

Appendix H

EMP Sub-Plans

*(Originally Prepared by ERIC and Amended
by ERM)*

SUB-PLANS for ESMMP-CP of Nam Ngiep 1 Hydropower Project

Sub-plans are proposed as guidelines for environmental implementation during construction phase and for minimizing the environmental impact of the Project. These 21 sub-plans include:

- SP01: Erosion and Sediment Control
- SP02: Water Availability and Pollution Control
- SP03: Emission and Dust Control
- SP04: Noise and Vibration
- SP05: Waste Management
- SP06: Hazardous Material Management
- SP07: Vegetation Clearing
- SP08: Landscaping and Re-vegetation
- SP09: Protected Area Management
- SP10: Biodiversity Management
- SP11: Spoil Disposal
- SP12: Quarry and Construction Layout
- SP13: Unexploded Ordnance (UXO) Survey and Disposal
- SP14: Construction of Work Camps
- SP15: Traffic and Access
- SP16: Training and Awareness
- SP17: Project Personnel Health Program
- SP18: Public Safety
- SP19: Damage to Properties and Facilities
- SP20: Emergency Preparedness
- SP21: Cultural Resources

Implementation of measures and monitoring is primarily undertaken by the Contractor's Environmental Inspector, under supervised, reviewed, and verified by the Owner's Environmental Officer/Manager.

SP01: EROSION AND SEDIMENT CONTROL

No.	Description of Measure
<i>Design specifications for erosion and sediment control</i>	
SP01.1	Retention and preservation of existing vegetation along watercourses will be maximized to reduce flow velocities and act as a sediment filter.
<i>Site Preparation</i>	
SP01.2	Erosion and Sediment Control Design Plans will be prepared prior to the commencement of works for each construction site to provide site-specific design details on: <ol style="list-style-type: none"> i. 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 SP02 (as required). An Erosion and Sediment Control Plan will be included in the Environmental Management and Monitoring Plan prepared for each construction site including an appropriately design.
SP01.3	Initial erosion and sediment controls shall be installed prior to or as early as possible after the commencement of vegetation clearance/ earthworks. Major control measures such as sediment basins shall be surveyed and pegged. The Contractor or its nominated sub-contractor shall then seek approval for the major controls from the NNP1 Site Manager prior to constructing each measure. Following approval, the measure shall be installed immediately.
SP01.4	Survey and peg all designed drainage works prior to the commencement of bulk earthworks. NNP1 and the Contractor shall then jointly inspect all pegged drainage works. Once approval has been granted by NNP1, the Contractor shall install site drains prior to, during or immediately following earthworks to minimise the erosion hazard.
SP01.5	All staff involved in earthworks shall be walked through the layout of control measures on site to familiarize themselves with the functioning of controls and to avoid the removal of or damage to these measures.
SP01.6	Each site to be cleared shall be inspected by the NNP1 Site Manager or NNP1 Environment Officer prior to any clearance activities. This officer shall approve vegetation clearance if the site to be cleared has been clearly marked in accordance with any Government permit and the initial erosion and sediment controls have been correctly installed.
<i>Erosion Control Measures</i>	
<i>Site Disturbance</i>	
SP01.7	The extent of areas to be cleared will be minimized as far as deemed practical and the use of existing cleared areas will be maximized.
SP01.8	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.
SP01.9	Progressively clear vegetation/ excavate/ disturb the site in a controlled manner, minimizing the area of disturbance until that part of the site is required for construction or ancillary purposes.
SP01.10	Undertake earthworks strictly within marked areas, avoiding soil disturbance beyond these areas.
SP01.11	Strictly control access to and from the site via designated access roads and entry and exit points.
SP01.12	Clearing of sites will be undertaken in the same sequence as the initiation of construction sites in order to minimize disturbances.
<i>Sensitive Erosion Areas</i>	
SP01.13	'Sensitive erosion areas' are defined as follows: <ol style="list-style-type: none"> 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.

No.	Description of Measure
SP01.14	The location of works in sensitive erosion areas will be avoided where possible.
SP01.15	Where possible, works in sensitive erosion areas will be restricted to the dry season.
<i>Erosion Control</i>	
SP01.16	Erosion control measures shall be progressively installed and modified as each construction site is developed, adapting the controls to the changing site features and activities.
SP01.17	Suitable soil erosion control measures (e.g., provision of cofferdam and related structures to redirect flows around construction areas, use of silt curtains, silt fences, fiber rolls, etc.) shall be implemented prior to excavation of the bridge pier foundation and construction activities at waterways to minimize the influx of sediment into surface water.
<i>Sediment Control</i>	
SP01.18	Sedimentation controls will be implemented in the form of sedimentation traps and basins, and silt fences or similar where appropriate, depending upon the size of the disturbed area and upslope catchment area, and other physical and environmental constraints. Discharged water from drilling or excavation shall not be allowed to discharge directly into natural water source. A sediment/settling basin shall be designed, installed and maintained with good efficiency to remove suspended solid from water prior to discharging into natural watercourses. This will be routine inspected by Environmental Officer (with more frequency if there such works in rainy season). Where the natural settling rate is too slow a flocculent will be added to accelerate the settling of suspended material in the sediment pond.
SP01.19	Sediment/settling basin volume shall be designed based on catchment area, estimated storm discharge (2 year return period), sediment particle size, etc.
SP01.20	Release of discharge will only occur after monitoring of installation in accordance with approved design as required to meet the requirements of SP02.
SP01.21	Sediment controls shall be installed across construction sites based on the principle of dividing the catchment into manageable areas (rather than providing a single trap at the bottom of the site that may fail).
SP01.22	Sediment fences and traps with adequate capacity shall be provided at each construction site, material storage area, camp site, etc.
SP01.23	Sediment/ settling basins shall be fitted with a runoff overflow pipe that either discharges into a secondary basin or to a watercourse.
SP01.24	Sediment shall be disposed of without creating a safety or erosion hazard, or degrading land (e.g. disposal on agricultural land will not be permitted).
SP01.25	Avoid or minimize grading during the rainy season to the maximum extent feasible, particularly in areas of steep topography/ or adjacent to watercourses.
SP01.26	Implement phased grading schedule to limit the area subject to erosion at any given time to maximum extent feasible.
<i>Drainage</i>	
SP01.27	The site erosion hazard shall be minimized with the installation of adequate permanent and temporary drainage: <ul style="list-style-type: none"> i. Catch drains (spoon drains or banks) installed above disturbed areas to prevent runoff entering the site. ii. Permanent drains installed as soon as possible; iii. Existing stable drainage lines used for trunk drains where possible; iv. Flow velocities in unlined drains kept low to prevent scouring; and v. Temporary drains (earth spoon drains or banks) installed across large construction sites to reduce overland runoff distances/ volumes/ velocities.
SP01.28	In case construction works cause obstruction of watercourses, such obstruction shall be immediately cleared to restore channel flow.

No.	Description of Measure
<i>Stockpile management measures</i>	
<i>General</i>	
SP01.29	Erodible construction material (soil, sand, etc.) shall be stockpiled: <ul style="list-style-type: none"> i. On relatively flat and flood-free areas; ii. At least 20 m from drainage lines and rivers where topographical conditions allow; iii. On sites already devoid of trees and at least 10 m away from retained vegetation; and iv. Not directly upslope of houses and other structures.
SP01.30	Stockpiling on privately used land shall only occur if written permission has been obtained from the land user and the NNP1 Site Manager has approved the site.
SP01.31	The Contractor shall seek approval from NNP1 to use any proposed stockpile sites prior to commencing stockpiling. NNP1 shall inspect and approve all correctly located sites. NNP1 shall inspect and approve all correctly located sites.
SP01.32	Long term spoil placement sites will be managed in accordance with the requirements of SP011.
<i>Topsoil Management</i>	
SP01.33	All topsoil shall be stripped off construction areas and ancillary sites and stockpiled for later reuse for site rehabilitation.
SP01.34	Topsoil shall be stockpiled separately from other materials in flood-free areas at least 20 m where practicable from drainage lines and rivers.
SP01.35	Topsoil stockpiles that are retained through the rainy season shall be treated by appropriate seasonal measures to minimize the erosion hazard (e.g. seeding with a cover crop or covered with a fortnight of stockpile formation or compaction of slope with backhoe bucket).
SP01.36	Temporary topsoil stockpiles will be developed in accordance with the following: <ul style="list-style-type: none"> i. Stockpiles will be constructed with smooth slopes, compacted using backhoe bucket. The creation of stockpiles with steep, smooth slopes minimized the area required for construction. ii. Topsoil shall be stockpiled separately from other materials in flood-free areas at least 20 m from drainage lines and rivers where topographic conditions allow. 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. vii. Diversion banks will be constructed uphill of stockpiles where there is a potential for run-on to erode the stockpile. viii. Appropriate measures will be installed in between the stream and the stockpile to control runoff where necessary.
<i>Works in and near watercourses</i>	
SP01.37	If in-stream diversion is required for any diversion infrastructure must be made of suitable materials that will not contribute to turbidity or salinity.
SP01.38	At watercourse crossings, machinery will operate from the streambank wherever possible, not within the stream channel, creating minimal streambed and bank disturbance. If disturbance occurs to the streambed or banks they shall be stabilised as soon as possible.
SP01.39	If vegetation clearing is required on streambanks, cut vegetation near or at ground level to leave root mass in the ground. This helps to reinforce soil stability and reduce erosion.
SP01.40	For areas in direct runoff path sediment and erosion control devices will be installed and maintained until vegetation replanting can occur to stabilise disturbed surfaces.
SP01.41	The removed soil from deposited areas in watercourses shall be shaped and re-vegetated.

No.	Description of Measure
<i>Maintenance and inspection of erosion and sediment controls</i>	
SP01.42	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 the activity and site stabilisation.
SP01.43	Sediment collection devices (including sediment basins, silt trap fences or similar) will be cleaned out when 60% of capacity is filled.
SP01.44	At least one month prior to the anticipated commencement of the rainy season, a review of the effectiveness and adequacy of the existing erosion and sediment controls will be made and any necessary modification and/or augmentation of controls carried out.
<i>Site Stabilisation</i>	
SP01.45	All saved topsoil shall be used for site re-vegetation. Topsoil shall be spread over final landformed areas prior to seeding/planting.
SP01.46	All disturbed areas shall be rehabilitated as soon as possible following the completion of construction activities on that site. The Contractor shall seek permission from NNP1 to commence site rehabilitation.
SP01.47	Use appropriate erosion control and stabilizing measures such re-vegetation on most disturbed areas, and more specialized control measures on sites with a high erosion hazard such as river banks (e.g. geotextile mat, natural fiber matting, soil binders that are not toxic to the environment, or vegetation measures/temporary landscaping in disturbed areas and on graded slopes.
SP01.48	Construction works (for bridges, culverts, drainage, etc.) on or near watercourse shall not cause obstruction of channel flow. Slopes along the channel shall be stabilized and dumping of soil, rocks, construction materials and debris onto watercourses shall be prohibited.
<i>Supervision and Remedial Action</i>	
SP01.49	The NNP1 Environment Officer shall inspect clearance activities at each site once a day, advising the Contractor or its nominated sub-contractor of any non-conformances against the permit or SSESMP, and specifying any required remedial action.
SP01.50	The Contractor or its nominated sub-contractor shall implement the remedial action specified by the NNP1 Environment Officer within the time frame advised.
SP01.51	The NNP1 Environment Officer shall sign off on site clearance activities only after all remedial actions have been implemented by the Contractor or its nominated sub-contractor. No other site work will be permitted to occur until sign off has occurred.

SP02: WATER AVAILABILITY AND POLLUTION CONTROL

No.	Description of Measure
<i>Pollution Control</i>	
SP02.1	Prior to operation of concrete batching plants and casting yards, the contractor shall install wastewater treatment systems that: have the capacity to treat wastewater to a quality compliant with relevant standards (refer <i>Appendix 4</i> of the ESMMP-CP); and are appropriate to site conditions. For example settling/retention ponds with sufficient specifications/ capacity for treatment of wastewater (e.g., from washing of equipment such as mixer drums, trucks and chute, contact storm water, etc.)
SP02.2	Properly operate and maintain settling/retention ponds to ensure effluent quality meets applicable effluent standards. Wastewater shall be retained in settling ponds to allow silt to settle and lower concentration of to acceptable levels. Water can be reused for dust suppression in construction sites and casting yard.
SP02.3	Bentonite slurry, bentonite sludge, mud and other materials and wastes from drilling will be collected and processed to avoid pollution of surface water. Discharge of such materials into watercourses shall be prohibited.
SP02.4	Drilling solutions (e.g., bentonite slurry) for bridge construction, abutment construction, piling, etc. will be processed in a closed system, especially for abutments and foundations at the riverbed.
SP02.5	Proper disposal of bentonite containing spoils as fill material in appropriate sites shall occur.
SP02.6	Spillage of bentonite mud in agricultural land shall be cleaned immediately to prevent caking and hardening.
SP02.7	Water from dewatering of foundation excavation for bridges shall not be disposed directly into a water body. It shall be pumped into a settling pond or allowed to flow in a grassed swale specifically constructed for the project to separate solids and then into a retention pond to allow finer solids to settle. The total suspended solids concentration of water when discharged into a waterbody shall comply with applicable standards.
SP02.8	Equipment service and maintenance yards shall be provided with impermeable flooring and collection sump.
SP02.9	Restricting paving operations during wet weather and using sediment control devices downstream of paving activities.
SP02.10	Implement solid and septic system waste management efforts, such as proper location, containment and disposal of construction debris and construction worker camp trash (e.g., use of watertight dumpsters and weekly trash collection/removal), and appropriate location (at least 30 m from drainage courses or other sensitive areas) and containment of portable septic systems. Maintain such facilities to ensure proper working order.
<i>Sewage</i>	
SP02.11	The construction of work camps, offices and construction sites will be equipped with adequate temporary sanitary facilities to avoid potential discharge both of gray and black wastewaters) to ground or nearby surface watercourses. These may include; <ul style="list-style-type: none"> i. Grease trap for canteen wastewater ii. Septic tanks
SP02.12	The contractors shall provide sanitation facilities/toilets with septic tanks with sufficient capacity to handle and treat domestic wastewater generated by workers.
<i>Hazardous Materials</i>	
SP02.13	Watertight receptacles shall be provided in all the equipment maintenance shops for waste oil, oily rags, spent oil filters, solvents and oily containers. Disposal shall be through authorized waste handlers and recyclers, as available.
SP02.14	Whenever feasible, use mobile fuelling/ maintenance units for construction equipment to avoid/ reduce on-site fuel/ lubricant storage.
SP02.15	Maintain accurate and up-to-date written inventories and labels for all stored hazardous materials.
SP02.16	Using berms, ditches, and/or impervious lines (or other applicable methods) in material storage and vehicle/ equipment maintenance and fuelling areas to provide containment and prevent discharge in the event of a spill, and restricting these uses to areas at least 30

No.	Description of Measure
	m form storm drains and surface waters.
SP02.17	Place warning signs in areas of hazardous material use or storage and along drainages and storm drains (or other appropriate locations) to avoid inadvertent hazardous material disposal.
<i>Water quality monitoring</i>	
SP02.18	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 - Standards).
SP02.19	The Erosion and Sediment Design Plans referred to in SP01 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).
SP02.20	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.
SP02.21	The results of water quality monitoring will be monthly reported to EMO.
SP02.22	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.
SP02.23	Wastewater quality monitoring will be implemented toward the target of the water quality criteria which are as set out in Annex C of CA (Appendix 2 - Standards).
<i>Hydrology</i>	
SP02.24	Road drainage shall be designed and constructed to retain surface runoff and facilitate infiltration. The 5 years return period rainfall shall be designed for capacity increasing of drainage, if possible.
SP02.25	Bridges shall be designed to maintain pre-construction flows, including by designing the bridge to: minimize the use of pylons to retain the existing channel section; operate with a freeboard between the flood level and bridge deck, avoid encroachment of bridge abutments into the channel.
SP02.26	Wherever possible, in-stream works (including bridge foundations) will be scheduled in the dry season to minimise adverse impacts to water quality and aquatic resources, and avoid safety risks.
SP02.27	In-stream works shall be managed to avoid changes to downstream water supply. If river diversion is expected to alter flows to an extent that would lower the downstream water level, local people must be informed of changes to water levels, including expected extent and duration of change.
SP02.28	If stream diversion, or flow inhibition is required during in-stream works, this shall only occur during dry periods.
SP02.29	Construction materials and chemicals must be secured and locked down during rainy season.
SP02.30	Upon completion of construction, grade any disturbed outside the limits of dams, reservoir pools, permanent roads, and other permanent facilities to provide proper drainage and blend with natural contour with the land.
SP02.31	The outlet height of culverts shall be set at the downstream bed level or masonry protection works shall be installed at the outlet to prevent undercutting.
SP02.32	The sidedrains were designed with grade of greater than 6-7% and lengths more than 5 m' lined shall be considered from the outset, rather than as a remedial measure once drain erosion has occurred.
SP02.33	The drainage maintenance needs to be undertaken to remove any construction waste or any blocking inlets during the rainy season.

SP03: EMISSION AND DUST CONTROL

No.	Description of Measure
<i>Minimization of dust generation</i>	
SP03.1	All vehicle movements will be confined to designated access routes and haul roads.
SP03.2	Management of short term and long term material stockpiles will be carried out in accordance with the requirements of SP01.
<i>Dust management measures</i>	
SP03.3	Dust generating activities (particularly clearing, excavation and earth moving) will be avoided or minimized during windy conditions.
SP03.4	If visible dust emissions result from a construction activity, that activity will cease until water spraying has been undertaken to prevent dust emissions or the dust hazard passes.
SP03.5	Vehicles transporting material to and from the construction site via a public road will have their loads covered immediately after loading to prevent windblown dust emissions and spillage.
SP03.6	Vehicle and machinery movements will be restricted to designated access ways and work areas.
SP03.7	Speed limits (40 km/h or less) will be imposed on all construction vehicles to minimize dust emission along areas where sensitive receptors are located.
SP03.8	Unsealed Project roads, compounds and work areas accessible by vehicle will be regularly sprayed with water to suppress dust when dust is being generated or a dust hazard exists.
SP03.9	High use construction compounds and roads will be gravelled to reduce dust and erosion and improve all-weather accessibility.
SP03.10	Sealed roads will be regularly swept or washed where construction activities and transport have deposited material that could generate dust.
SP03.11	Crushing and batching plants will employ suitable dust suppression measures to ensure that emissions are not excessive (e.g. unloading tubes).
SP03.12	Topsoil stockpiles to be retained during rainy season shall be treated by appropriate seasonal measures to minimize the erosion hazard (e.g. seeding with a cover crop or covered with a fortnight of stockpile formation or compaction of slope with backhoe bucket).
SP03.13	Rumble grids and/or wheel wash facilities or other appropriate mud-removal measures will be used at the main construction site exit points onto sealed public roads to remove mud from vehicles and minimize material being transferred onto road surfaces if necessary.
SP03.14	Work sites and workforce camps will be managed to minimize odour generation.
SP03.15	Exposed surfaces will be progressively rehabilitated within one month following the completion of use to reduce site dust and erosion hazards.
SP03.16	In the event of a spillage, spilled material will be removed as soon as practicable that day.
SP03.17	Ensure that borrow areas, casting yard and other facilities to be used for the Project are duly licensed and have all the necessary environmental approvals.
SP03.18	All construction equipment and machinery on the site works will be regularly maintained and will be repaired as necessary to ensure compliance with safety and emission standards.
SP03.19	For storage areas of construction materials such as sand, gravel, cement, etc., provisions will be made to prevent materials from being blown away towards sensitive receptors.
SP03.20	Regularly clean roadways to remove tracked in mud, cement, etc. from construction works.
SP03.21	Areas within the Project where there is a regular movement of vehicles shall have an acceptable hard surface and be kept clear of loose surface material.
SP03.22	Cement and other fine-grained materials delivered in bulk shall be stored in closed containers.
SP03.23	Weigh hoppers shall be vented to a suitable filter
SP03.24	Wheel washers shall be provided in active construction sites so that haul/delivery trucks can be cleaned of mud and dirt as they exit the work area if necessary.
SP03.25	To minimize/avoid impacts to nearby sensitive receptors, wind fences, high barriers, or water spraying will be implemented at construction sites and other locations of

No.	Description of Measure
	construction-related activities where there are sources of high dust levels.
SP03.26	Where deemed necessary, access roads around sensitive receptors will be temporarily paved.
<i>Exhaust Emissions</i>	
SP03.27	<p>All vehicles and equipment will be maintained in accordance with manufacturers' specifications. A maintenance program for the construction vehicle fleet will be implemented which will include consideration of the following issues:</p> <ol style="list-style-type: none"> i. General condition and safety of vehicles ii. Check of vehicle brakes and tires iii. Vehicle exhaust emissions visibly iv. Vehicle noise emissions <p>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.</p>
SP03.28	All construction vehicles and equipment shall be tested for compliance with the relevant emission standard and shall be properly licensed, where applicable.
SP03.29	Adequate ventilation will be provided in all confined areas (i.e. tunnels and power station cavern);
SP03.30	All construction vehicles and equipment shall be tested for compliance with the relevant emission standard and shall be properly licensed.
SP03.31	All vehicles, while parked on the site works, will be required to have their engines turned off.
SP03.32	Unnecessary engine idling of vehicles and equipment will be prohibited.
SP03.33	Smoke belching vehicles and equipment shall not be used for the Project.
SP03.34	Minimize construction vehicle trips and reduce transport distances for material deliveries and other construction-related trips to the maximum extent feasible (e.g., by using local materials and labour sources).
<i>Burning of waste</i>	
SP03.35	<p>The burning of waste materials shall be minimized on site and only take place under the following conditions:</p> <ol style="list-style-type: none"> 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. vi. Following completion of the burn, the trained fire protection officer will inspect and certify that the fire has been extinguished.
<i>Worker health</i>	
SP03.36	Appropriate breathing masks will be provided to staff working in areas where they may be exposed to poor air quality.
<i>Monitoring of dust level</i>	
SP03.37	Dust monitoring shall include visual assessment at sensitive receptors (e.g., community, labour camp, schools, health centre, temple, and national park) in the vicinity of borrow pits, Project camps and construction camps to ensure that associated impacts are being adequately addressed. If it is determined that significant dust-related impacts are occurring, additional dust control measures shall be implemented.
<i>Supervision and Remedial Action</i>	
SP03.38	The Owner shall inspect each waste site once a week, advising the Contractor or its nominated contractor of any non-conformances and required remedial action in accordance with approved SSES MMP.
SP03.39	The Contractor or its nominated sub-contractor shall undertake reasonable remedial action as directed by the Owner within the required period in accordance with approved SSES MMP.

SP04: NOISE AND VIBRATION

No.	Description of Measure
<i>Activity Siting</i>	
SP04.1	Stationary noise sources (e.g. generators) that generate noise levels well above background levels (i.e. 45 dB(A) and above) shall be set back as far as possible from dwellings, workforce camps, schools, offices, businesses and other receptor sites.
SP04.2	The siting of noisy activities and equipment shall consider natural buffers (e.g. hills) and/or the potential to install barriers around the source to reduce noise levels at nearby receptor sites where siting options exist.
SP04.3	The proposed siting of noise sources that can be located at the discretion of the Project (i.e. not site-dependant such as blasting) shall be reviewed by the NNP1 Site Manager. This officer shall either approve the proposed sites of noisy activities or request the Contractor to consider alternative sites.
SP04.4	Asphalt concrete batching plants and crushing plant shall be located at least 500 m away from inhabited areas and other sensitive receptors such as schools, places of worship and medical facilities, facilities unless there is a topographical feature (e.g. hill) between the noise source and sensitive site that adequately attenuates noise levels. If batching and crushing plants are located less than 500 m from sensitive receptors, appropriate noise barriers will be installed to comply with relevant noise standards (<i>Appendix 4 of the ESMMP-CP</i>).
<i>Minimize noise generation at source</i>	
SP04.5	For any particular construction activity, the vehicles and/or equipment which are equipped with appropriate muffles and/or other noise control equipment will be selected for use.
SP04.6	Construction equipment and vehicles will be subjected to regular inspections to check noise emissions and noise control equipment in accordance with the requirements of SP15.
SP04.7	Fitting mufflers to road vehicles and construction equipment, and, where applicable, engine shrouds (acoustic lining) to construction equipment.
SP04.8	Using plant and equipment appropriately, including no extended periods of 'revving', idling or 'warming up' within the proximity of existing residential receivers, and no use of air horns in settlement areas and Protected Areas unless required for safety purposes.
SP04.9	Maintaining all equipment in good working order to manufacturers' specifications, including mufflers, enclosures and bearings to ensure unnecessary noise emissions are minimized. All equipment used on-site will need to demonstrate compliance with the noise levels provided in <i>Appendix 4 of the ESMMP-CP</i> .
SP04.10	Only vehicles and equipment that are registered and have necessary permits will be used for the Project.
SP04.11	Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located.
SP04.12	To minimize noise and nuisance, construction traffic routes will be defined in cooperation with local communities and traffic police.
<i>Reduce transmission of noise to receivers</i>	
SP04.13	Stationary noise sources will be sited as far as possible from villages, construction camps and settlement areas.
SP04.14	Where possible, topographic features will be used to provide shielding between stationary noise sources and villages and construction camps.
SP04.15	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.
SP04.16	Suitable noise level reduction measures (e.g., equipment enclosures, barriers) shall be installed by the contractor if noise from construction activities is excessive and disrupts school activities or local residents.

No.	Description of Measure
<i>Reducing Vibrations</i>	
SP04.17	Operation of heavy equipment near sensitive areas will be avoided wherever possible.
SP04.18	Avoid simultaneous activities such as demolition, ground impacting activities and earthmoving since vibration level is considerably less if these activities do not occur at the same time.
SP04.19	Use alternative equipment if conditions allow.
SP04.20	Avoid use of vibrating rollers near vibration level sensitive structures.
<i>Reducing the impact on communities</i>	
SP04.21	Informing potentially affected nearby residents of construction activities, scheduled commencement and completion dates, hours of activities and noise reduction measures to be implemented prior to the commencement of noisy activities.
SP04.22	During school examination periods, noisy construction activities will be avoided near schools. The contractor will closely coordinate with the school administration on construction schedules to ensure that noise level from site works will be adequately mitigated so as not to be disruptive during school hours.
<i>Construction hours</i>	
SP04.23	General construction activities at major construction sites are likely to be undertaken 24 hours a day, with suitable noise mitigation measures implemented.
SP04.24	Undertaking controlled blasting.
SP04.25	Avoid noisy construction activities in the vicinity of sensitive receivers (e.g., residential areas) at night-time or other sensitive periods (e.g. during school hours in vicinity of schools). Suitable noise level reduction measures (e.g., noise barriers or equipment enclosures) shall be installed by the contractor if construction activities will be disruptive during normal school hours and/or during night time in residential areas.
SP04.26	As much as possible, noisy construction activities will be limited to daytime when within 200 m of a community settlement. Otherwise, prior notification and consultation shall be made with affected people and local officials, and suitable noise attenuation measures shall be implemented.
SP04.27	Restricting activities that will raise noise levels above background level plus 10 dB(A) at receptors to daylight hours only. Any excessively loud activities will be scheduled during periods of the day when higher ambient noise levels are apparent.
SP04.28	Blasting activities excluding tunneling will be restricted to 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.
SP04.29	The movement of vehicles to and from the construction sites and within construction sites will only take place subject to the restrictions identified in SP04.23.
SP04.30	If the need arises for construction work to occur outside approved hours then approval shall be sought by the Contractor from the Owner Environment Manager.
<i>Response to complaints about noise generation</i>	
SP04.31	If complaints are received about excessive noise levels in the vicinity of villages, the Owner 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 area) to be implemented.
SP04.32	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.
<i>Worker Health and Safety</i>	
SP04.33	Providing ear muffs to workers operating high decibel equipment or working in close proximity to this equipment.
<i>Supervision and Remedial Action</i>	
SP04.34	An Owner Environment Officer shall review all noise monitoring data and any complaints received about excessive noise levels, and periodically inspect the main noise-generating activities and facilities advising the Contractor or its nominated contractor of any non-conformances and required corrective action.

SP05: WASTE MANAGEMENT

No.	Description of Measure
<i>General requirements</i>	
SP05.1	Waste management sites shall be surveyed and clearly pegged by the Contractor or its nominated sub-contractor prior to the commencement of site preparation and waste.
SP05.2	All necessary waste site preparation activities shall be completed prior to the commencement of waste, material handling, processing and stockpiling.
SP05.3	The Consultant shall prepare the Pre-Commencement Checklist.
SP05.4	Each Project waste storage and disposal site shall be inspected by the nominated Owner Environment Officer prior to waste storage and disposal. This officer shall approve waste from a specific site or approve crushing plant operation at the site/facility and issue a Notice to Proceed if the site or facility is set up in accordance with the Waste Management Plan and any variations required by the Owner Environment Manager.
SP05.5	The Consultant shall prepare the Pre-Commencement Checklist.
SP05.6	A sufficient number of waste containers or similar one will be made available at construction site.
SP05.7	Waste containers (or similar disposal receptacles) will be marked clearly for "Hazardous Waste" and for "Non-Hazardous Waste" for separation and sorting of waste.
SP05.8	Project waste will be minimized by applying the waste minimization hierarchy principles of 'avoid/ reduce/ reuse/ recycle/ dispose'. Any waste material that is unable to be re-used, re-processed or recycled will be disposed at a facility approved to receive that type of waste.
SP05.9	Undertake regular collection and disposal of wastes (by contractor or authorized third party) to sites approved by local authorities.
SP05.10	Complaints will be investigated promptly and appropriate action initiated to reduce impact
SP05.11	Prohibit dumping of wastes into watercourses, agricultural land and surrounding areas.
<i>Hazardous waste disposal</i>	
SP05.12	Hazardous waste will be disposed of according to appropriate best practices.
<i>Non-hazardous waste disposal</i>	
SP05.13	Burning of non-hazardous waste will be minimized by reusing and recycling waste where possible, and delivering waste to a designated waste disposal site. If burning of waste is to occur, incineration will conform to the measures outlined in SP03 Emission and Dust Control.
SP05.14	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.
<i>Training of workers</i>	
SP05.15	All workers responsible for handling hazardous waste will receive appropriate training in accordance with SP16.
<i>Waste separation and provision of facilities</i>	
SP05.16	Waste segregation will occur at source to the maximum extent possible, separating re-usable/recyclable material from non-hazardous waste (packing timber, steel, wire, cables, aluminium, bricks, plaster, roofing material, glass, clay/ sand/ gravel, concrete, insulation material, tiles, fiberglass, cured asphalt, paper, cardboard, plastic, food waste) and hazardous waste (waste oils, oil filters, oily rags, used absorbent, old chemical/paint/fuel/oil drums, batteries, acids, alkalis, welding rods, sewerage sludge, and used tyres).
SP05.17	Recyclable waste (including batteries, tyres, glass, paper, scrap metal, aluminium cans and timber) will be transferred to appropriate recycling facilities where possible.
SP05.18	Waste will be stored in appropriate facilities (e.g. bins, stockpiles, secure compounds), with hazardous waste stored away from streams and rivers in secure areas.
SP05.19	Secure lids will be fitted to bins that store food waste to prevent scavenging by birds and animals.
SP05.20	All hazardous and industrial waste generated on site will be stored and disposed of in a manner that minimises the impact on the environment.

No.	Description of Measure
SP05.21	Each construction site and construction worker camp shall be provided with bins for the following types of waste: <ul style="list-style-type: none"> - Non-recyclable domestic waste (i.e. general litter and rubbish); - Recyclable domestic waste (i.e. metal, glass bottle, plastic bottle, cardboard); - Hazardous waste (i.e. used oil, oil contaminated waste, fluorescent, batteries, color spray, etc.); - Bio waste (i.e. waste from first aid and medic); and - Construction waste (i.e. scrap metal, concrete, debris, etc.).
SP05.22	Temporary storage facilities for hazardous wastes shall be managed to limit accidental discharge to the environment. Safety equipment shall be installed, in particular, labeling the waste, a concrete floor, oil weir and sunshade or roof.
<i>Sewage</i>	
SP05.23	Where sewerage toilet facilities are provided, sewage shall be treated to the level defined in <i>Appendix 4</i> of the ESMMP-CP before being released (or treated effluent shall be used for site watering).
SP05.24	Treated wastewater will be released into the Nam Ngiep River.
SP05.25	Pit latrines will be installed for the workforce at isolated construction areas.
SP05.26	Workers will be instructed to use the toilets provided.
<i>Sediment</i>	
SP05.27	Sediment-laden effluent from drilling, tunneling and other construction activities shall be treated in a settling system to settle out suspended particles prior to effluent discharge.
SP05.28	The settling system shall consist of a minimum of two basins for primary and secondary (overflow) treatment. Settling basins shall: <ol style="list-style-type: none"> i. be adequately sized to settle out fine soil particles over a short period ii. be structurally sound, capable of withstanding saturation and normal rainfall events iii. be isolated from local overland runoff, only subject to inflow from the intended source and direct rainfall.
SP05.29	A safety fence and signage shall be erected around settling basins to prevent unauthorized access.
SP05.30	The use of non-contaminating flocculants shall be considered where basin settling is inadequate to treat the volume of residue generated. Flocculants shall only be used as directed by NNP1.
SP05.31	Basins shall be cleared of sediment when 60% of their capacity is reached. Removed sediment shall be disposed of in a landfill or used as fill material.
SP05.32	The quality of water to be released from basins shall be monitored to ensure that it is of acceptable quality prior to release.
SP05.33	Water shall be used to spray areas for dust suppression and for other construction purposes where the quality is suitable. Excess water shall be released into the Nam Ngiep River.
SP05.34	The release of water from sediment basins shall be optimised according to site conditions during: <ol style="list-style-type: none"> i. the rainy season when river sediment levels are high and ii. larger rainfall events in the dry season when raised river sediment levels occur.
<i>Contaminated Material</i>	
SP05.35	Soil contaminated by fuel or oil will be managed as hazardous waste, except where such soil may be remediated on-site.
<i>Landfill Sites</i>	
SP05.36	Non-hazardous waste will be disposed of in a landfill site approved by the Environment Manager.
SP05.37	Landfill sites will be located at least 50 m from any drainage lines, streams or rivers.
SP05.38	Waste disposed of in landfills will be covered with soil on a weekly basis to prevent scavenging and wind-blown rubbish.

No.	Description of Measure
<i>Supervision and Remedial Action</i>	
SP05.39	The Owner Environment Officer shall inspect each waste site, advising the Contractor or its nominated sub-contractor of any non-conformances and required remedial action.
SP05.40	The Contractor or its nominated sub-contractor shall undertake remedial action as directed by the Owner within the required period.

SP06: HAZARDOUS MATERIAL MANAGEMENT

No.	Description of Measure
<i>Management of Hazardous Materials</i>	
SP06.1	<p>Registration of Hazardous Materials</p> <p>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 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.</p> <p>A register of fuel dispensed will be kept along with the records of fuel deliveries in order to reconcile the quantities used.</p>
SP06.2	<p>Selection of safer chemical types</p> <p>Chemicals to be used on any construction site will be selected, where possible, in accordance with general best practices and recommendations for environmental conservation.</p> <p>Pesticides for vector control (i.e., mosquitoes) and for vegetation control will be selected in accordance with the list of recommended pesticides provided by the Environment Manager.</p>
SP06.3	<p>Labelling of Hazardous Materials</p> <p>Containers of hazardous chemical or waste must be labelled with:</p> <ol style="list-style-type: none"> i. The words "Hazardous Waste" ii. Name of the CC 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.)
SP06.4	<p>Handling Safety Procedures and Personal Protective Equipment.</p> <p>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.</p> <p>Personal protective equipment (PPE) will be provided to concerned workers and the use of such equipment will be enforced.</p>
SP06.5	<p>Refueling procedures</p> <p>All refueling 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.</p>
SP06.6	<p>Selection, Handling & Application of Pesticides</p> <p>Pesticides for vector control (mosquitoes) and for vegetation control will be utilized in accordance with:</p> <ol style="list-style-type: none"> i. Authorized pesticides, in accordance with the list approved by EMO ii. Labelling and storage of pesticides, which will satisfy measures SP06.03, SP06.04 and SP06.05 of this sub-plan iii. The translation of all information related to toxicity of pesticides, including user instructions, to commonly used Lao language(s) <p>Safe handling of pesticides will rely on training users; specific training programs and supporting communication materials will be supplied for this purpose.</p>
<i>Storage of Hazardous Materials</i>	
SP06.7	<p>All the fuel and hazardous material storage will be adequately bounded to prevent any spillage problem.</p>
SP06.8	<p>Provide maintenance shops, fuel and oil depot with impermeable flooring or sheets with sump where wash water and sludge can be collected for proper disposal.</p>
SP06.9	<p>Only minimal chemicals, hazardous substances and fuel will be stored on site works, within an enclosed and covered secure area that has an impervious floor and impervious bund around it (with capacity at least 120% of the total capacity of the tanks). The storage area will be located away from watercourses, flood-prone areas, offices and barracks/accommodation, and danger areas.</p>

No.	Description of Measure
SP06.10	Oil stained refuse such as oily rags, spent oil filters and used oil shall be collected and disposed of through recyclers/authorized waste handlers and disposal in authorized waste facilities.
SP06.11	Check containers (at least weekly) for leakage and undertake necessary repair or replacement.
SP06.12	Store hazardous materials above flood level.
SP06.13	Equipment maintenance areas and fuel storage areas shall be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency.
SP06.14	Store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources. Transport and off-site disposal of such wastes shall comply with applicable laws and regulations.
SP06.15	The hazardous materials and chemical used in the construction shall be separated and kept in a suitable storage and the Material Safety Data Sheet (MSDS) shall be in place.
SP06.16	Proper equipment shall be installed at hazardous material storage facilities, including temporary construction sites (i.e. concrete floor, roof or sunshade, oil weir or trap and closed valve).
SP06.17	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.
<i>Spill Response</i>	
SP06.18	Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored and used. If spills or leaks do occur, undertake immediate clean up. Spill response kits will be located at the workshop(s) where the servicing will take place and also at the refueling point(s).
SP06.19	All personnel involved with refueling 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.
<i>Disposal of Hazardous Materials</i>	
SP06.20	Discharge of oil contaminated water into the environment shall be prohibited.
<i>Completion</i>	
SP06.21	Restoration of temporary work sites shall include removal and treatment or proper disposal of oil contaminated soils.

SP07: VEGETATION CLEARING

No.	Description of Measure
<i>Principles</i>	
SP07.1	Keeping clearance to the minimum area required for the proposed Project activity.
SP07.2	Strictly controlling clearing activities by site marking, fencing off significant trees/habitat, etc.
SP07.3	Making cleared vegetation available to local users where permitted by the Forestry Department (FD).
<i>Permits and Permission</i>	
SP07.4	Any necessary vegetation clearing permits, such as a 'Felling Permit' (<i>this and the other green highlights below need to be adapted to Lao requirements as they were written for another country's controls</i>), for the removal of trees on public land shall be applied for and obtained from FD prior to any vegetation clearance.
SP07.5	The permit application shall contain: estimated number of trees to be felled / lopped; marking process; party responsible for cutting and transport of trees; monitoring process; involvement of FD staff in tree clearance and construction monitoring; compensatory planting proposal and budget estimate.
SP07.6	A copy of the permit shall be provided to the Construction site manager prior to any vegetation clearance.
SP07.7	Permission' to fell trees in community controlled forests shall be obtained in writing from each affected community group prior to commencing vegetation clearance.
<i>Identification of vegetation to be cleared</i>	
SP07.8	Areas of 'critical habitat' will be determined and boundaries mapped. These areas will be subject to management in accordance with the Biodiversity Action Plan (BAP) and Biodiversity Offset Design (BOD) Report. No clearing of natural habitat will occur until critical habitat status is determined and approved by relevant government body. No clearing inside the Houay Ngua PPA will occur until approved by relevant government body. Restrict road improvement works to the existing ROW boundaries
SP07.9	A plan will be prepared including: <ul style="list-style-type: none"> 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. vegetation within and adjoining watercourses/ drainage lines). iii. Any required temporary timber storage sites for placing prior to its removal from site.
SP07.10	Marking of the clearance area boundary and trees to be retained shall be clearly visible, ideally with the use of marking tape along the boundary to create a visual 'barrier'.
SP07.11	A plan will be prepared to show the location of all IUCN endangered tree species and individual trees will be clearly marked at the site using tape or similar. These trees will be avoided during final design and where possible during construction especially <i>Dipterocarpus alatus</i> trees.
SP07.12	All staff involved in vegetation clearance shall be walked through the pegged area and instructed on strict adherence to clearing within this boundary by the Contractor or its nominated sub-contractor prior to the commencement of clearance.
SP07.13	Each site to be cleared shall be inspected by the Owner Site Environment Manager or nominated Owner Environment Officer prior to the commencement of vegetation clearance. This officer shall approve vegetation clearance if the site to be cleared has been clearly marked in accordance with the permit to clear issued by FD.
SP07.14	No clearing of vegetation outside of those areas identified in the plans will occur. Cutting of trees for firewood or for Project use will be prohibited.
SP07.15	No construction works, storage of materials/equipment or access by construction personnel will be permitted in 'sensitive vegetation' areas.
<i>Clearing methods</i>	
SP07.16	Progressively clear vegetation in a controlled manner, salvaging and stockpiling cleared vegetation in accordance with permit conditions and the approved SSES MMP.

No.	Description of Measure
SP07.17	Vegetation clearing will be undertaken by a combination of manual and mechanical methods. Chemical methods will not be used. Soil disturbance will be minimised as much as possible during vegetation clearance. Hand clearing will occur near vegetation to be protected, on environmentally sensitive sites where directional felling is required, and on excessively steep sites where it is hazardous to use machinery. Herbicides shall be selected on the basis of being non-residual and with regard to human health.
SP07.18	No material should be stockpiled at the base of trees.
SP07.19	Chemicals and construction materials should not be stored under or immediately upslope of trees.
SP07.20	Alternative fuel sources other than fuel wood should be provided at workforce camps for cooking, heating and lighting.
SP07.21	A nursery shall be established by NNP1 within 12 months of the commencement of construction for the propagation of re-vegetation of species seedlings.
SP07.22	Hand clearing shall be undertaken using appropriate safety equipment. Strict supervision of hand clearance activities will be undertaken to provide a safe working environment.
SP07.23	Machinery clearance shall be strictly controlled to ensure safe working conditions, and machinery shall not be parked underneath trees.
<i>Use of herbicides</i>	
SP07.24	Herbicide use and management will be undertaken in accordance with the requirements of SP06.
<i>Tree cutting</i>	
SP07.25	The contractor will arrange for the employment of construction contractor and locally licensed logging firms to log and clear as far as practicable within approved construction sites.
SP07.26	Any required temporary timber storage sites will be designed to ensure that they are stable and protected from the risk of fire.
SP07.27	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 SP05.
<i>Stockpiling</i>	
SP07.28	Cleared vegetation shall be stockpiled in accordance with permit conditions and the SSES MMP, to minimize site erosion and to enable the salvaging of trees as required in the permit conditions. This shall include only stockpiling cleared vegetation on previously disturbed areas to avoid further vegetation disturbance, and windrowing stockpiled vegetation along the contour to reduce erosion.
<i>Salvage and Disposal</i>	
SP07.29	The FD shall be notified about stockpiled salvaged trees.
SP07.30	Residual (non-salvaged) waste vegetation shall be stockpiled for later use in site re-vegetation where the material is suitable as a mulch or seed source, or, where surplus to needs, disposed of safely in accordance with FD approval. The disposal of residual, non-salvaged vegetation may involve making the material available to outside interests or burning it.
SP07.31	Burning of residual cleared vegetation will require the establishment of a fire control zone around the vegetation. Burning will not be permitted at times of the year when a high fire danger exists. In particular, burning will not be permitted when there is high grass fire hazard late in the dry season. Burning of waste vegetation will only take place in accordance with the requirement of SP03.
<i>Supervision</i>	
SP07.32	Each site to be cleared shall be inspected by the Owner Environment Manager or nominated Environment Officer prior to the commencement of vegetation clearance. This officer shall approve vegetation clearance if the site to be cleared has been clearly marked in accordance with the permit by the relevant authority. The relevant government authority shall be notified of the proposed vegetation clearance.

No.	Description of Measure
SP07.33	The Owner Environment Officer shall inspect clearance activities at each site once a day, advising the Contractor or its nominated sub-contractor of any non-conformances against the permit or SSES MMP and specifying any required remedial action.
SP07.34	The Contractor or its nominated sub-contractor shall implement the remedial action in accordance with the SSES MMP specified by the Owner Environment Officer within the time frame advised.
SP07.35	The Owner Environment Officer shall sign off on site clearance activities only after all remedial actions have been implemented by the Contractor or its nominated sub-contractor. No other site work will be permitted to occur until sign off has occurred.
<i>Impacts on agricultural land use</i>	
SP07.36	All works will be designed and implemented in a manner that minimizes the impact on agricultural land use.

SP08: LANDSCAPING AND RE-VEGETATION

No.	Description of Measure
<i>Landscaping and re-vegetation work</i>	
SP08.1	All area disturbed by construction activity will be, as far as reasonably possible, landscaped to reflect natural contours and restore suitable drainage paths. At least 10 m. set back either side of the centreline of large watercourses shall be implemented.
SP08.2	Undertake replanting of Project cleared areas at the outer portions of the road ROW and in other appropriate locations agreed with local authorities. 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. Replanting will use locally native plant species.
SP08.3	Monitoring and marking of vegetation that will be removed, as agreed with forest authority prior to commencement of construction.
SP08.4	Contractors shall not buy or use wood from illegal sources (that come from the illegal logging).
SP08.5	Contractors will take all precautions necessary to prevent fires from their construction activities. If a fire occurs contractors will immediately suppress it with appropriate methods.
SP08.6	Local depressions created by construction activities will be either backfilled or drained to prevent ponding wherever possible.
SP08.7	Watercourses, which have been temporarily diverted by the contraction activities, will be restored to their former flow paths and riparian zones rehabilitated.
SP08.8	Rehabilitation activities will be in accordance with the Biodiversity Action Plan (BAP)
SP08.9	Residual impacts to natural habitat areas and threatened species habitat will be managed through implementation of the Biodiversity Offset Design (BOD) Report
SP08.10	Conduct monitoring and maintenance to ensure a high survival rate of seedlings. Reasonable remedial measures (e.g. replacing dead or damaged replanted trees and other vegetation types) shall be implemented in case of the damage due to Project activities.
SP08.11	Use grading methods and facilities such as rounding benching, terracing, and retaining walls (as appropriate) to reduce the amount and/or severity of earthwork and related topographic alteration/ vegetation removal.
SP08.12	Install suitable wildlife crossing structures at locations agree with the relevant government authority as required.
SP08.13	Wherever possible, establish fill embankments at grades of between 1:1.5-2 (V:H) for re-vegetation rate improving
<i>Restoration of other land uses</i>	
SP08.14	Land used for agricultural activities 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.
SP08.15	Available subsoil on construction areas shall be shaped back to the original landscaping and topsoil mulch shall be taken for vegetation recovering.

SP09: PROTECTED AREA MANAGEMENT

No.	Description of Measure
<i>Location of Ancillary Sites</i>	
SP09.1	Project activities within Protected Areas (PA) shall be kept to the minimum essential for Project implementation and to approve activities only. Workers camps, machinery depots and material storage areas (other than the storage of small volumes of construction material excavated from a Protected Area site or about to be utilized in works within a week, on already disturbed areas) shall not be located within a Protected Area. Where activities or ancillary sites can be located outside Protected Areas they shall. Where activities or sites are required within a Protected Area government approval shall be obtained before use.
SP09.2	Worker camps, mixing plants, material storage sites (other than temporary storage - less than one week), excavated spoils and waste disposal sites, and other construction facilities are to be located at least one kilometre from protected areas and designated watershed areas. Where it is strongly desired to have a Project site within a PA this has to be justified and government approval is required. Government approval is also required if these facilities are to be located within one kilometer of protected areas of watershed designated areas.
<i>Site Preparation</i>	
SP09.3	Owner and the Contractor shall walk over or drive through the Protected Area with Provincial office of Natural Resources and Environment (PONRE) representatives prior to commencing construction activities to confirm the extent of the area to be utilised, the type and duration of construction activities, and the associated environmental management measures that will be implemented.
SP09.4	The extent of all works shall be surveyed and clearly pegged prior to the commencement of any related construction activities. Owner and the Contractor shall then jointly inspect the pegged works. Once approval has been granted by the Owner, the Contractor will install any management measures as early as possible, depending on a discussion with Owner as a variation order related to its mitigation measures.
SP09.5	Initial environmental management measures shall be installed prior to the commencement of construction activities where possible or as soon as possible after construction commences where these measures cannot be physically installed any earlier. Major control measures shall be surveyed and pegged. The Construction Contractor or its nominated sub-contractor will then seek agreement for each major control with Owner's Site Manager prior to commencing construction of that measure, depending on a discussion with Owner as a variation order. Following agreement, the measure shall be installed immediately.
SP09.6	All staff involved in construction activities within Protected Areas shall be walked through the on-site layout of control measures to familiarize themselves with the functioning of controls and to avoid the removal or damage of these measures.
SP09.7	The installed construction works and mitigation measures shall be checked against the approved designs/ plans by the Owner Site Manager and Owner Environment Officer.
<i>Vegetation Protection</i>	
SP09.8	In addition to the standard vegetation protection measures contained in SP07 Vegetation Clearing; Any specified individual trees to be retained shall be clearly marked prior to the commencement of vegetation clearance or other Project works with 50 m of these trees.
SP09.9	All machinery and tools with attached mud and soil brought from outside the country will be thoroughly washed down prior to use within a Protected Area to help prevent the spread of weeds and plant pathogens.
SP09.10	The re-vegetation of disturbed areas shall be done with a cover crop and species found within adjacent native vegetation in the Protected Area.
SP09.11	Weed control will be regularly undertaken using the best available practice/s.
<i>Wildlife Protection</i>	
SP09.12	The Contractor shall develop a construction procedure that allows/ encourages wildlife to move off-site before and during construction activities to avoid deaths. Measures may include: undertaking sequential clearing; and searching for fauna immediately prior to clearing then delaying clearing of any trees/ areas with fauna until fauna have moved away from the area.

No.	Description of Measure
SP09.13	All heavy vehicles are only permitted to use the section of the main Project access road through Houay Ngua Provincial Protected Area (PPA) during daylight hours to minimize the disturbance of wildlife in the Protected Area and the potential for wildlife deaths from traffic.
SP09.14	A speed limit of 30 km/hr shall apply to all Project vehicle movements through the Protected Areas.
SP09.15	All Project staff prohibited from harvesting any forest products and hunting wildlife within Protected Areas.
<i>General Provisions</i>	
SP09.16	Construction activities in Protected Areas will primarily be undertaken during dry conditions to minimize erosion, sedimentation and water quality decline.
SP09.17	Project works and associated management measures in Protected Areas shall be inspected one month prior to the commencement of the rainy season to identify any required works and prepare a maintenance program to be conducted prior to the rainy season.
SP09.18	No storage of fuels, chemicals or other hazardous materials shall occur within Protected Areas.
SP09.19	Construction wastes will be removed from site each day, with no waste stored within a Protected Area.
SP09.20	No chemicals will be used within a Protected Area unless essential to construction.
SP09.21	No burning will be undertaken within Protected Areas.
<i>Reporting Illegal Activities</i>	
SP09.22	Owner and the Contractor (or its sub-contractors) shall report any suspected illegal activities within a Protected Area it is using/ working within to the relevant Government agency as soon as practical.
<i>Supervision and Remedial Action</i>	
SP09.23	Inspect construction activities within a Protected Area at least twice a week, advising the Contractor or its nominated sub-contractor of any non-conformances against permit conditions or SSES MMP-specified measures, and specifying any required remedial action.
SP09.24	The Contractor or its nominated sub-contractor shall implement the remedial actions in accordance with the approved SSES MMP specified by the Owner Environment Officer within the time frame advised.
<i>Site Signoff</i>	
SP09.25	Upon completion of construction activities, the Owner Environment Officer shall sign off on completed sections within Protected Areas only after all remedial actions have been implemented in accordance with approved SSES MMP by the Contractor or its nominated sub-contractor.

SP10: BIODIVERSITY MANAGEMENT

No.	Description of Measure
<i>General</i>	
SP10.1	Implement the recommended offset package outlined in the Biodiversity Offset Design Report.
SP10.2	Implement the recommended actions outlined in the Biodiversity Action Plan (BAP).
SP10.3	Project activities within Protected Areas shall be kept to the minimum essential for Project implementation and to approved activities only. A plan will be prepared to show the location of all ancillary sites.
<i>Site Survey and Preparation</i>	
SP10.4	Any Project activities that involve disturbance of native vegetation will be preceded by an on-ground survey to assess presence of threatened species and other flora values that might be impacted. Results of the on-ground survey will be used to guide the clearing footprint (where possible).
SP10.5	The extent of all works shall be surveyed and clearly pegged prior to the commencement of any construction activities.
SP10.6	In natural habitat areas to be cleared, microhabitat features such as hollow logs will be relocated to adjacent natural habitat areas rather than being destroyed where possible.
<i>Avoidance of Weed Spread or Encouragement of Pests</i>	
SP10.7	All machinery and tools with attached mud and soil brought from outside the country will be thoroughly washed down prior to use within a Protected Area to help prevent the spread of weeds and plant pathogens.
SP10.8	Construction wastes will be appropriately stored and disposed of such that pest and/or native fauna cannot access hazardous or domestic waste items.
SP10.9	Landscaping and re-vegetation will utilise locally native species.
SP10.10	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.
<i>Wildlife Protection</i>	
SP10.11	The Contractor shall develop a construction procedure that allows/encourages wildlife to move off-site before and during construction activities to avoid deaths.
SP10.12	For areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible.
SP10.13	A speed limit of 40 km/hr shall apply to all Project vehicle movements and 30 km/hr through the Protected Areas.
SP10.14	All Project staff prohibited from harvesting any forest products and hunting wildlife (terrestrial and aquatic).
SP10.15	Re-vegetation adjacent to the road to occur upon completion of construction.
SP10.16	Raise awareness of the protection of threatened species to trade, poaching and hunting through education of construction team members.
<i>Management of Habitat Degradation</i>	
SP10.17	Dust suppression techniques will be utilised during construction, to control the dispersion of dust created by clearing lands.
SP10.18	To avoid/minimize releasing sediment load into the river, erosion control measures will be implemented and maintained e.g. using silt fence and temporary re-vegetation to minimise sediment transport from steep slope releasing to the waterways; and
SP10.19	Construction materials and chemicals will be appropriately secured and locked down during rainy season to avoid accidental release to the natural environment;
SP10.20	Implement emergency response procedures in accordance with SP20 Emergency Preparedness.
SP10.21	Wherever practicable, topsoil shall be stripped off construction and ancillary sites and stockpiled for later reuse for site rehabilitation. The proposed stockpile areas shall be marked before implementing.
SP10.22	Temporary topsoil stockpiles will be developed in accordance with SP01 Erosion and sediment control.

SP11: SPOIL DISPOSAL

No.	Description of Measure
<i>Design of Soil Areas</i>	
SP11.1	The volume of spoil that will be (i) generated by construction, (ii) used in construction (e.g. for aggregate, fill) and (iii) remaining and requiring disposal shall be estimated for all sites where excess spoil will be generated.
SP11.2	Spoil disposal sites shall be identified during the detailed design phase, with site capacities estimated and stabilisation works (retaining walls and drains) designed.
<i>Principles of spoil management</i>	
SP11.3	The volume of excess spoil will be minimised by appropriate Project design, including the maximum use of spoil for such purposes as concrete aggregate, road gravelling, and landforming for Project sites, community facilities or private uses.
SP11.4	Spoil disposal sites shall generally be located on: <ul style="list-style-type: none"> - lower slope land so that stable landforms can be created. If possible, land with a slope more than 10% shall generally not be used for spoil disposal, where possible; - degraded or lower value land (e.g. grasslands, poor quality cultivation land); - land devoid of forest or with highly degraded forest cover; and - areas where improved final landforms can be created, either for Project, community or private use.
SP11.5	Temporary stockpiling of spoil shall only be permitted where the final spoil disposal site cannot be used for a period of time due to other construction activities.
<i>Site Preparation</i>	
SP11.6	The spoil disposal site boundary and associated sediment traps or settling basins shall be surveyed and clearly pegged/ marked by the Contractor or its nominated sub-contractor prior to the commencement of related excavation/tunnelling and spoil generation, handling and disposal.
SP11.7	All necessary spoil disposal site preparation activities shall be completed prior to the commencement of the related spoil generation, handling and disposal, to ensure that disposal sites are fully prepared prior to use, thereby avoiding temporary stockpiling wherever possible. This shall include the construction of the initial retaining walls and sediment basins where required.
SP11.8	If the temporary stockpiling of spoil is required, temporary stockpile sites shall be pegged and temporary control measures shall be installed prior to the use of each site.
SP11.9	All staff involved in spoil handling and disposal shall be walked through the pegged disposal sites and instructed on strict adherence to planned spoil handling and disposal at the site.
SP11.10	Topsoil shall be removed from spoil disposal and settling basin sites prior to use and stockpiled nearby, to be utilised for eventual landform re-vegetation, if possible.
<i>Verification</i>	
SP11.11	Each temporary or permanent spoil disposal site and associated facilities (e.g. retaining walls, drains) shall be inspected by the Owner Environment Manager or the nominated Owner Environment Officer prior to any disposal activities. This officer shall approve spoil handling and disposal for a specific area if the handling and disposal facilities and sites are in accordance with the Spoil Management Plan and any variations required by the Owner Environment Manager.
<i>Spoil handling</i>	
SP11.12	Spoil shall be handled as little as possible to avoid creating an additional erosion hazard, additional sources of sediment and water quality and dust hazards.
SP11.13	Temporary stockpiling shall only be permitted when the final disposal site is temporarily unavailable due to use for another purpose.
SP11.14	Wherever possible, dry spoil shall be transported and disposed of in its final location in a single operation when it is removed from the point of generation.
SP11.15	Wet residue shall be kept separate from dry spoil and treated at a location as close as possible to the source, depending on condition of fine sediment.
<i>Procedure</i>	
SP11.16	Dry spoil shall be trucked to the disposal site and progressively laid.
SP11.17	In windy conditions, dust generation shall be suppressed during spoil handling, placement and compaction using such measures as water spraying if excessive dust generation is expected.

No.	Description of Measure
<i>Spoil Treatment</i>	
SP11.18	Settling basins shall be adequately sized to settle out fine soil particles over a short period.
SP11.19	Settling basins shall be isolated from local overland runoff, only subject to direct rainfall.
SP11.20	A safety fence and signage shall be erected around settling basins to prevent unauthorized access.
SP11.21	The settling system shall consist of at least two connected basins that provide (i) primary treatment and (ii) overflow treatment.
SP11.22	Settling basins shall be structurally sound, capable of withstanding saturation and normal rainfall events.
SP11.23	The use of non-contaminating flocculants shall be considered where basin settling is inadequate to treat the volume of effluent / residue generated. Flocculants shall only be used with the approval of and as directed by the Owner.
SP11.24	Settled sediment within each basin shall be removed and disposed of at an approved site when 75% of the capacity of settling basing capacity has been reached.
SP11.25	Water/ effluent to be released from the site from secondary basins shall be monitored to ensure that it is of acceptable quality prior to release.
<i>Spoil Disposal</i>	
SP11.26	Workers responsible for spoil handling and disposal shall be instructed by the Contractor or its nominated sub-contractor about the correct/approved placement and compaction of spoil.
SP11.27	Spoil shall be used on Project sites where possible (e.g. to create the power station platform).
SP11.28	Excess spoil shall be disposed of at approved sites, with landforms created as per the Spoil Management Plan.
SP11.29	The Owner Environment Officer shall inspect each pegged spoil disposal site with the Contractor or its nominated sub-contractor and approve each site prior to the commencement of site preparation works.
SP11.30	Topsoil shall be stripped off spoil disposal sites and stockpiled prior to spoil placement on the site.
SP11.31	Ancillary works required at spoil disposal sites such as gabion retaining walls and drains shall be constructed prior to filling each site, either entirely or progressively as each site develops, ensuring that placed fill is retained within the designated area.
SP11.32	Erosion and sediment controls shall be installed at each spoil disposal site and progressively adjusted as the landform changes, to minimise on-site erosion and prevent off-site sedimentation.
SP11.33	Spoil shall be shaped into stable landforms, with permanent drains installed to maintain landform stability and prevent erosion. Final landform slopes shall not exceed 1:2.0 (V:H). A bench shall be installed at vertical intervals of no greater than 10 m to provide slope stability, provided that sufficient slope stability would be expected considering actual site condition.
SP11.34	Adequate compaction of all placed fill shall be provided. This will generally be achieved by laying the fill in horizontal layers not exceeding 50 - 100 cm depth and compacting with bulldozer.
<i>Site Stabilisation</i>	
SP11.35	Final landforms shall be progressively stabilized within one month of completion during the dry season and within one week of completion during the rainy season.
SP11.36	Where topsoil is available, final landforms shall be covered in topsoil to promote re-vegetation.
SP11.37	Following topsoiling, each landform shall be treated to promote re-vegetation. Minimum treatment shall include sowing a cover crop and perennial species. Additional treatment may include planting tree and shrub seedlings and mulching the ground surface, if necessary.
SP11.38	The Contractor or its nominated sub-contractor shall monitor the condition of re-vegetated areas periodically, and may seed with insufficient ground cover, if necessary.

SP12: QUARRY AND CONSTRUCTION LAYOUT

No.	Description of Measure
<i>Siting</i>	
SP12.1	<p>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:</p> <ol style="list-style-type: none"> Clearing of vegetation will be minimized and the use of existing cleared areas will be maximized. The separation distance between dust generating activities, construction camps and villages will be maximized as far as possible to reduce noise and dust impacts. All infrastructure and equipment will be sited to maximize screening from public vantage points. Defined end-use or condition of the sites.
SP12.2	Borrow areas shall not be located on productive land, protected areas and near water courses (rivers, streams, drainage lines).
SP12.3	It is preferable to avoid or reduce the sections of quarry sites located on river bed. If it is not possible to locate quarries out of river beds, quarry sites lying on small rivers and streams shall be avoided.
<i>Clearing and disposal of vegetation</i>	
SP12.4	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.
SP12.5	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 SP05. Any burning of vegetation on-site will be undertaken in accordance with the requirements of SP03.
<i>Topsoil management and erosion and sediment control</i>	
SP12.6	Topsoil shall be properly removed, stockpiled and preserved for later use during restoration of the site and provision of vegetation cover to minimize erosion.
SP12.7	Notwithstanding the requirements of SP01, sediment basins of adequate size to cater for all contaminated runoff from the site will be implemented at each of the sites where practical.
<i>Quarry face stability</i>	
SP12.8	<p>The risk of quarry face instability and failure will be stabilized using appropriate methods such as:</p> <ol style="list-style-type: none"> Implementation of slope drainage measures Benching of slopes De-scaling of excess material <p>The proposed measures will be detailed in the site layout plan for the quarry.</p>
SP12.9	Provide stable side slopes during excavation of borrow pit.
<i>Hydrology</i>	
SP12.10	<p>Quarries and borrow areas will be contoured to avoid surface water collecting. Following completion of extraction, quarries and borrow areas will be rehabilitated to reinstate contours as similar as possible to the original contours. Rehabilitation will aim to reproduce surface water flows and ground water flows and levels as similar as possible to the original state.</p>
SP12.11	Provide adequate drainage during borrow areas operation to avoid accumulation of stagnant water.
<i>Air quality management</i>	
SP12.12	<p>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 SP03, and will include:</p> <ol style="list-style-type: none"> Watering of exposed surfaces and crusher operation.
SP12.13	All construction vehicles and equipment will be maintained in accordance with the requirements of SP15.

No.	Description of Measure
SP12.14	Access to, from and within the sites will be along designated routes as required by SP15.
<i>Internal access roads</i>	
SP12.15	Internal access roads within the quarry sites will be designed in accordance with the requirements of SP15.
<i>Waste management</i>	
SP12.16	Waste from the sites will be managed in accordance with the requirements of SP05.
SP12.17	An adequate number of pit latrine toilets will be provided at the sites for the use of all construction personnel.
<i>Noise and blasting controls</i>	
SP12.18	Noise generated by activities at the sites will be managed in accordance with the requirements of SP04.
SP12.19	General construction works at the construction areas will be carried out 24 hours a day subject to suitable safety and lighting measures being implemented.
SP12.20	Blasting activities excluding tunnelling will be basically carried out between 06.00 and 19.00.
SP12.21	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.
<i>Water quality management</i>	
SP12.22	The primary and secondary sediment basin shall be designed and installed in main quarry area to collect and treat runoff.
SP12.23	Prior to release, effluent discharged from the crushing plant will be monitored in accordance with the requirements of SP02.
SP12.24	Effluent from the sediment basins will be regularly monitored in accordance with the requirements of SP02.
SP12.25	Progressively implement of drainage management plan for each quarry, commencing with clear site pegging and approval by NNp1 before vegetation clearance and earthworks commence, installation of drainage and sediment controls, etc.
<i>Sub-camp construction</i>	
SP12.26	The design of the construction work sub-camps will be carried out in accordance with the requirements of SP14.
SP12.27	Materials, other than waste materials, which are sourced from the sites will only be used for the construction of the Project.
<i>Completion</i>	
SP12.28	Upon completion of extraction activities, quarry and borrow pits shall be dewatered and fences shall be installed, as appropriate, to minimize health and safety risks.
SP12.29	Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favourable for mosquito breeding.
SP12.30	Restore and rehabilitate of quarry sites and borrow pits after use.

SP13: UNEXPLODED ORDNANCE (UXO) SURVEY AND DISPOSAL

No.	Description of Measure
<i>Appropriately qualified organization to undertake work</i>	
SP13.01	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.
<i>Requirements for survey and disposal</i>	
SP13.02	The priority method of UXO disposal shall be in-situ explosion. Where this is not possible, due to potential danger to personnel or nearby population or damage to infrastructure, alternative proven methods of disposal may be implemented.
<i>Appropriately qualified organization to undertake work</i>	
SP13.03	Where disposal of UXO may cause physical damage to infrastructure, protective measures such as sandbagging, burial and trenching will be undertaken.
SP13.04	Storage and handling of explosives will be undertaken in accordance with the requirements of SP06.
<i>Marking of cleared areas and clearance reports</i>	
SP13.05	<p>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:</p> <ol style="list-style-type: none"> <li data-bbox="526 757 1436 846">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 <li data-bbox="526 846 1436 902">ii. Description of the survey, disposal and QC processes that were implemented on the site <li data-bbox="526 902 1436 958">iii. Description of UXO located, UXO destroyed and amount of scrap metal recovered <li data-bbox="526 958 1436 1014">iv. Certification that the area has been cleared of UXO and is suitable for its intended purpose
<i>Construction worker training</i>	
SP13.06	As part of the construction worker training program contained in SP16. 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.
<i>Notification of local communities</i>	
SP13.07	<p>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. UXO notification will include:</p> <ol style="list-style-type: none"> <li data-bbox="526 1305 1436 1384">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. <li data-bbox="526 1384 1436 1478">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).

SP14: CONSTRUCTION OF WORK CAMPS

No.	Description of Measure
<i>Use of camps</i>	
SP14.1	All workers who are based on the construction site will be accommodated by one of the construction camps.
SP14.2	Appropriate sanitation facilities will be installed in accordance with SP02.
<i>Disease control, health and safety issues</i>	
SP14.3	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.
SP14.4	Medical, sanitary and disease prevention measures for each camp will be implemented in accordance with the requirements of SP17.
SP14.5	Pesticide use in the camps and sub-camps will be carried out in accordance with the requirements of SP17.
SP14.6	Waste generated at the construction camps will be managed in accordance with the requirements of SP05.
SP14.7	Construction workers will be trained in health and safety issues relating to the camps in accordance with the requirements of SP16.
<i>Camp access</i>	
SP14.8	In general, access to the camps will be restricted to construction workers and visitors with an authorized access pass.
<i>Potable water supply</i>	
SP14.9	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.
SP14.10	Water quality monitoring of the potable water storage in camps and sub-camps will be carried out in accordance with the requirements of SP02.
<i>Camp rules and regulations</i>	
SP14.11	A set of rules and regulations applicable to camps and sub-camps will be developed. The rules and regulations will include: <ul style="list-style-type: none"> 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. Other prohibitions v. Measures for preserving health and the dissemination of vectors and transmissible diseases
SP14.12	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.

SP15: TRAFFIC AND ACCESS

No.	Description of Measure
<i>Road signage and speed limits</i>	
SP15.1	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.
SP15.2	Traffic speed regulation devices, such as speed bumps, and signage will be installed at sensitive locations including in the vicinity of villages, construction camps and at busy intersections or before the sharp bend, if necessary.
<i>Maintenance of construction vehicles</i>	
SP15.3	<p>A maintenance program for the construction vehicle fleet will be implemented which will include consideration of the following issues:</p> <ul style="list-style-type: none"> 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 <p>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.</p>
<i>Traffic movements on internal roads</i>	
SP15.4	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.
SP15.5	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.
<i>Traffic movements on public roads</i>	
SP15.6	Prior to the movement of special loads on public roads, including hazardous materials or large items of including hazardous materials or large items of construction equipment, the EMO will be notified. If the EMO 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.
SP15.7	Employ flag persons to control traffic when construction equipment is entering or leaving the work area to guide vehicles to regulate traffic movements, and to lead traffic through potentially hazardous areas.
SP15.8	Post traffic advisory signs (to minimize traffic build-up) in coordination with local authorities.
SP15.9	Provide sufficient lighting at night within and in the vicinity of construction sites.
SP15.10	Regularly monitor traffic conditions along access roads to ensure that Project vehicles are not causing congestion.
SP15.11	Define and observe schedules for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.). As much as possible, schedule delivery of construction materials and equipment as well as transport of spoils during non-peak hours.
SP15.12	Implement suitable safety measures to minimize risk of adverse interactions between construction works, traffic flows and pedestrians/public through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions, traffic cones, and barricades to alert vehicle and pedestrian traffic of potential hazards including lane closures, equipment use or crossing areas, and excavations.
SP15.13	Schedule heavy truck traffic such as equipment ingress/egress and material deliveries to avoid peak traffic periods, and using methods such as escort vehicles and warning signs/lights to increase public awareness of potential hazards and reduce accident potential. Project vehicles shall not be allowed in busy highways during peak hours in the morning and afternoon. This measure shall be among the conditions that shall be included in the traffic management plan that the contractor shall be required to prepare prior to construction. Traffic management shall include among others, strategy for coordination with the district/local traffic management office; alternative routes/traffic diversion routes; alternate routes for Project vehicles.

No.	Description of Measure
SP15.14	Coordinate proposed construction activities and schedules in advance with local agencies, community representatives, businesses, schools, temples and other Project affected parties to increase public awareness and reduce potential conflicts. Provide advance (and ongoing) notification of proposed construction operations, locations and schedules to local residents, businesses and other applicable parties.
SP15.15	Maintain existing access routes to local sites and uses whenever feasible, including methods such as preserving access roads, driveways or providing temporary crossings (e.g. metal plates) over excavated areas or trenches.
SP15.16	Provide alternative access (e.g. temporary roads and pedestrian pathways/bridges) and/or parking for local sites and uses when impacts to principle access routes and signing to improve alternative access function. Specific locations where alternative access and/or parking may be necessary include applicable residential/ commercial properties, schools, agricultural uses, health care facilities, cultural and recreational sites.
SP15.17	Schedule construction operations to avoid or minimize conflicts with local uses/activities to the maximum extent feasible. This may include efforts such as rescheduling construction operations to accommodate: (1) local school and temples schedules, (2) holidays and peak tourist seasons; and (3) agricultural planting and harvest seasons.
SP15.18	Coordinate construction operations to minimize the extent and duration of lane closures along affected roadways whenever feasible and maintain at least one safe through lane at all times (e.g. through efforts such as construction phasing, pavement restriping, use of temporary alternatives lanes, and as-needed repair of roadway surfaces).
<i>Training</i>	
SP15.19	Safety issues and regulations regarding traffic and site access will be included in the training plan for construction personnel (refer to SP16).
<i>Borrowed areas for road construction</i>	
SP15.20	Any borrowed areas that are required to be developed for the road construction works will be subject to evaluation of prevention of traffic congestion using the simple checklist. The EMO will approve the location of any identified borrowed areas prior to their establishment.
SP15.21	Notwithstanding the above, material for construction of the roads shall utilize construction spoil if possible.
<i>Implementation of load truck</i>	
SP15.22	Trucks carrying quarry materials pass the public road and sensitive locations would be investigated routinely. In case of materials falling onto the road, truck will be covered with e.g. tarpaulin to prevent excess materials from spilling onto road surfaces during travel to the construction site or reduced carrying capacity in truck.

SP16: TRAINING AND AWARENESS

No.	Description of Measure
SP16.1	<p>All workers will complete the environmental training programs. The goal of programs will be to educate all workers on the requirements of the environmental management plans (Owner ESMMP-CP, sub-plans, Contractor ESMMP-CP and Contractor Thematic Plans. In particular, the following issues will be addressed:</p> <ol style="list-style-type: none"> 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
SP16.2	<p>Health Awareness Training will be mandatory for all personnel. Training will cover the following topics:</p> <p>Health:</p> <ol style="list-style-type: none"> 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 <p>Safety:</p> <ol style="list-style-type: none"> 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 <p>Miscellaneous safety issues</p>
SP16.3	<p>Where necessary, participants in job-specific training will be identified on the basis of their skills and capacity to undertake the training.</p>
SP16.4	<p>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.</p>
SP16.5	<p>A training register will be maintained that will contain details of the following:</p> <ol style="list-style-type: none"> i. Name of training session ii. Date of training session iii. List of attendees and signatures iv. Name of trainer
SP16.6	<p>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.</p>
SP16.7	<p>The EMO 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.</p>

No.	Description of Measure
SP16.8	During audits of the construction areas, workers' knowledge of environmental, health and safety issues will be examined.
SP16.9	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.
SP16.10	All new employees will complete relevant training prior to commencement of any activities on the construction site.
SP16.11	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.
SP16.12	All Contractor employees and its nominated sub-contractor/s carrying out vegetation clearance, earthworks, spoil disposal, stockpiling or installing erosion and sediment control works shall complete the Environmental Induction Course incorporating an erosion and sediment Control measures. Appropriate training program will be established according to employee tasks and training of all employees and sub-contractors shall be recorded in the Contractor's Training Register.
SP16.13	All Contractor employees and its nominated sub-contractor/s carrying out vegetation clearance activities (site survey and pegging, vegetation clearance and cleared vegetation management) shall have completed the General Environmental Awareness Training (incorporating Vegetation Clearing controls). Appropriate training program will be established according to employee tasks and training of all employees and sub-contractors shall be recorded in the Contractor's Training Register.
SP16.14	All Contractor employees and its nominated sub-contractor/s carrying out Project activities within Protected Areas shall have completed the Environmental Induction Course incorporating Protected Areas Unit. Appropriate training program will be established according to employee tasks and sub-contractors shall be recorded in the Contractor's Training Register.

SP17: PROJECT PERSONNEL HEALTH PROGRAM

No.	Description of Measure
<i>Training</i>	
SP17.1	<p>Health Awareness Training will be mandatory for all personnel. Training will cover the following topics:</p> <p>Health:</p> <ol style="list-style-type: none"> 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 <p>Safety:</p> <ol style="list-style-type: none"> 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
SP17.2	<p>Additional material, including a "Health and Safety Manual" will be distributed to the personnel attending training in the language used by the workers during trainings. Health and safety related posters will be provided in visible locations at worker camp, canteen and offices.</p>
<i>First Aid</i>	
SP17.3	<p>First aid teams will be specifically trained and assigned in groups of two to three persons to the different sites.</p>
SP17.4	<p>First aid stations will be provided and will be appropriately equipped.</p>
SP17.5	<p>First aid kits will be readily accessible by workers.</p>
SP17.6	<p>A doctor shall be reached when an accident occurs.</p>
<i>Disease Control</i>	
SP17.7	<p>Vector control of mosquitoes and other pests will be managed according to the following actions:</p> <ol style="list-style-type: none"> i. Effective storm water drainage systems implemented to avoid stagnant water ii. Storm water drains and borrow pits will be kept free of vegetation iii. Minimizing the presence stagnant water within containers and other pools of water iv. Providing mosquito nets to buildings v. Safe application of pesticides when necessary vi. Removal of discarded items that could contain water
SP17.8	<p>Solid waste that might attract pests such as domestic rubbish and food waste shall be managed properly.</p>
SP17.9	<p>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.</p>
SP17.10	<p>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.</p>
SP17.11	<p>Provide adequate drainage in workers camps to avoid water logging/accumulation of stagnant water and formation of breeding sites for mosquitoes.</p>
SP17.12	<p>Provide adequate and clean housing and sanitation facilities for all workers at the workers'/construction camps. Separate sleeping quarters shall be provided for male and female workers.</p>

No.	Description of Measure
SP17.13	Provide reliable supply of water for drinking, cooking and washing purposes at the workers' camps.
SP17.14	Provide separate hygienic sanitation facilities/toilets and shower areas with sufficient water supply for male and female workers.
SP17.15	Ensure that all wastewater emanating from workers camps, construction camps and other Project-related activities and facilities are treated consistent with national regulations. Methods of wastewater treatment will be selected based on site conditions.
SP17.16	Ensure proper collection and disposal of solid wastes within the workers'/construction camps consistent with local regulations.
<i>Health and Safety</i>	
SP17.17	Workers at the bridge site shall be provided with life vests/buoyancy devices when river conditions dictate. Stable footpaths/access with sturdy guardrails to the bridge work sites shall be provided.
SP17.18	As part of navigation safety and as applicable, the contractor will comply with waterway traffic safety during construction. Prior to construction, the contractor will prepare a waterway safety plan. This will be submitted to and approved by a relevant government agency if required.
SP17.19	Provide fire-fighting equipment at the work areas, as appropriate, and at construction camps where fire hazards and risks are present.
SP17.20	Provide sturdy fencing on all areas of excavation greater than 2 m deep.
SP17.21	Provide personnel with appropriate safety equipment such as safety boots, helmets, gloves, protective clothes, breathing mask, goggles, ear protection, etc. and ensure that these are properly worn as required.
SP17.22	Ensure reversing signals are installed on all construction vehicles.
SP17.23	Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening in a work surface. Based on a case-specific basis, fall prevention/protection measures may include installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area, proper use of ladders and scaffolds by trained employees, use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard, fall protection devices such as full body harnesses, etc.
SP17.24	Implement precautions to ensure that objects (e.g., equipment, tool, debris, pre-cast sections, etc.) do not fall onto or hit people, vehicle, and properties in adjoining areas.

SP18: PUBLIC SAFETY

No.	Description of Measure
<i>Exclusion of public from unsafe areas</i>	
SP18.1	Barriers will be installed to keep pedestrians away from hazardous areas where required, such as at accessible areas of construction sites, if necessary.
SP18.2	Signage shall be installed at the periphery of the construction site to warn and direct traffic and pedestrians.
SP18.3	Provide security personnel in hazardous areas to restrict public access.
SP18.4	Backfilling, covering (e.g. with metal plates) and/or immediately repaving excavated areas such as utility trenches to avoid potential accidents and improve public access and safety.
SP18.5	Install appropriate safety barriers and warning signs in areas such as open excavations, cut slopes, erosion-prone slopes, manufactured slopes, drainages, and other areas that pose safety risks, to preclude unauthorized or accidental access and ensure public safety
<i>Road Safety</i>	
SP18.6	Install safe access to properties and establishments affected by construction works. If necessary, provide safe passageways for pedestrians crossing the construction site.
SP18.7	Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.
SP18.8	Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.
SP18.9	Limiting construction vehicle speeds to appropriate levels (typically 40 km per hour) to reduce accident potential, and securing all construction vehicles and equipment during non-working periods to prevent unauthorized access or use (e.g. through use of a fenced and locked staging site and/or security guards).

SP19: DAMAGE TO PROPERTIES AND FACILITIES

No.	Description of Measure
SP19.1	Local roads that will be used by the Project shall be restored prior to use and shall be repaired and fully restored at the end of the Project.
SP19.2	The Contractor shall immediately repair and/or compensate for any damage caused by the Contractor to properties (houses, farmlands, aquaculture ponds, irrigation canals, etc.), community facilities such as water supply, power supply, communication facilities and the like.
SP19.3	Access roads damaged during transport of construction materials and other construction related activities shall be repaired and maintained to ensure that these remain in passable condition to motorists and pedestrian.

SP20: EMERGENCY PREPAREDNESS

No.	Description of Measure
<i>Storage of hazardous materials</i>	
SP20.1	Hazardous materials will be stored on-site with the MSDS in accordance with the requirements of SP06.
<i>Spill response procedures</i>	
SP20.2	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.
SP20.3	<p>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:</p> <ol style="list-style-type: none"> 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
SP20.4	For spills of hazardous materials, appropriate treatment and disposal methods for the known range of hazardous materials will be applied by trained personnel.
<i>Emergency contact details</i>	
SP20.5	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.
<i>Training of personnel</i>	
SP20.6	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 SP16)
SP20.7	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.
<i>Emergency incident communication processes</i>	
SP20.8	In the event of a personal emergency implement the Emergency Response Procedure (Appendix 9). All staff will be made aware of the procedure during Project induction
SP20.9	<p>In the event of an accidental release or spill of a hazardous material, the following communication processes will be implemented:</p> <ol style="list-style-type: none"> i. Environmental Officer immediately notifies ESD ii. ESD immediately notifies emergency response team iii. ESD immediately notifies external emergency authorities (if required) <p>Communication will initially be verbal, with written communication as soon as practical.</p>
SP20.10	<p>The communication processes will include the following information in relation to accidental releases or spills:</p> <ol style="list-style-type: none"> 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 vi. Need for emergency or external assistant vii. Any safety/evacuation requirements to be implemented on the construction site
SP20.11	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.
<i>General Emergency</i>	
SP20.12	First aid teams will be specifically trained and assigned in groups of two to three persons to the different sites.

No.	Description of Measure
SP20.13	First aid stations will be provided and will be appropriately equipped.
SP20.14	First aid kits will be readily accessible by workers.
SP20.15	A doctor shall be reached when an accident occurs.
<i>Emergency Preparedness</i>	
SP20.16	Prior to the rainy season, all construction site will be reviewed for slope stability and stability of infrastructure and management measures identified to prepare for incidents that may arise as a result of flash flooding for example machinery being dislodged or landslip
SP20.17	All site plans to include clearly marked exclusion barriers around hazardous areas that must be separated from public access. Barriers will be installed as soon as is required to exclude access by non-working staff

SP21: CULTURAL RESOURCES

No.	Description of Measure
<i>Avoid impacts on significant cave network</i>	
SP21.1	Construction activities will be undertaken in such a manner as to avoid any physical effect on known sites of cultural or religious significance.
<i>Definition of physical cultural resources</i>	
SP21.2	Physical cultural resources will be defined as: <ol style="list-style-type: none"> <li data-bbox="531 398 1449 454">i. Remains left by previous human inhabitants (e.g., middens, shrines, graveyards and burial sites) <li data-bbox="531 454 1449 488">ii. Unique natural environmental features (e.g., canyons and waterfalls)
<i>Training of construction workers</i>	
SP21.3	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.
<i>Chance Finds</i>	
SP21.4	The Owner will employ a head of village who is familiar with cultural resources.
SP21.5	The following steps will be implemented in the event that previously unidentified artifacts are identified: <ol style="list-style-type: none"> <li data-bbox="531 779 1449 869">i. The contractor shall immediately cease operations on road section where artifacts/archaeological finds are unearthed and immediately inform NNP1 Site Manager. <li data-bbox="531 869 1449 925">ii. The Owner will consult the Head of Village and Culture and Tourism Administration Office to obtain advice regarding the next steps. <li data-bbox="531 925 1449 981">iii. The contractor to recommence work only after the Culture and Tourism Office has provided official notification accordingly.
SP21.6	Any directions or requirements from the ESD in relation to measures to protect the site will be recorded and communicated by the ESD to the construction workforce. All such requirements will be strictly adhered to.

Appendix I

**Agreement on National Environmental
Standards of Lao PDR, 2009**

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 ¹	CA - Annex C Concentration ²	WHO ³ (Drinking Water Quality Guideline)	EPA ⁴ (Human Health, Consumption of Water & Organism)
Faecal Coliform	MPN/100ml	0	0	-	-
Total Coliform	MPN/100ml	<2.2	<2.2	-	-
Enterovirus	MPN/100ml	0	0	-	-

Source:

- 1 Refer to Agreement on the National Environmental Standard, Lao PDR 2009
- 2 Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Bacteriological Parameters
- 3 Refer to Guidelines for Drinking-water Quality, WHO 2008
- 4 Refer to National Recommended Water Quality Criteria - Correction, EPA 822-Z-99-001, 1999

Table I.1.2 Physical-Chemical Parameters

Parameters	Symbol	Unit	Concentration ¹		CA - Annex C Maximum Concentration ²	WHO ³ (Drinking Water Quality Guideline)	EPA ⁴ (Human Health, Consumption of Water & Organism)
			Minimum	Maximum			
Aluminium	Al ³⁺	mg/l	0.1	0.2	0.2	<0.1	-
Ammonia	NH ₃	mg/l	0.5	1.5	1.5	1.5	-
Chloride	Cl ⁻	mg/l	200	250	250	250	-
Copper	Cu ²⁺	mg/l	1.0	2.0	2.0	2	1.3
Iron	Fe ²⁺ and Fe ³⁺	mg/l	0.3	<1	<1	0.3	0.3
Manganese	Mn ²⁺	mg/l	0.1	0.5	0.5	<0.1	0.05
Sodium	Na ⁺	mg/l	200	250	250	200	-
Sulphate	SO ₄ ²⁻	mg/l	200	250	250	250	-
Hydrogen Sulphide	H ₂ S	mg/l	0.05	0.1	0.1	0.05-0.1	-
Conductivity	EC	µS/cm	-	<1,000	<1,000	-	-
Total dissolved solids	TDS	mg/l	500	600	600	600	-
Sodium Chloride	NaCl	mg/l	100	300-350	300-350	-	-
pH	pH	-	6.5	8.5	8.5	6.5-8	5-9
Temperature	T	°C	25	35	35	-	-
Hardness	-	mg/l	50	300	300	100-300	-
Turbidity	-	NTU	-	<10	<10	<5	-
Taste and Odour	-	-	-	Acceptable	Acceptable	-	-
Colour	-	TCU	-	5	5	<15	-
Residual Chlorine (if Chlorine disinfection is used)	Cl ₂	mg/l	-	<0.2	<0.2	5	-

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Physical-Chemical Parameters

³ Refer to Guidelines for Drinking-water Quality, WHO 2008

⁴ Refer to National Recommended Water Quality Criteria - Correction, EPA 822-Z-99-001, 1999

Table I.1.3 Health Significant Chemical Parameters

Parameters	Symbol	Unit	Maximum Concentration ¹	CA – Annex C Maximum Concentration ²	WHO ³ (Drinking Water Quality Guideline)	EPA ⁴ (Human Health, Consumption of Water & Organism)
Antimony	Sb ³⁺	mg/l	0.005	0.005	0.02	0.0056
Arsenic	As ³⁺	mg/l	0.01-0.05	0.01-0.05	0.01	0.000018
Barium	Ba ²⁺	mg/l	0.7	0.7	0.7	1.0
Boron	B	mg/l	0.50	0.50	2.4	-
Cadmium	Cd ²⁺	mg/l	0.003	0.003	0.003	0.0088
Chromium	Cr	mg/l	0.05	0.05	0.05	-
Cyanide	CN ⁻	mg/l	0.07	0.07	0.07	0.14
Fluoride	F ⁻	mg/l	1.5	1.5	1.5	-
Lead	Pb	mg/l	0.01	0.01	0.01	-
Mercury	Hg	mg/l	0.001	0.001	0.006	-
Nitrate	NO ₃	mg/l	50	50	50	10
Nitrite	NO ₂	mg/l	3	3	3	-
Selenium	Se	mg/l	0.01	0.01	0.04	0.17

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Health Significant Chemical Parameters

³ Refer to Guidelines for Drinking-Water Quality, WHO 2008

⁴ Refer to National Recommended Water Quality Criteria – Correction, EPA 822-Z-99-001, 1999

Table I.1.4 Priority Parameters

Parameters	Symbol	Unit	Maximum Concentration ¹	CA - Annex C Maximum Concentration ²	WHO ³ (Drinking Water Quality Guideline)	EPA ⁴ (Human Health, Consumption of Water & Organism)
Iron	Fe	mg/l	<1	<1	0.3	0.3
Manganese	Mn	mg/l	<0.5	<0.5	<0.1	0.05
Arsenic	As	mg/l	<0.05	<0.05	0.01	0.000018
Fluoride	F ⁻	mg/l	<1.5	<1.5	1.5	-
Nitrate	NO ₃ ⁻	mg/l	50	50	50	10
Nitrite	NO ₂ ⁻	mg/l	3	3	3	-
Nitrite Nitrogen	NO ₂ -N	mg/l	1	1	-	-
pH	pH	-	6.5-8.5	6.5-8.5	6.5-8	5-9
Coliform	-	MPN/100m l	0	0	-	-
Conductivity	EC	µS/cm	1,000	1000	-	-
Residual Chlorine (if Chlorine disinfection is used)	Cl ₂	mg/l	0.2	0.2	5	-
Total Hardness	-	mg/l	<300	<300	100-300	-
Turbidity	-	NTU	<10	<10	<5	-
Taste and Odour	-	-	Acceptable	Acceptable	-	-

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.8 Drinking Water Quality Standards, Priority Parameters

³ Refer to Guidelines for Drinking-water Quality, WHO 2008

⁴ Refer to National Recommended Water Quality Criteria - Correction, EPA 822-Z-99-001, 1999

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	Standard Value ¹	CA - Annex C Maximum Concentration ²	N.J.A.C. 7:9C Ground Water Quality Standards ³
1	Benzene	mg/l	0.005	0.005	0.0002
2	Carbon Tetrachloride	mg/l	0.005	0.005	0.0004
3	1,2-Dichloroethane	mg/l	0.005	0.005	0.0003
4	1,1-Dichloroethylene	mg/l	0.007	0.007	0.001
5	Cis-1,2-Dichloroethylene	mg/l	0.070	0.070	0.07
6	Trans-1,2-Dichloroethylene	mg/l	0.1	0.1	0.1
7	Dichloromethane	mg/l	0.005	0.005	-
8	Ethylbenzene	mg/l	0.7	0.7	0.7
9	Styrene	mg/l	0.1	0.1	0.1
10	Tetrachloroethylene	mg/l	0.005	0.005	0.0004
11	Toluene	mg/l	1	1	0.6
12	Trichloroethylene	mg/l	0.005	0.005	0.001
13	1,1,1 Trichloroethane	mg/l	0.2	0.2	0.03
14	1,1,2 Trichloroethane	mg/l	0.005	0.005	0.003
15	Total Xylenes	mg/l	10	10	1

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.9 Groundwater Quality Standards

³ Refer to Department of Environmental Protection, New Jersey Administration Code, 2010

Table I.2.2 Heavy Metals

No.	Substances	Unit	Standard Value ¹	CA – Annex C Maximum Concentration ¹	N.J.A.C. 7:9C Ground Water Quality Standards ²
1	Cadmium	mg/l	0.003	0.003	0.004
2	Hexavalent Chromium	mg/l	0.05	0.05	-
3	Copper	mg/l	1	1	1.3
4	Lead	mg/l	0.01	0.01	0.005
5	Manganese	mg/l	0.5	0.5	0.05
6	Nickel	mg/l	0.02	0.02	0.1
7	Zinc	mg/l	5	5	2
8	Arsenic	mg/l	0.01	0.01	0.00002
9	Selenium	mg/l	0.01	0.01	0.04
10	Mercury	mg/l	0.001	0.001	0.002

Source:

- ¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009
- ² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.9 Groundwater Quality Standards
- ³ Refer to Department of Environmental Protection, New Jersey Administration Code, 2010

Table I.2.3 Pesticides

No.	Substances	Unit	Standard Value ¹	CA - Annex C Maximum Concentration ²	N.J.A.C. 7:9C Ground Water Quality Standards ³
1	Chlordane	mg/l	0.0002	0.0002	0.00001
2	Dieldrin	mg/l	0.00003	0.00003	0.000002
3	Heptachlor	mg/l	0.0004	0.0004	0.000008
4	Heptachlor Epoxide	mg/l	0.0002	0.0002	0.000004
5	DDT	mg/l	0.002	0.002	0.0001
6	2,4-D	mg/l	0.03	0.03	0.07
7	Atrazine	mg/l	0.003	0.003	0.003
8	Lindane	mg/l	0.0002	0.0002	-
9	Pentachlorophenol	mg/l	0.001	0.001	0.0003

Source:

- ¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009
- ² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.9 Groundwater Quality Standards
- ³ Refer to Department of Environmental Protection, New Jersey Administration Code, 2010

Table I.2.4 Other Parameters

No.	Substances	Unit	Standard Value ¹	CA - Annex C Maximum Concentration ¹	N.J.A.C. 7:9C Ground Water Quality Standards ²
1	Benzo[a]pyrene	mg/l	0.0002	0.0002	0.00005
2	Cyanide	mg/l	0.2	0.2	0.1
3	Polychlorinated biphenyls	mg/l	0.0005	0.0005	0.00002
4	Vinyl Chloride	mg/l	0.002	0.002	0.00008

Source:

- ¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009
- ² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.9 Groundwater Quality Standards
- ³ Refer to Department of Environmental Protection, New Jersey Administration Code, 2010

I.3 GROUNDWATER QUALITY STANDARDS FOR DRINKING PURPOSES

Lao PDR's current standards for groundwater for drinking purposes are provided below for reference. The values of each parameters of groundwater quality standards similar to the Water Environment Partnership in Asia (WEPA).

Table I.3.1 Physical Parameters

Characteristics	Parameters	Symbol	Unit	Permitted Standard Value ¹		Permitted Standard Value ²		WEPA Standard ³	
				Suitable	Maximum	Suitable	Maximum	Suitable Allowance	Maximum Allowance
Physical	Colour	-	Platinum-Cobalt (Pt-Co)	5	15	5	15	5	15
	Turbidity	-	JTU	5	20	5	20	5	20
	Total solids	TS	mg/l	≤600	1,200	≤600	1,200	≤600	1,200

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.10 Groundwater Standards for Drinking Purposes

³ Refer to Ground water Quality Standards for Drinking Purposes, WEPA, URL: http://www.wepa-db.net/policies/law/thailand/std_gw_for_drinking.htm

Table I.3.2 Chemical Parameters

Characteristics	Parameters	Symbol	Unit	Permitted Standard Value ¹		Permitted Standard Value ²		WEPA Standard ³	
				Suitable	Suitable	Suitable	Maximum	Suitable Allowance	Maximum Allowance
Chemical	Acidity	pH	-	7.0-8.5	6.5-9.2	7.0-8.5	6.5-9.2	6.5-8.5	6.5-9.2
	Iron	Fe(ii), Fe(iii)	mg/l	≤0.5	1	≤0.5	1	≤0.5	1
	Manganese	Mn ²⁺	mg/l	≤0.3	0.5	≤0.3	0.5	≤0.3	0.5
	Copper	Cu ²⁺	mg/l	≤1.0	1.5	≤1.0	1.5	≤1.0	1.5
	Zinc	Zn ²⁺	mg/l	≤5.0	15	≤5.0	15	≤5.0	15.0
	Sulphate	SO ₄ ²⁻	mg/l	≤200	250	≤200	250	≤200	250
	Chloride	Cl ⁻	mg/l	≤250	600	≤250	600	≤250	600
	Fluoride	F ⁻	mg/l	≤0.7	1	≤0.7	1	≤0.7	1.0
	Nitrate	NO ₃ ⁻	mg/l	≤15	45	≤15	45	≤45	45
	Total Hardness as CaCO ₃	Total	mg/l	≤300	500	≤300	500	≤300	500
	Non-carbonate hardness as CaCO ₃	Non CaCO ₃	mg/l	≤200	250	≤200	250	≤200	250
	Arsenic	As ³⁺ , As ⁵⁺	mg/l	None	0.05	None	0.05	None	0.05
	Cyanide	CN ⁻	mg/l	None	0.1	None	0.1	None	0.1
	Lead	Pb ²⁺	mg/l	None	0.05	None	0.05	None	0.05
	Mercury	Hg	mg/l	None	0.001	None	0.001	None	0.001
	Cadmium	Cd ³⁺	mg/l	None	0.01	None	0.01	None	0.01
	Selenium	Se(iv)	mg/l	None	0.01	None	0.01	None	0.01

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.10 Groundwater Standards for Drinking Purposes

³ Refer to Ground water Quality Standards for Drinking Purposes, WEPA, URL: http://www.wepa-db.net/policies/law/thailand/std_gw_for_drinking.htm

Table I.3.3 Bacteria Parameters

Characteristics	Parameters	Symbol	Unit	Permitted Standard Value ¹		Permitted Standard Value ²		WEPA Standard ³	
				Suitable	Maximum	Suitable	Maximum	Suitable Allowance	Maximum Allowance
Bacteria	Coliform bacteria	Coliform	MPN/100 ml	<2.2	<2.2	<2.2	<2.2	<2.2	-
	E. coli bacteria	E. coli	MPN/100 ml	None	None	None	None	None	-
	Standard plate count	-	Colonies/ml	≤500	-	≤500	-	≤500	-

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.10 Groundwater Standards for Drinking Purposes

³ Refer to Ground water Quality Standards for Drinking Purposes, WEPA, URL: http://www.wepa-db.net/policies/law/thailand/std_gw_for_drinking.htm

I.4 AMBIENT SURFACE WATER QUALITY STANDARDS

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 Value ¹	CA – Annex C Standard ²	EPA ³ (Freshwater CCC)
pH		5-9	5-9	6.5-9
Dissolved Oxygen	mg/l	6.0	>6.0	-
BOD ₅	mg/l	1.5	1.5	-
COD	mg/l	5.0	5.0	-
Nitrogen as nitrate (N-NO ₃)	mg/l	<5.0	5.0	-
Nitrogen as ammonia (N-NH ₃)	mg/l	0.2	0.2	-
Sulfate	mg/l	-	500	-
Total coliform bacteria	MPN/ml	5,000	5,000	-
Total faecal coliform	MPN/ml	1,000	1,000	-
Phenols	mg/l	0.005	0.005	-
Arsenic (As)	mg/l	0.01	0.01	0.15
Cadmium (Cd) CaCO ₃ ≤ 100 mg/l	mg/l	0.005	0.005	0.00025
Cadmium (Cd) CaCO ₃ ≥ 100 mg/l	mg/l	-	0.05	-
Chromium (VI) (Cr ⁶⁺)	mg/l	0.05	0.05	0.011
Copper (Cu)	mg/l	0.1	0.1	0.009
Cyanide	mg/l	0.005	0.005	0.0052
Lead (Pb)	mg/l	0.05	0.05	0.0025

Parameters	Units	Standard Value ¹	CA – Annex C Standard ²	EPA ³ (Freshwater CCC)
Mercury (Hg)	mg/l	0.002	0.002	0.00077
Nickel (Ni)	mg/l	0.1	0.1	0.052
Zinc (Zn)	mg/l	1.0	1.0	0.12
Manganese (Mn)	mg/l	1.0	1.0	-
Alpha γ -Radioactivity	Becquerel/l	0.1	0.1	-
Beta γ -Radioactivity	Becquerel/l	1.0	1.0	-
Total Organochlorine	mg/l	0.05	0.05	-
DDT	mg/l	1.0	1.0	0.000001
Alpha-BHC	mg/l	0.02	0.02	-
Dieldrin	mg/l	0.1	0.1	0.000056
Aldrin	mg/l	0.1	0.1	-
Heptachlor and Heptachlor Epoxide	mg/l	0.2	0.2	0.0000038
Endrin	mg/l	None	0	0.000036

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.11 Ambient Surface Water Quality Standards

³ Refer to National Recommended Water Quality Criteria – Correction, EPA 822-Z-99-001, 1999

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	Maximum Concentration ¹	Guideline Value ²	CA - Annex C Guidelines ³	Maximum Permission Limits ⁴
pH	-	6-9.5	6-9	6-9	6-8
Biochemical Oxygen Demand - BOD	mg/l	40	30	30	50
Chemical Oxygen Demand - COD	mg/l	-	125	125	100
Total suspended solids	mg/l	40	50	50	100
Oils and grease	mg/l	5	10	10	10
Phenol	mg/l	0.3	-	0.5	0.2
Cyanide	mg/l	0.1	-	0.1	0.1
Ammonia -N	mg/l	4	-	10	10
Total Nitrogen	mg/l	-	10	10	10
Total phosphorus	mg/l	-	2	2	10
Residual chlorine	mg/l	1.0	-	0.2	1.0

Parameters	Units	Maximum Concentration ¹	Guideline Value ²	CA - Annex C Guidelines ³	Maximum Permission Limits ⁴
Total coliforms	MPN/100ml	-	400	<400	-
Temperature increase	°C	-	-	<3	-
Arsenic	mg/l	0.25	-	0.1	0.2
Cadmium	mg/l	0.03	-	0.05	0.1
Chromium	mg/l	0.1	-	0.1	1.0
Copper	mg/l	0.5	-	0.3	1.0
Fluoride	mg/l	15	-	20	-
Iron	mg/l	2.0	-	2	10
Lead	mg/l	0.2	-	0.2	0.1
Mercury	mg/l	0.005	-	0.002	0.001
Nickel	mg/l	0.2	-	0.5	1.0
Selenium	mg/l	-	-	0.1	1.0
Silver	mg/l	0.1	-	0.5	0.5
Sulfides	mg/l	1.0	-	1	1.0
Zinc	mg/l	1.0	-	0.5	5
Total Toxic metals	mg/l	-	-	5-10	-

Source:

¹ Refer to Agreement on the National Environmental Standard, Lao PDR 2009

² Refer to IFC's General EHS Guideline: Environmental, 2007

³ Refer to Concession Agreement - Annex C - Appendix 2 Standard, 1.13 Effluent Standards

⁴ Refer to The National Environment (Standards For Discharge of Effluent into Water or on Land) Regulations, 1999

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) ¹			WHO Guideline ² in dB(A) (Specific Environments)	
	6.00-18.00	18.00-22.00	22.00-6.00	Indoor	Outdoor
Quiet areas: hospitals, libraries, treatment places, kindergarten and schools	50	45	40	#1- 35	55
Residential areas: hotels and houses	55	55	45	30-35	45
Commercial and service areas	70	70	50	70-85	70-85
Small industrial factories located in residential areas	70	70	50	70	70

Source:

¹ Refer to Agreement on the National Environmental Standards of Lao PDR, 2009

² Refer to Guidelines for Community Noise of WHO, 1999

Note: #1 = As low as possible

I.7 AIR QUALITY 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 ¹ : mg/m ³					Method of Measurement	WHO Guideline ² µg/m ³	NAAQ ³ (USEPA) µg/m ³
		Hour			1 month	1 year			
		1 hr	8 hr	24 hr					
Carbon monoxide	CO	30	10.26	-	-	-	Non dispersive infrared detection	-	0.2 ^b
Nitrogen dioxide	NO ₂	0.32	-	-	-	-	Chemiluminescence method	40 ^a	100 ^a
Sulphur dioxide	SO ₂	0.78	-	0.30	-	0.10	UV Fluorescence (1hr, 24hr, 1yr) or Pararosaniline (1hr, 4hr)	20 ^c	50 ^a
Total suspended Particulate	TSP	-	-	0.12	-	0.05	Gravimetric	100 ²	NA ^c
Particulate Matter less than 10 microns	PM-10	-	-	0.12	-	0.05	Gravimetric or Beta Ray or Taper Element Oscillating Microbalance or Dichotomous	50 ^c	100 ^c
Ozone	O ₃	0.20	-	-	-	-	Chemiluminescence or UV Absorption Phoptometry	100 ^b	100 ^b
Lead	Pb	-	-	-	1.5	-	Atomic Absorption Spectrometer	-	0.5 ^a

Source:

¹ Refer to Agreement on the National Environmental Standards of Lao PDR, 2009

² Refer to WHO: Air Quality Guideline, 2005

³ Refer to NAAQS, 2009

Note: a Annual mean
b 8-hr mean
c 24-hr average

I.8 VIBRATION STANDARDS

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

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