

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

LANDSLIDE SETTING

Mapped by	DMD	Date	29/11/01	Weather	Fine
1:1000 map sheet No	3-SW-24C,24D	Grid reference	E 835323	N 836202	
Catchment No	SE				
Landslide No	01M				
Year first observed	2001				
Evidence	Visible after rainstorm in early June 2001, and at Helicopter reconnaissance in July 2001				
Mapped geology	Formation: Shing Mun Lithology: Blocky tuff				

Within Catchment	Rock exposure	Break in slope	Ridgeline	Drainage line
Proximity of landslide source area to:	None	Very slight break in slope	Over 50 m	0 m
Morphological position	Open hillside and head of a drainage line			
Previous failure	Extensive previous failure			
Anthropogenic features (Paths, fires, drains etc)	None affecting landslide			

SOURCE

VEGETATION ☒ relevant box

☐ bare
☐ low shrub
 ☒ Grass
☒ tall shrub
 ☐ Low shrub + grass
 plantation / woodland
 ☐ Tall shrub + grass
 Hillfire

☒ all relevant boxes	Angle	Aspect	Irregular	Convex	Concave	Planar
Main scarp	70 - 80°	145°			☒	
Source floor	45°	140°	☒			
Pre-failure Slope	33°	160°		☒		

Max width	38 m	Max length	18 m
Max depth	6 m		

Notes:

Very Large previous failure, recent failure is retrogressive failure of old landslide
 Small Catchment
 Debris from 2001 landslide has remained within the scar of the previous landslide, no debris trail, with a maximum travel distance of about 30 m
 Difficult to access the landslide due to the steep sided flanks and mature vegetation within the landslide scar whole of landslide scar therefore not inspected

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

SOURCE (Continued)

MATERIALS EXPOSED

Max. Thick.	Material Type	Material Description	% material by volume			
			>200 mm	60-200 mm	20-60 mm	<20 mm
1.3 m	Fine Colluvium	Loose, light reddish brown silty SAND with some gravel and some to many angular cobbles of moderately decomposed tuff		15	25	60
2 m	CDT	Extremely weak light reddish brown completely decomposed tuff (slightly sandy SILT with occasional gravel of quartz				100
3 m	MDT	Moderately strong light brown mottled reddish brown moderately decomposed lapilli Tuff				100

Regolith Type(s): Colluvium

STRUCTURAL DETAILS

Type	Dip	Dip Direction	Persistence	Spacing	Opening / Aperture	infill	Waviness	Roughness	Significance
J	61	108	>3m	Close	3 - 5	clay	P	S	Parallel to western flank occasionally slickensided Potential for toppling failure
J	62	307	2 - 3 m	V close	2 - 3	Part clay	P	R	

SOIL PIPES * Total Number None Apparent

Diameter									
Open									
Infilled									

Seepage *	No	Flow Rate	
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* Mark locations of pipes and seepages on Sketch Plan

NOTES / 1) Some lapilli appear to have dissolved creating voids.
INITIATION: 2) Dark reddish brown clay between angular boulders (clay similar to clay infill at joints)

-3- **LANDSLIDE No. 01M**
Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

DEBRIS TRAIL

SUBSTRATE

Max. Thickness	Material Type	Description
		No Debris trail for the 2001 landslide, Debris contained within existing landslide scar (see Figure 2)
Regolith:		

Debris Type	Description *	Clast / Matrix Supported	% by volume			
			>200 mm	60 – 200 mm	2-60 mm	<2mm

* Include maximum clast size in Description

Notes / Process:

LANDSLIDE No. 01M
Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

PHOTOGRAPHS



PLATE 1: Aerial view of the Landslide Source (Photograph Taken 19 October 2001)

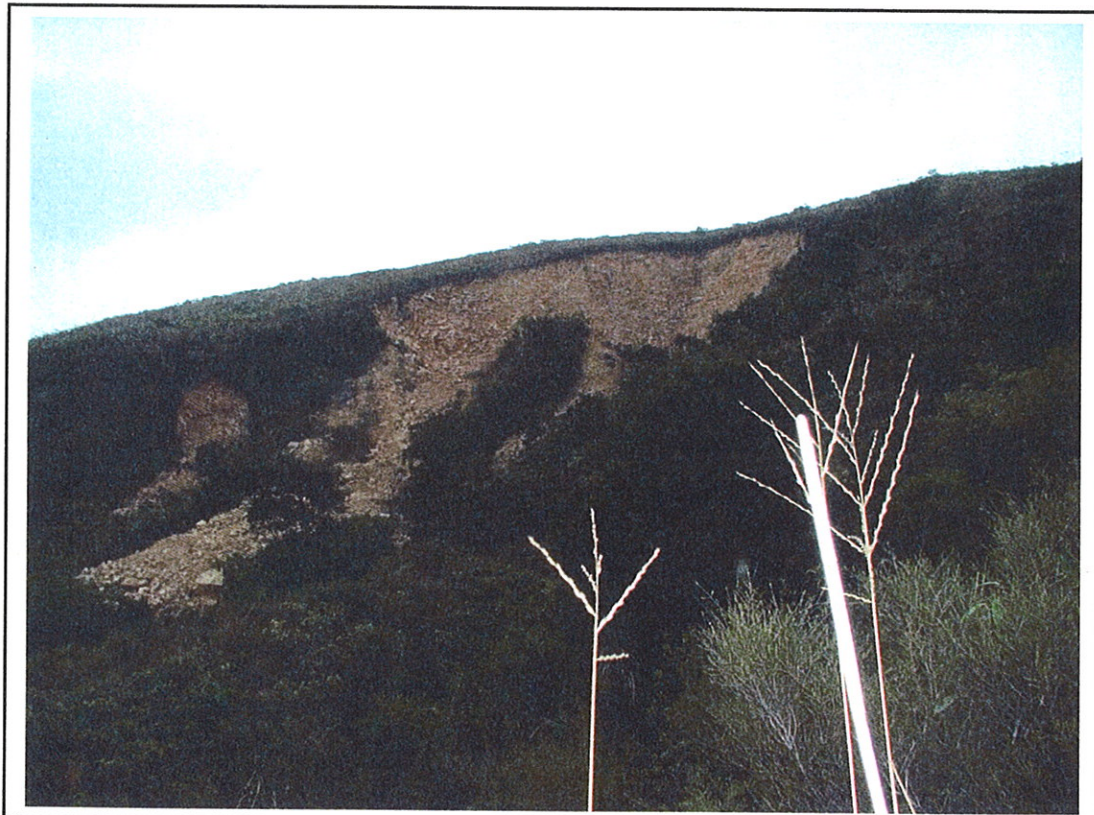


PLATE 2: View of Landslide Source from Source Toe (Photograph Taken 29 November 2001)

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

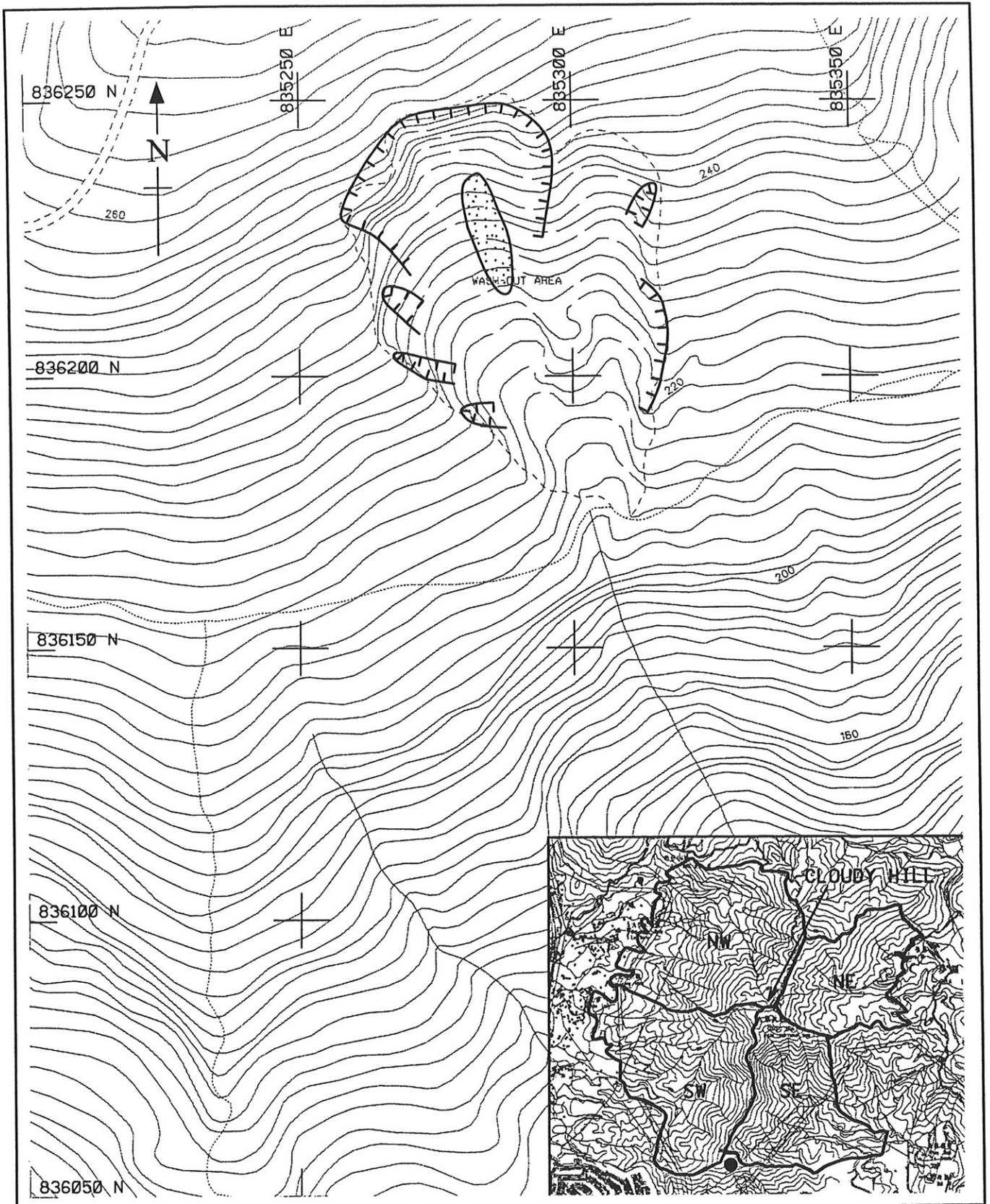


Figure 1 Location map

Scale 1:1000

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

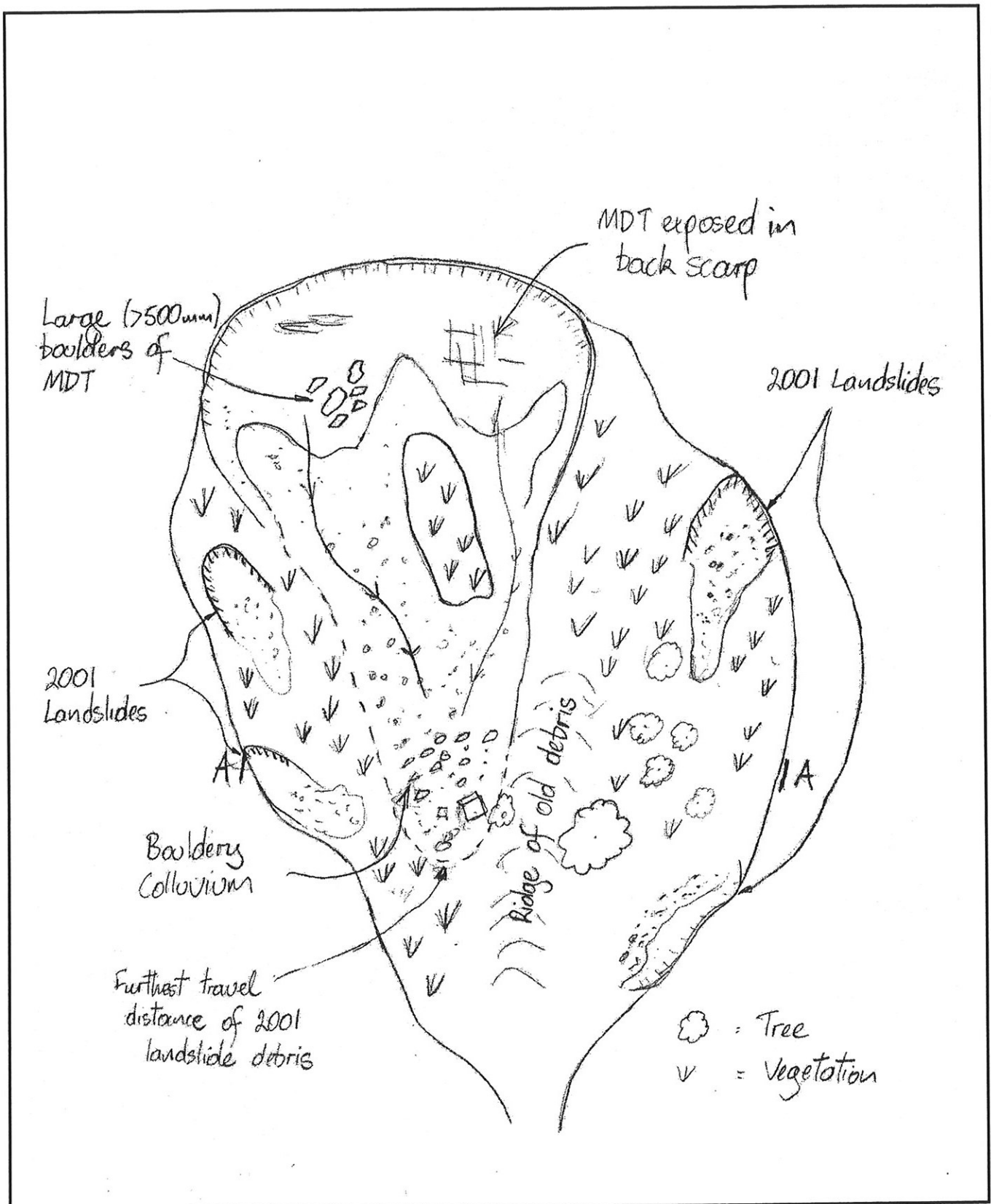


Figure 2 Sketch plan of landslide source

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

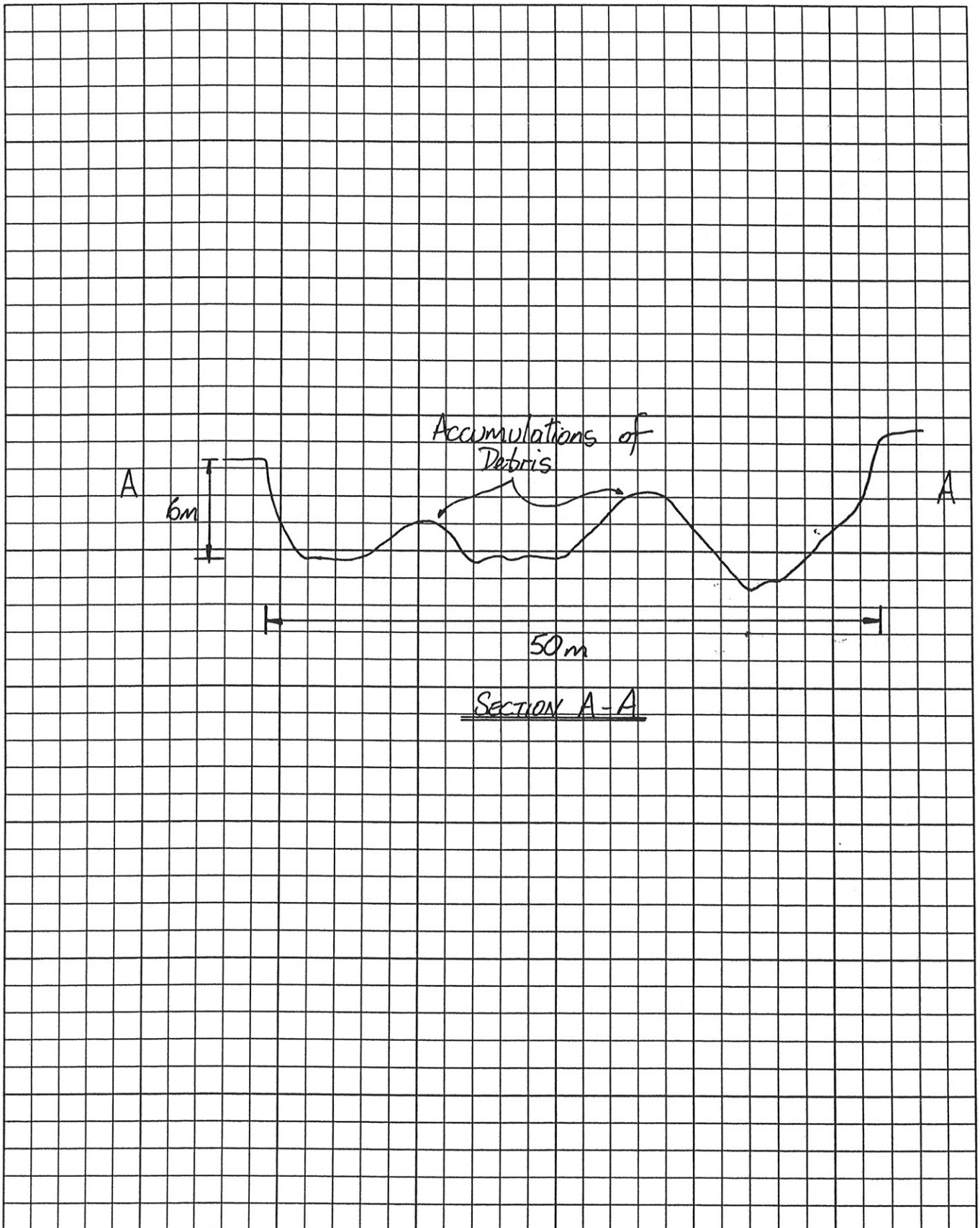


Figure 3 Annotated sections through landslide source

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill

LANDSLIDE SETTING

Mapped by	DMD/JAT	Date	18/10/01	Weather	Fine and Dry
1:1000 map sheet No	3-SW-19B/19D	Grid reference GPS	E 835837	N 837836	
Catchment No	NE				
Landslide No	01N				
Year first observed	2001				
Evidence	Visible after rainstorm in early June 2001, and at Helicopter reconnaissance in July 2001				
Mapped geology	Formation: Tai Mo Shan Lithology: Crystal tuff				

Within Catchment	Rock exposure	Break in slope	Ridgeline	Stream course
Proximity of landslide source area to:	None	None*	15-20m	200m
Morphological position	Below hill summit			
Previous failure	Possible previous landslide at west side			
Anthropogenic features (Paths, fires, drains etc)	Possible previous fire, footpath along western slope			

* possible convex break in slope prior to landslide, based on shape of eastward adjacent slope

SOURCE

VEGETATION ☒ relevant box

bare	Grass	☒ Low shrub + grass	Tall shrub + grass
low shrub	tall shrub	plantation / woodland	Hillfire

☒ all relevant boxes	Angle	Aspect	Irregular	Convex	Concave	Planar
Main scarp	80-90°	185°	✓			
Source floor	10-35°	185°	✓			
Pre-failure Slope	27-29°	180°		✓		

Max width	42 m	Max length	19.2 m
Max depth	1.5 m		

Notes:

Tension crack over 42m long running along landslide crown

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill

SOURCE (Continued)

MATERIALS EXPOSED

Max. Thick.	Material Type	Material Description	% material by volume			
			>200 mm	60-200 mm	20-60 mm	<20 mm
0.3m	Fine Colluvium	Light reddish brown, clayey silty gravelly SAND with some angular cobbles of tuff		5	10	85
1.2m	Bouldery Colluvium	Light brown and grey cobbles and boulders with much clayey/silty sand	5	40	15	40
0.2m	Completely Decomposed tuff	Extremely weak light reddish brown completely decomposed tuff (slightly sandy SILT/CLAY)				100
Regolith Type(s): Colluvium over CDT						

STRUCTURAL DETAILS

Type	Dip	Dip Direction	Persistence	Spacing	Opening / Aperture	infill	Waviness	Roughness	Significance
J	46	205	1-2m	-	-	-	Undulating	Smooth	Exposed in source floor adverse orientation Partial control on surface of rupture clay infill between fractured quartz
V	40	240	>5m	-	Tight	Qtz	Planar	Rough	

SOIL PIPES * Total Number

4

Diameter	83mm	64mm	22mm	27mm					
Open	✓	✓	✓	✓					
Infilled									

Seepage *	Yes/No	Flow Rate	
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* Mark locations of pipes and seepages on Sketch Plan

NOTES /

INITIATION: Orientation of quartz vein relative to surface of rupture indicative of possible underlying structural influence

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

DEBRIS TRAIL

SUBSTRATE

Max. Thickness	Material Type	Description
0.1	Top Soil	Firm to stiff grey sandy SILT/CLAY
0.2	Completely Decomposed Tuff	Extremely weak light reddish brown completely decomposed tuff (slightly sandy SILT/CLAY)
Regolith: Top soil over colluvium		

Debris Type	Description *	Clast / Matrix Supported	% by volume			
			>200 mm	60 – 200 mm	2-60 mm	<2mm
Colluvium	Gravelly angular COBBLES of tuff with much silty sand occasional boulders up to 600mm in size	Matrix	10	30	20	40

* Include maximum clast size in Description

Notes /

Process: Landslide has essentially occurred as a translational slide with the debris becoming partially channelised.

LANDSLIDE No. 01N
Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

PHOTOGRAPHS

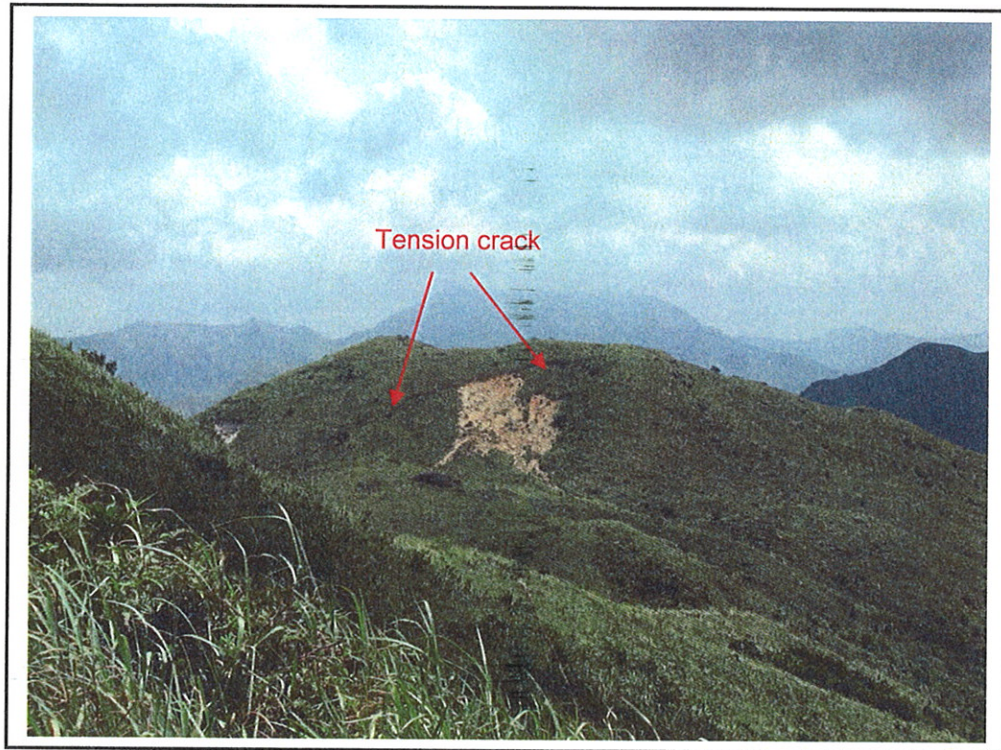


PLATE 1: View of Landslide Source and Tension Crack (Photograph Taken 9 August 2001)

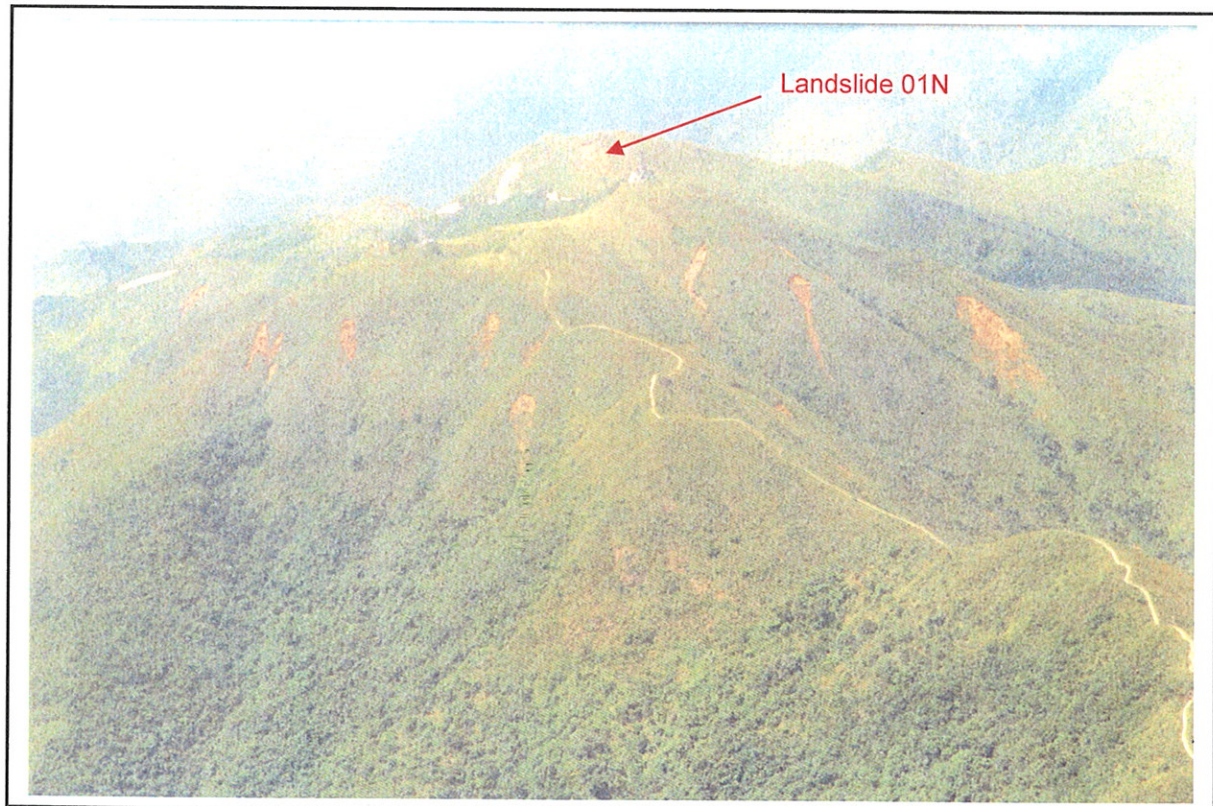


PLATE 2: View of Cloudy Hill Landslides (Photograph Taken 9 July 2001)

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

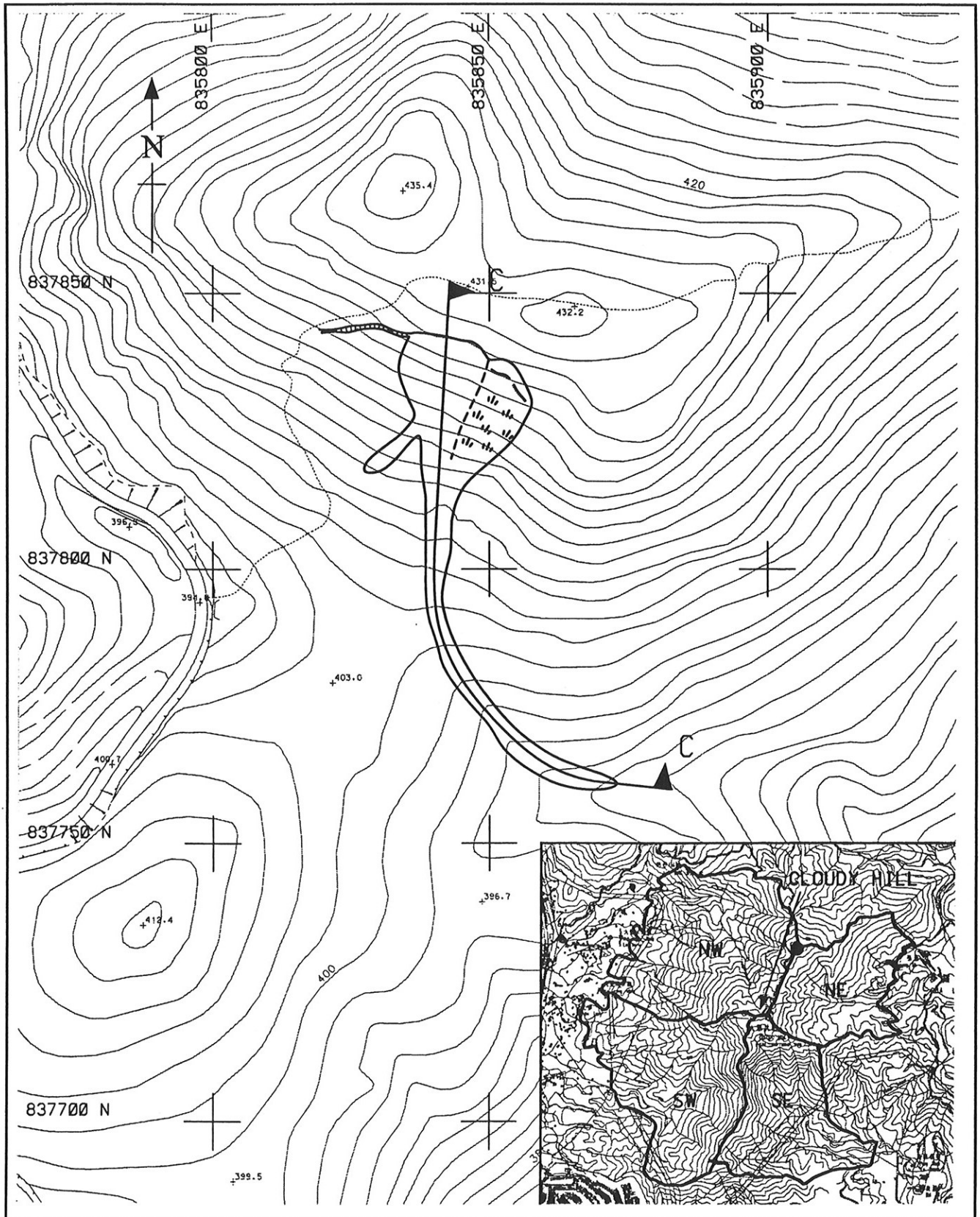


Figure 1 Location map (see Figure 5 for Section C-C)

Scale 1:1000

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

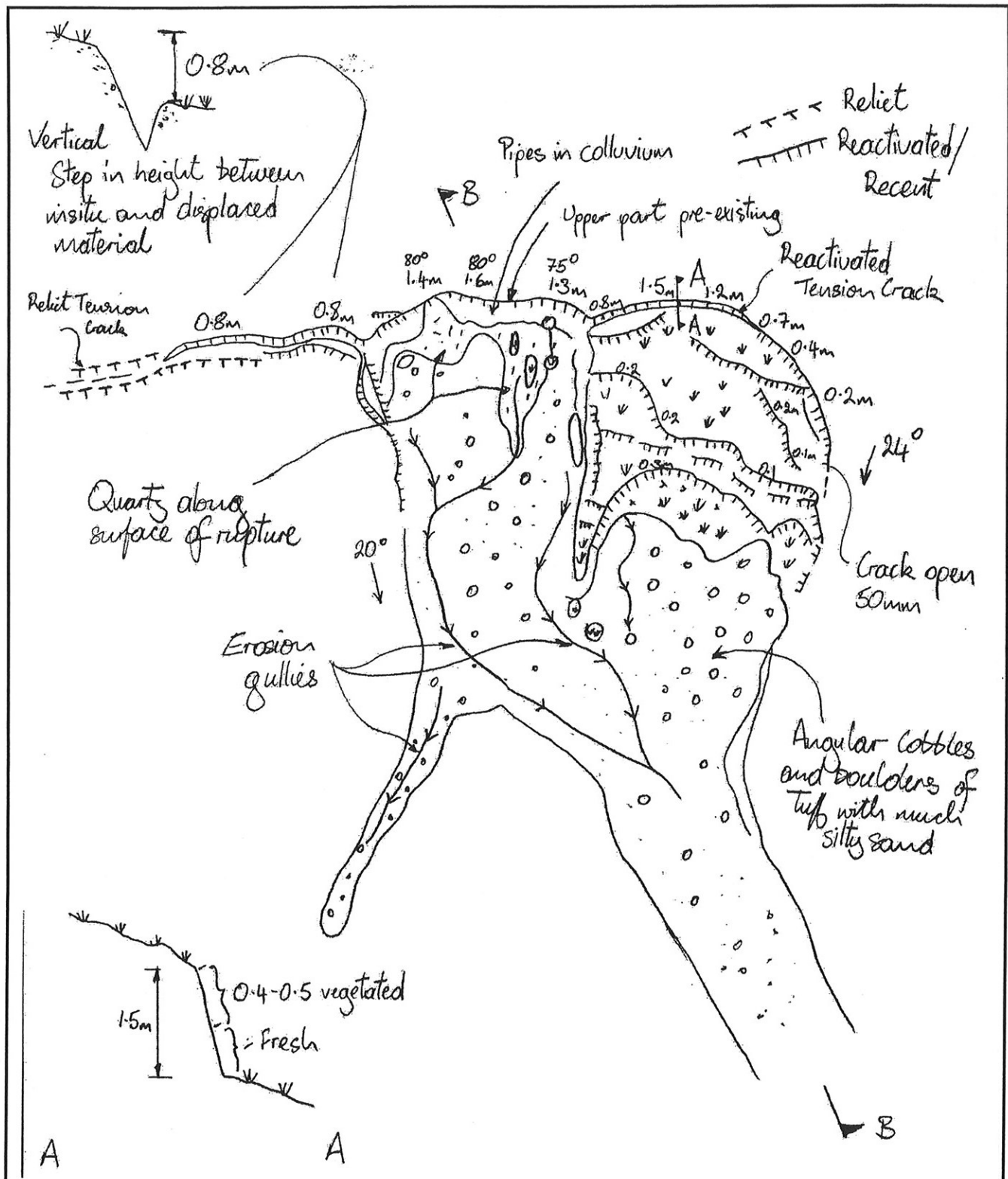


Figure 2 Sketch plan of landslide source

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

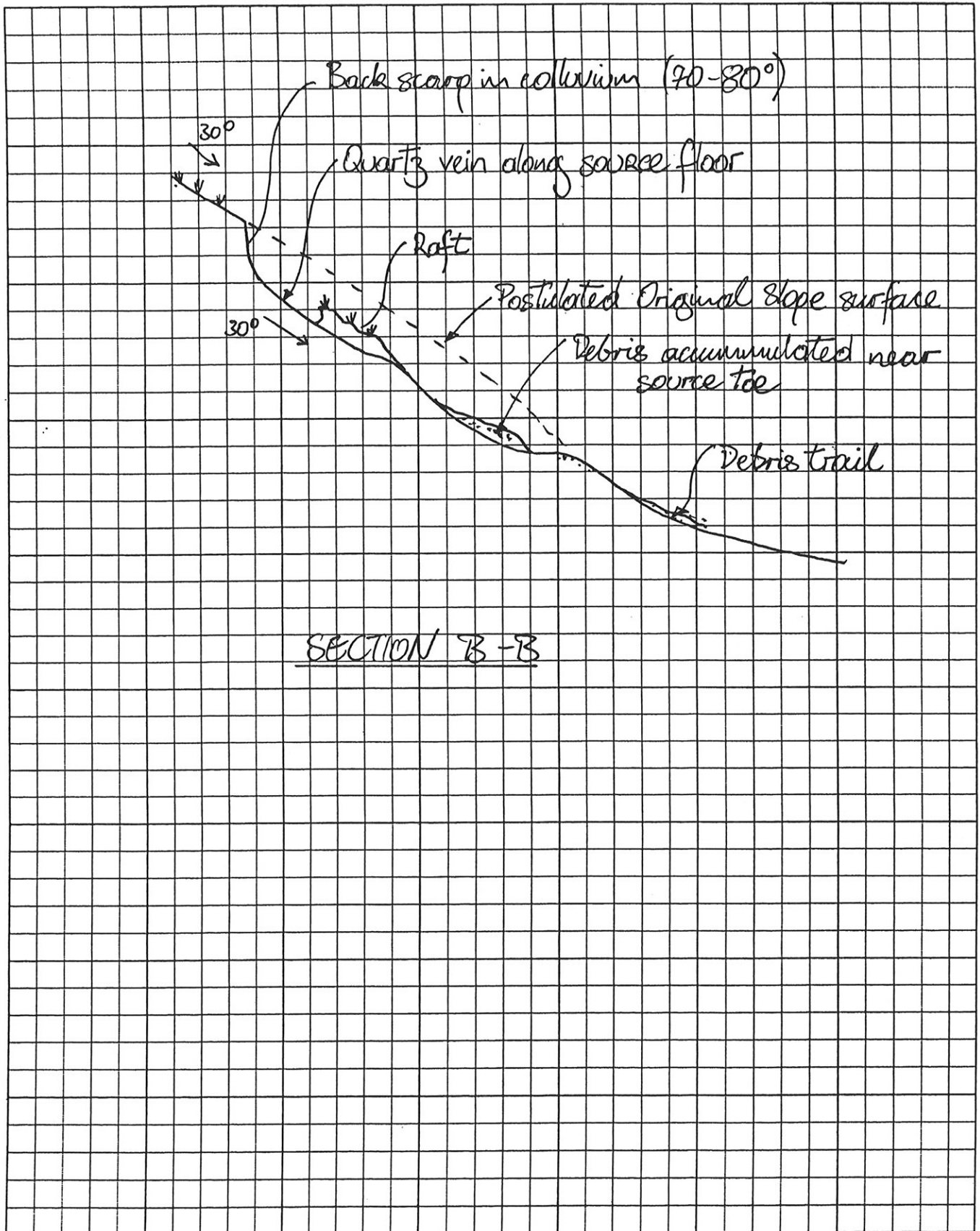


Figure 3 Annotated sections through landslide source

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

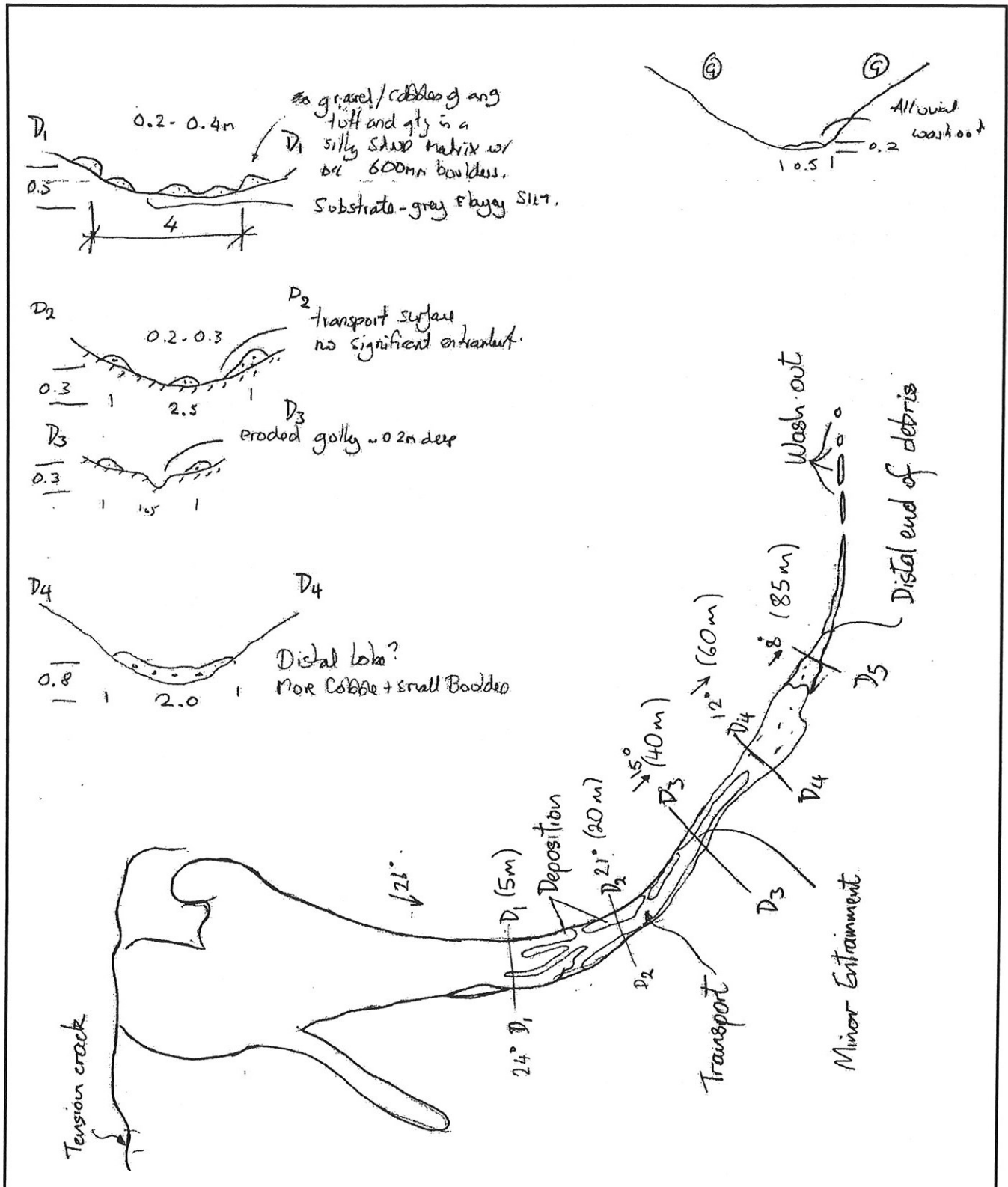


Figure 4 Sketch plan of debris trail

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill
Landslide Field Proforma

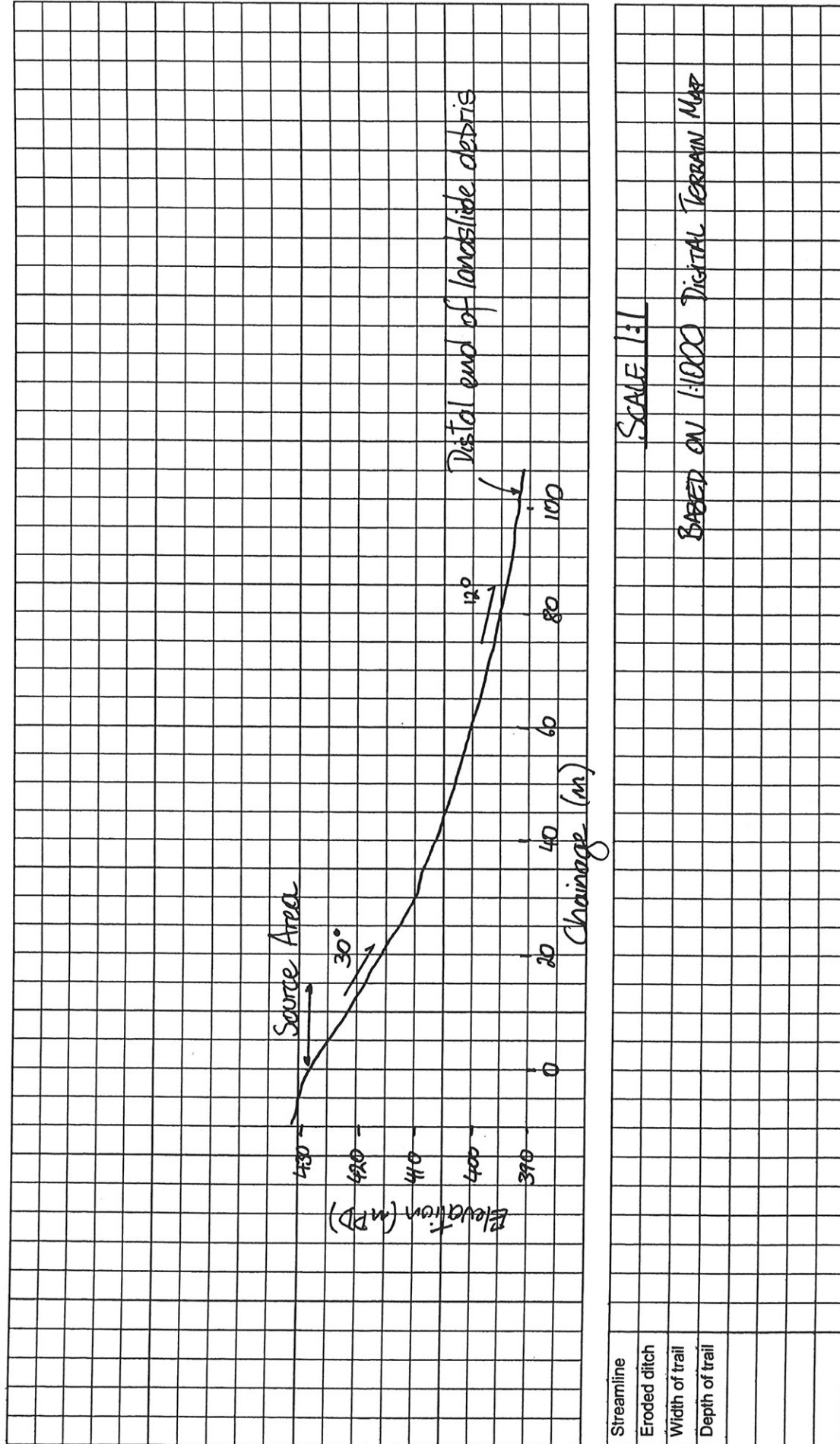


Figure 5 Longitudinal Section through Debris Trail

Landslide 01N

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill Landslide Field Proforma

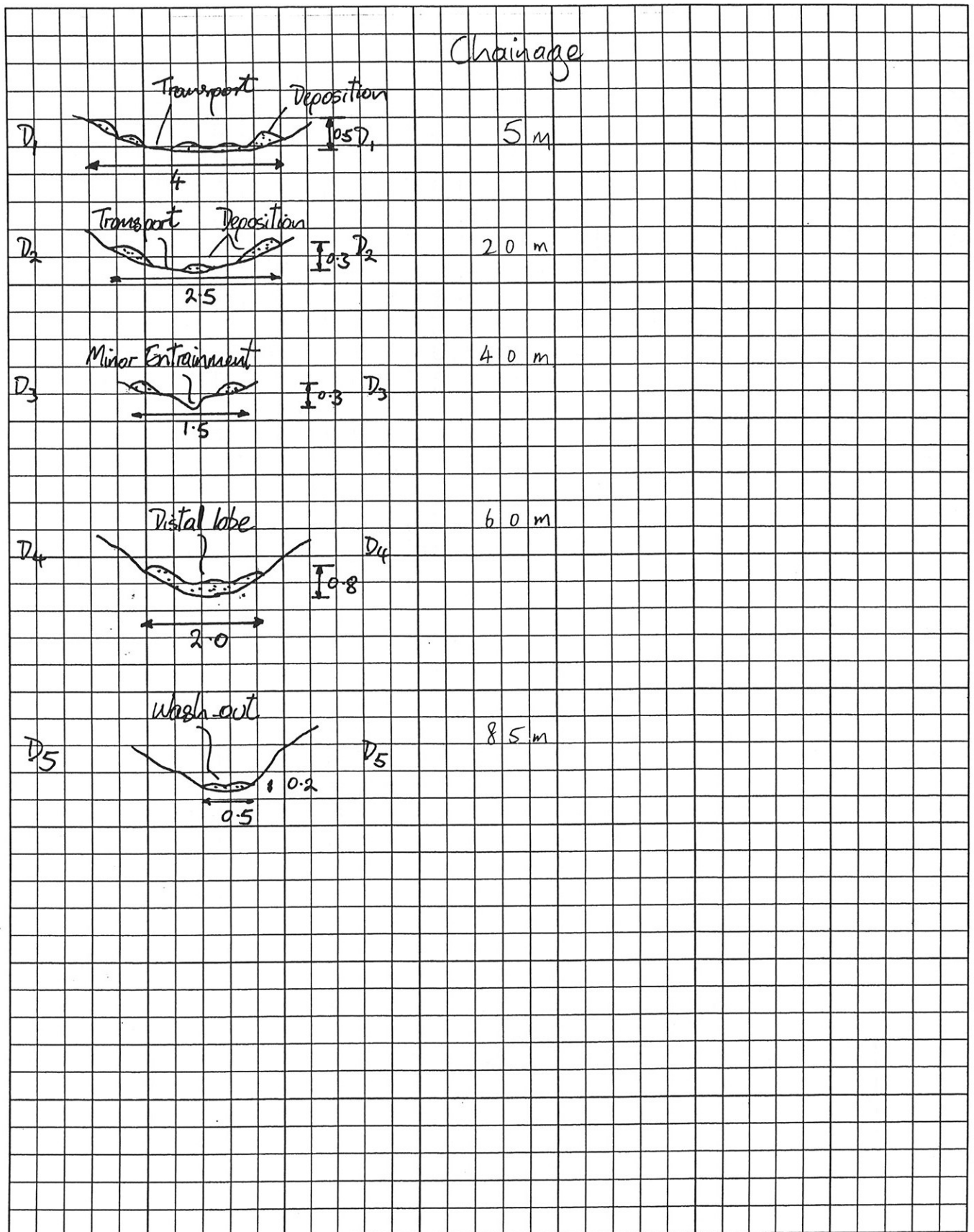


Figure 6 Sections through debris trail

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-1- **LANDSLIDE No. 01W**
Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

LANDSLIDE SETTING

Mapped by	DMD	Date	27/11/01	Weather	Fine & Dry
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1:1000 map sheet No	3-SW-14D	Grid reference GPS	E833816	N838588			
Catchment No	NE						
Landslide No	01W						
Year first observed	2001						
Evidence	Visible after rainstorm in early June 2001, and at Helicopter reconnaissance in July 2001						
Mapped geology	Formation: Tai Mo Shan Lithology: Undivided, coarse ash crystal tuff						

Within Catchment	Rock exposure	Break in slope	Ridgeline	Stream course
Proximity of landslide source area to:	Rock exposed at southern flank	Convex break 30-32 above scarp 37-38 below midpoint	5-10m	175
Morphological position	Below Ridgeline and Head of Drainage Channel			
Previous failure	Not apparent from field inspection			
Anthropogenic features (Paths, fires, drains etc)	Footpath at toe of landslide (Wilson Trail)			

SOURCE

VEGETATION ✓ **relevant box**

bare
 low shrub
 Grass
 tall shrub
 ✓ Low shrub + grass
 plantation / woodland
 Tall shrub + grass
 Hillfire – Minor Hillfire south of southern flank of landslide

✓ all relevant boxes	Angle	Aspect	Irregular	Convex	Concave	Planar
Main scarp	80-90°	280°			✓	
Source floor	32°	280°		✓		
Pre-failure Slope	30-37°	325°		✓		

Max width	12.2 m	Max length	26.4 m
Max depth	1.5 m		

Notes:

- i) Landslide source appears to be the result of accumulation of colluvium at head of a drainage line below a shallow rounded ridgeline.

-2-
**Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill**

LANDSLIDE No. 01W

SOURCE (Continued)

MATERIALS EXPOSED

Max. Thick.	Material Type	Material Description	% material by volume			
			>200 mm	60–200 mm	20–60 mm	<20 mm
1.5m	Fine Colluvium	Light reddish brown clayey silty fine SAND with some angular gravel and cobbles of tuff with occasional boulders up to 3m x 1m x 1m in size	1	14	5	80
Exposed only	Completely Decomposed Tuff	Dark reddish brown, extremely weak to weak clayey silty fine SAND occasional clay infilled relict joints up to 10mm wide				
Regolith Type(s): Grade V – Completely Decomposed Tuff						

STRUCTURAL DETAILS

Type	Dip	Dip Direction	Persistence	Spacing	Opening / Aperture	infill	Waviness	Roughness	Significance
J	34	245	1m						Possible underlying structural influence

SOIL PIPES * Total Number

1

Diameter	85mm*								
Open	✓								
Infilled	graded								

* Pipe obscured by remedial works for footpath

Seepage*	Yes/No	Flow Rate	
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* Mark locations of pipes and seepages on Sketch Plan

NOTES /

INITIATION:

- Perched water.
- Number of large angular boulders above crest of landslide. Area of regularly spaced young trees (4-5m tall ≈ 50-70mm trunk diameter) around northern flank of landslide.
- No evidence of tension cracks.

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

DEBRIS TRAIL

SUBSTRATE

Max. Thickness	Material Type	Description
Exposed	CDT	Extremely weak to weak dark reddish brown completely decomposed tuff (silty clayey fine SAND with occasional fine gravel of quartz)
Exposed	WSDT	Moderately strong to strong, grey occasionally dappled pink moderately to slightly decomposed tuff.
Regolith: CDV		

Debris Type	Description *	Clast / Matrix Supported	% by volume			
			>200 mm	60 – 200 mm	2-60 mm	<2mm
Cobbles & Boulders	COBBLES & BOULDERS with some silty clayey fine sand	CLAST	40	50	18	2

* Include maximum clast size in Description

Notes / Process:	Shape of debris trail dictated by drainage line topography below drainage line >30° for 150m
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LANDSLIDE No. 01W
Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

PHOTOGRAPHS



PLATE 1: View of Source (Photograph Taken 9 July 2001)

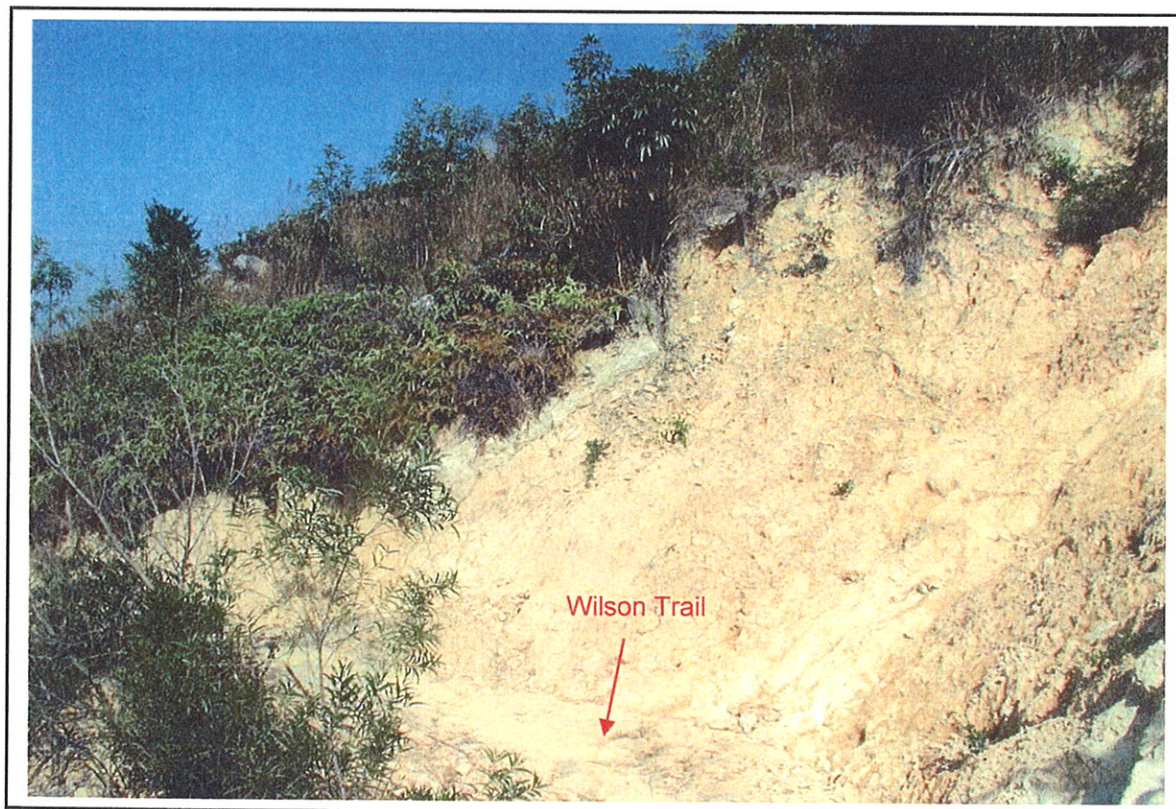


PLATE 2: View of the Landslide Toe (Photograph Taken 27 November 2001)

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

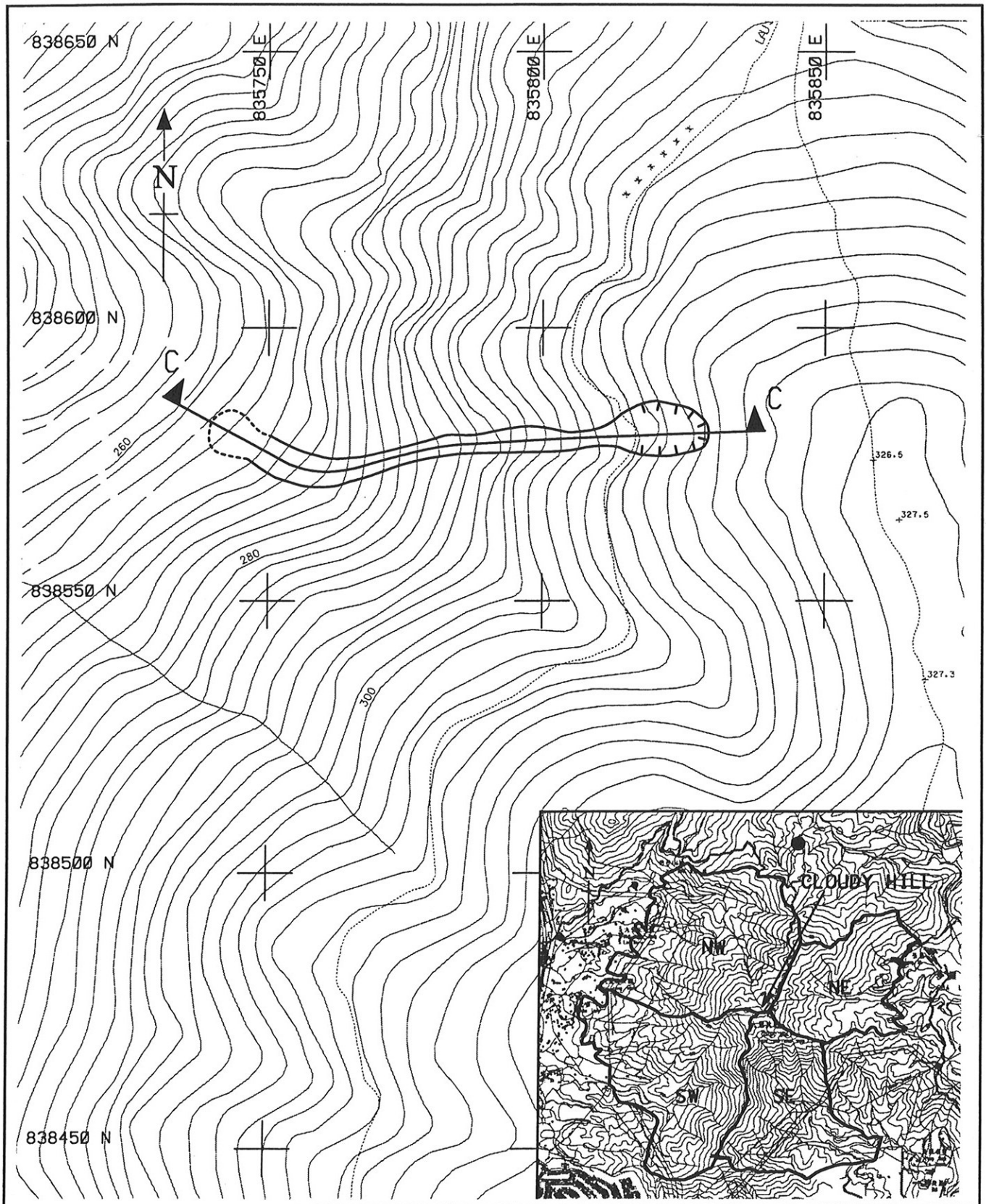


Figure 1 Location map (see Figure 5 for Section C-C)

Scale 1:1000

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

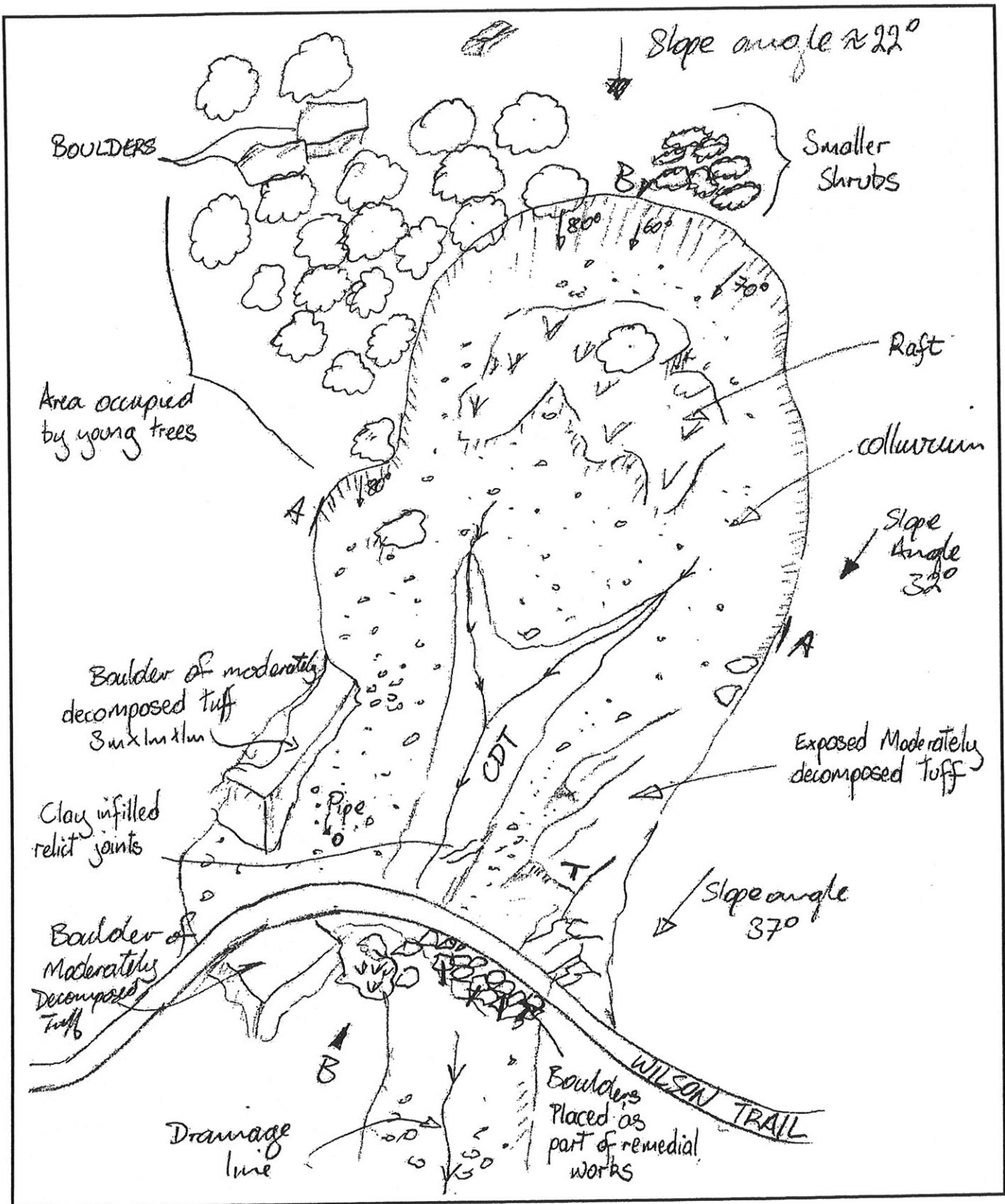


Figure 2 Sketch plan of landslide source

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

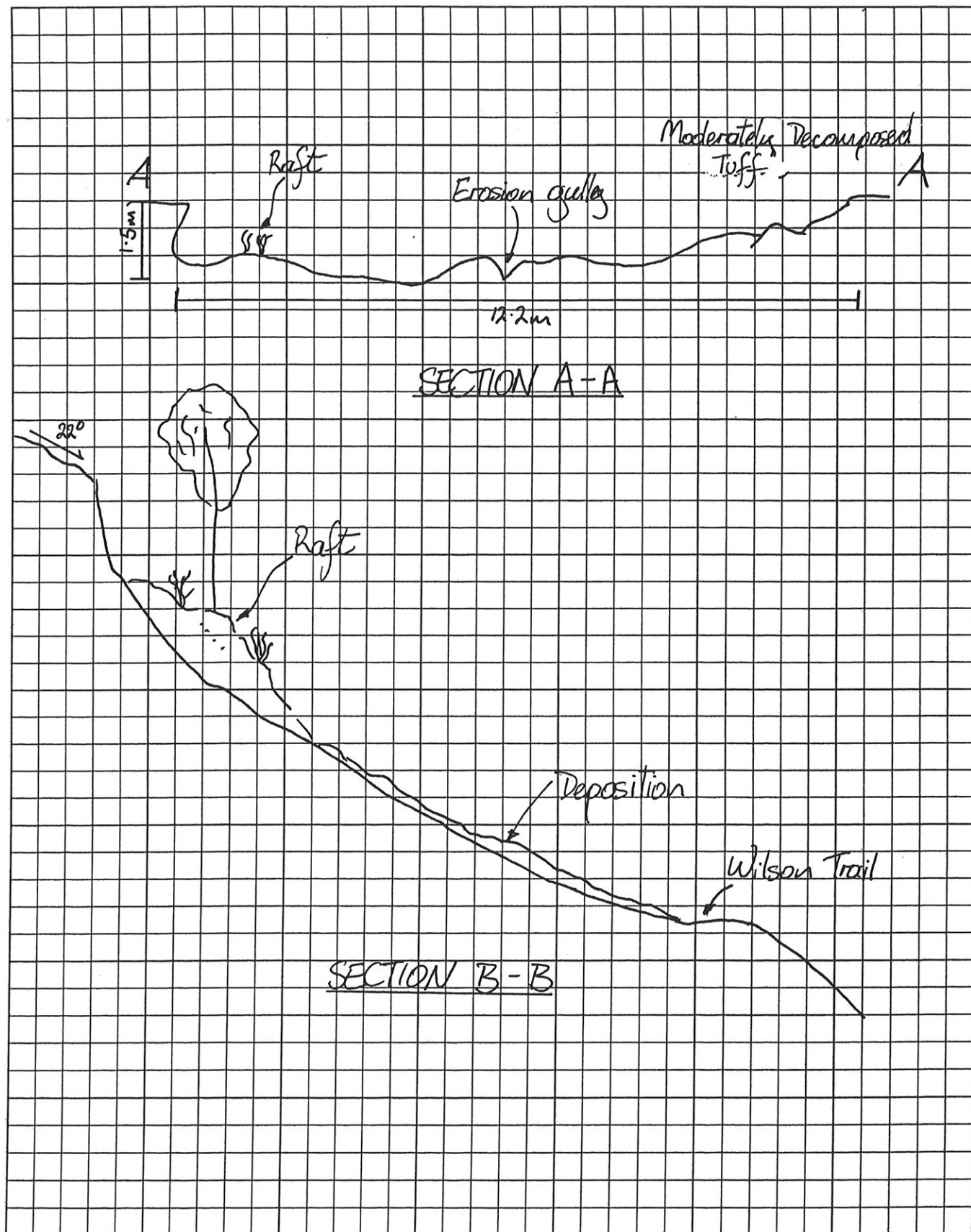


Figure 3 Annotated sections through landslide source

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

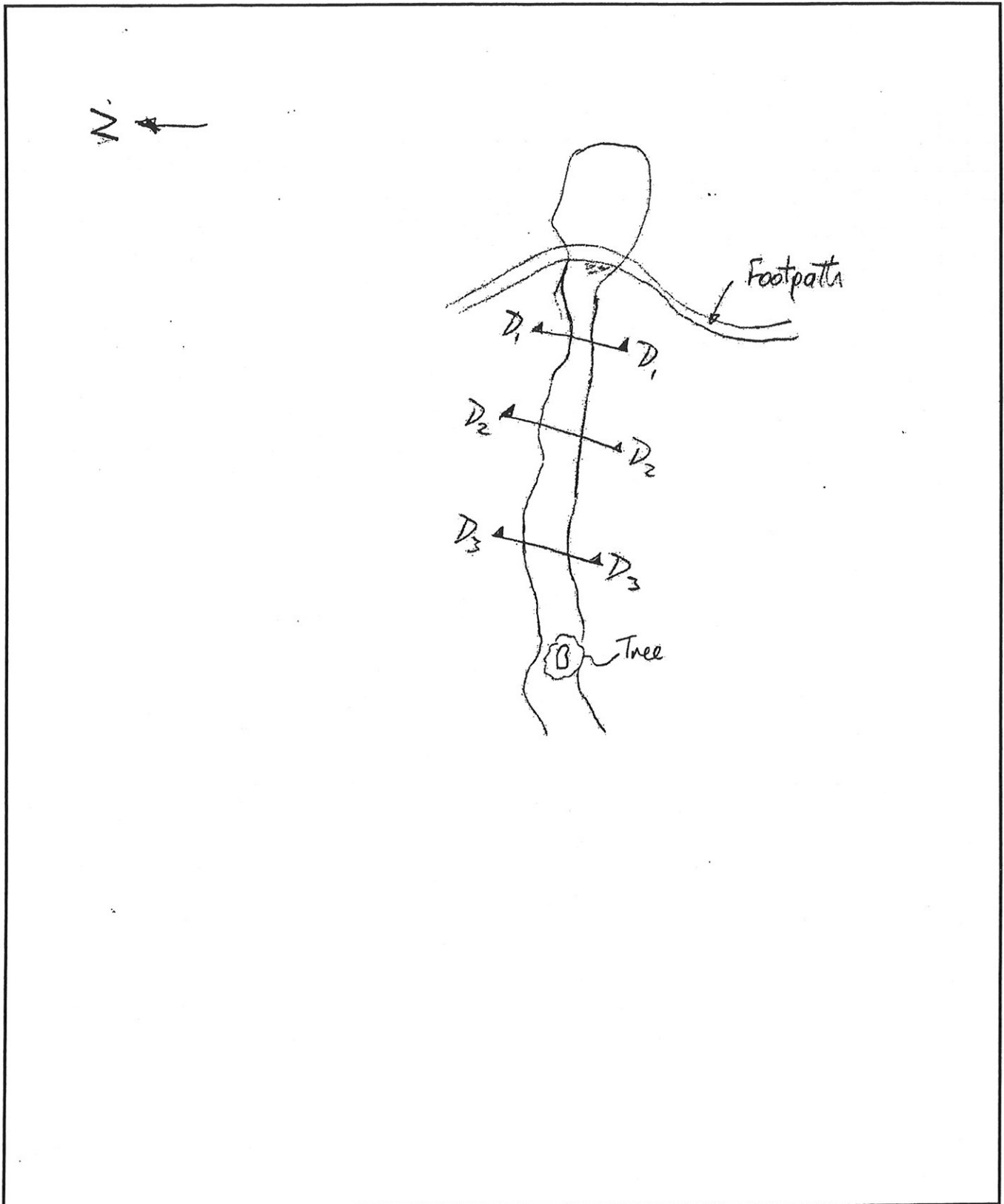


Figure 4 Sketch plan of debris trail

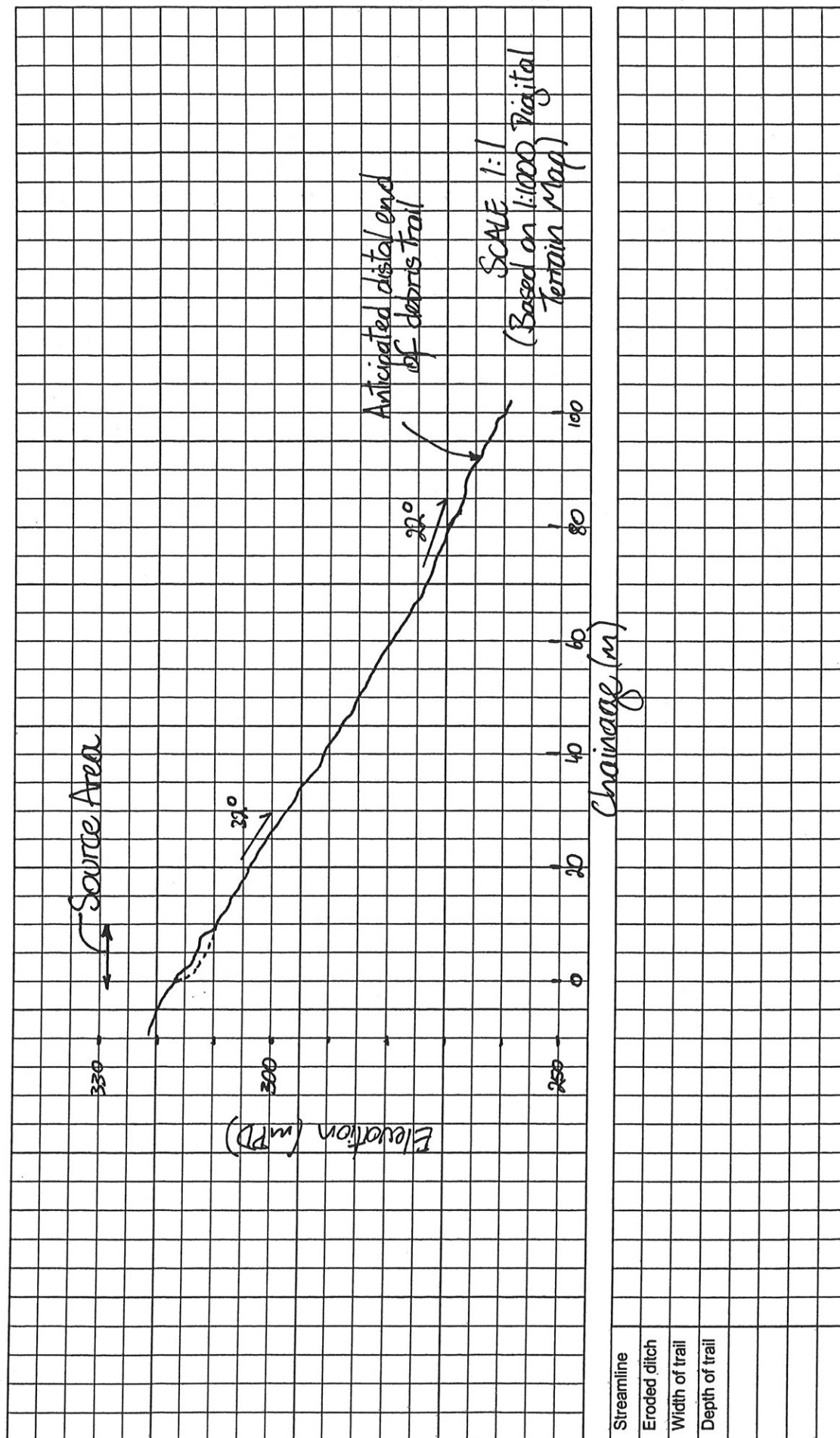


Figure 5 Longitudinal Section through Debris Trail

LANDSLIDE 01W

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill Landslide Field Proforma

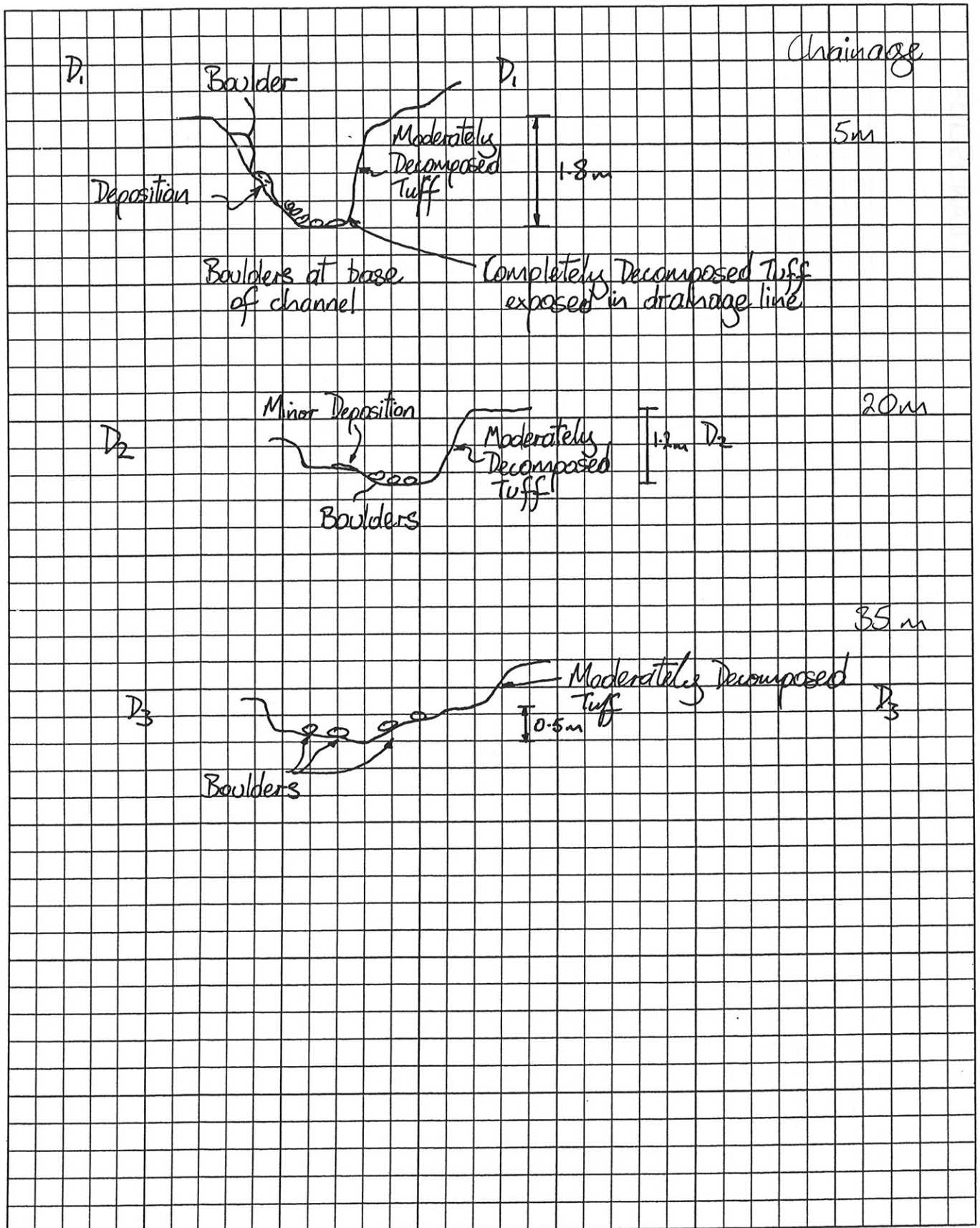


Figure 6 Sections through debris trail

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Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill

LANDSLIDE SETTING

Mapped by	DMD/HHSU	Date	28/11/01	Weather	Cloudy
1:1000 map sheet No	3-SW-15C	Grid reference GPS	E836120	N838721	
Catchment No	NE				
Landslide No	01EE				
Year first observed	2001				
Evidence	Visible after rainstorm in early June 2001, and at Helicopter reconnaissance in July 2001				
Mapped geology	Formation: <i>Tai Mo Shan</i> Lithology: <i>Undivided, coarse ash crystal tuff</i>				

Within Catchment	Rock exposure	Break in slope	Ridgeline	Stream course
Proximity of landslide source area to:	Moderately Decomposed Tuff in scar	None at landslide convex break 5m south-west	8-10m	0m to drainage line 80m to stream (dry)
Morphological position	Below ridgeline and flank of drainage channel			
Previous failure	None apparent from slope inspection			
Anthropogenic features (Paths, fires, drains etc)	None			

SOURCE

VEGETATION ☒ relevant box

bare	Grass	☒ Low shrub + grass	Tall shrub + grass
low shrub	tall shrub	plantation / woodland	Hillfire

☒ all relevant boxes	Angle	Aspect	Irregular	Convex	Concave	Planar
Main scarp	75-80°	050°			☒ slightly	
Source floor	45°	050°				☒
Pre-failure Slope	30-32°	080°		☒ slightly		

Max width	13.4 m	Max length	14.5 m
Max depth	1.4 m		

Notes:

Northwestern flank of landslide scar moderately decomposed crystal tuff exposed with quartz veins (up to 10mm) and joints, some infilled with clay.
Rock surface defines surface of rupture at this location (i.e. the northwestern flank) probably clay along joint surface prior to landslide.
Debris becomes channelised.

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill

SOURCE (Continued)

MATERIALS EXPOSED

Max. Thick.	Material Type	Material Description	% material by volume			
			>200 mm	60-200 mm	20-60 mm	<20 mm
0.8m	Colluvium	Firm to stiff dark reddish brown slightly sandy CLAY/SILT with some to many angular gravel and cobbles of tuff and occasional boulders	2	20	28	50
0.2m	Completely Decomposed tuff	Weak, dark reddish/purplish brown Completely Decomposed Tuff (slightly sandy clay/silt) moderately weak to moderately strong light pinkish red				100
Regolith Type(s): CDT						

STRUCTURAL DETAILS

Type	Dip	Dip Direction	Persistence	Spacing	Opening / Aperture	infill	Waviness	Roughness	Significance
J	42	100	7m	Close	(?)5-6mm	Clay			Forms north western flank of landslide, slickensided Slickensided
J	48	112	5.6m	-	-	-			

SOIL PIPES * Total Number

1

Diameter	40mm								
Open	Yes								
Infilled	Partial gravel infilled								

Seepage *	Yes/No	Flow Rate	
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* Mark locations of pipes and seepages on Sketch Plan

NOTES / INITIATION:

- Definite structural control to north western part of landslide
- slickensides indicate movement into drainage line, possible fault (?).

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

DEBRIS TRAIL

SUBSTRATE

Max. Thickness	Material Type	Description
Exposed only > 0.5 m	Topsoil (?) within old drainage line Colluvium	Firm dark grey SILT/CLAY Firm to still slightly sandy SILT/CLAY with occasional cobbles up to 200mm in size
Regolith: Fine & bouldery colluvium		

Debris Type	Description *	Clast / Matrix Supported	% by volume			
			>200 mm	60 – 200 mm	2-60 mm	<2mm
Colluvium	Light brown (dry) slightly sandy SILT/CLAY with much gravel and some angular cobbles up to 200mm x 150mm x 100mm in size	Matrix		20	20	40

* Include maximum clast size in Description

Notes / Process:	Debris has travelled along existing drainage line much debris appears to have travelled only a very short (<20m) distance.
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**Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill**

PHOTOGRAPHS



PLATE 1: View of Landslide Source (Photograph Taken 9 July 2001)

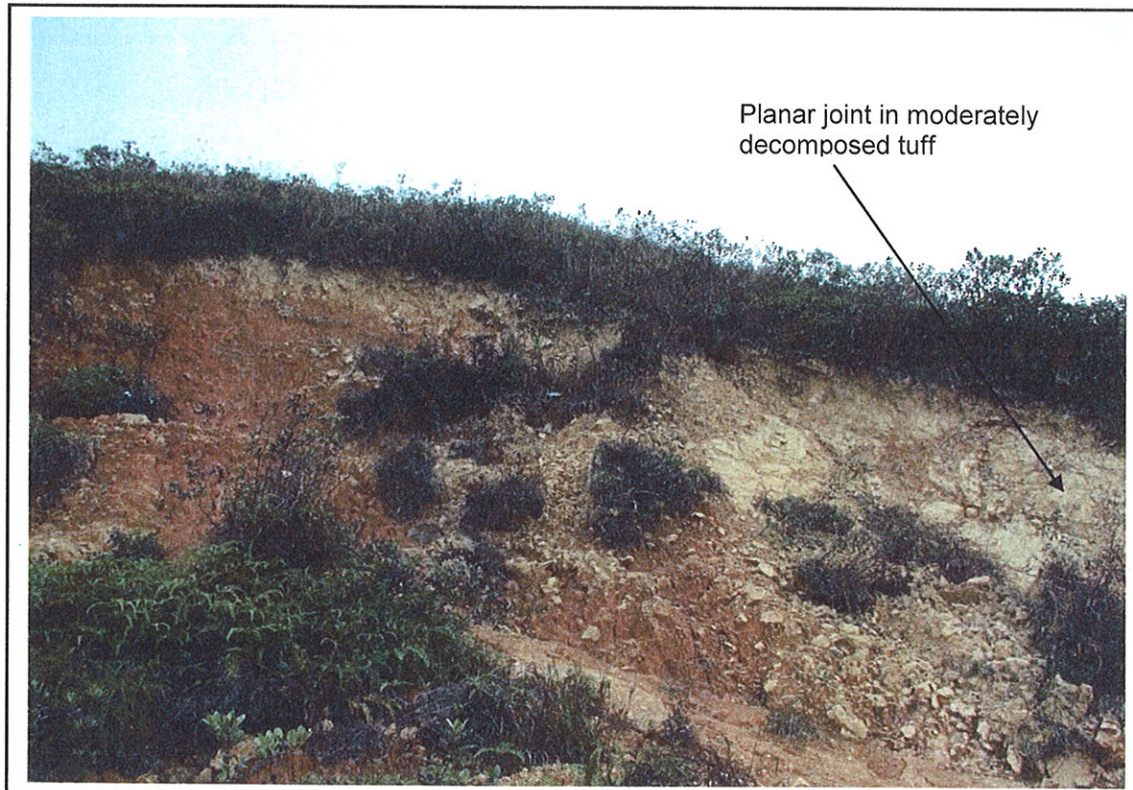


PLATE 2: Detailed View of Landslide Source (Photograph Taken 28 November 2001)

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

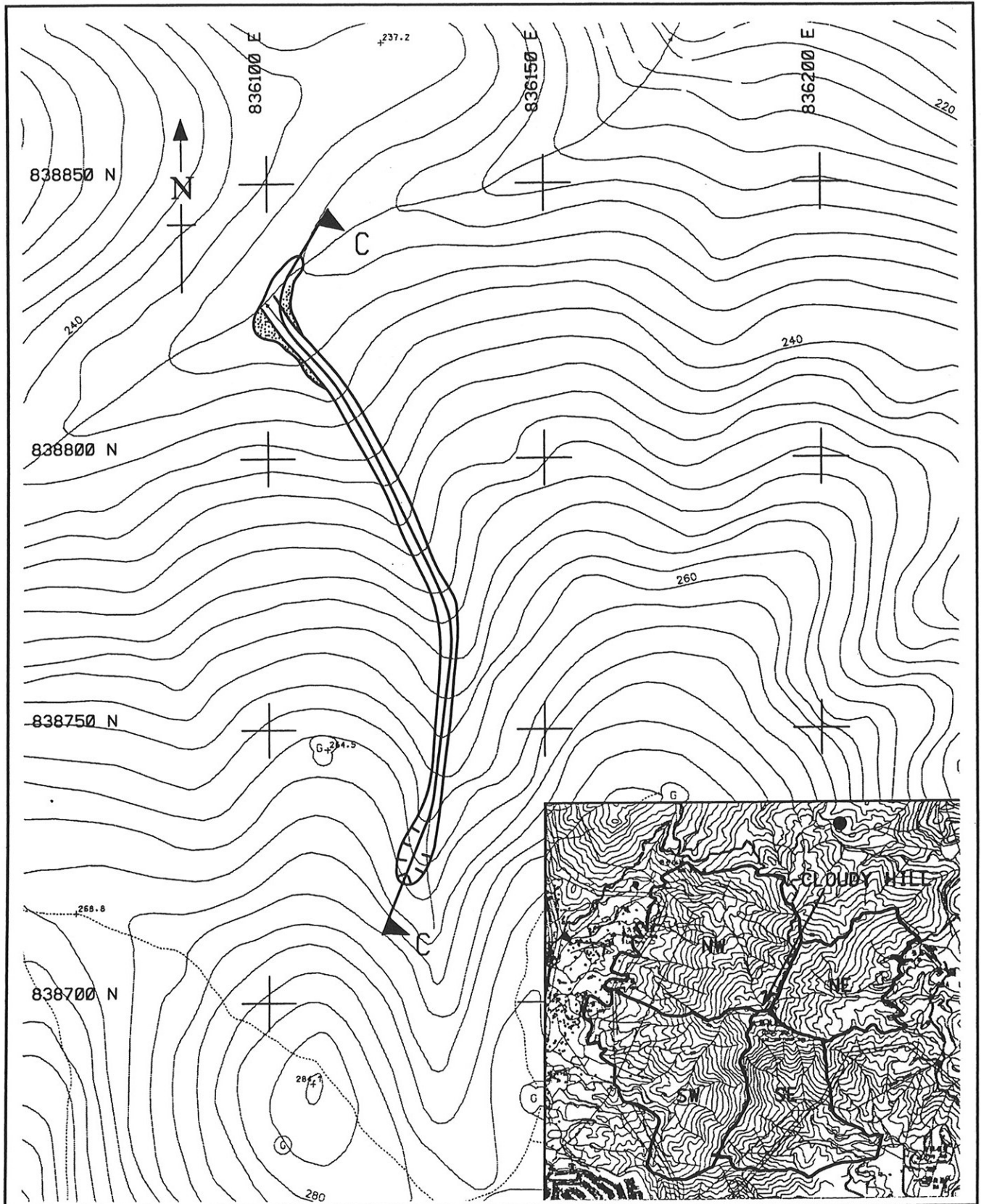


Figure 1 Location map (see Figure 5 for Section C-C)

Scale 1:1000

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

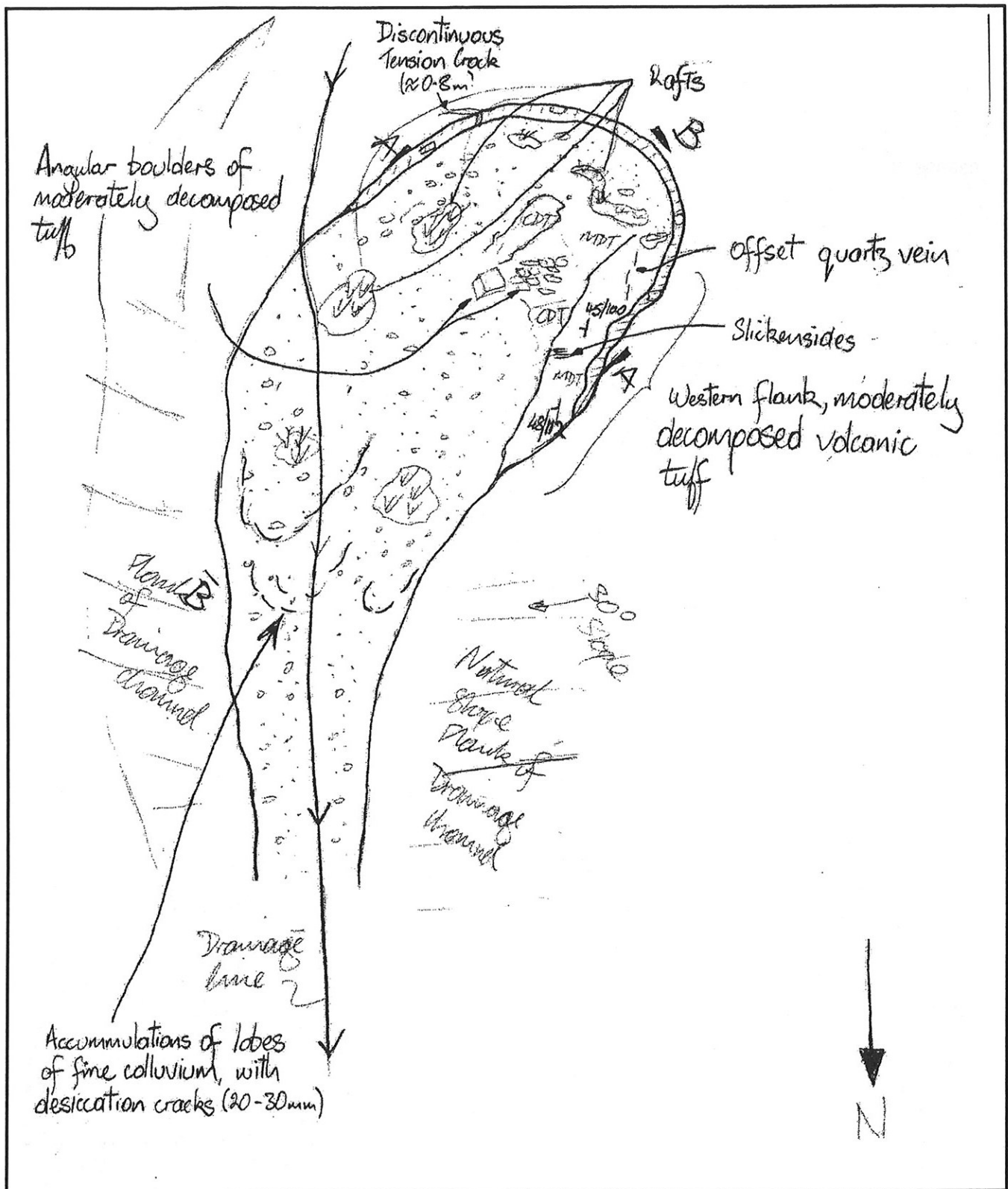


Figure 2 Sketch plan of landslide source

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

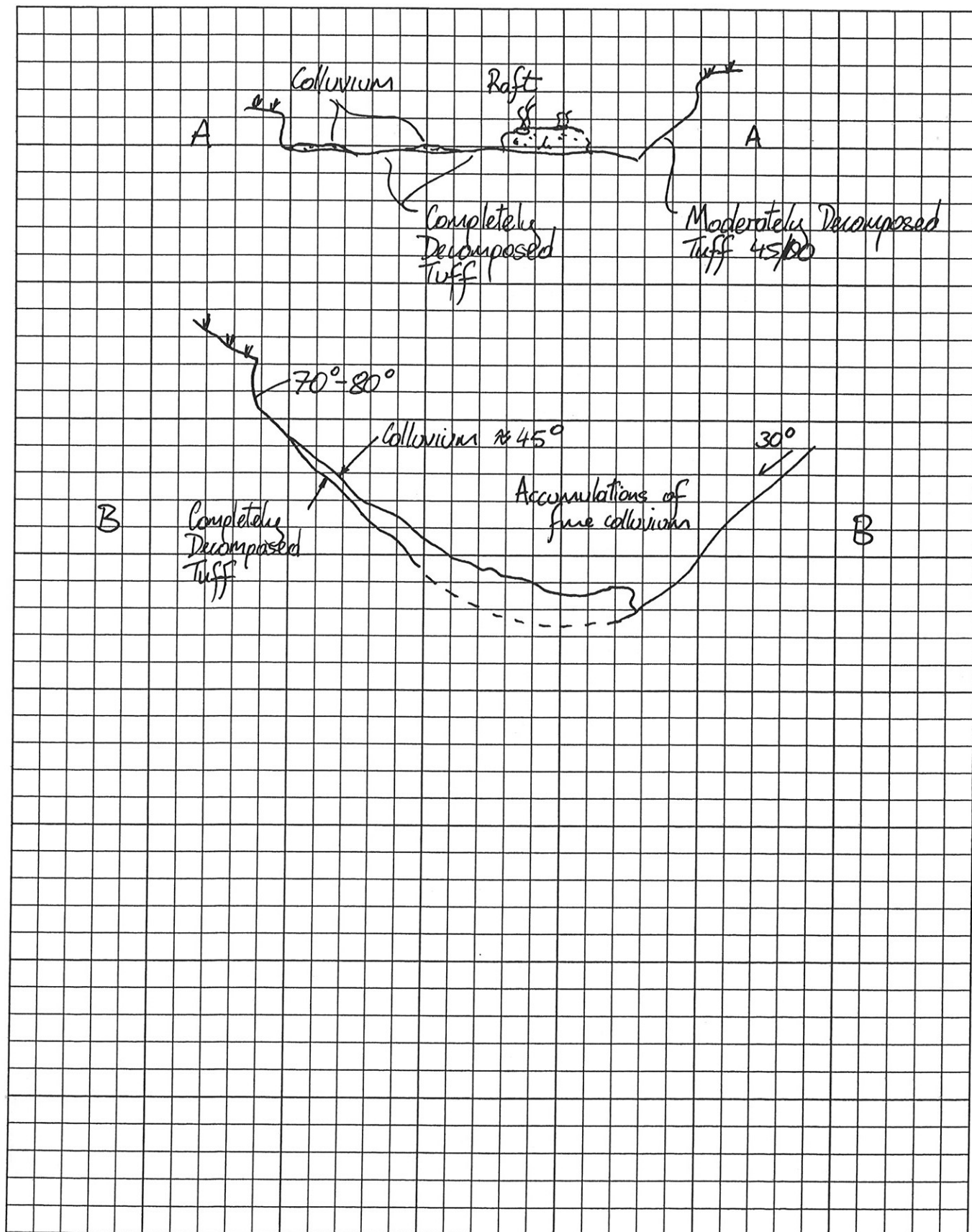


Figure 3 Annotated sections through landslide source

Detailed Study of Selected Natural Terrain Landslides
at Cloudy Hill

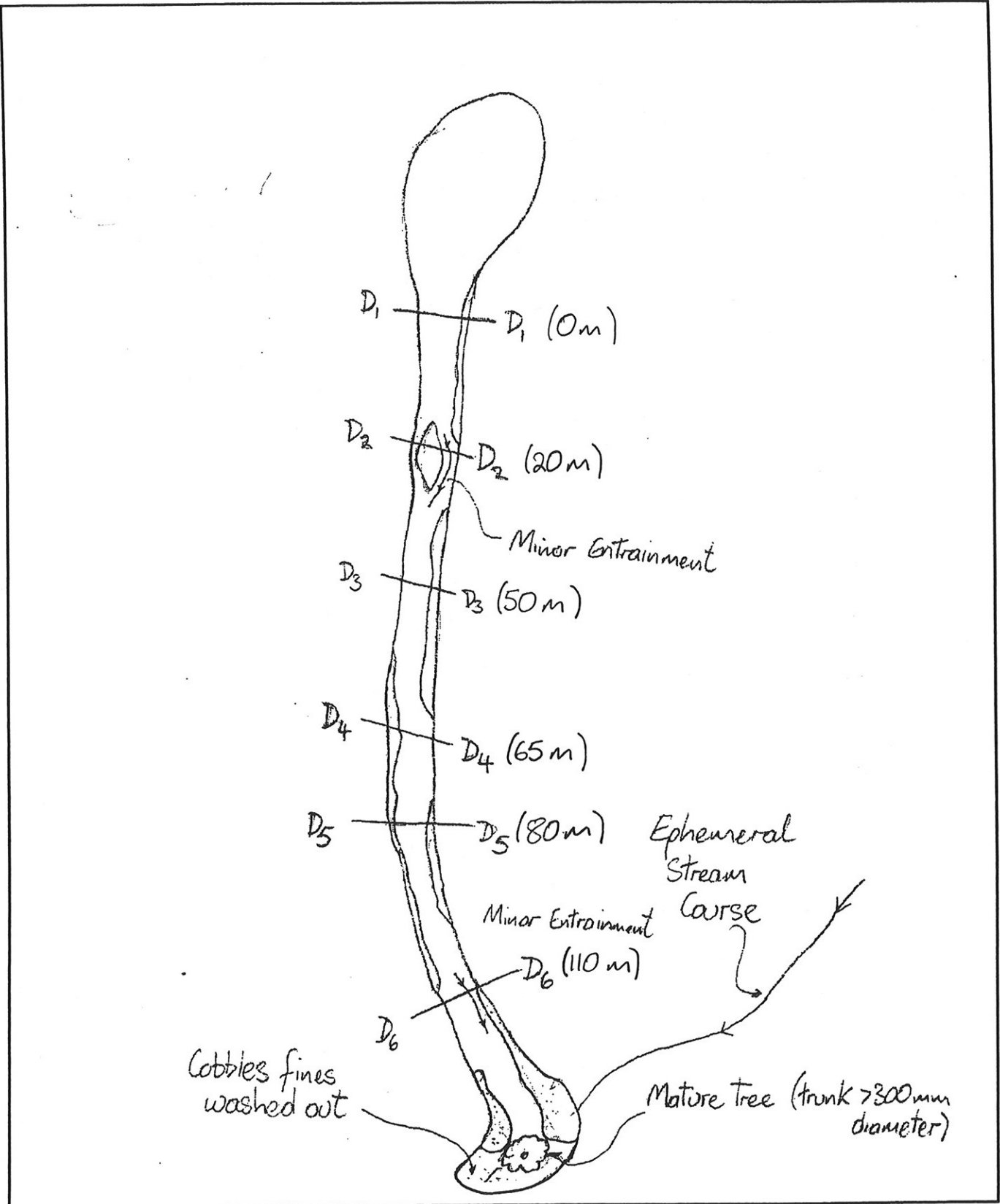


Figure 4 Sketch plan of debris trail

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill
Landslide Field Proforma

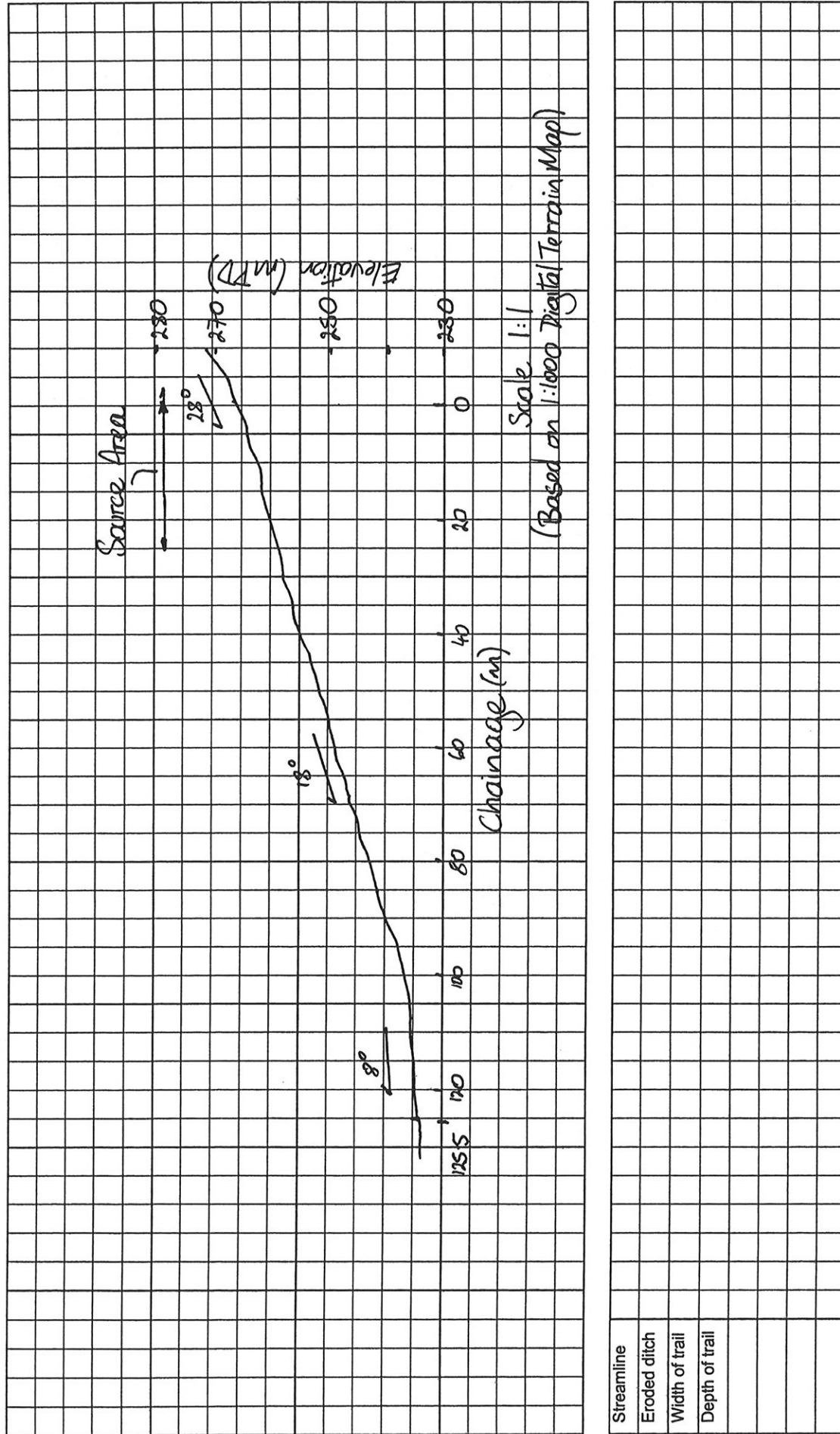


Figure 5 Longitudinal Section through Debris Trail

Detailed Study of Selected Natural Terrain Landslides at Cloudy Hill
Landslide Field Proforma

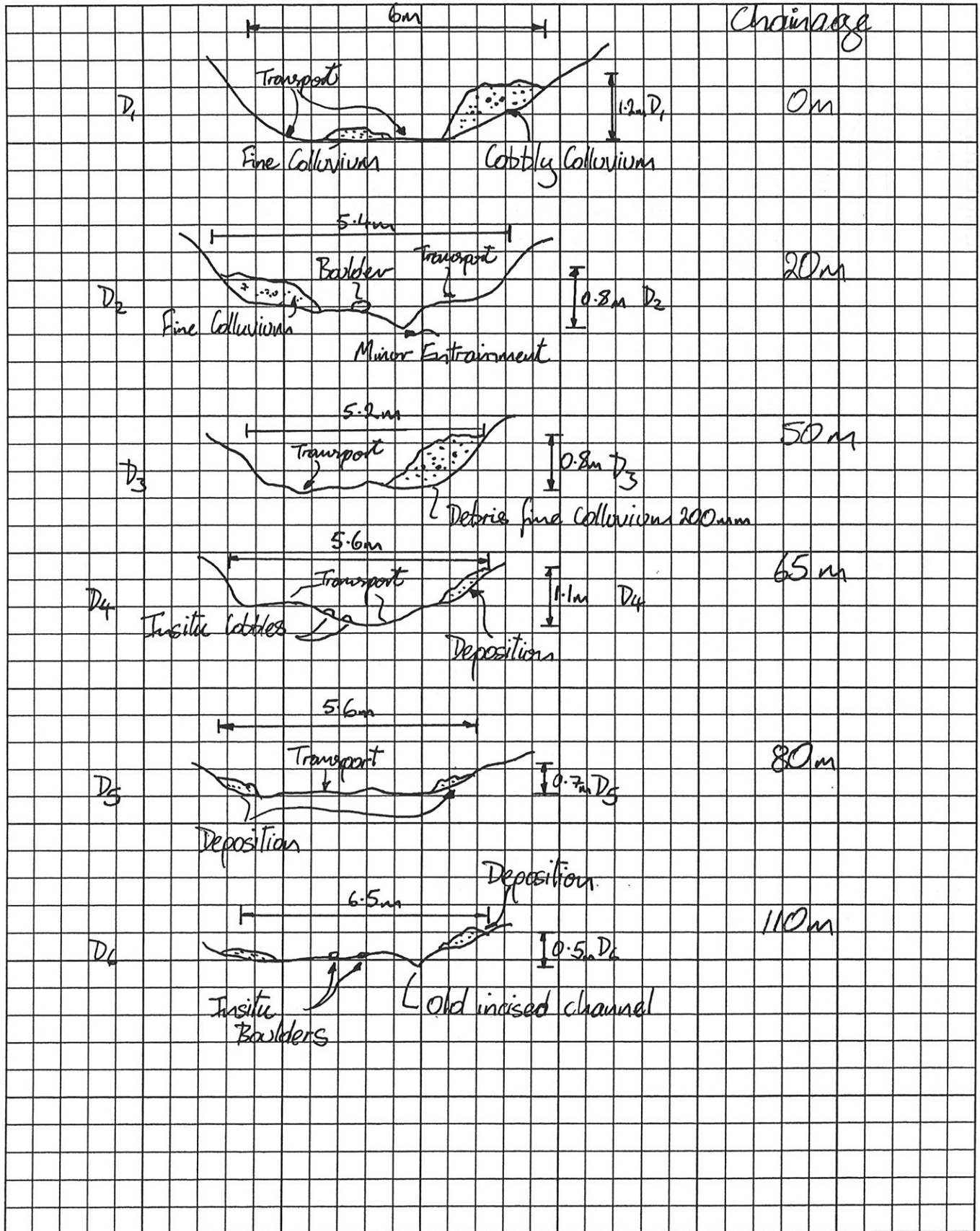


Figure 6 Sections through debris trail

[illegible]