterioration through water ingress.
- Pavement Rutting and bleeding due to hot climate.
- Culvert Overloading during intense rainfall.

Operational Phase

257. An analysis of greenhouse gas emissions (GHG) was undertaken by the World Bank based on fuel consumption rate at different speed under with- and without-project scenarios for the Project road section KM12-KM70. The analysis indicated that without project, the road's deteriorated condition limits vehicle speed and leads to higher fuel consumption per vehicle-km compared to the with-project scenario. With project, improved road condition leads to improved speed, and hence lower fuel consumption. The analysis for the KM12-KM70 section of NR-13N indicated that there would be a significant reduction in total emissions of CO^2 under the project scenario over the evaluation period (13 years) resulting in significant social benefits.[16] It can also be assumed that similar benefits would be applicable to this portion of the road.

Impact summary and assessment of significance

258. Table 36 provides an assessment of the significance of potential climate change impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 36: Potential Impacts from Climate Change

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
O	*Under capacity drainage*	*Road infrastructure / Local residents and businesses*	*H*	*H*	*H*	*-*	*MAJ*	*LT*	*SMALL*	*MOD*	*POSS*	***M***
O	*Road deterioration*	*Road infrastructure / Road users*	*H*	*H*	*L*	*-*	*MAJ*	*LT*	*SMALL*	*MOD*	*POSS*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

[16] Draft Project Appraisal Document - Report No: PAD2512. World Bank, 2017

Mitigation and Management Measures

Design Phase

259. Mitigation measures identified by the Project Report on Climate Change Adaptation in the Conceptual Design include:

- Raising of flood-prone areas above the calculated flood levels.
- Improve the surface integrity by using stronger surface courses.
- Use of harder grade bitumen &Improved asphalt mixes to resist rutting.
- Hydraulic capacity of culverts calculated with 15% safety coefficient and considering 25 / 50-year flood return periods.

Operational Phase

260. Monitoring of the mitigation measures during operation to determine their adequacy and if adaptive management measures are required.

261. Adequate and routine maintenance of the drainage system as a part of contractor's responsibilities under the OPBRC contract.

Residual Impacts

Table 37: Climate Change Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
O	*Under capacity drainage*	***Low***	*Incorporation of the proposed climate change measures should ensure that residual impacts are not significant. However, continued monitoring of these aspects is recommended throughout the operational period.*	***Not significant***
O	*Road deterioration*	***Low***		

6.2.3 Hydrology

Aspects of the Project that have the potential to impact upon hydrological resources

- Upgrading of the drainage network required as part of road widening.
- Poor waste management procedures.
- Supply of water for use as technical water (e.g., concrete batching plants).
- Supply of water for use in construction camps.
- Discharge of domestic wastewater from camps and worksites.
- Accidental release of potential contaminants (e.g., fuel, hazardous waste, chemicals).

Sensitive Receptors

262. Only two drainage channels have been identified within the Project area. Both channels are polluted with garbage thrown there by the local population. Neither of these channels are considered 'sensitive' in a biological sense or are a valued ecosystem component. According to data collected as part of this study, none of the population in the project area use groundwater.

263. Residents are, however, sensitive to potential flood issues.

Potential Impacts

Design Phase

264. Design errors could lead to portions of the drainage network operating below the required standard (e.g., culverts are not long enough, or poorly sized wing walls) and lead to erosion of embankments, road washout, flooding, inadequate flow of water to and from agricultural land and dangerous driving conditions. Further, the road drainage system needs to be coordinated with the district drainage system to ensure that road run-off can discharge away from the road in the public drainage system without flooding neighboring land and properties.

265. Improper siting and design of construction camps can have negative impacts to hydrology, both surface and groundwater, through improper disposal of liquid waste and spills of hazardous liquids.

Construction Phase

266. Impacts during the construction phase can result from the discharge of wastes to surface water from construction camps, the poor management of sanitary waste and accidental spills of hazardous liquids.

267. Temporary drainage structures may fail or get clogged with construction debris during the construction phase of the Project. This could lead to flooding of properties adjacent to these areas and construction sites.

Operational Phase

268. The aforementioned issue relating to inadequate design may result on localized flooding in portions of the Project area.

Impact summary and assessment of significance

269. Table 38 provides an assessment of the significance of potential impacts to hydrology before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 38: Potential Impacts to Hydrology

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
D	*Damage from poor drainage design*	*Local residents / road users*	*M*	*H*	*H*	*-*	*MAJ*	*LT*	*INT*	*H*	*POSS*	***H***
C	*Spills and leaks and poor waste management*	*Groundwater /surface water*	*L*	*L*	*L*	*L*	*MIN*	*ST*	*SMA*	*L*	*POSS*	***L***
C	*Localized flooding*	*Local residents / road users*	*M*	*L*	*L*	*-*	*MOD*	*ST*	*SMA*	*L*	*UNLIKE*	***L***
O	*Flooding*	*Local residents*	*M*	*M*	*H*	*-*	*MAJ*	*LT*	*INT*	*H*	*POSS*	***H***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Design Phase

270. Detailed designs will ensure that all drainage structures are sized and located correctly and will account for all the flood prone areas. Designs shall ensure that the drains discharge to existing drainage ditches of suitable capacity, or to streams without causing erosion of embankments, flooding, or damage to properties. Prior to discharge from the longitudinal drains, the water should pass through an oil / grease interceptor or control valves.

271. Designs will consider all necessary secondary drainage networks to ensure that they are sized correctly, and that water can drain freely from the road without flooding neighboring land. DoR and the designers shall coordinate designs with the Vientiane Urban Development Authority (VUDA) in charge of drainage in the flood prone regions.

Pre-construction Phase

272. No construction camp or plant, permanent or temporary, will be located within 200 meters of any river, or irrigation channel (not including drainage channels).

273. The Contractor will be responsible for the preparation of a Construction Camp Site Plan which will form part of the CESMP. The Plan will indicate the system proposed and the locations of related facilities in the site, including latrines, holding areas, septic tanks, etc. The Contractor will ensure the following conditions are met within the Plan:

- Wastewater arising on the site will be collected, removed from the site via a suitable and properly designed temporary drainage system and disposed of at a location and in a way that will cause neither pollution nor nuisance.

- There will be no direct discharge of sanitary or wash water to surface water. Disposal of materials such as, but not limited to, lubricating oil and onto the ground or water bodies will be prohibited.

- Liquid material storage containment areas will not drain directly to surface water (including wetlands).

- Lubricating and fuel oil spills will be cleaned up immediately and spill clean-up materials will be maintained (including spill kits) across the Contractors construction camp and ancillary facilities, e.g., asphalt plant.

- Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters.

- Discharge of sediment-laden construction water directly into surface watercourses or wetlands will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge.

- Spill clean-up equipment will be maintained on site. The following conditions to avoid adverse impacts due to improper fuel and chemical storage:

- Fueling operations will occur only within containment areas.

- All fuel and chemical storage (if any) will be sited on an impervious base within a bund and secured by fencing. The storage area will be located away from any watercourse or wetlands. The base and bund walls will be impermeable and of sufficient capacity to contain 110% of the volume of tanks.

- Filling and refueling will be strictly controlled and subject to formal procedures and will take place within areas surrounded by bunds to contain spills / leaks of potentially contaminating liquids.

- All valves and trigger guns will be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.

- The contents of any tank or drum will be clearly marked. Measures will be taken to ensure that no contaminated discharges enter any drain or watercourses.

- Disposal of lubricating oil and other potentially hazardous liquids onto the ground or water bodies will be prohibited.

- Should any accidental spills occur immediate cleanup will be undertaken, and all cleanup materials stored in a secure area for disposal. Disposal of such will be undertaken by a waste management company contracted by the Contractor. The waste management company must have the required licenses to transport and dispose of hazardous waste before any such waste is removed from the site. The Contractor will keep copies of the company's licenses and provide waste transfer manifests at his camp site for routine inspection by the Engineer.

274. Site plans will be devised to ensure that, insofar as possible, all temporary construction facilities are located at least 100 meters away from any surface water course. If determined

warranted by the Engineer, the Contractor will provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the Contractors camp sites. If so requested, the Contractor will ensure that all vehicles are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the site areas. The Contractor will provide necessary cleaning facilities on site and ensure that no water or debris from such cleaning operations is deposited off-site.

275. Where applicable, obtain all necessary permits from the relevant authorities for the abstraction of water for construction purposes.

Construction Phase

276. Even though there are no sensitive receptors relating to surface water and groundwater in the Project area, it is recommended that best practice measures are followed during construction to prevent further degradation of surface waters and to ensure that groundwater is not polluted, including the following measures:

277. The Engineer will undertake regular monitoring of the Contractors construction camp and storage areas to ensure compliance with the CESMP and the Contractors Construction Camp Site Plan.

278. Two sources of potable water exist for the Contractors staff; bottled water or groundwater. If groundwater is to be used for drinking it will be tested to ensure that the water quality meets the Lao PDR drinking water standards. Approximately 200 m^3 of technical water will be needed per day during the construction phase and around 15 m^3 of potable water per day. The Contractor shall obtain all necessary abstraction permits for both technical and potable water supplies.

279. During the construction phase the Contractor will be required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage to properties and land by flooding and silt washed down from the works. The Contractor will also be responsible for ensuring that no construction materials or construction waste block existing drainage channels within the Project corridor. The Engineer will be responsible for routine monitoring of drainage channels to ensure they remain free of waste and debris.

280. Irrigation channels shall be kept open at all times to avoid disruption. Any diversions will be agreed with the local community and VUDAA.

Operational Phase

281. None, other than implementation of the design phase measures.

Residual Impacts

Table 39: Hydrology Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
D	*Damage from poor drainage design*	***High***	*Design measures (including the required climate change mitigation) and coordination with VUDAA should ensure that flood issues are not significant.*	***Not significant***
C	*Spills and leaks and poor waste management*	***Low***	*Mitigation measures, if applied correctly, will ensure that there are no significant residual impacts.*	***Not significant***
C	*Localized flooding*	***Low***	*Mitigation measures, if applied correctly, will ensure that there are no significant residual impacts.*	***Not significant***
O	*Flooding*	***High***	*See design measures above*	***Not significant***

6.2.4 Soils

Aspects of the Project that have the potential to Impact upon Soils

- Operation of borrow pits.
- Operation of camps and ancillary facilities, such as asphalt plants and other areas that store hazardous / polluting liquids.
- Construction of embankments and excavation works.

Sensitive Areas

282. Given the urban nature of road only small areas of soils adjacent to the road and around construction camps and plant could be impacted. There are four gas stations adjacent to the road which underground fuel storage tanks are located at least 8-19 m from the COI and will not be affected by the project works. However, it is possible that soils around gas stations could be contaminated with hydrocarbon from site run-off. As described earlier, the project area is in urban areas therefore sensitivity of receptors is considered medium.

283. Borrow pits will be required for the Project. Three sites have already been identified for the Project, they open and according to information provided to date, licensed according to Lao PDR requirements (although the licenses have not been provided to the team preparing this ESIA).

Potential Impacts

Construction Phase

284. Potential soil contamination is a possibility resulting from poorly managed fuels, oils and other hazardous liquids used during the project works.

285. Soils around the gas stations could be contaminated with hydrocarbons. Excavation works in these areas could require handling and disposal of any contaminated soil. This represents health risks and pollution risks if the soils are not handled and disposed of correctly. This risk is rated Moderate given that none of underground fuel storage tanks will be affected by the project works and that risk and impact will only occur on small parcel of lands in front of the four small gas stations and only during project excavation. The risks rating also consider moderate sensitivity of receptors in urban setting.

286. Operating borrow pits can result in multiple environmental and social impacts, including elevated levels of noise, degradation of air quality, etc. Borrow pits can also fill with water that can then become a hazard to the local community.

Operational Phase

287. None identified.

Impact summary and assessment of significance

288. Table 40 provides an assessment of the significance of potential impacts to soils before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 40: Potential Impacts to Soils

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Spills and leaks of hazardous liquids*	*Soils in and around work zones and camps*	*L*	*L*	*L*	*L*	*MIN*	*ST*	*SMA*	*L*	*POSS*	***L***
C	*Management of potential contaminated soil*	*Workers and disposal sites*	*L*	*M*	*L*	*M*	*MOD*	*MT*	*SMA*	*M*	*POSS*	***M***
C	*Borrow pits*	*Local community*	*L*	*M*	*L*	*-*	*MOD*	*ST*	*SMA*	*L*	*POSS*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

289. A physical site investigation should be completed at all gas stations prior to any excavation works in these areas. If potential for soil contamination is noted during this investigation the Contractor shall complete soil sampling to determine the presence of any contaminated soils. A plan will be prepared by the Contractor to dispose of excavated

materials in these areas in line with national standards in case analysis of samples shows elevated levels of contamination. The plan shall also include procedures for the safe handling and transport of the material.

290. The Contractor, with oversight from the Engineer, will ensure that:

- All project fuel and chemical storage (if any) will be sited on an impervious base within a bund and secured by fencing. The storage area will be located away from any watercourse or wetlands. The base and bund walls will be impermeable and of sufficient capacity to contain 110% of the volume of tank (or one tank if more than one tank is in the bund).

- The construction camp maintenance yard will be constructed on impervious hard standing with adequate drainage to collect spills, there will be no vehicle maintenance activities on open ground.

- Filling and refueling will be strictly controlled and subject to formal procedures. Drip pans will be placed under all filling and fueling areas. Waste oils will be stored and disposed of in compliance with Lao PDR regulatory requirements, international best practices or by a licensed contractor.

- All valves and trigger guns will be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.

- The contents of any tank or drum will be clearly marked. Measures will be taken to ensure that no contaminated discharges enter any soils.

- No bitumen drums or containers, full or used, will be stored on open ground. They will only be stored on impervious hard standing.

Regarding borrow pits, a due diligence review will be carried out by the Engineer to confirm that the sites identified for use by the Contractor are operating or operable in an appropriate manner. This will include review of the borrow pits operational license and a site visit to the borrow pits to ensure that sensitive receptors are not located within 500 meters of the borrow pits. A copy of the agreement between the operator and the Contractor will also be provided to the Engineer for review.

Residual Impacts

Table 41: Soils Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Spills and leaks of hazardous liquids*	***Low***	*Mitigation measures, if applied correctly, will ensure that there are no significant residual impacts.*	***Not significant***
C	*Management of potential contaminated soil*	***Medium***	*Physical site investigation and soil sampling (in case potential for soil contamination is noted during physical site investigation) and preparation of a management plan for their handling and disposal in line with national requirements should ensure that any residual impacts are of low significance.*	***Low***
C	*Borrow Pits*	***Medium***	*Mitigation measures, if applied correctly, will ensure that there are no significant residual impacts.*	***Not significant***

6.3 BIOLOGICAL RESOURCES

6.3.1 Flora, Habitat & Fauna

Aspects of the Project that have the potential to impact upon flora, fauna and habitat

- Vegetation clearance for the road corridor and camp sites and ancillary facilities.
- Vehicle movements within the work corridor.
- Operation of camps and work sites.
- Operation of borrow pits.

Sensitive Receptors

291. No sensitive habitat (modified, natural or critical habitat) has been identified within the Project corridor. A number of trees have been identified within the corridor of impact most of which are common species except for seven planted IUCN EN / VU / Lao List I species (including *Pterocarpus macrocarpus*) which are found at the edge of the COI. The full list can be found in **Appendix H**. Four sacred trees (*Ficus Religiosa*) are located within the right of way, but not in the corridor of impact.

292. Existing borrow pits have been proposed for the Project. None of which are located within proximity of nationally or internationally designated sites. Haul routes from these sites to NR-13N will not pass-through designated sites.

293. Due to the urban nature of the Project road no sensitive fauna has been identified.

Potential Impacts

Construction Phase

294. The Project primary impacts on flora during the construction phase stem from the cutting of trees to accommodate the widened road and the clearance of land to establish construction camps, plant, etc.

295. The project tree survey identified 167 trees within the right of way, of which 87 are in the corridor of impact, i.e., most of them are anticipated to be cut to make way for the road widening. Among the 87 trees inside COI, seven trees are listed in IUCN special status species. These trees are all planted at the edge of the COI and not naturally occurring. They include five Burma Padauk (*Pterocarpus macrocarpus*) – IUCN EN (also List I according to the agreement of classification of tree types on Lao PDR); and two Dork Lueang India (*Handroanthus chrysanthus*) - IUCN (VU). The five “Burma Padauk” trees are 3-10 m in height and 0.06 – 0.20 m in diameter. The two “Dork Lueng India” trees are 10 m in height and 0.15 m in diameter. Since all the seven are located at the edge of the COI, it will not be necessary to remove these trees but keep them as a shed for pedestrians. This avoidance measure has been included in mitigation measures for Detailed Design.

296. Four sacred fig trees (Ficus Religiosa) have been identified within the right-of-way but all of the four sacred trees are outside the Corridor of Impacts (COI). Distance of the identified sacred trees from the edge of existing roadside range from 12 -15 m. Therefore, the four sacred trees will not be removed. These trees are not on the IUCN list of special status.

297. Because the locations of the construction camps and staging areas have yet to be determined, it is not yet possible to inventory the trees that may have to be removed there.

Operational Phase

298. None identified.

Impact summary and assessment of significance

299. Table 42 provides an assessment of the significance of potential flora and habitat impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 42: Potential Impacts to Flora, Fauna and Habitat

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Tree clearance*	*Special status trees*	*L*	*H*	*M*	*-*	*MOD*	*ST*	*SMAL L*	*MIN*	*UNLIK E*	***L***
		Common species trees	*M*	*L*	*L*	*L*	*Low*	*LT*	*SMAL L*	*MOD*	*DEF*	*M*

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Design Phase

300. Micro-alignment changes to the preliminary design will be made during the Detailed Design by the Contractor to avoid impact on the seven special status trees.

Pre-construction / Construction Phase

301. To minimize the impact on flora to the greatest extent possible, all of the temporary construction facilities, camps, plant etc., should be located on already heavily disturbed ground where secondary forest growth has not yet become well-established. Requirements relating to borrow pits are discussed separately below.

302. In addition, prior to the start of construction, the Contractor will obtain all necessary permits from the relevant authorities for the cutting of trees. The Contractor will prepare a tree clearance plan, as part of C-ESMP, for prior approval by the Engineer. Trees cutting should be limited as necessary and where avoidance is not technically feasible taking into account road safety aspect. The Clearance Plan will be followed strictly by the contractor.

303. The four sacred trees identified in the project tree survey will not be removed. Under no circumstances will any religious tree be trimmed, or cut without consultation between the local community, the Engineer and the Contractor.

304. All of seven special status trees will clearly marked prior to the start of construction works. These trees will not be removed. Construction works in the vicinity of these trees should be carried out with care to minimize impacts on the trees.

305. All other tree cutting, and tree replacement will be undertaken according to the law of the GoL.

Operational Phase

306. None required.

Residual Impacts

Table 43: Flora, Fauna and Habitat Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Special status tree clearance*	***Low***	*Seven special status trees will not be removed. The proposed mitigation measures will help reduce any other impacts on these trees from construction works in the vicinity areas.*	***Low***
C	*Tree clearance (common species)*	*Medium*	*Trees located inside COI will need to be removed to make way for road widening. The proposed mitigation measures will make sure that trees clearance should be carried out as necessary and when avoidance is not technically feasible taking into account road safety aspects. Trees those are outside of COI should not be removed.*	*Medium*

6.4 SOCIO-ECONOMIC ENVIRONMENT

6.4.1 Economy and Employment

Aspects of the Project that have the potential to Impact upon the Economy and Employment

307. Project activities will provide opportunities for companies at the international, national, and possibly regional, level to supply goods and services. The Project is expected to affect the local economies, employment, skills and livelihoods primarily by:

- Employing local people temporarily to carry out construction work.
- Local purchases of goods and services directly by the Project and workers, particularly in communities located in the vicinity of construction workforce camps.

- Potential in-migration of individuals/households to take advantage of economic opportunities created by the Project.

Key Sensitivities

- High expectations among local people that they will be employed.
- Concern that jobs should be given to local people and only to non-locals where no suitably qualified locals are available.
- Concern that jobs will not be allocated fairly between villages / communities.
- Job availability for women.
- Food and healthcare costs.

Potential Impacts

Construction Phase

308. Creation of Jobs - The community, including women along the alignment of sub-project will have opportunities for temporary employment during construction. For women this may include catering and other construction camp services. Although, this opportunity is temporary in nature, it could be be beneficial.

309. Notwithstanding the above, the Project will have some negative impacts on the economy of the Project area, including:

- Temporary disruption to house and businesses access exacerbated by possible construction delays;
- Impacts to commercial properties, road vendors and markets;
- Limited space available for roadside commercial activities during constructions;
- Income impacts due to construction and possible delays; and

Operational Phase

310. The Project is expected to have significant beneficial impacts to the economy of the Project area. The key benefits include:

- Reduced congestion – There will be less congestion on the road;
- The new road is perceived to improve safety for communities alongside the road. There will be more street signs and lightning and formal crossings, better enforcement of vehicle speeds, more space between houses and businesses and traffic.
- The new road is perceived to improve health. The existing road is dusty with solid waste and mud in wet season, some of which enters houses due to their current proximity to the road and due to the engineering design of the road. Blocked drainage is common in the existing road also.
- Reduction of maintenance costs – Increased maintenance of vehicles due to poor road condition drives up the costs of agricultural products;

- Benefits due to additional space between shops and the new road allowing shoppers to park easily, avail of goods and services and move on safely. The existing road is more cramped and busier causing many shoppers to seek goods and services elsewhere.

311. Notwithstanding the above, the Project will have some negative impacts on the economy of the Project area, including:

- Inadequate replacement land; and

- Possible issues with land titles changes.

Impact summary and assessment of significance

312. Table 44 provides an assessment of the significance of potential impacts on the economy and employment before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 44: Potential Impacts on the Economy and Employment

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Disruption to business	Local businesses and residents	H	H	H	-	MAJ	ST	SMA	M	DEF	M
C	Job creation	Local businesses and local population	H	H	M	-	MAJ	ST	INTER	M	DEF	M +
O	Road improvements	Local businesses and local population	H	H	M	-	MAJ	LT	INTER	H	DEF	H +

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

313. Employment - The Contractor will employ local labor to benefit local communities and to promote the overall acceptance of the project. A budget will be made available to pay for training of locals and a minimum target for local labor will be set in contracts and enforced. As part of the maintenance of the road the DoR should also investigate the possibility of employing the local people for the maintenance of roadside drains upon completion of rehabilitation works.

314. Road Vendors – To avoid disruption to vendors the Contractor, in coordination with the DoR and the Provincial government, shall set aside a specific area for road vendors to continue to operate throughout the construction phase. The area should be located within at least 50 meters of the project road and should be sized to accommodate all road vendors. The site should be clearly signposted for traffic and an all-weather track provided to the site with parking space.

315. Scheduling of civil works – The scheduling of the construction is a key aspect to mitigating disturbances to incomes and impacts on health. It is recommended that the schedule for civil works be divided into sections comprising several work sites each with specific arrangements custom designed for the affected community. The works schedule will be a key document in the contracts of the Contractor and advancement of works will need to be very carefully monitored by the Engineer. Contingencies for unaccounted disturbances to scheduling will be included in the works schedule.

316. Accessibility – Access to businesses must be always maintained throughout the construction period. This means that the contractor must prepare dedicated temporary pathways to all businesses that might otherwise be cut off from the road during the construction phase. The pathways must be wide enough to allow access to the business and must be kept free of mud and construction debris and should not be liable to flooding.

317. Public communication - Stakeholders will be able to communicate issues through the grievance redress mechanism (GRM) as and when they occur. In addition, the Contractor will provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions. This will be achieved by undertaking a rolling program of community meetings along the Project corridor as work progresses. Four weeks prior to the Contractor starting works in any village or town he will be responsible for holding a works orientation meeting within the village / town and will invite members of the public and village officials. The purpose of the meeting is to summaries the scope of works, the schedule and to provide copies of the GRM. The Contractor will also hold monthly community meetings in each village / town where construction works are on-going.

318. On-going Issues - Anecdotal evidence from business owners along the Sikeut-Phonhong section of NR-13N suggest that some of the mitigation measures prescribed for that section relating to accessibility have been largely unsuccessfully carried out. The measures included:

- Providing temporary access to houses/ businesses during construction.
- The temporary relocation of informal businesses to a safe place where they could continue to sell.
- Prompt removal of mounds of construction materials and debris when work on the section is finished.

319. These measures will also be applied to the Project, but extra attention should be paid to these issues by the Engineer to ensure that the mitigation measures are successfully applied in this section of NR-13N.

Operational Phase

320. Potential impacts relating to land are discussed below under Land Use.

Residual Impacts

Table 45: Economy and Employment Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Disruption to business*	***Medium***	*Some residual impacts of low significance may remain even with the applied mitigation, but these impacts are offset by the short- and long-term benefits of the Project.*	***Low***

6.4.2 Gender and Vulnerable People

Aspects of the Project that have the potential to impact upon vulnerable people or have gender impacts

321. Land acquisition, temporary displacement and other project activities that can impact upon livelihoods and economic activities.

Sensitive Receptors in the Project Area

- Women
- Disadvantaged and vulnerable people

Potential Impacts

322. Women form the backbone of the informal economy, which mostly operates along the roadsides and provides food and snacks from makeshift and semi-permanent structures close to the roadside. Construction activities have a differential effect on both commercial and social lives of women. Women own or manage almost all roadside businesses such as lottery stalls, snack stalls, small restaurants and so on. Women also have more responsibility for taking children to school and going to market to buy household provisions.

323. Disturbance due to construction work will have a greater impact on vulnerable people.

Impact summary and assessment of significance

324. Table 46 provides an assessment of the significance of potential impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 46: Potential Impacts on Gender, Vulnerable People and Ethnic Minorities

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Impacts to livelihoods*	*Women / Vulnerable People*	*M*	*H*	*H*	*-*	*MAJ*	*ST*	*SMA*	*MOD*	*DEF*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

325. Vulnerable People - One household in Yapha village was initially identified as vulnerable, but no longer categorized as such. Their land and structures will not be affected

by acquisition. Further consultation revealed that the couple was relatively wealthy and operated a brick manufacturing business.

326. Gender - Mitigation measures like those previously proposed for the Sikeut-Phonhong section are suitable – including providing temporary access to residences and small shops so that women can come and go without undue difficulty.

Residual Impacts

Table 47: Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Impacts to livelihoods*	***Medium***	*The mitigation measures proposed should ensure that any residual impacts are of low significance*	***Low***

6.4.3 Land Use

Aspects of the Project that have the potential to have land use impacts

327. Widening of the road requires that public land and some structures (or portions of structures) are acquired and demolished. This may affect not only the landowners, but also businesses that operate in these areas.

Sensitive Receptors

- Landowners and tenants
- Roadside Businesses
- Structures (including private, and public)
- Cultural heritage sites
- Crops
- Utilities

Potential Impacts

Design Phase

328. To ensure land acquisition issues are addressed appropriately a RAP has been prepared by the ESIA team. The RAP for the Project complies with the World Bank's OP 4.12, Decree 84 of the Lao Government, and the Ministry of Natural Resources and Environment's (MONRE) 2016 Ministerial Instruction No. 8030/MONRE on Environmental and Social Impact Assessment Process of the Investment Projects and Activities. The summary findings of the RAP are as follows:

- The residential land that will be permanently affected by the Project will be about 339 plots with the total area of 12,614 square meters that belong to 310 households while the permanently affected agricultural land will be much less at about 342 square meters in 12

plots. No ethnic group HHs are affected by land resumption. No vulnerable household will lose land. These permanently affected households will be compensated for the land acquisition. The 8 affected plots of government land will not be compensated.

- During the construction period there will be temporary impacts on 509 plots of the residential and government land and on 20 plots of agricultural land. The owners or occupants of these temporarily affected plots will not receive cash compensation as the contractor is required to provide temporary access during construction.. However, if the contractor does not provide such access in a timely manner he shall be responsible for compensation for the impacts on PAHs' livelihood and businesses due to his failure to maintain/provide access facilities and the prolonged access lost (beyond the agreed work schedule). A clause on these measures will be specified in the bidding document including the BOQ form and the work contract. For more detail please see the RAP Entitlement Matrix p 27

- The structures on both permanently and temporarily affected land plots have been measured and included in the inventory list of loss and these affected structures will be compensated based on the severity of the impacts resulting from the DMS. Altogether there are 7 severely affected houses belonging to 4 AHs where it is safe to build a new residential house. The secondary affected structures include extension part of the main house, veranda, porch, cement slab, fence, etc.

- The PAPs in 10 villages will have their trees and crops affected. The affected crops are insignificant and limited to home gardening crops. Most affected trees are decorative trees and fruit trees. Cash compensation of three times the value of annual production will be provided for the loss of productive trees.

- Approximately 474 businesses will be affected by the Project of which 17 businesses will be permanently affected and need to be relocated.

329. During the consultation stages of the Project stakeholders have indicated that streetlights on the roadside will require more land to be acquired. As such they would prefer streetlights to be located within the road median to limit any land take on the side of the roads.

Construction Phase

330. Potential impacts to land use outside of the RoW during the construction stage are limited to the creation of construction camps and other ancillary facilities such as borrow pits, batching plants, etc.; and are discussed under headings relating to those items below.

Impact summary and assessment of significance

331. Table 48 provides an assessment of the significance of land use impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 48: Potential Land Use Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal [illegible]	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
	C	*Loss of land, structures*	*Residents, tenants, businesses*	*H*	*H*	*H*	*-*	*MAJ*	*LT*	*SMA*	*H*	*DEF*	***H***
	C	*Loss of income / Livelihood*	*Businesses*	*H*	*H*	*H*	*-*	*MAJ*	*LT*	*SMA*	*H*	*DEF*	***H***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Design Phase

332. Where practical, and while ensuring compliance with technical standards, streetlights should be located in the median.

Pre-construction Phase

333. The RAP has included several compensation measures in the form of an entitlement matrix which outlines in detail measures to compensate for:

- Loss of land or use of land;
- Loss of crops and trees;
- Loss of structures and fixed assets;
- Livelihood impacts;
- Allowances, assistance, and livelihood restoration; and
- Temporary impact during construction.

334. The total budget for RAP implementation is about 4.8 million US dollars. It will cover the costs for compensation of the affected assets and businesses of the individual households and the communities as well as consultancy cost for the implementation of the RAP. This does not include the cost of relocation of public utilities, which will be added to the contractor's cost, and is estimated at $1.1 million.

335. As with this ESIA, the RAP will be reviewed and approved by the DoR and World Bank before it can be implemented prior to the start of the construction phase.

Residual Impacts

Table 49: Land Use Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Loss of land, structures*	***High***	*Despite implementation of the RAP, some residual impacts may remain as money cannot entirely compensate for the loss of property and livelihoods which may take some time to restore and recover.*	***Low***
C	*Loss of income / Livelihood*	***High***		***Low***

6.4.4 Infrastructure

336. This section discusses the potential impacts on infrastructure during construction and operation of the Project and associated mitigation measures to be adopted.

Aspects of the Project that have the potential to impact upon infrastructure

- Undertake earth-moving/excavation works that may inadvertently damage existing infrastructure.
- Road widening requiring the permanent or temporary movement of utilities.
- Use existing infrastructure and utilities for transport of materials, construction camps and other temporary or permanent above ground facilities.
- Moving existing bus bay locations.

Sensitive Receptors

- Roads and their users (including bus passengers)
- International Airport
- Utilities (electricity, water supply, telecoms) and their users
- Drainage networks

Potential Impacts

Construction Phase

337. Drainage Infrastructure – Discussed above under the topic of Hydrology.

338. Roads - During the construction phase, it may be inevitable that disruption of existing traffic and local accessibility are impaired which may cause problems with the local community and for local businesses if access is restricted. Access to the airport may also be affected.

339. Bus Bays – Moving bus bays to areas where they are not practical may inconvenience bus users.

340. Utilities - Low voltage power lines, fiber optic lines and water supply pipes are located within the Project corridor. Some of these lines and pipes may need to be relocated permanently or temporarily during the construction phase.

Impact summary and assessment of significance

341. Table 50 provides an assessment of the significance of potential impacts on infrastructure before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 50: Potential Impacts on Infrastructure

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Temporary loss of utility supply*	*Local community*	*M*	*M*	*M*	*-*	*MOD*	*L/F*	*SMA*	*MIN*	*DEF*	***M***
C/O	*Bus bay impacts*	*Local Community*	*M*	*M*	*M*	*-*	*MOD*	*M/F*	*SMA*	*MIN*	*DEF*	***M***
C	*Wear and degradation of road surface*	*Local community*	*M*	*M*	*M*	*-*	*MOD*	*ST*	*SMA*	*MIN*	*POSS*	***L***
C	*Traffic congestion and delays*	*Local community*	*M*	*M*	*M*	*-*	*MOD*	*M/F*	*SMA*	*MIN*	*DEF*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

342. Relocation of public utilities should be carried out as early as possible prior to the construction. This will need good coordination and contract preparation upfront to avoid delay of works and poor relocation planning.

343. To mitigate the potential impacts to existing roads the Contractor will:

- Submit a Traffic Management Plan to local traffic authorities and the Engineer prior to mobilization and include the plan as part of his CESMP;
- Provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions.
- Allow for adequate traffic flow around construction areas;

- Provide adequate signalization, appropriate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control;

- Provide temporary access where accessibility is temporarily restricted due to civil works; and

- Ensure that access routes, via diversions, always remain open to businesses, residential properties, schools, medical facilities, the airport, etc.

344. Prior to the commencement of works a road condition survey will be undertaken by the Engineer to record the condition of access roads to borrow pits, asphalt plants, camps, etc. These access roads will be maintained during the construction phase and repaired to their original state at the end of construction by the Contractor to the satisfaction of the Engineer, local authorities and in compliance with the contract.

345. Utilities - During construction all power lines (transmission and distribution) and water pipes in the Project Corridor will be kept operational, this will include temporary transmission lines while existing poles and lines are moved. If any temporary disruption to water or power supplies is necessary, the Contractor must warn the affected population and receive approval from the Engineer for the disruption at least 24 hours in advance and no disruption will last longer than 4 hours. Should utilities need relocating in a different location the Contractor will consult with the relevant utilities and local community to ensure that there is no change in supply because of these changes.

346. Bus Bays – Designers and DoR to consult with stakeholders to determine the final locations of the bus bays.

Residual Impacts

Table 51: Infrastructure Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Temporary loss of utility supply*	***Medium***	*No significant residual impacts are anticipated if the mitigation measures are implemented correctly.*	***No significant residual impacts***
C	*Wear and degradation of road surface*	***Low***	*No significant residual impacts are anticipated.*	***No significant residual impacts***
C	*Traffic congestion and delays*	***Medium***	*No residual impacts are anticipated if the TMP and the other mitigation measures for traffic outlined above are implemented correctly.*	***No significant residual impacts***
C/O	*Bus Bays*	***Medium***	*Residual impacts will not be significant as long at stakeholders are consulted and their requests for bus bay locations are considered in the road design.*	***No significant residual impacts***

6.4.5 Cultural Heritage

347. This section discusses potential impacts on cultural heritage during construction and operation of the Project and associated mitigation measures to be adopted.

Aspects of the Project that have the potential to impact upon cultural heritage

348. Land clearance for road widening.

349. Issues relating to air quality, noise and land acquisition are discussed in separate sections of this ESIA.

Sensitive Receptors

- Temples (as identified in Figure 7)
- Cemeteries (as identified in Figure 7)
- Sacred Trees (as identified in Appendix H)

Potential Impacts

Construction Phase

350. Widening of the road may impact upon portions of cultural heritage sites such as boundary walls. Three temples and two cemeteries will have portions of their land or structures (boundary walls) impacted.

351. Widening may also impact upon sacred trees. This issue has been discussed above under flora, fauna and habitat.

352. Given Lao PDRs rich cultural heritage it is possible that chance finds could occur, although this is considered remote since the works are confined to the already heavily disturbed right of way.

Impact summary and assessment of significance

353. Table 52 provides an assessment of the significance of potential cultural heritage impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 52: Potential Impacts to Cultural Heritage

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Loss of land / Structure*	*Temple / Cemetery*	*L*	*H*	*H*	*-*	*MAJ*	*LT*	*SMA*	*H*	*DEF*	***H***
C	*Chance find*	*Unidentified resources*	*L*	*M*	*L*	*-*	*MOD*	*ST*	*SMA*	*L*	*UN*	***L***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

354. The loss of cultural and religious assets of the community such as spirit stupa, and the decoration of entrance gates and fences of the temples will be compensated per the RAP. These costs will include ritual ceremonies and art works for the main gates and fences. Consultations with temples, communities and local authorities will be completed as part of the compensation process.

355. The Contractor will prepare a chance find procedure. The procedure will incorporate all of the requirements of the GoL regarding chance finds. A template for the chance finds procedure is included as **Appendix K**.

Residual Impacts

Table 53: Cultural Heritage Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Loss of land / Structure*	***High***	*Compensation measures outlined above should ensure that residual impacts are not significant.*	***Not significant***
C	*Chance finds*	***Low***	*It is considered unlikely that chance finds will occur in these areas. However, the chance find procedure, in line with the ESOM, will ensure that any residual impacts are not significant*	***Not significant***

6.4.6 Workers' Rights and Occupational Health and Safety (OHS)

356. This section discusses potential OHS impacts during construction and operation of the Project and associated mitigation measures to be adopted.

Aspects of the Project that have the potential to result in OHS impacts

357. The main Project-related activities that may result in OHS issues are:

- Accidents involving the use of heavy equipment.
- Accidents involving construction vehicles.
- Accidents due to lack of, or poor application of, personal protective equipment (PPE).
- Poor sanitary and OHS conditions at camps and work sites.
- Lack of first aid and medical facilities.
- Spread of COVID-19.
- Unexploded Ordnance (UXO)

358. Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labor abuses and to ensure fair treatment, remuneration and working and living conditions. These issues need to be considered not only for workers who are directly employed by the Project but also sub-contractors.

Sensitive Receptors

359. Contractors staff and sub-contractors are the sensitive receptors.

Potential Impacts

Construction Phase

360. Worker Health and Safety - Accidents are common during a project of this size and scale. Accidents can occur if workers are not adequately trained or qualified for the job or if they have incorrect safety equipment and clothing. There may be a risk/possibility that the construction area is not clear of any UXO. Spread of COVID-19 is also possible during the construction phase as is any type of common illness such as those associated with drinking water quality.

361. Sexually Transmitted Diseases – See the section on Community Health and Safety below for impacts and mitigation relating to STDs.

362. Workers' Rights - Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labor abuses and to ensure fair treatment, remuneration and working and living conditions. These issues need to be considered not only for workers who are directly employed by the Project but also sub-contractors.

Impact summary and assessment of significance

363. Table 54 provides an assessment of the significance of potential OHS impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 54: Potential OHS Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Accidents involving workers*	*Contractors staff / sub-contractors*	*M*	*M*	*L*	*M*	*MOD*	*ST*	*SMA*	*MED*	*POSS*	***M***
C	*Workers' rights ignored.*	*Contractors staff / sub-contractors*	*M*	*L*	*L*	*L*	*MIN*	*ST*	*SMA*	*LOW*	*POSS*	***L***
C	*COVID-19*	*Contractors staff / sub-contractors*	*M*	*M*	*L*	*M*	*MOD*	*ST*	*SMA*	*MED*	*POSS*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

364. An OHS Plan will be prepared by the Contractor to manage worker safety. The Plan will include the following items:

- Risk Assessment and Risk Register to enable the safe systems of work to be identified and any PPE requirements ascertained.

- Safety Training Program. A Safety Training Program is required and will consist of:

  i. Initial Safety Induction Course: All workmen will be required to attend a safety induction course before they are allowed access to the Site.

  ii. Periodic Safety Training Courses: Periodic safety courses will be conducted not less than once every six months. All Contractor (and any sub-contractor) employees will be required to participate in relevant training courses appropriate to the nature, scale and duration of the subcontract works. Training courses will be compulsory for all workers on the Site and at all levels of supervision and management. A list of training participants names and time-stamped photographic evidence of the training will be provided by the Contractor to the Engineer for his records.

  iii. Safety Meetings. Regular safety meetings will be conducted monthly. The Engineer will be notified of all safety meetings in advance. The Engineer may attend in person

or by representative at his discretion. The minutes of all safety meetings will be taken and sent to the Engineer within seven (7) days of the meeting and will include a list of participants' names and time-stamped photographic evidence of the training.

iv. Safety Inspections. The Contractor will regularly inspect, test and maintain all safety equipment (including firefighting equipment), scaffolds, guardrails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs will be kept clear of obstructions and legible to read. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, will be repaired or replaced immediately by the Contractor.

365. Contractor will be responsible for accident log keeping. The Engineer will undertake audits and inspections of Contractor's accident logs. The Engineer should review and critique, in a timely manner, regular reports and incident reports submitted to the Engineer and to provide advice to ensure the accuracy and efficacy of the documentation. The NOHSS will prepare Quarterly OHS Reports also including a summary of incident and accident reports.

366. Workers will be provided (before they commence works) with appropriate PPE suitable for electrical work such as safety boots, helmets, gloves, protective clothes, goggles, and ear protection at no cost to the workers.

367. All construction plant and equipment used on or around the Site will be fitted with appropriate safety devices. These will include but not be limited to:

- Effective safety catches for crane hooks and other lifting devices, and
- Functioning automatic warning devices and, where applicable, an up-to-date test certificate, for cranes and hoists.

368. In addition, all Project sub-contractors will be supplied with copies of the CESMP in local language. Provisions will be incorporated into all sub-contracts to ensure the compliance with the CESMP at all tiers of the sub-contracting. All subcontractors will be required to appoint a safety representative who will be available on the Site throughout the operational period of the respective sub-contract unless the Engineers approval to the contrary is given in writing. In the event of the Engineers approval being given, the Engineer, without prejudice to their other duties and responsibilities, will ensure, as far as is practically possible, that employees of sub-contractors of all tiers are conversant with appropriate parts of the CESMP. To implement the above items the Contractor will designate qualified environmental, health and safety personnel.

369. Any gaps and discrepancies in guidelines for gender-based violence and child abuse will be governed by the World Bank Guidelines for a Code of Conduct and Action Plan on Gender-Based Violence (GBV) and Violence Against Children. The guideline provides guidance and procedures to identify, address and mitigate the above-described issues to be complied with by contractors, sub-contractors and concerned agencies. The key provisions of the guideline will be incorporated into the package of bidding documents to be submitted by the bidders.

370. Prior to the start of any works the Contractor will consult with the relevant regulatory authorities to confirm that the construction area is clear of any UXO. If this cannot be confirmed the Contractor (through an approved sub-contractor) will be responsible for surveying the construction areas (including ancillary facilities, such as borrow pits and access roads) and confirming that the work sites are free of UXO. The Contractor will provide, in writing, the findings of the survey to the Engineer. If any UXO is found on site the Contractor, through his approved sub-contractor, will be responsible for removing any UXO.

371. The Contractor shall follow the national regulations and guidelines relating to COVID-19.

372. A Service Provider will be subcontracted to provide an HIV Awareness Program to the Contractor's Personnel and the Local Community. The HIV Awareness Program will be repeated at intervals not exceeding four months.

373. The Contractor will ensure that no persons under the age of 18 are employed on the Project.

374. Workers will also be given awareness training relating to vector born disease and posters will be located around work sites warning workers of the potential health risks. The Contractor will also ensure that medicines for the treatment of vector borne diseases are provided at his camp medical facility. In addition, Water and drainage facilities at construction camps and work sites will be maintained to avoid breeding of mosquitoes. Effective measures will be used to ensure that water stagnant is not present around the camp site. Use of pesticides for vegetation control is prohibited. A worker grievance redress mechanism (GRM) will be prepared and all workers will be provided with information about the GRM as part of their induction training.

Residual Impacts

Table 55: OHS Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Accidents involving workers*	***Medium***	*Correct implementation of the mitigation and management measures will ensure that residual impacts in the construction phase are Low.*	***Low***
C	*Workers' rights ignored.*	***Low***	*No significant residual impacts anticipated.*	***No significant residual impacts***
C	*COVID-19*	***Medium***	*Despite efforts to follow national guidelines, it may still be possible that COVID-19, or its variants, may spread among the workforce. National guidelines should however help reduce the significance of residual impacts to low.*	***Low***

6.4.7 Community Health and Safety

375. This section discusses potential community health and safety impacts, other than issues already addressed elsewhere in this report, e.g., noise, air quality, etc., during construction and operation of the Project and associated mitigation measures to be adopted.

Aspects of the Project that have the potential to result in community health and safety impacts

376. The main Project-related activities that may result in impacts to community health and safety are:

- Introduction of non-local workers, almost entirely males, to certain localities.
- Provision of early works accommodation and construction camps for these workers with operating rules that allow for interaction between workers and local people.
- Storage and handling of food and drinks in accommodation/camps.
- Movement of construction vehicles.
- Dangerous work sites, such as excavated areas, manholes, etc.
- Uncontrolled facilities, such as temporary storage areas.
- Solid and liquid waste disposal.
- Operational traffic.

Sensitive Receptors

377. Residents within the Project area could be impacted as well as regional traffic using the road. Several schools and medical facilities have also been identified near the Project corridor.

Potential Impacts

Construction Phase

378. Road Traffic Accidents and Accidents at Construction Sites - Construction activities may result in an increase in the total number of road traffic accidents between vehicles, pedestrians and vehicles and livestock and vehicles. Accidents could also occur if work sites are not appropriately sign posted and secured, for example borrow pits, excavation areas for culverts, etc. Four accidents involving fatalities of road users had occurred during the construction phase of the original project (none of which involved construction workers). Root cause analysis (RCA) has been undertaken for all of the project related fatalities. The RCAs identified a number of root causes, most of which are not associated with the project itself, rather general human behavior, weak law enforcement, including:

- Unsafe driving practice (including those drive without driving license) and general lack of driving skills and awareness in Laos and specifically along the project road / drunk-driving / over-speeding / over-loading
- No respect of traffic rules and regulations by road users and weak enforcement of traffic rules and regulations
- Lack of general road safety awareness by surrounding population and road users

Other root causes are associated with original project works and conditions, and it is possible they could also occur during this Project. They include:

- Inadequate traffic management
- Incomplete cross sections with gaps (central reserve)
- Unsafe driving environment
- Environmental, social health and safety including occupational, health and safety (ESHS/OHS) system is not fully implemented to the best possible practice

Several immediate, medium-term and long-term actions have been prepared and implemented under the parent project as described in the Mitigation and Management Measures. These measures will be applied and continue for this 6 kms section.

379. Labour Influx - Labor influx for construction works can lead to a variety of adverse social and environmental risks and impacts, they include:

- Risk of social conflict: Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural, or ethnic differences, or based on competition for local resources.

- Increased risk of illicit behavior and crime: The influx of workers and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community. Such illicit behavior or crimes can include theft, physical assaults, substance abuse, prostitution, and human trafficking.

- Influx of additional population ("followers"): Especially in projects with large footprints and/or a longer timeframe, people can migrate to the project area in addition to the labor force, thereby exacerbating the problems of labor influx. These can be people who expect to get a job with the project, family members of workers, as well as traders, suppliers and other service providers (including sex workers). However, this issue cannot be mitigated by this ESIA.

- Increased burden on and competition for public service provision: The presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the provision of public services, such as water, electricity, medical services, transport, education, and social services. However, workers will be housed in construction camps with independent services, so this issue will not be significant.

- Increased risk of communicable diseases and burden on local health services: The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs) and COVID-19, or the incoming workers may be exposed to diseases to which they have low resistance.

- Gender-based violence: Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and act outside their normal sphere of social control. This can lead to inappropriate and criminal behavior, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may also lead to an increase in exploitative sexual relationships and human trafficking whereby women and girls are forced into sex work. According to the Lao National Survey on Women's Health and Life Experiences (2014), 5.1% of women interviewed had experienced physical violence by a non-partner in their lifetime from the age of 15, while the percentage of women who report a variety of types of sexual violence (forced intercourse, attempted forced intercourse, or other unwanted sexual acts) was 5.3%. This is somewhat lower that the global lifetime prevalence of non-partner sexual violence (7.2%) reported by the World Health Organization in 2013.

- Child labor and school dropout. Increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

- Local inflation of prices: A significant increase in demand for goods and services due to labor influx may lead to local price hikes and/or crowding out of community consumers. However, this issue cannot be mitigated by this ESIA.

- Increased pressure on accommodations and rents: Depending on project worker income and form of accommodation provided, there may be increased demand for accommodations, which again may lead to price hikes and crowding out of residents. Contractors staff will be located within camps and as such this issue is unlikely to occur during the construction phase.

380. Given the nature of the project and the context in which it is operating, the marginal risk associated with the labor influx under the project is moderate. This is based on the expected size of the labor influx population against the absorption capacity of the area experiencing influx. The works will be in an urban area with high absorption capacity. The size of labor influx will be moderate: with around 100 workers, 60% of whom will be recruited locally.

Operational Phase

381. Increases in the number of vehicles using the Project Road and their speeds may result in an increase in the number of road accidents during the operational phase of the Project. It is relatively easy for pedestrians to cross the road in its current two-lane form. However, when the section of the road is increase to four lanes with a concrete median, crossing will only become possible at dedicated crossing points otherwise accidents will occur as people attempt to cross the four lanes and a median which will, over time, see an increase in traffic levels.

382. Since the project development objective is to improve the road conditions, safety, and climate resilience on critical sections of NR13. Road safety has been considered in a comprehensive way through all aspects in the design of 6 kms road sections. The conceptual design has included measures to improve road safety of five accident black spots identified. Some educational and health facilities are located adjacent to the road. Areas outside of these facilities need to be designed to account for vehicles pulling in and out of these areas, provision of suitable parking to avoid cars parking in the roadside, provision of suitable bus bays and adequate road crossings. Road crossing at the eye hospital need specific consideration to ensure they are suitable for the visually impaired.

Impact summary and assessment of significance

383. Table 56 provides an assessment of the significance of potential community health and safety impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 56: Potential Impacts on Community Health and Safety

Phase	*Potential Impact*	*Receptors*	*No. of Receptors Affected*	*Sensitivity of Receptors*	*Level of Public Concern*	*Risk of Exceeding Legal Threshold*	*Magnitude*	*Timeframe*	*Spatial Scale*	*Consequence*	*Probability*	*Significance*
C	*Road traffic accidents*	*Local community*	*H*	*H*	*M*	*-*	*MAJ*	*ST*	*SMA*	*M*	*POSS*	***M***

Phase	*Potential Impact*	*Receptors*	*No. of Receptors Affected*	*Sensitivity of Receptors*	*Level of Public Concern*	*Risk of Exceeding Legal Threshold*	*Magnitude*	*Timeframe*	*Spatial Scale*	*Consequence*	*Probability*	*Significance*
C	*Work zone accidents*	*Local community*	*H*	*M*	*M*	*-*	*MAJ*	*ST*	*SMA*	*M*	*POSS*	***M***
C	*Labour influx*	*Local community*	*H*	*M*	*M*	*-*	*MAJ*	*ST*	*SMA*	*M*	*POSS*	***M***
O	*Road traffic accidents*	*Local community*	*H*	*H*	*H*	*-*	*MAJ*	*LT*	*SMA*	*H*	*POSS*	***H***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Design Phase

384. Designs to include suitable bus bays, parking areas, access and crossings outside all schools, medical facilities, and markets.

385. Road crossing at the eye hospital to include specific measures for the visually impaired.

386. It is therefore important that during consultations the Concept Design Team and the DoR ensure that the most appropriate forms of road crossing are incorporated into the design.

Pre-construction / Construction Phase

387. Road Traffic Accidents and Accidents at Construction Sites - PMU/DOR, DPWT and the traffic police have been provided with specific corrective actions under the original project to help reduce the risk of specific issues occurring again relating to human behavious (e.g. drunk driving, speeding, etc) and these will continue to be applied to this Project. Corrective actions to manage project related issues will also be applied to this Project. The corrective actions are included in Appendix M.

388. Safe Access - It will be the responsibility of the Contractor to provide safe access at all times through the construction site to people whose residences/businesses and routes are temporarily severed by road construction. Open manholes will be fenced during construction and covered timely after construction.

389. Public Safety – The Contractor will be responsible for preparation of a Traffic Management Plan (TMP) that will outline how he will manage issues relating to transport of materials and staff, road closures, diversions, safety signs, etc. The plan will be reviewed and approved by the Engineer. The Contractor will not be allowed to commence works until the plan has been approved. In addition, the Contractor will be responsible for fencing and sign posting any excavated area that are identified by the Engineer as a potential hazard to public safety.

390. Labour Influx Management Plan – Approximately 100 staff and workers will be employed on the entire Project. They will be in Construction camps, unless they live locally, and no accommodation is required. Camp sites will be selected keeping in view the availability of an adequate area for establishing campsites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Prior to the start of construction, the Contractor will be responsible for the preparation of a Labour Influx Management Plan as part of his CESMP. The Labour Influx Management Plan will include a worker orientation program as part of worker induction to discuss religious, cultural, or ethnic differences within the Project area and sexual behavior and Gender based violence. As part of the worker orientation program, Contractors staff shall sign a Code of Conduct relating to his personal behavior on site. Violations of the code of conduct may lead to dismissals. As part of the plan the Contractor will also be obliged to keep a record of all workers staying overnight in a village, including within construction camps in that village, this information will be relayed to village authorities on a weekly basis.

391. Worker Orientation Program - The Labour Influx Management Plan will include a worker orientation program as part of worker induction to discuss religious, cultural or ethnic differences within the Project area and sexual behavior and Gender based violence. As part of the worker orientation program, Contractors staff shall sign a Code of Conduct in their native language relating to his personal behavior on site. Violations of the code of conduct may lead to dismissals.

392. Sexually Transmitted Diseases – It will be a requirement of the Contract that the Contractor sub-contracts with a Service Provider to provide an HIV Awareness Program to the Contractor's Personnel and the Local Community as soon as practicable after the Contractor's Personnel arrive at the Site but in any case, within two weeks after the Contractor's Personnel arrive at Site and to repeat the HIV Awareness Program at intervals not exceeding four months.

393. COVID-19 – Ensure all workers follow national COVID-19 regulations. This should help reduce the possibility of contractors staff spreading COVID-19 in the community.

394. Educational Facilities – During the construction phase specific attention will be given to the schools that are located adjacent to the Project road. The Contractor will place warning signs outside of each school to alert construction vehicles of their locations and to be aware of children crossing the road in these areas. In addition, at least two weeks before construction starts within the vicinity of any school adjacent to the road, the Contractor will be responsible for informing the School of the works program and schedule so that the school can inform pupils of the impending works and to be vigilant throughout the construction program. If warranted, the Engineer may recommend that the Contractor places protective barriers in-front of school entrances to prevent children rushing out from the school gates into the path of construction vehicles or works. When working in the immediate vicinity of a school, the Contractor will cease works for at least 30 minutes before school starts and after it closes to allow children to arrive and leave the area safely and to allow parents safe access to collect their children.

Operational Phase

395. Public Safety During Operational Phase – Physical features include enhanced measures to safeguard pedestrians' safety; traffic calming options; street lighting; road furniture and sidewalks.

396. To complement the physical measures, the project will implement a program of public education and communication on road safety, targeting motorists and pedestrians throughout project implementation, as well as innovative solutions such as geospatial data gathering, Safety signs should also be erected warning people not to attempt to cross the four-lane section. With these measures, the project will provide a model for traffic safety on national roads in the country.

Residual Impacts

Table 57: Community Health and Safety Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Road traffic accidents*	***Medium***	*The proposed construction phase mitigation measures will help reduce the residual impact significance to low because accidents cannot be entirely ruled out.*	***Low***
C	*Work zone accidents*	***Medium***		***Low***
C	*Labour influx*	***Medium***	*The extensive range of mitigation measures for labour influx should help ensure that residual impacts are not significant.*	***Not significant***
O	*Road traffic accidents*	***High***	*Several design measures have been proposed as part of the initial road design. However, they need to be complemented with further measures that should be discussed further with project stakeholders. Until the additional measures can be defined residual impacts will be medium.*	***Medium***

6.4.8 Waste Management

397. This section discusses potential waste management impacts during construction and operation of the Project and associated mitigation measures to be adopted.

Aspects of the Project that have the potential to result in waste management issues

398. The following aspects of the Project are likely to generate waste:

- Operation of construction camps will generate domestic and liquid waste.
- Ancillary facilities, e.g., asphalt plants and vehicle maintenance facilities, will generate a range of waste material including hazardous waste.
- General construction activities along the Project corridor will generate waste, both inert, such as wood and plastic, and hazardous; bitumen drums, oil cans, etc.

Sensitive Receptors

399. Construction waste from camp sites and ancillary facilities will be managed and disposed of according to national regulations by state licensed companies. There will not be any nearby receptors that would be impacted directly by waste disposal from the site if national waste management regulations are followed. Management of waste at work sites within the Project corridor can be more challenging and local communities and the environment can be affected by improper management and disposal of liquid and solid wastes.

Potential Impacts

Construction Phase

400. Road construction will inevitably generate solid and liquid waste products, potentially including:

- Inert waste – for example, concrete, metal, wood and plastics.

- Hazardous waste – acids and alkaline solutions, waste oils and oily sludge, batteries, and bitumen.

401. In addition, uncontrolled discharges of sewage and 'grey water' (e.g., from washrooms and canteens) from construction sites and worker's camps may also cause odors and pollute local water resources. As well as being a cause of complaints by the local population, this may lead to contravention of local regulations and fines being imposed on the Contractor.

402. Table 58 indicates the main types of waste and an estimate of volumes (based on similar road construction projects).

Table 58: Waste Types and Estimated Volumes

#	Waste Type	Hazardous	Estimated Volume
1	Concrete	No	50 m^3
2	Asphalt	No	Currently unknown
3	Bituminous Mixtures	Yes	1 t
4	Wood	No	1 t

#	Waste Type	Hazardous	Estimated Volume
5	Uncontaminated Metal	No	2 t
6	Uncontaminated Plastic	No	1 t
7	Contaminated metal (paint tins, etc.)	Yes	1 t
8	Contaminated plastic (oil containers)	Yes	1 t
9	Domestic waste (food stuffs)	No	2 t
10	Domestic Waste (non-foodstuff)	No	10 t
11	Sewage Water	No	40 m^3
12	Tires	Yes	20 t
13	Hazardous liquid waste	Yes	2 m^3
14	Hazardous solid waste	Yes	2 t

403. It is noted that the waste management situation in Lao PDR is far from perfect, and that the waste management facilities in Vientiane Capital Province are poor quality and do not comply with international best practice, i.e., controlled landfills for hazardous waste, suitable capacity for medical waste, etc. The waste generated by the Project should not simply be dumped in this existing landfill (even if it is a licensed facility) if it adds to existing pollution.

Impact summary and assessment of significance

404. Table 59 provides an assessment of the significance of potential waste management impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 59: Potential Waste Management Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Improper management and disposal of solid / liquid waste*	*Local community*	*M*	*M*	*L*	*M*	*MOD*	*MF*	*SMA*	*MOD*	*POSS*	***M***
C	*Improper management and disposal of*	*Local community*	*M*	*M*	*L*	*M*	*MOD*	*MF*	*SMA*	*MOD*	*POSS*	***M***

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
	hazardous waste											

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

405. To ensure waste management is adequately controlled, given the constraints mentioned above, the Contractor will be responsible for a range of measures including:

Waste Management and Recycling Plan - The Plan will include items relating to the safe handling and management, including storage, collection, and disposal of the following wastes on site:

- Domestic waste
- Food waste
- Recycled Waste (including Asphalt)
- Plastic
- Metals
- Wood
- Construction Waste
- Hazardous Waste
- Liquid Waste

406. Oversight of the implementation of the Plan is the responsibility of the Contractor as outlined in the CESMP.

Recycling and Reuse - Where possible, surplus materials will be reused or sent for recycling at the landfill at NR13 South – this will include wood, plastic, metal, and glass. A plan for the recycling of materials will be included in the Contractors waste management plan. In addition, where practical, the Contractor will explore opportunities to recycle concrete and reuse asphalt especially as base material.

Storage of Hazardous Wastes - Oils, fuels, and chemicals (including bitumen and concrete) are substances which are hazardous to human health. They need to be stored properly in

correctly labeled containers, both within the construction camp and at construction sites (e.g., culverts, etc.). Bitumen, oil and fuel will be stored in tanks with lined bunds to contain spillage (the bund will be able to contain at least 110% of the volume of the largest storage tank within the bund).

Waste Disposal – Collection and Disposal of all waste materials shall be properly undertaken in line with national regulatory requirements. The Contractor will keep a record of the waste volumes and types removed from the site. Prior to the start of the works the Contractor will provide copies of the waste management contractors licenses to the Engineer for review. The Engineer shall then perform a due diligence review of the waste management contractor's facilities to ensure that they follow Lao PDR regulatory requirements.

Concrete - Waste concrete and reinforced concrete will also require disposal. Waste concrete should be crushed and re-used as fill material, or base material where possible. Under no circumstances will concrete mixers be washed out onto open ground at construction sites.

Liquid Waste -The issue of liquid waste, including concrete sludge, camp run-off water, vehicle washing water, batching plant wastewater, etc., is discussed below under **Section 6.4.9**. Under no circumstances will liquid waste be used in water bowsers from water spraying.

Asbestos - Buildings should be surveyed for presence of asbestos or asbestos containing material before demolition of properties subject to acquisition. If registered, the Contractor shall prepare a **Method Statement for the Safe Management of Asbestos** following international best practices such as HSE-A14. The method statement shall be submitted to the Engineer for approval before any works involving asbestos materials can commence.

Residual Impacts

Table 60: Waste Management Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Improper management and disposal of solid / liquid waste*	***Medium***	*In general, if the mitigation measures suggested are implemented there will be no significant residual impacts.*	***No significant residual impacts***
C	*Improper management and disposal of hazardous waste*	***Medium***		***No significant residual impacts***

6.4.9 Construction Camps and Plant

407. This section discusses potential impacts of construction camps and plant during construction of the Project and associated mitigation measures to be adopted.

Aspects of the Construction Camps and Plant that can result in environmental and social impacts

408. Operation of camp sites and ancillary facilities involves the accommodation of hundreds of workers, storage and operation of machinery and plant and hundreds of vehicle

movements per day. All these activities have the potential to create multiple environmental impacts.

Sensitive Receptors

409. At this stage of the Project the camp sites and other facility sites are not currently known. They will be selected by the Contractor, as such it not possible to say what specific areas will be affected. However, the key sensitivities in the Project area are:

- Identified PCR Sites
- Residential Areas
- Educational and health facilities.

Potential Impacts

Construction Phase

410. Construction camps constitute a temporary land use change and raise issues related to activities such as impacts to air quality; poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent; and transmission of communicable diseases to the local people by the construction workers due to inappropriate health monitoring facilities. Specific issues may arise because of the following:

411. Design and Siting - Improper siting and design of construction camps can have negative impacts to hydrology through inappropriate disposal of liquid waste and spills of hazardous liquids. Poor management of sanitary waste and accidental spills of hazardous liquids from construction camps can also have negative impacts on ground and surface water. Rock crushing plants and concrete batching plants can also have impacts on sensitive receptors located downwind of the sites if the plants are too close to the urban areas.

412. Concrete Batching Plants - Potential pollutants in batching plant wastewater include cement, sand, aggregates, and petroleum products. The main sources of wastewater at batching plants are; contaminated storm water runoff, dust control sprinklers, the agitator washout station, the agitator charging station, the slumping station, and cleaning and washing areas. These substances can adversely affect the environment by:

- Increasing water pH.

- Increasing the turbidity of waterways (turbidity is a measure of the cloudiness of a suspension).

Impact summary and assessment of significance

413. Table 61 provides an assessment of the significance of potential impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 61: Potential Impacts Resulting from Operation of Camps and Plant

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Operation of camps*	*Residential areas / PCR / Education and health facilities*	*M*	*H*	*M*	*M*	*MOD*	*ST*	*SMA*	*MOD*	*POSS*	***M***
C	*Concrete Batching*	*Residential areas / PCR / Education and health facilities*	*M*	*H*	*M*	*M*	*MOD*	*ST*	*SMA*	*MOD*	*POSS*	***M***
C	*Asphalt Plants*	*Residential areas / PCR / Education and health facilities*	*M*	*H*	*M*	*M*	*MOD*	*ST*	*SMA*	*MOD*	*POSS*	***M***
C	*Temporary Storage Sites*	*Residential areas / PCR / Education and health facilities*	*L*	*M*	*M*	*M*	*MOD*	*ST*	*SMA*	*MOD*	*POSS*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase

414. Construction Camps – In the first instance, no construction camp will be permitted within 500 meters of any sensitive receptor or within 2 kilometers of a protected area.

415. The Engineer will approve the locations of the Contractors camps prior to the establishment of the camp. In addition, the Contractor will be responsible for the preparation of a Construction Camp Site Plan which will form part of the CESMP. The Plan will indicate the system proposed and the locations of related facilities in the site, including latrines, holding areas, etc. The Contractor will ensure the following conditions are met within the Plan:

- Rain-water run-off arising on the site will be collected, removed from the site via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that will cause neither pollution nor nuisance. The drainage system will be fitted with oil and grease interceptors.

- There will be no direct discharge of sanitary or wash water to surface water.

- In the absence of functioning sewerage and sewage treatment facilities it is recommended that the Contractor provides his own on-site wastewater treatment facilities. For sites

servicing a small number of employees (less than 150), septic tanks may be used. For larger sites, liquid wastes will as a minimum receive primary treatment in anaerobic tank or pond preceded by a bar screen to remove large solid objects (e.g., sticks, rags). Primary treatment (also referred to as clarification, sedimentation or settling) is the process where wastewater is allowed to settle for a period (around 2 hours) in a settling tank. This leads to separation of a liquid effluent which includes oils and grease and a liquid-solid sludge. Primary treatment leads to reduction in suspended solids, biological oxygen demand and removal of floating material (e.g., feces). There will be no direct discharge of untreated sanitary or oily wastewater to surface water bodies.

- Licensed contractors will be required to collect and disposal of liquid waste from the septic tanks on regular basis.

- Disposal of materials such as, but not limited to, lubricating oil and onto the ground or water bodies will be prohibited.

- Liquid material storage containment areas will not drain directly to surface water.

- Wastewater from vehicle washing bays will be free of pollutants if the wash bay has been constructed correctly.

- Lubricating and fuel oil spills will be cleaned up immediately and spill cleanup materials will be maintained at the storage area.

- Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and are connected to septic tanks, or wastewater treatment facilities.

- Discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge.

- Washing out concrete trucks at construction sites will be prohibited unless specific concrete washout areas are provided for this purpose at the construction site. The washouts will be impermeable and emptied when 75% full.

- Spill cleanup equipment will be maintained on site (including at the site maintenance yard and vehicle fueling areas). The following conditions to avoid adverse impacts due to improper fuel and chemical storage:

    i. Fueling operations will occur only within containment areas.

    ii. All fuel and chemical storage (if any) will be sited on an impervious base within a bund and secured by fencing. The storage area will be located away from any watercourse or wetlands. The base and bund walls will be impermeable and of sufficient capacity to contain 110% of the volume of tanks.

    iii. Filling and refueling will be strictly controlled and subject to formal procedures and will take place within areas surrounded by bunds to contain spills / leaks of potentially contaminating liquids.

    iv. All valves and trigger guns will be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.

    v. The contents of any tank or drum will be clearly marked. Measures will be taken to ensure that no contaminated discharges enter any drain or watercourses.

vi. Disposal of lubricating oil and other potentially hazardous liquids onto the ground or water bodies will be prohibited.

vii. Should any accidental spills occur immediate cleanup will be undertaken, and all cleanup materials stored in a secure area for disposal to a site authorized to dispose of hazardous waste.

416. If determined warranted by the Engineer, the Contractor will provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the sites. If so requested, the Contractor will ensure that all vehicles are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the site areas. The Contractor will provide necessary cleaning facilities on site and ensure that no water or debris from such cleaning operations is deposited off-site. The Engineer will undertake regular monitoring of the construction camps to ensure compliance with the CESMP and the Construction Camp Site Plan.

417. The Contractor will also be responsible to maintain and cleanup campsites and respect the rights of local landowners. If located outside the RoW, written agreements with local landowners for temporary use of the property will be required and sites must be restored to a level acceptable to the owner within a predetermined period.

418. Concrete Batching Plants – The following measures will be followed to limit the potential for pollution from batching plants:

- To limit impacts from dust, the following conditions will apply:

i. Batching plants will be located downwind of urban areas and not within 500 meters of any sensitive receptor, urban area or within 2 kilometers of a protected area and at least 200 m from any surface water course.

ii. The entire batching area traversed by vehicles – including driveways leading into and out of the area – will be paved with a hard, impervious material.

iii. Sand and aggregates will be delivered in a dampened state, using covered trucks. If the materials have dried out during transit, they will be re-wetted before being dumped into the storage bunker.

iv. Sand and aggregates will be stored in a hopper or bunker which shields the materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend one metre above the height of the maximum quantity of raw material kept on site and extend two metres beyond the front of the stockpile.

v. The hopper or bunker will be fitted with water sprays, which always keep the stored material damp. Monitor the water content of the stockpile to ensure it is maintained in a damp condition.

vi. Overhead storage bins will be totally enclosed. The swivel chute area and transfer point from the conveyor will also be enclosed.

vii. Rubber curtain seals may be needed to protect the opening of the overhead bin from winds.

viii. Conveyor belts which are exposed to the wind and used for raw material transfer will be effectively enclosed, to ensure dust is not blown off the conveyor during transit. Conveyor transfer points and hopper discharge areas will be fully enclosed.

ix. Conveyor belts will be fitted with belt cleaners on the return side of the belt.

x. Weigh hoppers at front-end loader plants will be roofed and have weigh hoppers shrouded on three sides, to protect the contents from the wind. The raw materials transferred by the front-end loader should be damp, as they are taken from a dampened stockpile.

xi. Store cement in sealed, dust-tight storage silos. All hatches, inspection points and duct work will be dust tight.

xii. Silos will be equipped with a high-level sensor alarm and an automatic delivery shut-down switch to prevent overfilling.

xiii. Cement dust emissions from the silo during filling operations must be minimised. The minimum acceptable performance is obtained using a fabric filter dust collector.

xiv. Totally enclose the cement weigh hopper, to ensure that dust cannot escape to the atmosphere.

xv. An inspection of all dust control components will be performed routinely – for example, at least weekly.

- All contaminated storm water and process wastewater will be collected and retained on site.

- All sources of wastewater will be paved and bunded. The specific areas that will be paved and bunded include the agitator washout area, the truck washing area, the concrete batching area, and any other area that may generate storm water contaminated with cement dust or residues.

- Contaminated storm water and process wastewater will be captured and recycled by a system with the following specifications:

  i. The system's storage capacity must be sufficient to store the runoff from the bunded areas generated by 20 mm of rain.

  ii. Water captured by the bunds will be diverted to a collection pit and then pumped to a storage tank for recycling.

  iii. An outlet (overflow drain) in the bund, one metre upstream of the collection pit, will divert excess rainwater from the bunded area when the pit fills due to heavy rain (more than 20 mm of rain over 24 hours).

  iv. Collection pits should contain a sloping sludge interceptor, to separate water and sediments. The sloping surface enables easy removal of sludge and sediments.

  v. Wastewater will be pumped from the collection pit to a recycling tank. The pit will have a primary pump triggered by a float switch and a backup pump which automatically activates if the primary fails.

  vi. Wastewater stored in the recycling tank needs to be reused at the earliest possible opportunity. This will restore the system's storage capacity, ready to deal with wastewater generated by the next rainfall event. Uses for recycling tank water include concrete batching, spraying over stockpiles for dust control and washing out agitators.

Residual Impacts

Table 62: Camp and Plant Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Operation of camps*	***Medium***	*If the mitigation measures suggested are implemented, specifically those relating to siting of facilities, residual impacts will not be significant*	***Not significant***
C	*Concrete Batching*	***Medium***		***Not significant***
C	*Temporary Storage Sites*	***Medium***		***Not significant***

6.4.10 Noise & Vibration

419. This section discusses potential noise and vibration impacts during construction and operation of the Project and associated mitigation measures to be adopted.

Aspects of the Project that have the potential to result in noise and vibration impacts

420. During the construction phase noise and vibration impacts can arise from multiple activities, including:

- Operation of plant and stationary equipment, e.g., asphalt plant, diesel generators, etc.
- Movement and operation of construction vehicles.
- Excavation works and other general construction works.

421. During the operational phase, the movement of vehicles along the road will also create elevated noise levels and low levels of vibration.

Sensitive Receptors

422. Residents and educational and health facilities within the Project corridor are those most sensitive to noise in both the construction and operational phases of the Project. Commercial properties are also sensitive to noise, although the guideline noise limits for commercial properties are much higher than residential areas indicating that their sensitivity is much lower.

423. Residents and structures (including schools, temples, etc.) within the Project area are the key sensitive vibration receptors.

Potential Impacts

Construction Phase Noise

424. Noise during the construction phase will mostly come from the operation of construction equipment. Typical noise signatures of the different equipment for different construction activities are enumerated below.

Table 63: Construction Equipment Noise Levels

Site Clearing		Excavation and Earth Moving		Structure Construction	
Equipment	**Noise Level**	**Equipment**	**Noise Level**	**Equipment**	**Noise Level**
Bulldozer	80	Bulldozer	80	Pneumatic drill	81-98
Front end loader	72-80	Backhoe	72-93	Crane	75-77
Dump Truck	83-94	Dump Truck	83-94	Welding Machine	71-82
Grading and compacting		Jack Hammer	80-93	Concrete Mixer	74-88
Grader	80-93	**Landscaping and Clean Up**		Concrete Pump	81-84
Roller	73-75	Bulldozer	80	Concrete Vibrator	76
Paving		Excavator	72	Air Compressor	74-87
Paver	86-88	Truck	83-94	Bulldozer	80
Truck	83-94	Paver	86-88	Cement and Dump trucks	83-94
Tamper	74-77				

425. Assuming three pieces of equipment maybe working at the same time in a specific work zone and taking a random sample of equipment (bulldozer, front end loader and dump truck) and combining their maximum noise levels, a noise level of approximately 94.3 decibels will be generated at the work zone.

426. Many properties are set within the Project corridor at less than 20 meters from the center line of the existing pavement. It is noted that many of the properties within the corridor are a mix of commercial and residential buildings and that there are no specifically defined residential or commercial zones along the alignment. Therefore, this assessment uses residential guideline limits for noise for the whole alignment.

427. A cumulative noise level of around 95 decibels would result in an approximate noise level of around 67 decibels at 20m. This is considerably higher than WBG daytime and nighttime guideline limits for noise (although lower than commercial property limits).

428. Referring to the recorded ambient noise levels in the Project area one of the sample sites NQ03 (close to Sikeut Junction) recorded average noise levels between 63 and 68 dBA (Leq) during the daytime period. This suggests that construction activities in this location would not result in a significant increase above the ambient noise levels (more than 3dBA). Construction noise would be more significant in the sections between KM6 and KM10.

429. However, this impact would be temporary in nature as construction activities move along the corridor and would be restricted to the daytime period meaning that no nighttime disturbance from construction works is anticipated.

Operational Phase Noise

430. Traffic forecasts provided by the Project FS indicate that traffic volumes will not double between 2022 and 2040. Doubling of traffic generally leads to an increase of more than 3 dBA. [17] Given that this is unlikely it is not expected that the noise levels would increase by more than 3 dBA over ambient levels, therefore the predicted noise levels would comply with WBG guidelines.

Construction Phase Vibration

431. Construction works, specifically movement of heavy good vehicles on uneven surfaces, excavation works and compacting have the potential to induce significant levels of vibration. No blasting or piling is anticipated for this Project.

432. It is possible that activities, such as the use of vibratory rollers, could result in some cosmetic damage to structures (if the buildings are close enough to the work zones) and some annoyance to residents (during the daytime only).

Operational Phase Vibration

433. Highway traffic during the operational phase is not likely to have any measurable impact on structures or on comfort. The Federal Highway Administration of the USA has determined that 'All studies the highway agencies have done to assess the impact of operational traffic induced vibrations have shown that both measured and predicted vibration levels are less than any known criteria for structural damage to buildings. In fact, normal living activities (e.g., closing doors, walking across floors, operating appliances) within a building have been shown to create greater levels of vibration than highway traffic.' [18]

Impact summary and assessment of significance

434. Table 64 provides an assessment of the significance of potential noise and vibration impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 64: Potential Noise & Vibration Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Construction*	*Local residents and*	*H*	*M*	*L*	*H*	*MAJ*	*ST*	*SMA*	*M*	*DEF*	***M***

[17] For example, see: https://www.akustik.lth.se/fileadmin/tekniskakustik/education/2021_VTAF01/NV7_TrafficNoise_26Apr2021_VTAF01.pdf
[18] http://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/analysis_and_abateme nt_guidance/polguide09.cfm

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
	equipment noise	*businesses / Schools / Health facilities / Temples*										
C	*Construction equipment vibration*	*Local residents / structures / schools / Health facilities / Temples*	*H*	*M*	*L*	*M*	*MAJ*	*LF*	*SMA*	*M*	*POSS*	***M***
C	*General worksite vibration*	*Local residents / structures / schools / Health facilities / Temples*	*H*	*M*	*L*	*M*	*MAJ*	*LF*	*SMA*	*M*	*POSS*	***M***
C	*General work site noise*	*Local residents and businesses / Schools / Health facilities / Temples*	*H*	*M*	*L*	*H*	*MAJ*	*ST*	*SMA*	*M*	*DEF*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely / SMA: Small / INT – Intermediate / EXT – Extensive. + denotes positive impact

Mitigation and Management Measures

Pre-construction / Construction Phase Noise

435. Given the proximity of many properties to the construction site exposure to elevated noise levels will be unavoidable during the construction phase in the daytime. However, number of mitigation and management measures can be provided to reduce noise levels during daytime and nighttime periods:

- Source Controls, i.e., requirements that all exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance will be undertaken.

- Site Controls, i.e., requirements that stationary equipment will be placed as far from sensitive land uses as practical; selected to minimize objectionable noise impacts; and provided with shielding mechanisms where possible. No rock crushing plants, or any long-term generators of significant noise will be allowed that are located within 500 meters of sensitive receptors or urban areas.

- Time and Activity Constraints, i.e., operations will be scheduled to coincide with periods when people would least likely be affected; work hours and workdays will be limited to less noise-sensitive times. Hours-of-work will be approved by the Engineer having due regard for possible noise disturbance to the residents or other activities. Construction activities will be strictly prohibited between 10 PM and 6 AM in the residential areas. When operating close to sensitive areas such as residential areas, medical facilities, educational facilities, and religious temples the Contractor's hours of working will be limited to 8 AM to 6 PM. During religious holidays the Contractor will not work within 250 meters of any temple.

- Community Awareness, i.e., public notification of construction operations will incorporate noise considerations.

Operational Phase Noise

436. Noise levels during the operational phase are not anticipated to increase by more than 3dBA above the ambient noise levels. No specific mitigation measures are therefore required for the operational phase.

Pre-construction / Construction Phase Vibration

437. To manage the potential vibration issues the following procedures have been developed which must be followed by the Contractor.

438. Condition Surveys – Not later than 28 days before the commencement of construction works, the Contractor and the Engineer will carry out joint condition surveys of all buildings within 20 meters of the road alignment that, in the opinion of the Engineer might be affected by vibration resulting from the Contractor's construction operations. The surveys shall be conducted in the presence of and with the permission of the property owners. The findings of the building condition surveys shall be recorded in the reports that shall contain the following information, as a minimum:

- Building address and location;
- A description of the building condition and any cosmetic and/or structural damage;
- Sketches and photographs showing the location and extent of any damage;
- High resolution video recordings of the surveyed buildings; and
- Verification of the report by the building owner.

439. Construction Vibration Management Plan – Within 28 days of the Commencement Date, the Contractor shall submit to the Engineer for review and approval a written **Construction Vibration Management Plan (CVMP)** detailing the procedures for vibration monitoring and control. Such details shall include:

- Measurement locations and methods;
- Method statements for works likely to induce vibrations, including programs of trial construction sections to determine the likely magnitude of vibrations at defined distances from the vibration source, in sufficient detail for the contractor to develop a final method for constructing the works without excessive vibration;
- Description of the instrumentation and equipment to be used;
- Copies of the instruction manuals and the laboratory calibration and test equipment certification;
- The resumes of the vibration monitoring technical support personnel, sufficient to define details of relevant experience;
- Procedures for data collection and analysis;
- Frequency of measurements;

- Means and methods of providing warnings when the specified construction vibration limits are reached; and
- Action plans to be implemented in the event the specified construction vibration limits are reached. The generalized plans of action shall comprise the positive measures by the Contractor to control vibrations using alternative construction methods.

440. Vibration Monitoring – The Contractor shall establish a vibration monitoring and control system in accordance with the CVMP approved by the Engineer, and measure vibrations resulting from its construction operations at predetermined points, in accordance with the CVMP.

441. The Contractor shall monitor vibration during significant vibration-producing construction activities as determined by the Engineer. This monitoring shall consist of a continuous recording of the maximum single-component peak particle velocities for one-minute intervals. During the monitoring, the Contractor shall document all events that are responsible for the measured vibration levels and submit the documentation to the Engineer.

442. All vibration monitoring data shall be recorded contemporaneously and plotted continuously on a graph by the data acquisition equipment. Each graph shall show time-domain wave traces (particle velocity versus time) for each measurement location with the same vertical and horizontal axes scale.

443. Claims for Construction Vibration Damages – Claims for damage caused by vibration shall be handled through the Project Grievance Redress Mechanism (GRM).

444. Alternative Construction Methods – Where the results of the vibration monitoring show that the specified construction vibration limit is reached at a particular location, the Contractor shall suspend the construction activities that generate the excessive vibration at such location, notify the Engineer and with the approval of the Engineer take mitigative actions necessary to keep the construction vibration within the specified limit. This may, for example include:

- The use of low roller vibration settings and performing compaction without vibration.
- Provide temporary vibration barriers in sensitive locations.

Operational Phase Vibration

445. None required.

Residual Impacts

Table 65: Noise and Vibration Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Construction equipment noise*	***Medium***	*It may not be possible to eliminate all construction phase noise however, the proposed mitigation measures should help reduce the significance of impacts to a low level that will only be experienced temporarily during daytime periods.*	***Low***
C	*General work site noise*	***Medium***		

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Construction equipment vibration*	***Medium***	*By following the set mitigation measures above and implementation of the CVMP, residual impacts should not be significant.*	***Not significant***
C	*General worksite vibration*	***Medium***		

6.5 INDUCED IMPACTS

446. Induced impacts can be described as: "*Adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project, which may occur at later or at a different location*".[19]

447. Construction and operation of the road has not been identified as a key factor for the future development of projects that may have significant environmental and social impacts, e.g., construction of a new industrial park. The project is a rehabilitation project which intends only to upgrade the existing road to provide a safer road for an increased volume of traffic.

6.6 CUMULATIVE IMPACTS

448. Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.[20] Current projects ongoing in the Project area that could result in cumulative impacts include upgrading of the section of NR-13N from Sikeut Junction to KM70. Cumulative impacts may involve additional construction vehicles in a particular area and additional numbers of construction workers. However, this Project is a simple extension of the ongoing project and given its relatively short length the cumulative impacts in association with the ongoing NR-13N works will be of minor nature and unlikely to result in significant impacts that require specific mitigation measures.

6.7 COMPLIANCE IMPACTS

449. In addition to the impacts associated with the construction and operation phases of the Project several compliance impacts have also been identified as follows:

450. Lack of Environmental Clauses in Contracts -The ESIA is an environmental statement by the DoR. While it is prepared by the ESIA consultant the ESIA defines the commitment by the GoL through the proponent and its contractors and consultants, to implement the mitigation and monitoring actions listed in the ESIA. For the measures proposed in the ESIA's ESMP to be taken seriously, they must become legally binding through inclusion as environmental clauses in the loan agreement between the GoL and the AIIB/NDF/WB as well as the specifications in the contract-bid documents. This will be achieved by integrating the ESMP

19 ADB, 2012. Source: https://www.adb.org/sites/default/files/institutional-document/33739/files/environment-safeguards-good-practices-sourcebook-draft.pdf

20 IFC. Source: IFChttps://www.ifc.org/wps/wcm/connect/028897b1-7a06-4653-a20c-aba5864d7d72/Lao+PDR+HPP+CIA+Guidelines_English+version.pdf?MOD=AJPERES&CVID=ltRkF7l

into the contract specifications as a clause and using the ESMP to prepare CESMPs defining specific steps to be taken by the contractors and the government during the project construction phase. References to the ESMP will be made in the loan agreement between the GoL and WB. It will be the Engineer's responsibility to review the environmental mitigation and monitoring activities undertaken by the Contractor, with payments made only after verification that each work component has been completed as prescribed.

451. Lack of Construction Compliance Inspection Services and Environmental Training - While the ESMP and the environmental covenants can be very clear and specific, if there is no one knowledgeable to undertake compliance monitoring, inspection and regular reporting, little of the ESMP will be implemented or completed. The Engineer, through his Environmental Manager or International/Regional Environmental Specialist, will ensure that compliance inspections are undertaken on a regular basis. In addition, the Engineer's International/Regional Environmental Specialist will also provide training to the Contractor and his HSE team in the correct implementation of the CESMPs prior to the commencement of works.

7.0 STAKEHOLDER CONSULTATIONS

7.1 PUBLIC CONSULTATIONS

452. According to OP 4.01 “For all Category A and B projects proposed for IBRD or IDA financing, during the EA process, the borrower consults project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and takes their views into account. The borrower initiates such consultations as early as possible”.

453. Accordingly, this section of the report provides the results of the consultations undertaken during the preparation of this ESIA report.

7.2 PUBLIC CONSULTATIONS

7.2.1 Draft ESIA Consultations Findings

454. To date eleven consultation sessions have been undertaken to discuss the social and environmental aspects of the Project. The consultations were undertaken during December, 2021.

455. A total of 351 stakeholders have attended these eleven events of which 138 were women (39%).

456. Overall, participants noted that this is a good project as it will attract investment and tourism into the area of influence. They also noted that it should help solve flooding issues during the rainy season.

457. Other key issues raised by stakeholders in consultations so far include:

- Concerned about the drainage system as residents have had bad experience with their land flooding because of poor road drainage. Flooding issue occurs from Thongpong. Stakeholders also wanted to know what the capacity of the side drains will be and where the drain outlets will be.
- Propose to rebuild temple’s wall and gate or compensate where they are affected.
- Propose to change the location of the bus bay from Toyota to Lao-Japanese school area, to have the same median width as Sikhai.
- The location of any U Turn must avoid impacts as much as possible.
- Where will we park our cars during construction?
- Have the road lighting post on the median strip and to decrease the median’s width to 1 meter.
- During construction, the road should be watered regularly to avoid dust, and traffic circulation must not be hampered by equipment.

458. All of these issues raised to date have been included within this draft ESIA and where relevant mitigation and management measures have been applied, e.g., changing bus bay locations.

459. Full documentation relating to stakeholder consultations can be found in **Appendix J**.

7.3 PLANNED INFORMATION DISCLOSURE

460. The draft ESIA will be disclosed on the MPWT website and the World Bank website. Final ESIA reports will be disclosed once finalized. Tentative date for disclosure is mid-late August 2022.

7.4 GRIEVANCE MECHANISM

461. Due to differing perceptions, values, objectives and responsibilities among different stakeholders, a range of conflicts may occur among and between affected people and villages, resettled households, district authorities, central government, and others. Obviously, avoidance is preferable to resolution, but that is not always possible. While the consultative and participatory nature of the impact assessments and RAP are aimed at reducing disagreements and conflicting positions, in instances where disagreements do occur, it is important that they are resolved quickly before positions harden and the conflict escalates. The earlier that discord is recognized and dealt with, the higher the chance of a successful outcome. Grievances related to environmental and social issues from directly or indirectly affected groups as a result of implementation of the project will be resolved by the Grievance Redress Committee (GRC) through the project grievance redress mechanism

462. Article 23 and 24 of the C&R Decree (No. 84/GOL, 2016) requires the project to establish an effective mechanism for grievance resolution. The decree requires that the project proponent, MPWT/DOR/PMU, is responsible for setting up the grievance redress mechanism and to take actions to resolve issues.

463. District Grievance Committee has been updated for Naxaythong district and set up for Sikhottabong district where the 6 KM NR13N section is located with the decision No. 393/VTC dated 29.11.2021. The grievance committee members in Sikhottabong district composed of the following parties:

- Deputy Chief of the District as the chairperson
- Deputy Director of DPWT of Vientiane Capital as deputy char
- Chairman of District Lao Front for National Construction
- Head of District Administration Office
- Chairman of District Lao Women Union
- Head of District PWT Office
- Head of District Office for Natural Resources and Environment
- Head of District Agriculture and Forestry
- Head of District Finance Office
- Technical staff from District Housing and Urban Planning Office

464. The roles and responsibilities identified in the decision of the Governor of VT Capital is summarized below.

- Coordinate with MPWT, village authorities and other concerned parties to create awareness of the APs on the project purposes and to mobilize for cooperation with the project
- Monitor compensation of the affected land plots, structures and crops
- Coordinate with the Project executive agency in monitoring of compensation payment of the affected land plots, structures and crops approved by the government
- Resolve grievances, problems and settle compensations according to legal frameworks and with peaceful arrangement
- Report periodically on the compensation implementation to the higher authorities and to seek guidance.

465. The process by which people concerned with or potentially affected by the project can express their grievances for consideration and redress is being slightly modified from the procedures for the Sikeut-Phonehong Road section to reflect the current context as summarized in the following Table.

Table 66: Grievance Procedures

Steps	Actions and Level of Intervention	Day
	VILLAGE	
	Contact Person for Complaint: Village Mediation Committee's Coordinator	
1	1-1 Complaints from the project affected people towards the Village Mediation Committee's coordinator (Representative from Village Front for National Development) and the village resource person who has experience in public works	1-2 days
	1-2 To solve through explanation and actions as/if required.	
	1-3 If required engineering construction work Supervision Consultant and Contractor's site engineer to be involved	
	➢ If complaint cannot be solved at this stage, the 2nd step below is to apply	
	Contact Person for Complaints: District Grievance Committee	
	2-1 Complainant can address district grievance coordinator (safeguard officers from OPWT).	
2	2-2 If required to involve the safeguards officer of PTI (DEDP)	
	2-3 If required to involve engineering construction work Supervision Consultant and Contractor's site engineer	1-5 days
	2-4 To solve through corrective action with agreed deadline	

	➢ If complaint cannot be solved at this stage, the 3rd step below is to apply	
3	Contact Person for Complaints: PTI	1-7 days
	3-1 Complainant can submit his/her grievance to PTI via WhatsApp or telephone. Complainant can also call hotline of MTPC number 1458 to file their grievance.	
	3-2 PTI acts on behalf of MPWT	
	3-3 PTI to verify with district grievance committee	
	3-4 If required, an independent external opinion in this matter could be considered (MONRE)	
	3-5 Ministerial decision about solution	
	➢ If complaint cannot be solved at this stage, the 4th step below is to apply	
4	National level	
	4-1 Final step to solve the complaint	
	4-2 The complainant may submit directly or through the Cabinet of MPWT his/her case to the Court of Law	10 – 15 days
	5-3 Court will take note and register the case	
	5-4 Court to provide juridical decision	
	5-5 In case of required actions, the complainant and or the Project have to follow those actions.	
	World Bank	
	Project affected individual or community or their authorized representative can submit a complaint by the following methods:	
	➢ Online: wbgcmsgrs.powerappsportals.com/en-US/new-complaint/	
	➢ By email to grievances@worldbank.org	
	➢ By letter or by hand delivery to the World Bank Country Office in Lao PDR	

7.4.1 Submitting Grievance

466. A Grievance can be sent by any individual or group of individuals that believes it has been or will be harmed by the Project .If a Grievance is to be lodged by a different individual or organization on behalf of those said to be affected, the Claimant must identify the individual and/or people on behalf of who the Grievance is submitted and provide written confirmation by the individual and/or people represented that they are giving the Claimant the authority to present the Grievance on their behalf. The GRM will take reasonable steps to verify this authority.

7.4.2 Grievance Communication

467. The GRM shall maintain a flexible approach with respect to receiving Grievances considering known local constraints with respect to communications and access to resources for some affected people. A Grievance can be transmitted to the GRM by any means available i.e., by email, letter, phone call, meeting, SMS, WhatsApp, etc.…

468. To facilitate communications with and between the GRM and potential Complainants, the GRM will receive support from the village grievance committee members and relevant local government units.

7.4.3 Information included in a Grievance

469. The Grievance should include the following information :

a) the name of the individual or individuals making the Complaint (the “Complainant”) – note a complaint may also be anonymous;
b) means for contacting the Complainant (email, phone, address, other)
c) if the submission is on behalf of those alleging a potential or actual impacts, the identity of those on whose behalf the Grievance is made, and written confirmation by those represented of the Complainant's authority to lodge the Grievance on their behalf;
d) the description of the potential or actual impact;
e) Complainant's statement of the risk of impacts or actual impacts)description of the risk/impacts and those affected, names of the individual)s (or institutions responsible for the risk/impacts, the location)s (and date)s (of harmful activity(;
f) what has been done by Complainant thus far to resolve the matter;
g) whether the Complainant wishes that their identity is kept confidential; and
h) the specific help requested from the GRM .

7.4.4 Logging, Acknowledgment, and Tracking.

470. All Grievances and reports of conflict will be received, assigned a tracking number, acknowledged to Complainant, recorded electronically, and subject to periodic updates to the Complainant as well as the office file. Within one (1) week from the receipt of a Grievance, the GRM will send a *written* acknowledgement to Complainant of the Grievance received with the assigned tracking number. Oral acknowledgments can be used for expediency and also recorded, but it must be followed by a written acknowledgment. Each Grievance file will contain, at a minimum :

a) the date of the request as received;
b) the date the written acknowledgment was sent and oral acknowledgment if also done;
c) the dates and nature of all other communications or meetings with the Complainant and other relevant Stakeholders;
d) any requests, offers of, or engagements of a Mediator or Facilitator;
e) the date and records related to the proposed solution/way forward;
f) the acceptance or objections of the Complainant or other Stakeholders;
g) the proposed next steps if objections arose;
h) the alternative solution if renewed dialogues were pursued;
i) notes regarding implementation; and
j) any conclusions and recommendations arising from monitoring and follow up.

7.4.5 Maintaining Communication and Status Updates.

471. Files for each Grievance will be kept by OPWT and PTI and will be available for review by the Complainant and other Stakeholders involved in the Grievance, or their designated representatives. Appropriate steps will be taken to maintain the confidentiality of the Claimant if previously requested. The GRM will provide periodic updates to the Claimant regarding the status and current actions to resolve the Grievance. Not including the acknowledgment of receipt of the Grievance, such updates will occur within reasonable intervals not greater than every thirty (30) days.

7.4.6 Investigation and Consensus Building.

472. Within one (1) week of receiving a Grievance, PTI will notify the Supervision Engineer or vice versa and PMU of the receipt of the Grievance. PTI will coordinate with the Supervision Consultant to develop a response to the Grievance. The names of these individuals will be made available to the Complainants. The designated staff of PTI will promptly engage the Complainant and any other relevant Stakeholders deemed appropriate to gather all necessary information regarding the Grievance. Through PTI staff, the various manifestations of the GRM (Village Mediation Committee, etc.) will have the authority to request from PMU any information (documents or otherwise) relevant to resolving the Grievance and avoiding future Grievances of the same nature. As necessary, the PTI will convene one or more meetings with relevant individuals and concerned district offices as needed. The objective of all investigative activities is to develop a thorough understanding of the issues and concerns raised in the Grievance and facilitate consensus around a proposed solution and way forward. At any point during the investigation, PTI may determine that an onsite field investigation is necessary to properly understand the Grievance and develop an effective proposed solution and way forward.

7.4.7 Taking Proposed Actions and Solutions Public and Overseeing Implementation and Reporting

473. PTI through grievance coordinator from OPWT will communicate to the Complainant one or more proposed actions or resolutions and clearly articulate the reasons and basis for proposed way forward. If the Complainant does not accept the resolution, PTI will engage with the Complainant to provide alternative options. If the Complainant accepts the proposed solution and way forward, the GRM will continue to monitor the implementation directly and through the receipt of communications from the Complainant and other relevant parties. As necessary, the GRM may solicit information from the relevant parties and initiate renewed dialogue where appropriate.

474. MPWT/DOR/PMU will be responsible for meeting the administrative and legal costs that will be incurred in the resolution of complaints and grievances. If the grievance relates to a dispute over the valuation of an asset to be acquired, then the MPWT/DOR/PMU will use an additional independent assessor to inform the decision of the relevant grievance redress committee. The grievance redress committees will function, for the benefit of PAP and PAH, during the entire life of the project, including the defects liability period.

475. As per the good practice observed under the ongoing original project for the NR13N and required under the WB policy on IR, MPWT/DOR/ PMU will document and update the status of GRM in the Safeguard monitoring report, RAP completion report and project progress reports to be prepared and submitted to the WB on semi-annual basis or as requested.

8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 GENERAL

476. The ESMP provided herewith documents the impacts identified in this ESIA report, the actions required to mitigate those impacts to acceptable levels in accordance with the laws of Lao PDR and the World Banks Operational Policies, and the monitoring activities that are to be undertaken as part of the project to confirm that the mitigation actions have been effective in achieving their objectives or to initiate changes in the actions required.

477. The ESMP also details the institutional arrangements and capacities that currently exist, or that will be put in place as part of the project implementation, to ensure that the environmental due diligence (including the ESMP) has comprehensively considered both Lao PDR, AIIB, NDF and World Bank requirements for environmental protection, has identified all likely environmental impacts and proposed appropriate mitigation measures, and has the systems in place to ensure that effective procedures for environmental monitoring and control of the project impacts and mitigation measures are implemented throughout the life of the project. Finally, this section of the report provides the required implementation schedule and costs for the proposed mitigation and monitoring.

8.2 MITIGATION AND MONITORING

478. The environmental impacts associated with the Project activities, have been detailed above in the relevant sections of this ESIA. Mitigation measures required to address the impacts identified in the ESIA have been summarized in each of the relevant sections covering the physical, biological, and socio-economic environment affected by the project. The impacts identified and the specific mitigation measures proposed to address them have been consolidated into the **Environmental and Social Mitigation Plan (ESMP)** presented in Table 67, Table 68 and Table 69, which includes time frames and responsibilities. An Additional **Environmental Monitoring Plan** is presented in Table 70 which outlines the activities and responsibilities associated with instrumental monitoring, i.e., Air Quality and Noise Monitoring.

8.3 IMPLEMENTATION ARRANGEMENTS AND RESPONSIBILITIES

479. The main institutions that will be involved in implementation of the ESMP are the Concept Design Consultant, the Implementation Support and Work Supervision (ISWS) Consultant (the Engineer), the Contractor(s) and to a lesser extent the DoR through their Project Management Unit (PMU).

8.3.1 Design Consultants Responsibilities

480. The Concept Design Consultant and the Contractor (responsible for detailed design) will ensure that he reads and understands all the identified environmental impacts highlighted by this ESIA. He will also ensure that all recommendations made for the design phase of the ESMP are considered and incorporated in the designs, or that justifications are made for the exclusion of any recommended mitigation measure.

Table 67: Environmental and Social Management Plan - Design / Pre-construction Phase

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
Air Quality	Construction impacts	Preparation of an Air Quality Plan (AQP) including the location of haul routes.	Contractor to prepare AQP Engineer to review and approve AQP.	N/A	N/A
	Air quality impacts from stationary sources	Locations for quarry sites, borrow pits and concrete batching plants will require approval from the Engineer and PONRES. No quarry, borrow pit or batching plant will be located within 2 km of protected areas or within 500 meters of sensitive receptors or urban areas.	Contractor to select sites. Engineer and PONRE to approve sites.	N/A	N/A
Land Use	Road Vendors	The Contractor, in coordination with the DoR and the Provincial government, will set aside a specific area for road vendors to continue to operate throughout the construction phase. The area will be located within at least 50 meters of the project road and should be sized to accommodate all road vendors. The site will be clearly signposted for traffic and an all-weather track provided to the site with parking space. This should in line with measures proposed in the RAP.	Contractor, DoR and Provincial government to select site. Contractor to implement mitigation.	N/A	N/A
	Streetlights	Where practical, and while ensuring compliance with technical standards, streetlights should be located in the median.	Concept Design Consultant Contractor	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
			Engineer to review final design documents prior to the start of construction.		
Climate Change	Damage to roads and drainage systems due to increased flooding and more intense rainfall.	As part of the design, the following measures will be considered: • Raising of flood-prone areas above the calculated flood levels • Improve the surface integrity by using stronger • surface courses • Use of harder grade bitumen & mproved asphalt mixes to resist rutting • Hydraulic capacity of culverts calculated with 15% safety coefficient and considering 25 / 50-year flood return periods	Concept Design Consultant Contractor Engineer to review final design documents prior to the start of construction.	N/A	N/A
Borrow Pits and Quarry's	Suitability of borrow pits	No Project borrow pits will be utilized that are located within 2km of protected areas or within 500 m of urban areas and sensitive receptors.	Contractor to select sites. Engineer and PONRE to approve sites.	N/A	N/A
	New Quarry Sites	Any new quarries must obtain the required permits prior to commencement of works at these sites, this will include approval from PONRE and the Engineer. No quarry will be located within 500 meters of any urban area, sensitive receptor or within 2 kilometers of a protected area.	Contractor to select quarry sites and apply for approval from PONRE and any other regulatory agencies as necessary. Engineer to review quarry locations, licenses and approvals from PONRES.	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
	Existing Borrow Pits	For all existing borrow pits/quarries proposed for use by Contractor, a due diligence review including a review of borrow pits/quarry locations, licenses and approvals from PONRES and other regulatory agencies will be carried out by the Engineer during project implementation (pre-construction phase) to determine their suitability and ensure that the borrow pits/quarries are not within 2 kms from protected areas; and not within 500 meters from sensitive receptor. For all existing borrow pits/quarries, the Engineer will consult with PONRES to confirm the exact distance from protected areas and to ensure the borrow pits are not located within 2 kms from protected areas; and not within 500 meters from sensitive receptor. The due diligence review will be undertaken before the Contractor signs any contract with the existing borrow pit owner.	Engineer to undertake due diligence review. Results of the due diligence review will be presented to PMU and Contractor clearly stating the reasons for any rejection of the site.	N/A	N/A
	New Borrow Pits	Obtain all necessary permits from the regulatory authorities. Prepare a Borrow Pit Action Plan (BAP) No borrow pit will be located within 2 kilometers of a protected area. Arrangements for opening and using material borrow pits will contain enforceable provisions.	Contractor to select borrow sites and apply for approval from PONRES and any other regulatory agencies as necessary. Engineer to review borrow locations, licenses and approvals from PONRE.	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
Hydrology	Culverts	Per the climate change mitigation measures above.	Concept Design Consultant Contractor Engineer to review final design documents prior to the start of construction.	N/A	N/A
	Flooding	Designs will take into account all necessary secondary drainage networks to ensure that they are sized correctly and that water can drain freely from the road without flooding neighbouring land. DoR and the DD Team shall coordinate designs with the Vientiane Urban Development Authority (VUDA) in charge of drainage in the flood prone regions.	Concept Design Consultant Contractor Engineer to review final design documents prior to the start of construction.	N/A	N/A
	Drainage	Designs shall ensure that the drains discharge to existing drainage ditches of suitable capacity, or to streams without causing erosion of embankments, flooding, or damage to properties. Prior to discharge from the longitudinal drains, the water should pass through an oil / grease interceptor or control valves.	Concept Design Consultant Contractor Engineer to review final design documents prior to the start of construction.	N/A	N/A
	Siting of facilities	No construction camp, permanent or temporary, will be located within 200 meters of any or irrigation channel (not including drainage channels).	Contractor to select sites. Engineer and PONRE to approve sites.	N/A	N/A
	Water Use	The Contractor will be responsible for obtaining all necessary permits for the abstraction of water for technical and potable	Contractor to obtain licenses / permits. Engineer to review permits.	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		uses prior to the start of construction, or abstraction.			
Flora & Fauna	Tree cutting	Tree cutting and tree replanting will be undertaken according to the law of the GoL. The Contractor will prepare a tree clearance plan, as part of C-ESMP, for prior approval by the Engineer. Trees cutting should be limited as necessary and where avoidance is not technically feasible taking-into account road safety aspect. The Clearance Plan will be followed strictly by the contractor.	Contractor to undertake tree cutting according to the approved plan Relevant regulatory Authority (District Forest Office) to monitor tree cutting.	N/A	N/A
	Religious Trees	The four sacred trees identified in the project tree survey will not be removed. Under no circumstances will any sacred/religious tree be trimmed, or without consultation between the local community, the Engineer and the PMU.	Contractor to follow tree protection and trimming guidelines during land clearing.	Visual inspections of trees	Prior to the start of works and then throughout construction.
	Special status tree avoidance	Make micro-alignment changes to avoid the seven special status trees during Detailed Design.	Contractor who will be responsible for Detailed Design to adopt design measures	Engineer to review design documents prior to the start of construction.	N/A
Construction Camps	Selection of Construction Camp Site	Preparation of a Construction Camp Site Plan. Preparation of a Spills Response Plan. Construction camps will not be located within 500 meters of any sensitive receptors, urban area and at least 200 meters from any surface water course and not within 2 kilometers of a protected area.	Engineer to review & approve Plans. Engineer and PMU to approve camp locations.	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Coordinate all construction camp activities with neighboring land uses.			
Transportation and Utilities	Damage to roads	Prior to the commencement of works a road condition survey will be undertaken by the Engineer to record the condition of access roads to borrow pits, asphalt plants, camps, etc.	Engineer to complete road condition survey.	N/A	N/A
	Bus Bays	DD Team and DoR to consult with stakeholders to determine the final locations of the bus bays.	Concept Design Consultant Contractor Engineer to review final design documents prior to the start of construction.	N/A	N/A
	Public Utility	Public utility relocation will be done with good coordination and contract preparation upfront to avoid delay of works and poor relocation planning.	PMU	N/A	N/A
Ethnic Groups	Communication	As 96% of landowners/renters are Laoloum it will not be necessary to hire interpreters for other ethnic Lao groups. Develop posters containing a list of key project contacts (with name and phone numbers)	PMU	N/A	N/A
	Information Sharing	Make 12 copied sets of the final approved technical design to be shared with each affected villages.	PMU	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
	Compensation	For those temporary residents, especially poor female head household, the compensation should cover the cost of moving following the World Bank resettlement policy. The GoL should provide a higher rate of compensation and support for those women headed households who need to demolish and re-construct their houses/shops.	MPWT	N/A	N/A
Occupational Health and Safety	Worker Health and Safety	Prepare an Occupational Health and Safety Plan (OHS Plan) Ensure that sub-contractors are provided with copies of the CESMP.	Contractor to prepare OHS Plan. Contractor to provide copies of the CESMP to sub-contractors prior to their access to the site. Engineer to review and approve OHS Plan.	N/A	N/A
	Traffic Safety	Submit a Traffic Management Plan (TMP) to PMU and local traffic authorities prior to mobilization.	Contractor to prepare TMP. Engineer to approve TMP.	N/A	N/A
	UXO	Prior to the start of any works the Contractor will consult with the relevant regulatory authorities to confirm that the construction area is clear of any UXO. If this cannot be confirmed the Contractor (through an approved sub-contractor) will be responsible for surveying the construction areas (including ancillary facilities, such as borrow pits and access roads) and confirming that	Contractor to consult with relevant regulatory authorities. Sub-contractor to survey the site, if required. Contractor to provide the results of the survey to the Engineer.	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		the work sites are free of UXO. The Contractor will provide, in writing, the findings of the survey to the Engineer. If any UXO is found on site the Contractor, through his approved sub-contractor, will be responsible for removing any UXO.			
Community Health and Safety	Health and Safety	Traffic safety issues will be accounted for during the design phase of the Project. Safety signs will be included in the design warning people not to attempt to cross the four-lane section of the road without using dedicated crossing areas. Project sticker with contact information of site supervisor should put on all contractor's, sub-contractor's vehicles and equipment and all projects vehicles and equipment.	Concept Design Consultant Contractor Engineer to review final design documents prior to the start of construction.	N/A	N/A
	Road Crossings	DD Team and DoR to consult with stakeholders to determine the final locations of any pedestrian crossings.	Concept Design Consultant and DoR to undertake consultations Contractor to prepare final designs. Engineer to review design documents prior to the start of construction.	N/A	N/A
	Migrant Workers	Preparation of a Labour Influx Management Plan in line with WBG ESHS standards. The Labour Influx Management Plan will include a worker orientation program as part of worker induction to discuss religious,	Contractor to prepare plan. Engineer to review and approve plan	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		cultural or ethnic differences within the Project area and sexual behavior and Gender based violence. As part of the worker orientation program, Contractors staff shall sign a Code of Conduct relating to his personal behavior on site. Violations of the code of conduct may lead to dismissals.			
	Nearby Residents	Design will consider site-specific issues to nearby resident such as accessibility, local drainage, and drainage outlet.	Concept Design Team / Contractor	N/A	N/A
	Communications	Four weeks prior to the Contractor starting works in any village or town he will be responsible for holding a works orientation meeting within the village / town and will invite members of the public and village officials.	Contractor to hold meeting. Engineer to be present at all meetings.	N/A	N/A
Emergency Response	Fires, explosions, traffic accident, earthquakes, etc.	Preparation of an Emergency Response Plan (ERP). Including measures to handle traffic accidents.	Contractor to prepare ERP Engineer to review and approve ERP.	N/A	N/A
Waste Management	Management of waste materials	Preparation of a waste management and recycling plan. Preparation of a construction camp management plan to manage liquid wastes. Prior to the start of the works provide copies of the waste management contractors licenses to the Engineer for review. Perform a due diligence review of the waste management contractors' facilities to ensure	Contractor to prepare Plans Engineer to review and approve Plans. Contractor to give copies of the waste management contractors licenses to the Engineer.	N/A	N/A

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		that they follow Lao PDR regulatory requirements.	Engineer to undertake due diligence review.		
PCR	Chance Finds	The Contractor will prepare a chance find procedure in line with the requirements of the GOL.	Contractor to prepare Plans Engineer to review and approve Plans.	N/A	N/A
Permits and Licenses	Tree cutting, borrow pits and water extraction	Obtain all necessary permits and licenses to operate these facilities.	Contractor to obtain permits. Engineer to review permits.	N/A	N/A
Stipulated Contractual Penalties	Repeated non-compliance on key ES impacts	Stipulate more stringent contractual penalties (in case of repeated non-compliance on key ES impacts that could lead to serious or severe E&S incident including road safety, community safety, and delay due to coordination among concerns agencies).	PMU	N/A	N/A
ESMP Requirement	Preparation of CESMPs	Prepare CESMPs including alignment sheets.	Contractor to prepare CESMPs including alignment sheets. Engineer to review and approve CESMPs	N/A	N/A
	Incorporation of Items into Bid Documents	A specific environmental and social section will be included within the main Bid Documents indicating that the Contractor will be responsible for conforming with the requirements of the ESMP.	DoR to ensure ESMP is included within Bid Documents.	N/A	N/A

Table 68: Environmental and Social Management Plan - Construction Phase

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
Air Quality	Open burning of waste materials	No burning of debris or other materials will occur on the at any camp or construction site.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.
	Fuel Emissions	No furnaces, boilers or other similar plant or equipment using any fuel that may produce air pollutants will be installed without prior written consent of the Engineer.	Contractor to implement mitigation. Engineer to routinely monitor Contractors activities.	Engineers NESS	Daily site inspections, throughout construction period.
	Rock-crushing plant	Rock crushing plant equipment will be fitted with water sprinklers that will run continuously while the plant is operational.	Contractor to implement mitigation. Engineer to routinely monitor Contractors activities.	Engineers NESS	Daily site inspections, throughout construction period.
	Exhaust emissions from the operation of construction machinery	No furnaces, boilers or other similar plant or equipment using any fuel that may produce air pollutants will be installed without prior written consent of the Engineer. Construction equipment will be maintained to a good standard and fitted with pollution control devices regularly monitored by the Contractor and Engineer.	Contractor to implement mitigation. Engineer to routinely monitor Contractors activities.	Engineers NESS	Daily site inspections, throughout construction period.
	Fugitive emissions	Conveyor belts (e.g., at batching plants and rock crushing plants) will be fitted with wind-boards, and conveyor transfer points and	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		hopper discharge areas will be enclosed to minimize dust emission. All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins. Carry out watering for dust control at least 3 times a day: in the morning, at noon, and in the afternoon during dry weather with temperatures of over 25^{C}, or in windy weather. Avoid overwatering as this may make the surrounding muddy. Identify hotspots with severe dust issue and adjust the watering plan accordingly.	Engineer to routinely monitor Contractors activities.		
Borrow Pits and Quarries	New Borrow Pits	The Contractor will: Before the materials extraction the layer of top-soil (about 20 cm) will be removed to the side of excavation area and kept until the area works will be finalized. Top-soil stockpiles will be located at least 50 meters distance from any watercourses to avoid water siltation and obstruction. The height of stockpiles will not exceed three meters to avoid wind erosion and dust emissions. Provide an access road to the borrow site. All drivers will be instructed to use only this officially designated road.	Contractor to select borrow sites and apply for approval from PONRES and any other regulatory agencies. Engineer to review borrow locations, licenses and approvals from PONRES. Engineer to determine if the site requires fencing.	Engineers NES Engineers NES and IES to ensure reinstatement of borrow pits are completed satisfactorily.	Monthly inspections of borrow pits. Final inspection of reinstatement activities.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		If the Engineer deems the site to be hazardous to the local community, he will request the Contractor to fence the site to prevent access and provide warning signs on the fencing. Due to the sensitivity of the borrow pit locations, borrow haul routes will follow established transport corridors/rights-of-way, to the extent that is practicable. Full site reinstatement will be undertaken by the Contractor to avoid landscape damage and habitat loss. Rehabilitation measures will include: Removing of all types of equipment from the site; Removing of all types of waste or/and polluted soil and materials if any exist; Slope stabilization measure such as re-covering with topsoil, and further seeding, grassing and planting of appropriate bushes or/and trees if reasonable. The excavation and restoration of the borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the Engineer will be required before final acceptance and payment under the terms of contracts.			

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Additional borrow pits will not be opened without the restoration of those areas no longer in use.			
Flora and Fauna	Special status trees	All of seven special status trees will clearly marked prior to the start of construction works. These trees will not be removed. Construction works in the vicinity of these trees should be carried out with care to minimize impacts on the trees.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.
	Vegetation clearance	Follow tree clearance plan approved by Engineers. No chemicals will be used to clear vegetation.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.
Soils Erosion and Soil Contamination	Contamination of Soils	All fuel and chemical storage (if any) will be sited on an impervious base within a bund and secured by fencing. The storage area will be located away from any watercourse or wetlands. The base and bund walls will be impermeable and of sufficient capacity to contain 110% of the volume of tank (or one tank if more than one tank is located in the bund). The construction camp maintenance yard will be constructed on impervious hard standing with adequate drainage to collect spills, there will be no vehicle maintenance activities on open ground.	Contractor to implement mitigation. Engineer to review and approve bunding prior to the start of construction. Engineer to review and approve vehicle fueling area prior to the start of construction.	Engineers NESS	Daily site inspections, throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Filling and refueling will be strictly controlled and subject to formal procedures. Drip pans will be placed under all filling and fueling areas. Waste oils will be stored and disposed of by a licensed contractor. All valves and trigger guns will be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use. The contents of any tank or drum will be clearly marked. Measures will be taken to ensure that no contaminated discharges enter any soils. No bitumen drums or containers, full or used, will be stored on open ground. They will only be stored on impervious hard standing. Areas using bitumen will be constructed on impervious hard standing to prevent seepage of oils into the soils. No bitumen drums or containers, full or used, will be stored on open ground. They will only be stored on impervious hard standing. Areas using bitumen will be constructed on impervious hard standing to prevent seepage of oils into the soils.			
	Gas Stations	Physical site investigation should be done and if needed, soil sampling of the project	Contractor to implement mitigation.	Engineers NESS	Inspections during works around gas stations.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		road section to be excavated in front of gas stations. If analysis of samples shows elevated levels of contamination a plan will be prepared by the Contractor to dispose of any excavated materials in these areas as hazardous waste. The plan shall also include procedures for the safe handling and transport of the material.			
	Soil Erosion	Material that is less susceptible to erosion will be selected for placement around culverts. Re-vegetation of exposed areas including; (i) selection of fast growing and grazing resistant species of local flora; (ii) immediate re-vegetation of all slopes and embankments if not covered with gabion baskets; (iii) placement of fiber mats to encourage vegetation growth. The Engineer and the Contractor will both be responsible for ensuring that embankments are monitored continuously during construction for signs of erosion.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.
Hydrology	Drainage and Flooding	During the construction phase the Contractor will be required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of	Contractor to implement mitigation.	Engineers NESS	Monitor drainage channels on a weekly basis.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		damage to properties and land by flooding and silt washed down from the works. Arrange with the village representatives those works which might interfere with the flow of irrigation waters to be carried out at such times as will cause the least disturbance to irrigation operations. Should any operation being performed by the Contractor interrupt existing irrigation facilities, the Contractors will restore the irrigation appurtenances to their original working conditions within 24 hours of being notified of the interruption. The Contractor will also be responsible for ensuring that no construction materials or construction waste block existing drainage channels within the Project corridor. The channels shall be kept open at all times to avoid disruption. The Engineer will be responsible for routine monitoring of drainage channels to ensure they remain free of waste and debris.			
	Ground and surface water pollution.	Implementation of the specific mitigation measures outlined under **Construction Camps**, below. Provide portable toilet facilities for workers at road work sites.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
	Water Supply	Only legally permitted water resources are used for technical water supply.	Contractor to implement mitigation.	Engineers NESS	Weekly inspections, throughout construction period.
Employment	Use of Local Labour	The Contractor will employ local labour to benefit local communities and to promote the overall acceptance of the project. A budget will be made available to pay for training of locals.	Contractor to ensure local labour employment rates are maintained.	Engineer to routinely monitor contracts to ensure levels are maintained.	Monthly.
	Migrant workers	The Contractor will be obliged to keep a record of all workers staying overnight in a village, including within construction camps in that village, this information will be relayed to village authorities on a weekly basis. The Contractor will be responsible for the behavior of all his staff.	Contractor	Engineers NESS	Monthly review of records.
Waste and Spoil	Recycling and re-use	Where possible, surplus materials will be reused or recycled. Used oil and grease will be removed from site and sold to an approved used oil recycling company.	Contractor to implement mitigation.	Engineers NESS	Monthly review of waste manifests to determine if wastes are being recycled.
	Spoil	Under no circumstances will the Contractor dump excess materials on private lands. Excess spoil will not be dumped or pushed into any river at any location.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
	Inert Solid & Liquid waste	Provide refuse containers at each worksite. Maintain all construction sites in a cleaner, tidy and safe condition. Waste storage containers will be covered, tip-proof, weatherproof and scavenger proof. Train and instruct all personnel in waste management practices and procedures. Collect and transport non-hazardous wastes to all approved disposal sites.	Contractor to implement mitigation and conduct training. Engineer to approve any waste disposal site.	Engineers NESS	Daily site inspections, throughout construction period. Regular review of Contractors training sessions.
	Concrete	Waste concrete will be crushed and re-used as fill material, or base material where possible. Under no circumstances should concrete mixers be washed out onto open ground at construction sites, such as bridges. The existing pavement will be scarified, and where the material meets the required specification, it will be compacted and re-used as sub-base material.	Contractor to implement any recommendations for re-use of asphalt. Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.
	Hazardous Waste	Storage of hazardous waste will be in specific secure locations as identified by the waste management plan. Hazardous liquids must be stored within impermeable bunds. Collect and temporarily store used hazardous waste separately in specialized containers and place in safe and fire-free areas with	Contractor to implement mitigation. Engineer to approve any waste disposal site. Engineer to review waste manifests.	Engineers NESS	Daily site inspections, throughout construction period. Monthly review of waste manifests.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		impermeable floors roofs, at a safe distance from fire sources and according to the requirements of their MSDS. Training and suitable PPE will be provided to all personnel handling hazardous waste. Disposal of waste materials will be properly undertaken in-line with national regulatory requirements. Keep records of the types and volumes of waste removed from the site on a weekly basis. A method statement for the safe handling and disposal of asbestos waste.			
Construction Camps	Soil and water pollution	Wastewater arising on the site will be collected, removed from the site via a suitable and properly designed temporary drainage system and disposed of at a location and in a way that will cause neither pollution nor nuisance. There will be no direct discharge of sanitary or wash water to surface water. Disposal of materials such as, but not limited to, lubricating oil and onto the ground or water bodies will be prohibited. Liquid material storage containment areas will not drain directly to surface water (including rice paddies).	Contractor to implement mitigation.	Engineers NESS	Daily site inspections, throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Lubricating and fuel oil spills will be cleaned up immediately and spill cleanup materials will be maintained (including spill kits) across the Contractors construction camp. Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters. Discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge. Spill clean-up equipment will be maintained on site. The following conditions to avoid adverse impacts due to improper fuel and chemical storage: • Fueling operations will occur only within containment areas. • All fuel and chemical storage (if any) will be sited on an impervious base within a bund and secured by fencing. The storage area will be located away from any watercourse or wetlands. The base and bund walls will be impermeable and of sufficient capacity to contain 110% of the volume of tanks. • Filling and refueling will be strictly controlled and subject to formal			

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		procedures and will take place within areas surrounded by bunds to contain spills / leaks of potentially contaminating liquids. • All valves and trigger guns will be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use. • The contents of any tank or drum will be clearly marked. Measures will be taken to ensure that no contaminated discharges enter any drain or watercourses. • Disposal of lubricating oil and other potentially hazardous liquids onto the ground or water bodies will be prohibited. • Should any accidental spills occur immediate cleanup will be undertaken, and all cleanup materials stored in a secure area for disposal. Disposal of such will be undertaken in line with national regulatory requirements. • The Contractor will provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the Contractors camp sites. • The Contractor will ensure that all vehicles are properly cleaned (bodies			

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		and tires are free of sand and mud) prior to leaving the site areas. • Maintenance of vehicles will only occur in a covered vehicle maintenance yard with spill containment measures, e.g., bunding or drainage fitted with interceptor tanks. • The Contractor will provide necessary cleaning facilities on site and ensure that no water or debris from such cleaning operations is deposited off-site.			
	Water Supply	Ensure that potable water for construction camps and workers meets the necessary water quality standards. If groundwater is to be used for drinking it will be tested before being used to ensure that the water quality meets the Lao PDR drinking water standards.	Contractor to implement mitigation. Contractor to sub-contract water testing company and provide results to the Engineer	Engineers NES	Daily site inspections, throughout construction period. Monthly review of water tests, if required.
Concrete Batching Plants	Pollution and Emissions from Concrete Batching Plants	To limit impacts from dust, the following conditions will apply: Batching plants will be located downwind of urban areas. The entire batching area traversed by vehicles – including driveways leading into and out of the area – will be paved with a hard, impervious material.	Contractor to implement mitigation.	Engineers NES	Daily site inspections, throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Sand and aggregates will be delivered in a dampened state, using covered trucks. If the materials have dried out during transit they will be re-wetted before being dumped into the storage bunker. Sand and aggregates will be stored in a hopper or bunker which shields the materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend one meter above the height of the maximum quantity of raw material kept on site and extend two meters beyond the front of the stockpile. The hopper or bunker will be fitted with water sprays which keep the stored material damp at all times. Monitor the water content of the stockpile to ensure it is maintained in a damp condition. Overhead storage bins will be totally enclosed. The swivel chute area and transfer point from the conveyor will also be enclosed. Rubber curtain seals may be needed to protect the opening of the overhead bin from winds. Conveyor belts which are exposed to the wind and used for raw material transfer will be effectively enclosed, to ensure dust is not blown off the conveyor during transit.			

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Conveyor transfer points and hopper discharge areas will be fully enclosed. Conveyor belts will be fitted with belt cleaners on the return side of the belt. Weigh hoppers at front end loader plants will be roofed and have weigh hoppers shrouded on three sides, to protect the contents from the wind. The raw materials transferred by the front-end loader should be damp, as they are taken from a dampened stockpile. Store cement in sealed, dust-tight storage silos. All hatches, inspection points and duct work will be dust tight. Cement dust emissions from the silo during filling operations must be minimized. The minimum acceptable performance is obtained using a fabric filter dust collector. Totally enclose the cement weigh hopper, to ensure that dust cannot escape to the atmosphere. An inspection of all dust control components will be performed routinely – for example, at least weekly. All contaminated storm water and process wastewater will be collected and retained on site. All sources of wastewater will be paved and bunded. The specific areas that will be paved and bunded include; the agitator washout			

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		area, the truck washing area, the concrete batching area, and any other area that may generate storm water contaminated with cement dust or residues. Contaminated storm water and process wastewater will be captured and recycled by a system with the following specifications: The system's storage capacity must be sufficient to store the runoff from the bunded areas generated by 20 mm of rain. Water captured by the bunds will be diverted to a collection pit and then pumped to a storage tank for recycling. An outlet (overflow drain) in the bund, one meter upstream of the collection pit, will divert excess rainwater from the bunded area when the pit fills due to heavy rain (more than 20 mm of rain over 24 hours). Collection pits should contain a sloping sludge interceptor, to separate water and sediments. The sloping surface enables easy removal of sludge and sediments. Wastewater will be pumped from the collection pit to a recycling tank. The pit will have a primary pump triggered by a float switch and a backup pump which automatically activates if the primary fails.			

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Wastewater stored in the recycling tank needs to be reused at the earliest possible opportunity.			
Occupational Health and Safety	HIV / AIDS	Subcontract with a Service Provider to provide an HIV Awareness Program to the Contractor's Personnel and the Local Community. Repeat the HIV Awareness Program at intervals not exceeding four months	Contractor to implement mitigation. Service Provider to implement training. Engineer to review program.	Engineers NESS	Annual review of awareness program activities.
	Worker Health & safety	Develop a Safety Training Program including training to recognize and respond to workplace chemical hazards. Safety Meetings conducted on a monthly basis. Incident and accident reporting Regularly inspect, test and maintain all safety equipment. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, will be repaired or replaced immediately. All construction plant and equipment used on or around the Site will be fitted with appropriate safety devices. The roads opened for the traffic while construction should be with diversion signs.	Contractor to implement mitigation. Engineer to review and approve training program. Contractor to maintain accident log	Engineers NESS Engineers NESS to review and monitor	Daily site inspections, throughout construction period. Periodic attendance of training sessions to determine quality and numbers in attendance. Daily site inspections. Audits and inspections of Contractor's accident logs.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		A fully equipped first aid base will be provided. Coordinate with local public health officials and will reach a documented understanding with regard to the use of hospitals and other community facilities. Workers will be provided (before they commence works) with of appropriate PPE suitable for electrical work such as safety boots, helmets, gloves, protective clothes, goggles, and ear protection at no cost to the workers.			
	Sub-contractor H&S	All sub-contractors will be supplied with copies of the CESMP. Provisions to be incorporated into all sub-contracts to ensure the compliance with the CESMP. All sub-contractors will be required to appoint a safety representative who will be available on the Site.	Contractor to provide CESMP. Sub-contractors to ensure compliance with CESMP	Engineers NESS	Routinely monitor sub-contractors activities.
	Vector borne disease	Effective measures will be used to ensure that water stagnant is not present around the camp site. Use of pesticides for vegetation control is prohibited. Workers will be given awareness training relating to vector born disease and posters will be located around work sites warning workers of the potential health risks.	Contractor to implement mitigation. Engineer to review and approve training program. Engineer to approve any pesticide use.	Engineers NES	Daily site inspections, throughout construction period. Periodic attendance of training sessions to determine quality and numbers in attendance.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		Medicines for the treatment of vector borne diseases will be provided at the camp medical facility.			Monthly inspections of Contractors medical facilities.
	COVID	The Contractor shall follow the national regulations and guidelines relating to COVID-19.	Contractor to implement mitigation.	Engineers NES	Daily site inspections, throughout construction period.
	Noise	Zones with noise level above 80 dBA must be marked with safety signs and appropriate PPE must be worn by workers.	Contractor to implement mitigation.	Engineers NES	Daily site inspections and monitoring (with smartphone technology) throughout construction period.
Economic Activity	Accessibility	The Contractor must prepare dedicated temporary pathways to all businesses that might otherwise be cut off from the road during the construction phase. The pathways must be wide enough to allow access to the business and must be kept free of mud and construction debris and should not be liable to flooding.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.
Community Health and Safety	Road closures, diversions and blocking of access routes	Provision of all road diversion signs and ensure that diversion roads do not impact negatively upon private lands. Any diversions will be agreed upon by the Engineer. All access routes will be kept open during Project works for at least 50% of the day during construction works and 100% of the	Contractor to implement mitigation. Engineer to review and approve diversions.	Engineers NESS	Daily site inspections throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		time after construction works are completed for the day.			
	Access	Provide safe access at all times through the construction site to people whose residences/shelters and routes are temporarily severed by road construction.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.
	General safety	Implement all applicable corrective actions in Appendix M.	Per the corrective action plan in Appendix M	Engineers NESS	Throughout construction period.
	Traffic safety	Provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions. Allow for adequate traffic flow around construction areas. The signs should be visible day and night and sufficiently installed. Given that there is no by-pass road, installation of suitable physical demarcation between working areas and the carriageway open to traffic is a must Provide for road safety campaigns and enforcement of road safety regulations. Provide adequate signalization, appropriate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control. Access roads for borrow pits, batching plants, etc., should be maintained during the	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		construction phase and rehabilitated at the end of construction.			
	Educational Facilities	Place warning signs outside of each school to alert construction vehicles of their locations and to be aware of children crossing the road in these areas. At least two weeks before construction starts within the vicinity of all schools, the Contractor will be responsible for informing the School of the works program and schedule so that the school can inform pupils of the impending works and to be vigilant throughout the construction program. If warranted, the Engineer may recommend that the Contractor places protective barriers in-front of school entrances to prevent children rushing out from the school gates into the path of construction vehicles or works. When working in the immediate vicinity of a school, the Contractor will cease works for at least 30 minutes before school starts and after it closes to allow children to leave the area safely and to allow parents safe access to collect their children.	Contractor to implement mitigation. Contractor to provide letters to schools to Engineer to confirm that the schools have been informed of impending works.	Engineers NESS	Daily site inspections throughout construction period.
	Child Labour	The Contractor will ensure that no persons under the age of 18 are employed on the Project.	Contractor to implement mitigation	Engineers NESS	Routine review of staff contracts to determine age of staff.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
	Labour Influx	Camp sites will be selected keeping in view the availability of an adequate area for establishing campsites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. The Labour Influx Management Plan will include a worker orientation program as part of worker induction to discuss religious, cultural, or ethnic differences within the Project area and sexual behavior and Gender based violence. As part of the worker orientation program, Contractors staff shall sign a Code of Conduct relating to his personal behavior on site. Violations of the code of conduct may lead to dismissals. As part of the plan the Contractor will also be obliged to keep a record of all workers staying overnight in a village, including within construction camps in that village, this information will be relayed to village authorities on a weekly basis. a worker orientation program as part of worker induction to discuss religious, cultural or ethnic differences within the Project area and sexual behavior and Gender based violence. As part of the worker orientation program, Contractors staff shall sign a Code of Conduct relating to his personal behavior	Contractor to implement mitigation	Engineers NESS	Daily site inspections throughout construction period. Routine inspection of records

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		on site. Violations of the code of conduct may lead to dismissals.			
	Construction Noise and Vibration	All exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance will be undertaken. Stationary equipment will be placed as far from sensitive land uses as practical and provided with shielding mechanisms where possible. Work near Sensitive Receptors will be limited to short term activities. Construction activities will be strictly prohibited between 10 PM and 6 AM in the residential areas. When operating close to sensitive areas such as residential, nursery, or medical facilities, the Contractor's hours of working will be limited to 8 AM to 6 PM. Public notification of construction operations. Disposal sites and haul routes will be coordinated with local officials. Implement vibration management plan.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.
Social Sector	Accessibility	The Contractor must prepare dedicated temporary pathways to all properties that might otherwise be cut off from the road	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		during the construction phase. The pathways must be wide enough to allow access to the properties and must be kept free of mud and construction debris and should not be liable to flooding.			
Infrastructure	Electrical Systems and water pipes	During construction all power lines (transmission and distribution) and water pipes in the Project Corridor will be kept operational, this will include temporary transmission lines while existing poles and lines are moved. If any temporary disruption to water or power supplies caused by construction activities is absolutely necessary the Contractor must warn the affected population and receive approval from the Engineer for the disruption at least 24 hours in advance and no disruption will last longer than 4 hours.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.
Physical and Cultural Resources	Impacts to sensitive areas adjacent to building structures	The construction method used in sensitive sections will be carefully reviewed (e.g., user manual work instead of the heavy machine at the location that works are carried out just adjacent to building structure);	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.
	Loss of assets	The loss of cultural and religious assets of the community such as spirit stupa, and the decoration of entrance gates and fences of the temples will be compensated per the RAP. These costs will include ritual ceremonies and art works for the main gates	DoR PMU	Engineers NESS	Throughout the consultation and RAP implementation process

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
		and fences. Consultations with temples, communities and local authorities will be completed as part of the compensation process.			
	Impacts to Historical and archeological areas	In the event of any chance finds during the construction works procedures will apply that are governed by GoL legislation and guidelines and as outlined in the Contractors Chance Find Procedure.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.
	Religious Holidays	During religious holidays the Contractor will not work within 250 meters of any temple.	Contractor to implement mitigation.	Engineers NESS	Daily site inspections throughout construction period.

Table 69: Environmental and Social Management Plan - Operational Phase

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
Air Quality	Exhaust emissions from the operation of machinery Fugitive emissions	No furnaces, boilers or other similar plant or equipment using any fuel that may produce air pollutants will be installed without prior written consent of the Engineer. Equipment will be maintained to a good standard and fitted with pollution control devices regularly monitored by the Contractor and Engineer. All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins.	Contractor

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
Flora and Fauna	Special status trees	Contractor will ensure maintenance of trees through out OPBRC period.	Contractor
	Vegetation clearance	No chemicals will be used to clear vegetation.	Contractor
Soils Erosion and Soil Contamination	Contamination of Soils	Filling and refueling will be strictly controlled and subject to formal procedures. Drip pans will be placed under all filling and fueling areas. Waste oils will be stored and disposed of by a licensed contractor. All valves and trigger guns will be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use. The contents of any tank or drum will be clearly marked. Measures will be taken to ensure that no contaminated discharges enter any soils. No bitumen drums or containers, full or used, will be stored on open ground. They will only be stored on impervious hard standing. Areas using bitumen will be constructed on impervious hard standing to prevent seepage of oils into the soils. No bitumen drums or containers, full or used, will be stored on open ground. They will only be stored on impervious hard standing. Areas using bitumen will be constructed on impervious hard standing to prevent seepage of oils into the soils.	Contractor
	Soil Erosion	Re-vegetation of exposed areas including; (i) selection of fast growing and grazing resistant species of local flora; (ii) immediate re-vegetation of all slopes and embankments if not covered with gabion baskets; (iii) placement of fiber mats to encourage vegetation growth.	Contractor

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
Hydrology	Drainage and Flooding	Should any operation being performed by the Contractor interrupt existing irrigation facilities, the Contractors will restore the irrigation appurtenances to their original working conditions within 24 hours of being notified of the interruption. During O&M phase the contractor shall ensure that all drainage channels are adequately maintained to prevent blockages and ensure the free flow of water away from the road and residential property / Land. The channels shall be kept open at all times to avoid disruption.	Contractor
	Water Supply	Only legally permitted water resources are used for technical water supply.	Contractor
Waste and Spoil	Recycling and re-use	Where possible, surplus materials will be reused or recycled. Used oil and grease will be removed from site and sold to an approved used oil recycling company.	Contractor
	Spoil	Under no circumstances will the Contractor dump excess materials on private lands. Excess spoil will not be dumped or pushed into any river at any location.	Contractor
	Inert Solid & Liquid waste	Provide refuse containers at each worksite. Maintain all work sites in a cleaner, tidy and safe condition. Waste storage containers will be covered, tip-proof, weatherproof and scavenger proof. Train and instruct all personnel in waste management practices and procedures. Collect and transport non-hazardous wastes to all approved disposal sites.	Contractor
	Hazardous Waste	Storage of hazardous waste will be in specific secure locations as identified by the waste management plan. Hazardous liquids must be stored within impermeable bunds.	Contractor

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
		Collect and temporarily store used hazardous waste separately in specialized containers and place in safe and fire-free areas with impermeable floors roofs, at a safe distance from fire sources and according to the requirements of their MSDS. Training and suitable PPE will be provided to all personnel handling hazardous waste. Disposal of waste materials will be properly undertaken in-line with national regulatory requirements. Keep records of the types and volumes of waste removed from the site on a weekly basis.	
Occupational Health and Safety	HIV / AIDS	Subcontract with a Service Provider to provide an HIV Awareness Program to the Contractor's Personnel and the Local Community. Repeat the HIV Awareness Program at intervals not exceeding four months	Contractor
	Worker Health & safety	Safety Meetings conducted on a monthly basis. Incident and accident reporting Regularly inspect, test and maintain all safety equipment. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, will be repaired or replaced immediately. All plant and equipment used on or around the Site will be fitted with appropriate safety devices. A fully equipped first aid base will be provided. Workers will be provided (before they commence works) with of appropriate PPE suitable for electrical work such as safety boots, helmets, gloves, protective clothes, goggles, and ear protection at no cost to the workers.	Contractor
	Sub-contractor H&S	All sub-contractors will be supplied with copies of the CESMP.	Contractor

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
		Provisions to be incorporated into all sub-contracts to ensure the compliance with the CESMP. All sub-contractors will be required to appoint a safety representative who will be available on the Site.	
	Vector borne disease	Use of pesticides for vegetation control is prohibited. Medicines for the treatment of vector borne diseases will be provided.	Contractor
	COVID	The Contractor shall follow the national regulations and guidelines relating to COVID-19.	Contractor
Economic Activity	Accessibility	The Contractor must prepare dedicated temporary pathways to all businesses that might otherwise be cut off from the road. The pathways must be wide enough to allow access to the business and must be kept free of mud and debris and should not be liable to flooding.	Contractor
	Use of local labour	As part of the maintenance of the road the Contractor should also look into the possibility of employing the local people for the maintenance of roadside drains upon completion of rehabilitation works.	Contractor
Community Health and Safety	Road closures, diversions and blocking of access routes	Provision of all road diversion signs and ensure that diversion roads do not impact negatively upon private lands. All access routes will be kept open during Project works for at least 50% of the day during works and 100% of the time after works are completed for the day.	Contractor
	Access	Provide safe access at all times through the work site to people whose residences/shelters and routes are temporarily severed by activities.	Contractor
	Traffic safety	Provide information to the public about the scope and schedule of activities and expected disruptions and access restrictions. Allow for adequate traffic flow around work sites.	Contractor

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
		Provide adequate signalization, appropriate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control.	
	Child Labour	The Contractor will ensure that no persons under the age of 18 are employed on the Project.	Contractor
	Noise and Vibration	All exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance will be undertaken. Stationary equipment will be placed as far from sensitive land uses as practical and provided with shielding mechanisms where possible. Work near Sensitive Receptors will be limited to short term activities. Work activities will be strictly prohibited between 10 PM and 6 AM in the residential areas. When operating close to sensitive areas such as residential, nursery, or medical facilities, the Contractor's hours of working will be limited to 8 AM to 6 PM.	Contractor
Social Sector	Accessibility	The Contractor must prepare dedicated temporary pathways to all properties that might otherwise be cut off from the road. The pathways must be wide enough to allow access to the properties and must be kept free of mud and debris and should not be liable to flooding.	Contractor
Infrastructure	Electrical Systems and water pipes	If any temporary disruption to water or power supplies caused by work activities is absolutely necessary the Contractor must warn the affected population at least 24 hours in advance and no disruption will last longer than 4 hours.	Contractor
Physical and Cultural Resources	Impacts to sensitive areas adjacent to building structures	The work method used in sensitive sections will be carefully reviewed (e.g., user manual work instead of the heavy machine at the location that works are carried out just adjacent to building structure);	Contractor

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
	Impacts to Historical and archeological areas	In the event of any chance finds during the works procedures will apply that are governed by GoL legislation and guidelines and as outlined in the Contractors Chance Find Procedure.	Contractor
	Religious Holidays	During religious holidays the Contractor will not work within 250 meters of any temple.	Contractor

Table 70: Construction and Operational Phase Instrumental Monitoring[21]

Issue	Mitigation	Locations	Schedule	Responsibilities	Reporting
Air Quality	The Engineer will establish routine ambient air quality monitoring throughout the construction period. In addition, if complaints are received from stakeholders regarding air quality additional monitoring maybe undertaken. The following parameters will be monitored: Particulate Matter (PM_{10} & $PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2) and Carbon Monoxide (CO). Other parameters maybe warranted as determined by the Engineer.	Three construction locations per the baseline monitoring locations in the ESIA.	Monitoring to be undertaken once every 6 months during construction period, or as required in the event of complaints.	The Engineer will hire certified laboratory to perform the monitoring activities.	The certified laboratory will provide the results to the Engineer within one week of the monitoring activity.

[21] All instrumental monitoring results shall be compared against both the national standards and WBG standards outlined in Sections 2.4.1, 2.4.2, 2.4.3, 2.5.1 and 2.5.2 of this ESIA. Non-compliance shall be measured against both national and WBG standards.

Issue	Mitigation	Locations	Schedule	Responsibilities	Reporting
Noise	The Engineer will establish routine noise monitoring throughout the construction period. Noise monitoring will also be conducted once Before construction period. In addition, if complaints are received from stakeholders regarding construction noise additional monitoring maybe undertaken. Parameters to be monitored include: Laeq daytime (dBA), Laeq night-time (dBA)	Three construction locations determined by the Engineer (at the façade of the building). The sensitive receptors may include a sample of residential building, school, health facility, temple, etc.	Monitoring to be undertaken monthly both daytime and night-time measurements during construction period and once Before construction period.	The Engineer will hire certified laboratory to perform the monitoring activities.	The certified laboratory will provide the results to the Engineer within one week of the monitoring activity.

8.3.2 Implementation Support and Work Supervision (ISWS) Consultant (Engineer) Responsibilities

481. The Engineer is tasked with specific responsibility to ensure safeguard compliance of civil works – with particular emphasis on the monitoring of implementation of ESMP through the Contractors Construction Environment and Social Management Plan (CESMP) and related aspects of the project. The Engineer will ensure the Contractor's ESHS performance is in accordance with good international industry practice and delivers the Contractor's ESHS obligations.

482. To achieve this, the Engineer will include a part-time International Environmental and Social Specialist (IESS) (for 3 months for each year of construction) and a full time National Environmental and Social Specialist (NESS) and a full time National Occupational Health and Safety Specialist (NOHSS) to monitor implementation of the ESMP during construction of all Project Components. In addition, an International Team Leader of the Implementation support and supervision consultant will take overall responsibility in ensuring that the Project is implemented consistent with the provisions of the ESMP. The main responsibility of the Engineer includes, but is not limited to:

- review and approve the Contractor's CESMP, including all updates and revisions (not less than once every 6 monthly);
- review and approve ESHS provisions of method statements plans, proposals, schedules and all relevant Contractor's documents;
- review ESHS risks and impacts of any design change proposals and the implications for compliance with ESIA, ESMP, consent/permits and other relevant project requirements;
- undertake audits, supervisions and/or inspections of any sites where the Contractor is undertaking activities related to the Works, to verify the Contractor's compliance with ESHS requirements, with and without contractor and/or client relevant representatives, as necessary, but not less than once per month. NESS to monitor the Contractor's implementation of his CESMP via weekly inspections of the Contractors camps and work sites;
- undertake audits and inspections of Contractor's accident logs, community liaison records, monitoring findings and other ESHS related documentation, as necessary, to confirm the Contractor's compliance with ESHS requirements;
- agree remedial action/s and their timeframe for implementation in the event of a noncompliance with the Contractor's ESHS obligations;
- attend meetings including site meetings, progress meetings to discuss and agree appropriate actions to ensure compliance with ESHS obligations;
- check that the Contractor's actual reporting (content and timeliness) is in accordance with the Contractor's contractual obligations;
- review and critique, in a timely manner, the Contractor's ESHS documentation (including regular reports and incident reports) submitted to the Engineer and to provide advice to ensure the accuracy and efficacy of the documentation
- undertake liaison, from time to time and as necessary, with project stakeholders to identify and discuss any actual or potential ESHS issues;

- prepare a brief monthly and quarterly report that describes the work that the Engineer's IESS, NESS and NOSHS have undertaken, the issues (including any Contractor's ESHS noncompliance, details of the Contractors activities (such as training programs, community meetings, etc.) and compliance with the ESMP and CESMP)) identified and the actions taken to address the issues;

- conduct a due diligence of the borrow pits proposed for use by contractor to ensure that the borrow pits meet requirements set out in this ESMP;

- help the Contractor with the development of the Contractors CESMPs (at least three months prior to the start of construction);

- engage external service from a certified laboratory for environmental instrumental monitoring of air quality, noise and water quality;

- assess the RAP implementation and prepare the RAP completion report with recommendations if the project site/road section or parts of it can be handed over to the contractor;
- Promptly report, within 24 hrs after learning of the incident/accident, to the PMU of any incident or accident related to the Project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers, including, inter alia, cases of sexual exploitation and abuse (SEA), sexual harassment (SH), and accidents that result in death, serious or multiple injury including road accidents, and workplace accident. .

- Monitoring the corrective actions for road safety per Appendix M.

483. If the Engineer identifies any ESMP / CESMP non-compliance issues by the Contractor, a Non-Compliance Notice will be issued to the contractor if the Engineer requires action to be taken. The Contractor will be required to prepare a corrective action plan which is to be implemented by a date agreed with the Engineer. Non-compliance will be ranked according to the following criteria:

- Non-Compliance Level I: A situation that is not consistent with requirements of the ESMP/CESMP, but not believed to represent an immediate or severe social or environmental risk. Repeated Level I concerns may become Level II concerns if left unattended.

- Non-Compliance Level II: A situation that has not yet resulted in clearly identified damage or irreversible impact, but which demonstrates potential significance. Level II requires expeditious corrective action and site-specific attention to prevent severe effects. Repeated Level II concerns may become Level III concerns if left unattended.

- Non-Compliance Level III: A critical situation that will result in significant social or environmental damage occurring or a reasonable expectation of very severe impending damage. Intentional disregard of Non-Compliance Notices or specific prohibitions is also classified as a Level III concern.

484. The failure to prepare a corrective action plan or to implement it within the required timeframe will result in the Employer undertaking the work at the Contractor's expense (as will be specified in the Contract).

485. A Terms of Reference for the Engineers IESS and NESS is provided below.

National Environmental and Social Specialist (NESS)

486. Scope of Services: He/she will (i) review all documents and reports regarding the integration of environmental and social including contractor's environmental and social action plan, (ii) supervise the contractors' compliance to ESMP / CESMP, (iii) conduct a due diligence of the borrow pits proposed for use by contractor to ensure that the borrow pits meet requirements set out in this ESMP, and (iii) prepare monthly compliance reports.

487. Qualification: Degree in environmental sciences or equivalent. Preferably five (5) years' experience in conducting environmental and social impact assessments and implementation of environment and social mitigation plans and/or monitoring implementation of environmental and social mitigation measures during implementation of projects including highway projects funded by developing partners.

488. Time Period: The NESS will be a full-time position over the duration of the construction period.

International/Regional Environmental and Social Specialist (IESS)

489. Scope of Services: During the supervision stage the IESS will prepare a detailed action plan including environmental and social monitoring checklists to be completed by the NESS to ensure that the Environmental and Social Management System is established, implemented, maintained and will monitor its performance. He/she will also take care of all environmental and social issues during construction works. He/she will also conduct environmental and social training and briefings to provide environmental awareness on World Bank and the government's environmental safeguards policies, requirements and standard operating procedures in conformity with the government's regulations and international practice; ensure baseline monitoring and reporting of Contractor's compliance with contractual environmental and social mitigation measures during the supervision stage. The IESS will review and advise the relevant person (of the Engineer) on the ESHS risks and impacts of any design change proposals and the implications for compliance with ESIA, ESMP, consent/permits and other relevant project requirements. The IESS will also help the with the development of the Contractors CESMPs (at least three months prior to the start of construction). The IESS will prepare Quarterly Environmental Reports providing details of the Contractors activities (such as training programs, community meetings, etc.) and compliance with the ESMP and CESMP. The IESS will conduct a due diligence of the borrow pits proposed for use by contractor/provide advice to the NESS and NOHSS in conducting the due diligence to ensure that the borrow pits meet requirements set out in this ESMP.

490. Qualification: Degree or diploma in environmental sciences or equivalent. Preferably twelve (12) years' experience in conducting environmental and social impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures and health and safety plans during implementation of projects including highway projects funded by developing partners, including 8 years' international experience. Working knowledge in Lao Language and experience in Southeast Asian countries is preferred.

491. Time Period: The IESS will be engaged on a part-time basis for a period of 3 months per year).

National Occupational Health and Safety Specialist (NOHSS)

492. Scope of Services: The NOHSS shall help prepare the Occupational Health and Safety (OHS) Plan which forms part of the Contractors overarching CESMP. The NOHSS will also prepare health and safety monitoring checklists to ensure that the OHS Plan is implemented

and maintained throughout the contract period. He/she will also take care of all OHS issues during construction works including conducting OHS training and daily toolbox briefings to provide OHS awareness. The NOHSS will review and advise the relevant person (of the Engineer) on the OHS risks and impacts of any design change proposals and the implications for compliance with ESIA, ESMP, consent/permits and other relevant project requirements. The NOHSS will prepare Quarterly OHS Reports providing a summary of the reporting periods monitoring checklists, incident and accident reports, non-compliance reports, training programs, etc.

493. Qualification: A relevant, recognized OHS qualification (such as NEBOSH / IOSH / OSHA or another regionally recognized qualification). Preferably five (5) years' experience as an OHS practitioner during implementation of large infrastructure projects including highway projects. Working knowledge of English is required.

494. Time Period: The NOHSS will be engaged on a full-time basis over the duration of the construction period.

495. It is also recommended to include a Road Safety Specialist on a part-time basis.

8.3.3 Contractor Responsibilities

496. The Contractor will appoint one part-time Environmental and Social Manager (ESM) for six months a year, and one full-time Occupational Health and Safety Manager (OHSM) to be a senior members of the construction management team based on site for the duration of the contract. The Contractor will also include a full-time Community Liaison Officer (CLO).

497. The ESM will have a university degree (preferably at Master's level) in Environmental Science or related discipline and have at least 10 years work experience in environmental management of infrastructure projects. The OHSM will have a university degree and a recognized health and safety certification and at least 10 years work experience in health and safety issues for infrastructure projects.

498. Key responsibilities of the Contractor (through the ESM, CLO and OHSM) are as follows:

- Completing detailed design including all of the environmental and social mitigation measures in this ESIA.
- Following the corrective actions for road safety per Appendix M.
- Preparing the CESMP for approval by the Engineer prior to the Contractors taking possession of the construction site (see below).
- Ensuring the CESMP is implemented effectively throughout the construction period.
- Coordinating community relations issues through acting as the Contractor's community relations focal point (proactive community consultation, complaints investigation and grievance resolution).
- Establishing and maintaining site records of:
    i. Weekly site inspections using checklists based on the CESMP;
    ii. Environmental and health and safety accidents/incidents including resolution activities (including reporting of accidents to the ISWS Consultant);

iii. Non-compliance notifications issued by the Engineer;

iv. Corrective action plans issued to the Engineer in response to non-compliance notices;

v. Community relations activities including maintaining complaints register;

- Preparing monitoring reports (Monthly);

- Routine reporting of CESMP compliance and community liaison activities;

Promptly report, within 24 hrs after learning of the incident/accident, to the ISWS of any incident or accident related to the Project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers, including, inter alia, cases of sexual exploitation and abuse (SEA), sexual harassment (SH), and accidents that result in death, serious or multiple injury including road accidents, and workplace accident..

- Ad hoc reporting to the Engineer of environmental incidents/spillages including actions taken to resolve issues; and

- Provide daily toolbox training at the construction camp and also at construction sites. The ESM and OHSM will keep a record of all monthly training and toolbox training undertaken.

8.3.4 Project Management Unit (PMU) Responsibilities

499. A PMU established within the DoR will be responsible for the day-to-day management of the Project components including implementation of the ESMPs. The Environmental and Social Management Unit (ESMU) under PMU will be responsible for overseeing and monitoring implementation of the ESMP, RAPs, EGEP and gender action plan (GAP). The ESMU will be headed by a manager. The PMU / ESMU responsibilities in respect of implementation of the ESMP will be as follows:

- Overseeing full compliance with project safeguard instruments and will conduct monitoring of safeguard policy implementation.

- Ensure that all relevant ESMP requirements (including environmental designs and mitigation measures) are duly incorporated into the project bidding documents.

- Review necessary permits and/or clearance, as required, from MONRE / PONRE and other relevant government agencies, ensuring that all necessary regulatory clearances are obtained by the Contractor before commencing any civil work on the project.

- Liaising with the Department of Environment and Social Impact Assessment of the Ministry of Natural Resources and Environment (MONRE).

- Ensure that the Contractor has access to the ESMP and ESIA report.

- Ensure that the Contractor understands his responsibilities to mitigate environmental problems associated with their construction activities and facilitate training of their staff in implementation of the ESMP.

- Approve the CESMP, with support from the engineer, before the Contractor takes possession of construction site.

- Undertake regular site visits to assess the Contractors compliance with the ESMP / CESMP and make recommendations to the Contractor where non-compliance issues are identified.

- Keep proper safeguards documentations.

- Lead safeguard supervision and reporting at the project level. ESMU will prepare six month and annual safeguard progress report.

- Integrating the gender dimension into safeguards documents, and consultation processes;

- Track and report on grievances received, addressed, and overall work and implementation of the grievance redress mechanism (GRM).

- Regular coordination and meetings with the Engineer to discuss Project progress and any issues.

- Promptly report, within 48 hrs after learning of the incident/accident, to the World Bank, AIIB and NDF of any incident or accident related to the Project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers, including, inter alia, cases of sexual exploitation and abuse (SEA), sexual harassment (SH), and accidents that result in death, serious or multiple injury including road accidents, and workplace accident.
- Subsequently, at the Financiers' request, prepare a report on the incident or accident and propose any measures to address it and prevent its recurrence.

500. The ESMU, headed by a ESMU Manager, will also be responsible for overall planning and implementation of environmental and social management for the Project, as well facilitating consultation activities, and coordination with local authorities, AHs, NGOs/civil society organizations (CSOs) and other stakeholders. The ESMU will monitor and report on the effectiveness of implementation of the ESMPs and RAPs and coordinate activities during construction and post-construction aimed at improving the environmental and social performance of the Project.

501. The ESMU will support the PMU to prepare all documentation and reports concerning the environmental and social aspects of the Project including progress reports to be submitted to PMU and DONRE/PONRE during the implementation period.

502. The team of social and resettlement specialists will undertake their tasks in accordance with TOR and job descriptions and will ensure all plans are updated and complied with. The resettlement specialist will report to the ESMU-Manager.

503. The ESMU will work closely with the Project Resettlement Committee (PRC) to review and address all complaints and grievances arising in the course of implementation of any ESMP and RAP and resolve them as far as it can with the concerned parties. If the complainant is not satisfied, the matter will be resolved through appeal and tracking through the grievance redress procedure.

504. The ESMU Manager will report directly to PMU and work closely with provincial/district authorities. S/he will also work with and provide with support from the World Bank's safeguard specialists. The role of the ESMU Manager will be to ensure that the environmental and social mitigation and monitoring measures are implemented during the course of Project construction and operation. The ESMU Manager will act on behalf of the PMU in dealing with Government agencies, PRC, or other concerned parties, and will be the MPWT/PMU representative on the PRC.

505. The activities of the Manager-ESMU will include, but not necessarily be limited to:

- Maintaining good relations and communication with the local communities affected by or involve in the project;
- Coordination, supervision, monitoring and reporting on activities undertaken in compliance with each ESMP & RAP;
- Liaising between the project manager (PMU), consultants, Government agencies, PRC, and contractors/agencies engaged to implement the ESMPs and RAP;
- Supervising and monitoring field activities in relation to ESMP and RAP implementation;
- Supervising specific routine technical tasks of the ESMU and performance of ESMU staff and consultants; and
- Preparing internal progress reports as required and reporting to the head of the PMU.

506. At the district level, project implementation teams (PIT) will be established to oversee the implementation of the project, including environmental and social safeguards, at the project towns. The responsibilities of the PIT are summarized below:

- Coordinate the implementation of project activities at the district level;
- Ensure the implementation of the approved work plans and program of activities;
- Prepare and submit regular quarterly and annual physical and financial progress reports to the PMU;
- Oversee and coordinate civil works and construction activities;
- Ensure the implementation of social and environmental safeguards and including timely disclosure of safeguards documents;
- Ensure the implementation of the Consultation and Participation Plan, Gender Action Plan, and Ethnic Minorities Plan;
- Ensure implementation of resettlement plans including adequate measures to mitigate adverse resettlement impacts;
- Coordinate implementation of environmental management plan, and submit regular monitoring reports to the PMU;
- Coordinate the updating of the resettlement plans and monitor implementation of resettlement activities; and
- Undertake monitoring of project activities and prepare regular reports to the PMU on project achievements.

8.3.5 Construction Environmental and Social Management Plan (CESMP)

507. Following the award of the contract and prior to construction commencing the Contractor will review the ESMP and develop this into his detailed CESMP. The CESMP will

identify persons who will be responsible for supervising the work within the Contractor's team. This information will be presented in a series of site plans covering the whole project site showing all environmental management requirements for all activities in the construction phase. The CESMP will also include the following plans:

- Waste Management and Recycling Plan
- Construction Camp Plan
- Borrow Pit Plan
- Emergency Response Plan
- Air Quality Plan
- Occupational Health and Safety Plan
- Traffic Management Plan
- Spill Response Plan
- Construction Vibration Management Plan
- Labour Influx Management Plan
- Chance Find Procedure

508. The CESMP will also include a monitoring plan and a reporting program corresponding to the requirements of the ESMP. The CESMP, and all of its plans without exception, will be submitted to the Engineer, PMU and World Bank for review and will require approval from the Engineer prior to the Contractor taking possession of any work site.

509. It is recommended that the Engineers' IESS supports the Contractor's ESM through on the job training in the preparation of the CESMP.

8.3.6 Site Induction

510. Following approval of the CESMP the Contractor will be required to attend a site induction meeting with the Engineers IESS whereby the CESMP is confirmed with the Contractor to ensure that all compliance conditions are clearly understood. Following confirmation of the CESMP with the Contractor the Engineers IESS advises the Engineers Team Leader that the Contractor is now cleared to take possession of the Site and may commence moving equipment to the Site. The Contractor will be responsible for ensuring that all sub-contractors abide by the conditions of the CESMP.

8.3.7 Reporting

511. Contractors Reporting - The Contractor will prepare two levels of environmental reports:

- Weekly Environmental Checklists – These will be prepared weekly by the Contractors ESM and will be submitted to the Engineer on a weekly basis.

- Monthly Summary Report - in respect of compliance with ESMP / CESMP requirements that will be submitted to the PMU through the Engineer. The report will contain sections relating to:

    - environmental incidents or non-compliances with contract requirements, including contamination, pollution or damage to ground or water supplies, temples or cultural heritage site, protected areas, etc.;

    - health and safety incidents, accidents, injuries and all fatalities that require treatment;

    - interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none);

    - status of all permits and agreements:

        - work permits: number required, number received, actions taken for those not received;

        - status of permits and consents:

            - list areas/facilities with permits required (quarries, asphalt & batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to the engineer, status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.);

            - list areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, dates submitted to resident engineer (or equivalent);

            - identify major activities undertaken in each area this month and highlights of environmental and social protection (land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation);

    - health and safety supervision:

        - occupational, health and safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;

        - number of workers, work hours, metric of PPE use, worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);

    - worker accommodations:

        - number of expats housed in accommodations, number of locals;

        - date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;

- actions taken to recommend/require improved conditions, or to improve conditions.

- HIV/AIDS: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);

- gender (for expats and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);

- training:

  - number of new workers, number receiving induction training, dates of induction training;

  - number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;

  - number and dates of HIV/AIDS sensitization training, no. workers receiving training (this month and in the past); same questions for gender sensitization, flag lady/flagman training.

- environmental and social supervision:

  - Environmental and social person(s): days worked, areas inspected and numbers of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, stream crossings, etc.), highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to environmental and/or social specialist/construction/site management; and

  - community liaison person(s): days worked (hours community center open), number of people met, highlights of activities (issues raised, etc.), reports to environmental and/or social specialist /construction/site management.

- Grievances: list current month's and unresolved past grievances by date received, complainant, how received, to whom referred to for action, resolution and date (if completed), data resolution reported to complainant, any required follow-up (Cross-reference other sections as needed):

  - Worker grievances;

  - Community grievances

- Traffic and vehicles/equipment:

  - traffic accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;

  - accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;

- overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).

o Environmental mitigations and issues (what has been done):

- dust: number of working bowsers, number of waterings/day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); % of rock/muram/spoil lorries with covers, actions taken for uncovered vehicles;

- erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to resolve issues, emergency repairs needed to control erosion/sedimentation;

- quarries, borrow areas, spoil areas, batch plants: identify major activities undertaken this month at each, and highlights of environmental and social protection: land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation;

- blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), incidents of off-site damage or complaints (cross-reference other sections as needed);

- spill cleanups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination;

- waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;

- details of tree plantings and other mitigations required undertaken this month;

o compliance:

- compliance status for conditions of all relevant consents/permits, for the Work, including quarries, etc.): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;

- compliance status of ESMP/CESMP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance, status of all non-conformances identified during audits and inspections that are identified by non-compliance notices.

o other unresolved issues from previous months related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc. Cross-reference other sections as needed.

512. The Contractor will have a duty to immediately and within 24 hours report to the Engineer if any serious environmental breach has occurred during construction e.g., clearing of sensitive areas, serious oil spills etc. This including serious accident cases and fatality.

513. Engineer Reporting – The Engineer will prepare two levels of environmental reports as follows:

a) Monthly Environmental Report – prepared by the NESS and submitted to the PMU. This monthly report will summarize the Contractors environmental social and health and safety performance based on the Contractors weekly checklists and the weekly site visits by the NESS.

b) Quarterly Environmental Report – prepare by the IESS and submitted to the PMU and World Bank, this report will be more detailed that the monthly monitoring reports and will include findings of the IESS site visits to the Contractors work sites and camps.

514. The Engineer will have a duty to within 24 hours report to the PMU, AIIB, NDF and World Bank if any serious environmental breach has occurred during construction e.g., clearing of sensitive areas, serious oil spills etc. This including serious accident cases and fatality.

515. PMU Reporting – The ESMU/PMU will prepare six month and annual safeguard progress report and submit to the World Bank, AIIB and NDF.

8.3.8 World Bank responsibilities

516. In regard to implementation of environmental and social safeguards requirements for the project include undertaking periodic monitoring of the ESMP / CESMP implementation and due diligence as part of an overall project review mission, and if required, providing advice to the PMU in carrying out its responsibilities to implement the ESMP for the project.

8.4 PMU CAPACITY BUILDING REQUIREMENTS

517. The PMU has experienced Safeguard Specialists with experience of oversight of these types of road rehabilitation projects. However, PMU capacity to implement and supervise implementation of mitigation measures and monitoring program that meet international best practices could be further strengthened. The engineer's International Environmental and Social Specialist tasks will include strengthening the capacity of DoR to implement and monitor environmental and social mitigation measures and monitoring as specified in the project ESIA/ESMP.

8.5 ESMP COSTS

518. Most costs associated with the environmental recommendations of the ESMP are a normal part of preparing the bid and contract documents and ensuring that proper environmental provisions are incorporated therein. The installation of septic systems at construction camps, for example, is an environmental necessity, but not generally considered an "environmental cost". Table 71 lists the proposed mitigation measures and indicates where they would be "included in the project budget" as part of a bid document and where additional costs are a likely "environmental cost" beyond what would normally be included in a project budget.

Table 71: ESMP Mitigation Costs

Activity	Item	Number of Units / Unit cost	Cost estimate / US$	Responsibility
Pre-construction				
CESMP	CESMP and associated plans	Included in Project Budget	-	Contractor
Approval of Camp locations	Approval	Included in Project Budget	-	PMU / Engineer
Incorporation of Environmental Items into Bid Documents	Item in Bid Document	Included in Project Budget	-	PMU
Obtain permits	Permits	Included in Project Budget	-	Contractor
Construction				
Standard site management Additional environmental measures	Septic Tanks	Included in Project Construction costs	-	Contractor
	Spill Kits	10 / US$200	$2,000	Contractor
	Bunds for fuel and oil storage	Included in Project Construction costs	-	Contractor
	Waste containers	Included in Project Construction costs	-	Contractor
	Waste Storage areas	Included in Project Construction costs	-	Contractor
	Waste collection and disposal	Included in Project Construction costs	-	Contractor
	Storage areas for hazardous materials	Included in Project Construction costs	-	Contractor
	Sprinklers for rock crushing plant	Included in Project Construction costs	-	Contractor
	Drainage (including oil and grease interceptors)	Included in Project Construction costs	-	Contractor
	Vehicle washing bay	Included in Project Construction costs	-	Contractor
	Fire safety	Included in Project Construction costs	-	Contractor
	PPE	Included in Project Construction costs	-	Contractor

Activity	Item	Number of Units / Unit cost	Cost estimate / US$	Responsibility
	Impervious hardstanding (for maintenance yards, bitumen storage, etc)	Included in Project Construction costs	-	Contractor
	First aid facilities	Included in Project Construction costs	-	Contractor
	Protective barriers at school entrances	$1,000	$1,000	Contractor
	Water bowsers	Included in Project Construction costs	-	Contractor
	Water sprinklers (rock crushing plant)	Included in Project Construction costs	-	Contractor
	Dust control measures (rock crushing and batching plants)	Included in Project Construction costs	-	Contractor
	Tarpaulins	Included in Project Construction costs	-	Contractor
Tree / Vegetation maintenance	Tree /Vegetation maintenance (including labour and water)	Included in Project Budget for OPBRC road maintenance period		Contractor
Embankment vegetation and soil erosion measures	Vegetation, labour and maintenance	Included in Project Budget	-	Contractor
Training & Awareness Programs	Safety Training	Included in Project Budget	-	Contractor
	HIV/AIDS Training	4 / US$1,000	$4,000	Independent Contractor
	Toolbox Training	Included in Project Budget	-	Contractor
	Construction orientation meetings	Included in Project Budget	-	Contractor
	Periodic meetings with stakeholders	Included in Project Budget	-	Contractor
Clean-up of construction sites.	Labor, waste disposal	Included in Project Budget	-	Contractor
Environmental Staff	ESM OSHM	10 / US$ 2,000 18 / US$ 2,000	$20,000 $36,000	Contractor Contractor

Activity	Item	Number of Units / Unit cost	Cost estimate / US$	Responsibility
	CLO	18 / US$ 2,000	$36,000	Contractor
	IESS	2 / US$ 12,000	$24,000	Engineer
	NESS NOHSS RSS	10 / US$ 2,000 18 / US$ 2,000 10 / US$ 2,000	$20,000 $36,000 $20,000	Engineer Engineer Engineer
Total			$**199,000**	

Table 72: ESMP Instrumental Monitoring Costs

Activity / Item	Frequency	Unit Cost / USD	Total Cost / USD	Responsibility	Source: WB	Source: GoL
1. Air Quality Monitoring	Once every six months at locations specified by the Engineer (maximum three sites)	1,550 per site	13,950	Engineer	X	
2. Noise Monitoring	Once every six months at locations specified by the Engineer (maximum three sites)	800 per site	7,200	Engineer	X	
3. Soil Sampling	Once at four gas stations	1,550 per site	6,200	Engineer	X	
Total			**27,350**			

8.6 ESMP IMPLEMENTATION SUMMARY

519. The following Table summarizes the various institutional responsibilities for the implementation of the environmental management plan at various stages of the Project.

Table 73: ESMP Implementation

Project Stage	Responsible Institution	Responsibilities
Concept Design	Concept Designers	• Incorporate ESMP mitigation measures into concept design.
Detailed Design	PMU with the Contractor, ISWS and ESIA Team.	• Incorporate ESMP mitigation measures into final design.
	PMU	• Ensure ESMP is incorporated into the works Contracts.
	PMU	• Review Contractors proposals to ensure that they are aware of the ESMP requirements and that line items for environmental management as per the ESMP are included in the BOQ.
Pre-construction	Contractor	• Prepare CESMP • Obtain all necessary environmental and social related permits for construction.
	World Bank	• Review CESMP and provide comments, if requested
	PMU	• Review CESMP based on recommendation from the Engineer
	ISWS Engineer	• Review CESMP and provide recommendations
	Contractor and Engineer	• Site Induction
Construction	Contractor (through its ESM)	• Daily monitoring of environmental and social issues. • Preparation of weekly environmental and social checklists. • Preparation of monthly and quarterly environmental and social reports. • Preparation of the dedicated environmental and social monitoring report (annually). • Preparing Corrective action plans. • Reporting accidents to the ISWS
	PMU	• Routine site visits to monitor Contractors environmental and social performance.
	ISWS Engineer	• Weekly monitoring of the Contractors compliance with ESMP / CESMP by the NESS. • Issuing the Contractor with Non-compliance Notices.

		• Monthly reporting to PMU of Contractors performance based on the review of Contractors weekly checklists and weekly site visits. • Quarterly Environmental and Social Reports prepared by the IESS and submitted to PMU/PTI and World Bank. • Implement instrumental monitoring per Appendix A. • Instrumental Environmental monitoring. • Reporting accidents to the PMU

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

520. The Project comprises the upgrading of approximately 6km of urban road. The impacts associated with the Project relate almost exclusively to humans during the construction phase, e.g., elevated noise levels, generation of dust, community health and safety, access, etc. Most of these issues are generic to any urban transport rehabilitation project and can be adequately managed through implementation of the mitigation measures provided in this ESIA and its associated ESMP. Some impacts will require additional consideration and monitoring especially those relating to excavated soils around gas stations.

521. Some potential impacts identified will also occur during the operational phase of the project, particularly relating to community health and safety and community infrastructure. The ESIA has identifies specific issues, such as pedestrian crossing and bus bay locations, which need to be further discussed with stakeholders during the design phase to ensure that they are in suitable locations.

522. Additional design recommendations relate to flooding which has been identified by stakeholders as a specific issue along the project road. The detailed design must be coordinated with VUDA to ensure that the road drainage network and the local drainage network function together to ensure that all road run-off drains away from the road without flooding nearby land and properties.

523. All the proposed Project mitigation and management measures, including those key items summarized above, have been included within the Project ESMP provided in Section 8.

9.2 RECOMMENDATIONS

524. The ESIA and its ESMP will be implemented in three phases:

A. Design Phase - The design phase mitigation measures shall be discussed with the Concept Design team to ensure that all the required actions and design measures included in the ESMP are accounted for. The Contractor will also ensure that all of the measures are included in the final detailed designs. Design documents will be reviewed and approved by the Engineer and DoR to determine their compliance with the ESMP.

B. Pre-construction Phase - The ESMP, its mitigation and monitoring programs will be included within the bid documents for project works for all Project components. The bid documents will state that the Contractor will be responsible for the implementation of the requirements of the ESMP through his own CESMP which will adopt all the conditions of the ESMP and add site specific elements that are not currently known, such as the Contractors final borrow pit locations, construction camp locations, etc. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs which can be budgeted for in their financial proposal. The ESMP and all its requirements will then be added to the Contractors Contract, thereby making implementation of the ESMP a legal requirement according to the Contract. He will then prepare his CESMP which will be approved and monitored by the Engineer.

C. Construction Phase - To ensure compliance with the CESMP the Contractor should employ an Environmental and Social Manager to monitor and report Project activities throughout the Project Construction phase. Should the Engineer note any non-conformance with the CESMP (and the ESMP) the Contractor can be held liable for breach of the contractual obligations of the ESMP.

Addendum to the Environmental and Social Impact Assessment (ESIA) and the Resettlement Action Planning (RAP) for Improvement of Sikeut-Sihhai Section (KM6 to KM12) of NR-13N

Environmental and Social Impact Assessment Appendices

Prepared by

ລາວ ຄອນຊາວຕິ້ງກຼຸບ ຈຳກັດ
LAO CONSULTING GROUP

innogreen
Innovations for a Greener Development

25 August 2022

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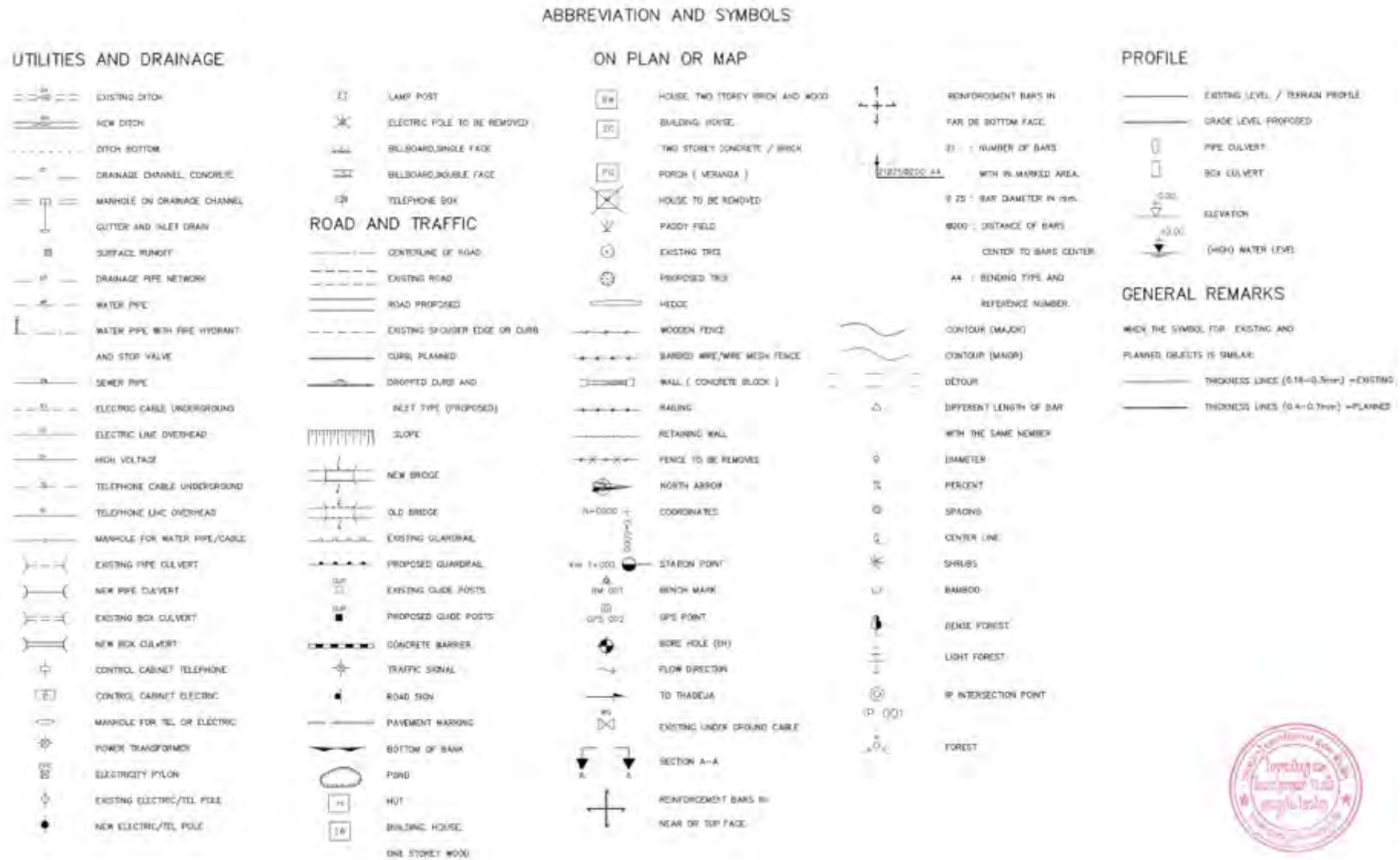
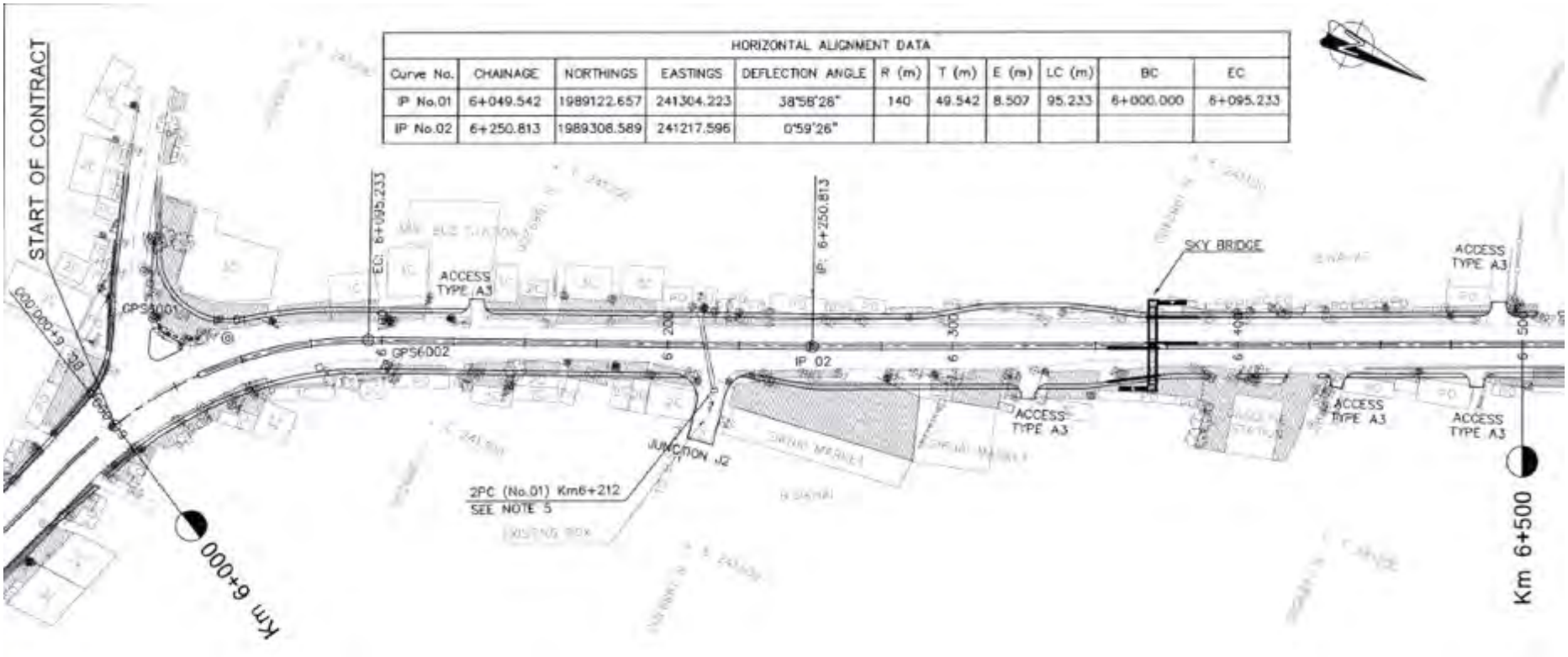
APPENDIX A – INTERNATIONAL AGREEMENTS

Year	Convention	Focal Points	Remarks and Status in Lao PDR
1985	ASEAN Agreement on the Conservation of Nature and Natural Resources	MAF, ASEAN	Lao PDR became a full member of the 'Association of Southeast Asian Nations' (ASEAN) in 1997. The government has been engaged in implementing the 'Hanoi Action Plan' and its environmental strategic plan and is considering a number of agreements with significant influences on the national development and environmental protection.
1987	Protection of the World Cultural and Natural Heritage	MIC	The Government accepted accession to the 'Convention for the Protection of the World Cultural and Natural Heritage' on 20 March 1987 and is taking the legal, scientific, technical, administrative and financial measures necessary for identification, protection, conservation, and rehabilitation of designated heritage sites in the country. Luang Prabang town was designated as the first site and others are being proposed.
1995	Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin	LNMC	The Government signed the 'Agreement on the Cooperation for Sustainable Development of Mekong River Basin' together with other members of the Mekong River Commission on 5 April 1995 and is implementing the 'Mekong River Programs'.
1995	United Nations Convention to Combat Desertification (CCD)	STEA	The Government has been a signatory of the 'United Nations Convention to Combat Desertification' (CCD) since 30 August 1995 and accepted accession to the Convention on 20 September 1996. The Government adopted the 'National Action Plan' (NAP) to combat desertification in 1999 and is revising it.
1995	United Nations Framework Convention for Climate Change (UNFCCC)	STEA	The Government has accepted accession to the 'United Nations Framework Convention on Climate Change' (UNFCC) on 4 April 1995. The first 'National Communication' was issued in 2000.
1996	Convention on Biological Diversity (CBD)	STEA	The Government has accepted accession to the 'Convention on Biological Diversity' (CBD) on 20 September 1996 and has finalized its 'National Biodiversity Strategy and Action Plan' (NBSAP) for conservation and sustainable use of the nation's biodiversity in 2004. In 2004, the Government signed the convention.
1998	Montreal Protocol	STEA	The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in September 1987. The Protocol was adjusted to accelerate the phase out schedules, and has also been amended to introduce other kinds of control measures and to add new controlled substances to the list. Governments are not legally bound until they ratify the Protocol as well as the Amendment. Lao PDR has ratified the Protocol, but not yet the amendment.
1998	Vienna Convention on the Protocol of the Ozone Layer	STEA	The Government accepted accession to the 'Vienna Convention for the protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer' on 21 August 1998 and has finalized the 'National Action Plan' to deal with this issue in the beginning of 2004.
2000	Millennium Declaration	MOFA	In September 2000, Lao PDR adopted the Millennium Declaration. The Declaration includes the Millennium Development Goals (MDG), a set of development goals related to peace, security and development concerns, including environment, human rights, and governance. The MDG incorporate most of the goals and targets set at the global conferences and world summits of the 1990s.
2004	Convention on International Trade in Endangered Species of Flora and Fauna (CITES)	MAF and STEA	Lao PDR has sign the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in May 2004. CITES entered into force in July 1975 and now has more than 115 member countries. These countries act by banning commercial international trade in an agreed list of endangered species and by regulating and monitoring trade in others that might become endangered.
-	Stockholm Convention on Persistent Organic Pollutants	STEA	Signed but not yet ratified.
-	Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention)	MAF	Under preparation.

APPENDIX B – DESIGN PLANS


ABBREVIATION AND SYMBOLS
UTILITIES AND DRAINAGE
EXISTING DITCH
NEW DITCH
DITCH BOTTOM
DRAINAGE CHANNEL, CONCRETE
MANHOLE ON DRAINAGE CHANNEL
GUTTER AND INLET DRAIN
SURFACE RUNOFF
DRAINAGE PIPE NETWORK
WATER PIPE
WATER PIPE WITH PIPE HYDRANT
AND STOP VALVE
SEWER PIPE
ELECTRIC CABLE UNDERGROUND
ELECTRIC LINE OVERHEAD
HIGH VOLTAGE
TELEPHONE CABLE UNDERGROUND
TELEPHONE LINE OVERHEAD
MANHOLE FOR WATER PIPE/CABLE
EXISTING PIPE CULVERT
NEW PIPE CULVERT
EXISTING BOX CULVERT
NEW BOX CULVERT
CONTROL CABINET TELEPHONE
CONTROL CABINET ELECTRIC
MANHOLE FOR TEL OR ELECTRIC
POWER TRANSFORMER
ELECTRICITY PYLON
EXISTING ELECTRIC/TEL POLE
NEW ELECTRIC/TEL POLE
LAMP POST
ELECTRIC POLE TO BE REMOVED
BILLBOARD,SINGLE FACE
BILLBOARD,DOUBLE FACE
TELEPHONE BOX
ROAD AND TRAFFIC
CENTERLINE OF ROAD
EXISTING ROAD
ROAD PROPOSED
EXISTING SHOULDER EDGE OR CURB
CURB, PLANNED
DROPPED CURB AND
INLET TYPE (PROPOSED)
SLOPE
NEW BRIDGE
OLD BRIDGE
EXISTING GUARDRAIL
PROPOSED GUARDRAIL
EXISTING GUIDE POSTS
PROPOSED GUIDE POSTS
CONCRETE BARRIER
TRAFFIC SIGNAL
ROAD SIGN
PAVEMENT MARKING
BOTTOM OF BANK
POND
HUT
BUILDING, HOUSE
ONE STOREY WOOD
ON PLAN OR MAP
HOUSE, TWO STOREY BRICK AND WOOD
BUILDING, HOUSE
TWO STOREY CONCRETE / BRICK
PORCH (VERANDA)
HOUSE TO BE REMOVED
PADDY FIELD
EXISTING TREE
PROPOSED TREE
HEDGE
WOODEN FENCE
BARBED WIRE/WIRE MESH FENCE
WALL (CONCRETE BLOCK)
RAILING
RETAINING WALL
FENCE TO BE REMOVED
NORTH ARROW
COORDINATES
STATION POINT
BENCH MARK
GPS POINT
BORE HOLE (BH)
FLOW DIRECTION
TO THADEUA
EXISTING UNDER GROUND CABLE
SECTION A–A
REINFORCEMENT BARS IN
NEAR OR TOP FACE
REINFORCEMENT BARS IN
FAR OR BOTTOM FACE
: NUMBER OF BARS
WITH IN MARKED AREA
: BAR DIAMETER IN mm.
: DISTANCE OF BARS
CENTER TO BARS CENTER
: BENDING TYPE AND
REFERENCE NUMBER
CONTOUR (MAJOR)
CONTOUR (MINOR)
DETOUR
DIFFERENT LENGTH OF BAR
WITH THE SAME NUMBER
DIAMETER
PERCENT
SPACING
CENTER LINE
SHRUBS
BAMBOO
DENSE FOREST
LIGHT FOREST
IP INTERSECTION POINT
FOREST
PROFILE
EXISTING LEVEL / TERRAIN PROFILE
GRADE LEVEL PROPOSED
PIPE CULVERT
BOX CULVERT
ELEVATION
(HIGH) WATER LEVEL
GENERAL REMARKS
WHEN THE SYMBOL FOR EXISTING AND
PLANNED OBJECTS IS SIMILAR:
THICKNESS LINES (0.15–0.3mm) =EXISTING
THICKNESS LINES (0.4–0.7mm) =PLANNED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IP No.02 | 6+250.813 | 1989308.589 | 241217.596 | 0°59'26"
START OF CONTRACT
EC: 6+095.233
IP: 6+250.813
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GPS-001
GPS-002
IP 02
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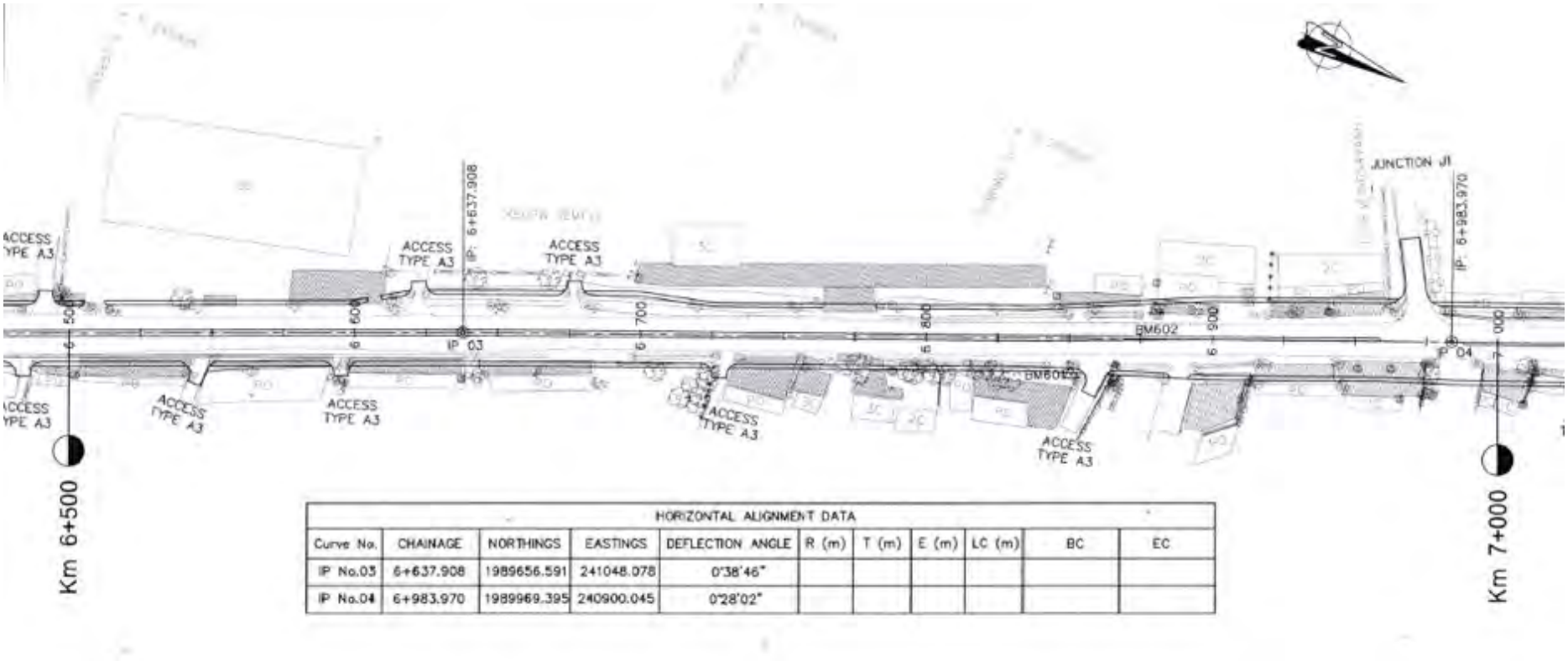
2PC (No.01) Km6+212
SEE NOTE 5
Km 6+000
Km 6+500



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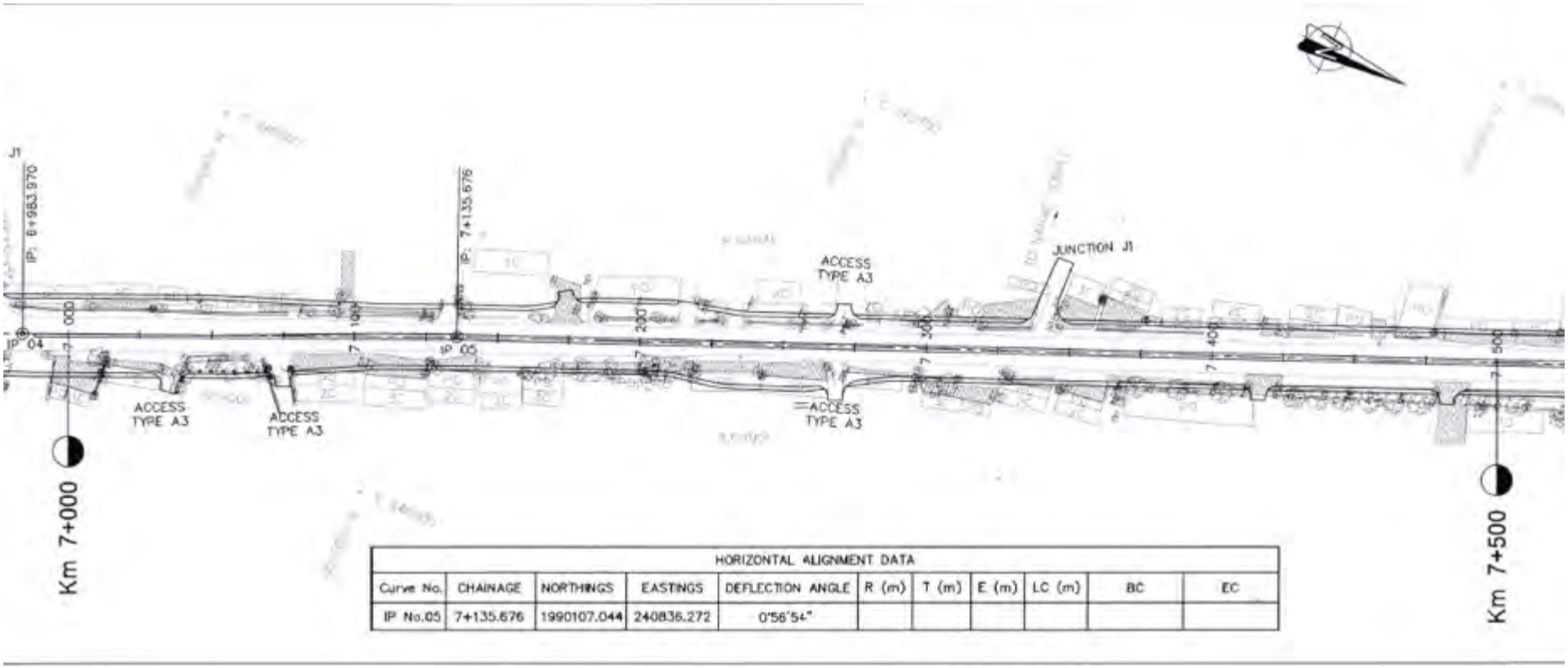

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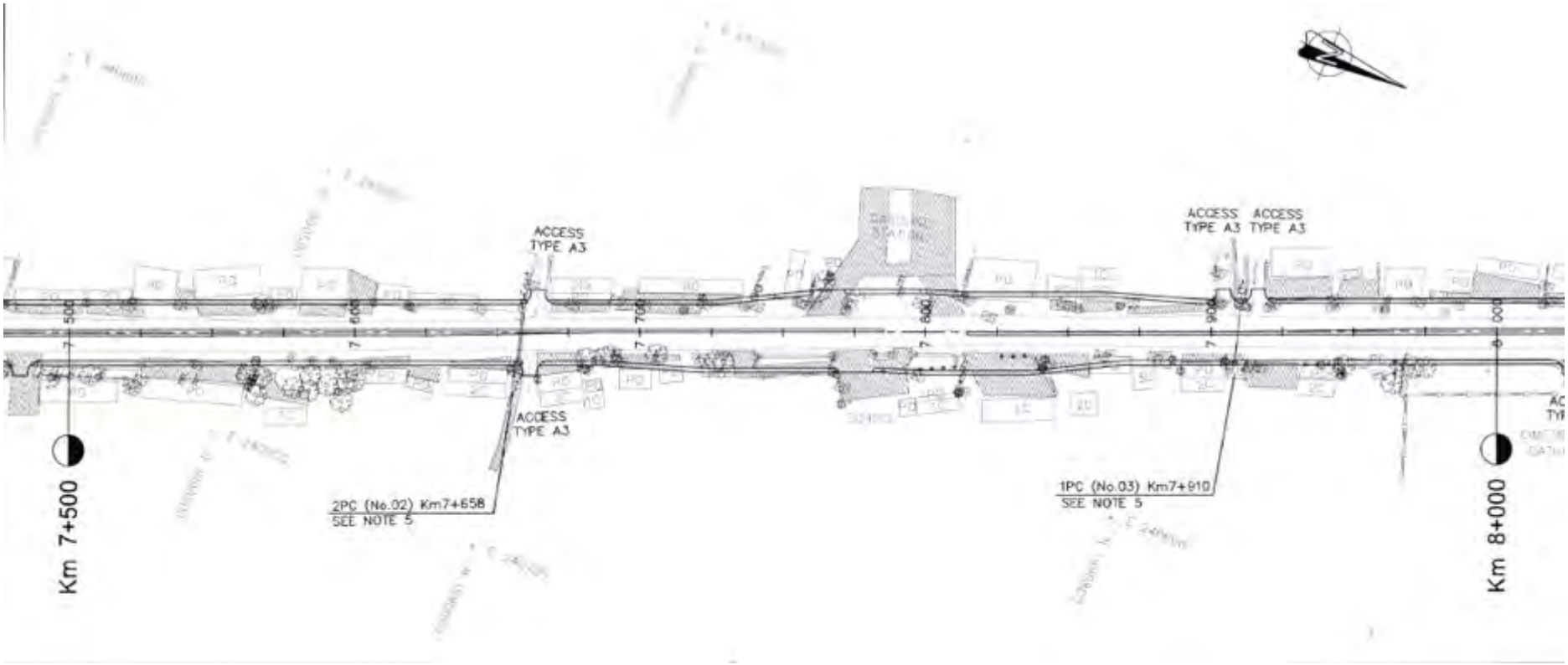
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TYPE A3
ACCESS
TYPE A3
ACCESS
TYPE A3
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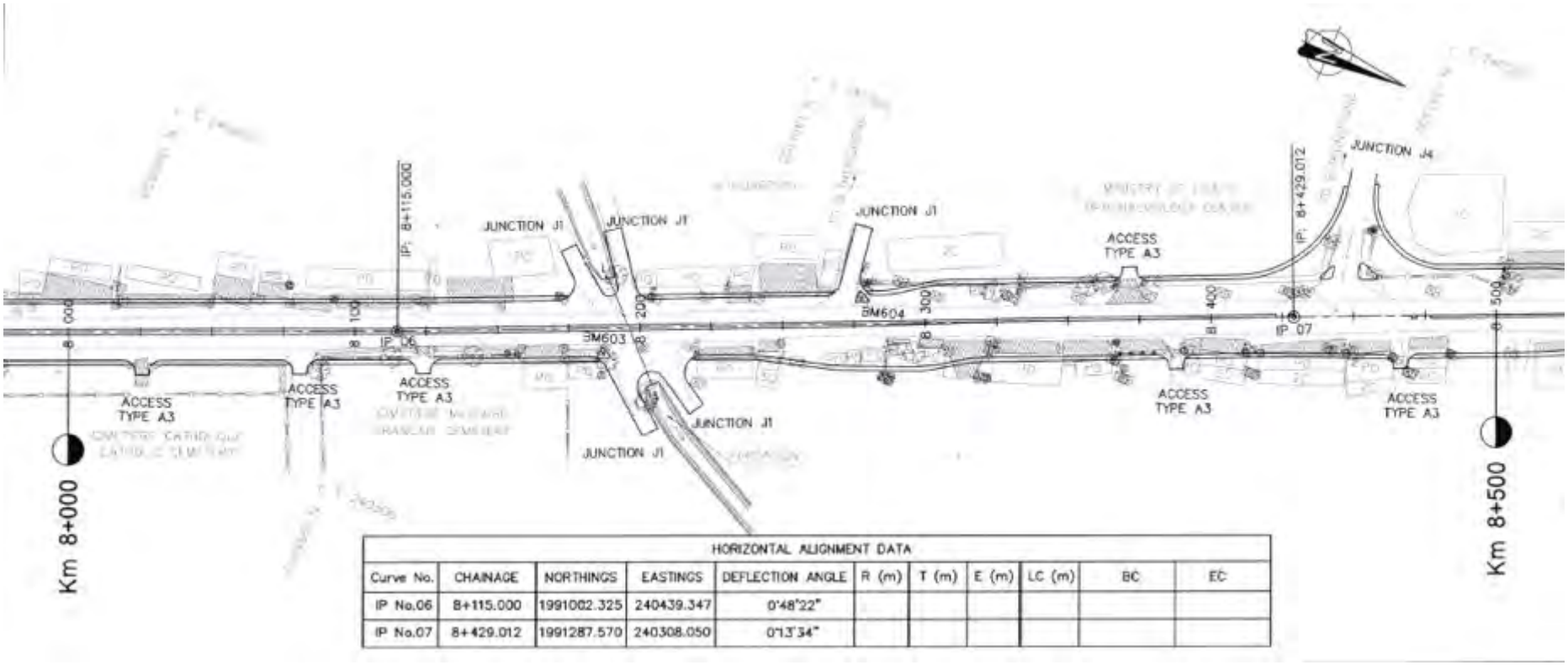
SEE NOTE 5
1PC (No.03) Km7+910
SEE NOTE 5
Km 7+500
Km 8+000



HORIZONTAL ALIGNMENT DATA

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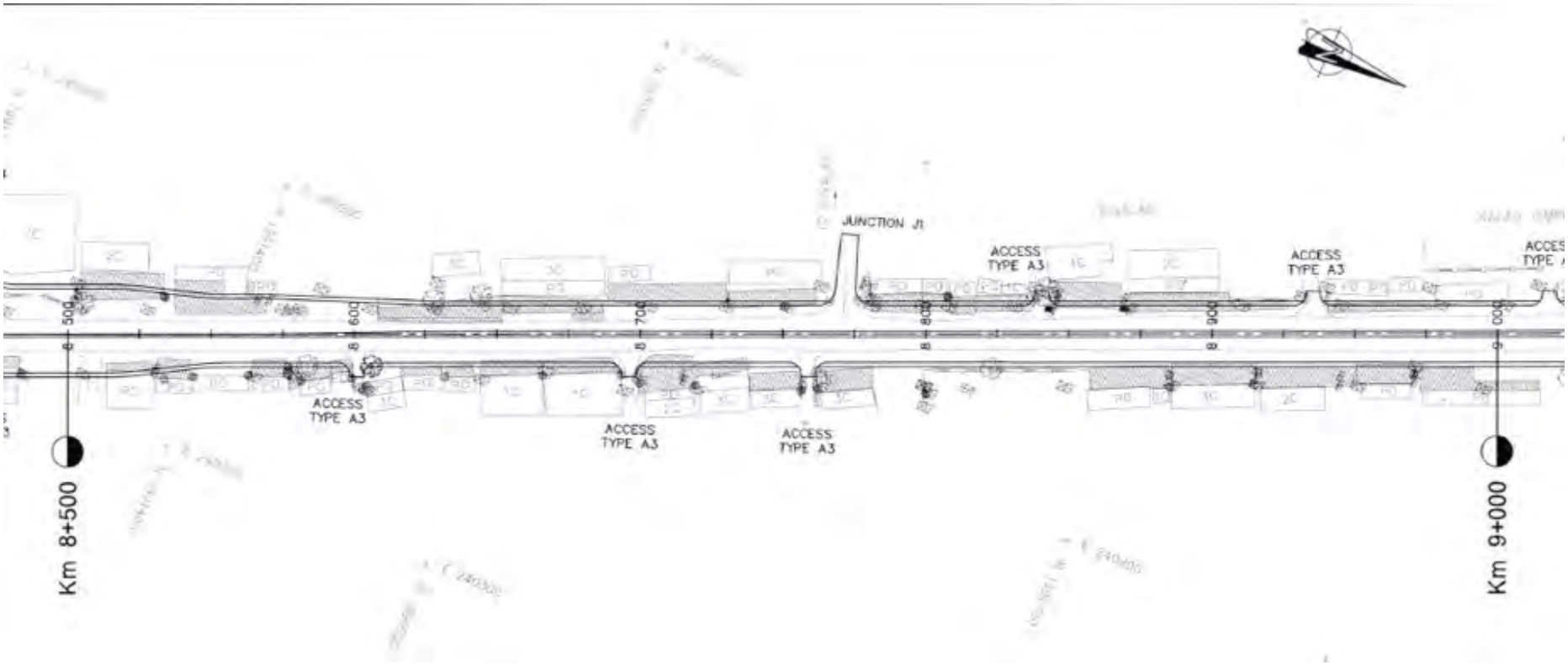
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ACCESS TYPE A3
ACCESS TYPE A3
ACCESS TYPE A3
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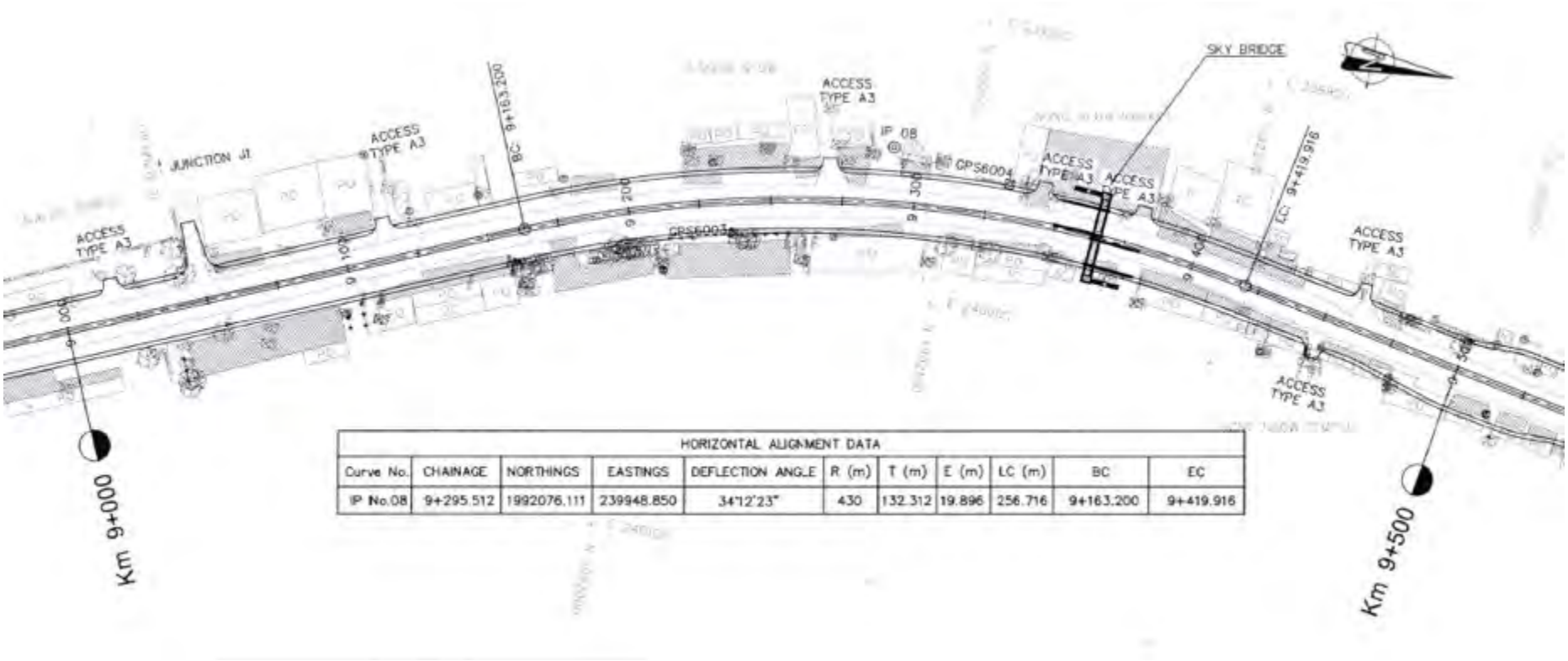
600
700
800
900
000
Km 8+500
Km 9+000



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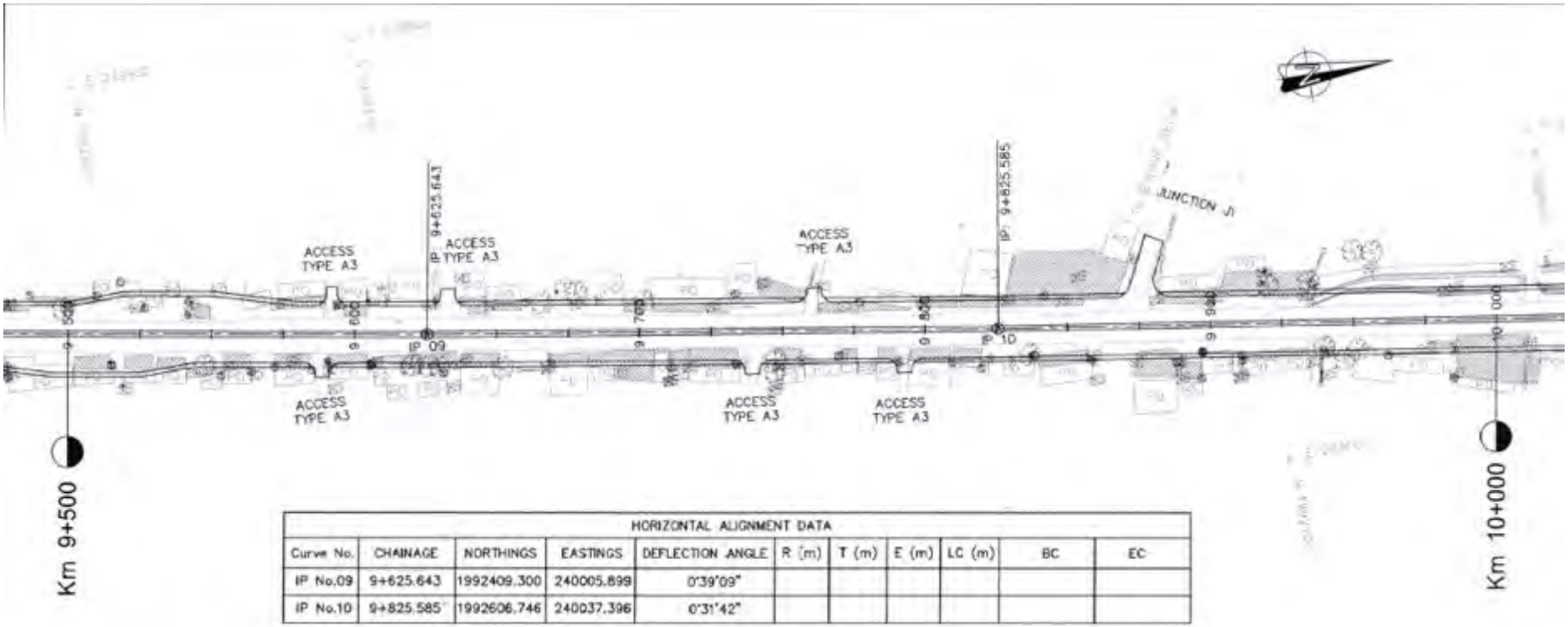

HORIZONTAL ALIGNMENT DATA									
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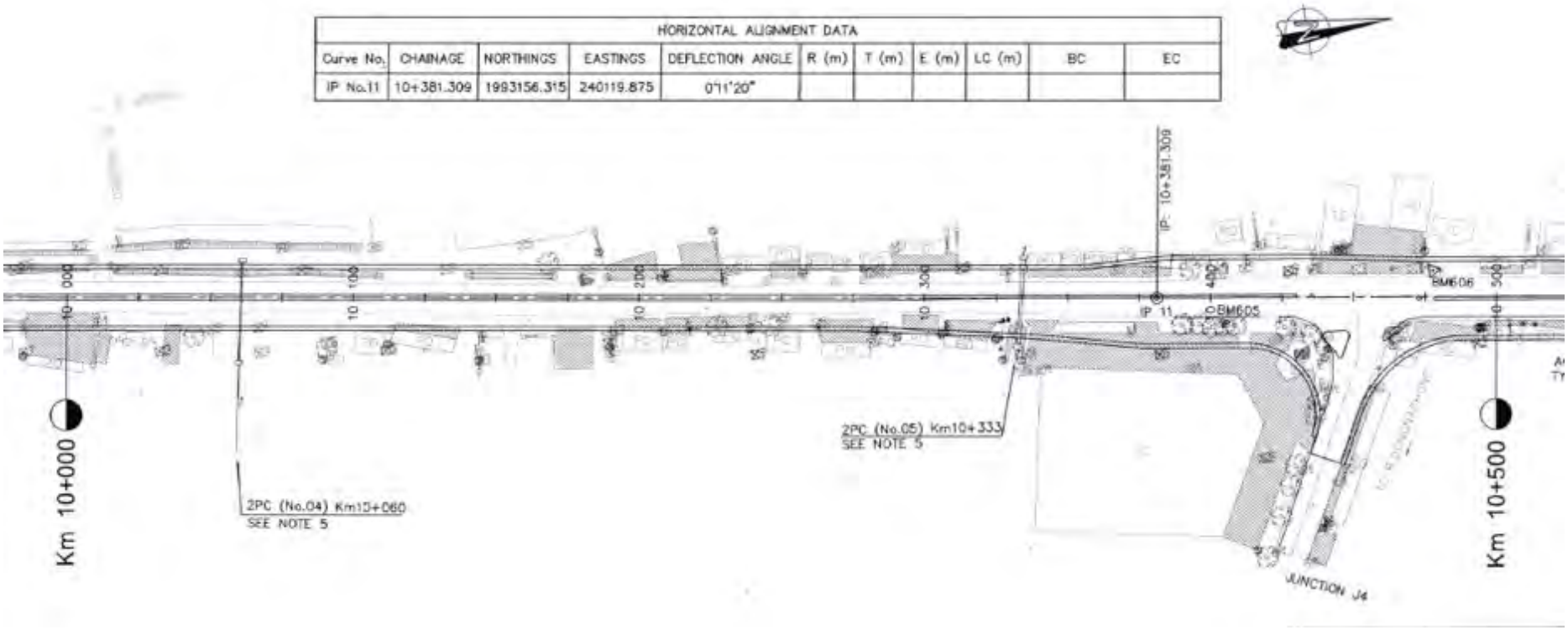
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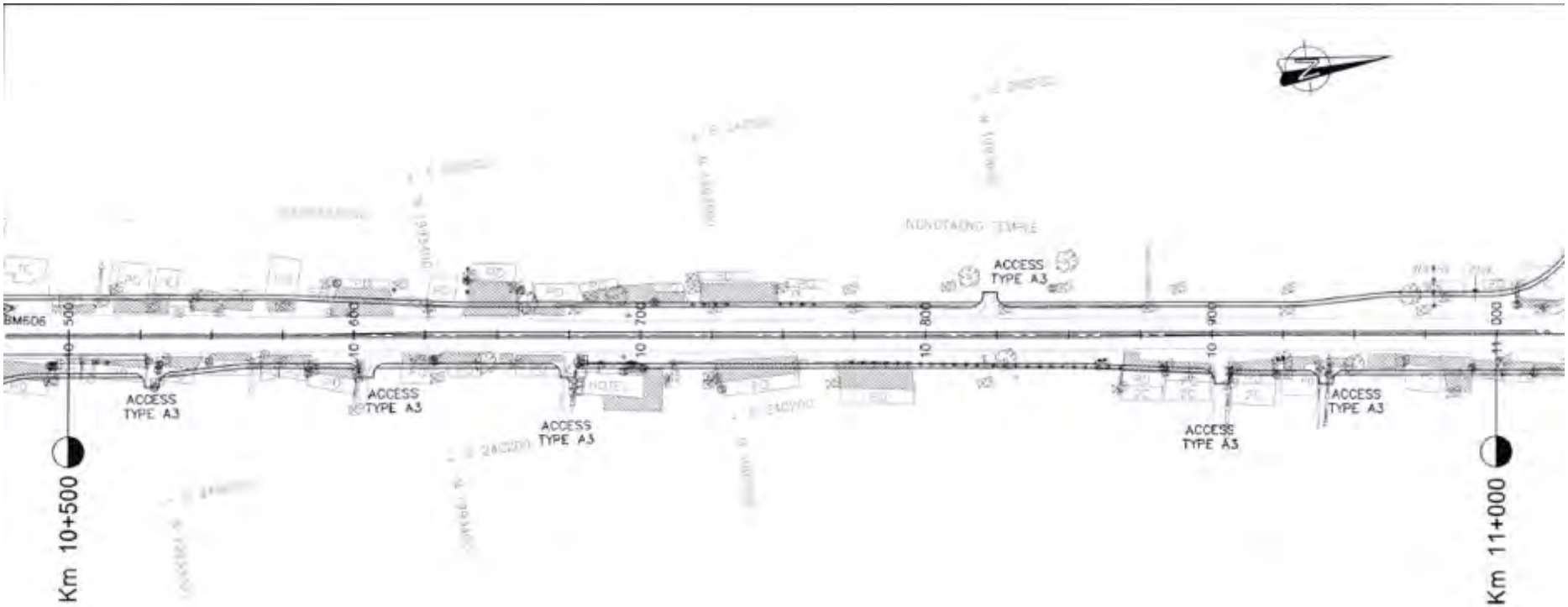
IP: 10+381.309
IP 11
BM605
BM606
2PC (No.05) Km10+333
SEE NOTE 5
2PC (No.04) Km10+060
SEE NOTE 5
Km 10+000
Km 10+500
JUNCTION J4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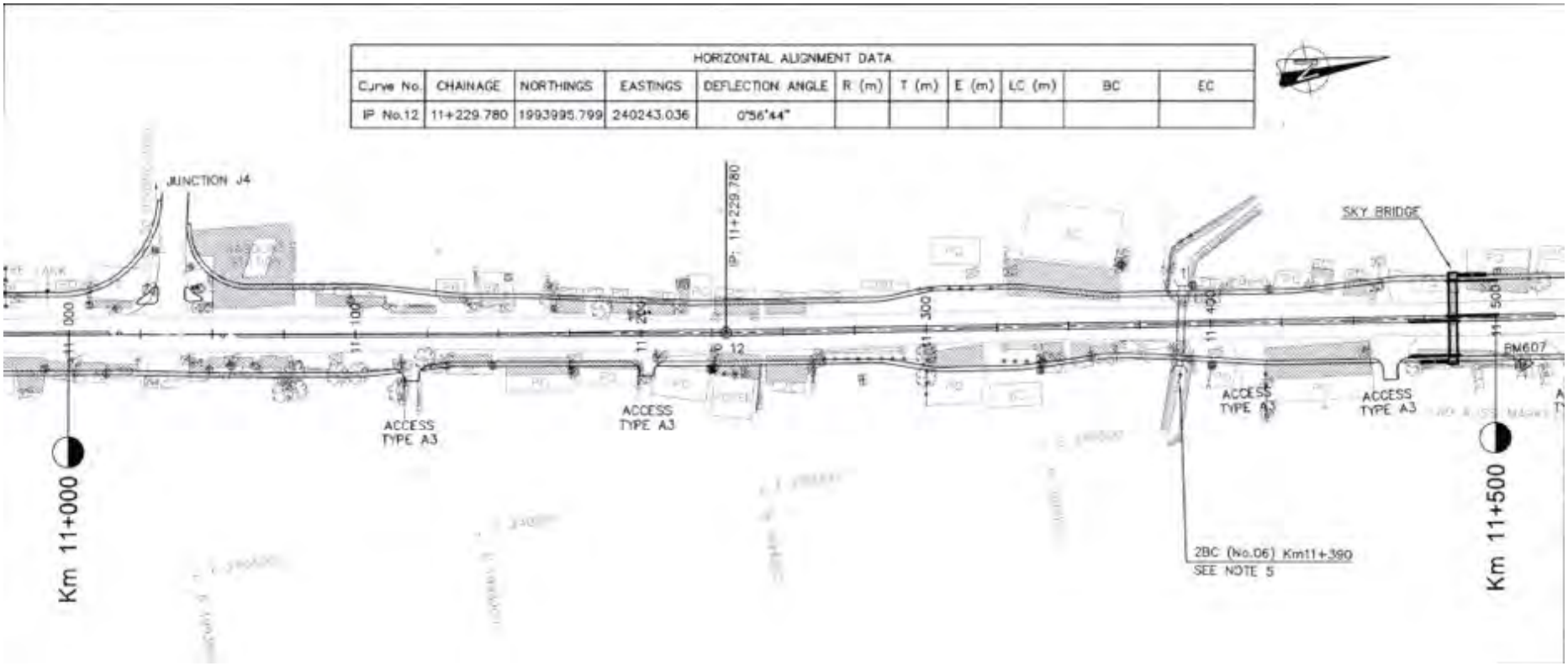
ACCESS TYPE A3
ACCESS TYPE A3
ACCESS TYPE A3
ACCESS TYPE A3
ACCESS TYPE A3
Km 10+500
Km 11+000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JUNCTION J4
IP: 11+229.780
IP 12
SKY BRIDGE
ACCESS TYPE A3
ACCESS TYPE A3
ACCESS TYPE A3
ACCESS TYPE A3
BM607
Km 11+000
Km 11+500
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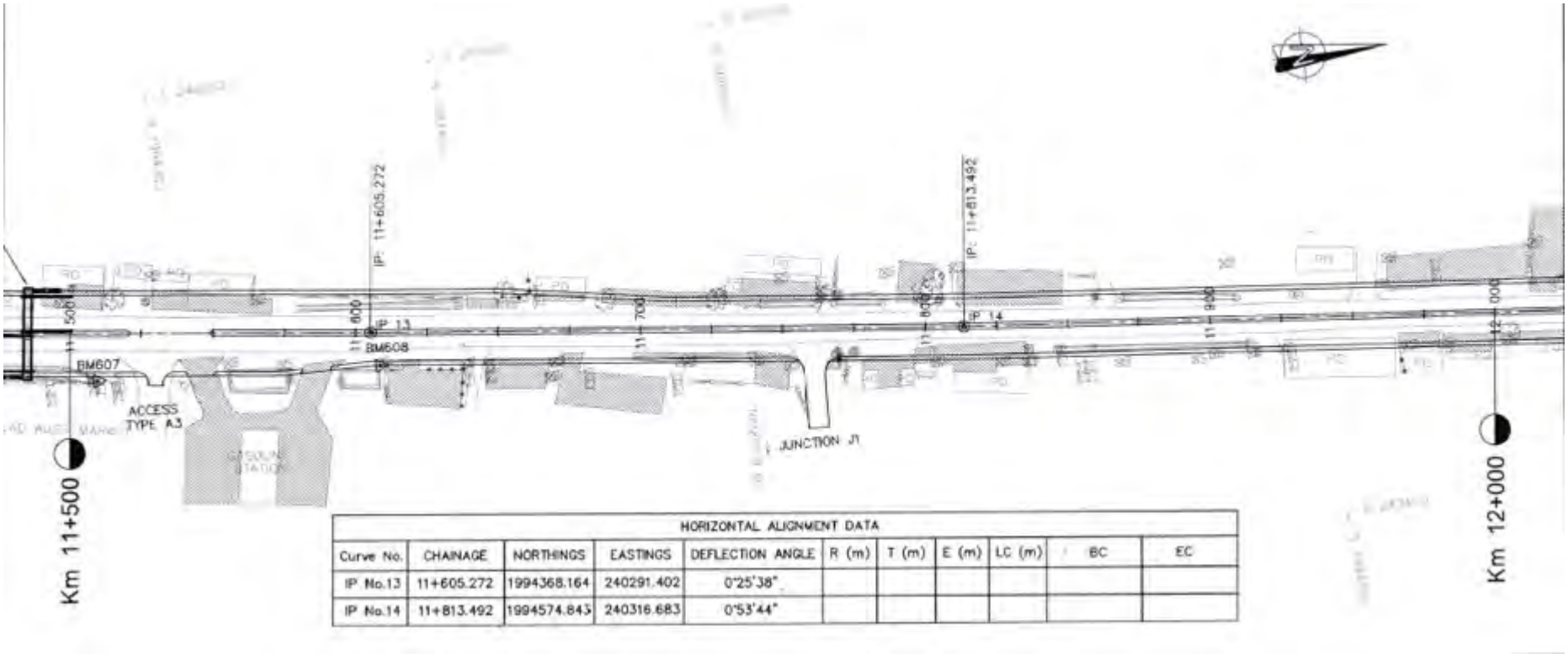
SEE NOTE 5



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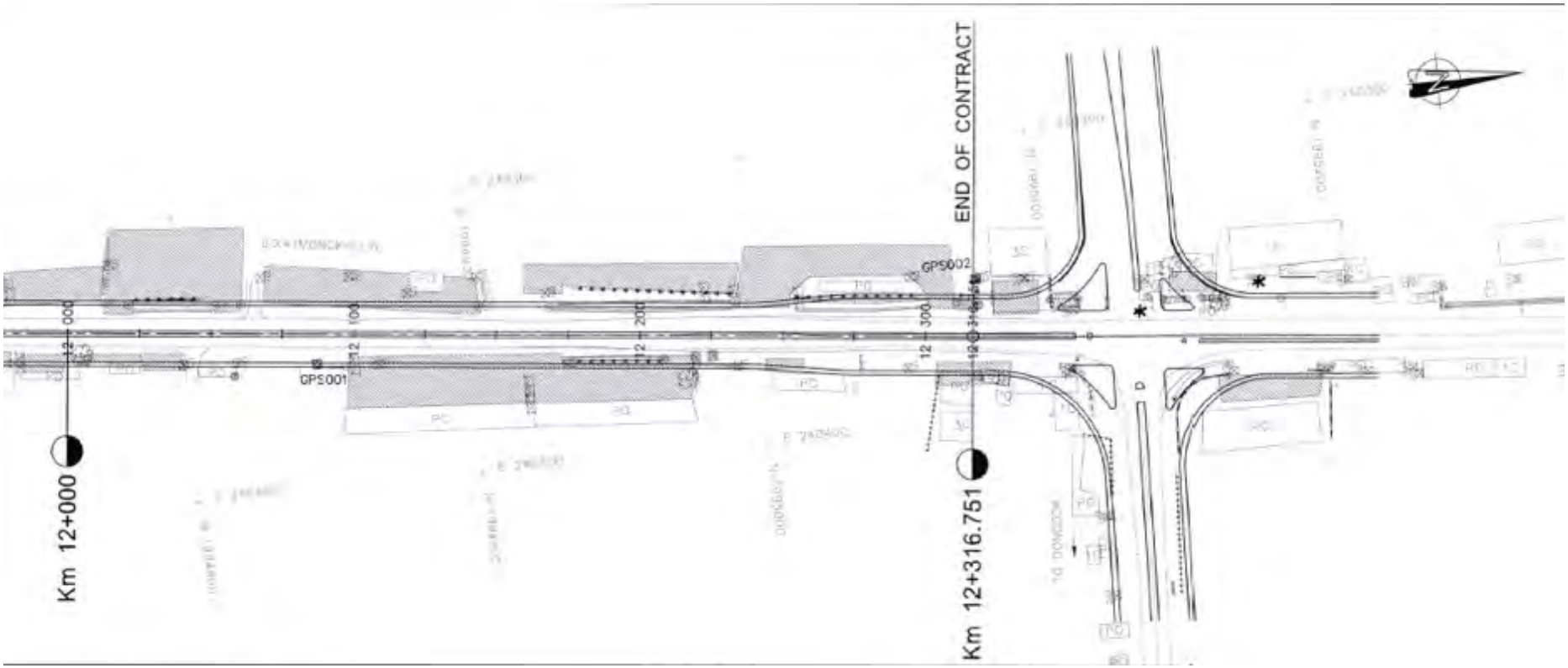

END OF CONTRACT
GPS002
GPS001
Km 12+000
Km 12+316.751

APPENDIX C – CULVERTS

Box Culvert

No.	Station (km)	$Q_{2\%}$ (m^3/s)	$V_{ass.}$ (m/s)	$A_{req.}$ (m^2)	Extension of existing box culvert				FS	Control depth h (m)		$V_{down\ chan.}$ (m/s)	Assessment/ Comments
					n	b (m)	h (m)	$A_{act.}$ (m^2)		Inlet	Outlet		
1	11+390	10.91	2.5	3.46	2	2.00	1.50	5.20	1.19	1.43	1.46	2.04	sufficient

Pipe Culverts

No.	Station (km)	$Q_{4\%}$ (m^3/s)	$V_{ass.}$ (m/s)	$A_{req.}$ (m^2)	New pipe culverts			FS	Control depth h (m)		$V_{down\ chan.}$ (m/s)	Assessment / Comments
					n	d (m)	$A_{act.}$ (m^2)		Inlet	Outlet		
1	6+212	1.96	2.20	0.89	2	1.00	1.57	1.77	0.85	0.90	1.28	Sufficient
2	7+658	2.34	2.20	1.07	2	1.00	1.57	1.47	0.95	0.84	1.68	Sufficient
3	7+910	1.62	2.20	0.74	1	1.20	1.13	1.53	1.05	0.93	1.68	Sufficient
4	10+060	2.22	2.20	1.01	2	1.00	1.57	1.56	0.92	0.72	1.65	Sufficient
5	10+333	2.13	2.20	0.97	2	1.00	1.57	1.63	0.81	0.66	1.28	Sufficient

APPENDIX D – INSTRUMENTAL SURVEYS

Air Quality Monitoring Locations and Procedures

1	Sample ID	AQ01		Location	
2	Date	11-12/11/2021		Village	Phosy
3	Time	09:00		District	Sykhodtabong
4	Coordinate	X	240990	Province	Vientiane Capital
		Y	1989703		

Photo Sampling Survey



Water Survey Location Map

Recorded By

Name: Xonlatha

Date: 12/11/2021

1	Sample ID	**AQ02**		Location	
2	Date	12-13/11/2021		Village	Nalao
3	Time	09:30		District	Sykhodtabong
4	Coordinate	X	240013	Province	Vientiane Capital
		Y	1991796		

Photo Sampling Survey

Water Survey Location Map

Recorded By

Name: Xonlatha

Date: 13/11/2021

1	Sample ID	AQ03		Location	
2	Date	13-14/11/2021		Village	Xaimoungkhoun
3	Time	10:30		District	Naxaiythong
4	Coordinate	X	240298	Province	Vientiane Capital
		Y	1994545		

Photo Sampling Survey

Water Survey Location Map

Recorded By

Name: Xonlatha

Date: 14/11/2021

Noise Monitoring Locations and Procedures

NQ01

Receptor

Geographic Coordinations

Coordination System WGS 1984 – UTM 48N

Coordinate [m]	X	Y
	240990	1989703

Measurement Description

Reference Time

Date 11-12/11/2021

Time 24 hours

Instrumentation

Noise Measure Instrument: ST-107S Class 2 Integrating Sound Level Meter

Noise Pressure Level [dBA]

Date	Time	Leq	Lamax	Lamin	LA05	LA10	LA90	LA95
11/11/2021	09:00	54.8	57.8	50.1	57.1	56.6	52.7	51.5
11/11/2021	10:00	61.5	71.5	51.1	63.3	56.5	52.3	51.7
11/11/2021	11:00	53.1	54.6	50.8	54.5	54.4	51.7	51.3
11/11/2021	12:00	53.3	54.9	51.5	54.7	54.5	51.7	51.6
11/11/2021	13:00	54.7	59	52	58	57.1	52.1	52.1
11/11/2021	14:00	52.9	54.5	50.1	54.2	54	51.1	50.6
11/11/2021	15:00	52.3	53.8	50.6	53.6	53.4	50.8	50.7
11/11/2021	16:00	53	54.5	49.9	54.4	54.3	50.6	50.3
11/11/2021	17:00	57.4	65.7	51	60.4	56	52.7	51.9
11/11/2021	18:00	55.1	58.1	53	57.4	56.8	53.4	53.2
11/11/2021	19:00	55	58.1	53.1	57.2	56.5	53.1	53.1
11/11/2021	20:00	56.8	63.3	52.1	60.1	57.3	53.4	52.8
11/11/2021	21:00	54.8	57.6	51.9	57.5	57.4	52.3	52.1
11/11/2021	22:00	54	56.7	51.8	56.2	55.7	52.1	52
11/11/2021	23:00	53	54.7	51.9	54.4	54.1	52	52
12/11/2021	00:00	53.1	56.2	51.6	55.6	55	51.7	51.7
12/11/2021	01:00	52.6	54.4	51.7	53.8	53.3	51.9	51.8
12/11/2021	02:00	53.4	57.5	51.8	56.5	55.5	51.9	51.9
12/11/2021	03:00	52	52.9	51.4	52.6	52.4	51.5	51.5
12/11/2021	04:00	52.7	55.7	51.3	54.6	53.7	51.7	51.5
12/11/2021	05:00	52.9	55.3	51.2	54.9	54.4	51.8	51.5
12/11/2021	06:00	52.5	53.5	51.3	53.4	53.4	51.4	51.4
12/11/2021	07:00	56.5	61.1	52.9	60.1	59.2	53	53
12/11/2021	08:00	56.5	60.5	52.2	58.6	57	54.3	53.3
Leq 24hr		**55.00**						
StandardcLeq 24hr		**70**	**115**					

NQ02

Receptor

Geographic Coordinations

Coordination System WGS 1984 – UTM 48N

Coordinate [m]	X	Y
	240013	1991796

Measurement Description

Reference Time

Date 12-13/11/2021

Time 24 hours

Instrumentation

Noise Measure Instrument: ST-107S Class 2 Integrating Sound Level Meter

Noise Pressure Level [dBA]

Date	Time	Leq	Lamax	Lamin	LA05	LA10	LA90	LA95
12/11/2021	09:30	52.6	57.7	48.4	56.8	55.8	48.4	48.4
12/11/2021	10:30	50.8	52.7	47.7	52.3	52	48.6	48.1
12/11/2021	11:30	50.8	53.8	48.7	52.8	51.9	48.8	48.8
12/11/2021	12:30	51	53.7	48.7	53.3	52.8	49	48.8
12/11/2021	13:30	52.7	60.3	47.7	56.5	53.2	48	47.9
12/11/2021	14:30	53	59.3	48.5	56.9	54.8	48.8	48.7
12/11/2021	15:30	52	57.1	48.8	54.8	52.8	49.5	49.2
12/11/2021	16:30	54	59.6	49.9	57.1	55	50.4	50.1
12/11/2021	17:30	53.7	56.7	49.6	55.9	55.3	50.6	50.1
12/11/2021	18:30	52.2	54.8	49.5	53.8	53	50.6	50.1
12/11/2021	19:30	52.8	55.2	51.3	54.6	54.1	51.6	51.5
12/11/2021	20:30	51.9	53.6	50.4	53.2	52.8	50.6	50.5
12/11/2021	21:30	52.1	57.7	50.3	55	52.6	50.4	50.4
12/11/2021	22:30	51.3	53.8	50.2	53.5	53.1	50.3	50.3
12/11/2021	23:30	53.2	59.7	50	57.5	55.3	50	50
13/11/2021	00:30	50.6	53.7	49.7	52.2	50.9	49.8	49.8
13/11/2021	01:30	50.6	52.1	49.7	52	51.9	49.9	49.8
13/11/2021	02:30	50.9	51.9	50	51.7	51.5	50	50
13/11/2021	03:30	53.2	59.2	49.9	57.3	55.4	50.1	50
13/11/2021	04:30	52.9	59.5	49.9	56.5	53.8	50.2	50.1
13/11/2021	05:30	53.6	56.4	51.1	56.1	55.8	51.2	51.2
13/11/2021	06:30	52.3	54.5	49.3	54	53.5	50.4	49.9
13/11/2021	07:30	53.2	57.1	49.8	55.5	54	50.3	50.1
13/11/2021	08:30	52.8	56.9	49.2	55.4	54.2	49.7	49.4
Leq 24hr		**52.40**						
StandardcLeq 24hr		**70**	**115**					

NQ03

Receptor

Geographic Coordinations

Coordination System WGS 1984 – UTM 48N

Coordinate [m]	X	Y
	240298	1994545

Measurement Description

Reference Time

Date 13-14/11/2021

Time 24 hours

Instrumentation

Noise Measure Instrument: ST-107S Class 2 Integrating Sound Level Meter

Noise Pressure Level [dBA]

Date	Time	Leq	Lamax	Lamin	LA05	LA10	LA90	LA95
13/11/2021	10:30	65	69.5	59.5	68.9	68.3	60.1	59.8
13/11/2021	11:30	64.4	68.7	56.8	68.6	68.3	57.1	56.9
13/11/2021	12:30	68.4	73	59.1	72.7	72.4	61	60.1
13/11/2021	13:30	64.1	71.5	54.9	67.8	64.6	59.6	57.4
13/11/2021	14:30	66.1	73.4	56.7	70.5	68.1	59.9	58.4
13/11/2021	15:30	66	70.8	58.7	69.6	68.4	62.7	60.9
13/11/2021	16:30	66.4	73.5	56.3	70.4	67.6	59.9	58.2
13/11/2021	17:30	65	68.8	60.9	68.2	67.6	61.7	61.3
13/11/2021	18:30	64.1	70.2	54.8	68.2	66.5	57.1	56.1
13/11/2021	19:30	62.7	71.2	54.2	67.2	63.8	56.5	55.5
13/11/2021	20:30	62.9	68.2	54.4	66.8	65.7	57.1	55.9
13/11/2021	21:30	59.8	67.5	52	65.9	64	52.4	52.2
13/11/2021	22:30	61	70.5	50.5	65.4	61	51.9	51.3
13/11/2021	23:30	59.7	66.1	51.6	65.6	64.7	51.7	51.7
14/11/2021	00:30	54.1	58	50.6	57.6	57.2	51	50.8
14/11/2021	01:30	59	64.6	50.8	64.1	63.5	51.6	51.2
14/11/2021	02:30	60.1	66.4	51.2	66	65.2	52.4	51.9
14/11/2021	03:30	61.9	69.2	51.6	66.7	64.5	52.3	51.9
14/11/2021	04:30	61.5	67.4	51.6	65.8	64.4	52.6	52
14/11/2021	05:30	64.4	71	53	69.4	68	54.7	53.7
14/11/2021	06:30	68.3	76.3	59.4	72	68.4	62.5	61.1
14/11/2021	07:30	66.8	72.2	60.3	71.5	70.5	62	61.2
14/11/2021	08:30	64	66.5	55.5	66.4	66.4	59.3	57.4
14/11/2021	09:30	65	67.5	63.2	67	66.5	63.5	63.3
Leq 24hr		**64.40**						
StandardcLeq 24hr		**70**	**115**					

Water Sampling Locations and Procedures

1	Water Sampling Point	GW01			On Site Parameters /Observations	Result
2	Date	11/11/2021			pH	5.43
3	Time	12:20			DO	7.7
4	Location	Village	District	Province	Water temperature	33.3
		Na hae	Sykhodtabong	VTE Capi		
5	Coordinate	N	240944		Oder	Non
		E	1989667		Color	light
6	Environment Condition in the Sampling Point	A well that is still being used and maintained				

Photo Sampling Survey



Water Survey Location Map

Name of Sampling Equipment
PONPE 510PD pH/COND./SALT/DO METER
Recorded By
Name: Xonlatha
Date: 11/11/2021

1	Water Sampling Point	GW02			On Site Parameters /Observations	Result
2	Date	11/11/2021			pH	5.01
3	Time	11:45			DO	3.7
4	Location	Village	District	Province	Water temperature	28.2
		Nong teang	Sykhodtabong	VTE Capi		
5	Coordinate	N	240121		Oder	Non
		E	1993629		Color	light
6	Environment Condition in the Sampling Point	It is a well that has not been used for many years. There is no maintenance.				

Photo Sampling Survey



Water Survey Location Map

Name of Sampling Equipment
PONPE 510PD pH/COND./SALT/DO METER
Recorded By
Name: Xonlatha
Date: 11/11/2021

1	Water Sampling Point	**SW01**			On Site Parameters /Observations	Result
2	Date	11/11/2021			pH	6.29
3	Time	12:10			DO	2.9
4	Location	Village	District	Province	Water temperature	26
		Thong pong	Sykhodtabong	VTE Capi		
5	Coordinate	N	240447		Oder	have
		E	1991030		Color	Brown
6	Environment Condition in the Sampling Point	It is a public drainage ditch, with garbage in the canal.				

Photo Sampling Survey



Water Survey Location Map

Name of Sampling Equipment

PONPE 510PD pH/COND./SALT/DO METER

Recorded By

Name: Xonlatha

Date: 11/11/2021

1	Water Sampling Point	**SW02**			On Site Parameters /Observations	Result
2	Date	11/11/2021			pH	6.29
3	Time	11:30			DO	2.8
4	Location	Village	District	Province	Water temperature	27.9
		Nong teang	Sykhodtabong	VTE Capi		
5	Coordinate	N	240270		Oder	have
		E	1994148		Color	Brown
6	Environment Condition in the Sampling Point	It is a public drainage ditch, with garbage in the canal.				

Photo Sampling Survey



Water Survey Location Map

Name of Sampling Equipment

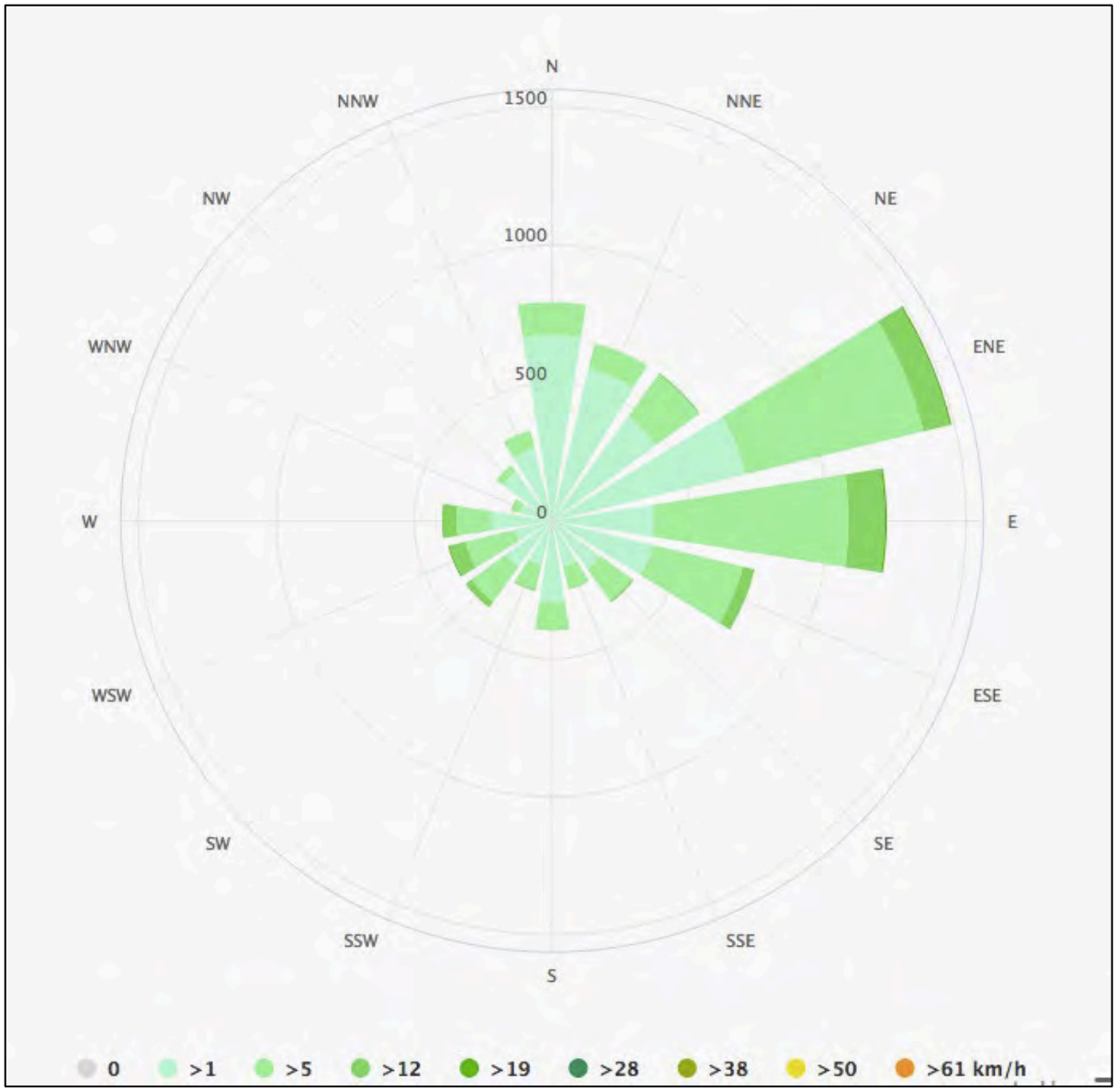
PONPE 510PD pH/COND./SALT/DO METER

Recorded By

Name: Xonlatha

Date: 11/11/2021

APPENDIX E – WIND ROSE


N
NNE
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ENE
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ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
1500
1000
500
0
0
>1
>5
>12
>19
>28
>38
>50
>61 km/h

APPENDIX F – GAS STATION SURVEYS

Summary of Petrol Stations along corridor of Sikhai to Sikert Road

Petrol Station 01		
1	Date Survey	10 Feb 2022
2	Contact	Mr. Saengkeo
3	Tell	020 55504566
4	Coordinates	E: 241161, N: 1989474
5	Description	The underground fuel tanks are around 8 meters from Corridor of Impact (CoI) on the right side of the road.

Sampling Location Map

Petrol Station 02		
1	Date Survey	10 Feb 2022
2	Contact	Mr. Vonevilay
3	Tell	020 54066373
4	Coordinates	E: 240542, N: 1990711
5	Description	The underground fuel tanks are around 11 meters from Corridor of Impact (CoI) on the left side of the road.

Sampling Location Map

Petrol Station 03		
1	Date Survey	10 Feb 2022
2	Contact	Mr. Aek
3	Tell	020 77517997
4	Coordinates	E: 240195, N: 1993845
5	Description	The underground fuel tanks are around 12 meters from Corridor of Impact (CoI) on the left side of the road.

Sampling Location Map

Petrol Station 04		
1	Date Survey	10 Feb 2022
2	Contact	Ms. Taen
3	Tell	020 22116696
4	Coordinates	E: 240316, N: 1994303
5	Description	The underground fuel tanks are around 19 meters from Corridor of Impact (CoI) on the right side of the road.

Sampling Location Map

Note:
Only PTT Gas station 04 that have a proper drainage system built but the gas station 01, 02 and 03 do not have the proper drainage. They just let the runoff flow over road surface during the rainy season.

APPENDIX G – BORROW PITS

Summary of Existing Borrow Pits that may be used for Shikai-Sikert Road Project

Borrow pit 01		
1	Date Survey	10 Feb 2022
2	Contact	Mr. Noy
3	Tell	020 92474986
4	Coordinates	E: 237186, N: 1993469
5	Descriptions	This point, the borrow pit 01 is around 3 km from project location (Sikhai to Sikert road 6 km)
Photos		

Borrow pit 02		
1	Date Survey	10 Feb 2022
2	Contact	Mr. Serd
3	Tell	020 55685589
4	Coordinates	E: 237270, N: 1997159
5	Descriptions	The borrow pit 02 is around 5 km from project location (Sikhai to Sikert road 6 km)
Photos		

Borrow pit 03

1	Date Survey	10 Feb 2022
2	Contact	Mr. Touthep
3	Tell	020 28642299
4	Coordinates	E: 233276, N: 2005631
5	Descriptions	For The borrow pit 03 is around 14 km from project location (Sikhai to Sikert road 6 km), And the segment 12 km of 13N project used this borrow pit03.
Photos		

Note:

- The borrow pit 03 had been used for the construction of the 1st phase Sikert-Phonhong Road.
- All borrow pits are already obtained proper licenses from concern authorities but they have not shared it to us.

APPENDIX H – TREE SURVEY

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
1	8	Out COI	RHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	3	8	20	Sykhai	N/A	N/A	ü
2	9	Out COI	RHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	3	8	20	Sykhai	N/A	N/A	ü
3	9	Out COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	2.5	5	15	Sykhai	N/A	LC (Least Concern)	ü
4	2	In COI	RHS	Cham pa/ ດອກຈຳປາ	Plumeria rubra L.	2.2	5	8	Sykhai	N/A	N/A	ü
5		In COI	RHS	Cham pa/ ດອກຈຳປາ	Plumeria rubra L.	4	5		Sykhai	N/A	N/A	ü
6		In COI	RHS	Cham pa/ ດອກຈຳປາ	Plumeria rubra L.	6	16		Sykhai	N/A	N/A	ü
7	3	In COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	8	10		Sykhai	N/A	LC (Least Concern)	ü
8	1	In COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	2	3		Sykhai	N/A	LC (Least Concern)	ü
9	1	In COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	2	5	8	Sykhai	N/A	LC (Least Concern)	ü
10	3	In COI	RHS	Ton Yom/ຕົ້ນຍົມ	Phyllanthus acidus	2	2	8	Sykhai	N/A	N/A	ü
11	1	In COI	RHS	Cham pa/ ດອກຈຳປາ	Plumeria rubra L.	1.5	2		Sykhai	N/A	N/A	ü
12	2	In COI	LHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	2.5	5		Sybounheuang	List III	LC (Least Concern)	ü
13		In COI	RHS	Ton Yom/ຕົ້ນຍົມ	Phyllanthus acidus	4	3		Sybounheuang	N/A	N/A	ü
14	7	In COI	RHS	Ngiew/ຕົ້ນງິ້ວ	Bombax ceiba L	2.5	2		Phosy	List III	LC (Least Concern)	ü
15	7	In COI	RHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	2	10		Phosy	N/A	N/A	ü
16		In COI	RHS	Ton lam yai/ຕົ້ນລຳໄຍ	Dimocarpus longan Loureiro subsp	4	6	6	Phosy	N/A	N/A	ü
17		In COI	RHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	6	10	10	Phosy	N/A	N/A	ü
18	4	In COI	LHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	3	40		Na hae	List II	LC (Least Concern)	ü
19	10	Out COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	4	15	25	Phosy	N/A	N/A	ü
20	3	Out COI	LHS	katan/ກະທັນ	Ziziphus jujuba Miller	3	5		Na hae	N/A	N/A	ü
21	15	Out COI	LHS	Pho/ກ໊ກໂພ	Ficus religiosa L.	10	40		Na hae	N/A	N/A	û
22	12	Out COI	LHS	Pho/ກ໊ກໂພ	Ficus religiosa L.	12	80		Na hae	N/A	N/A	û

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
23	12	Out COI	LHS	Pho/ກົກໂພ	Ficus religiosa L.	12	80		Na hae	N/A	N/A	û
24	5	Out COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	3	15		Na hae	List I	EN (Endangered)	ü
25	5	Out COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	3	10		Na hae	List I	EN (Endangered)	ü
26	5	Out COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	3	10		Na hae	List I	EN (Endangered)	ü
27	5	Out COI	LHS	Mai Peuy /ເປືອຍ	Lagerstroemia calyculata Kurz	3	10		Na hae	List II	N/A	û
28	20	In COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	10	20	25	Phosy	N/A	N/A	ü
29	20	In COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	8	20	25	Phosy	N/A	N/A	ü
30	4	In COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	5	10		Phosy	N/A	N/A	ü
31	4	In COI	RHS	Ton Mark mee/ຕົ້ນມີ້	Artocarpus heterophyllus Lamk.	5	10		Phosy	N/A	N/A	ü
32	5	In COI	RHS	Ton Kham/ຂາມ	Tamarindus indica L	3	5		Phosy	N/A	LC (Least Concern)	ü
33	3.5	In COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	1.5	2		Phosy	N/A	N/A	ü
34	3.5	In COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	10	20		Phosy	N/A	N/A	ü
35	3.5	In COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	8	15		Phosy	N/A	N/A	ü
36	4	In COI	RHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	8	50		Phosy	List II	LC (Least Concern)	ü
37	3	In COI	RHS	Kok Deua/ກົກເດື່ອ	Ficus fistulosa	3	8		Phosy	List III	LC (Least Concern)	ü
38	1.5	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	15		Phosy	List III	LC (Least Concern)	ü
39	4.5	In COI	RHS	Ton Hu Koung/ຫູກວາງ	Terminalia catappa L.	6	12		Phosy	N/A	LC (Least Concern)	ü
40	5	Out COI	RHS	Ton Hu Koung/ຫູກວາງ	Terminalia catappa L.	3	3		Phosy	N/A	LC (Least Concern)	ü
41	2	Out COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	2	5		Na hae	N/A	LC (Least Concern)	ü
42	1	Out COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	2.5	3		Phosy	N/A	LC (Least Concern)	ü
43	3	Out COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	7		Phosy	N/A	LC (Least Concern)	ü
44	3	Out COI	LHS	Kok Deua/ກົກເດື່ອ	Ficus fistulosa	6	40		Na hae	List III	LC (Least Concern)	ü

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
45	8	Out COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	10		Na hae	N/A	LC (Least Concern)	ü
46		In COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	6	6		Na hae	N/A	LC (Least Concern)	ü
47	4	In COI	RHS	ຕົ້ນແຜ່ບາລະມີ (ໄມ້ປະດັບ)	Terminalia ivorensis Chev.	3	5	5	Phosy	N/A	N/A	ü
48	2	In COI	RHS	kok Mark/ກົກໝາກ	Areca catechu L.	3	10		Phosy	N/A	N/A	ü
49	3	In COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	2	10		Phosy	N/A	N/A	ü
50	3	Out COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	2	3		Phosy	N/A	N/A	ü
51	3.5	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	20		Phosy	List III	LC (Least Concern)	ü
52	3.5	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	5	40		Phosy	List III	LC (Least Concern)	ü
53	3.5	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	5	40		Phosy	List III	LC (Least Concern)	ü
54	3.5	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	10	60		Phosy	List III	LC (Least Concern)	ü
55	3.5	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	10	60		Phosy	List III	LC (Least Concern)	ü
56	3.5	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	10	80		Phosy	List III	LC (Least Concern)	ü
57	3.5	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	10	60		Phosy	List III	LC (Least Concern)	ü
58	3.5	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	10	80		Phosy	List III	LC (Least Concern)	ü
59	3.5	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	10	80		Phosy	List III	LC (Least Concern)	ü
60	3.5	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	10	80		Phosy	List III	LC (Least Concern)	ü
61	2.5	In COI	LHS	Ton Mark mee/ຕົ້ນມີ້	Artocarpus heterophyllus Lamk.	3	8		Na hae	N/A	N/A	ü
62	4	In COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	12	25	30	Phosy	N/A	N/A	ü
63	4	In COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	4	20		Phosy	N/A	N/A	ü
64	4	In COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	4	20		Phosy	N/A	N/A	ü
65	4	In COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	4	20		Phosy	N/A	N/A	ü

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
66	4	Out COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	4	15		Phosy	N/A	N/A	ü
67	2	In COI	RHS	Ton Hu Koung/ຫູກວາງ	Terminalia catappa L.	8	30		Phosy	N/A	LC (Least Concern)	ü
68		In COI	RHS	Kor Phai/ກໍ່ໄຜ່	Bamboo sp.			10	Phosy	N/A	N/A	ü
69	3	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	3	5		Na hae	N/A	N/A	ü
70	2	In COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	5		Phosy	N/A	LC (Least Concern)	ü
71	12	Out COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	4	15		Phosy	List III	LC (Least Concern)	ü
72	3	Out COI	LHS	Ton Yom/ຕົ້ນຍົມ	Phyllanthus acidus	2	3		Na hae	N/A	N/A	ü
73	3	In COI	RHS	Ton Hu Koung/ຫູກວາງ	Terminalia catappa L.	5	20		Phosy	N/A	LC (Least Concern)	ü
74		In COI	RHS	Ton Hu Koung/ຫູກວາງ	Terminalia catappa L.	5	20		Phosy	N/A	LC (Least Concern)	ü
75	12	Out COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	7	10		Phosy	N/A	N/A	ü
76	12	Out COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	6	10		Phosy	N/A	N/A	ü
77	12	Out COI	RHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	10	40		Phosy	List II	LC (Least Concern)	ü
78	12	Out COI	RHS	Ton Hu Koung/ຫູກວາງ	Terminalia catappa L.	10	15		Tong pong	N/A	LC (Least Concern)	ü
79	4	Out COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	10		Tong pong	N/A	LC (Least Concern)	ü
80	2	Out COI	LHS	Ta kob/ຕາກົບ	Muntingia calabura L	2	5		Tong pong	N/A	N/A	ü
81	3	Out COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	8		Tong pong	N/A	LC (Least Concern)	ü
82	3	In COI	RHS	mai Vik/ໄມ້ວິກ	Eucalyptus camandulensis	5	20		Tong pong	N/A	N/A	ü
83		In COI	LHS	Pang deang/ຜາງແດງ	Caesalpinia sappan L.	8	25		Tong pong	N/A	N/A	ü
84	3	Out COI	LHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	6	70		Tong pong	List II	LC (Least Concern)	ü
85	8	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	6	80		Tong pong	N/A	N/A	ü
86	8	Out COI	LHS	Ton Kham/ຂາມ	Tamarindus indica L	6	50		Tong pong	N/A	LC (Least Concern)	ü
87	8	Out COI	LHS	Ton lam yai/ຕົ້ນລຳໃຍ	Dimocarpus longan Loureiro subsp	7	40		Tong pong	N/A	N/A	ü

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
88	8	Out COI	LHS	Ton Mark nam nom/ໝາກນ້ຳນົມ	Chrysophyllum cainito L.	7	70		Tong pong	N/A	N/A	ü
89	8	Out COI	LHS	mai ket sa na/ໄກດສະໜາ	Betula alnoides Buch.-Ham	5	5		Tong pong	List I	N/A	ü
90	8	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	8	20		Tong pong	N/A	N/A	ü
91	8	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	7	20		Tong pong	N/A	N/A	ü
92	8	Out COI	LHS	Ton Kham/ຂາມ	Tamarindus indica L	7	80		Tong pong	N/A	LC (Least Concern)	ü
93	8	Out COI	LHS	Ton Kham/ຂາມ	Tamarindus indica L	7	80		Tong pong	N/A	LC (Least Concern)	ü
94	8	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	7	20		Tong pong	N/A	N/A	ü
95	8	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	7	20		Tong pong	N/A	N/A	ü
96	8	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	7	20		Tong pong	N/A	N/A	ü
97	2	Out COI	RHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	7	70		Na Lao	N/A	N/A	ü
98	3	In COI	LHS	ຕົ້ນເຜ່ບາລະມີ (ໄມ້ປະດັບ)	Terminalia ivorensis Chev.	3	10		Na Lao	N/A	N/A	ü
99	4	In COI	LHS	ຕົ້ນເຜ່ບາລະມີ (ໄມ້ປະດັບ)	Terminalia ivorensis Chev.	3	10		Na Lao	N/A	N/A	ü
100	8	In COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	5	10		Na Lao	N/A	N/A	ü
101	4	In COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	6	40		Na Lao	N/A	N/A	ü
102	4	In COI	LHS	Ton Kham/ຂາມ	Tamarindus indica L	5	30		Na Lao	N/A	LC (Least Concern)	ü
103	5	In COI	LHS	Ton lam yai/ຕົ້ນລຳໄຍ	Dimocarpus longan Loureiro subsp	5	20		Na Lao	N/A	N/A	ü
104	6	Out COI	LHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	6	40		Na Lao	List II	LC (Least Concern)	ü
105	4	Out COI	LHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	6	60		Na Lao	List II	LC (Least Concern)	ü
106	3	In COI	RHS	Mai bok/ໄມ້ບົກ	Irvingia malayana Oliv	5	50		Na Lao	List II	N/A	û
107	4	In COI	RHS	Ton lam yai/ຕົ້ນລຳໄຍ	Dimocarpus longan Loureiro subsp	3	8		Nong Niew	N/A	N/A	ü
108		In COI	RHS	kok mark tong/ກົກໝາກຕ້ອງ	Sandoricum indicum Cav.	7	8		Nong Niew	List III	N/A	û

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
109	4	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	5	15		Nong Niew	List III	LC (Least Concern)	ü
110	3	In COI	RHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	6	60		Nong Niew	List II	LC (Least Concern)	ü
111	3	Out COI	RHS	Pang deang/ຜາງແດງ	Caesalpinia sappan L.	5	10		Nong Niew	N/A	N/A	ü
112	3	Out COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	4	20		Nong Niew	N/A	LC (Least Concern)	ü
113	3	In COI	RHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	4	8		Nong Niew	N/A	N/A	ü
114	2.5	In COI	LHS	katan/ກະທັນ	Ziziphus jujuba Miller	2	10		Nong Niew	N/A	N/A	ü
115	3	Out COI	LHS	Ton lam yai/ຕົ້ນລຳໄຍ	Dimocarpus longan Loureiro subsp	2	5		Nong Niew	N/A	N/A	ü
116	3	Out COI	LHS	Ton Kham/ຂາມ	Tamarindus indica L	2	5		Nong Niew	N/A	LC (Least Concern)	ü
117	4	In COI	LHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	20		Nong Niew	List III	LC (Least Concern)	ü
118	2	In COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	6		Nong Niew	N/A	LC (Least Concern)	ü
119	3	In COI	RHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	10	60		Nong Niew	List II	LC (Least Concern)	ü
120	3	In COI	LHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	4	10		Nong Niew	N/A	N/A	ü
121	8	In COI	LHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	15	80		Nong Niew	List II	LC (Least Concern)	ü
122	4	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	10		Nong Niew	List III	LC (Least Concern)	ü
123	4	Out COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	10		Nong Niew	N/A	LC (Least Concern)	ü
124	2	Out COI	LHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	4	10		Nong Niew	List II	LC (Least Concern)	û
125	4	In COI	LHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	3	10		Nong Niew	N/A	N/A	ü
126	3	In COI	LHS	Pang deang/ຜາງແດງ	Caesalpinia sappan L.	5	20		Nong teang Neua	N/A	N/A	ü
127	2.5	In COI	LHS	Ta kob/ຕາກົບ	Muntingia calabura L	2	5		Nong teang Neua	N/A	N/A	ü
128	2.5	In COI	LHS	Ton lam yai/ຕົ້ນລຳໄຍ	Dimocarpus longan Loureiro subsp	6	15		Nong teang Neua	N/A	N/A	ü
129	3	In COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	6	10		Nong teang Neua	N/A	LC (Least Concern)	ü

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
130		In COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	6	8		Nong teang Neua	List I	EN (Endangered)	ü
131		In COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	10	20		Nong teang Neua	List I	EN (Endangered)	ü
132		In COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	10	15		Nong teang Neua	List I	EN (Endangered)	ü
133		In COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	5	7		Nong teang Neua	List I	EN (Endangered)	ü
134		In COI	LHS	Dork Lueang India/ດອກເຫຼືອງອິນເດຍ	Handroanthus chrysanthus	10	15		Nong teang Neua	N/A	VU (Vulnerable)	ü
135		In COI	LHS	Mai Dou/ດູ່	Pterocarpus macrocarpus	3	6	6	Nong teang Neua	List I	EN (Endangered)	ü
136		In COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	6	10		Nong teang Neua	N/A	LC (Least Concern)	ü
137		In COI	LHS	Dork Lueang India/ດອກເຫຼືອງອິນເດຍ	Handroanthus chrysanthus	10	15		Nong teang Neua	N/A	VU (Vulnerable)	ü
138	15	Out COI	RHS	mai sak/ໄມ້ສັກ	Tectona grandis L.f.	6	20		Nong teang tai	List I	N/A	ü
139	2	In COI	RHS	katan/ກະທັນ	Ziziphus jujuba Miller	2	3		Nong teang tai	N/A	N/A	ü
140	5	Out COI	LHS	Mak muang/ຕົ້ນມ່ວງ	Mangifera indica L.	4	10		Nong teang Neua	N/A	N/A	ü
141	15	Out COI	LHS	Pho/ກົກໂພ	Ficus religiosa L.	10	80		Nong teang Neua	N/A	N/A	û
142	10	Out COI	LHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	10	20		Nong teang Neua	N/A	N/A	ü
143	10	Out COI	LHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	10	20		Nong teang Neua	N/A	N/A	ü
144	10	Out COI	LHS	phao/ຕົ້ນພ້າວ	Cocos nucifera L.	10	20		Nong teang Neua	N/A	N/A	ü
145	12	Out COI	LHS	Ton lam yai/ຕົ້ນລຳໄຍ	Dimocarpus longan Loureiro subsp	10	20		Nong teang Neua	N/A	N/A	ü
146	3	In COI	RHS	kok mark tong/ກົກໝາກຕ້ອງ	Sandoricum indicum Cav.	3	10		Nong teang tai	List III	N/A	ü
147	3	In COI	RHS	kok mark jieng/ກົກໝາກຈຽງ	Syzygium jambos	2	8		Nong teang tai	N/A	LC (Least Concern)	ü
148	4	In COI	LHS	Ngiew/ຕົ້ນງິ້ວ	Bombax ceiba L	5	15		Nong teang Neua	List III	LC (Least Concern)	ü
149	2.5	Out COI	RHS	Sam sa/ສາມສາ	Samanea saman (Jacquin) Merrill	5	15		Nong teang tai	List II	LC (Least Concern)	ü
150	3	In COI	LHS	Kok Deua/ກົກເດື່ອ	Ficus fistulosa	2	8		Nong teang Neua	List III	LC (Least Concern)	ü

No_	Distance from edge of existing roadside	Out COI/ In COI	LHS/ RHS (6+00 to12km)	Common Name/ Local Name	Scientific Name	Height (m)	Stem Diameter (cm)	Life Stage (year)	Village	Lao	IUCN	Planted tree (ü), Not Planted (û)
151	2.5	In COI	LHS	Ta kob/ຕາກົບ	Muntingia calabura L	2	1.5		Nong teang Neua	N/A	N/A	ü
152	5	Out COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	10		Nong teang tai	N/A	LC (Least Concern)	ü
153	5	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	10		Nong teang tai	List III	LC (Least Concern)	ü
154	3	Out COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	2.5	5		Nong teang Neua	N/A	LC (Least Concern)	ü
155	3	Out COI	LHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	3	15		Nong teang Neua	N/A	N/A	ü
156	5	Out COI	LHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	20		xay moung khoun	List III	LC (Least Concern)	ü
157	6	Out COI	LHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	20		xay moung khoun	List III	LC (Least Concern)	ü
158	6	Out COI	LHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	20		xay moung khoun	List III	LC (Least Concern)	ü
159	4	Out COI	LHS	Pang deang/ຜາງແດງ	Caesalpinia sappan L.	3	10		xay moung khoun	N/A	N/A	ü
160	4	Out COI	LHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	8		xay moung khoun	N/A	LC (Least Concern)	ü
161		In COI	LHS	Ton ka ka dao/ຕົ້ນກາກະເລົ່າ	Lagerstroemia speciosa	4	7		xay moung khoun	List III	N/A	ü
162	2	In COI	RHS	Tin pet/ຕົ້ນຕີນເປັດ	Alstonia scholaris L.	3	10		xay moung khoun	List III	LC (Least Concern)	ü
163	8	Out COI	LHS	Mai Peuy /ເປືອຍ	Lagerstroemia calyculata Kurz	3	5		xay moung khoun	List II	N/A	û
164	3	Out COI	RHS	Mak muang/ຕົ້ນໝ່ວງ	Mangifera indica L.	3	5		xay moung khoun	N/A	N/A	ü
165	4	Out COI	RHS	Ton Khoun/ຕົ້ນຄູນ	Cassia fistula L.	3	5		xay moung khoun	N/A	LC (Least Concern)	ü
166	4	Out COI	RHS	Pang deang/ຜາງແດງ	Caesalpinia sappan L.	5	20		xay moung khoun	N/A	N/A	ü
167	3	Out COI	RHS	Ton Yom/ຕົ້ນຍົມ	Phyllanthus acidus	2	2		xay moung khoun	N/A	N/A	ü

APPENDIX J – STAKEHOLDER CONSULTATIONS

Summary Minutes of consultation meetings with PAPs in December 2021, Sikeut-Sikhai Section-NR13N

Date/Villages	Key Process	Topic Dissemination/ Consultation	Responsibility	Stakeholder								comment/activities conduction
				PTRI, GRM and village authorities		Participant/female*/ethnicity**						
				Total	Fem.	Total	Fem.	Lao	Viet	Chinese	Ethnic	
13/12/2021 Xaymoungkhoun village	The meeting was opened at 8:30. The deputy chief of the district provided brief overview of the project. The consulting company's staff presented the details about the road design and the …….. Questions and answers session. Conclusion and end of the meeting at 12:00 pm.	Dissemination of the project history and its importance as well as information on the project activities. Presentation on the details of the road design. Presentation on the compensation policies and the entitlement of the APs as well as the payment of the compensation for the project impacts.	Mr Bouavone deputy chief of Naxaythong district Mr. Lae Somchanh, LCG staff Ms. Phengvichit, LCG staff All of the participants	3	0	30	13	29		1		***General comments from PAPs:*** The village authority and PAPs appreciate the project. Propose to reduce the median in order to widen the road. Request a balance on impacts on both sides of the road. The compensation details should be clear. Concerned about flood, drainage system should be well elaborated.
13 &14 /12/21 -Nongteng Neua				17	4	52	14	50	2			***General comments from PAPs*:** Village and district authority and the government appreciate for the improvement of this road. They requested that all the villagers living along the NR13N in Nongteng to support and coordinate in order to facilitate with the

Date/Villages	Key Process	Topic Dissemination/ Consultation	Responsibility	Stakeholder								comment/activities conduction
				PTRI, GRM and village authorities		Participant/female*/ethnicity**						
				Total	Fem.	Total	Fem.	Lao	Viet	Chinese	Ethnic	
												project. The PAPs request the project to compensate with a fair price. The community requested the project to support for a construction of a new wall and gate for Nongteng temple and conduct a ceremony for the relocation of the urn (ash). Propose PRC from district level to work closely with village GRC to solve problem in village. The drainage design near Aussie Market should be big and wide enough to ensure a good drainage system. Propose to move the Pedestrians bridge at Nongteng area to the empty land and land title should be issued immediately after compensation.
14/12/2021 Nongteng Tai				6	2	44	20	43		1		***General comments from PAPs:*** The compensation must be settled before the start of civil works. The participants agree with the project as it will bring convenience and solve flooding issue. Most of them are concerned about the drainage system as they have had bad experience. Propose to rebuild temple's wall and gate or compensate, to clearly differentiate each lane (cars, motorcycles, pedestrians), minimize impacts from construction (dust and traffic obstruction). ***Question: Will the compensation for structures and crops/trees be paid before the compensation for land? Are funds for compensation provided by the government not the donors?***

Date/Villages	Key Process	Topic Dissemination/ Consultation	Responsibility	Stakeholder								comment/activities conduction
				PTRI, GRM and village authorities		Participant/female*/ethnicity**						
				Total	Fem.	Total	Fem.	Lao	Viet	Chinese	Ethnic	
												Answer: Compensation will be paid before the start of civil works, however, if a PAP did not agree with the compensation costs, the investigation process would start again and the payment for the PAP may be delayed
15/12/2021 NongNiew				2	0	45	19	41		4		***General comments from PAPs:*** Overall the participants see that this is a good project as it will attract investment and tourism into the area of influence. However, most PAPs are concerned about the valuation of the land unit cost and it should be participatory for the benefits of the affected people and to also avoid future problems with the project. The location of the U Turn must avoid impacts as much as possible. Propose to change the location of the bus bay. The project must avoid involuntary impacts as much as possible. The compensation must be settled before the start of the civil works ***Question: Will the PAPs receive compensation on the RoW that is being used and will be affected by the project?*** Answer: The land legal owners or occupants are entitled to receive compensation on the affected land area. ***Question: How will be the compensation for the extended structure?*** Answer: It will be calculated based on the type of the structure identified and agreed with the PAPs during the DMS

Date/Villages	Key Process	Topic Dissemination/ Consultation	Responsibility	Stakeholder								comment/activities conduction
				PTRI, GRM and village authorities		Participant/female*/ethnicity**						
				Total	Fem.	Total	Fem.	Lao	Viet	Chinese	Ethnic	
												Question: During the construction where will the PAPs park their cars? A temporary parking lot must be identified for the PAPs. Answer: This issue will be considered in the RAP development ***Question: What will be the capacity of the drain along the road and where will be the drain outlet?*** Answer: The road design team will consider it
16/12/2021 Thongpong				4	0	30	13	29		1		***General comments from PAPs:*** The participants agree with the project for the country's development, as well as to solve flooding issue during rainy season. Propose to have equal impact on each affected land, have the road lighting post on the median strip and to decrease the median's width to 1 meter. The project must avoid involuntary impacts as much as possible. During construction, the road should be watered regularly to avoid dust and traffic circulation must not be hampered by equipment. ***Question: Will the three-way junction have traffic lights or a roundabout?*** Answer: We will answer this question later as the social team does not look at the details of the design
17/12/2021 Nalao				4	0	19	10	19				***General comments from PAPs:*** The participants agree with the project. They are

Date/Villages	Key Process	Topic Dissemination/ Consultation	Responsibility	Stakeholder								comment/activities conduction
				PTRI, GRM and village authorities		Participant/female*/ethnicity**						
				Total	Fem.	Total	Fem.	Lao	Viet	Chinese	Ethnic	
												concerned about flooding, unit rate approval/valuation and compensation timeframe. Propose to lower the median's width to 1 meter and have lighting posts on the median. The median should not be too short in order to avoid accidents. ***Question: How is the road median determined?*** Answer: The design was provided by the Ministry of Public Work and Transport and it is based on detailed measurement and technical standards. ***Question: How long will the compensation cost be determined?*** Answer: The unit rate has to be approved by the Vientiane Capital Assembly and we will seek comments as soon as possible. ***Question: Where is the drain outlet?*** Answer: There will be several drain outlets and this is based on the previous drainage system but problems due to flooding will be solved.

20/12/2021 Nahea				5	1	21	9	20	1			***General comments from PAPs:*** Flooding issue occurs from Thongpong. PAPs are mostly concerned about the valuation of the land unit cost and drainage system. The project must avoid involuntary impacts as much as possible. Propose to construct one lane at a time. ***Question: How is the compensation cost determined, is it based on the agreement from the Vientiane Capital Assembly?*** Answer: PAPs will participate in the measurement process. Upon design approval, public consultations regarding unit cost will be held. After approval from the Assembly, the compensation process can be proceeded.
21/12/2021 Phosi				4	1	34	14	34				***General comments from PAPs:*** The compensation must be settled before the start of civil works. Propose to change the location of the bus bay from Toyota to Lao-Japanese school's area, to have the same median's width as Sikhai. They are concerned about their affected land area and the drainage system as they have had bad experience from flooding. ***Question: Is the median the starting point for road measurement?*** Answer: Yes ***Question: During construction, should the shops be closed? If closed, will***

												there be compensation for income loss or tax? Answer:There will be some disturbance but access to the shops will be provided so the shops can be opened as normal. ***Question: If the project is delayed, how will PAPs be compensated for recurring income loss?*** Answer: If but if the shops cannot be operated and close its operation due to the civil works, the PAP are entitled to receive compensation of revenue loss and it will be calculated based on the income declared for tax payment.
22/12/2021 Sibounheuang Tha				5	1	6	3	6				***General comments from PAPs:*** The village authorities urge the PAPs to support and coordinate with the project. PAPs agree to have lighting posts on the median. Propose to change the location of the crossing bridge and ensure a good drainage system. Compensation payment should be made before the civil works start. The vendors and buyers at Sikhai market should be informed about the civil works start date.
22/12/2021 Sikhai thong				4	1	3	2	3				
22/12/2021 Yapha				2	0	3	3	3				
23/12/2021 Sibounheuang Thong				4	0	19	13	19				***General comments from PAPs:*** The village authorities urge the PAPs to support and coordinate with the project. The design of U-turn should be appropriate to local context. Propose to relocate crossing bridge to minimize impact towards PAPs' land and to put roofing on the bridge for convenience during rainy seasons. The road should be well lightened and propose to have

												lighting posts on the median. Change median strip width to 1meter. Compensation cost should be appropriate and fair. Income loss should be compensated as well. The entry and exit of the bus station should be cleared during civil works. Signs should be put in order prevent accidents and the road should be watered regularly. Urge the project to be finished as planned. Propose start the civil works from Sikhai first.

* The list of participants will be kept ** To evaluate the percentage of the participation of ethnic groups

APPENDIX K – CHANCE FIND PROCEDURE TEMPLATE

1 Definition of Physical Cultural Resources

PCR is defined as:
"movable or immovable objects, sites, structures or groups of structures having archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance".

2 Ownership

Any artifacts found during construction are the property of landowner where the artifacts were found.

3 Procedure upon Discovery

3.1 Suspension of Work

If a PCR comes to light during the execution of the works, the Contractor shall stop the works within the vicinity of the find (10 meters) until a qualified archaeologist can confirm the status of the find.

After stopping work, the Contractor must immediately report the discovery to the Resident Engineer.

The Contractor is not entitled to claim compensation for work suspension during this period.

The Engineer is entitled to suspend work and to request from the Contractor further excavations at the contractor's expense if he thinks that a discovery was made and not reported.

3.2 Demarcation of the Discovery Site

With the approval of the Engineer, the Contractor is required to temporarily demarcate, and limit access to, the site.

3.3 Non-Suspension of Work

The Engineer, after consultation with a qualified archaeologist shall decide whether the PCR can be removed and for the work to continue, for example in cases where the find is one coin.

3.4 Chance Find Report

The Contractor should then, at the request of the Engineer, and within a specified time period, make a *Chance Find Report*, recording:

- Date and time of discovery;
- Location of the discovery;
- Description of the PCR;
- Estimated weight and dimensions of the PCR;
- Temporary protection implemented.

The *Chance Find Report* should be submitted to the Engineer, and other concerned parties as agreed with the cultural authority, and in accordance with national legislation.

The Engineer, or other party as agreed, is required to inform the cultural authority accordingly.

3.5 Arrival and Actions of Cultural Authority

The cultural authority undertakes to ensure that a representative will arrive at the discovery site within an agreed time such as 24 hours, and determine the action to be taken. Such actions may include, but not be limited to:

- Removal of PCR deemed to be of significance;
- Execution of further excavation within a specified distance of the discovery point;
- Extension or reduction of the area demarcated by the contractor.

These actions should be taken within 7 days.

The Contractor shall be entitled to claim compensation for work suspension during this period.

If the cultural authority fails to arrive within the stipulated period (24 hours), the Engineer will have the authority to extend the period by a further stipulated time.

If the cultural authority fails to arrive after the extension period, the Engineer will have the authority to instruct the Contractor to remove the PCR or undertake other mitigating measures and resume work. Such additional works can be charged to the contract. However, the contractor may not be entitled to claim compensation for work suspension during this period.

3.6 Further Suspension of Work

During this 7-day period, the Cultural authority may be entitled to request the temporary suspension of the work at or in the vicinity of the discovery site for an additional period of up to 30 days.

The contractor will be entitled to claim compensation for work suspension during this period.

APPENDIX L – DRAINAGE SURVEY

Field visit for proposed flood drainage system by DPWT

I. Section 1: Drainage no. 1 from Sikhai market to Ban Dong Nasok

General drainage layout

- **Site survey P1_001: Sikhai market area**

The area on both sides of the road in general there are shop, garage, car shop, restaurant, parking lot and some trees along both sides. Existing drainage canal is made by concrete and tends to be shallow and can not drain properly due to there is a lack of maintenance work.

Sikhai Junction

Right side of Sikhai's traffic light


Right side of Sikhai's traffic light to market Front of Sikhai market


Existing road side drainage condition

- **Site survey P1_002**: **Road along Wattay Airport's wall**

Drainage canals are located on both sides of the road linking from Sikhai market and connect each households' drain. There are dense houses and shops along the road.


Condition of the existing drainage on the road.

- **Site survey P1_003:**
  Drainage in Ban Akart area passes through dense residential area, in some places there are house built over the drainage. There are also some trees planted along the drainage and household's garden plots.

Condition of drainage in Ban Akart area

- **Site survey P1_004 Ban Dongnasok**
  Drainage condition in this area is wide and shallow due to vegetation and sedimentation with no regular maintenance has been carried out

Condition of drainage in Ban Dongnasok area

II. Section 2: Drainage no. 02 from Souvanni Shop to road along Wattay Airport's wall

General drainage layout

- **Site survey P2_001: Crossing drainage on road 13N near Souvanni Shop**

Existing drainage is in poor condition with huge sedimentation and vegetation in the drainage. There are shops, houses and some trees along both sides along the road. However, these trees are not in the COI.


Crossing drainage on Road 13N


Front of Souvanni Shop


Condition of the road in the north next to the crossing drainage no. 2

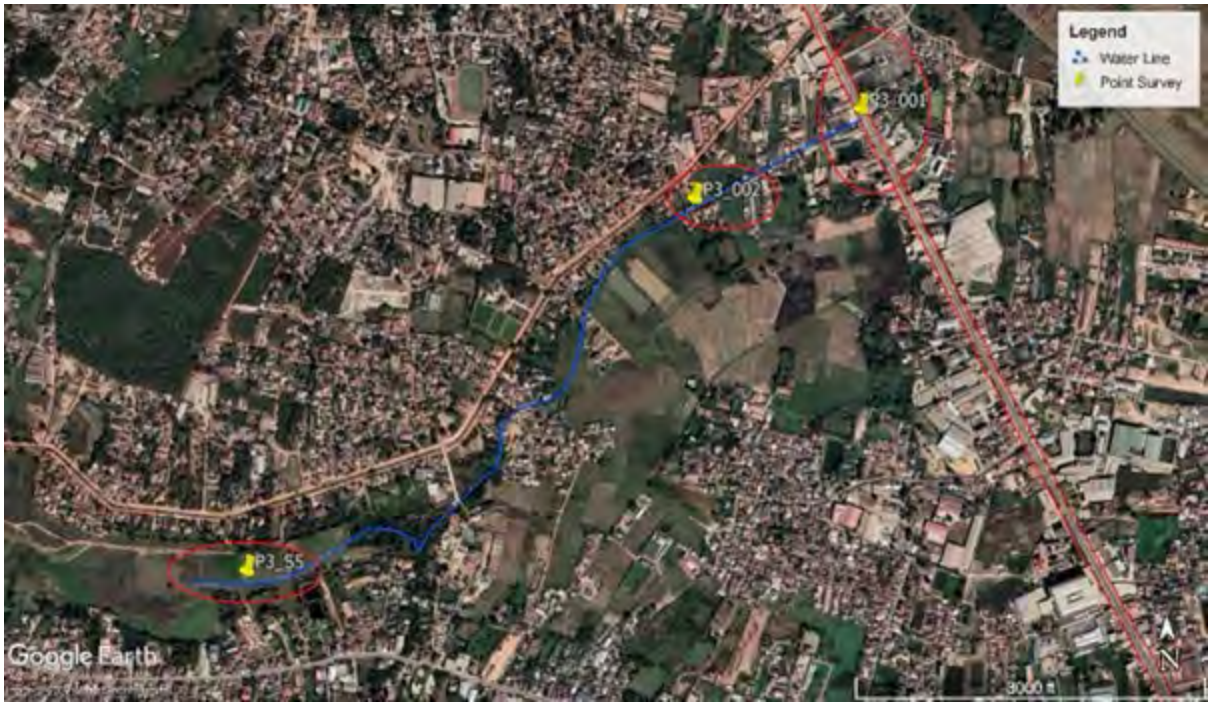
- **Site survey P2_002:**
  The survey point is behind Souvanni shop. There are grass, vegetation and trees cover the drainage which may hugely block water flow.

Condition of the drainage behind Souvanni Shop

- **Site survey P3_003:**
  This drainage connects to the crossing drainage at Souvanni shop. In general, condition of the drainage is covered by vegetation, trees, and wall of residential land.

Condition of drainage canal

III. Section 3: Drainage no. 3 from Ban Na Hae to Nong Or



General drainage layout

- **Site survey P3_001**:
  There are houses and structures on both sides of the drainage. The drainage is uneven shape with vegetation covered and is shallow due to thick sedimentation


Structures along the drainage.

Condition of the drainage near crossing drainage on road 13N

- **Site survey P3_002:**
  The drainage canal is quite wide and some section was built underneath front yard of local houses. There are some Albizia saman (Samsa) tree along the drainage.

Condition of land use along the drainage

- **Site survey P3_003:**
  The drainage in the Nong Or area is quite large. Water discharges from road 13N and local households and empty lands here will be drained to Nong Or canal.

Condition of Nong Or canal

IV. Section 4: Drainage no. 4 from junction of Northern bus-station to irrigation canal

General drainage layout

- **Site survey P4_001:**
  The proposed drainage canal in this area will need to cross Road 13N. From the site survey land use in this area is quite low and the drainage alignment is blocked by a zinc fence. Land use along the proposed drainage canal include shops, empty lands, and residential areas.

Condition of road sides where the canal no. 4 will pass

- **Site survey P4_005:**
  This section is the irrigation canal which will receive water from the crossing drainage no. 4. From site observation there is no existing drainage here and the project may dig a new one to drain water in order to minimize flood.

Condition of the drainage canal

V. Section 5: Drainage no. 5 from junction of northern bus-station to other irrigation canal

General drainage layout

- **Site survey P5_001:**
  The canal near this area is quite large. Some section of the canal is covered by dense vegetation and trees along the sides. There area houses, shops and commercial activities along the main road.

Condition of the drainage canal along main road

- **Site survey P5_002:**
  This section is the connection point of the drainage canal to the irrigation canal. There are varies in width of the drainage canal and trees found in this section.

Condition of the drainage canal.

VI. Section 6: Drainage no. 6 from Lao Ozi market to Hong Deng to boundary of Chanthabouly district

- **Site survey P6_001:**
  This point is close to Lao Ozi market. Condition of the canal's flow is slow with thick sedimentation at the outlet of the canal. There are houses and shops along both sides of the canal.

Condition of crossing drainage.

- **Site survey P6_002:**
  There are some orchid plantations along the canal and pass through paddy fields and agricultural lands and it is close to irrigation canal of local people.

Condition of the drainage canal

- **Site survey P6_003:**
  From site observation, there is a wide ranges of the canal's width, some section passes through paddy fields, gardens, and residential areas.

Condition of the drainage canal

- **Site survey P6_004:**
  The canal passes through different types of land use, some section passes paddy field, gardens, residential areas, and road.

Condition of the drainage canal.

APPENDIX M – ROAD SAFETY CORRECTIVE ACTIONS

Root Causes	Corrective Actions	Measures to be taken	Responsibility
Unsafe driving Drunk-driving / over-speeding / over-loading	Enforcement on unsafe driving behaviours	Increase Police check points, Implement Police patrolling and presence on the project site Police control for enforcement of driving under influence, over speeding and overloading	*i. Traffic police* *ii. Taskforce* *iii. PMU/DOR*
	Safety Awareness trainings in communities	Continue Implementation of safety campaign with cooperation of traffic police Implementing the alternative virtual means of awareness campaigns, including the messages through public loudspeakers, radio, and the use of mobile app.	*i. Taskforce* *ii. Traffic Police* *iii. PMU/DOR*
	Extend Taskforce Action Plan	- Revise Taskforce Action plan for 2022/2023 - Extend Taskforce to NR13S.	*i. PMU/DOR* *ii. Taskforce*
	Minimize safety hazards to drivers	- Improvement of temporary signage and in particular at sections substantially completed	*i. Contractor* *ii. ISWS* *iii. PMU/DOR* *iii.*
No respect of traffic rules	Implement traffic police control	- Resolve administrative hindrance and obstacles regarding speed and alcohol control - Enforce basic traffic rules. - Capacity strengthening and equipment to be provided to the traffic police.	*i. Taskforce and traffic police* *ii. Local Authorities* *iii. PMU/DoR*
Inadequate Traffic management	Improve TMP version 2 to address specific locations	- Provide more enhanced traffic management system such as Flag man and specific signs in critical areas to enforce traffic flow - Envisage installation of variable message signs already proposed under previous SCAP	*i. Contractor* *ii. ISWS*
Incomplete cross sections with gaps (central reserve)	Review work flow to complete cross-sections timely without exposed gaps	- The gap at the curbstone to be filled. - Before completion of curbstone, strictly monitor traffic to divert traffic in this area. - Organize teams for curbstone and expedite completion. - Adjust work sequence to minimize partial uncompleted sections. - Provide temporary cover to open manholes	*i. Contractor* *ii. ISWS*

Root Causes	Corrective Actions	Measures to be taken	Responsibility
Unsafe driving environment	Improve traffic management in specific zones	- Update the contractor's ESMP and traffic management plan to ensure the TMP is site-specific and covers all particular conditions, including substantially completed sections - Investigate the possibility to use temporary marking after completion of the concrete slabs	*i. Contractor* *ii. ISWS*
	Maintain daily inspections of Traffic Management Arrangements under supervision of ISWS	- Continue to provide on daily basis on-site supervision through a patrolling group on the whole project site, including all sections, even where no works are ongoing. - Stop the work immediately if working or traffic condition are unsafe	*i. Contractor* *ii. ISWS*
General road safety awareness	Expand the Work Plan agreed with the Road Safety Taskforces	- Work with the Taskforce to expand the plan to continue actions on NR13N, develop new actions and extend the activities to NR13S	i. *Road Safety Taskforce* ii. *PMU/DOR*
Safe driving Environment	Implementation of speed calming measures	- Develop typical designs for speed calming measures - Implement pilot locations on finished milestones - Extend speed calming measures to the whole section	*i. Contractor* *ii. ISWS*
	Road Safety Audit on completed works	- Implement the corrective measures identified under the first RSA - Conduct second RSA on all sections	*i. Contractor* *ii. ISWS* *iii. PMU* *iv. Road Safety Auditor*
	Traffic management on completed sections (maintenance phase)	- Investigate the limits of liability of the parties under OPBRC maintenance phase. - Identify measures required for DPWTs to ensure road safety operations during the maintenance phase. Implement identified measures, f. ex. axle load control, speed control.	*i. ISWS* *ii. PMU/DOR* *iii. DPWT* *iv. Traffic police*
		-	

Root Causes	Corrective Actions	Measures to be taken	Responsibility
		-	