EMP SUB-PLANS

EMP sub-plans are proposed as guidelines. EMP sub-plans, or equivalent measures should be done for safety precautions during construction and for minimizing the environmental impact of the Project. These 17 EMP sub-plans include:

SP01. Erosion and Sediment Control

SP02. Spoil Disposal

SP03. Quarry and Construction Layout Management

SP04. Water Quality Monitoring

SP05. Chemical Products and Spillage Management

SP06. Emergency Plan for Hazardous Materials

SP07 Emission and Dust Control

SP08 Noise Control

SP09 Cultural Resources

SP10. Landscaping and Revegetation

SP11. Vegetation Clearing

SP12. Waste Management and Disposal

SP13. Environmental Training for Workers

SP14. Traffic and Access

SP15. Unexploded Ordnance (UXO) Survey and Disposal

SP16. Construction of Work Camps

SP17. Project Personnel Health Program

EMP SUB-PLANS

SP01: EROSION AND SEDMENT CONTROL

No.	Description of Measure
Design and implementation of erosion and sediment controls	
SP01.01	Erosion and Sediment Control Design Plans will be prepared prior to the commencement of works which will contain the following in greater detail: i. Conceptual design of erosion and sediment controls to be implemented on-site in accordance with the requirements of this sub-plan. ii. Water quality monitoring points in accordance with the requirements of SP04: Water Quality Monitoring (as required). Erosion and Sediment Control Plans will be included in the Environmental Management and Monitoring Plan prepared for each construction site.
SP01.02	The erosion and sediment control works will be implemented prior to the commencement of any construction works which may cause soil disturbance at the site.
Measures to control erosion	
SP01.03	The extent of areas to be cleared will be minimized as far as deemed practical.
SP01.04	The use of existing cleared areas will be maximized.
SP01.05	Areas within the construction areas not required to be disturbed by construction activities will be maintained in their existing condition or equivalent to status quo ante.
SP01.06	'Sensitive erosion areas' are defined as follows: i. Areas with slopes > 30% ii. Areas within 30 m of a bank of a natural watercourse iii. Cut and fill slopes in areas of slope instability or erodible geology
SP01.07	The location of works in sensitive erosion areas will be minimized.
SP01.08	Where possible, works in sensitive erosion areas will be restricted to the dry season.
SP01.09	Clearing of sites will be undertaken in the same sequence as the initiation of construction sites in order to minimize disturbances.
Stockpile management measures	
SP01.10	Temporary topsoil stockpiles will be developed in accordance with the following: i. Stockpiles will be constructed with smooth slopes and free draining patterns. ii. Stockpiles will not be located on drainage lines or in floodway zones other areas important for the conveyance of floodwaters during major floods. iii. Stockpiles will be deeply ripped to provide for moisture retention and re-growth. iv. Stockpiles will be constructed and stabilized, including provision of drainage and erosion control measures. v. The height of stockpile with a berm will be determined appropriately by the locations occupied. vi. In windy conditions, watering of stockpiles will be carried out if excessive dust generation is evident.

No.	Description of Measure
Design and implementation of erosion and sediment controls	
	vii. Diversion banks will be constructed uphill of stockpiles where there is a potential for run-off to erode the base of the stockpile. viii. Appropriate measures will be installed in between the stream and the stockpile to control runoff where necessary.
SP01.11	Topsoil spoil removed from the site will be piled and saved for the use of revegetation and eco-restoration activities.
SP01.12	Long term spoil placement sites will be managed in accordance with the requirements of SP2: Spoil Disposal.
Design specifications for erosion and sediment control	
SP01.13	Retention and preservation of existing vegetation along watercourses will be maximized to reduce flow velocities and act as a sediment filter.
SP01.14	Sedimentation controls will be implemented in the form of sedimentation basins, silt trap fences or similar where appropriate depending upon the size of the catchment area, and other physical and environmental constraints.
SP01.15	Release of discharge will only occur after monitoring as required to meet the requirements of SP04: Water Quality Monitoring.
Maintenance and inspection of erosion and sediment controls	
SP01.16	Sediment collection devices will be built prior to the commencement of any construction works which may cause soil disturbance at the site and will be maintained until the completion of activity.
SP01.17	Sediment collection devices (including sediment basins, silt trap fences or similar) will be cleaned with appropriately frequency because of its sustainable effect.
SP01.18	At least one month prior to the anticipated commencement of the wet season, a review of the effectiveness and adequacy of the existing erosion and sediment controls will be made by ESMMU and any necessary modification and/or augmentation of controls carried out.
Used of designated access road	
SP01.19	Access to and within construction sites will be limited to designated access roads and internal haul roads.
Wastewater from tunneling works	
SP01.20	Wastewater generated during tunneling works – either from rain infiltration or groundwater seepage – will be treated in accordance with SP04: Water quality monitoring.

SP02: SPOIL DISPOSAL

No.	Description of Measure
Principles of spoil placement	

No.	Description of Measure
Principles of spoil placement	
SP02.01	The spoil disposal area will be developed in accordance with the following requirements: i. Constructed with smooth slopes and free draining patterns ii. The spoil disposal area will not be located on drainage lines or in floodway zones other areas important for the conveyance of floodwaters during major floods. iii. The spoil dumps will be constructed and stabilized by using appropriate techniques. iv. The height of stockpile with a berm will be determined appropriately by the locations occupied. v. In windy conditions, watering of spoil disposal area will be carried out if excessive dust generation is evident. vi. Diversion banks will be constructed uphill of spoil disposal area where there is a potential for run-off to erode the base. vii. If needed, appropriate measures will be constructed downstream of spoil disposal area to control runoff.
Design of spoil disposal area	
SP02.02	All spoil from the construction activities will be placed within the general boundaries of the spoil disposal area as identified in the relevant Contractor's Environmental Monitoring and Management Plan. Spoil placement in other areas will not be permitted.
SP02.03	Prior to any placement of spoil, the detailed engineering design of the spoil disposal area will be completed. The design will provide details of the staged development of the spoil disposal area and will include details on the final landform to be achieved. The design will incorporate the following principles: i. Spoil placement activities will be contained within designated boundaries. ii. Natural drainage patterns will be avoided where possible. iii. Where natural drainage lines are affected, they will be reinstated following completion of the spoil placement. iv. The final landform will be compatible with the existing and surrounding landforms and designed to minimize visual pollution.
SP02.04	Prior to the placement of any spoil, an erosion and sediment control practice will be prepared for the spoil disposal area. The practice will be prepared in accordance with the requirements of SP01: Erosion and Sediment Control.
Transport of spoil	
SP02.05	Vehicles transporting spoil to the spoil disposal area will be abided by the management measurements identified in SP14: On-site Traffic and Access Management.

SP03: QUARRY AND CONSTRUCTION LAYOUT MANAGEMENT

No.	Description of Measure
Detailed Site Layout Plan	
SP03.01	Prior to the commencement of any construction works, detailed site layout plans will be prepared for each site. The site layout plans will include details of the areas of disturbance for the activities and all infrastructure and equipment required for the activities, including erosion and sediment controls, and will be based on the following principles:

No.	Description of Measure
Detailed Site Layout Plan	
	i. Clearing of vegetation will be minimized and the use of existing cleared areas will be maximized. ii. The separation distance between dust generating activities, construction camps and villages will be maximized as far as possible to reduce noise and dust impacts. iii. All infrastructure and equipment will be sited to maximize screening from public vantage points.
Clearing and disposal of vegetation	
SP03.02	Clearing of vegetative groundcover will be restricted to that area required for test material excavation, internal access road development, establishment of the crushing plant and other required site infrastructure.
SP03.03	All vegetation cleared from the sites will either be mulched on-site for re-use in landscaping or ground stabilization works, burnt on-site or disposed of in accordance with SP12: Waste Management. Any burning of vegetation on-site will be undertaken in accordance with the requirements of SP07: Emissions and Dust Control.
Topsoil management and erosion and sediment control	
SP03.04	Notwithstanding the requirements of SP01: Erosion and Sediment Control, sediment basins of adequate size to cater for all contaminated runoff from the site will be implemented at each of the sites where practical.
Quarry face stability	
SP03.05	The risk of quarry face instability and failure will be stabilized using appropriate methods such as: i. Implementation of slope drainage measures ii. Benching of slopes iii. De-scaling of excess material iv. The proposed measures will be detailed in the site layout plan for the quarry.
Air quality management	
SP03.06	Dust suppression measures will be implemented on exposed areas during windy conditions, or when visual inspection indicates excessive dust generation. Dust suppression measures will be implemented in accordance with the requirements of SP07: Emissions and Dust Control, and will include: i. Watering of exposed surfaces and crusher operation
SP03.07	All construction vehicles and equipment will be maintained in accordance with the requirements of SP14: Traffic and Access.
SP03.08	Access to, from and within the sites will be along designated routes as required by SP14: On-Site Traffic and Access Management.
Internal access roads	
SP03.09	Internal access roads within the quarry sites will be designed in accordance with the requirements of SP14: Traffic and Access.

No.	Description of Measure
Detailed Site Layout Plan	
Waste management	
SP03.10	Waste from the sites will be managed in accordance with the requirements of SP12: Waste Management and Disposal.
SP03.11	An adequate number of pit latrine toilets will be provided at the sites for the use of all construction personnel.
Noise and blasting controls	
SP03.12	Noise generated by activities at the sites will be managed in accordance with the requirements of SP08: Noise Control.
SP03.13	General construction works at the construction areas will be carried out 24 hours a day subject to suitable safety and lighting measures being implemented.
SP03.14	Blasting activities excluding tunneling will be basically carried out between 06.00 and 19.00.
SP03.15	All construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB (A)), or any construction personnel who requests hearing protection, will be provided with hearing protection. Training will be provided to personnel in relation to the need for hearing protection to be used.
Water quality management	
SP03.16	Prior to release, effluent discharged from the crushing plant will be monitored in accordance with the requirements of SP4: Water Quality Monitoring.
SP03.17	Effluent from the sediment basins will be regularly monitored in accordance with the requirements of SP04: Water Quality Monitoring.
Sub-camp construction	
SP03.18	The design of the construction work sub-camps will be carried out in accordance with the requirements of SP16: Construction Work Camps.
SP03.19	Materials, other than waste materials, which are sourced from the sites, will only be used for the construction of the project.

SP04: WATER QUALITY MONITORING

No.	Description of Measure
Water quality criteria	
SP04.01	The reasonable treatment, which is suited to site condition, will be implemented toward the target of the water quality criteria which are as set out in Annex C of CA (Appendix 2 -

No.	Description of Measure
Water quality criteria	
	Standards)
Water quality monitoring locations	
SP04.02	The Erosion and Sediment Design Plans referred to in SP1: Erosion and Sediment Control will include details of upstream and downstream water quality monitoring locations. Upstream and downstream monitoring locations will be identified in accordance with Annex C of CA (Appendix 2 - Standards).
Notification of risks to humans or environment	
SP04.03	Based on the results of water quality monitoring, EMO will be notified within 48 hours of the discovery of a condition that could cause harm to humans or the environment.
Reporting requirements	
SP04.04	The results of water quality monitoring will be monthly reported to EMO.
SP04.05	The presence of any groundwater wells or tube wells downstream of the waste disposal areas will be identified. If any wells are present, monthly monitoring of fecal coliform levels will be undertaken and reported in accordance with the above requirements.

SP05: CHEMICAL PRODUCTS AND SPILLAGE MANAGEMENT

No.	Description of Measure
SP05.01	Safe Storage & Handling for Explosives Explosives will be stored in facilities located underground or sufficiently protected by bunding and will be located close to areas for use, where possible. Site storage facilities will be kept locked, and access limited to authorized staff. A log book at each facility will register movements of explosives (e.g., quantity, name of user and date). Explosive boxes will be labelled with an "explosive sign", and explosive sign posters will be dispatched at each site storage facility. Fire fighting equipment will be kept available next to each storage facility.
Prevention of Pollution by Hazardous Materials (HazMat)	
SP05.02	Selection of safer chemical types Chemicals to be stored and used on any construction site will be selected, where possible, in accordance with general best practices and recommendations for environmental conservation. Pesticides for vector control (i.e., mosquitoes) and for vegetation control will be selected in accordance with the list of recommended pesticides provided by ESMMU.
SP05.03	Storage of Hazardous Materials All the fuel and hazardous material storage will be adequately bounded to prevent any spillage problem.
SP05.04	Registration of Hazardous Materials All chemicals and waste considered as potentially hazardous materials will be registered in order to follow up type, quantities stored, quantities used or generated. Movements from

No.	Description of Measure
	storage and to waste disposal site will be registered. Information will be logged in a register, which will be available in each hazardous materials storage area. A register of fuel dispensed will be kept along with the records of fuel deliveries in order to reconcile the quantities used.
SP05.05	Labelling of Hazardous Materials Containers of hazardous chemical or waste must be labelled with: i. the words "Hazardous Waste" ii. name of the Container's user or generator iii. the date of storage of the chemical, or initial date that waste accumulation began in the container iv. the name of the material and its physical state (solid or liquid) v. the hazard characteristics of the waste (ignitable, corrosive, toxic, reactive) vi. main danger for user (poison, burning, dangerous for eyes, skin, lungs, etc)
SP05.06	Handling Safety Procedures and Personal Protective Equipment Safety procedures applicable to the handling and use of hazardous materials will be established and become a part of the training program. Safety rules will be translated in Lao languages and printed on posters to be posted on the walls of the dedicated buildings where hazardous materials are to be used. Personal protective equipment (PPE) will be provided to concerned workers and the use of such equipment will be enforced.
SP05.07	Refuelling procedures All refuelling of heavy equipment and machinery will be undertaken by a service vehicle, with appropriate safeguards and protection measures to prevent any spillage or contamination by chemical wastes or maintenance oils, lubricants etc. Appropriate service vehicles are dedicated to the refueling of heavy equipment and machinery. Safety procedures regarding fire and accidental spill management are posted on-site. "No Smoking" labels and posters will be placed wherever fuel is handled or stored.
SP05.08	Spill Response Kits Spill response kits will be used to contain any ground spills that may occur as a result of servicing or through other means. The spill response kits will be located at the workshop(s) where the servicing will take place and also at the refuelling point(s). All personnel involved with refuelling and with the servicing of equipment will be familiar with the use of the spill response kits and will be trained in the emergency procedures as described in the Emergency Response for Hazardous Materials Sub Plan.
SP05.09	Selection, Handling & Application of Pesticides Pesticides for vector control (mosquitoes) and for vegetation control will be utilized in accordance with: i. Authorized pesticides, in accordance with the list approved by ESMMU ii. Labelling and storage of pesticides, which will satisfy measures SP05.3, SP05.4 and SP05.5 of this sub-plan iii. The translation of all information related to toxicity of pesticides, including user instructions, to commonly used Lao language(s) Safe handling of pesticides will rely on training users; specific training programs and supporting communication materials will be supplied for this purpose.

SP06: EMERGENCY PLAN FOR HAZARDOUS MATERIALS

No.	Description of Measure
Storage of hazardous materials	
SP06.01	Hazardous materials will be stored on-site in accordance with the requirements of SP05: Chemical Products and Spillage Management.
Spill response procedures	
SP06.02	In the event of a spill of any hazardous material, work will be ceased in the immediate vicinity and the area will be cleared of all construction personnel except those involved in the clean-up activities, if necessary.
SP06.03	In the event of a spill of any hazardous material, the following response hierarchy will apply and will be used in the development of the detailed emergency response procedures: i. First priority is to seek medical attention for any injured personnel ii. Second priority is to prevent further injury to personnel iii. Third priority is to prevent environmental damage iv. Fourth priority is to clean-up spill v. Fifth priority is to remediate area of spill vi. Sixth priority is to complete reporting requirements
SP06.04	For spills of hazardous materials, appropriate treatment and disposal methods for the known range of hazardous materials will be applied by trained personnel
Emergency contact details	
SP06.05	At each construction site, information on emergency response procedures, emergency contact numbers and communication and reporting procedures (to be implemented in case of an emergency situation) will be clearly displayed.
Training of personnel	
SP06.06	At each construction site where hazardous materials are used and where there exists a potential for a spill, there will be at least two employees on-site at all times who are trained in appropriate emergency response procedures and communication and reporting procedures to be implemented in case of an incident (refer to SP13: Environmental Training for Workers Plan).
SP06.07	All construction personnel will be trained in basic emergency response procedures including communication and reporting procedures to be implemented in case of an emergency situation.
Emergency incident communication processes	
SP06.08	In the event of an accidental release or spill of a hazardous material, the following communication processes will be implemented: i. ESO (Environmental and Social Officer) immediately notifies ESMMU ii. ESMMU immediately notifies emergency response team iii. ESMMU immediately notifies external emergency authorities (if required) Communication will initially be verbal, with written communication as soon as practical.

No.	Description of Measure
SP06.09	The communication processes identified in SP06.12 will include the following information in relation to accidental releases or spills: i. Location of spill ii. Nature of material spilt iii. Amount of material spilt iv. Clean-up processes to be implemented v. Any injuries to personnel iv. Need for emergency or external assistant v. Any safety/evacuation requirements to be implemented on the construction site
SP06.10	Within 48 hours of the completion of a spill clean-up, a report will be submitted to the Owner. The report will be used to identify any required corrective or preventive actions and emergency response procedures and training programs will be modified accordingly.

SP07: EMISSIONS AND DUST CONTROL

No.	Description of Measure
Minimization of dust generation	
SP07.01	All vehicle movements will be confined to designated access routes and haul roads.
SP07.02	Management of short term and long term material stockpiles will be carried out in accordance with the requirements of SP1: Erosion and Sediment Control.
Dust suppression measures	
SP07.03	Watering of exposed surfaces will be implemented in the following situations: During windy conditions i. When visual inspection indicates excessive dust generation ii. In response to complaints by external parties iii. During period of heavy traffic use on unsealed hauls roads, if necessary.
Vehicle maintenance	
SP07.04	A maintenance program for the construction vehicle fleet will be implemented which will include consideration of the following issues: 1. General condition and safety of vehicles 2. Check of vehicle brakes and tires 3. Vehicle exhaust emissions visibly 4. Vehicle noise emissions Each construction vehicle in the fleet will be inspected regularly and a written certificate provided by a qualified mechanic as to its fitness for service (refer to SP14: Traffic and Access Management).
SP07.05	The burning of waste materials will only take place under the following conditions: i. Burning will only be undertaken in the presence of a trained fire protection officer. ii. Burning will not be undertaken during severe wind conditions iii. Appropriate fire protection equipment will be available on-site during the burn. iv. Burning will be undertaken at a safe distance from vegetated areas. v. Burning will not be undertaken near a village.

No.	Description of Measure
Minimization of dust generation	
	vi. Following completion of the burn, the trained fire protection officer will inspect and certify that the fire has been extinguished

6.1.8 SP08: NOISE CONTROL

No.	Description of Measure
Minimise noise generation at source	
SP08.01	For any particular construction activity, the vehicles and/or equipment which are equipped with appropriate mufflers and/or other noise control equipment will be selected for use.
SP08.02	Construction equipment and vehicles will be subjected to regular inspections to check noise emissions and noise control equipment in accordance with the requirements of SP14: Traffic and Access.
Reduce transmission of noise to receivers	
SP08.03	Stationary noise sources will be sited as far as possible from villages, construction camps and settlement areas.
SP08.04	Where possible, topographic features will be used to provide shielding between stationary noise sources and villages and construction camps.
SP08.05	All construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB(A)), or any construction personnel who requests hearing protection, will be provided with hearing protection. Training will be provided to personnel in relation to the need for hearing protection to be used.
SP08.06	General construction works at the construction areas will be carried out 24 hours a day, and suitable measures against the noise should be implemented.
SP08.07	Blasting activities excluding tunneling will be basically carried out between 06.00 and 19.00. Residents will be provided with at least 24 hours notice that blasting is to take place and given information on the likely timing and number of blasts.
SP08.08	The movement of vehicles to and from the construction site and within the construction site will only take place subject to the restrictions identified in SP8.06.
SP08.09	If complaints are received about excessive noise levels in the vicinity of villages, the ESMMU will consult with the complainant to identify appropriate additional mitigation measures (e.g. additional shielding, change of equipment type, restriction of construction hours in particular

No.	Description of Measure
Minimise noise generation at source	
	area) to be implemented.
SP08.010	Monthly reports will be prepared identifying any complaints received in relation to construction noise and documenting the actions that were undertaken to resolve such complaints.

SP09: CULTURAL RESOURCES

No.	Description of Measure
Avoid impacts on significant cave network	
SP09.01	Construction activities will be undertaken in such a manner as to avoid any physical effect on known sites of cultural or religious significance.
Definition of physical cultural resources	
SP09.02	Physical cultural resources will be defined as: i. remains left by previous human inhabitants (e.g., middens, shrines, graveyards and burial sites) ii. unique natural environmental features (e.g., canyons and waterfalls)
Training of construction workers	
SP09.03	ESOs will be trained to identify potential sites or items of cultural significance. Construction workers will be trained in the appropriate reporting and communication procedures to be followed if they identify any potential sites or items and the importance of implementing these procedures.
Steps to be implemented if sites identified	
SP09.04	The following steps will be implemented to protect any previously unidentified sites of potential cultural significance: i. If a construction worker identifies a potential site or item of cultural significance, he/she will immediately notify the ESO. ii. The ESO will determine whether the site/item has potential significance iii. If the site/item is considered to have significance, the ESO will immediately cease work and secure the areas adjacent to the site and item to prevent damage to such site and item iv. The ESO will immediately notify the ESMMU v. The ESMMU will notify the Owner of the potential site as soon as practical vi. The report will be completed within 24 hours of a potential site being identified.
SP09.05	Any directions or requirements from the ESMMU in relation to measures to protect the site will

No.	Description of Measure
Avoid impacts on significant cave network	
	be recorded and communicated by the ESMMU to the construction workforce. All such requirements will be strictly adhered to.

SP10: LANDSCAPING AND REVEGETATION

No.	Description of Measure
Landscaping and Revegetation work	
SP10.01	All area disturbed by construction activity will be, as far as reasonably possible, landscaped to reflect natural contours and restore suitable drainage paths.
SP10.02	Re-establishment of vegetation will be implemented in disturbed areas except surface of rock, if necessary, and commenced at the earliest possible opportunity. Appropriate local species of vegetation will be used.
SP10.03	Local depressions created by construction activities will be either backfilled or drained to prevent ponding wherever possible.
SP10.04	Watercourses, which have been temporarily diverted by the contraction activities, will be restored to their former flow paths.
Avoidance of weed spread	
SP10.05	To avoid the spread of non-endemic species between different areas of the construction site, topsoil and vegetation (for mulching) removed from an area during site-clearing activities will—as far as practical—only be reused on that area.
Restoration of other land uses	
SP10.06	Land used for agricultural activity prior to use for construction activities will be, as much as reasonably possible, restored to a state to allow the same agricultural activity to continue.

SP11: VEGETATION CLEARING

No.	Description of Measure
Identification of vegetation to be cleared	
SP11.01	The plan will be prepared including: i. mapped boundaries of vegetation to be cleared, including identification of which clearing will be undertaken by the Forestry Department and which will be undertaken by the project. ii. any areas of 'sensitive vegetation' located on-site which require specific protection (e.g.

No.	Description of Measure
Identification of vegetation to be cleared	
	vegetation adjoining drainage channels). iii. any required temporary timber storage sites for placing prior to its removal from site.
SP11.02	No clearing of vegetation outside of those areas identified in the plans will take place.
SP11.03	No construction works, storage of materials/equipment or access by construction personnel will be permitted in 'sensitive vegetation' areas.
Clearing methods	
SP11.04	Vegetation clearing will be undertaken by a combination of manual, mechanical and chemical methods. Chemicals should be selected on the basis of being non-residual and with regard to human health.
SP11.05	Burning of waste vegetation will only take place in accordance with the requirements of SP7: Dust and Emissions Control.
Use of herbicides	
SP11.06	Herbicide use and management will be undertaken in accordance with the requirements of SP05: Chemical Use and Management.
Tree cutting	
SP11.07	The Contractor will arrange for the employment of construction contractor and locally licensed logging firms to log and clear as far as practicable.
SP11.08	Any required temporary timber storage sites will be designed to ensure that they are stable and protected from the risk of fire.
SP11.09	Timber products that are not to be removed from site will be disposed of in accordance with the Forestry Department guidelines and the requirements of SP12: Waste Management and Disposal.
Impacts on agricultural land use	
SP11.10	All works will be designed and implemented in a manner that minimizes the impact on agricultural land use.

SP12: WASTE MANAGEMENT AND DISPOSAL

No.	Description of Measure
General requirements	
SP12.01	A sufficient number of containers or similar one will be made available at Construction site.

No.	Description of Measure
General requirements	
SP12.02	The containers (or similar disposal receptacles) will be marked clearly for 'Hazardous Waste' and for 'Non-Hazardous Waste' for separation and sorting of waste.
Hazardous waste disposal	
SP12.03	Hazardous waste will be disposed of according to the most appropriate and practical best practices.
Non-hazardous waste disposal	
SP12.04	Non-hazardous waste will be burned, if confirming to SP07 Emission and Dust Control, or collected regularly to a designated waste disposal site, whichever is more appropriate.
SP12.05	When designated waste disposal areas are full or no longer used, they will be covered by soil at the appropriate depth from the ground surface.
Training of workers	
	All workers responsible for handling hazardous waste will receive appropriate training in accordance with SP13: Environmental Training for Workers.

SP13: ENVIRONMENTAL TRAINING FOR WORKERS

No.	Description of Measure
SP13.01	All workers will complete the environmental training programs. The goal of programs will be to educate all workers on the following issues; i. Fire arms possession ii. Traffic regulations iii. Illegal logging & collection of non-timber forestry products iv. Non disturbance of resettlement communities v. Hunting & fishing restrictions vi. Waste management vii. Erosion control viii. General health
SP13.02	Where necessary, participants in job-specific training will be identified on the basis of their skills and capacity to undertake the training.
SP13.03	All training sessions will be conducted in Lao language for Lao personnel and as appropriate for foreign staff. All written materials will be provided in Lao language and other languages as appropriate.
SP13.04	A training register will be maintained that will contain details of the following: i. Name of training session ii. Date of training session

No.	Description of Measure
	iii. List of attendees and signatures iv. Name of trainer
SP13.05	Upon completion of each relevant training course, each participant will be issued with a certificate of successful completion. A copy of the certificate will also be placed on each participant's employment file.
SP13.06	The ESMMU will implement a rolling program of refresher courses in environmental, health and safety awareness issues through the use of 'tool-box' sessions at construction sites.
SP13.07	During audits of the construction areas, workers' knowledge of environmental, health and safety issues will be examined.
SP13.08	Workers who have undergone job-specific training will be examined in relation to their knowledge and skills, and are subject to re-training, if necessary. Records of examination results and any re-training will be kept as part of the training register.
SP13.09	All new employees will complete relevant training prior to commencement of any activities on the construction site.
SP13.10	The key messages from the training sessions will be produced in both poster and leaflet form, in Lao and English language. Posters will be displayed prominently in construction work camps and construction areas and leaflets will be distributed to staff on a regular basis.

SP14: TRAFFIC AND ACCESS

No.	Description of Measure
Road signage and speed limits	
SP14.01	All roads within the construction area will be signposted to facilitate traffic movement, provide directions to various components of the construction activities and provide safety advice and warnings in Lao and English.
SP14.02	Traffic speed regulation devices, such as speed humps, and signage will be installed at sensitive locations including in the vicinity of villages, construction camps and at busy intersections, if necessary.
Maintenance of construction vehicles	
SP14.03	A maintenance program for the construction vehicle fleet will be implemented which will include consideration of the following issues: i. General condition and safety of vehicles ii. Check of vehicle brakes and tires iii. Vehicle exhaust emissions iv. Vehicle noise emissions and noise control measures

No.	Description of Measure
Road signage and speed limits	
	Each construction vehicle in the fleet will be inspected regularly and a written certificate provided by a qualified mechanic as to its fitness for service.
Traffic movements on internal roads	
SP14.04	Visual inspection of traffic movements within the construction area will be carried out. If there is evidence that traffic congestion is occurring on the roads, appropriate management measures will be implemented.
SP14.05	Movement of construction vehicles and traffic on-site will be confined to the designated access road network. No movement of vehicles outside the designated access road network will be permitted.
Traffic movements on public roads	
SP14.06	Prior to the movement of special loads on public roads, including hazardous materials or large items of construction equipment, the ESMMU will be notified. If the ESMMU require additional measures, the reasonable and practical measures will be implemented to ensure that the risk of harm to the community and environment is minimized during transportation of special loads.
Training	
SP14.07	Safety issues and regulations regarding traffic and site access will be included in the training plan for construction personnel (refer to SP13: Environmental Training for Workers).
Borrowed areas for road construction	
SP14.08	Any borrowed areas that are required to be developed for the road construction works will be subject to evaluation by using the simple checklist. The ESMMU will approve the location of any identified borrowed areas prior to their establishment.
SP14.09	Notwithstanding the above, material for construction of the roads should utilize construction spoil if possible.

SP15: UNEXPLODED ORDNANCE (UXO) SURVEY AND DISPOSAL

No.	Description of Measure
Appropriately qualified organization to undertake work	
SP15.01	An appropriately qualified organization will be engaged to undertake survey and disposal of UXO in areas where project activity are to take place, prior to the commencement of any construction works on-site.
Requirements for survey and disposal	
SP15.02	The first priority method for disposal of UXO should be in-situ explosion. Where this is not possible, due to potential danger to personnel or nearby population or damage to

No.	Description of Measure
Appropriately qualified organization to undertake work	
	infrastructure, alternative proven methods of disposal may be implemented.
SP15.03	Where disposal of UXO may cause physical damage to infrastructure, protective measures such as sandbagging, burial and trenching will be undertaken.
SP15.04	Storage and handling of explosives will be undertaken in accordance with the requirements of SP05: Chemical Waste/Spillage Management.
Marking of cleared areas and clearance reports	
SP15.05	All cleared areas will be semi-permanently marked with concrete posts or similar. Within 30 days of completion of the clearing work at a site, a clearance report will be prepared and will contain the following information: i. Description (using GPS coordinate system or similar) and mapping of boundaries of the cleared area – area identifiers will be in keeping with the overall identification process used for engineering design drawings ii. Description of the survey, disposal and QC processes that were implemented on the site iii. Description of UXO located, UXO destroyed and amount of scrap metal recovered iv. Certification that the area has been cleared of UXO and is suitable for its intended purpose
Construction worker training	
SP15.06	As part of the construction worker training program contained in SP13: Environmental Training for Workers, construction workers will be trained in the potential risks associated with disturbance of UXO and procedures to be followed if potential items of UXO are identified during construction activities.
Notification of local communities	
SP15.07	A UXO notification will be implemented in communities that are located in the vicinity of survey and disposal works at the time that the survey and disposal works are being undertaken. The UXO notification will include the following: i. Notification of local communities of the commencement and likely duration of UXO disposal activities in their area and any likely precautions that should be taken. ii. Information to communities about the location of cleared areas and the meaning of the cleared area markings or signage (i.e., the delineation between cleared and un-surveyed areas).

SP16: CONSTRUCTION WORK CAMPS

No.	Description of Measure
Use of camps	
SP15.08	All workers who are based on the construction site will be basically accommodated by the construction camps.
SP16.01	Appropriate sanitation facilities will be installed in accordance with SP04: Water Quality Management.

No.	Description of Measure
Use of camps	
Disease control, health and safety issues	
SP16.02	Buildings in Residence camps and sub-camps will be made 'mosquito-proof' as far as possible through ensuring adequate sealing of doors and windows, provision of suitable ventilation and as necessary, installing mosquito-nets and other prevention devices.
SP16.03	Medical, sanitary and disease prevention measures for each camp will be implemented in accordance with the requirements of SP17: Project Personnel Health Program.
SP16.04	Pesticide use in the camps and sub-camps will be carried out in accordance with the requirements of SP17: Project Personnel Health Program.
SP16.05	Waste generated at the construction camps will be managed in accordance with the requirements of SP12: Waste Management.
SP16.06	Construction workers will be trained in health and safety issues relating to the camps in accordance with the requirements of SP13: Environmental Training for Workers.
Camp access	
SP16.07	In general, access to the camps will be restricted to construction workers and visitors with an authorized access pass.
Potable water supply	
SP16.08	All potable water storage facilities will be secured, with access limited to authorized personnel. Local rivers or underground water will be used as the source of the potable water supply. The intake for the potable water storage will be located a suitable distance upstream of any wastewater discharge point.
SP16.09	Water quality monitoring of the potable water storage in camps and sub-camps will be carried out in accordance with the requirements of SP04: Water Quality Monitoring.
Camp rules and regulations	
SP16.10	A set of rules and regulations applicable to camps and sub-camps will be developed. The rules and regulations will include: i. Prohibitions on hunting and poaching of wildlife, purchasing wildlife meat, fishing, gathering and harvesting medicinal or valued plants and trees, and possessing firearms, snares, traps and other hunting equipment ii. Access restrictions for non-construction personnel iii. Housecleaning and waste management requirements iv. Prohibitions v. Measures for preserving health and the dissemination of vectors and transmissible diseases
SP16.11	Residents of the camps shall be provided with written information and training on camp rules and regulations. Camp rules and regulations will be prominently displayed in the camp areas.

PROJECT PERSONNEL HEALTH PROGRAM

No.	Description of Measure
SP17.01	The "Health and Safety Manual" will be distributed to the personnel attending health and safety training in the language used by the workers during trainings. It contains the following contents: Health: i Anti malaria precautions ii Precautions for HIV / AIDS and other venereal diseases iii Diarrhea precautions iv Symptoms of other diseases typical of the area (such as dengue fever) v Recommendations regarding proper disposal of all wastes vi Use of proper drinking water vii Use of appropriate toilets Safety: i Use of Personal Protective Equipment (PPE) ii Use of specific equipment according to the safety procedures iii Use of appropriate clothing iv Use of appropriate ladders v Use of appropriate slinging vi Attention to signals of danger vii Attention to suspended weights viii Attention to unprotected pits ix Attention to buried cables x Attention to overhead power cables xi Attention to all flammable items xii Procedure for fire extinguishing xiii Miscellaneous safety issues
SP17.02	First aid teams will be specifically trained and assigned in groups of two to three persons to the different sites
SP17.03	Medical facilities, including items such as First Aid kits and bedding for patients, should be provided.
SP17.04	A doctor should be reached when an accident occurs.
SP17.05	In the event of a spill of any hazardous material, actions and responses will be taken according to SP06: Emergency Plan for Hazardous Materials.
SP17.06	Vector control of mosquitoes and other pests will be managed in the appropriate manner.
SP17.07	Solid waste that might attract pests such as domestic rubbish and food waste shall be managed properly.
SP17.08	The water supply and sewage system, especially in camp sites, will be maintained in good working condition through regular monitoring according to the required standards.
SP17.09	The use of pesticides to control pests will be limited to only those cases deemed necessary. Use and handling of pesticides will be conducted on the appropriate manners.

I.1 DRINKING WATER QUALITY STANDARDS

Lao PDR current standards for drinking water of the Lao PDR are provided below for reference.

Table I.1.1 Bacteriological Parameter

Parameters	Units	Concentration
Faecal Coliform	MPN/100ml	0
Total Coliform	MPN/100ml	<2.2
Entero virus	MPN/100ml	0

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Bacteriological Parameters

Table I.1.2 Physical-Chemical Parameters

Parameters	Symbol	Unit	Maximum Concentration
Aluminium	Al^{3+}	mg/l	0.2
Ammonia	NH_3	mg/l	1.5
Chloride	Cl^-	mg/l	250
Copper	Cu^{2+}	mg/l	2.0
Iron	Fe^{2+} and Fe^{3+}	mg/l	<1
Manganese	Mn^{2+}	mg/l	0.5
Sodium	Na^+	mg/l	250
Sulphate	SO_4^{2-}	mg/l	250
Hydrogen Sulphide	H_2S	mg/l	0.1
Conductivity	EC	µS/cm	<1,000
Total dissolved solids	TDS	mg/l	600
Sodium Chloride	NaCl	mg/l	300-350
pH	pH	-	8.5
Temperature	T	^0C	35
Hardness	-	mg/l	300
Turbidity	-	NTU	<10
Taste and Odour	-	-	Acceptable
Colour	-	TCU	5
Residual Chlorine (if Chlorine disinfection is used)	Cl_2	mg/l	<0.2

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Physical-Chemical Parameters

Table I.1.3 Health Significant Chemical Parameters

Parameters	Symbol	Unit	Maximum Concentration
Antimony	Sb^{3+}	mg/l	0.005
Arsenic	As^{3+}	mg/l	0.01-0.05
Barium	Ba^{2+}	mg/l	0.7
Boron	B	mg/l	0.50
Cadmium	Cd^{2+}	mg/l	0.003
Chromium	Cr	mg/l	0.05
Cyanide	CN^-	mg/l	0.07
Fluoride	F^-	mg/l	1.5
Lead	Pb	mg/l	0.01
Mercury	Hg	mg/l	0.001
Nitrate	NO^-_3	mg/l	50
Nitrite	NO^-_2	mg/l	3
Selenium	Se	mg/l	0.01

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Health Significant Chemical Parameters

Table I.1.4 Priority Parameters

Parameters	Symbol	Unit	Maximum Concentration
Iron	Fe	mg/l	<1
Manganese	Mn	mg/l	<0.5
Arsenic	As	mg/l	<0.05
Fluoride	F^-	mg/l	<1.5
Nitrate	NO_3^-	mg/l	50
Nitrite	NO_2^-	mg/l	3
Nitrite Nitrogen	NO_2-N	mg/l	1
pH	pH	-	6.5-8.5
Coliform	-	MPN/100ml	0
Conductivity	EC	µS/cm	1000
Residual Chlorine (if Chlorine disinfection is used)	Cl_2	mg/l	0.2
Total Hardness	-	mg/l	<300
Turbidity	-	NTU	<10
Taste and Odour	-	-	Acceptable

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Priority Parameters

I.2 GROUNDWATER QUALITY STANDARDS

Lao PDR current standards for groundwater are provided below for reference.

Table I.2.1 Volatile Organic Compound

No.	Substances	Unit	Maximum Concentration
1	Benzene	mg/l	0.005
2	Carbon Tetrachloride	mg/l	0.005
3	1,2-Dichloroethane	mg/l	0.005
4	1,1-Dichloroethylene	mg/l	0.007
5	Cis-1,2-Dichloroethylene	mg/l	0.070
6	Trans-1,2-Dichloroethylene	mg/l	0.1
7	Dichloromethane	mg/l	0.005
8	Ethylbenzene	mg/l	0.7
9	Styrene	mg/l	0.1
10	Tetrachloroethylene	mg/l	0.005
11	Toluene	mg/l	1
12	Trichloroethylene	mg/l	0.005
13	1,1,1 Trichloroethane	mg/l	0.2
14	1,1,2 Trichloroethane	mg/l	0.005
15	Total Xylenes	mg/l	10

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.9 Groundwater Quality Standards

Table I.2.2 Heavy Metals

No.	Substances	Unit	Maximum Concentration
1	Cadmium	mg/l	0.003
2	Hexavalent Chromium	mg/l	0.05
3	Copper	mg/l	1
4	Lead	mg/l	0.01
5	Manganese	mg/l	0.5
6	Nickel	mg/l	0.02
7	Zinc	mg/l	5
8	Arsenic	mg/l	0.01
9	Selenium	mg/l	0.01
10	Mercury	mg/l	0.001

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.9 Groundwater Quality Standards

Table I.2.3 Pesticides

No.	Substances	Unit	Maximum Concentration
1	Chlordane	mg/l	0.0002
2	Dieldrin	mg/l	0.00003
3	Heptachlor	mg/l	0.0004
4	Heptachlor Epoxide	mg/l	0.0002
5	DDT	mg/l	0.002
6	2,4-D	mg/l	0.03
7	Atrazine	mg/l	0.003
8	Lindane	mg/l	0.0002
9	Pentachlorophenol	mg/l	0.001

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.9 Groundwater Quality Standards

Table I.2.4 Other Parameters

No.	Substances	Unit	Maximum Concentration
1	Benzo[a]pyrene	mg/l	0.0002
2	Cyanide	mg/l	0.2
3	Polychlorinated biphenyls	mg/l	0.0005
4	Vinyl Chloride	mg/l	0.002

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.9 Groundwater Quality Standards

I.3 GROUNDWATER QUALITY STANDARDS FOR DRINKING PURPOSES

Lao PDR's current standards for groundwater for drinking purposes are provided below for reference.

Table I.3.1 Physical Parameters

Characteristics	Parameters	Symbol	Unit	Permitted Standard Value	
				Suitable	Maximum
Physical	Colour	-	Platinum-Cobalt (Pt-Co)	5	15
	Turbidity	-	JTU	5	20
	Total solids	TS	mg/l	≤600	1,200

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.10 Groundwater Standards for Drinking Purposes

Table I.3.2 Chemical Parameters

Characteristics	Parameters	Symbol	Unit	Permitted Standard Value	
				Suitable	Maximum
Chemical	Acidity	pH	-	7.0-8.5	6.5-9.2
	Iron	Fe(ii), Fe(iii)	mg/l	≤0.5	1
	Manganese	Mn^{2+}	mg/l	≤0.3	0.5
	Copper	Cu^{2+}	mg/l	≤1.0	1.5
	Zinc	Zn^{2+}	mg/l	≤5.0	15
	Sulphate	SO_4^{2-}	mg/l	≤200	250
	Chloride	Cl^-	mg/l	≤250	600
	Fluoride	F^-	mg/l	≤0.7	1
	Nitrate	NO_3^-	mg/l	≤15	45
	Total Hardness as $CaCO_3$	Total $CaCO_3$	mg/l	≤300	500
	Non-carbonate hardness as $CaCO_3$	Non $CaCO_3$	mg/l	≤200	250
	Arsenic	As^{3+}, As^{5+}	mg/l	None	0.05
	Cyanide	CN^-	mg/l	None	0.1
	Lead	Pb^{2+}	mg/l	None	0.05
	Mercury	Hg	mg/l	None	0.001
	Cadmium	Cd^{3+}	mg/l	None	0.01
	Selenium	Se(iv)	mg/l	None	0.01

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.10 Groundwater Standards for Drinking Purposes

Table I.3.3 Bacteria Parameters

Characteristics	Parameters	Symbol	Unit	Permitted Value	Standard
				Suitable	Maximum
Bacteria	Coliform bacteria	Coliform	MPN/100 ml	<2.2	<2.2
	E. coli bacteria	E. coli	MPN/100 ml	None	None
	Standard plate count	-	Colonies/ml	≤500	-

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.10 Groundwater Standards for Drinking Purposes

Deviation from these standards will only be allowed with the prior written approval of MONRE on a case by case basis, where the Company is able to demonstrate to MONRE's reasonable satisfaction that such deviation is caused by the inherent nature of the Nam Ngiep river or by the initial impoundment of the reservoir during the appropriate period as approved by MONRE. In applying for MONRE's approval, the Company shall clearly specify and justify all parameters, the proposed temporary standards for such parameters and the period during which such temporary standards are proposed to be in force together with appropriate monitoring plans and proposed steps promptly to address and resolve any failure to meet temporary standards. For the avoidance of doubt, the Company remains at all times responsible for Adverse Impacts related to approve deviations from the Ambient Water Quality Standards caused by the initial impoundment.

Table I.4.1 Ambient Surface Water Quality Parameter

Parameters	Units	Standard
pH		5-9
Dissolved Oxygen	mg/l	>6.0
BOD_5	mg/l	1.5
COD	mg/l	5.0
Nitrogen as nitrate ($N\text{-}NO_3$)	mg/l	5.0
Nitrogen as ammonia ($N\text{-}NH_3$)	mg/l	0.2
Sulfate	mg/l	500
Total coliform bacteria	MPN/ml	5,000
Total faecal coliform	MPN/ml	1,000
Phenols	mg/l	0.005
Arsenic (As)	mg/l	0.01
Cadmium (Cd) $CaCO_3 \leq 100$ mg/l	mg/l	0.005
Cadmium (Cd) $CaCO_3 \geq 100$ mg/l	mg/l	0.05
Chromium (VI) (Cr^{6+})	mg/l	0.05
Copper (Cu)	mg/l	0.1
Cyanide	mg/l	0.005
Lead (Pb)	mg/l	0.05
Mercury (Hg)	mg/l	0.002
Nickel (Ni)	mg/l	0.1
Zinc (Zn)	mg/l	1.0
Manganese (Mn)	mg/l	1.0
Alpha ¬Radioactivity	Becquerel/l	0.1
Beta ¬ Radioactivity	Becquerel/l	1.0
Total Organochlorine	mg/l	0.05
DDT	mg/l	1.0
Alpha-BHC	mg/l	0.02
Dieldrin	mg/l	0.1
Aldrin	mg/l	0.1
Heptachlor and Heptachlor Epoxide	mg/l	0.2
Endrin	mg/l	0

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.11 Ambient Surface Water Quality Standards

I.5 EFFLUENT STANDARDS

The Company is responsible for compliance with applicable effluent standards. This applies to all effluents and runoff from project activities, facilities, installations as well as discharges from resettlement sanitation and drainage.

Selected standards are listed below. All other parameters shall comply with the Lao National Standards and IFC Guidelines whichever is stricter.

Deviation from these standards will only be allowed

(i) with the prior written approval of MONRE, and in circumstances where the Company and its contractors have applied an appropriate waste water treatment system used by international construction contractors in Lao PDR and applicable to the construction site or

(ii) if the water from any project activities does not have an adverse effect on the existing water quality or

(iii) to the extent that the deviations are present as a result of the existing water quality.

Table I.5.1 Effluent Standards

Parameters	Units	Guidelines
pH		**6-9**
Biochemical Oxygen Demand -BOD	mg/l	**30**
Chemical Oxygen Demand -COD	mg/l	**125**
Total suspended solids	mg/l	**50**
Oils and grease	mg/l	**10**
Phenol	mg/l	**0.5**
Cyanide	mg/l	**0.1**
Ammonia -N	mg/l	**10**
Total Nitrogen	mg/l	**10**
Total phosphorus	mg/l	**2**
Residual chlorine	mg/l	**0.2**
Total coliforms	MPN/100ml	**<400**
Temperature increase	°C	**<3**
Arsenic	mg/l	**0.1**
Cadmium	mg/l	**0.05**
Chromium	mg/l	**0.1**
Copper	mg/I	**0.3**
Fluoride	mg/l	**20**
Iron	mg/l	**2**
Lead	mg/l	**0.2**
Mercury	mg/l	**0.002**
Nickel	mg/l	**0.5**
Selenium	mg/l	**0.1**
Silver	mg/I	**0.5**
Sulfides	mg/l	**1**
Zinc	mg/l	**0.5**
Total Toxic metals	mg/l	**5-10**

Source: Refer to CA - Annex C – Appendix 2 Standard, 1.13 Effluent Standards

I.6 NOISE STANDARDS

Noise emission and ambient noise levels shall be in compliance with the Lao National Environmental Standard for noise as provided below for reference.

Table I.6.1 Noise Standards

Standards Method of Measurement	Standards Method of Measurement
Maximum Sound Level (L_{max}) should not exceed 115 dB(A)	Maximum Sound Level (L_{max}) should not exceed 115 dB(A)

Source: Refer to Agreement on the National Environmental Standards of Lao PDR, 2009

Table I.6.2 Noise Standards for Other Places

Type of Area	Standard Value in dB(A)		
	6.00-18.00	18.00-22.00	22.00-6.00
Quiet areas: hospitals, libraries, treatment places, kindergarten and schools	50	45	40
Residential areas: hotels and houses	55	55	45
Commercial and service areas	70	70	50
Small industrial factories located in residential areas	70	70	50

Source: Refer to Agreement on the National Environmental Standards of Lao PDR, 2009

I.7 AIR STANDARDS

Air emission and ambient air levels shall be in compliance with the Lao National Environmental Standard for ambient air quality standard as provided below for reference.

Table I.7.1 Ambient Air Quality Standards

Parameters	Symbol	Average Time Unit: mg/m³					Method of Measurement
		Hour			1 month	1 year	
		1 hr	8hr	24 hr			
Carbon monoxide	CO	30	10.26	-	-	-	Non dispersive infrared detection
Nitrogen dioxide	NO_2	0.32	-	-	-	-	Chemiluminescene method
Sulphur dioxide	SO_2	0.78	-	0.30	-	0.10	UV Fluorescence (1hr, 24hr, 1yr) or Pararosaniline (1hr, 4hr)
Total suspended Particulate	TSP	-	-	0.12	-	0.05	Gravimetric
Particulate Matter less than 10 microns	PM-10	-	-	0.12	-	0.05	Gravimetric or Beta Ray or Taper Element Oscillating Microbalance or Dichotomous
Ozone	O_3	0.20	-	-	-	-	Chemiluminescence or UV Absorption Phoptometry
Lead	Pb	-	-	-	1.5	-	Atomic Absorption Spectrometer

Source: Refer to Agreement on the National Environmental Standards of Lao PDR, 2009

I.8 VIBRATION STANDARD

The vibration standard was not mentioned in the Lao PDR national standard and international standard guideline. Therefore, to compare the results of measuring in construction activities of the Project such as blasting plant and quarry, the guideline for vibration standards from Mining and Quarry in Thailand is proposed in ***Table I.8.1.***

Table I.8.1 Vibration from Mining and Quarry Standard

Frequency (Hertz)	Velocity (mm/s)	Displacement (mm)
1	Not Exceed 4.7	Not Exceed 0.75
2	Not Exceed 9.4	Not Exceed 0.75
3	Not Exceed 12.7	Not Exceed 0.67
4	Not Exceed 12.7	Not Exceed 0.51
5	Not Exceed 12.7	Not Exceed 0.40
6	Not Exceed 12.7	Not Exceed 0.34
7	Not Exceed 12.7	Not Exceed 0.29
8	Not Exceed 12.7	Not Exceed 0.25
9	Not Exceed 12.7	Not Exceed 0.23
10	Not Exceed 12.7	Not Exceed 0.20
11	Not Exceed 13.8	Not Exceed 0.20
12	Not Exceed 15.1	Not Exceed 0.20
13	Not Exceed 16.3	Not Exceed 0.20
14	Not Exceed 17.6	Not Exceed 0.20
15	Not Exceed 18.8	Not Exceed 0.20
16	Not Exceed 20.1	Not Exceed 0.20
17	Not Exceed 21.4	Not Exceed 0.20
18	Not Exceed 22.6	Not Exceed 0.20
19	Not Exceed 23.9	Not Exceed 0.20
20	Not Exceed 25.1	Not Exceed 0.20
21	Not Exceed 26.4	Not Exceed 0.20
22	Not Exceed 27.6	Not Exceed 0.20
23	Not Exceed 28.9	Not Exceed 0.20
24	Not Exceed 30.2	Not Exceed 0.20
25	Not Exceed 31.4	Not Exceed 0.20
26	Not Exceed 32.7	Not Exceed 0.20
27	Not Exceed 33.9	Not Exceed 0.20
28	Not Exceed 35.2	Not Exceed 0.20
29	Not Exceed 36.4	Not Exceed 0.20
30	Not Exceed 37.7	Not Exceed 0.20
31	Not Exceed 39.0	Not Exceed 0.20
32	Not Exceed 40.2	Not Exceed 0.20
33	Not Exceed 41.5	Not Exceed 0.20
34	Not Exceed 42.7	Not Exceed 0.20
35	Not Exceed 44.0	Not Exceed 0.20
36	Not Exceed 45.2	Not Exceed 0.20
37	Not Exceed 46.5	Not Exceed 0.20
38	Not Exceed 47.8	Not Exceed 0.20
39	Not Exceed 49.0	Not Exceed 0.20
40	Not Exceed 50.8	Not Exceed 0.20

Note: Pollution Control Department (PCD), Ministry of National Resources and Environment, Thailand