

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) FOR NATIONAL ROAD 13 NORTH (NR13 NORTH) IMPROVEMENT AND MAINTENANCE

EXECUTIVE SUMMARY

February 5, 2018

Revision 2.0

Lao People's Democratic
Republic

MINISTRY OF PUBLIC
WORKS AND
TRANSPORT

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I. INTRODUCTION

I.1 General

1. The Government of Lao PDR (GoL) has a program to improve National Road 13 North (NR13 North) on an Output and Performance-Based Road Contract (OPBRC) basis. The Project is designed to improve transport connectivity by rehabilitating and upgrading the road forming the main road network of Lao PDR, thereby improving connectivity and fostering inclusive economic growth. The Project is to be implemented by the Ministry of Public Works and Transport (MPWT) through its Department of Roads (DoR).

2. An Environmental and Social Impact Assessment (ESIA) has been prepared as part of the process of compliance with the World Bank Safeguard Policies in relation to the Project. The document in hand provides the Executive Summary of the full ESIA.

3. The ESIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the project. More specifically, the ESIA:

- Describes the existing socio-environmental conditions within the Project area;
- Describes the 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).

I.2 World Bank Safeguard Policies

4. Based on the existing World Bank Operational Policy for Environmental Assessment (OP4.01), 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. This ESIA has been prepared by the MPWT to examine the project's potential negative and positive environmental impacts, compare them with those of feasible alternatives (including the "without project" situation), and recommend any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

6. **Table ES-I** lists other World Bank Safeguard policies and indicates if they are triggered by the Project and why.

Table ES-I: Other World Bank Safeguard Policies

Safeguard Policies	Triggered?	Explanation
Natural Habitats OP/BP 4.04	Yes	This policy is triggered since landscape of the areas along the proposed NR13 N project is typical of a marshy area (with flood plains and riverine forest vegetation along both sides) combined with small hilly zones. The project road improvements activities will involve expansion of three bridges to accommodate 4 lanes and improvements of 4 bridges on the 2 lanes section.
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.
Indigenous Peoples OP/BP 4.10	Yes	This policy is triggered due to the presence of a Hmong Ethnic Community in the project area that will be impacted by labor influx, dust, noise, gas emission and other forms of pollution from construction, drainage blockage, traffic interruption, removal of vegetation and impacts to temples or graves during construction, increased traffic flow and speed during operation. No household resettlement is anticipated in the ethnic community.
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 agricultural and livelihood activities, and the displacement of residential and commercial structure. This is primarily because the section of NR13 from Vientiane to Ban Dong (km 12 to km 31) will be upgraded from 2 to 4-lanes requiring the acquisition of 1.5m of land on each side.
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.

2. DESCRIPTION OF THE PROJECT

2.1 Background

7. NR13 is the most important core road in Lao PDR and its upgrade, rehabilitation, and maintenance can result in extremely large benefits for the country. NR13 is a North-South corridor (1,500 km) that connects Lao PDR with China in the North and with Cambodia in the South, and links ten of the seventeen Lao provinces. The main sections of the road were completed in 1997 and have not been rehabilitated since, receiving only periodic and emergency maintenance. 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 border with China.

8. Strong economic growth and trade expansion have been accompanied by a rapid increase in traffic volume and transit traffic on NR13, particularly in stretches near Vientiane Capital, some of which are expected to reach full capacity in the next 5 years. A detailed feasibility study financed by the World Bank in 2015 identified several critical sections on both NR13 North and NR13 South. The study indicated that improvements in these sections would result in reduced vehicle operating costs and travel time, increased accessibility of enterprises, increased labor productivity, and reduced road fatality rates. MPWT will use a phased approach to the improvement of NR13. To start, it has prioritized the section from km 12 to km 70 on NR13 North, as this stretch serves the highest traffic volume. The improvement of other critical sections will follow as financing becomes available.

2.1 Project Location

9. The Project road is located within two provinces (Naxaithong and Phonhong) commencing at Sikeut Junction, approximately four kilometers north of Wattay International Airport in Vientiane and ending approximately 58 kilometers north of Vientiane in Phonhong (see **Figure ES-1**).

10. Project works are divided into two sub-sections (which will form two construction Lots):

- Sub-section 1 - Vientiane-Ban Dong (km 12 to km 31)
- Subsection 2 - Ban Dong-Phonhong (km 31 to km 70)

11. **Figure ES-2** illustrates the locations of both of these sections.

2.2 Project Works

12. In summary, Project works will include:

- Upgrade sub-section 1 from two to four-lane with 23m right-of-way (with either asphalt concrete pavement or Portland cement concrete pavement);
- Improve sub-section 2, a two-lane with 16m right-of-way (with Portland cement concrete pavement);
- Upgrading of seven bridges (mostly single span);
- Improve the geometry of the Project road;

- Raise embankments in areas of flood risk;
- Provide adequate road safety measures, including elevated pedestrian crossings;
- Cleaning and upgrading of existing culverts and installation of new culverts where required;
- Construction of ten intersections; and
- Operation and Maintenance (O&M) of the Project road over a 10 year period.

Figure ES-I: Project Location

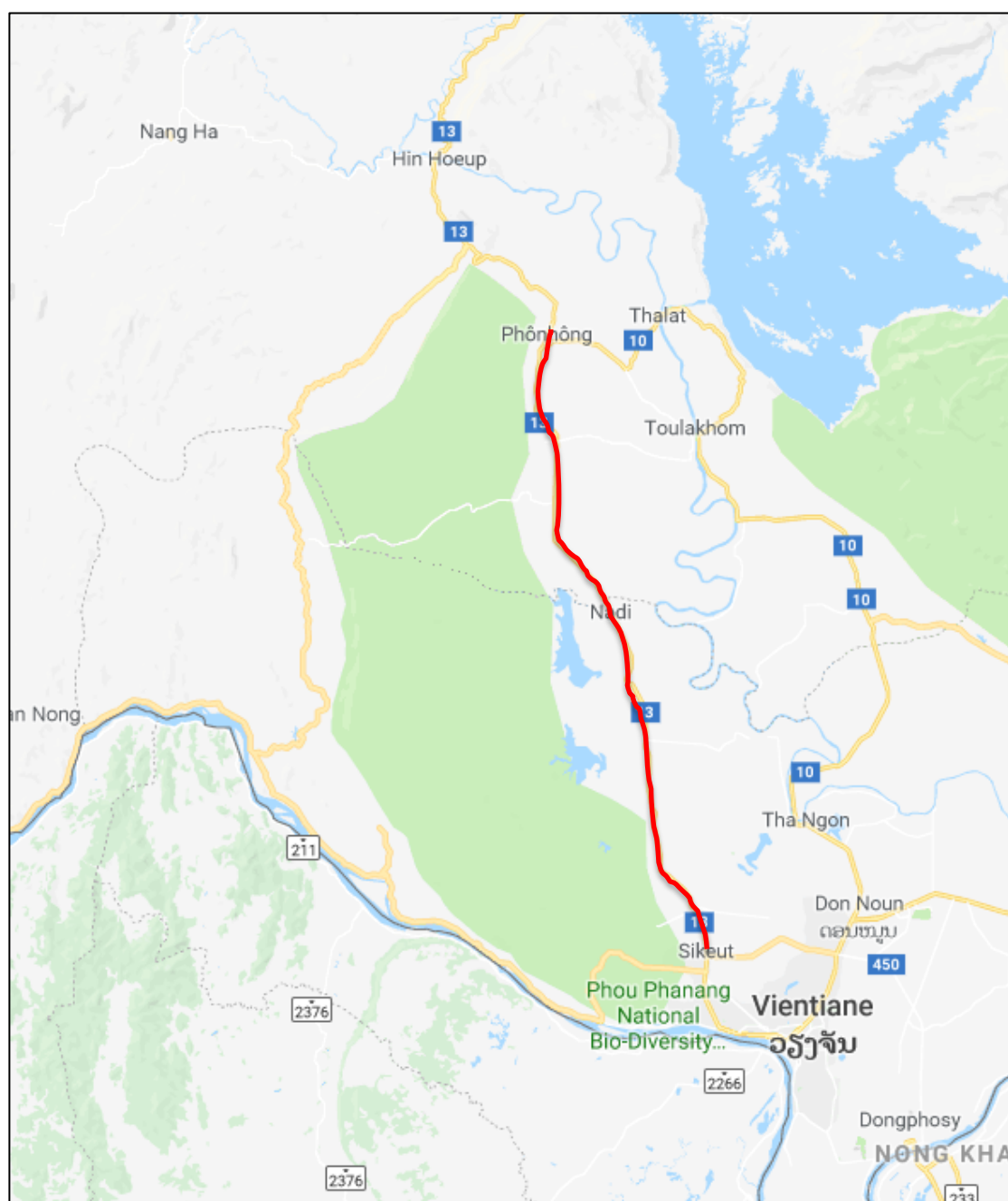
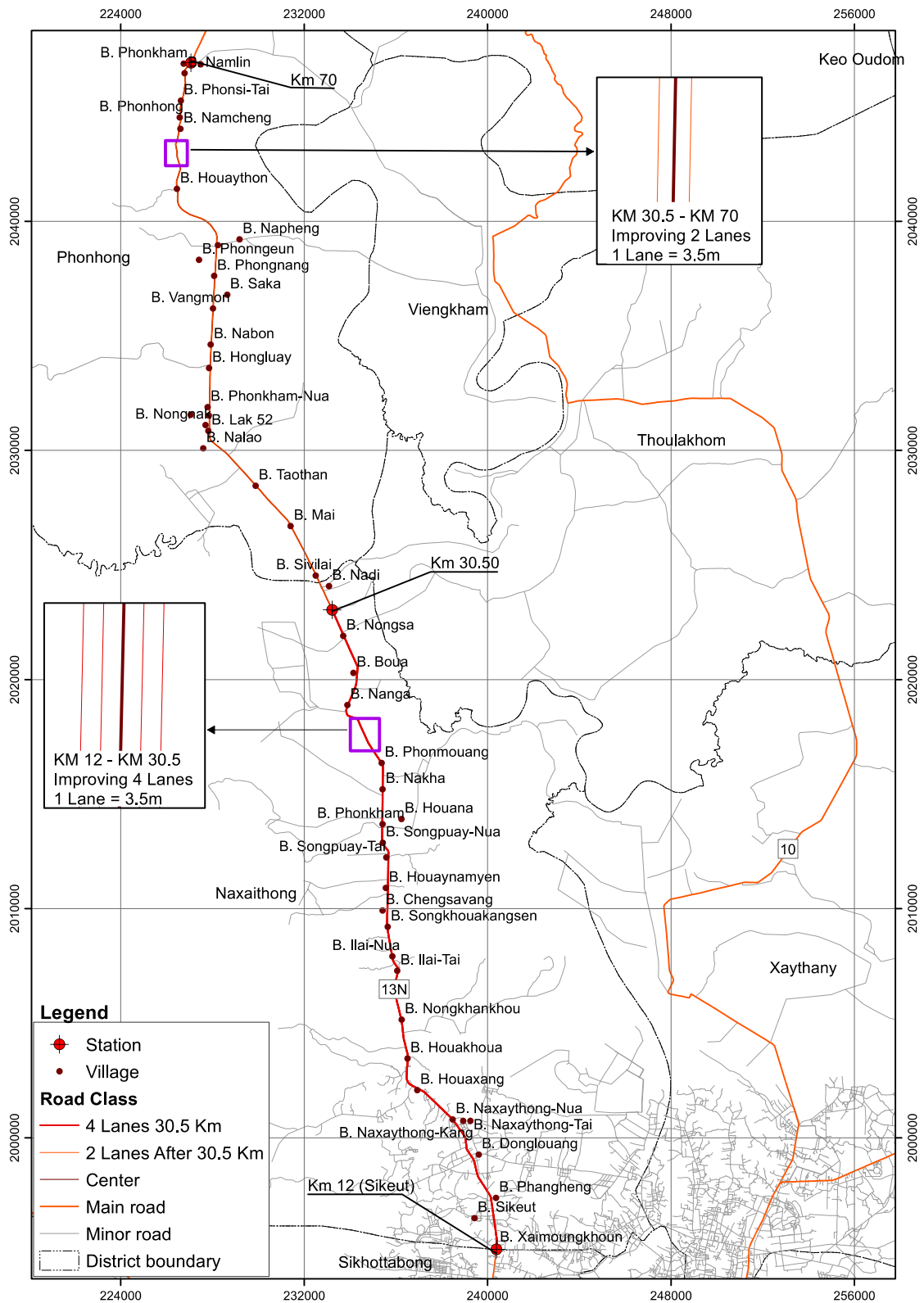


Figure ES-2: Project Area



2.3 Project Phases

13. Detailed Design - During this phase of the Project detailed designs are prepared. Currently a Detailed Design (DD) Consultant is preparing the detailed engineering design for rehabilitating the road. In doing so, the DD Consultant is preparing all the documents necessary for the approval, bidding and construction of the works. These documents include, but are not necessarily limited to, detailed drawings, specifications, bill of quantities (BoQ), cost estimates and traffic management plans. The detailed engineering design will incorporate recommendations to be produced as a result of the ESIA and the BoQ will reflect all the costs associated with the implementation of the Projects Environmental and Social Management Plan (ESMP). The DD Consultant will also ensure that all aspects of the design takes full account the historical occurrence of severe flooding and the potential for future floods to affect the roads.

14. Pre-construction Phase - During this phase of the Project typical activities will include:

- Site Clearing Works;
- 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; and
- Site Specific Environmental and Social Management Plan (SSESMP) - During this period the Contractor will prepare his own SSESMP to conform to this ESIA and its ESMP. The SSESMP will be completed with 30 days of the signing of the Contract to ensure that all ESMP measures are included within the Pre-construction phase.

15. Construction Phase – During the construction phase the following activities will occur:

- Pavement Construction – Construction of Portland cement concrete pavement.
- Bridges Rehabilitation – Rehabilitation of seven bridges.
- Construction and Rehabilitation of Culverts - Project works will include design and construction of cross drainage structures (culverts), including inlet and outlet structures and associated works.
- Construction of other Drainage Structures - 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 may include construction of the drainage system components in urban and rural areas.
- Earthworks, including construction of embankments, excavation and removal of the existing pavement materials and the existing road embankment, etc.
- Construction of Intersections – Ten Intersections will be constructed.

2.4 Materials and Staffing

16. The following section describes the construction materials which will be required as part of the Project.

17. **Borrow Material** - 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. The Project DD Consultants have identified a number of borrow pits for NR13 North. A review of the suitability of these borrow pits has been undertaken as part of the ESIA and recommendations for their use or exclusion from the Project based on their locations have been provided below.

18. **Asphalt and Concrete Batching Plants** - The Contractor will be responsible for ensuring these facilities comply with the ESMP and that all necessary permits to operate are obtained from the local authorities. It is assumed that the Contractor will operate his own asphalt facility with his own plant. He may also operate his own concrete batching plant, but it is possible that local suppliers could also be used.

19. **Water** - 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. Two sources of potable water exist for the Contractors staff; bottled water or groundwater. If groundwater is to be used it will be tested to ensure that the water quality meets the Lao PDR drinking water standards.

20. **Construction Camps** - According to the DoR approximately 100 staff will be employed on both Project Lots, meaning a total of 200 staff for the entire Project. They will be located 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. Final locations will be selected by the Contractor after the approval from the Engineer. 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 and a sickbay and first aid facilities.

2.5 Road Safety Measures

21. The road safety features that were used in the design are as follows:

- Provision of a wider sealed shoulder and side walk in community areas;
- Provision of bridges for pedestrian crossing by over pass in community areas such as schools and market areas;
- Provision of Bus Bay at road side where there is suitable space;
- Improvement of poor sight distances;
- Improved horizontal geometry by providing curve widening at on all sharp curves;
- Design and installation raised median for separation of traffic direction;
- Traffic Calming, Amber flashing where these should be provided;
- Road signs such as warning, information and direction signs, especially at curves less than 50 kph and installation of chevron signs;

- Raised pavement reflectors and provision of rumble bars at centreline on small radius curves;
- Lane Markings consist of centreline, edge line and pedestrian crossing;
- Speed humps and/or rumble strip at the entrance of populated town area and through the towns;
- Chicanes, physical traffic islands constructed on the shoulders to reduce speeds to the desired level, where the road passes through communities;
- Traffic islands and channelization at key intersection; and
- Guardrails provided on bridge approaches, box culverts and area where sharp curves, and high embankments

2.5 Implementation Method

22. The works and maintenance will be carried out through the implementation of an Output and Performance-Based Road Contract (OPBRC). The main features of the OPBRC approach for the project include:

- A share of the improvement cost of the project will be reimbursed to the contractor over the initial 3-year estimated construction period through milestone payments based on completion of nominated proportions of the works, financed by IDA and NDF.
- The rest of the contractor's financing of the improvements works and the Operation and Maintenance (O&M) cost over a 7-year period will be paid through performance-based quarterly payments (adjusted for inflation) based on the contractor's performance in meeting or exceeding the contracted service levels for the road.
- Bidders would be assessed on their technical and financial proposals. The financial offers will include O&M costs and amortization of the capital expenditures (improvement works) that were not covered by the construction payments to the contractor during the initial construction period.

3. ALTERNATIVES

23. Several alternatives were considered as part of the ESIA. The “No Action” Alternative would result in the continued deterioration of the road, bridges and drainage structures along the right of way (ROW), thereby impeding the economic development of the Project Area and the region. All positive benefits would be foregone and as such this alternative is not deemed prudent.

24. Minor changes to the alignment have been assessed, the most significant of which is the re-adjustment of curve at Ban NaNga. The alternative has been incorporated into the detailed design as it will reduce accidents in a location where many were previously recorded.

25. Three bridges located within sub-section I (the four lane section of the Project road) were also assessed to determine if alternative locations for bridge widening should be adopted instead of the assumed symmetrical widening to accommodate four lanes of traffic. After consultations with the ESIA team and the DD Consultant it has been determined that asymmetrical widening will be undertaken to lessen environmental and social impacts associated with symmetrical widening.

4. EXITING CONDITIONS

4.1 Physical Resources

26. The Project Area is generally flat, the topography of the Project road ranges from 170 meters above mean sea level to a maximum of 205 meters above mean sea level.

27. The road is located 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.

28. 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. These storms frequently deliver torrential rains that can last for several days. 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.

29. 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.

30. Lao PDR is one of the world's most vulnerable countries to climate change. According to the recent USAID funded Mekong Adaptation and Resilience to Climate Change Project, precipitation levels around Vientiane could increase as much as 10%. Another report funded by the World Bank indicated that the mean annual temperatures in Lao PDR are projected to increase by 1.4°C to 4.3°C by 2100, with similar projected rates of warming for all seasons.

31. Dust is currently the most significant air quality pollutant within the corridor, especially during the dry season. Ambient air quality monitoring was carried out as part of the ESIA at five different locations during July 2017 to characterize the current air quality within the Project corridor.

- Ambient carbon monoxide (CO) is well below Lao and IFC standards.
- Ambient PM₁₀ complies with both Lao PDR standards and United States Environmental Protection Agency (UESPA) standards. However, two locations had ambient PM₁₀ levels higher than IFC standards.
- Ambient Sulfur Dioxide (SO₂) levels are within Lao PDR and European Union (EU) standard limits.
- Ambient levels of Nitrogen Dioxide (NO₂) are within the limits set by Lao PDR standards and IFC guidelines.
- Ambient levels of Total Suspended Particulate (TSP) are within the limits set by Lao PDR standards.

32. As noted above, the project area is located in the plain of Vientiane which is situated on the lower reaches of the Nam Ngum and Nam Lik Rivers. This area physiographically is

part of the Mekong River floodplain that includes the floodplains of its larger tributaries. The Project road crosses seven small rivers and numerous irrigation channels. To confirm the status of water quality in the Project area monitoring was undertaken in July 2017. The results showed that surface water quality in the locations monitored is degraded by high levels of phosphate, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Dissolved Oxygen (DO). Five groundwater samples were collected and analyzed to determine the baseline groundwater quality levels in the Project area. The results show that groundwater quality in the locations monitored does not exceed any of the Lao PDR standards for drinking water. Several areas were identified by the Project FS that are currently affected by flooding.

4.2 Biological Resources

33. Two protected areas are located within the region; Phou Khao Khoay (PKK) and Phou Phanang (PPN). At its closest point of approach to NR13 North, the PKK is more than 20 km to the east, and the Nam Ngum River also lies between NR13 North and the PKK. While the PKK includes large areas of natural habitat, and a number of IUCN Red List species are considered to occur in the area, it is far enough from NR13 North that the Project is expected to have no discernible impact on the protected area or its flora and fauna. PPN's main axis runs generally north-south and is roughly parallel to NR13 North for the entire length of the project area. The closest point of approach from the road to PPN occurs near the middle of the project area and is nearly 5 km distant. On average PPN is more than 10 kilometers from the road.

34. There are 27 Important Bird Areas (IBA) in Laos, and the closest one to NR13 North project area is about 30 km east of the road near PKK's southwestern boundary. Given its distance from NR13 North, the Project is expected to have no discernible impact on the IBA.

35. A wildlife survey conducted during July and August 2014 as part of the Project FS identified 2 mammals, 13 birds, 2 reptiles, 5 amphibians, and 9 fish in the Project area. Of the 31 species, 30 are categorized as *Least Concern* or in the lowest risk category on the IUCN Red List, and only the falcon is listed as *Vulnerable* or at high risk of extinction in the wild, but falcons range over wide areas to hunt. A second wildlife survey conducted during September 2017 asked residents along NR13 North to identify what wildlife they had observed or knew of in the local area, including the NR13 North roadway and nearby areas. This survey identified many more species than did the one from the FS, including 14 mammals, 17 birds, 16 reptiles, one amphibian, and 23 fishes, for a total of 71 species. Of those species, 11 appear on the IUCN Red List: one mammal is critically endangered; two mammals are endangered; one mammal, one bird, three reptiles and one fish are vulnerable; and one bird and one fish are near threatened. Any of the listed species could be resident in PPN (except for the two carp species and the Nile tilapia) and it is doubtful that IUCN Red List species such as the slow loris or gibbons would be observed outside of PPN unless they were poached and either kept as pets or sold into the illegal trade in wildlife.

4.3 Socio-economic Resources

36. Naxaithong district is one of nine districts in the Vientiane Capital. It is located in the northern part of the Capital and covers an area of 90,800ha. The district has 54 villages a total number of 13,414 households and a population of 69,727 habitants, of which 34,850 are females (49.98%).

37. Phonhong district is one of the 13 districts of the Vientiane province and has a border with Naxaithong in the south and with Vangvieng district in the north. The district has 59 villages with 12,465 households and a population of 67,106 habitants, of which female are 33,441 habitants or 50% of the population.

38. The total number of Hmong and Khmu ethnic households living along the road number 57 including 43 Hmong households (which includes those households selling food and fruits along the road at Lak 52 market) and 14 Khmu households, from a total of 17 villages. According to the household survey undertaken for the Ethnic Group Engagement Plan (EGEP) and focus group discussions (FGDs), the main livelihood activities for Hmong living in Lak 52 include various businesses, such as selling foods, clothes, groceries, construction materials, electrical appliances and phone shops. Most of Hmong members are settlers from other regions; the land ownership is mainly from purchasing from others, mainly Lao Loum, and most land plots already permanently and legally registered; that is, they already have their permanent land titles. The 14 Khmu households living along the Project road have not settled as an ethnic group, but rather as individual households spread among 7 villages. The household members between them owned and operated 13 businesses. The Khmu had no vulnerable households.

39. Land use within the Project corridor is dominated by a ribbon of residential / commercial / light industrial properties and patches of agricultural land between each village and town. Often it is difficult to determine when one village ends and another starts due to continuous development along the road. As the road continues further north to Phonhong, areas of natural vegetation can be noted (km 49 – 55), although within the ROW most portions are degraded by human activity.

40. The waste management situation in and around Vientiane and the Project area is poor. Most waste is sent to uncontrolled landfills meaning that waste is simply dumped without consideration of the types of waste or the potential for pollution of soils and groundwater, or indeed potential health and safety impacts to those living around the site. There appears to be no method to dispose of hazardous waste in the region according to international best practice.

41. Noise monitoring was undertaken in July 2017 at six locations along the Project road adjacent to existing roadside properties. The results of the noise monitoring show that noise levels in the Project corridor are considered moderate noise levels according to national Leq 24 hrs limit (55-70 dBA). Daytime and nighttime noise is elevated well above national and WBG standards for residential areas and sensitive receptors (but not for commercial / industrial areas).

42. Stakeholder consultations in Naxaithong and Phonhong (September, 2017) included specific questions about the issue of noise impacts. The majority of stakeholders (50% in Naxaithong and 90% in Phonhong) indicated that road noise was not currently a concern for them and they were not concerned about future noise levels.

4.4 Sensitive Receptors

43. The key sensitive receptors identified in the ESIA that require special consideration include:

- Educational Facilities – Twenty three educational facilities were noted within the Project corridor. The boundaries of the facilities were all within 20 meters of the edge of the Project road, although in many instances the actual school buildings were set back

between 50 and 100 meters from the road itself and as such noise levels and air quality impacts will be less in these areas. The school gates are often very close to the edge of the roadside which leads to some congestion in this area when children arrive and leave school. An inventory of the facilities, their proximity to the road and their GPS coordinates are provided within the ESIA.

- Health Facilities – Five health facilities are located within the Project corridor. The boundaries of the facilities were all within 15 meters of the edge of the Project road. Usually the buildings used by patients and staff are set further back than the boundary, in some cases more than 50 meters. An inventory of the facilities, their proximity to the road and their GPS coordinates are provided within the ESIA.
- Physical Cultural Heritage – Thirty-one religious temples and two cemeteries were identified within the Project corridor during site surveys. The boundaries of the religious temples are often located within 20 meters of the edge of the Project road, however, as with many of the educational facilities, the temples are often set back further, often as much as 50 meters from the road side thereby reducing the potential impact of noise and air emissions in these areas. The ethnic Hmong (mainly located around Lak 52) follow an important and well-known ceremony; the Hmong New Year (*Boun Kin Chieng*), which is between December and January of every year for a maximum of 7 days. The purpose of the ceremony is to celebrate the harvest.
- Economic Centers – The Project road passes through a number of towns and villages which comprise numerous commercial and light industrial businesses located adjacent to the road. Some of the towns, such as Lak 52, also host bustling market places which have encroached within the right of way. Maintaining access to these businesses during the construction and operation phases of the Project is a key activity to ensure impacts to livelihoods are kept at a minimum.
- Ecological Sites – As mentioned above, two protected areas are located within the region; Phou Khao Khoay (PKK) and Phou Phanang (PPN). At its closest point of approach to NR13 North, the PKK is more than 20 km to the east. The closest point of approach from the road to PPN occurs near the middle of the project area and is nearly 3 km distant. On average PPN is more than 10 kilometers from the road.
- Residential Areas – The residential properties within the Project corridor are also considered sensitive receptors, although this very much depends on their proximity to the road where noise levels will be highest and construction activities most intense.

5. IMPACT IDENTIFICATION

44. The impact assessment and mitigating measures cover the entire cycle of the project activities, from design, pre-construction, construction and operation and maintenance. The coverage of each of this sub-project phases is defined as follows:

- Design – This is the period of the detailed design.
- Pre-construction Phase – this period is the time that the ‘Notice to Proceed’ is given to the Contractor until commencement of construction.
- Construction Phase - the period from the completion of the Pre-construction activities time until the issuing of the ‘Certificate of Completion’.
- Operation and Maintenance Phase – This final period is the time from completion of works.

45. The key feature of the Project activities that mitigate the overall adverse impact is the fact that all Projects will be confined within the existing road alignment.

5.1 Design / Preconstruction Phase Impacts

46. Air Quality – lack of foresight in the siting of construction camps, rock crushing plants, concrete batching plants and borrow pits in the pre-construction phase could lead to significant air quality impacts in the construction phase, especially if they are located within 500 meters of any of the sensitive receptors identified above.

47. Soils – By the same token, productive soils can also be impacted without due consideration of their value when locating borrow pits, access roads, camps, plant, etc. Soil erosion can also occur on embankments and around structures if adequate consideration of this issue is not taken into account in the design phase.

48. Hydrology - Inadequate assessment of the hydrological conditions in the Project Area and poor design could result in the failure of some of the Project structures, including drainage structures. This in turn would result in several impacts including cost to rebuild the structures, potential flooding of valuable agricultural lands and impacts to surface water quality.

49. Health safety – Failure to incorporate a full range of safety measures into the road design may result in accidents and even deaths on the road, especially close to the educational facilities located adjacent to the Project road.

50. Land Use & Property – The road widening will result in impacts to land and structures which will require resettlement and compensation payments as part of the resettlement action plan (RAP) prepared for the Project. The following summarizes the findings of the RAP:

- Land - According to the RAP the Project will affect 2,625 plots of land covering about 141,672 m², of which 95% is in Naxaithong with the 4-lane road section. The most affected land areas are residential land (48%), followed by commercial land (31%), agricultural land (12%), empty land (6.62%) whose owners cannot be identified or reached, and government land (2.96%). Approximately 211 affected plots of land (8%) will lose more than 10% of their total land area and all but one (210) are located in

Naxaithong District. Amongst the more than 10% affected plots of land, 52% are residential land, 39% are commercial land, 7.6% are agricultural land and empty land.

- Structures - The Project will affect 3,297 structures of 2,161 households and amongst the affected structures 30% are houses, 13% are fences, 32% are cement slabs in front of commercial buildings, and 32% are house entrances. The severely affected houses are found in Naxaithong district where eight houses will be relocated, and another 16 houses can be built on the existing plots. In the two districts there are 963 partially affected houses where the extended veranda and roof will be affected.
- Loss of Income - Apart from physical impacts resulting from the requirement to pull back from the ROW, many small business owners anticipated negative effects on their income due to restrictions on access during construction. There were approximately 246 restaurants and food stalls which were felt to be at risk from construction dust and noise. Of which, 192 food stalls are at risk of losing income.

5.2 Construction Phase Impacts

51. Air Quality - During construction of the road, air quality may be degraded by a range of operational activities including; exhaust emissions from the operation of construction machinery; open burning of waste materials; and dust generated from quarries, borrow pits, haul roads, unpaved roads, exposed soils, material stock-piles, etc. This can lead to health impacts to people living and working in the Project area (and also close to any borrow pits, haul routes, etc) and impacts to ecology and crops.

52. Soils - Potential soil contamination is a possibility in the construction phase resulting from poorly managed fuels, oils and other hazardous liquids used during the project works. It is also possible, that without adequate protection measures soil erosion could occur on road and bridge embankments.

53. Surface and groundwater – Impacts to surface water and groundwater could occur through improper operation of construction camps, asphalt plants, etc. Poor construction management around bridges and close to surface watercourses could also lead to pollution incidents. Without due care temporary drainage structures may also fail, or get obstructed with construction debris, leading to flooding of property and access roads. Irrigation channels may also be negatively affected as culverts are rehabilitated in these areas.

54. Flora – A number of trees have been identified within the four-lane section of the road that may need to be cut. Because the locations of the construction camps, staging areas and borrow pits have yet to be determined, it is not yet possible to inventory the trees that may have to be removed there.

55. Fauna - Project impacts on fauna are expected to be minimal along the roadway, as the loss of habitat due to additional land areas taken to permanently widen the road and to facilitate construction are so small as to be inconsequential, and those areas already are heavily impacted by human development. Any species of wildlife commonly found along the roadway will be species with widespread distributions that have generally adapted to living in developed areas. The threat of being hit by a vehicle while crossing the roadway is a more significant long-term threat to wildlife than the temporary or permanent loss of habitat associated with Project construction.

56. Protected Areas - The closest point of approach from NR13 North to PPN is about 3 km, and the closest point of approach to PKK is about 25 km. There is no known wildlife

migration route between the two protected areas, largely due to the barrier presented by the Nam Ngum River that flows between them to the east of NR13 North. Neither the proposed construction activities nor the normal traffic use along NR13 North after project completion should have any significant impact on either PPN or PPK, largely due to the distances separating the road and the protected areas, and also the even greater distances to their core areas.

57. Infrastructure - Medium and low voltage power lines and water supply pipes are located within the Project corridor. It is possible that these utilities will need to be temporarily removed during construction. In addition, construction works will result in delays and detours on the Project road, thereby affecting business and people traveling along the road.

58. Waste - Road construction will inevitably generate solid and liquid waste products including inert waste (e.g. concrete, wood, plastics, etc.) and hazardous waste (e.g. waste oils, batteries, etc.). 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.

59. Borrow Pits - Opening and operating of borrow pits can result in multiple environmental and social impacts, including degradation of productive soils, 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. The DD Consultant has identified numerous potential borrow pits which can provide the necessary quantity of materials for the Project. All of these borrow pits are located outside the protected areas. Distances of the borrow pits from the project NR 13 N road vary from 0.1 km to 8 kms while the closest point of approach from the road to Phou Phanang protected areas occurs near the middle of the project area and is nearly 3 km distant. On average the PA is more than 10 kilometers from the road. The Contractor will make the final decisions on the borrow pits that he wishes to use, however, using a borrow pit close to, or within a protected area is not considered good international best practice, and will be prohibited under this Project. A Due diligence of all existing borrow pits proposed for use by Contractor including consultation with PONRES will be conducted by the Engineer during the project implementation (Pre-Construction phase) 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 meter from sensitive receptor.

60. Community Health and Safety – Construction activities may result in an increase in road traffic accidents between vehicles, pedestrians and vehicles and livestock and vehicles. This can be a specific issue in residential areas and close to educational facilities. There will also be short term impacts to noise and air quality, which may impact upon the health of people living and working close to construction areas (including haul routes). More specifically, elevated levels of dust generated by construction activities may result in health impacts to residents and construction and operational phase activities will result in elevated noise levels which may have adverse impacts upon sensitive receptors such as the health and educational facilities located within twenty meters of the road. In many instances the actual health and school buildings were set back between 50 and 100 meters from the road itself and as such noise levels and air quality impacts will be less in these areas.

61. Occupational Health and Safety - 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.

62. Ethnic Groups - From the household survey, 57 ethnic group households were found to be living in the project area along the Project road. Of these, 41 were found to be living in the Right of Way, and would lose some part of their land and/or buildings. Most ethnic households have formal land titles: 83% of Hmong households and 73% of Khmu (compared with 78% of Lao/Tai). The EGEP shows the following issues to be the key concerns of ethnic groups in the Project area:

- Traditional festival season: Hmong new year festival (Kin Chieng) happens between December and January every year and lasts for 7 days.
- Air pollution (dust and smoke).
- The vibration from the road construction might cause the damage to their property located close to the road.
- Noise from the construction might make it difficult to sleep at night, particularly those who have old people, young children and sick people in their houses.
- Waste/chemical water pollution and flooding.
- Increased road accidents due to negligence during construction.
- Broken electrical cables, internet cable and water pipes.
- Difficult access, particularly to exit and enter into houses/shops.
- Difficult to cross the road.
- High speed could increase number of fatal road accidents.

Additional issues identified based on the social assessment included:

- 6 Khmu households and 35 Hmong households are directly affected by the project as their landholdings are in the RoW. The remainder will be affected by noise and dust in the same way as the other Hmong and Lao Loum who live along the road but whose land is not being acquired. .
- The number of project workers has been estimated at 100 for the 4 lane section and 100 for the 2 lane section. Of these 40+40 will be foreign workers (depending on the origin of the successful contractors) and 60+60 will be Lao. All the foreign workers and non-local Lao workers will be located in controlled camps. This number of foreign workers is smaller than the current total of foreign residents living in the road corridor, and is not expected to adversely impact members of ethnic groups living along the alignment.
- The percentage of Hmong and Khmu with formal land titles is similar to that of Lao residents (Hmong 83%, Lao Loum 78%, Khmu 73%). Replacement of current land titles with new ones, and the issuing of land titles for those without one, has been acknowledged as a task of the Social Safeguards Team + Resettlement Committee.
- There is no agricultural land along the RoW (apart from personal vegetable/kitchen gardens) that belong to members of ethnic groups.

The process of establishing broad community support, through free, prior and informed consultation was as follows.

- The 1st public consultation meetings were conducted in all 44 affected villages from the last week of June 2017 to the first week of July 2017. The first public consultation meeting was not only for the ethnic group members, but for the communities as a whole. The meeting covered the presentation of (i) the purpose of the project, (ii) the purpose of the consultation meeting, (iii) affected areas, (iv) relevant policies including World Bank Policies and government decrees, (V) Steps to be taken including informing the community that there would be different teams to meet with the community separately (including meeting with the ethnic group

members for the EGEP). These meetings provided the baseline information that could be further considered by the ethnic group members that could subsequently inform their participation in focus group meetings, and the 2nd consultation meeting where broad community support was established.

- The first and second consultation meeting and FGDs were conducted by the Public Consultation team of experienced facilitators at the village temples and village meeting rooms, where they were supposed to create a friendly environment where it was convenient for everybody to access and attend. In addition, the meetings and FGDs always allowed sufficient time for all participants to express their thoughts and opinion freely including small group work and discussion.
- The overall consultation process took place over a period of three months, and provided ample opportunity and time for members of ethnic groups to learn about the project impacts, and contribute to the preparation of the EGEP. Engagement opportunities ranged from the first broad community consultation meeting, to more in-depth focus group meetings, and a 2nd consultation meeting with ethnic group members to establish broad community support. Participants were identified with the help of village authorities and through the household socio-economic survey.

63. Construction Camps - 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.

64. 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, increased risk of illicit behavior and crime, increased burden on and competition for public service provision, increased risk of communicable diseases and burden on local health services, gender-based violence, child labor and school dropout, local inflation of prices and increased pressure on accommodations and rents.

65. Physical and Cultural Resources - A number of cemeteries and temples have been identified within the Project area. However, according to the MPWT none of these will need to have any portion of their properties removed, e.g. walls, gates, etc. Most of the temples identified within the Project corridor will be subject to elevated noise levels above national and WBG standards during the operational phase of the Project. In addition, they may be subject to short term elevated noise levels during the construction phase of the Project. A Buddha tree was noted close to the road at a temple in Songeuy-Neua in Naxaithong District. However, the DD Consultants have moved the road alignment slightly to the east to prevent the Buddha tree from being cut. Given Lao PDRs rich cultural heritage it is possible that chance finds could occur, although this is considered remote due to the fact that the works are confined to the already heavily disturbed right of way.

66. Noise – Calculations of construction phase noise levels indicate that noise levels as high as 67 dBA could be reached at residential and other sensitive receptors in the Project corridor (including all of the identified health and educational facilities in the Project corridor) which is considerably higher than WBG daytime and nighttime standards. In addition, significant noise impacts may result from long-term exposure to noise from static construction facilities such as rock crushing plants and quarries where operational activities may last for the entire construction period.

5.3 Operation and Maintenance Phase Impacts

67. Climate Change – Increased precipitation resulting from climate change could result in a range of impacts including embankment stability, flooding, etc. Higher average temperatures could impact asphalt surfaces (if this material is chosen for the pavement).

68. Hydrology – Run-off from bridge decks could pollute the waterways beneath them.

69. Noise - Operational phase simple noise calculations indicate that operational noise levels in commercial areas are unlikely to increase above WBG and national standards. However, it is difficult to define exactly what areas are commercial and what are residential within the Project corridor as many people both live and work in properties along the road. Many sensitive receptors identified during the surveys such as schools/health facilities/temples are already exposed to elevated noise levels due to their proximity to the Project road. However, often school/health facility/temple buildings identified in the surveys are often set further back from the boundary wall of the facility even though the boundary walls are often very close to the Project road. As noted above, consultations with stakeholders indicated that road noise is not a significant issue for them.

70. Air Quality – Given the existing low levels of NO₂ and CO in the Project corridor, it is considered unlikely that they will rise above the national standards in the future or affect sensitive receptors such as residential areas and health and educational facilities. In addition, improvements to the pavement, shoulders and intersections should reduce the amount of dust currently found on the Project road.

71. Health and safety – Rehabilitation of the road will result in numerous beneficial health and safety impacts, including; reduced dust levels, faster emergency response times; improved pedestrian crossing facilities and improved road geometry. However, increases in the number of vehicles using the Project road and their speeds may result in an increase in the number of road accidents occurring 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 first section of the road is increase to four lanes with a concrete median, crossing will only become possible at dedicated crossing points otherwise accidents may occur as people attempt to cross the four lanes and a median which may, over time, see an increase in traffic levels.

72. Cumulative and Induced Impacts

Cumulative Impacts No other existing, proposed and anticipated future road projects have been identified that may result in cumulative impacts to the Project area. In addition, 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.

Induced Impacts Potential may lead to both beneficial and adverse induced impacts.

It is anticipated that road improvement would result in improving connectivity, communities access to public services and markets, reduced vehicle operating costs and travel time, enhanced accessibility of enterprises, increased labor productivity, and reduced road fatality rates. Improved access to markets, jobs and services along the major transport corridor will benefit a larger share of population and contribute to inclusive growth. As a result of climate resilience measures, there will be positive effects on accessibility to markets and public services. Induced positive impacts to the community, including possible increase in land values, and development of more business opportunities and jobs. These support the Eighth

National Socio-Economic Development Plan (NSED) 2016-2020, goals of achieving sustained and inclusive economic growth, while reducing the effects of natural shocks as well as the national efforts to achieve Sustainable Development Goal (SDG) 9 to build resilient infrastructure and SDG 13 to address the impacts of climate change.

However, Potential adverse induced impacts may include:

- Conversion of agricultural land to commercial, industrial factory and residential property, this in turn may lead to:
 - Increased population living within the corridor which may lead to stress on social services, such as schools, hospitals, etc.
 - Required upgrading or expansion of utilities, such as electricity supply.
 - Stresses on water availability, specifically groundwater.
- Expansion of development towards the Phou Phanang Protected area.

6. MITIGATION ACTIONS

6.1 Design / Preconstruction Phase Mitigation

73. Requirements set out in the ESIA and ESMP will be incorporated into the OPBRC Bidding Document, Supervision Consultant Terms of Reference (TOR) and contracts. Pre-bid meeting/workshop will include discussions on safeguards requirements to ensure that contractors understand and include safeguards tasks, personnel and cost in their proposal.

Site Specific Environmental Management Plan (SSESMP) – Following the award of the contract and prior to construction commencing the Contractor will review the ESIA and its ESMP and develop this into his own detailed SSESMP. The SSESMP will present a series of site plans covering the whole project site showing all environmental and social management requirements for all activities in the construction phase. The SSESMP will include the following plans:

- Waste Management and Recycling Plan.
- Construction Camp Plan.
- Borrow Pit Plan.
- Emergency Response Plan.
- Air Quality Plan.
- Health and Safety Plan.
- Traffic Management Plan.
- Spill Response Procedures.
- Labour Influx Management Plan.

74. The SSESMP will also include a monitoring plan and a reporting program corresponding to the requirements of the ESMP and OPBRC contract. The SSESMP, and all of its plans without exception, will be submitted to the Engineer and the PMU for review and approval prior to the Contractor taking possession of any work site.

75. Siting of Facilities – During the pre-construction phase the Contractor will consult with the Engineer, (Implementation Support and Construction Supervision Consultants), the PMU and PONREs, as well as local village committees to determine the locations of construction camps and ancillary facilities, such as concrete batching plants. 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 not within two kilometers of a protected area.

76. Permits – The Contractor will be responsible for obtaining all of the required environmental permits prior to the start of construction. All permits will be reviewed by the Engineer before construction work commences.

77. Bridge Design - Bridge designs should ensure that drainage from bridge decks over 50 meters does not discharge directly to the watercourses beneath the bridges. In addition,

the bridge design and layout must be aesthetically pleasing and in harmony with the existing environment.

78. Drainage Design - Consideration in the design phase has been given to the issue of drainage and culverts to ensure that drainage patterns are improved from the existing conditions and that increased run-off does not occur or result in flooding of areas previously undisturbed or in those areas identified as flood prone by the Project FS. During design, all drainage works have been designed based on the historical flood data and flood forecasting. A design discharge of 50 years return period is considered for culverts, and 100 years of bridges.

79. Community Health and Safety - Traffic safety issues will be accounted for during the design phase of the Project to include; safety barriers, road crossings and speed limits. It is especially important to consider additional traffic safety measures close to schools, including reduced speed limits (maximum 50 kilometers per hour) and traffic calming measures such as speed bumps. Road safety audit had been conducted by the DDC and the issues will be addressed in the designs. An additional independent Road Safety Audit will be carried out during the design phase. Road safety features requested by PAPs in the scope of consultation will be considered by Road Safety Audit Consultant and the contractor for potential inclusion in the final design (e.g. night lighting, road crossing around schools, etc.). Two related activities under the proposed project are: (a) education and awareness campaigns with a focus on school along the alignment; and (b) road safety enhancement along the road.

80. Loss of Land and Property – The Project RAP includes an entitlement matrix which specifies the particular conditions for; a) loss of land or use of land, b) permanent loss of agricultural or garden land, c) loss of crops and trees, d) livelihood impacts, e) allowances, assistance and livelihood restoration, f) temporary impact during construction.

81. The DoR / MPWT retains overall responsibility for implementing the RAP and its entitlement matrix. A PMU established within the DoR will be responsible for the day to day planning and implementation 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 team of social and resettlement specialists will be hired to support the ESMU/PMU and will ensure that all plans are updated and complied with. The resettlement specialist will report to the ESMU-Manager. 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.

82. The estimated cost of compensating for the land, structures and trees is US\$19,184,123 (159,362.51 M Kip). The cost for compensation of temporary loss of access to 1,469 businesses and shops during construction work is \$300 per business with the total amount of \$440,700 to facilitate businesses operations. This cost to be covered by the contractor. Cost for temporary affected 192 food shops and restaurants based on the median income of 5,800,000 Kip per month per unit with the total amount of \$403,200. Including administration charges (cost of updating and implementing the RP) of 5% and a 5% contingency, the total estimate of the RP for the Project is US\$22,039,626 (183,083.17 M Kip).

6.2 Construction Phase Mitigation

83. Air Quality - Proper control, siting and maintenance of equipment, including concrete batching plants, will mitigate emissions impacts. Spraying of roads with water during dry periods and covering of friable materials will also help prevent dust impacts.

84. Soils - Measures are outlined within the ESMP to reduce the impacts of potential spills and leaks. They include storing hazardous liquids in special storage areas within concrete bunds and the provision on spill kits in these areas. Erosion control measures and measures to preserve topsoil are also recommended within the ESMP.

85. Surface and groundwater – Proper design, siting and management of facilities (including construction camps and concrete batching plants) will help reduce impacts to water quality. Accidental spills could occur and provisions are recommended in the ESMP to manage such accidents. Temporary drainage in villages will be kept clear of construction debris to prevent flooding at work sites. A range of measures are provided in the ESIA to prevent impacts occurring at bridge construction sites, including for example; ensuring no waste materials are dumped in the river, including re-enforced concrete debris, ensuring that no hazardous liquids are placed within 10 meters of the river and providing portable toilets at bridge construction sites to prevent defecation by workers into the river.

86. Flora – To minimize the impact on flora to the greatest extent possible, all of the temporary construction facilities should be located on already heavily disturbed ground where secondary forest growth has not yet become well-established. Tree cutting will follow the formal procedures of the GoL.

87. Fauna - The bridges that will be replaced or renovated along NR13 North can be designed with dry paths under the bridge on either side of the streams to facilitate movements of people, livestock and wildlife, the latter primarily at night when people are not around. Other pedestrian crossings

88. In areas where livestock occasionally must be moved from one side of the road to the other, warning signs will be posted to alert drivers to the possibility of encountering livestock on the roadway, and lower speed limits also may be posted. Awareness raising programs for both villagers and road users should be initiated by the DoR traffic safety division.

89. Protected Areas - Project facilities will not be located within two kilometers of a protected area wherever possible, to minimize their potential impacts on the flora and fauna of protected areas. This is especially important for the worker camps in order to limit worker access to protected area, and thereby limit the possibilities that the workers would engage in hunting and collecting wildlife inside the protected area. In addition, project facilities will be located on land that already is heavily impacted by human activities, and avoid clearing land where good vegetative ground cover or secondary forest has been established.

90. Infrastructure - Before the removal of utilities or other infrastructure (such as irrigation channels), the Contractor will notify the general public of the potential disruption and arrangements will be made between the Contractor and those affected to minimize the disruption. Implementation of the approved traffic management plan will reduce traffic disruptions.

91. Waste Management - The Contractor will be responsible for the safe collection and removal of all waste materials from his site. Accordingly, he will prepare waste management plan, including measures to re-use and recycle wastes to be approved by engineer before

construction start. Contractor will also prepare contracts with a suitably licensed waste management contractor for the removal of all wastes from his sites and maintain waste disposal records. Engineer will perform a due diligence review of the waste management contractors facilities to ensure that they are in compliance with Lao PDR regulatory requirements.

92. Economic Aspects - To avoid disruption to road-side 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.

93. Access - Access to businesses will be maintained at all times throughout the construction period. This means that the contractor will prepare dedicated temporary pathways to all businesses that might otherwise be cut off from the road during the construction phase. The pathways will be wide enough to allow access to the business and will be kept free of mud and construction debris and will not be liable to flooding.

94. Influx of Workers - Prior to the start of construction the Contractor will be responsible for the preparation of a Labour Influx Management Plan as part of his SSESMP. The Labour Influx Management Plan will include the 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.

95. Ethnic Groups – A number of environmental and social issues were identified by the ethnic groups in the Project area. Most of the concerns raised by the ethnic groups were the similar to those raised by other Project stakeholders and are addressed herewith, including impacts from noise, air emissions, safety, etc. Regarding construction phase vibration, this impact is not considered to be significant given the fact that no blasting is anticipated as part of the Project works. Regarding the Hmong new year, the ESMP will contain provisions to prohibit works during the seven day Hmong New Year period at Lak 52.

96. Asphalt Plants, Concrete Batching Plants and Construction Camps – In the first instance, no construction camp, or ancillary facility will be permitted within 500 meters of any sensitive receptor or within two kilometers of a protected area and at least 200 m from any surface water course. In addition, if possible construction camps should be located on the eastern side of the Project road. This will help reduce noise, water and air quality impacts and impacts to the protected areas. 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 SSESMP. The Plan will indicate the system proposed and the locations of related facilities in the site, including latrines, holding areas, etc. The Contractor will also be responsible to maintain and reinstate campsites and other ancillary facilities 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 time period after construction works are completed.

97. Borrow Pits - In the first instance, use of Project borrow pits that are located within protected areas is prohibited under this project. Borrow pits will only be selected that are at least two kilometers from the protected areas. Efforts will be made to ensure that these facilities are as near to the Project road as practical to avoid impacts to communities and protected areas.

98. If the Contractor intends to utilise materials from any existing borrow pits, a due diligence review including a review of licenses and approvals from regulatory agencies will be carried out by the Engineer to confirm that these sites identified for use by the Contractor are indeed 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 or urban areas are not located within 500 meters of the borrow pits. The Engineer will also consult with PONRES to confirm exact distance of the borrow pits and to ensure that the borrow pits are not located within two kilometers of a protected area. A copy of the agreement between the operator and the Contractor will also be provided to the Engineer for review. The due diligence review will be undertaken before the Contractor signs any contract with the existing borrow pit owner. Results of the due diligence review will be presented to PMU and Contractor clearly stating the reasons for any rejection of the site. It is more likely that contractor would use the existing borrow pits. If the Contractor intends to open and operate his own borrow pits, the Contractor will: i) obtain all necessary permits from PONRE and other regulatory authorities; ii) prepare a Borrow Pit Action Plan (BAP) that will be submitted to the Engineer prior to the start of construction. Pit restoration will follow the completion of works in full compliance all applicable standards and specifications; and, iii) ensure that borrow pit will not be located within 2 kilometers of a protected area.

99. While operational, the Contractor will ensure that top soil from the borrow pit is saved, pits are fenced (if deemed a safety hazard), access roads are controlled and haul routes followed as per the Contractors traffic management plan.

100. Community Health and Safety – It will be the responsibility of the Contractor to provide safe access at all times through the construction site to people whose residences/shelters and routes are temporarily severed by road construction. During the construction phase, specific attention will be given to the schools identified within 20 meters of 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 a school, 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.

101. Occupational Health and Safety - Health and safety plans, training and HIV/AIDS and vector borne disease awareness programs will be provided by the Contractor. In addition, the Contractor will prepare traffic management plans to reduce potential impacts to villagers during construction periods. The Contractor will also be responsible for providing adequate Personal Protective Equipment for all workers, including sub-contractors and site visitors.

102. Physical and Cultural Resources - Only one Buddha tree has been identified that maybe directly impacted by the Project. Trimming of the trees braches may be required. This activity will be coordinated between the Contractor and the temple. No cutting of the tree will be allowed without the permission of the Engineer. Any other Buddha trees that are within ten meters of a construction zone will be clearly marked and fenced prior to the

start of construction works in the vicinity of the tree (within 50 meters). Under no circumstances will any Buddha tree be trimmed, or cut without consultation between the Temple, the Engineer and the Contractor. The Contractor will prepare a chance find procedure. The procedure will incorporate all of the requirements of the GoL regarding chance finds.

103. Noise - 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 including; 1) source Controls, i.e., requirements that all exhaust systems will be maintained in good working order; 2) site Controls, i.e., requirements that stationary equipment will be placed as far from sensitive land uses as practical; 3) Time and Activity Constraints, i.e., operations will be scheduled to coincide with periods when people would least likely be affected. In addition, during religious holidays the contractor will not work within 250 meters of any temple. No work shall be undertaken during the 7 day Hmong New Year period at Lak 52; and 4) Community Awareness, i.e., public notification of construction operations.

6.3 Operational and Maintenance Phase Mitigation

104. Hydrology – If, during the operational phase of the Project, the rehabilitated road does result in increased run-off and flooding, the Contractor will be responsible for rectifying this issue during the defects liability period and the DoR will be responsible after this period.

105. Public Safety During Operational Phase – On the physical side, the detailed design incorporates findings from a traffic safety audit, International Road Assessment Program (iRAP) inspections, and public feedback provided by residents during project preparation consultations. Physical features include enhanced measures to safeguard pedestrians' safety, including: pedestrian bridges; traffic calming options; street lighting in populated areas; road furniture; reflectors; improvements in driving vision facilities; motorcycle lanes; and sidewalks. Traffic safety aspects will be embedded in the service levels under the OPBRC. 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.

106. Noise - Operational phase simple noise calculations indicate that operational noise levels in commercial areas are unlikely to increase above WBG and national standards. However, it is difficult to define exactly what areas are commercial and what are residential within the Project corridor as many people both live and work in properties along the road. Consultations with stakeholders indicate that noise from the road is not a significant issue for them.

107. However, the following recommendations are made to address the issue of operational noise levels:

- I. DoR undertakes a program of consultation with stakeholders within the Project corridor to determine:

- a. If noise is a significant issue? Does it affect sleep or work? Does it have any health impacts?
 - b. Are stakeholders concerned about an increase in noise levels?
 - c. Would stakeholders like noise to be reduced?
 - d. If so, what measures would they consider?
2. If stakeholders do not think noise is a significant issue and they are not concerned about increases in noise levels no further actions should be considered during this stage of the Project. However, routine monitoring of noise levels along the road should be undertaken annually to assess how noise levels are changing year or year. The noise monitoring should also include surveys with stakeholders to continue assessing their thoughts on noise levels. If noise levels rise more than 3 dBA over the next ten years, and if stakeholders become more sensitive to the noise issue the DoR should investigate concrete methods to reduce noise levels through the potential mitigation measures proposed in the ESIA.
 3. If stakeholders feel that noise is a significant issue and that they are concerned about increases in noise levels the DoR should prepare a noise model to determine the exact nature and extent of any noise levels increase over the next 25 years. The model should be part of a report that recommends precise mitigation measures, or a combination of measures, to reduce noise levels. The model should clearly define what areas of the corridor are commercial and which are residential / sensitive locations so that mitigation measures can be applied accordingly. The DoR would then have to consult with the stakeholders to confirm that they are willing to accept the proposed mitigation measures and then implement the noise mitigation measures.

108. Induced Impacts - The ESIA has identified several beneficial and adverse induced impacts that may occur in the future as a result of the road improvement. The beneficial induced impacts support the Eight NESDP goals of achieving sustained and inclusive economic growth, while reducing the effects of natural shocks as well as the national efforts to achieve Sustainable Development Goal (SDG). The potential adverse induced impacts may be arised from unplanned development along the road corridor and from potential change of land use including the potential expansion of development (all types) towards the Phou Phanang Protected area. Such impacts may include: i) stress on social services, such as schools, hospitals, etc.; ii) required upgrading or expansion of utilities, such as electricity supply; and iii) stresses on water availability, specifically groundwater, etc. However, the project will have less adverse induced impacts comparing to green field development.

109. In Lao PDR, provincial authorities have mandate to manage relevant measures to address such induce impacts. Typically, such aspects are addressed by relevant legal framework and sector strategy including urban planning regulations, Land law, Agriculture law, National Land Policy, etc. Under the agriculture law individual or entities are not allow to convert agriculture land to other propose unless receive permission from agriculture authorities. The national land policy also has similar requirements in term of protecting protected areas and forestry. These are also included in Five Years Provincial Socio-Economic Development Plan (Provincial SEDP). Under this project, the MPWT will establish the Project Steering committee, chaired by the Minister and consist of relevant provincial authorities and representative from relevant lines ministries. This expect to bring about an

improved inter-agency coordination. To address unplanned ribbon development along the project road, the MPWT, through steering committee, should encourage provincial authorities and lines ministries to take into account potential impacts from these induced growth in the next Five years SEDP and respective development plans/strategies. Also, the DoR and DPWTs should strictly implement its policy to control re-encroaching to the road ROW.

110. Mitigating Impacts on Ethnic Groups

Most of the impacts identified during the focus group meetings with Ethnic Groups were similar to those identified during the broader consultation process. Therefore, the mitigation measures presented in the table below (with the exception of assistance to ethnic groups) are included not only in the EGEP, but also in the RAP and ESIA respectively.

Main Themes	Mitigation Measure
Communication	1. Recruit a Hmong interpreter for communicating with the ethnic group, especially women.
	2. Hire necessary translator to facilitate the communication between village authorities or/and affected people and construction workers.
	3. Develop 50 posters containing a list of key project contacts (with name and phone numbers)
Assistance to ethnic groups	4. Recruit a Social Specialist to work part-time with groups along the road to convey any concerns or complaints to the appropriate authority
Information Sharing	5. Make 44 copied sets of the final approved technical design to be shared with each affected villages.
Demolition of affected structures	6. For those temporary residents, especially poor female head household, the compensation should cover the cost of moving following the World Bank resettlement policy.
	7. 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.
Business	8. Compensation for income loss during the construction
Compensation	9. Compensation for asset loss (land, house and shop structures, drainage and tree)
	10. The compensation for issuing a new land title for the affected land title.
	11. The compensation for the demolition
Issues During the Construction	12. Water the road during the construction at least 2 or 3 or time a day.
	13. Put warning signs and lights, and barriers at the incomplete construction areas.
	14. Pay for any loss/accident cause by the company's neglects during the construction
	15. Conducts the site inspection to avoid damaging the water pipe and electrical cable.
	16. Include the driveways in the construction design.
Safety issues after completing the construction	17. Arrange the temporary crossing driveway for AP's houses if the drainage canal needs to be done or if the construction has to be blocked their houses/shops.
	18. Construct sky-bridges or zebra crossings at markets, schools, temple and hospitals.
	18. Put up speed limit control warning signs and lights at the cross sections, schools, markets, temples and hospitals.
	19. Put up warning sign for "Drink, Don't Drive"
	20. Install sufficient street lights and traffic lights at the cross section or T-

Main Themes	Mitigation Measure
	junction
	21. Organize the community awareness raising about the traffic rules and regulations for the villagers and teenagers
	22. Assign the patrolling police officers at a particular section to ensure that drivers obey the traffic rules.

7. MONITORING ACTIONS

111. To ensure that all of the above mitigation actions are completed according to the requirements of this ESIA, monitoring will be undertaken of Project works by the Engineer and by independent monitoring specialists. Specifically, both observational monitoring and instrumental monitoring will be undertaken as follows:

- **Instrumental Monitoring** – This will be completed by independent specialists and will include routine air quality, water quality and noise monitoring during the construction phase. Schedules, parameters, locations are indicated by the ESMP. The Engineer will be responsible for contracting the independent monitoring specialists.
- **Observational Monitoring** – The Contractors actions will be continually monitored by the Engineer throughout the Projects Construction phase. This will be achieved through weekly inspections of the Contractors environmental performance and his SSESMP by national and international environmental and social specialists and health and safety specialist engaged by the Engineer throughout the construction period. The Engineer will have the right to suspend works if the Contractor is in violation of any of his obligations under the ESMP and this ESIA.

8. CONSULTATIONS

112. Stakeholder consultations were undertaken throughout the Project corridor. They included 'scoping' consultations in Naxaithong and Phonhong in June 2017 (comprising 115 people), consultations on the draft ESIA in Naxaithong and Phonhong in September 2017 (comprising 556 people) and 68 Focus Group Discussions (FGD) in 44 locations. Two key FGDs were conducted in Lak 52: one with a Hmong women's group and another with elderly Hmong.

113. Further stakeholder consultations were undertaken to; 1) present a brief summary of the social impact assessment conducted during June and July 2017, 2) establish broad community support, and 3) discuss and finalize the Ethnic Group Engagement Plan. The meetings, organized in two sessions, one in Phonhong district - attended by 28 potentially affected ethnic group members, and one in Naxaithong district - attended by six potentially affected ethnic group members.

114. The consultations with villagers, local officials and government representatives revealed broad support for the Project. However, a number of issues were raised, such as the potential for increased noise levels, degradation of air quality, decreased safety levels and reduced access to property. All of the concerns raised in the consultations have been included within the impact assessment portion of the ESIA and where practical, measures have been proposed to reduce the significance of, or mitigate impacts as outlined above in **Section 6**.

9. IMPLEMENTATION

115. All of the summarized impacts and mitigation measures outlined above and the actions to monitor the mitigation measures during the construction and operational and maintenance phases of the Project have been included in the ESIA within a detailed Environmental and Social Management Plan (ESMP) which can also be found in **Appendix A**.

116. The ESMP and its mitigation and monitoring programs will be included within the Project Bidding documents for project works for both Project Lots. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs which will also be included in the Project BoQ.

117. The Bid documents will state that the Contractor will be responsible for the implementation of the requirements of the ESMP through the afore mentioned SSESMP which will adopt all of the conditions of the ESMP and add site specific elements that are not currently known, such as the Contractors final list of borrow pit locations and waste disposal sites.

118. The ESMP and all its requirements will be added to the Contractors Contract, thereby making implementation of the ESMP a legal requirement according to the Contract.

119. The Contractors (one for each of the two Lots) will appoint one part-time Environmental and Social Manager (ESM) for six months a year, and one full-time Health and Safety Manager (HSM) to be a senior members of the construction management team based on site for the duration of the contract. The ESM will have a university degree (preferably at Masters level) in Environmental Science or related discipline and have at least 10 years work experience in environmental management of infrastructure projects. The HSM 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.

120. Key responsibilities of the Contractor (through the ESM and HSM) are as follows:

- Preparing the Site Specific Environmental Management Plan (SSESMP) for approval by the Engineer prior to the Contractors taking possession of the construction site (see below).
- Ensuring the SSESMP 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:
 - Weekly site inspections using checklists based on the SSESMP;
 - Environmental and health and safety accidents/incidents including resolution activities;
 - Non-compliance notifications issued by the Engineer;
 - Corrective action plans issued to the Engineer in response to non-compliance notices;

- Community relations activities including maintaining complaints register;
- Preparing monitoring reports (Monthly);
- Routine reporting of SSESMP compliance and community liaison activities;
- Adhoc 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 HSM will keep a record of all monthly training and toolbox training undertaken.

121. An Engineer will be responsible for the oversight of the Contractors activities. Should the Engineer, through routine monitoring by a national and international environmental and social specialist and health and safety specialist, note any non-conformance with the Contractors SSESMP the Contractor can be held liable for breach of the contractual obligations of the ESMP. The Engineer will include a part-time International Environmental and Social Specialist (IESS) (for 3 months during the first year of construction and 2 months per year for the second and the third year) , a full time National Environmental and Social Specialist (NESS) and a full time Health and Safety Specialist to monitor implementation of the SSESMP 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 environmental management plan (ESMP). The main responsibilities of the Engineer are as follows:

- NESS to monitor the Contractor's implementation of his SSESMP via weekly inspections of the Contractors camps and work sites;
- NESS to prepare Monthly Environmental Reports summarizing the Contractors compliance with the ESMP and SSESMP for that particular month;
- IESS to prepare Quarterly Environmental Reports providing details of the Contractors activities (such as training programs, community meetings, etc) and compliance with the ESMP and SSESMP; and
- Engage external service from a certified laboratory for environmental instrumental monitoring of air quality, noise and water quality.

122. A grievance redress mechanism (GRM) has also been prepared as part of the Project. The GRM provides a structure for stakeholders to make complaints and a mechanism for the complaints to be resolved both locally and centrally. The GRM applies to both the ESIA, the RAP, and the EGEP.

APPENDIX A – ESMP

Environmental and Social Management Plan - Detailed Design / Pre-construction Phase

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Responsibility & Schedule
Air Quality	Construction impacts	<ul style="list-style-type: none"> Preparation of an Air Quality Plan (AQP) including the location of haul routes and the items specified under Item 5.6.3.3 of the ESIA. 	<ul style="list-style-type: none"> Contractor to prepare AQP Engineer to review and approve AQP. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
	Air quality impacts from stationary sources	<ul style="list-style-type: none"> Locations for quarry sites, borrow pits and concrete batching plants will require approval from the Engineer and PONRES. Quarry, borrow pit or batching plant will Not be located within 500 meters of any urban area or sensitive receptor. 	<ul style="list-style-type: none"> Contractor to select sites. Engineer and PONRE to approve sites. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
Land Use	Road Vendors	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Contractor, DoR and Provincial government to select site. Contractor to implement mitigation. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A

		measures proposed in the RAP.			
Climate Change	Damage to roads and drainage systems due to increased flooding and more intense rainfall.	<p>As part of the detailed design, the following measures will be considered:</p> <ul style="list-style-type: none"> • Increase ditch and culvert capacity; • Maintain positive cross slope to facilitate flow of water from surface; • Increase pavement resistance to rutting; • Reduce splashing/spray through porous surface mixtures; • More frequent use of elevated pavement section; • Improve visibility and pavement marking demarcation; and • Ensure that all embankments are seeded to help increase stability. 	<ul style="list-style-type: none"> • DD Consultants • Engineer to review design documents prior to the start of construction. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
Borrow Pits and Quarry's	Suitability of borrow pits	<ul style="list-style-type: none"> • Use of Borrow pits that are located within protected areas is prohibited under this project. • The following borrow locations listed in Table 3-6 of the ESIA will not be utilised by the Contractor: 	<ul style="list-style-type: none"> • Contractor to select sites. • Engineer and PONRE to approve sites. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A

		<ul style="list-style-type: none"> ○ RG01, RG02, RS01, RS02 and RS03. • The Contractor will not use borrow pits located within 2km of protected areas. 			
New Quarry Sites	<ul style="list-style-type: none"> • 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. • Quarry will Not be located within 500 meters of any urban area, sensitive receptor or within 2 kilometers of a protected area. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	
Existing Borrow Pits	<ul style="list-style-type: none"> • 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 to ensure that the borrow pits/quarries are not within 2 kms from protected areas; and not within 500 meter 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 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	

		<p>ensure the borrow pits are not located within 2 kms from protected areas; and not within 500 meters from sensitive receptor.</p> <ul style="list-style-type: none"> The due diligence review will be undertaken before the Contractor signs any contract with the existing borrow pit owner. 			
	New Borrow Pits	<ul style="list-style-type: none"> Obtain all necessary permits from the regulatory authorities. Prepare a Borrow Pit Action Plan (BAP) according to the requirements of Section 5.8.7.2 of the ESIA. Borrow pit will Not be located within 2 kilometers of a protected area. Arrangements for opening and using material borrow pits will contain enforceable provisions. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
Hydrology	Bridge Construction	<ul style="list-style-type: none"> All new bridges will be designed for the life expectancy of 75 years. A design discharge of 100 years return period is considered for bridges. The bridge rehabilitation and strengthening works will be designed for the life expectancy of 50 years. Bridge designs should ensure that drainage from bridge decks over 50 meters does not discharge directly to the watercourses beneath 	<ul style="list-style-type: none"> DD Consultants Engineer to review design documents prior to the start of construction. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A

		<p>the bridges.</p> <ul style="list-style-type: none"> • The bridge design and layout must be aesthetically pleasing and in harmony with the existing environment. • Provide dry paths under the bridge on either side of the river to facilitate movements of people, livestock and wildlife. 			
	Culverts	<ul style="list-style-type: none"> • A design discharge of 50 years return period is considered for culverts 	<ul style="list-style-type: none"> • DD Consultants • Engineer to review design documents prior to the start of construction. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
	Siting of facilities	<ul style="list-style-type: none"> • No construction camp, permanent or temporary, will be located within 200 meters of any river, or irrigation channel (not including drainage channels) identified in Table 3-4 of the ESIA report. 	<ul style="list-style-type: none"> • Contractor to select sites. • Engineer and PONRE to approve sites. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
Flora & Fauna	Tree cutting	<ul style="list-style-type: none"> • Tree cutting will be undertaken according to the law of the GoL. 	<ul style="list-style-type: none"> • Contractor to undertake tree cutting. • Relevant regulatory Authority to monitor tree cutting. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
	Animal Crossing	<ul style="list-style-type: none"> • Awareness raising program to be initiated by DOR traffic safety division. • Provide warning signs and speed restrictions in 	<ul style="list-style-type: none"> • DD Consultant to consult with villagers to determine 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A

		locations where cattle frequently cross the road.	appropriate crossing locations. <ul style="list-style-type: none"> • DD Consultant include safety signs in design documents. 		
	Land clearance	<ul style="list-style-type: none"> • The Contractor will prepare a Clearance, Re-vegetation and Restoration Management Plan for prior approval by the Engineer. The Clearance Plan will be followed strictly by the contractor. Areas to be cleared should be minimized as much as possible. • All temporary construction facilities should be located on already heavily disturbed ground where secondary forest growth has not yet become well-established. 	<ul style="list-style-type: none"> • Contractor to prepare and implement Plan • Engineer to review and approve plan. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
	Impacts to Protected Areas	<ul style="list-style-type: none"> • No construction camp, or construction facility, such as a concrete batching plant, will be constructed within 2 km of a Protected Area. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. • Engineer to approve final locations. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
Construction Camps	Selection of Construction Camp Site	<ul style="list-style-type: none"> • Preparation of a Construction Camp Site Plan. • Preparation of a Spills Response Plan. • Construction camps will not be located within 500 meters of an urban area and at least 200 meters from any surface water course and not within 2 kilometers of a protected area. • Coordinate all construction camp activities 	<ul style="list-style-type: none"> • Engineer to review & approve Plans. • Engineer and PMU to approve camp locations. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A

		with neighboring land uses.			
Transportation and Utilities	Damage to roads	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Engineer to complete road condition survey. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
Occupational Health and Safety	Worker Health and Safety	<ul style="list-style-type: none"> Prepare an Occupational Health and Safety Plan (OHS Plan), including the items specified by Item 5.8.9.3 of the ESIA. Ensure that sub-contractors are provided with copies of the SSESMP. 	<ul style="list-style-type: none"> Contractor to prepare OHS Plan. Contractor to provide copies of the SSESMP to sub-contractors prior to their access to the site. Engineer to review and approve OHS Plan. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
	Traffic Safety	<ul style="list-style-type: none"> Submit a Traffic Management Plan (TMP) to PMU and local traffic authorities prior to mobilization. 	<ul style="list-style-type: none"> Contractor to prepare TMP. Engineer to approve TMP. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
	UXO	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Contractor to consult with relevant regulatory authorities. Sub-contractor to survey the site, if 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A

		<p>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.</p>	<p>required.</p> <ul style="list-style-type: none"> Contractor to provide the results of the survey to the Engineer. 		
Community Health and Safety	Health and Safety	<ul style="list-style-type: none"> 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. Consider additional traffic safety measures close to schools, including reduced speed limits (maximum 50 kilometers per hour) and traffic calming measures such as speed bumps. Construct pedestrian walkways in urban areas, specifically in the four lane section of the road. Project sticker with contact information of site supervisor should put on all contractor's, sub-contractor's vehicles and equipment and all 	<ul style="list-style-type: none"> DD Consultants to prepare designs incorporating traffic safety measures. Engineer to review design documents prior to the start of construction. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A

		projects vehicles and equipment.			
	Migrant Workers	<ul style="list-style-type: none"> Preparation of an Labor Influx Management Plan in line with WBG ESHS standards. The Labour Influx Management Plan will include the 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. 	<ul style="list-style-type: none"> Contractor to prepare plan. Engineer to review and approve plan 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
	Communications	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor to hold meeting. Engineer to be present at all meetings. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
Emergency Response	Fires, explosions, traffic accident, earthquakes,	<ul style="list-style-type: none"> Preparation of an Emergency Response Plan (ERP). Including measures to handle traffic accidents. 	<ul style="list-style-type: none"> Contractor to prepare ERP Engineer to review and approve ERP. 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A

	etc.				
Waste Management	Management of waste materials	<ul style="list-style-type: none"> • Preparation of a waste management plan, including measures to re-use and recycle wastes. • Preparation of a construction camp management plan to manage liquid wastes. 	<ul style="list-style-type: none"> • Contractor to prepare Plans • Engineer to review and approve Plans. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
PCR	Chance Finds	<ul style="list-style-type: none"> • The Contractor will prepare a chance find procedure in line with the requirements of the GOL and Appendix B of the ESIA. 	<ul style="list-style-type: none"> • Contractor to prepare Plans • Engineer to review and approve Plans. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
ESMP Requirement	Preparation of SSESMPs	<ul style="list-style-type: none"> • Prepare SSESMPs including alignment sheets. 	<ul style="list-style-type: none"> • Contractor to prepare SSESMPs including alignment sheets. • Engineer to review and approve SSEMPs 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
	Incorporation of Items into Bid Documents	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • DOR to ensure ESMP is included within Bid Documents. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A

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	<ul style="list-style-type: none"> No burning of debris or other materials will occur on the at any camp or construction site without permission of the Engineer. 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period.
	Fuel Emissions	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor to implement mitigation. Engineer to routinely monitor Contractors activities. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period.
	Rock-crushing plant	<ul style="list-style-type: none"> Rock crushing plant equipment will be fitted with water sprinklers that will run continuously while the plant is operational. 	<ul style="list-style-type: none"> Contractor to implement mitigation. Engineer to routinely monitor Contractors activities. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period.
	Exhaust emissions from the operation of construction machinery	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Contractor to implement mitigation. Engineer to routinely monitor Contractors activities. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period.

		Contractor and Engineer.			
	Fugitive emissions.	<ul style="list-style-type: none"> • Conveyor belts (e.g. at batching plants and rock crushing plants) will be fitted with wind-boards, and conveyor transfer points and 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. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. • Engineer to routinely monitor Contractors activities. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period.
Borrow Pits and Quarry's	New Quarry Sites	<ul style="list-style-type: none"> • Any new quarries must obtain the required permits prior to commencement of works at these sites, this will include approval from PONRES and the Engineer. • No quarry will be located within 500 m of any urban area or sensitive receptor and not within two kilometers of a protected area. 	<ul style="list-style-type: none"> • Contractor to select quarry sites and apply for approval from PONRES and any other regulatory agencies. • Engineer to review quarry locations, licenses and approvals from PONRES. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A

New Borrow Pits	<ul style="list-style-type: none"> • The Contractor will: <ul style="list-style-type: none"> - Prior to the start of excavation works, ensure that the borrow area, and its access roads are free of any UXO. - 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. • 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. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Engineers NES • Engineers NES and IES to ensure reinstatement of borrow pits are completed satisfactorily. 	<ul style="list-style-type: none"> • Monthly inspections of borrow pits. • Final inspection of reinstatement activities.
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		<ul style="list-style-type: none">• 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:<ul style="list-style-type: none">– 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 top soil, 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.• Additional borrow pits will not be opened without the restoration of those areas no			
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		longer in use.			
Bridge Construction	Bridge Construction	<p>Divert the water flow near the bridge piers.</p> <ul style="list-style-type: none"> • Provide coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within streams. • Perform dewatering and cleaning of cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit. • Carry out bridge construction works without interrupting the traffic on the Project Road with the provision of suitable diversions. • Ensure no waste materials are dumped in the river, including re-enforced concrete debris. • Place generators more than 20 meters from the river. • Ensure that no concrete waste is dumped in the river. • Carefully collect all polystyrene (from expansion joints) so that it does not litter the local environment. • Ensure that no hazardous liquids are placed within 10 meters of the river. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period.

		<ul style="list-style-type: none"> • Provide portable toilets at bridge construction sites to prevent defecation by workers into the river. • Ensure that workers are provided with correct PPE including harnesses (at Nam Cheng). • During piling works ensure that pumped water is filtered through a silt trap before being discharged to the river. 			
Flora and Fauna	Vegetation clearance	<ul style="list-style-type: none"> • No chemicals will be used to clear vegetation. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period.
Soils Erosion and Soil Contamination	Contamination of Soils	<ul style="list-style-type: none"> • 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 hardstanding with adequate drainage to collect spills, there 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period.

		<p>will be no vehicle maintenance activities on open ground.</p> <ul style="list-style-type: none"> • 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 hardstanding. • Areas using bitumen will be constructed on impervious hardstanding 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 			
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		impervious hard standing to prevent seepage of oils into the soils.			
Loss of topsoil	<ul style="list-style-type: none"> • Locate topsoil stockpiles outside drainage lines and protect stockpiles from erosion. • Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. • Rip ground surface prior to the spreading of topsoil. • Remove unwanted materials from topsoil such as roots of trees, rubble and waste etc. • Specifically regarding soil compaction, the Contractor will confine operation of heavy equipment within the RoW, as much as possible, to avoid soil compaction and damage to privately owned land. • If in case private lands are disturbed, the contractor should promptly inform the owner and agree on the ways to remedy the situation. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period. 	
Soil Erosion	<ul style="list-style-type: none"> • Material that is less susceptible to erosion will be selected for placement around bridges and 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) 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period. 	

		<p>placement of fiber mats to encourage vegetation growth.</p> <ul style="list-style-type: none"> The Engineer and the Contractor will both be responsible for ensuring that embankments are monitored continuously during construction for signs of erosion. 			
Hydrology	Drainage and Flooding	<ul style="list-style-type: none"> 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. 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 Engineer will be responsible for routine 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Monitor drainage channels on a weekly basis.

		monitoring of drainage channels to ensure they remain free of waste and debris.			
	Ground and surface water pollution.	<ul style="list-style-type: none"> Implementation of the specific mitigation measures outlined under Construction Camps, below. Provide portable toilet facilities for workers at road work sites. 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period.
	Water Supply	<ul style="list-style-type: none"> Only legally permitted water resources are used for technical water supply. 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Weekly inspections, throughout construction period.
Employment	Use of Local Labour	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor to ensure local labor employment rates are maintained. 	<ul style="list-style-type: none"> Engineer to routinely monitor contracts to ensure levels are maintained. 	<ul style="list-style-type: none"> Monthly.
	Migrant workers	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Monthly review of records.
Waste and Spoil	Recycling and re-use	<ul style="list-style-type: none"> Where possible, surplus materials will be reused or recycled. Used oil and grease will be removed from site 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Monthly review of waste manifests to determine if

		and sold to an approved used oil recycling company.			wastes are being recycled.
Spoil	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period. 	
Inert Solid & Liquid waste	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor to implement mitigation and conduct training. Engineer to approve any waste disposal site. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period. Regular review of Contractors training sessions. 	
Asphalt and Concrete	<ul style="list-style-type: none"> Waste asphalt will be recycled where possible for base material and shoulder material. Unused or rejected tar or bituminous products will be returned to the supplier's production plant. Waste concrete will be crushed and re-used as fill material, or base material where possible. Under no circumstances should concrete 	<ul style="list-style-type: none"> Contractor to implement any recommendations for re-use of asphalt. Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period. 	

		<p>mixers be washed out onto open ground at construction sites, such as bridges.</p>			
Hazardous Waste	<ul style="list-style-type: none"> 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 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. 	<ul style="list-style-type: none"> Contractor to implement mitigation. Engineer to approve any waste disposal site. Engineer to review waste manifests. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period. Monthly review of waste manifests. 	

<p>Construction Camps</p>	<p>Soil and water pollution</p>	<ul style="list-style-type: none"> • 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, including the surface watercourses identified in Table 3-5 of the ESIA. 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). • 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 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period.
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		<p>or tanks prior to final discharge.</p> <ul style="list-style-type: none"> • Spill clean-up equipment will be maintained on site. • The following conditions to avoid adverse impacts due to improper fuel and chemical storage: <ul style="list-style-type: none"> - 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 			
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		<p>and vandalism and be turned off and securely locked when not in use.</p> <ul style="list-style-type: none"> - 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 was will be undertaken inline with national regulatory requirements. <ul style="list-style-type: none"> • The Contractor will provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the Contractors camp sites (see Appendix S of the ESIA for proposed designs). • The Contractor will ensure that all vehicles are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the site 			
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		<p>areas.</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 specified in Section 2 of the ESIA. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. • Contractor to sub-contract water testing company and provide results to the Engineer 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period. • Monthly review of water tests, if required.
Asphalt Plants	Pollution and Emissions from Asphalt Plant	<ul style="list-style-type: none"> • Emissions & Noise: <ul style="list-style-type: none"> – Asphalt plants will be located downwind of urban areas and not within 500m of any sensitive receptor. – Adequate PPE will be provided to staff working in areas of high noise and emissions. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period. • Monthly review of hazardous waste log.

		<ul style="list-style-type: none"> - Storage and Use of Hazardous Materials (including bitumen): - Ensure all hazardous materials are stored (including within suitable sized bunds for liquids), handled and disposed of according to their Material Safety Data Sheet (MSDS). - Copies of MSDS will be kept on site with all hazardous materials. - The Contractor will keep a log of the type and volume of all hazardous wastes on site. - The Contractor will keep a plan of site indicating where all hazardous materials are stored. • Vehicle Movement: <ul style="list-style-type: none"> - The Contractor will include the asphalt plant in his Traffic Management Plan, including haul routes from the plant. • Health and Safety: <ul style="list-style-type: none"> - All transportation, handling and storage of bitumen will be handled safely by experienced personnel. 			
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		<ul style="list-style-type: none"> - The dust from the manufacturing process may pose respiratory hazards, hence protective air mask will be provided to the operators for the loading and unloading of aggregates. - Ear-muffs will be provided those working on the plant. - First Aid kit will be available on site for the workers in case of emergency. - The Material and Data Sheet (MSDS) for each chemical product will be made accessible onsite and displayed. 			
Concrete Batching Plants	Pollution and Emissions from Concrete Batching Plants	<ul style="list-style-type: none"> • To limit impacts from dust, the following conditions will apply: <ul style="list-style-type: none"> - 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. - Sand and aggregates will be delivered in a dampened state, using covered trucks. If the materials have dried out 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period.

		<p>during transit they will be re-wetted before being dumped into the storage bunker.</p> <ul style="list-style-type: none"> - 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. - 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 			
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		<p>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.</p> <ul style="list-style-type: none">- 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 minimised. The minimum acceptable performance is obtained using a fabric filter dust collector.			
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		<ul style="list-style-type: none"> - 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 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: <ul style="list-style-type: none"> - 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 			
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		<p>diverted to a collection pit and then pumped to a storage tank for recycling.</p> <ul style="list-style-type: none">- 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).- 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.- Wastewater stored in the recycling tank needs to be reused at the earliest possible opportunity.			
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Occupational Health and Safety	HIV / AIDS	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Contractor to implement mitigation. • Service Provider to implement training. • Engineer to review program. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Annual review of awareness program activities.
	Worker Health & safety	<ul style="list-style-type: none"> • Develop a Safety Training Program including training to recognize and respond to workplace chemical hazards. • Safety Meetings conducted on a monthly basis. • 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. • 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. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. • Engineer to review and approve training program. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections, throughout construction period. • Periodic attendance of training sessions to determine quality and numbers in attendance.

	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> All sub-contractors will be supplied with copies of the SSESMP. Provisions to be incorporated into all sub-contracts to ensure the compliance with the SSESMP. All sub-contractors will be required to appoint a safety representative who will be available on the Site. 	<ul style="list-style-type: none"> Contractor to provide SSESMP. Sub-contractors to ensure compliance with SSESMP 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Routinely monitor sub-contractors activities.
Vector borne disease	<ul style="list-style-type: none"> 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. Medicines for the treatment of vector borne diseases will be provided at the camp medical facility. 	<ul style="list-style-type: none"> Contractor to implement mitigation. Engineer to review and approve training program. Engineer to approve any pesticide use. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections, throughout construction period. Periodic attendance of training sessions to determine quality and numbers in attendance. Monthly inspections of

					Contractors medical facilities.
	Noise	<ul style="list-style-type: none"> Zones with noise level above 80 dBA must be marked with safety signs and appropriate PPE must be worn by workers. 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections and monitoring (with smartphone technology) throughout construction period.
Economic Activity	Accessibility	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor to implement mitigation. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections throughout construction period.
Community Health and Safety	Road closures, diversions and blocking of access routes	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Contractor to implement mitigation. Engineer to review and approve diversions. 	<ul style="list-style-type: none"> Engineers NES 	<ul style="list-style-type: none"> Daily site inspections throughout construction period.

		time after construction works are completed for the day.			
Access	<ul style="list-style-type: none"> • Provide safe access at all times through the construction site to people whose residences/shelters and routes are temporarily severed by road construction. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction period. 	
Traffic safety	<ul style="list-style-type: none"> • 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. • Access roads for borrow pits, batching plants, etc, should be maintained during the construction phase and rehabilitated at the end of construction. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction period. 	
Educational Facilities	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Contractor to implement mitigation. • Contractor to provide letters to schools to Engineer to confirm 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction period. 	

		<p>within the vicinity of one of the schools listed in Table 4-28 of the ESIA, 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.</p> <ul style="list-style-type: none"> • 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. 	that the schools have been informed of impending works.		
Child Labour	<ul style="list-style-type: none"> • The Contractor will ensure that no persons under the age of 18 are employed on the Project. 	<ul style="list-style-type: none"> • Contractor to implement mitigation 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Routine review of staff contracts to determine age of staff. 	
Construction Noise and Vibration	<ul style="list-style-type: none"> • All exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction 	

		<p>will be undertaken.</p> <ul style="list-style-type: none"> • 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. 			period.
Social Sector	Accessibility	<ul style="list-style-type: none"> • The Contractor must prepare dedicated temporary pathways to all properties that might otherwise be cut off from the road 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. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction period.

Infrastructure	Electrical Systems and water pipes	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction period.
Physical and Cultural Resources	Impacts to Historical and archeological areas	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction period.
	Religious Holidays	<ul style="list-style-type: none"> • During religious holidays the Contractor will not work within 250 meters of any temple. • No work shall be undertaken during the 7 day Hmong New Year period at Lak 52. 	<ul style="list-style-type: none"> • Contractor to implement mitigation. 	<ul style="list-style-type: none"> • Engineers NES 	<ul style="list-style-type: none"> • Daily site inspections throughout construction period.

Environmental and Social Management Plan - Operational Phase

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities
Employment	Use of Local Labor	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Contractor
Hydrology	Flooding	<ul style="list-style-type: none"> If the rehabilitated road does result in increased run-off and flooding the issue will be rectified during the operational phase. 	<ul style="list-style-type: none"> Contractor during defects liability period. DoR after this period.
Noise	Elevated noise levels in residential areas	<ul style="list-style-type: none"> Consultation with stakeholders. Take appropriate mitigation measures as agreed with local communities. 	<ul style="list-style-type: none"> DoR to undertake consultation with stakeholders. DoR to implement mitigation measures and necessary.

Construction and Operational Phase Instrumental Monitoring

Issue	Mitigation	Locations	Schedule	Responsibilities	Reporting
Air Quality	<p>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.</p> <p>The following parameters will be monitored: Particulate Matter (PM₁₀ & PM_{2.5}), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂) and Carbon Monoxide (CO).</p> <p>Other parameters maybe warranted as determined by the Engineer.</p>	Five construction locations determined by the Engineer.	Monitoring to be undertaken once every 6 months during construction period (24 months), 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 seven days of the monitoring activity.
Noise	<p>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.</p> <p>Parameters to be monitored include: Laeq 1h (dBA)</p>	Five locations at the facades of selected sensitive receptors determined by the Engineer. The sensitive receptors may include a sample of residential building, school, health facility, temple, etc.	Monitoring to be undertaken once every 6 months 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 three days of the monitoring activity.

	Laeq 24 h (dBA)				
	DoR to undertake noise monitoring (Laeq 24h (dBA).	10 villages within the Project corridor, including the five locations monitored in this ESIA. Noise monitoring locations should be at the facades of selected sensitive receptors which may include residential building, school, health facility, temple, etc.	Annually during Operation including once Before construction period.	The DoR will hire certified laboratory to perform the monitoring activities.	N/A
Water Quality	The Engineer will undertake water quality monitoring during the construction period. In addition, if complaints are received from stakeholders regarding water quality additional monitoring may be undertaken. Parameters to be monitored include: pH; Suspended Solids; BOD5; COD; Coliforms; Nitrate (NO3); Phosphate (PO4); Oil and Grease Other parameters may be warranted as and when	50 meters upstream from all bridge sites during construction; 50 meters downstream of the bridge site;	Monitoring to be undertaken twice during bridge construction works	The Engineer will hire certified laboratory to perform the monitoring activities.	The certified laboratory will provide the results to the Engineer within seven days of the monitoring activity.

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