Appendix 2

Survey Result of Slope Chart

Evaluation sheet (Slope failure/Rockfall)

Code no.	N 15_1
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34°27' 49.7"
	Longitude	E 73°19' 58.3"
Road name	N15	Km 28+400

Date	14-Dec-17
Inspector	Makoto Tokuda

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		
			2 correspondences		✓
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		
			a little marked		
			None		✓
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		
			a little marked		✓
			None		
	Structure	dip slope of bedding plane	It corresponds.		
			None		✓
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		
			None		✓
Surface codition	Topsoil, detached rock and unsteady rock		instability		
			a little unstable		✓
			stability		
	Spring water		notable spring waster		
			seepage		
			none		✓
	Surface condition		bare land with minor vagetation		
			intermediate (bare・grass・tree)		✓
			mainly structure, mainly tree		
Profile	Height (H), dip (i)		height	H≧50m	
				30≦H＜50m	✓
				15≦H＜30m	
				H＜15m	
			dip	i≧70°	
				45°≦i＜70°	
				i＜45°	✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		
			certain・unclarity		✓
			none		

[Disaster type]

Rock fall	
Slope failure	✓

[Main check object]

Cut slope	✓
Natural slope	

[Countermeasure]

Type of countermeasures	
Retaining wall	

Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	✓
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

60m(w)*20m(h)*1m(d)=1,200m3

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	✔

[Description]

Trace of the slope failure at the side of the stream. Retaining wall is constructed at the toe of the slope. However, the slope is covered with vegetation and seems stable.

Evaluation sheet (debris flow)

Code no.	N 1 5 _ 1
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34° 27' 49.7"
	Longitude	E 73° 19' 58.3"
Road Name	N 1 5	Km 2 8 + 4 0 0

Date	14-Dec-17
Inspector	Makoto Tokuda

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	✓
	steepest slope of river bed	40°or more	
		30° - 40°	
		less than 30°	✓
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	✓
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	✓
		less than 0.02km^2	
	artificial works that cause negative effects	certain	
		none	✓
	new crack and/or slope failure in stream	certain	
		none	✓
	traces of large slope failure in stream	certain	
		none	✓

[Road structure]

structure	category of score	Check
River width	10m or more	✓
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	✓
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	✓
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	✓

[Expected size of disaster] (width, length, depth, etc.)

100(l)*1(w)*1(d) = 100m^3

[Countermeasure]

Type of countermeasure		Check
Causeway, pipe culvert		
Effect of existing countermesure	none・low	✓
	moderate	
	high	
	enough	

[Hazard]

Hazard rank:	A: the possibility of debris flow is high	
	B: the possibility of debris flow is moderate	✔
	C: the possibility of debris flow is low/none	

[Description/comments]

Large boulders are deposited along the stream. However, the gradient of the river is low.The are 3 pipe culvert (Φ30cm) below the causeway though the causeway are the main channel to let the water flow to the valley side during the heavy rain.Optical fibre cable is buried 1m at the mountain side of the road.
There are car wash area at the causeway.

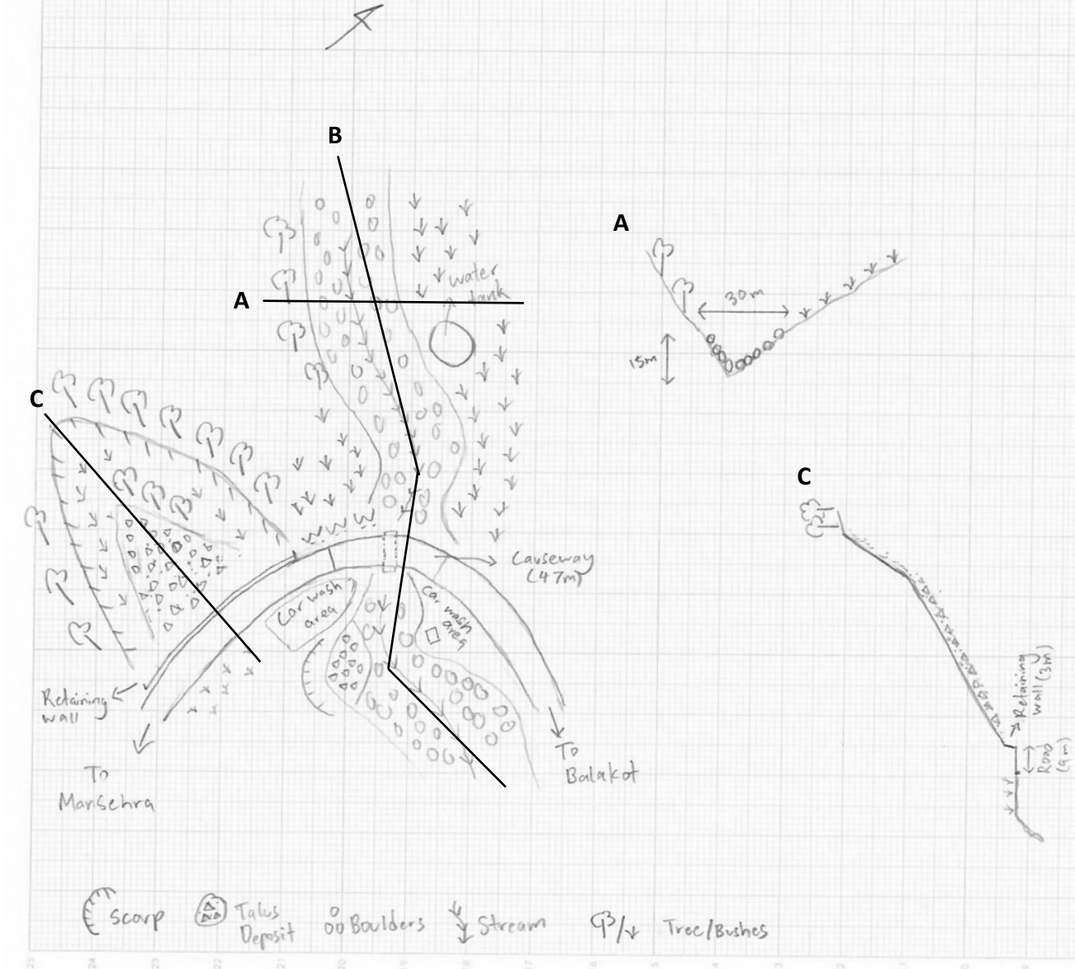
Sketch sheet

Code no.	N	1	5	_	1				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°27' 49.7"										
	Longitude	E 73°19' 58.3"										
Road Name	N	1	5		Km	2	8	+	4	0	0	

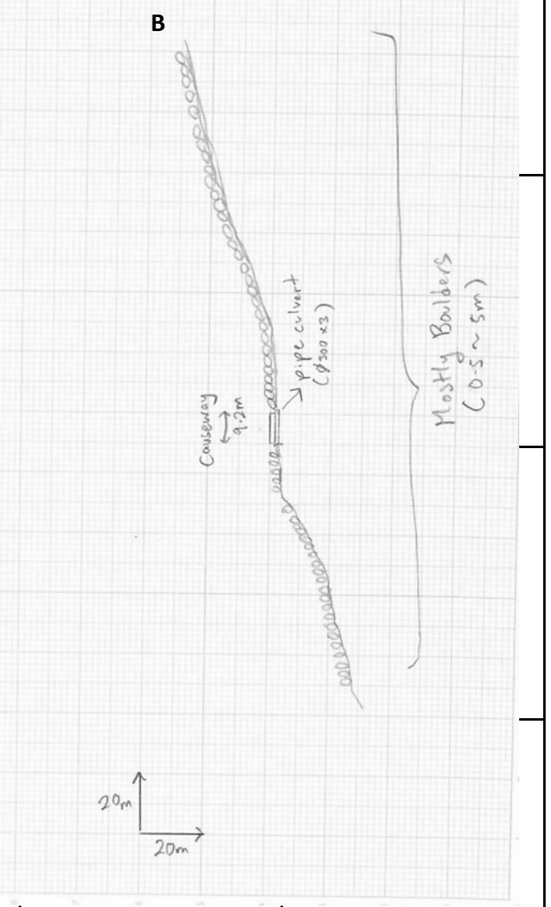
Date	14-Dec-17
Inspector	Makoto Tokuda

Plane view



Scale: ← ( ) m →

Cross sectional view



Scale: ← ( ) m →

Scale: ← ( ) m →

Code no.	N	1	5	_	1				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Photo sheet

Coordinates	Latitude	N 34°27' 49.7"
	Longitude	E 73°19' 58.3"

Road Name	N	1	5		Km	2	8	+	4	0	0	

Date	14-Dec-17
Inspector	Makoto Tokuda

Mountain side: Large boulders are deposited on the mountain side.

Valley side: Large boulders are deposited on the valley side.

Road condition: The causeway is installed crossing the stream.

Existing countermeasures : Three pipe culvert are installed under the causeway.

Existing anomalies: Some trace of the slope failure was observed on the valley side of the road.

Others: Trace of the slope failure at the side of the stream. Retaining wall is constructed at the toe of the slope. However, the slope is covered with vegetation and seems stable.

Evaluation sheet (Slope failure/Rockfall)

Code no.	N 1 5 _ 2
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34° 33' 15.3"
	Longitude	E 73° 21' 22.9"
Road name	N 1 5	Km 4 1 + 7 0 0

Date	14-Dec-17
Inspector	Makoto Tokuda

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		
			2 correspondences		✓
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		
			a little marked		✓
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		
			a little marked		✓
			None		
	Structure	dip slope of bedding plane	It corresponds.		
			None		✓
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		
			None		✓
Surface codition	Topsoil, detached rock and unsteady rock		instability		
			a little unstable		
			stability		✓
	Spring water		notable spring waster		
			seepage		
			none		✓
	Surface condition		bare land with minor vagetation		
			intermediate (bare・grass・tree)		
			mainly structure, mainly tree		✓
Profile	Height (H), dip (i)		H≧50m	height	✓
			30≦H＜50m	height	
			15≦H＜30m	height	
			H＜15m	height	
			i≧70°	dip	
			45°≦i＜70°	dip	
			i＜45°	dip	✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		✓
			certain・unclarity		
			none		

[Disaster type]

Rock fall	
Slope failure	✓

[Main check object]

Cut slope	✓
Natural slope	

[Countermeasure]

Type of countermeasures	
None	

Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	✓
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

40m(w)*20m(h)*1m(d)=800m^3

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	✔

[Description]

Scarp can be observed on the top of the slope. Road subsidence (30m) was confirmed on the valley side of the road though the cause are unknown. However, no disaster were recorded in recent years. Weathered metamorphic rocks is distributed around the slope. A restaurant was constructed six months ago on the toe of the slope.Optical fibre cable is buried 1m at the mountain side of the road.

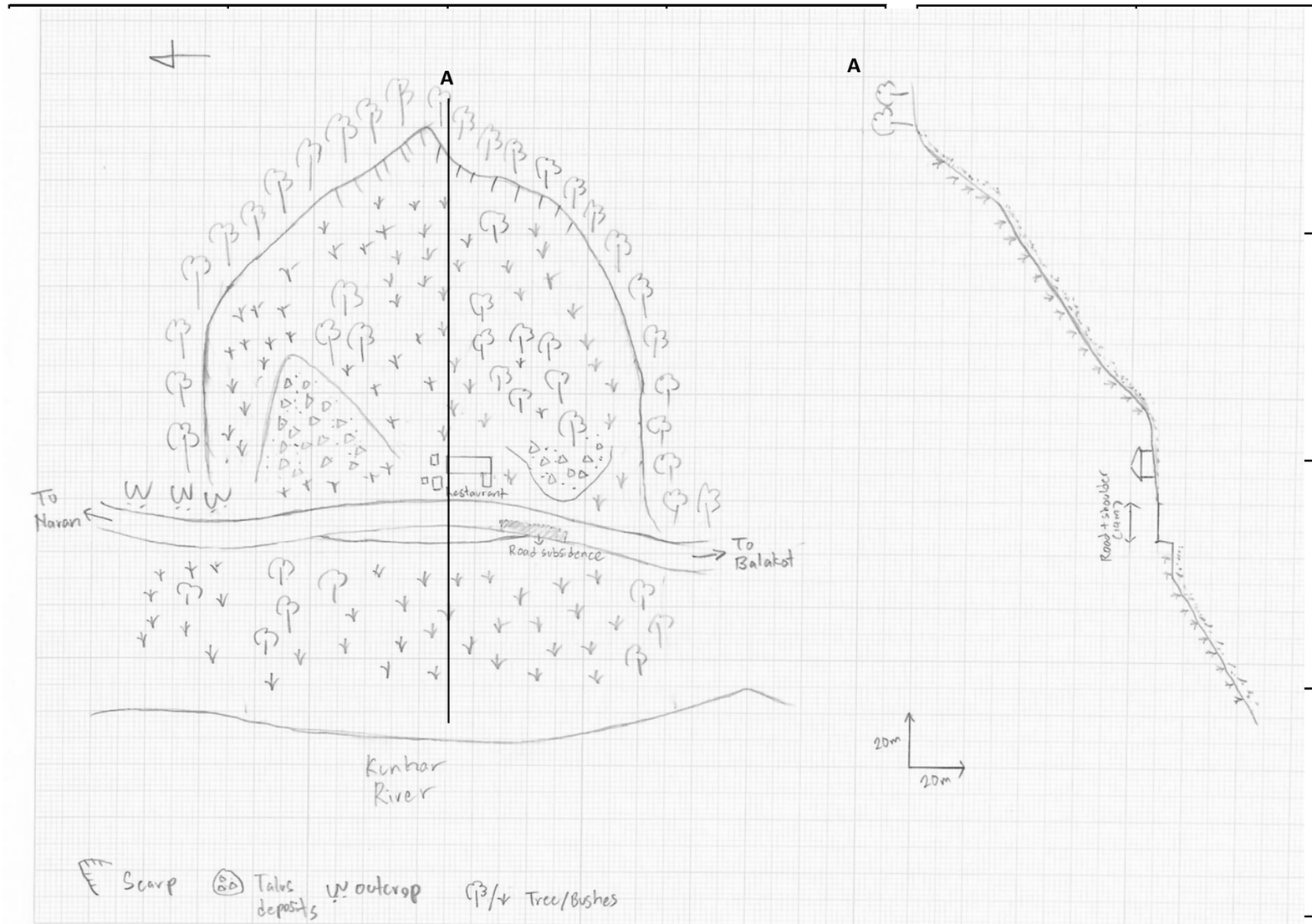
Sketch sheet

Code no.	N	1	5	_	2	0	0	0	
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°33' 15.3"										
	Longitude	E 73°21' 22.9"										
Road Name	N	1	5		Km	4	1	+	7	0	0	

Date	14-Dec-17
Inspector	Makoto Tokuda

Plane view



Cross sectional view

Scale: ← ( ) m →

Scale: ← ( ) m →

Scale: ← ( ) m →

Code no.	N	1	5	_	2	0	0	0	
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Photo sheet

Coordinates	Latitude	N 34°33' 15.3"
	Longitude	E 73°21' 22.9"
Road Name	N 1 5	Km 4 1 + 7 0 0

Date	14-Dec-17
Inspector	Makoto Tokuda

Mountain side: Scarp can be observed on the upper part of the slope. The slope is covered by tree and bushes.

Valley side: The valley is covered by tree and bushes.

Road condition: Partial of the road were replaced due to subsidence.

Existing anomalies: Cracks (20cm) was confirmed on the replaced portion of the road.

Existing countermeasures: The waterway is filled mostly by the talus.

Others: A restaurant was constructed six months ago at the toe of the slope.

Evaluation sheet (Slope failure/Rockfall)

Code no.	N 1 5 _ 3
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34° 39' 27"
	Longitude	E 73° 30' 4.2"
Road name	N 1 5	Km 7 2 + 3 0 0

Date	14-Dec-17
Inspector	Makoto Tokuda

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		✓
			2 correspondences		
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		✓
			a little marked		
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		
			a little marked		✓
			None		
	Structure	dip slope of bedding plane	It corresponds.		✓
			None		
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		✓
			None		
Surface codition	Topsoil, detached rock and unsteady rock		instability		✓
			a little unstable		
			stability		
	Spring water		notable spring waster		
			seepage		
			none		✓
	Surface condition		bare land with minor vagetation		✓
			intermediate (bare・grass・tree)		
			mainly structure, mainly tree		
Profile	Height (H), dip (i)		H≧50m	height	✓
			30≦H＜50m	height	
			15≦H＜30m	height	
			H＜15m	height	
			i≧70°	dip	
			45°≦i＜70°	dip	
			i＜45°	dip	✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		✓
			certain・unclarity		
			none		

[Disaster type]

Rock fall	
Slope failure	✓

[Main check object]

Cut slope	✓
Natural slope	

[Countermeasure]

Type of countermeasures
Retaining wall

Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

400m(w)*300m(h)*1m(d)=120,000m^3

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	✓
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	

[Description]

The massive slope failure was triggered by the earthquake on 2013. Actual road is still buried 5m under the talus deposit. The removal of the talus deposit is still ongoing though it the work has to be done carefully as the small surface failure is continuouly occuring at the site. Outcrop (quartzite, shale) can be observed from the scarp of the slope. By pass road were constructed on the opposite of the river though the long-sized truck has a difficulty due to road allignment. Optical fibre cable is buried at the mountain side of the bypass road.

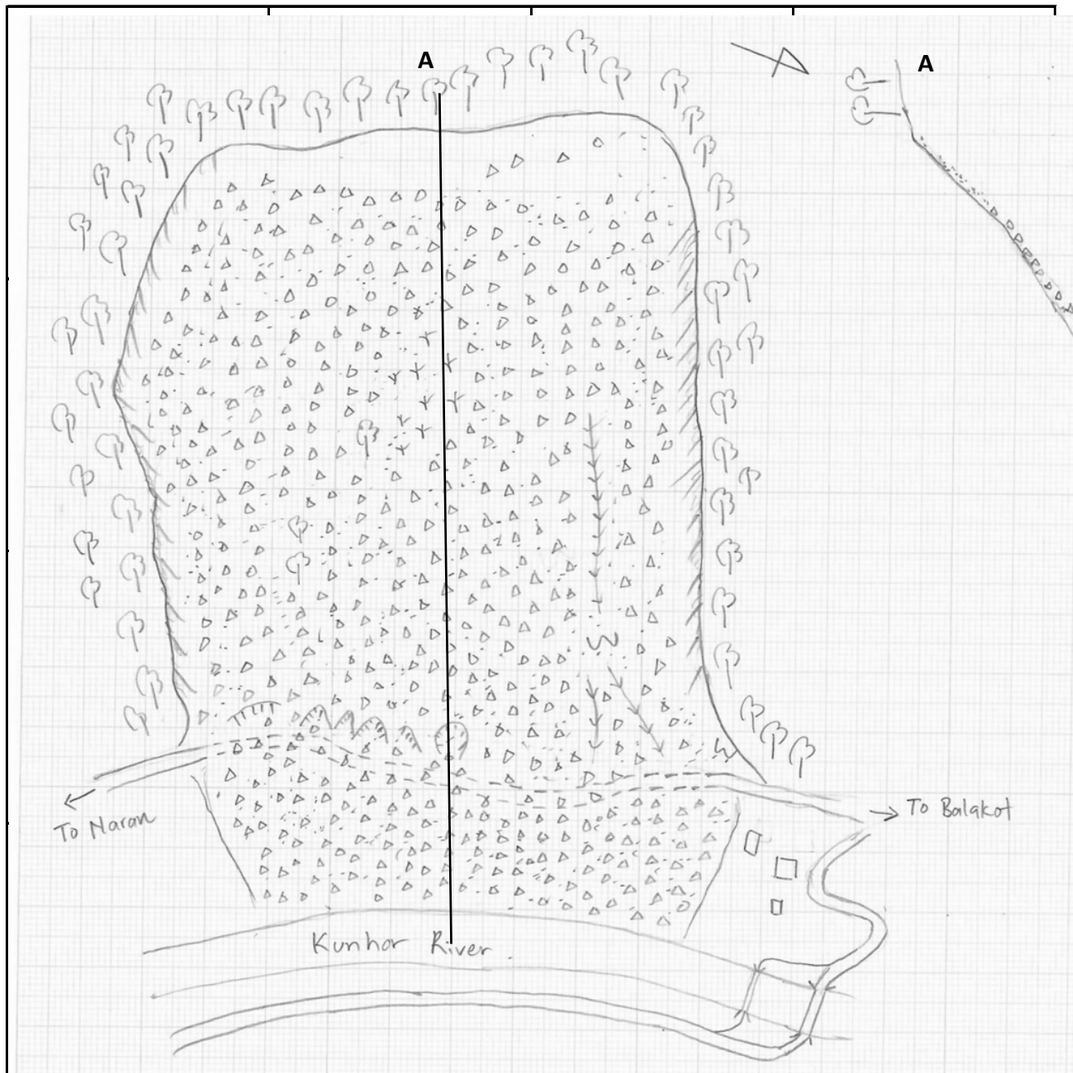
Sketch sheet

Code no.	N	1	5	_	3				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

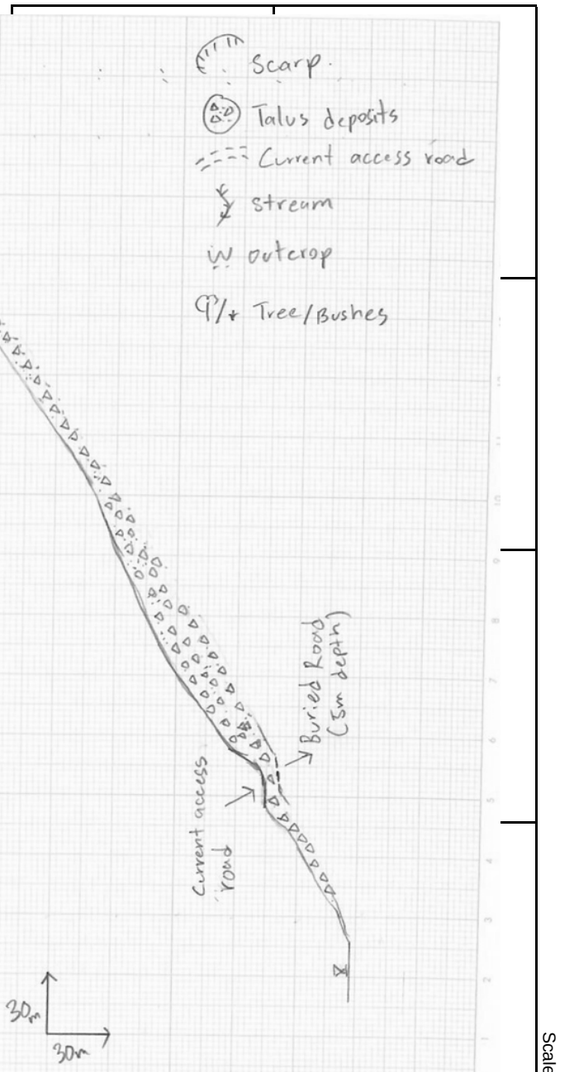
Coordinates	Latitude	N 34°39' 27"										
	Longitude	E 73°30' 4.2"										
Road Name	N	1	5		Km	7	2	+	3	0	0	

Date	14-Dec-17
Inspector	Makoto Tokuda

Plane view



Cross sectional view



Scale: ← ( ) m →

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Scale: ← ( ) m →

Photo sheet

Code no.	N	1	5	_	3				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°39' 27"										
	Longitude	E 73°30' 4.2"										
Road Name	N	1	5		Km	7	2	+	3	0	0	

Date	14-Dec-17
Inspector	Makoto Tokuda

Overall view of the slope from the opposite site of the river. Talus deposited on whole surface of the slope failure area.

Valley side: Talus deposits can be observed on the valley side of the slope.

Road condition: Existing road is still buried 5m under the talus deposits.

Existing countermeasures: Temporary access road used for the long-sized truck which cannot pass the road alignment on the bypass road.

Existing countermeasures: Bailey bridge is used as temporary on the bypass road.

Mountain side: Talus deposits can be observed throughout the slope.

Code no.	N	1	5	_	4					
Region Office	Abbottabad									
Maintenance Unit	Balakot									

Evaluation sheet (Slope failure/Rockfall)

Date	13-Dec-17
Inspector	Makoto Tokuda

Coordinates	Latitude	N 34° 41' 1.6"
	Longitude	E 73° 34' 12.2"
Road name	N 15	Km 81+400

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		
			2 correspondences		✓
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		✓
			a little marked		
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		
			a little marked		✓
			None		
	Structure	dip slope of bedding plane	It corresponds.		
			None		✓
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		
			None		✓
Surface codition	Topsoil, detached rock and unsteady rock		instability		
			a little unstable		✓
			stability		
	Spring water		notable spring waster		
			seepage		
			none		✓
	Surface condition		bare land with minor vagetation		✓
			intermediate (bare・grass・tree)		
			mainly structure, mainly tree		
Profile	Height (H), dip (i)		height	H≧50m	✓
				30≦H＜50m	
				15≦H＜30m	
				H＜15m	
			dip	i≧70°	
				45°≦i＜70°	
				i＜45°	✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		✓
			certain・unclarity		
			none		

[Disaster type]

Rock fall	✓
Slope failure	✓

[Main check object]

Cut slope	✓
Natural slope	

[Countermeasure]

Type of countermeasures
Retainiing wall, water canal

Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	✓
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

100m(w)*50m(h)*0.5m(d)=2,500m^3
Maximum rock fall size=3m*1m*1m=3m^3

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	
	B: the possibility of collapse/fall is moderate	✔
	C: the possibility of collapse/fall is low/none	

[Description]

There is disaster recorded in the past and continuous surface failure is expected due to surface erosion. Metamorphosed slate was observed at the site. Optical fibre cable is buried 1m at the mountain side of the road.

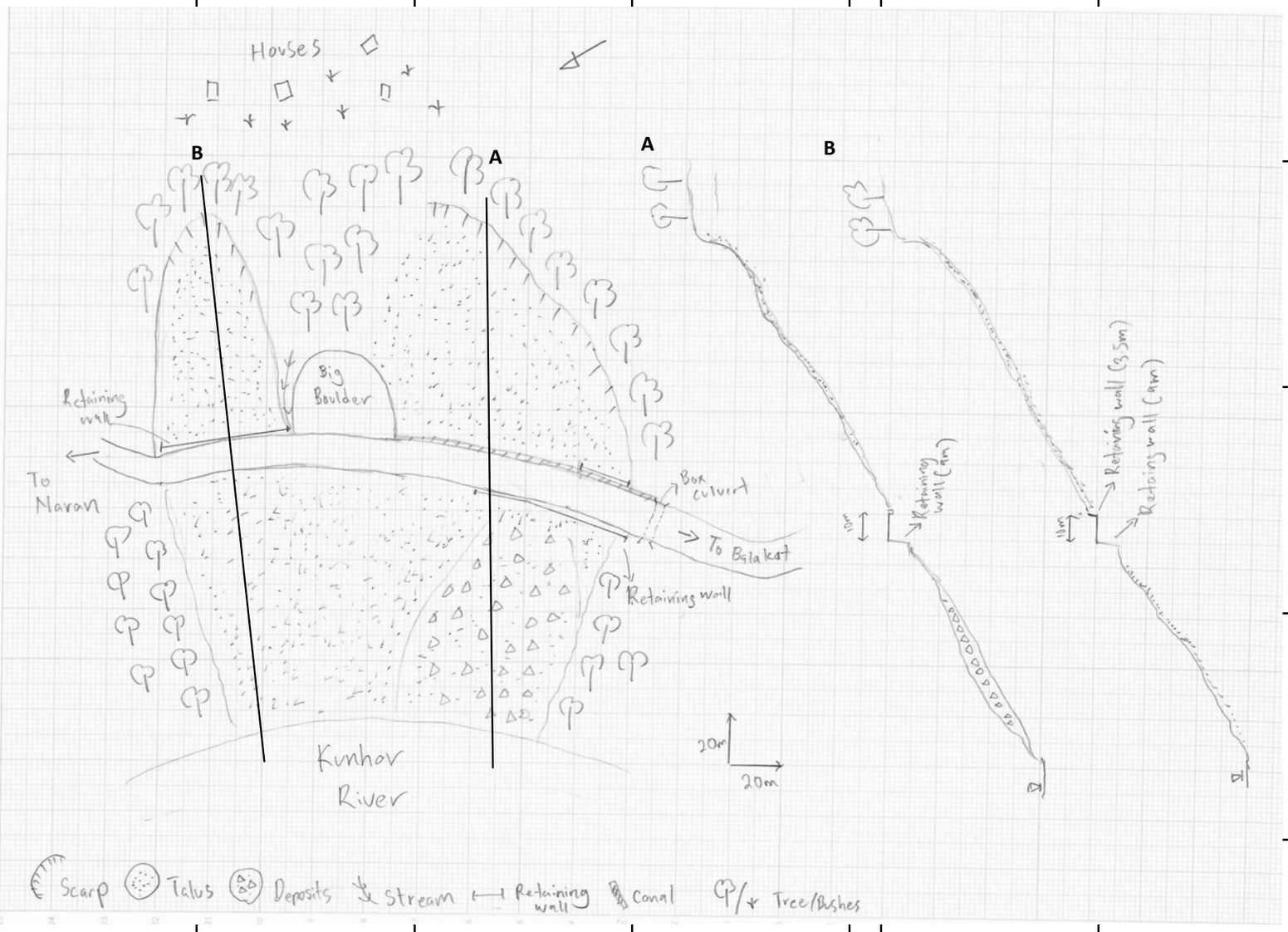
Sketch sheet

Code no.	N	1	5	_	4				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°41' 1.6"										
	Longitude	E 73°34' 12.2"										
Road Name	N	1	5		Km	8	1	+	4	0	0	

Date	13-Dec-17
Inspector	Makoto Tokuda

Plane view



Scale: ← ( ) m →

Cross sectional view

Scale: ← ( ) m →

Code no.	N	1	5	_	4				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Photo sheet

Coordinates	Latitude	N 34°41' 1.6"										
	Longitude	E 73°34' 12.2"										
Road Name	N	1	5		Km	8	1	+	4	0	0	

Date	13-Dec-17
Inspector	Makoto Tokuda

Mountain side: The mountain side is covered mostly by the talus

Valley side: The valley side is covered mostly by the talus and several rocks

Road condition: road ditch is covered by debris

Existing countermeasures: Retaining walls are constructed partially on the mountain side. They are partially damaged by the slide

Part of the slope is highly eroded and shows multiple gullies

The outcrop that can be seen in the top part of the slope seems highly weathered

Evaluation sheet (debris flow)

Code no.	N 1 5 _ 5
Region Office	Abbottabad
Maintenance Unit	Balakot

Date	13-Dec-17
Inspector	Makoto Tokuda

Coordinates	Latitude	N 34° 43' 34.1"
	Longitude	E 73° 33' 36.4"
Road Name	N 1 5	Km 8 6 + 4 0 0

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	✓
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	✓
		30° - 40°	
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	
		0.08km^2 - 0.20km^2	✓
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	✓
		0.02km^2 - 20km^2	
		less than 0.02km^2	
	artificial works that cause negative effects	certain	
		none	✓
	new crack and/or slope failure in stream	certain	
		none	✓
	traces of large slope failure in stream	certain	
		none	✓

[Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	✓
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	✓
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	✓

[Expected size of disaster] (width, length, depth, etc.)

200m(l)*3m(w)*2(d)=1,200m^3

[Countermeasure]

Type of countermeasure		Check
Retaining Wall		
Effect of existing countermesure	none・low	
	moderate	✓
	high	
	enough	

[Hazard]

Hazard rank:	A: the possibility of debris flow is high	✓
	B: the possibility of debris flow is moderate	
	C: the possibility of debris flow is low/none	

[Description/comments]

Continuous debris flow is reported in this site. According to the disaster record, the debris could cover 100m along the road.
Also, extra precaution shall be given for the big boulders located near the exit of the stream on the mountain side. Optical fibre cable is buried 1m at the mountain side of the road.

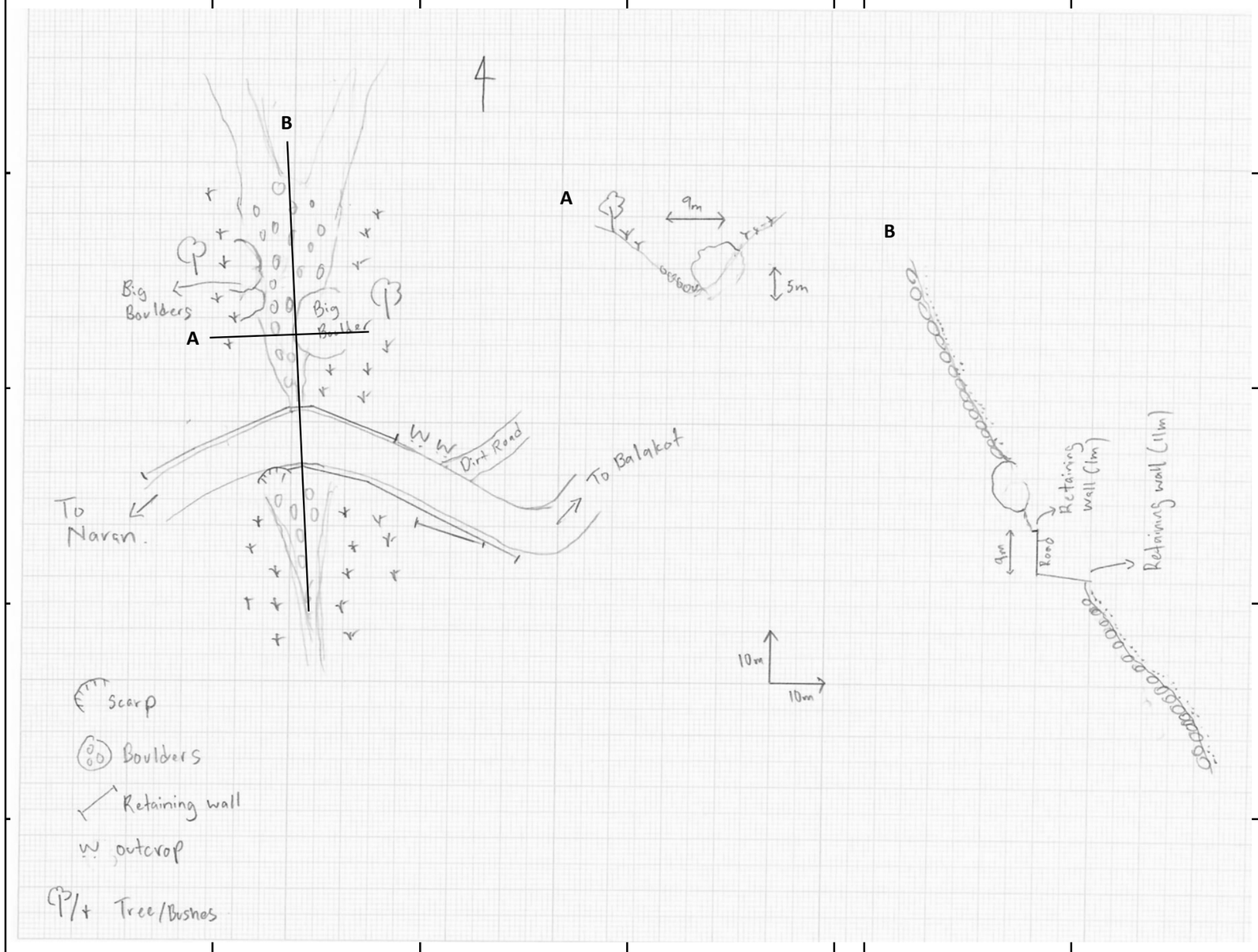
Sketch sheet

Code no.	N	1	5	_	5				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°43' 34.1"										
	Longitude	E 73°33' 36.4"										
Road Name	N	1	5		Km	8	6	+	4	0	0	

Date	13-Dec-17
Inspector	Makoto Tokuda

Plane view



Scale: ← ( ) m →

Cross sectional view

Scale: ← ( ) m →

Photo sheet

Code no.	N	1	5	_	5				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°43' 34.1''										
	Longitude	E 73°33' 36.4''										
Road Name	N	1	5		Km	8	6	+	4	0	0	

Date	13-Dec-17
Inspector	Makoto Tokuda

Mountain side: Big boulders (2~5m) can be observed at the exit of the stream on the mountain side.

Valley side: The starting point of the stream on the valley side are narrow. Boulders can be observed on the valley side.

Road condition: there is mud and debris on the road and the road surface is damaged considerably

Existing countermeasures / anomalies: small damage (2m) of the retaining wall on the shoulder of the road (valley side) due to the debris flow.

Existing countermeasures / anomalies: The exit of the retaining wall on the mountain side was re-shaped to allow the debris flow. However, this is resulting a steeper angle of the stream. The thickness of the sediment in the stream bed is around 2m

Possible countermeasures: a bridge can be constructed in the valley side of the road avoiding the debris flow stream.

Evaluation sheet (Slope failure/Rockfall)

Code no.	N 1 5 _ 6
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34° 45' 30.6"
	Longitude	E 73° 31' 37.3"
Road name	N 1 5	Km 9 6 + 5 0 0

Date	12-Dec-17
Inspector	Makoto Tokuda

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		
			2 correspondences		✓
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		✓
			a little marked		
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		
			a little marked		✓
			None		
	Structure	dip slope of bedding plane	It corresponds.		
			None		✓
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		✓
			None		
Surface codition	Topsoil, detached rock and unsteady rock		instability		✓
			a little unstable		
			stability		
	Spring water		notable spring waster		✓
			seepage		
			none		
	Surface condition		bare land with minor vagetation		✓
			intermediate (bare・grass・tree)		
			mainly structure, mainly tree		
Profile	Height (H), dip (i)		height	H≧50m	✓
				30≦H＜50m	
				15≦H＜30m	
				H＜15m	
			dip	i≧70°	
				45°≦i＜70°	✓
				i＜45°	
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		✓
			certain・unclarity		
			none		

[Disaster type]

Rock fall	✓
Slope failure	✓

[Main check object]

Cut slope	✓
Natural slope	

[Countermeasure]

Type of countermeasures
Retaining walls, Gabions

Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

50m(w)*100m(h)*2m(d)=10,000m3
Max Rockfall size=2m*1m*1m=2m3

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	✓
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	

[Description]

The surface failures is causing the damages on the retaining wall. There are several unstable big boulders hanging on the mountain side which needs to be removed. The surface of the slope collapse after every removal of the debris (deposit).
Spring water can be seen in multiple spots.
Cracks, road subsidence and cavity under the road has been confirmed at starting point (from Balakot) of the slope. Optical fibre cable is buried 1m at the mountain side of the road.

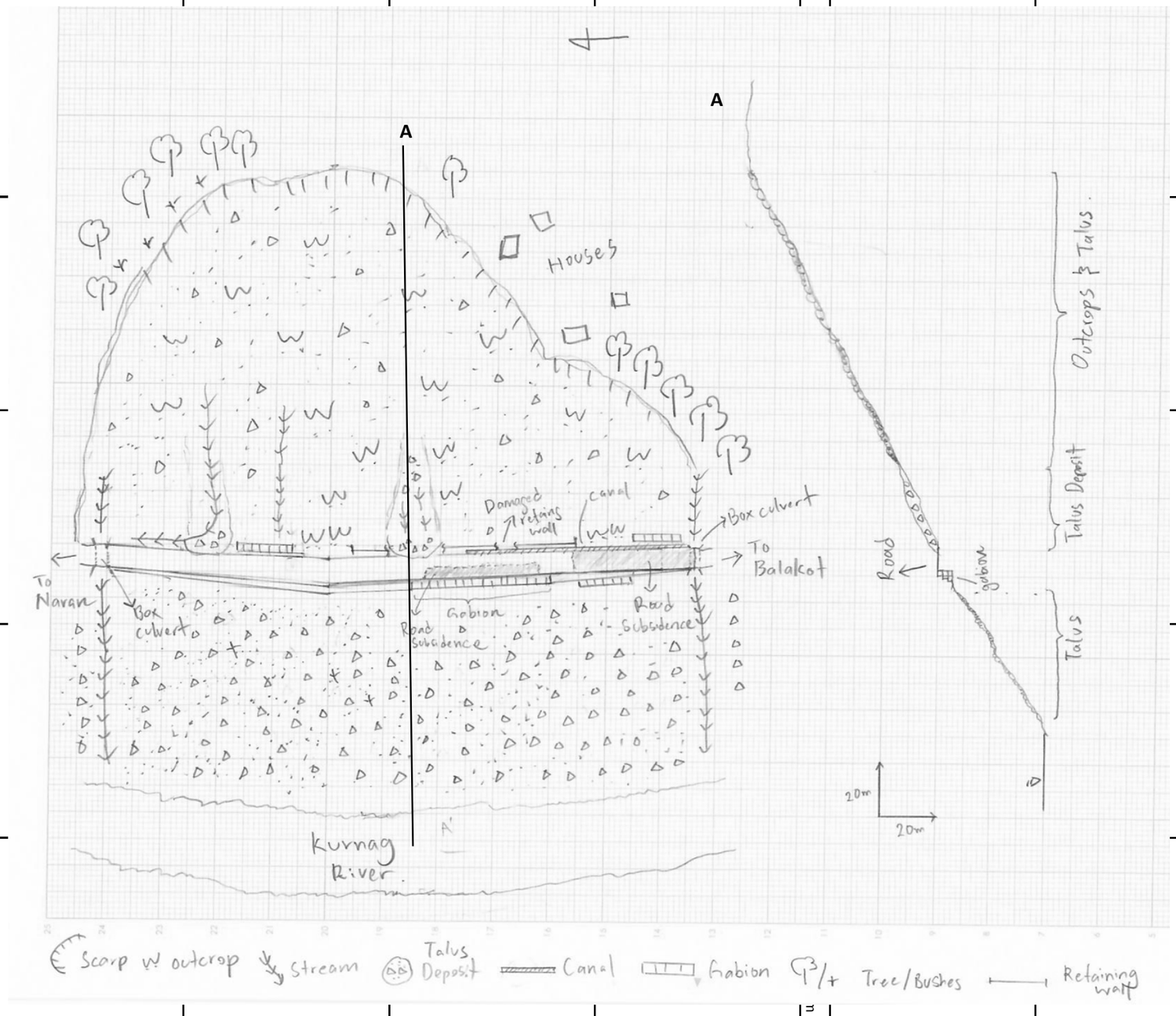
Sketch sheet

Code no.	N	1	5	_	6				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°45' 30.6"										
	Longitude	E 73°31' 37.3"										
Road Name	N	1	5		Km	9	6	+	5	0	0	

Date	12-Dec-17
Inspector	Makoto Tokuda

Plane view



Scale: ← ( ) m →

Cross sectional view

Scale: ← ( ) m →

Scale: ← ( ) m →

Photo sheet

Code no.	N	1	5	_	6				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°45' 30.6"										
	Longitude	E 73°31' 37.3"										
Road Name	N	1	5		Km	9	6	+	5	0	0	

Date	12-Dec-17
Inspector	Makoto Tokuda

Mountain side: Talus deposit, boulders and outcrop can be observed on mountain side.

Valley side: Mostly talus deposit can be observed in the valley side.

Road condition: Two area of the road subsidence was confirmed. There might be a cavity underneath the road.

Existing countermeasures / anomalies: Several damages on the gabions was confirmed due to overload of the deposit.

Existing countermeasures / anomalies: The slope failure is causing rocks on the road.

Existing countermeasures / anomalies: Some part of the water canal are filled with the debris.

Evaluation sheet (debris flow)

Code no.	N 1 5 _ 7
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34° 46' 45.5"
	Longitude	E 73° 31' 25.4"
Road Name	N 1 5	Km 9 9 + 9 0 0

Date	12-Dec-17
Inspector	Makoto Tokuda

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	
		0.15km^2 - 0.50km^2	✓
		less than 0.15km^2	
	steepest slope of river bed	40°or more	
		30° - 40°	
		less than 30°	✓
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	✓
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	✓
		0.02km^2 - 20km^2	
		less than 0.02km^2	
	artificial works that cause negative effects	certain	
		none	✓
	new crack and/or slope failure in stream	certain	
		none	✓
	traces of large slope failure in stream	certain	
		none	✓

[Road structure]

structure	category of score	Check
River width	10m or more	✓
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	
	1m - 2m	✓
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	✓

[Potencial disaster mode]

	Check
Damage of bridge/culvert	✓
Outflow of embankment	
Debris flooding on the road	

[Expected size of disaster] (width, length, depth, etc.)

Not expected

[Countermeasure]

Type of countermeasure		Check
Retaining wall		
Effect of existing countermesure	none・low	
	moderate	✓
	high	
	enough	

[Hazard]

Hazard rank:	A: the possibility of debris flow is high	
	B: the possibility of debris flow is moderate	
	C: the possibility of debris flow is low/none	✔

[Description/comments]

The stream is passing a populated area of the Kaghan city.There are boulders and surface waters at the bottom of the stream.The bailey bridge is constructed crossing the stream.The bridge seems have enough capacity for debris flows at present.Optical fibre cable is buried 1m at the mountain side of the road.

Sketch sheet

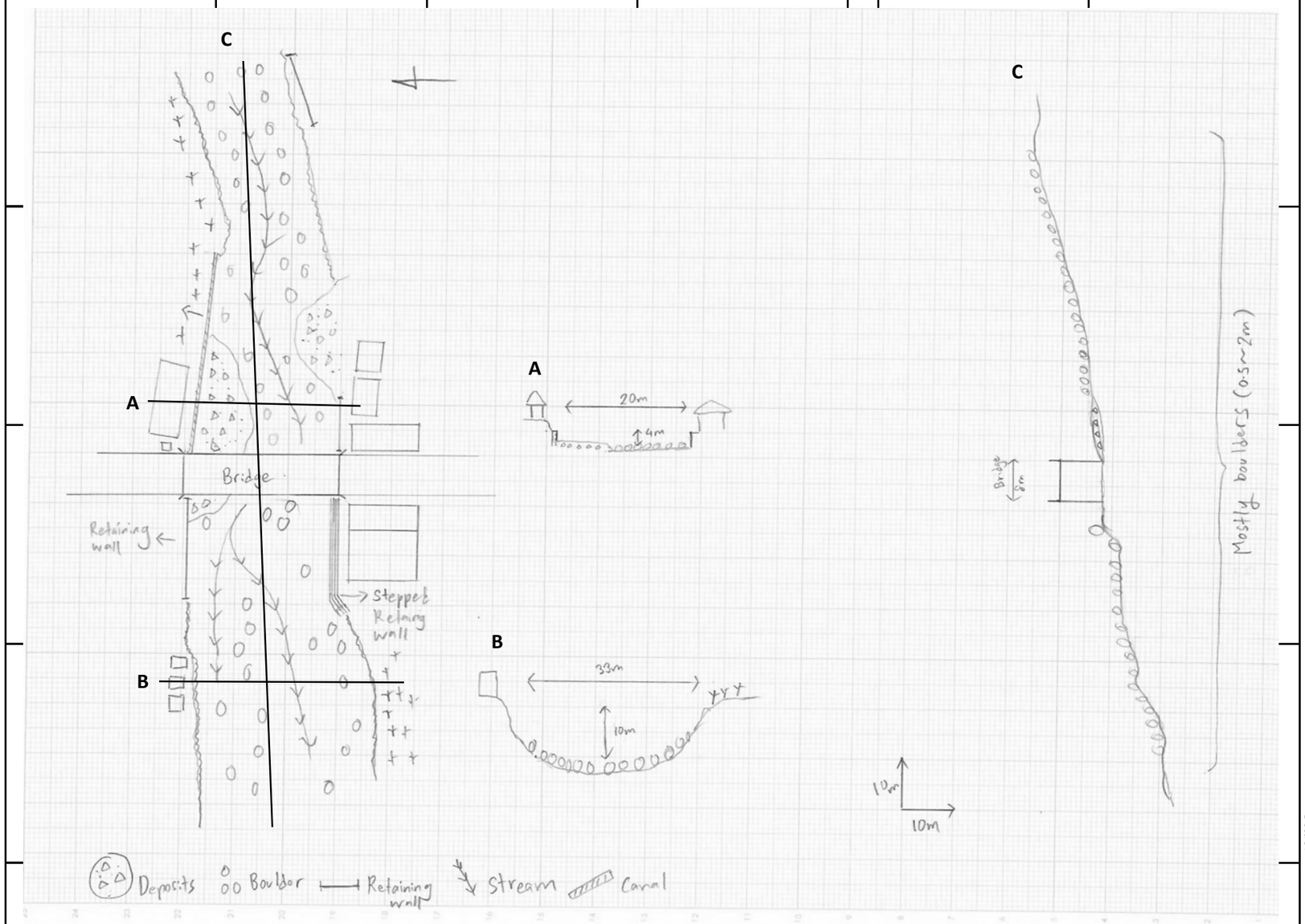
Code no.	N	1	5	_	7				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°46' 45.5"
	Longitude	E 73°31' 25.4"

Road Name	N	1	5		Km	9	9	+	9	0	0	

Date	12-Dec-17
Inspector	Makoto Tokuda

Plane view



Scale: ← ( ) m →

Cross sectional view

Scale: ← ( ) m →

Code no.	N	1	5	_	7				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Photo sheet

Coordinates	Latitude	N 34°46' 45.5''
	Longitude	E 73°31' 25.4''

Road Name	N	1	5		Km	9	9	+	9	0	0	

Date	12-Dec-17
Inspector	Makoto Tokuda

Mountain side: Boulders and debris deposited along the gentle angle of the stream.

Valley side: Boulders and debris deposited along the gentle angle of the stream. The width of the river is wider on the valley side.

Road condition: No anomalies was confirmed on the road (bailey bridge)

Existing countermeasures: The height of the bridge from the stream bed seems have enough capacity for debris flows at present.

Existing countermeasures: Retaining wall is constructed on the both side of the bridge to protect the bank erosion.

Photo

Existing countermeasures / anomalies:

Evaluation sheet (Slope failure/Rockfall)

Code no.	N 1 5 _ 8
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34° 51' 18.4"
	Longitude	E 73° 35' 44.4"
Road Name	N 1 5	Km 1 0 8

Date	9-Apr-18
Inspector	Wakita

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		
			2 correspondences		✓
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		
			a little marked		✓
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		✓
			a little marked		
			None		
	Structure	dip slope of bedding plane	It corresponds.		
			None		✓
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		✓
			None		
Surface condition		Topsoil, detached rock and unsteady rock	instability		✓
			a little unstable		
			stability		
		Spring water	notable spring waster		
			seepage		✓
			none		
		Surface condition	bare land with minor vegetation		✓
			intermediate (bare・grass・tree)		
			mainly structure, mainly tree		
Profile		Height (H), dip (i)	height	H≧50m	✓
				30≦H＜50m	
				15≦H＜30m	
				H＜15m	
			dip	i≧70°	✓
				45°≦i＜70°	
				i＜45°	
Anomaly		Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	2 or more correspondences・clarity		✓
			certain・unclarity		
			none		

[Disaster type]

Rock fall	✓
Slope failure	

[Main check object]

Cut slope	
Natural slope	✓

[Countermeasure]

Type of countermeasures	
Retaining walls (h=2m), Gabions	
Effectiveness of existing countermeasures	**Check**
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✔
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✔
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

Maximum rock fall size: 2m × 2m × 2m=8m

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	✓
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	

[Description]

A vertical rock wall of approximately 250 m produces rock falls towards the road. Terrain of the area is cup-shaped valley, which means that the fallen rocks would be gathered into the valley and reach the road.
There are records that large fallen rocks happened and were obstacles to the road traffic.
The retaining wall has no effect as a countermeasure for rock falls.
The possibility of rock fall is very high.

Sketch sheet

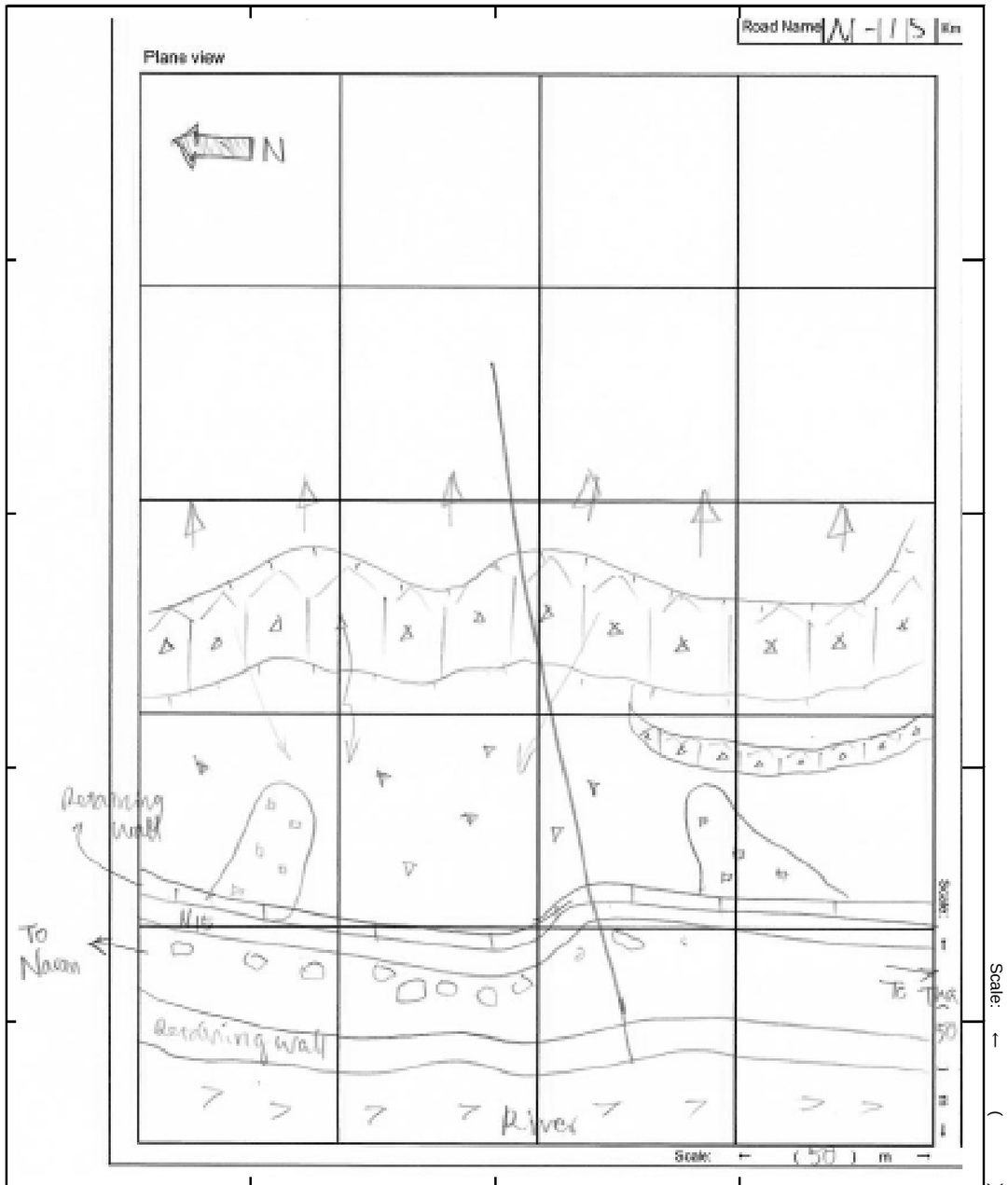
Code no.	N	1	5	_	8				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°51' 18.4"
	Longitude	E 73°35' 44.4"

Road Name	N	1	5		Km	1	0	8				

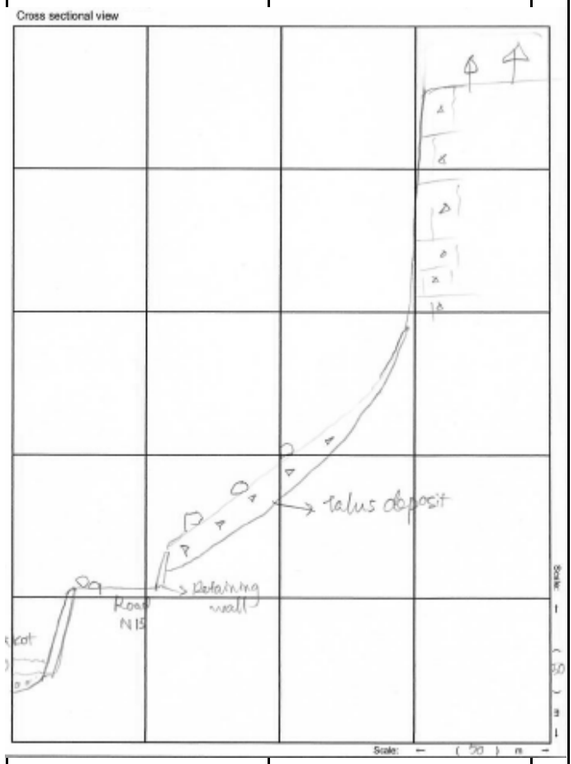
Date	9-Apr-18
Inspector	Wakita

Plane view



Scale: ← ( ) m →

Cross sectional view



Scale: ← ( ) m →

Photo sheet

Code no.	N	1	5	_	8				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°51' 18.4"										
	Longitude	E 73°35' 44.4"										
Road Name	N	1	5		Km	1	0	8				

Date	9-Apr-18
Inspector	Wakita

A vertical rock wall of approximately 250 m produces rock falls towards the road. The retaining wall has no effect as a countermeasure for rock falls

Fallen rocks that have not reached the road but may collapse and fall again can be identified throughout the slope

The vertical rock wall that produces the falls seems to have significant fractures

There is eveidence of rock falls in the past that have been pushed to the valley side to clear the road

The biggest fallen rock identified (2m*1m*1m) has been pushed to the road side

The rock falls cause damage on the road bed forming pot holes

Evaluation sheet (Slope failure/Rockfall)

Code no.	N 1 5 _ 9
Region Office	Abbottabad
Maintenance Unit	Balakot

Coordinates	Latitude	N 34° 51' 47.98''
	Longitude	E 73° 36' 11.83''
Road name	N 1 5	Km 1 1 0

Date	9-Apr-18
Inspector	Wakita

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		✓
			2 correspondences		
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		
			a little marked		
			None		✓
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		✓
			a little marked		
			None		
	Structure	dip slope of bedding plane	It corresponds.		
			None		✓
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		✓
			None		
Surface condition		Topsoil, detached rock and unsteady rock	instability		✓
			a little unstable		
			stability		
		Spring water	notable spring waster		
			seepage		✓
			none		
		Surface condition	bare land with minor vegetation		✓
			intermediate (bare･grass･tree)		
			mainly structure, mainly tree		
Profile		Height (H), dip (i)	H≧50m	height	✓
			30≦H＜50m	height	
			15≦H＜30m	height	
			H＜15m	height	
			i≧70°	dip	✓
			45°≦i＜70°	dip	
			i＜45°	dip	
Anomaly		Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	2 or more correspondences･clarity		✓
			certain･unclarity		
			none		

[Disaster type]

Rock fall	✓
Slope failure	✓

[Main check object]

Cut slope	
Natural slope	

[Countermeasure]

Type of countermeasures
Retaining wall

Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✔
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✔
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

120m(L) × 100m(W) × 1m(D) = 12,000m^3
including 2m × 2m × 2m rock

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	✓
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	

[Description]

Base rock is highly weathered and fractured rock, which is distirubuted in the area. It would be black muddy schists.
The base rock is susceptible to erosion and less strength with water. Accoding to NHA, slope failure happens and reached to the road every day, and is remarkable after rainfall especially. The retaining wall is NOT enogh to protect the road from the failure.
The possibility of failure/fall is very high.

Sketch sheet

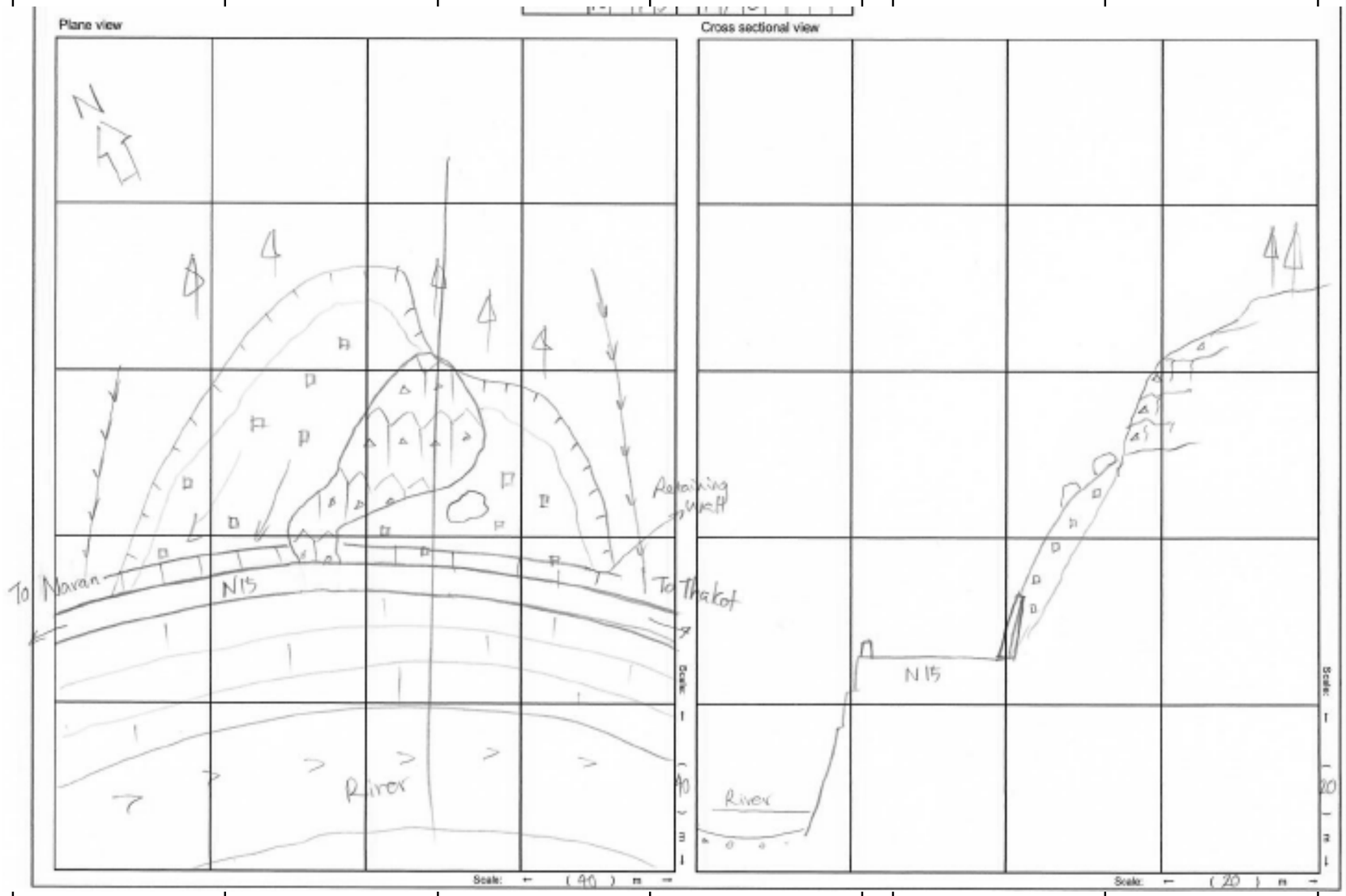
Code no.	N	1	5	_	9				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°51' 47.98"										
	Longitude	E 73°36' 11.83"										
Road Name	N	1	5		Km	1	1	0				

Date	9-Apr-18
Inspector	Wakita

Plane view

Cross sectional view



Scale: ← ( ) m →

Scale: ← ( ) m →

Photo sheet

Code no.	N	1	5	_	9				
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°51' 47.98"										
	Longitude	E 73°36' 11.83"										
Road Name	N	1	5		Km	1	1	0				

Date	9-Apr-18
Inspector	Wakita

Overall view of the slope. The debris produced from the highly weathered base rock is collapsing and affecting the road.

The valley side of the road is located in the outer curve of a river but it is protected by a concrete wall

The debris and rocks detached from the highly weathered base rock surpass the retaining wall and fall on top of the road

Condition of the road: the road needs to be cleared regularly due to constant collapse of the slope. The debris are removed to the valley side of the road.

Outcrops of the base rock can be identified throughout the slope. The outcrops are highly weathered and fractured.

In some sections the retaining wall is damaged and the debris reach the road directly.

Evaluation sheet (debris flow)

Code no.	N 1 5 _ 1 0
Region Office	Abbottabad
Maintenance Unit	Balakot

Date	9-Apr-18
Inspector	Wakita

Coordinates	Latitude	N 34° 52' 10.32"
	Longitude	E 73° 36' 41.52"
Road Name	N 1 5	Km 1 1 5

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	✓
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	✓
		30° - 40°	
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	✓
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	✓
		0.02km^2 - 20km^2	
		less than 0.02km^2	
	artificial works that cause negative effects	certain	
		none	✔
	new crack and/or slope failure in stream	certain	✓
		none	
	traces of large slope failure in stream	certain	✓
		none	

[Road structure]

structure	category of score	Check
River width	10m or more	✔
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	✔
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potential disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	✓

[Expected size of disaster] (width, length, depth, etc.)

200m(L) × 4m(W) × 2m(D) = 1,600m^3
including 4m × 4m × 2m rock

[Countermeasure]

Type of countermeasure		Check
No coutnermeasure		
Effect of existing countermeasure	none･low	✔
	moderate	
	high	
	enough	

[Hazard]

Hazard rank:	A: the possibility of debris flow is high	✓
	B: the possibility of debris flow is moderate	
	C: the possibility of debris flow is low/none	

[Description/comments]

The river crosses on the road. In winter season, glacial mass from the upper side of the river moves downward and covers the road.
Debris, sand and rocks, which could be debris flow, are filled on the river. Surface water and debris are continuously flowed out to the road, especially in snow melting season. There is no countermeasures for the debris flow.
The possibility of debris flow is high.

Sketch sheet

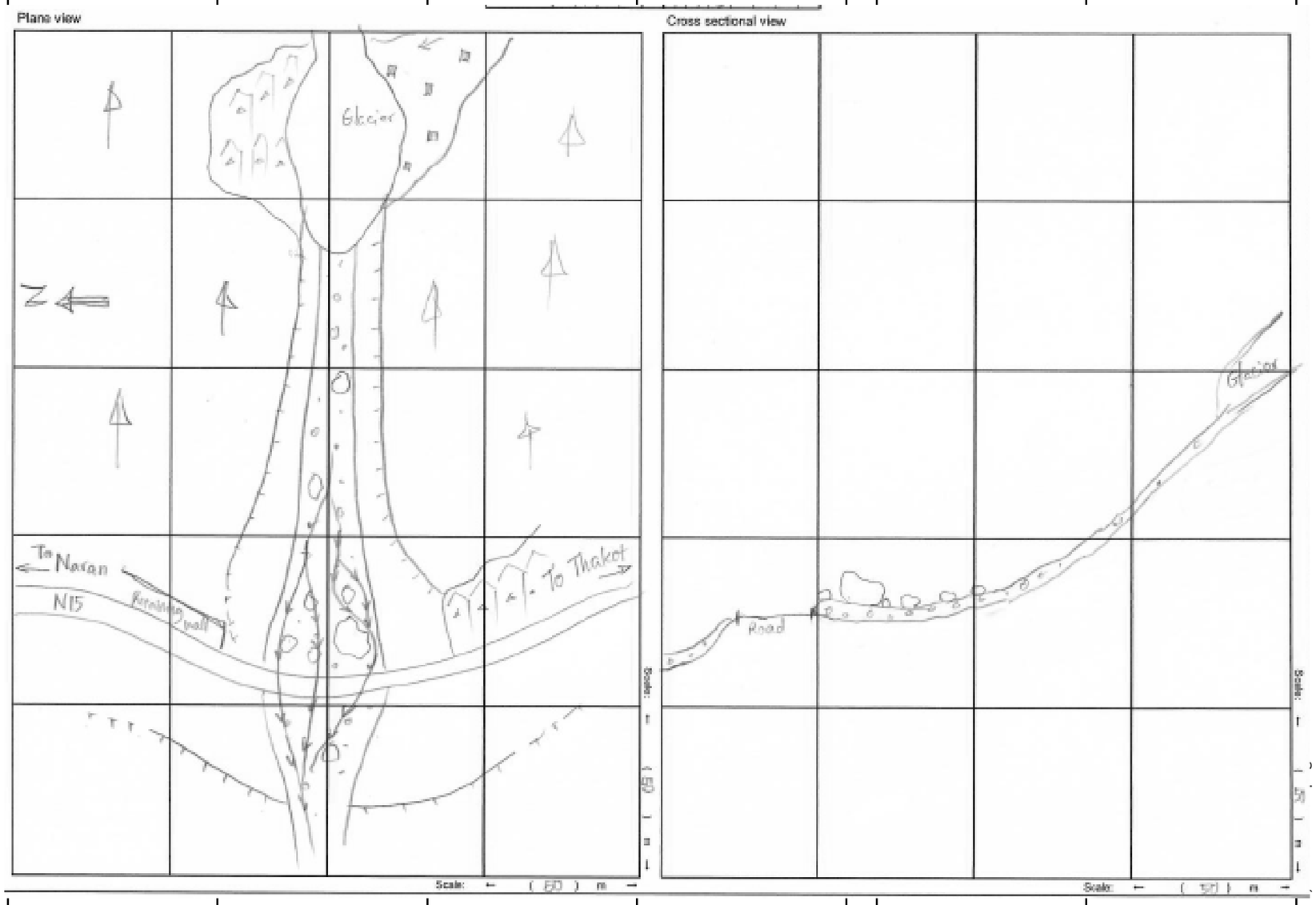
Code no.	N	1	5	_	1	0			
Region Office	Abbottabad								
Maintenance Unit	Balakot								

Coordinates	Latitude	N 34°52' 10.32"										
	Longitude	E 73°36' 41.52"										
Road Name	N	1	5		Km	1	1	5	0	0	0	

Date	9-Apr-18
Inspector	Wakita

Plane view

Cross sectional view



Scale: ← ( ) m →

Scale: ← ( ) m →

Photo sheet

Code no.	N	1	5	_	1	0				
Region Office	Abbottabad									
Maintenance Unit	Balakot									

Coordinates	Latitude	N 34°52' 10.32"										
	Longitude	E 73°36' 41.52"										
Road Name	N	1	5		Km	1	1	5	0	0	0	

Date	9-Apr-18
Inspector	Wakita

Overall view of the debris flow affecting the road

Valley side: debris flow deposits head towards the river. The geomorphology on which it lays is an alluvial fan

The mountainside of the road is full of debris flow deposits and a glacier can be seen at the end of the valley

There is a big collapsed slope in the water catchment area

Big sized boulders (5m*8m*3m) can be seen on the stream bed. The Sides of the stream are completely bare and highly erodable

The road is flooded and partially covered by debris

Evaluation sheet (landslide)

Code no.	Sat	_	N	1	5	_	4	
Region Office								
Maintenance Unit								

Coordinates	Latitude	34° 55' 43.4"
	Longitude	73° 40' 51.4"
Road Name		Km

Date	2018/6/19
Inspector	Basharat, Yasir, Sajid, Shafiq

[Main body of landslide]

Mountain side	
Valley side	√
Both	

[Causes]

Category			Check
Topographical factor	Result of photo interpretation	exist clearly	√
		exist but partial and not clear	
		exist but not clear	
	Surface anomalies	large and new cracks, steps and subsidence	
		small and old cracks, steps and subsidence	√
		slight deformation	
		no anomalies	
Geological conditions	Geological structure	fault, fracture zone	
		dip slope	
		undip slope/ no characteristic feature	√
	Main rock formation of landslide body	metamorphic rock (schist, quartzite, phyllite etc.)	√
		sedimentary rock (sandstone, limestone etc.)	
		igneous rock (granite etc.)	√
		quaternary deposit (colluvial deposit etc.)	
	Hydrological feature	much springs / much seepage	√
		little springs /little seepage	
		trace of water	
		no water observed	

[History]

category			Check
Records of Landslide	Existing record (documents or patrimony)	obvious	√
		slight	
		none	
	Damage on road facilities and houses	obvious	√
		slight	
		none	

[Countermeasure]

Category		Check	Type of countermeasure
There is no countermeasure			Retaining Wall has been constructed
Effectiveness of countermeasure	No effect	√	
	Some effect		
	High effect		

[Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	(1)	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

[Expected size of disaster](width, length, depth, etc.)

L= 300m , W= 500m , D= 40 m

[Description]

This landslide is located along N-15, about 3 km away from the Naran town. It is an old rotational landslide which has been reactivated due to road construction and rainfall. The upper part of the landslide is stable with vegetation cover, however, the landslide is active at the toe. Thick forest is also present on the left side of the slide. Due to re-activation of this slide about 100 meters road has been affected. Above the road the landslide scarp is clearly visible. Many detached boulders are hanging on the landslide scarp that can damage the road and the continuity of traffic. The boulders comprising of granite and schist ranges between 1-3 m3 size was present. A retaining wall above 2 m height has been constructed to protect the road from the slide material. However, the central part of this retaining wall has been damaged due to the reactivation of the slide material. Presently, there is no high risk to damage the road, however, in the future if the whole mass of the landslide body will move, lead to the damage and block the road for the continuity of traffic. For mitigation purpose, a retaining wall with a height of 5 meters has been suggested with proper drainage control.

Sketch sheet

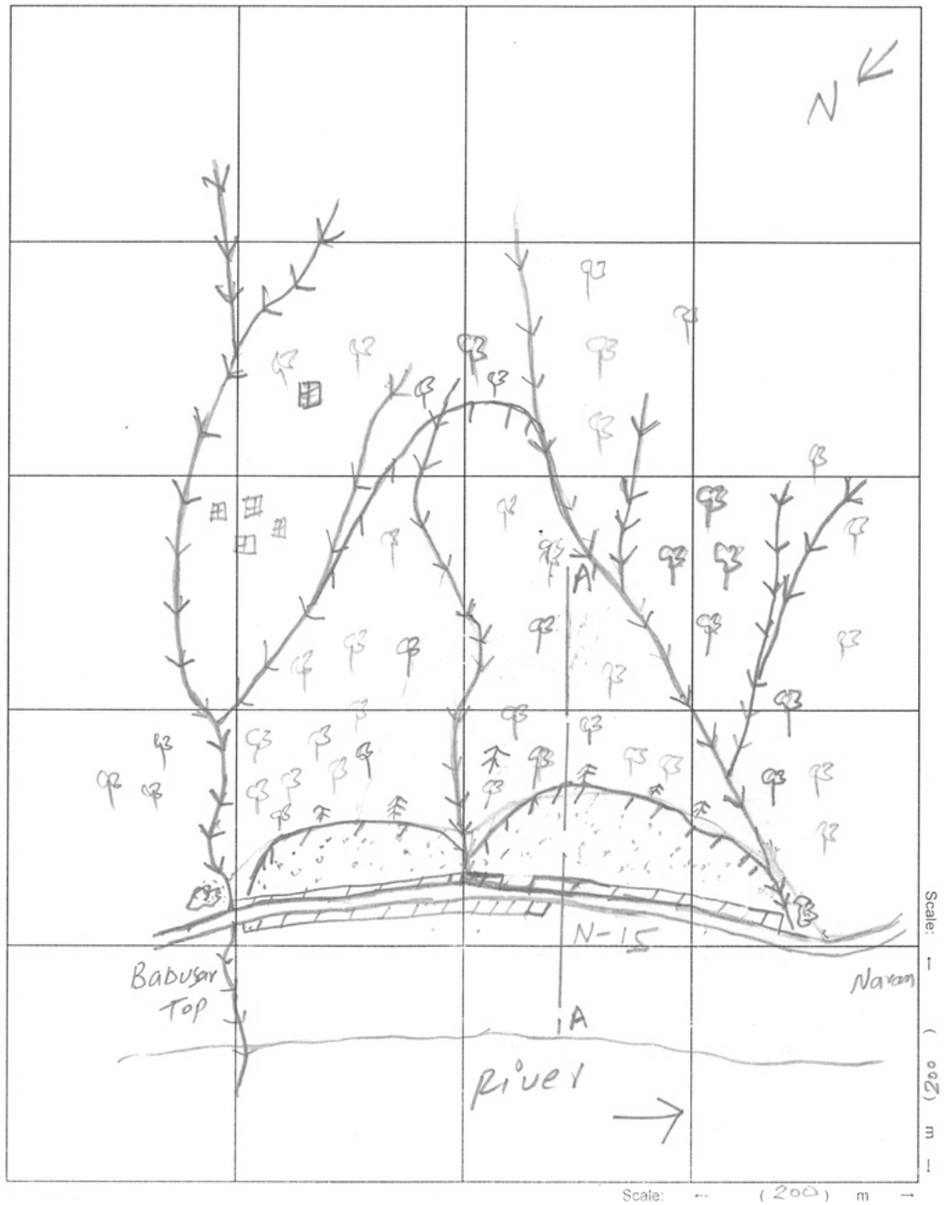
Code no.	Sat_	N	1	5	_	4		
Region Office								
Maintenance Unit								

Coordinates	Latitude	34° 55' 43.4"
	Longitude	73° 40' 51.4"
Road Name		Km

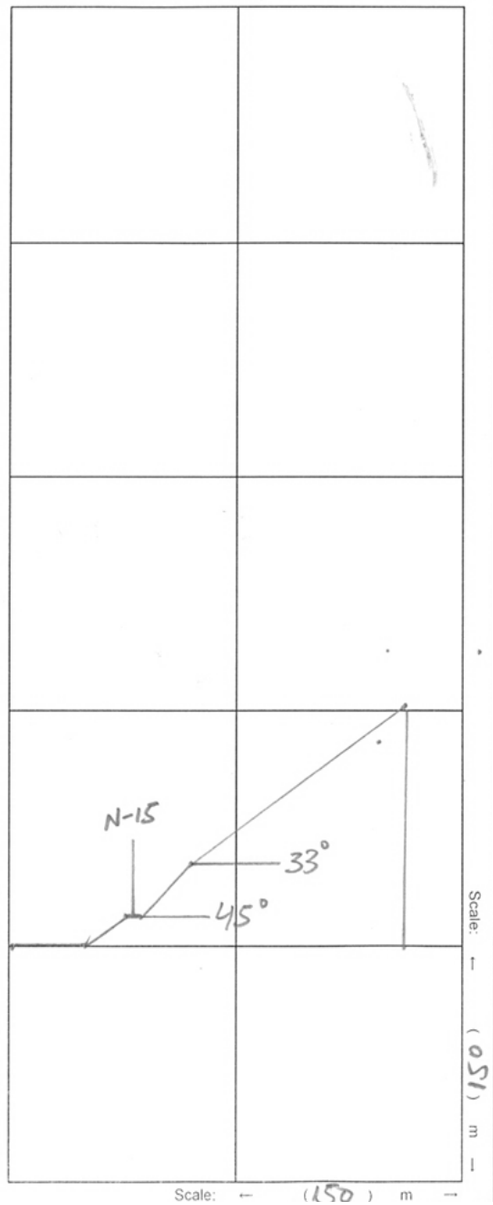
Date	2018/6/19
Inspector	Basharat, Yasir, Sajid, Shafiq

Scarp
Drainage
Trees
Debris material
Bushes
Retaining wall
Houses
Glacial Material
Profile

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	4		
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	34° 55' 43.4"
	Longitude	73° 40' 51.4"
Road Name		Km

Date	2018/6/19
Inspector	Basharat, Yasir, Sajid, Shafiq

Full view of the landslide

View of landslide on Valley side:

Road condition

View of the Landslide at the middle point

Existing countermeasures / anomalies: View of damaged Retaining Wall as counter measure

View of Glacier on the left flank of the Landslide

Evaluation sheet (debris flow)

Code no.	Sat _ N 1 5 _ 8
Region Office	
Maintenance Unit	

Coordinates	Latitude	34º 56' 17.8"
	Longitude	73º 40' 51.4"
Road Name		Km

Date	2018/6/20
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	√
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	√
		30° - 40°	
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	
		0.08km^2 - 0.20km^2	√
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	
		less than 0.02km^2	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

[Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	
	3m - 5m	
	less than 3m	√
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

[Expected size of disaster] (width, length, depth, etc.)

L= 1000 m, W= 600 m, D= 6 m

[Countermeasure]

Type of countermeasure		Check
Gabion Wall Retaining walls		
Effect of existing countermesure	none・low	
	moderate	√
	high	
	enough	

[Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	(1)	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or mor

-Medium risk: road closed for 1 day or les

-Low risk: no road closure

[Description/comments]

This is an active debris flow with large catchment area. The debris flow origin appears from the glacier valley. The debris material mainly comprises boulders, cobble, gravel, sand and silt. The size of the boulders ranges upto 5 m3. The debris flow has a large amount of water in the channel posing great and frequent risk to road. Very huge material is present on both the sides of the erosional channel. The gabion wall has seen at the mouth of the channel to control the debris, however, no culvert has been constructed for the outlet of the water and debris flow material. Therefore, this debris flow posing a significant threat for the continuity of traffic on the road, particularly during heavy rainfall. According to the local inhabitants a very serious debris flow disaster occurred after every five years at the site. For the mitigation measures it has been suggested to construct the culvert for the outlet of the water flow and develop the erosional channel properly.

Sketch sheet

Code no.	Sat_	N	1	5	_	8		
Region Office								
Maintenance Unit								

Coordinates	Latitude	34° 56' 17.8"										
	Longitude	73° 40' 51.4"										
Road Name					Km							

Date	2018/6/20
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view

Cross sectional view

Plane view

Cross sectional view

Tree
Drainage
Retaining wall
Houses
Bushes
Debris material
Profile
Link Road
Glacial material
Gabion wall

N
A
A'
Link Road
N-15
Naran
Babusar Top
River
Scale: ← (600) m →
Scale: ↑ (600) m ↓
N-15
30°
15°
A
A'
Scale: ← (500) m →
Scale: ↑ (500) m ↓

Scale: ← ( ) m →
Scale: ↑ ( ) m ↓
Scale: ← ( ) m →

Code no.	Sat_	N	1	5	_	8		
Region Office								
Maintenance Unit								

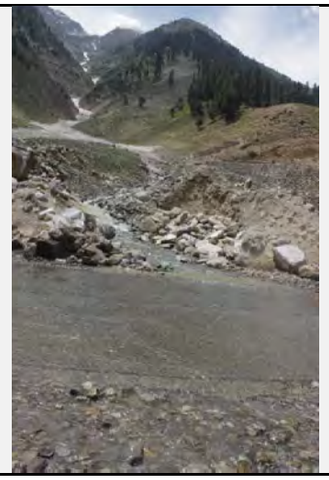
Photo sheet

Coordinates	Latitude	34° 56' 17.8"
	Longitude	73° 40' 51.4"
Road Name		Km

Date	2018/6/20
Inspector	Yasir, Basharat, Shafiq, Sajid

Mountain side view of the debris flow

Valley side view of the debris flow



Front view of the debris flow

The boulder has been found along the debris flow

Road condition

Existing countermeasures / anomalies:Gabion wall has been constructed along the Debris Flow

Evaluation sheet (debris flow)

Code no.	Sat _ N 1 5 _ 9
Region Office	
Maintenance Unit	

Coordinates	Latitude	34º 56' 22.4"
	Longitude	73º 42' 45.6"
Road Name		Km

Date	2018/6/21
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	√
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	√
		30° - 40°	
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	√
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	
		less than 0.02km^2	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

[Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	
	3m - 5m	
	less than 3m	√
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	√
Outflow of embankment	√
Debris flooding on the road	√

[Expected size of disaster] (width, length, depth, etc.)

L= 500 m, W= 200 m, D= 8-10 m

[Countermeasure]

Type of countermeasure		Check
Channel Diversion through Culvert Retaining walls		
Effect of existing countermesure	none・low	√
	moderate	
	high	
	enough	

[Evaluation Rank]

Scale of disaster / Risk	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	(2)	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or mor

-Medium risk: road closed for 1 day or les

-Low risk: no road closure

[Description/comments]

The debris material might be active during the rainfall and can also lead to a debris flow disaster in future. Presently, the water is flowing through a narrow channel and along the road it is diverted through channel to reduce its impact on road damage. The loose debris comprises boulder, cobble, gravel, sand and silt. It is likely that future debris flow will continue along the slope. A retaining wall is constructed to protect the road which is also partly damaged. However, no countermeasures have been taken to drain the water and protect the road from the debris material. The debris flow posing risk of road damage in future.

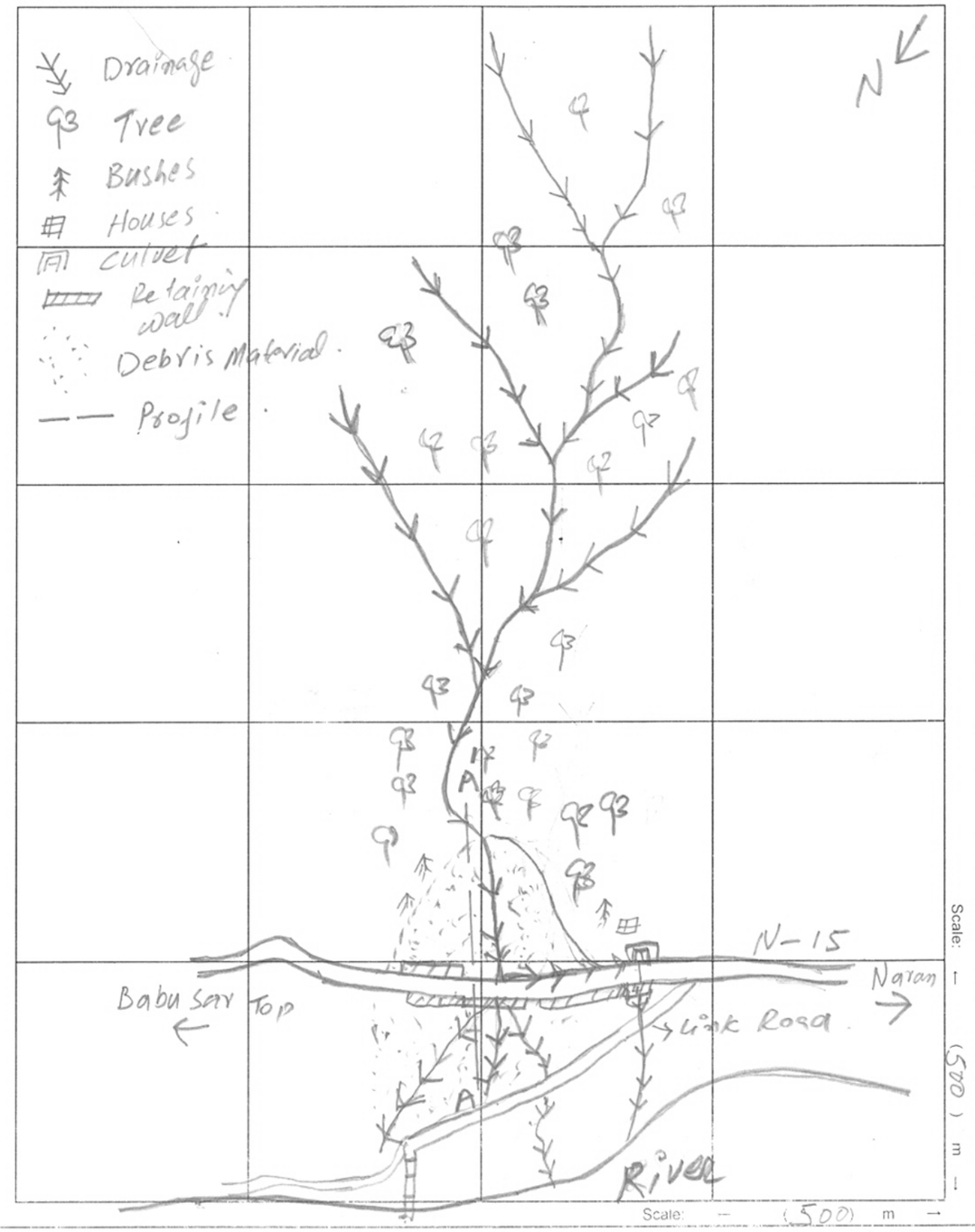
Code no.	Sat_	N	1	5	_	9		
Region Office								
Maintenance Unit								

Sketch sheet

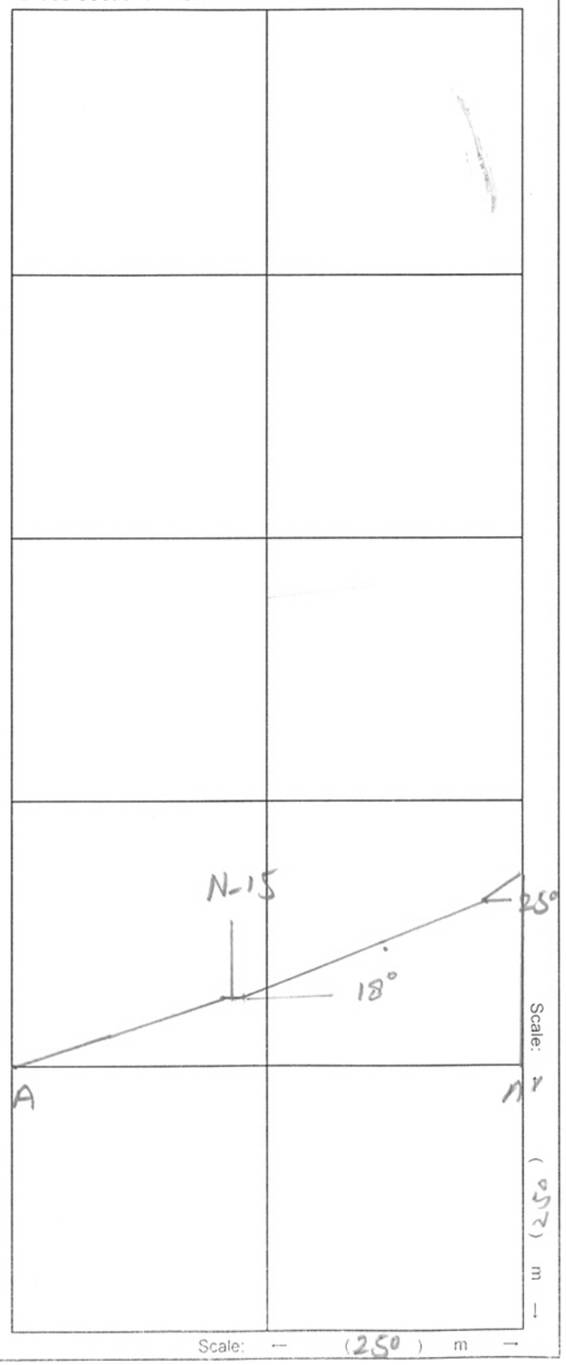
Coordinates	Latitude	34° 56' 22.4"
	Longitude	73° 42' 45.6"
Road Name		Km

Date	2018/6/21
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view



Cross sectional view



Scale: ← ( ) m →

Scale: ← ( ) m →

Code no.	Sat_	N	1	5	_	9		
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	34° 56' 22.4"
	Longitude	73° 42' 45.6"
Road Name		Km

Date	2018/6/21
Inspector	Yasir, Basharat, Shafiq, Sajid

Mountain side view of the debris flow

Valley side view of the debris flow

Outlet of Culvert constructed

The boulder has been found along the debris flow

Road condition

Existing countermeasures / anomalies:Retaining wall has been constructed along the Debris Flow which has been damaged by the debris material

Code no.	Sat _ N 1 5 _ 2 4
Region Office	
Maintenance Unit	

Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 56' 19.9"
	Longitude	73° 50' 59.7"
Road name		Km

Date	2018/6/22
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		√
			2 correspondences		
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		√
			a little marked		
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		√
			a little marked		
			None		
	Structure	dip slope of bedding plane	It corresponds.		
			None		√
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		√
			a little marked		
			None		
Surface codition	Topsoil, detached rock and unsteady rock		instability		√
			a little unstable		
			stability		
	Spring water		notable spring waster		
			seepage		√
			none		
	Surface condition		bare land with minor vagetation		√
			intermediate (bare・grass・tree)		
			mainly structure, mainly tree		
Profile	Height (H), dip (i)		H≧50m	height	√
			30≦H＜50m	height	
			15≦H＜30m	height	
			H＜15m	height	
			i≧70°	dip	
			45°≦i＜70°	dip	
			i＜45°	dip	√
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		√
			certain・unclarity		
			none		

[Disaster type]

Rock fall	
Slope failure	√

[Main check object]

Cut slope	
Natural slope	√

[Countermeasure]

Type of countermeasures	
Culvert has been constructed along the slope failure	
Effectiveness of existing countermeasures	**Check**
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	√

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	√

[Expected size of disaster](width, length, depth, etc.)

L= 400m, W= 350m, D = 56 m

[Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	(4)

[Description]

This slope failure is located about 100 meters away from the N-15. It is an active slope failure of loose material composed of boulder, cobble, gravel, sand and silt. On the back of the slope failure steep cliff is comprised of metamorphic rocks. Any impact to damage the road from the slope failure has not been observed. On the right side of the slope failure man made terraces has been formed. Active erosion on the slope leads to the development of the gullies. A retaining wall is built to protect the road, however, no mitigation measures have been taken to stabilize the slope failure. The slope failure is not being considered to endanger the road.

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

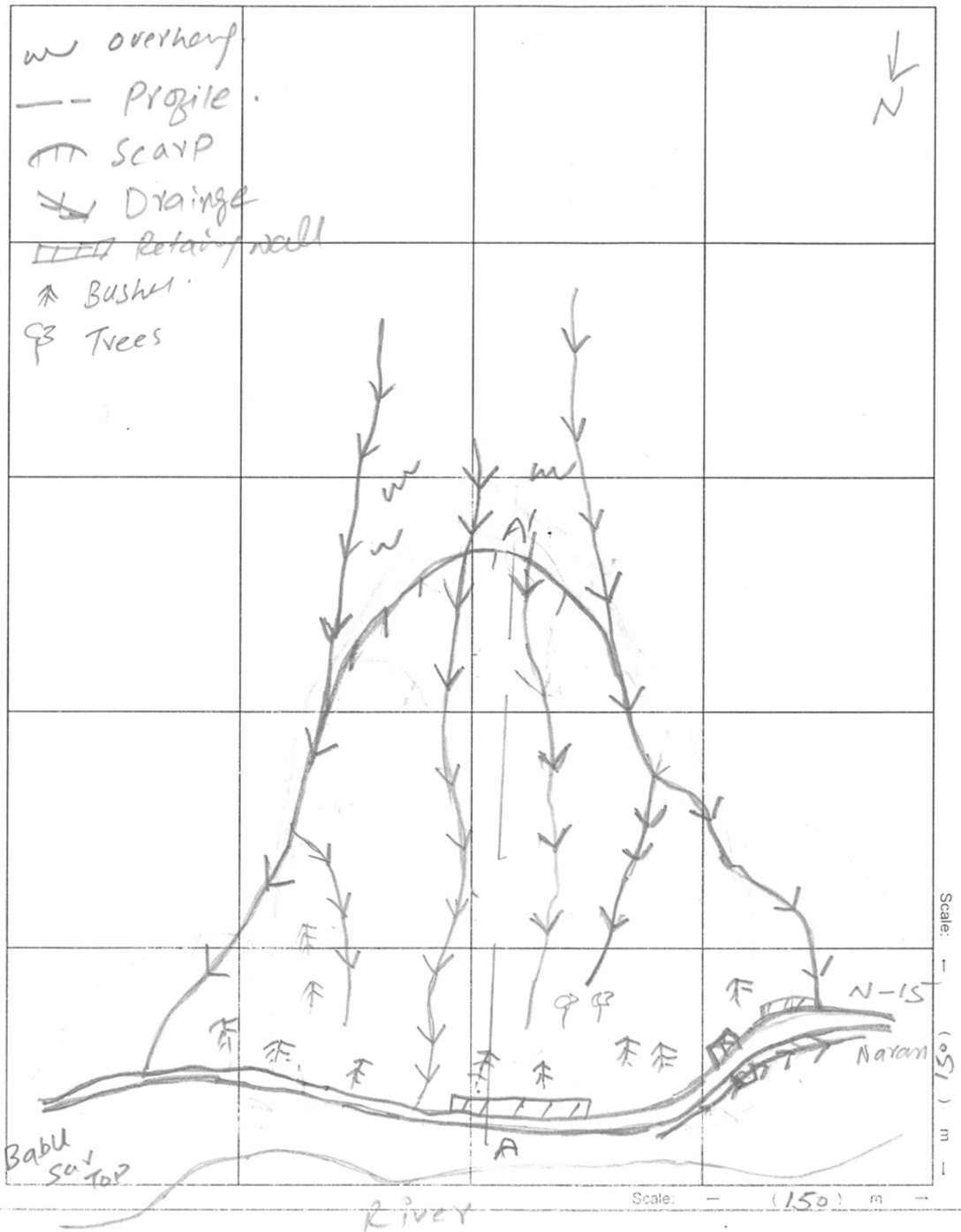
Sketch sheet

Code no.	Sat_ N 1 5 _ 2 4
Region Office	
Maintenance Unit	

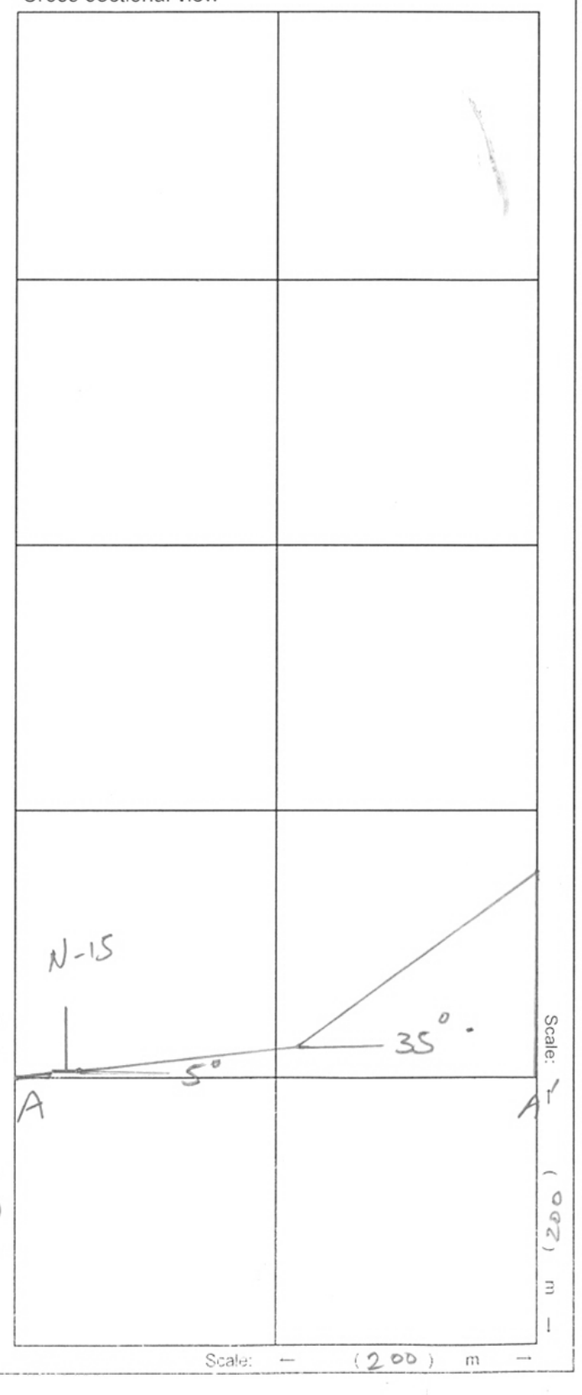
Coordinates	Latitude	34° 56' 19.9"
	Longitude	73° 50' 59.7"
Road Name		Km

Date	2018/6/22
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	2	4
Region Office							
Maintenance Unit							

Photo sheet

Coordinates	Latitude	34° 56' 19.9"
	Longitude	73° 50' 59.7"
Road name		Km

Date	2018/6/22
Inspector	Yasir, Basharat, Shafiq, Sajid

Full view of the landslide

View of landslide on Valley side:

Road condition:Cut slope at the start point

View of the slope failure at the middle point

Existing countermeasures / anomalies

View of Box Culvert at the toe of slope

Evaluation sheet (debris flow)

Code no.	Sat _ N 1 5 _ 3 4
Region Office	
Maintenance Unit	

Coordinates	Latitude	34º 58' 15.8"
	Longitude	73º 55' 37.1"
Road Name		Km

Date	2018/6/23
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	√
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	
		30° - 40°	
		less than 30°	√
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	√
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	
		less than 0.02km^2	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	
		none	√
	traces of large slope failure in stream	certain	√
		none	

[Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

[Expected size of disaster] (width, length, depth, etc.)

L= 600m, W= 70m, D= 4-5 m

[Countermeasure]

Type of countermeasure		Check
Effect of existing countermesure	none・low	√
	moderate	
	high	
	enough	

[Evaluation Rank]

Scale of disaster / Risk	Big	Medium	Small
Great risk	(1)	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or mor

-Medium risk: road closed for 1 day or les

-Low risk: no road closure

[Description/comments]

This is an active debris flow with large catchment area and flowing great amount of water. The debris is being mainly comprised of large boulders up to 5 m3 size. The loose material is present on both sides of the erosional channel. About 60 meters road has been damaged due to this debris flow. The debris flow has continuous water flowing on the road. A retaining wall is constructed to protect the road, however, no mitigation measures have been taken for the outflow of the water. To protect the road from this debris flow in the future, the construction of the bridge has been suggested for the outflow of debris material.

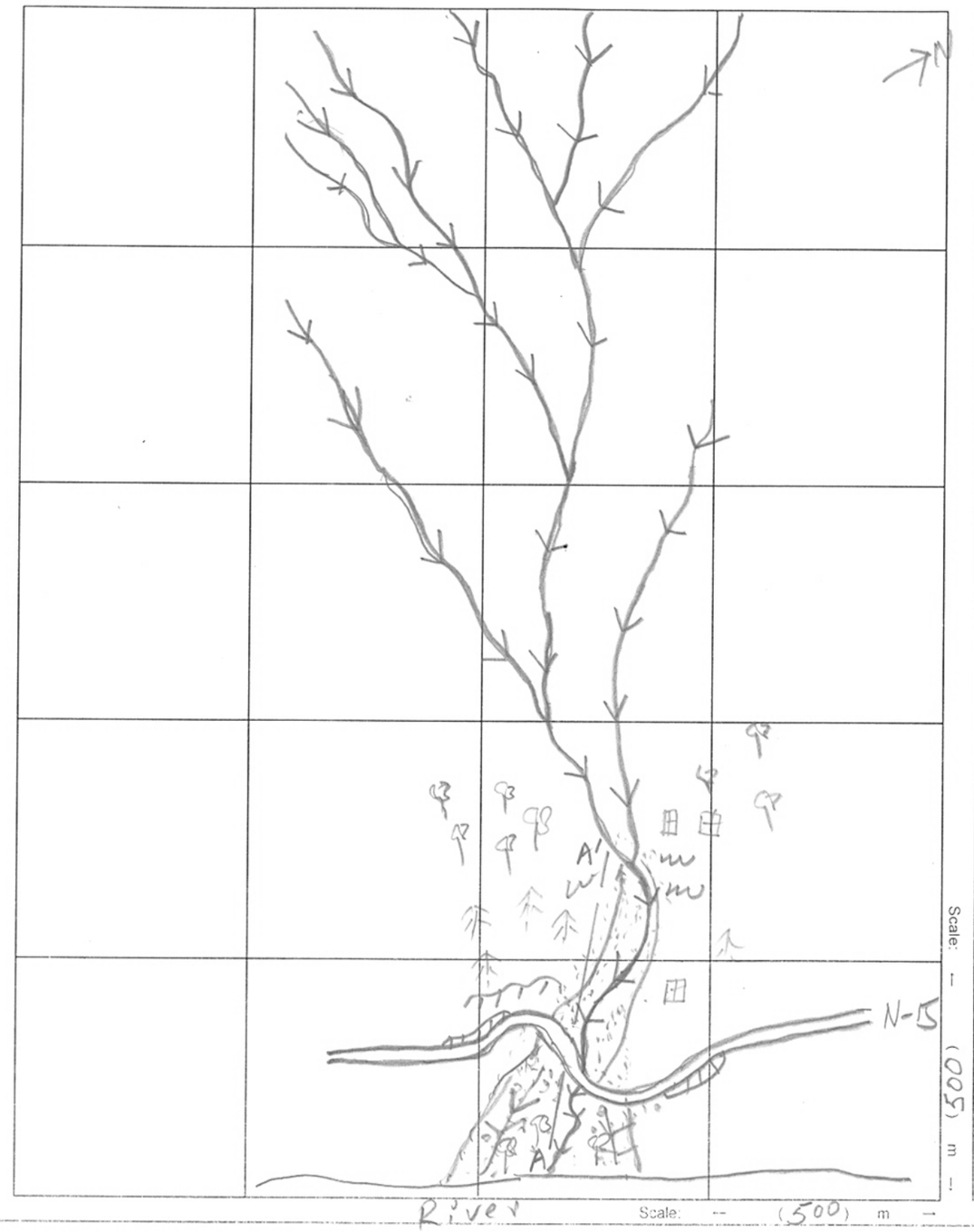
Sketch sheet

Code no.	Sat_	N	1	5	_	3 4
Region Office						
Maintenance Unit						

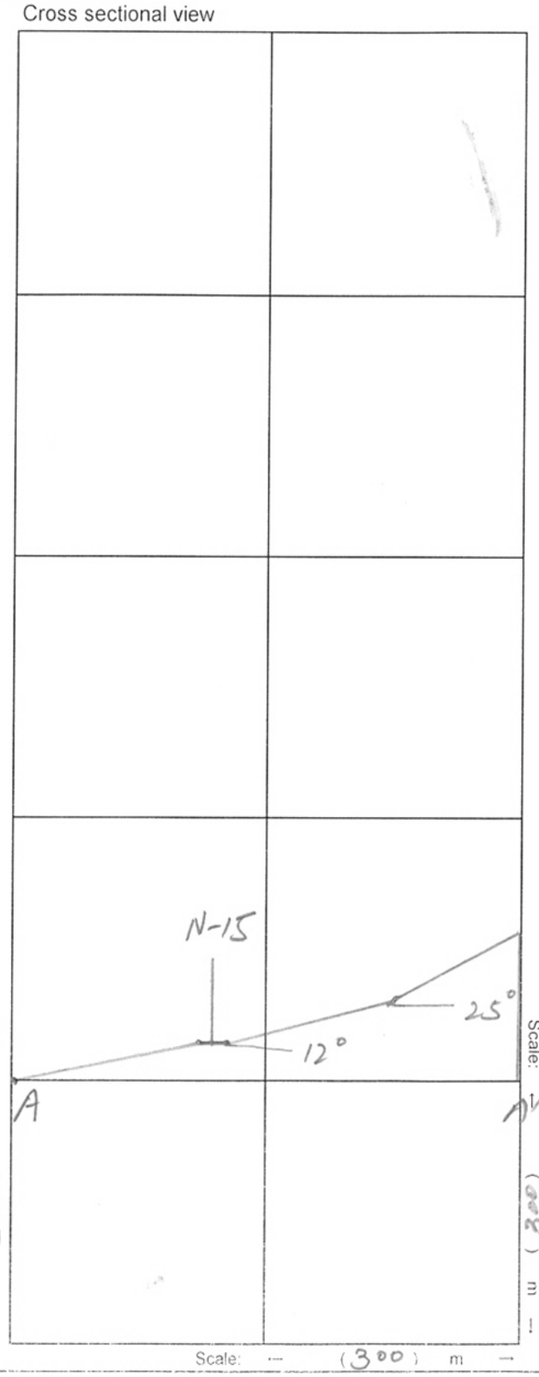
Coordinates	Latitude	34° 58' 15.8"
	Longitude	73° 55' 37.1"
Road Name		Km

Date	2018/6/23
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	3	4	
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	34° 58' 15.8"
	Longitude	73° 55' 37.1"
Road Name		Km

Date	2018/6/23
Inspector	Yasir, Basharat, Shafiq, Sajid

Mountain side view of the debris flow

Valley side view of the debris flow

Front view of the debris flow

The boulder has been found along the debris flow

Road condition

Debris flowing on road

Evaluation sheet (landslide)

Code no.	Sat_	N	1	5	_	53_1
Region Office						
Maintenance Unit						

Coordinates	Latitude	35° 4' 28.0"
	Longitude	73° 56' 17.9"
Road Name		Km

Date	2018/6/24
Inspector	Basharat, Yasir, Sajid, Shafiq

[Main body of landslide]

Mountain side	
Valley side	
Both	√

[Causes]

Category			Check
Topographical factor	Result of photo interpretation	exist clearly	√
		exist but partial and not clear	
		exist but not clear	
	Surface anomalies	large and new cracks, steps and subsidence	
		small and old cracks, steps and subsidence	√
		slight deformation	
		no anomalies	
Geological conditions	Geological structure	fault, fracture zone	√
		dip slope	
		undip slope/ no characteristic feature	√
	Main rock formation of landslide body	metamorphic rock (schist, quartzite, phyllite etc.)	√
		sedimentary rock (sandstone, limestone etc.)	
		igneous rock (granite etc.)	√
		quaternary deposit (colluvial deposit etc.)	
	Hydrological feature	much springs / much seepage	
		little springs /little seepage	
		trace of water	
		no water observed	√

[History]

category			Check
Records of Landslide	Existing record (documents or patrimony)	obvious	√
		slight	
		none	
	Damage on road facilities and houses	obvious	
		slight	√
		none	

[Countermeasure]

Category		Check	Type of countermeasure
There is no countermeasure			Retaining Wall has been constructed
Effectiveness of countermeasure	No effect	√	
	Some effect		
	High effect		

[Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	(1)	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

[Expected size of disaster](width, length, depth, etc.)

L= 1000m , W= 60m , D= 70 m

[Description]

This is an old rock avalanche which triggered due to any tectonic activity in the ancient time. It is presumed the rock avalanche has blocked the stream and created a lake which is known as Lalusar Lake. A channel has been constructed for the outflow of the water from the lake. The rock avalanche material is mainly composed of granite and granite gneisses. The huge boulders are present at the site up to more than 10 m3 sizes. Presently, this rock avalanche has no impact on the road, however, in future if rock avalanche material will be remoblized it may block the water channel and disrupt the road. A retaining wall has been constructed to protect the road.

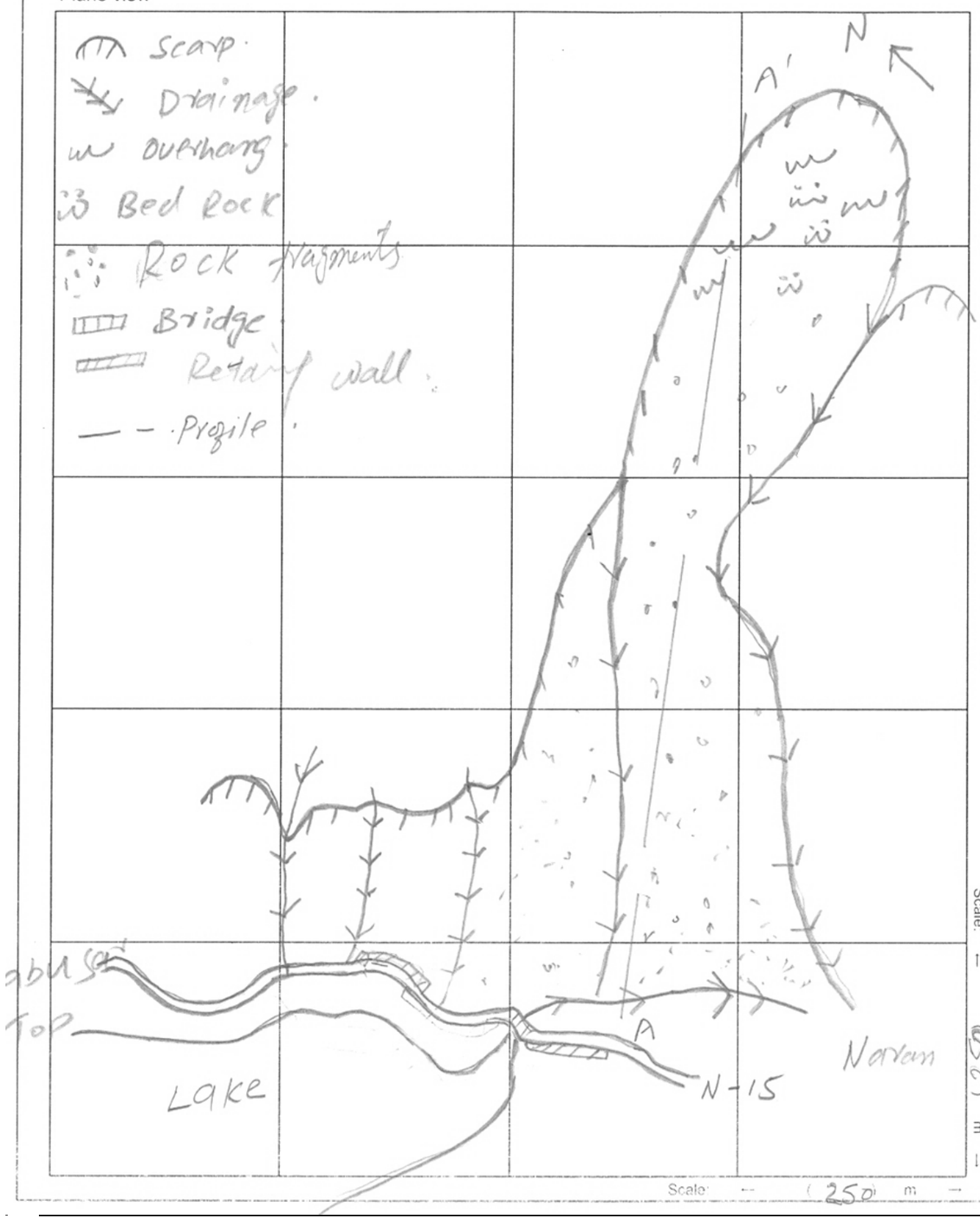
Code no.	Sat_	N	1	5	_	53_1
Region Office						
Maintenance Unit						

Sketch sheet

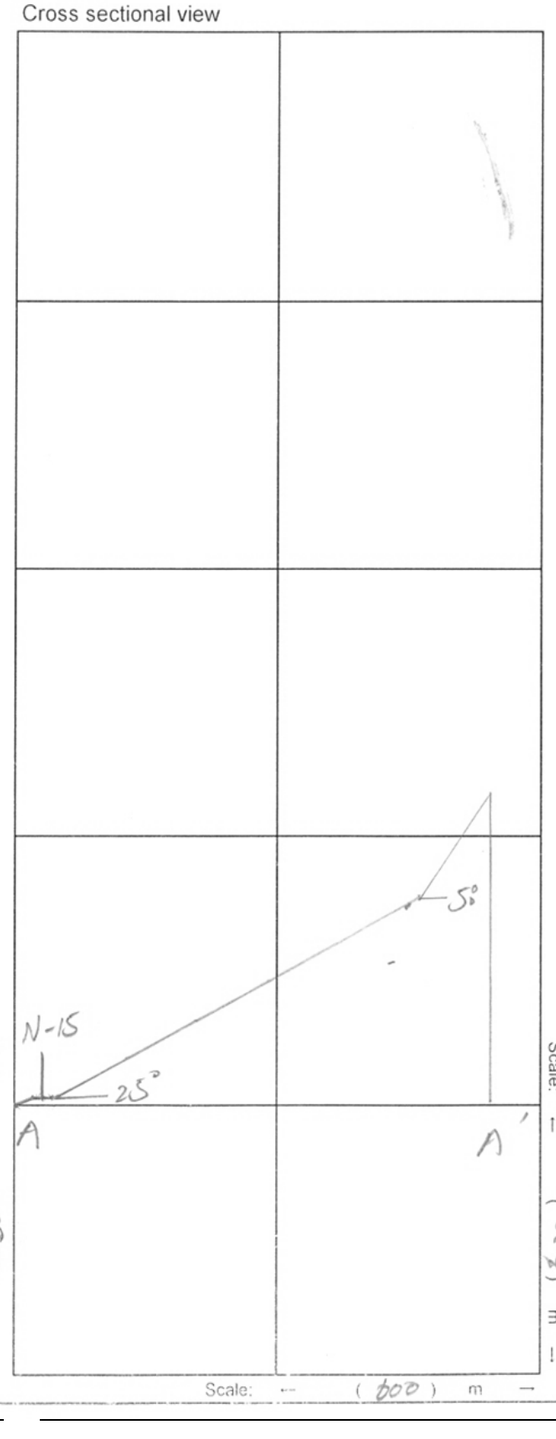
Coordinates	Latitude	35° 4' 28.0"
	Longitude	73° 56' 17.9"
Road Name		Km

Date	2018/6/24
Inspector	Basharat, Yasir, Sajid, Shafiq

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	53_1
Region Office						
Maintenance Unit						

Photo sheet

Coordinates	Latitude	35° 4' 28.0"
	Longitude	73° 56' 17.9"
Road Name		Km

Date	2018/6/24
Inspector	Basharat, Yasir, Sajid, Shafiq

Full view of the landslide

View of landslide on Valley side:

Road condition

View of the Landslide at the middle point

Existing countermeasures / anomalies: View of damaged Retaining Wall as counter measure

View of the toe of Landslide cut by the stream

Evaluation sheet (debris flow)

Code no.	Sat _ N 1 5 _ 6 1
Region Office	
Maintenance Unit	

Coordinates	Latitude	35º 05' 46.6"
	Longitude	73º 57' 17.0"
Road Name		Km

Date	2018/6/25
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	√
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	
		30° - 40°	
		less than 30°	√
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	√
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	
		less than 0.02km^2	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

[Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

[Expected size of disaster] (width, length, depth, etc.)

L= 1000 m, W= 40 m, D= 3-4 m

[Countermeasure]

Type of countermeasure		Check
Culvert Retaining walls		
Effect of existing countermesure	none・low	√
	moderate	
	high	
	enough	

[Evaluation Rank]

Scale of disaster / Risk	Big	Medium	Small
Great risk	(1)	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or mor

-Medium risk: road closed for 1 day or les

-Low risk: no road closure

[Description/comments]

This is an active debris flow located at the sharp bend along N-15. Presently, the erosional channel is covered with glacier and road has been severely damaged. The debris flow has very large surface run off with steep gradient. The water seeps beneath the road and boulders ranges between 1-3 m3 are present in the channel towards valley side. Due to this steep gradient debris flow posing serious debris flow disaster which cause to damage the road and discontinuity of the traffic. A culvert is constructed for the out flow of the water, however, it does not fulfill the requirement. The active landslides were also observed both side of the river bed along the road posing risk to damage the road. A retaining wall is constructed to protect the road which has been damaged due to the debris flow. For the mitigation purpose, a culvert for the outflow of the water and debris material should be redesign and constructed.

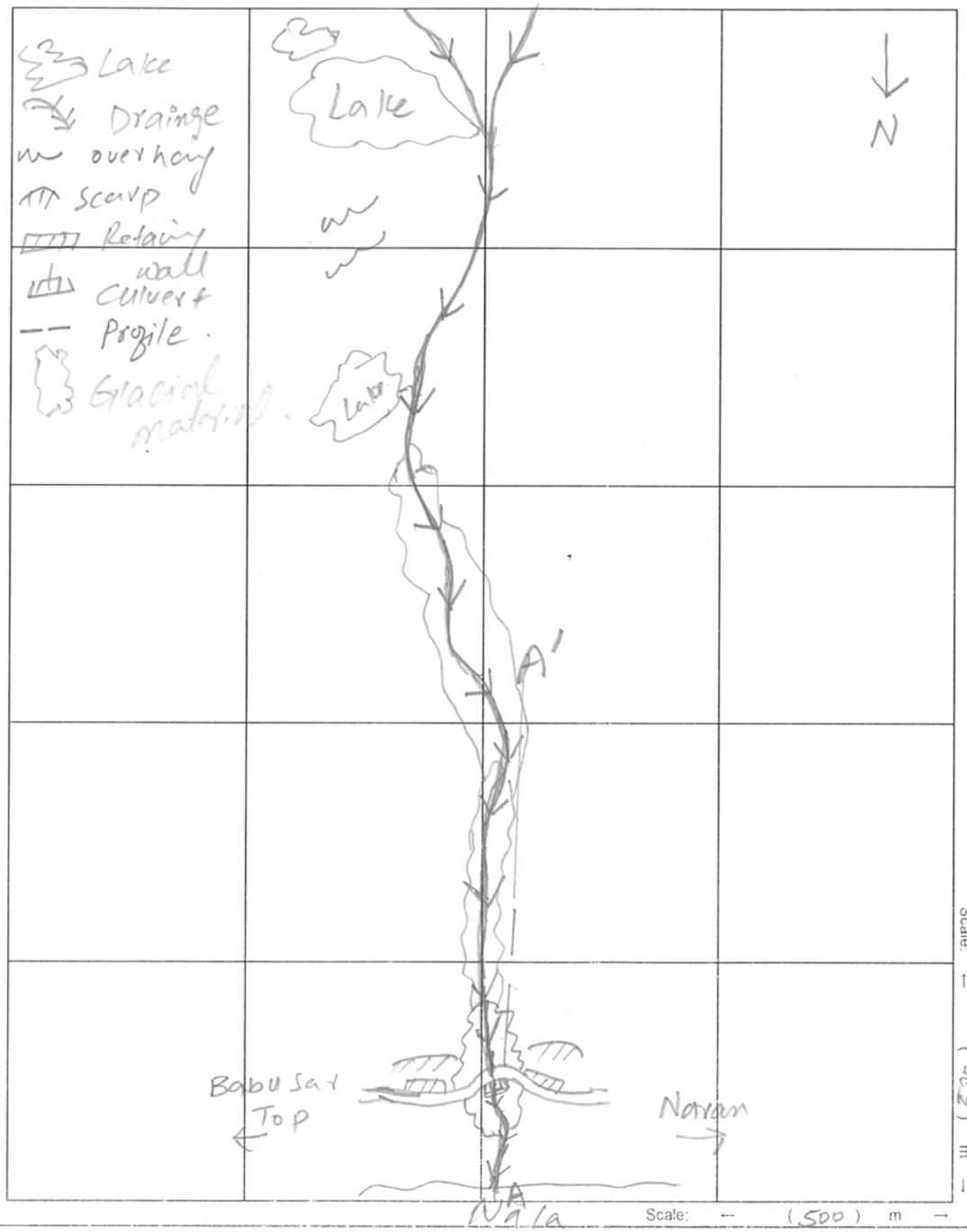
Code no.	Sat_	N	1	5	_	6	1	
Region Office								
Maintenance Unit								

Sketch sheet

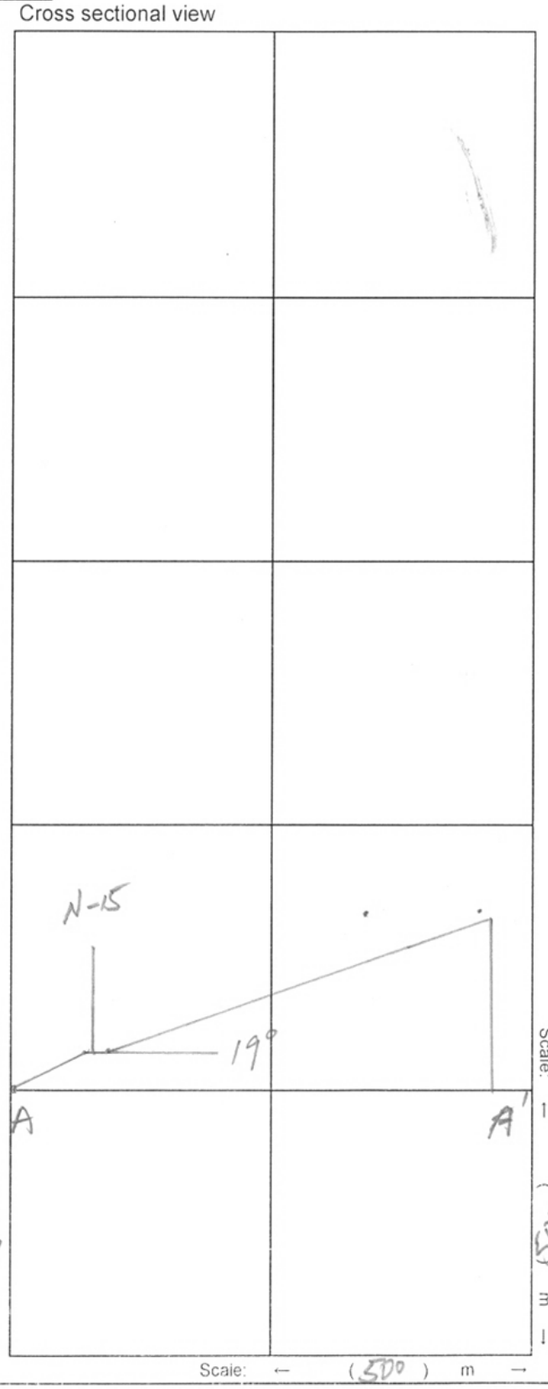
Coordinates	Latitude	35° 05' 46.6"
	Longitude	73° 57' 17.0"
Road Name		Km

Date	2018/6/25
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	6	1	
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	35° 05' 46.6"
	Longitude	73° 57' 17.0"
Road Name		Km

Date	2018/6/25
Inspector	Yasir, Basharat, Shafiq, Sajid

Mountain side view of the debris flow

Valley side view of the debris flow

Culvert outlet

The boulder has been found along the debris flow

Road condition

Existing countermeasures / anomalies:Retaining wall has been constructed along the Debris Flow

Evaluation sheet (debris flow)

Code no.	Sat _ N 1 5 _ 75_1
Region Office	
Maintenance Unit	

Coordinates	Latitude	35º 15' 36.0"
	Longitude	74º 05' 28.1"
Road Name		Km

Date	2018/6/27
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	√
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	
		30° - 40°	√
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	√
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	
		less than 0.02km^2	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

[Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

[Expected size of disaster] (width, length, depth, etc.)

L= 1000 m, W= 45m, D= 7-8 m

[Countermeasure]

Type of countermeasure		Check
Retaining walls		
Effect of existing countermesure	none・low	√
	moderate	
	high	
	enough	

[Evaluation Rank]

Scale of disaster / Risk	Big	Medium	Small
Great risk	(1)	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or mor

-Medium risk: road closed for 1 day or les

-Low risk: no road closure

[Description/comments]

This is an active debris flow along N-15. The debris flow event occurred in July 2017 due to a very heavy rainfall in the area. The debris flow origin from the cliff and lead to a serious debris flow disaster. According to the local inhabitant, three vehicles and local irrigation system have been damaged and road has been blocked more than a week. After one week the material has been removed from the road for the continuity of the traffic. The debris flow has very long run-out and transported a huge debris material which covered the entire road section. Still huge material is deposited along the road site. Large size of the boulders ranges between 1-5m3 are present at the site. The boulders are comprised gabbro diorite and granitic rocks. It has been observed the debris flow is drained by the seasonal water. The gradient of the erosional channel is very steep and lead to potential in future disaster and significant damage of the road. The area is still very unstable and there is a high potential for more events occur. In future, there is possibility this debris flow block the Thak Nala and create a landslide dam. A retaining wall is constructed to protect the road which has been damaged due to this debris flow. For the mitigation purpose the construction of shed has been suggested to protect the road in the future.

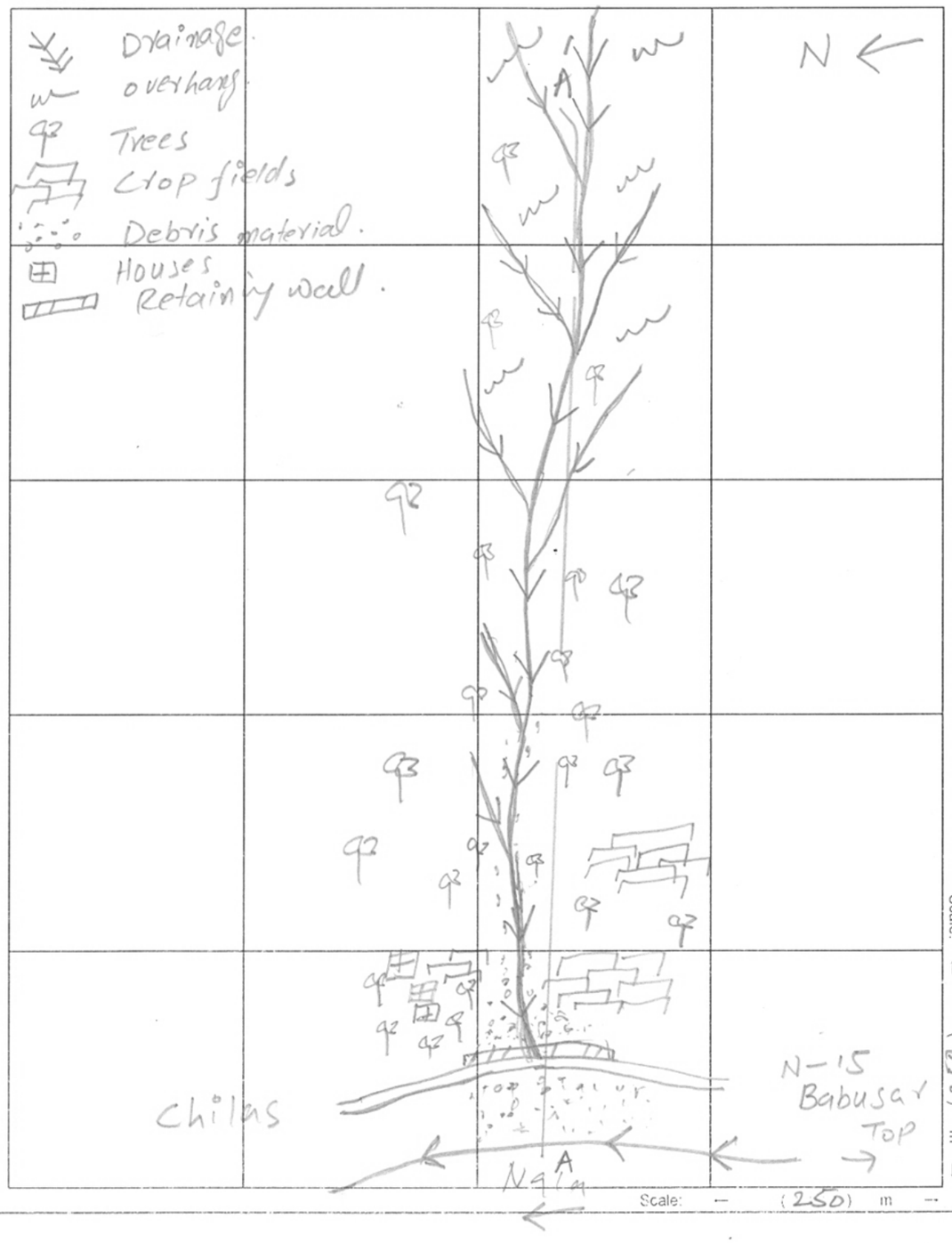
Code no.	Sat_	N	1	5	_	75_1
Region Office						
Maintenance Unit						

Sketch sheet

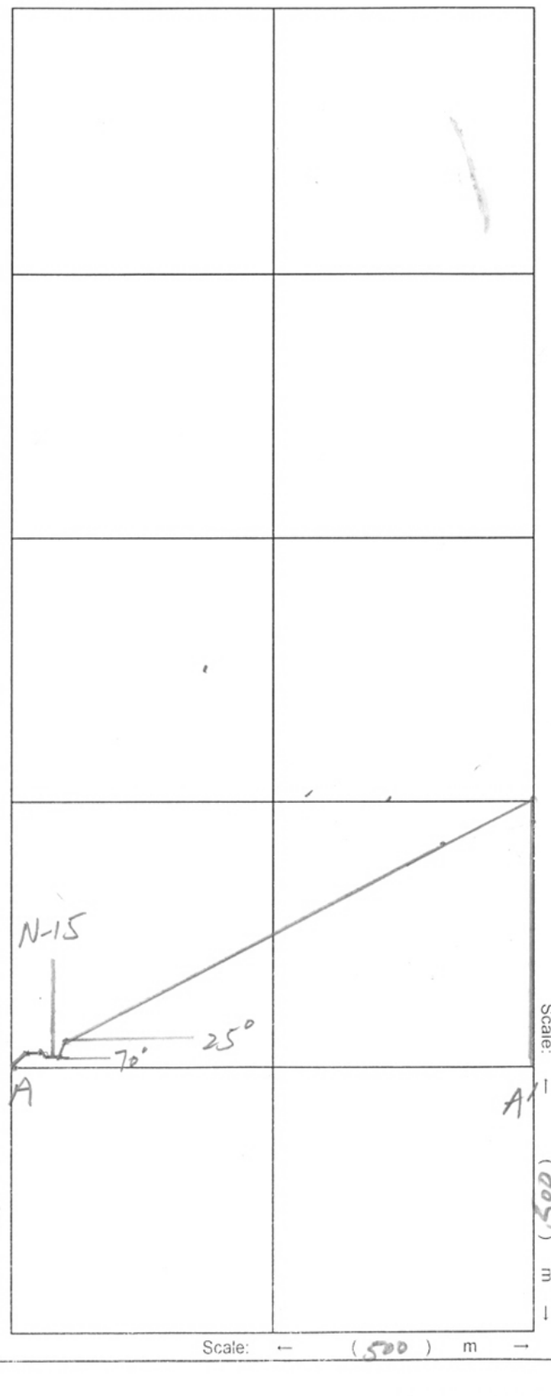
Coordinates	Latitude	35° 15' 36.0"
	Longitude	74° 05' 28.1"
Road Name		Km

Date	2018/6/27
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	75_1
Region Office						
Maintenance Unit						

Photo sheet

Coordinates	Latitude	35° 15' 36.0"
	Longitude	74° 05' 28.1"
Road Name		Km

Date	2018/6/27
Inspector	Yasir, Basharat, Shafiq, Sajid

Mountain side view of the debris flow

Valley side view of the debris flow

Mid view of the debris flow

The Check dams has been built along the debris flow

Road condition

Existing countermeasures / anomalies:Retaining Wall has been constructed along the Debris Flow

Evaluation sheet (debris flow)

Code no.	Sat _ N 1 5 _ 75_2
Region Office	
Maintenance Unit	

Coordinates	Latitude	35º 15' 40.2"
	Longitude	74º 05' 28.2"
Road Name		Km

Date	2018/6/28
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	√
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	
		30° - 40°	√
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	√
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	
		less than 0.02km^2	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

[Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

[Expected size of disaster] (width, length, depth, etc.)

L= 600 m, W= 54 m, D= 7-8 m

[Countermeasure]

Type of countermeasure		Check
No Counter Measure		
Effect of existing countermesure	none・low	√
	moderate	
	high	
	enough	

[Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	(1)	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or mor

-Medium risk: road closed for 1 day or les

-Low risk: no road closure

[Description/comments]

This active debris flow also occurred in July 2017 during heavy rainfall at the 100 meters away from the previous location. The debris flow leads to similar disaster as N-15-75-1. Due to this debris flow about 60 meters road has been partially damaged. The source of the debris flow has very steep cliff. The debris flow comprises two water channel, however, both channels have been drained by seasonal water. The erosional channel has a very steep gradient. Detached boulders of the size range between 1-5m3 was present in the channel and large number of boulders are still hanging along the road that lead to further disaster. The area is still very unstable and there is a high potential for more events occur. Due to the recent debris flow no mitigation measures have been taken to protect the road. Therefore, construction of shed is suggested to protect the road in the future.

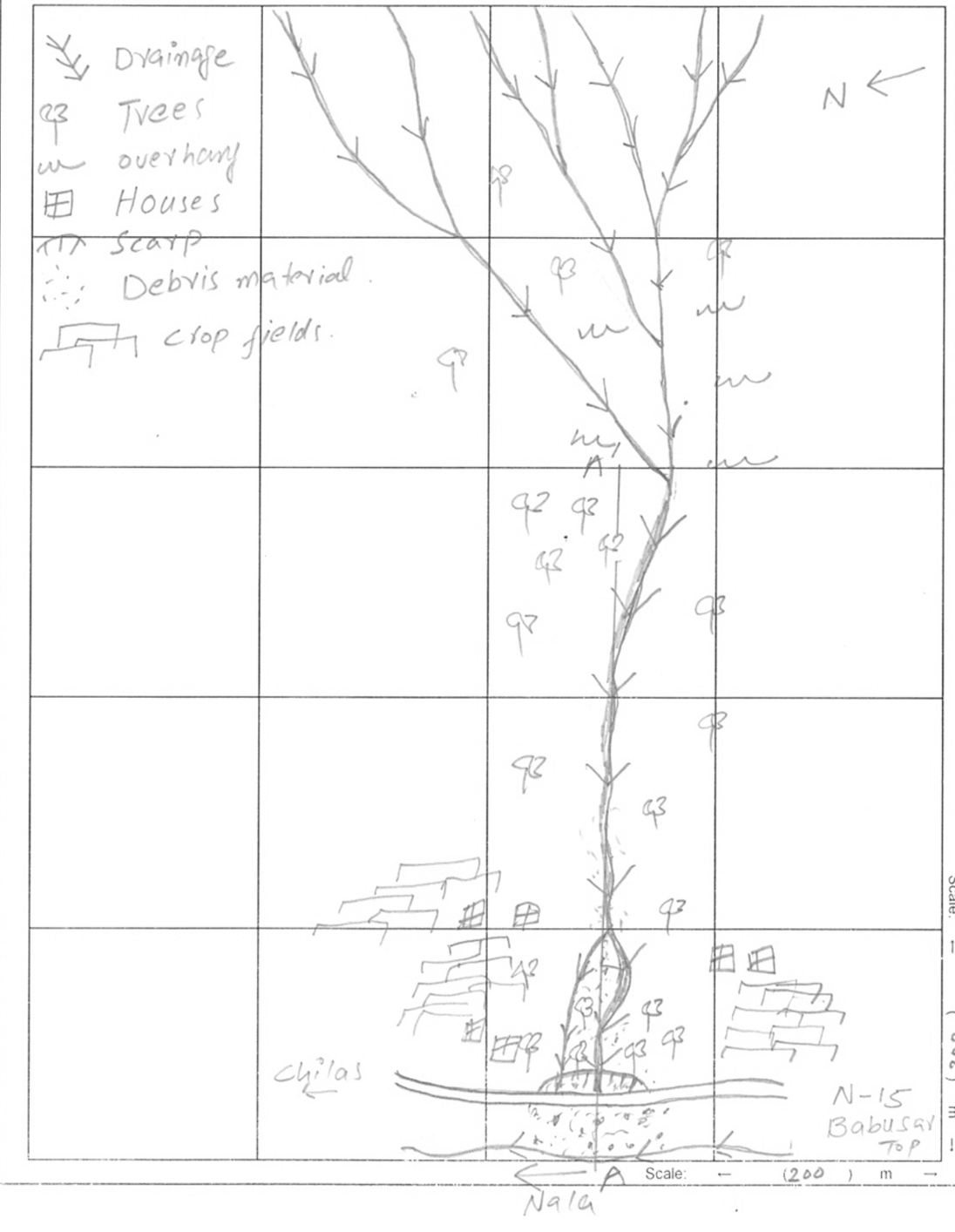
Code no.	Sat_	N	1	5	_	75_2
Region Office						
Maintenance Unit						

Sketch sheet

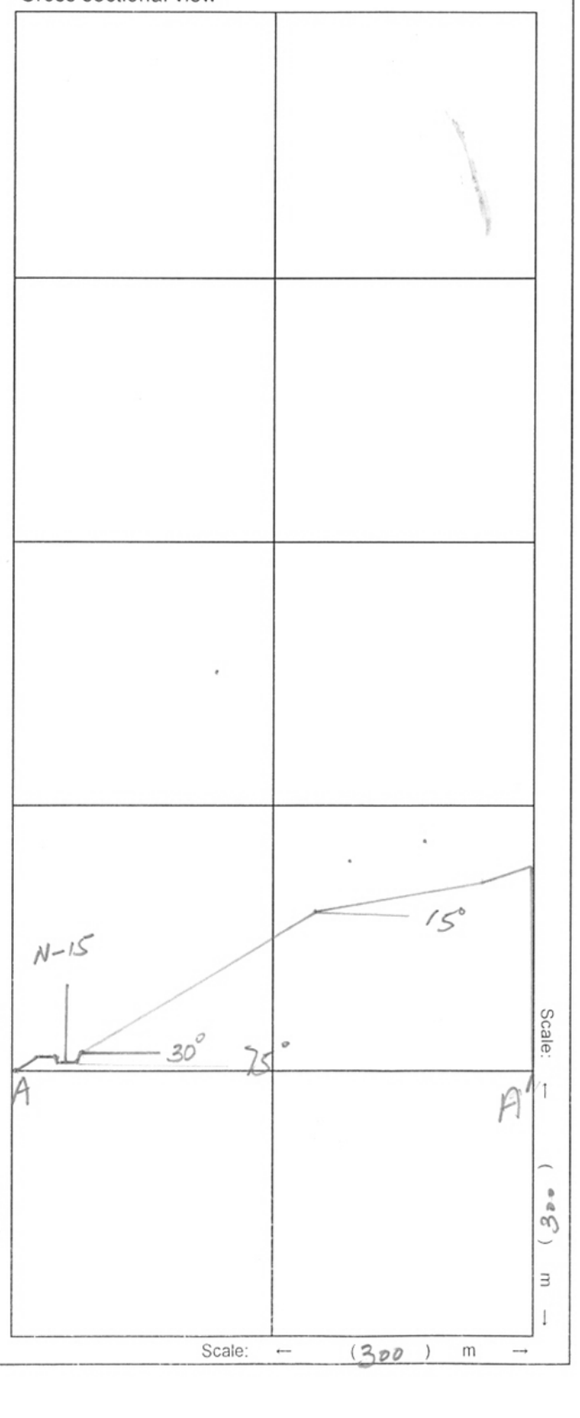
Coordinates	Latitude	35° 15' 40.2"
	Longitude	74° 05' 28.2"
Road Name		Km

Date	2018/6/28
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	75_2
Region Office						
Maintenance Unit						

Photo sheet

Coordinates	Latitude	35° 15' 40.2"
	Longitude	74° 05' 28.2"
Road Name		Km

Date	2018/6/28
Inspector	Yasir, Basharat, Shafiq, Sajid

Mountain side view of the debris flow

Valley side view of the debris flow

Mid view of the debris flow

The Check dams has been built along the debris flow

Road condition

Existing countermeasures / anomalies: No Counter Measure

Evaluation sheet (debris flow)

Code no.	Sat _ N 1 5 _ 7 8
Region Office	
Maintenance Unit	

Coordinates	Latitude	35º 21' 18.8"
	Longitude	74º 08' 18.8"
Road Name		Km

Date	2018/6/29
Inspector	Yasir, Basharat, Shafiq, Sajid

[Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km^2 or more	√
		0.15km^2 - 0.50km^2	
		less than 0.15km^2	
	steepest slope of river bed	40°or more	
		30° - 40°	
		less than 30°	√
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km^2 or more	√
		0.08km^2 - 0.20km^2	
		less than 0.08km^2	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km^2 or more	
		0.02km^2 - 20km^2	
		less than 0.02km^2	√
	artificial works that cause negative effects	certain	√
		none	
	new crack and/or slope failure in stream	certain	
		none	√
	traces of large slope failure in stream	certain	
		none	√

[Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

[History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

[Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

[Expected size of disaster] (width, length, depth, etc.)

L= 600m, W= 60 m, D= 3-4 m

[Countermeasure]

Type of countermeasure		Check
No Counter Measure		
Effect of existing countermesure	none・low	√
	moderate	
	high	
	enough	

[Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	(2)	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffice when potential disaster

-Great risk: road closed for 2 days or mor

-Medium risk: road closed for 1 day or les

-Low risk: no road closure

[Description/comments]

This debris flow is located on N-15. It is an old debris flow with large catchment area. The unconsolidated debris material is present both sides of the erosional channel. A temporary house is constructed in the middle of the stream and is prone to disaster. No countermeasures have been taken to avoid the debris material on the road. Therefore the road has been damaged due to this debris flow. Presently water is not flowing in the stream, therefore, the stream has been drained by seasonal water. It is likely that future debris flow will continue on the road. For the mitigation purpose construction of the bridge or a culvert has been suggested for the smooth outflow of the water and the debris material

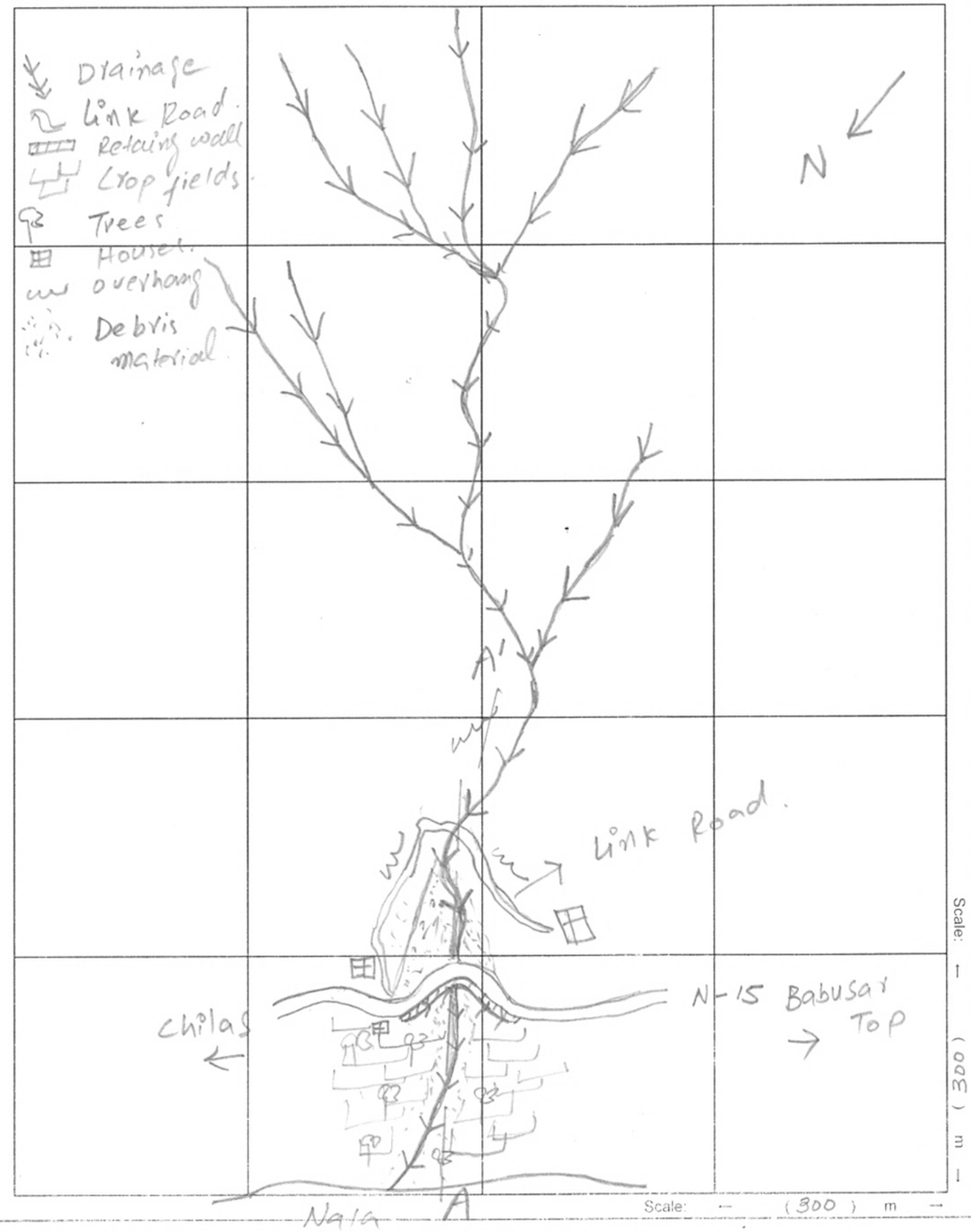
Sketch sheet

Code no.	Sat_	N	1	5	_	7	8	
Region Office								
Maintenance Unit								

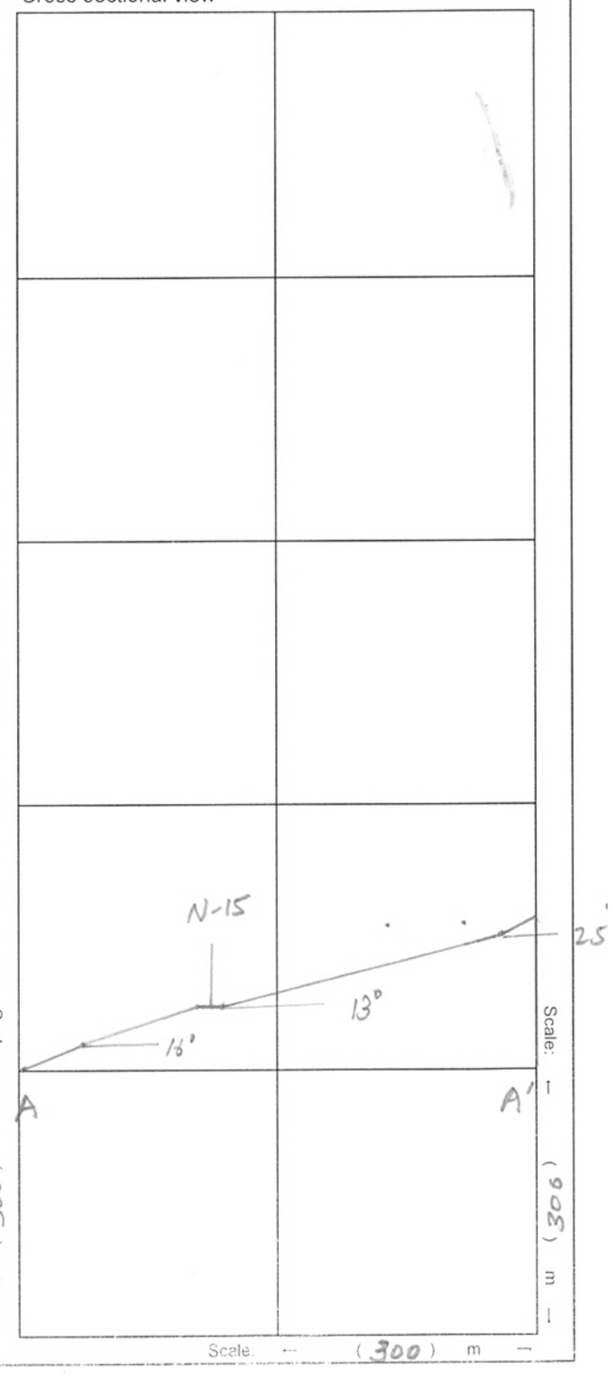
Coordinates	Latitude	35° 21' 18.8"												
	Longitude	74° 08' 18.8"												
Road Name						Km								

Date	2018/6/29
Inspector	Yasir, Basharat, Shafiq, Sajid

Plane view



Cross sectional view



Code no.	Sat_	N	1	5	_	7	8	
Region Office								
Maintenance Unit								

Photo sheet

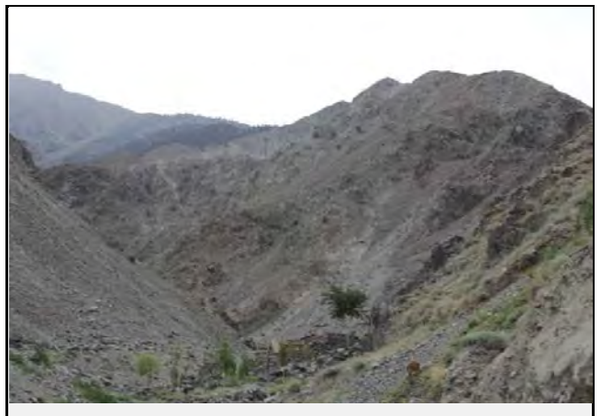
Coordinates	Latitude	35° 21' 18.8"
	Longitude	74° 08' 18.8"
Road Name		Km

Date	2018/6/29
Inspector	Yasir, Basharat, Shafiq, Sajid

Mountain side view of the debris flow

Valley side view of the debris flow

Mid view of the debris flow



The Check dams has been built along the debris flow

Road condition

Existing countermeasures / anomalies:No Counter Measure. House has been damaged along the Debris Flow

Evaluation sheet (Slope failure/Rockfall)

Code no.	N 3 5 _ 1
Region Office	Abbottabad
Maintenance Unit	Abbottabad

Coordinates	Latitude	N 34° 43' 8"
	Longitude	E 73° 57' 52.6"
Road name	N 3 5	Km 1 7 3 + 2 0 0

Date	18-Dec-17
Inspector	Makoto Tokuda

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		
			2 correspondences		✓
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		
			a little marked		✓
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		✓
			a little marked		
			None		
	Structure	dip slope of bedding plane	It corresponds.		✓
			None		
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		✓
			None		
Surface codition	Topsoil, detached rock and unsteady rock		instability		
			a little unstable		✓
			stability		
	Spring water		notable spring waster		
			seepage		
			none		✓
	Surface condition		bare land with minor vagetation		✓
			intermediate (bare・grass・tree)		
			mainly structure, mainly tree		
Profile	Height (H), dip (i)		height	H≧50m	✓
				30≦H＜50m	
				15≦H＜30m	
				H＜15m	
			dip	i≧70°	
				45°≦i＜70°	✓
				i＜45°	
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		✓
			certain・unclarity		
			none		

[Disaster type]

Rock fall	✓
Slope failure	✓

[Main check object]

Cut slope	✓
Natural slope	

[Countermeasure]

Type of countermeasures	
Retaining wall (with steel piping), shotcrete	
Effectiveness of existing countermeasures	**Check**
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	✓
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

100m(w)*60m(h)*1m(d)=6,000m3
Rock fall max size: 2m*2m*1.5m＝6m3

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	
	B: the possibility of collapse/fall is moderate	✔
	C: the possibility of collapse/fall is low/none	

[Description]

The existing countermeasure (shotcrete) was outsourced by the NHA to Frontier Works Organization (FWO) after the first collapse (five years ago). New collapse was confirmed at the side of the first collapse since three years ago.The talus deposit is covering part of the road but the are no traffic obstacle. Some treatment to the new slope maybe required. CPEC is currently shifting the road allignment to the valley side.Optical fibre cable is buried 1m at the mountain side of the road.

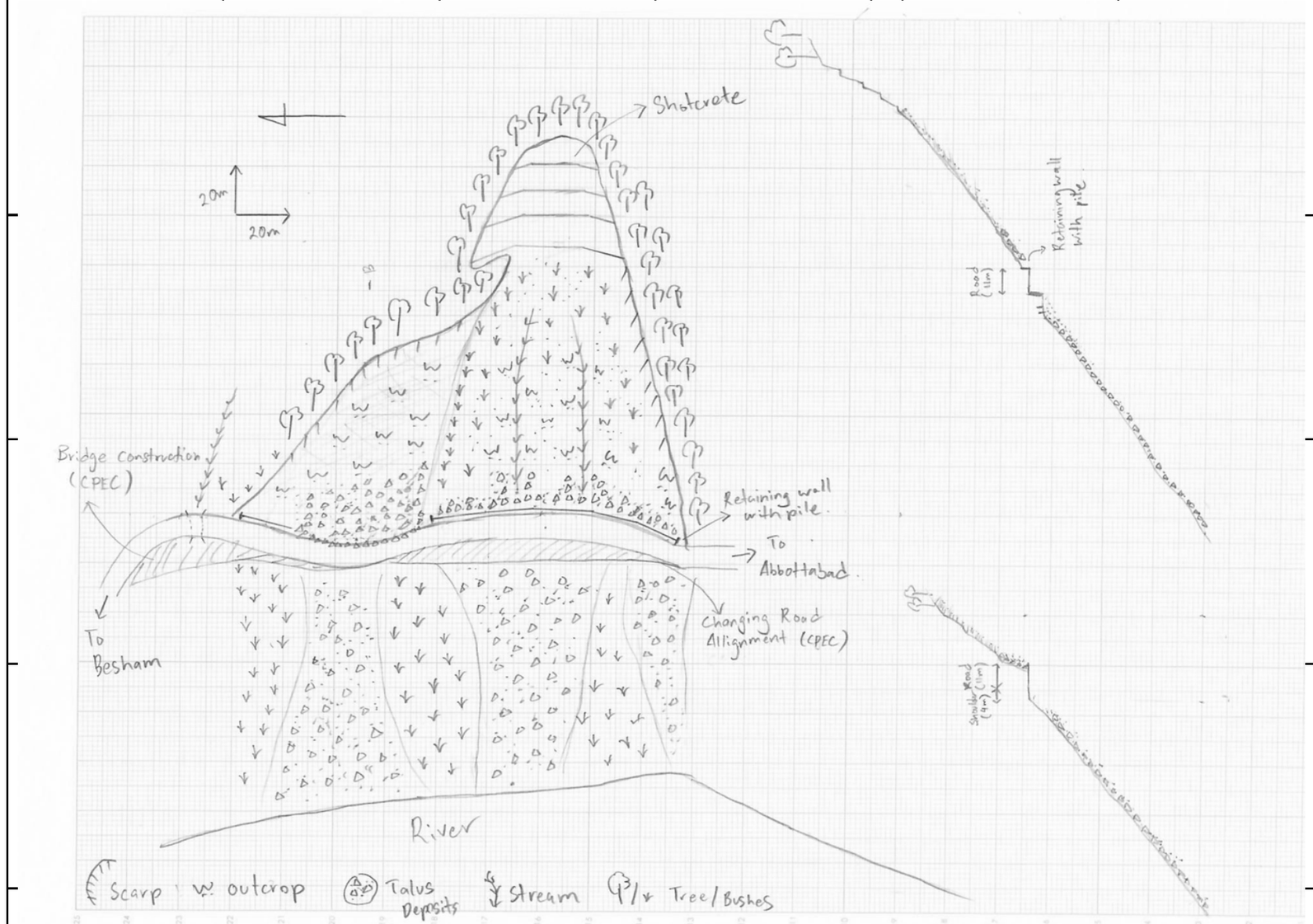
Sketch sheet

Code no.	N	3	5	_	1				
Region Office	Abbottabad								
Maintenance Unit	Abbottabad								

Coordinates	Latitude	N 34°43' 8"										
	Longitude	E 73°57' 52.6"										
Road Name	N	3	5		Km	1	7	3	+	2	0	0

Date	18-Dec-17
Inspector	Makoto Tokuda

Plane view



Scale: ← ( ) m →

Cross sectional view

Scale: ← ( ) m →

Scale: ← ( ) m →

Code no.	N	3	5	_	1				
Region Office	Abbottabad								
Maintenance Unit	Abbottabad								

Photo sheet

Coordinates	Latitude	N 34°43' 8"										
	Longitude	E 73°57' 52.6"										
Road Name	N	3	5		Km	1	7	3	+	2	0	0

Date	18-Dec-17
Inspector	Makoto Tokuda

Mountain side: Outcrop and bushes can be observed on the body of the slope.

Valley side: Talus deposit can be observed on the valley side of the slope

Road condition: Construction on shifting the road allignment to the valley side is being carried out by CPEC.

Existing countermeasures : Shotcrete was undertaken by FWO on the head of the slope to minimize the surface erosion.

Existing countermeasures: Retaining wall (with piling) constructed at the toe of the slope.

Existing anomalies: New slope failure was confirmed at the side of the previous slope where the talus deposit covered a part of the road. Some treatment maybe necessary.

Evaluation sheet (Slope failure/Rockfall)

Code no.	N	3	5	_	2					
Region Office	Abbottabad									
Maintenance Unit	Abbottabad									

Coordinates	Latitude	N 34° 44' 51.9"
	Longitude	E 72° 57' 5.7"
Road name	N 3 5	Km 1 7 8 + 7 0 0

Date	18-Dec-17
Inspector	Makoto Tokuda

[Causes]

Item		factor	category of score		Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences		
			2 correspondences		✓
			1 correspondences		
			no correspondence		
Geological conditions	Soil	susceptible to erosion less strength with water	marked		
			a little marked		✓
			None		
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked		✓
			a little marked		
			None		
	Structure	dip slope of bedding plane	It corresponds.		✓
			None		
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked		
			a little marked		✓
			None		
Surface codition	Topsoil, detached rock and unsteady rock		instability		✓
			a little unstable		
			stability		
	Spring water		notable spring waster		
			seepage		
			none		✓
	Surface condition		bare land with minor vagetation		
			intermediate (bare・grass・tree)		✓
			mainly structure, mainly tree		
Profile	Height (H), dip (i)		height	H≧50m	
				30≦H＜50m	
				15≦H＜30m	✓
				H＜15m	
			dip	i≧70°	✓
				45°≦i＜70°	
				i＜45°	
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences・clarity		✓
			certain・unclarity		
			none		

[Disaster type]

Rock fall	✓
Slope failure	✓

[Main check object]

Cut slope	✓
Natural slope	

[Countermeasure]

Type of countermeasures	
None	

Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

[History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	✓
No disaster records	

[Expected size of disaster](width, length, depth, etc.)

20m(w)*10m(h)*1m(d)=200m3
Rock fall max size: 2m*1m*1m＝2m3

[Hazard]

Hazard rank	A: the possibility of collapse/fall is high	
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	✔

[Description]

The disaster occurred beside the stream. This site is susceptible to both slope failure and rock fall.Talus and fallen rock can be osbserved at the toe of the slope. Vertical cracks can be seen at the outcrop which is resulting the rockfall.The retaining wall between road and the slope may minimize the potential of the road disaster. Optical fibre cable is buried 1m at the mountain side of the road.

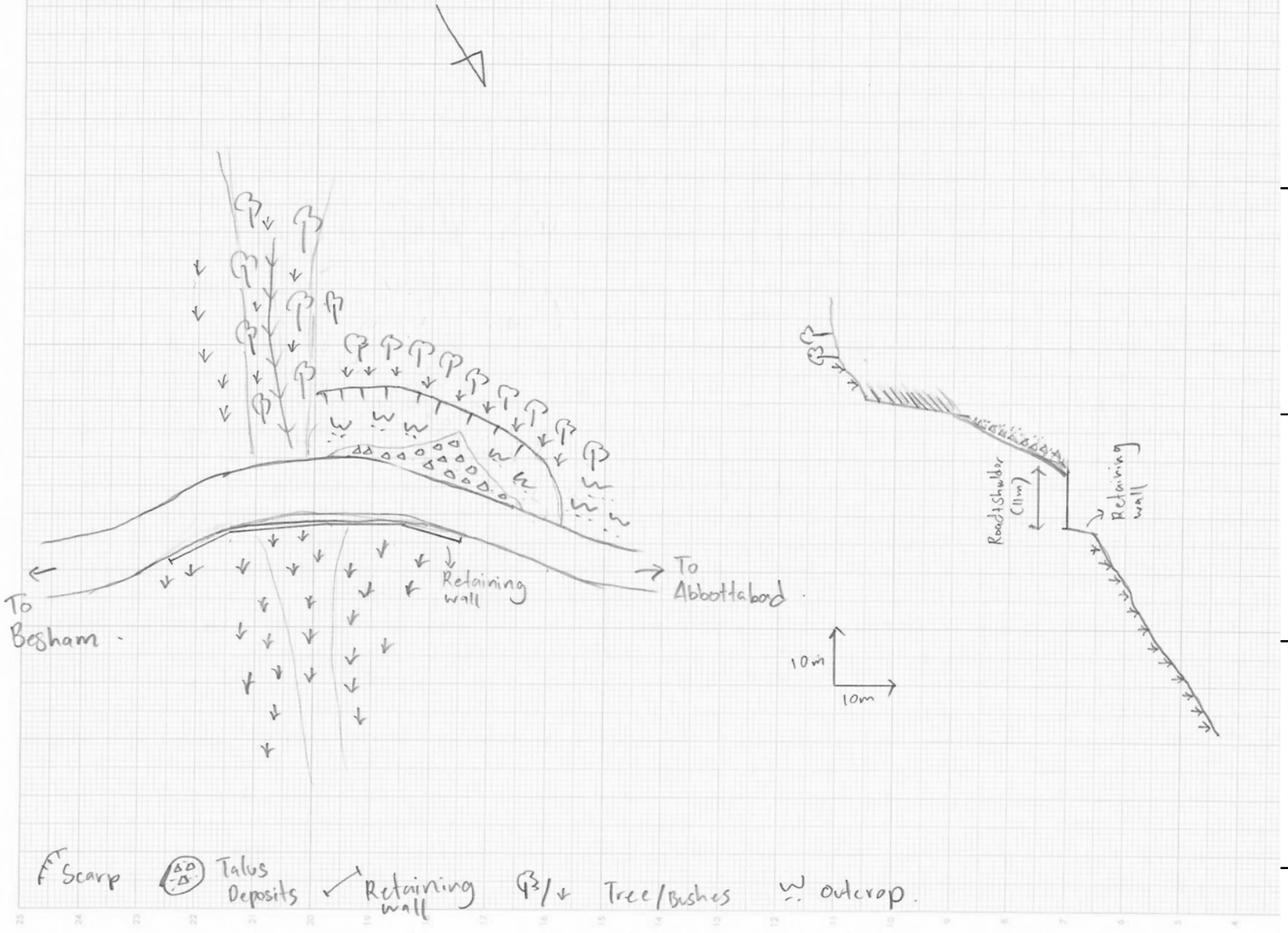
Sketch sheet

Code no.	N	3	5	_	2				
Region Office	Abbottabad								
Maintenance Unit	Abbottabad								

Coordinates	Latitude	N 34°44' 51.9"										
	Longitude	E 72°57' 5.7"										
Road Name	N	3	5		Km	1	7	8	+	7	0	0

Date	18-Dec-17
Inspector	Makoto Tokuda

Plane view



Scale: ← ( ) m →

Cross sectional view

Scale: ← ( ) m →

Photo sheet

Code no.	N	3	5	_	2				
Region Office	Abbottabad								
Maintenance Unit	Abbottabad								

Coordinates	Latitude	N 34°44' 51.9''										
	Longitude	E 72°57' 5.7''										
Road Name	N	3	5		Km	1	7	8	+	7	0	0

Date	18-Dec-17
Inspector	Makoto Tokuda

Mountain side: Both slope failure and rock fall was observed at this site.

Valley side: The valley side is abundant with vegetation and no trace of slope failure was confirmed.

Road condition: No anomalies or damages was confirmed on the road though there was a small portion of talus deposit observed at the shoulder of the road.

Existing anomalies: Dip slope of bedding towards the road can be observed on the slope.

Existing anomalies: Unstable rocks can be observed ath the top part of the slope. The ctacks are also mostly vertical.

Existing anomalies: The size of the fallen rock is large enough to damage the road or cars.