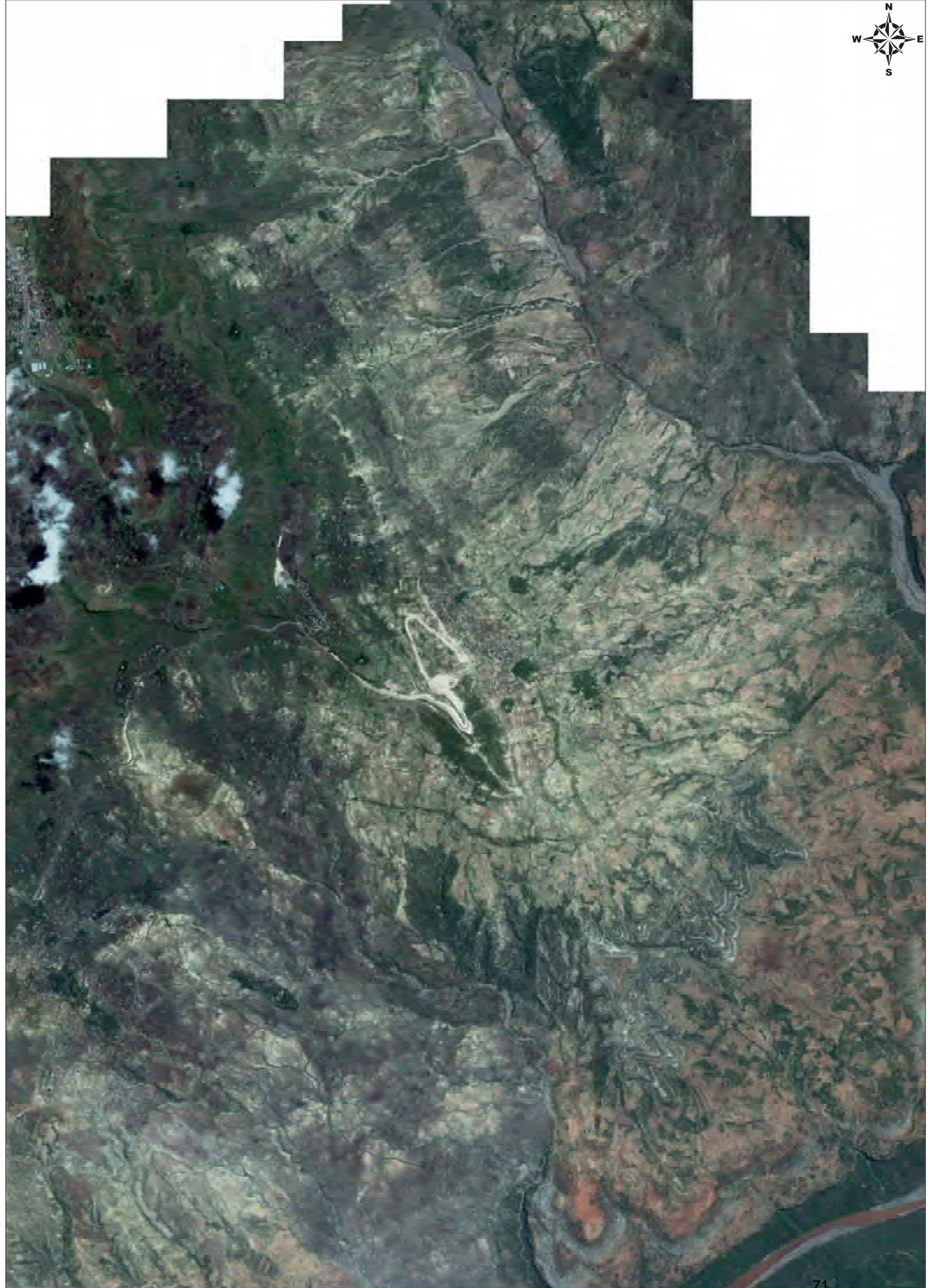


5. Satellite image

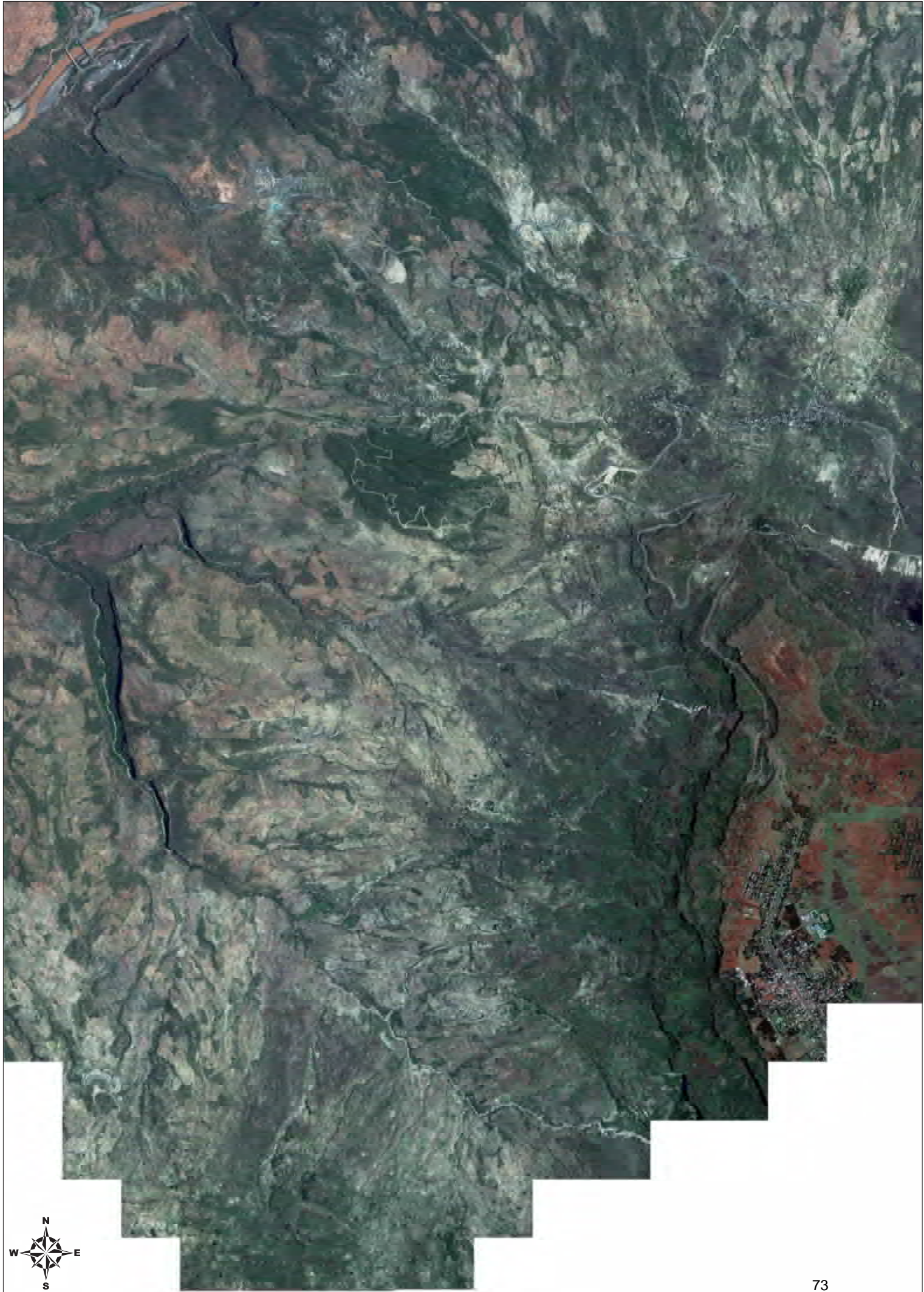


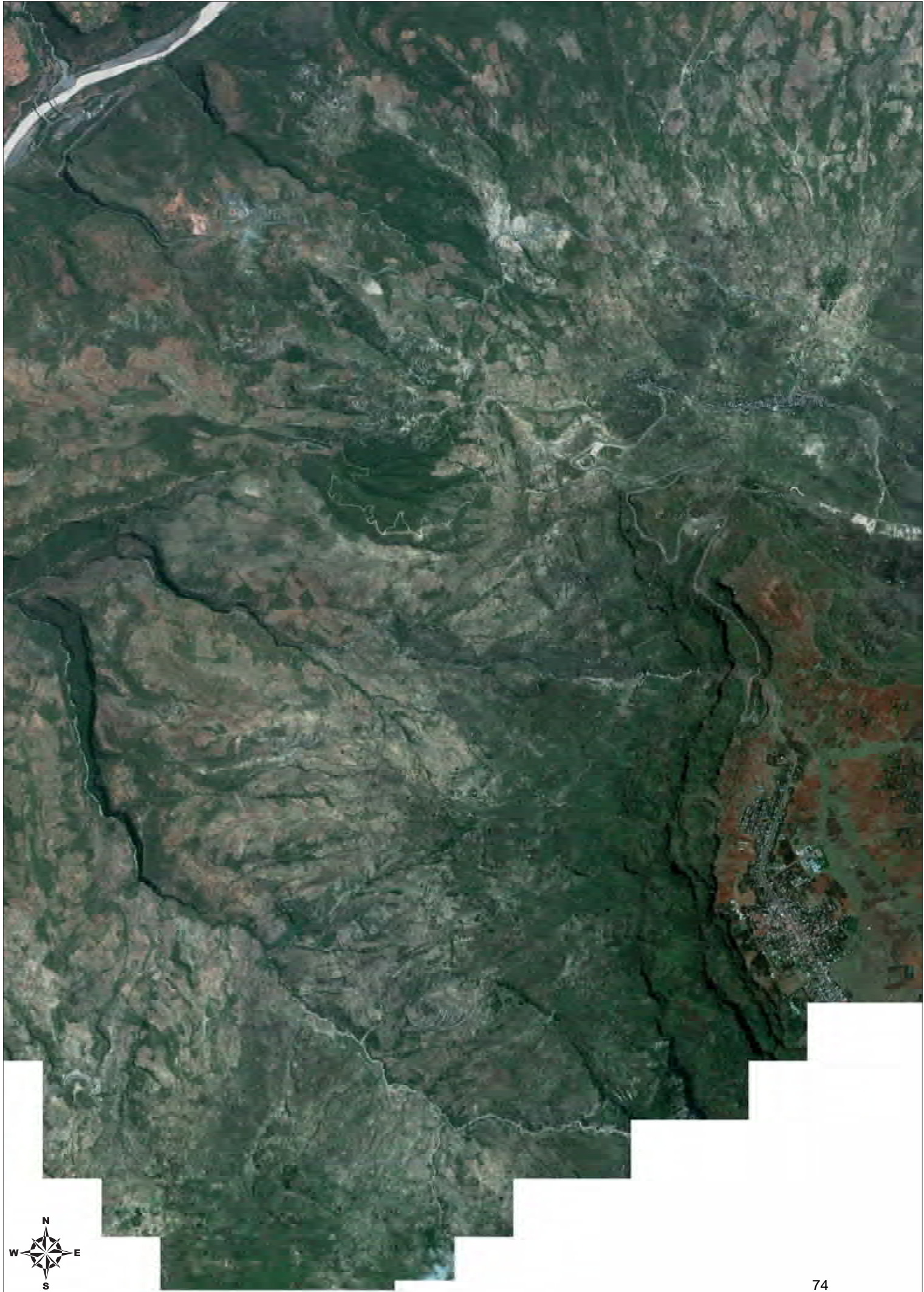


0 1 2 4 Kilometers

72

02C: North (Dejen side) Left





0 1 2 4 Kilometers

04C: North (Dejen side) Left

6. Drilling log

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH00-11	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.01.267	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	9th/Jul/2010 to 15th/Jul/2010		Longitude	38.14.360
Surveyer	Makito NODA		Core appraiser	Takeshi KUWANO		Drilling operators	Getnet Kassaye
Elevation (m)	2,435		Depth (m)	50.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole extensometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test							
1.0	2434.8	0.2	0.2		Top soil						Top soil (replaced by cement for drilling)		90	13	13										
2.0					Basalt	bluish grey	relatively high	hard	relatively fresh	5-18 cm	Fresh massive basalt with weathered cracks. The cracks are red-brown in color by weathering.		95	18	18										
3.0				relatively fresh								90	14	42											
4.0			3.1	moderately								85	14	14											
4.0	2430.5	4.3	4.5	moderately																					
5.0					Sandstone	white brown	moderately	relatively brittle, soft	relatively weathered	2-40cm	Tuffaceous sandstone with weathered cracks. The cracks were red-brown in color by weathering. 6.7-6.9m: highly weathered, grey to black brown mud which is soft and brittle.		85	8	0										
6.0				relatively weathered					95			15	15												
7.0	2428.1	2.4	6.9										100	40	89										
8.0					Basalt	bluish grey	relatively high	very hard	relatively fresh	2-35cm	Fresh massive and porous basalt with cracks and calcite vein of 0.5-2mm width. The cracks are sparsely red-brown in color by weathering. The scattered pores in core are around 1-4mm in diameter.		100	35	60										
9.0																				100	35	65			
10.0																				95	25	47			
11.0																				90	30	55			
12.0																				100	33	63			
13.0																				100	28	69			
14.0																				100	35	90			
15.0																				95	8	0			
16.0																				75	29	55			
17.0																				75	27	36			
18.0	2417.5	10.6	17.5																						
19.0	2416.8	0.7	18.2			grey brown	relatively low	brittle	highly weathered	sand-gravel	Highly weathered basalt with red brown cracks and calcite veins, which is partly sand or clay by weathering.		70	16	40										
20.0					Basalt	bluish grey	relatively high	very hard	relatively fresh	10-35cm	Fresh massive basalt with cracks and calcite vein of 0.5-2mm width. The cracks are relatively fresh. Highly scattered pores in core are concentrated at 18.4-20.5m and 26.3-31.75m depth, which are around 2-20mm in diameter.		100	17	40										
21.0																				100	27	72			
22.0																				100	23	65			
23.0																				95	21	44			
24.0																				100	30	82			
25.0																				100	34	84			
26.0													100	35	75										
27.0			27.0										100	35	90										
28.0						black grey	moderately	hard	relatively weathered	-9cm	27.0-28.0m: fractured porous cores with calcite veins with red-brown in color by weathering.		95	31	70										
29.0			28.0			bluish grey - black brown	relatively high	hard	moderately	5-28cm	28.0-31.8m: relatively weathered porous cores of bluish grey - black brown in color with calcite veins.		80	9	0										
30.0													95	22	55										
													95	21	49										

22.8
Labo 1
23.0
30.3
Labo 2


Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
31.0	2403.3	13.6	31.8										95	28	78			30.6
32.0													95	17	32			
33.0													100	26	66			
34.0													100	29	62			33.4
35.0													100	32	80			Labo 3
36.0													95	11	21			33.6
37.0													90	24	59			
38.0			37.8										100	18	58			
39.0													100	22	72			
40.0													100	21	43			
41.0													100	20	20			
42.0													100	25	25			
43.0													95	7	0			
44.0	2391.1	12.2	44.0										100	35	72			
45.0	2390.2	0.8	44.8										100	30	61			
46.0													100	18	38			
47.0													100	23	23			
48.0													100	23	23			48.3
49.0													100	21	21			Labo 4
50.0	2385.0	5.2	50.0										100	15	28			48.7
																		Anchor of borehole extensometer

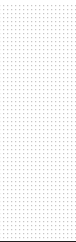
Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH00-12	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.01.284	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	16th/Jul/2010 to 21st/Jul/2010		Longitude	38.14.343
Surveyer	Makito NODA		Core appraiser	Takeshi KUWANO		Drilling operators	Getnet.K
Elevation (m)	2,386		Depth (m)	35.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole inclinometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
	2386.1	0.3	0.3		Top soil						Top soil (replaced by cement for drilling)							
1.0																		
2.0																		
3.0																		
4.0																		
5.0																		
6.0																		
7.0											Artificial fill-back embankment							
8.0											It is composed of basalt boulder (5cm - 60cm), gravel, sand, mud and clay, which are debris coming from mountainside cliff.							
9.0											The core matrix except for the basalt boulder was loss due to drilling operation with flowing water.							
10.0																		
11.0																		
12.0																		
13.0																		
14.0																		
15.0																		
16.0																		
16.0	2369.8	16.3	16.6		Embankment													
17.0			17.4			dark brown	low	soft	highly	sand								
			17.7			dark brown	low	brittle	highly	2-5cm								
18.0													35	4	0			
19.0													35	5	0			
20.0						red brown	relatively low	brittle	highly weathered	3-13cm	Highly weathered basalt with cracks which are red-brown or black in color by weathering.		40	11	11			
21.0											Fractured and wethered parts are clay, sand and gravel.		45	3	0			
22.0											Calcite veins are sparsely found in core.		50	13	25			
23.0			22.7		Basalt								45	4	0			
24.0						brownish black	moderately	relatively brittle	relatively weathered	5-31cm	Top part is very weathered		95	31	31			23.6
25.0											16.6-17.4m: fractured basalt sand and gravel by weathering		95	25	25			23.9
26.0			25.5								17.4-17.7m: fractured basalt gravel by weathering		60	4	0			
27.0						red brown	relatively low	soft, brittle	highly weathered	sand- gravel			65	8	0			
28.0	2358.6	11.2	27.8										55	9	0			
29.0													55	9	0			
30.0						uish grey	oderately	atively soft	ly weathered	5-22cm	Weathered fine-grain tuff with cracks which are red-brown or black in color by weathering.		75	20	39			
											Fractured and wethered parts are clay,							

Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test			
31.0	2351.4	9.5	35.0		fine tuff	bl	m	rel	slight		sand and gravel. As deeper, the core gradually become fresh rod-like mudstone. 27.8-28.4m: core is clayey mud or clay, which is vey soft. 31.5m: possible slickenside, which is frag mark indicating a main slip surface.		95	15	15						
32.0							31.9								100	22			60		
33.0															100	35			73		
34.0										bluish green		relatively high	moderately	fresh	10-40cm	100			40	82	
35.0																95			33	65	
																		33.6			
																		Labo 2			
																		33.9			

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH00-13	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.01.284
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	7th/Oct/2010 to 11st/Oct/2010		Longitude	38.14.343
Surveyer	Makito NODA		Core appraiser	Makito NODA		Drilling operators	Getnet.K
Elevation (m)	2,379		Depth (m)	35.0		Drilling rig, Engine, Pump Crysten Rig, Crystensen, Triplex	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole Inclinator	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test						
	2378.2	0.6	0.6		Top soil						Top soil (replaced by cement for drilling)													
1.0					Embakment						Artificial fill-back embankment It is composed of basalt boulder (2cm - 25cm), gravel, sand, mud and clay, which are debris coming from mountainside cliff. The core matrix except for the basalt boulder was loss due to drilling operation with flowing water.													
2.0																								
3.0																								
4.0																								
5.0	2373.8	4.4	5.0																					
6.0					colluvial deposit	dark brown to black					colluvial deposit. It is mainly composed of basalt boulder (5cm - 6m), gravel, sand, mud and clay, which are debris coming from mountainside cliff. The core matrix except for the basalt boulder was loss due to drilling operation with flowing water													
7.0																								
8.0																								
9.0																								
10.0																								
11.0																								
12.0																								
13.0																								
14.0																								
15.0																								
16.0																								
17.0																								
18.0																								
19.0																								
20.0																								
21.0																								
22.0																								
23.0																								
24.0	2378.8	-5.0	23.5		lapili tuff	greenish brown	relatively low	relatively soft	highly weathered	sand- gravel	Highly weathered lapili tuff. Fractured and wethered parts are clay, sand and gravel. Top part is very weathered 23.5-25.3m fractured sand and gravel, which is vey soft.		75	0	0									
25.0																								
26.0																								
27.0																								
28.0																								
29.0																								
30.0	2378.8	6.5	30.0																					
																		30.2						
																		labo 2						

Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
31.0					tuff	greenish gray	relatively high	moderately	relatively weathered	5-20cm	Weathered fine-grain tuff with cracks which are red-brown or black in color by weathering and sometimes contain clay. As deeper, the core gradually become fresh rod-like mudstone.		100	19	53			30.35
32.0			100										0	0				
33.0					Mudstone	brownish grey	relatively low	relatively soft	highly weathered	sand-gravel	Weathered mudstone with cracks which are red-brown or black in color by weathering. Fractured and wethered parts are clay, sand and gravel. As deeper, the core become fresh rod-like mudstone, but this rock had characterized by susceptibility to slaking.		100	19	52			
34.0	2345.0	3.9	33.9										100	25	63			
35.0			35		black	moderately	relatively soft	relatively fresh	5-20cm				100	30	52			
36.0													95	11	21			
37.0													100	22	32			37.6
38.0	2340.8	4.2	38.0										100	20	74			labo 3


Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH00-14		Location		Around -km from Dejen, Abay Gorge area, National road 3				Latitude		1108158						
Organization		Geological Survey of Ethiopia, JICA Study Team			Duration		July 16-19,2010			Longitude		417013						
Surveyer		Habtamu and Ezra			Core appraiser		Habtamu Eshetu		Drilling operators		Getnet.K							
Elevation (m)		2,384		Depth (m)		30.0		Drilling rig, Engine, Pump		作業日報確認								
Angle		Vertical		Direction		Gradient		Remarks		Installation of borehole Inclinator(30.0m)								
Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
	2383.6	0.4	0.4		Embankment	dark	high	high	slight	gravel	base course embankment material				0			
1.0																		
2.0																		
3.0														15	30			
4.0											0.4-8m: angular, fragmented, and short columns of basalt				0			
5.0														13	13			
6.0														15	15			
7.0															0			
8.0															0			
9.0											8-11m: long, fresh, massive columns of basalt core samples				0			
10.0															0			
11.0															0			11.5
12.0					Basalt	dark brown	very high	very strong	slightly weathers d to fresh	max core length= 35cm average core length= 5-10cm					0			Labo 1
13.0															0			11.7
14.0														15	38			
15.0											11-20m: subrounded, fresh, proportional short columns and gravels cores				0			
16.0														12	12			
17.0															0			
18.0															0			
19.0														32	44			
20.0															0			
21.0															0			21.1
22.0															0			Labo 2
23.0											20-24.5: proportional angular gravels, and short columns, slightly weathered brownish basalt.			25	25			21.4
24.0														21	51			
25.0	2,359.5	24.1	24.5		soil	dark brown	less dense	soft	completely weathered	sand size	loose, soft, completely weathered, soil material. This depth may comprise the slipping surface of the landslide				0			
26.0	2,359.2	0.3	24.8												0			
27.0					Mudstone	gray	medium	moderate	slight to fresh	max=20cm average=5-8cm	very fine grained, massive, moist when appraised, gray colored with light red spots on some cores (discoloration)			29	62			26.5
28.0															0			Labo 3
29.0														15	29			26.7
30.0	2,354.0		30.0											16	40			

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH00-22	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.01.299
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	12nd/Oct/2010 to 16th/Oct/2010		Longitude	38.14.343
Surveyer	Makito NODA		Core appraiser	Makito NODA		Drilling operators	Getnet.K
Elevation (m)	2,377		Depth (m)	21.4		Drilling rig, Engine, Pump Crysten Rig, Crystensen, Triplex	
Angle	Vertical	Direction	Gradient	Remarks		Installation of Automatic water level meter (28.0 m depth)	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
	2376.4	0.6	0.6		Top soil						Top soil (replaced by cement for drilling)							
1.0																		
2.0																		
3.0																		
4.0																		
5.0																		
6.0																		
7.0																		
8.0																		
9.0																		
10.0																		
11.0																		
12.0	2365.7	10.7	11.3															
13.0																		
14.0																		
15.0																		
16.0																		
17.0																		
18.0																		
19.0																		
20.0																		
21.0																		
22.0	2355.6	10.1	21.4															
23.0																		
24.0																		
25.0																		
26.0																		
27.0																		
28.0																		
29.0																		
30.0																		

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH05-11	Location	Around 5km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.02.333	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	5th/Aug/2010 to 7th/Aug/2010		Longitude	38.14.208
Surveyer	Makito NODA		Core appraiser	Shoji TSUCHIYAMA		Drilling operators	Getnet Kassaye
Elevation (m)	2143.7m		Depth (m)	35.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole extensometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
1.0	2142.55	2.5	2.5		colluvial deposit	greyish white - bluish grey - dark grey	low	soft	no		0.0-0.45m: Core is composed mainly of tuffaceous rounded gravel and coarse sand with Ø 10-60mm diameter. Rounded gravel is slightly soft.		60					
2.0											0.45-1.50m: matrix of this core is solid angular basaltic fragment with Ø 20-60mm diameter. 1.50-2.45m: dominantly sandy clay with fragement mixed.							
3.0											This entire core-layer is composed dominantly of limestone, and clay can be mixed in spots. The hardness of rock is entirely solid.			80	15	25		
4.0							slightly low	slightly soft	mildly weathering	5 - 25cm	2.45-6.95m: dominantly rock fragment - short columnar core			100	25	70		
5.0											2.60-2.70m: Core is clay, which is brown in color.			100	20	31		
6.0											3.00-3.10m and 5.60-5.80m and 6.80-6.95m: yellowish-brown - brown clay can be mixed in spots. The rock indicates the hardness extent of C _L - C _M class.			90	16	39		
7.0			7											90	18	29		
8.0			8.20				slightly high	very hard	relative y-new	5-30cm	6.95-8.10m: Dominantly short-columnar core and has the extent of C _M class. The hardness is solid.			100	32	57		
9.0							high	very hard	fresh	10 - 45 cm	8.20-10.85m: middle- long columnar core. The hardness of rock is solid. The hardness extent of C _H class. It sounds metallic when hammered lightly-blow.			100	46	89		
10.0														100	40	82		
11.0			10.85				slightly high	very hard	relative y-new	10-20cm	10.85-12.10m: rock fragment - middle columnar core. The hardness of rock is solid. The hardness extent of C _H class.			100	20	55		12.30
12.0			12.10				high	very hard	fresh	15cm	12.10-12.50m: middle- long columnar core. The hardness of rock is solid. The extent of C _H class. It sounds slightly metallic when hammered lightly-blow.			100	26	44		Labo 1
13.0			12.50				slightly low	slightly soft	mildly weathering	10 - 25cm	12.50-13.30m: rock fragment-shaped core. The hardness of rock is slightly soft. The hardness extent of C _L -C _M class.			100	26	36		12.50
14.0			13.30											100	26	36		
15.0							high	very hard	fresh		13.30-17.20m: short- long columnar core. The hardness of rock is solid. The extent of C _H class. It sounds lightly-metallic when hammered lightly-blow.			100	46	61		
16.0														100	26	75		
17.0	2127.8	17.20	17.20											100	52	89		
18.0							relatively high	relatively hard	relatively fresh	10 -50 cm	17.20-20.20m: middle - long columnar core. The hardness of rock is solid. The extent of C _M class.			100	33	97		
19.0														100	27	92		
20.0			20.20				slightly low	slightly soft	mildly weathering	rock fragment	20.20-20.90m: plate-like structure core with some vertical cracks. The hardness of rock is slightly soft. The hardness extent of C _L -C _M class.			100	20	96		
21.0			20.90											100	16	16		
22.0							relatively high	relatively hard	relatively fresh	15 - 55 cm	20.90-26.20m: dominantly middle - long columnar core. The hardness of rock is solid. The hardness extent of C _M class.			100	20	82		22.50
23.0											Of this total, 25.00-26.20m: This core is light brown in color. The hardness of rock is solid			100	23	89		Labo 2
24.0														100	25	59		22.70
25.0														100	47	99		
26.0	2118.8	26.20	26.20											100	47	99		
27.0							high	very hard	fresh	10 - 45 cm	26.20-29.20m: dominantly middle - long columnar core. The hardness of rock is solid. The hardness extent of C _H class.			100	38	98		
28.0														100	46	85		
29.0			29.20											100	28	80		
30.0							slightly high	slightly hard	slightly fresh	25 cm	29.20-32.20m: dominantly middle - long columnar core. The hardness of rock is solid			100	27	83		

Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test								
31.0	2110.0	35.0	35.0			Greyis	relative	relative	relative	10 - 4	The hardness extent of C _H class.		100	17	43											
32.0																										
33.0								32.20																		
34.0													high	very hard	fresh				10 - 45 cm	32.20-35.00m: middle - long columnar core. The hardness of rock is solid. The extent of C _H class. It sounds slightly metallic when hammered lightly-blow to core.		100	24	86		
35.0																						100	43	79		
35.0																	Anchor of borehole extensometer									

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH05-12	Location	Around 5km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.02.355
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	10th/Aug/2010 to 13rd/Aug/2010		Longitude	38.14.211
Surveyer	Shoji TSUCHIYAMA		Core appraiser	Shoji TSUCHIYAMA		Drilling operators	Getnet Kassaye
Elevation (m)	2104.7m	Depth (m)	32.0	Drilling rig, Engine, Pump		Crysten Rig, Crystensen, Triplex	
Angle	Vertical	Direction	Gradient	Remarks		Installation of Automatic water level meter(depth ?m)	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test		
1.0			1.3	X	topsoil	Brownish-red					0.0-1.30m: clayey topsoil mixed with not only plant roots scattered but tuff and basalt with dominantly angular and sub-angular gravel .		40							
2.0					colluvial deposit	blackish-brown					1.30m -4.45m: clayey soil mixed with basalt with dominantly angular and sub-angular gravel around 10-60mm in diameter. The clay is partly scattered among the rock fragment		90							
3.0													90	11	11					
4.0	2116.45	4.45	4.45				grayish-black	high	very hard	fresh	15-35 cm	4.45-7.05m: rod-like - long columnar core. It sounds clearly-metallic when hammered lightly-blow.The hardness extent of C _M -C _H class.		100	19	46				
5.0							grayish-black	low	very soft	relatively-new		7.05-7.40m: silty clay. Greyish brown in color.		100	28	93				
6.0	2119.05	2.6	7.05				grayish-black	high	hard	fresh	11 cm	7.40-7.75m: The rock fragment is around 30-50mm in diameter. The hardness extent of C _L - C _M class.		100	11	11				
7.0	2119.4	0.35	7.40				slightly whitish brown	high	hard	fresh	10-50 cm	7.75-9.30m: The matrix core is tuff with dominantly angular and sub-angular gravel. Rock fragment is hard. The hardness extent of C _M class.		90	48	48				
8.0	2119.75	0.35	7.75				grayish-black	high	relatively-hard	fresh	5-30 cm	9.30-10.80m: basaltic core with dominantly angular and sub-angular gravel around 30-60mm in diameter. The scattered clay in core is partly found.		90	11	11				
9.0	2121.3	1.55	9.30			limestone	slightly whitish brown	high	hard	fresh	10-50 cm	10.80-18.60m: Fresh massive tuff. Slightly whitish brown in color with dominantly fractured rock. 10.80-11.25m, 15.40-15.90m, and 17.0-17.25m: It is composed of rod structured core. In particular, 15.90-16.50m: The core is concentrated at very soft and whitish brown clay. Of this total, the hardness is hard. The hardness extent of C _L -C _M class.		90	22	34				
10.0							grayish-black	high	relatively-hard	fresh	5-30 cm	18.00-19.75m: The core is composed of fractured and fragmented rock in total. The hardness is high. The hardness extent of C _M class. In particular, 18.00-18.30m: The long-columnar core is found.		100	26	45				15.7
11.0	2122.8	1.50	10.80				slightly whitish brown	relatively-high	relatively-hard	fresh	5-50 cm			100	15	15				15.9
12.0							grayish white	high	hard	fresh	5-30 cm			100	26	26				
13.0							grayish white	high	hard	fresh	5-30 cm			100	28	28				
14.0							grayish white	high	hard	fresh	5-30 cm			100	28	28				
15.0							grayish white	high	hard	fresh	5-30 cm			100	28	28				
16.0							grayish white	high	hard	fresh	5-30 cm			100	28	28				
17.0							grayish white	high	hard	fresh	5-30 cm			100	28	28				
18.0	2130	7.2	18.0				grayish white	high	hard	fresh	5-30 cm			100	28	28				
19.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
20.0	2131.75	1.75	19.75			grayish white	high	hard	fresh	5-30 cm			100	28	28					
21.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
22.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
23.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
24.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
25.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
26.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
27.0	2138.95	7.20	26.95			grayish white	high	hard	fresh	5-30 cm			100	28	28					
28.0	2139.6	0.65	27.6			grayish white	high	hard	fresh	5-30 cm			100	28	28					
29.0						grayish white	high	hard	fresh	5-30 cm			100	28	28					
30.0	2142.3	2.7	30.3			grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					
						grayish white	high	hard	fresh	5-30 cm			100	28	28					

Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
31.0	2142.65	0.35	30.65			grayish-black	slightly-high	hard	high-weathering	32 cm	30.65-32.00m: The rock of cores is tuff. It is composed of short - long columnar core. The hardness is solid. The hardness extent of C _u (-C _u) class.		100	32	32			30.55
32.0	2144.0	1.35	32.0			slightly whitish brown	high	hard	slightly-weathering	20 cm			100	20	58		water level meter	

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH05-13		Location		Around 15km from Dejen, Abay Gorge area, National road 3				Latitude		1110198												
Organization		Geological Survey of Ethiopia, JICA Study Team			Duration		16th to 18th July 2010			Longitude		416617												
Surveyer		Habtamu and Ezra			Core appraiser		Habtamu Eshetu		Drilling operators		Getnet.K													
Elevation (m)		2,020		Depth (m)		35.0		Drilling rig, Engine, Pump		作業日報確認														
Angle		Vertical		Direction		Gradient		Remarks		Installation of Automatic water level meter (34.0 m depth)														
Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test						
1.0	2,018.2	1.8	1.8		gravelly basalt, limestone, clay	lightish yellow	relatively dense	relatively strong	slightly weathered	ave diameter of 3-4cm	road embankment material.													
2.0					Basalt	Dark	high	very strong	fresh	maximum core length= 35cm average core length= 6-10cm	The geology of the core consists of boulder sized colluvium basalt. 1.8-5m: the core is composed of one 32cm long core column and dominantly 5cm long gravel sized samples. The core samples are fresh.													
3.0																5-6m: the core is composed of only 12cm long colluvium of sample. the rest of the core is empty which perhaps attributed to the empty space space between colluvium boulders below the surface.								
4.0																								
5.0																								
6.0																								
7.0																								
8.0																								
9.0																								
10.0																								
11.0																								
12.0																								
13.0																								
14.0	2,005.4	12.8	14.6														12.4-14.6m: the core consists of few subangular fragments of basalt. the fragments (gravels) are slightly weathered and have relatively high hardness. the rest of the core is empty which may be attributed to the empty space found b/n colluvial boulders of basalt.							
15.0											limestone	whitish	relatively dense	relatively strong	fresh	maximum core length=36cm average core length =10-12cm								
16.0																								
17.0																								
18.0																	14.6-23.0m: the core consists of medium (9cm) collumns to long (35cm) collumns of limestone. The color of the cores is whitish and they are fresh. In this depth interval the core also consists of proportional gravel sized fragments. The color of the fragmented samples is yellowish to light yellow , which indicate slight weathering. the fragmented onces are moderately strong.							
19.0																								
20.0																								
21.0																								
22.0																								
23.0																								
24.0																								
25.0																								
26.0																								
27.0																								
28.0																								
29.0																								
30.0																	23.0-29.0m: the core is dominantly composed of gravel sized fragmented limestone samples. its color is lightish yellow. few short collumns also present at within this depth.							

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH05-13		Location		Around 15km from Dejen, Abay Gorge area, National road 3				Latitude		1110198						
Organization		Geological Survey of Ethiopia, JICA Study Team			Duration		16th to 18th July 2010			Longitude		416617						
Surveyer		Habtmanu and Ezra			Core appraiser		Habtamu Eshetu		Drilling operators		Getnet.K							
Elevation (m)		2,020		Depth (m)		35.0		Drilling rig, Engine, Pump		作業日報確認								
Angle		Vertical		Direction		Gradient		Remarks		Installation of Automatic water level meter (34.0 m depth)								
Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
31.0					limestone	lightish yellow	relatively dense	relatively strong	fresh	maximum core length=36cm average core length = 10-12cm	29.0-35.0m: at this depth interval the core is mainly made of long columns and few short ones. the cores are fresh, massive, relatively high strength limestone.							
32.0																		
33.0																		
34.0																		
35.0	1,985.0	20.4	35.0															

Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test	
31.0						g		ha			In particular, 30.65-30.90m: The slightly gray brown silty-clayey in soil texture is partly scattered.		100						
32.0											31.10-35.00m: Short - middle columnar core is found. The hardness extent of C _u -C _t class.		100	14	24				
33.0											In particular, The argillation of rock by the force of weathering is distinguished at 33.65-33.75m, 33.85-34.00m, 34.15-		100	23	51				labo 3 sample X-ray diffraction
34.0											34.25m depth.		100	39	52				34.15
35.0	2173	10.6	35.0										100	14	37		Anchor of borehole inclinometer	labo 3	34.25

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH05-22	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.02.392	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	13rd/Aug/2010 to 18th/Aug/2010		Longitude	38.14.263
Surveyer	Shoji Tsuchiyama		Core appraiser	Shoji Tsuchiyama		Drilling operators	Getnet Kassaye
Elevation (m)	2109.9m		Depth (m)	30.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole inclinometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test						
1.0	2109	0.9	0.4 0.9		top soil	slightly grey-dark grey					0.0-0.40m: sandy clay, which is scattered among powder around 5-10 mm in diameter. Slightly grey in color. Some plant roots are found. High water content. 0.40-0.90m: dominantly basaltic sand gravel around 5-10 mm		50											
2.0			1.8		colluvial deposit	dark gray - blackish grey	low	soft	no	10 - 29 cm	0.90-10.80m: Geology soil is colluvial deposit. Sand gravel of dark and blackish grey in color, which is mixed with clay. Gravels are dominantly around 5-10mm in diameter. The hardness in gravel (rock fragment) is hard. Water content of clayey soil is low - middle. Thereamong, 0.90-1.80m: Gravels of 30-60mm in diameter are dominantly composed of limestone. Clay soil in core is partly found. 1.80-2.75m: Gravels of 30-60mm in diameter are dominantly composed of basalt. Clay soil in core is partly found. 2.75-4.40m: Gravels of 30-60mm in diameter in core are dominantly composed of basalt, limestone and 4.40-9.55m: Gravels of 30-62mm in diameter in core are dominantly composed of basalt. Clay soil in core is partly found 9.55-10.30m: Gravels in core are dominantly composed of limestone. 10.30-10.80m: Gravels of more than 62mm in diameter in core are dominantly composed of basalt. Clay soil in core is partly found.		70											
3.0			2.75																80	29	29			
4.0			4.4																80	10	10			
5.0																			80					
6.0																			80					
7.0																			80					
8.0																			80					
9.0																			80					
10.0			9.55 10.3																80	10	10			
11.0	2105.8	9.9	10.8																100	16	57			
12.0					limestone	slightly grayish white	relatively-high	relatively-hard	moderately weathering	10 - 27 cm	10.80-21.85m: tuff in core in geology. Thereamong, 10.80-14.40m: rock fragment - short columnar core partly become fresh rod-like limestone. The extent of CM class. It sounds slightly fozy when hammered lightly-brow to core.		90	19	30			12.50						
13.0																		100	17	64			labo 1	12.65
14.0			14.4															90	15	52				
15.0																		80	27	27				
16.0																		60						
17.0																		70	13	13				
18.0																		60						
19.0			19.5															60						
20.0																		70	11	21				
21.0			21.0															100	17	40				
22.0			21.85									70												
23.0						greyish white	high	hard	fresh	13 - 43 cm	21.85-30.00m: limestone in core in geology. Thereamong,21.85-23.70m: dominantly rod-like - long columnar core. The hardness extent of CH class. It sounds slightly fozy when hammered lightly-brow to core.		100	43	83			24.75						
24.0			23.7 24.3				low	soft	high-weathering					100	21	48			labo 2	25.00				
25.0			25.3				slightly high	slightly hard	relatively-fresh					100	25	47								
26.0			25.7				low	soft	high-weathering					100	13	46								
27.0			27.3				high	hard	relatively-fresh					100	13	49								
28.0			28.55				low	soft	high-weathering					100	25	39			labo 3	28.30				
29.0						high	relatively hard	relatively-fresh				100	17	27										
30.0	2079.9	19.2	30.0									100	36	60			Anchor of borehole inclinometer							

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH05-23		Location		Around 14km from Dejen, Abay Gorge area, National road 3				Latitude		1110210						
Organization		Geological Survey of Ethiopia, JICA Study Team			Duration		13th to 16 th July 2010			Longitude		416676						
Surveyer		Habtamu and Ezra			Core appraiser		Habtamu Eshetu		Drilling operators		Getnet K							
Elevation (m)		2,108		Depth (m)		40.0		Drilling rig, Engine, Pump		作業日報確認								
Angle		Vertical		Direction		Gradient		Remarks		Installation of borehole Inclinator(30.0m)								
Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-situ test	Laboratory test
1.0	2,106.1	1.9	1.9		Limestone	yellowish	medium	moderate	slightly weathered	gravel	road embankment material(Base course)				0			
2.0														15	30			
3.0																		
4.0																		
5.0														13	13			
6.0						dark	high	strong	fresh		1.9-9.9m: The core is mainly composed of short columns of length 8cm. Also fragmented angular basalt and clayey soil present.			15	15			
7.0																		
8.0																		
9.0																		
10.0																		
11.0					Basalt													11.5
12.0						dark lightish brown	relatively high	relatively strong	slightly weathered		9.9-15m: the core comprises fragmented, angular to sub angular, very slightly weathered basalt. Black, fine, plastic soil is mixed with the gravelly basalt cores.							11.7
13.0																		
14.0														15	38			
15.0																		
16.0														12	12			
17.0																		
18.0						dark	high	strong	fresh		15-19.8m: fresh, proportional fragmented and short columns of basalt cores. a little clayey soil is mixed with the fragmented portion of the cores.							
19.0																		
20.0	2,088.2	17.9	19.8											32	44			
21.0																		21.1
22.0						lightish	relatively high	strong	fresh		19.8-23m: massive, fresh, short to long columnar cores. Max core length 50cm, ave= 10-12cm							21.4
23.0														25	25			
24.0																		
25.0					Limestone													
26.0						light yellow	less dense	weak	completely weathered		23-30.2m: fragmented and angular limestone cores with average diameter of 2-4cm. * at 25.5m depth there is one 20cm long columnar core, which is karstified(have lots of holes). some of the holes are refilled with quartz.							26.5
27.0														21	51			26.7
28.0											*28.7-29.1m: the core consists of completely weathered, moist, light yellowish limestone.							
29.0														29	29			
30.0														16	40			

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH05-23		Location		Around 14km from Dejen, Abay Gorge area, National road 3				Latitude		1110210							
Organization		Geological Survey of Ethiopia, JICA Study Team				Duration		13th to 16 th July 2010				Longitude		416676					
Surveyer		Habtamu and Ezra				Core appraiser		Habtamu Eshetu		Drilling operators		Getnet.K							
Elevation (m)		2,108		Depth (m)		40.0		Drilling rig, Engine, Pump		作業日報確認									
Angle		Vertical		Direction		Gradient		Remarks		Installation of borehole Inclinator(30.0m)									
Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-situ test	Laboratory test	
31.0					Limestone	yellowish	less dense	weak	completely weathered	max core length= 35cm ave= 10-15cm	30.2-31.2m: very fine grained, yellowish, moist, completely weathered, soft mixture of angular fragments, short columns and gravels of limestone.								
32.0						lightish	relatively high	relatively strong	fresh		31.2-39.5m: at this depth core consists of dominantly long columns of fresh, whitish(lightish) limestone. max= 35cm. ave= 18-20cm. * present also fragmented fresh limestone at this depth interval								
33.0																			
34.0																			
35.0																			
36.0																			
37.0																			
38.0																			
39.0																			
40.0	2,068.0	20.2	40.0			gray	medium	moderate	slightly weathered		39.5-40m: fragmented, gray , fine grained limestone.								

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH05-31	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.02.350		
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	2nd/Aug?2010 to 4th/Aug/2010		Longitude	38.14.258	
Surveyer	Shoji Tsuchiyama		Core appraiser	Shoji Tsuchiyama		Drilling operators	Getnet Kassaye	
Elevation (m)	2130.5m		Depth (m)	35.0		Drilling rig, Engine, Pump		
Angle	Vertical	Direction	Gradient			Crysten Rig, Crystensen, Triplex		
						Remarks		Installation of Automatic water level meter (31.0 m depth)

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test	
1.0	2130.0	0.5	0.5	X	topsoil	slightly grey					0.00-0.50m: slightly weathering tuff gravel. The extent of C ₁ class. 0.50-0.60m: basaltic gravel. The extent of C ₂ class.								
2.0						slightly greyish white				20 - 28 cm	0.60-3.75m: talus cone of blackish grey in color. rock fragment - rod-like core is found. The hardness extent of C ₁ -C ₂ class. It sounds clear-metallic when hammered light-blow to core.		100	20	68				
3.0						slightly greyish white	high	hard	fresh				100	25	70				
4.0			3.75			slightly greyish white					1.15-1.40m, 2.15-2.30m, and 3.20-3.60m: plenty of the cracks is distinguished. The matrix core is rock fragment.		100	28	67				
5.0													100	22	39				
6.0													100	48	68				
7.0													100	28	96				
8.0						slightly grey-brown	relatively-high	relatively-hard	slightly-weathering	15 - 48 cm	3.75-13.05m: limestone. slightly brown grey in color. Short - long columnar core is found. The hardness extent of C ₁ -C ₂ class.		100	31	86				
9.0											In particular, 4.80-4.90m and 10.20-10.40m: The core is fractured. The longitudinal cracks of 60-70 degree in angle is distinguished.		100	28	84				
10.0													100	38	81				
11.0													100	35	94			10.40	
12.0													100	32	52			labo 1	
13.0			13.05										100	25	79			10.60	
14.0											13.05-35.00m: limestone. Slightly greyish white in color.		100	15	73				
15.0											Thereamong, 13.05-24.85m: Slightly greyish white in color.		100	34	84				
16.0													100	32	91				
17.0											In particular, 13.05-23.05m: short - long columnar core is found. The hardness of rock is hard. The hardness extent of CH class. The cracks dominantly indicates in a horizontal direction in general.		100	26	92				
18.0													100	26	94				
19.0													100	25	90				
20.0													100	23	91				
21.0											23.05-23.15m: slightly hard clay in low water content and yellow brown in color, it is found. High weathered core by effect of sparse remaining rock structure.		100	38	65				
22.0													100	34	81				
23.0											23.15-24.85m: rock fragment long columnar core is found and it is hard, according to the indication of the hardness extent of C ₁ class. The cracks dominantly indicates in a horizontal direction in general.		100	17	83				
24.0											24.00-24.40m: plenty of the cracks are found.		100	40	90				
25.0						slightly greyish white	relatively-high	relatively-hard	slightly-weathering	17 - 79 cm			100	42	60			25.10	
26.0													100	25	57			labo 2	
27.0												26.7	100	21	71			25.30	
28.0												04August	100	47	91				
29.0													100	79	79				
30.0											24.85-35.13m: As deeper, the matrix core become more and more slightly blackish grey in color. It is dominantly composed of rod-like - long columnar core. The hardness extent of CH class. It sounds lightly-entail direction in general.		100	29	97				
													100	47	98				

Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
31.0													100	20	85		Water level meter	
32.0												100	43	81				
33.0												100	35	98				
34.0												100	32	96				
35.0	2095.5	###	###										100	40	90			

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH05-32	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.02.395	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	19th/Aug/2010 to 21st/Aug/2010		Longitude	38.14.283
Surveyer	Shoji Tsuchiyama		Core appraiser	Shoji Tsuchiyama		Drilling operators	Getnet Kassaye
Elevation (m)	2116.1m		Depth (m)	30.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		No installation of landslide monitoring equipment	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test							
1.0	2115.3	0.8	0.8	X	top soil	whitish brown					0.00-0.80m: sandy clay mixed with gravel. White brown in color. The matrix is dominantly composed of coarse sand and some plant roots as organic matter.		50												
2.0					colluvial deposit	dark grey	relatively low	hard	no	27 cm	0.80-7.25m: The matrix core is colluvial deposit, which is dark grey in color. It is dominantly composed of different rocks of basalt, tuff, and limestone. Sand and clay in core except for these rocks are found. The gravels are around 30-60 mm in diameter. The gravel dominantly indicates sub-angular - angular. The gravel is hard.		40												
3.0																			50						
4.0																				50					
5.0																				60					
6.0																				50					
7.0	2108.9	6.45	7.25																	80	27	27			
8.0					limestone	slightly greyish white	relatively-high	slightly-hard	slightly-weathering	20 - 30 cm	7.25-9.50m: fragmented - long columnar core in limestone is found. Thereamong, 8.25-8.50m and 9.20-9.40m: The core indicates rock fragment, and is fractured. The hardness extent of C _M -C _H class.		100	30	55										
9.0			9.50			slightly brownish white	slightly soft	relatively-soft	moderately	14 cm	9.50-10.50m: lime stone of slightly brownish white in color. The porous with weathering cracks is distinguished. rock fragment - short columnar core indicates. The hardness extent of C _L -C _M class.		100	14	26										
10.0			10.50								10.50-30.00m: limestone of slightly grey white in color.		100	51	61										
11.0											10.50-11.50m: It is composed of long columnar core. The core rock is solid in hardness. The hardness extent of C _M class. It sounds clear and metallic when hammered lightly.		100	49	49										
12.0											11.50-12.90m: The weathering cracks is distinguished. The matrix core indicates rock fragment - angular gravel. The yellow brown clay are partly found. The rocks are relatively soft. The hardness extent of C _L class.		100	13	13										
13.0											12.90-14.00m: The core indicates short columnar. The hardness extent of C _M class.		100	19	29										
14.0											14.00-14.30m: sand gravel - rock fragment indicates in core. The weathered cracks is distinguished.		100	14	14										
15.0											14.30-19.70m: rock fragment - short columnar core indicates. The hardness extent of C _M class. Clayey soil in thin layer is partly found.		100	21	41										
16.0							slightly greyish white	relatively-low - relatively-high	relatively-soft - relatively-hard	relatively-weathering	11 - 51 cm		100	13	26										
17.0											19.70-24.05m: rock fragment - short columnar - rod-like core indicates. The hardness extent of CM-CH class. In particular, 21.40-21.70m and 22.00-22.20m: The weathering cracks is distinguished. The core is fractured. The direction of cracks in core are horizontal in whole.		100	13	36										
18.0											24.05-25.00m: The weathered cracks is distinguished. angular gravel - rock fragment core dominantly indicates. The hardness extent of CL-CM class.		100	23	66										
19.0											sandy and clayey soil in rock fragment is partly found.		100	23	46										
20.0											25.00-30.00m: rock fragment - rod-like core indicates. The rock is solid. The hardness extent of C _M -C _H class.		60												
21.0											Tuffaceous gravels in thin layer in core are partly found. Tuffaceous gravels are lightly-weathered and soft in hardness. The extent of C _L class about tuffaceous gravel. The cracks are horizontally distinguished mainly.		90	22	67										
22.0										26.90-28.50m and 29.35-29.73m: The weathered cracks are slightly distinguished. The core is fractured. It indicates		90	23	47											
23.0												80													
24.0												90	31	93											
25.0												90	13	24											
26.0																									
27.0																									
28.0																									
29.0																									
30.0	2086.1	22.8	30.0																						

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH22-11	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.05.386	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	6 Aug. to 8 Aug. 2010		Longitude	38.11.198
Surveyer	Shoji Tsuchiyama		Core appraiser	Shoji Tsuchiyama	Drilling operators	Getnet Kassaye	
Elevation (m)	1263.1m	Depth (m)	20.0	Drilling rig, Engine, Pump		Top200Rig, Crystensen, Duplex pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole inclinometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test						
1.0	1262.4	0.7	0.7		top soil	brownish grey																		
2.0					embankment	dark grey	slightly low	slightly soft		5-25 cm	0.00-13.95m: embankment.													
3.0																								
4.0			4.4																					
5.0																								
6.0					colluvial deposit	blackish grey	relatively-low	relatively-soft		5-25 cm	0.70-4.40m: It is composed of sand gravel, which is mixed with clay in embankment. Dark grey - black grey in color. Sub-angular - angular gravel in basalt, which are dominantly around 20-60 mm in diameter. The hardness of gravel is solid.													
7.0																								
8.0	1255.5	6.9	7.6																					
9.0																								
10.0																								
11.0																								
12.0					sandstone	reddish brown	low	relatively-soft		5-25 cm	4.40-7.60m: There is rich clay in soil texture fragment. The water content in clay is low and consolidated.													
13.0																								
14.0			13.95																					
15.0																								
16.0			15.8			slightly greenish grey					13.95-17.90m: high weathered reddish silt and greenish shale. The rock structure is slightly remained. The matrix core partly indicates argillaceous property by force of high weathering. (sliding soil mass)													
17.0			17.3			reddish brown	relatively-high				Thereamong, 15.80-17.30m: The core indicates slightly greenish grey in color by effect of thermal alteration. The matrix core partly become arenaceous.													
18.0	1245.2	10.3	17.9			slightly brownish grey	high	relatively-hard	relatively-fresh	17-40 cm	17.65-17.90m: hard and basaltic gravel of more than 50mm in diameter. Gravel indicates sub-angular and							18.60						
19.0			18.7							17-40 cm	17.90-20.00m: sandstone of slightly brownish grey in color. Short - middle columnar core. The core is hard. The extent of C _u class.		100	25	92			labo 1						
20.0	1243.1	6.05	20.0							17-40 cm	In particular, 17.90-18.50m: The core indicates brown in color concentratedly. 18.70-20.00m: The property in core indicates crystalline.		100	24	92			Anchor of borehole inclinometer	18.75					

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH27-09		Location		Around 13km from Dejen, Abay Gorge area, National road 3				Latitude		1117331						
Geological Survey of Ethiopia, JICA Study Team				Duration		6th to 10 th July 2010				Longitude		407720						
Surveyer		Habtamu and Ezra				Core appraiser		Habtamu Eshetu		Drilling operators		Getnet.K						
Elevation (m)		1,748		Depth (m)		50.0				Drilling rig, Engine, Pump		作業日報確認						
Angle		Vertical		Direction		Gradient		Remarks		Installation of Automatic water level meter, borehole inclinometer (50.0 m depth)								
Scale (m)	Elevation (m)	Thickness (m)	Depth(m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
1.0	1,747.6	0.4	0.4		Co	grey					cement for drilling purpose				0			
2.0					Embankment	pale brown	medium	moderate	slight	A.V. 1.5-2.5cm max 8cm	Artificial fill-back embankment It is composed of basalt and limestones gravel, sand, mud and clay.				0			
3.0															0			
4.0	1,744.6	3.0	3.5		Basalt	Dark	High	Hard	Fresh	Max=10cm Ave=1-5cm	core is composed largely of gravel size basalt. The shape of the grains is angular with average diameter of 2.6cm. The core is fine grained aphanatic to medium grained in texture.			14	14			
5.0															0			
6.0	1,742.1	2.5	6.0		Loose Sand	grey	low	soft	fresh	sand size	the core consists of loose and incoherent sandy material				0			
7.0	1,741.6	0.5	6.5												0			
8.0						Dark	High	Hard	fresh		6.5-9.6m: the core is dominantly composed of massive and 6-10cm long core samples.			15	15			
9.0														13	13			
10.0															0			
11.0															0			
12.0						lightish gray	relatively high	relatively strong	slightly weathered		9.6-14m : in this depth interval the core consists of largely fragmented, angular to subangular basalt. The texture is aphanitic				0			
13.0															0			
14.0														13	13			
15.0															0			
16.0						dark	High	strong	Fresh		14-18m: the core comprises average 10cm long collumnar samples. when hammered it is very strong, the samples are dark, fresh, and forms largely 10cm long collumns. the texture is aphanitic.			20	62			
17.0															12	12		
18.0															14	14		
19.0															0			
20.0															0			
21.0						lightish gray	relatively high	relatively strong	slightly weathered		18-23.2m: at this depth interval the core is composed of slightly weathered gravelly sized samples of average diameter 4-5cm and sub rounded basalt. few samples display vesticular textue at depth range of 20.2-20.6m.				0			
22.0														11	11			
23.0															0			
24.0	1,741.1	16.7	23.2		Limestone	kaki	relatively high	relatively hard	fresh	max= 15cm Ave= 10cm	relatively long collumnar, fine grained limestone core samples.				17	33		
	1,724.4	0.5	23.7												0			
	1,723.9	1.0	24.7		Basalt	Dark	High	hard	slightly weathered	max=8cm Ave=2-4cm	fragmented, angular to subangular gravelly basalt				0			
25.0															0			
					Limestone	kaki	moderate	medium	moderately weathered	max=5cm ave= 1-2cm	at this depth interval there are few core samples. The samples are fragmented, moderately weathered limestone. Few number of sample perhaps indicate presence of caving				0			
26.0	1,722.9	1.3	26.0												0			26.3
27.0	1,721.6	0.7	26.7		Shale	lightish grey	less dense	weak	moderately weathered	max=5cm ave=1-4cm	fissile and weak shally material				0			26.5
28.0															0			27.1
					siltstone?	reddish	medium	medium	fresh	ave= 1-4cm	the geology at depth consists of siltstone?			11	11			27.3
29.0															0			
	1,719.0	2.6	29.3												0			
30.0															0			

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH27-09		Location		Around 13km from Dejen, Abay Gorge area, National road 3				Latitude		1117331								
Geological Survey of Ethiopia, JICA Study Team				Duration		6th to 10 th July 2010				Longitude		407720								
Surveyer		Habtamu and Ezra				Core appraiser		Habtamu Eshetu		Drilling operators		Getnet.K								
Elevation (m)		1,748		Depth (m)		50.0		Drilling rig, Engine, Pump		作業日報確認										
Angle		Vertical		Direction		Gradient		Remarks		Installation of Automatic water level meter, borehole inclinometer (50.0 m depth)										
Scale (m)	Elevation (m)	Thickness (m)	Depth(m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test		
31.0					Mudstone	lightish gray	relatively low	medium	weathered	maximum core length = 30cm ave core length= 14cm	29.3-31.5m: weathered, lightish gray, fine grained mud stone. The average core length is 6cm.			10	10					
32.0																				
33.0							dark gray	relatively high	relatively strong		Fresh		31.5-35m: fresh, dark gray, massive, very fine grained mudstone.			20	20			32.2
34.0																30	54			32.4
35.0														34	57					
36.0						lightish gray	medium	moderately strong	slightly weathered		The core dominantly forms 30cm long collums. Some core samples are subrounded to subangular.			40	54					
37.0	1,715.8	7.4	36.7								35-36.7m: slightly weathered, lightish gray mudstone.					0				
38.0					siltstone?	reddish	medium	medium	Fresh	max=5cm ave=2-3cm	massive, fresh Siltstone?					0				
39.0											The core is mainly composed of long collumnar samples					0				
40.0	1,711.6	3.1	39.8											11	11					
41.0					Mudstone	lightish gray	medium	moderately strong	slightly weathered	max= 15cm Ave= 10cm	39.8-41m: slightly weathered , lightish gray shorter core collums					0				
42.0															18	18			41.2	
43.0															20	42			41.4	
44.0															21	48				
45.0														60	86					
46.0						dark gray	relatively high	relatively strong	Fresh	max core size= 60cm ave core size= 20cm	41-50m: fresh, dark gray, very fine grained, massive, dominantly long collumnar cores			21	82			45.5		
47.0														38	76			45.7		
48.0														30	87					
49.0														26	50					
50.0	1,708.5	10.2	50.0											30	75					

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name		BH27-10		Location		Around 14km from Dejen, Abay Gorge area, National road 3				Latitude		1117211						
Organization		Geological Survey of Ethiopia, JICA Study Team			Duration		10th to 13th July 2010			Longitude		407799						
Surveyer		Habtamu and Ezra			Core appraiser		Habtamu Eshetu		Drilling operators		Getnet.K							
Elevation (m)		1,729		Depth (m)		25.0		Drilling rig, Engine, Pump		作業日報確認								
Angle		Vertical		Direction		Gradient		Remarks		Installation of Automatic water level meter (25.0 m depth)								
Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
1.0	1,728.0	1.0	1.0		Top Soil	Black	moderate	hard		fine	Black, moderately plastic clayey soil							
2.0					Colluvial Deposit	Dark	high	hard	slight	2-4cm	fragmented and subangular basalt							
3.0						Black	moderate	hard	weathered	fine	Black, moderately plastic clayey soil							
4.0								high	strong	fresh	max=15cm ave=10cm	2.2-6m: fresh, medium columns of ~15cm with proportional gravel basalt core samples			23	38		
5.0							Dark											
6.0								very high	very strong	fresh	max = 60cm ave=20-30cm	6-9m: dominantly massive, long columns of maximum length 60cm. Fresh and fine grained basalt.			60	93		
7.0																		
8.0																		
9.0																		
10.0																		
11.0							lightish dark	high	strong	slightly weathered	max=12cm ave=2-10 cm	9-13.3m: mainly fragmented, angular gravel sized basalt.						
12.0																		
13.0																		
14.0	1,715.7	11.1	13.3		Limestone	lightish yellow	relatively high	relatively strong	slight	average core size= 1-3cm	fragmented, slightly weathered limestone							
15.0	1,714.7	1.0	14.3		mudstone	yellowish	medium	moderately strong	slight		14.3-15.5m: fragmented, slightly weathered yellowish mudstone							
16.0											max core length= 14cm ave core length= 3-6cm			16	16			
17.0							lightish gray	relatively stronger	relatively stronger	fresh		15.5-19.4m: dominantly short columns of average length 5-8cm mudstone.			14	14		
18.0																		
19.0	1,709.6	5.1	19.4											17	17			
20.0					siltstone?	reddish	medium	moderately strong	fresh	max=4cm ave=1-3cm	partially fissile, short columns, relatively fine grained siltstone.							
21.0																		
22.0	1,706.8	2.8	22.2															
23.0	1,705.7	1.1	23.3		mudstone	lightish gray	medium	medium strength	slight	max=6cm ave= 1-3cm	very fine grained, slightly fissile lightish gray mudstone							
24.0																		
25.0	1,704.0	1.7	25.0		siltstone?	reddish	medium	moderately strong	fresh	max=6cm ave= 2-4cm	slightly fissile, fine to medium grained reddish siltstone?							

15.6
Labo 1
15.8

23.5
Labo 2
23.7

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH27-11	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.06.234	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	28 Sep. to 1st Oct.2010		Longitude	38.09.325
Surveyer	Shoji Tsuchiyama		Core appraiser	Shoji Tsuchiyama		Drilling operators	Getnet Kassaye
Elevation (m)	1722.0m		Depth (m)	25.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole inclinometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test							
1.0					colluvial deposit	black grey	relatively-low	soft			<p>0.00-8.90m: colluvial deposit in black grey in color. It is dominantly composed of basaltic gravel.</p> <p>In the surface layer, some tufficious gravels is found. The gravels are around 20-60mm in diameter in size , hard in hardness and sub-angular - angular in shape. (possibility of natural ground)</p> <p>The sandy gravels mixed with clayey soil. The gravels in geological property are dominantly basalt, and silty - clayey soil partly found. It is dominantly composed of sub-angular - angular gravels and around 20-50mm in size. The gravels in hardness is hard.</p>		60												
2.0																			80						
3.0																			90						
4.0						yellow brown - black grey	high	hard				15 - 19 cm			70										
5.0																				100					
6.0																				100					
7.0																				100					
8.0																				100					
9.0	1713.1	8.9	8.9																	100					
10.0			9.4		sliding soil mass (mainly silt and shale)	greenish grey	slightly high	slightly soft	slightly	15 - 19 cm	8.90-9.40m: weathered silt(tuffaceous) in rock fragment shape.The hardness extent of CL class.It's fractured when		100	19	19										
11.0		11.0		greenish grey		slightly high		slightly weathering					9.40-11.00m: slightly weathered silt(tuffaceous). It is composed of rock fragment - short columnar core. It sounds fozy when hammered blow to core.		100	15	26								
12.0						brownish grey	slightly low	soft	high weathering	10 cm	11.00-22.65m: It is dominantly composed of rock fragment core. The porous cracks by force of weathering are distinguished. The color around cracks partly become brown grey. It can check rock structure remaining. It is fractured when hammered lightly-blow to core. The hardness extent of CL class. The direction about cracks is mainly horizontal.		100												
13.0				greenish grey											11.00-14.10m: moderate whethring silt in reddish grey in color.		100								
14.0		14.1		brownish grey											14.10-15.35m: moderate whethred shale in greenish grey in color.		100								
15.0		15.35		greenish grey											15.35-17.15m: moderate whethred silt(tuffaceous) in reddish grey in color.		100								
16.0						brownish grey							100												
17.0			17.15			greenish grey						17.15-18.50m: moderate whethred shale in greenish grey in color.		100	10	10			18.40						
18.0			18.50			brownish grey							100	10	10			labo 1	18.50						
19.0													100												
20.0												100													
21.0											18.50-25.00m: moderate whethred silt in reddish grey in color.		100												
22.0										10 - 21 cm	20.80-21.45m: shale in greenish grey - white grey in color. 22.65-25.00m: silt in brown grey in color. It is composed of rock fragment - short columnar core. The hardness extent of C ₁ -C ₄ class.The cracks in a horizontal direction are dominantly distinguished. At 24.60-25.00m in depth, the cracks in a vertical direction is distinguished.		100	10	10										
23.0												100		15	26										
24.0												100		21	21										
25.0	1697.0	16.1	25.0									100													

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH27-12	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.06.249	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	22 Sep. to 5 Oct.2010		Longitude	38.09.364
Surveyer	Shoji Tsuchiyama		Core appraiser	Shoji Tsuchiyama		Drilling operators	Getnet Kassaye
Elevation (m)	1709.0m		Depth (m)	25.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole extensometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test	
1.0	1708.1	0.9	0.9	X	Top soil						Top soil (replaced by cement for drilling)		40						
2.0					colluvial deposit						<p>0.90-13.40m: colluvial deposit. the core characterized by basaltic boulder in black grey - brown grey in color.</p> <p>0.90-3.95m: It is dominantly composed of basaltic gravel. The gravels in size are around 20-60mm in diameter. It is composed of sub-rounded - sub-angular gravels. The hardness of gravels are hard.</p> <p>3.95-7.60m: sandy basaltic gravels, which is mixed with clay. blackish brown - brownish grey. The gravels are around 20-60 mm in diameter. Clay among gravels is partly found. It is dominantly composed of sub-rounded - sub-angular gravels.</p> <p>7.60-13.40m: hard basaltic gravels in blackish grey in color. The gravels are around 30-60 mm in diameter. Some basaltic gravels among tuffaceous ones is partly found. It is dominantly composed of sub-rounded - sub-angular gravels.</p>		60						
3.0													80						
4.0			3.95											90					
5.0														90					
6.0														100					
7.0														100					
8.0			7.6											100					
9.0														100					
10.0														100					
11.0														100					
12.0												100							
13.0												100							
14.0	1723.4	12.5	13.4		sliding soil mass (mainly silt and shale)						<p>13.40-15.70m: high weathered silt(tuffaceous) in greyish white in color. It is composed of sandy - rock fragment by force of high weathering. The hardness extent of D_r-D_h class in entire. It is possible to break up the rock fragments by finger. It is very soft, however, can check rock structure slightly-remaining.</p> <p>15.70-17.30m: relatively fresh massive siltstone in greyish white in color. It is composed of rock fragment - short columnar core. The rocks in core are hard. The hardness extent of C₁-C₄ class. It sounds poor fozy when hammered lightly-blow to core.</p> <p>17.30-18.70m: high weathered silt and shale in slightly brownish gray - brownish gray in color. It is composed of sandy - rock fragment by force of high weathering. The hardness extent of DM-DH class. It is slightly soft.</p> <p>18.70-21.10m: moderate weathered tuff in brownish yellow - greenish grey(reseda) in color. It is composed of rock fragment - short columnar core by force of high weathering. The rock hardness condition is slightly soft. It can check rock structure remaining. It's fractured when hammered blow to core.</p> <p>21.10-25.00m: moderate-weathered silt and shale in brown-grey - greenish grey(reseda) in color. It is composed of sandy - rock fragment core in entire. It indicates the hardness extent of C₁ class. It is slightly soft. It checks rock structure remaining. In particular,</p> <p>22.40-22.85m: reddish brown in color by weathering.</p> <p>23.90-24.70m: high weathered siltstone. It is composed of sandy - angular gravel core. It break up in relatively fracture when hammered poorly-blow to core.</p>		100						
15.0						greyish white	very low	slightly-soft	high-weathering	13 cm				100					
16.0			15.7			greyish white	slightly high	hard	relatively-fresh	10 -13 cm				100	13	23			
17.0			17.3			brownish gray	slightly low	slightly-soft	high-weathering	10 cm				100	10	20			
18.0			18.7			reddish brown - brownish yellow - greenish grey	slightly low	slightly soft	moderate - high weathering	10 -12 cm				100					
19.0														100	10	10			
20.0														100					20.45
21.0														100	12	12			labo 1
22.0														100	10	10			20.55
23.0														100					
24.0												100							
25.0	1735.0	11.6	25.0									100					Anchor of borehole extensometer		

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH27-21	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.06.241	
Organization	Geological Survey of Ethiopia, JICA Study Team			Duration		Longitude	38.09.303	
Surveyer	Shoji Tsuchiyama			Core appraiser	Shoji Tsuchiyama		Drilling operators	Getnet Kassaye
Elevation (m)	1734.0m		Depth (m)	25.0		Drilling rig, Engine, Pump		Top200Rig, Crystensen, Duplex pump
Angle	Vertical	Direction	Gradient	Remarks			Installation of Automatic water level meter (depth 0m)	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test	
1.0	1733.7	0.3	0.3	X	top soil						Top soil (replaced by cement for drilling)		80						
2.0					colluvial deposit	blackish brown	low	soft			0.30-4.50m: colluvial deposit is mainly clay in blackish brown in color. In particular, 0.30-0.50m: Some plant roots as organic matter are found. The gravels are dominantly composed of basalt. A few of limestone are partly found. The gravels in size are around 30-50mm in diameter.		80						
3.0													80						
4.0			4.5										100						
5.0													80						
6.0													90						
7.0													100						
8.0							blackish grey	low	soft			4.50-12.40m: It is dominantly composed of basaltic gravels. The gravels are hard in hardness and around 30-60mm in diameter in size. Sand among gravels is found.		100					
9.0													100						
10.0													100						
11.0													70						
12.0												60							
13.0	1721.6	12.1	12.4		siding soil mass (mainly silt and shale)	brownish grey	very low	relatively soft	high weathering	17 cm	12.40-14.05m: highly weathered siltstone (to sand) in brownish grey in color. The matrix core become brownish grey in color by force of high weathering. The gravels are like sandy sediment, and it is possible to break them up by finger.		100	17	39				
14.0		1.65	14.05				greenish grey	very low	relatively soft	high weathering	13 - 18 cm	14.05-17.60m: highly weathered tuffaceous silt(to shale) in greenish grey in color. It can check rock fragment structure remaining in core. Rock fragment is found in core. The hardness extent of D _r -C _L class, namely, it is relatively soft. Core in a high weathering partly become sandy sedimental.		100	13	24			15.05
15.0													100	18	29			labo 1	15.20
16.0													100						
17.0		3.55	17.6				white grey	slightly-low	slightly-soft	slightly	10 - 17 cm	17.60-18.40m: limestone in white grey in color. The hardness extent of C _r -C _u class. It is composed of rock fragment - short columnar core in entire. 17.60-17.90m: short columnar core. And 17.90-18.40m: rock fragment getting.		100	17	27			
18.0		0.8	18.4									18.40-25.00m: moderately weathered siltstone and shale (tuffaceous) in greenish grey -brownish grey in color.		100	10	10			
19.0			19.5				brownish grey	relatively-low	relatively-soft	moderately-weathering	10 -20 cm	18.40-19.50m: It is composed of rock fragment - short columnar core. The hardness extent of C _r -C _M class. It is relatively hard.		100					
20.0			20.5									19.50-20.50m: Rock fragment getting. The hardness extent of D _r -C _L class.		100					
21.0			21.25									20.50-21.25m: rock fragment - short columnar condition in core. The hardness extent of C _r class.	21.75m	100					
22.0			21.9									21.25-21.90m: gravel - rock fragment condition in core. The core become moderately weathered. The core is brownish grey in color.	24.Sep	100					Automatic water level meter
23.0		4.9	23.3			greenish grey	relatively-high	relatively-hard	slightly weathering		21.90-25.00m: slightly weathered tuff in brownish grey - greenish grey in color. It is composed of rock fragment - short columnar core in entire. The hardness extent of CL class. At 21.90-23.30m depth, core is brownish grey in color. At 23.30-25.00m: core is greenish grey in color.		100	20	44				
24.0													100	18	28				
25.0	1709.0	1.7	25.0																

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH27-22	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.06.238
Organization	Geological Survey of Ethiopia, JICA Study Team			Duration		Longitude	38.09.315
Surveyer	Shoji Tsuchiyama			Core appraiser	Shoji Tsuchiyama	Drilling operators	Getnet Kassaye
Elevation (m)	1733.0m		Depth (m)	27.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks			Installation of borehole inclinometer

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
1.0	1733.7	1.7	1.7	X	top soil	black brownish grey					0.00-1.70m: sandy soil in black grey - brown grey in color , which is mixed with some gravels		80					
2.0													100					
3.0													80					
4.0													40					
5.0													50					
6.0													70					
7.0													90					
8.0													90					
9.0													100					
10.0													100					
11.0													100					
12.0													100					
13.0													100					
14.0													90					
15.0													100					
16.0	1747.4	13.7	15.4										100					
17.0													100					
18.0										12 cm	15.40-19.35m: slightly weathered siltstone to shale in greenish grey in color. It is composed of gravel - rock fragment (- short columnar(partly)) core. The hardness extent of C ₁ class.		100	12	12			
19.0			19.35										100					19.65
20.0										14 - 15 cm	19.35-21.00m: slightly weathered siltstone (to sandstone) in greenish white in color. The hardness extent of C ₁ -C _{III} class.		100	14	34			labo 1
21.0			21										100	15	15			19.80
22.0													100					
23.0			23.4								21.00-23.40m: highly weathered shale in reddish brown in color. It is composed of gravel - rock fragment (- short columnar(partly)) core. The hardness extent of DH-CL class. It can check in fractured rock hardness when hammered light-blow to core.		100					
24.0											23.40-27.00m: It is composed of rock fragment - short columnar core.		100					
25.0										10 - 28 cm	Thereamong, 23.40-24.60m: It is composed of gravel - rock fragment core by force of slightly weathering. 24.60-25.50m: slightly weathered tuff in reddish brown grey in color by force of (poor) weathering. The hardness of rock fragment is hard. It indicates the hardness extent of C ₁ -C _{III} class.		100	10	10			
26.0											25.50-27.00m: It is composed of middle columnar core. The hardness extent of C ₁ -C _{III} class.		100	28	59			
27.0	1759.0	27.0	27.0										100	22	32			Anchor of Borehole inclinometer

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH27-23	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10/06/22.9
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	20 Sep. to 5th Oct. 2010		Longitude	38/09/32.0
Surveyer	Shoji Tsuchiyama		Core appraiser	Makito Noda		Drilling operators	Getnet Kassaye
Elevation (m)	1723.9m		Depth (m)	25.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole inclinometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test											
1.0					colluvial deposit	black grey	relatively-low	soft			0.00-6.10m: colluvial deposit in black grey in color. It is dominantly composed of basaltic gravel. In the surface layer, some tuffaceous gravels is found. The gravels are around 20-60mm in diameter in size , hard in hardness and sub-angular - angular in shape. (possibility of natural ground)		60																
2.0																			80										
3.0																			80										
4.0																			90										
5.0																			90										
6.0			6.1																40										
7.0					sliding soil mass (mainly silt and shale)	yellowish grey				sand size -12 cm	6.10-9.00m: colluvial deposit in yellowish grey in color. The sandy gravels mixed with clayey soil. The gravels in geological property are dominantly basalt, and silty - clayey soil partly found. It is dominantly composed of sub-angular - angular. dominantly basalt, and silty - clayey soil partly found. It is		60																
8.0																			80										
9.0	1714.9	9.0	9.0																40										
10.0													greenish grey	low	soft	high weathering	sand to grtavel size	9.00-12.50m: weathered silt(tuffaceous). It is composed of rock fragment - short columnar core. The hardness extent of CL class.It's fractured when hammered.		85									
11.0																								80	12	12			10.10
12.0			12.5																					65					10.20
13.0													greenish grey to brownish grey											90					
14.0																								90					
15.0																								90					
16.0																								90					
17.0																								90					
18.0																								90					
19.0			18.45									90	10						10										
20.0												90																	
21.0						reddish grey	relatively-high	slightly-hard	moderately weathering	10 -13 cm	18.50-25.00m: moderate whethereed silt in reddish grey in color. 18.45-18.75m, 19.90-20.35m: boulder of sandstone which white in color. 22.00-25.00m: silt in reddish grey in color. It is composed of rock fragment - short columnar core. The hardness extent of C _L -C _M class.The cracks in a horizontal direction are dominantly distinguished.		75																
22.0												85	11	11			22.10												
23.0												100	12	23			22.20												
24.0												100	13	25															
25.0	1698.9	16.0	25.0									100																	

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH28-11	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.06.379	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	16 Sep. to 18 Sep.2010		Longitude	38.09.322
Surveyer	Shoji TSUCHIYAMA		Core appraiser	Shoji TSUCHIYAMA	Drilling operators	Getnet Kassaye	
Elevation (m)	1762.0m	Depth (m)	25.0	Drilling rig, Engine, Pump		Top200Rig, Crystensen, Duplex pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole inclinometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
1.0	1761.6	0.4	0.4	X	top soil						Top soil (replaced by cement for drilling)		50					
2.0					colluvial deposit	black grey - dark grey	low	soft			0.40-4.70m: colluvial deposit in black grey - dark grey in color. 0.00-1.25m: It is dominantly composed of sandy gravels mixed with coarse sand. The sub-angular gravels are around 2-10mm in diameter. The gravels in geology are andesite. 1.25-2.50m: It is dominantly composed of andesite, tuff and limestone gravels of around 10-30mm in diameter. Coarse sand among gavels is mixed. 2.50-4.70m: It is dominantly composed of basalt, tuff and limestone gravels of around 10-40mm (max 100 mm) in diameter. sub-angular sandy gravels mixed with clay. Coarse sand and a bit of clay among gavels is mixed.		50					
3.0						white grey	high	hard			4.70-5.80m: slightly weathered limestone in white grey in color. It is composed of rock fragment - short columnar core. The hardness extent of C ₁ -C _M class.(hard core)		100					
4.0						black grey	slightly high	slightly hard			5.80-13.60m: relatively weathered andsite in black grey in color. 5.80-6.40m: It is composed of short columnar core. The hardness extent of C _M class. It is hard. 6.40-7.35m: It is composed of rock fragment - angular-shaped core. The hardness extent of C ₁ class. slightly hard. 7.35-7.90m: It is composed of short columnar core. The hardness extent of CM class. It is hard. 7.90-9.00m: It is dominantly composed of rock fragment core and a bit of coarse sand. The hardness extent of C ₁ class. 9.00-9.70m: It is dominantly composed of rock fragment - short columnar core. The rock in core hardness is the extent of C _M class. 9.70-11.05m: sandy gravels mixed with clay. greyish black - dark grey in color. The matrix core is dominantly andesitic sub-angular - angular gravel. Sand and clay among rock fragments are found. The hardness extent of C ₁ class in entire. It is slightly hard.		70					
5.0														100				
6.0														100				
7.0														100				6.20
8.0														90				labo 1
9.0														100				6.35
10.0														100				
11.0														100				
12.0													100					
13.0													100					
14.0	1748.1	13.55	13.95		sliding soil mass (mainly silt and shale)	white grey - greenish grey	slightly high	slightly hard	moderately	24 cm	13.95-25.00m: moderately and highly weathered sliding soil mass (mainly silt and shale) in greenish grey - reddish brown grey in color. 13.95-15.00m: moderately weathered shale in white grey - greenish grey in color. The hardness extent of CL class (the upper part D class: like loose surface soil) 15.10-18.00m: high weathered siltstone (to sand) in greenish grey - reddish brown grey in color. The hardness extent of DM-DH class. It is very soft. It can check rock structure slightly-remained, argillation by force of high weathering is partly found. Rock fragment-shaped core is partly found.		100					
15.0		1.05	15.00			green grey - reddish brown grey	very low	very soft	high weathering		20 -22 cm	17.60-25.00m: moderately weathered siltstone in mainly reddish grey in color. It indicates the hardness extent of C ₁ class. It can entirely check rock structure remained. In particular, 21.25-21.95m, 22.30-22.70m, and 23.20-24.35m depth: the matrix core become brown in color by force of high weathering, and argillation of the cores is found. At 24.35-25.00m depth, the porous cracks with weathering is distinguished. It indicates the hardness extent of C ₁ class.		100	24	34		
16.0														100	20	20		
17.0														100				
18.0		2.6	17.6											100				18.50
19.0														100	22	57		labo 2
20.0														100				18.65
21.0														100	26	46		
22.0														100				
23.0														100				
24.0													100					
25.0	1737.0	7.4	25.0								22 -26 cm		100					Anchor of Borehole inclinometer

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH28-21	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3		Latitude	10.06.426	
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	2nd Sep. to 4th Sep.2010		Longitude	38.09.335
Surveyer	Shoji TSUCHIYAMA		Core appraiser	Shoji TSUCHIYAMA		Drilling operators	Getnet Kassaye
Elevation (m)	1772.0m		Depth (m)	25.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of Automatic water level meter (depth 24.7m)	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test	
	1771.5	0.5	0.5	XXXX	Top soil						Top soil (replaced by cement for drilling)								
1.0					colluvial deposit	Slightly greyish white - grey brown	slightly low	slightly soft	moderately		0.00-6.20m: mainly composed by Limestone gravels. Slightly greyish white - grey brown. The rock in core is hard, the hardness extent of CL-CM class. It is composed of rock fragment - short columnar core in entire. In particular, 4.95-5.06m: Some andesitic gravel are partly found.		100						
2.0														100					
3.0														100					
4.0														90					
5.0														90					
6.0			6.2											80					
7.0														80					
8.0														90					
9.0														90					
10.0							greyish brown	low	soft	high-weathering			6.20-14.85m: High weathered siltstone, shale and limestone in greyish brown in color. It is dominantly composed of sandy gravel - rock fragment core. It is soft. The hardness extent of D _M -D _H class. In particular, 7.20-7.65m: It is composed of rock fragment - short columnar core.		90				
11.0												100							
12.0												100							
13.0												100							
14.0												100							
15.0			14.85									100							
16.0			15.65			white brown	slightly low	slightly hard	slightly weathering		14.85-15.65m: slightly weathered limestone in white brown in color. The hardness extent of C _u class. It sounds poor fozy when hammered lightly-blow to core.			100				15.25	
17.0	1755.0	16.50	17.00			yellow greyish brown	very low	very soft	high-weathering		15.65-16.90m: high weathered shale in yellow greyish brown in color. The core columnar shapecondition is sandy - sandy gravel by force of high weathering. It is very soft. The hardness extent of D _M class.			100				15.40	
18.0					sliding soil mass (mainly basalt and sometime contain limestone)	blackish grey	high	hard	moderately	12 - 22 cm	16.90-25.00m: sliding soil mass which moderate-weathered basalt and limestone in black gray in color. Rock fragment - short columnar core is entirely found. The hardness extent of C ₁ -C _M class. It sounds poor fozy when hammered lightly-blow to core. In particular, 19.75-20.20m and 20.85-22.40m depth: moderate weathering tuff. It is hard. The hardness extent of C ₁ -C _M class. 23.45-24.80m depth: Some tufficious rock fragments are partly found.			100					
19.0															90				
20.0														90					
21.0														90					
22.0														100					22.00
23.0														100					22.15
24.0														100					
25.0	1747.0	8.0	###											24.77m 8.Sep	100				Automatic watr level meter

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH28-31	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.06.450
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	6 Sep. to 7 Sep. 2010		Longitude	38.09.343
Surveyer	Shoji TSUCHIYAMA		Core appraiser	Shoji TSUCHIYAMA		Drilling operators	Getnet Kassaye
Elevation (m)	1778.0m		Depth (m)	25.0		Drilling rig, Engine, Pump	
Angle	Vertical	Direction	Gradient			Top200Rig, Crystensen, Duplex pump	
						Remarks	Installation of borehole inclinometer

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test							
1.0	1777.3	0.7	0.7		Top soil						Top soil (replaced by cement for drilling)		80												
2.0					colluvial deposit	slightly yellow brown - slightly white brown	very low	very soft	high-weathering	15 - 16 cm	0.70-14.00m: colluvial deposit contains high weathered limestone, siltstone and shale in slightly yellowish brown - slightly white brown in color. The matrix core become in sandy sedimentation, partly argillation by force of high weathering. 0.70-1.80m: high-weathering in core is distinguished, it can see rock structure remained. 1.50-2.00m: Some andesitic gravels in core are found, and hard in hardness. 4.55-4.80m: Some andesitic gravels in core are found, and hard in hardness. 4.80-4.90m: Some tufficious gravels in core are found, and hard in hardness. 5.70-5.80m: Some tufficious gravels in core are found, and hard in hardness. 6.25-6.35m: Some andesitic gravels in core are found, and hard in hardness. 7.00-7.40m: Some tufficious gravels in core are found, and hard in hardness. 8.80-12.75m: It is entirely composed of hard rock-fragment core. Partly, 10.10-10.35m, 10.55-10.70m and 11.15-11.30m: sandy gravels in core are composed.		80												
3.0																				80					
4.0																					80				
5.0																					80				
6.0																					90				
7.0																					90				
8.0																					100				
9.0																					100				
10.0																					90				
11.0																					100				
12.0																					90				
13.0																					90				13.20
14.0	1764.0	13.3	14.0																	100					labo 3
15.0					sliding soil mass (basaltic tuff-breccia)	black grey	relatively high	relatively hard	no weathering (fresh) - slightly weathering	13 - 32 cm	14.00-23.60m: sliding soil mass which composed by basaltic tuff-breccia in black grey in color. 14.00-14.60m: It is composed of long columnar core. It indicates the hardness extent of C ₄ class. It sounds clearly-metallic when hammered blow to core. 14.60-16.20m: It is composed of rock-fragment - short columnar core. The hardness extent of C ₆ class. In particular, 14.60-15.00m: sandy sediment - sandy gravels among gravels in core are found. 16.20-20.70m: It is dominantly composed of sandy sediment - sandy gravels. It can partly see argillation to core, and hard andesitic gravels in core are found. The hardness extent of D _r -D _H class. It is relatively soft. 20.70-23.60m: slightly weathered andesite in black grey in color. It is composed of rock-fragment - short columnar core. The hardness extent of C ₄ class. Rock fragments in hardness are hard. It sounds lightly-fozy when hammered blow to core.		100												
16.0																				100					
17.0																				100					
18.0																				100					
19.0																				100					
20.0																				100					
21.0																				100					21.00
22.0																				100					labo 1
23.0																				23.0m	100				
24.0	1754.4	9.6	23.6		limestone	greyish white	slightly low	slightly soft	slightly fresh	12 cm	23.60-25.00m: little weathered limestone in slightly white grey -greyish white in color. It is composed of rock fragment - short columnar core. The hardness extent of C ₄ class. It sounds poorly fozy when hammered light-blow to core. At 23.75-23.90m depth, the core is lightly weathered, and sandy sediment is composed.		100												
25.0	1753.0	1.4	25.0																	100	12	12		labo 2	
																Anchor of Borehole Inclinometer	25.00								

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH28-32	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.06.443
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration		Longitude	38.09.345	
Surveyer	Shoji TSUCHIYAMA		Core appraiser	Shoji TSUCHIYAMA		Drilling operators Getnet Kassaye	
Elevation (m)	1777.0m		Depth (m)	40.0		Drilling rig, Engine, Pump Top200Rig, Crystensen, Duplex pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole inclinometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test							
1.0	1776.3	0.7	0.7	X	top soil						0.00-0.70m: topsoil as cultivation impact, which is in slightly blackish brown. Some plant roots as organic matter are mixed. The tuffaceous and basaltic gravels in size are dominantly around 20-40 mm in diameter. Water content in core is low.		90												
2.0					colluvial deposit	blackish grey	low	soft			0.70-11.80m: colluvial deposit 0.70-2.45m: It is dominantly composed of basaltic gravels, which are around 20-40mm in diameter in size. The gravels in shape are dominantly sub-rounded - rounded. The gravels in hardness are hard. Blackish grey in color. 2.45-5.15m: It is dominantly composed of limestone gravels in greyish white in color. Silty -clayey soil in the matrix core is mixed. Sub-angular - angular Gravels in hardness are hard, and in size are around 30-60mm in diameter. 5.15-11.80m: It is dominantly composed of hard basalt. The gravels in size are around 30-60mm in diameter. sub-angular - angular gravels in shape. The core in color is blackish grey.		90												
3.0																			90						
4.0																				90					
5.0																				80					
6.0																				90					
7.0																				100					
8.0																				90					
9.0																				90					
10.0																				80					
11.0																				100					
12.0	1765.2	11.1	11.8		limestone	greyish white	high	hard	fresh	10 -22 cm	11.80-24.65m: It is composed of hard and fresh massive limestone. The gravels in size are around 10 -60 mm in diameter, in shape are sub-angular - angular, and in color are greyish white.		100												
13.0																				100					
14.0																				80	18	18			
15.0																				80					
16.0																				90					
17.0																				90					
18.0																				80					
19.0																				80	10	10			
20.0																				100	15	28			
21.0																				90	18	18			
22.0																				100	10	10			
23.0																				100	22	53			
24.0					anation	rey			/ fresh		24.65-40.00m: siltstone and limestone altanation in greenish grey - brownish grey in color. Thereamong, 24.65-32.05m: relatively weathered tuff in greenish grey - brownish grey in color. The dominant cracks by force of weathering are distinguished. Sandy sediment - rock fragment condition in core is found. It is relatively soft. The hardness extent of DH-CL class. Rock structure remainina is found. It is slightly		100	19	29										
25.0	1752.4	12.85	24.65																	100	15	38			
26.0																				100	22	33			
27.0																				100	20	20			
28.0																				100					
29.0																				100					
30.0																				100					

Drilling log

Name of Study : THE PROJECT FOR DEVELOPING COUNTERMEASURES AGAINST LANDSLIDES IN THE ABAY RIVER GORGE

Borehole name	BH28-41	Location	Around 1km from Goha Tsion, Abay Gorge area, National road 3			Latitude	10.06.477
Organization	Geological Survey of Ethiopia, JICA Study Team		Duration	27 Aug. to 1st Sep.2010		Longitude	38.09.365
Surveyer	Shoji TSUCHIYAMA		Core appraiser	Shoji TSUCHIYAMA		Drilling operators	Getnet Kassaye
Elevation (m)	1788.5m		Depth (m)	45.0		Drilling rig, Engine, Pump Top200Rig, Crystensen, Duplex pump	
Angle	Vertical	Direction	Gradient	Remarks		Installation of borehole extensometer	

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test					
1.0				X	embankment	blackish-brown	low	soft			0.00-5.30m: embankment. The matrix core is sandy clay in black-brown in color, which is mixed with some gravels. The gravels are dominantly composed of no weathered basalt and limestone in sub-angular and angular shape. The size of gravels is around 30-60 mm in diameter. The hardness of them is hard. The water content is entirely moderate.		40										
2.0																0.00-0.30m: topsoil with some plant roots as organic matters.		60					
3.0																		60					
4.0																		80					
5.0	1783.2	5.3	5.3															80					
6.0					sliding soil mass (limestone, siltstone and mudstone)	yellow-brown	low	soft			5.30-9.80m: sliding soil mass (and/or colluvial deposit). Sandy gravels in brownish-red and yellowish brown in color, which is mixed with clay. The gravels are sub-angular and angular and around 30-60mm in diameter in size, and geological composition is dominantly limestone, siltstone and sandstone. The hardness of them is hard. The water content of clay is low. The agglomeration degree is high.		100										
7.0																		100					
8.0																		100					
9.0																		100					
10.0			9.8															100					
11.0																		100					
12.0																		100					
13.0																		100					
14.0																		100					
15.0																		100					
16.0												100											
17.0												100											
18.0												100											
19.0												100											
20.0												100											
21.0												100											
22.0												100											
23.0												100											
24.0												100											
25.0												100											
26.0												100											
27.0												100											
28.0												100											
29.0												100											
30.0												100											

Drilling log

Scale (m)	Elevation (m)	Thickness (m)	Depth (m)	Column	Geology/ Soil	Colour	Relative density	Hardness	Weathering	Size	Geological logs	Groundwater level (m)	Core recovery (%)	Maximum length (cm)	Rock Quality Designation	SPT N value	In-site test	Laboratory test
31.0													100	13	13			
32.0													100	34	46			
33.0													100	12	12			
34.0													100	14	14			
35.0	1753.0	30.2	35.5										100	12	12			
36.0													100	20	30			
37.0					siltstone	yellow-grey	relatively-high	relatively-hard	relatively-weathering	26 -39 cm	35.50-38.55m: limy siltstone in slightly yellow grey in color. The hardness in core is hard. The hardness extent of C _u class. In particular, 36.50-36.55m, 36.70-36.80m, 37.00-37.10m, 37.60-37.80m, and 38.20-38.35m in depth, clayey property by force of high weathering are found. It is dominantly composed of rock fragment - short columnar core in brown and yellowish brown in color.		100	16	26			
38.0	1750.0	3.05	38.55										100	20	39			
39.0	1749.2	0.75	39.3		limestone	relatively-high	relatively-high	hard	slightly-weathering	23 cm	38.55-39.30m: limestone in slightly greyish white. Short - middle columnar core. The hardness extent of C _u C _u class indicates. In particular, at 38.85-39.00m in depth, rock fragment - clayey property by force of high weathering is		100	23	75			
40.0													100	27	67			
41.0													100	12	12			
42.0					shale	dark greenish grey	relatively-soft	relatively-soft	moderately	12 - 40 cm	39.30-45.00m: moderately weathered shale in dark greenish grey in color, (and it may be originally pyroclastic materials). 39.30-39.40m and 40.30-40.65m in depth: the core rock indicates rock fragment - angular property by force of high weathering. Clay in the matrix gravels in core is sparsely found. The hardness extent of C _u class in entire. 40.00-41.35m: Highly weathered basalt around cracks become brown in color.		100	13	47			
43.0													100	24	61			42.85
44.0													100	33	66			labo 1
45.0	1743.5	5.7	45.0										100	40	81			43.00
																	Anchor of Borehole extensometer	

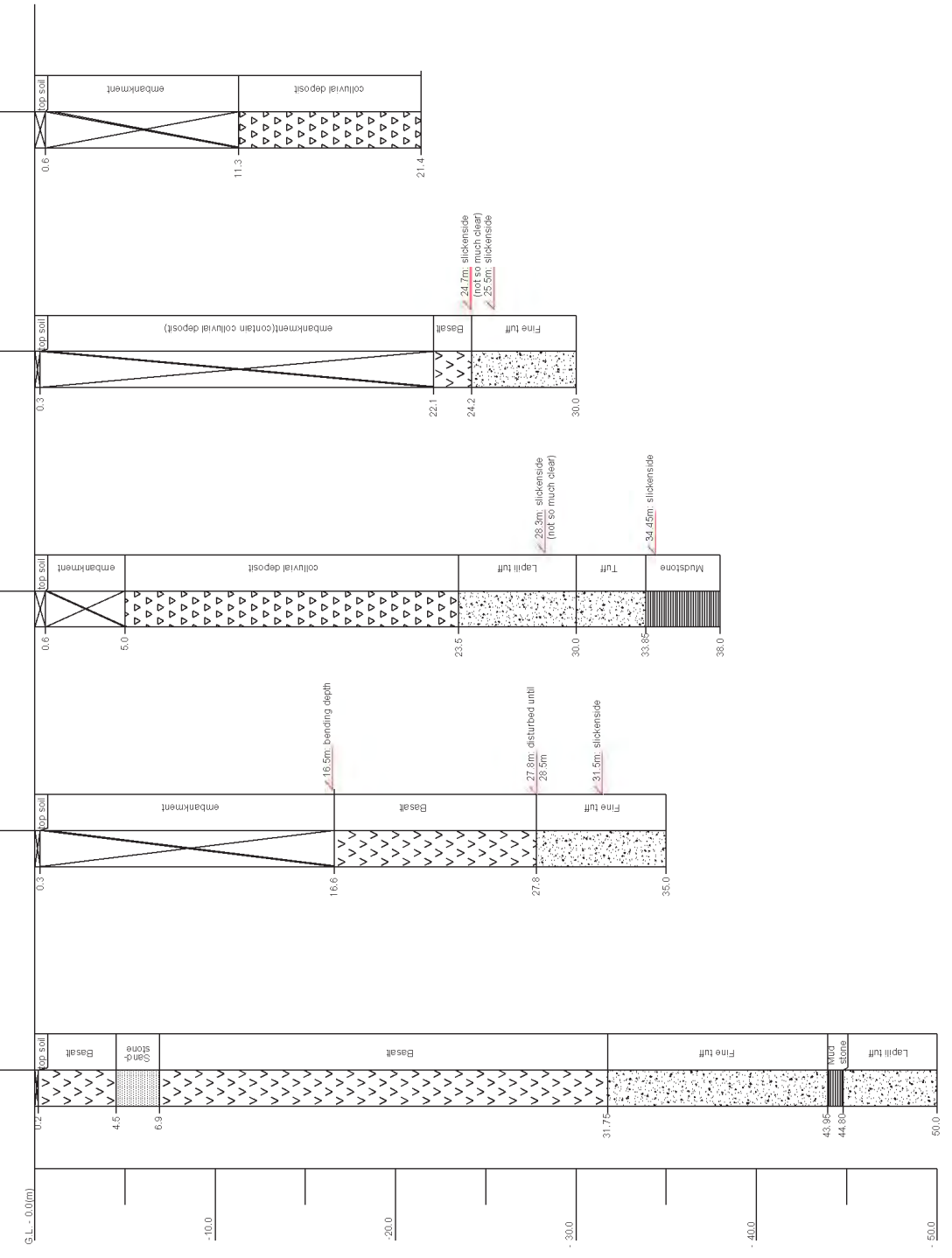
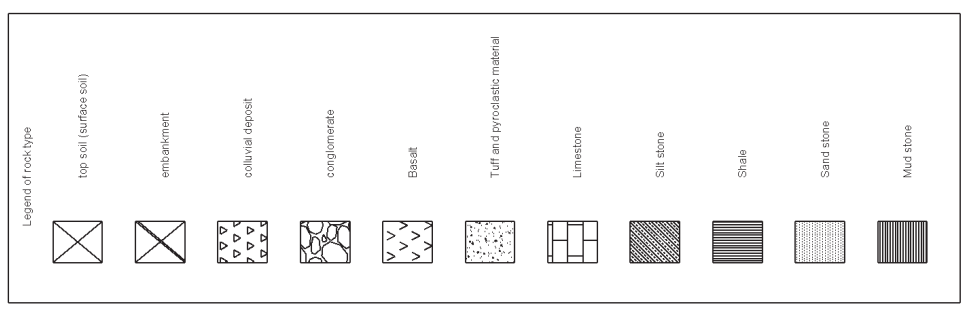
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 W.L.=

NO. B00-12
 Dep.=35.0m
 W.L.=

NO. B00-13
 Dep.=38.0m
 W.L.=

NO. B00-21
 Dep.=30.0m
 W.L.=

NO. B00-22
 Dep.=21.0m
 W.L.=



NO. B05-11
 Dep.=35.0m
 W.L.=

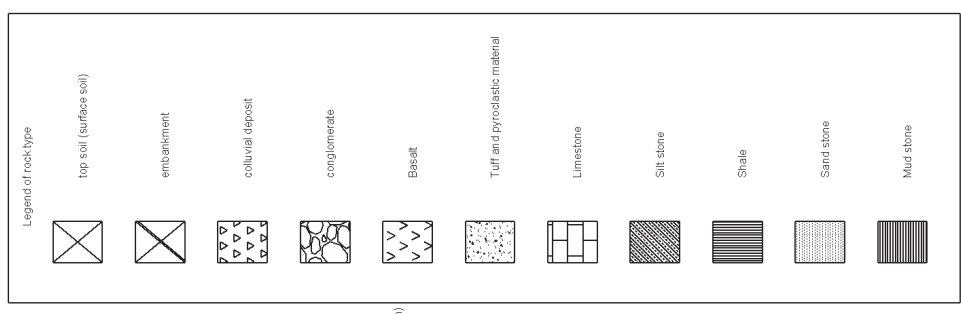
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 W.L.=

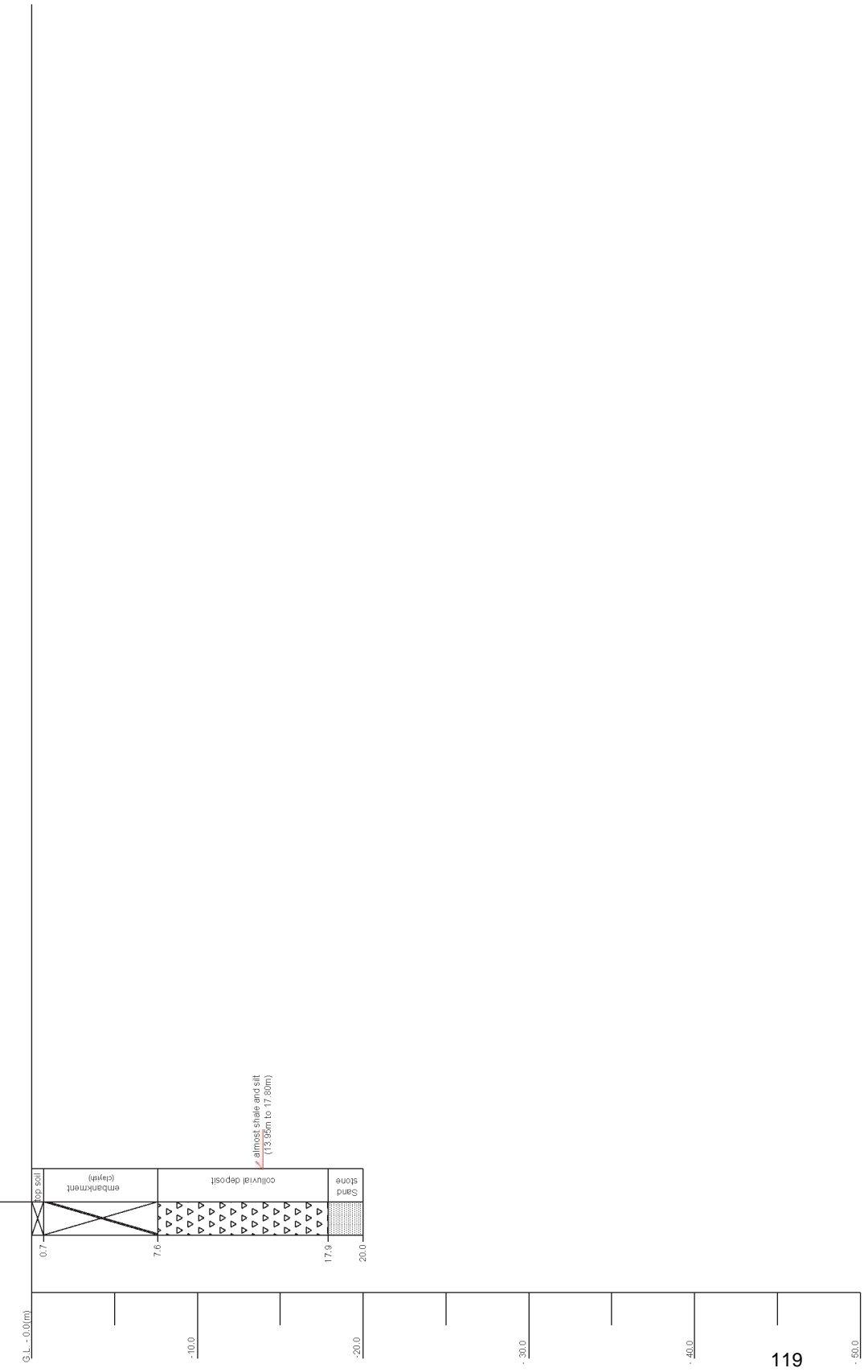
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 W.L.=

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 W.L.=

NO. B05-32
 Dep.=30.0m
 W.L.=



NO. B22-11
 Dep. = 20.0m
 W.L. =



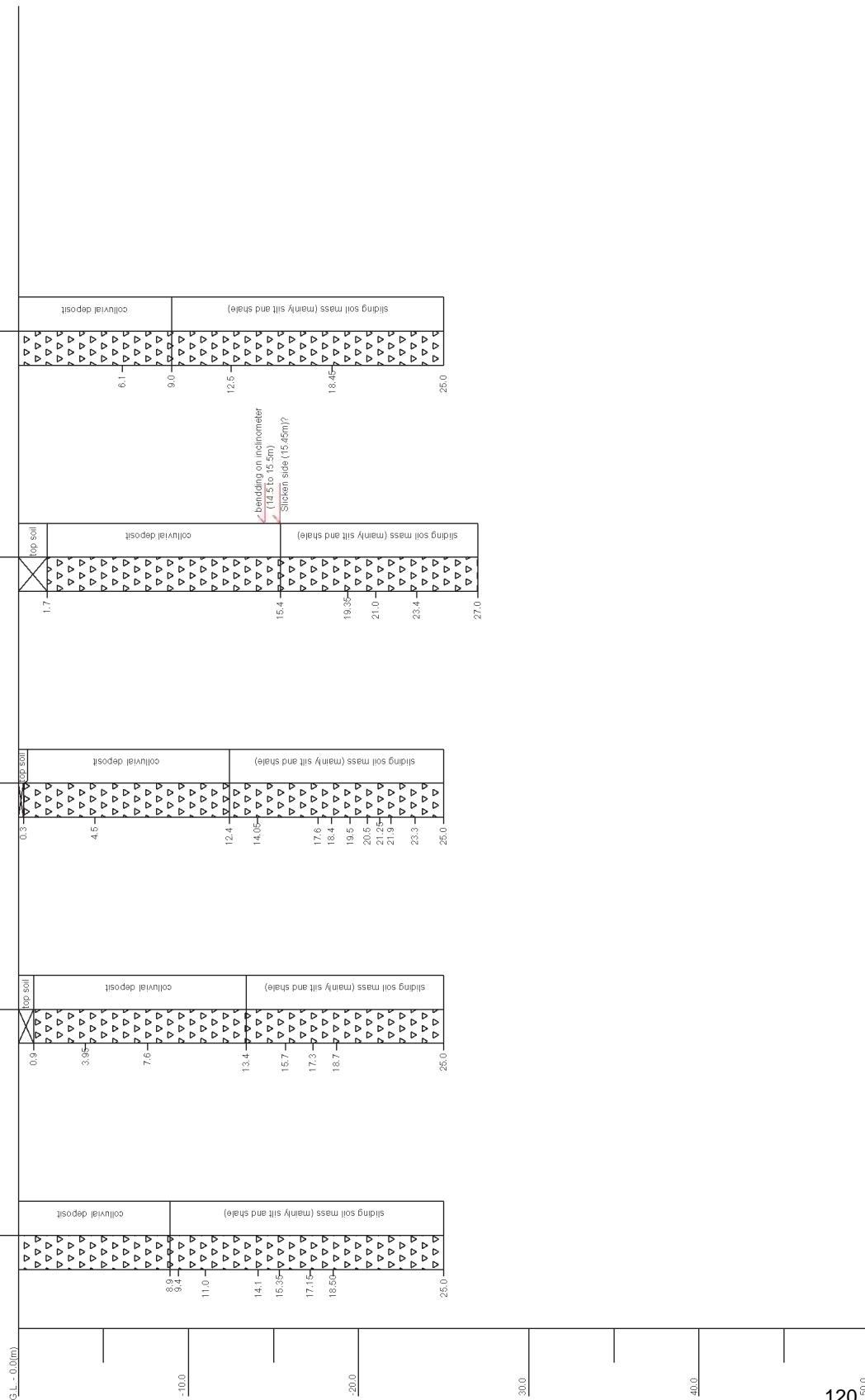
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NO. B27-12
 Dep.=25.0m
 W.L=-

NO. B27-21
 Dep.=25.0m
 W.L=-21.9 m

NO. B27-22
 Dep.=27.0m
 W.L=-

NO. B27-23
 Dep.=25.0m
 W.L=-



NO. B28-11
 Dep.=25.0m
 W.L.=

NO. B28-21
 Dep.=25.0m
 W.L.=20.0m

NO. B28-31
 Dep.=25.0m
 W.L.=23.0m

NO. B28-32
 Dep.=40.0m
 W.L.=35.3m

NO. B28-41
 Dep.=45.0m
 W.L.=27.4m

