MYANDAWEI
INDUSTRIAL ESTATE
COMPANY LIMITED

FINAL REPORT

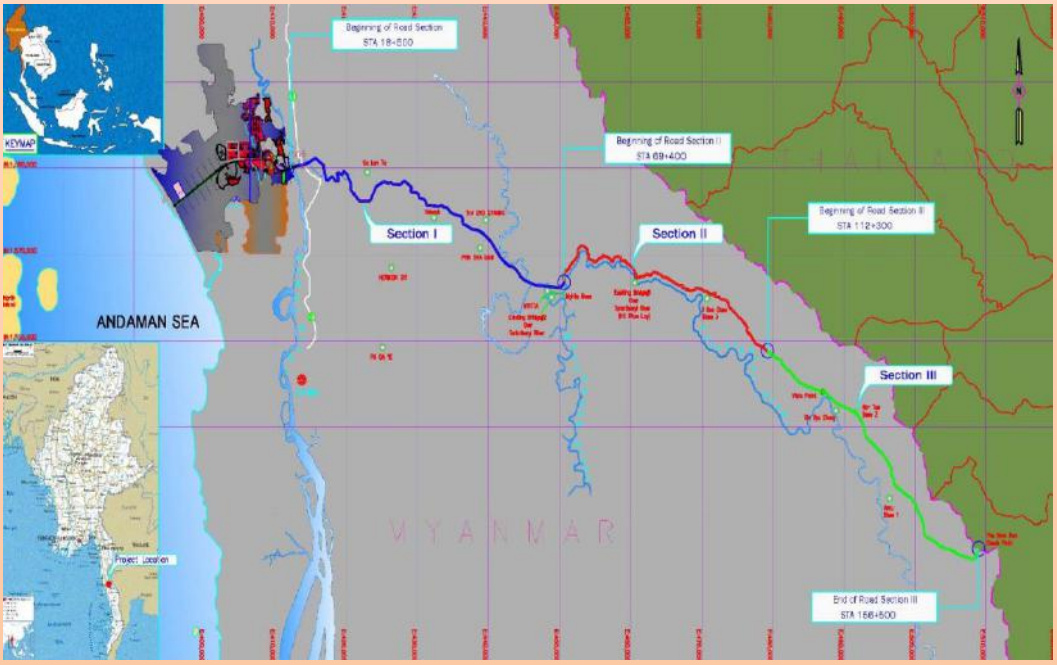
For

Environmental Management Plan (EMP)

On

Two-Lane Road Project,
Linking the Dawei SEZ with Thai Border

In Dawei District, The Republic of the Union of Myanmar



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June 2018

EMP FOR TWO-LANE ROAD LINKING THE DAWEI SPECIAL ECONOMIC ZONEWITH THAI BORDER PROJECT, MYANMAR

FINAL REPORT

TABLE OF CONTENT

PAGE

PAGE

PAGE

LIST OF FIGURES

FIGURE **PAGE**

LIST OF TABLES

TABLE **PAGE**

LIST OF PHOTOS

PHOTO **PAGE**

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 NEED FOR ENVIRONMENTAL MANAGEMENT PLANS

Results of an EIA study for a proposed development project will not lead to any practical outcomes if the proposed mitigation measures and monitoring program are not implemented in the construction and operational phases of the proposed project. Therefore, an EIA study will need to extend beyond impact assessment to planning for implementation of the proposed mitigation measures and monitoring program. In this regard, the results of the EIA study will need to cover preparation of two environmental management plans (EMPs): (i) one EMP for implementation by the contractor in the construction phase; and (ii) one EMP for implementation by the project proponent in the operational phase. Recognizing this fact, the EIA Procedure requires the EIA study to include preparation of a construction phase EMP (CEMP) and an operational phase EMP (OEMP). The two EMPs may be presented in Volume 2-EMPs while results of the EIA study are to be presented as Volume 1-Main EIA Report.

The two EMPs are defined in the EIA Procedure as follows:

Construction Phase EMP *means a detailed and comprehensive Environmental Management Plan (EMP) for the construction phase of a Project. Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements and include a description of the construction works, present an overview of Adverse Impacts, present mitigation measures and monitoring programs together with time schedules, overview maps, images, aerial photos, satellite images, site layout plans, cross- sections, transects, environmental management and monitoring sub-plans for each construction site, thematic sub-plans, and management procedures as appropriate.*

Operational Phase EMP *means a detailed and comprehensive EMP for the operational phase of a Project.Such plan shall present all relevant commitments, Emission Limit Values, Environmental Quality Standards and other environmental requirements. The plan shall include a description of the Project operations, installations, and infrastructure, and shall present an overview of Adverse Impacts, present mitigation measures together with time schedules, overview maps, images, aerial photos, satellite images, site layout plans, cross- sections, transects, environmental management and monitoring sub- plans for each Project site, thematic sub- plans, and management procedures as appropriate.*

The above definitions clearly indicate that the two EMPs required by MONREC will be comprehensive and have more details than conventional EMPs presented in EIA reports of the past. This requirement of MONREC is in line with current good EIA practices.

1.2 GENERIC SCOPE OF AN EMP

Environmental management is based on the basic principle of management known as the PDCA cycle (see ***Figure 1.2-1***). Environmental management thus consists of four related tasks:

(i) plan (P)-what need to be done;

(ii) do (D)-implement the plan;

(iii) check (C)-monitor and evaluate the results of implementation

(iv) act (A)-taking corrective actions to improve the results, if found inadequate

FIGURE 1.2-1 : PDCA CYCLE FOR ENVIRONMENTAL MANAGEMENT

Therefore, an EMP will need to cover the following subjects: (i) mitigation measures to be implemented; (ii) arrangements for the implementation of mitigation measures; (iii) monitoring, evaluating and reporting of the implementation of mitigation measures to provide feedback information on whether the environmental performance deviates from the prescribed benchmarks; (iv) corrective actions process if the environmental performance below the benchmarks, environmental incident response, and emergency plan; (v) arrangements for operating the EMS, including organizational structure, responsibilities, documentation, training, communication, and management review; and (vi) involvement of stakeholders or affected people in environmental management, including public grievance redress mechanism.

It should be noted that the context of the six elements of environmental management during project construction will be different from those during project operation. Therefore, it is preferable to present a CEMP separate from an OEMP to facilitate their use and reference.

1.3 ORGANIZATION OF THIS EMP DOCUMENT

According to EIA procedure 29th December, 2015 recommends an outline of the EMP, the essence of each chapter following this introductory chapter is as follows:

Chapter 2 - Project Proponent's environmental and social policy and commitments

Chapter 3 - Institutional Arrangements

Chapter 4 - Legal Requirements

Chapter 5 - Summary of Impacts and Mitigation Measures

Chapter 6 - Construction Environmental Management and Monitoring Program

Chapter 7 - Operation Environmental Management and Monitoring Program

Chapter 8 - Implementation Budget and Schedule

1.4 NEED FOR UPDATING THE EMPs

The CEMP and OEMP presented in this Document are based on preliminary project designs and initial construction plans and schedules. Therefore, the two EMPs should be considered as framework plans. They are intended to provide framework and prescribe requirements for the preparation of detailed CEMP and OEMP by the EPC Contractor (Contractor) . In this regard, the Project Proponent will require the EPC Contractor to prepare a detailed CEMP in due course before commencing the construction, and a detailed OEMP in due course before operation of the road.

The Contractor will use the CEMP presented in this Document as the basis to prepare a detailed CEMP based on the Contractor's detailed design, construction plan, and construction schedule. The scope and content of the Contractor's CEMP will not be less than the scope and content of the CEMP in this Document. The Contractor's CEMP shall be contractually binding. During the construction, the Contractor will implement the Contractor CEMP under the supervision of the Project Manager to be appointed by the Project Proponent (Owner).

As the Contractor will be responsible for the design and construction of the road and its associated facilities e.g. toll booth, service center and vista point, the Contractor will use the OEMP presented in this Document as the basis for preparing a detailed OEMP based on the actual operational procedures. The Project Management Team of the Project Proponent or Owner will review and revise the Contractor's OEMP as appropriate to prepare the Owner's OEMP for implementation in the operational phase.

For clarity, the application of the EIA's EMPs as above described is shown as a diagram in ***Figure 1.4-1***.

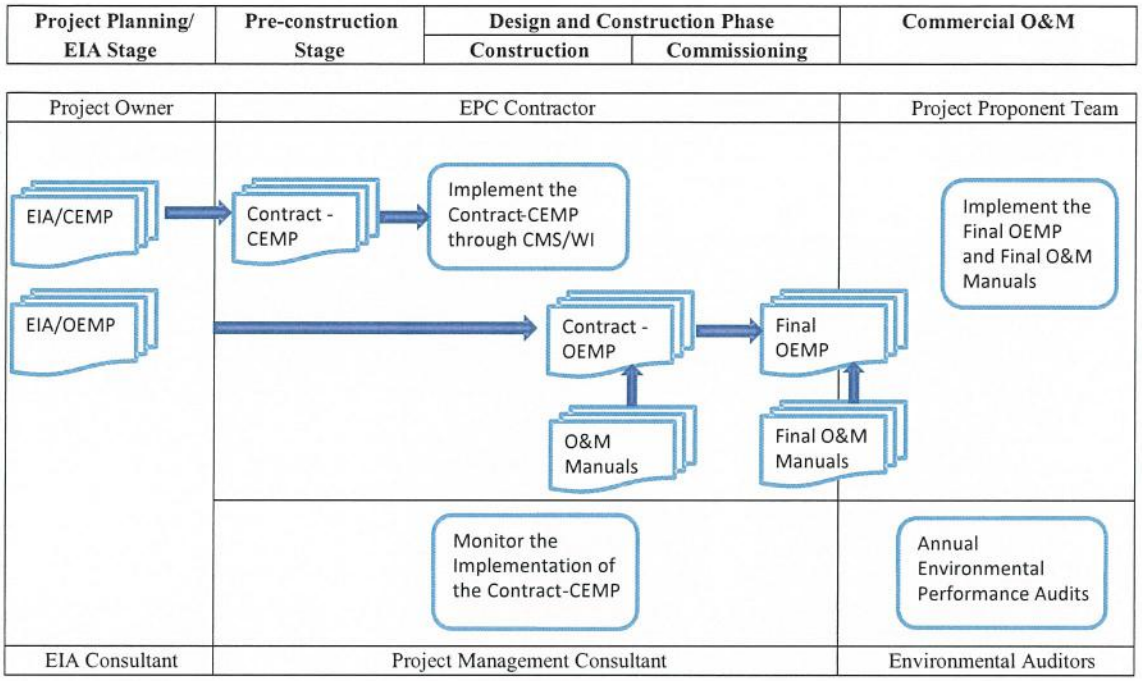

FIGURE 1.4-1 : APPLICATION OF THE EIA'S EMPS

CHAPTER 2

PROJECT PROPONENT's ENVIRONMENTAL AND SOCIAL POLICY AND COMMITMENTS

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PROJECT PROPONENT'S ENVIRONMENTAL AND SOCIAL POLICY AND COMMITMENTS

2.1 CORPORATE ENVIRONMENTAL AND SOCIAL POLICIES

Myandawei Industrial Estate Company Limited, the Project Proponent, will formulate an environmental and social management policy to guide its environmental and social management during the construction phase and the operation phase of the Project. The policy will be similar to the one of the developer (Myandawei Industrial Estate Company Limited), which adopts for its existing development projects in Thailand as shown below:

Myandawei Industrial Estate Company Limited's Policy Statement

Environmental Policy

- Will comply with relevant environmental laws and regulations.

- Will manage our business with the goal to alleviate the adverse effects on the environment, undertake appropriate reviews and evaluations of our performance to measure and to ensure compliance with this environmental policy,

- Will encourage employees to have strong concern and be responsible for the clean environment, and

- Will educate the employees on the environment including exchanging the knowledge with other agencies in order to continuously and regularly maintain good environment and to improve the working practice appropriate to the environment.

Safety and Health Policy

- Will strive to prevent accident, injury and occupational illnesses through the active participation of every employee.

- Commit to continuous efforts to identify and eliminate or manage safety risks associated with our activities.

- Will strictly comply with all applicable laws and regulations. In case that no enforceable body of law exists, we will apply reliable standards of our own.

- Will arrange for the proper design of tool and equipment, regulations, training and the control tools in a manner that safeguards workers, property and the communities in which we operate from machine, working procedures and occupational illnesses.

- Employees who report to work with illegal drugs in their system or report with level of alcohol or other chemical substances that could impair performance are subject to disciplinary action.

2.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

The Project Proponent will establish an environmental and social management system (ESMS) to support the implementation of the CEMP and the OEMP. The ESMS for the construction phase is described in the CEMP while that for the operational phase is described in the OEMP.

In addition, the Project Proponent will require the EPC Contractor to establish its own ESMS to support its implementation of the detailed CEMP.

2.3 ENVIRONMENTAL AND SOCIAL PROCEDURES AND GUIDELINES

Myandawei Industrial Estate Company Limited (MIE) has established Health, Safety, Environmental Management General Guidelines, and Health, Safety and Environmental Risk Assessment for Site Activities.

2.4 ENVIRONMENTAL AND SOCIAL COMMITMENTS

Myandawei Industrial Estate Company Limited's environmental and social commitments are clearly indicated in its policy statement in ***Section 2.1.1***. In this Project, Myandawei Industrial Estate Company Limited and its partners will make utmost efforts to minimize environmental and social impacts that the Project may cause in its construction and operation, Myandawei Industrial Estate Company Limited (MIE) and partners recognize the need for the Project to exist in harmony with all stakeholders, particularly the communities nearby the Project alignment.

CHAPTER 3

INSTITUTIONAL ARRANGEMENTS

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INSTITUTIONAL ARRANGEMENTS

3.1 RESPONSIBILITIES OF THE PROJECT PROPONENT

The Project Proponent is legally responsible for environmental performance of the Project as prescribed in the ECC and other permits. The Project Proponent will report to MONREC on the Project's environmental and social performance, and also to other authorities responsible for specific environmental and social issues relevant to the Project.

Specifically, the Project Proponent will have the following responsibilities:

Construction Phase

1) Ensure that the Contractor will update the CEMP presented in this document to prepare a detailed CEMP based on the results of detailed design, construction plan, and construction schedule.

2) Establish and operate an environmental and social management system (ESMS) containing elements outlined in this EMP.

3) Supervise the Contractor closely in implementing the Contractor CEMP as an integral part of its project implementation management and construction supervision.

4) Submit periodic monitoring and audit reports to MONREC as required in the EIA Procedure.

5) Notwithstanding the periodic monitoring reports to be submitted to MONREC, keep MONREC and other concerned authorities informed of any serious environmental events and responses to the events.

6) Conducting periodic audit of environmental and social performances of the Contractor.

Operational Phase

1) Ensure that the Contractor will update the OEMP presented in this document to prepare a detailed OEMP based on the results of detailed design and operational manuals.

2) Establish and operate an environmental and social management system (ESMS) containing elements outlined in this EMP. The ESMS will be part of the management system of the project.

3) Establish an environmental, health and safety (EHS) unit within the organization for operation and maintenance of the road. The EHS unit will be adequately staffed with qualified personnel.

4) Ensure that the Project Manager will operate the ESH unit to comply with all ESH requirements prescribed in the ECC.

5) Submit periodic monitoring and audit reports to MONREC as required in the EIA Procedure.

6) Notwithstanding the periodic monitoring reports to be submitted to MONREC, keep MONREC and other concerned authorities informed of any serious environmental events and responses to the events.

7) Conducting annual audit of environmental and social performances of the project.

3.2 RESPONSIBILITY OF THE CONTRACTOR

The Contractor, including its approved sub- contractors, is contractually responsible to the Project Proponent for environmental performance of the project construction as prescribed in the Contract.

Specifically, the Contractor will have the following responsibilities:

1) Prepare a detailed Contractor CEMP for review and approval by the Project Proponent. The Contractor CEMP should follow the outline prescribed by the Project Proponent.

2) Implement the mitigation measures during the construction through construction method statements and work instructions in strict conformance with environmental conducts prescribed in the Contract.

3) Ensure that all process and environmental control equipment meet all technical specifications related to their environmental performance.

4) Conduct periodic monitoring and reporting of its compliance with the environmental and social performance prescribed in the Contract.

5) Ensure that its sub-contractors shall comply with the Contractor CEMP.

6) Consistently update the Contractor CEMP and submit the updated version to the Project Proponent for approval.

3.3 RESPONSIBILITY OF MONREC

MONREC is the key agency to monitor and evaluate environmental performance of the construction and operation. Other agencies concerned will support MONREC in the monitoring and evaluation of environmental performance of the Project during construction and operation.

3.4 RESPONSIBILITY OF STATE/REGION AND DISTRICT AUTHORITIES

Local government authorities are the regulator to monitor and evaluate environmental performance of the construction and operation.

3.5 RESPONSIBILITY OF THE EHS UNITS

In the construction phase, the Project Proponent will establish an EHS unit within its project management organization. In the operational phase, the Project Proponent will establish an EHS unit within the organization for O&M of the road and its associated facilities. Functions and responsibilities of the two EMS units are described in the CEMP and OEMP.

Arrangements for Operating the EMS

There are three key groups with responsibility for environmental management of the Project:

- Project Proponent or Project Owner who manages the Project through a Project Manager;
- Contractor as the party undertaking the construction; and
- MONREC through ECD and other government agencies at the regional, township and community levels.

CHAPTER 4

LEGAL REQUIREMENTS

CHAPTER 4

LEGAL REQUIREMENTS

4.1 SUMMARY OF KEY LEGAL REQUIREMENTS

Environmental management of the Project will comply with legal requirements pertinent to the EMP prescribed in the Environmental Conservation Rule 2013, and the Environmental Impact Assessment Procedure 2015.

4.1.1 Environmental Conservation Rules 2013

The Environmental Conservation Rules were prepared by MONREC for implementing the Environmental Conservation Law. In essence, the Environmental Conservation Rules prescribe:

1) Functions, duties, activities, and authorities of MONREC and the Environmental Conservation Department of MONREC related to the various work areas.

2) Responsibility of investors to have an EIA prepared for submission to MONREC.

3) Composition, functions and responsibility of the EIA Report Review Body which consists of experts from various relevant government organizations.

4) The need for investors to apply for a prior permission before executing investment plans. Institutional arrangements for cooperation and coordination between ECD and other government organizations at the national, region and state levels.

The project proponent has to follow the prescribed functions, responsibility, composition and the need for investors which conserves the environmental near the project area under the said law.

4.1.2 EIA Procedure 2015

Articles in the EIA Procedure relevant to the preparation and implementation of the EMPs are summarized in ***Table 4.1-1***. Preparation and implementation of the two EMPs will need to comply with relevant articles in the table.

TABLE 4.1-1

CONTENT OF THE EIA PROCEDURE RELEVANT TO THE EMPS

Subject	Relevant Articles
Content of the EMPs	60
Project Approval Requirements	
- Issuance of an ECC	67
- Conditions of the ECC	77, 78, 80, 81, 82, 83, 84, 86, 87, 88
- Submission of an CEMP and OEMP	82, 84
Revision and updating the EMPs	84, 87, 88, 89
Implementing the EMPs	93, 94
Monitoring and Reporting	
- Responsibility for Monitoring	95, 96
- Content of Monitoring Report	98
- Submission of Monitoring Report	97
- Disclosure of Monitoring Report	99
- Inspection by MOECAF	100-111

4.1.3 National Environmental Quality (Emission) Guidelines (2015)

MONREC prepared the National Environmental Quality (Emission) Guidelines on 29th December 2015. The objectives are to provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health. These Guidelines have been primarily excerpted from the International Finance Corporation (IFC), Environmental Health and Safety (EHS) Guidelines, which provide technical guidance on good international industry pollution prevention practice. The Guidelines are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of these Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

The project proponent has to follow all the detail of the National Environmental Quality (Emission) Guidelines to prevent international/national pollution that might affect from the project activities.

4.1.4 Motor Vehicle Rules (1987)

The project proponent has to follow the detail section of motor vehicle rules to avoid the negative impact of air and noise pollution, occupation health and safety, and socio-safety for who lived near the project area, under this Law.

4.1.5 Motor Vehicle Law (2015)

The project proponent should announces local community to follow the law for road safety and should explain to workers, vehicle drives should follow the law of motor vehicle to avoid road accident, air and noise pollution during pre-construction and construction phase that described at **section 51, 52, 54, and 57** of said law as follows:

Section 51: No one is allowed to offer motor vehicle driving training without business driving license.

Section 52: No one is allowed to operate a private business of inspecting motor vehicles without a business license.

Section 54: No one is allowed to do the following; (a) working as a motor vehicle assistant permit, (b) driving a motor vehicle while in an inappropriate mental or physical state, (c) driving a motor vehicle loaded above the loading capacity, (d) failing to wear a helmet while driving a motor-cycle, (e) failing to wear a safety belt while driving vehicles, this includes passengers, (f) driving a motor vehicle in places reserved for pedestrians, (g) changing, without legal permission or reasons backed up by evidence, the original type of a vehicle, its main parts, or the facts in a motor vehicle inspection certificate, (h) driving a motor-cycle without back mirror or silencer over the shock absorber.

Section 57: No one is allowed to drive, or work as an assistant, by using the driving license or assistant permit of another person.

4.2 PROJECT STANDARDS

Environmental management of the Project during construction and operation will comply with the national or international environmental guidelines and standards as appropriate. The international guidelines and standards will be adopted as appropriate only when the national guidelines and standards do not exist.

Table 4.2-1 presents international ambient environmental quality standards to be adopted as the national ambient environmental quality standards have not yet been issued. ***Table 4.2-2*** presents the draft of national environmental quality (emission) guidelines for ambient environmental quality. ***Table 4.2-3*** presents national quality standards for effluents to be discharged from construction activities.

TABLE 4.2-1

RELEVANT ENVIRONMENTAL GUIDELINES AND STANDARDS

Subjects	Parameters	Values	References
Vibration - for industrial buildings and residential building	Peak Particle Velocity	5 mm/s	DIN4150
Sediment Quality		Maximum limits	International Association for Impact Assessment (IAIA) NOAA Screen Quick Reference Table, 2004
	Total Chromium	81 mg/kg	
	Total Arsenic	8.2 mg/kg	
	Total Lead	46.7 mg/kg	
	Total Nickel	20.9 mg/kg	
	Total Zinc	150 mg/kg	
	Total Copper	34 mg/kg	
	Total Mercury	0.15 mg/kg	
Groundwater Quality	pH at 25° C	6.5-8.5	WHO's Guidelines for Drinking Water Quality, 2011
	Nitrate-Nitrogen	≤ 11 mg/L	
	Nitrite-Nitrogen	≤ 0.9 mg/L	
	Cadmium	≤ 0.003 mg/L	
	Lead	≤ 0.01 mg/L	
	Arsenic	≤ 0.01 mg/L	
	Copper	≤ 2 mg/L	
	Mercury	≤ 0.006 mg/L	

TABLE 4.2-2

NATIONAL ENVIRONMENTAL QUALITY (EMISSION) GUIDELINES (2015)

Subjects	Parameters	Values
Ambient Air Quality	PM-10 (1 yr)	20 $\mu g/m^3$
	PM-10 (24 hr)	50 $\mu g/m^3$
	PM-2.5(1 yr)	10 $\mu g/m^3$
	PM-2.5 (24 hr)	25 $\mu g/m^3$
	Ozone (8 hr daily maximum)	100 $\mu g/m^3$
	NO_2 (1 yr)	40 $\mu g/m^3$
	NO_x as NO_2 (1 hr)	200 $\mu g/m^3$
	SO_2 (24 hr)	20 $\mu g/m^3$
	SO_2 (10 minute)	500 $\mu g/m^3$
Ambient Noise Levels		
- industrial and commercial area	LAeq (24 hrs)	70 dB(A)daytime
		70 dB(A) nighttime
- residential areas	LAeq (24 hrs)	55 dB(A)daytime
		45 dB(A) nighttime

TABLE 4.2-2

NATIONAL ENVIRONMENTAL QUALITY (EMISSION) GUIDELINES (2015) (CONT'D)

Subjects	Parameters	Values
Maximum concentration of site runoff and wastewater discharges (construction phase)	BOD	30 mg/l
	COD	25 mg/l
	Oil and grease	10 mg/l
	pH	6-9 (SU.)
	Total Coliform Bacteria	400 MPN by 100 ml
	Total Nitrogen	10 mg/l
	Total Phosphorus	2 mg/l
	Total Suspended Solids	50 mg/l

TABLE 4.2-3

NATIONAL EFFLUENT STANDARDS

Parameter	Maximum Concentration
5-day Biochemical oxygen demand	30 mg/l
Chemical oxygen demand	125 mg/l
Oil and Grease	10 mg/l
pH	6-9 S.U.[a]
Total coliform bacteria	400/100 ml
Total nitrogen	10 mg/l
Total phosphorus	2 mg/l
Total suspended solids	50 mg/l

Note : [a] Standard unit

Sources : National Environmental Quality (Emission) Guidelines, 29th December, 2015

CHAPTER 5

SUMMARY OF IMPACTS AND MITIGATION MEASURES

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5.1 PROJECT DESCRIPTION

The Project will upgrade the existing two-lane un-paved road from the Thai border to Dawei SEZ by providing asphaltic road surface based on Class 4 of the Highway Design Standards of the Department of Highways (DOH), Thailand. The Project road will have a total length of about 138 km. The road will have a traffic surface width of about 7 m consisting of two traffic lanes, each with 3.5 m width, and 1 m paved shoulder on each side (7 to 9 m road type). The right-of- way ("R.O.W") will be 40 m.

The existing road is divided into three sections for construction and maintenance management.

Section 1-Sta. 18+500 to Sta. 69+400

Section 2-Sta. 69+400 to Sta. 112+300

Section 3-Sta. 112+300 to Sta. 156+500

The Project will also realign some sections of the existing road to improve its geometric design, and construct permanent bridges, and road side and cross drainage structure at sections crossing natural water courses or cutting across the direction of surface runoff. The Project will maintain the existing alignment as much as possible (see ***Figure 5.1-1***.).

5.2 IMPACTS DURING CONSTRUCTION AND MITIGATION MEASURES

The preconstruction and construction activities will cause some environmental disturbances which will be transient and will not have significant irreversible impacts. The identified environmental disturbances and mitigation measures are presented in ***Table 5.2-1***. The mitigation measures are well-established conventional measures. Details are presented in individual management plans under the Construction EMP. The impacts of land acquisition and mitigation measures are presented in a Resettlement Action Plan (RAP) in Volume 1 EIA Report, ***Appendix 6A***.

5.3 IMPACTS DURING OPERATION

Table 5.3-1 presents brief information on the impacts and mitigation measures during operation period.

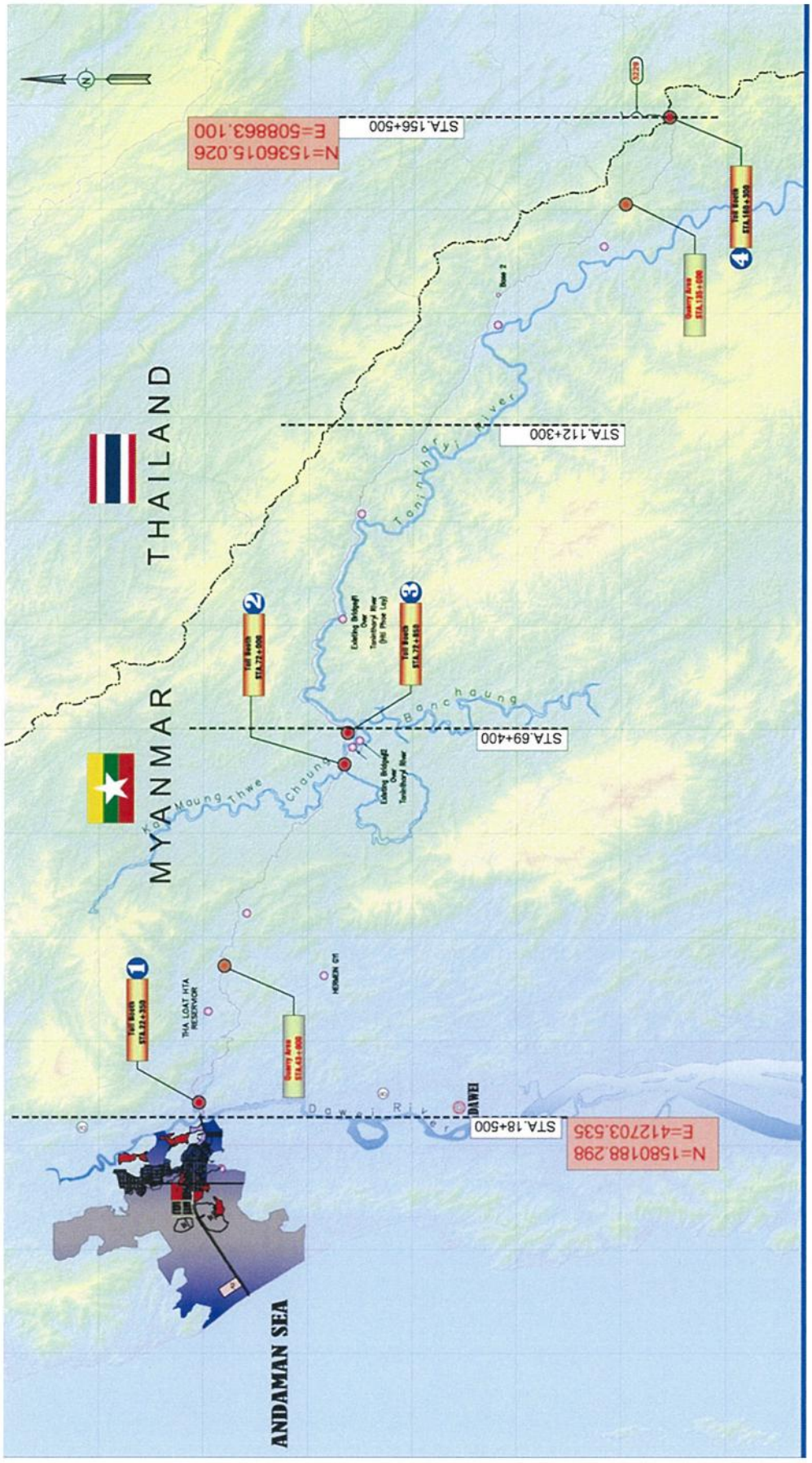

FIGURE 5.1-1 : THE TWO-LANE ROAD ALIGNMENT ON THE EXISTING ACCESS ROAD

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES

Environmental and Social Issue	Impacts	Mitigation Measures
Air Quality	Increases in air pollutants caused by fugitive dust from construction activities; for example, top soil opening, excavation, drilling and etc.	• Spray water at and around the construction areas during site preparation and grading. • Enforce a speed limit for vehicles and trucks in the construction sites not to exceed 40 km/hr. Construction activities shall be kept as planned so that the disturbed areas will be minimized at any time. • Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance. • Prohibit the open burning of waste in the construction area. • Dust masks should be provided (where applicable) to all construction workers. • Enforce speed limit for trucks not to exceed 40 km/hr when passing the communities. • Cover construction materials by tarpaulin sheet during transportation, materials should be dampened, if necessary, before transportation. • Establish a vehicle washing facilities to minimize the quantity of material deposition on public roads. • Establish a checkpoint at project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Air Quality (Cont'd)		• Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites; • Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. The engines of the construction equipment fleet must be routinely maintained by qualified mechanics to ensure their proper conditions during operations. • Provide adequate training to the equipment operators in the proper use of equipment. • Use the proper size of equipment for the job. • Use the equipment fitted engines with latest low emission technologies (repowered engines, electric drive trains). For example, the diesel generator set to be used must be equipped with modern pollution control equipment. • Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines). • Take measures to manage the movement of construction vehicles entering and leaving the construction sites to avoid, or mitigate and manage the potential for vehicle emissions impacting on adjacent properties, except where such residential or sensitive activities front an arterial road to be used for access to or from the construction site.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Air Quality (Cont'd)		• Construction fleet management are to be provided in the construction vehicle management plan and the construction traffic management plan. Such measures may include avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities; • For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities. For example, ensure all construction vehicles and stationary plant and equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications. **Proposed Monitoring** • Levels of fugitive dust should be monitored twice a year during dry season (once) and wet season (once). Details are provided in the environmental management plan for the construction phase.
Noise	Increase ambient noise level at the construction site and communities near the project construction sites.	• Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Noise (Cont'd)		• Speeds of vehicles in the construction site will not be more than 40 km/hr. • Noise performance requirements of construction equipment will need to be clearly stated in contract specifications. • The EPC contractor will be required to regularly monitor ambient noise levels at the receptors, particularly during the noise generation period such as piling. • The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of noise performance. **Proposed Monitoring** • A proposed noise monitoring program is proposed in the construction phase EMP.
Vibration	Impacts of the Project on vibration will be an issue of concern only during the construction phase. Major of vibration is heavy machines using.	• Major construction activities which generate vibration should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers. • Speeds of vehicles in the construction site will not be more than 40 km/hr. • The EPC contractor will be required to regularly monitor ambient vibration levels at the receptors.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Vibration (Cont'd)		• The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of vibration performance.
River water quality	• Increased turbidity of river water due to the bridge construction of the road alignment crossing water courses. • Wastewater contamination caused by the camp site.	• Retain as much natural vegetation cover as possible during excavation. • No materials will be stored within 50 m of a water course. • Provide temporary drainage to ensure that any storm water running off construction areas will be controlled around permanent water bodies. • Install water collection basins and sediment traps in all areas where construction equipment is washed. • Place at fuel storage, maintenance shop and vehicle cleaning areas at least 300 m away from the nearest water body. • The bridge and cross drain construction should be conducted in dry season. • Provide an adequate number of latrines and other sanitary arrangements at the site and work areas, and ensure that they are cleaned and maintained in a hygienic state. **Proposed Monitoring** • River water quality will need to be monitored during the construction period particularly in the dry season. A water quality monitoring program is proposed in the construction phase EMP.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Aquatic Ecology	Increasing amount of SS in watercourses and wastewater contamination generating from camp sites.	As same as mitigation measures for surface water quality and inform the construction schedule of bridge to local fishermen living near the river where the road alignment cut across. **Proposed Monitoring** Aquatic ecology will need to be monitored during the bridge construction particularly in the dry season. Aquatic ecology monitoring program is proposed in the construction phase EMP.
Soil Erosion and Soil Contamination	• The impact of soil erosion mostly occurs in the construction site is erosion at slop areas of rolling and mountain areas. • Contamination of soil in the construction phase may result from the inappropriate transfer, storage, and disposal of petroleum products, lubricants, chemicals, hazardous materials, liquids and solid waste.	**Mitigation Measures for Soil Erosion** • Grass planting covering on side slope immediately after completion of embankment construction. • Minimizing the area of soil clearance. • Construction in erosion and flood-prone areas will be mainly restricted to the dry season where possible. • Properly stabilize slopes and re-vegetate disturbed surfaces using locally available indigenous grass species. • Use of temporary berms or other appropriate temporary drainage provisions at construction sites. **Mitigation Measures for Soil Contamination** • Store chemicals/hazardous products and waste on impermeable surfaces in secure, covered areas with clear labeling of containers and with a tray or bund to contain leaks. • Regularly remove all construction wastes from the site to approved waste disposal sites.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Forest and Wildlife	**Impacts on Forest** • The road construction will cause the loss of trees which are currently within the Right Of Way about 1,364 acres of land and the construction of the existing road was cleared about 1,514 acres of land, mostly forest area. In addition, the loss of forest land for construction of the 10 realigned sections will be about 306 acres. **Impacts on Wildlife** • Habitats of some wildlife species are altered through clearing tree and shrubs in the Right Of Way area and in the access road area. • Feeding areas and food sources, both direct and indirect, of wildlife are diminished. • Wildlife may be disturbed by noise of construction machines, engines and the crowd of construction workers and vehicles. • Features of natural habitat in some areas may be changed due to and filling by residual soil getting from the road area and bridge construction vicinity areas.	**Mitigation Measures for Forest** • Protect vegetation adjacent to the working area and/or materials storage. • Contractors to label all trees deemed necessary to be removed for construction before they are removed. • Avoid disturbing vegetation in areas outside the construction zone. • Replacement of trees where they are removed; for every tree removed tree will be replanted. • Follow to Tree Species Transplanting Activity, Tree Clearing Activity, Forest Monitoring Activity and Deforestation Control Activity. **Mitigation Measures for Wildlife** • Construction workers and site foremen will watch for wildlife that may be harmed and take avoidance action as required. • Prior to commencing work each day, any open ditches will be searched for trapped wildlife. Any trapped wildlife will be salvaged and returned to a safe location as soon as possible. • Control the movement of construction traffic by marking access tracks and restricting traffic to these areas. • Identify locations where preservation of habitat is not possible and employ suitably qualified personnel to capture and relocate any wildlife found in these locations. • Follow to Hunting Control and Other Measures for Wildlife Protection.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Land Acquisition	The project will acquire about 340.5 acres of additional land outside the existing right-of-way for construction of all project components.	• A detailed compensation plan identifying individuals/families, which will lose their land due to project development. • An adequate compensation package to be developed in close collaboration with all stakeholders. • Compensation should be for both land and crops as well as for other properties such as valuable trees. • The compensation should be done according to international standards and with the overall objectives of improving the standard of living for those who will be affected.All crops, valuable trees should be compensated. Cash compensation is the mode agreed with the people in project affected village during consultations. • Set up grievance redress mechanism for project affected people. • Arrange vocational extension activities in accordance with peoples' need and site condition especially agricultural production, marketing and supplementary occupational support to compensate for reduced agricultural production. • Cooperation with local and district authorities regarding improved infrastructural development could enhance mitigation measures dealing with health, drinking water supply education, electricity supply and general social uplift. This means the project could become development opportunity with long-term, positive implications for the project area and the region as a whole.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Socio-Economic	• The Project will employ about 1,200 people at peak during project construction. Most of the workers will be local. • Exposure of the affected communities to new social norms, value, traditions, practices, and new economic opportunities brought about by an influx of external workers and cash inflow into the village economy through project spending and employment. • Conflict between immigrated worker and local people.	• Inform the community before proceeding any activity in construction area. • Hire construction workers from local sources as many as possible. • Initiate livelihood development programs designed to make the best use of new economic opportunities that will come with the project spending and employment. • Village headmen and the responsible authorities should establish local rules and regulations for control of alcoholic abuse and sexually transmitted diseases. • Stay on-site workers should be accommodated in more than one camp to be located far from the villages • Closely control workers behavior to not disturb people nearby construction area. • Provide communication access between communities and project developer to receive requests and to listen to the needs and problem of communities including to respond to the requests and to solve the problem e.g. establishing complaint centre, informing communities about project address and telephone number.

TABLE 5.2-1

IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Land Use	• During construction period, the land use pattern will be permanently changed to be road right of way.	• Declare the actual R.O.W as soon as possible after detail design is accomplished • Limit width of route as necessary to minimize the lost of agricultural and residential area. • Inform the schedule and construction process in order to reduce conflict on land use between project proponent and land owners
Cultural Heritage	• Cultural heritage or previously unknown heritage resources may be exposed or found during construction of the project.	Chance find procedures for cultural heritage resources to be followed to avoid any further damage comprise the following steps: 1) The person or group (identifier) who identified or discovered physical cultural resources must cease all activity in the immediate vicinity of the site; 2) The identifier must immediately inform his/her supervisor of the discovery; 3) The supervisor must ensure that the site is secured and control access; and 4) The supervisor must then inform the relevant personnel responsible included local and government cultural heritage administrative department. 5) Potential significance of the remains will be assessed and mitigate options will be identified. 6) If the significance of the remains is judged to be sufficient to warrant further action and they cannot be avoided, then the project archaeologist in consultation with the government cultural heritage administrative department and representatives of local communities will determine the appropriate course of action.

TABLE 5.3-1

IMPACTS DURING OPERATION PHASE AND MITIGATION MEASURES

Environmental and Social Issue	Impacts	Mitigation Measures
Air Quality	• During operation period there would be more vehicles using the road. There would be impact on ambient air quality due to exhaust emission from motor vehicles.	• Establish speed limit along the road especially areas near communities. • Providing good traffic management to avoid traffic congestion in populated areas. • Planting tall, leafy and dense vegetation between roads and human settlements to filter pollutants. • Install roadside air quality monitoring program. **Proposed Monitoring** • Twice a year during dry season (once) and wet season (once).
Noise	• Increase in traffic volume on the road would cause increase of ambient noise level resulting in degrading of human welfare and disrupting wildlife. Chronic noise exposure can be source of annoyance, creating communication problems and leading to elevated stress levels as well as associated behavioral and health effect. It can cause auditory fatigue, temporary and permanent lessening of hearing ability and sleep disorders.	• Reduction of speed limit in settlement areas. • Always maintain road surface in good condition. **Proposed Monitoring** • Twice a year during dry season (once) and wet season (once).
Vibration	• The major sources of vibration in operation period are only vehicles including motorcycles, passenger cars, and trucks.	• No mitigation measures are needed. **Proposed Monitoring** • Twice a year during dry season (once) and wet season (once).

TABLE 5.3-1

IMPACTS DURING OPERATION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Surface Water Quality	• Wastewater Contamination from Service Areas. • Water quality contamination from leachate of over road runoff.	• Regular monthly check up wastewater treatment system with carrying capacity within the wastewater treatment area of the service areas. • Continuous weekly checkup and maintenance the project drainage system. • Provide adequate numbers of sanitary toilets (with septic tanks) at ratio of 15 persons/room (separated between men and women) at service areas and the toll Booths. • Grease & oil trap to collect grease & oil and wastewater from food shops at service areas must be installed before all wastes and wastewater being drained into the septic tank.
Aquatic Ecology	There will be no increasing amounts and other contaminants in the watercourses generating by the road operation.	Apply the same mitigation measures as for wastewater contamination.
Soil Erosion and Soil Contamination	There will be no impact on soil erosion because the project has set up erosion prevention measures during construction period and efficient measures for soil conservation after construction is completed.	No mitigation measures are needed.

TABLE 5.3-1

IMPACTS DURING OPERATION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Forest and Wildlife	The impacts on flora and fauna during operation period comprise of increased vehicle derived pollutant, vehicle/wildlife collisions and increased edge effects and deterioration of habitat.	• Follow to Forest Rehabilitation Activity and Forest Monitoring Activity. • Keep an updated and accurate record of all rare flora and fauna species in close proximity of the Two-Lane road. • Ensure all operation workers are aware of the location of important flora and fauna species. • Monitor fauna habitats and patterns near the Two-Lane road Alignment. • Protect vegetation alongside the Two-lane road by undertaking maintenance regularly and vegetation if needed. • Minimize removal of vegetation, dead tree trunks or hollows at the edge of the two-lane road that may provide habitat refuge. • Plant native species to provide additional habitats and migration routes for local animals. • Reduce speed limit at night and in area of frequent animal crossing. • Install signs warning motorists of the presence of animals in areas of frequent animal crossings. • Install roadside reflectors to scare animals away from the roadway when vehicle approach at night.

TABLE 5.3-1

IMPACTS DURING OPERATION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Socio-Economic	After the construction is completed, the road will become a permanent infrastructure affecting socio-economic development in areas along the alignment as follows; • Change in land use from agricultural area into residential area and shops. • Increase in price of land along both sides of the road. • In-migration of people from outside. • Alteration of way of living and way of thinking due to innovations and technology.	• Provide space in vista site (Rest area) for local people to sell local products/handicraft. • Related government agencies should support the communities to sustainably exist with ability to adapt to changes and innovations.
Transportation	During two lane road implementation, there are increasing of vehicles and traffic accidents.	• Provide and install appropriate traffic signs along the road alignment including entrance-exist tool booths and service areas to alleviate traffic accidents. • Material for road traffic control will be provided e.g., Radio communication apparatus (long distance, short distance, base and hand held), long base ambulance vehicle, Patrol motorcycle and Safety cones. • The construction of overpasses will be carried out by capable suppliers through contractual agreement. Accessing pedestrian overpass on project road significantly reduces casualties, protects pedestrian from injury and contributes towards the goal of achieving reduced road fatalities. The location of overpasses will be determines during Detailed Design stage. • Technical and financial support for awareness creation activities – for example mass media, workshops and driver training.

TABLE 5.3-1

IMPACTS DURING OPERATION PHASE AND MITIGATION MEASURES (CONT'D)

Environmental and Social Issue	Impacts	Mitigation Measures
Transportation (Cont'd)		• Undertake road safety engineering activities along federal roads and urban areas and improved signs and markings. • Improve emergency service to victims. • Strictly enforce the traffic regulations (on drivers and pedestrians) to reduce road traffic accidents. • Enforcement of traffic law for road safety along major roads with support for purchasing equipment and for road safety enforcement training. • Strictly enforce the traffic regulations (on drivers and pedestrians) to reduce road traffic accidents. • Road traffic crash data, cause of road traffic crash, challenges to traffic police duty and the community's attitude will be assessed in order to increase enforcement. The scope of assessment and enforcement will increase as the time increases focused on enforcing critical road safety traffic law against drunk driving, speeding, use of mobile phones, and non-use of seatbelts and helmets.
Land Use	The impact on land uses would be in terms of expansion of community and commercial area (positive impact) and termination of communities within the Right Of Way along the road alignment.	No mitigation measures are needed.

CHAPTER 6

CONSTRUCTION ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

CHAPTER 6

CONSTRUCTION ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

6.1 OBJECTIVES

For the Project Proponent, the objectives of environmental management of Project construction and operation are to ensure that the project will not create significant impacts and will meet all applicable standards and guidelines and requirements prescribed as conditions for issuing an Environmental Compliance Certificate (ECC). The standards, guidelines and requirements will be prescribed in the Contract.

For construction phase, the key objective of the Owner-CEMP (OCEMP) is to establish a clear operational framework and requirements for environmental management during the construction phase of the Project. Based on the OCEMP, the Contractor will prepare a Contractor-CEMP (CCEMP) which will have operational details based on the detailed designs, construction methods, and construction schedule. The CCEMP will therefore be part of the Contract.

6.2 MANAGEMENT AND MONITORING PLANS

The Project involves several environmentally sensitive activities that require unique considerations and may require specific Management and Monitoring Plan.

Based on the environmental and social impact assessment as identified in the ESIA report of this Project, which covered five components (Physical, Biological, Socio-economic, Cultural and Visual components), the summary of the significant project impacts (Site specific and thematic), their proposed mitigation measures, and responsibilities of these mitigation measures are tabulated in ***Table 6.2-1*** to ***Table 6.2-2***.

Regarding to ***Table 6.2-1*** and ***Table 6.2-2***, the conducting of mitigation measures and monitoring program are essentially required since the construction phase to mitigate the significant impacts that likely to occur. Because Project developer and Contractor are important key man who are obligated to perform numerous of mitigation measures and monitoring programs and to ensure minimum impact to environment and human.

This EMP detail the relevant objective, legal requirements, mitigation measures, monitoring program, performance specifications, implementation schedule, responsibilities for implementation, and budget. This EMP will be developed prior to the start of construction works and during the course of the Project when construction works requiring more detailed environmental planning are identified and will be subject to the review procedure. The following EMPs will be developed for the Project;

1) Environmental Management and Monitoring Plan

1.1) Site or Area Specific Plans and Programs

- Air Quality Management and Monitoring Plan
- Noise Management and Monitoring Plan
- Vibration Management and Monitoring Plan
- Surface Water Quality Management and Monitoring Plan
- Aquatic Ecology Management and Monitoring Plan
- Soil Erosion Protection Management and Monitoring Plan

1.2) Thematic Plans and Programs

- Transportation Management and Monitoring Plan
- Water Use Management and Monitoring Plan
- Solid Waste Management and Monitoring Plan
- Hazardous Waste Management and Monitoring Plan
- Biodiversity Action Plan
- Occupational Health Management and Monitoring Plan
- Construction Emergency Response Plan (CERP)

2) Social Management and Monitoring Plan

2.1) Site or Area Specific Plans and Programs

- Chance Find Management and Monitoring Plan

2.2) Thematic Plans and Programs

- Compensation and Livelihood Restoration Management and Monitoring Plan
- Land Use Management and Monitoring Plan
- Socio-Economic Management and Monitoring Plan

TABLE 6.2-1

CONCLUSIONS OF ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Environmental Aspect / Issue	Description of Impact	Management Action or Mitigation Measures	Residual Impacts	Compliance	Responsible Unit/sub-plans
SITE OR AREA SPECIFIC PLANS AND PROGRAMS					
1. Air Quality Management and Monitoring Plan					
Air Quality	- Fugitive dust from the construction activities could affected to the personnel health of construction workers.	- Water spraying twice a day at and around the construction areas and access roads during site preparation and grading - Dust masks should be provided (where applicable) to all construction workers	LOW	NEQEG Standards	Developer and EPC Contractor
2. Noise Management and Monitoring Plan					
Noise	- Excessive noise from the construction activities could affected to the personnel health of construction workers	- Speeds of vehicles in the construction site will not be more than 40 km/hr. - Noise performance requirements of construction equipment will need to be clearly stated in contract specifications.	LOW	NEQEG Standards	Developer and EPC Contractor
3. Vibration Management and Monitoring Plan					
Vibration	- Excessive vibration from the construction activities could affected to the personnel health of construction workers	- Speeds of vehicles in the construction site will not be more than 40 km/hr. - Noise performance requirements of construction equipment will need to be clearly stated in contract specifications.	LOW	NEQEG Standards	Developer and EPC Contractor
4. Surface Water Quality Management and Monitoring Plan					
Surface Water	- The impact on water quality due to turbidity increasing from construction activities of road and bridge and wastewater contamination from camp site	- Provide temporary drainage to ensure that any storm water running off construction areas will be controlled around permanent water bodies. - Install water collection basins and sediment traps in all areas where construction equipment is washed.	LOW	NEQEG Standards	Developer and EPC Contractor

TABLE 6.2-1

CONCLUSIONS OF ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (CONT'D)

Environmental Aspect / Issue	Description of Impact	Management Action or Mitigation Measures	Residual Impacts	Compliance	Responsible Unit/sub-plans
5. Aquatic Ecology Management and Monitoring Plan					
Aquatic Ecology	- Turbidity increasing in watercourses that located nearby construction sites and river where the bridge construction	- Provide temporary drainage to ensure that any storm water running off construction areas will be controlled around permanent water bodies. - Install water collection basins and sediment traps in all areas where construction equipment is washed.	LOW	NEQEG Standards	Developer and EPC Contractor
6. Soil Erosion Protection Management and Monitoring Plan					
Soil Erosion	- Soil impacts during construction are erosion at slope areas of rolling and mountain areas, and soil contamination.	- Minimizing the area of soil clearance. - Construction in erosion and flood-prone areas will be mainly restricted to the dry season where possible.	LOW	NEQEG Standards	Developer and EPC Contractor
THEMATIC PLANS AND PROGRAMS					
1. Transportation Management and Monitoring Plan					
Transportation	- Increased numbers of vehicle which may impact in terms of accidents passengers and local villagers who are locate near the access road and damage the road surface	- Inform concerned authorities and local people about the project construction activities plan. - The speed of truck should not exceed 40 km/hr.	LOW	NEQEG Standards	Developer and EPC Contractor
2. Water Use Management and Monitoring Plan					
Water Use	- Possible conflict on water used between local villager and project	- Ensure construction resources do not conflict with local commune supplies.	LOW	NEQEG Standards	Developer and EPC Contractor
3. Solid Waste Management and Monitoring Plan					
Solid Waste	- Increase quantity of waste from worker and construction activities	- Solid waste disposal procedures will comply with solid waste management regulations, as well as any additional disposal facility requirements.	LOW	NEQEG Standards	Developer and EPC Contractor

TABLE 6.2-1

CONCLUSIONS OF ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (CONT'D)

Environmental Aspect / Issue	Description of Impact	Management Action or Mitigation Measures	Residual Impacts	Compliance	Responsible Unit/sub-plans
4. Hazardous Waste Management and Monitoring Plan					
Hazardous Waste	- Increase quantity of waste from worker and construction activities	- Hazardous materials use will only be handle by personnel who are trained and qualified in the handling of these materials and in accordance with the manufacturer's instructions and government regulations.	LOW	NEQEG Standards	Developer and EPC Contractor
5. Biodiversity Action Plan					
Forest and Wildlife	- The tree and shrubs standing within the Right Of Way area will be removed for constructing access roads, bridges and road. - These activities may effect on habitats.	- Protect vegetation adjacent to the working area and/or materials storage. - Construction workers and site foremen will watch for wildlife that may be harmed and take avoidance action as required.	LOW	NEQEG Standards	Developer and EPC Contractor
6. Occupational Health Management and Monitoring Plan					
Health Profile	- The influx of outside workers will bring new diseases , and they will also contract endemic diseases, and health risk to the communities and construction workers	- Provide the Health Management Plan	LOW	NEQEG Standards	Developer and EPC Contractor
7. Construction Emergency Response Plan					
Risk and Accidents	- Effect to the personal health of project worker and damage to the project properties.	- Provide the Construction Emergency Response Plan	LOW	NEQEG Standards	Developer and EPC Contractor

TABLE 6.2-2

CONCLUSIONS OF SOCIAL MANAGEMENT AND MONITORING PLAN

Environmental Aspect / Issue	Description of Impact	Management Action or Mitigation Measures	Residual Impacts	Compliance	Responsible Unit/sub-plan
SITE OR AREA SPECIFIC PLANS AND PROGRAMS					
1. Chance Find Management and Monitoring Plan					
Chance Find	- Cultural heritage or previously unknown heritage resources may be exposed or found.	- Provide Chance Find Management Plan	LOW	Not Applicable	Developer and EPC Contractor
THEMATIC PLANS AND PROGRAMS					
1. Compensation and Livelihood Restoration Management and Monitoring Plan					
Land Acquisition	- Impacts on land and perennial trees to be within the existing right-of-way for construction.	- Implement Compensation and Livelihood Restoration Management and Monitoring Plan	LOW	NEQEG Standards	Developer and EPC Contractor
2. Land Use Management and Monitoring Plan					
Land Use	- The land use pattern will be permanently changed to be road right of way.	- Implement Land Use Management and Monitoring Plan	LOW	NEQEG Standards	Developer and EPC Contractor
3. Socio-Economic Management and Monitoring Plan					
Socio-Economic	- The major negative impacts on the socio-economic condition will be due to the large influx of workers.	- Implement Socio-Economic Management and Monitoring Plan	LOW	NEQEG Standards	Developer and EPC Contractor

6.3 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

6.3.1 Site-Specific Management Plan

6.3.1.1 Air Quality Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects construction activities in the construction site

- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

During construction phase, fugitive dust (TSP and PM10) is expected to generated and caused adverse affect to the worker and people living in the vicinity. The potential sources of fugitive dust included; site clearing, excavation, handling and transportation activities.

Moreover, an operation of construction equipment and track could be emitted the gaseous emission such as SO_2, NO_2, CO, and PM. For SO_2, according to the existing fuel standard, (EURO 4 or later), the sulfur content decreased from 1,300 ppm to 50 or 10 ppm.

Therefore, the SO_2 generated from the combustion of gasoline engine which use for construction equipment or track will modicum and can be negligible.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

Fugitive Dust

a. At the Construction Sites

- Spray water at and around the construction areas during site preparation and grading.
- Enforce a speed limit for vehicles and trucks in the construction sites not to exceed 40 km/hr. Construction activities shall be kept as planned so that the disturbed areas will be minimized at any time.
- Restore, resurface, and rehabilitate the disturbed areas as soon as practicable after completion of construction or disturbance.
- Prohibit the open burning of waste in the construction area.
- Dust masks should be provided (where applicable) to all construction workers.

b. Along the Transportation Routes

- Enforce speed limit for trucks not to exceed 40 km/hr when passing the communities.
- Cover construction materials by tarpaulin sheet during transportation, materials should be dampened, if necessary, before transportation.
- Establish a vehicle washing facilities to minimize the quantity of material deposition on public roads.
- Establish a checkpoint at project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions.

Gaseous Emissions at Sources

- Adopt procedures to avoid construction vehicles idling for excessive periods (e.g. more than 5 minutes) if required to queue to enter the construction sites;
- Maintain all construction equipment in proper working conditions according to the manufacturer's specifications. The engines of the construction equipment fleet must be routinely maintained by qualified mechanics to ensure their proper conditions during operations.
- Provide adequate training to the equipment operators in the proper use of equipment.
- Use the proper size of equipment for the job.
- Use the equipment fitted engines with latest low emission technologies (repowered engines, electric drive trains). For example, the diesel generator set to be used must be equipped with modern pollution control equipment.
- Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).

- Take measures to manage the movement of construction vehicles entering and leaving the construction sites to avoid, or mitigate and manage the potential for vehicle emissions impacting on adjacent properties, except where such residential or sensitive activities front an arterial road to be used for access to or from the construction site. Measures for construction fleet management are to be provided in the construction vehicle management plan and the construction traffic management plan. Such measures may include avoiding or minimizing queuing on streets approaching the worksites or adjacent to other sensitive activities;

- For stationary plant and equipment powered by diesel motors, take measures to avoid or mitigate and manage the potential impacts of exhaust emissions on adjacent residential or other sensitive activities. For example, ensure all construction vehicles and stationary plant and equipment powered by diesel motors are fitted with emission control measures, and are regularly maintained to manufacturers' specifications.

5) Monitoring Programs

Parameters

- Total Suspended Particulate (TSP)
- Particulate Matter less than 10 μm (PM-10)
- Wind speed and directions
- Nitrogen Dioxide (NO_2)
- Carbon monoxide (CO)

Location (Figure 6.3.1.1-1)

- Station 1: Located at Dauk Lauk village, Yebyu Township
- Station 2: Located at Myitta village, Myitta Sub-Township
- Station 3: Located at Vado village, Yebyu Township
- Station 4: Located at Elasto Base 1 Camp, Yebyu Township
- Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township

Frequency

Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.

Methodology

Parameter	Sampling/ Analysis Method
PM-10 (Average 24 Hour)	High-Volume Air Sampler (PM-10) / Gravimetric
TSP (Average 24 Hour)	Method High-Volume Air Sampler/ Gravimetric Method)
Wind speed and directions	Cup Anemometer and Wind Vane
NO_2 (Average 1 Hour)	Chemiluminescence
CO (Average 1 Hour)	NDRI

Remark: Monitoring parameters based on the study on diesel-engine exhaust study of Khair and Majewski, 2006 and review on EURO gasoline standard.

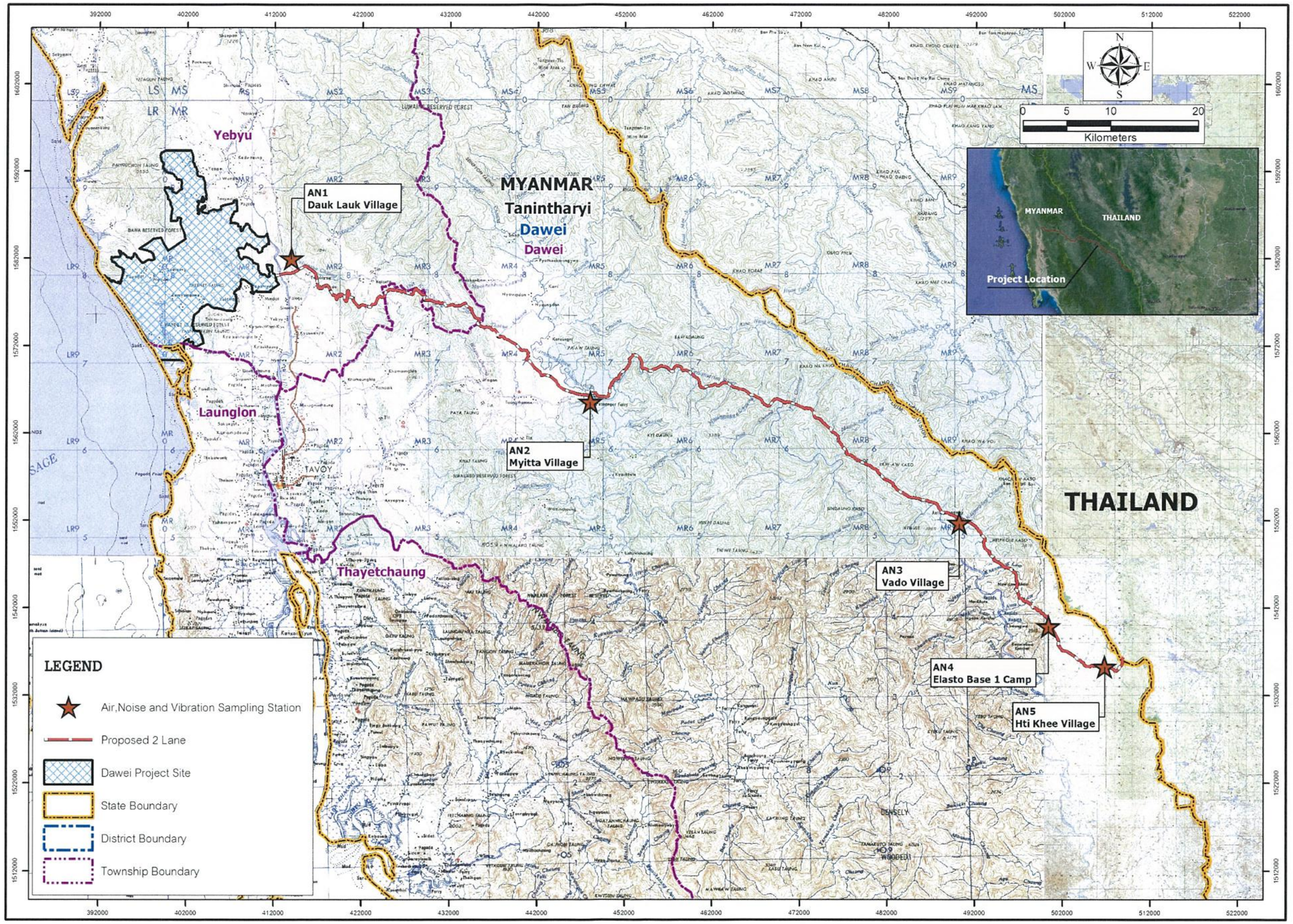

FIGURE 6.3.1.1-1 : LOCATION OF AIR, NOISE AND VIBRATION SAMPLING STATION

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Monitoring of air quality at 5 stations approximately costs 6,000 USD/time (or 1,200 USD/station/time). The monitoring must be conducted twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. Total annual budget approximately costs 60,000 USD. Total budget for 4 years during construction phase is 240,000 USD.

6.3.1.2 Noise Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects construction activities in the construction site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

During construction phase, the potential source of noise level is an operation of construction equipment and track used during road construction and bridge construction. Power and pile driver is the most loundest noise equipment with the maximum noise level of 89 and 101 dBA at 15 m from source. The predicted results on noise impact show that the construction activities might caused the ambient noise level within 200-300 m exceeded the National EQEG (2015). Therefore, the mitigation measures and monitoring programs should be implemented to ensure the impacts of noise one mitigated and alleviated, and to monitor the effectiveness of the mitigation measures.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Major construction activities which generate loud noise should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers, and will need to have adequate noise control equipment or measures.
- Speeds of vehicles in the construction site will not be more than 40 km/hr.
- Noise performance requirements of construction equipment will need to be clearly stated in contract specifications.
- The EPC contractor will be required to regularly monitor ambient noise levels at the receptors, particularly during the noise generation period.
- The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of noise performance.

5) Monitoring Programs

Parameters to be monitored

- Leq (24 hrs)
- L_{max}
- Ldn
- L_{90}

Location (Figure 6.3.1.1-1)

- Station 1: Located at Dauk Lauk village, Yebyu Township
- Station 2: Located at Myitta village, Myitta Sub-Township
- Station 3: Located at Vado village, Yebyu Township
- Station 4: Located at Elasto Base 1 Camp, Yebyu Township
- Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township

Frequency

Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.

Methodology

International Organization for Standardization (ISO1996) for noise level measurement.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Monitoring of air quality at 5 stations approximately costs 1,500 USD/time (or 300 USD/station/time). The monitoring must be conducted twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. Total annual budget approximately costs 15,000 USD. Total budget for 4 years during construction phase is 60,000 USD.

6.3.1.3 Vibration Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects construction activities in the construction site

- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

During construction phase, the potential source of vibration is an operation of heavy construction equipment. At the nearest sensitive receptor which considered (50 m), the PPV were predicted at below the limit set by DIN4150-3: Standard of 5.0 mm/sec, and unlikely to cause damage any type of structures. However, the mitigation measures and monitoring programs should be implemented to ensure that the vibration impacts are mitigated and alleviated, and to monitor the effectiveness of the mitigation measures.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Major construction activities which generate vibration should be limited to only during the day time. Activities that are necessary to be carried out at night time will need approval of the site engineers.
- Speeds of vehicles in the construction site will not be more than 40 km/hr.
- Noise performance requirements of construction equipment will need to be clearly stated in contract specifications.
- The EPC contractor will be required to regularly monitor ambient vibration levels at the receptors.
- The construction environmental management plan will need to include an efficient complaints redress procedure and an efficient corrective action procedure to address the non-compliance of vibration performance.

5) Monitoring Programs

Parameters to be monitored

- Vibration or PPV measured

Location (Figure 6.3.1.1-1)

- Station 1: Located at Dauk Lauk village, Yebyu Township
- Station 2: Located at Myitta village, Myitta Sub-Township
- Station 3: Located at Vado village, Yebyu Township
- Station 4: Located at Elasto Base 1 Camp, Yebyu Township
- Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township

Frequency

Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.

Methodology

International Organization for Standardization (ISO1996) for vibration measurement.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Monitoring of air quality at 5 stations approximately costs 1,000 USD/time (or 200 USD/station/time). The monitoring must be conducted twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. Total annual budget approximately costs 10,000 USD. Total budget for 4 years during construction phase is 40,000 USD.

6.3.1.4 Surface Water Quality Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects construction activities in the construction site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

During the construction phase, the impact on water quality due to turbidity increasing from construction activities of road and bridge and wastewater contamination from camp site is low and temporary. However, a surface water quality management plan should be prepared to mitigate the impact on water quality and to control of water quality within the Standard.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Retain as much natural vegetation cover as possible during excavation.
- No materials will be stored within 50 m of a water course.
- Provide temporary drainage to ensure that any storm water running off construction areas will be controlled around permanent water bodies.

- Install water collection basins and sediment traps in all areas where construction equipment is washed.

- Place at fuel storage, maintenance shop and vehicle cleaning areas at least 300 m away from the nearest water body.

- The bridge and cross drain construction should be conducted in dry season.

- Provide an adequate number of latrines and other sanitary arrangements at the site and work areas, and ensure that they are cleaned and maintained in a hygienic state.

5) Monitoring Programs

Parameters to be monitored

Surface water quality parameters in construction phase are shown in ***Table 6.3.1.4-1***.

TABLE 6.3.1.4-1

SURFACE WATER QUALITY PARAMETERS

Parameter	Unit	Preservation Method [1/]
Depth	m.	Measure at Site
pH	- -	Measure at Site
Temperature	°c	Measure at Site
Transparency	m	Measure at Site
Conductivity	µmho/cm	Measure at Site
Salinity	ppt	Measure at Site
Dissolved oxygen	mg/L	Measure at Site
Turbidity	NTU	Refrigerate in Cooling Container
Suspended Solids	mg/L	Refrigerate in Cooling Container
Total Dissolved Solids	mg/L	Refrigerate in Cooling Container
Total Solids	mg/L	Refrigerate in Cooling Container
Oil and grease	mg/L	Add H_2SO_4 to pH<2 and refrigerate
BOD_5	mg/L	Refrigerate in Cooling Container
Lead	mg/L	Add HNO_3 to pH<2 and refrigerate
Cadmium	mg/L	Add HNO_3 to pH<2 and refrigerate
Total Iron	mg/L	Add HNO_3 to pH<2 and refrigerate
Total Coliform Bacteria	(MPN/100 ml)	Refrigerate in Cooling Container
Fecal Coliform Bacteria	(MPN/100 ml)	Refrigerate in Cooling Container
COD	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Total Hardness	mg $CaCO_3$/L	HNO_3 or H_2SO_4 to pH<2
Total Petroleum Hydrocarbon (TPH)	µg/L	Cool,≤6°C
Total Kjeldahl (TKN-N)	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Ammonia Nitrogen(NH3-N)	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Total Nitrogen (Nitrate+Nitrite)	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Total Phosphate	mg/L	Cool,≤6°C
Copper(Cu)	mg/L	HNO_3 to pH<2
Zinc (Zn)	mg/L	HNO_3 to pH<2

Remark: Guidance Manual for Monitoring Highway Runoff Water Quality (US Department of Transportation, 2001).

Location (Figure 6.3.1.4-1)

Seven stations at the wide river of the bridge construction (more than 30 m) as follows;

- Station 1 (WQ1) : Dawei River
- Station 2 (WQ2) : Tha Laing Ya shaung
- Station 3 (WQ3) : Tha Laing Ya shaung, Mia Phyu
- Station 4 (WQ4) : Tha Byu Shaung
- Station 5 (WQ5) : Kamoethway River
- Station 6 (WQ6) : Proposed Bridge No. 11
- Station 7 (WQ7) : Proposed Bridge No. 13

Frequency

Seven times per year during the construction phase (monthly monitoring during Wet Season (June-October) and quarterly monitoring during Dry Season).

Methodology

The Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF)

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Monitoring of air quality at 7 stations approximately costs 4,200 USD/time (or 600 USD/station/time). The monitoring will be implemented must be conducted for seven times per year during the construction phase. Total annual budget approximately costs 29,400 USD. Total budget for 4 years during construction phase is 117,600 USD.

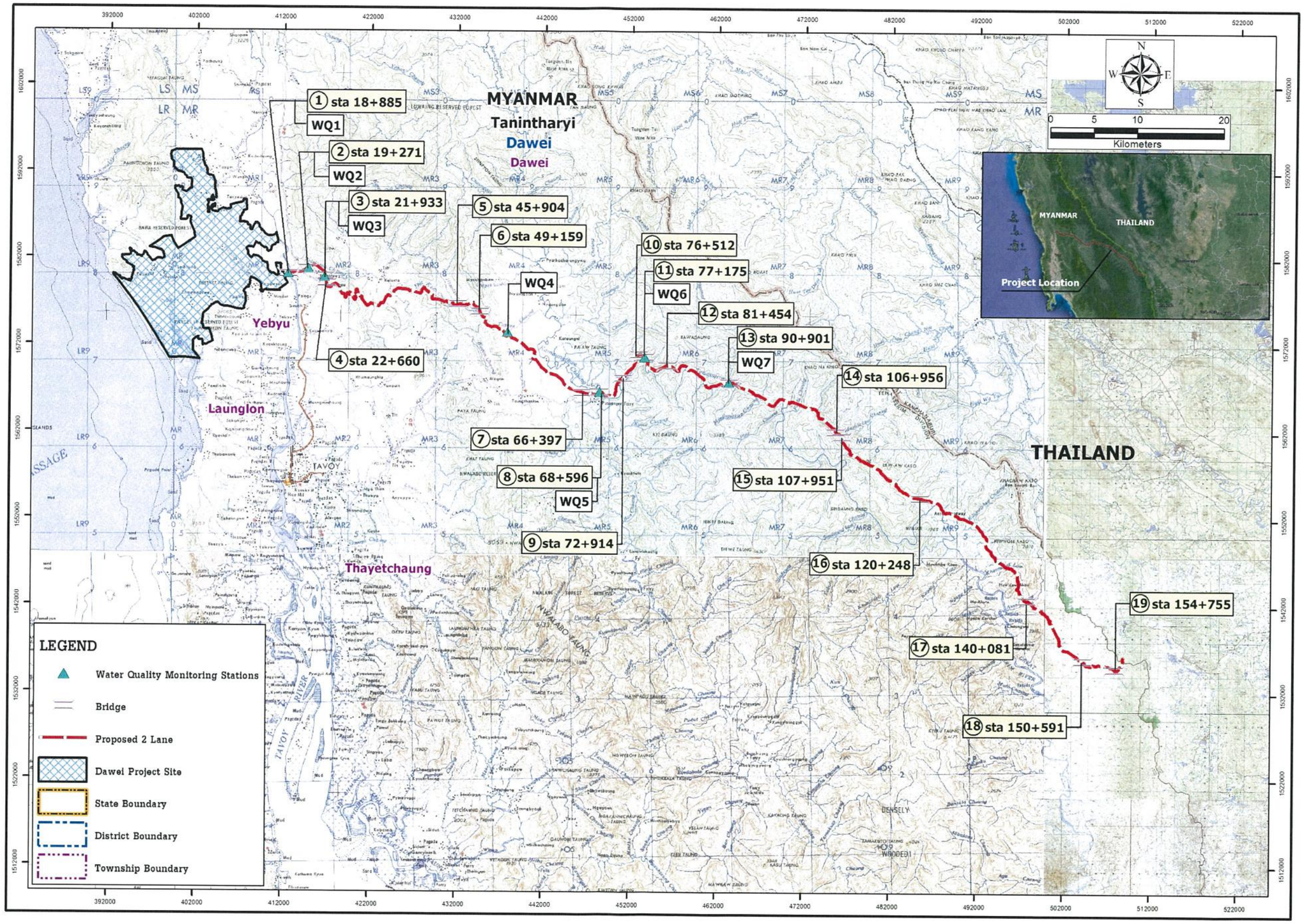

FIGURE 6.3.1.4-1 : LOCATION OF SURFACE WATER AND AQUATIC SAMPLING STATION

6.3.1.5 Aquatic Ecology Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects construction activities in the construction site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

Turbidity increasing in watercourses that located nearby construction sites and river where the bridge construction including 21 bridges might lead to phytoplankton population decreasing due to the lower level of photosynthesis activities. Benthos loss from under excavation can be limited. The benthic organisms can transferring/migrating themselves from unfavorable conditions such as high SS or turbidity due to their mobile nature. Fish can easily avoid the turbid area. Wastewater being generated by employees in each camp site, approximately 64 m^3/day, will go to septic tank system with no directly draining into water sources directly. Therefore, impact on plankton and benthic organisms will be minimum.

To ensure that the impacts on aquatic ecology are mitigated and alleviated, a mitigation plan for aquatic ecology will be implemented throughout construction phase.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Apply the same mitigation measures as for surface water quality.
- Inform the construction schedule of bridge to local fishermen living near the river where the road alignment cut across

5) Monitoring Programs

Parameters to be Monitored

- Plankton
- Benthos

Location (Figure 6.3.1.4-1)

Seven stations at the wide river of the bridge construction (more than 30 m) as follows;

- Station 1 (WQ1) : Dawei River
- Station 2 (WQ2) : Tha Laing Ya shaung
- Station 3 (WQ3) : Tha Laing Ya shaung, Mia Phyu
- Station 4 (WQ4) : Tha Byu Shaung
- Station 5 (WQ5) : Kamoethway River
- Station 6 (WQ6) : Proposed Bridge No. 11
- Station 7 (WQ7) : Proposed Bridge No. 13

Frequency

Seven times per year during the construction phase (monthly monitoring during Wet Season (June-October) and quarterly monitoring during Dry Season).

Methodology

Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF)

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Monitoring of air quality at 7 stations approximately costs 1,400 USD/time (or 200 USD/station/time). The monitoring must be conducted seven times per year during the construction phase. Total annual budget approximately costs 9,800 USD. Total budget for 4 years during construction phase is 39,200 USD.

6.3.1.6 Soil Erosion Protection Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects construction activities in the construction site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

The major soil impacts during construction are erosion at slope areas of rolling and mountain areas, and soil contamination from the inappropriate transfer, storage, and disposal of petroleum products, lubricants, chemicals, hazardous materials, liquids and solid waste. To ensure that the impacts on soil are mitigated and alleviated, a mitigation plan for soil will be implemented throughout construction phase.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

Soil Erosion

- Grass planting covering on side slope immediately after completion of embankment construction.
- Minimizing the area of soil clearance.
- Construction in erosion and flood-prone areas will be mainly restricted to the dry season where possible.
- Properly stabilize slopes and re-vegetate disturbed surfaces using locally available indigenous grass species.
- Use of temporary berms or other appropriate temporary drainage provisions at construction sites.

Soil Contamination

- Store chemicals/hazardous products and waste on impermeable surfaces in secure, covered areas with clear labeling of containers and with a tray or bund to contain leaks.
- Regularly remove all construction wastes from the site to approved waste disposal sites.

5) Monitoring Programs

Parameters to be Monitored

- Surface Water Quality

Location

Seven stations at the wide river of the bridge construction (more than 30 m) as follows;

- Station 1 (WQ1) : Dawei River
- Station 2 (WQ2) : Tha Laing Ya shaung
- Station 3 (WQ3) : Tha Laing Ya shaung, Mia Phyu
- Station 4 (WQ4) : Tha Byu Shaung
- Station 5 (WQ5) : Kamoethway River
- Station 6 (WQ6) : Proposed Bridge No. 11
- Station 7 (WQ7) : Proposed Bridge No. 13

Frequency

Seven times per year during the construction phase (monthly monitoring during Wet Season (June-October) and quarterly monitoring during Dry Season).

Methodology

Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF)

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Included in the cost of surface water quality management and monitoring plan.

6.3.2 Thematic Management Plan

6.3.2.1 Transportation Management and Monitoring Plan

1) Objective

- The main objective of this program is to minimize transportation impact during project construction phase and avoid damage on transportation route and accident on road user and local villagers who locate near access road.

2) Context

During the construction phase, the major impacts on the traffic will be due to the transportation of construction materials, construction workers, machinery and supplies for workers on the site. In addition, increase number of vehicles may increase impact on road damage and accident on passer and local villagers who locate near access road. In order to alleviate and mitigate the impacts on transportation route and traffic volume, management plan on transportation shall be developed and implemented.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- Motor Vehicle Rules (1987)

4) Management Action or Mitigation Measures

- Inform concerned authorities and local people about the project construction activities plan.
- Strictly enforce drivers in following traffic regulations during transporting material, workers, and equipment during project construction.
- The speed of truck should not exceed 40 km/hr.
- Repair the damaged road surface where this caused by project transportation at least after finished site clearance and construction activities. This management should be cover in CSR program.
- Cover material by canvas during transportation to prevent falling and spreading of material.
- Provide sufficient traffic signs and easily observed signs to clearly indicate site construction zone.
- In case of accident, the concerned sections must promptly follow the Construction Emergency Response Plan.

- Test alcohol and drug use on drivers before transportation.
- Avoid operation of trucks at night.
- The used/operated truck should be checked annually.
- Establish a vehicle washing facility to minimize the quantity of material deposition on public roads.
- Establish a checkpoint at the project gate to ensure the vehicles leaving the project site are following the measures prescribed to reduce dust emissions.

5) Monitoring Programs

Parameters to be monitored

- Traffic volume record
- Traffic accident record

Location

Three stations at the toll booth as follows;

- Station 1: Toll Booth No. 1
- Station 2: Toll Booth No. 3
- Station 3: Toll Booth No. 4

Frequency

Twice a year and each sampling must be conducted for 2 consecutive days covered working day and holiday.

Methodology

- Collect data from related agencies.
- Prepare report on traffic volume record and traffic accident record of the two lane road.

6) Performance Specifications

- Number of complaints filed through the complaint response channel.
- Number of accident and injured related to the transportation activity.

7) Implementation Schedule

Throughout construction phase

8) Responsibilities

Contractor under supervision of project developer

9) Budget

Monitoring of air quality at 5 stations approximately costs 600 USD/time (or 200 USD/station/time). The monitoring must be conducted twice a year and each sampling must be conducted for 2 consecutive days covered working day and holiday. Total annual budget approximately costs 2,400 USD. Total budget for 4 years during construction phase is 9,600 USD.

6.3.2.2 Water Use Management and Monitoring Plan

1) Objective

- To ensure on sufficient of water supply for construction workers and construction activities
- To minimize impacts in term of water use disturb to local people nearby project sites.

2) Context

The major impact during construction phase came from water requirement for workers and construction activities. In addition, the village related to project sites is lack of water for drinking and domestic consumption (especially in dry seasons, 3-5 months). Main water sources for both drinking and domestic use in all villages are shallow wells and collected rainwater. Therefore, setting and checking on management of water supply for worker and construction activities to minimize impacts in term of water use disturb to local people nearby project sites.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- Electricity Law (2014)
- The Conservation of Water Resources and Rivers Law (2006)

4) Management Action or Mitigation Measures

- Prepare sufficient and appropriate water tanks to collect water for worker consumption.
- Prepare sufficient potable water for workers.
- Avoid use of shallow well for worker consumption since it is main water source for nearby villages

5) Monitoring Programs

Number of complaints filed through the complaint response channel.

6) Performance Specifications

Number of complaints filed through the complaint response channel.

7) Implementation Schedule

Throughout construction phase

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Mitigation Measures and Monitoring Program: Included in construction cost by Contractors.

6.3.2.3 Solid Waste Management and Monitoring Plan

1) Objective

To manage the solid waste with appropriate methods to minimize the source of adverse effect to human health

2) Context

Solid waste will be generated from activities associated with the Project, the main types of solid waste include; solid waste from the construction workers and solid waste from the construction activities. Solid waste from construction workers are domestic waste such as garbage, glass, and food waste, etc. For the solid waste from the project activities is biomass from site clearance activities, scrap steel and metals, and erosion control materials during construction phases. The management of solid waste is very important. If not properly controlled and disposed of, waste can be unsightly and cause human health and safety concerns.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

- Electricity Law (2014)
- The Forest Law (1992)

4) Management Action or Mitigation Measures

- Prepare garbage bins or containers with covers for garbage collection at the workers' campsites and inform concerned local authorities or agencies that get permission from government section to collect and dispose garbage
- Prohibit open burning wastes in worker campsite and project area.
- The biomass wastes should be separated into usable timber and woods
- The separated timbers and woods will be sold based on the concerned laws and regulations.
- The unusable wastes will be disposed of a disposal area or landfill site to be selected by the contractor with approval of the concerned authority.
- For used oil and chemicals, they will collect at a temporary warehouse before sending back or disposed by contractors or inform concerned authorities to dispose used oil and chemicals.
- Prepare garbage bins or containers with covers for garbage collection at the workers' campsites and construction area. Also, inform concern local authorities or sub-contractor that gets permission from government section to collect and dispose garbage.
- Solid waste disposal procedures will comply with solid waste management regulations, as well as any additional disposal facility requirements.
- Separate each type of wastes and collected solid waste in appropriate and safety container for recycling where facilities are available. Any surplus to the recycling activity will be disposed of at an approved waste disposal site.
- Prohibit dumping waste in watercourse or wildlife habitat.
- No construction materials or debris are allowed to become waterborne. Any materials/debris that enters the aquatic environment must be removed immediately and disposed of in an approved manner.
- All temporary structures, piles, false works, debris, cofferdams etc. will be removed from the waterway upon completion of the work.
- Hazardous wastes will be collected and disposed of in accordance with the appropriate regulatory requirements.
- Prohibit burning waste in construction area and worker camp site.

5) Monitoring Programs

Daily checking amount of Solid waste generated during construction phase and results will be included in monthly reports.

6) Performance Specifications

Amount of Solid waste generated during pre-construction and construction phases.

7) Implementation Schedule

Throughout construction phase

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Mitigation Measures and Monitoring Program: Included in construction cost by Contractors.

6.3.2.4 Hazardous Waste Management and Monitoring Plan

1) Objective

To reduce the problem from hazardous material and to prevent the impact from hazardous material to human health and environment, and controlling problem due to spillage situation.

2) Context

Hazardous material will be used for this project such as lubricant, oil, and hydraulic fluid. Hazardous materials are cause of adverse effect to both human health and environment. Therefore, the mitigation and monitoring plan are required for controlling use of hazardous materials and suitable management for hazardous wastes.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- Electricity Law (2014)

4) Management Action or Mitigation Measures

- Preparation of emergency plan for all material used or store onsite the plan will cover planning, response and training measure for various scenarios.

- Hazardous materials use will only handle be by personnel who are trained and qualified in the handling of these materials and in accordance with the manufacturer's instructions and government regulations.
- Storage of hazardous materials will be in a designated, clearly marked area, and be at least 30 m from any watercourse.
- There will be no smoking within any hazardous materials storage area.
- Disposal of hazardous materials will be in accordance with applicable regulations in effect at the time of disposal.
- Maintenance and cleaning of mobile construction equipment will not be carried out near residential properties, on the dam, or within 30 m of any watercourse and with no potential for POL materials to enter the watercourses.
- Material safety data sheets (MSDS) must be located in close proximity to all areas where hazardous materials are handled and inventory is to be made available to regulatory agencies upon request.
- Personal Protection equipment must be prepared in the site.
- Ensure all vehicles and heavy equipment are equipped with a spill kit for using in the accident situation.
- All containers, hoses and nozzles will be free of leaks. All fuel nozzles will be equipped with functional automatic shut-offs.
- Training all workers to follow to the emergency responsible plan.

5) Monitoring Programs

- Daily site inspection includes observation of the collection and storage of hazardous material in a construction site and the results will be included in monthly reports.
- Report immediately to the relevant authorities any incident in term of accident from hazardous material leak to environment on effect to worker.

6) Performance Specifications

- Number of hazardous material
- Accident from hazardous material

7) Implementation Schedule

Throughout construction phase

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Mitigation Measures and Monitoring Program: Included in construction cost by Contractors.

6.3.2.5 Biodiversity Action Plan

6.3.2.5.1 Tree Species Transplanting Activity

1) Objective

- To reduce impact on biodiversity resources.
- To set procedure and methodology for tree transplanting, from the proposed project area to supporting area with high survival.

2) Context

The development of Two Lane Road Project will be carried on within forest area where tree cutting cannot be avoided, also five threatened tree species as follows;

Critically Endangered Species (CR) one species found in this area is namely *Dipterocarpus chartaceus* Symington.

Endangered Species (EN) one species found in this area is namely *Shorea roxburghii* G. Don.

Vulnerable Species (VU) three species were found, namely *Borassodendron machadonis* (Ridl.) Becc., *Cycas pectinata* Buch.-Ham. and *Hopea odorata* Roxb.

Therefore, this project plans to minimize such impact by reducing forest loss. The threatened tree species found within the proposed project area are shown in ***Photo 6.3.2.5.1-1***.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- The Forest Law (1992)

(*Dipterocarpus chartaceus* Symington.)

(*Shorea roxburghii* G. Don)

(*Borassodendron machadonis* (Ridl.) Becc.)

(*Cycas pectinata* Buch.-Ham.)

(*Hopea odorata* Roxb.)

PHOTO 6.3.2.5.1-1 : THREATENED TREE SPECIES FOUND WITHIN THE PROPOSED PROJECT AREA

4) Management Action or Mitigation Measures

- Survey focuses on above near threatened tree species at the appropriate size.
- Trees to be transplanted are marked with color tag.

Tree Transplanting Techniques

1. Set up marking circular shape for digging area around tree to be transplanted, in general, the circular mark is estimated over 0.5 to 1.0 of tree diameter. If a tree with crown is not wide, the digging circular is over 0.5 of tree diameter, otherwise the big tree with wide crown, the digging circular may be over 1.0 of tree diameter.

2. To dig around tree stumpage within circular marking with simple tool as pickax, spade, and etc. For the small tree with small root ball and the big tree, use small backhoe machine at first and then use pickax or spade to cut and embellish tree root ball completely. The root ball covering tree root system is to be spherical shape and at this stage it must retain main root and base soil under root ball for tree growing. After that root system should be decorated and fungicide should be used for fungi protection.

3. Soil mixed with dry coconut husk or/and peanut shell to use as fertilizer is to fill up the ditch of root ball. Use some straw to cover tree stumpage to keep moisture and water. To leave behind the transplanted tree about 2-3 months for tree adapting and new regenerated root system.

4. After 2-3 months, branches should be pruned to reduce crown size to be suitable for tree transport and leaves transpiration. The above mixed soil should be dug and main root should be cut under root ball with bewared and new root system and root ball should be covered by sack. If root ball is so big that it is not possible to lift tree to cut root ball by labor, it is needed to use small crane fixing on truck or small back-hoe machine to lift before cutting root ball and also covering root ball with tightened sack to prevent root ball broken during tree transportation. For big tree lifting, it is needed to use bank-hoe machine or crane with rope instead of iron string at two lifting points' bottom and middle of tree. All of activities should be bewared to prevent root ball broken which may lead to tree mortality while waiting to be planted. For small tree lifting, small root ball can be lifted by labor with wood fixing at bottom of tree.

5. In case that nursery area is far and truck is used for transporting; small tree can be laid down in vertical direction and big trees may be transported by 2 or 3 trees/trip and only be placed in horizontal direction with their root balls being laid to the front of truck.

6. Due to tree root system is growing within limited area where water and nutrient absorption are not enough for tree growing; these may cause tree mortality or dormancy. The transplanted tree must be kept in maintainer with good condition. Therefore, plan of tree transplanting site preparation must be done rapidly.

7. For transplanting pit preparation, tree transplanting pit should be fitted with root ball of each tree and also the depth of pit should cover all of tree root ball. The reserved materials are existing soil mixed with organic and chemical fertilizers (15-30-15) for keeping tree adapting in new condition rapidly.

8. Tree transportation from nursery area to planting site should be carefully done; root ball must be always kept in good condition in hemp sack to prevent soil broken.

9. Tree lifting in planting pit, especially big tree size, should be done with small crane or back-hoe in the same procedures as tree root cutting activities. Hemp sack should be remained for root ball to allow it fertilized. Tree stem must be in natural horizontal direction, and fully fill up with soil mixed organic fertilizer in pit.

10. High and big trees may be fallen down by windstorm due to weak root system, therefore, the supporting wood for tree are needed. The building methods for supporting wood are available in many types which can be suitable adopted for different tree sizes, height, and tree forms, including planting sites and supporting materials. The general methods are as follow:

10.1 For supporting tree of small size, diameter 8-12 cm. and 4 m long, woody pile can be used. Stick pile into soil parallel with transplanting tree 1-2 piles and also use rope inserted in hose tie with tree stem. Use iron string to tie between wooden pile and rope with medium tightness as shown in ***Photo 6.3.2.5.1-2***, or use supporting pile with diameter 8 cm. and 3-4 m long as 3 sides supporting type as shown in ***Photo 6.3.2.5.1-2***.

10.2 To support tree with bigger size but less in height (under 10 m), stronger supporting piles should be used. Use wooden piles with diameter 12 cm. and 5-6 m long each to support between middle of the tree and ground as 4 sides type as shown in ***Photo 6.3.2.5.1-2***.

10.3 To support tree with bigger size, high crown and many branches, it needs stronger pile than other methods. Therefore the method as in **Topic 10.2**, should be strengthened with iron-string between the big branch or upper the tree stem as shown in ***Photo 6.3.2.5.1-2***.

11. Transplanted tree should be kept in good conditions that is free from weed and applied with chemical fertilizer, formula 15-30-15, 2-3 weeks/time to keep root system being in high growth. After 3 months, if the tree has not wilted symptom, and having sprout leave, it indicates that root system is in good condition and can absorb nutrients and water normally. However, supervisor should always maintain tree supporters until the transplanted tree grows up and can support itself, which may take 1-2 years up depending on tree conditions.

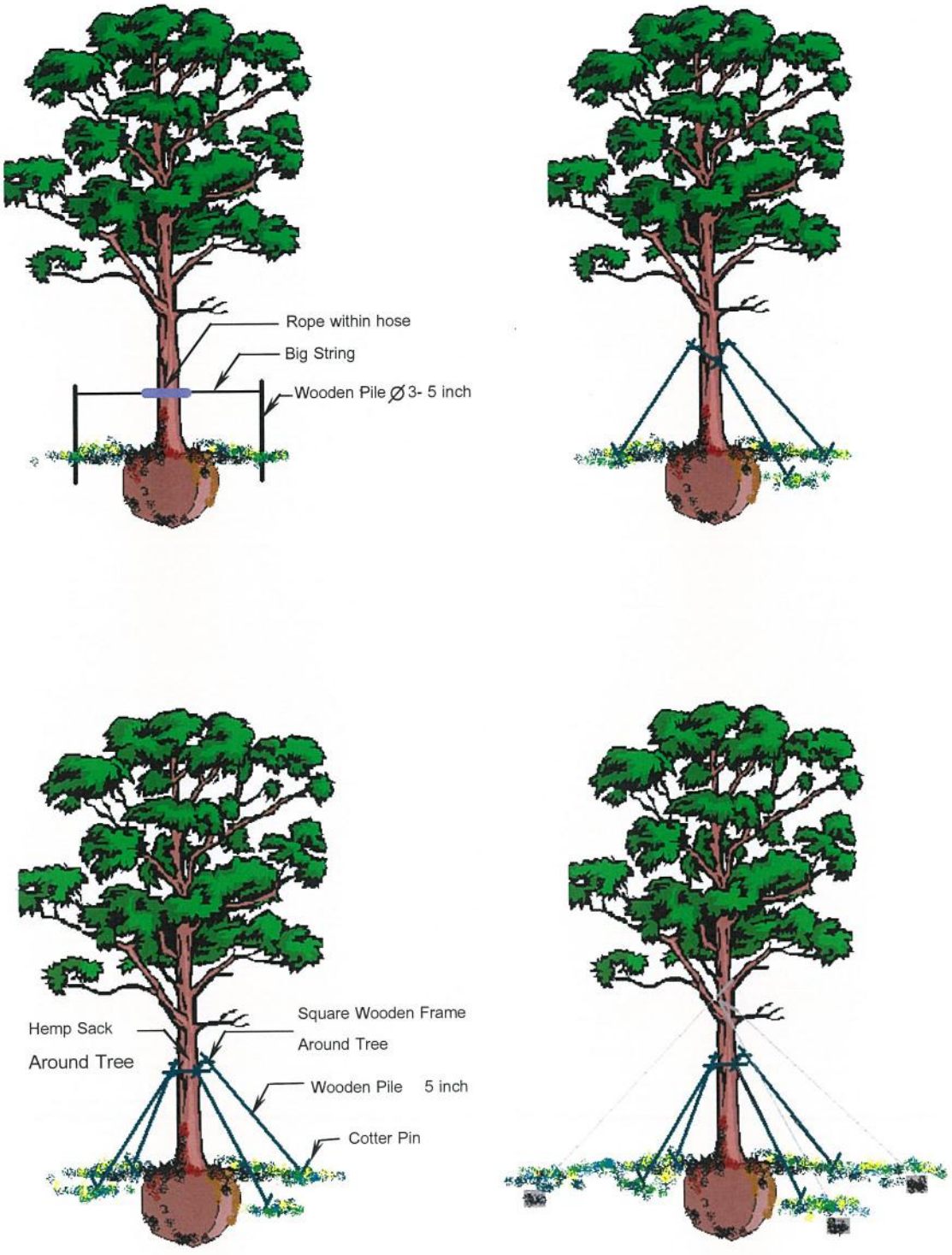

PHOTO 6.3.2.5.1-2 : TREE TRANSPLANT TECHNIQUE

5) Monitoring Programs

Location

Trees will be transplanted within the proposed project featured mainly Two Lane Road area.

Methodology

Developers will prepare a report in order to submit to The Forest Department.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Before construction period at least one year in pre-construction phase and should be done in wet season.

8) Responsibilities

Developers will take responsibility to implement towards this plan.

9) Budget

The budget for tree transplanting will be approximately 1,500 US$ (5 trees, 300 US$/tree).

6.3.2.5.2 Trees Clearing Activity

1) Objective

- To alleviate the impacts on forest resources by removing all economic timbers prior to road construction.
- To reduce negative impacts on forest ecology and the forest utilization.

2) Context

The two lane road project will be made long way with 138 km. from Thailand border to Dawei Special Economics Zones (DSEZ). The total area of native forest to be cleared for project right of way is 456 acres. The timber volume to be lost is 14,636.03 m3 along the project alignment. Therefore, it is necessary to remove all economic timbers from the project area in order to reduce economic loss. Furthermore, as the results, clearing vegetation can cause impacts on forest ecology and forest utilization. Therefore, it is recommended that clearing must be properly under taken in order to minimize the impacts.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- The Forest Law (1992)

4) Management Action or Mitigation Measures

- After road demarcations, all timber will be registered by Ministry of Forestry. The timber will then be removed by contractor, partly, by using own equipments and the rest will be removed by hiring local subcontractor. The timber transfer or logging will be conducted from east to west side or/and from middle of the road to find the boundary in order to incorporate with other relevant activities, such as tree transplanting. Existing service tracks will be used for transport mode.

- Clearing and burning will be managed and implemented by using proposed level of clearing which has been considered by developer. These activities should be conformed to other activities, such as timber logging.

- Clearing has to be restricted to the right of way area. For erosion protection it is important, in view of the relatively steep slopes, to conserve all the vegetation above road way. This can only be achieved if right of way to project is clearly marked in the field, and if the activities, especially of logging crews, are supervised.

- Logging companies involved in the clearing process must be obliged to cut all the vegetation on the plots assigned to them, i.e. not just to remove valuable timber and leave the remaining part standing.

- Left-over biomass from any form of clearing has to be burned. This burning has to be done carefully in order to prevent fires from spreading to near forest area.

- Encouraging the removal of bamboo as construction material, paper production etc. by local enterprises; nothing will have to be paid for this activity, but bamboo will only be cut and removed from areas within close range to roads.

- Use smaller stems either as construction material or for producing charcoal. Such activities also will be done on a commercial basis, i.e. without payment required, but with the same restrictions as far as transport is concerned.

- Cut, if possible, all the large trees in the project area. If they cannot be removed, they might be left there to be recovered once within the wooden yard. Waiting for the next move.

5) Monitoring Programs

Location

At proposed project site and the vicinity.

Methodology

The main agency for those activities is the Ministry of Forestry. Quarterly progress reports will be submitted to (MONREC). Final report will submitted after the completion of the activities.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

After removing all kind of timbers, clearing and firing will then be undertaken by both project owner and contractors. It is expected that these activities will be finished within 2 year (1 year of pre-construction phase and 1 year of construction phase).

8) Responsibilities

Developers and Contractors under co-operated with Ministry of Forestry.

9) Budget

Budget for forest clearing is included in project construction cost.

6.3.2.5.3 Forest Monitoring Activity

1) Objective

- To prevent further deforestation in the project vicinity.
- To follow-up and evaluate the forest in the project vicinity reforestation area.

2) Context

A close monitoring on forest condition, both in construction and implementation period, is one of the important measures to ensure a compliance with the forest conservation rule and regulations and to prevent deforestation in the nearby areas. Moreover, the monitoring will be a measure to evaluate progress of forest resource conservation and rehabilitation plan under the project to ensure the attainment of its objectives and goals.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)

- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- The Forest Law (1992)

4) Management Action or Mitigation Measures

- Observe the contractor's operation to ensure their conformity with relevant forest rule and regulations.
- Study and survey the forest in the project vicinity and reforestation area.

5) Monitoring Programs

Location

Forest in related construction areas and reforestation area.

Methodology

Responsible agency (Ministry of Forestry, Environmental Protection Unit of developer) reports accomplishment every six months.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

- Start overseeing logging activities and contractor's operation during forest clearing.
- Survey the fertility of forest in vicinity of the project and reforestation area once every year during pre-construction phase and construction.

8) Responsibilities

Ministry of Forestry is main responsible agency in coordination with Environmental Protection Unit of developer.

9) Budget

A total cost of 8,000 US$ will be provided by the developer. Operation will be carried out by Ministry of Forestry.

- 2,000 US$/year for first 4 year of pre-construction phase and construction phase.

6.3.2.5.4 Hunting Control and Other Measures for Wildlife Protection

1) Objective

The objective of this program is to minimize the impact to habitat and survival of wildlife.

2) Context

The project development will have direct impacts on forest resource around the project site. Disturbance of forest area can cause impact on survival of wildlife and ecology. Hunting in this area is also cause of reduction of wildlife abundance.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- The Forest Law (1992)

4) Management Action or Mitigation Measures

- Hunting and poaching are not allowed within forest and conservation area. This strict of this ban will be required from all workers appointed by the contractor and sub-contractors for construction of the project.
- Ban firearm within the premises of the workers' camp site and the entire working site area. However, some firearms may be required to ensure the security of workers particularly when working in densely forest area. In this case, those in charge of security will be clearly registered and the use of their arms is strictly controlled.
- All workers will be prohibited from wildlife hunting activities which may harm ecosystem, e.g. using explosive or poison.
- Rehabilitate the destroyed forest around proposed project area. The rehabilitated forest can be further used as habitats for wildlife move from other changed areas.

5) Monitoring Programs

Location

At proposed project site and the vicinity.

Methodology

Developers will prepare a report consisting of implementation of mitigation measure for hunting control and other wildlife protection measures activity including

problem and recommendations every six months through pre-construction and construction phases and submit to the (MONREC) and Ministry of Forestry.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

This program must be implemented throughout pre-construction and construction phases.

8) Responsibilities

Ministry of Forestry is main responsible agency in coordination with Environmental Protection Unit of the developer.

9) Budget

Budget for implementing this management plan during pre-construction and construction phases will be included in construction cost.

6.3.2.5.5 Deforestation Control Activity

1) Objective

The main objective of this program is to control and minimize the impact from deforestation.

2) Context

Deforestation activities cannot be avoided due to most areas of this project are within forest. However, control of deforestation is important to minimize the impact from deforestation to the local and wildlife.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- The Forest Law (1992)

4) Management Action or Mitigation Measures

- The wildlife inventory in detail will be done before tree cutting or forest clearing to help and evacuate of slowly movement species, hole living species, and non-moving with long distance.

- Tree cutting and forest clearing for construction should be done in necessity area.

- Prohibit tree cutting outside construction area.

- Do not settle camp site in dense forest area, it should be settled in degraded forest area.

- Road construction through the forest must be the shortest way as possible.

- Rehabilitate the destroyed forest around the proposed project area. The rehabilitated forest can further used as habitats for wildlife moved from other changed area.

5) Monitoring Programs

Location

At proposed project site and the vicinity.

Methodology

Developers will prepare a report consisting of implementation of mitigation measure on deforestation control including problem and recommendations every six months through pre-construction and construction phases and submit to the (MONREC) and Ministry of Forestry.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

This program must be implemented throughout pre-construction and 5 years of construction phases.

8) Responsibilities

Ministry of Forestry is main responsible agency in coordination with Environmental Protection Unit of the developer.

9) Budget

Budget for implementing this management plan during pre-construction and construction phases will be included in construction cost.

6.3.2.6 Occupational Health Management and Monitoring Plan

1) Objective

To minimize the negative impacts on health, sanitation, and safety from the project to workers during construction period.

2) Context

Occupational health problems, injuries, and accidents may occur during construction activities due to workers' carelessness, machinery malfunction, or inadequately training. Therefore, stringent management and monitoring programs are required to reduce these injuries, accidents, occupational health problems, and fire hazards.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- Public Health Law (1972)

4) Management Action or Mitigation Measures

- Inspection of a medical care unit, its screening and caring of important infectious diseases among workers, necessary services and records.
- Inspection of machinery maintenance records, occupational health and safety records of workers.
- Inspection of construction camp's sanitation and living conditions.
- Inspection of accident prevention measures such as traffic sings, use of seat belts, alcohol consumption.
- Screening among all workers and personnel by taking blood examination for malarial infection. Cases found must be radically treated.
- Chest radiography for workers to detect tuberculosis should be conducted. And cases detected must be closely under surveillance and treated.
- Single dose treatment for helminthic infection for all workers and families should be implemented.
- Any suspected case of sexually transmitted diseases (STD) should be adequately treated and followed-up with practical health education.
- Conduct safety training courses and rehearsal for the workers, to prevent and reduce work accidents.
- Ensure the continued safe disposal of all solid waste and sewage.

- Implement fly, insect and other pest control at construction camp sites and in the project area.

- Surveillance, investigate and document all disease outbreaks within the workforce. Using the epidemiologic approach. Consultation should be available.

- The construction camps shall have an adequate supply of potable water compliant with WHO criteria and Applicable Laws.

- Ventilation of buildings within the camp areas shall be in accordance with Applicable Laws and Standards.

- Canteen and residential quarter shall be equipped with mosquito net and screen.

- Camp sanitation facilities should be provided and routinely inspected. Any occurrence of water-borne diseases should be epidemiological studied. Local and provincial health agencies are good sources for advice.

- Implement regular surveillance and inspection on occupational hazard, equipment and protective device.

- Minimize dust, noise, air pollutants by strictly implement the mitigation plans of air quality and noise.

- Prepare and enforce the wearing of safety protection equipment or devices to prevent accident or reduce severity such as eye glasses, safety shoes, ear muffs, safety belts, protective clothing and helmets with regular inspection.

- Provide adequate proper material and equipment used in construction activities in order to increase effective working and decrease the risk of causing accidents or injuries.

- Provide appropriate information and health education to the workforce on prevention of diseases, including, malaria, diarrhea, food poisoning, STD, AIDS and tuberculosis.

- Providing emergency treatment and first aid for major accident/injuries and also emergency patient transfer. An ambulance shall be also provided. Connection can extend to neighboring countries.

- Effective public relations activities and social cooperation is necessary with special attention on community leaders and young adults.

- Recording of water-borne diseases, accident, dengue fever, malaria, STD, tuberculosis, and violence should be done and analyses for future prevention or reduction.

5) Monitoring Programs

Monitoring occupational health issue during construction period using the following approach-methodology as followings;

Parameter:

- Inspection of a medical care unit, its screening and caring of important infectious diseases among workers, necessary services and records.

- Inspection of machinery maintenance records, occupational health and safety records of workers.
- Inspection of construction camp's sanitation and living conditions.
- Inspection of accident precaution measures such as traffic sings, use of seat belts, alcohol drinking.
  - ➢ Methodology: Observation, interview and site visit.
  - ➢ Frequency: one time per month.

6) Performance Specifications

- Total Recordable Injury Frequency Rate (TRIFR)
- Lost Time Injury Frequency Rate (LTIFR)
- Medical Treatment Injury Frequency Rate (MTIFR)
- Duration rate
- Incident rate

7) Implementation Schedule

The management plan must be implemented during construction period. Monitoring plan must be implemented once a month during construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Budget for implementing monitoring plan as shown in the following details;

(1) The budget for setting up first aid unit/medical care unit including concerned equipment and worker's health insurance is also included in the construction budget as follows:

- Four first aid unit plus equipment (20,000 USD×4 units) 80,000 USD
- Manpower (12,000 USD×4 years) 48,000 USD
- Medication (12,000 USD ×4 years) 48,000 USD
- Worker's health insurance will be included in the construction costs.

(2) Expenses to strengthen capacity of local government health facilities including in the annual budget of Ministry of Health,

- 5,000 USD/year ×4 years equal to 20,000 USD

Therefore, total cost is about 196,000 USD for 4 years of construction phase.

6.4 SOCIAL MANAGEMENT AND MONITORING PLAN

6.4.1 Site-Specific Management Plan

6.4.1.1 Chance Find Management and Monitoring Plan

1) Objective

The objectives of the plan are to ensure that any chance – find physical cultural resources that might be identified during construction period are dealt with in an appropriate manner and there is no theft or destruction of physical cultural resources.

2) Context

Cultural heritage or previously unknown heritage resources may be exposed or found during construction of the project. In order to alleviate and mitigate the impacts on cultural heritage resources, chance find procedures shall be implemented.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- The Protection and Preservation of Cultural Heritage Regions Law (1998), Amended by Law No.1/2009
- The Protection and Preservation of Antique Objects Law (2015)
- The Protection and Preservation of Ancient Monuments Law (2015)

4) Management Action or Mitigation Measures

- The person or group (identifier) who identified or discovered physical cultural resources must cease all activity in the immediate vicinity of the site;
- The identifier must immediately inform his/her supervisor of the discovery;
- The supervisor must ensure that the site is secured and control access; and
- The supervisor must then inform the relevant personnel responsible included local and government cultural heritage administrative department.
- Potential significance of the remains will be assessed and mitigate options will be identified.
- If the significance of the physical cultural resources is judged to be sufficient to warrant further action and they cannot be avoided, then the project archaeologist in consultation with the government cultural heritage administrative department and representatives of local communities will determine the appropriate course of action.

5) Monitoring Programs

- Performance monitoring of the Chance Find Management Plan will be implemented through the regular Compliance Monitoring inspections of construction sites in construction period.
- There should be also visual inspections on whether construction workers are causing theft or destruction of physical cultural resource items.

6) Performance Specifications

Physical Cultural Resource Chance Find Management.

7) Implementation Schedule

Mitigation measures must be performed during pre-construction and construction periods when there is "Chance-Find" of Physical Cultural Resource.

8) Responsibilities

- The construction contractor
- The project proponent

9) Budget

Mitigation Measures and Monitoring Program: Included in construction cost by Contractors.

6.4.2 Thematic Management Plan

6.4.2.1 Compensation and Livelihood Restoration Management and Monitoring Plan

1) Objective

To reduce the social impacts on villagers in the affected villages in the area along the road alignment and ROW.

2) Context

Land acquisition by the project will have impacts on land and perennial trees to be within the existing right-of-way for construction of all project components. To ensure that the impacts on land acquisition are mitigated and alleviated, a mitigation plan for land acquisition will be implemented throughout construction phase.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- The Land Acquisition Act (1894)
- The Lower Myanmar Town and Village Act (1899)
- Village Act (1908)
- The Land Purchase Act (1941)
- The Requisition (Emergency Provisions) Act (1947)
- Law Safeguarding Peasant Rights (1963)
- The Constitution of the Republic of the Union of Myanmar (2008)
- The Farmland Act (2012)
- The Vacant, Fallow and Virgin Land Act (2012)
- The Foreign Investment Act (2012)

4) Management Action or Mitigation Measures

The detailed measures are presented in the resettlement action plan (RAP) will include the following:

- A detailed compensation plan identifying individuals/families, which will lose their land due to project development.
- An adequate compensation package to be developed in close collaboration with all stakeholders.
- Compensation should be for both land and crops as well as for other properties such as valuable trees.
- The compensation should be done according to international standards and with the overall objectives of improving the standard of living for those who will be affected.All crops, valuable trees should be compensated. Cash compensation is the mode agreed with the people in project affected village during consultations.
- Set up grievance redress mechanism for project affected people.
- Arrange vocational extension activities in accordance with peoples' need and site condition especially agricultural production, marketing and supplementary occupational support to compensate for reduced agricultural production.
- Cooperation with local and district authorities regarding improved infrastructural development could enhance mitigation measures dealing with health, drinking water supply education, electricity supply and general social uplift. This means the project could become development opportunity with long-term, positive implications for the project area and the region as a whole.

5) Monitoring Programs

Interview with affected households

6) Performance Specifications

- PAPs will be compensated fairly within due date; and
- PAPs who accesses in appeal process, less than 5%.

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Total budget during construction phase is 4,700,000 USD.

6.4.2.2 Land Use Management and Monitoring Plan

1) Objective

To reduce the social impacts on villagers in the affected villages in the area along the road alignment and ROW.

2) Context

During the construction, the land use pattern will be permanently changed to be road right of way. The permanently changed areas comprise a strip of 40 meters of width along the road alignment, rest areas (service center) and vista points. In order to alleviate and mitigate the impacts of land use, a management plan on land use shall be implemented.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- The Land Acquisition Act (1894)
- The Lower Myanmar Town and Village Act (1899)
- Village Act (1908)
- The Land Purchase Act (1941)
- The Requisition (Emergency Provisions) Act (1947)
- Law Safeguarding Peasant Rights (1963)
- The Constitution of the Republic of the Union of Myanmar (2008)
- The Farmland Act (2012)
- The Vacant, Fallow and Virgin Land Act (2012)
- The Foreign Investment Act (2012)

4) Management Action or Mitigation Measures

- Declare the actual R.O.W as soon as possible after detail design is accomplished
- Limit width of route as necessary to minimize the lost of agricultural and residential area.
- Inform the schedule and construction process in order to reduce conflict on land

5) Monitoring Programs

- Interview with affected households

6) Performance Specifications

- PAPs will be compensated fairly within due date; and
- PAPs who accesses in appeal process, less than 5%.

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

The cost is included in land acquisition management and monitoring plan.

6.4.2.3 Socio-Economic Management and Monitoring Plan

1) Objective

To reduce the social impacts on villagers in the affected villages in the area along the road alignment and ROW.

2) Context

During the construction, project construction activities would create some effects on socio-economic condition with nearby communities both of positive and negative impact. The major negative impacts on the socio-economic condition will be due to the large influx of workers to the project site. In order to alleviate and mitigate the impacts of socio-economic condition, a management plan on socio-economic shall be implemented.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- The Land Acquisition Act (1894)
- The Lower Myanmar Town and Village Act (1899)
- Village Act (1908)
- The Land Purchase Act (1941)
- The Requisition (Emergency Provisions) Act (1947)
- Law Safeguarding Peasant Rights (1963)
- The Constitution of the Republic of the Union of Myanmar (2008)
- The Farmland Act (2012)
- The Vacant, Fallow and Virgin Land Act (2012)
- The Foreign Investment Act (2012)

4) Management Action or Mitigation Measures

- Hire construction workers from local sources as many as possible.
- Initiate livelihood development programs designed to make the best use of new economic opportunities that will come with the project spending and employment.
- Village headmen and the responsible authorities should establish local rules and regulations for control of alcoholic abuse and sexually transmitted diseases.
- Stay on-site workers should be accommodated in more than one camp to be located far from the villages
- Closely control workers behavior to not disturb people nearby construction area.
- Provide communication access between communities and project developer to receive requests and to listen to the needs and problem of communities including to respond to the requests and to solve the problem e.g. establishing complaint centre, informing communities about project address and telephone number.

5) Monitoring Programs

Parameter

Socio-economic impact and opinion of local people toward the project development.

Location

Villages along two-lane road project. The targeted villages are as follows:

- Dauk Lauk
- Ta Laing Ya
- Pa Dao Geou
- Tha Loat Htar
- Thi Khat Done
- Ye Bouk
- Tha Byu Chaung
- Pyin Tha Daw
- Myitta
- Taung Thone Long
- Sin Byu Daing
- Va Do
- Amu
- Gad Tra Khee
- Hti Hkee

Frequency

Every 6 months during 4 years of project construction.

Methodology

Socio-economic survey to monitor socio-economic impact and opinion of local peoples toward the project. Interview village leaders, village committee and villagers in 15 villages about 400 samples by questionnaires.

6) Performance Specifications

- PAPs will be compensated fairly within due date; and
- PAPs who accesses in appeal process, less than 5%.

7) Implementation Schedule

Throughout the project construction period.

8) Responsibilities

Contractor under supervision of project developer.

9) Budget

Total budget during construction phase is 24,000 USD.

6.5 EMERGENCY RESPONSE PLAN (ERP)

6.5.1 Application of the CERP

At the request of the Project Proponent, the EIS Consultant prepares this Emergency Response Plan (CERP) for the construction of Two-Lane Road Linking the Dawei Special Economic Zone with Thai Border Project as part of the EIS study and present as part of the CEMP. It should be noted that the EPC Contractor will have to be contractually binding to prepare and implement an ERP for review and approval by the Project Proponent. The CERP must be based on the detailed design and construction plan, schedule, and methods prepared by the EPC Contractor and approved by the Project Proponent to be part of the contract. Therefore, this CERP prepared as part of the EIS study can only be considered as an initial ERP with substance at the conceptual level. The Project Proponent should use this initial CERP to prescribe minimum requirements for the CERP to be prepared by the EPC Contractor before commencing the construction.

The EPC Contractor will further develop this initial CERP to become the final CERP which will have to be ready for implementation in due course before the construction. To facilitate its further development by the EPC Contractor, this initial ERP adopts the structure of the final CERP. The EPC Contractor will have to fill identified information gaps and add more details as appropriate.

6.5.2 The Initial ERP

(1) Purpose and Scope

This Emergency Response Plan for Construction (CERP) is prepared by (Name of the EPC Contractor). The CERP covers emergency incidents that may occur in the construction sites during the construction of the Two-Lane Road. The emergency incidents could have adverse impacts on the environment, and on health and safety of construction workers and nearby communities.

The purposes of the CERP are:

- To ensure that all concerned personnel of the EPC Contractor will efficiently and effectively discharge their assigned responsibilities in handling emergency situations occurring in the construction of the Two-Lane Road to minimize adverse impacts on the environment and health and safety of the construction workers and the nearby communities; and
- To ensure public confidence in the readiness of the Contractor to efficiently and effectively respond to emergency situations occurring in the construction.

In line with the above purpose, the CERP presents key emergency incidents, procedures for responding to the emergency incidents, organization for the management of CERP implementation, responsibilities of concerned units and persons in the Contractor's construction management organization in emergency response, training requirements, and guidelines for review and updating of the CERP.

(2) Implementers of the CERP

The CERP is applied to all personnel of the Contractor and Subcontractors. The CERP should be studied by staff of the Project Management Office of the Project Owner and concerned staff of the local authorities.

The CERP is made available to the Tripartite Committee. The CERP is also disclosed to the public through the web site of the Project Owner: http://www.daweiindustrialestate.com

Questions regarding the CERP can be directed to:
Mr.
Construction Manager
Name of the Contractor
Tel.
E-mail:

(3) Incidents Considered Emergencies

Emergency incidents are:

- Risk events or incidents that still occur despite the implementation of risk mitigation measures
- Risk events that cannot be managed such as natural calamities.

Incidents that are considered emergencies are those that demand quick response as they are causing serious consequences or are certain to escalate and cause serious consequences.

In the construction of this Project, the following incidents are considered emergencies:

- Accidents resulting in serious injuries or fatalities of construction personnel
- Fire and explosion, including fires at the worker camp
- Hazardous chemical/oil spill on water or land
- Vehicle/equipment accident

(4) Organization for Emergency Response

The departments responsible for the implementation of the Construction-EMP are the Company's Environmental Management Office and, for the EPC Contractor, the Health, Safety, and Environment (HSE) Department. Both the Company and the EPC Contractor will ensure the availability of staff resources to establish, implement, maintain and improve the Construction-ESMMP.

Role, responsibility and authority of the Company's EMO and the EPC Contractor's HSE Department will be defined, documented and communicated in order to facilitate effective environmental management.

(5) Procedures

A. Emergency Communications

Emergency communication will generally be through Ultra High Frequency (UHF) radio using a dedicated emergency channel as nominated by the Project Owner. However, manually activated alarm systems will be installed at various high risk areas in the construction site.

B. Notification Procedure

In case of Emergency incidents, the person discovered the incident must promptly activate the manual alarm system, and notify the Area Supervisors or raise alarm on emergency UHF channel.

For Employee Notification, the alarm warning to evacuate the location and assemble at Muster Point or safe location will be delivered through an audible, intermittent sound signal alarm. When the evacuation signal is given, all personnel will evacuate the location and proceed to the designated assembly areas. An internal network of communications has been developed to alert workers to danger, convey safety information, and maintain site control. Any effective system or combination of systems is to be employed.

During emergency action and response training, employees are made aware of the various types of notification systems.

After the emergency incident is verified and its nature is defined, the EHS Manager will immediately inform the Project Manager (PM). The Project Manager will activate the HSE for implementation of the CERP. All teams under the HSE will be immediately deployed to take appropriate actions as prescribed in the Response Procedures.

C. Emergency Response Actions

Emergency response actions have been predetermined to facilitate the management of incidents at the Project. Incidents may include one or more response plans and they should be used in unison as required. The responses covered include:

- Incident resulting in injuries
- Incident resulting in fatality
- Fire and explosion
- Hazardous chemical/oil spill on water or land
- Vehicle/equipment accident

The procedure of each Emergency response actions are shown in ***Figure 6.5-1 to Figure 6.5-5***.

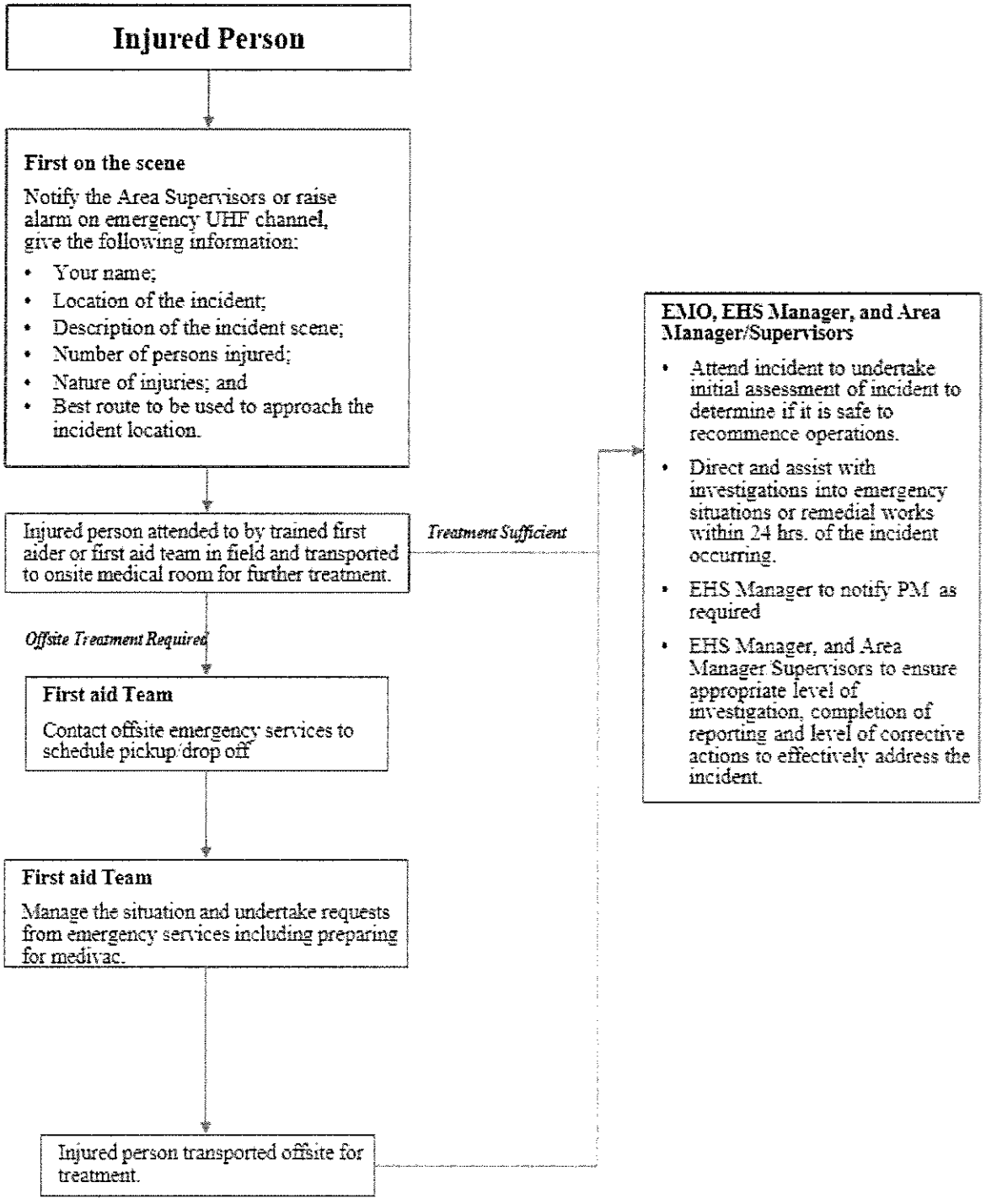

FIGURE 6.5-1 : INCIDENT RESULTING IN INJURIES

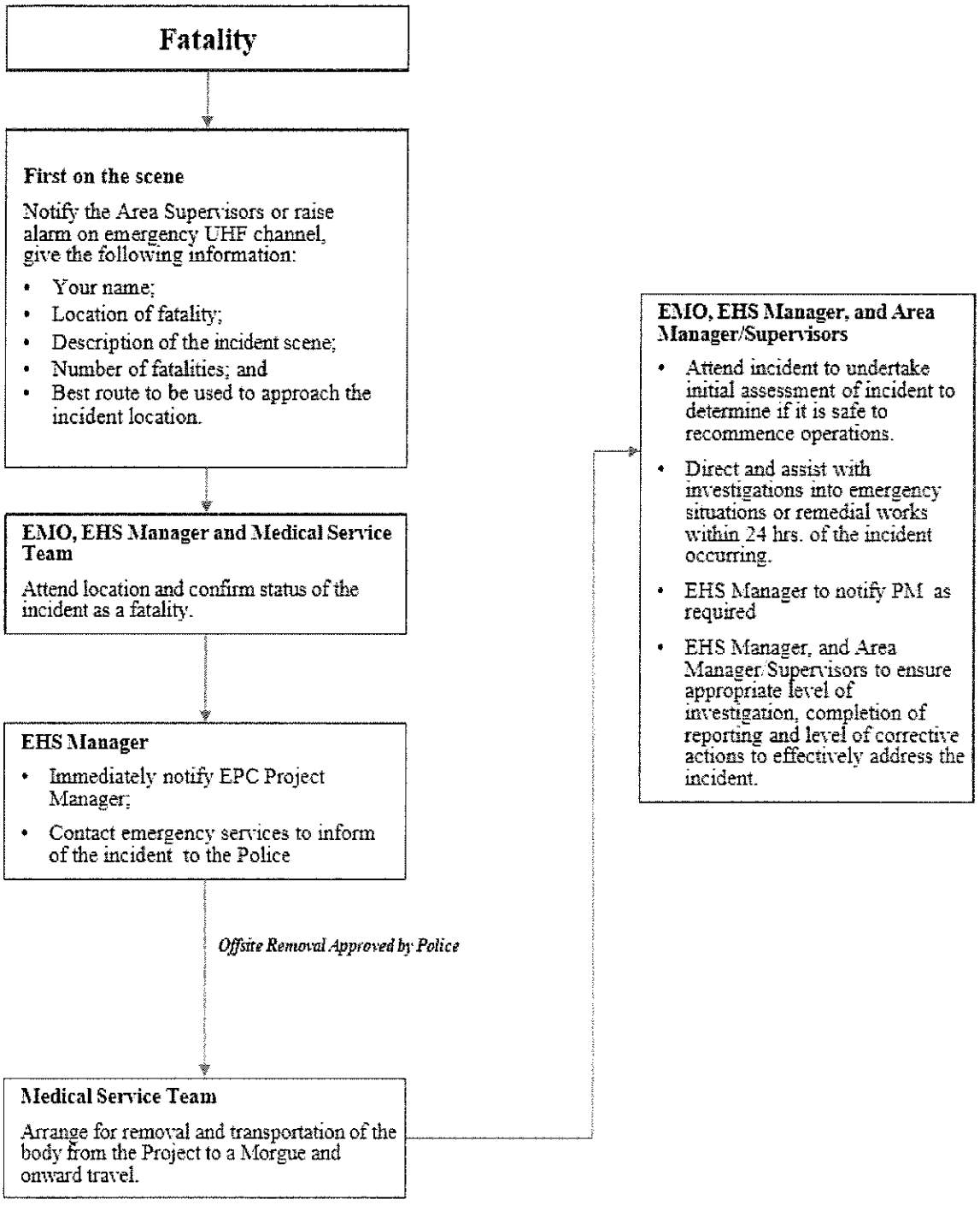

FIGURE 6.5-2 : INCIDENT RESULTING IN FATALITY

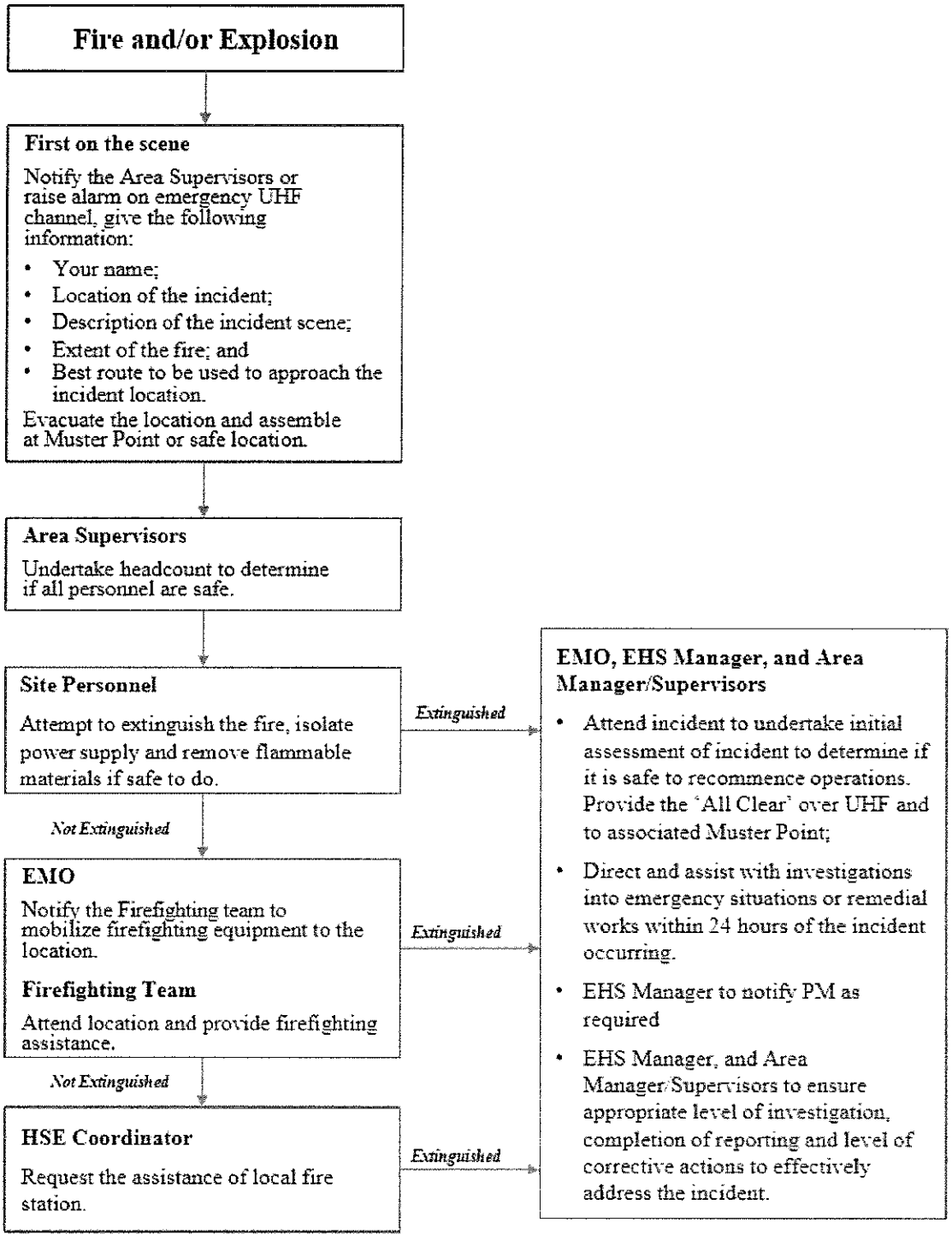

FIGURE 6.5-3: FIRE AND EXPLOSION

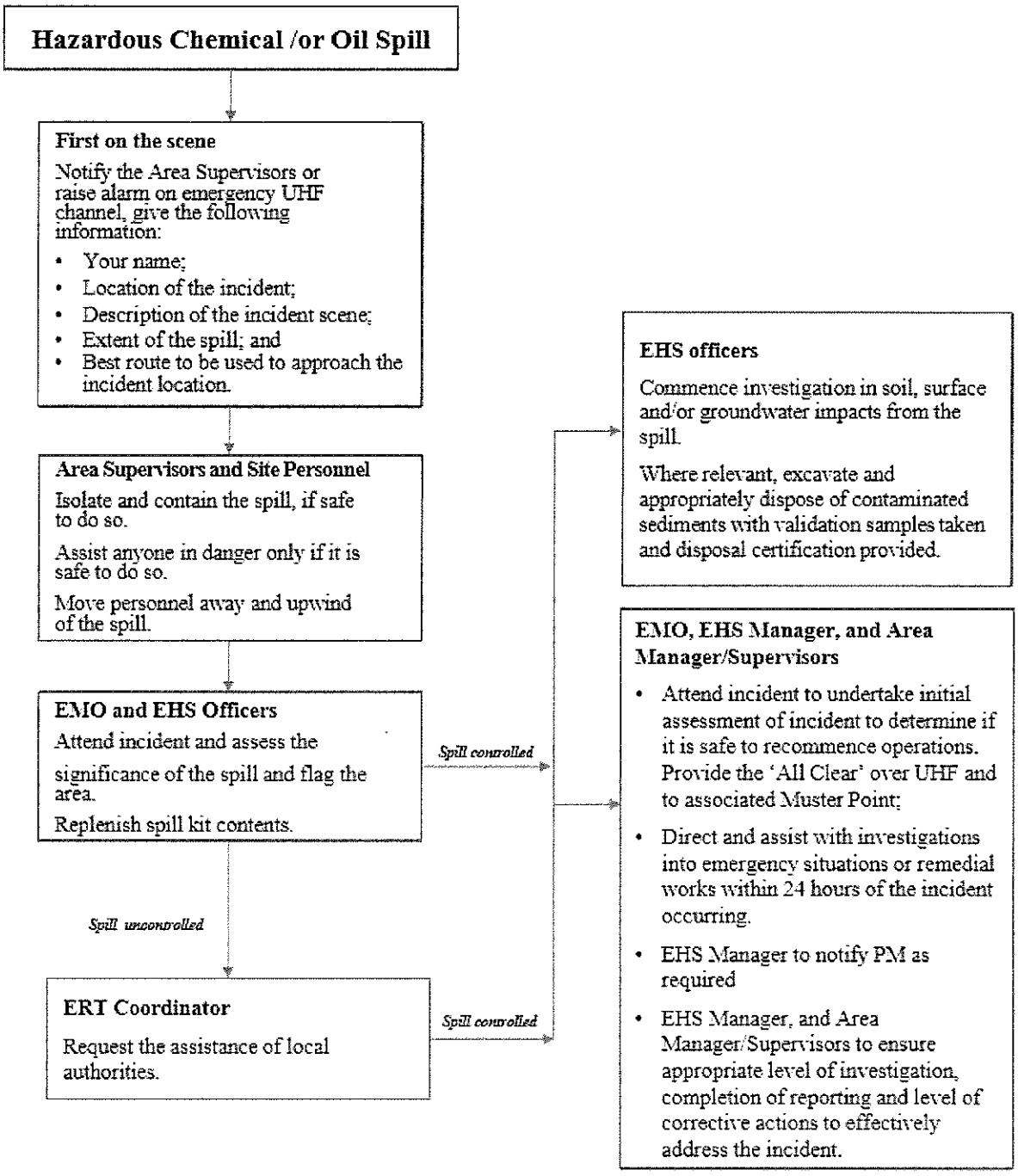

FIGURE 6.5-4 : HAZARDOUS CHEMICAL/OIL SPILL ON WATER OR LAND

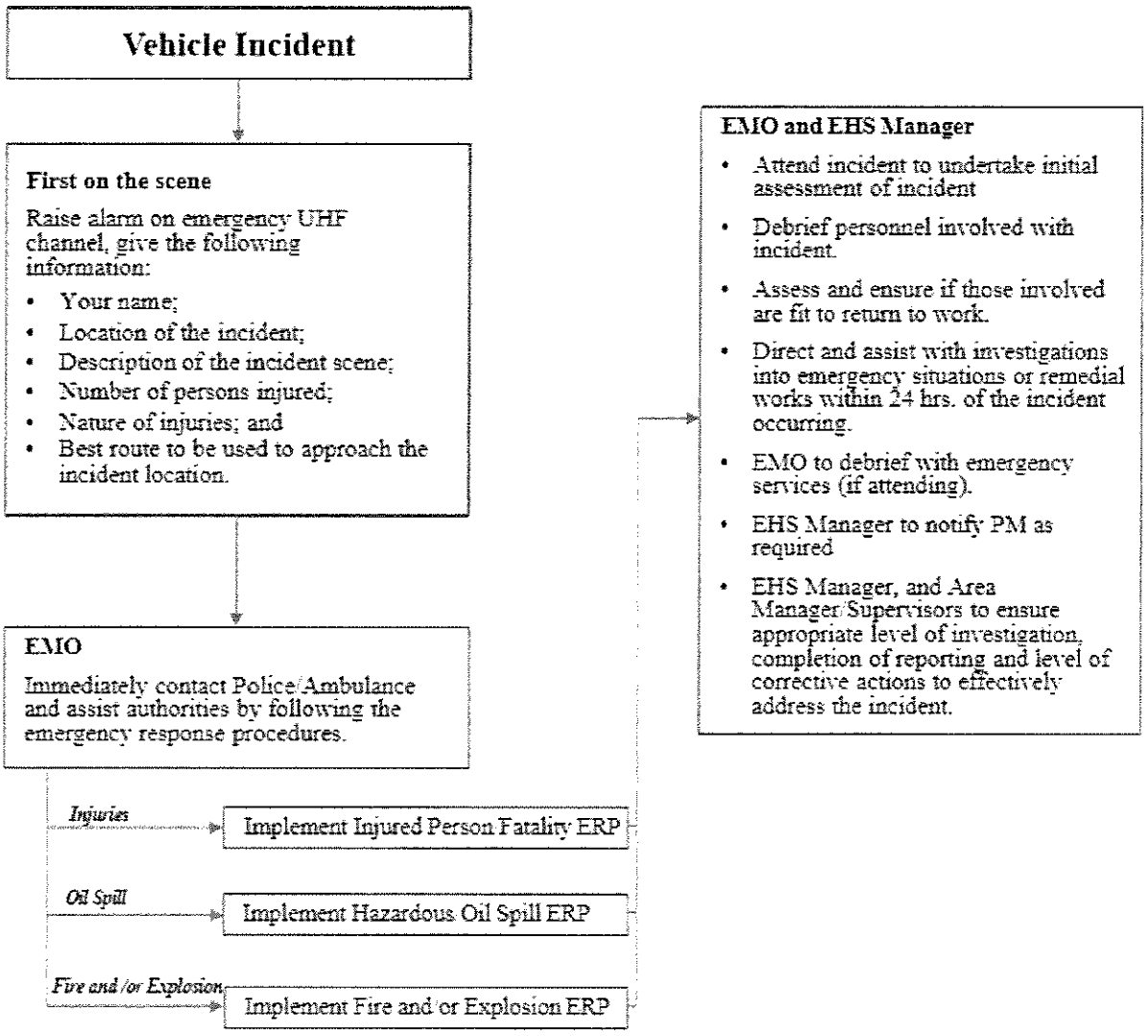

FIGURE 6.5-5 : VEHICLE/EQUIPMENT ACCIDENT

D. Emergency Evacuation

In the event of an emergency and evacuation is determined necessary, all personnel are to be evacuated to the muster point. The evacuation procedures are as follows:

- Should close doors behind, but do not lock unless otherwise instructed.
- Should switch off or unplug the electrically operated machines or equipment prior to leaving the work area.
- Leave lights on for Emergency personnel.
- Should walk, remain quiet, and follow all other emergency instructions.
- All personnel will assemble at the muster point.
- The evacuation team will account for all personnel at the muster point.
- The evacuation will follow the incident reporting procedures.

E. Documentation Procedure

The emergency response team dispatched to the site shall record necessary information which will be later used for preparing documentation and an Emergency Response Report (ERR). The required information includes but is not limited to:

Rescue and Medical Response (Accidents resulting in serious injuries / fatality / Vehicle/equipment accident)

a. Date and time of being notified of the incident
b. Date and time of arrival at the site
c. Exact location of the incident (including GPS coordinates)
d. Description of the incident scene
e. Number of person injuries/fatality or illness
f. Nature of injuries/fatality or illness
g. Description of the medial action taken/intended
h. Cause of the incident

Fire Response

a. Date and time of being notified of the incident
b. Date and time of arrival at the site
c. Exact location of the incident (including GPS coordinates)
d. Magnitude and Location of the fire
e. The extent of smoke observed and direction
f. Activities taken to control the fire
g. Time that the fire is successfully put under control
h. Time cleanup completed and description of cleanup activities
i. Time the team left site
j. Time, name, and nature of other regulatory agencies that have been notified by the fire response team or that have participated in the fire control
k. The area impacted by the smoke

l. Cause of the fire
m. Interviews with residents or businesses in the area impacted by the smoke.
n. Impact on the pipeline operation

Hazardous Chemical/Oil Spill Response

a. Date and time of being notified of the incident
b. Date and time of arrival at the site
c. Exact location of the incident (including GPS coordinates)
d. Location of the leakage
e. Estimated rate of the leakage
f. Activities taken to contain and fix the leakage
g. Time that the leakage is successfully put under control
h. Time cleanup completed and description of cleanup activities
i. Time the team left site
j. Time, name, and nature of other regulatory agencies that have been notified by the Oil Spill Containment Team or that have participated in the oil spill control
k. Cause of the leakage

(6) Resources

The Contractor has procured or leased all equipment and materials deemed adequate for effective emergency response during the construction. The Project Manager shall ensure orderly and systematically storage or installation of the provided resources ready for immediate use in time of emergency. Emergency equipment must be maintained through preventive maintenance procedures (inspection and testing) in accordance with the manufacturer's recommendations to ensure that equipment is in ready condition for use. The inspection shall be documented in a field logbook or similar means to be kept in the project files. Emergency equipment is to include, but not limited to the following:

- Class A,B,C fire extinguisher based on construction site and construction activities
- First aid kit
- Eye wash
- Emergency shower
- Potable water
- Appropriate vehicles for transporting injured person

It is recognized that emergency response resources, such as fire control resources, of local authorities are very limited. Therefore, the EPC Contractor has a fire-truck on a 24-hour standby basis to effectively respond to emergency situations. In addition, a clinic with a medical officer and two nurses is established to provide initial medical treatment to construction workers as well as to respond to medical aid needs during emergencies.

(7) Training Program

Effective training is essential for members of the HSE to enable them to efficiently and effectively respond to emergency incidents. The EPC Contractor will identify key personnel to receive training which will be conducted annually focusing on new members of the HSE. The training is to include, but not limited to the following:

- Firefighting;
- First Aid;
- Emergency Evacuation;
- Medical and Environmental Emergencies; and
- Other subjects as required.

(8) Drilling

The ERM will ensure that the emergency operations must be rehearsed once every six months.

(9) Review and Updating the CERP

The CERP shall be reviewed and amended annually or any time to:

- Correct deficiencies or inadequacies that are found
- Reflect changes in the organizational structure of the HSE, contact lists, telephone numbers, and e-mail addresses. The Project Manager and HSE members will be responsible for the review and amendment process.

(10) Operational Manuals

Members of the HSE will refer to the relevant operational manuals in their implementation of the response procedures in this CERP. The reference operational manuals include, but not limited to, the following:

- Operational Manual on Safety Construction
- Operational Manual on Specific Works (work in places exposed to heat, etc.)
- Operational Manual on Firefighting and Evacuation at Construction Sites
- Operational Manual on First-aid and Initial Medical Treatment in Construction Site
- Operational Manual on Hazardous and Oil Spills Management

CHAPTER 7

OPERATION ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

CHAPTER 7

OPERATION ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

7.1 OBJECTIVES

For operation phase, the key objective of the operation phase EMP (OEMP) presented in this section is to establish a clear operational framework for environmental management during the operational phase of the Project. The project developer will then use this OEMP to prepare a more detailed OEMP which will be based on the detailed designs of the road. The detailed OEMP will be reviewed and revised as appropriate by the road O&M team to reflect actual conditions during operation under supervision of Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC).

7.2 MANAGEMENT AND MONITORING PLANS

Based on the environmental and social impact assessment as identified in the ESIA report of this Project, which covered five components (Physical, Biological, Socio-economic, Cultural and Visual components), the summary of the significant project impacts (Site specific and Thematic)and their proposed mitigation measures, and responsibilities of these mitigation measures is tabulated as shown in ***Table 7.2-1***.

Regarding to ***Table 7.2-1***, the conducting of mitigation measures and monitoring program are essentially required since the pre-construction throughout the construction phase to mitigate the significant impacts that likely to occur. Because Project-owner and Contractor are important key man who are obligated to perform numerous of mitigation measures and monitoring program and to ensure minimum impact to environment.

This EMP detail the relevant objective, legal requirements, mitigation measures, monitoring program, performance specifications, implementation schedule, responsibilities for implementation, and budget. This EMP will be developed prior to the start of construction works and during the course of the Project when construction works requiring more detailed environmental planning are identified and will be subject to the review procedure. The following EMPs will be developed for the Project;

TABLE 7.2-1

CONCLUSIONS OF ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Environmental Aspect / Issue	Description of Impact	Management Action or Mitigation Measures	Residual Impacts	Compliance	Responsible Unit/sub-plans
SITE OR AREA SPECIFIC PLANS AND PROGRAMS					
1. Air Quality Management and Monitoring Plan					
Air Quality	- The potential impact is emission from motor vehicles exhaust emission from motor vehicles.	- Establish speed limit along the road especially areas near communities. - Providing good traffic management to avoid traffic congestion in populated areas.	LOW	NEQEG Standards	Project Owner
2. Noise Management and Monitoring Plan					
Noise	- The potential impact is loud noise from motor vehicles.	- Reduction of speed limit in settlement areas. - Always maintain road surface in good condition.	LOW	NEQEG Standards	Project Owner
3. Vibration Management and Monitoring Plan					
Vibration	- The potential impact is vibration from motor vehicles.	- Reduction of speed limit in settlement areas. - Always maintain road surface in good condition.	LOW	NEQEG Standards	Project Owner
4. Surface Water Quality Management and Monitoring Plan					
Surface Water	- The major surface water quality impacts during operation period are wastewater contamination from service areas and contamination from leachate of over road runoff.	- Continuous weekly check up and maintenance the project drainage system.	LOW	NEQEG Standards	Project Owner

TABLE 7.2-1

CONCLUSIONS OF ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (CONT'D)

Environmental Aspect / Issue	Description of Impact	Management Action or Mitigation Measures	Residual Impacts	Compliance	Responsible Unit/sub-plans
THEMATIC PLANS AND PROGRAMS					
1. Transportation Management and Monitoring Plan					
Transportation	- There are increasing of vehicles and traffic accidents.	- Provide and install appropriate traffic signs and notice boards along the road alignment including entrance-exist toll booths and service areas to alleviate traffic accidents.	LOW	NEQEG Standards	Project Owner
2. Biodiversity Action Plan					
Forest and Wildlife	- The impacts on flora and fauna during operation period comprise of increased vehicle derived pollutant, vehicle/wildlife collisions and increased edge effects and deterioration of habitat.	- Keep an updated and accurate record of all rare flora and fauna species in close proximity of the Two-Lane road - Ensure all operation workers are aware of the location of important flora and fauna species.	LOW	NEQEG Standards	Project Owner

1) Environmental Management and Monitoring Plan

1.1) Site or Area Specific Plans and Programs

- Air Quality Management and Monitoring Plan
- Noise Management and Monitoring Plan
- Vibration Management and Monitoring Plan
- Surface Water Quality Management and Monitoring Plan

1.2) Thematic Plans and Programs

- Transportation Management and Monitoring Plan
- Biodiversity Action Plan

7.3 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

7.3.1 Site-Specific Management Plan

7.3.1.1 Air Quality Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects operation activities in the project site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

During operation period there would be more vehicles using the road. The potential impact is emission from motor vehicles exhaust emission from motor vehicles. To ensure the impacts of air quality operation period are mitigated and alleviated, and to monitor the air quality (especially in sensitive areas) the following mitigation measures are needed.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Establish speed limit along the road especially areas near communities.
- Providing good traffic management to avoid traffic congestion in populated areas.
- Planting tall, leafy and dense vegetation between roads and human settlements to filter pollutants.
- Install roadside air quality monitoring program

5) Monitoring Programs

Parameters

- Total Suspended Particulate (TSP)
- Particulate Matter less than 10 μm (PM-10)
- Wind speed and directions
- Nitrogen Dioxide (NO_2)
- Carbon monoxide (CO)

Location (as same in construction phase)

- Station 1: Located at Dauk Lauk village, Yebyu Township
- Station 2: Located at Myitta village, Myitta Sub-Township
- Station 3: Located at Vado village, Yebyu Township
- Station 4: Located at Elasto Base 1 Camp, Yebyu Township
- Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township

Frequency

Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.

Methodology

Parameter	Sampling / Analysis Method
PM-10 (Average 24 Hour)	High-Volume Air Sampler (PM-10) / Gravimetric
TSP (Average 24 Hour)	Method High-Volume Air Sampler/ Gravimetric Method)
Wind speed and directions	Cup Anemometer and Wind Vane
NO_2 (Average 1 Hour)	Chemiluminescence
CO (Average 1 Hour)	NDRI

Remark: Monitoring parameters based on the study on diesel-engine exhaust study of Khair and Majewski, 2006 and review on EURO gasoline standard.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.

8) Responsibilities

Myandawei Industrial Estate Co., Ltd.

9) Budget

Monitoring of air quality at 5 stations approximately costs 6,000 USD/time (or 1,200 USD/station/time). The monitoring must be conducted twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. Total annual budget approximately costs 60,000 USD. Total budget for 5 years during operation phase is 300,000 USD.

7.3.1.2 Noise Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects operation activities in the project site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

During operation phase, there would be more traffic volume on the road. The potential impact is the noise from the passenger vehicle. Therefore, the mitigation measures and monitoring programs should be implemented to ensure that the noise impacts are mitigated and alleviated, and to monitor the effectiveness of the mitigation measures.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Reduction of speed limit in settlement areas.
- Always maintain road surface in good condition.

5) Monitoring Programs

Parameters to be monitored

- Leq (24 hrs)
- L_{max}
- Ldn
- L_{90}

Location (as same in construction phase)

- Station 1: Located at Dauk Lauk village, Yebyu Township
- Station 2: Located at Myitta village, Myitta Sub-Township
- Station 3: Located at Vado village, Yebyu Township
- Station 4: Located at Elasto Base 1 Camp, Yebyu Township
- Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township

Frequency

Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.

Methodology

International Organization for Standardization (ISO1996) for noise level measurement.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.

8) Responsibilities

Myandawei Industrial Estate Co., Ltd.

9) Budget

Monitoring of air quality at 5 stations approximately costs 1,500 USD/time (or 300 USD/station/time). The monitoring will be implemented must be conducted for twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. Total annual budget approximately costs 15,000 USD. Total budget for 5 years during operation phase is 75,000 USD.

7.3.1.3 Vibration Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects operation activities in the construction site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

To ensure the impacts of vibration during operation period are mitigated and alleviated, and to monitor the vibration (especially in sensitive areas) the following mitigation measures are needed:

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Reduction of speed limit in settlement areas.
- Always maintain road surface in good condition.

Parameters to be monitored

- Vibration or PPV measured

Location (as same in construction phase)

- Station 1: Located at Dauk Lauk village, Yebyu Township
- Station 2: Located at Myitta village, Myitta Sub-Township
- Station 3: Located at Vado village, Yebyu Township
- Station 4: Located at Elasto Base 1 Camp, Yebyu Township
- Station 5: Located at Hti Hkee village (proposed check point), Yebyu Township

Frequency

Twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days.

Methodology

International Organization for Standardization (ISO1996) for vibration measurement.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.

8) Responsibilities

Myandawei Industrial Estate Co., Ltd.

9) Budget

Monitoring of air quality at 5 stations approximately costs 1,000 USD/time (or 200 USD/station/time). The monitoring must be conducted twice a year during dry season (once) and wet season (once). Each sampling must be conducted for 5 consecutive days. Total annual budget approximately costs 10,000 USD. Total budget for 5 years during operation phase is 50,000 USD.

7.3.1.4 Surface Water Quality Management and Monitoring Plan

1) Objective

- To minimize the adverse impacts caused by the projects operation activities in the construction site
- To monitor the performance of the management action or mitigation measures and assess compliance with the applicable standards

2) Context

The major surface water quality impacts during operation period are wastewater contamination from service areas and contamination from leachate of over road runoff. To ensure that the impacts on soil are mitigated and alleviated, a mitigation plan for surface water quality will be implemented throughout operation phase.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)

4) Management Action or Mitigation Measures

- Regular monthly check up wastewater treatment system with carrying capacity within the wastewater treatment area of the service areas.

- Continuous weekly check up and maintenance the project drainage system.

- Provide adequate numbers of sanitary toilets (with septic tanks) at ratio of 15 persons/room (separated between men and women) at service areas and the toll Booths.

- Grease & oil trap to collect grease & oil and wastewater from food shops at service areas must be installed before all wastes and waste water being drained into the central wastewater treatment system.

5) Monitoring Programs

Parameters to be monitored

Surface water quality parameters in operation phase are shown in ***Table 7.3.1.4-1***.

TABLE 7.3.1.4-1

SURFACE WATER QUALITY PARAMETERS

Parameter	Unit	Preservation Method [1/]
Depth	m.	Measure at Site
pH	- -	Measure at Site
Temperature	°c	Measure at Site
Transparency	m	Measure at Site
Conductivity	µmho/cm	Measure at Site
Salinity	ppt	Measure at Site
Dissolved oxygen	mg/L	Measure at Site
Turbidity	NTU	Refrigerate in Cooling Container
Suspended Solids	mg/L	Refrigerate in Cooling Container
Total Dissolved Solids	mg/L	Refrigerate in Cooling Container
Total Solids	mg/L	Refrigerate in Cooling Container
Oil and grease	mg/L	Add H_2SO_4 to pH<2 and refrigerate
BOD_5	mg/L	Refrigerate in Cooling Container
Lead	mg/L	Add HNO_3 to pH<2 and refrigerate
Cadmium	mg/L	Add HNO_3 to pH<2 and refrigerate
Total Iron	mg/L	Add HNO_3 to pH<2 and refrigerate
Total Coliform Bacteria	(MPN/100 ml)	Refrigerate in Cooling Container
Fecal Coliform Bacteria	(MPN/100 ml)	Refrigerate in Cooling Container
COD	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Total Hardness	mg $CaCO_3$/L	HNO_3 or H_2SO_4 to pH<2
Total Petroleum Hydrocarbon (TPH)	µg/L	Cool,≤6°C
Total Kjeldahl (TKN-N)	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Ammonia Nitrogen (NH3-N)	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Total Nitrogen (Nitrate+Nitrite)	mg/L	H_2SO_4 to pH<2; Cool,≤6°C
Total Phosphate	mg/L	Cool,≤6°C
Copper(Cu)	mg/L	HNO_3 to pH<2
Zinc (Zn)	mg/L	HNO_3 to pH<2

Remark: Guidance Manual for Monitoring Highway Runoff Water Quality (US Department of Transportation, 2001).

Location (as same in construction phase)

Seven stations at the wide river of the bridge construction (more than 30 m) as follows;

- Station 1 (WQ1) : Dawei River
- Station 2 (WQ2) : Tha Laing Ya shaung
- Station 3 (WQ3) : Tha Laing Ya shaung, Mia Phyu)
- Station 4 (WQ4) : Tha Byu Shaung
- Station 5 (WQ5) : Kamoethway River
- Station 6 (WQ6) : Proposed Bridge No. 11
- Station 7 (WQ7) : Proposed Bridge No. 13

Frequency

Twice a year during dry season (once) and wet season (once) during the operation phase.

Methodology

The Standard Methods for Examination of Water and Wastewater, 2005 (APHA-AWWA-WEF).

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.

8) Responsibilities

Myandawei Industrial Estate Co., Ltd.

9) Budget

Monitoring of air quality at 7 stations approximately costs 4,200 USD/time (or 600 USD/station/time). The monitoring must be conducted twice a year during dry season (once) and wet season (once). Total annual budget approximately costs 8,400 USD. Total budget for 5 years during operation phase is 42,000 USD.

7.3.2 Thematic Management Plan

7.3.2.1 Transportation Management and Monitoring Plan

1) Objective

The main objective of this program is to minimize transportation impact during project cooperation phase and avoid damage on transportation route and accident on passer and local villagers who locate near access road

2) Context

During two lane road implementation, there are increasing of vehicles and traffic accidents. To ensure that the impacts on transportation are mitigated and alleviated, a mitigation plan for transportation included emergency preparedness and response plan for pedestrian will be implemented throughout operation phase.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- Motor Vehicle Rules (1987)

4) Management Action or Mitigation Measures

- Provide and install appropriate traffic signs and notice boards along the road alignment including entrance-exist toll booths and service areas to alleviate traffic accidents.

- Material for road traffic control will be provided e.g., Radio communication apparatus (long distance, short distance, base and hand held), long base ambulance vehicle, Patrol motorcycle and Safety cones.

- The construction of overpasses will be carried out by capable suppliers through contractual agreement. Accessing pedestrian overpass on project road significantly reduces casualties, protects pedestrian from injury and contributes towards the goal of achieving reduced road fatalities.

- Arrange training programs for local people in order to acknowledge them about traffic law, driving rules, traffic sign, notice boards and awareness on road using for both local pedestrian and drivers.

- Technical and financial support for awareness creation activities – for example mass media, workshops and driver training.

- Undertake road safety engineering activities along federal roads and urban areas and improved signs and markings.

- Improve emergency service to victims.

- Enforcement of traffic law for road safety along major roads with support for purchasing equipment and for road safety enforcement training.
- Strictly enforce the traffic regulations (on drivers and pedestrians) to reduce road traffic accidents.
- Road traffic crash data, cause of road traffic crash, challenges to traffic police duty and the community's attitude will be assessed in order to increase enforcement. The scope of assessment and enforcement will increase as the time increases focused on enforcing critical road safety traffic law against drunk driving, speeding, use of mobile phones, and non-use of seatbelts and helmets.

5) Monitoring Programs

Parameters to be monitored

- Traffic volume record
- Traffic accident record

Location

Three stations at the toll booth as follows;

- Station 1 : Toll Booth No. 1
- Station 2 : Toll Booth No. 3
- Station 3 : Toll Booth No. 4

Frequency

Twice a year and each sampling must be conducted for 2 consecutive days.

Methodology

- Collect data from related agencies.
- Prepare report on traffic volume record and traffic accident record of the two lane road.

6) Performance Specifications

- Number of complaints filed through the complaint response channel.
- Number of accident and injured related to the transportation activity

7) Implementation Schedule

During the first 5 years of operation phase, if the monitoring results are within standards the monitoring can be stopped after 5 years.

8) Responsibilities

Myandawei Industrial Estate Co., Ltd.

9) Budget

Monitoring of air quality at 3 stations approximately costs 600 USD/time (or 200 USD/station/time). The monitoring must be conducted twice a year and each sampling must be conducted for 2 consecutive days. Total annual budget approximately costs 2,400 USD. Total budget for 5 years during operation phase is 12,000 USD.

7.3.2.2 Biodiversity Action Plan

7.3.2.2.1 Forest Rehabilitation Activity

1) Objective

The main objectives for the activities are as follow;

- To mitigate impacts on forest resources and forest area in the project vicinity.
- To rehabilitate and conserve forest resource in the project vicinity.

However, to reduce the impact on the forest resources from the development of the project. There will be forest plantation to restore the forest ecosystem, covering a total area of 456 acres.

2) Context

The project development will directly cause impacts on native forest resource, especially in right of way area. In order to alleviate the impacts on forest resource, the appropriate program for reforestation has been established under Two Lane Road Project.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- The Forest Law (1992)

4) Management Action or Mitigation Measures

Forest Resources Planning

As the forest plantation areas are proposed in ***Figure 7.3.2.2.1-1***, the performance of each step should be considered by the coordination of developers, local people, related local government staff and NGOs. The area should be specified for forest resources planning due to project development as following steps.

Step 1: Survey and set the boundary of plantation area, calculate the area, draw the map and overlay on the map scale 1:50,000 (in case that some forest areas are of relative good condition, they should be separately surveyed and should be divided with set boundary). In this case, the planting area is divided into 3 forest plantation sites approximately 14, 47 and 395 acres per unit as shown in ***Figure 7.3.2.2.1-1***.

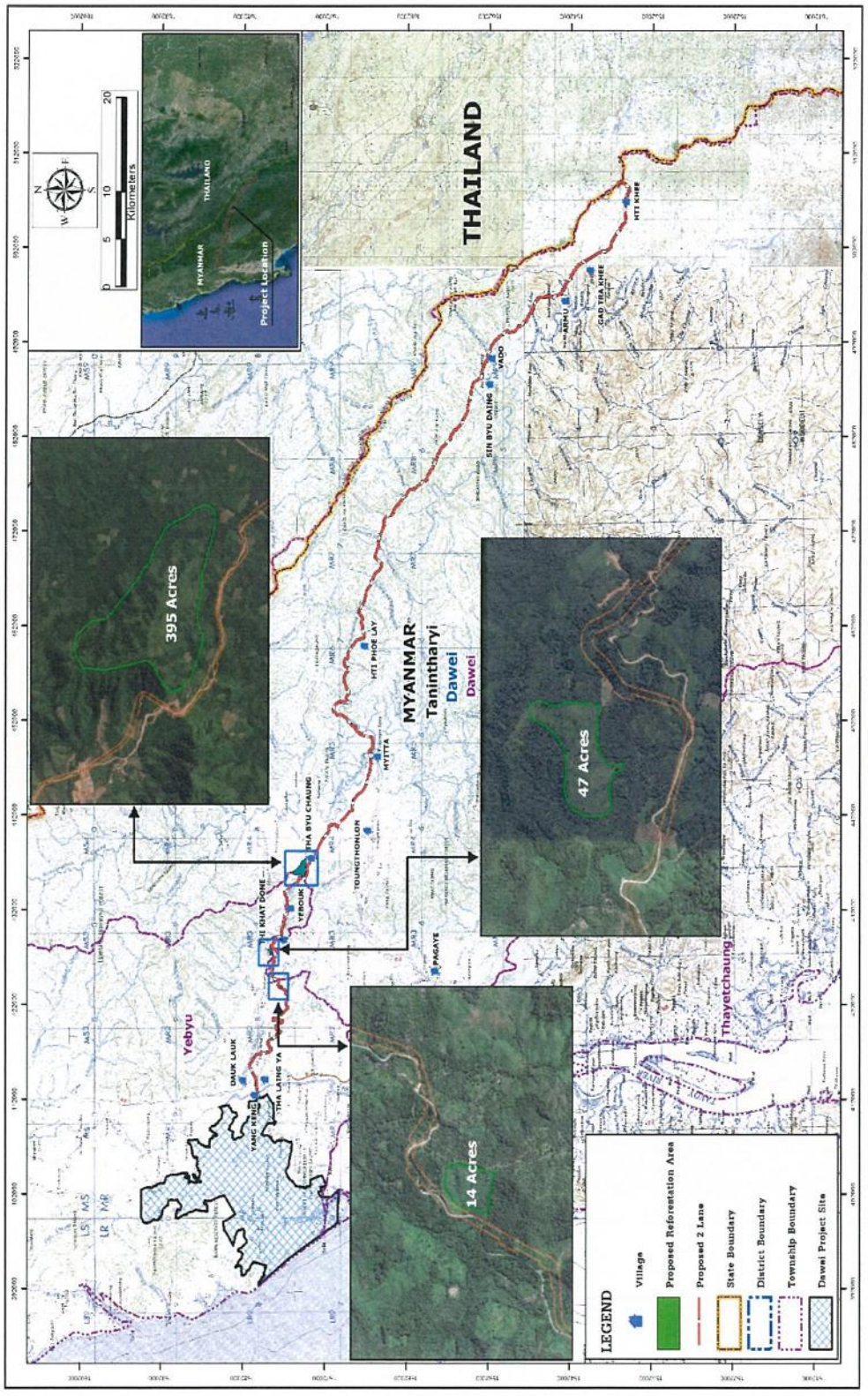

FIGURE 7.3.2.2.1-1 : THE PROPOSED FOREST PLANTATION AREA OF THE TWO LANE ROAD PROJECT

Step 2: Specify the species of proper plants from previous condition and plant nursery should be provided nearby the plantation area. In this case, (*Hopea odorata* Roxb.), (*Xylia xylocarpa* (Roxb.) W. Theob. var. xylocarpa), (*Lagerstroemia calyculata* Kurz), (*Dillenia obovata* (Blume) Hoogland) and (*Shorea roxburghii* G. Donare) are recommended, and the other recommended plant species are shown in ***Table 7.3.2.2.1-1***.

Step 3: For preparation of plantation area, the weeds should be cleared (tree and seedling cutting and burning should be prohibited). The procedures for plantation area preparation should be considered for different condition.

Step 4: Define the area by digging the location of planting. The diameter of pit is approximately 0.5 m. while the depth is 25 cm. At the bottom of excavated holes the fertilizer should be added and the number of plants should be at least 250 trees/acres or spacing 4×4 m.

Step 5: Set up the fire protection zone with at least 8 m. of width around the forestation area.

Step 6: Inspection and planting.

After the completion of tree planting, there should be an inspection of surviving trees, causes of tree death should be recorded and replanting should be carried out.

TABLE 7.3.2.2.1-1

THE RECOMMENDED TREE SPECIES FOR FOREST PLANTATION

No.	Botanical Name (Species)	Family Name	Habit
1	*Swintonia floribunda* Griff.	Anacardiaceae	T
2	*Bouea oppositifolia* (Roxb.) Meisn.	Anacardiaceae	T
3	*Holigarna albicans* Hook. f.	Anacardiaceae	T
4	*Gluta compacta* Evrard	Anacardiaceae	T
5	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	T
6	*Mangifera caloneura* Kurz	Anacardiaceae	T
7	*Monoon viride* (Craib) B. Xue & R. M. K. Saunders	Annonaceae	T
8	*Borassodendron machadonis* (Ridl.) Becc.	Arecaceae	P
9	*Stereospermum fimbriatum* (Wall. ex G. Don) A. DC.	Bignoniaceae	T
10	*Stereospermum tetragonum* DC.	Bignoniaceae	T
11	*Markhamia stipulata* (Wall.) Seem. var. kerrii Sprague	Bignoniaceae	T
12	*Garuga pinnata* Roxb.	Burseraceae	T
13	*Canarium subulatum* Guillaumin	Burseraceae	T
14	*Garcinia cowa* Roxb. ex Choisy	Clusiaceae	ST
15	*Terminalia pierrei* Gagnep.	Combretaceae	T
16	*Crypteronia paniculata* Blume	Crypteroniaceae	T

TABLE 7.3.2.2.1-1

THE RECOMMENDED TREE SPECIES FOR FOREST PLANTATION (CONT'D)

No.	Botanical Name (Species)	Family Name	Habit
17	*Cycas pectinata* Buch.-Ham.	Cycadaceae	ST
18	*Dillenia ovata* Wall.ex Hook.f.&Thomson	Dilleniaceae	T
19	*Dillenia obovata (Blume) Hoogland*	Dilleniaceae	T
20	*Hopea siamensis F. Heim.*	Dipterocarpaceae	T
21	*Hopea odorata Roxb.*	Dipterocarpaceae	T
22	*Shorea roxburghii G. Don*	Dipterocarpaceae	T
23	*Dipterocarpus turbinatus C. F. Gaertn.*	Dipterocarpaceae	T
24	*Dipterocarpus chartaceus Symington*	Dipterocarpaceae	T
25	*Diospyros montana Roxb.*	Ebenaceae	T
26	*Diospyros areolata King & Gamble*	Ebenaceae	T
27	*Polyosma integrifolia Blume*	Escalloniaceae	T
28	*Suregada multiflora (A. Juss.) Baill.*	Euphorbiaceae	S/T
29	*Elateriospermum tapos* Blume	Euphorbiaceae	T
30	*Croton persimilis* Müll. Arg.	Euphorbiaceae	S/ST
31	*Balakata baccata* (Roxb.) Esser	Euphorbiaceae	T
32	*Mallotus philippensis* (Lam.) Müll. Arg.	Euphorbiaceae	S/T
33	*Macaranga triloba* (Thunb.) Müll. Arg.	Euphorbiaceae	T
34	*Albizia odoratissima* (L. f.) Benth.	Fabaceae	T
35	*Flemingia sootepensis* Craib	Fabaceae	S
36	*Albizia lebbekoides* (DC.) Benth.	Fabaceae	T
37	*Callerya atropurpurea* (Wall.) Schot	Fabaceae	T
38	*Xylia xylocarpa* (Roxb.) W. Theob. var. xylocarpa	Fabaceae	T
39	*Erythrina subumbrans* (Hassk.) Merr.	Fabaceae	T
40	*Pterocarpus macrocarpus* Kurz	Fabaceae	T
41	*Parkia leiophylla* Kurz	Fabaceae	T
42	*Millettia leucantha* Kurz var. buteoides (Gagnep.) P. K. Lôc	Fabaceae	T
43	*Lithocarpus sp.*	Fagaceae	T
44	*Castanopsis cerebrina* (Hickel & A. Camus) Barnett	Fagaceae	T
45	*Lithocarpus vestitus* (Hickel & A. Camus) A. Camus	Fagaceae	T
46	*Castanopsis wallichii* King ex Hook. f.	Fagaceae	T
47	*Castanopsis diversifolia* (Kurz) King ex Hook. f.	Fagaceae	T
48	*Quercus brandisiana* Kurz	Fagaceae	T
49	*Lithocarpus curtisii* (King ex Hook. f.) A. Camus	Fagaceae	T
50	*Cratoxylum cochinchinense* (Lour.) Blume	Hypericaceae	T
51	*Gmelina arborea* Roxb.	Lamiaceae	T
52	*Phoebe paniculata* (Nees) Nees	Lauraceae	T

TABLE 7.3.2.2.1-1

THE RECOMMENDED TREE SPECIES FOR FOREST PLANTATION (CONT'D)

No.	Botanical Name (Species)	Family Name	Habit
53	*Dehaasia candolleana* (Meisn.) Kosterm.	Lauraceae	T
54	*Dehaasia kurzii* King ex Hook. f.	Lauraceae	T
55	*Barringtonia macrocarpa* Hassk.	Lecythidaceae	T
56	*Barringtonia racemosa* (L.) Spreng.	Lecythidaceae	S/ST
57	*Lagerstroemia calyculata* Kurz	Lythraceae	T
58	*Magnolia baillonii* Pierre	Magnoliaceae	T
59	*Pterospermum semisagittatum* Buch.-Ham. ex Roxb.	Malvaceae	T
60	*Bombax ceiba* Pierre	Malvaceae	T
61	*Firmiana colorata* (Roxb.) R. Br.	Malvaceae	T
62	*Pterocymbium tinctorium* (Blanco) Merr.	Malvaceae	T
63	*Pterygota alata* (Roxb.) R. Br.	Malvaceae	T
64	*Toona ciliata* M. Roem.	Meliaceae	T
65	*Chukrasia tabularis* A. Juss.	Meliaceae	T
66	*Artocarpus chama* Buch.-Ham.	Moraceae	T
67	*Streblus macrophyllus* Blume	Moraceae	T
68	*Ficus heteropleura* Blume	Moraceae	CrS/ST
69	*Ficus cambodica* Gagnep.	Moraceae	T
70	*Ficus hispida* L. f.	Moraceae	ST
71	*Artocarpus lacucha* Roxb. ex Buch.-Ham.	Moraceae	T
72	*Ficus geniculata* Kurz var. geniculata	Moraceae	T
73	*Horsfieldia amygdalina* (Wall.) Warb. var. amygdalina	Myristicaceae	T
74	*Horsfieldia crassifolia* (Hook. f. & Thomson) Warb.	Myristicaceae	T
75	*Knema globularia* (Lam.) Warb.	Myristicaceae	T
76	*Tristaniopsis merguensis* (Griff.) Peter G. Wilson & J. T. Waterh.	Myrtaceae	ST
77	*Syzygium siamense* (Craib) Chantar. & J. Parn.	Myrtaceae	T
78	*Syzygium antisepticum* (Blume) Merr. & L. M. Perry	Myrtaceae	ST/T
79	*Syzygium cumini* (L.) Skeels	Myrtaceae	T
80	*Schoepfia fragrans* Wall.	Olacaceae	ST
81	*Eurya acuminata* DC.	Pentaphylacaceae	S/ST
82	*Phyllanthus emblica* L.	Phyllanthaceae	ST/T
83	*Putranjiva roxburghii* Wall.	Putranjivaceae	T
84	*Carallia brachiata* (Lour.) Merr.	Rhizophoraceae	T
85	*Mitragyna rotundifolia* (Roxb.) Kuntze	Rubiaceae	T
86	*Neolamarckia cadamba* (Roxb.) Bosser	Rubiaceae	T
87	*Aidia wallichii* Steud.	Rubiaceae	T

TABLE 7.3.2.2.1-1

THE RECOMMENDED TREE SPECIES FOR FOREST PLANTATION (CONT'D)

No.	Botanical Name (Species)	Family Name	Habit
88	*Gardenia sootepensis* Hutch.	Rubiaceae	ST
89	*Nephelium hypoleucum* Kurz	Sapindaceae	T
90	*Schleichera oleosa* (Lour.) Merr.	Sapindaceae	T
91	*Lepisanthes rubiginosa* (Roxb.) Leenh.	Sapindaceae	S/ST
92	*Madhuca esculenta* H. R. Fletcher	Sapotaceae	T
93	*Stemonurus malaccensis* (Mast.) Sleumer	Stemonuraceae	T
94	*Symplocos cochinchinensis* (Lour.) S. Moore var. laurina (Retz.) Noot.	Symplocaceae	S/ST
95	*Tetrameles nudiflora* R. Br.	Tetramelaceae	T
96	*Schima wallichii* (DC.) Korth.	Theaceae	T

Note: T : Tree
ST : Shrubby Tree
S : Shrub

5) Monitoring Programs

Location

The proposed area for forest rehabilitation program is shown in *Figure 7.3.2.2.1-1*.

Methodology

Developers will prepare a report to be submitted to Ministry of Forestry.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Maintenance

The maintenance should be performed during the second year to the tenth year as follow:

a. Weeding no.1 : May – June
b. Weeding no.2 : August – September
c. Weeding no.3 : November – December
d. Inspect the fire line : December – May
e. Fertilizer and in planting : June – August

Schedule

Reforestation program will start planting in the first year of operation phase and the planted trees will be maintained for another 9 years of operation phase (The total implementation period is 10 years).

The schedule for forest plantation for the first year is shown in ***Table 7.3.2.2.1-2***. And the maintenance should be carried out for 9 years later as shown in ***Table 7.3.2.2.1-3***.

8) Responsibilities

Ministry of Forestry is main responsible agency in coordination with the developers.

9) Budget

Budget for forest rehabilitation program. It will cost 450 US$/acres, total cost is amount 205,200 US$ (administration cost and contingency not included) comprising.

(1) Expense for seedling preparation,

(2) Expense for construction building as nursery, office, equipment, and some vehicle,

(3) Expense for labor for the plantation.

TABLE 7.3.2.2.1-2

SCHEDULE FOR FOREST PLANTATION IN THE FIRST YEAR OF OPERATION PHASE

No.	Procedure	Time (month)											
		1	2	3	4	5	6	7	8	9	10	11	12
		Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	Survey and set boundary and zoning			←	—	→							
2	Specify species in each zone				←	—	→						
3	Transportation				←	—	→						
4	Site preparation					←	—	→					
5	Fire line										←	—	→
6	Staking					←	—	→					
7	Plantation					←	—	—	—	—	→		

TABLE 7.3.2.2.1-3

PROCEDURE FOR MAINTENANCE OF FOREST PLANTATION IN THE SECOND TO TENTH YEAR OF OPERATION PHASE

No.	Procedure	Time (year)																																	
		2nd year				3rd year				4th year				5th year				6th year				7th year				8th year				9th year				10th year			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Fire line maintenance				—				—				—				—				—				—				—				—				—
2	Weeding No.1 (May)		—				—				—				—				—				—				—				—				—		
3	Weeding No.2 (Aug.)			—				—				—				—				—				—				—				—				—	
4	Weeding No.3 (Nov.)				—				—				—				—				—				—				—				—				—
5	Inspect forest fire	—			—	—			—	—			—	—			—	—			—	—			—	—			—	—			—	—			—
6	Fertilize and replanting			—				—				—				—				—				—				—				—				—	
7	Forest plantation inspection				—				—				—				—				—				—				—				—				—
8	Forest plantation evaluation				—				—				—				—				—				—				—				—				—

7.3.2.2.2 Forest Monitoring Activity

1) Objective

- To prevent further deforestation in the project vicinity.
- To follow-up and evaluate the forest in the project vicinity reforestation area.

2) Context

A close monitoring on forest condition, both in construction and implementation period, is one of the important measures to ensure a compliance with the forest conservation rule and regulations and to prevent deforestation in the nearby areas. Moreover, the monitoring will be a measure to evaluate progress of forest resource conservation and rehabilitation plan under the project to ensure the attainment of its objectives and goals.

3) Legal Requirements

National laws and standards that are most relevant to the management of this plan include;

- National Environmental Policy (1994)
- Environmental Conservation Law (2012)
- Environmental Conservation Rules (2014)
- National Environmental Quality (Emission) Guidelines (2015)
- The Forest Law (1992)

4) Management Action or Mitigation Measures

- Observe the contractor's operation to ensure their conformity with relevant forest rule and regulations.
- Study and survey the forest in the project vicinity and reforestation area.

5) Monitoring Programs

Location

Forest in related construction areas and reforestation area.

Methodology

Responsible agency (Ministry of Forestry, Environmental Protection Unit of developer) reports accomplishment every six months.

6) Performance Specifications

The Performance Specifications or target are within National Environmental Quality (Emission) Guidelines (2015).

7) Implementation Schedule

Start overseeing logging activities and contractor's operation during forest clearing.

Survey the fertility of forest in vicinity of the project and reforestation area every two years during the first 10 years of operation phase.

8) Responsibilities

Ministry of Forestry is main responsible agency in coordination with Environmental Protection Unit of developer.

9) Budget

A total cost of 10,000 US$ will be provided by the developer. Operation will be carried out by Ministry of Forestry.

- 2,000 US$/time 5 times for every 2 years in the 2nd, 4th, 6th, 8th and 10th years of operation phase.

CHAPTER 8

IMPLEMENTATION BUDGET AND SCHEDULE

CHAPTER 8

IMPLEMENTATION BUDGET AND SCHEDULE

8.1 BUDGET

The Summary budget of Two-Lane Road Linking the Dawei Special Economic Zone with Thai Border Project, Myanmar is about 6,130,100 USD as show in table below:

No	Plan	Construction Phase	Operation Phase	TOTAL
1	**Environmental Management and Monitoring Plan**			
	Site or Area Specific Plans and Programs			
1.1	Air Quality Management and Monitoring Plan	240,000	300,000	**540,000**
1.2	Noise Management and Monitoring Plan	60,000	75,000	**135,000**
1.3	Vibration Management and Monitoring Plan	40,000	50,000	**90,000**
1.4	Surface Water Quality Management and Monitoring Plan	117,600	42,000	**159,600**
1.5	Aquatic Ecology Management and Monitoring Plan	39,200	-	-
1.6	Soil Erosion Protection Management and Monitoring Plan	-	-	-
Sub Total (1.1)		**496,800**	**467,000**	**924,600**
	Thematic Plans and Programs			
1.7	Transportation Management and Monitoring Plan	9,600	12,000	-
1.8	Water Use Management and Monitoring Plan	(a)	-	-
1.9	Solid Waste Management and Monitoring Plan	(a)	-	-
1.10	Hazardous Waste Management and Monitoring Plan	(a)	-	-
1.11	Biodiversity Action Plan	9,500	215,200	**224,700**
1.12	Occupational Health Management and Monitoring Plan	196,000	-	**196,000**
1.13	Construction Emergency Response Plan (CERP)	(a)	-	-
Sub Total (1.2)		**215,100**	**227,200**	**420,700**
Sub Total (1)		**711,900**	**694,200**	**1,406,100**
2	**Social Management and Monitoring Plan**			
	Site or Area Specific Plans and Programs			
2.1	Chance Find Management and Monitoring Plan	(a)	-	-
Sub Total (2.1)		**(a)**	**-**	**-**
	Thematic Plans and Programs			

No	Plan	Construction Phase	Operation Phase	TOTAL
2.2	Compensation and Livelihood Restoration Management and Monitoring Plan	4,700,000	-	**4,700,000**
2.3	Land Use Management and Monitoring Plan	(a)	-	-
2.4	Socio-Economic Management and Monitoring Plan	24,000	-	**24,000**
Sub Total (2.2)		**4,724,000**	-	**4,724,000**
Sub Total (2)		**4,724,000**	-	**4,724,000**
Total (1+2)		**5,435,900**	**694,200**	**6,130,100**

(a) = Included in construction cost

(b) = Include in operation cost

8.2 SCHEDULE

The schedule for implementing the CEMP and OEMP will be linked to the project schedule. After the Contractor completes the detailed designs and detailed construction plan and schedule, the Contractor should prepare a detailed CEMP within one month.

The Contractor should prepare a detailed OEMP within one month after implementation of the road and its associated facilities.