Sri Lanka
National Building Research
Organization (NBRO)

The Democratic Socialist Republic of Sri Lanka

Technical Cooperation for Landslide Mitigation Project

Final Report
Appendix (1/2)

September 2018

Japan International Cooperation Agency (JICA)

Earth System Science Co., Ltd.

Nippon Koei Co., Ltd.

GE
JR
18-114

Sri Lanka
National Building Research
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Appendix (1/2)

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Appendix 1

PDM and PO

Project Design Matrix: PDM (Version-2)

Project title: The Technical Cooperation for Landslide Mitigation Project
Project period: Four years (mid 2014 – mid 2018)
Target group: NBRO
Target area: Kandy, Matale, Nuwar Eliya and Badulla Districts

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal: Sediment disaster (landslide) in the target area is mitigated.	1. Number of sediment disaster events in the target area in 2017-2020	DesInventar data base on the number of sediment disaster s	
Project Purpose: Sediment disaster (landslide) management capacity of NBRO is improved through application of appropriate mitigation measure with Japanese and other technology in the pilot project sites.	1. Number of completed sediment disaster mitigation works designed, supervised and monitored by NBRO in the pilot areas in enhanced manners.	-Completion reports of sediment disaster mitigation measures in 2014-2017 -NBRO's Annual Report in 2014-2017	Government policy on NBRO's mandate is unchanged.
Output 1: Capacity of investigation, planning and evaluation for sediment disaster (landslide) mitigation measures is strengthened.	1-1 Number of reports on survey and evaluation for selection of sediment disaster(landslide) mitigation measures in the pilot areas 1-2 Number of reports on geological investigation 1-3 Number of reports on monitored data, analysis and evaluation for the pilot areas. 1-4 Number of reports on construction implementation plan utilizing air compressor for sediment disaster (landslide) mitigation measures	-Reports on survey and evaluation for selection of sediment disaster(landslide) mitigation measures in the pilot areas -Geological investigation report -Monthly report on monitoring data, analysis and evaluation result and maintenance -Result of examination conducted by the project -Report on construction implementation plan utilizing air compressor for sediment disaster (landslide) mitigation measures	NBRO coordinates all related government organization and other agencies and groups
Output 2: Capacity of design, construction supervision, and monitoring for landslide mitigation measure is strengthened.	2-1 Number of reports on NBRO' s activities for implementation of landslide measure work in a pilot area	-Completion Reports of sediment disaster(landslide) measure works in each pilot area	
Output 3: Capacity of design for slope failure mitigation measure is strengthened.	3-1 Number of reports on NBRO' s activities for implementation of slope failure measure work in a pilot area	-Tender Documents on respective measure work in sediment disaster measure works in the	

<table>
<tr><td>Output 4:
Capacity of design, construction supervision, and monitoring for rock fall mitigation measure is strengthened.</td><td>4-1 Number of reports on NBRO’ s activities for implementation of rock fall measure work in a pilot area</td><td>pilot area

-Tender Evaluation Reports for respective sediment disaster measure work in the pilot area

-Reports of construction supervision of respective sediment disaster measure works in the pilot area</td><td rowspan="2"></td></tr>
<tr><td>Output 5:
Knowledge and know-how for landslide mitigation measures are improved.</td><td>5-1 Number of documents including technical standard and manual for design and construction supervision of sediment disaster(landslide) mitigation measures as well as materials on land use regulation, and early warning and risk information dissemination
5-2 Number of participants in seminars/workshops</td><td>-Completion reports of sediment disaster mitigation measures in 2014-2017
-NBRO’s Annual Report in 2014-2017
-Project Progress Report</td></tr>
<tr><td>Activities
1.1 Conduct preliminary investigations on sediment disaster (landslide) in pilot areas.
1.2 Execute geological and geotechnical investigations at a candidate site in the pilot areas.
1.3 Install necessary monitoring equipment such as piezometers, extensometers, strain gauges with piezometer and inclinometer pipes.
1.4 Examine and determine the concept of sediment disaster (landslide) mitigation measures in pilot areas.
1.5 Procure air compressor and make construction implementation plan utilizing air compressor for sediment disaster (landslide) mitigation measures

2.1 Monitor and evaluate the landslides in the pilot areas.
2.2 Design and estimate construction cost for landslide mitigation measures in the pilot areas.
2.3 Prepare tender documents for landslide mitigation measures in the pilot areas.
2.4 Evaluate tender documents and procure contractor for landslide mitigation measures in the pilot areas.
2.5 Supervise the construction work for landslide mitigation measures in the pilot areas.</td><td colspan="2">Inputs
Japan side
1. Experts
(Long-term)
- Chief Adviser / Sediment Disaster Management Policy

(Short-term)
- Team Leader / Expert of Sediment Disaster (Landslide) Analysis
- Expert of Investigation & Monitoring
- Expert of Landslide Mitigation Measure (Design / Construction Supervision)
- Expert on Slope Failure Mitigation Measure (Design / Construction Supervision)
- Expert of Rock Fall Mitigation Measure (Design / Construction Supervision)
- Drilling Expert
- Expert of Procurement / Tender Evaluation
- Expert of Non-Structural Measures (Land Use and Early Warning)
- Project Coordinator / Landslide Mitigation Measure Assistant

2. Training in Japan / Third Country

Sri Lankan side
1. Counterpart personnel

2. Project office and facilities

3. Expenses
Running expenses necessary for the implementation of the Project</td><td>Counterparts who acquired skills through the project are not transferred

No catastrophic disaster will occur during project period.

No rapid change of natural environment

<u>Preconditions</u>
NBRO has appropriate budget for project management fund.</td></tr>
</table>

2.6 Prepare completion report of the landslide mitigation measures in the pilot areas including an evaluation on effectiveness of the measures. 3.1 Monitor and evaluate the slope failure in the pilot area. 3.2 Design and estimate construction cost for slope failure mitigation measure in the pilot area. 4.1 Monitor and evaluate the rock fall in the pilot area. 4.2 Design and estimate construction cost for rock fall mitigation measure in the pilot area. 4.3 Prepare tender documents for rock fall mitigation measure in the pilot area. 4.4 Evaluate tender documents and procure contractor for rock fall mitigation measure in the pilot area. 4.5 Supervise the construction work for rock fall mitigation measure in the pilot area. 4.6 Prepare completion report of the rock fall mitigation measure in the pilot area. 5.1 Review and update the existing guideline and technical manual on sediment disaster (landslide) mitigation on structural measures. 5.2 Conduct trainings using the revised guideline and technical manual on sediment disaster (landslide) mitigation on structural measures. 5.3 Conduct technical seminars and workshops on sediment disaster (landslide) mitigation for both structural and non-structural measures. 5.4 Stakeholder consultation on land use regulation for sediment disaster (landslide) mitigation. 5.5 Prepare materials on landuse regulation for sediment disaster (landslide) mitigation. 5.6 Stakeholder consultation on early warning and disseminating risk information for sediment disaster (landslide) mitigation based on the experiences in Japan. 5.7 Prepare materials on early warning and risk information dissemination for sediment disaster (landslide) mitigation based on the experiences in Japan.	3. Equipment - Desktop Computer - Laptop Computer(s) - Printer(s) - Piezomter (s) - Extensometer(s) - Strain gauge(s) with piezometer - Inclinometer pipe(s) - Equipment related to training - Other equipment mutually agreed upon as necessary for the implementation of the Project 4. Survey / Investigation - Topographic Survey - Geological investigation including drilling, geophysical survey and seismic exploration 5. Expenses Expenses necessary for the implementation of the Project		

Plan of Operation (Version-2)

	1st Year				2nd Year				3rd Year				4th Year			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
1.1 Conduct preliminary investigations on sediment disaster (landslide) in pilot areas.	■	■														
1.2 Execute geological and geotechnical investigations in the pilot areas.	■	■	■													
1.3 Install necessary monitoring equipment such as piezometers, extensometers, strain gauges with piezometer, inclinometer pipes.		■	■													
1.4 Examine and determine the concept of sediment disaster (landslide) mitigation measures in pilot areas.			■													
1.5 Procure air compressor and make construction implementation plan utilizing air compressor for sediment disaster (landslide) mitigation measures							■	■								
1.6 Monitor implementation of construction implementation plan									▨	▨	▨	▨	▨	▨	▨	▨
2.1 Monitor and evaluate the landslides in the pilot areas.		■	■	■	■	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
2.2 Design and estimate construction cost for landslide mitigation measures in the pilot areas.		■	■	■		■										
2.3 Prepare tender documents for landslide mitigation measures in the pilot areas					■											
2.4 Evaluate tender documents and procure contractor for landslide mitigation measures in the pilot areas.						■										
2.5 Supervise the construction work for landslide mitigation measures in the pilot areas.							■	■	■	■	■	■				
2.6 Prepare completion report of the landslide mitigation measures in the pilot areas including an evaluation on effectiveness of the measures.											■	■	■	■	■	■
3.1 Monitor and evaluate the slope failure in the pilot area.	■	■														
3.2 Design and estimate construction cost for slope failure mitigation measure in the pilot area			■	■												
3.3 Prepare tender documents for slope failure mitigation measure in the pilot area																
3.4 Evaluate tender documents and procure contractor for slope failure mitigation measure in the pilot area																
3.5 Supervise the construction work for slope failure mitigation measure in the pilot area																
3.6 Prepare completion report of the slope failure mitigation measure in the pilot area									■	■	■	■	■	■	■	■
4.1 Monitor and evaluate the rock fall in the pilot area	■	■														
4.2 Design and estimate construction cost for rock fall mitigation measure in the pilot area			■	■												
4.3 Prepare tender documents for rock fall mitigation measure in the pilot area					■											
4.4 Evaluate tender documents and procure contractor for rock fall mitigation measure in the pilot area						■										

	1st Year				2nd Year				3rd Year				4th Year			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
4.5 Supervise the construction work for rock fall mitigation measure in the pilot area																
4.6 Prepare completion report of the rock fall mitigation measure in the pilot area																
5.1 Review and update the existing manual and technical standard on sediment disaster (landslide) mitigation on structural measures																
5.2 Conduct trainings using the revised technical standard and manual on sediment disaster (landslide) mitigation on structural measures																
5.3 Conduct technical seminars and workshops on sediment disaster (landslide) mitigation for both structural and non-structural measures																
5.4 Discuss among stakeholders concerned on land-use regulation for sediment disaster (landslide) mitigation																
5.5 Prepare materials on land-use regulation for sediment disaster (landslide) mitigation																
5.6 Stakeholder consultation on early warning and disseminating risk information for sediment disaster (landslide) mitigation based on the experiences in Japan																
5.7 Prepare materials on early warning and risk information dissemination for sediment disaster (landslide) mitigation based on the experiences in Japan																

Appendix 2

Flow Chart of Work

1st Term Early Sep. 2014 ~ Late Feb. 2016

2nd Term Early Apr. 2016 ~ Late Sep. 2018

Activities

Works in Japan

Works in Sri Lanka

Collect and review existing materials and information

Make Work Plan (W/P) and plan for technique transfer

Submission, explanation and discussion about the W/P

Conduct baseline survey

Output1
Capacity of investigation and evaluation for sediment disaster (landslide) mitigation measures is enhanced

- [1.1] Conduct preliminary investigations on sediment disaster in pilot areas
- [1.2] Execute geological and geotechnical investigation at a candidate site in the pilot area
- [1.3] Install necessary monitoring equipment
- [1.4] Examine and determine the concept of sediment disaster (landslide) mitigation measure in the pilot areas

Pilot Construction Tendering・Selection

Output 2
Capacity of design, construction, supervision and monitoring for landslide mitigation measure is strengthened

Monitoring

- [2.1] Monitor and evaluate the landslide in the pilot areas

Continue

Design・Cost estimation

- [2.2] Design and estimate construction cost
- [2.3] Prepare tender documents

[2.4] [4.4] Evaluate tender documents and procure contractor

Output 3
Capacity of design, construction, supervision and monitoring for slope failure mitigation measure is strengthened

Monitoring

- [3.1] Monitor and evaluate the slope failure in the pilot areas

Continue

Design・Cost estimation

- [3.2] Design and estimate construction cost
- [3.3] Prepare tender documents

Output 4
Capacity of design, construction, supervision and monitoring for rock fall mitigation measure is strengthened

Monitoring

- [4.1] Monitor and evaluate the rock fall in the pilot areas

Continue

Design・Cost estimation

- [4.2] Design and estimate construction cost
- [4.3] Prepare tender documents

Output 5
Knowledge and know-how for landslide mitigation measures are improved

- [5.1] Review and update the existing guideline and technical manual on sediment disaster mitigation on structural measures
- [5.2] Conduct trainings using the reviced guideline and technical manual
- [5.3] Conduct technical seminars and workshops on sediment disaster mitigation for both structural and non-structural measures (workshop△ technical seminar△)
- [5.5] Prepare materials on landuse regulation for sediment disaster mitigation
- [5.6] Stakeholder consultation on early warning and risk information dissemination for sediment disaster mitigation
- [5.7] Prepare materials on early warning and risk information dissemination for sediment disaster mitigation

※Mainly conducted by long/short term JICA experts

Construction Start

Completion Inspection Transfer

Defect Inspection

[2.5] Supervise the construction work in the pilot areas

Landslide Countermeasure Construction

Nuwara Eliya (9months)

Badulla (16months)

till Jul. 2017

[2.6] Prepare completion report including an evaluation on effectiveness of measures

Continuous monitoring

Defect liability period (12months)

※ If the structure is damaged

Judging the failure is defect of execution or not

repairing

[4.5] Supervise the construction work

Rock Fall Countermeasure Construction

Matale (11months)

till Feb. 2017

[2.6] Prepare completion report including an evaluation on effectiveness of measures

Defect liability period (12months)

Continuous monitoring

Construction Start

Completion Inspection, Transfer

Defect Inspection

Project Purpose

Sediment disaster (landslide) management capacity of NBRO is improved through application of appropriate mitigation measure with Japanese and other technology in the pilot project sites

Conduct outcome monitoring

JCC Equipment procurement

JCC Equipment procurement Mid-term review

JCC Terminal evaluation

Training in Japan Training management

Discussion aboutactivities in 1st term

Revision of project outline literature

Training in Japan Training management

Reports & Products

Operating Plan and Work Plan

Completion Report (1st. Term)

Operating Plan

Progress Report 1

Progress Report 2

Project Completion Report (Eng.)

Project Completion Report (Jpn.)

① Guideline of Landslide Countermeasure

② Technical Manual of Landslide Countermeasure

③ Guideline of Slope Failure Countermeasure

④ Technical Manual of Slope Failure Countermeasure

⑤ Guideline of Rock Fall Countermeasure

⑥ Technical Manual of Rock Fall Countermeasure

Appendix 3

Detailed Activity Plan

Detailed Work Plan

■Work in Sri Lanka
□Work in Japan

			1st term																						2nd term																					
			9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
			F/Y 2014							F/Y 2015												F/Y 2016												F/Y 2017												F/Y 2018				
Preliminary information collection, W/P, baseline survey																																															
【1】	Preliminary learning from exisiting materials and discussion on basic policies	Plan	□																																											
		Actual	□																																												
【2】	Formulation of W/P and technical transfer plan	Plan		□																																										
		Actual		□																																											
【3】	Discussion on W/P	Plan			▯																																										
		Actual			■																																											
【4】	Baseline survey	Plan			▬	▬	▬																																								
		Actual			■	■	■																																									
Outputs 1: Capacity of investigation and evaluation for sediment disaster (landslide) mitigation measures is strengthened.																																														
【5】	Conduct preliminary investigations on sediment disaster (landslide) in pilot areas	Plan			▬	▬		▬	▬																																							
		Actual			■	■		■	■																																							
【6】	Execute geological and geotechnical investigations at a candidate site in the pilot areas	Plan				▬	▬	▬	▬	▬	▬	▬	▬		▨	▨	▨	▨																															
		Actual				■	■	■	■	■	■	■	■																																			
【7】	Install necessary monitoring equipment such as piezometersextensometers, strain gauges with piezometer and inclinometer pipes	Plan				▬	▬			▬	▬																																					
		Actual				■	■																																									
【8】	Examine and determine the concept of sediment disaster landslide) mitigation measures in pilot areas	Plan								▬	▬	▬																																				
		Actual										■	■	■																																		
Outputs 2: Capacity of design, construction supervision, and monitoring for landslide mitigation measure is strengthened.																																														
【9】	Monitor and evaluate the landslides in the pilot areas	Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
		Actual			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																					
【10】	Design and estimate construction cost for landslide mitigation measures in the pilot areas	Plan				▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
		Actual			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
【21】	Evaluate tender documents and procure contractor for landslide mitigation measures in the pilot areas	Plan												▬	▬	▬	▬	▬																														
		Actual												■	■	■	■	■																														
【22】	Supervise the construction work for landslide mitigation measures in the pilot areas	Plan																																												
		Actual																																													
【23】	Prepare completion report of the landslide mitigation measures in the pilot areas including an evaluation on effectiveness of the measures	Plan																																												
		Actual																																													
Outputs 3: Capacity of design, construction supervision, and monitoring for slope failure mitigation measure is strengthened.																																														
【11】	Monitor and evaluate the slope failure in the pilot area	Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
		Actual				■	■																																								
【12】	Design and estimate construction cost for slope failure mitigation measure in the pilot area	Plan					▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
		Actual					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
【21'】	Evaluate tender documents and procure contractor for slope failure mitigation measure in the pilot area	Plan																																												
		Actual																																													
【22'】	Supervise the construction work for landslide mitigation measures in the pilot areas	Plan																																												
		Actual																																													
【23'】	Prepare completion report of the slope failure mitigation measure in the pilot area	Plan																																												
		Actual																																													
Outputs 4: Capacity of design, construction supervision, and monitoring for rock fall mitigation measure is strengthened.																																														
【13】	Monitor and evaluate the rock fall in the pilot area	Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
		Actual				■	■																																								
【14】	Design and estimate construction cost for rock fall mitigation measure in the pilot area	Plan					▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
		Actual					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
【21''】	Evaluate tender documents and procure contractor for rock fall mitigation measure in the pilot area	Plan												▬	▬	▬	▬	▬																														
		Actual																																													
【22''】	Supervise the construction work for rock fall mitigation measure in the pilot area	Plan																																												
		Actual																																													
【23''】	Supervise the construction work for rock fall mitigation measure in the pilot area	Plan																																												
		Actual																																													

Project period (Year 1) changed from May 2015 to Feb.

Construction

Defects liability period

Construction

Defects liability period

Kandy is excluded from pilot sites.

Detailed Work Plan

※W/P:Work Plan C/R:Completion Report(1st term) PR1/2:Progress Report1・2 FRE,J:Final Report(English・Japanese)

Appendix 4

Work Record

Work Record

1. Work in Sri Lanka

Schedule: Fiscal year 2014 – Fiscal year 2018 (1st term: months 8/2014 – 3/2016; 2nd term: months 4/2016 – 10/2018)

Name (Category)		Schedule (Fiscal year 2014 – Fiscal year 2018)	1st Term LKA	1st Term JPN	2nd Term LKA	2nd Term JPN	Total LKA	Total JPN
Ryuichi Hara (Team Leader / Sediment Disaster Analysis)	Plan	(60) (60) (45) (30) (15) (15) (15) (15) (15) (37) (45) (15)	5.50		6.73		12.23	
	Actual	10/1-11/29 (60); 1/7-3/13 (60+6); 5/30-8/3 (45+21); 4/12-5/11 (30); 7/9-7/23 (15); 9/10-9/24 (15); 10/9-10/22 (14); 1/28-2/12 (16); 5/13-5/27 (15); 6/6-6/17 (12); 9/14-10/19 (36); 12/2-12/16 (15); 1/15-1/29 (15); 2/22-4/7 (45); 7/9-7/29 (20)	6.40		8.27		14.67	
Akira Ogawara (Landslide (Design, Supervision))	Plan	(30) (30) (45) (30) (15) (15) (15) (30) (15) (30) (15) (15)	3.50		6.30		9.80	
	Actual	10/31-11/29 (30); 1/26-2/27 (30+3); 5/30-8/3 (45+21); 4/12-5/20 (30+9); 6/11-6/25 (15); 11/10-11/24 (15); 12/5-12/19 (15); 7/17-8/5 (20); 7/14-7/29 (16)	4.30		4.00		8.30	
Kyoichi Kawakami (Slope Failure (Design, Supervision))	Plan	(40) (30) (35) transferred from Mr. Uzawa and Mr. Koike (15) (15) (15) (15) (15) (15) (15) (15) (15) (29) (15)	3.50		5.97		9.47	
	Actual	10/1-11/29 (20+40); 1/7-3/4 (60); 3/29-4/11 (8+6); 11/28-12/10 (13); 1/3-1/20 (18); 4/3-4/24 (21); 8/14-8/28 (15); 1/9-23 (15); 2/9-23 (15); 3/9-23 (15); 4/15-29 (15); 2/22-3/21 (28); 7/5-7/22 (18)	4.53		4.77		9.30	
Tomoyuki Nishikawa (Monitoring Equipment / Geology)	Plan	(30) (45) (24) (15) (15)	3.00		1.80		4.80	
	Actual	11/25-12/14 (30); 5/22-7/5 (45); 4/18-5/11 (24); 9/10-9/24 (15); 3/24-4/7 (15); 5/12-5/31 (20); 6/17-7/1 (15); 7/16-7/29 (14)	2.50		3.43		5.93	
Takashi Ogino (Rock Fall (Design, Supervision))	Plan	(30) (60) 15 days were transferred to work in Japan (15) (15) (15) (15) (15) (15)	3.00		3.00		6.00	
	Actual	10/31-11/29 (30); 5/30-8/3 (60+6); 4/28-5/11 (14); 9/10-9/24 (15); 2/9-2/23 (15); 10/5-10/19 (15); 5/12-5/27 (16); 7/8-7/22 (15)	3.20		3.00		6.20	
Pucai Yang (Drilling Technology)	Plan	(30) (105) (15)	4.50		0.50		5.00	
	Actual	10/31-11/29 (30); 1/27-5/11 (105); 5/25-6/8 (15)	4.50		0.50		5.00	
Koji Uzawa (Procurement / Evaluation of Bidding)	Plan	(30) (15) (27)	1.50		0.90		2.40	
	Actual	10/31-11/29 (30); 5/9-5/23 (15); 8/24-9/24 (30); 11/14-11/21 (13); 7/9-8/4 (27)	2.83		0.90		3.73	
Toru Koike (Landslide (Risk Assessment))	Plan	(15) (15) 6 dayswere transferred to Mr. Kawakami (15) (7) (15)	1.00		1.23		2.23	
	Actual	1/13-2/5 (24); 2/15-3/1 (15); 3/18-3/24 (7); 7/30-8/10 (12)	0.80		1.13		1.93	
Tomoyuki Wada (Topographical Analysis)	Plan	(30)	1.00		0.00		1.00	
	Actual	10/18-11/16 (30)	1.00		0.00		1.00	
Kaoru Sasaoka (Non-structual Measure / Project Coordination)	Plan	(30) (15)	1.50		0.00		1.50	
	Actual	10/22-11/20 (30); 1/23-2/27 (15+21)	2.20		0.00		2.20	
Akira Sasaki (Non-structual Measure / Project Coordination)	Plan	(30) (15) (30)	0.00		2.50		2.50	
	Actual	8/22-9/10 (20); 1/12-1/26 (15); 2/28-4/8 (40)	0.00		2.50		2.50	
	Plan		26.50		28.93		56.93	
	Actual		30.06		28.50		60.76	

Legend: Plan (grey) / Actual (black) / Self-budget (orange) / Additionnal (red) / Work for another project in Sri Lanka (blue)

Work Record

1. Work in Japan

Name (Category)		Fiscal year 2014								Fiscal year 2015												Fiscal year 2016												Fiscal year 2017												Fiscal year 2018								M/M					
		1st term																				2nd term																														1st Term		2nd Term		Total	
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	LKA	JPN	LKA	JPN	LKA	JPN
Ryuichi Hara (Team Leader / Sediment Disaster Analysis)	Plan		(3)							(3)	(7)																																				(2)								0.65		0.10		0.75
	Actual		9/24-26 (3)							4/1,1,14,17 (3)	5/20-22,25-28 (7)																																						8/1,2 (2)								0.65		0.10		0.75
Akira Ogawara (Landslide (Design, Supervision))	Plan		(1)							(2)	(3)																																				(2)								0.30		0.10		0.40
	Actual		9/24 (3)							4/1,14 (2)	5/25-27 (3)																																						8/1,2 (4)								0.30		0.20		0.50
Kyoichi Kawakami (Slope Failure (Design, Supervision))	Plan		(1)							(3)	(7)																																				(1)								0.55		0.05		0.60
	Actual		9/27 (1)							4/14,15,22 (3)	5/20-22,25-28 (7)																																														0.55		0.05		0.60
Takashi Ogino (Rock Fall (Design, Supervision))	Plan																																																					0.50		0.00		0.50
	Actual									4/6-10,13-17 (10)																																														0.50		0.00		0.50
Koji Uzawa (Procurement / Evaluation of Bidding)	Plan													(5)																																								0.25		0.00		0.25
	Actual													8/17-21 (5)																																									0.25		0.00		0.25
Toru Koike (Landslide (Risk Assessment))	Plan																																																				0.00		0.00		0.00
	Actual																																																		8/13,14 (2)								0.00		0.10		0.10
Kaoru Sasaoka (Non-structual Measure / Project Coordination)	Plan									(10)																																												0.50		0.00		0.50
	Actual									4/6-10,13-17 (10)																																														0.50		0.00		0.50
Akira Sasaki (Non-structual Measure / Project Coordination)	Plan																																	(10)																			0.00		0.50		0.50
	Actual																																	5/15-19,22-26 (10)																			0.00		0.50		0.50
	Plan																																																				2.75		0.75		3.50
	Actual																																																			2.75		0.95		3.70
Report		W/P △														C/P △								△ PR1												△ PR2												FRJ,FRE △								30.06	2.75	28.50	0.95	60.76	3.70
																																																							32.81		29.45		64.46	

Legend

Plan
Actual
Self-budget
Additionnal
Work for another project in Sri Lanka

Appendix 5

Equipment List

TCLMP

Technical Cooperation for Landslide Mitigation Project
in the Democratic Socialist Republic of Sri Lanka

Ministry of Disaster Management (MDM) National Building Research Organisation (NBRO)

Japan International Cooperation Agency (JICA)

Office: 99/1, Jawalta Road, Colombo 5 (within NBRO Head Office)
Tel: (011) 2588964, 2503826, 2500354
Extension: 646

Our Ref: TCLMP-15-004 Date: 8th December 2014

Subject: Understanding of Equipment Delivered by JICA

JICA Expert Team procured the equipment No.7 to No.10 as per attached list according to the Item [28] in '3. Activities in the Project of the Work Plan (WP)'. The equipment is used by NBRO counterparts and JICA Expert Team only for the Technical Cooperation for Landslide Mitigation Project (TCLMP) purposes. Upon this delivery, NBRO shall be in charge of the management and maintenance of the equipment with his sole responsibility.

ENG. (Dr.) Asiri Karunawadena

Director General
National Building Research Organisation (NBRO)

30/7/2015

Ryuichi HARA

Team Leader
JICA Expert Team for TCLMP Project

Attachment 1: Equipment List

No.	Equipment	Initial Operator Guidance	Operational Guidance	Installation /Monitoring Guidance	Quantity	Remarks
1	***Desktop PC***	—	—	—	*1*	***1st Term in Sri Lanka***
2	***Laptop PC***	—	—	—	*5*	***1st Term in Sri Lanka***
3	***Multifunction Printer***	△	—	—	*5*	***1st Term in Sri Lanka***
4	***Projector***	—	—	—	*1*	***1st Term in Sri Lanka***
5	***Screen***	—	—	—	*1*	***1st Term in Sri Lanka***
6	Underground Water Gauge (automatic transmission record type)	△	△	◎	3	1st Term in Japan
7	Extensometer (automatic record type)	△	△	◎	7	1st Term in Japan
8	Pipe Strain Gauge with piezometer (automatic record type, with water gauge)	△	△	◎	2	1st Term in Japan
9	Inclinometer guide pipe	△	△	◎	3	1st term in Japan
10	Boring Machine	◎	◎	—	1	1st Term by JICA
11	Air Compressor	◎	△	—	1	2nd Term

◎: Necessary △: As necessary —: Unnecessary／Not covered

1st Term: Oct. 2014 - Nov. 2015 2nd Term: Jan. 2016 - Aug. 2018 As of Jul. 2015

Attachment 2: Details of equipment

Monitoring Equipment

No.	Item	Model	Quantity	Unit	Remarks
6	Piezometer	LG-001E(English version)	3	items	
	Storage box of piezometer	Plastic Box-12C	3	items	
	Sensor of undergroundwater level	DS-1(50m cable)	3	items	
7	Extensometer	SLG-10E(English version)	7	items	
	Storage box of extensometer	Wooden	7	items	
	Controller	CT-1E(English version)	1	items	
	CF Memory Card Set	256MB	1	items	
8	Straingauge Pipe/Piezometer	LG-301E(English version)	2	items	
	Strage box of straingauge Pipe and Piezometer	Plastic Box-18BC	2	items	
	Pipe Straingauge 20m	20m	1	set	20m * 1 hole
	Pipe Straingauge 40m	40m	1	set	40m * 1 hole
9	Guidepipe of inclinometer	KBF-31-3(3m/each, Total 75m)	25	pcs	40m * 1 hole
	Guidepipe of inclinometer	KBF-31-1(1m/each, Total 5m)	5	pcs	20m * 2 holes
	Socket	KBF-32	27	pcs	Total 80m
	Cap	KBF-34	6	pcs	
	Cable holder	KBF-37	3	pcs	
	Rivet	KBF-38	3	packs	
	Riveting machine	KBF-39	3	pcs	

Appendix 6

Minutes of Meeting of Joint Coordinating Committee

Appendix 6-1

Minutes of Meeting of Joint Coordinating Committee 1st JCC

MINUTES OF MEETING

ON

JOINT COORDINATION COMMITTEE (JCC)

FOR

TECHNICAL COOPERATION PROJECT

FOR

"IMPROVING OF METEOROLOGICAL OBSERVATION, WEATHER FORECASTING AND DISSEMINATION"

AND

"LANDSLIDE MITIGATION PROJECT"

IN

THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

The series of discussions on the above captioned project among the officials concerned of the Government of Sri Lanka and the Japan International Cooperation Agency (JICA) Sri Lanka Office have been conducted under chairmanship of Ms. S M. Mohamed, Secretary to the Ministry of Disaster Management.

As the result of the discussions, both sides have confirmed the main items described in the attached sheet.

Colombo, October , 2014

ATTACHMENT

1. Date and Venues of Joint Coordination Committee

   1) Date: Tuesday, October 14th 2014

   2) Time: 14:00hrs to 17:00hrs

   3) Venue: Conference Room of Ministry of Disaster Management

   4) Agenda: As per attached.

2. Main Points Discussed

   1) Welcome Address by Secretary to the Ministry of Disaster Management

      Secretary, Ministry of Disaster Management welcomed JICA officials, JICA Experts and relevant officers from Department of Meteorology, National Building Research Organization and Disaster Management Centre.

      She appreciated the past cooperation project from Japan and JICA, which fulfilled the gap existed for Disaster Risk Reduction. Since the project formulation took several years after the Government of Sri Lanka has decided to implement these two projects, she expects that the project will achieve producing the satisfactory outcomes. She also expressed that meaningful and fruitful discussion for firm implementation of the project is required for the success of the project.

      Therefore, she appreciates to organize JCC every quarter and requested to conduct On-The-Job (OJT) Training to relevant officers to maintain the sustainability of the projects. Based on the signed Record of Discussion (R/D), she wants JICA Experts to transfer their skills and knowledge to counterpart to sharpen their skills.

   2) Opening Address by JICA Chief Representative

      JICA Chief Representative appreciated cooperation between Sri Lanka and Japan to inaugurate both two projects. While thanking all the related officers, he expects smooth and successful implementation of the Project as these two projects are mentioned in the Joint Statements of Japanese Government and Sri Lankan Governments.

   3) Explanation of the Work Plan on the Project for Improving of Meteorological Observation, Weather Forecasting and Dissemination

      Sri Lankan side indicated following points for successful implementation of the project.

- ❖ The importance of procurement of the required equipment for the project as indicated in the Record of Discussions (R/D).
- ❖ Request to provide the ID and password of data for SATAID by Japan Meteorological Agency through JICA.
- ❖ To keep the first two years for mainly the project implementation and the third year for monitoring/verification.

JICA Sri Lanka responded to the above inquiries as follows.

- JICA Sri Lanka will reconfirm the equipment to be procured in line with R/D.
- JICA Sri Lanka will contact JMA through JICA HQ and ask for ID and password of SATAID data.
- JICA Expert team indicated the schedule of weather forecasting and warning activities has been considered so that the first two years for mainly the project implementation and the third year for mainly verification of the accuracy and appropriateness.
- JICA expert team requested hazard information available at NBRO and they agreed to provide them.

4) Explanation of the Work Plan on the Technical Cooperation for Landslide Mitigation Project

Sri Lankan side indicated following points for the successful implementation of the project:

- ❖ To expedite the survey and design process in order to start physical construction before the next monsoon season, which starts next April.
- ❖ Including the DMC staff to conduct OJT training on Early Warning.
- ❖ Conduct trainings in Japan in the early first and second year, rather than having one in year 2016 and 2017.
- ❖ Since the four pilot sites are ear-marked by JICA out of 36 places approved by the cabinet, Sri Lankan side wishes to have the early implementation of the physical project as the pattern of the rainfall changes.

JICA Sri Lanka responded to the above inquiries as follows.

- JICA and JICA Expert team will try their best to meet the request from Sri Lankan side for expedite physical works.
- JICA and JICA Expert team agreed to include DMC staff to conduct OJT on Early Warnings.
- JICA Expert team will reconsider the timing of trainings in Japan.

- JICA Expert team asked about the procedure of utilizing UAV for surface observation. Sri Lankan side agrees to take necessary arrangement for UAV usage with Ministry of Defense and Urban Development, Sri Lankan Air Force and Civil Aviation Authority.

5) Revision of Project Design Matrix (PDM)

While the percentage mentioned in the revised PDM is set below 100%, based on the request of Sri Lankan Side, JICA Expert team assured to conduct OJT to all the staff concerned in the project. Proposed revision of the PDM was approved as per attached (Annex 2).

6) Project Launch

Both the Sri Lankan Side and JICA side agreed to organize Project Launch for both project. Date of the Launch should be late November or early December as budget related works finish in middle of November.

Both sides agreed to have further discussion to finalize the date.

7) Next JCC Meeting

Chairperson has informed that next JCC meeting to be organized in January 2015.

Annex:

1. Agenda of JCC
2. PDM version 1
3. List of Attendants

Appendix 6-2

Minutes of Meeting of Joint Coordinating Committee 2nd JCC

MINUTES OF MEETINGS

BETWEEN

THE JAPANESE MID-TERM EVALUATION TEAM AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

ON

THE JAPANESE TECHNICAL COOPERATION

FOR

TECHNICAL COOPERATION FOR LANDSLIDE MITIGATION PROJECT

The Japanese Mid-term Evaluation Team (hereinafter referred to as "the Team"), organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Yoichi Inoue, Acting Director of Disaster Risk Reduction Team 1, Global Environment Department, visited the Democratic Socialist Republic of Sri Lanka from September 22 to October 12, 2016 for the purpose of conducting the Mid-term evaluation on the Japanese technical cooperation for technical cooperation for land slide mitigation project (hereinafter referred to as "the Project").

During its stay, both the Team and the Sri Lankan side formulated the Joint Evaluation Team, exchanged the views and had a series of discussions on the Project with the Sri Lankan authorities related and concerned. As a result of the discussions, the Team submitted a report as attached (Annex-1) and both Sri Lankan and Japanese sides (hereinafter referred to as "Both sides") agreed upon the descriptions of the report and the attached document.

Colombo, October 12, 2016

井上陽一

YOICHI INOUE
Team Leader
Mid-Term Evaluation Team
Japan International Cooperation Agency (JICA)

S. S. MIYANAWALA
Secretary
Ministry of Disaster Management

DR. ASIRI KARUNAWARDENA
Director General
National Building Research Organisasion
Ministry of Disaster Management
the Democratic Socialist Republic of
Sri Lanka

ATTACHED DOCUMENT

1. **Joint Mid-term Evaluation:**

Both sides agreed the result of the Joint Mid-term Evaluation as Annex-1.

2. **Recommendations and lesson learned:**

A series of recommendations and lessons learned are written in the Report. Below points are to be highlighted by the Team because of its importance for the remaining period of the Project.

Recommendations:

(1) Measures to prevent unplanned construction works

During the mid-term review, JICA experts and NBRO discussed and agreed on the measures to prevent unplanned construction works as follows.

a. Permanent assignment of at least one supervisor per project site

There were days when none of a TCLMP assistant and a NBRO site engineer or JICA experts were present at the project sites. This caused the unplanned construction.

In principle, NBRO is requested to make sure that a site engineer is always present at the project sites. This is also important from the perspective of technology transfer on the construction supervision. At the same time, since it can happen for him or her to be absent due to unavoidable circumstances (e.g. sickness), JICA experts and NBRO are requested to ensure that at least one supervisor (a TCLMP assistant, a NBRO site engineer or a JICA expert) always supervises the construction work at the project sites.

b. Prior approval of any change to the construction plan

In order to make sure that countermeasures are constructed according to the approved construction plan, NBRO and JICA experts are requested to ensure that the contractors submit a request letter when any change to the plan is necessary and all the changes are documented with photos. Approval should be done in the written letter and in timely manner. Documents approval procedure were agreed between NBRO and JICA experts as attached in Appendix-1, and prior approval should be done in accordance with the agreed procedure.

(2) Improvement of communication

Better and faster communication among JICA experts, NBRO and the contractors is indispensable to avoid further delay and unplanned construction works. In order to improve communication, daily onsite meeting among a TCLMP assistant, a site engineer and field office staff of NBRO and the contractors is highly recommended in order to confirm the progress, the quality of work, daily works, technical matters and any concerns before commencement of the daily works. In addition, JICA experts are requested to have a monthly meeting with NBRO

headquarters staff, a TCLMP assistant, a site engineer and field office staff of NBRO and the contractors in order to confirm the progress, the quality of work, technical matters and any concerns. In order to respond to a change of the construction plans in a timely manner, NBRO is recommended to take a step to shorten the time to issue an approval letter as per agreed procedure attached in Appendix-1. In addition, all parties should try to avoid miscommunication. Important communication related to decision making should be done in written document and in timely manner.

ANNEX:

ANNEX-1: Joint Mid-term Evaluation Report

APPENDIX:

APPENDIX-1: Flow of the letter

APPENDIX: Flow of the letter

Flow of the letter 【include the cost changing】

①Proposal letter from the Contractor

The Contractor	→	To : The Engineer
	→	CC : JICA

・Technical Change and the reason

・Change of Quantity (Increase/Decrease)

Initial quantity and changed quantity are should be shown (for contrast)

・Attachment for unit price and total cost (necessary)

②Letter of Approval / improvement request / non approval Letter

The Engineer	→	To : The Contractor
	→	CC : JICA

Noted at the letter end " Change of the cost will be reviewed by JICA office"

After the Approval by the Engineer

③Request for the Rate Variation , Quantity Change

The Contractor	→	To : JICA
		CC : The Engineer

Show the unit price and total cost

④Acceptance for the request

JICA	→	To : The Contractor
		CC : The Engineer

After above process, the contractor can start the proposed site work.

Do not start the work for modified drawing or increased quantity before the JICA's acceptance.

Appendix 6-3

Minutes of Meeting of Joint Coordinating Committee 3rd JCC

MINUTES OF MEETINGS

BETWEEN

THE JAPANESE TERMINAL EVALUATION TEAM AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

ON

TECHNICAL COOPERATION FOR LANDSLIDE MITIGATION PROJECT

The Japanese Terminal Evaluation Team (hereinafter referred to as "the Team"), organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Yuki Aratsu, Senior Assistant Director, Global Environment Department, visited the Democratic Socialist Republic of Sri Lanka from September 14 to October 4, 2017 for the purpose of conducting the Terminal evaluation on technical cooperation for land slide mitigation project (hereinafter referred to as "the Project").

During its stay in Sri Lanka, both the Team and the Sri Lankan side formulated the Joint Evaluation Team, exchanged the views and had a series of discussions on the Project with the Sri Lankan authorities related and concerned. As a result of the evaluation works and discussions, the Team submitted a report as attached (Annex-1) and both Sri Lankan and Japanese sides (hereinafter referred to as "Both sides") agreed upon the descriptions of the report and the documents attached hereto.

Colombo, October 4, 2017

YUKI ARATSU
Team Leader
Terminal Evaluation Team
Japan International Cooperation Agency（JICA）

M. KINGSLY FERNANDO
Secretary
Ministry of Disaster Management

ASIRI KARUNAWARDENA
Director General
National Building Research
Organization(NBRO)
Ministry of Disaster Management

ATTACHED DOCUMENT

1. Joint Terminal Evaluation:

Both sides agreed on the result of the Joint Terminal Evaluation as Annex-1.

2. Modification of Project Design Matrix (PDM)

Both sides agreed on modified PDM as Annex-2.

3. Recommendations and lesson learned:

A series of recommendations and lessons learned are written in the **Joint Terminal Evaluation Report in Annex1**. The following points were highlighted by the Team and necessary measures were agreed by both sides to secure the sustainability of the Project.

a. Assignment of responsible personnel at NBRO local offices

The Team pointed out the necessity to check the constructed facilities at 3 pilot sites (referred to as "the Facilities") during the defects liability period of the contract(s) until August 2018.

NBRO agreed to assign responsible personnel at local offices in charge of the Facilities and inform to JICA Sri Lanka office immediately, if a defect appears or damage occurs.

b- Proper maintenance of the Facilities after the completion of the Project

The Team pointed out the importance of the continuous monitoring and proper maintenance of the Facilities after the completion of the Project so as to secure sustainability. NBRO agreed to make monitoring with a check sheet at least two times per year after the rainy seasons (monsoons), especially after heavy rainfall and maintain the Facilities properly by themselves. NBRO also agreed that whenever necessity arises, such as any major damages occur, NBRO should inform it with its actions to be taken to JICA Sri Lanka Office.

c-Utilization and recognition of a manual on sediment disaster countermeasures as an institutional publication

JICA experts and NBRO will jointly prepare a manual on sediment disaster countermeasures by the end of the Project, which includes lessons learned through the Project. In order to widely share the knowledge and technology transferred by the Project and sustain them. NBRO agreed to fully utilize the manual and widely share it as an institutional publication.

Annex-1: Joint Terminal Evaluation Report

Annex-2: Project Design Matrix Ver. 3.0

Appendix 7

Utilization Plans of Equipment

Utilization Plan for Drilling Machine - 2018/2019

No	Project Description	2018									2019
		April	May	June	July	August	September	October	November	December	January
1	Slope stability assessment at Attanagalla site										
2	Hanthana IFS site										
3	Soil Investigation and stability assessment at Uva Wellassa University site										
4	Installation of monitoring equipments at Watawala landslide										

Utilization Plan for Air Compressor - 2018/2019

No	Project Description	2018									2019
		April	May	June	July	August	September	October	November	December	January
1	Nurses Training School, Kandy										
2	Hanthana IFS Site										
3	Landslide Mitigation projects at Welimada and Badulla										

1 / Aug. / 2017

Operation and Maintenance

LOG BOOK

AIRMAN PDSF750S-4BS

Procedures

1. Towing the Machine

WEIGHT = 3,570kg (3.6ton)

Check

Tire pressure and Nuts

Connection of Drawbar

Speed

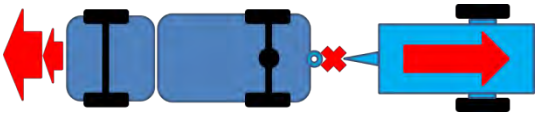
Maximum 20km/h

Avoid

Abrupt steering

Sudden Braking

Rapid Acceleration



2. Before operation

Parking

Chocks on the wheel

Pull the parking brake

Only for Parking

Inspection

Daily inspection

Follow the "Check sheet"

Starting

Discharge air pressure "0M/Pa"

Service valve "Fully closed"

Warm up time "5minutes"

Turbo charger engine

3. After operation

Stopping

Service valve “Fully closed”

Discharge residual pressure

Cooldown time “5minutes”

Turbo charger engine

Inspection

Check the all condition

Check the Hour meter for

Periodic maintenance

Cleaning

Body and Undercarriage

Hose and Equipment

4. Any problems

Following the “AIRMAN Instruction manual”

5. Fuel consumption

Fuel tank capacity: 300liter

Load	Liter/hour
100%	41.9
70%	27.8
50%	23.7
0%	19.9

OPERATION LOG

AIRMAN PDSF750S-4BS

Operation date	Operation place	Operation time		Hour meter		Daily operation hours (b)-(a)	Discharge air pressure (M/Pa)	Rated RPM (rpm/min)	Discharge air temperature (℃)	Coolant temperature (℃)	Remarks (Inspection/Parts change history etc.)
		Start time	Finish time	Start (a)	Finish (b)						
/ /		:	:								
/ /		:	:								
/ /		:	:								
/ /		:	:								
/ /		:	:								
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Periodic Inspection List

Item marked ○shall be carried by NBRO.
Item marked ● contact AIRMAN official distributer.

	Maintenance	Daily	50	250	300	500	1,000	2,000	3,000	6,000	12,000
Engine	Check engine oil level	○									
	Check coolant level	○									
	Check fuel	○									
	Drain fuel tank	○									
	Drain and check in fuel pre-filter	○									
	Check for looseness in pipe connectors, terminal and tear in wiring	○									
	Check belt tension	○									
	Change engine oil		○	○							
	Change engine oil filter		○	○							
	Check battery electrolyte			○							
	Check and clean clogging air filter element			○							
	Change fuel filter element			○							
	Change element of the fuel pre-filter			○							
	Change air filter element					○					
	Clean the strainer provided inside the engine feed pump					○					
	Change coolant						○/2Y				
	Clean outside of the radiator and inter cooler						○				
	Clean inside of radiator						●				
	Change inter cooler hose							●/2Y			
	Change fuel hose							●/2Y			
	Clean inside of fuel tank							●			
	Change radiator hoses								●/2Y		
	Change wiring harness									●	
Compressor	Check compressor oil level	○									
	Drain separator receiver tank	○									
	Check for looseness in pipe connecting part, wear and tear of pipe	○									
	Check oil, water, fuel and air leak	○									
	Check functions of all instruments and devices	○									
	Conduct the performance check of the safety valve	○									
	Check and clean clogging air filter element			○							
	Change compressor oil				○	○					

	Change compressor oil filter				○	○					
	Change air filter element					○					
	Clean strainer in the scavenging orifice					○					
	Clean outside of the oil cooler						○				
	Change nylon tubes							●/2Y			
	Change oil separator							●			
	Change the O-ring of the unloader								●/3Y		
	Check and change the unloader bushing								●/3Y		
	Change pressure regulator diaphragm								●/3Y		
	Change speed regulator diaphragm								●/3Y		
	Change rubber hoses								●/3Y		
	Check consumable parts of the auto-relief valve								●/3Y		
	Change consumable parts of the vacuum relief valve								●/3Y		
	Performance check of pressure control valve									●	
	Check the O-ring and piston of pressure control valve									●	
	Change rubber coupling										●
	Change oil seal / bearing										●
	Change solenoid valve										●
Undercarriage	Check and confirm that the nuts with which tires are fixed are properly tightened	○									
	Check and confirm the specified tightening torque of the nuts with which tires are fixed			○/3M							
	Supply grease to trailer hub bearing						○				
	Greasing axle						○				

Periodic Inspection schedule (1)

Item marked ○shall be carried by NBRO. Item marked ● contact AIRMAN official distributer.

	Maintenance	50	250	300	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000
Engine	Change engine oil (CD-SAE10W-30)	○	○		○	○	○	○	○	○	○	○	○	○	○
	Change engine oil filter	○	○		○	○	○	○	○	○	○	○	○	○	○
	Check battery electrolyte		○		○	○	○	○	○	○	○	○	○	○	○
	Check and clean clogging air filter element		○		○	○	○	○	○	○	○	○	○	○	○
	Change fuel filter element		○		○	○	○	○	○	○	○	○	○	○	○
	Change element of the fuel pre-filter		○		○	○	○	○	○	○	○	○	○	○	○
	Change air filter element				○		○		○		○		○		○
	Clean the strainer provided inside the engine feed pump				○		○		○		○		○		○
	Change coolant						○				○				○
	Clean outside of the radiator and inter cooler						○				○				○
	Clean inside of radiator						●				●				●
	Change inter cooler hose										●				
	Change fuel hose										●				
	Clean inside of fuel tank										●				
	Change radiator hoses														●
	Change wiring harness														
Compressor	Check and clean clogging air filter element		○		○	○	○	○	○	○	○	○	○	○	○
	Change compressor oil (Mobil Rarus SHC1025) (VG46)			○	○		○		○		○		○		○
	Change compressor oil filter			○	○		○		○		○		○		○
	Change air filter element				○		○		○		○		○		○
	Clean strainer in the scavenging orifice				○		○		○		○		○		○
	Clean outside of the oil cooler						○				○				○
	Change nylon tubes										●				
	Change oil separator										●				
	Change the O-ring of the unloader														●
	Check and change the unloader bushing														●
	Change pressure regulator diaphragm														●
	Change speed regulator diaphragm														●
	Change rubber hoses														●
	Check consumable parts of the auto-relief valve														●
	Change consumable parts of the vacuum relief valve														●
Undercarriage	Check and confirm the specified tightening torque of the nuts with which tires are fixed		○		○	○	○	○	○	○	○	○	○	○	○
	Supply grease to trailer hub bearing						○				○				○
	Greasing axle						○				○				○

Periodic Inspection schedule (2)

Item marked ○shall be carried by NBRO. Item marked ● contact AIRMAN official distributer.

	Maintenance	3,250	3,500	3,750	4,000	4,250	4,500	4,750	5,000	5,250	5,500	5,750	6,000	12,000
Engine	Change engine oil (CD-SAE10W-30)	○	○	○	○	○	○	○	○	○	○	○	○	
	Change engine oil filter	○	○	○	○	○	○	○	○	○	○	○	○	
	Check battery electrolyte	○	○	○	○	○	○	○	○	○	○	○	○	
	Check and clean clogging air filter element	○	○	○	○	○	○	○	○	○	○	○	○	
	Change fuel filter element	○	○	○	○	○	○	○	○	○	○	○	○	
	Change element of the fuel pre-filter	○	○	○	○	○	○	○	○	○	○	○	○	
	Change air filter element		○		○		○		○		○		○	
	Clean the strainer provided inside the engine feed pump		○		○		○		○		○		○	
	Change coolant				○				○				○	
	Clean outside of the radiator and inter cooler				○				○				○	
	Clean inside of radiator				●				●				●	
	Change inter cooler hose				●								●	
	Change fuel hose				●								●	
	Clean inside of fuel tank				●								●	
	Change radiator hoses												●	
	Change wiring harness												●	
Compressor	Check and clean clogging air filter element	○	○	○	○	○	○	○	○	○	○	○	○	
	Change compressor oil (Mobil Rarus SHC1025) (VG46)		○		○		○		○		○		○	
	Change compressor oil filter		○		○		○		○		○		○	
	Change air filter element		○		○		○		○		○		○	
	Clean strainer in the scavenging orifice		○		○		○		○		○		○	
	Clean outside of the oil cooler				○				○				○	
	Change nylon tubes				●								●	
	Change oil separator				●								●	
	Change the O-ring of the unloader												●	
	Check and change the unloader bushing												●	
	Change pressure regulator diaphragm												●	
	Change speed regulator diaphragm												●	
	Change rubber hoses												●	
	Check consumable parts of the auto-relief valve												●	
	Change consumable parts of the vacuum relief valve												●	
	Performance check of pressure control valve												●	
	Check the O-ring and piston of pressure control valve												●	
	Change rubber coupling													●
	Change oil seal / bearing													●
	Change solenoid valve													●
Undercarriage	Check and confirm the specified tightening torque of the nuts with which tires are fixed	○	○	○	○	○	○	○	○	○	○	○	○	
	Supply grease to trailer hub bearing				○				○				○	
	Greasing axle				○				○				○	

Daily Inspection check sheet

Good : ✔ Bad : X

AIRMAN PDSF750S-4BS

	Item number / Contents	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Engine	1 Check engine oil level																																
	2 Check coolant level																																
	3 Check fuel																																
	4 Drain fuel tank																																
	5 Drain and check in fuel pre-filter																																
	6 Check for looseness in pipe connectors, terminal and tear in wiring																																
	7 Check belt tension																																
Compressor	8 Check compressor oil level																																
	9 Drain separator receiver tank																																
	10 Check for looseness in pipe connecting part, wear and tear of pipe																																
	11 Check air leakage																																
	12 Check functions of all instruments and devices																																
	13 Conduct the performance check of the safety valve																																
U/C	14 Check and confirm that the nuts with which tires are fixed are properly																																
Inspector																																	
Remarks																																	

Countermeasures (When you filled in "X", fill in this column with checked item number, date and method.)

Air compressor Periodic inspection check sheet

Date	Model	Reg. No.	Hour meter	Checked by	Engineer sig.
			h		

✔	OK	×	Change	**A**	Adjust	**C**	Clean up	**T**	Tighten	**L**	Lubricant

Check		Engine	Qty.
	250	Change engine oil (CD-SAE10W-30)	L
	250	Change engine oil filter	
	250	Check battery electrolyte	
	250	Check and clean clogging air filter element	
	250	Change fuel filter element	
	250	Change element of the fuel pre-filter	
	500	Change air filter element	
	500	Clean the strainer provided inside the engine feed pump	
	1,000	Change coolant	
	1,000	Clean outside of the radiator and inter cooler	
	1,000	Clean inside of radiator	
	2,000	Change inter cooler hose	
	2,000	Change fuel hose	
	2,000	Clean inside of fuel tank	
	3,000	Change radiator hoses	
	6,000	Change wiring harness	

Check		Compressor	Qty.
	250	Check and clean clogging air filter element	
	500	Change compressor oil (Mobil Rarus SHC1025) (VG46)	L
	500	Change compressor oil filter	

Check		Compressor	Qty.
	500	Change air filter element	
	500	Clean strainer in the scavenging orifice	
	1,000	Clean outside of the oil cooler	
	2,000	Change nylon tubes	
	2,000	Change oil separator	
	3,000	Change the O-ring of the unloader	
	3,000	Check and change the unloader bushing	
	3,000	Change pressure regulator diaphragm	
	3,000	Change speed regulator diaphragm	
	3,000	Change rubber hoses	
	3,000	Check consumable parts of the auto-relief valve	
	3,000	Change consumable parts of the vacuum relief valve	
	6,000	Performance check of pressure control valve	
	6,000	Check the O-ring and piston of pressure control valve	
	12,000	Change rubber coupling	
	12,000	Change oil seal / bearing	
	12,000	Change solenoid valve	

Check		Undercarriage	Qty.
	250	Check and confirm the specified tightening torque of the nuts with which tires are fixed	
	1,000	Supply grease to trailer hub bearing	kg
	1,000	Greasing axle	kg

Comments:

OPERATION LOG

AIRMAN PDSF750S-4BS

Operation date	Operation place	Operation time		Hour meter		Daily operation hours (b)-(a)	Discharge air pressure (M/Pa)	Rated RPM (rpm/min)	Discharge air temperature (℃)	Coolant temperature (℃)	Remarks (Inspection/Parts change history etc.)
		Start time	Finish time	Start (a)	Finish (b)						
/ /		:	:								
/ /		:	:								
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Air compressor monitoring sheet

Date:

Name:

Position:

	Monitoring	Monitoring items	Confirmation method	Evaluation		If evaluation is "No" fill in the reason
				Yes	No	
Inspection	Daily inspection	Daily inspection (DI) check sheet	Followed and checked the DI check sheet			
			After found trouble or abnormality, conducted appropriate countermeasures			
	Periodic inspection	Periodic inspection (PI) check sheet	Followed and checked the PI check sheet			
			After found trouble or abnormality, conducted appropriate countermeasures			
Operation	Before operation	Procedures	Follow the proper procedures			
	Operation	Procedures	Follow the proper operation			
	Operator	Safety protection equipment	Wearing appropriate equipment			
		Health condition	Proper behavior for works			
	Operation log	Operation log sheet	Followed and written the Operation log sheet			
	After operation	Cleaning after use the Air compressor	Cleaning condition			
		Cleaning after use the equipment	Cleaning condition			

comment:

Appendix 8

Others

Appendix 8-1

Bid documents

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

The Government of Democratic Socialist Republic of Sri Lanka

THE TECHNICAL COOPERATION FOR LANDSLIDE MITIGATION PROJECT

BID DOCUMENTS

FOR

THE PILOT PROJECT FOR LANDSLIDE AND ROCK FALL MITIGATION WORKS

LOT 1, LOT 2 and LOT 3

NOVEMBER 2015

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) SRI LANKA OFFICE

Table of Contents – Summary Description

INVITATION FOR BIDS

For

THE PILOT PROJECT FOR LANDSLIDE AND ROCK FALL MITIGATION WORKS

Under

THE TECHNICAL COOPERATION FOR LANDSLIDE MITIGATION PROJECT

In

The Democratic Socialist Republic of Sri Lanka

Date: 23rd November, 2015

1. Japan International Cooperation Agency(JICA) (hereinafter referred to as "the Employer") has decided to extend the Pilot project for Landslide and Rock fall mitigation works to the Government of Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "the Recipient") for the construction supervision of structural mitigation measures and services necessary for the execution of the above-captioned Pilot project (hereinafter referred to as "the Project") and intends to apply the fund of the project to eligible payments under three (3) contracts for the Work related to the Project as the project for Landslide and Rock fall mitigation works (hereinafter referred to as "the Work") which includes the followings;

   Lot.1
   Horizontal drainage drilling, Gabion works and Suface drainage ditch works at Badulusirigama/ Uva Wellasa University in Badulla District, Uva Provinces. (Landslide mitigation works)

   Lot.2
   Horizontal drainage drilling, Gabion works and Suface drainage ditch works at Udamadura in Nuwara Eliya District, Central Provinces. (Landslide mitigation works)

   Lot.3
   Earth works (Excavation, Craushing rock, Embankment, Ground leveling and Stone pitching), Gabion works and Drainage works at Alagumale in Matale District, Central Provinces. (Rock fall mitigation works)

2. In order to implement the Project in an expeditious manner, Employer has sent JICA Technical cooperation team, TCLMP – JICA, the Joint Venture consisting of Earth System Science Co., LTD.as the leading firm, duly organized and existing under laws of Japan, having its principal office of business at 7F Shinjukumarune,Bldg.1-23-1, Shinjukuku, Shinjuku,Tokyo, 160-0022 Japan and Nippon Koei Co., Ltd., duly

organized and existing under laws of Japan, having its principal office of business at 5-4 Kojimachi, Chiyodaku, Tokyo, 102-8639 Japan.
TCLMP and National Building Research Organization (NBRO), an organization duly organized and existing under laws of the Democratic Socialist Republic of Sri Lanka, No. 99/1 Jawatte Road, Colombo 05, Sri Lanka, (Two Japanese firms and NBRO will hereinafter be referred to as "the Engineer") assist Employer in procuring the Work.

3. Under the Project, the JICA Sri Lanka Office (hereinafter referred to as "the Employer") invites eligible Bidders to the Bidding for the Work.

4. In this connection, you are invited to bid for the Work, and the Bidder may obtain further information from, and inspect and acquire the Bid Documents at the following offices of the Employer respectively:

Employer's Office

Sri Lanka Office, Japan International Cooperation Agency
10th & 13th Floors, DHPL Building,
No. 42, Navam Mawatha,
Colombo 02. Sri Lanka
Tel/Fax: 011-230-0470/ 011-230-0473
E-mail: shimano.toshiyuki@jica.go.jp RupasingheMegumi.SL@jica.go.jp

from 24th,25th and 26th of November 2015 from 8:30 am to 4:15 pm during working hours.

5. All Bids must be delivered to the following Employer's office at 10:00 hours for Lot 1, 13:00 hours for Lot 2 and 15:00 hours for Lot 3 on the 5th of January 2016. Bids will be opened immediately thereafter in the presence of the Bidder's representatives who are authorized with Power of Attorney of Bidder.

Sri Lanka Office, Japan International Cooperation Agency
10th & 13th Floors, DHPL Building,
No. 42, Navam Mawatha,
Colombo 02. Sri Lanka

6. The estimated date of award will be 13rd of January 2016.

VOLUME I

BIDDING PROCEDURES

TABLE OF CONTENTS

Volume I: BIDDING PROSEDURES

Section 1

INSTRUCTIONS TO BIDDERS

TABLE OF CLAUSES

Section 1
INSTRUCTIONS TO BIDDERS

A. GENERAL

1. Scope of Bid

1.1 Japan International Cooperation Agency(JICA) (hereinafter referred to as "the Employer") has decided to extend the Pilot project for Landslide and Rock fall mitigation works to the Government of Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "the Recipient") for the construction supervision of structural mitigation measures and services necessary for the execution of the above-captioned Pilot project (hereinafter referred to as "the Project") and intends to apply the fund of the project to eligible payments under three (3) contracts for the Work related to the Project as the project for Landslide and Rock fall mitigation works (hereinafter referred to as "the Work") which includes the followings;

Lot.1
Horizontal drainage drillings, Gabion works and Surface drainage ditch works at Badulusirigama/ Uva Wellasa University in Badulla District, Uva Province (Landslide mitigation works).

or

Lot.2
Horizontal drainage drillings, Gabion works and Surface drainage ditch works at Udamadura in Nuwara Eliya District, Central Province (Landslide mitigation works).

or

Lot.3
Earth works (Excavation, Crushing rock, Embankment, Ground levelling and Stone pitching), Gabion works and Drainage works at Alagumale in Matale District, Central Province (Rock fall mitigation works).

Under the Project, the JICA Sri Lanka Office (hereinafter referred to as "the Employer") invites eligible Bidders to the Bidding for the Work.

1.2 The Employer takes overall responsibility for implementing the Work, and the consulting services for the Work shall be performed by National Building Research Organization (NBRO) and the JICA Technical cooperation team, TCLMP – JICA, the Joint Venture consisting of Earth System Science Co., LTD. and Nippon Koei Co., Ltd. who shall assist JICA in procuring the Work during the bidding stage and act as "the Engineer" in the Contract between the Employer and the Contractor during the implementation stage.

1.3 The successful Bidders will be expected to complete the Work on or before the date stipulated in Article 4 of the General Conditions of Contract.

2. Source of Funds

2.1 Employer has Technical cooperation funds for The project for Landslide and Rock fall mitigation works in Sri Lanka.

3. Eligible Bidder

3.1 Eligible Bidders shall be such firms and/or voluntarily formed consortium consisting of building/civil construction contractors and/or equipment suppliers residing in the Democratic Socialist Republic of Sri Lanka. Eligible Bidders should be those who have received notification which clearly states that the applicant satisfies the conditions of prequalification for the Work subject to the following criteria:

(a) A Bidder can participate in one or more Lots as of Clause 1.1

(b) General civil contractor or specialized Construction Contractor duly organized and registered as SP2, M4 or C5 or above grade in specialized Contractor's Registration in Civil work as of the CIDA (ICTAD) Registration.

(c) Not blacklisted by the National Procurement Agency or any other organization and any history of litigation or arbitration resulting from contracts executed in the last five (5) years or currently under execution should be declared.

(d) Experience in 1) not less than one (1) project of landslide mitigation of which contract price is not less than fifteen million Sri Kankan Rupees during the last five (5) years, 2) not less than three (3) projects of horizontal drainage drilling (using casing pipes) and/or of soil nailing (using casing pipes) during the last five (5) years, and 3) not less than one (1) project of horizontal drainage drilling and/or soil nailing of which drilling length is not less than 15 m during the last five (5) years, are necessary to apply for Lot.1 and/or Lot.2.

(e) Experience in 1) not less than three (3) projects of Civil works and/or Earth works each of which the contract price is not less than ten (10) million Sri Lankan Rupees during the past five (5) years and 2) not less than five (5) projects of earth works of Gabion works, Excavation, Crushing rock, Drainage works, Embankment and/or Stone pitching in Earth works during the past five (5) years are necessary to apply for Lot.3.

(f) Minimum in-house staff of three (3-Lot.1 and Lot.2), two (2-Lot.3) experienced and qualified Engineers.

(g) Bidders shall be capable of owning or hiring the landslide mitigation works equipment in good condition.

3.2 The company who received notification which clearly state that the applicant satisfies the conditions of prequalification for the Work is required to participate in the Pre-Bid Meeting (See Clause 17) to participate in the bid. Otherwise the company shall lose the right to participate in the bid.

4. Qualification of the Bidder

4.1 To be qualified for award of Contract, the Bidder shall:

(a) Submit a written power of attorney authorizing the signatory of the Bid to commit the Bidder; and

(b) Submit documentary evidence establishing sufficient capability to undertake the Contract. The assessment of the Bidder's proposal regarding work program, scheduling and resourcing which shall be provided in sufficient detail to confirm the Bidder's capability to complete the Work in accordance with the specification and the time for completion.

5. Limitation of Bidding

5.1 A Bidder shall be allowed to bid any or all three (3) lots.

6. Cost of Bidding

6.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid and the Employer shall in no case be responsible or liable for those costs.

7. Site Visit

7.1 The Bidder is required to visit and examine the Site of the Work and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for the Work. The costs of visiting the Site shall be at the Bidder's own expense.

7.2 The Bidder and any of its personnel or agents will be granted permission by the Engineer to enter upon its premises and lands for the purpose of such inspection, but only upon the express condition that the Bidder, its personnel and agents, shall release and indemnify the Engineer and its personnel and agents from the against all liability in respect thereof and shall be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.

B. THE BID DOCUMENTS

8. Content of Bid Documents

8.1 The Bid Documents are those stated below, and should be read in conjunction with any addenda issue in accordance with Clause 10:

Invitation for Bid
Volume I: Bidding Procedures
- Section 1: Instruction to Bidders
- Section 2: Forms of Bid
- Section 3: Preamble to the Bill of Quantities
- Section 4: Forms of Contract Agreement and General Conditions of Contract

Volume II: Technical Specifications
- Section 5: Instructions for Technical Specifications

Section 6: Specification for Civil works
Section 7: Specification for Earth work
Section 8: Specification for Surface drainage ditch
Section 9: Specification for Horizontal drain
Section 10: Specification for Gabion box
Section 11: Specification for Geotextile

Volume III: Drawings
Section 12: LOT 1. Badulla Landslide mitigation works
Section 13: LOT 2. Nuwara Eliya Landslide mitigation works
Section 14: LOT 3. Matale Rock fall mitigation works

8.2 The Bidder is expected to examine carefully the contents of the Bid Documents. Failure to comply with the requirements of Bid submission will be at the Bidder's own risk. Pursuant to Clause 25, the Bid which is not substantially responsive to the requirements of the Bid Documents shall be rejected.

9. Clarification of Bid Documents

9.1 The Bidder requiring any clarification of the Bid Documents may notify the Employer in writing and such clarification shall be sent by e-mail or fax to the Employer's address indicated in the Invitation for Bid twenty five (25) days prior to the Bid closing.

9.2 The Employer shall respond in writing to the clarification stated above. The responses will be sent by e-mail or fax to all prospective Bidders who obtained the Bid Documents eighteen (18) days prior to the Bid closing.

9.3 All the prospective Bidders shall send e-mail or fax to the Employer for the confirmation of the receipt.

9.4 The responses shall constitute a part of the Bid Documents provided in Clause 8.1.

10. Amendment of Bid Documents

10.1 The Employer may, for any reason, whether at its own initiative, modify the Bid Documents by issuing addenda fourteen (14) days prior to the Bid Closing.

10.2 The prospective Bidders shall send the confirmation of receiving the addenda stated above to the Employer by e-mail or fax.

10.3 The addenda shall constitute a part of the Bid Documents provided in Clause 8.1.

C. PREPARATION OF BID

11. Language of Bid

11.1 The Bid, and all correspondence and documents, related to the Bid, exchanged between the Bidder and the Employer / the Engineer shall be written in the English language.

12. Documents

12.1 The bid submitted by the Bidder shall be referred to the Clause 19.

Comprising the Bid

13. Bid Prices

13.1 The Contract shall be for the whole Work, as described in Clause 1.1, based on the priced Bill of Quantities submitted by the bidder.

13.2 All expenses shall be included in the priced Bill of Quantities.

13.3 The Employer is to use the priced Bill of Quantities as a reference material for the following purposes such as;
(1) evaluation of the Bids,
(2) Confirmation of the adjusted contract price in case of change of work quantities during implementation of the work, and
(3) Unit price of Bill of Quantities is not changeable.

13.4 All taxes, such as VAT for the Work shall be included in the Bid and shall be eligible for the contract price for the successful Bidder.
Such taxes shall be itemized separately in the Bill of Quantities as they will be non-eligible for the contract price.

13.5 The Contract Price shall be subjected to modification during the performance of the Contract in accordance with Article 2 and 23 of the General Condition of Contract.

14. Currencies of Bid and Payment

14.1 The Bid price shall be quoted by the Bidder in Sri Lankan Rupees.

14.2 Payment of the contract price shall be made in the currency in which the bid price is expressed in the bid.

15. Bid Validity

15.1 The Bid shall remain valid for a period of 30 days after the date of deadline for submission of bid specified in Clause 20.

16. Bid Security

16.1 NOT APPLICABLE

17. Pre-Bid Meeting

17.1 The Bidder's designated representative is required to attend (a) pre-bid meeting(s) which will take place at the time and venue notified by the Engineer via e-mail or fax.
The Pre-Bid Meeting will be separately scheduled for each lot. The Bidder shall participate in the each Pre-Bid Meeting of the Lot that the Bidder intends to participate in. For example, if a Bidder intends to participate in Lot 1 and Lot 2, the Bidder shall participate in the Pre-Bid Meetings of Lot 1 and Lot 2.

17.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage. The Bidder is requested, as far as possible, to submit any questions in writing or by fax to reach the Employer not later than five days (5) before the meeting. It may not be practicable at the meeting to answer questions received late.

17.3 The minutes of such pre-bid meeting shall be made available to all

Bidders within a reasonable time prior to the closing date of the Bid. Such minutes should be included by the Bidder in his Bid.

18. Format and Signing of Bid

18.1 The Bidder shall prepare one (1) original and one (1) copy of the Bid Documents comprising the Bid as described in Clause 19 of this Instruction to Bidders, bound with the volume containing the Form of Bid, and clearly marked "ORIGINAL" and "COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.

18.2 The original of the Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder. All pages of the Bid where entries or amendments have been made shall be initialed by the person or persons signing the Bid.

18.3 The Bid shall contain no alterations, omissions or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

D. SUBMISSION OF BID

19. Sealing and Marking of Bid

19.1 The Bidder shall submit the followings;

(a) Power of attorney……..(Form-P1)

[Envelope A]
(a) Project Organization Chart (Free Form)
(b) Key Personnel……(Form-A2)
(c) Master Time Schedule for Construction……...(Form-A3)
(d) Proposed Major Construction Materials……..…(Form-A4)
(e) Proposed Construction Equipment……..(Form-A5)
(f) Safety Plan…….....…(Form-A6)
(g) Minutes of Pre-Bid meeting

[Envelope B]
(a) Forms of Bid……(Form-B1)
(b) Priced Bill of Quantities for Lot 1……(Form-B2-Lot1)
Priced Bill of Quantities for Lot 2……(Form-B2-Lot2)
Priced Bill of Quantities for Lot 3……(Form-B2-Lot3)

Envelopes shall be sealed and duly marked as "Envelope A" or "Envelope B", "ORIGINAL" or "COPY", name of the Bidder and the name of the Project and Lot number.

19.2 The envelopes shall be submitted to the Employer at the following place:

Chief Representative
Sri Lanka Office
Japan International Cooperation Agency

10th & 13th Floors, DHPL Building,
No. 42, Navam Mawatha,
Colombo 02. Sri Lanka, and

19.3 If the envelopes are not sealed, stamped and marked as above, the Employer shall assume no responsibility for the misplacement or premature opening of the Bid.

20. Deadline for Submission of Bid

20.1 The Bid must be delivered by the Bidder himself and received by the Employer at the place specified above no later than following time:

Lot 1: 10:00 hours
Lot 2: 13:00 hours
Lot 3: 15:00 hours

On the 5th of January 2016.

20.2 The Employer may, at its discretion, extend the deadline for submission of Bid by issuing an addendum in accordance with Clause 10, in which case all rights and obligations of the Employer and the Bidder previously subject to the original deadline will thereafter be subject to the deadline as extended.

21. Late Bid

21.1 Any Bid received by the Employer after the deadline for submission of Bids prescribed in Clause 20 will be rejected and returned unopened to the Bidder.

22. Modification and Withdrawal of Bid

22.1 No Bid shall be modified by the Bidder after the submission of Bid.

E. BID OPENING AND EVALUATION

23. Bid Opening

23.1 The Employer will open the Bid in the presence of Bidder's representative who are authorized with Power of Attorney of Bidder.

23.2 The presence or absence of the Bid Prices, any discounts and such other details as the Employer may consider appropriate shall be recorded by the Employer at the Bid opening under the presence of the Bidder's representative. The Bidder's representative shall be required to sign the record.

23.3 All Bids shall be opened on the date, time and place specified in the Invitation for Bids, immediately after the closing time, in the presence of the Employer, the Engineer and the Bidders.

At least one (1) authorized person with Power of Attorney of Bidder who submitted the Bid Documents shall attend the Bid opening.

23.4 Bid Opening Procedure

(1) All participants in the Bid opening shall register their signatures in an attendant list prepared by the Employer before the Bid opening.

(2) The Employer shall confirm each “Power of Attorney” of the Bidders. In case the document is incomplete or inappropriate, the Bidder shall forfeit his right to participate in the Bid opening any further and the Bid shall be returned unopened.

(3) Envelope-A will be opened and availability of the documents in Envelope-A required in 19.1 shall be examined. In case the document is incomplete or inappropriate, the Bidder shall forfeit his right to participate in the Bid opening any further and Envelope-B shall be returned unopened. The appropriateness of each document shall be examined carefully and thoroughly afterwards in the stage of Bid evaluation.

(4) Envelope-B will be opened and the Bid price offered by each Bidder shall be read aloud and recorded. The Bidder who submits the lowest Bid price within the ceiling price set forth by the Employer shall be designated as the prioritized negotiator for the contract. In the event that the prioritized negotiator is rejected as a result of the evaluation of the Bid, the Employer will invite the next lowest Bidder to enter into negotiation for the contract. This procedure will be followed until the Employer reaches agreement with a Bidder.

(5) In the event that all Bid prices offered exceed the ceiling price, the Bidders are requested to submit the prices again immediately after the first Bid opening. In this case, Bidders shall be requested to submit the Form of Bid only. The Form of Bid will be prepared by the Employer and distributed to each Bidder before the second Bid. The representative of each Bidder who attends the Bid opening shall, therefore, be duly authorized by his firm or company to submit the Bids for these second offers.

(6) In the second bidding, the Bidder who submits the lowest Bid price within the ceiling price set forth by the Employer shall be designated as the prioritized negotiator for the contract. In the event that the prioritized negotiator is rejected as a result of the evaluation of the Bid, the Employer will invite the next lowest Bidder to enter into negotiation for the contract. This procedure will be followed until the Employer reaches agreement with a Bidder.

(7) If the Bid prices in the second bidding exceed the ceiling price, the same procedure of (5) and (6) stated above shall be repeated for the third bidding.

(8) If the Bid prices in the third bidding exceed the ceiling price, the Bidder submitting the lowest price on the third bidding will be asked to enter into price negotiation in the stage of the bid evaluation for price reduction to the ceiling price. When negotiation with the Bidder submitting the lowest price on the third bidding is not successful, the Bidder submitting second lowest price will be asked to enter into price negosiation.

(9) In case there are two or more Bids at the same price within the ceiling price, a prioritized Bid shall be determined by drawing lots.

24. Process to be Confidential

24.1 Information relating to the examination, clarification and evaluation of the Bid and recommendations for the award of a contract shall not be disclosed to the Bidder or any other persons not officially concerned with such process until the award to the Bidder has been announced. Any effort by the Bidder to influence the Employer's processing of Bid or award decisions may result in the rejection of the Bidder's Bid.

25. Clarification of Bid

25.1 To assist in the examination and evaluation of Bids, the Employer may, at its discretion, ask the Bidder for clarification of its Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by fax, but no change in the price or substance of the Bid shall be sought, offered or permitted except as required to confirm to correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 27.

26. Examination of Bid Responsive-ness

26.1 The Employer will determine whether the Bid

(i) meets the eligibility criteria
(ii) has been properly signed;
(iii) is substantially responsive to the requirements of the Bid Documents; and
(iv) Provides any clarification and/or substantiation that the Employer may require pursuant to Clause 26.

26.2 The Employer will carefully review the Bid to determine that it technically confirms the following major items derived from the submitted technical documents by the Form of Supplemental Information;

(a) Project Organization
(b) Key Personnel
(c) Master Time Schedule for Construction
(d) Proposed Major Construction Materials
(e) Proposed Construction Equipment
(f) Safety Plan
(g) Minutes of Pre-Bid meeting

26.3 A substantially responsive Bid is one which conforms all the terms, conditions and specifications of the Bid Documents, without material deviation or reservation. A material deviation or reservation is one (i) which affects in any substantial way the scope, quality or performance of the Work; (ii) which limits in any substantial way, inconsistent with the Bid Documents, the Employer's rights or the Bidder's obligations under the Contract; or (iii) whose rectification would affect unfairly the conditions of and substantial responsiveness to the Bid.

26.4 If a Bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

27. Correction of Errors

27.1 The Bid determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Arithmetic errors will be rectified on the following basis. If there is a discrepancy between the unit rate and the total cost per item that is obtained by multiplying the unit rate and quantity, the unit rate shall prevail and the total cost per item will be corrected unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit rate, in which case the total cost per item as quoted will govern and the unit rate corrected. If there is a discrepancy between the total Bid amount and the sum of total costs per item, the total Bid amount shall prevail and the sum of the total costs per item shall be corrected.

27.2 The amount stated in the Form of Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, shall be considered as bin
ding upon the Bidder. If the Bidder does not accept the corrected amount of Bid, its Bid will be rejected.

28. Evaluation of Bid

28.1 In evaluating the Bid, the Employer will determine the Evaluated Bid Price by adjusting the Bid Price as follows:

(a) making any correction for errors pursuant to Clause 27;

28.2 The Employer reserves the right to accept or reject any variation, deviation or alternative offer. Variations, deviations, alternative offers and other factors which are in excess of the requirements of the Bid Documents or otherwise result in the accrual of unsolicited benefits to the Employer shall not be taken into account in bid evaluation.

28.3 The evaluation of Bids shall take into account the price and other commercial features of the offer.

28.4 The estimated effect of the price adjustment provisions of the General Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Bid evaluation.

28.5 If the Bid is seriously unbalanced in relation to or substantially below the Employer's estimate of the cost of work to be performed under to Contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in Article 12 of the General Conditions of Contract be increased at the expense of the Bidder to

a level sufficient to protect the Employer against financial loss in the event of default of the Bidder under the Contract.

F. AWARD OF CONTRACT

29. Award

29.1 Subject to Clause 31, the Employer will award the Contract to the Bidder provided that the Bidder has been determined to be eligible in accordance with the provisions of Clause 3.1 and 4.1.

30. Employer's Right to Accept or Reject the Bid

30.1 Notwithstanding Clauses 31, the Employer reserves the right to accept or reject the Bid, and to annul the Bidding process and reject the Bid at any time prior to award of Contract, without thereby incurring any liability to the Bidder or any obligation to inform the Bidder of the grounds for the Employer's action.

31. Notification of Award

31.1 Prior to expiration of the period of Bid validity of thirty (30) days as described in the Clause 15, the Employer will notify the Bidder by registered letter that its Bid has been accepted. This letter (hereinafter and in the General Conditions of Contract called the "Letter of Acceptance") shall name the sum which the Employer will pay the Contractor in consideration of the execution, completion and maintenance of the Work by the Contractor as prescribed by the Contract (hereinafter and in the General Conditions of Contract called "the Contract Price").

31.2 The notification of award will constitute the form of Contract agreement

31.3 The Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

32. Signing of Agreement

32.1 Subject to Clause 31, the Employer will enter into signing Form of Contract Agreement provided in the Bid Documents, incorporating all agreements with the Bidder whose Bid has been determined to be substantially responsive to the Bid Documents and who has offered acceptable evaluated bid price. At the same time, the Bidder shall sign the Form of Contract Agreement.

33. Common Conditions

33.1 Safety Procedure

The Contractor shall:

(1) comply with all applicable safety regulations,

(2) prepare safety plan and method statements on safety plan in line with "The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects"

URL:
http://www.jica.go.jp/activities/schemes/oda_safety/ku57pq00001nz4eu-att/guidance_en.pdf

(3) take care for the safety of all persons entitled to be on the Site,

(4) use reasonable efforts to keep the Site and the Work clear of unnecessary obstruction so as to avoid danger to these persons,

(5) provide fencing, lighting, guarding and watching of the Work until completion and taking-over, and

(6) Provide any temporary works (including roadways, footways, guard and fences) which may be necessary, because of the execution of the Work, for the use and protection of the public and of owners and occupiers of adjacent land.

33.2 Quality Assurance

(1) The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. The system shall be in accordance with the details stated in the Contract.

(2) Compliance with the quality assurance system shall not relieve the Contractor of any of his duties, obligations or responsibilities under the Contract.

33.3 Protection of the Environment

The Contractor shall take all reasonable steps to protect the environment (both on and off Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other result of his operations.

Section 2

FORMS OF BID

The Bidder shall complete and submit the Form of Bid and Appendix to Bid all in accordance with the requirements of the bidding documents.

TABLE OF FORMS

(Form P1)

**1 fill in the number of Lot*

LOT **1*

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, that (Name of Bidder) , a corporation duly organized and existing under the laws of Sri Lanka, with its principal place of business at (Address of Bidder), dose hereby constitute, designate and appoint (Name and designation of Representative of the Bidder), whose specimen signature is shown below, as our true and lawful attorney-in-fact, in our name, place and stead, with full powers of substitution and revocation, to sign and submit the bid documents and all documents related to the Bidder for the Pilot project for Landslide and Rock fall mitigation works, and to do any and all acts and deeds as the said attorney-in-fact may deem requisite, necessary or proper to be done in connection therewith, all in our name and on our behalf, hereby ratifying and confirming all that the said attorney-in-fact shall do pursuant to the power hereunder granted.

This Power of Attorney has been drawn up in the city of_____, Sri Lanka on this (day)th day of (month), 2015 and shall remain in full force and effect until our further notice.

NAME OF BIDDER

(Signature)_____

(Name in Print)_____

(Title)_____

(Specimen Signature of the Representative)

(Verification of signature by the relevant Authority)

(Form A2)

**1 fill in the number of Lot*

LOT **1*

KEY PERSONNEL

	Name of Nominee	Summary of Qualifications Experience and Present Occupation
Site Office Key Staff		

Notes:

1. The bidder shall list in this form the key personnel who will employ from Site Office to direct and execute the Work. The bidder shall attach CV's of each Site Office Key staff above describing their education, technical qualifications, work experience with its assignment and positions, language capability held and their nationalities.
2. The form shall be entered into the Contract for information purposes only. Its inclusion shall not relieve the Contractor of his General Obligations under the Contract.

(Form A3)

**1 fill in the number of Lot*

LOT **1*

MASTER TIME SCHEDULE FOR CONSTRUCTION

The Bidder shall submit a comprehensive Master Time Schedule indicating all major work activities for execution of the work in their sequence order and expected duration, sequence and relation of all major operation or construction activities. The Master Time Schedule shall clearly show but not limited to the following views and work activities and shall be supported by a time schedule for manpower utilization and other relevant data or statements, etc.

1) Mobilization and Demobilization Schedule
2) Procurement and Delivery of Major Construction Materials
3) Sequence and Duration of Major Works
4) Identification of Works executed by Subcontractor(s)
5) Critical Operations or Activities of Construction
6) Time of Completion for the Whole Works

The Schedule shall be prepared in the form of arrow diagram.

(Form A4)

**1 fill in the number of Lot*

LOT **1*

PROPOSED MAJOR CONSTRUCTION MATERIALS

Description (Type, Name)	Class or Size of Product	Name of Manufacture	Code or Specifications

NOTES:

1. The bidder shall enter in this form all items of materials and equipment for their identification which are proposed to use and incorporate as the Work under the contract.
2. The inclusion of this form into the Contract for identification of materials and equipment to be procured for the Work shall not relieve the Contractor of his General Obligation under the Contract.

(Form A5)

**1 fill in the number of Lot*

LOT **1*

PROPOSED CONSTRUCTION EQUIPMENT

1. Mobilization

Description (Type, Model, Make)[1]	No. of Each	Year of Manufacture	New or Used	Owned (O) or Leased (L)	Rating	Power t or m^3	Capacity
1.1							
1.2							
1.3							
1.4							
1.5							

2. Demobilization

Description (Type, Model, Make)[1]	No. of Each	Year of Manufacture	New or Used	Owned (O) or Leased (L)	Rating	Power t or m^3	Capacity
2.1							
2.2							
2.3							
2.4							
2.5							

NOTES:

1. The bidder shall enter in the information 1 & 2 above all items of construction equipment owned, leased (rented) and proposed to buy, which he proposes to bring on Site and which formed the basis of the Mobilization/Demobilization Lump Sum Items.
2. The inclusion of this form into the Contract for certification of the Mobilization/Demobilization Lump Sum shall not relieve the Contractor of his General Obligations under the Contract.

(Form A6)

**1 fill in the number of Lot*

LOT **1*

SAFETY PLAN

COMPOSITION OF THE SAFETY PLAN

1. Items for inclusion in the Safety Plan

A typical Safety Plan shall be comprised of the followings:

(1) Basic Policies for Safety Management
(2) Internal Organizational Structure for Safety Management
(3) Promotion of the PDCA Cycle
(4) Monitoring
(5) Safety Education and Training
(6) Voluntary Safety Management Activities
(7) Sharing Information
(8) Response to Emergencies and Unforeseen Circumstances

2. Compliance with items for inclusion

Since items that constitute the Safety Plan as described in " Items for inclusion in the Safety Plan (1)-(8)" apply generally to all ODA Projects, the Contractor shall incorporate all those items into their Safety Plan.

Items other than those specified in "Items for inclusion in the Safety Plan" which arise with respect to the scope of work or the conditions for construction, shall also be specified in the Safety Plan.

NOTES:

The Bidder shall read through " The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects"

http://www.jica.go.jp/activities/schemes/oda_safety/ku57pq00001nz4eu-att/guidance_en.pdf

(Form B1)

**1 fill in the number of Lot*

LOT **1*

Form of Bid

The Pilot project for Landslide and Rock fall mitigation works

LOT 1, LOT 2 or LOT 3

for

The Technical Cooperation for Landslide Mitigation Project

Mr. Kiyoshi AMADA
Chief Representative,
Sri Lanka Office,
Japan International Cooperation Agency,
10th & 13th Floors, DHPL Building,
No. 42, Navam Mawatha,
Colombo 02. Sri Lanka

Gentlemen:

1. Having examined the Conditions of Contract, Specification, Drawings, and Bill of Quantities and Addenda Nos. …….. for the execution of the above-named Works, we, the undersigned, offer to execute and complete such Works and remedy any defects therein in conformity with the Conditions of Contract, Specification, Drawings, Bill of Quantities and Addenda for the sum of Sri Lankan Rupees ……..…… (excluding the VAT) as specified in the Appendix to Bid or such other sums as may be ascertained in accordance with the said Conditions.

2. We undertake, if our Bid is accepted, to commence the Work as soon as is reasonably possible after the receipt of the Employer's notice to commence, and to complete the whole of the Work comprised in the Contract within the time stated in the General Conditions of Contract.

3. We agree to abide by this Bid for the period of 30 days from the date fixed for receiving the same, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

4. Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
5. We understand that you are not bound to accept the lowest or any bid you may receive.

Date this…….day of……..2015……..in the capacity of……..duly authorized

to sign bids for and on behalf of ……..…….

[in block capitals or typed]

Signature:
……

Name:
……

Address:
.....

Witness:
……

Address:
.....

Occupation:
……

(Form B2-Lot 1)

BILL OF QUANTITIES fot Badulla Landslide mitigation works

Japan International Cooperation Agency (JICA) Sri Lanka Office,
10th & 13th Floors, DHPL Building,
No. 42, Navam Mawatha,
Colombo 02. Sri Lanka

Item	Description	Unit	Qty	Rste	AMOUNT
1	**CONTRACTOR'S SITE ESTABLISHMENT**				
1.1	Establishment, maintenance, and removal of contractor's site facilities such as office, stores, services, security, etc…	LS	1		
1.2	Mobilization and de-mobilization of plant, equipment, and machinery	LS	1		
TOTAL OF CONTRACTOR'S SITE ESTABLISHMENT				**A**	
2	**HEALTH, SAFETY AND ENVIRONMENT**				
2.1	Health and safety measures during construction confirming to the latest industrial standards	LS	1		
2.2	Environmental protection and precaution during construction (hording and dust screens shall be provided to control dust escaping to surrounding areas).	LS	1		
TOTAL OF HEALTH, SAFETY AND ENVIRONMENT				**B**	
3	**INSURANCE, BONDS AND SECURITIES**				
3.1	Insurance of works, contractor's equipment, third party, and workmen's compensation	LS	1		
3.2	Performance security	LS	1		
3.3	Advance payment security	LS	1		
TOTAL OF INSURANCE, BONDS AND SECURITIES				**C**	
4	**PROJECT SIGN BOARDS**				
4.1	Provide and maintain project signboards	item	1		
TOTAL OF PROJECT SIGN BOARDS				**D**	
5	**SITE INVESTIGATION / TESTING**				
5.1	Site investigation and Testing as directed by the Engineer (Not included in contractors quality control/assurance plane)	PS	1		
TOTAL OF SITE INVESTIGATION / TESTING				**E**	
6	**QUALITY STANDARD AND PROGRESS**				
6.1	Provision for monthly progress reports and photograps and etc	Month	16		
6.2	Provide as built drawings, Quality assurance reports	LS	1		
TOTAL OF QUALITY STANDARD AND PROGRESS				**F**	

7	**HORIZONTAL DRAINAGE DRILLING**				
7.1	Temporary working platform for Horizontal Drilling Work.	m³	24		
7.2	Drilling for 100mm dia horizontal drains through any type of soil an intermittent rock and disposal of drilled material away from site as directed by Engineer.	m	2,400		
7.3	Ditto - do - but through fresh bedrock.	m	255		
7.4	90mm dia long drains with perforated type 1000 PVC pipes and geotextile wrapping. Rate shall include for any other associated work as directed by the Engineer.	m	2,655		
7.5	Supplying and placing of 90mm dia Polyethylene pipes Type 1000. Rate shall include for connecting the pipes to the PVC pipes and any other associated work as directed by the Engineer.	m	127		
TOTAL OF HORIZONTAL DRAINAGE DRILLING				**G**	
8	**GABION WORK.**				
8.1	Supplying, assembling and placing of PVC coated Gabion wall boxes of size 1.0 x 1.0 x 1.0m, filling dry rubble 6" x 9" at toe region of the surface drain outlet including provision of excavation & trimming and preparation of ground surface to accommodate the proper placing of gabion boxes and as per the specifications, drawings and instructed by the Engineer.	m³	60		
TOTAL OF GABION WORK				**H**	
9	**SURFACE DRAINAGE DITCH**				
	Construction of RCC drains including Excavation for structures in soil, backfilling with existing soil, and disposal of excess materials away from the site within 5km distance as directed by the Engineer, planking and strutting if necessary, Supply and laying Grade 15 concrete and Grade 25 concrete prepared at site using mixer and vibrator, Tor steel reinforcement, Supply and fabricate, installing removing of formwork (ply wood) to sides of Drain Expansion joints with water stops for drain @20m intervals and cost of curing continuously. Specification: SCA 05-302 SCA/5/1001 SCA/5/1002 SCA/5/1008 Parti.Spec. Pay: SCA 05-302(1) SCA/5/1001(2) SCA/5/1002(1) SCA/5/1008(1)Parti.Preamble				
9.1	B300 H300	m	380		
9.2	B450 H450	m	225		
9.3	B600 H500	m	69		
9.4	B600 H600	m	103		
9.5	B600 H900	m	84		
TOTAL OF SURFACE DRAINAGE DITCH				**I**	

10	**WATER COLLECTING PIT**				
	Construction of RCC drains including Excavation for structures in soil, backfilling with existing soil, and disposal of excess materials away from the site within 5km distance as directed by the Engineer, planking and strutting if necessary, Supply and laying Grade 15 concrete and Grade 25 concrete prepared at site using mixer and vibrator, Tor steel reinforcement, Supply and fabricate, installing removing of formwork (ply wood) to sides of walls and siffits and cost of curing continuously. Specification: SCA 05-302, SCA/5/1001, SCA/5/1002, SCA/5/1008 Pay: SCA 05-302(1), SCA/5/1001(2), SCA/5/1002(1), SCA/5/1008(1)				
10.1	0.6 x 0.6 x 0.5m	nos.	1		
10.2	1.5 x 1.5 x 0.8m	nos.	2		
10.3	1.7 x 1.7 x 1.1m	nos.	1		
TOTAL OF WATER COLLECTING PIT				**J**	

1. Lot 1: TOTAL OF BILL OF QUANTITIES (TOTAL OF A～J)	
2. Contingencies-10% of Sub Total	
TOTAL BID PRICE (1+2)	
TOTAL BID PRICE (Amount in words):	
VAT 12% OF TOTAL BID PRICE	
GRAND TOTAL INCLUDING VAT	

(Signature)

(Name of Signer)

(Title of Signer)

(Form B2-Lot 2)

Lot 2: BILL OF QUANTITIES fot Nuwara Eliya Landslide mitigation works

Japan International Cooperation Agency (JICA) Sri Lanka Office,
10th & 13th Floors, DHPL Building,
No. 42, Navam Mawatha,
Colombo 02. Sri Lanka

Item	Description	Unit	Qty	Rate	Amount
1	**CONTRACTOR'S SITE ESTABLISHMENT**				
1.1	Establishment, maintenance, and removal of contractor's site facilities such as office, stores, services, security, etc…	LS	1		
1.2	Mobilisation and de-mobilization of plant, equipment, and machinery	LS	1		
	TOTAL OF CONTRACTOR'S SITE ESTABLISHMENT			**A**	
2	**HEALTH, SAFETY AND ENVIRONMENT**				
2.1	Health and safety measures during construction confirming to the latest industrial standards	LS	1		
2.2	Environmental protection and precaution during construction (hording and dust screens shall be provided to control dust escaping to surrounding areas).	LS	1		
	TOTAL OF HEALTH, SAFETY AND ENVIRONMENT			**B**	
3	**INSURANCE, BONDS AND SECURITIES**				
3.1	Insurance of works, contractor's equipment, third party, and workmen's compensation	LS	1		
3.2	Performance security	LS	1		
3.3	Advance payment security	LS	1		
	TOTAL OF INSURANCE, BONDS AND SECURITIES			**C**	
4	**PROJECT SIGN BOARDS**				
4.1	Provide and maintain project signboards	item	1		
	TOTAL OF PROJECT SIGN BOARDS			**D**	
5	**SITE INVESTIGATION / TESTING**				
5.1	Site investigation and Testing as directed by the Engineer (Not included in contractors quality control/assurance plane)	PS	1		
	TOTAL OF SITE INVESTIGATION / TESTING			**E**	
6	**QUALITY STANDARD AND PROGRESS**				
6.1	Provision for monthly progress reports and photographs and etc	Month	9		
6.2	Provide as built drawings, Quality assurance reports	LS	1		
	TOTAL OF QUALITY STANDARD AND PROGRESS			**F**	
7	**HORIZONTAL DRAINAGE DRILLING**				
7.1	Temporary working platform for Horizontal Drilling Work.	m^3	11		
7.2	Drilling for 100mm dia horizontal drains through any type of soil an intermittent rock and disposal of drilled material away	m	450		

	from site as directed by Engineer.				
7.3	Ditto - do - but through fresh bedrock.	m	50		
7.4	90mm dia long drains with perforated type 1000 PVC pipes and geotextile wrapping. Rate shall include for any other associated work as directed by the Engineer.	m	500		
7.5	Supplying and placing of 90mm dia Polyethylene pipes Type 1000. Rate shall include for connecting the pipes to the PVC pipes and any other associated work as directed by the Engineer.	m	25		
	TOTAL OF HORIZONTAL DRAINAGE DRILLING			**G**	
8	**GABION WORK.**				
8.1	Supplying, assembling and placing of PVC coated Gabion wall boxes of size 1.0 x 1.0 x 1.0m, filling dry rubble 6" x 9" at toe region of the surface drain outlet including provision of excavation & trimming and preparation of ground surface to accommodate the proper placing of gabion boxes and as per the specifications, drawings and instructed by the Engineer.	m^3	10		
	TOTAL OF GABION WORK			**H**	
9	**SURFACE DRAINAGE DITCH**				
	Construction of RCC drains including Excavation for structures in soil, backfilling with existing soil, and disposal of excess materials away from the site within 5km distance as directed by the Engineer, planking and strutting if necessary, Supply and laying Grade 15 concrete and Grade 25 concrete prepared at site using mixer and vibrator, Tor steel reinforcement, Supply and fabricate, installing removing of formwork (ply wood) to sides of Drain Expansion joints with water stops for drain @20m intervals and cost of curing continuously. Specification: SCA 05-302, SCA/5/1001, SCA/5/1002, SCA/5/1008, Parti.Spec. Pay: SCA 05-302(1), SCA/5/1001(2), SCA/5/1002(1), SCA/5/1008(1), Parti.Preamble				
9.1	B450 H450	m	149		
9.2	B600 H500	m	230		
9.3	B600 H700	m	106		
	TOTAL OF SURFACE DRAINAGE DITCH			**I**	
10	**WATER COLLECTING PIT**				
	Construction of RCC drains including Excavation for structures in soil, backfilling with existing soil, and disposal of excess materials away from the site within 5km distance as directed by the Engineer, planking and strutting if necessary, Supply and laying Grade 15 concrete and Grade 25 concrete prepared at site using mixer and vibrator, Tor steel reinforcement, Supply and fabricate, installing removing of formwork (ply wood) to sides of walls and siffits and cost of curing continuously.				

	Specification: SCA 05-302, SCA/5/1001, SCA/5/1002, SCA/5/1008 Pay: SCA 05-302(1), SCA/5/1001(2), SCA/5/1002(1), SCA/5/1008(1)				
10.1	1.1×1.1×0.7m	nos.	1		
10.2	1.6×1.6×0.9m	nos	2		
	TOTAL OF WATER COLLECTING PIT			**J**	
11	**SMALL DAM**				
11.1	Supplying, assembling and placing of PVC coated Gabion wall boxes of size 1.0 x 1.0 x 1.0m, filling dry rubble 6" x 9" at toe region of the surface drain outlet including provision of excavation & trimming and preparation of ground surface to accommodate the proper placing of gabion boxes and as per the specifications, drawings and instructed by the Engineer. Gabion H=2.0m Specification: SCA/5/1001 Pay: SCA/5/1001(2)	nos	1		
11.2	Supplying, assembling and placing of PVC coated Gabion wall boxes of size 1.0 x 1.0 x 1.0m, filling dry rubble 6" x 9" at toe region of the surface drain outlet including provision of excavation & trimming and preparation of ground surface to accommodate the proper placing of gabion boxes and as per the specifications, drawings and instructed by the Engineer. Concrete H=1.0m Specification: SCA/5/1001 Pay: SCA/5/1001(2)	nos	1		
	TOTAL OF SMALL DAM			**K**	
1. Lot 2: TOTAL OF BILL OF QUANTITIES (TOTAL OF A～K)					
2. Contingencies-10% of Sub Total					
TOTAL BID PRICE (1+2)					
TOTAL BID PRICE (Amount in words):					
VAT 12% OF TOTAL BID PRICE					
GRAND TOTAL INCLUDING VAT					

(Signature)

(Name of Signer)

(Title of Signer)

(Form B2-Lot 3)

Lot 3: BILL OF QUANTITIES fot Matale Rock fall mitigation works

Japan International Cooperation Agency (JICA) Sri Lanka Office,
10th & 13th Floors, DHPL Building,
No. 42, Navam Mawatha,
Colombo 02. Sri Lanka

Item	Description	Unit	Qty	Rate	Amount
1	**CONTRACTOR'S SITE ESTABLISHMENT**				
1.1	Establishment, maintenance, and removal of contractor's site facilities such as office, stores, services, security, etc…	LS	1		
1.2	Mobilisation and de-mobilization of plant, equipment, and machinery	LS	1		
	TOTAL OF CONTRACTOR'S SITE ESTABLISHMENT			**A**	
2	**HEALTH, SAFETY AND ENVIRONMENT**				
2.1	Health and safety measures during construction confirming to the latest industrial standards	LS	1		
2.2	Environmental protection and precaution during construction (hording and dust screens shall be provided to control dust escaping to surrounding areas).	LS	1		
	TOTAL OF HEALTH, SAFETY AND ENVIRONMENT			**B**	
3	**INSURANCE, BONDS AND SECURITIES**				
3.1	Insurance of works, contractor's equipment, third party, and workmen's compensation	LS	1		
3.2	Performance security	LS	1		
3.3	Advance payment security	LS	1		
	TOTAL OF INSURANCE, BONDS AND SECURITIES			**C**	
4	**PROJECT SIGN BOARDS**				
4.1	Provide and maintain project signboards	item	1		
	TOTAL OF PROJECT SIGN BOARDS			**D**	
5	**SITE INVESTIGATION / TESTING**				
5.1	Site investigation and Testing as directed by the Engineer (Not included in contractors quality control/assurance plane)	PS	1		
	TOTAL OF SITE INVESTIGATION / TESTING			**E**	
6	**QUALITY STANDARD AND PROGRESS**				
6.1	Provision for monthly progress reports and photograps and etc	Month	11		
6.2	Provide as built drawings, Quality assurance reports	LS	1		
	TOTAL OF QUALITY STANDARD AND PROGRESS			**F**	
7	**EARTH WORK**				
7.1	Excavation for canal (ditch) in soil soft rock, disposal of materials on site location and presevating for reuse as directed by the Engineer.	m^3	1,030		
7.2	Rock excavation for structures/reshaping the slope/berms using **control blasting** and disposal of excess materials away	m^3	412		

	from the site within 5km distance as directed by the Engineer.				
7.3	Rock excavation for rock **using mechanical** (using excavator or breaker) and disposal of materials on site location and presevating for reuse as directed by the Engineer. Specification:SCA/5/302 Pay: SCA 05-302(3&4)	m^3	1		
7.4	Rock excavation for rock **using mechanical** (using excavator or breaker) and disposal of materials on site location and presevating for reuse as directed by the Engineer.	m^3	1		
7.5	Filling to Embankment using exsisting soil at downside of the slope including compaction (Ave. effective height-2m approximate) as per the specifications, drawing and instructed by the Engineer.	m^3	738		
7.6	Leveling of excavated Canal disposal of materials on site location and presevating for reuse as directed by the Engineer.	m^3	91		
7.7	Suppying and placing of Rubble stone pitching top of the Earth embankment and bottom of the Canal as directed by the Engineer.	m^2	679		
	TOTAL OF EARTH WORK			**G**	
8	**GABION WORK.**				
8.1	Supplying, assembling and placing of PVC coated Gabion wall boxes of size 1.0 x 1.0 x 1.0m, filling dry rubble 6" x 9" at toe region of the surface drain outlet including provision of excavation & trimming and preparation of ground surafce to accomodate the proper placing of gabion boxes and as per the specifications, drawings and instructed by the Engineer.	m^3	201		
	TOTAL OF GABION WORK			**H**	
9	**DRAINAGE WORK**				
9.1	Supplying and placing of 700mmØ Precast RCC hume Pipee. Rate to include for Excavation for drian, Connection of Pipes and Backfill as per the drawings, specifications and as instructed by the Engineer.	m	18		
	TOTAL OF DRAINAGE WORK			**I**	
1. Lot 3: TOTAL OF BILL OF QUANTITIES (TOTAL OF A～I)					
2. Contingencies-10% of Sub Total					
TOTAL BID PRICE (1+2)					
TOTAL BID PRICE (Amount in words):					
VAT 12% OF TOTAL BID PRICE					
GRAND TOTAL INCLUDING VAT					

(Signature)

(Name of Signer)

(Title of Signer)

Section 3

PREAMBLE TO THE BILL OF QUANTITIES

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Preamble to the Bill of Quantities

A. General

1.1 The Bill of Quantities shall be read in conjunction with all parts of this entire Bidding Document; the Instructions to Bidders, General Conditions of Contract, Technical Specifications, Drawings, and supplementary information.

1.2 The Bill of Quantities includes lump items, unit price items and provisional sum items.The lump sum price quoted will be deemed to be full compensation for completion o fwork items and paid in full when the work is completed. The quantities given in the Bill of Quantities for the unit price items are estimated and provisional, and are given to provide a common basis for bidding. They are not intended to be the maximum or minimum quantities for payment. The unit prices will be considered full compensation for those work items. The basis of payment will be the actual quantities of work carried out under the provisions of the Contract, measured and valued at the applicable rates and prices in the priced Bill of Quantities.

1.3 The rates and prices bid in the priced Bill of Quantities shall, except as otherwise provided under the Contract, include all construction plant, equipment, labour, supervision, materials, transport, erection, maintenance, testing, insurance, overheads, taxes, and duties, together with all general risks, liabilities, and obligations set out or implied in the Contract.

1.4 A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

1.5 The rates and prices entered in the Bill of Quantities shall be full compensation for completed work and shall have taken full account of all requirements and obligations, covered by all parts of the contract, including but not limited to, the following,unless expressly stated otherwise:

a. All setting out and survey works including Pre and Post Construction Surveys.
b. All additional site surveys and investigations, preparation of field amendment drawings, shop drawings and As-Built drawings.
c. Mobilization and Demobilization of labour, all construction plant and equipment.
d. Establishment, Maintenance and Removal of all temporary facilities (Contractor's and Engineer's) including offices, workshops, houses, labour camps construction

and storage yards, Laboratory facilities and Equipment, Transport for staff and labour etc.

e. Labour and all costs in connection therewith, including but not limited to social charges or fringe benefits.
f. The supply of material and goods, storage and costs in connection therewith including delivery to site and handling material within the site/sites.
g. Taking delivery of materials and goods supplied by others, unloading, storage, handling materials within site, and costs in connection therewith.
h. Construction Plant & Equipment and all costs in connection therewith.
i. Fixing, erecting and installing or placing of materials and goods in position, including usual auxiliary material etc.
j. Temporary Works.
k. Complying with any limitations and constraints on the use of the site/sites including coordinating with other Contractor's, with regard to site access, security etc., maintenance of access to households and other users, maintenance of existing roads, waterways etc.
l. Dealing with the existing flow of water from any source including rainfall and surface runoff, groundwater, wave action and the like. This includes all and any dewatering operations necessary for the execution of the Work.
m. General obligations, liabilities and risks involved in the execution of the Work set forth or reasonably implied in the documents on which the Bid is based.
n. Overheads and profit.
o. Waste of material.
p. Attendance and transport for surveys, survey instruments, sampling and testing carried out by the Engineer.
q. Performing all sampling and testing which are required to be carried out by the Contractor, and supplying results of such tests.
r. Providing required material delivery certificates.
s. Coordination with Regulatory Institutes & all stake holders.
t. Disposal of all waste material.
u. Complying with all requirements in Specifications and Conditions of Contract where separate items have not been provided.

1.6 Where Bill of Quantities items describe the replacement of existing equipment or components, including mechanical and electrical equipment, the equipment

removed remains the property of the Employer, unless stated otherwise in the contract documents. The rates entered shall include for delivery of such equipment to the Employer or for disposal if so directed by the Employer.

1.7 The whole cost of complying with the provisions of the Contract (excluding VAT) shall be included in the Items provided in the priced Bill of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.

1.8 General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities.

1.9 Provisional Sums included and so designated in the Bill of Quantities shall be expended in whole or in part or not at all at the direction and discretion of the Engineer .

1.10 The method and unit of measurement of completed work for payment shall be in accordance with the method described in the specifications for each item or in the Bill of Quantities. For Lump Sum items, measurements for Interim Payment Certificates shall be based on percentage completion of such item of work or milestone as per the Contractor's proposed schedule of quarterly payments, as approved by the Engineer.

B. Descriptions of Items and Measurement Methods

INTRODUCTION

The descriptions of the different items in the Bills of Quantities and the method adopted for measurements are indicated in the following paragraphs.

The quantities shall be computed using dimensions from the drawings based on the pre-bid meeting or as varied by the Engineer, except where clearly stated otherwise under the following individual items. No allowance shall be made for settlement, bulking, shrinkage, or waste.

The B.1 items will be paid from Advance payment.

B.1 Bill of Quantities for Lot 1, Lot 2 and Lot 3

1 Contractor's site establishment

1.1 Establishment, maintenance, and removal of contractor's site facilities such as office, stores, services, security, etc.

The sub item provides for the establishment and removal on completion of all the facilities required by the Contractor for execution of the work under the contract including offices, stores, services, security workshops, housing etc.

1.2 Mobilization and demobilization of plant Equipment and machinery

The item provides for mobilization and demobilization, removal of Contractors equipment's including mobilization of all necessary equipment's to the site, removal of all rubbish & debris and clearing up site on completion, leaving all the good in order and handing over.

2 Health, Safety and Environment

2.1 Health and safety measures during construction confirming to the latest industrial standards

This sub item provides for all necessary Health, Environment Protection and safety items. This includes employing workmen to clean and maintain all areas to be in good hygienic conditions including toilets, wash areas, kitchen etc. supply adequate drinking water, after for washing purposes, soap, detergent, etc. throughout the period of construction.

Providing all necessary safety measures to workmen at site confirming to the latest industrial safety regulations and "The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects" prepared by JICA and as directed by the engineer.

2.2 Environmental protection and precaution during construction

Environment protection shall include making adequate provisions against air and noise pollution of surrounding areas. Hording and dust screens to prevent escaping dust to surrounding areas. Maintaining the site in a clean and orderly manner at all times during entire contract period.

3 Insurances, Bonds and Securities

3.1 Insurance of works, contractor's equipment, third party, and workmen's compensation

The sub items provide for the provision of the different types of insurances as required in Article 16 of the General Conditions of Contract as lump sum items. This includes insurance of works, Machinery & Equipment, Plant, Materials, third party persons & Property and Employer's personal & property at site as per the Contract. Insurance against accidents and injury to Contractor's personnel as per the Contract.

3.2 Performance security

The item provides for the provision of Performance Security as required in Article 12 of the General Conditions of Contract (GCC) as a lump sum item.

3.3 Advance payment Security

The item provides for the provision of Security Bonds and Guarantees against advance payment etc. as required in the Contract as a Lump Sum item. The Contractor shall submit with his Bid a breakdown of the items that he wishes to be paid under this lump sum item.

4 Project Sign boards

4.1 Provide and maintain project signboards

The sub item provides for the supply, erection, maintenance and removal on completion of a Notice Board of min. 3 square metre giving details of the Project, Employer, Contractor and other details to be specified by the Engineer.

5 Site Investigation / Testing

5.1 Site investigation and Testing as directed by the Engineer

Engineers may instruct any additional investigation to be carried out which as a requirement of carrying out work this item may include but not limited to any soil testing. Ground investigation and etc. contractor should carry out each and every test based on the Engineer's request.

Testing of all material used for the work or intended to use for the work. Engineer may instruct additional test to be carried out as for the requirement of carrying out work.

6 Quality Standard and Progress

6.1 Provision for monthly progress reports and photograps and etc

The sub item is provided as a lump sum for the submission of Monthly Progress Reports and photographs, schedules etc.

6.2 Provide As-Built drawings, Quality Assurance reports.

The sub item is provided on a lump sum basis for the submission of As-Built Drawings, In general terms quality assurance includes measures to meet the required quality. It is necessary to prevent errors (not finding the mistakes),In our case it is based on a quality model which is a conceptual framework in which the abstract term of quality is gradually resolved into individual aspects. It typically consists of characteristics and parameters. A quality characteristic is an

inherent feature of a product or process, related to a requirement etc. as specified in the Contract and requested by the Engineer.

B.2 Bill of Quantities for Lot 1 and Lot 2

7. Horizontal Drainage Drilling

The bidder refer to the Lot 1 and Lot 2 of Bill of Quantities.

8. Gabion work

The bidder refer to the Lot 1 and Lot 2 of Bill of Quantities.

9. Surface Drainage Ditch

The bidder refer to the Lot 1 and Lot 2 of Bill of Quantities.

10. Water Collecting Pit

The bidder refer to the Lot 1 and Lot 2 of Bill of Quantities.

11. Small Dam

The bidder refer to the Lot 2 of Bill of Quantities.

B.3 Bill of Quantities for Lot 3

7. Earth Work

The bidder refer to the Lot 3 of Bill of Quantities.

8. Gabion work

The bidder refer to the Lot 3 of Bill of Quantities.

9. Drainage Work

The bidder refer to the Lot 3 of Bill of Quantities.

Section 4

FORM OF CONTRACT AGREEMENT
AND
GENERAL CONDITIONS OF CONTRACT

The Bidder should not complete the Form of Contract Agreement at this time.

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CONTRACT AGREEMENT

BETWEEN

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

AND

(NAME OF THE CONTRACTOR)

THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

FOR

THE PILOT PROJECT FOR LANDSLIDE AND ROCK FALL MITIGATION WORKS

LOT 1, LOT 2 OR LOT 3

UNDER

THE TECHNICAL COOPERATION FOR LANDSLIDE MITIGATION PROJECT

CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT, made and entered into on this **th day of ****, 2015 and between JAPAN INTERNATIONAL COOPERATION AGENCY (JICA), JAPAN, represented by his Representative Office in the Democratic Socialist Republic of Sri Lanka, (hereinafter referred to as "the Employer") and (name of the contractor), duly organized and existing under the laws of the Democratic Socialist Republic of Sri Lanka, having its principal office of business at (address of the contractor), (hereinafter referred to as "the Contractor"),

WITNESSETH:

WHEREAS, JICA extends its Pilot project for Landslide and Rock fall mitigation works for the Democratic Socialist Republic of Sri Lanka, on the basis of the Record of Discussions for "The Technical Cooperation for Landslide Mitigation Project" signed on the 7th of March 2014 agreed between the Democratic Socialist Republic of Sri Lanka and JICA;

WHEREAS, the Employer, as a competent authority for the Project, is desirous of having the Work for the Project carried out by the Contractor; and

WHEREAS, the Contractor is willing to execute the Work on the terms and conditions as set forth in this Contract;

NOW, THEREFORE, in consideration of the mutual covenants hereinafter contained, the parties agree as follows:

Now this Agreement witness as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the General Conditions of Contract hereinafter referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, namely:

    - The Contract Agreement
    - The Letter of Acceptance
    - General Conditions of Contract
    - Technical Specifications
    - Contractor's Bid
    - Drawings
    - Other addenda, if any, that are issued prior to the signing of this Contract

3. In consideration of the payments to be made to the Contractor by the Employer as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Work and remedy any defects therein in conformity with all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Work and the remedying of defects therein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

5. The Contract Price to be paid to the Contractor by the Employer subject to the requirements of the Contract Document is:

   Amount in words (Rs. Figure, excluding the VAT)

   The payment schedule is described in Article 6.3of the General Conditions of Contract.
   The payment from the Employer to the Contractor shall not include VAT.
   The VAT for the payment shall be paid by NBRO to the Contractor.
   The Contract price is changeable as per Article 2 of the General Conditions of Contract.

6. The time for completion of the Work shall be within (days in word, Figure) from the Commencement Date.

   The Defect Liability Period shall be twelve (12) months calculated from the date of issue of "the Certificate of Completion of the Work" according to Article 10 and 11 of the General Conditions of Contract.

7. This Agreement shall become effective upon the latest date when the following conditions have been satisfied:
   a) Each of the parties has signed this Agreement
   b) Necessary approval on this Agreement has been made by JICA.

8. The Contractor's Bank particulars and Account Number to which the payments are due shall be credited in respect of this Project.

Name of Bank	:
Name of Branch	:
Address of Bank	:
Beneficiary	:
Account Number	:

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed the day and year first above written.

The Contractor	The Employer
(Signature)	(Signature)
	Mr. Kiyoshi AMADA Chief Representative, Japan International Cooperation Agency Sri Lanka Office
Democratic Socialist Republic of Sri Lanka	10th and 13th Floors, DHPL Building, No.42, Navam Mawatha, Colombo 02, Sri Lanka

Witness

(Signature)

Dr. Asiri Karunawardana
Director General
National Building Research
Organization (NBRO)
Democratic Socialist Republic of
Sri Lanka

GENERAL CONDITIONS OF CONTRACT

FOR

THE PILOT PROJECT FOR LANDSLIDE AND ROCK FALL MITIGATION WORKS

LOT 1, LOT 2 OR LOT 3

UNDER

THE TECHNICAL COOPERATION FOR LANDSLIDE MITIGATION PROJECT

CONTENTS

Article 1. Definitions

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires.

Words importing the singular only also include the plural and vice versa where the context requires. Words indicating one gender include all genders.

"The Project" means The Pilot Project for Landslide and Rock fall mitigation works under the Technical Cooperation for Landslide Mitigation Project in conformity with the Scope of Work.

"The Employer" means the Japan International Cooperation Agency (JICA), represented by his Representative office in the Democratic Socialist Republic of Sri Lanka and shall include any person or persons authorized by JICA.

"The Recipient" means the Government of Democratic Socialist Republic of Sri Lanka who receives the Grant for the Project from JICA and takes over the Work from the Contractor upon completion thereof pursuant to Article 10.2 hereof.

"The Contractor" means (name of the contractor) who shall legally and actually exist in the Democratic Socialist Republic of Sri Lanka and shall include any person or persons authorized by the Contractor under this Contract.

"The Subcontractor" means any person named in the contract as a Subcontractor for a part of the Work or any person to whom a part of the Work has been subcontracted with the consent of the Engineer and the legal successors in title to such person, but not any assignee of any such person.

"The Engineer" means National Building Research Organization (NBRO), an organization duly organized and existing under laws of the Democratic Socialist Republic of Sri Lanka, No. 99/1 Jawatte Road, Colombo 05, Sri Lanka, and the Joint Venture Consultant team consisting of Earth System Science Co., LTD. a company duly organized and existing under laws of Japan, having its principal office of business at 7F Shinjukumarune Bldg.1-23-1, Shinjukuku, Shinjuku, Tokyo, 160-0022 Japan and Nippon Koei Co., Ltd., duly organized and existing under laws of Japan, having its principal office of business at 5-4 Kojimachi, Chiyodaku, Tokyo, 102-8639 Japan, who are appointed by the Employer to support NBRO for the purposes of providing technical supervisory work relating to the Contract and shall include any person or persons authorized by the Employer.

"The Contract" means this contract concluded between the Employer and the Contractor.

"The Contract Documents" means the documents consisting of the following and are incorporated

in and made part of this Contract, as though fully written out and set forth herein.

1) Contract Agreement
2) Letter of Acceptance
3) General Conditions of Contract
4) Technical Specifications
5) Contractor's Bid
6) Drawings
7) Addenda that shall be issued prior to the signing of the Contract, if any, and other documents intended to form the Contract

"The Party" means the Employer or the Contractor, as the context requires, and "Parties" means both of them.

"The Specification" means the specification of the Work included in the Contract and any modification thereof or addition thereto made under the related article of the contract documents or submitted by the Contractor and approved by the Engineer.

"The Drawing" means all drawings, calculations and technical information of a like nature provided by the Engineer to the Contractor under the Contract and all drawings, calculations, samples, patterns, models, operation and maintenance manuals and other technical information of a like nature submitted by the Contractor and approved by the Engineer.

"The Bid" means the Contractor's priced offer to the Employer for the execution and completion of the Work and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Acceptance.

"The Letter of Acceptance" means the formal acceptance by the Employer of the bidder.

"The Commencement Date" means the date of commencing the Work in accordance with Article 4.1 herein.

"**Time for Completion**" means the time for completing the execution of and passing the tests on completion of the Work as stated in the Contract calculated from the Commencement Date.

"**Certificate of Completion of the Work**" means a certificate issued pursuant to Article 10 hereof.

"The Contract Price" means the price defined in Article 6 hereof, and includes adjustments in accordance with Article 6 hereof.

"The Work" means the construction works for the Project to be rendered by the Contractor as described in Article 3 of this Contract.

"**Site**" means the places secured by the NBRO where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of the site.

"**Day**" means Gregorian calendar day.

"**Writing**" means any hand-written, type-written, or printed communication, including facsimile transmission.

Article 2. Basis of Contract

2.1 Any and all stipulations of this Contract shall be consistent with the content of the Scope of Work. Should any of the stipulations of this contract be in conflict with the Scope of Work, such stipulations shall be deemed null and void ab initio.

2.2 The Contract Price shall be subject to change according to the actual completion of work quantities and shall be recalculated agreed between the Employer and the Contractor.

Article 3. Scope of Work

3.1 All works to be rendered under this Contract shall consist of the following items specified in the Contract Documents.

The Work

Lot 1 Horizontal drainage drillings, Gabion works and Surface drainage ditch works at Badulusirigama/ Uva Wellasa University in Badulla District, Uva Province. (Landslide mitigation works)
or

Lot 2 Horizontal drainage drillings, Gabion works and Surface drainage ditch works at Udamadura in Nuwara Eliya District, Central Province. (Landslide mitigation works)
or

Lot 3 Earth works (Crushing rock, Embankment and Stone pitching) Gabion works and Drainage works at Alagumale in Matale District, Central Province. (Rock fall mitigation works).

3.2 The Scope of the Work prescribed in Article 3.1 above shall include site survey, design and supply for performance test, transportation, insurance and all other things required in and for the Project implementation in due conformity with the Contract Documents.

3.3 The extent of the Project prescribed in Article 3.1 may be amended and modified pursuant to mutual agreement in writing under this Contract.

Article 4. Period of Execution of Work

4.1 The Contractor shall commence the Work within seven (7) days from the date of receipt of the notice of the commencement of the Work issued by the Employer.

4.2 The Contractor is expected to complete the Work on or before the **th day of ******, 2017, if the Work can be commenced at the beginning (in the middle, at the end) of February 2016.

Article 5. Remuneration

5.1 Contract Price

The Employer shall remunerate the Contractor with a total amount of Sri Lankan Rupees ******* **million ******** thousand ******* (Rs. ***, ***, ***)** (excluding the VAT) as the Contract Price for the Work, in accordance with the payment schedule stated in Article 6.3 of this Contract.

Article 6. Payment

6.1 Terms of Payment

The payment shall be made through bank account of the Employer which shall be existing in the Democratic Socialist Republic of Sri Lanka to the Contractor's bank account in the Democratic Socialist Republic of Sri Lanka or in any other country as an International and first ranked bank accepted by the Employer.

The currency unit of payment shall be the Sri Lankan Rupees (Rs.). Any bank charge, commission and/or other required charges of transferring money through the bank shall be borne by the beneficiary i.e. the Contractor.

6.2 Items of the Work for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

6.3 Payment schedule

(1) Advance Payment

********** million ********** thousand (Rs **, ***, 000), which corresponds to Twenty percent (20) of the Construction Price, shall be paid by the Employer within fourteen (14) days after

submission of Advance Payment Security stipulated in Article 13 hereunder. The request for the advance payment shall be accompanied with the Advance Payment Security.

(2) Interim Payment

2.1 The Interim Payment shall be paid in March, June, September and December according to the progress. The amount of each interim payment shall be calculated based on the Quarterly progress report for the past three (3) months of each month to be paid.

2.2 The Engineer shall check the Contractor's Quarterly progress report and certify the amount to be paid to the Contractor within 21 days of the receipt of the Contractor's statement.

2.3 The value of work executed shall be determined by the Engineer and comprise the value of the quantities of the items in the Bills of Quantities completed.

2.4 The request for the Interim Payment shall be accompanied with the certificate of progress of works issued by the Engineer after checking quarterly progress report which was submitted by the Contractor. The Employer shall pay the Contractor the amounts certified by the Engineer within 14 Days of the date of each certificate.

2.5 The retention from each interim payment shall be ten percent (10%) of the certified work done.

(3)Final Payment

********** million ********** thousand (Rs **, ***,000), which corresponds to ten (10) percent of the Contract Price, shall be paid within fifty six (56) days after submission of Retention / Maintenance Security stipulated in Article 14 hereunder, after the certificate of completion of the Work under this Contract issued by the Engineer under the approval of Employer. The request for the final payment shall be accompanied with the certificate of completion of the Work and the Retention / Maintenance Security.

6.4 In case any amendments and/or modifications of the Contract Price are necessary in accordance with Article 23, the payment shall be adjusted accordingly.

Article 7. Employer's Responsibilities

7.1 The Employer shall carry out the following works in time for the commencement of the Work;

(1) To obtain a permission to utilize required land area for implementation of the project prior to the commencement of work,

(2) To obtain permission to utilize land area, if required, for a temporary site office, warehouse, stock yard and motor pool during the contract period.

7.2 The Employer shall assist the Contractor to collect data and information necessary for implementation of the work.

7.3 The Employer shall cooperate with the resident representative of the Contractor in the negotiations and procedures with the various authorities concerned and public and private organizations for the execution of the Work.

Article 8. Contractor's Obligations

8.1 The Contractor shall perform the Work in accordance with the Contract Documents.

8.2 The Contractor shall, with due care and diligence, execute and complete the Work and remedy defects therein in accordance with the provisions of the Contract. The Contractor shall provide all superintendence, labor, materials, and plant. Contractor's equipment and all other things, whether of a temporary or permanent nature, required in and for such design, execution, and completion and remedying of any defects, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

8.3 The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Bid, all of which shall, except insofar as it is otherwise provided in the Contract; cover all his obligations under the Contract including those in respect of the supply of goods, materials, plant or services or of contingencies and all matters and things necessary for the proper execution and completion of the Work and the remedying of any defects therein.

8.4 Unless it is legally or physically impossible, the Contractor shall execute and complete the Work and remedy defects therein in strict accordance with the Contract to the satisfaction of the Engineer. The Contractor shall comply with and adhere strictly to the Engineer's instructions on any matter, whether mentioned in the Contract or not, touching or concerning the Work. The Contractor shall take instructions only from the Engineer.

8.5 The Contractor shall survey and examine the condition of the site and its surroundings and shall collect information available in connection therewith and have satisfied himself before starting site work;

(1) The nature and character of surroundings adjacent to the project site including unexplored ordinances, landmines, and people's daily activity for avoiding any conflict caused by the execution of the Work.

(2) The extent and nature of work and materials necessary for the execution and Completion of the Work and the remedying of any defects therein

(3) The necessary information which may influence to the Work for avoiding any disturbance to maintaining smooth operation of the Work.

8.6 The Contractor shall prepare shop drawings, progress schedules, safety plan, method statements on safety and other technical documents required by the Engineer.

(1) The Contractor shall submit the Method Statements on Safety to the Engineer no later than seven (7) days prior to the commencement of the relevant works according to the execution plans or their equivalent document.

(2) The Method Statements on Safety, prepared and submitted by the Contractor, shall be reviewed by the Engineer from the viewpoint of maintaining safety during the Work at site.

8.7 The Contractor shall submit to the Engineer a Construction method statement including construction program, quality control method, safety plan, safety and health control plan, manning schedule, shop drawings and other required data and documents before starting the Work.

During implementation period, the Contractor shall submit to the Engineer a daily and monthly progress report, material test result and daily quality control report and other technical documents required by the Engineer.

8.8 The Contractor shall submit to the Engineer the list of country/area of origin of the materials which the Contractor proposes to purchase for the Work.

8.9 The Contractor shall be responsible for the implementation means, methods, techniques, sequences or procedures, quality control and safety and health control in connection with the Work.

8.10 The Contractor shall be responsible for the acts or omissions of the Contractor's subcontractors, or any of the Contractor's agents or employees, or any other persons performing any part of the Work for the Contractor.

8.11 The Contractor shall furnish one (1) resident representative with sufficient faculty to execute the Work at the Project Sites.

8.12 The Contractor shall bear the handling charges, customs clearance charges, storage charges, and transportation expenses related to the importation of the materials for the Work.

8.13 The Contractor shall, at his own expense, take necessary measures in accordance with the Contract Documents and relevant laws, ordinances and regulations to prevent damage to the Work, construction materials, adjacent structures, or the Third Parties, until the completion and delivery of the Work.

8.14 The Contractor shall, whenever he considers it especially necessary for the prevention of accidents, take appropriate measures, asking in advance for the Employer's opinion.
Provided the Employer considers it necessary to take appropriate accident preventive measures, and may have so required them from the Contractor, the latter should comply therewith.

8.15 If the Employer suffers damage as a result of a default by the Contractor in the execution of its obligations under the Contract, the Employer and the Contractor shall consult mutually to settle such matters. If both Parties cannot reach agreement within twenty eight (28) days from the date of the notice, both Parties shall comply with the dispute settlement process stipulated in Article 21 hereof.

8.16 The Contractor shall, to the maximum extent possible, employ workers from the immediate vicinity of the Site and shall select such employees on the basis of competence, efficiency and skill in the various occupations and trades.

Article 9. Engineer's Duty and Authority

9.1 The Engineer will be responsible for any technical supervision for the Project implementation of the Contract. The Engineer shall not, however, have the right to make final decision on any matter relating to Change, Modification and/or Variation order or similar character and nature of contractual issue without the approval of the Employer.

9.2 The Engineer shall, as a daily supervisory work on the project site, be authorized by the Employer for any Approval, Observation, Certification, Agreement, Inspection, Instruction, Notice, Suggestion, Request, Testing, and/or similar works required for the smooth implementation of the Contract.

Article 10. Inspection and Delivery

10.1 Upon completion of the Work, the Contractor shall request a final inspection of the Engineer for the Work.

10.2 When the Work has passed the final inspection conducted by the Engineer, the Engineer shall issue the Certificate of Completion of the Work under Employer's approval and thereupon the Work shall be delivered to the Recipient.

Article 11. Warranty against Defects

11.1 The Contractor shall guarantee all the Work to be executed in accordance with the Contract Documents for a period of twelve (12) months from the date of issue of Certificate of Completion of the Work.

11.2 The Employer and the Recipient shall notify the Contractor in writing as stipulated in Article 28 hereof, of any defects for which a claim is made under this warranty as promptly as possible after discovery thereof.

The Employer and the Recipient's written notice shall describe the nature and extent of the defects. The Contractor shall have no obligation for any defects discovered subsequent to the expiry date of the said twelve (12) month period, unless notice of such defects is received by the Contractor not later than twenty one days(21) after such expiry date.

11.3 The Contractor shall remedy, at his own expense, any defects by making all necessary measures for repair or replacement.

11.4 After confirmation with Recipient that no defects on the work has not be identified during warranty period or all the defects which have been claimed with the Employer and Recipient have been remedied by the Contractor, the Engineer shall issue the Defects Liability Certificate to the Contractor under the Employer's approval.

11.5 The Contract shall not be considered as completed until a Defects Liability Certificate has been signed by the Engineer under the Employer's approval and has been delivered to the Contractor, stating the date on which the Contractor shall have completed his obligations to execute and complete the Work and remedy and defects therein to the Engineer's satisfaction.

11.6 The Contractor shall confirm whether what phenomena shall be deemed as defects with the Engineer and the Employer in advance of commencement of the project.

Article 12. Performance Security

12.1 The Performance security shall be valid until the Contractor has executed and completed the Work in accordance with Article 10.2 hereof.

12.2 The Contractor shall provide a Performance Security of five percent (5%) of the contract price to the Representative office of the Employer in the Democratic Socialist Republic of Sri Lanka within fourteen days (14) after receiving the Letter of Acceptance.

12.3 The Performance Security shall secure the proper execution of all the Contractor's obligations during the period from the date of signing of this Contract to the date of issuance of the Certificate of Completion of the Work.

12.4 The Performance Security shall be released immediately after submission of Maintenance Security from the Contractor after the issuance of the Certificate of Completion of the Work.

Article 13. Advance Payment Security

13.1 The Contractor shall provide an Advance Payment Security of equivalent value of twenty percent (20%) of the payment of Contract Price to the Employer when the Contractor shall claim an advance payment to the Employer.

13.2 The Advance Payment Security shall secure the repayment of any sum advanced by the Employer upon the Contractor's default from the date of the advance payment to the date of the issuance of the Certificate of Completion of the Work.

13.3 The amount of the Advance Payment Security shall cover the amount to be paid as the advance payment for the Work, but only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Engineer.

13.4 Prior to requesting the advance payment, the Contractor shall obtain the Advance Payment Security and the Employer shall have the custody of the Advance Payment Security. Such security shall be returned to the Contractor immediately after submission of Maintenance Security from the Contractor after the issuance of the Certificate of Completion of the Work.

13.5 In making a claim under the Advance Payment Security, the Employer shall notify the financial institution of said security in writing, stating the nature of the defect and the amount of damages in respect of the claim.

13.6 The amount to be paid under the claim shall be the amount of the actual damage incurred, and in no case shall it exceed, the amount of the Advance Payment Security.

Article 14. Maintenance Security

14.1 The Contractor shall provide and submit a Maintenance Security of five percent (5%) of the Contract

price to the Employer for twelve months (12) defect liability period at the same time when the Contractor receives the Certificate of Completion of the Work.

14.2 No claim shall be made against such security after the issue of the Defects Liability Certificate and such security shall be returned to the Contractor within fourteen days (14) of the issue of the said Defect Liability Certificate.

The Defects Liability Certificate shall be given to the Contractor by the Engineer within fourteen days (14) after the expiration of the Defects Liability Period.

Article 15. Currency of the Contract

15.1 The Applicable Currency of the Contract price and all of the settlement under this contract shall be in Sri Lankan Rupees (Rs).

15.2 All payment and Security/ Guarantee/ Bond described in Articles 12, 13, 14 and other related Articles and Clauses shall be in Sri Lankan Rupees (Rs).

15.3 Aforesaid Security shall be issued by the international and/or first class bank or bonding or insurance company duly existing and operating in the Democratic Socialist Republic of Sri Lanka including foreign organizations which are established and operated in the Democratic Socialist Republic of Sri Lanka, and approved by the Employer.

Article 16. Insurance

16.1 The Contractor shall provide, in the joint name of the Employer, the Engineer and the Contractor, insurance cover from the commence date to the end of the Defect Liability Period for following events which are due to the Contractor's risks.

The insurance policy should cover for special natural perils like Earthquake, Volcanism, Storm, Cyclone, Landslide and Rock fall.

(a) The minimum coverage of insurance for loss of, or damage to the Work, Equipment, Plant and Materials shall be One hundred ten percent (110%) of the Contract amount, with a maximum deductible of Twenty percent (20%).

(b) The minimum coverage of insurance for loss, or damage to property, except the Work, Plant, Materials and Equipment, is Twenty percent (20%) of the Contract amount with a maximum

deductible of Fifty percent (50%).

16.2 The Contractor shall provide Workman Compensation Insurance in the joint name of the Employer, the Engineer and the Contractor.

(a) The minimum coverage of insurance for Workman Compensation Insurance for personal injury or death caused by the Work shall be Ten percent (10%) of the Contract with no deductible.

16.3 The Contractor shall also provide Third Party Liability Insurance.

(a) The minimum coverage of insurance for Third Party Liability for property, or personal injury or death caused by the Work shall be Ten percent (10%) of the Contract amount with no deductible.

16.4 Aforementioned insurance shall be applied and become effective on or just before commencing the Work. And the Contractor shall submit Two (2) clear photocopies of proper certificates and those policies of the insurance for aforementioned each item to the Engineer reasonably before commencing the Work.

Article 17. Liquidated Damages

17.1 The Contractor shall pay liquidated damages to the Employer at the rate of Zero point one percent (0.1%) per day of the Final Contract amount.

17.2 The countable delayed days for liquidated damages shall start from following day of the date for completion of the Work specified in Article 4.2 hereof until actual completion date of all the works.

17.3 The total amount of liquidated damages shall not exceed Ten percent (10%) of the Final Contract amount.

17.4 The Employer may deduct liquidated damages from any payments due to the Contractor. Payment of liquidated damage shall not affect the Contractor's liabilities.

Article 18. Assignment and Subletting

Neither of the Parties hereto shall assign this Contract or any part thereof to any Third Party without prior written consent of the other Party. The Contractor shall not sublet the whole of the Work or a major part of the Work to any Third Party together with its responsibility.

Article 19. Force Majeure

19.1 Definitions

Neither Party shall be deemed to be in default or in breach of this Contract if he is unable to perform his obligations under this Contract owing to circumstances beyond his reasonable control or coverage of the insurance. Such circumstances (hereinafter referred to as "Force Majeure") shall include, but shall not be limited to, the following:

a) war (declared or undeclared), hostilities, invasion, act of any foreign enemy, threat of or preparation for war; terrorism, riot, insurrection, civil commotion, rebellion, revolution, usurped power, civil war; and labor troubles or other industrial troubles, strikes, embargoes, blockades, and sabotage of labor.

19.2 Monetary Obligations

Notwithstanding the foregoing, the occurrence of Force Majeure shall not prejudice nor otherwise affect either Party's liability to pay remuneration or reimbursement of expenses to which the other Party is entitled on or before the date of occurrence.

19.3 Notice

The Party affected by Force Majeure shall give the other Party a written detailed account of the circumstances of Force Majeure as soon as practicable, but not later than fourteen (14) days from the occurrence.

19.4 Expatriate Staff

In the event that Force Majeure is likely to endanger the safety of any expatriate staff members of the Contractor, they shall be allowed to leave the site and/or office, giving notice to a staff member of the Employer responsible for the management of the Work as soon as possible.

19.5 Suspension

Upon occurrence of Force Majeure, the Party affected may be allowed to temporarily suspend the performance of his duties under this Contract for so long a period as Force Majeure continues and as his performance is prevented thereby. In such instance, he shall make all reasonable efforts to mitigate the effect of Force Majeure upon his duties.

Article 20. Applicable Laws

This Contract shall be governed by and interpreted in accordance with the laws of the Democratic Socialist Republic of Sri Lanka.

Article 21. Disputes and Arbitration

21.1 This Contract shall be executed by the Parties hereto in good faith, and in case any doubtful point is raised or any dispute occurs concerning the interpretation or performance of this Contract, such matters shall be settled through consultation of the Parties. Unless the Contract has already been abandoned, repudiated or terminated in accordance with Article 25 hereof, the Contractor shall continue to perform the Work in accordance with this Contract. If the Parties cannot reach an agreement within thirty (30) days from the date of the notice informing the occurrence of such matters, the Employer will offer its suggestion for the settlement of the matter.

21.2 In the event that an amicable settlement cannot be reached through consultation referred to in the Article 21.1 above, the matter shall be referred to arbitration. The arbitration shall be conducted in accordance with the Rules of Arbitration of the International Chamber of Commerce.

21.3 The arbitration shall be conducted in English.

21.4 The place of arbitration shall be in Singapore or Malaysia

21.5 The arbitral award shall be final and binding upon the Parties hereto and the Parties shall comply in good faith with the decision. Judgment upon the award may be entered in any court having jurisdiction or application may be made to such court for juridical acceptance of the award or order of enforcement as the case may be.

21.6 As for fees for all proceedings for arbitration, each Party shall bear the costs of his own arbitrator's service and an equal share of the costs for the third arbitrator.

Article 22. Language and Measurement System

22.1 All correspondence between the two Parties including notices, requests, consents, offers, and demands shall be made in English. All drawings, specifications, reports, and other documents shall also be prepared in English.

22.2 All documents made under this Contract shall adopt the metric system and the Gregorian calendar day.

Article 23. Project Modifications

23.1 In case the Employer considers any modifications of the Work necessary, the Employer shall discuss the solution with the Engineer, and the modifications can be made subject to the prior consent by

JICA HQs. Each modification may include:
(a) obvious change in appearance of the building or facilities,
(b) change of the Project Site,
(c) change of major structure and/or strength of the building or facilities,
(d) change of dimensions of the building or facilities,
(e) change of the period of execution of the Work,
(f) change of terms and/or amount of the Contract Price.
(g) change that requires amendment of the verified contract, and
(h) other changes for which JICA HQs requires the Employer to obtain its prior consent.

In addition to the changes mentioned above, modifications can be made on an ex-post facto report to the Employer within the criteria of minor modifications set by the Employer.

23.2 Proposal by the Contractor
In case the Contractor considers any modifications of the Work necessary, the Contractor shall discuss the solution with the Engineer, and the Contractor can propose the modifications to the Employer. This proposal may include the changes from (a) to (h) mentioned in Article 23.1.

23.3 Procedures
Modifications shall be agreed upon by the Parties and Employer's consent shall be obtained for the modifications. Details of the procedures for such modifications are advised by Employer.

Article 24. Amendments and Modifications

Any amendments and/or modifications, such as caused by unforeseeable underground obstructions and/or physical conditions, if necessary, may be negotiated between the Parties hereto and shall be agreed by a written document signed by both Parties.

Article 25. Early Termination

25.1 Should either Party default in the execution of his obligations under this Contract, the other Party shall give the defaulting Party notice in writing to remedy such default promptly.

25.2 Failure of the defaulting Party, to take corrective measures as required by the other Party within thirty (30) days of the receipt of such notice, shall constitute a sufficient cause for the other Party to terminate this Contract.

25.3 Either Party may terminate this Contract without prejudice, should the performance of his obligations under this Contract not be resumed within a cumulative period of sixty (60) days of

suspension due to Force Majeure stipulated in Article 19 hereof.

25.4 The early termination of this Contract under this Article shall be subject to the approval of the competent authorities of the Employer.

25.5 In the event of early termination for reasons stated in Article 25.2 and 25.3, the Contractor shall be paid by the Employer, a fair and reasonable proportion of the Contract Price that is calculated on the basis of the Contractor's works carried out up to the termination date and the Contractor's Bill of Quantities, instead of the payment schedule stipulated in Article 6 hereof.

Article 26. Interpretation

26.1 All general language or requirements embodied in the specifications are intended to amplify, explain and implement the requirements of this Contract. However, in the event that any language or requirements so embodied permit an interpretation inconsistent with any provisions of this Contract, then in each and every such event, the applicable provisions of this Contract shall prevail and govern.

26.2 The specifications and drawings are also intended to explain each other, and anything shown on the drawings and not stipulated in the specifications or vice versa shall be deemed and considered as if embodied in both. In the event of conflict between the specifications and drawings, the specifications shall prevail and govern.

Article 27. Entire Agreement

This Contract sets forth the entire agreement between the Parties in respect of the subject matter hereof and supersedes and cancels any and all previous agreements, negotiations, commitments, and writings in respect of the subject matter thereof.

Article 28. Notice

All notices pertaining to this Contract between the Employer and the Contractor shall be sent in writing by registered airmail, facsimile, electronic mail or shall be handed to the addresses so stated herein. Such notices shall take effect from the date of receipt by the other Party. In case either Party hereto changes the address, the Party concerned shall give such notice to the other Party beforehand.

The Employer:

Name : Japan International Cooperation Agency (JICA)
Sri Lanka Office
Address : 10th and 13th Floors, DHPL Building, No.42, Navam Mawatha,
Colombo 02, Sri Lanka
Telephone : 94-011-2300470
Facsimile : 94-011-2300473

The Contractor:

Name :
Address :
Telephone :
Facsimile :
E-mail address :

IN WITNESS WHEREOF, the Parties hereto have caused this Contract to be signed, as of the day and year first above written, in their respective names in duplicate, each Party retaining one (1) original copy thereof.

The Contractor	The Employer
(Signature)	(Signature)
	Mr. Kiyoshi AMADA Chief Representative, Japan International Cooperation Agency Sri Lanka Office
Democratic Socialist Republic of Sri Lanka	10th and 13th Floors, DHPL Building, No.42, Navam Mawatha, Colombo 02, Sri Lanka

Witness

(Signature)
Dr. Asiri Karunawardana
Director General
National Building Research
Organization (NBRO)
Democratic Socialist Republic of
Sri Lanka

VOLUME II

TECHNICAL SPECIFICATIONS

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Section 5
Instructions for Technical Specifications

The Work consist of three (3) Lots shown below.

Lot 1: Landslide Mitigation Works at Badulusirigama/ Uva Welassa University in Badulla District , Uva Provinces including the works shown below.

- Horizontal Drainage Drilling
- Gabion Works
- Surface Drainage Ditch Works

Lot 2: Landslide Mitigation Works at Udamadula in Nywara Eliya District, Central Provinces including the works shown below.

- Horizontal Drainage Drilling
- Gabion Works
- Surface Drainage Ditch Works
- Small dam

Lot 3: Rock Fall Mitigation Works at Alagmale in Matale District, Central Provinces including the works shown below.

- Excavation
- Crushing Rock
- Embankment
- Ground levelling
- Stone Pitching

Technical Specifications shall be applied for each lot shown below.

Lot 1 :

- Specification for Civil Works
- Specification for Earth Work
- Specification for Surface Drainage Ditch
- Specification for Horizontal Drainage Drilling
- Specification for Gabion Box
- Specification for Geotextile

Lot 2 :

- Specification for Civil Works

- Specification for Earth Work
- Specification for Surface Drainage Ditch
- Specification for Horizontal Drainage Drilling
- Specification for Gabion Box
- Specification for Geotextile

Lot 3 :

- Specification for Civil Works
- Specification for Earth Work
- Specification for Gabion Box
- Specification for Geotextile

Section 6
SPECIFICATIONS FOR CIVIL WORKS

GENERAL TECHNICAL SPECIFICATIONS

ICTAD Publication No. SCA/3/1 – 'Specifications for Irrigation and Drainage Works' and ICTAD Publication No. SCA/A/5 – 'Specifications for Roads and Bridges – Revised 2009, are applicable as the general specifications for the Civil Works of this Contract to relevant items.

Where there is a discrepancy between two general specification, Specification for Irrigation and land drainage work supersede.

These publications are not issued with the Bidding Document package and the Bidder/Contractor should obtain them from a suitable source.

PARTICULAR TECHNICAL SPECIFICATIONS

Where there is a discrepancy between two general specification and particular specifications, Particular specification supersede.

1 INTRODUCTION

The following Particular Specifications are part of the requirements for the work related to the Civil Works which are to be provided according to the stipulations of the Contract. Hence, the instructions given herein form an integral part of, and are applicable to, all technical and Contract Documents issued for the Work. Addenda to these Specifications may be issued as required during the construction phase.

These Particular Technical Specifications shall be read in conjunction with General Technical Specifications (ICTAD), the Conditions of Contract and the Bidding Drawings. The Contractor shall comply with all provisions contained within the Contract Documents.

The General Technical Specifications and the Particular Technical Specifications in conjunction with the Bidding Drawings define the technical standard and quality to be achieved during construction.

The Particular Technical Specifications include the following subsections:

It is the intent of these Specifications, together with other relevant documents issued as part of the Contract Documents or to follow later on, to provide the Contractor with complete and detailed information and subsequent instructions necessary to enable him to carry out the design, where and when required, and to execute properly the work prescribed.

It is the intent of these Particular Specifications to establish acceptable standards of quality. On the other hand they shall also allow the construction of the Work in an efficient and economical way. Minor deviations in details due to selected work procedures and due to manufacturer's standard shop process will be considered for acceptance provided that, in the opinion of the Engineer, the proposed substitutions are equal in quality to those specified.

The Drawings available shall serve as a basis for detail design drawings to be produced by the Contractor.

All work shall be executed according to the Drawings and requirements released for construction, in a professional and diligent manner, and all supplies and work shall comply with the quality requirements defined in the relevant Sections of these Specifications and other Contract Documents. The Contractor shall provide all necessary efforts to comply with the intent of the General and Particular Specifications to the satisfaction of the Engineer.

2 CONTRACTOR'S SUBMITTALS AND ENGINEER'S APPROVAL

The Contractor shall provide the Engineer with all submittals as requested in these Specifications and other Contract Documents. Although their extent shall be to the discretion of the Contractor, they shall be complete enough to illustrate adequately their intent and facilitate full for the understanding of the Engineer.

At any time the Engineer may call for additional information, completion of the submittals.

The Contractor shall submit these documents to the Engineer so that, even if not specifically expressed, reasonable time will be given to the Engineer to comment or approve the submittals. The approval of the Engineer shall always be given in written form prior to the commencement of any work under this Contract and the Contractor shall not be paid for any work that is performed without the express written approval or instruction by the Engineer.

3 SITE INSTALLATION, SERVICES AND ENVIRONMENTAL OBLIGATIONS

3.1 General

3.1.1 Scope of work

The Contractor shall be responsible for providing plant, equipment, materials and labour for the provision of all necessary site installations and services adequate for the realisation of the Work under this Contract.

The Contractor shall design, furnish, install, maintain and operate all site installations and Contractor's equipment for his own use and for the use of the Engineer and Subcontractors, and as required for third parties, including workshops, warehouses, storage and assembly areas, all machinery, vehicles, scaffolding, equipment, water and power supply, etc.

Site installations and services provided by the Contractor for his own use as well as for that of the Engineer or for third parties shall conform to the applicable standards, codes and sanitary requirements set down by the Sri Lankan authorities for such purpose.

The construction, operation and maintenance of the Contractor's site installations and services shall be subject to inspection and written consent by the Engineer.

All plants, facilities, installations and services for the Contractor's and Engineer's use shall at all times remain the Contractor's property, except as specified hereinafter. Should the Contractor wish to sell his plant after the Completion of the Contract facilities and equipment in the country of the Work, he shall pay any and all taxes and duties required by law as stipulated in the Conditions of Contract.

The scope of the Work includes but is not limited to following site installation parts:

a) All temporary structures required for the performance of the work such as access roads, temporary construction roads or temporary working platforms
b) Stores, Warehouses, Materials Yards
c) Materials testing laboratory
d) Construction equipment
e) Power supply and illumination
f) Water supply

g) Sanitation, sewerage and waste disposal
h) Communication System
i) Site security

All installations of any Subcontractors shall comply with these Specifications.

3.1.2 Submittals

Within 30 days from the date of contract award the Contractor shall submit to the Engineer updated layout plans showing, at adequate scale, the locations and arrangement of all site installations. These plans shall be consistent with the plan submitted by the Contractor with his Bid as well as with any amendments and additions.

Within 14 days from the date of contract award the Contractor shall submit to the Engineer an updated project schedule on paper and as soft copy in Microsoft MS Project form showing all the activities he intends to perform to meet his obligations in is contract and to complete the work within its stipulated time for completion. This baseline schedule will be used for monitoring progress each month and for evaluating the impacts of any departures from the baseline schedule.

3.2 Prior to the Work

The Contractor shall carry out all necessary surveying work required for the approved performance of the work and shall ensure that the position and elevation of all works thus constructed are correct. The measuring methods and devices used must meet the standard of accuracy required for this purpose.

3.3 Access Works (Matale site)

The construction and maintenance of permanent and temporary access roads or access ramps from public roads to the sites, including crossings, shall be the Contractor’s responsibility to the approval of the Engineer.

In general, all roads within the site area shall be the Contractor responsibility, construction and maintenance, during the work until final handover to the Engineer.

Proper maintenance of all roads being used by the Contractors during the entire construction period, both permanent existing ones as well as temporary roads, shall be the Contractor’s responsibility.

Additional roads and ramps which have to be built to transport equipment and materials shall be constructed by the Contractor at his own expense and with the Engineer’s prior approval,

and the maintenance of such roads during the construction period shall also be at the Contractor's expense. The same applies for existing public roads and bridges used by the Contractor in the vicinity of the site for the execution of the work.

Any work, improvement or modification at the existing access roads made by the Contractor, for his own convenience, and without being ordered by the Engineer, shall be at the Contractor's own risk and expense.

If any damage or pollution occurs during the execution of the work, the Contractor must restore and clean the roads immediately at his own cost.

After completion of the Contract and before delivering the work to the Engineer (final takeover), all temporary structures shall be removed to the satisfaction of the Engineer.

3.4 Construction Facilities

3.4.1 Stores, warehouse, workshops and material yards

The Contractor shall provide and equip, for his own and his Subcontractors' use, warehouses, materials storage areas and fuel storage areas, all of which shall be maintained in good condition until the completion of works.

Listed hereunder are the buildings, workshops and warehouses expected to be constructed and equipped by the Contractor for use in the performance of the work under this Contract, in addition to facilities explicitly specified elsewhere in these specifications:

A Workshop and service facilities for vehicles and construction equipment

B Main warehouse and parts store

C Storage facilities for all materials applied within the conduction of the rehabilitation works

3.4.3 Materials testing laboratory

The Contractor shall build and equip an adequate field laboratory for the sampling and for testing of all materials as specified in the pertinent sections of the specifications.

The laboratory shall be located in a building properly equipped with electricity, water, air-conditioning/heating, etc., and shall have enough room for storing the samples tested as required by the Engineer.

The equipment to be supplied and the methods of testing shall be in accordance with the relevant codes and standards and as approved by the Engineer. All apparatus and equipment shall be in good working conditions, functional and manufactured by a reputable manufacturer.

The Contractor shall operate and maintain the laboratory until the Completion of Works and make all facilities and services available to the Engineer as required. All sampling and testing to be undertaken shall be under the direct supervision of the Engineer. The laboratory shall be run by Contractor's personnel experienced in sampling and testing of materials, and quality control.

Specialised testing which may be required and which cannot be performed in the Contractor's laboratory due to lack of time or equipment shall be assigned to an independent organisation approved by the Engineer. The Contractor shall accept all results, instructions or restrictions stipulated by the Engineer in writing based on such tests.

Upon completion of the work, all laboratory equipment shall remain the property of the Contractor. However, the Engineer reserves the right to purchase some or all of the equipment by mutual agreement.

3.4.4 Construction equipment

The Contractor shall provide suitable and adequate temporary construction equipment until the completion of the work under this Contract.

A schedule including a list of quantities for temporary construction equipment has to be delivered to the Engineer on a monthly basis for information.

Full costs of all construction equipment shall be included under the unit prices of each part of the Work.

3.5 Utilities

3.5.1 Power supply and illumination

The Contractor shall supply, install, operate and maintain an adequate power supply system and illumination for running the site and other site installation facilities during the whole construction period. The concept shall be approved by the Engineer.

3.5.2 Water supply

The Contractor shall provide, install, operate and maintain adequate and suitable water supplies for the work within the contract including storage for drinking purposes, sanitation, construction, cleaning, testing and commissioning of the various equipment items and plant components of the construction lot.

The water supplies shall be continuously available during working hours and rated to meet the maximum demand required during construction on the basis of 'firm supply' and shall supply all temporary installations.
The drinking water provided shall at all times meet the criteria of the local health authority.
The concept shall be approved by the Engineer.

3.5.3 Sanitation, sewerage and waste disposal

The installations shall meet the requirements of the local health authorities and environmental regulation.
The Contractor shall collect waste material and garbage from site on a daily basis and transport it to an approved area where it shall be treated and disposed of in accordance with local environmental requirements.
The Site shall be kept clean and free of refuse at all times. No waste shall be dumped in areas other than those approved by the Engineer for waste disposal. No waste of any kind shall be deposited in any water courses.

3.5.4 Communication systems

The Contractor shall supply, install, operate and maintain a complete telephone system satisfying all his needs and the needs of the Engineer at site including external lines to the public switched telephone network and external connection to an internet access provider.

3.5.5 Office space

The Contractor shall supply, construct, equip and maintain an office for the sole and exclusive use of the Engineer, fully furnished and equipped with facilities and services.
The office building shall be provided with the necessary portable fire extinguishers and service facilities necessary for normal and comfortable occupation by 6 people. The building shall be air-conditioned.
The offices shall be equipped with adequate furniture (desk, chair etc.) and fittings (electricity, lights, toilets, water etc.) for use as an office. Furthermore the office shall be equipped with an Internet connection.
The offices shall be maintained by the Contractor at his expense.

3.6 Site security

The Contractor shall employ an adequate force of trained security guards at the work site and at the construction camp on 24-hour duty including weekends and holidays.

3.7 Demobilisation

Upon the completion of works the Contractor shall reinstate the site and dismantle and demobilize all temporary facilities erected by himself or his Subcontractors, and remove all debris, objectionable material and all other refuse which may have been deposited on site during the construction period. Such materials may be deposited only in areas approved by the Engineer.

All excavated areas shall be filled, graded and dressed in a clean and orderly condition acceptable to the Engineer. As far as possible such areas should conform to the natural appearance of the landscape.

3.8 Environmental obligations

The Contractor shall, during the whole period of the work comply fully with all national Sri Lankan laws and regulations relating to environmental protection, mitigating measures for reducing environmental impacts and remedial works on completion of the Work. This obligation shall extend to the construction sites themselves and all of the Contractor's site installations.

Notwithstanding any specific obligations as these may be specified in prevailing Sri Lankan laws and regulations, the Contractor shall at all times comply with the following particular requirements for the protection of the environment, the local population and the workers at the construction site:

- Collect, treat, remove from site and dispose of in accordance with the regulations and to the satisfaction of the Engineer all domestic and industrial waste and excess construction materials (both solid and liquid), fuel, chemicals and other matter.
- Make every effort to minimise the harmful effects of transport to and from the site, in particular vehicle emissions and noise and the control of dust on roads.

The Contractor shall maintain close contact with local representatives and government institutions in addressing issues arising from the construction activities. Such issues needing particular attention are the following.

- Pollution caused by the Work
- Disruption to the local community
- Disputes related to the use of land for construction activities and/or site installations etc.

- Disputes arising from traffic congestion and restrictions on the use of the main project access road and roads in the project area
- All matters relating to road safety and the reduction to a minimum of the risk of traffic accidents.

3.9 Social obligations

As far as may be reasonably practicable, the Contractor shall recruit his unskilled labour from those persons from the local community who may apply for work. Suitably skilled workers in the local community should also be recruited wherever practicable.

4 SAFETY AND HEALTH PRECAUTIONS

4.1 General

This section covers the precautions that have to be taken for the health and safety of all personnel on Site that the Contractor and his Sub-Contractors shall apply in all civil construction and equipment erection works during the construction time.

The Contractor shall provid all necessary safety measures to workmen at site confirming to the latest industrial safety regulations and “The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects” prepared by JICA and as directed by the engineer. In the Guidances, two plans for the safety management for the work sites shall be prepared and implemented by the Contractor, namely the "Safety Plan" and "Method Statements on Safety." The Contractor shall prepare the Safety Plan in the Bidding stage and Method Statements on Safety in the construction stage.

4.2 Safety precautions

4.2.1 Safety programme and its implementation

A safety program shall detail policies, procedures, and plans which the Contractor intends implementing to ensure the safety and health of his employees. It shall comply with the standards and regulations in force in the country of the Work applicable to construction safety.

The Contractor shall designate a competent employee specially trained and experienced to act as Safety Officer, who will administer and be responsible for the implementation of the safety program. He shall carry out frequent and regular safety inspections of the working areas, materials, and equipment. The name and qualifications of the Safety Officer shall be submitted for approval to the Engineer prior to his appointment.

The Contractor shall be responsible for the implementation of health and safety provisions for his subcontractors employed at Site.
All serious and fatal injuries and diseases caused by the progress of work shall be immediately investigated by the Contractor and a comprehensive report shall be submitted to the Engineer.
In case of a fatal accident, only rescue and emergency teams and operations shall be permitted at the place of the occurrence until the Engineer gives permission to resume normal operations.

4.2.2 Safety standards

In addition to the requirements of the following specified herein, the Contractor shall comply with all currently applicable safety documents and/or organizations:

4.2.3 Safety of personnel

The Contractor shall be responsible for the safety of all personnel on the Site and shall provide his employees and his sub-contractors employees working on the Site, the Engineer's staff and all visitors to the Site with safety equipment appropriate to the tasks upon which they are engaged, including helmets, high visibility vests or jackets, safety footwear and, where required, gloves, lamps, waterproof clothing, dust masks and/or safety belts. The use of such safety equipment shall be compulsory, as deemed necessary by the Engineer.
During drilling works and in areas where the personnel are exposed to harmful noise levels and dust, ear protectors and masks shall be furnished and required to wear.
Employees engaged in work having an inherent danger of eye or face injury shall be furnished and required to wear protection glasses, goggles or masks. Where irritant or toxic substances may come in contact with the skin or clothing, employees shall be wearing protective clothing or shall be required to apply a protective ointment by a competent physician.
Personnel working on steep slopes or otherwise subject to possible falls from levels not protected by fixed guardrail or safety nets, shall be secured by safety belts and lifelines.
Portable ladders shall be wooden or steel ladders sufficiently strong and with suitable size for the use intended. Wooden ladders shall have the steps fixed to the longitudinal posts by assembly. The use of ladders with steps nailed or wired along the longitudinal posts is not permitted.

4.2.4 Security of personnel and working areas

The Contractor shall take at all times the necessary measures to ensure the safety and security of all persons, work and property. This shall include but not be limited to the following:

- Access control to all areas related to the Work
- Installation of fences
- Security patrols

4.2.5 Maintenance of traffic and safety on roads

The Contractor shall be responsible for the safety on the roads related to the Site. He shall take all necessary precautions for the protection of the work and the safety of the public on the roads affected by his activities. Where the work will be carried out at the site of, or close to an existing road, the Contractor shall maintain the vehicular and pedestrian traffic safe at all times. If his operations can cause traffic hazards, he shall repair or fence or take other measures for ensuring safety which are satisfactory to the Engineer.

Roads subjected to interference with the work shall be kept open or suitable detours shall be provided and maintained by the Contractor, who shall provide, erect, and maintain all necessary barricades, suitable and sufficient flashlights, flagmen, danger signals, and signs.

Roads which will be closed to traffic shall be protected by effective barricades on which acceptable warning and detour signs shall be placed. All barricades and all lights shall be kept burning from sunset to sunrise.

The Contractor shall submit his weekly activities schedule and the locations of his work along the existing public roads to the authorities concerned, and obtain all necessary approvals prior to commencement of the respective work.

The Contractor shall provide temporary passes and bridges to give an access to the existing villages, houses, etc., to the satisfaction of the Engineer and the authorities concerned whenever he disturbs such existing ways during the execution of the Work.

4.2.6 Weather precautions

In order that the Work may proceed according to the programme, the Contractor is to undertake at his expense all necessary precautions for protection against inclement weather, which shall be subject to the approval of the Engineer.

4.3 Health precautions

4.3.1 First aid

Prior to the commencement of construction, the Contractor shall organize and train a first aid team composed of his employees. This team shall be capable to render help after accidents.

The first aid team shall be organized in such a way that sufficient number of members will be ready for action at any time until the completion of the Work.

The team members shall be instructed and trained for their task by a qualified and experienced person. Each team member shall be skilled in giving first aid, dealing with the appliances for artificial respiration, and firefighting equipment and shall possess a good local knowledge. Adequate equipment for reaching even the remotest working area shall be at their disposal.
The Contractor shall submit the details of the proposed first aid team organization to the Engineer for approval.

4.3.2 Noise control

The Contractor shall take the provisions required to assure that noise from his construction activities and from the operations of any plants are within the limits established by the WHO for the health of his personnel, or shall provide his personnel with ear protectors. Ear protectors shall be provided to all personnel subject to noise levels above 85 dB on a continuous basis during work shifts.

5 SITE SUPERVISION AND REPORTING

5.1 Site supervision

The Contractor is responsible for providing proper supervision of his site activities by employing suitably qualified and experienced site management and supervisory personnel so that he can carry out his obligations under the Contract.
For the Contractor's information, the Engineer has issued a Construction Supervision Manual, dated August 2010, which is intended for use by the Engineer and his staff for the supervision of the Work. This manual includes standard forms which will be used during construction for control of the work. It is available to view in the office of the Engineer.

5.2 Monthly progress report

Before the tenth day of each month, the Contractor shall submit three copies of a monthly progress report in a form acceptable to the Engineer detailing the progress during the preceding month. The monthly progress report shall show the amount of work completed, materials actually used, materials in storage and the cumulative results of all operations completed or in progress and shall be summarized in terms of percentage of completion referenced to the agreed programme for the work.

The monthly progress report shall include at least the following:

- Total percentage of work completed and total percentage programmed to be completed by the end of the reporting period;

- Actual percentage of each main work item completed as well as their scheduled percentage, both total and for the reporting period together with the estimated quantities;
- List of manpower by trade and foreign personnel by position for the reporting period;
- List of equipment and operational days for the reporting period and materials on site at the end of the period;
- Description of weather conditions for the period including records of each rainfall duration and recorded river water levels (if any);
- List of any accident except of minor nature and any damage that occurred;
- Any matter which affected or may affect the progress of the work, problems encountered and proposed remedial measures;
- Colour photographs with imprinted date, not smaller than 100 mm by 150 mm of the work progress during the period for all major components of the Work. The Contractor shall also provide digital versions as well as 5 sets of hard copies of these photographs in albums with titles.

Further the Contractor shall submit financial statements, purchasing and expediting reports, shipping reports, and any other data which the Engineer may reasonably ask for.

Additional to the photographs included in the progress reports, the Contractor shall arrange for the taking of progress colour photographs every month, covering all aspects of the Work. Two copies of such photographs, suitably dated and captioned, shall be submitted to the Engineer, plus a CD with all relevant files.

5.3 Quarterly progress report

Before the tenth day of March, June, September and December, the Contractor shall submit three (3) copies of a quarterly progress report in an acceptable form to the Engineer detailing the progress.

The quarterly progress report shall show the amount of work completed, materials actually used, materials in storage, and the cumulative results of all operations completed or in progress, and shall be summarized in terms of percentage of completion referenced to the agreed programme for the work.

Upon receipt of the quartely progress report, the Engineer will issue the certificate of progress of works after careful checking.

5.4 Final report

The Contractor shall submit the final report not later than one month after completion of the Work. This report shall include all relevant information related to the Work in a format approved by the Engineer. The Contractor shall submit to the Engineer one copy of the draft report. The final report shall be submitted in triplicate. The final report shall also be made available electronically in pdf format or alternative approved format. The submission of the final report shall follow within one week of acceptance of the draft report.

6 DESIGN DOCUMENTS AND CONSTRUCTION DRAWINGS

The Contractor shall ensure that design work is only allocated to personnel with adequate qualifications and relevant experience to perform the required tasks. Based on the Bidding drawings assigned design engineers shall develop designs and prepare associated design documents and construction drawings to be approved by the Engineer.

The Contractor will be responsible for the control of the design activities performed as well as their verification. The Contractor shall control and document any revised information in the same manner as drawings and specifications, to assure correct communication through the design interfaces.

7 PREPARATION OF AS-BUILT DRAWINGS

During the construction and commissioning period any variations between the "Construction Drawings" and the "As-built Drawings" shall be agreed between the Contractor and Engineer at site.

All agreed modifications will be marked up by the Contractor's draughtsman and included on the originals at site. A complete set of these mark ups shall remain at site. The Contractor shall allow for the provision of a draughtsman as required at site to co-ordinate and include all modifications on the drawings. The originals shall then be returned to the Contractor's head office and these shall form the basis of the “As-built Drawings”.

The Contractor shall submit to the Engineer all final revisions of all original drawings depicting the “As-built” situation for the work. All drawings and documents prepared exclusively for the project shall become the property of the Engineer.

Final drawing prints shall be size A1 or smaller. Reproducible of the final drawings shall be supplied as follows:

- 2 prints of each drawing to the Engineer.
- 2 CDs with original AutoCAD drawing files to the Engineer

Where drawings are reduced, an appropriate scale shall be included on the reduced print. To accompany the drawings, the Contractor shall provide a Master Schedule of “As Built” drawings.

Section 7
SPECIFICATION FOR EARTHWORK

1 SURFACE EXCAVATION AND EMBANKMENT

1.1. Scope of work

This section covers all surface excavation work to be performed under this Contract, which shall consist of removing all existing material of whatever nature to the lines and grades shown on the drawings or as otherwise directed by the Engineer in writing. This work shall include excavating, ripping, loading, hauling, double handling and disposal of materials in designated spoil or stockpile areas, according to these Specifications.

This section also covers all embankment work to be performed under this Contract, which shall consist of soil laying and levelling and soil compaction using excavate-reusing soil, generated soil, collected soil and purchased soil.

1.2. Submittals

Prior to the commencement of any surface excavation and embankment, the Contractor shall submit in writing to the Engineer details of the proposed excavation and embankment methods and sequences, including necessary safety precautions.

Prior to dumping or stockpiling any material, the Contractor shall submit in writing the layout of spoil or stockpile areas to the Engineer and wait the approval in writing. All pertinent data of working methods and provisions for the security, stability and temporary and permanent drainage of the areas shall be included by the Contractor. Details of volumes, material types, heights and grades shall be provided.

1.3. Lines and grades

The final excavation grades shall in general be rock of specified quality. However, where the final excavation grades are defined by line and grade, the Contractor shall take every precaution and use the most appropriate method of excavation, to avoid the loosening of material or the breaking of rock beyond the lines and grades shown on the drawings. Loose weathered rock shall be removed.

The bottoms of all excavations shall be trimmed to line and grade to the satisfaction of the Engineer.

If, for any reason, excavation is carried out beyond the lines and grades shown on the drawings, the Contractor shall remove the excess material and take the necessary measures to restore the required lines and grades with approved backfill or concrete, at his own expense.

Should the Contractor wish to excavate beyond the limits given on the drawings for his own convenience, he may do so, at his own expense but only with the prior written approval of the Engineer.

1.4. Clearing and grubbing

Clearing means the removal, transport and appropriate disposal of all trees, brush, stumps, fences, existing structures, spoil, debris and other obstructions in the areas to be occupied by the Work, surfaces of borrow and quarry areas, spoil and stockpile areas, and where interfering with the procedure or functioning of the work.

Grubbing means the removal, transport and disposal of all roots, buried logs, foundations of structures (except concrete or masonry in mortar) and other materials foreign to the natural topsoil in the areas to be occupied by the Work and surfaces of borrow and quarry areas.

Clearing and grubbing work shall be performed either manually or with mechanical equipment. The Contractor shall make every reasonable effort to salvage such material which may be put to beneficial use.

All materials from clearing and grubbing work shall remain the Employer's property but the Contractor may, subject to written approval from the Engineer, retain any material for his use. Materials which the Contractor does not wish to use shall be disposed of in an approved manner.

Materials to be burnt shall be piled neatly in such a manner and in such locations as to not cause any fire risk and shall be burnt completely so that all material is reduced to ashes.

The Contractor shall have suitable equipment and supplies for fighting fire during the burning of material and shall take all necessary precautions to prevent fire from spreading. Toxic materials such as tyres etc. shall not be burnt but disposed of in the approved manner.

1.5. Excavated materials

All suitable materials from the excavations shall be utilised to the fullest extent practicable as construction materials in the Work, subject to the written approval of the Engineer.

The Contractor's excavating techniques shall be such, that as much as practicable, construction materials will be yielded.

The suitable material shall be stockpiled. If the moisture content of excavated materials suitable for embankments or backfill is too high after excavation, the material shall be drained and dried in the stockpile until the moisture content is sufficiently reduced to allow placement, or vice versa moistened if too dry.

1.6. Disposal of excavated materials

Excavated material which is not suitable for, or are in excess of the construction requirements shall be disposed of in the spoil area as directed or approved by the Engineer.

The spoil tips shall be located where they will not interfere with the natural flow of streams or rivers or other works. No rock material may be dumped into the river bed.

The Contractor shall shape and trim the stockpiles to the lines and grades as directed. Adequate diversion of water courses in such areas and proper drainage shall be provided as proposed by the Contractor and approved by the Engineer. The Contractor shall be liable for any damage to the work or to the property of third parties caused by poor drainage in the spoil or stockpile areas.

1.7. Preparation and protection of excavation and embankment surfaces

Excavation and embankment surfaces against or upon which concrete, embankment fill, or backfill will be placed shall be prepared and protected as specified herein and in combination with specifications contained in the pertinent sections of these specifications or as shown on the drawings.

If, during excavation work, materials beyond the limits of excavation shown on the drawings are loosened or disturbed, the Contractor shall re-compact the loosened material or remove it altogether and replace it with other compacted fill or concrete as directed.

Foundation excavation shall be kept well drained and free of standing water. The Contractor shall provide all necessary drains, ditches and sumps and use pumps when necessary to ensure that foundation surfaces are not harmed by water. When foundations are thus affected, the affected material shall be removed and replaced with approved backfill.

Any support to be applied to the finished excavation surfaces where it is deemed necessary shall be carried out by the Contractor and approved by the Engineer.

1.8. Specification for field compaction

Performance based specification should be practiced for embankment.

Field compaction equipment utilized for compaction shall be a suitable vibrator depending on the available soil type.

The fill material should be free from clay lumps.

Fill material shall be placed in layers not exceeding 250mm thickness in loose state. The fill shall be compacted at each lift not less than 92% of the modified Procter density (ASTM D1557). If sizes of materials are more than biggest allowable limits, the Contractor shall

conduct tampering more than three times in each layer or appropriate compaction method shall be proposed by the Contractor and approved by the Engineer.

The earth fill shall be compacted at or near the optimum moisture content.

The moisture content of the material shall be checked during compaction at a frequency agreed by the Engineer. If the material is too wet, it shall be dried by aeration and if it is too dry the material shall be sufficiently wetted prior to the compaction.

Each successive layer shall be placed only after the degree of compaction of the previous layer has been tested and found satisfactory as specified.

In situ compacted unit weight should be determined by the sand cone test or core cutter test.

- For the earth embankment, refer the document of ICTAD 2009; Specifications for Construction and Maintenance of Roads and Bridges, clause 300.
- For the rubble dressing on the embankment, refer the ICTAD publication No.SCA/3/1 on Irrigation and Land Drainage Work, chapter 6

Section 8
SPECIFICATION FOR SURFACE DRAINAGE DITCH

1 EXCAVATION

1.1 Excavation for Structures

The work shall consist of the necessary excavation for foundation of any structure, culverts, retaining walls, lined drains and other structures. The work shall include upholding sides of excavation, additional excavation to provide working space and removal of dead services.

The work shall include preparation and trimming of the excavated surface and additional difficulties occurring excavation below ground water level, backfilling and disposal of excavated material.

The excavation shall deem to be carried upon material other than unsuitable soil, rock or artificial hard material.

1.2 Extra over for rock excavation（If necessary）

This item measured extra over to item 1.2. The item includes all kinds of rock including hard rock and soft rock excavation. The excavation includes rock excavation other than use pneumatic tools or drilling and blasting operation. The item includes weathered rock, stand stone, limestone and such materials which in opinion of engineer, can be excavated by picking, ripping or other similar means without resorting to blasting.

Item includes disposal of excavated material as directed by the engineer.

2.0 Concrete Drains

2.1 Surface drainage ditch

All concrete works include formwork and other ancillary work and shall be covered by relevant specification. The work shall include supply, proportionate and mixing of all materials; transporting, placing and compaction, finishing and protecting and curing for specific periods. The work shall be carried out in accordance with specification and with the lines, grades and dimensions shown in the drawings and instructed by Engineer.

Casting, curing and testing of concrete cubes shall be carried out as given in BS 1881 Part 108 of 1983.

The material shall be tested in accordance with these specifications and shall meet the prescribed standard of acceptance.

The work shall confirm to these Specifications and shall meet the prescribed standard of acceptance.

All reinforcement work shall consist of furnishing, fabricating and placing of reinforcement of the specified grade and type in concrete structures in accordance with specification.

The rate shall include protection & storage and make reinforcement to clean and free from loose rust and mill scale, dirt, oil, grease and paint at the time of fixing in position and subsequently concreting.
Rate to include cutting and bending, confirmed to requirement.
Rate to include Placing and Fixing of Reinforcement, testing to confirm standards
Rate to include all tying wires, spaces, chairs, laps, welded, sewage or screwed sleeve joints and other special joints.
The work for drains shall include compacting bottom of excavation, all levelling and other works
The work shall include all necessary formwork including to formwork where necessary.
The work for drains shall include expansion joints.

If necessary

2.2 Connecting to existing drains and necessary improvement for existing drains

This include connecting new drains to existing drains to complete the drainage system and any additional improvement to meet the requirement of the drainage system including enlargement of existing drains, repair and renovation to existing drain as instructed by Engineer.

Refer the same ICTAD document of 2009 version which was mentioned before clause 700 on Drainage Construction.(Construction & maintenance of roads & bridges)

3 OTHER STRUCTURES

The work includes construction of access road as per the drawings. The work shall consist of construction of un reinforced, jointed plain cement concrete pavement in accordance with the requirements of specification and in conformity with lines, grades and cross sections shown in the drawings or as directed by the engineer. The material shall confirm to relevant specifications.
All concrete works include formwork and other ancillary work and shall be covered by relevant specification. The work shall include supply, proportionate and mixing of all materials; transporting, placing and compaction, finishing and protecting and curing for specific periods. The work shall be carried out in accordance with specification and with the lines, grades and dimensions shown in the drawings and instructed by Engineer.
Casting, curing and testing of concrete cubes shall be carried out as given in BS 1881 Part 108 of 1983.
The material shall be tested in accordance with these specifications and shall meet the prescribed standard of acceptance.
The work shall confirm to these Specifications and shall meet the prescribed standard of acceptance.

The work includes preparation of sub grade or existing ground and proper levelling to receive the concrete work. Concrete work shall include polyphone.

Provision shall be made for contraction, expansion and longitudinal drawings as directed by engineer.

Rate to include all construction joints.

Section 9
SPECIFICATION FOR HORIZONTAL DRAINAGE DRILLING

1 GENERAL

Long length horizontal drainage drilling of specified length shall be provided in a fixed space on the landslide slope as drawing. The Engineer may direct the placement of horizontal drainage at particular locations.

Each borehole are drilled using the rotary percussion type drilling machine. The upper angle of each borehole are set 5(five) degrees.

Long horizontal drainage drilling of specified length shall be installed at specified locations. The drains should be of dia.90mm external diameter PVC pipes (Type 1000) perforated on the surface of each pipe on the upper half (perforated dia.6mm with 100 mm centers with 4 rows of holes on upper half) and wrapped with an approved type of geotextile. Inner end of the PVC pipe shall be closed with an end cap. Geotextile used shall comply with general filter requirements.

Each pipe are connected by joint pipe to keep the designed length of horizontal drainage drilling.

The outlet of each borehole is connected with a pipe and drains groundwater into the surface drainage ditch. The outlet of the pipe is protected with a gabion box for protection.

SECTION 10
GABION BOX

The quality of the mesh used should confirm to BS443 for Zink coating &BS 1052 for Tensile Strength

Mesh size of the Gabion box should be 80mmX100mm.

Mesh wire should be in core wire exceeding 2.5mm in diameter and coated wire exceeding 3.5mm in diameter.

Selvedge wire should be in core wire exceeding 3.0mm in diameter and coated wire exceeding 4.0mm in diameter.

Lacing wire should be in core wire exceeding 2.2mm in diameter and coated wire exceeding 3.2mm in diameter.

Diaphragms should be placed at every 1.0m.

Gabion box should be made of high galvanized low carbon steel inter-twisted wire by Triple inter-twisted with machine and forming Hexagonal structure.

Resin film (PVC, PE) used for coating the wires should confirms to ASTM D412, ASTM D 719

The Gabion baskets shall be filled with hard durable crushed stone. This fill shall comprise of 100mm to 150mm well graded stone, it shall be not less than the mesh size (80mm) and not normally greater than 200mm. Filling shall be carried out by hand.

For further details on construction requirements like assembly, installation & filling and also for measurement & payments, refer the following ICTAD document mentioned below;

- ICTAD 2009; Specifications for Construction and Maintenance of Roads and Bridges, clause 805.

SECTION 11

GEOTEXTILE

Refer the ICTAD 2009; Specifications for Construction and Maintenance of Roads and Bridges, clause 1710 and use the Table 1710-2.

VOLUME III

DRAWINGS

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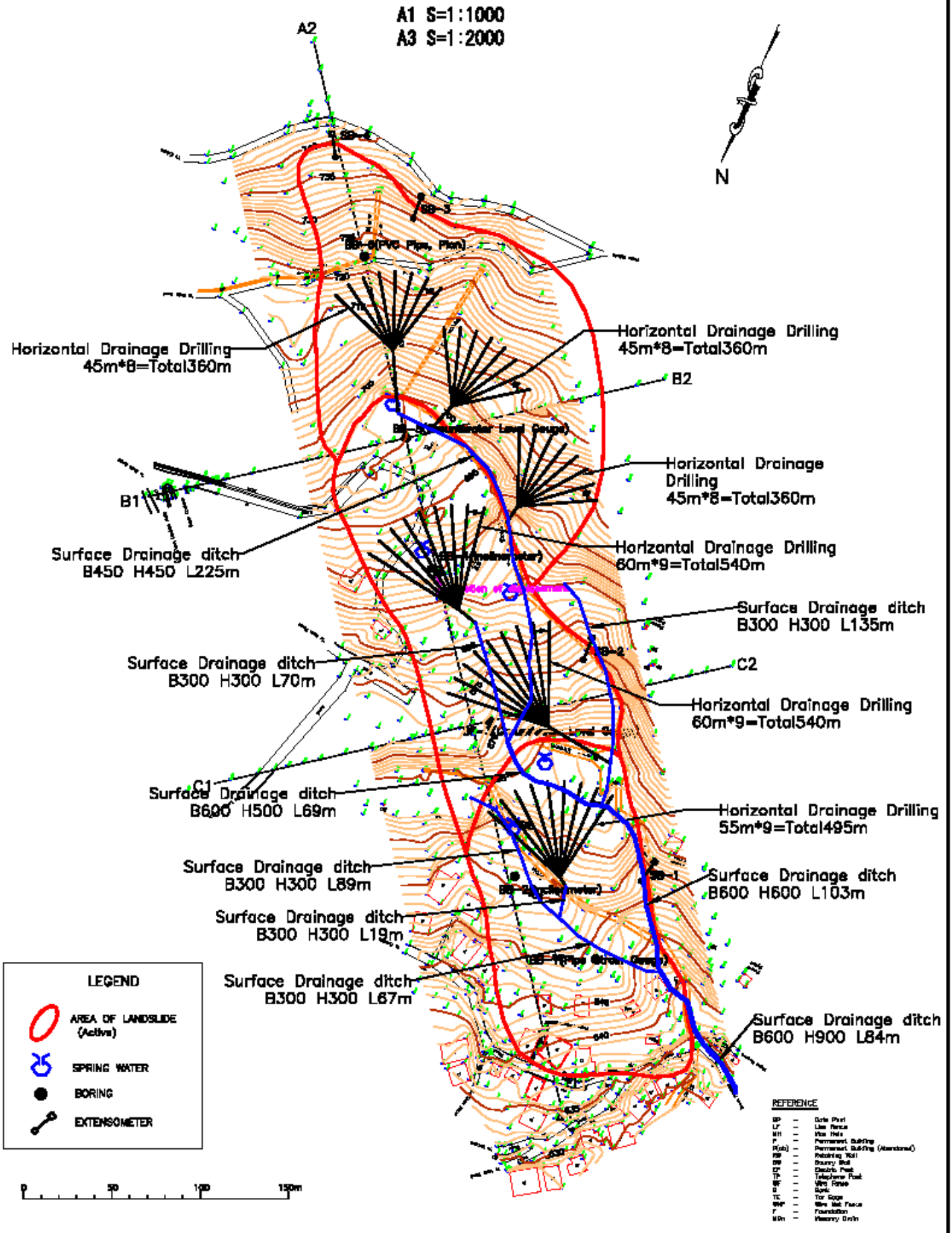
BADULLA LANDSLIDE



CROSS SECTION OF BADULLA LANDSLIDE

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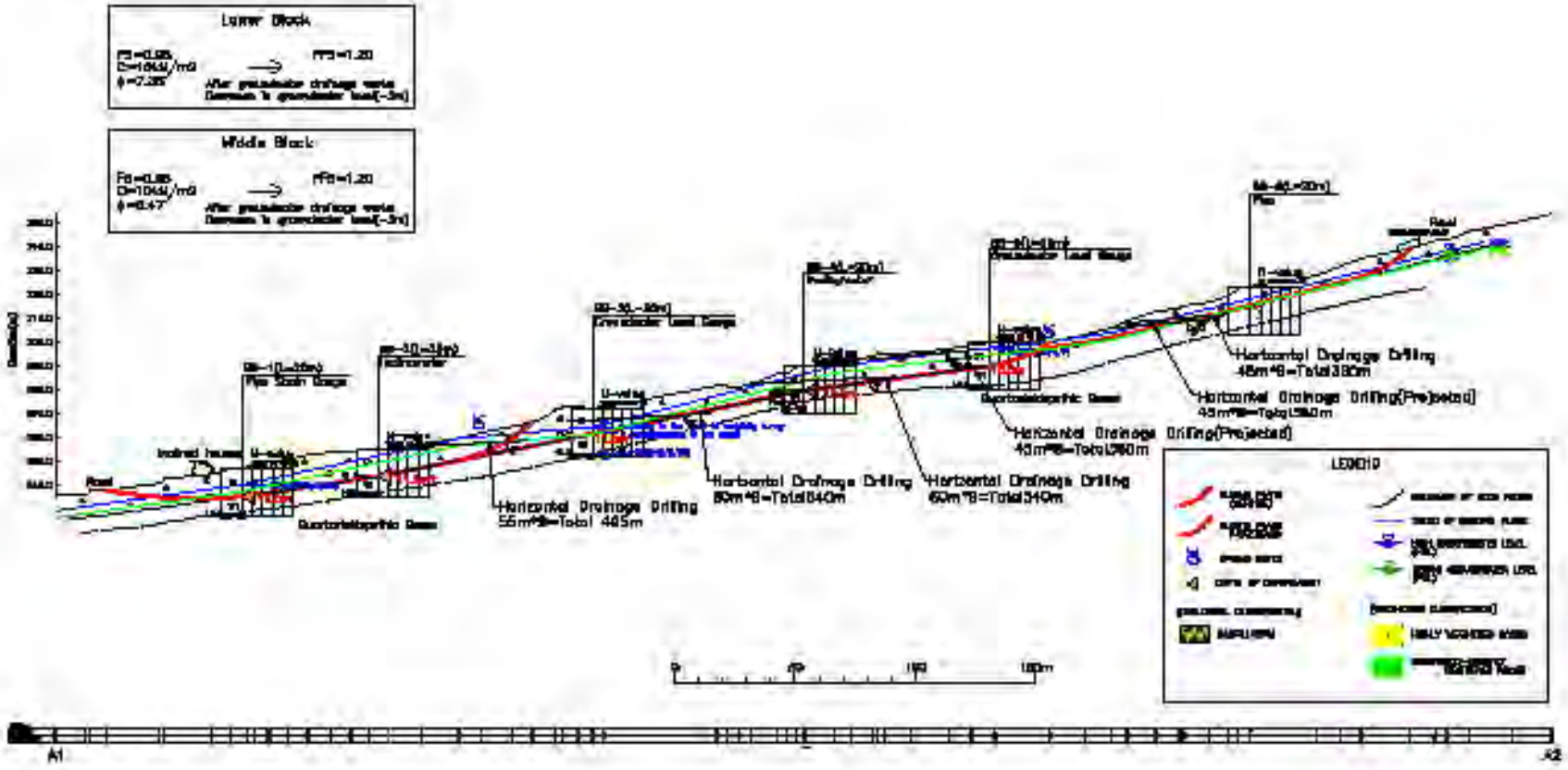

CROSS SECTION OF BADULLA LANDSLIDE

Section B1-B2

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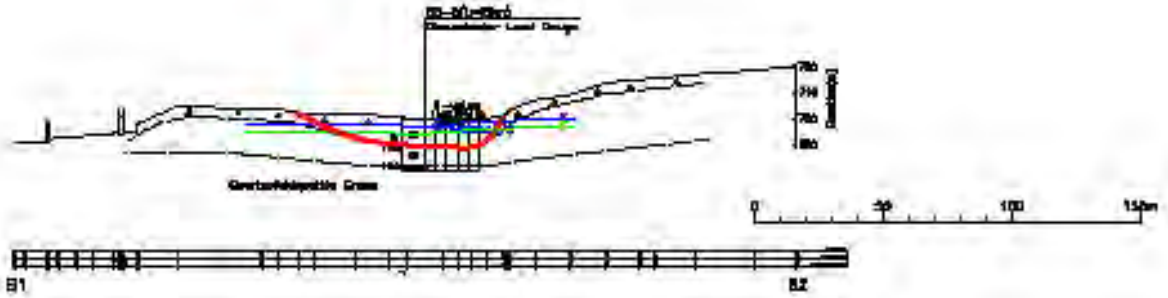
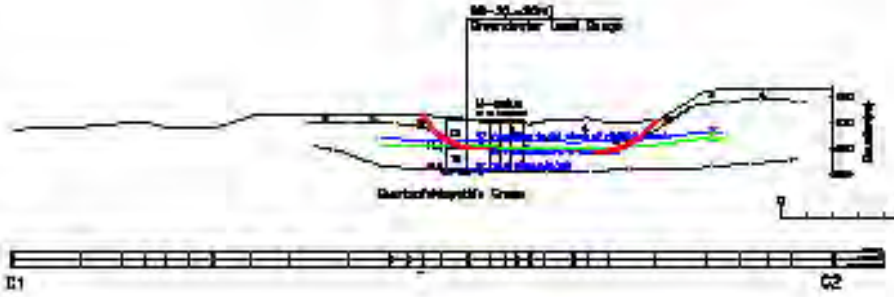
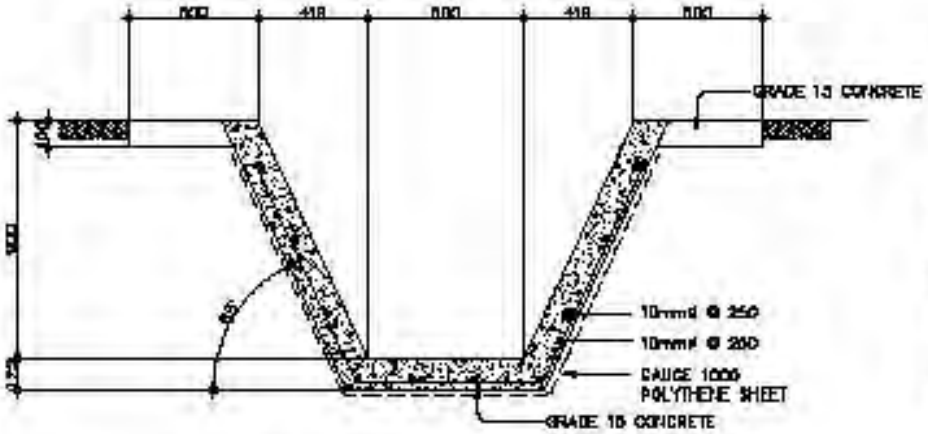
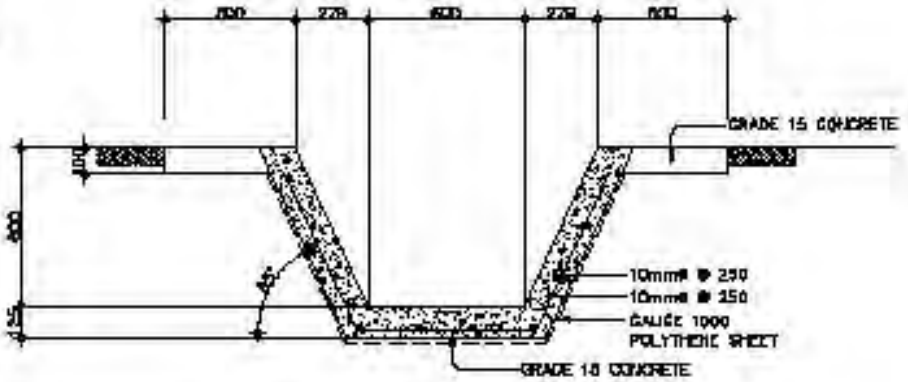


Section C1-C2





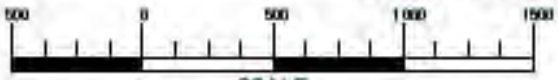
TYPE-A SURFACE DRAINAGE DITCH



TYPE-B SURFACE DRAINAGE DITCH

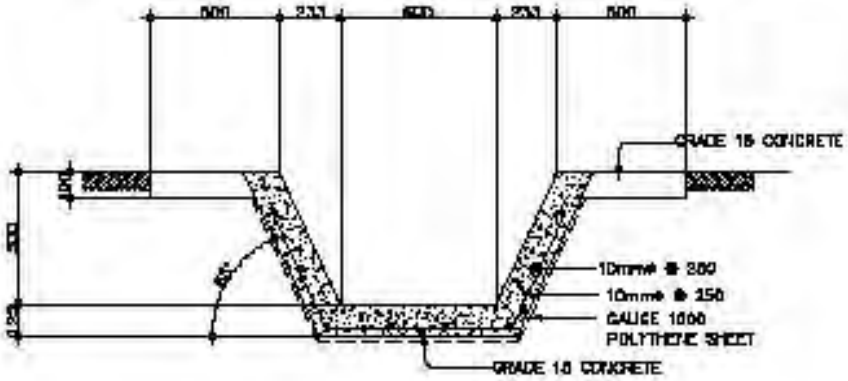
NOTES

1. ALL DIMENSIONS ARE IN mm.
2. STRUCTURAL CONCRETE TO BE GRADE 25.
3. MINIMUM CLEAR COVER TO R/F TO BE NOT LESS THAN 25mm.
4. REINFORCEMENT NOTATION 'Y' DENOTES LANKA TOR STEEL OF Y(S>460N/mm2.
5. COMPRESSION LAP LENGTH TO BE 40 x BAR Dia.
6. TENSION LAP LENGTH TO BE 56 x BAR Dia.
7. ANCHORAGE LENGTH SHOULD BE 40 x Bar Dia.
10. HEIGHT OF SIDE WALLS OF THE THAPIZOIDAL CROWN DRAIN WILL BE VARIED ACCORDING TO THE SITE CONDITIONS.
11. DEPTH OF EXCAVATION SHALL BE VARIED ACCORDING TO THE SITE CONDITION.

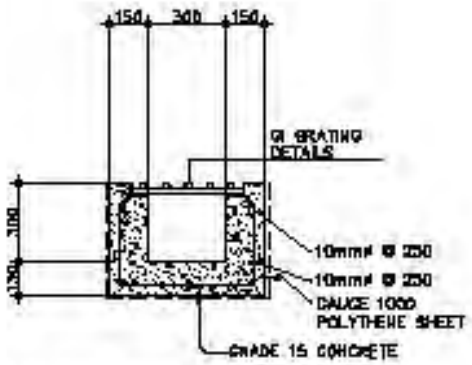


SCALE

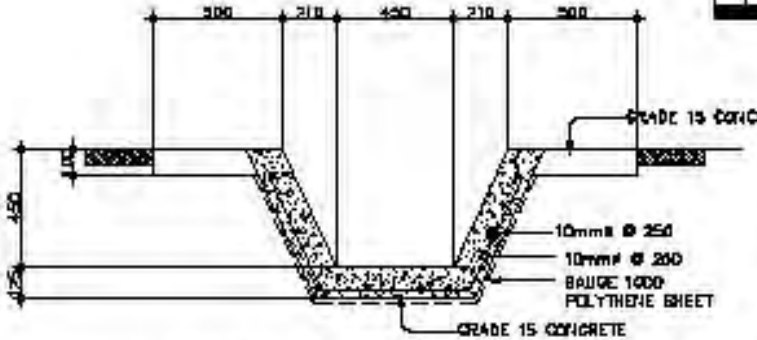
DRAWING TITLE : *DETAILS OF PROPOSED TYPE SURFACE DRAINNAGE DITCH*	DRAWING NO: KN/HO/KCD/TY-DRAIN/DR-01 A	DESIGNED BY:	RECOMMENDED BY:	MINISTRY OF DISASTER MANAGEMENT LANDSLIDE RESEARCH & RISK MANAGEMENT DIVISION NATIONAL BUILDING RESEARCH ORGANISATION NO : 99/1, JAWATTA ROAD COLOMBO -05 TEL -011-2589946
	DATE: 20.07.2015	CHECKED BY:	APPROVED BY:	
BADULLA	DRAWN BY			



TYPE-C SURFACE DRAINAGE DITCH

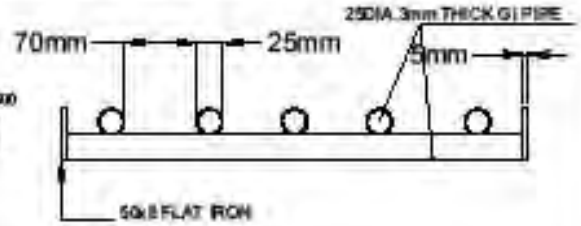


TYPE E SURFACE DRAINAGE DITCH



TYPE-D SURFACE DRAINAGE DITCH

SCALE



DETAILS OF THE GRATING

SCALE -1:25

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. STRUCTURAL CONCRETE TO BE GRADE 25.
3. MINIMUM CLEAR COVER TO R/F TO BE NOT LESS THAN 25mm.
4. REINFORCEMENT NOTATION 'Y' DENOTES LANKA TOR STEEL OF Y/S>460N/mm2.
5. COMPRESSION LAP LENGTH TO BE 40 x BAR Dia.
6. TENSION LAP LENGTH TO BE 56 x BAR Dia.
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10. HEIGHT OF SIDE WALLS OF THE TRAPZODIAL CROWN DRAIN WILL BE VARIED ACCORDING TO THE SITE CONDITIONS.
11. DEPTH OF EXCAVATION SHALL BE VARIED ACCORDING TO THE SITE CONDITION.

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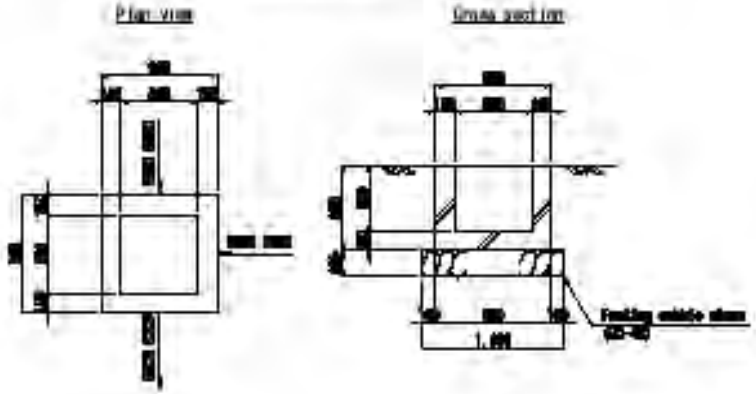
	DATE: 20.07.2015	CHECKED BY:	APPROVED BY:	
BADULLA	DRAWN BY:			

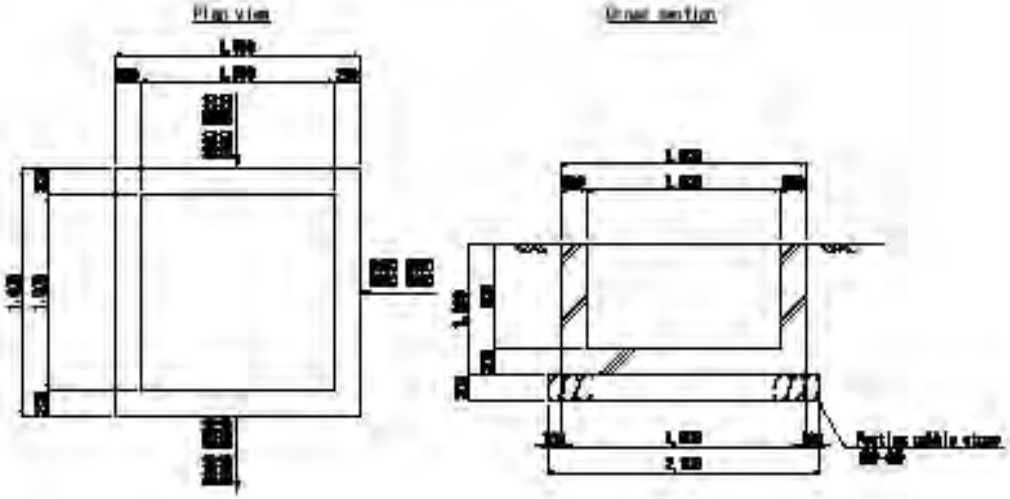
DETAIL FIGURE OF THE WATER COLLECTING PIT

(Badulla)

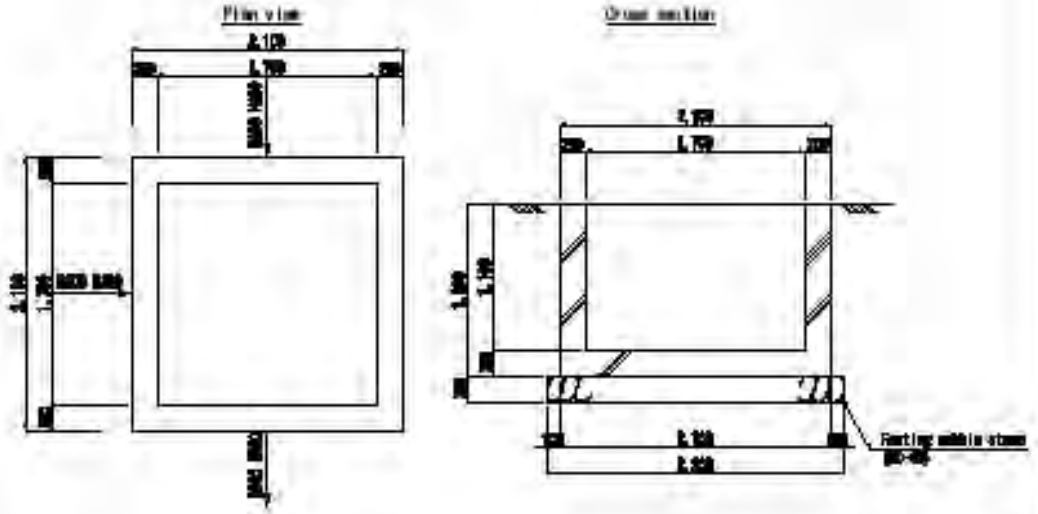
(600×500×500)

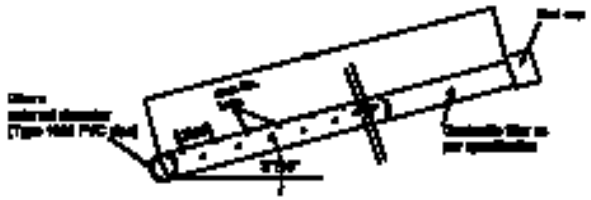


(1,500×1,500×600)

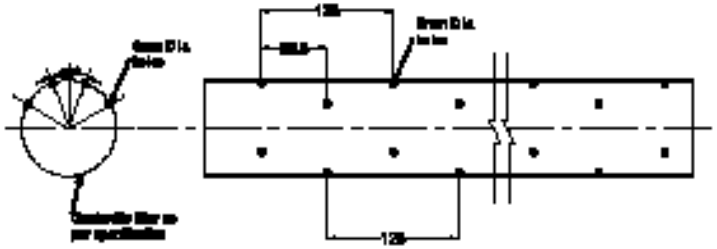


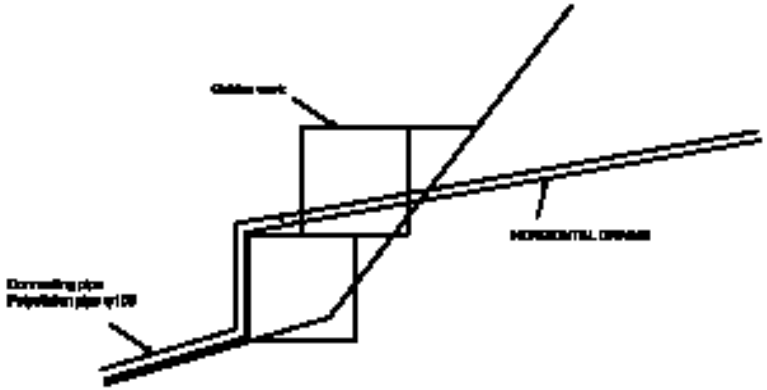
(1,700×1,700×1,100)





DETAILS OF TYPICAL HORIZONTAL LONG LENGTH DRAINS





SCALE

ALL DIMENSIONS ARE IN MILLIMETERS

SCALE

ALL DIMENSIONS ARE IN MILLIMETERS

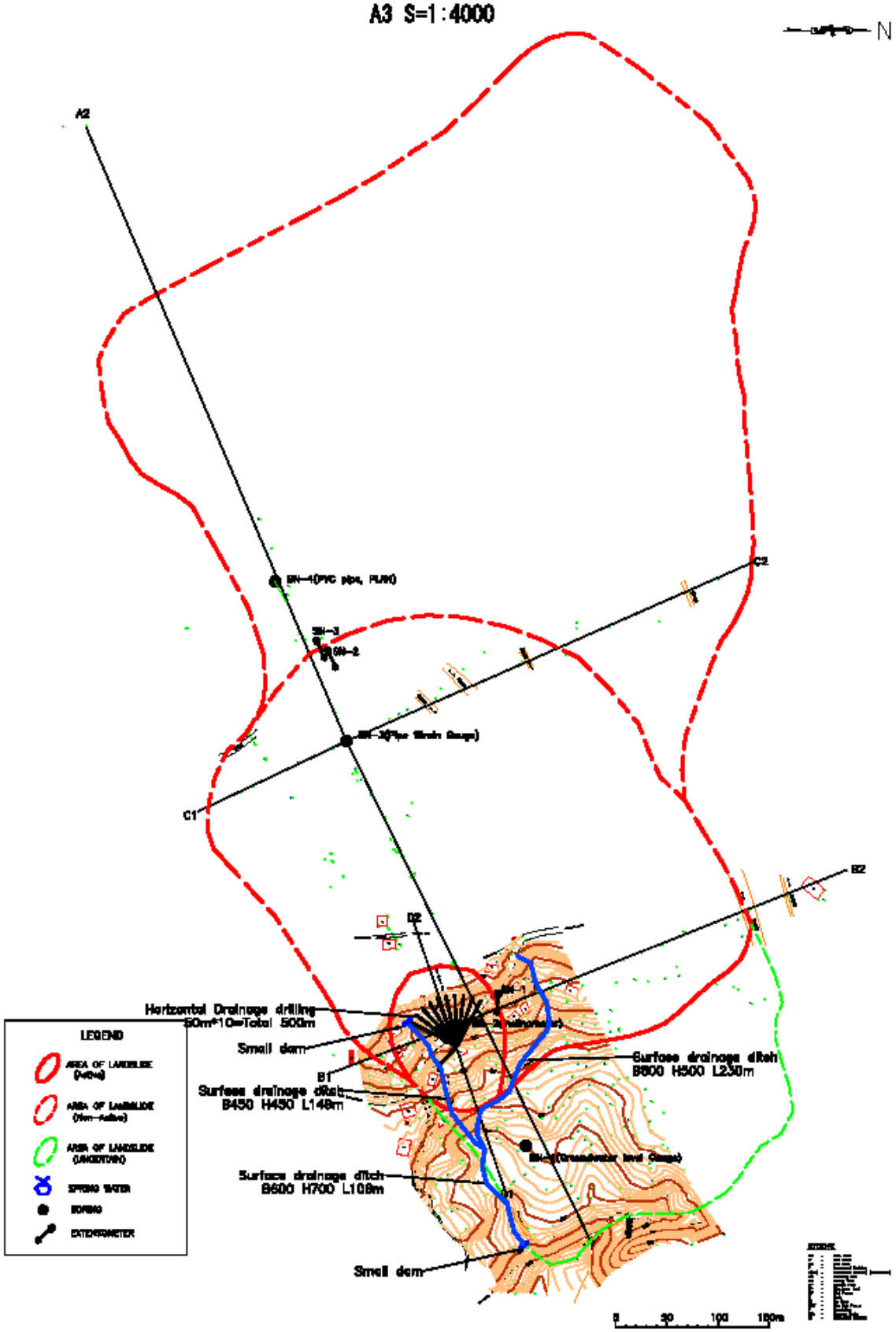
DRAWING TITLE : *DETAILS OF PROPOSED HPRIZONTAL DRAINS*	DRAWING NO: KN/HO/KCDITY-DRAINDR-01A	DESIGNED BY:	RECOMMENDED BY:	*MINISTRY OF DISASTER MANAGEMENT* *LANDSLIDE RESEARCH &* *RISK MANAGEMENT DIVISION* *NATIONAL BUILDING RESEARCH ORGANIZATION* *NO : 99/1, JAWATTA ROAD* *COLOMBO -05* *TEL -011-2555945*
	DATE : 05.10.2016	CHECKED BY:	APPROVED BY:	
BADULLA	DRAWN BY:			

Section 13

LOT 2. Nuwara Eliya Landslide mitigation works

NUWARA ELIYA LANDSLIDE

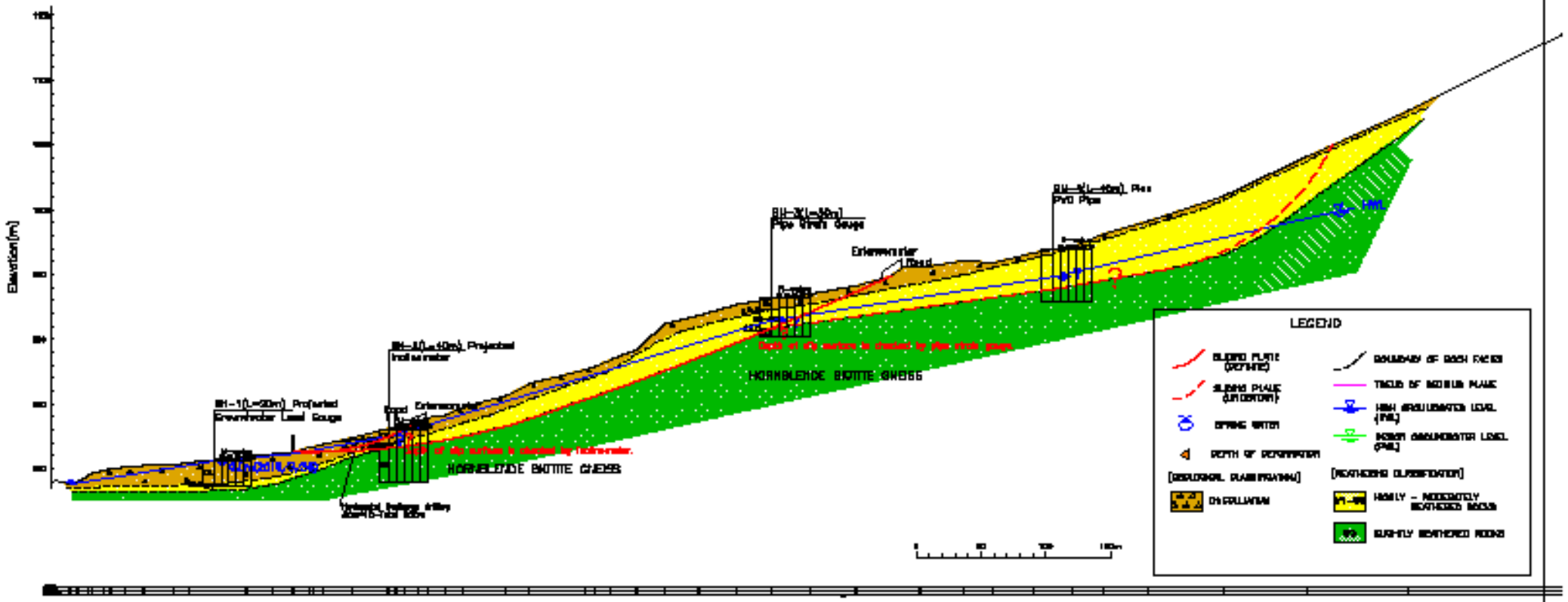
A1 S=1:2000
A3 S=1:4000



CROSS SECTION OF NUWARA ELIYA LANDSLIDE

Section A1-A2

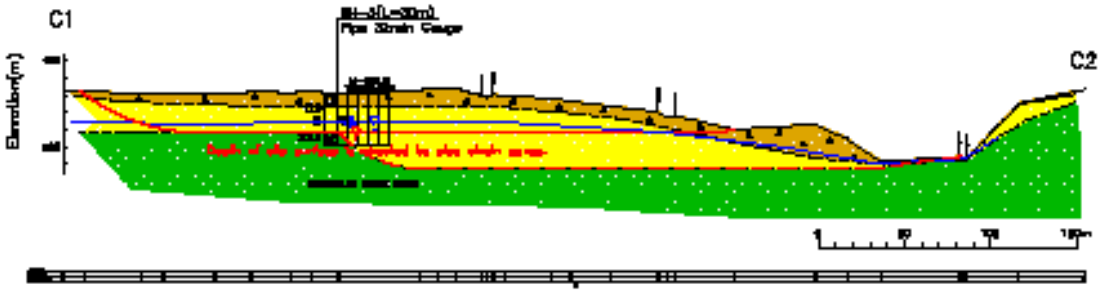
A1 S=1:1500
A3 S=1:3000



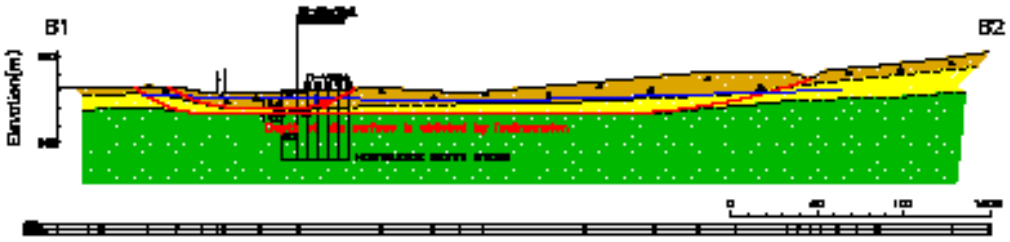
CROSS SECTION OF NUWARA ELIYA LANDSLIDE

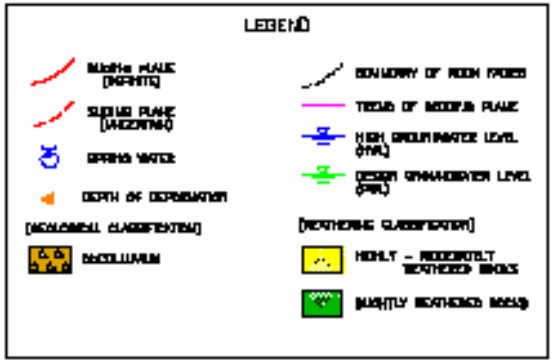
A1 S=1:1500
A3 S=1:3000

Section C1-C2



Section B1-B2





CROSS SECTION OF NUWARA ELIYA LANDSLIDE

Section D1–D2

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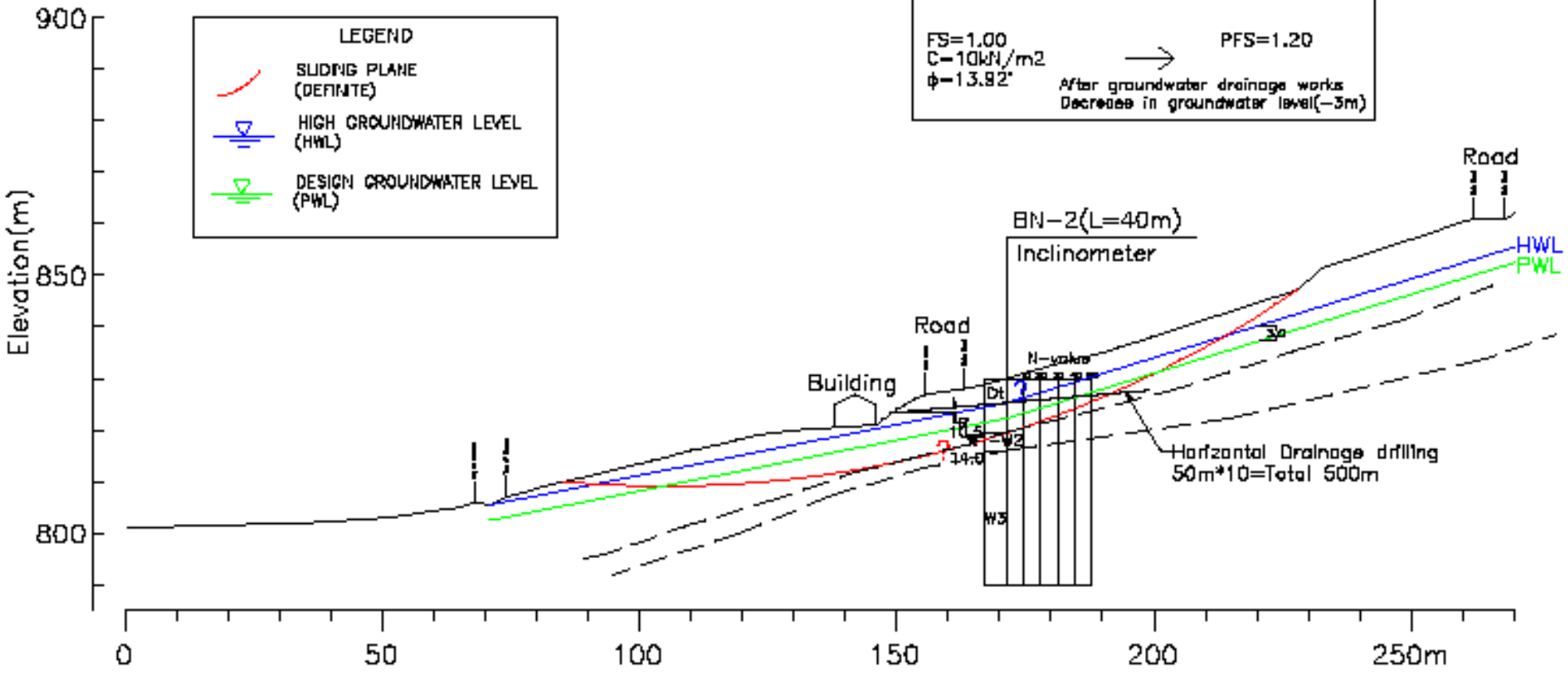
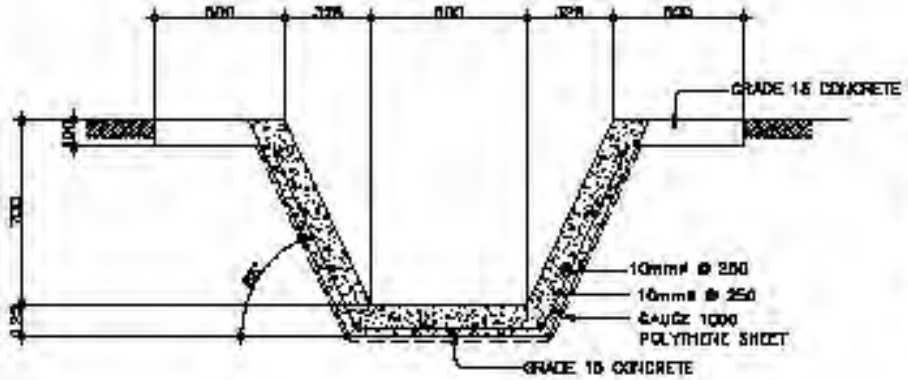
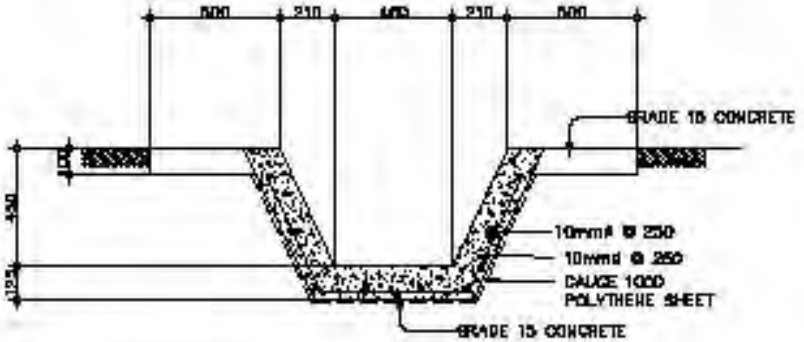
A3 S=1:800

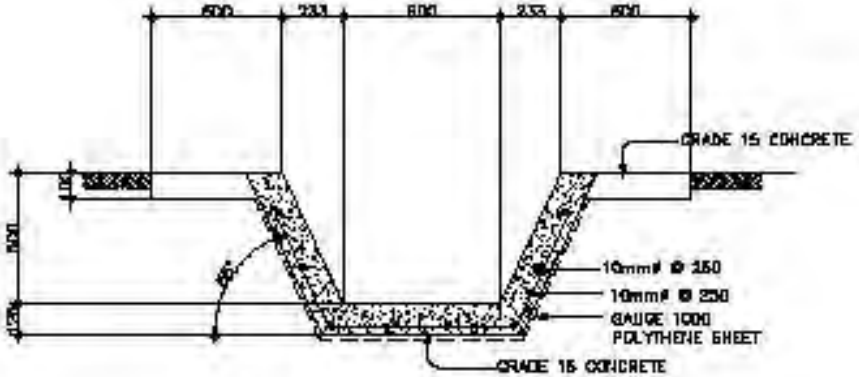




TYPE-A SURFACE DRAINAGE DITCH



TYPE-C SURFACE DRAINAGE DITCH



TYPE-B SURFACE DRAINAGE DITCH

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. STRUCTURAL CONCRETE TO BE GRADE 25.
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4. REINFORCEMENT NOTATION "Y" DENOTES LANKA TOR STEEL OF Y(fy=460N/mm2.
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SCALE

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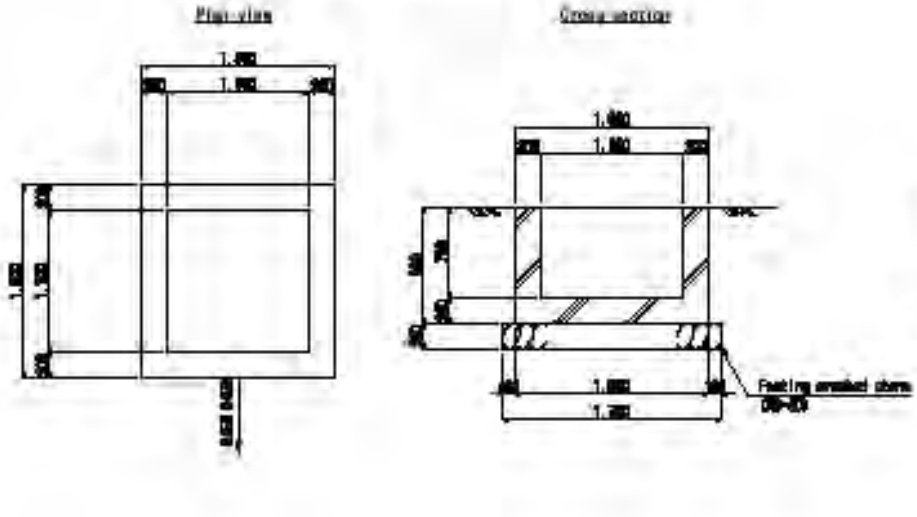
	DATE : 20.07.2015	CHECKED BY:	APPROVED BY:	
NUWARA ELIYA	DRAWN BY			

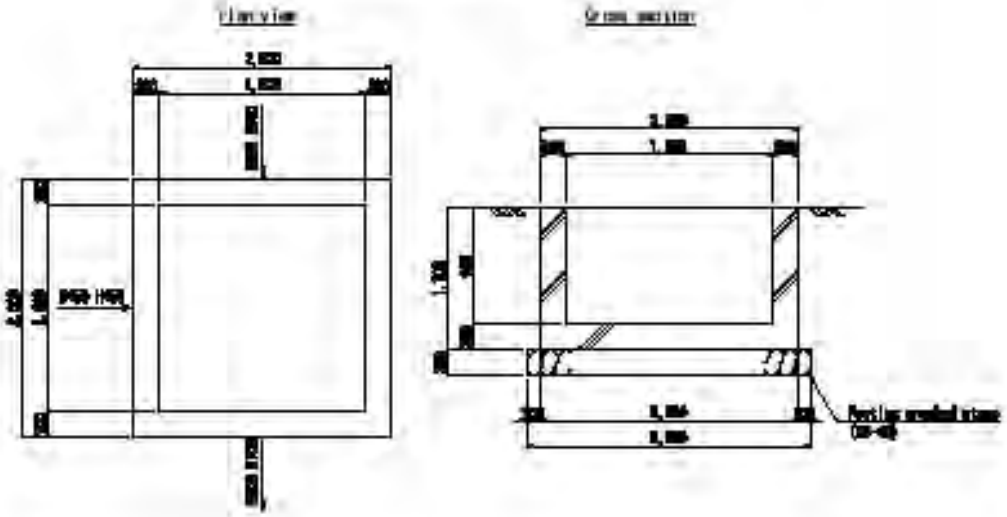
DETAIL FIGURE OF THE WATER COLLECTING PIT [redacted]

(Nuwara Eliya)

(1,100×1,100×700)

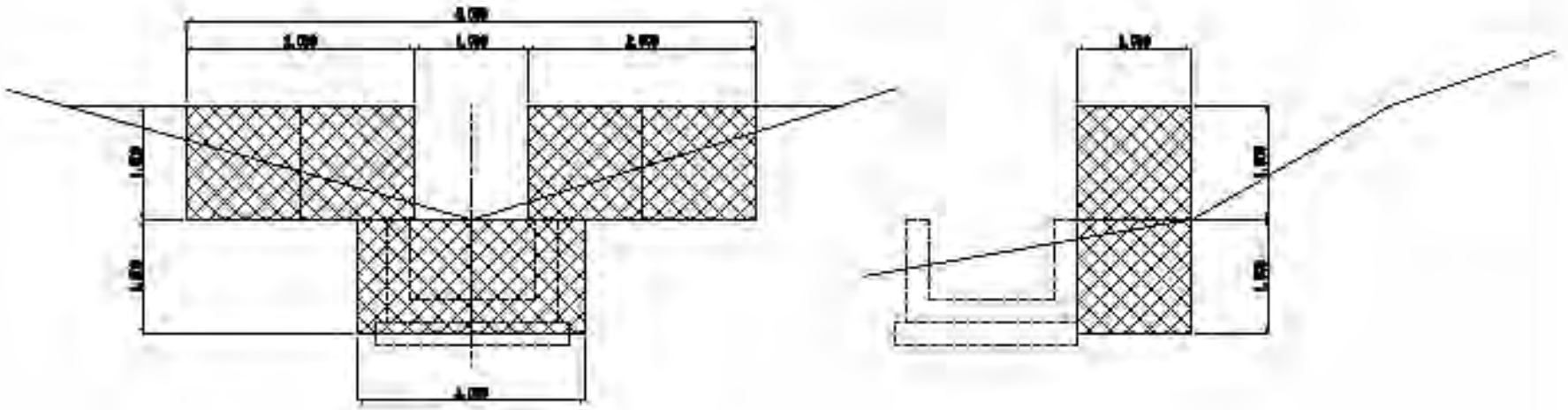


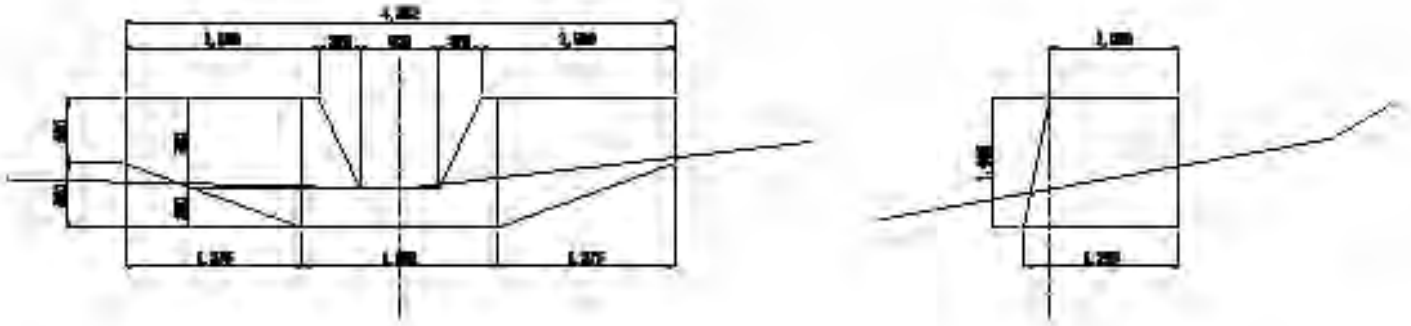
(1,600×1,600×900)

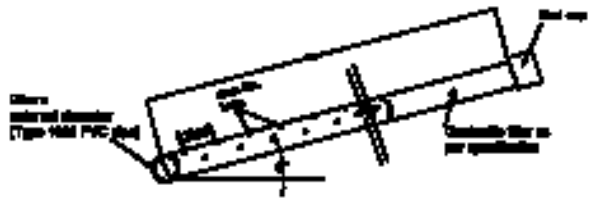


DETAIL FIGURE OF THE SMALL DAM

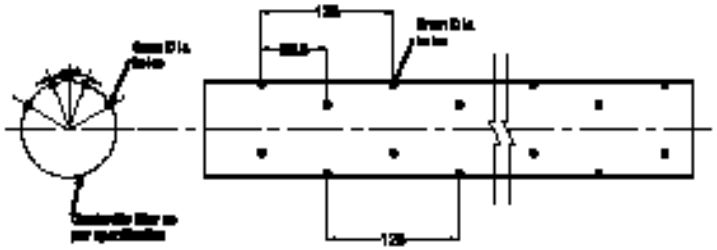
(Nuwara Eliya)

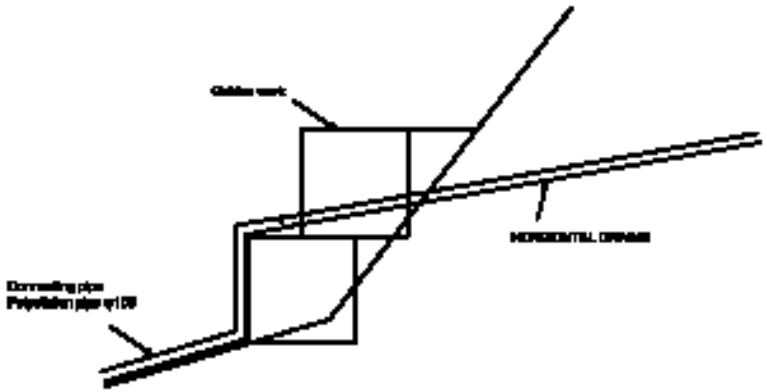






DETAILS OF TYPICAL HORIZONTAL LONG LENGTH DRAINS





SCALE

ALL DIMENSIONS ARE IN MILLIMETERS

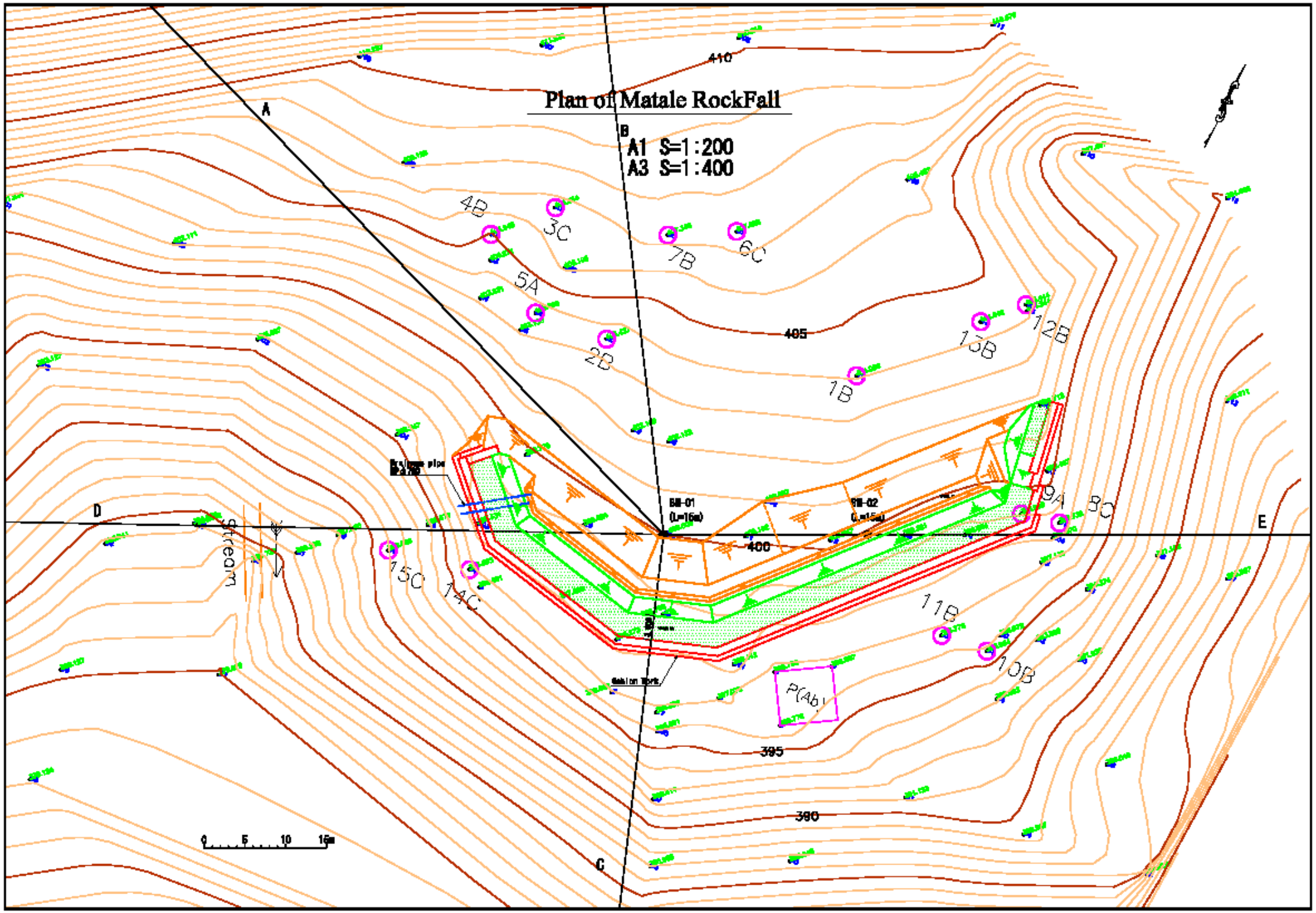
SCALE

ALL DIMENSIONS ARE IN MILLIMETERS

DRAWING TITLE : *DETAILS OF PROPOSED HPRIZONTAL DRAINS*	DRAWING NO: KN/HDK/CDITY-DRAIN/DR-01A	DESIGNED BY:	RECOMMENDED BY:	*MINISTRY OF DISASTER MANAGEMENT* *LANDSLIDE RESEARCH &* *RISK MANAGEMENT DIVISION* *NATIONAL BUILDING RESEARCH ORGANIZATION* *NO : 99/1, JAWATTA ROAD* *COLOMBO -05* *TEL -011-2555045*
	DATE : 06.10.2016	CHECKED BY:	APPROVED BY:	
Nuwara Eliya	DRAWN BY:			

Section 14

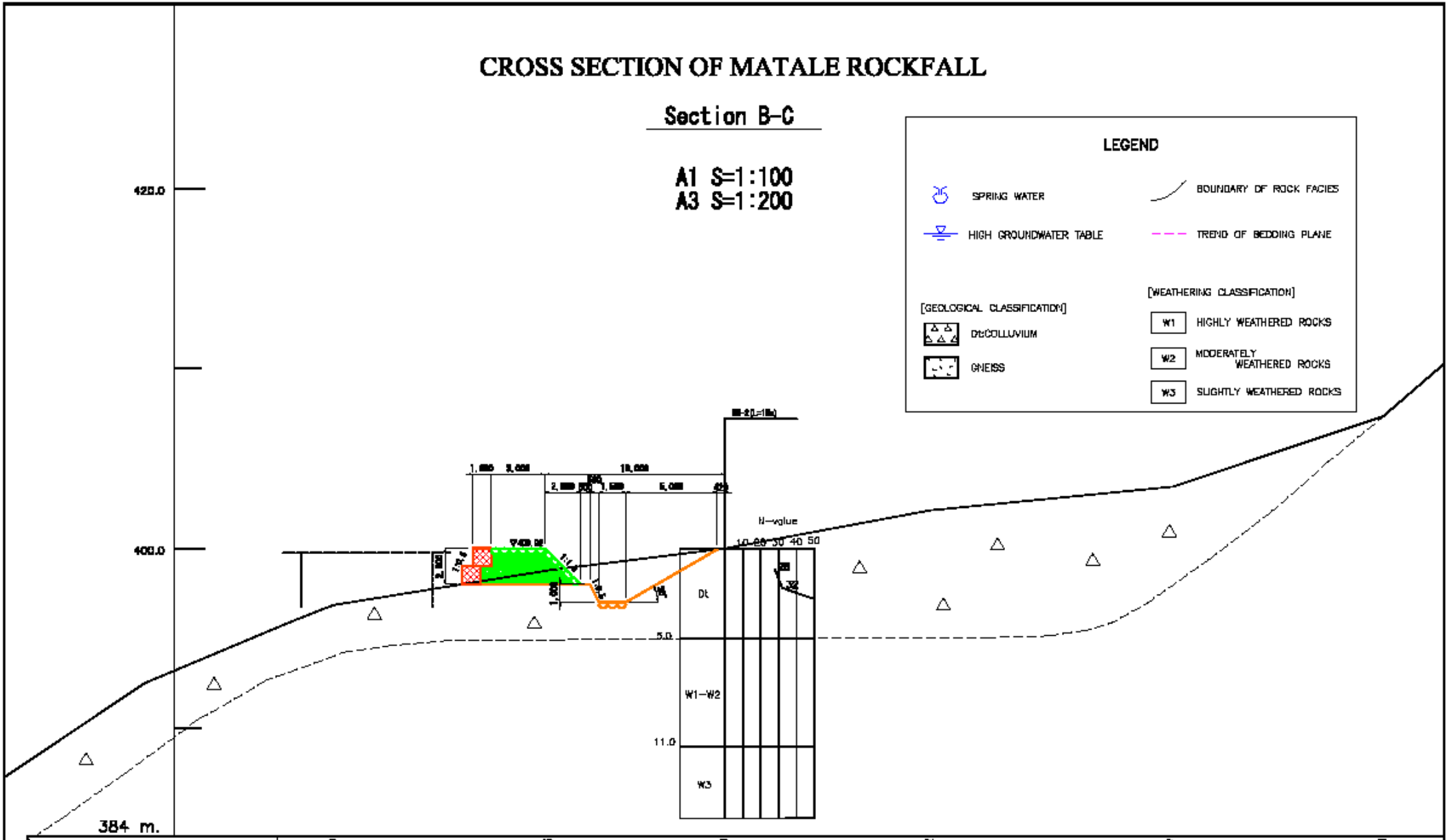
LOT 3. Matale Rock fall mitigation works


Plan of Matale RockFall
A1 S=1:200
A3 S=1:400
A
B
C
D
E
410
405
400
395
390
4B
3C
7B
6C
5A
2B
1B
15B
12B
9A
8C
15C
14C
11B
10B
P(Abv)
0 5 10 15m

CROSS SECTION OF MATALE ROCKFALL

Section B-C

A1 S=1:100
A3 S=1:200

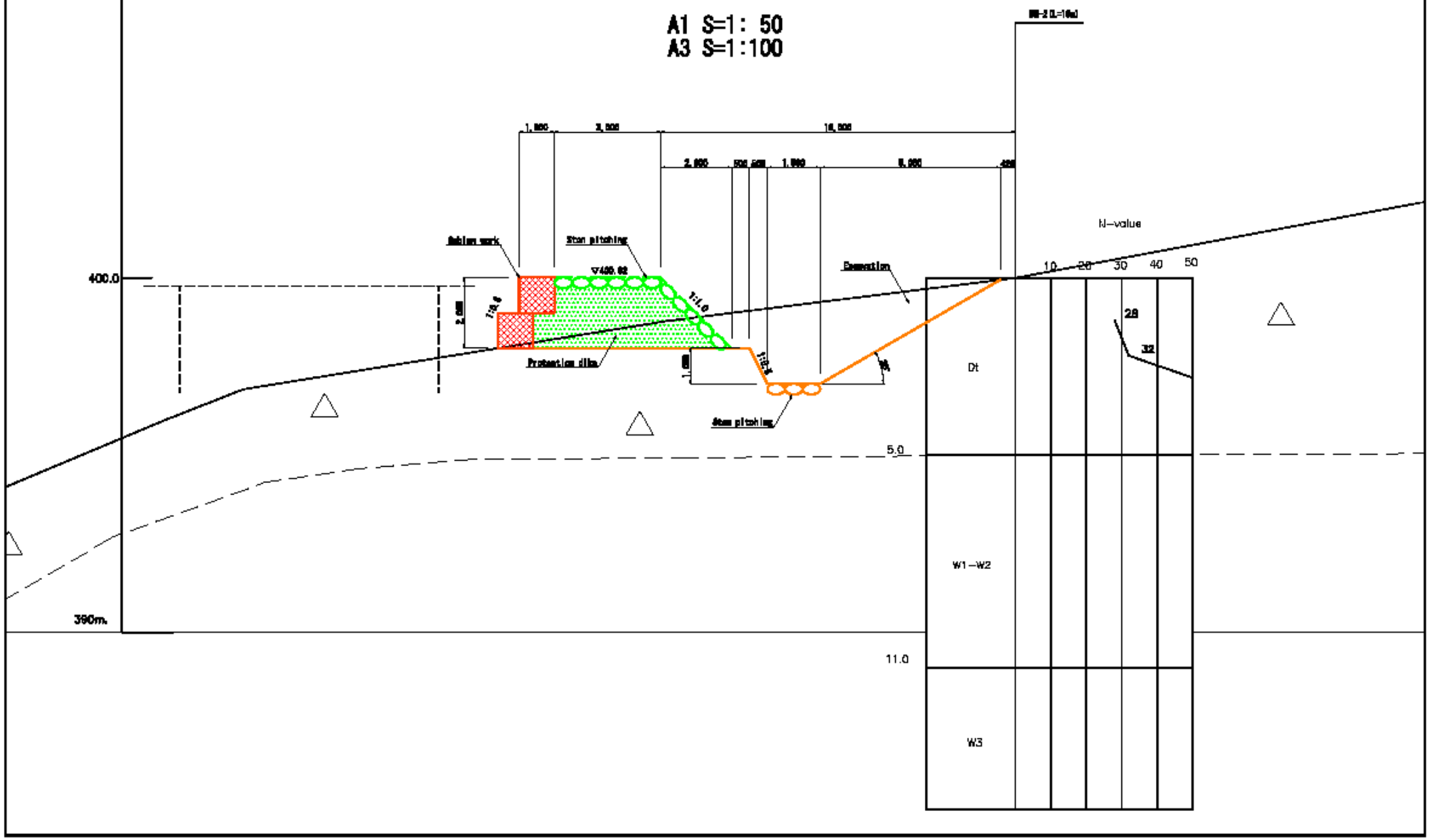


GROUND LEVEL (m)	395.991	396.859	398.793	400.000	402.122	403.437	407.348
HORIZONTAL DISTANCE (m)							

CROSS SECTION OF MATALE ROCKFALL

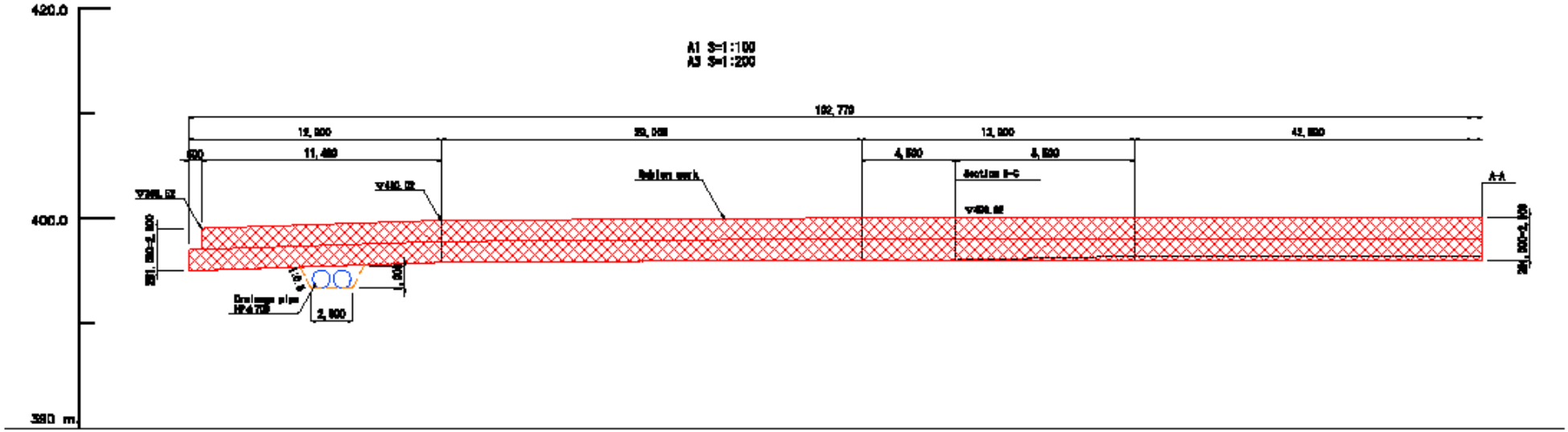
Section B-C

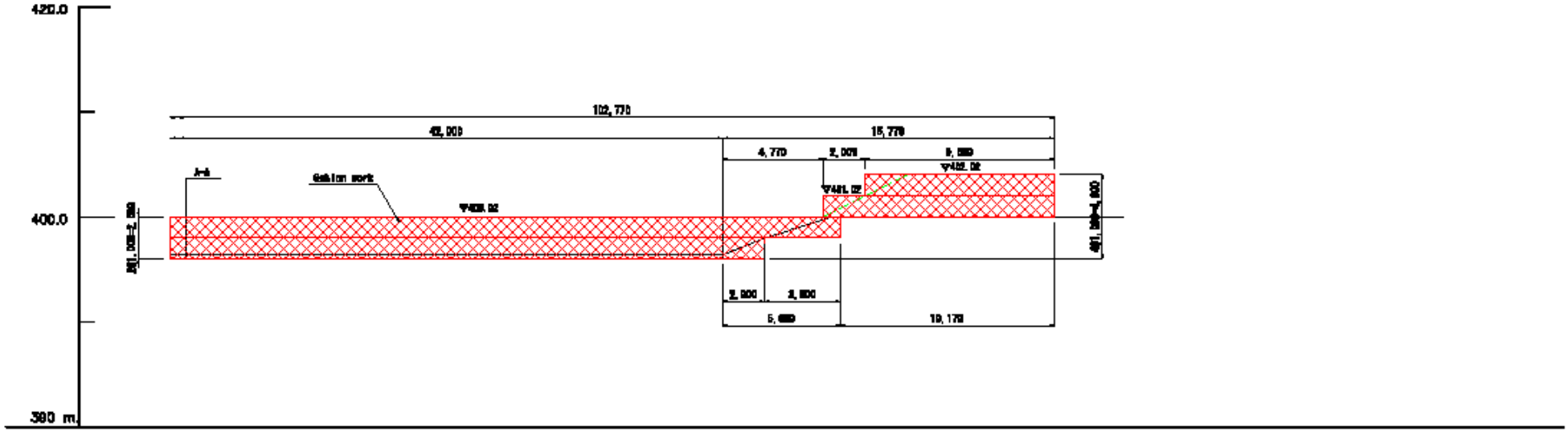
A1 S=1: 50
A3 S=1:100



MATALE ROCKFALL

Front elevation of Gabion work





Appendix 8-2

Survey Report on Koslanda Landslide

5th November, 2014
JICA Technical Cooperation for Landslide Mitigation Project (TCLMP)
in Democratic Socialist Republic of Sri Lanka

Helicopter Survey Report on Badulla Koslanda Landslide

*This report is based on the aerial survey done from the helicopter
*The contents of this report can be changed in the future with additional survey

1. Object of Survey
   A landslide occurred in Koslanda, Badulla District, Uva Province on October 29th around 7:30 am. The objectives of this survey are as follows;
   - grasp the overall view from the helicopter
   - identify the effect and risk of secondary disaster when the area has heavy rain in the near future and;
   - Conduct the OJT (On the Job Training) of DMC and NBRO on the helicopter survey (a staff of DMC and NBRO boarded in the helicopter this time for this purpose)


Photo-1 Overall View

2. Date of Survey
   5th November, 2014 from 8:40 to 9:15am
   The helicopter of Helitours by Sri Lanka Air Force was chartered for this survey.

3. Location of Survey
   Koslanda Meeriyabedda, Badulla District, Uva Province in Sri Lanka (about 100km East of Colombo)

4. Investigator
   Mr. Toshiyuki SHIMANO, JICA Sri Lanka Office (Representative)
   Mr. Wijeratne Sanath, JICA Sri Lanka Office (National Staff)
   Mr. Kenichi HANDA, JICA TCLMP Team (Chief Advisor)
   Mr. Ryuichi HARA, JICA TCLMP Team (Team Leader)
   Mr. Srimal Priyantha Samansiri, DMC
   Mr. Dayan Sanjeewa Munasinghe, NBRO

5. Summary of Survey
   - The damage from the disaster is as follows (DMC Situation Report as of November 5th, 2014)

- Number of death: 12 people
- Number of missing: 22 people

- The angle of the slope is assumed to be below 30 degree by the aerial survey from the helicopter.
- The survey team confirmed considerable amount of water flow in the landslide area. It is believed the percentage of water content in the soil is high even now.
- The survey team could see some parts of the scarp of the landslide as it was before the landslide in the downward of the area. The nick line (the turning point of the slope degree) was confirmed that it could be around 250m below the scarp of the landslide (a little above where the community was located before the landslide). The survey team assumed that the landslide occurred above the nick line. This observation led to an assumption that 40 to 50 % of the landslide mass still remains there.

Photo-2 Angle of Landslide Slope

- There are 3 to 4 of relatively large trees still standing in the lower part (300m above from the stream on the map). Based on the aerial survey from the helicopter, the left part facing the landslide was deeply eroded. The condition told that the landslide mass was fluidized downwards.
- The most of the mud was stagnated in the lower area where the community was located before. The slope is comparatively gentle in the area. Therefore, there is a less possibility of becoming a landslide dam right after a heavy rain in the future.
- In the lower part of the landslide area, there are some communities along the river (the communities were more than 1km away from the landslide area). The most of the housings were located comparatively in high lands, but some housings were in low lands along the river.

Photo-3 Conservation Area of the Downstream of the Landslide

6. Measures that should be Taken in Future
   - Some of the landslide mass was still remaining and since still the water spring is flowing, there is a high possibility that this area remains unstable (some factors such as the angle of the slope and the deposit condition of the landslide mass are not clear enough through the aerial survey). Especially around the scarp may expand from now on. Therefore, the community people should beware of a heavy rain. We also should beware of sediment disasters including landslide in this area and in surrounding areas as well.
   - A site visit survey is required in addition to this aerial survey to observe detailed condition and information.

7. Others

- This survey was conducted on the 7th day after the landslide occurred due to the availability of the helicopter and the weather condition. The team would like to recommend the Government of Sri Lanka to develop a system for conducting an aerial survey immediately after the occurrence of disasters in order to grasp overall view of the emergency situation, to examine the risk of secondary disaster in surrounding area and disseminate a warning to community people (for example there is a possibility of outburst flood of a landslide dam and it might breach river dikes of lower streams of the river, and they cause massive overflow and inundation).
- Staffs from DMC and NBRO boarded in the helicopter in this survey. In the future, the survey team suggests developing a system for emergency situations between MDM and MD&UD including the Air Force.

Photos

	Water Flow at the head of the Landslide
	Landslide Mass Flowing in to the Stream
	Scarp Condition of the Landslide Mass Remains
	Trees Remaining after the Landslide

November 25, 2014

JICA Technical Cooperation for Landslide Mitigation Project

Survey Results of Koslanda Landslide (2nd Report)

※ The results presented in this report may be revised based on further surveys.

1. Survey Purpose

Following the aerial survey on 5th Nov. 2014, which aims at grasping the whole picture of landslide disaster, this survey is conducted to further analyze and clarify the landslide occurrence mechanism.

2. Date and Member of the Survey

Field survey was conducted between November 19 and November 20, 2014, by three landslide experts from Technical Cooperation for Landslide Mitigation Project, as listed below.

- Mr. Kenichi HANDA, JICA TCLMP Team, Chief Advisor(Landslide Professional Engineer)
- Mr. Ryuichi HARA, JICA TCLMP Team, Team Leader, from Earth Science System Co. Ltd. (Landslide Professional Engineer)
- Mr. Akira OHKAWARA, JICA TCLMP Team, Landslide Expert, from Nippon Koei Co. Ltd. (Landslide Professional Engineer)

3. Situation of Landslide Occurrence

Based on the interview with local residents, the event occurred as following sequence;

1) The spurts of groundwater in the upper slope (near the toe of the landslide) and toe collapse took place around 7:15.
   (Refer to You Tube picture https://www.youtube.com/watch?v=U1c4sdYopBQ)
2) The whole mass of landslide started to move down slowly.
3) The landslide mass became fluidized by mixing abundant surface and subsurface water in the middle slope.
4) Once fluidized, the landslide mass transformed into debris flow and moved rapidly downslope. (the upper section of debris flow area).
5) The debris flow that contained some boulders with a diameter of 5 m or more destroyed the

temple and houses located in the middle slope, and reached the road across the lower slope.

6) The landslide mass and debris flow materials accumulated mostly on the gentle slope above the road (near the old tea factory and the cricket ground), and flowed partially down along the valley in the lower slope and into the Eruwendumpola Oya river (around 7:30).

4. Scale of the Landslide

The slope where the landslide occurred was divided into the following three parts:

1) The upper slope (landslide area): The landslide was approximately 100 m in width and 260 m in length with an average depth of about 15 m (estimated from the height of headscarp). The landslide mass was roughly estimated to be about 260,000 m^3, and half remained on the upper slope.
2) The middle slope (the upper section of debris flow area): The area was about 150 m wide and 330 m long, and had a maximum thickness of about 5m (near the gentle slope above the road). The deposits included some large boulders of 5 m in size. The amount of the debris flow deposits within the middle slope was roughly estimated to be about 150,000 m^3 .
3) The lower slope (the lower section of debris flow area): The area was about 30 to 40 m in width and had an average thickness of about 3 m (estimated from bank erosion).

5. Mechanism of Landslide Occurrence

The landslide mechanism is summarised below:

1) The landslide occurred within the eastern part of landslide topography or a previous landslide block that was about 280 m wide, as shown in the plan view of landslide.
2) The upmost steep part of the upper slope, exposed with biotite gneiss, forms a water-catchment landform. A large amount of rainwater and groundwater was collected by the previous week of the event and then flowed into the landslide area from the steep slope above the landslide area.
3) The landslide mass became saturated, leading to rapid instability of landslide area. As a result, tension cracks were developed and expanded around the road in the upper slope, while the spurts of groundwater near the toe of the landslide and toe collapse took place at about 7:15. The whole mass of the landslide subsequently started to move downslope.
4) Subsequent to movement towards the middle slope, the landslide mass became fluidized by mixing abundant surface and subsurface water, and then changed into debris flow. The debris flow moved rapidly downslope, destroying the temple and houses located near the middle slope and extending into the road across the lower slope.

5) A hill (remaining trees) of about 10 m of difference in elevation and a gentle slope (the old cricket ground) are present above the road. The majority of the debris flow materials (including large boulders of 5 m in size) deposited within the hill and gentle slope because of a lower velocity, and the finer-grained debris flow materials with high mobility continued down through the valley in the lower slope and entered directly into the Eruwendumpola Oya river in the lowermost slope.
6) The amount of the landslide mass and associated debris flow materials that reached the Eruwendumpola Oya river was very small, and therefore it was considered to be much less likely to form a landslide dam in the river and to flow further downstream.
7) Some landslide topographies were observed to concentrate on the both sides and in the upper slope of the landslide area. In addition, new cracks existed around the headscarp slope of the landslide and some small collapses were also considered to be likely to occur, however, field observations and hearings from local residents indicated that no significant ground deformations occurred within the landslide topographies or previous landslide blocks.

6. Suggested Emergent Measures

In response to this landslide disaster our observations during this field reconnaissance led to the following recommendations:

Structural Mitigation Measures

- Implementation of drainage channel within the landslide area to collect surface and subsurface water and to drain it away from the landslide area, and of drainage channels outside the landslide area to prevent surface water from flowing into the landslide area.
- Emergent restoration of the road crossing the lower slope of the landslide area, including some lifelines such as transmission line, etc.
- Implementation of emergency earth retaining work (gabion wall) on the maintain side of the road across the landslide in order to provide a pocket or space to catch further landslide materials

Non-Structural Mitigation Measures

- Installation of rain gauge and establishment of warning control values to prevent human casualties during the road restoration.
- Formulation of the warning and evacuation plan of landslide disaster focusing on the local residents.
- Implementation of disaster education to local residents and tea factory workers (priority measure).

Appendix 8-3

Outline of conditions of pilot site

Outline of Preliminary Survey in the Pilot Site

Site name	Nurse's Training College (Kandy District)	Surveyed by	Mr.R.Peris (Kandy Office) Mr.Handa,Mr.Hara,Mr.Kawasaki,Mr.Wada	Survey Date	2014/10/22

Disaster Type and Scale	Slope Failure	Scale	Upper slope: 100m wide, 20~30m long Lower slope 90m wide, 15~20m long
Geostructure	Bed rock is gneiss. Surface is unstable and covered by highly weathered gneiss and colluvial deposits.		
Vegetation Cover/Land Use	Mainly covered by weed, scattered shurb. Some part is artificial modification land, but no area of land using.		
Existing Conditions	The site is upper and lower slope of the Kandy Nursing school. Slope gradient is 30 to 45 degree, difference in hight is 15 to 18m. Shallow slope failure is repeated several time. At the time of October and December of 2015, some slope failure is occured around the site.		
Occurrence Mechanism	Rain water penetrates into the ground. Then surface material will unstabilize and fall down. Slope failure is easy to occur at steep slope. Shallow slope failure is repeated several time(0.5 to 1.0m depth,10 to 20m width).		
Affected Area	Slope failure at the upper slope will hit the Nursing school directly.(Distance from the foot of slope is 2m) Slope failure at the lower slope will bury the arterial road. Then road traffic will shut down and schoolyard will be unstable.		
Survey Plan	Contour mapping: 100×150m(1:200) Cross section profile survey:L50m×6 Line Boring core sample:15~20m×4site, some physical test		
Mitigation Measures and Selection Reasons	Cutting soil and grating crib works with soil nailing		
Construction Problems	Power line along the arterial road and steel plate in the lower slope will disturb the construction work. It is important that check the land owner before the construction work		

Site Photos

Whole view(Centre building is Nursing school)

Road along the foot of the lower slope

Upper slope and Nursing school

View of the lower slope from vestibule of the Nursing School

Outline of Preliminary Survey in the Pilot Site

Site name	Udamadura (Nuwara Eliya District)	Surveyed by	Ms Chaturi Subasingha (Nuwara Eliya Office) Mr. Handa, Mr. Ohkawara, Mr. Hara, Mr. Yang, Mr. Nishikawa	Survey Date	2014/11/11

Disaster Type and Scale	Landslide	Scale	Approximately 400m to 500m wide, 900 to 1000m long

Geostructure	The landslide is located in the Highland Complex. The structural geology of the Highland Complex is characterized by distribution of many NW-SE folds and NE-SW faults. The landslide slope is underlain by hornblende gneiss. The highly weathered hornblende gneiss and its overlying colluvial deposits form the potential landslide mass. The potential sliding surface is presumably due to foliation joints and shear zones.
Vegetation Cover/Land Use	The upper and middle slopes of landslide are covered by herbs and shrub with some scattered houses, while the lower part of landslide is used as paddy field. In addition, farm land reclamation and residential land are observable in places and the village roads cross the landslide.
Existing Conditions	The landslide can be classified into three landslide blocks, the upper block, the middle block and the lower block based on topographic interpretation. The landslide topography is characterized by the presence of multiple concave and plateau in the upper and middle parts of landslide, and by the presence of stepped landforms in the lower part. The landslide slope is gentle, ranging from 5 to 10 degrees in the lower part and from 20 to 25 degrees in the middle and upper parts of landslide. At the time of the 2007 heavy rain, cracks and gaps of the road surface crossing the lower landslide block were formed, and some cracks on the walls of houses around the road were also observed. The 2012 heavy rainfall reactivated the landslide and caused the local subsidence of road surface and the partial damages of residential houses such as cracks of house wall.
Occurrence Mechanism	A large quantity of rainwater penetrates from the ground surface at the time of the rain, resulting in the rise of groundwater level, consequently reactivating landslide movement.
Affected Area	The gap and crack of road crossing the lower landslide block could be expanded due to further landslide movement, causing impassableness. In addition, because mitigation works such as groundwater drainage works have not been implemented, the cracks of the damaged residential houses are likely to further be expanded as a result of continuous landslide movement.
Survey Plan	Topographic survey: 200×300m (1:200), Cross-section survey: 600m×2 lines＋1200m×1lines Boring survey: 20m×1 borehole + 40m×2 borehole+50m×1borehole Seismic refraction: 600m×2 lines＋1200m×1 line, High density electric siunding: 600m×2 lines＋1200m×1line Laboratory test: Unit weight, moisture content, atterberg limits, particle size analysis by sieve
Mitigation Measures and Selection Reasons	The lower landslide block has repeatedly moved during rainy periods, and therefore horizontal boring and surface drainage works have been planned to remove the main triggering factors – rainwater and shallow groundwater. In addition, a small check dam has been proposed to prevent the riverbed and bank erosion of the landslide side stream.
Construction Problems	New construction road will be required for the construction of the proposed mitigation works.

Landslde Site Photos

Whole view (looking at the lower slope from the upslope)

The gap of road surface formed due to landsldie movement

Close view of the lower slope of landslide

Crack caused by landslide on the residence wall

Outline of Preliminary Survey in the Pilot Site

Site Name	Badulusirigama/Uva Wellasa University (Badulla District)	Surveyed by	Mr.Kalum Senivirathna, Ms. Harsahni Perera (Badulla District Office) Mr. Handa, Mr. Ohkawara, Mr. Hara, Mr. Yang, Mr. Nishikawa	Survey Date	2014/11/13

Disaster Type and Scale	Landslide	Scale	Approximately 120m wide and 500 to 600m long

Geostructure	The disaster is a colluvial landslide formed on a gentle valley-type slope and the landslide mass consists of earth mixed with gravels.
Vegetation Cover/Land Use	The landslide occurs on gentle slope of 10 to15 degrees, which is covered with herb and plants. A lot of residential houses are concentrated around the toe parts of the landslide and the slope before the landslide.
Existing Conditions	The landslide area is subdivided into several stepped slopes, and the ground surface of the landslide has been highly deformed, typically in the form of pond, stream, depression and steps. The walls of some residential houses located around the landslide toe have been inclined and cracked due to the movement of landslide. The landslide moved slowly and sporadically in the rainy seasons of 2007, 2011 and 2012, accompanied by some retrogressive local collapses around the crown and flank slopes. It has been concerned that a heavy rainfall could cause the landslide movement active, destroying these houses around the landslide toe and killing people.
Occurrence Mechanism	The sliding surface has been formed with a weak strength due to the repeated movement of the landslide. In addition, a lot of cracks and steps formed in the landslide slope promote the infiltration of rainwater and the formation of water pressure in cracks, reactivating landslide movement.
Affected Area	The landslide poses considerable risk to the residential houses around the lower part of the landslide slope.
Survey Plan	Topographic survey: 120×580㎡ (1:200), Cross-section survey: 400m×2lines＋800m×1line Boring survey: 20㎡×6 boreholes Seismic refraction: 400m×2 lines＋800m×1 lines, High density electric sounding: 400m×2 lines＋800m×1 line Laboratory test: Unit weight, moisture content, atterberg limits, particle size analysis by sieve
Mitigation Measures and Selection Reasons	The activity of the landslide is related closely to the rainfall, a combination of horizontal boring work (shallow groundwater drainage) and surface drainage works has been thus proposed to stabilize the landslide. In addition, gabion wall has been proposed to maintain the deformation of the village road around the landslide toe.
Construction Problems	Because of no available access road, new construction road will be required for the construction of the proposed mitigation works.

Landslde Site Photos

Whole view (looking down from upslope)

Pond observed in landslide area

Ground deformation due to landsldie movement

Colluvial deposits (earth mixed with gravel)