TASMANIA
DEVELOPMENT
AND RESOURCES

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A landslide at Pelverata

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INTRODUCTION

A landslide, affecting an area of about 4.5 hectares, has taken place just north of Pelverata in the Huon area of southern Tasmania. The slip is located about one kilometre along the southern part of Halls Track Road from its junction with the Sandfly–Pelverata Road (at approximately AMG 509 400 mE, 5235 000 mN) . The movement occurred during early 1996 and appears to be related to above average rainfall starting from December 1995. One timber house is located within the moving mass and about fifteen metres from the margin, while several sheds are also within the landslide. Another (brick) house is located about half a metre from the edge of the slip on unaffected land. The movement also affects a section of Halls Track Road. The approximate location and extent of the landslide are shown on Figure 1.

TOPOGRAPHY

The landslide has occurred in a localised broad shallow valley on the lower slopes of Sherwood Hill and extends down to Flynns Creek, east of Halls Track Road. The landslide area and much of the surrounding land, particularly to the west and north, is hummocky and uneven. The average slope angle from the head to the toe of the landslide is about 7°, but the slip is surrounded by steeper sloping land on all sides.

GEOLOGY

The geological map covering the district (Kingborough 1:50 000 scale map sheet; Farmer, 1981) shows that the area around the landslide is underlain by Triassic age interbedded sandstone and shale and dolerite talus of Quaternary age. The landslide has occurred near the boundary of these two units just inside the talus area. The Triassic rocks are expected to underlie the talus at depth.

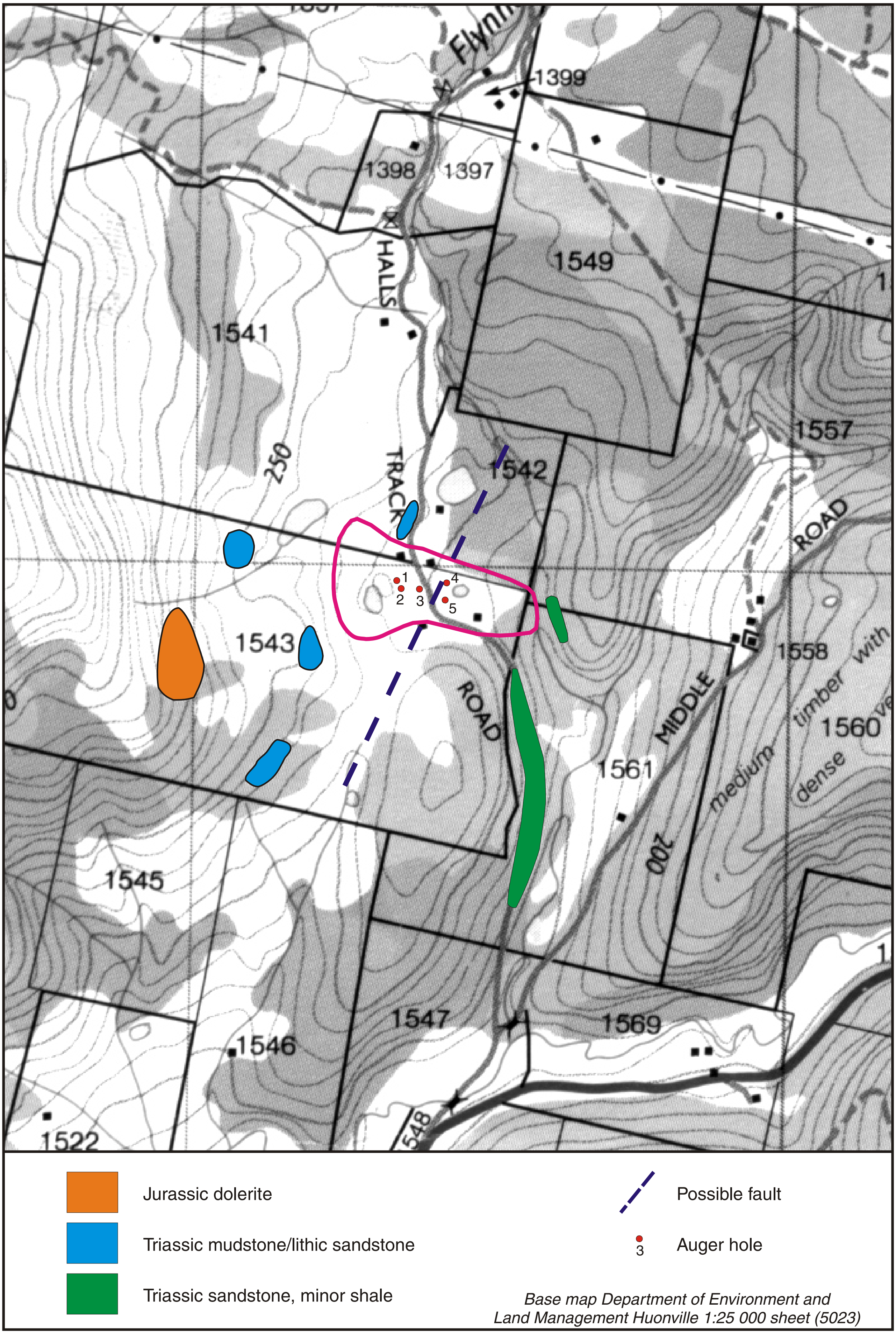
The dolerite talus has almost certainly been derived from a more distant location than the landslide area as it does not appear that there is any *in situ* dolerite in the vicinity of the landslide. Dolerite has been mapped to the south and southwest of the slip on the lower slopes of Sherwood Hill, and it is likely that the talus has moved downslope from these areas as a result of mass movement in ancient times (debris flows, landslide, soil creep, etc.) and covered the older Triassic rocks that probably underlie the area. There is a slight possibility that dolerite underlies the talus in some parts of the landslide area but no signs of *in situ* rock have been seen.

A brief examination of the area shows that the Triassic sediments are somewhat variable in lithology. Exposures along Halls Track Road from its junction with the Sandfly–Pelverata Road to the landslide area are mainly of quartz sandstone with very minor mudstone bands. Massive sandstone beds occur across Flynns Creek from the toe area of the slip. In other places, where there are indications of Triassic rocks near the surface (in small road and track cuttings), mudstone and lithic sandstone are the dominant materials. As there are two different lithologies within the area, there is a distinct possibility that a fault extends through the landslide area. The exact location of a fault is difficult to determine with limited exposure and only a limited amount of field examination. However, a possible position is a small valley extending to the south of the slip and through the saddle between two ridges (fig. 1).

LANDSLIDE DESCRIPTION

The landslide has taken place on an unusually low slope angle of about 7° and extends for about 350 m down the slope. The slip is about 180 m wide at the head but narrows in the toe zone to about 90 metres. The total translational movement is about one metre or a little more since the movement began early in 1996.

The disturbance was first recognised by local residents as being caused by a landslide in early August 1996. Land disturbance had been noted in the vicinity of the brick house adjacent to the landslide in June. Residents in the timber house on the landslide experienced difficulty in closing a door in their house and noted distortion in a nearby fence in February 1996. These observations were probably some of the first signs of re-activation of the landslide.


Flynn
1399
1398
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HALLS
TRACK
1549
1541
250
1542
1557
ROAD
1543
1558
ROAD
MIDDLE
1560
1561
medium
timber
with
dense
200
1545
1547
1569
1546
1522
548
1
2
3
4
5
Jurassic dolerite
Triassic mudstone/lithic sandstone
Triassic sandstone, minor shale
Possible fault
Auger hole
Base map Department of Environment and Land Management Huonville 1:25 000 sheet (5023)

Figure 1

Halls Track Road extends across the middle of the landslide. The head zone of the slide shows typical tension cracks and minor graben features, with vertical scarps in the soil of about 750 mm in height. The flanks of the movement are relatively straight for long distances while the toe is being eroded by the creek, with exposed bare soil about five metres in height. The erosion has maintained a steep slope and, as a result, slumping in the toe area has occurred. Cracks can be seen at various points within the slide mass. The timber house within the slide mass has been damaged by the movement but the brick house marginal to the slide is undamaged at this stage, apart from the septic tank outlet which extends into the landslide. The depth of the movement is unknown but it is probable that movement is taking place at the contact of the talus and weathered Triassic mudstone. The slide appears to extend under the creek bed.

INFLUENCE OF RAIN

New or renewed landslide movements are often associated with periods of heavier than average rainfall or as a result of soil becoming saturated with water from some other source. Unusually high rainfall occurred in the Pelverata area in the period from 1 December 1995 to 30 April 1996, when 750 mm of rain was recorded by Mr and Mrs McCarthy, nearby local residents. The months of February and April had particularly heavy falls of 203 and 254 mm respectively. Rainfall records for the Pelverata area and average monthly figures for Sandfly, the nearest Bureau of Meteorology station, are shown in Table 1.

Table 1

Rainfall figures, Pelverata and Sandfly

Pelverata (mm)		Sandfly (monthly average) (mm)	
October 1995	58	January	65
November	83	February	47
December	128?	March	67
January 1996	96	April	66
February	203	May	82
March	69	June	71
April	254	July	104
May	28	August	99
June	39	September	85
July	72	October	88
August	50	November	92
September	115	December	85
October	64	Annual Average	950
November (to 27 November)	104		

Pelverata rainfall figures supplied by Mr and Mrs McCarthy. Sandfly rainfall figures supplied by the Bureau of Meteorology.

As well as recording rainfall, the McCarthy's have been recording movement on the landslide at two points — one at the back of their house and the other at the front (Appendix 1). These recordings show that in a number of cases periods of rain are associated with increased movement, as would be expected, although there is sometimes a slight delay after the rain before the increased movement begins. Prior to the start of measurements there had been 33 mm of rain since the beginning of August and an additional 54 mm of rain in the last eleven days of July. This rain is obviously the cause of the large movements recorded after the start of measurements.

PREVIOUS MOVEMENTS AND STABILITY OF SURROUNDING AREAS

Local information indicates that movement has taken place on a number of occasions in the past, the most recent being in 1969. The first movement remembered by local residents was for only a part of the area (southwest corner) involved in the present movement, but subsequent movements involved a similar area to that being currently affected. The area is very hummocky and this is an indication that landslides have previously occurred. Land to the north and west of the active landslide is also very hummocky and it is apparent that large areas in the region have been subject to past landslides.

Other active movements can be seen at various locations around the area. These include an area about 400 m south of the Halls Track Road slip, at least two slides on the slopes of Sherwood Hill, and several on the banks of Flynns Creek where the stream has undercut the banks. The area has been extensively affected by landslide in the past and when particularly adverse conditions prevail, there is potential for significant areas of land to be further affected.

DRILLING

Auger drilling was used in an attempt to locate the depth of the slip surface and the standing water level of the groundwater within the landslide. The drilling did not extend to the depth planned because of the presence of boulders under the surface. Five holes were attempted above and below the road (fig. 1), the deepest reaching about 6.6 m before drilling was stopped (Table 2). Each hole passed through brown clay and clay with dolerite boulders to the final depth.

The standing water levels in the holes are very shallow, indicating almost complete saturation of the landslide thickness at these points.

When water levels were measured on 4 November 1996, it was found that there was some distortion in the PVC pipe in hole three at about 3.5 m below the surface (about one metre above the base of the hole), suggesting that movement is occurring at that depth. No distortions have been identified in hole five, a deeper hole located below the road.

Table 2

Details of auger drilling

Hole No.	Approx. depth (m)	Standing Water Level (m) 4/11/1996	Standing Water Level (m) 27/11/1996	Conductivity (μS/cm)
1	2.2		0.22	
2	3.0	0.98	0.50	
3	4.5	0.40	0.15	380
4	3.0			
5	6.6	0.44	0.37	500

REMEDIAL MEASURES

Drainage appears to be the main activity that could be undertaken to aid in stabilising the area. This includes preventing water from outside the slide area running into the slide mass and drainage within the slide itself.

The shape of the land surface ensures that surface water is directed towards the area where the slide has taken place and it is also probably a zone through which groundwater is directed.

Water which previously ran into the northern side of the landslide has been diverted away from the affected area while surface drainage within the slip has been improved. However, the greatest influence on stability would occur by a considerable lowering of the water table within the slide mass on a permanent basis. This may be achievable by the installation of deep drains (2–4 m deep) down the slip at right angles to the contours. The number, depth and position of the drains needs further examination but at least two or three in the lower part (below the road), and perhaps extending into the upper part, are likely to be required to lower the water table sufficiently. The number will depend on the permeability of the material and this is probably quite variable throughout the slide mass.

The removal of water from the two dams on the slide mass has been undertaken from time to time but inflow into them is continuous, although in their undisturbed state they may not be contributing much water to the slide. A greater influence could be expected if a crack related to movement extended into a dam. The weight of water on the slide mass (particularly the upper one) would also have a destabilising influence.

The dam above the northeast corner of the slide has an unknown but probably small influence on the stability of the area. Some seepage through the base will be occurring but as the dam has been there for some time (20+ years?), continued reduction of seepage loss by sedimentation is likely to have occurred. The biggest danger from this dam appears to be if there is headward movement of the slip upslope and a failure occurred in or near the dam wall.

Erosion of the toe area by the creek is a destabilising factor. Continual erosion and removal of large volumes of material will increase the influence of this factor. The proposal to try to move the creek bed away from the steep slope at the toe should greatly reduce this effect.

Planting of trees on the slide would help to reduce the water level and thus have a stabilising influence. The slide is probably too deep for roots to penetrate to the slip surface to provide mechanical strength across it but the roots would bind the near-surface material and strengthen it. Some of the slip area is currently timbered but in really adverse conditions, trees may only have a relatively minor effect on the maintenance of stability.

Restraining structures are not regarded as being an economical solution to prevent further movement because of the volume of material involved.

CONCLUSIONS

The landslide has occurred in an irregular valley feature to which surface and groundwater is directed.

The land where the movement is taking place is underlain by dolerite talus which at depth is probably underlain by Triassic sediments (possibly mainly mudstone). A fault may extend across the zone that is moving and this may have induced locally deeper weathering.

The shape of the land and the presence of dolerite talus suggests that landslides have previously been a feature in the area. Landslides may have caused the wide distribution of talus in the Pleistocene or earlier and re-activation of parts of the talus has subsequently taken place. Long-term local residents know of previous movements in the area currently subject to active movement.

Drainage of water from the area is likely to have the greatest influence on increasing stability. This should include preventing surface water from entering the slip area from outside, surface drainage within the slip area, and deep drains down the slip so that standing groundwater levels are lowered. Drainage of the dams on the slip will also have a stabilising affect.

Other measures that will increase stability include the diversion of the stream at the toe to prevent continued erosion of the slip mass and tree planting in selected areas.

REFERENCE

FARMER, N. 1981. *Geological atlas 1:50 000 series. Sheet 88 (8311N). Kingborough*. Department of Mines, Tasmania.

[12 March 1997]

APPENDIX 1

Recorded movements on Pelverata landslide

Date	*Weather*	*Movement (mm)* *Back*	*Front*	*Agg. Av.*
15 August 1996	R	31	33	32
16 August 1996	F	39	37	70
17 August 1996	S	13	11	82
18 August 1996	S	15	15	97
19 August 1996	F	13	8	108
20 August 1996	S	10	9	117
21 August 1996	F	10	10	127
22 August 1996	F	8	4	133
23 August 1996	S	12	12	145
24 August 1996	F	9	5	152
25 August 1996	S	6	7	158
26 August 1996	S	3	0	160
27 August 1996	F	3	6	164
28 August 1996	F	0	2	165
29 August 1996	S	0	0	165
30 August 1996	F	0	0	165
31 August 1996	F	2	2	167
1 September 1996	F	1	0	168
2 September 1996	F/S	1	5	171
3 September 1996	S	3	1	173
4 September 1996	F	1	2	174
5 September 1996	S	2	1	176
6 September 1996	S	2	0	177
7 September 1996	F	0	1	177
8 September 1996	S	0	0	177
9 September 1996	S	0	0	177
10 September 1996	F	0	0	177
11 September 1996	S	0	0	177
12 September 1996	S	0	0	177
13 September 1996	R	2	0	178
14 September 1996	S?	–		181?
15 September 1996	S	5	0	184
16 September 1996	S	0	1	184
17 September 1996	S	1	0	185
18 September 1996	S	1	17	194
19 September 1996	R	12	2	201
20 September 1996	R	7	0	204
21 September 1996	F	5	0	207
22 September 1996	S	11	0	212
23 September 1996	F	–	–	–
24 September 1996	F	–	–	–
25 September 1996	S	5	3	216
26 September 1996	S	0	0	216
27 September 1996	R	3	0	218
28 September 1996	R	–	–	–
29 September 1996	R	12	0	224
30 September 1996	R	24	16	244
1 October 1996	S	–	–	–
2 October 1996	S	18	26	266
3 October 1996	F	10	5	273
4 October 1996	F/S	10	7	282
5 October 1996	F	8	2	287
6 October 1996	F	5	6	292

Date	*Weather*	*Movement (mm)* *Back*	*Front*	*Agg. Av.*
7 October 1996	F	5	0	295
8 October 1996	F	5	5	300
9 October 1996	F	0	5	302
10 October 1996	F	1	4	305
11 October 1996	R	13	1	312
12 October 1996	R	7	7	319
13 October 1996	R	2	3	321
14 October 1996	S	12	7	331
15 October 1996	F	15	3	340
16 October 1996	S	2	10	346
17 October 1996	F	3	1	348
18 October 1996	S	5	4	352
19 October 1996	S	7	12	362
20 October 1996	F	4	0	364
21 October 1996	F	0	0	364
22 October 1996	F	4	0	366
23 October 1996	F	0	3	367
24 October 1996	F	5	2	371
25 October 1996	S	0	2	372
26 October 1996	S	5	1	375
27 October 1996	S	0	0	375
28 October 1996	F	2	0	376
29 October 1996	S	2	0	377
30 October 1996	S	2	0	378
31 October 1996	F	0	2	379
1 November 1996	F	0	0	379
2 November 1996	F	2	2	381
3 November 1996	F/S	4	1	383
4 November 1996	F	0	0	383
5 November 1996	F	4	2	386
6 November 1996	F	4	3	390
7 November 1996	F	0	5	392
8 November 1996	F	0	0	392
9 November 1996	F	0	5	394
10 November 1996	R	0	2	395
11 November 1996	R	0	0	396
12 November 1996	R	0	0	396
13 November 1996	F/S	0	0	396
14 November 1996	S	2	0	397
15 November 1996	S	2	0	398
16 November 1996	S	0	0	398
17 November 1996	F	3	0	399
18 November 1996		3	0	401
19 November 1996	S	0	0	401
20 November 1996	R	0	0	401
21 November 1996	R	2	0	402
22 November 1996	F	8	3	407
23 November 1996	F	0	0	407
24 November 1996	F	0	0	407
25 November 1996	F	0	0	407
26 November 1996	F	0	0	407
27 November 1996	R/S	0	0	407

Weather: F = fine, S = showers, R = rain
Table supplied by Mr and Mrs McCarthy, Pelverata.