

**Site Specific Environmental and Social Management Plan  
(SSE & SMP)**

**Site No. 04  
Pahiyangala Temple  
Kalutara District - Package 8  
October 2018**

**Prepared for:**

**Sri Lanka Landslide Mitigation Project  
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**Prepared by:**

**Environmental Studies and Services Division  
National Building Research Organization  
99/1, Jawatta Rd  
Colombo 05**



*Tel: 011-2588946, 011-2503431, 011-22500354*



## Table of Contents

1. Introduction.....	1
2. Location details and site description.....	1
3. Landslide hazard incident details.....	2
4. Description of any remedial measures already undertaken to reduce the potential risk.....	4
5. Description of the area of the landslide, areas adjacent to the landslide and current level of risk .....	4
6. Brief description on the surrounding environment with special reference to sensitive elements that may be affected by the project actions.....	5
7. The works envisaged under the project.....	5
8. Identification of social and environmental impacts and risks related to the works .....	5
8.1 Positive impacts .....	5
8.2 Negative impacts .....	6
8.2.1 Loosing access to land and future development activities .....	6
8.2.2 Ecological, biological impacts, and fauna and flora .....	7
8.2.3 Impact on the drainage pattern of the area .....	7
8.2.4 Erosional impacts and stream bed alterations .....	7
8.2.5 Water pollution impacts from construction activities .....	7
8.2.6 Open defecation and waterborne infections spread during construction phase .....	7
8.2.7 Impacts on the downstream water uses .....	7
8.2.8 Solid waste disposal issues .....	7
8.2.9 Air pollution impacts.....	7
8.2.10 Noise pollution, vibration, blasting, impacts during construction, potential damage to buildings, infrastructure .....	8
8.2.11 Relations between workers and the people living in the vicinity of the site and possibility of disputes .....	8
8.2.12 Work camps and lay-down sites requirement .....	8
8.2.13 Risks of public accessing the site during construction.....	8
8.2.14 Explosive hazards and hazardous materials .....	8
8.2.15 Safety to the public from construction activities: High risk for commuters .....	8
8.2.16 Workers safety during construction .....	8
8.2.17. Damage to archeological sites (prehistoric /historical) and artifacts .....	8
8.2.18 Misconduct of the workforce .....	9
9. Public and Stakeholder Consultations - that have been held and/or will be held.....	9
9.1 Stakeholders involved in the consultations; recommendations or agreements reached in the consultations .....	9
10. Significant Environmental and Social Impacts: Social or Environmental impacts or risks that will require special measures on the part of NBRO.....	9
10.1 Impacts on water or wetlands (issues relating to changes or contamination of streams, rivers and other bodies of water, typically downstream from the site):Long-term impacts and potential impacts and risks during construction/remediation of the landslide site .....	9

10.2 Erosional impacts and stream bed alterations.....	9
10.3 Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion).....	9
10.4 Impacts on downstream service provision (water supply, sewerage, electricity, etc.) .....	9
10.5 Ecological, biological impacts, and fauna and flora.....	9
10.6 Impact on the drainage pattern of the area.....	9
10.7 Open defecation and waterborne infections spread during construction phase.....	10
10.8. Solid waste disposal and contamination of water.....	10
10.9 Households living in high-risk or medium-risk areas adjacent or near to the site (up-slope, down-slope, downstream, etc.).....	10
10.10 Areas used for businesses, agriculture or other within the area to be remediated .....	10
10.11 Areas used for businesses, agriculture or other immediately to the site.....	10
10.12 Need for people to enter or cross the site.....	10
10.13 Priority Health and Safety Issues -Specific H&S concerns that require measures that go beyond the standard contractual requirements for contractors.....	10
10.14 Child labour & forced labour.....	10
11. Clearances, no objection, consent and approvals required for the implementation of the project.....	10
11.1 Project implementation.....	10
11.2 Approval to implement the project in the specified site .....	11
11.3Approval from Central Environmental Authority, Department of Forest, Department of Wildlife Conservation.....	11
11.4 Other approvals.....	11
11.5 Consent/ no objection/ legally bound agreement from the private land ownerships.....	11
12. Environmental Social Management Plan (ESMP).....	12
12.1 Resettlement action plan.....	12
12.2 Evacuation of people: arrangements to move people from the site or areas immediately adjacent to the site, or from high-risk areas up-slope/down-slope or downstream from the site .....	12
12.3 Procedure for removal of damaged structures, facilities infrastructure.....	12
12.4 Requirement for compensation for loss of property /uses due to project actions.....	12
12.5 Public awareness and education- needed for following areas .....	12
12.6 Design based environmental/ social management considerations .....	12
12.7 Mitigation of impacts during the construction phase.....	13
12.7.1 Construction contractors' requirement to comply with environmental and social management during the construction phase.....	13
12.7.2 Site specific mitigation.....	14
13. Monitoring requirements specific to the site.....	17
14. Grievance redress mechanism for this site.....	18
15. Information disclosure .....	18

## **List of Annexures**

Annexure I: Drone image of the project area .....	i
Annexure II: Images of the site condition and consultation.....	ii
Annexure III: Report on the Stakeholder Consultation: Kalutara District .....	iii
Annexure IV: Study team.....	iv
Annexure V: List of references .....	iv

## **List of Figures**

Fig 1: Google image of the proposed landslide mitigation site .....	2
Fig 2a: Sloping area in front of the cave potential landslide area .....	3
Fig 2b: Separation between newly constructed concrete steps and the wall.....	3
Fig 2c: Tension cracks appeared in the wall of the shrine room.....	3
Fig 2d: Tension cracks appeared in front of the shrine room .....	3
Fig 2e: Front view of Pahiyangala temple .....	3
Fig 2f: Pahiyangala rock cave .....	3
Fig 3: Diagrammatic interpretation of affected slope area and buildings due to ground movement .....	4

## **List of Tables**

Table 1: The tentative timeline for getting approvals .....	11
Table 2: Design stage Environmental & Social considerations .....	12
Table 3: Contractor requirement to comply with ES & HS .....	14
Table 4: Site specific ES & HS migratory measures .....	14
Table 5: Environmental and Social monitoring plan; construction phase .....	17
Table 6: Proposed scheme of information disclosure .....	18
Table 7: Level of information gathered through consulting institutions.....	18

## **Abbreviations**

AIIB	Asian Infrastructure Investment Bank
CEA	Central Environmental Authority
DFC	Department of Forest Conservation
DS	Divisional Secretary
DWLC	Department of Wild Life Conservation
EH & S	Environmental Health & Social
E&SU of PMU	Environmental & Social Unit of Project Management Unit
E & S & H & S unit of PMU	Environmental & Social & Health & Safety Unit of Project Management Unit
ESMF	Environmental and Social Management Framework
ESMP	Environmental Social Management Plan
SSE&SMP	Site Specific Environmental and Social Management Plan
GN	Grama Niladhari
GOSL	Government of Sri Lanka
GSMB	Geological & Mines Bureau
NBRO	National Building Research Organization
RDA	Road Development Authority
SSE & SMP	Site Specific Environmental and Social Management Plan

## 1. Introduction

The government of Sri Lanka intends obtaining a loan from the Asian Infrastructure Investment Bank (AIIB) for mitigating/rectifying unstable slopes in high risk areas especially in 11 districts of 06 provinces of the country. The project requires to be implemented in accordance with environmental and social safeguards and mandates of the AIIB and that of Sri Lanka. Considering the nature of project actions and its implementation, an environmental and social management framework has been (ESMF) prepared as required by the AIIB environmental and social safeguard policy.

The purpose of the environmental and social management framework (ESMF) is to provide a guide for application of AIIB safeguards and national environmental and social mandates during the implementation of project actions. The project implementing agency; National Building Research Organization (NBRO) is expected to ensure implementation of environmental and social management plans prepared under the ESMF during all phases of project implementation so that the impacts on the environment and community are minimum.

During the scoping exercise it was revealed that the environmental & social setting, and health & safety conditions are more site specific, and require to be addressed specific to site conditions. Therefore, the ESMF has recommended a site specific environmental and social assessments followed by Site Specific Environmental and Social Management Plans (SSE & SMP) for each site. The SSE & SMP gives planning, design, construction and operation phase environmental, social, and health & safety management measures to be considered in the project implementation.

**This is the site specific environmental and social management plan for Pahiyangala temple landslide mitigation site. The plan has been prepared by an in-depth environmental and social assessment to;**

- i. Identify sensitive environmental and social elements in the project influence area
- ii. Identify significant environmental and social impacts due to project actions
- iii. Propose mitigation measures
- iv. Decide appropriate environmental and social monitoring requirements specific to this project
- v. Study relevant environmental regulation and procedures to be followed during project implementation specific to the site

## 2. Location details and site description

Site reference: Site No.4, Package-8 Kalutara District, Landslide near Pahiyangala temple

Site Details

- i. The site falls administratively under Niggaha Grama Niladhari Division (GN Division) of Bulathsinhala Divisional Secretariat Division (DS Division), Kalutara District of Western Province.
- ii. The nearest town to the site is Bulathsinghala, about 5.4km from the site.
- iii. The GPS Coordinate of the location is 6.648681N and 80.216487 E Ref. Fig 1.Google Map of the location.
- iv. The unstable slope section is located in front of prehistoric Pahiyangala cave
- v. The land belongs to the Pahiyangala temple and the area of the cave belongs to Archeological Department



Fig 1: Google image of the proposed landslide mitigation site. Ref. Drone image for details-Annex 1

### 3. Landslide hazard incident details

A large scale landslide had occurred on 26.05.2017 at the Pahiyangala kanda to the West of prehistoric cave site (42, 000 years old) and the historical Pahiyangala temple site (300-400 years). The landslide had resulted a complete damage to houses on the down slope, loss of life to occupants while damming a stream to cause temporary flooding. Also, the incident had resulted a tension cracks at the prehistoric cave and temple sites.

#### The damages occurred due to incident

The landslide had completely damaged 7 houses located down slope of the mountain with their property leading to 23 death of occupants. At the event, the debris from the collapsed mountain had moved down and dammed the “Nagaha Dola River” causing temporary flooding in the upstream. The floods had caused 17 houses to damage completely, however had not caused any casualties. NBRO had investigated the site, and monks residing in the Pahiyangala Temple (located down slope) were evacuated upon the site being declared as high landslide hazard risk. A large tension crack has appeared on the historic temple site located east to the landslide while causing cracks on the wall, floor and stairways. However, there was no damage to prehistoric caves, the burial site or to the statues of the historic temple.



Fig 2a: Landslide area of the Pahiyangala kanda



Fig 2b: Separation between newly constructed concrete steps and the wall of stairway to prehistoric caves and the historical temple



Fig 2c. Tension cracks appeared in the shrine room of the historical Pahiyangala temple

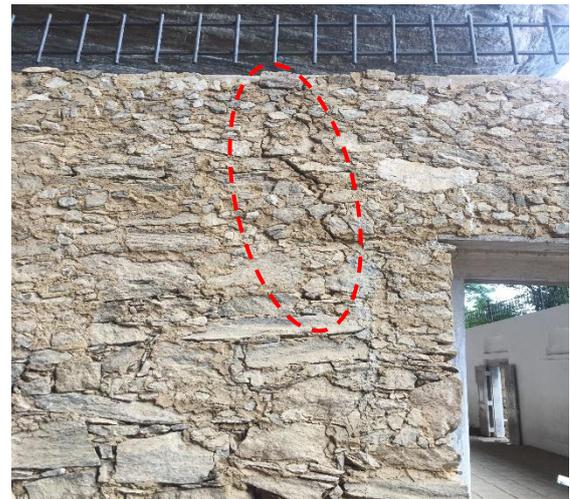


Fig 2d: Cracks appeared in the wall of the shrine room of the historic Pahiyangala temple



Fig 2e: Front view of Pahiyangala temple built in 1983 at the downslope area



Fig 2f: Interior view of Pahiyangala prehistoric rock cave

Fig 2: Images of the project area

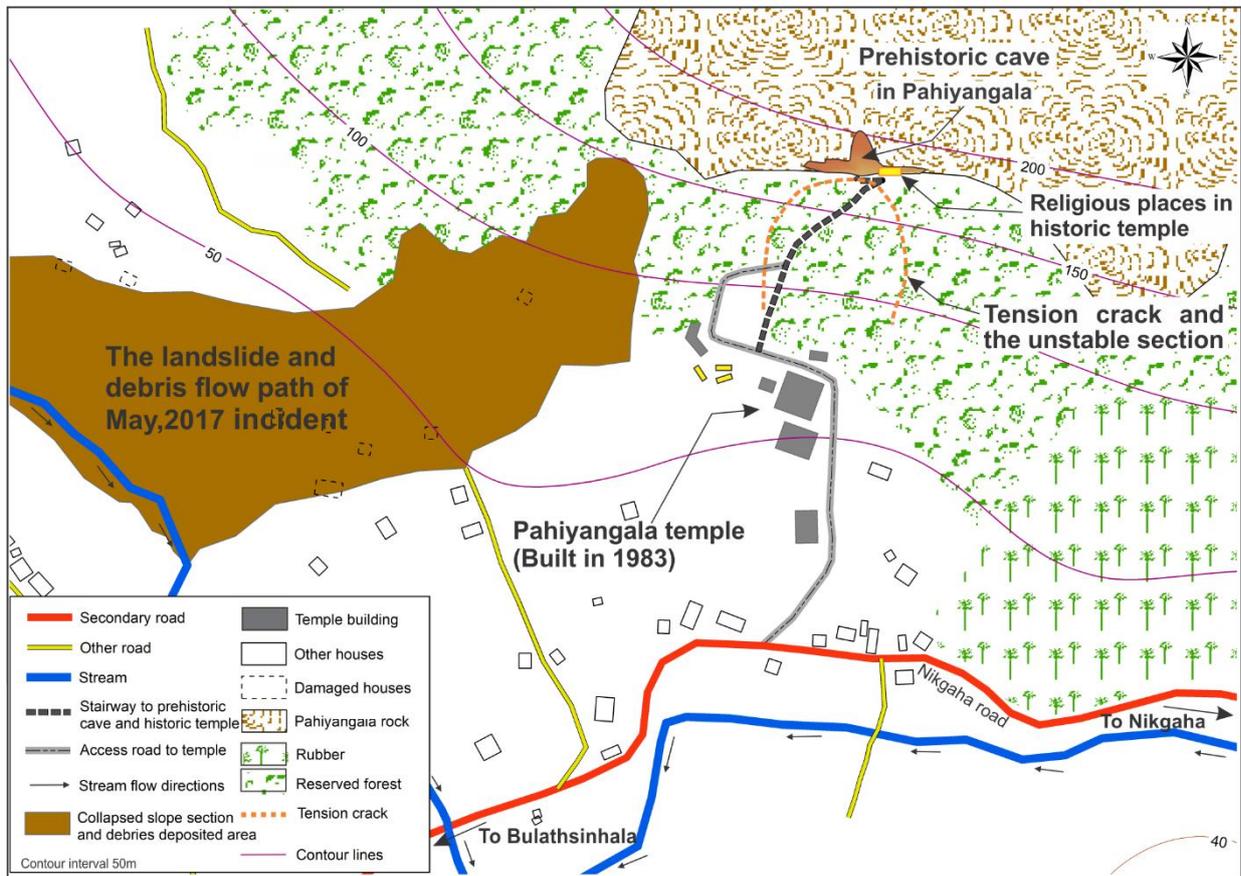


Fig3: Diagrammatic interpretation of landslide and surrounding buildings

#### 4. Description of any remedial measures already undertaken to reduce the potential risk

The slide had completely smashed the houses and occupants down slope. The incident had created a new tension crack to the East of the failed slope while threatening the Pahiyangala temple buildings downslope and the resident monks. The monks residing in the Pahiyangala temple (which was built in 1983) situated below the new tension crack area were evacuated.

As this is a large tension crack threatening the prehistoric cave sites and the historical temple sites, Prof. P.B.Mandawala, Director General, Department of Archaeology, requested National Building Research Organisation to carry out a detailed geotechnical investigation to assess the risk and to propose mitigation measures to stabilize the unstable slope adjoining prehistoric Pahiyangala cave. In response to the request, NBRO conducted an initial investigation at the site on 14<sup>th</sup> June 2017 and 19<sup>th</sup> June 2017 and submitted an investigation report including a proposed mitigation design. According to geological and geomorphological description, the site is sloping towards the South -Western direction with an average slope ranging from 20° to 30°. There is a large tension crack in the pre historic cave sites and on the historic temple site area. According to the geotechnical investigations of NBRO the location is on “creep” movement. Removing of additional weight on the slope exerted by the deposited soils in the crown of the slope had been proposed as an immediate measure in addition to surface and subsurface drainage improvement and other stabilization measures. At present the proposal awaits funding while an automated rain gauge station has been installed to issue site specific rainfall based landslide early warning alarms.

#### Evacuations:

The monks in the downhill Temple (built in nineties) were evacuated immediately following the incident, but had returned later.

#### 5. Description of the area of the landslide, areas adjacent to the landslide and current level of risk

The area where the landslide had occurred was a prehistoric cave site and a historic temple site of Pahiyangala kanda, which is a large rock outcrop in a mountainous terrain. The outcropped rock had turned into a natural rock cave which had made shelter for prehistoric Balangoda man who had lived in the area some 38,000-42,000 year ago, according to proven prehistoric archeology. Some parts of the cave were

later turned into a Buddhist temple of about 250-300 years old. To down slope of these, there is the Pahiyangala temple and the Buddhist education center. This temple is located in a monastic environment in a forest reserve. Currently, about 70 monks are residing in the temple following Buddhist education in a Pirivena (educate centre for Buddhist monks). There is a large forest reserve and pockets of settlements in the down slope area. The settlements affected by landslide in the Niggaha GN was one such pocket located bellow the Pahiyangala Kanda.

The tension cracks and associated cracks in the structures are visible in the area between dry rubble wall and the shrine room of the historic temple situated inside the massive cave. Further, a separation between newly constructed concrete steps of the stairways and the wall can be observed. The potential failure has made following elements at high risk of future failure.

- i. Some parts of the prehistoric cave site, archeological ruins, deposits
- ii. Historical temple and statues
- iii. Access stairway ( the only access)
- iv. Pahiyangala Temple ( built in 1983) located straight down slope of the tension crack
- v. The monks, the Buddhist education facilities and services offered by the temple

## **6. Brief description on the surrounding environment with special reference to sensitive elements that may be affected by the project actions**

As explained earlier, the proposed landslide mitigation site is located in an area with steep mountain slopes. A Buddhist temple with high historic significance is located adjacent to the site.

The elements at risk during project actions;

- i. Some parts of the prehistoric cave site and archeological ruins
- ii. Historical temple , statues and other archeological ruins
- iii. Access stairways
- iv. Pahiyangala Temple (built in 1983) located straight down slope of the tension crack
- v. The monks, Buddhist education facilities and services offered by the temple and the devotees

## **7. The works envisaged under the project**

The landslide site which is located west of the prehistoric cave will not be considered for mitigation because the incident and the debris flow had completely destroyed the settlements downslope. But the proposed mitigation will be concentrated on the potential landslide area (the tension crack and unstable downslope) of the prehistoric cave. The proposed mitigation works will be highly design exclusive as the slope instability conditions are very much complex and specific to the site. They will include surface and sub-surface drainage improvement to unstable slope sections, lowering the existing ground water table to reduce the pore water pressure along the slip plane and soil nailing to improve the strength of unstable soil masses.

## **8. Identification of social and environmental impacts and risks related to the works**

### **8.1 Positive impacts**

The environmental and social investigation at this site revealed its significance of the site as one of the unique archaeological treasure that Sri Lanka and the world inherit. Therefore a detailed account on the archaeological, cultural and historical importance of the site was included in this report under following sections.

#### ***Archeological value***

Fa-Hsiengala, the rock cave temple, commonly known as Pahiyangala temple, has both documented and legendary history. The name Pahiyangala to the site has gained from a Chinese traveler monk (Fashien) who had been voyaging through Silk Road in search of pure Buddhism during the 5<sup>th</sup> century. The inscription of the Chinese monk Fa-Hsien, available in China, gives eyewitness information on 5<sup>th</sup> Century Ceylon. The monk had stayed in Anuradhapura for a period of 2 years learning Theravada Buddhism and gathering Buddhist literature to take back to China. According to the annotated information the monk had made a pilgrimage to worship sacred foot print of Lord Buddha at Sri Pada (now Adam's Peak). On his pilgrimage he had found shelter at this cave. According to the resident Buddhist priest of Pahiyangala temple (Ven. Pahiangala Chandima) the information reveals that the Chinese monk had been living in the cave for some period meditating and practicing Buddhism. People then had visited the monk with food and

other needs and later the cave was identified in monk's name. The Pahiyangala was also the site of a remarkable archeological discovery that dug up human skulls dating back about 38,000 years, it possessed remains of one of the region's oldest prehistoric settlements. The archeological explorations in 1986 and 2009, found that the cave was the prehistoric site for Balangoda man (who was a hunter gather) who lived some 38,000 -40,000 years ago, from this site a full skeleton of the Balangoda man (*Homo sapiens balangodensis*), their burial grounds, stone and bone artifacts, food remains, costume artifacts etc. were discovered. The natural cave formation of Pahiyangala reveals that it is the largest cave in the island and one of the largest rock formation in all of Asia. Further, the soil deposits in the cave resembles millions of years sedimentary history of the deposits.

### ***Historical Buddhist temple***

East side of the cave is a historical temple for Buddhists built by a religious devotee named "Ganinnanase Porogama" about 300-400 years ago. The temple was improved by several priest time to time. There is a 40 feet long reclining Buddha statue, a shrine room, and statues of gods etc. in the temple. The Buddha statue is the second largest reclining Buddha statue in Sri Lanka. The temple has paintings drawn during the Mahanuvara kingdom time.

### ***Pahiyangala Temple***

In 1983, a Buddhist religious facility with an education center for monks were established in the down slope area in the forested landscape ideal for Buddhist education. Currently, about 60-70 monks obtain education residing at this place. The temple belongs to Kandy-Malwathu chapter. About 700 devotees are associated with the temple for a wide range of religious, cultural and social activities. They include serving dana (regular offering of food other needs) to the temple, Katina pooja, sermons and other activities.

### ***Unique aesthetic beauty, scenic value and environmental significance***

A footpath at the side of the cave has the most fascinating sight; a natural pond which never goes dry. The forest reservation on crown area is the Pahiyangala Forest Reservation which contains large span of sub montane and montane forests. It consists ample of naturally grown forest trees, shrubs and herbs, flowers including endemic species.

### ***Scientific (anthropology), tourism importance***

Due to the sites significance largely as the pre historic archaeology, it has become a research and exploration site for anthropological research. Anthropologists worldwide visit the site for wide range of scientific exploration and explorative interests. Also, the site is an attraction for foreign and largely local tourists. Due to the sites connection with Chinese monk Fashein, it is visited by substantial number of Chinese tourists who visit Sri Lanka.

The above account on the site's significance portrays the importance of proposed landslide mitigation measures at this site. Implementations of structural mitigation measures are crucial to reduce critical landslide risk associated with archeological, religious, environmental and spiritual values at this site. The initiative will have a great positive impacts to safeguard all above invaluable assets and treasures unique to the site.

## **8.2 Negative impacts**

The mitigation works are generally confined to an area of slope section. Therefore, direct negative impacts are confined to the area treated and limited mostly to construction phase. However, as the site has very strong archaeological sensitively, possible indirect impact are highly significant.

### **8.2.1 Loosing access to land and future development activities**

The land where the project activities are envisaged belongs to the temple and the area of the caves are under Department of Archaeology. During the construction phase access to the archaeological site (caves), shrine room will be obstructed as the proposed mitigation structures will be exclusive to comparatively high magnitude potential landslide. There will be structures extending to relatively large spans of land. The project will not result loss to land ownership of temple, neither the project will require removal of the buildings. However, the priests/devotees/tourists and other may require to discontinue the visits to the cave and the temple temporarily during the construction phase as potential risk of failure will be high during the

construction phase. The construction activities will not require removal of telephone lines and electricity line etc.

### **8.2.2 Ecological, biological impacts, and fauna and flora**

The forest reservation on crown area is the Pahiyangala Forest Reservation which contains large span of sub montane and montane forests. Compared to the extent of forest the direct impacts on the forest reserve is highly localized and will not cause significant impacts. However, following impacts to forest ecology and wildlife can happen during construction phase.

- There is a tendency that contractor labor force may engage in hunting and poaching wildlife or may collect of protected forest specimens (plants and animals). Such acts are prohibited under the Fauna and Flora Protection Ordinance and may damage the resource hence impacts are significant.
- The contractor may cut and use forest trees for temporary structures for construction works and may damage the resource hence impacts are significant.
- Contractor labour force may set fire (intentionally or unintentionally) to the forest. During dry season this may initiate forest fires and damage the forest resource, hence impacts are significant.

### **8.2.3 Impact on the drainage pattern of the area**

The mitigation measures include improvement to drainage in a relatively a large area, it lowers the ground water table. A significant lowering of ground -water table may dry out the springs. The impacts however will be localized and confined to the area. Currently, the spring water in the mountain is used by the temple for drinking and other purposes. Lowering water table by drainage improvement may dry these springs causing water stress to the temple and the neighbors. Hence, impacts on drainage is locally significant.

### **8.2.4 Erosional impacts and stream bed alterations**

The project activities will open the slope for surface erosion during the construction phase. During heavy rains which is common in the monsoons periods may generate sediment laden runoff. The runoff with sediments may flow down and deposit in down slope areas where temple facilities are present. Therefore, the impacts are significant.

### **8.2.5 Water pollution impacts from construction activities**

As there are no water streams immediate to the site the sediment laden runoff will not directly enter the natural water courses. Hence the effect on water pollution is not significant.

### **8.2.6 Open defecation and waterborne infections spread during construction phase**

The site is located in forested area with large extent of remote places. Hence, labour force may use these areas for open defecation if on-site sanitary facilities are not made available.

### **8.2.7 Impacts on the downstream water uses**

Since there are no water stream closes to the site impact will be insignificant.

### **8.2.8 Solid waste disposal issues**

Haphazard disposal of Solid waste; various types of waste such as litter, food waste, construction waste will be generated and may store or dispose on site. The littering and hap hazard storage and disposal of solid waste in and around the temple will create inconveniences to the priest, devotees, and students of Sunday school etc. Waste can pollute the soil, and leave various environmental impacts if proper disposal mechanism is not in place during the construction period. Therefore, **environmental impacts of poor management of solid waste in this site is highly significant.**

### **8.2.9 Air pollution impacts**

Construction activities that contribute to air pollution include: land clearing, operation of diesel engines, demolition, burning, from storage, transportation disposal of construction materials, construction waste and working with toxic materials (blasting chemicals). During construction, it generates high levels of dust

typically from concrete, cement, wood, stone, and silica. The effect will have locally significant impacts on the devotees, the priests and visitors etc.

#### **8.2.10 Noise pollution, vibration, blasting, impacts during construction, potential damage to buildings, infrastructure**

Noise and vibration is expected from construction equipment. Noise impact is significant as the construction is carried in the proximity of the temple. The noise generated from the machinery will disturb the religious activities in the temple. **Hence the impacts of noise is considered significant at this site**

If heavy machinery is operated the vibration can affect the buildings of the historic temple. As a result structural deformations such as cracks and collapse of walls etc. may happen. **Hence vibration impacts at this site is considered significant.**

#### **8.2.11 Relations between workers and the people living in the vicinity of the site and possibility of disputes**

There may be disputes of the workers of the construction site with the devotees, priests, security staff of the Archaeological Department, villages etc.

#### **8.2.12 Work camps and lay-down sites requirement**

The work camps will be established closer to the site. Often the contractor rent out houses in the proximity. The camps sites will be selected in the neighbourhood of community. If proper camp management is not in place it may result several labour issues, social issues with community, conflicts for shared resources with the community, nuisances, and management of waste etc.

If temporary camps are built in the close proximity of the site, management of solid waste and sewerage will be an issue. Therefore, **the risks are locally significant.**

#### **8.2.13 Risks of public accessing the site during construction**

The site may have machinery with high hazard risk such as drilling, boring and excavation machines etc. Only skilled workforce will be safe working in this environment. If unauthorized persons access the site there may be a risk of being subjected to accidents by the heavy machinery.

#### **8.2.14 Explosive hazards and hazardous materials**

Explosives may be used to blast the boulders. This may pose risk due to unsafe use. As these operations are to be done on unstable slopes the risk of improper use of explosive and accidents from rock fragment are highly significant.

#### **8.2.15 Safety to the public from construction activities: High risk for commuters**

As the site is located away from a public road, the risk on commuters will be very much low. The temple is a public place where devotees from different ages and backgrounds with poor knowledge on construction risk may participate in various religious activities. The unsafe electrical connections, machinery operations etc may pose a risk on the public. Hence the impacts on public safety during construction phase is significant if the worshiping of the temple is not stopped temporarily.

#### **8.2.16 Workers safety during construction**

The construction machinery may require to be lifted to an upslope area through a relatively steep terrain along the stairways. Risk of hazard from construction machinery accidents is significant as workers have climb and move the machinery on steep stairways. As the site is located in an area with high unemployment and poverty, under age workers (children) may engage in construction work, which is risky, can lead to serious accidents and injuries.

#### **8.2.17. Damage to archaeological sites (prehistoric /historical) and artifacts**

The construction work may intentionally or unintentionally damage the archeological ruins in the site. According the Department of Archeology the site has not been fully explored. Hence, may have unexplored ruins buried in deposited sediments. During construction work some of these may be damaged. The

workforce may damage the site and the ruins due to ignorance, carelessness or intentionally for various reasons. **Therefore, damage to historical sites and archeological ruins are highly significant at this site.**

### **8.2.18 Misconduct of the workforce**

Workers misconduct may be significant at this site. There can be workers indiscipline acts at this site; alcohol, drugs, stealing artifacts, treasure hunting, disputes etc.

## **9. Public and Stakeholder Consultations - that have been held and/or will be held**

Rev. Pahiyangala Chandima thero of Pahiyangala temple was consulted during site visits. The priest, was made aware of the project, the current level of risk, the intended mitigation, the funding mechanism and requirement to use the lands for access the site to move construction machinery and to carry out mitigation works, project benefits, both negative and positive environmental and social impacts etc. The priest stated the archaeological value of the cave and priest expressed his emotional distress living under risk of landslide.

The priest was more than willing to accommodate the project, and agreed to provide facilities and lands in the temple premises for construction activities.

### **9.1 Stakeholders involved in the consultations; recommendations or agreements reached in the consultations. (Ref: Annexure II- Images of consultation)**

## **10. Significant Environmental and Social Impacts: Social or Environmental impacts or risks that will require special measures on the part of NBRO**

### **10.1 Impacts on water or wetlands (issues relating to changes or contamination of streams, rivers and other bodies of water, typically downstream from the site): Long-term impacts and potential impacts and risks during construction/remediation of the landslide site**

Improper disposal of oils and other harmful substances/contaminants from machineries, leakages from temporary storage tanks, solid waste and wastewater disposal/dumping from workers sites could occur causing adverse impacts on the environment. Since there is no water stream nearby the impacts will be localized and insignificant.

### **10.2 Erosional impacts and stream bed alterations**

Erosional impacts on the upslope area is high if the work envisaged during rainy weather periods. The water with high suspended solids may flow down and deposit area where temple facilities are located.

### **10.3 Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion)**

As the site is very much interior from the road full or partial road closure will not be required. However, moving machinery will be a nuisance to pedestrians and commuters.

### **10.4 Impacts on downstream service provision (water supply, sewerage, electricity, etc.)**

Since there is no water stream nearby the impacts will be localized and insignificant.

### **10.5 Ecological, biological impacts, and fauna and flora**

Following impacts to forest ecology and wildlife can happen during construction phase

- i. Hunting and poaching of wildlife or may collect of protected forest specimens (plants and animals).
- ii. Carelessly or intentional removal of valuable timber species in the forest area or clear large patches of forest
- iii. Cutting and use forest trees for temporary structures for construction works
- iv. Set fire (intentionally or unintentionally) to the forest during dry season to initiate forest fires

### **10.6 Impact on the drainage pattern of the area**

If the mitigation measures include improvement to drainage in a relatively a large area, it lowers the ground water table. The spring water in the mountain is used mainly by the temple in the downslope area may dry out due to lowering of water table by drainage improvement causing water stress to the temple.

#### **10.7 Open defecation and waterborne infections spread during construction phase**

Open defecation by the workforce, possibility of fecal contamination of water and spread of water borne infections.

#### **10.8. Solid waste disposal and contamination of water**

Haphazard disposal of Solid waste can become a nuisance, can pollute the runoff and leave various environmental impacts if proper disposal mechanism is not in place during the construction period. The effect is significant unless a proper solid waste disposal mechanism is used during the construction period.

#### **10.9 Households living in high-risk or medium-risk areas adjacent or near to the site (up-slope, down-slope, downstream, etc.)**

There are no houses living nearby demarcated as high risk near to the site (upslope, downslope). The Pahiyangala temple building located just downslope of tension crack is demarcated as high risk.

#### **10.10 Areas used for businesses, agriculture or other within the area to be remediated**

There are no areas used for business, specific agriculture practices or other immediately adjacent to the site hence has no significant impact.

#### **10.11 Areas used for businesses, agriculture or other immediately to the site**

The site has multiple uses as mentioned earlier, the religious functions, archaeological and anthropogenic explorations, tourism (foreign and local) etc will be affected during the project period.

#### **10.12 Need for people to enter or cross the site**

The site if left open for public may pose a risk on people as entry of ordinary people may occur due to intentional or unintentional purposes, they may be at risk due to operating machinery, and vehicles, electricity, and may be blasting materials.

#### **10.13 Priority Health and Safety Issues -Specific H&S concerns that require measures that go beyond the standard contractual requirements for contractors**

Workforce is exposed to following high hazard risk

- i. Snake bites inside the forest area
- ii. Risk of hazard from construction machinery, unsafe electrical wires etc.
- iii. Risk from slope instability
- iv. Falling hazard

#### **10.14 Child labour & forced labour**

Child labor & Forced labor is detailed under 2003.3 under section 2003: Working conditions and community health and safety in the Bidding document.

### **11. Clearances, no objection, consent and approvals required for the implementation of the project**

#### **11.1 Project implementation**

- i. Approval from the District Secretariat

The approvals will require to be obtained from the District secretary for the implementation of project where the proposals need to be presented at the district coordinating committee, to which chief minister and stakeholder agencies in the district will also participate. The Officer of PMU will present the project, disclose the project details and various concerns including environmental and social. This issues will be discussed, the recommendation at this meeting will be considered in the implementation of the ESMP.

- ii. Approval from the planning committee

The project will obtain the approval from the planning committee of the Bulathsinghala Pradeshiya Sabha.

### 11.2 Approval to implement the project in the specified site

- i. Approvals from regional office of Ceylon electricity board will be required for power supply for site operation.
- ii. Approval from Chief incumbent of the temple

### 11.3 Approval from Central Environmental Authority, Department of Forest, Department of Wildlife Conservation

According to the Central Environmental Authority, the area is not covered under a sensitive area hence CEA approval is not needed. The approval will not require to be obtained from the Forest Department or Wildlife Conservation as the mitigation works are largely restricted to an Archeological Department site.

### 11.4 Other approvals

- i. Approval from the Archeology Department as the area is under the jurisdiction of Archeology Department
- ii. Approval from regional Geological Surveys and Mines Bureau will be obtained for transportation and disposal of earth, rocks and mineral debris
- iii. Approval for extraction of materials-Approval from Geological & Mines Bureau (GSMB) is needed (if necessary only).
- iv. Approvals from Bulathsinghala Pradeshiya Sabha will be obtained for the disposal of waste and plant litter.
- v. Approval through the Divisional Secretary from the district office of Ministry of Defense will be obtained for the sites if requiring rock blasting.

### 11.5 Consent/ no objection/ legally bound agreement from the private land ownerships

Signing a legally bound agreement between the Director General Archeology Department, chief incumbent of the temple and the project implementing authority will be made allowing no-objection to remove the structures, access the land, implement construction works, and engage in long-term maintenance works. The tentative timeline for getting approval is given in the table 1.

Table 1: The tentative timeline for getting approvals  
12.

Approvals	Month 1				Month 2			
	W1	W2	W3	W4	W1	W2	W3	W4
<b>Project implementation</b>								
<i>Approval from the District Secretariat</i>								
Submission of application	—							
Project briefing		—						
Respond to comments			—	—				
Approvals					—			
<i>Approval from planning committee</i>								
Submission of application	—							
Project briefing		—						
Respond to comments			—	—				
Approvals				—	—			
<b>Other approvals</b>								
GSMB		—						
Ministry of Defense (Depends on the requirement)			—	—				
Department of Archeology								

Consent/ no objection from the private land ownership Director General Archeology Department Chief incumbent of the temple								
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**13. Environmental Social Management Plan (ESMP)**

Measures to manage and or mitigate the impacts and risks, especially the impacts and risks identified in Sections 8 & 10. This will be included in the specific recommendations and requirements of the ESMP.

**12.1 Resettlement action plan**

Will not be applicable to this site as there is no project based resettlement.

**12.2 Evacuation of people: arrangements to move people from the site or areas immediately adjacent to the site, or from high-risk areas up-slope/down-slope or downstream from the site**

The Pahiyangala temple is in the high risk category. As possible activation of slide during the construction phase may occur, and also as the mitigation work has a strong influence to the aggravation of slope failure risk, it is logical to consider that the risk is linked with project works. Therefore a temporary evacuation system is strongly recommended to this site.

Also, the Environmental, Social and Health and Safety unit of PMU should pay special attention to implement the warning systems and ensure evacuations of people at this site. Further, measurers should be taken to minimize all possible risks on the community from the boulder fall, debris flows and etc.

It is strongly recommended that the site is made closed for public during the construction phase.

**12.3 Procedure for removal of damaged structures, facilities infrastructure**

The stairway to prehistoric site may require to be removed from the section where cracks have appeared.

**12.4 Requirement for compensation for loss of property /uses due to project actions**

May be applicable as moving vehicles, construction machinery and excavation works may damage roads, structures and water supply lines etc

**12.5 Public awareness and education- needed for following areas**

- i. Programs to inform and educate monks in the temple, devotees of the temple about the risks posed by landslides.
- ii. Requirement for special awareness for communities with potentially high risk during construction phase; short-term early warning measures (evacuation), and measures related to construction and land-use.
- iii. Workers code of conduct- Awareness programs to workers on behaviour and discipline inside religious places
- iv. Snake bite risk management and first aid

**12.6 Design based environmental/ social management considerations**

Following environmental and social design considerations are recommended for this depending on its environmental and social relevance.

Table 2: Design stage Environmental & Social considerations

Design feature	Recommended level of consideration for this site
<p><b>1. Natural resource management and resource optimized designs</b></p> <p>Project specific designs should be considered to eliminate mass clearing of vegetation and minimum number of removal of tree species. The design should consider minimum site excavations for not to disturb the archeological ruins</p>	Very high

<p><b>2. Conservation of water resources</b></p> <p>Analysis of design for drainage control should consider whether proposed mitigation measure would dry out the natural springs on the mitigation slope. If drying out of springs is significant permanent design solution for domestic water should be provided for the affected parties. Such solutions could be storage for extracted water to be used as a source of drinking water. This involves extraction of water both surface and sub-surface. The water extracted is in relatively good quality. In a well thought design this extracted water can be conveyed in such a manner that the water can be accessed by wild fauna as well as use by the temple</p>	<p>Very high</p>
<p><b>3. Aesthetically compatible design considerations</b></p> <p>The designs in aesthetically sensitive environments should consider structures that blend with natural environment to keep the visual pollution to minimum. Service of landscape architect may be important for the design of suitable mitigation structures.</p>	<p>Moderate</p>
<p><b>4. Consideration of green environmental features</b></p> <p>As many of the mitigations works are carried out in ecologically sensitive habitats, It is recommended to consider green environmental designs as much as possible in the designs e.g.: use of local vegetation species for erosion control, combination of plants to sustain species diversity in the environment, avoiding inclusion of potentially invasive species &amp; etc.</p>	<p>High</p>
<p><b>5. Workers/ commuters and community safety</b></p> <p>Activation of slide may occur during construction phase and may pose threat to workers and devotees. Therefore design based safety consideration such as berms, safety nets etc. should be considered.</p>	<p>Very high</p>
<p><b>6. Low post maintenance and operation designs</b></p> <p>The mitigation should consider passive techniques such as gravity drains for drainage management. Correct pipe diameters, pore diameters and laying angles should be considered to avoid clogging of drains. Low maintenance structures and designs such as designs to withstand erosive forces, sediment trapping systems etc. should be considered if drain water is expected to be directed to natural streams.</p> <p>The materials used for structures should be chosen carefully so as to withstand local weather conditions with high durability. Designs should specially consider corrosion prevention techniques if steel structures are used and geotextiles if fine sediments are prone to enter sub drains.</p>	<p>Very high</p>

## 12.7 Mitigation of impacts during the construction phase

### 12.7.1 Construction contractors' requirement to comply with environmental and social management during the construction phase

Measures to manage and to mitigate the environmental and social impacts are generally common to all landslide mitigation sites. Such impacts are largely attributed to activities in the construction phase. The mitigation of impacts therefore becomes an obligation of construction contractor. NBRO has prepared a comprehensive document on "***contractors' requirement to comply with environmental and social and Health and Safety (ES & HS) management during the construction phase***" to be included in construction contractors' bid document. The main sections are summarised below (Table 3) indicating the degree of relevancy for this site. For details, ESMP for construction contractors should be referred.

The contractor is expected to indicate in the bid the ESMP procedure to be implemented along with relevant proofs of his competency. The cost for ESMP will require to be indicated as a separate pay item. The environmental and social management method statement is expected to be submitted by the selected construction contractor and to be approved by the PMU unit.

Table 3: Contractor requirement to comply with ES &amp; HS

Reference No. as per construction contractors obligation to ESMP	Item	Relevant to the project
<b>2002. Environmental and Social Monitoring</b>		
2002.2 1)	Storage on site	Highly Relevant (temple)
2002.2 2)	Noise and Vibration	Highly relevant (temple)
2002.2 3)	Cracks and damages to the buildings	Highly relevant (temple)
2002.2 4)	Disposal of waste	Highly relevant (temple)
2002.2 5)	Disposal of refuse	Highly relevant (temple)
2002.2 6)	Dust control	Relevant (temple)
2002.2 7)	Transport of Construction materials and waste	Relevant
2002.2 8)	Water	Relevant
2002.2 9)	Flora and Fauna	Highly Relevant (forest)
2002.2 10)	Physical and cultural resources	Highly Relevant (temple)
2002.2 11)	Soil Erosion	Highly relevant
2002.2 12)	Soil Contamination	Relevant
2002.2 13)	Borrowing Earth	Relevant
2002.2 14)	Quarry Operations	Not relevant
2002.2 15)	Maintenance vehicles and Machinery (pollution)	Relevant
2002.2 16)	Disruption to public	Highly relevant (temple)
2002.2 17)	Utilities and roadside amenities	Highly relevant (temple, archeologically valued structures)
2002.2 18)	Visual environment enhancement	Highly Relevant (temple)
<b>2002.5. Environmental Monitoring</b>	Baseline surveys (air, water, noise , vibration, crack surveys)	Refer site specific monitoring plan
	Surveys during construction (air, water, noise , vibration, crack surveys)	Refer site specific monitoring plan
	Surveys during operation phase	Optional
	Reporting and maintenance of records	Relevant
<b>2003. Working Conditions and Community Health and Safety</b>		
2003.2	Safety organization and communication	Highly relevant
2003.3	Child Labor and Forced Labor	Highly relevant
2003.4	Safety reports and notification of accidents	Highly relevant
2003.5	Safety Equipment and Clothing	Highly relevant
2003.6	Safety inspections	Highly relevant
2003.7	First Aid Facilities	Highly relevant
2003.8	Health and safety information and training	Highly relevant
2003.9	Plant equipment and qualified personnel	Highly relevant
<p><b>Relevant:</b> The section is relevant to the site as a common ESMP applicable to any site</p> <p><b>Highly relevant:</b> The contractor should pay special emphasis in the preparation of environmental method statements to ensure that the relevant ESMP is implemented specific to the site</p> <p><b>Possibly relevant:</b> This ESMP will be triggered if the site come across with relevant aspect during project implementation</p> <p><b>Not relevant:</b> The section may not be relevant to this site under disclosed conditions</p> <p><b>Optional:</b> require to be implement if needed only</p> <p><b>Refer site specific monitoring plan:</b> Contractor is obliged to carry out monitoring as specified in the site specific monitoring plan in addition to monitoring requirement indicated in contractors ESMP</p> <p><b>Reference:</b> Contractors Obligation for implementation of ESMP</p>		

### 12.7.2 Site specific mitigation

Table 4: Site specific ES &amp; HS migratory measures

Mitigation item	Project implementation phase	Responsibility
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<p><b>i. Disturbance to flora and fauna</b>  The contractor should not deviate from the design without permission from the PMU; felling of forest trees, clearing large section of forests etc.  Construction activities should be carried out with minimum disturbance to wild habitats.  The wild fauna, niches (dens of wild animals) if found should be protected or relocate safely without harming the animals  Hunting and poaching wild animals and collection of valuable forest specimens are prohibited under the fauna and flora protection ordinance and hence such activities are strictly prohibited.  Timber from forest should not be extracted for any construction work.  Intentional and unintentional Setting of fire to forest area should be strictly controlled.</p>	Construction	Construction Contractor
<p><b>ii. Minimize erosional impacts during construction</b>  It is recommended that mitigation works involved with site clearance, slope reshaping, removal of debris etc. are avoided during rainy season. Therefore, it is imperative that site works in upslope mitigation are carried out in the dry season before rainy season begins and avoid such activities on upslope area in the wet season as much as possible. This should be considered in project planning stage.</p>	Site preparation and construction	Construction Contractor
<p><b>iii. Disposal of construction waste</b>  The contractor should pay special attention with respect to disposal of construction waste. Such waste if generated should store properly without getting washed off and dispose according to approved procedures by the PMU. Under any circumstance construction waste should not be released to the temple premises Contractor should obtain the approval from the Bulathsinhala UC for disposal of solid waste at approved locations.</p>	Site preparation and construction	Construction Contractor
<p><b>iv. Noise pollution</b>  The heavy noise generating activities should be discontinued during Poyadays and during large public gatherings such as in delivering sermons, Poojas etc.in the temple  The priest should be made adequately aware of planned heavy construction activities before execution</p>	Site preparation and construction	Construction Contractor
<p><b>v. Vibration impacts</b>  Vibration generating activities should be done within the prescribed limits specially to avoid damage to temple structures. Cracks in the temple buildings should be monitored before, during and after completion of the project. Suitable compensation should be made if damages/ cracks due to construction work occur in the buildings</p>	Site preparation and construction	Construction Contractor
<p><b>vi. Water for construction</b>  Water for construction works should be obtained only from the approved places. Water in the temple sources should not be used for construction and should be under approval from relevant authority</p>	Site preparation and construction	Construction Contractor
<p><b>vii. Dust and aerosol control screen</b>  The heavy dust generation activities should be carried out with sufficient care. Adequate water spaying is recommended to this site.</p>	Site preparation and construction	Construction Contractor
<p><b>viii. Managing disputes between construction workers and public and workers code of conduct</b>  The PMU should make the contractor aware on all potential disputesbetween contractor workforce and devotees that should be properly managed. Following are recommended for contractor’s workforce.</p> <ul style="list-style-type: none"> <li>• Proper awareness, education on code of conduct, monitoring and punishing.</li> <li>• Define project activity zone with restricted access to other areas in the temple.</li> <li>• Workers cannot use water sources of the temple without proper permission.</li> </ul>	Site preparation and construction	Construction Contractor

<ul style="list-style-type: none"> <li>• Workers cannot use sanitary facilities of the temple, on site sanitary facilities should be arranged to avoid possible open defecation.</li> <li>• The contractor should not use children for any form of project related works (direct/indirect)</li> <li>• The heavy machinery operators should be extremely cautious in operation of machinery as possible accidents will be high during religious events.</li> <li>• Full time watchmen should be kept in the risk area to ensure safe movement of heavy machinery and vehicles</li> <li>• Discontinue construction work on Poya days and religious festival days of Buddhists</li> <li>• The electrical wiring systems and layout should be done with proper safety measures approved by the PMU to ensure that accidents mainly to children from electric shocks are prevented</li> <li>• Parking and storage areas should be done in approved locations by the PMU</li> <li>• Establish a system of vigilance to monitor the behaviour of the workforce and the movement and address immediately any dispute that would rise during construction phase</li> <li>• Ensure that strict code of conduct in the worksite is maintained. They include No alcohol, no smoke, indiscipline noisy behaviour, any form of sexual abuses with female devotees.</li> <li>• The workers should not enter the worship places with untidy un acceptable dresses or use worship places for resting during construction without a purpose</li> </ul>		
<p><b>ix. Working hours</b> The construction activities should be in accordance with priest of the temple. Noise, vibration and dust generation activities should be carried out not disturbing religious activities of the temple. If night time operations are required to achieve project targets such works should be carried out with adequate safety measures.</p>	Construction	Construction Contractor
<p><b>x. Invasive species</b> Should be avoided in using vegetative erosion control structures. Native plants in the local environment should be chosen for vegetative control. The species used for vegetative control measures need approval from the Department of Wildlife Conservation &amp; Department of Forest.</p>	Construction	Construction Contractor
<p><b>xi. Special attention during works in an archaeological site</b> The PMU should make the contractor aware on importance, all potential damage to archaeological site.</p> <ul style="list-style-type: none"> <li>• Whenever chance finds are made during the works, the contractor shall immediately inform to the Project Manager</li> <li>• Works at the archeological area should be done under proper supervision of appointed Archeological assistants of Central Cultural Fund</li> </ul>	Construction	PMU Construction Contractor
<p><b>xii. Warning dissemination</b> Proper warnings/ safety signs should be made at the construction site preventing entry by public, hazard risks etc.</p>	Construction	PMU Construction Contractor
<p><b>xiii. Households living in high risk areas</b> It is advised that holding of religious activities and public gatherings are avoided during heavy rainy period while responding to NBRO landslide hazard warning alerts.</p>	Construction	PMU & the priest in the temple
<p><b>xiv. Workers health and safety</b></p> <p>i. As the workers in the site have to work in high risk conditions, it is imperative to implement recommendations given in section 2003 of contractors’ obligation on ESMP under “working conditions and community health and safety”. These recommendations should be followed carefully in a proper organization and safety monitoring system. Additionally,</p>	Construction	Construction Contractor

<ul style="list-style-type: none"> <li>ii. Work should be discontinued for sufficient time period during rainy period as working on unstable slopes will be highly risky in the rainy season.</li> <li>iii. A good warning system and fulltime watchmen is highly recommended for this site for both worker and commuter safety.</li> <li>iv. Safety barriers and safety nets should be installed at places of risk to protect workers and commuters from boulder falling risk</li> <li>v. Onsite sanitary facilities should be made available for the workers, and sanitary waste should be properly disposed.</li> <li>vi. Work force should be properly aware of the snake bites. Prior arrangements for hospitalization awareness posters on snakes and emergency hospitalization arrangements should be in place.</li> </ul>		
<p><b>xv. Fire hazard and forest fires</b> The electrical lines should be placed safely to ensure no leaking of current and sparks, burning in the construction should be prohibited</p>	Construction	Construction Contractor
<p><b>xvii Explosive chemicals</b> On site use of explosive chemicals should be done by authorized personnel, once used remaining materials should be removed as soon as possible. Proper onsite chain of custody should be ensured for explosive materials.</p>	Construction	Construction contractor PMU

### 13. Monitoring requirements specific to the site

Following monitoring plan is recommended during the construction phase.

Table 5: Environmental and Social monitoring plan; construction phase

Monitoring requirement	Parameters	Frequency
Baseline monitoring	Water quality	-
	Pre crack survey of the buildings of the temple (Shrine room)	Once*
	Air quality: particulate matter	Once*
	Ground vibration	Once*
	Background noise measurement	Once*
During Construction	Crack survey of the buildings	If noticeable displacement is observed during construction **
	Ground vibration	During operation of drilling machinery, boring works, or any works that generate ground vibrations*
	Construction noise	Once a month during heavy noise generation times *
	Air quality particulate matter	Once a month *
	Micro habitat assessment	Once ***
Vehicle Emission	All machinery/vehicles operational should have the emission control test certificate as applicable - should be checked by the site ES officer of the consultant	
Monitoring agency	<p>* A competent independent monitoring agency with registration of Central Environmental Authority for all parameters except crack surveys</p> <p>**Crack surveys should be conducted by competent agency acceptable to PMU</p> <p>*** Micro habitat assessment should be conducted by a competent authority approved PMU as required by the FD</p>	
Reporting requirements	<p><b>Stream water quality</b> – Comparison with ambient water quality standards published by the CEA, 2017</p> <p><b>Pre crack survey of the high risk buildings</b>-Professional report</p> <p><b>Ground vibration</b>-as per The interim standards on vibration for the Machinery, Construction activities and Vehicular movements, CEA</p> <p><b>Background noise measurement</b> –Extraordinary Gazette No.924.1, May 23,1996, CEA</p> <p><b>Air quality particulate matter</b>- The National Ambient Air Quality standards stipulated under the Extraordinary Gazette, No. 1562/22 August 15, 2008 -Central Environmental Authority of Sri Lanka.</p>	

	<b>Micro habitat assessment:</b> Micro habitat assessment report, recommendations with habitat impact mitigation as per the ToR of FD
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#### 14. Grievance redress mechanism for this site

The consultants ES officer is responsible for establishing the grievance redress mechanism for this site **with special consideration for following impact communities;**a)Chief incumbent of temple b) Assistant Director –Western (*Reference: Environmental and Social Management Framework for recommended procedure for establishment of grievance redress mechanism*).

Also, it is recommended to keep a grievance box in the temple premises

#### 15. Information disclosure

It is the responsibility of the PMU to disclose the ES information to following agencies and organizations by indicated modes as a minimum.

Table 6: Proposed scheme of information disclosure

Information	Proposed agencies	Mode of information disclosure
i. Project plan ( site details, design , implementation arrangements)	District CEA, DFC, DWLC, District Secretariat, Divisional Secretary, Other district levels Agencies, NBRO district office, AIIB, Department of Archaeology	Meetings, District coordination committee, submission of relevant report to sign agreements, approvals and consents.
ii. Environmental and Social Management plan	District CEA, DFC, DWLC, AIIB, Principal of the school	Meetings, District Coordination Committee, submission of relevant report to sign agreements, approvals and consents During consultation
iii. Monitoring reports (baseline and during construction)	District CEA, DFC, DWLC, AIIB and relevant parties as appropriate	Progress meetings, special meetings, submission of relevant reports
iv. Site inspections for environmental conformance workers health and safety	District CEA, DFC, DWLC, Divisional Secretary, Police, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate, Department of Archaeology	Written and verbal communications, submission of relevant reports
v. Decisions taken and progress review meetings pertinent to ES matters	District CEA, DFC, DWLC, Divisional Secretary, Police, State Land Owners, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate , principal of the school	Meetings, submission of relevant reports
vi. Grievance redress mechanism	Relevant parties , AIIB, Department of Archaeology, Chief incumbent of the temple	Meetings, written and verbal communications

Table 7: Level of information gathered through consulting institutions

Date	Institution	Person contacted for information
27/09/2018 @ 11.30 hrs	Forest Department	Mr Upul Vijayantha – Range Forest Officer
05/10/2018 & 14.00 hrs	Central Environmental Authority	Mrs.Chandrika Hewage Deputy Director –CEA Kalutara District
14/11/2018 @ 11.00 hrs	Archaeological Department	M.A.S.T.K. Madurapperuma Assistant Director Western Province

**Annexure I: Drone image of the project area**



**Annexure II: Images of the site condition and consultation**



*Fig a: Consultation with priest, Pahiyangala Chandima thero in the Pahiyangala temple*



*Fig b. Buddha statue in the shrine room*



*Fig c. Paintings (Kandian kingdom) at the old shrine room wall*



*Fig 4 d. Painting reflecting Fa-Hsien monk*



*Fig e: Statue of lord Buddha, at the temple*



*Fig g. Newly constructed rain gauge station closes to the temple*

**Annexure III: Report on the Stakeholder Consultation: Kalutara District**

Date: 27/09/2018		
<b>Institution</b>	<b>Name and designation of the contact officer</b>	<b>Concerns raised</b>
Forest Department	Mr Upul Vijyantha Range Forest Officer	✓ The Forest Department has no objection on the project Following matters were emphasized. <ul style="list-style-type: none"><li>• If plants are used for remediation prior approval should be obtained</li></ul>
14/11/ 2018 (over the telephone conversation)		
Archaeological Department	M.A.S.T.K. Madurapperuma Assistant Director (Western Provoince) Regional Archeological Office Sri Marcun Fernando Mw	✓ No objection with the project. ✓ All construction activities to be carried out under close supervision of the Archaeological Department.

**Annexure IV: Study team**

<b>Name</b>	<b>Designation</b>	<b>Position in the study</b>
TDSV Dias	Director/ ESSD/NBRO	Team leader
SAMS Dissanayake	Senior Scientist/ESSD/NBRO	Senior Environmental Scientist
Prabath Liyanaarachchi	Scientist/ ESSD/NBRO	Environmental scientist
H Kusalasiri	Technical Officer/ESSD/NBRO	GIS/Demographic data /survey support
Harsha Ekanayaka	Officer in charge-Kalutara District office	Geologist

**AnnexureV: List of references**

1. Report on “Rectification of destabilized slope in front of caved shrine room of the Pahiyangala Historic caved temple –LRRMD/ NBRO
2. Contractor’s obligations for Geriatric Environmental and Social Management Plan- Sri Lanka Landslide Mitigation Project-AIIB
3. Environmental and Social Management Framework-Sri Lanka Landslide Mitigation Project -AIIB
4. Resettlement Planning Framework- Sri Lanka Landslide Mitigation Project -AIIB