

## A LANDSLIDE AT MATLOCK, DERBYSHIRE, 1966

by

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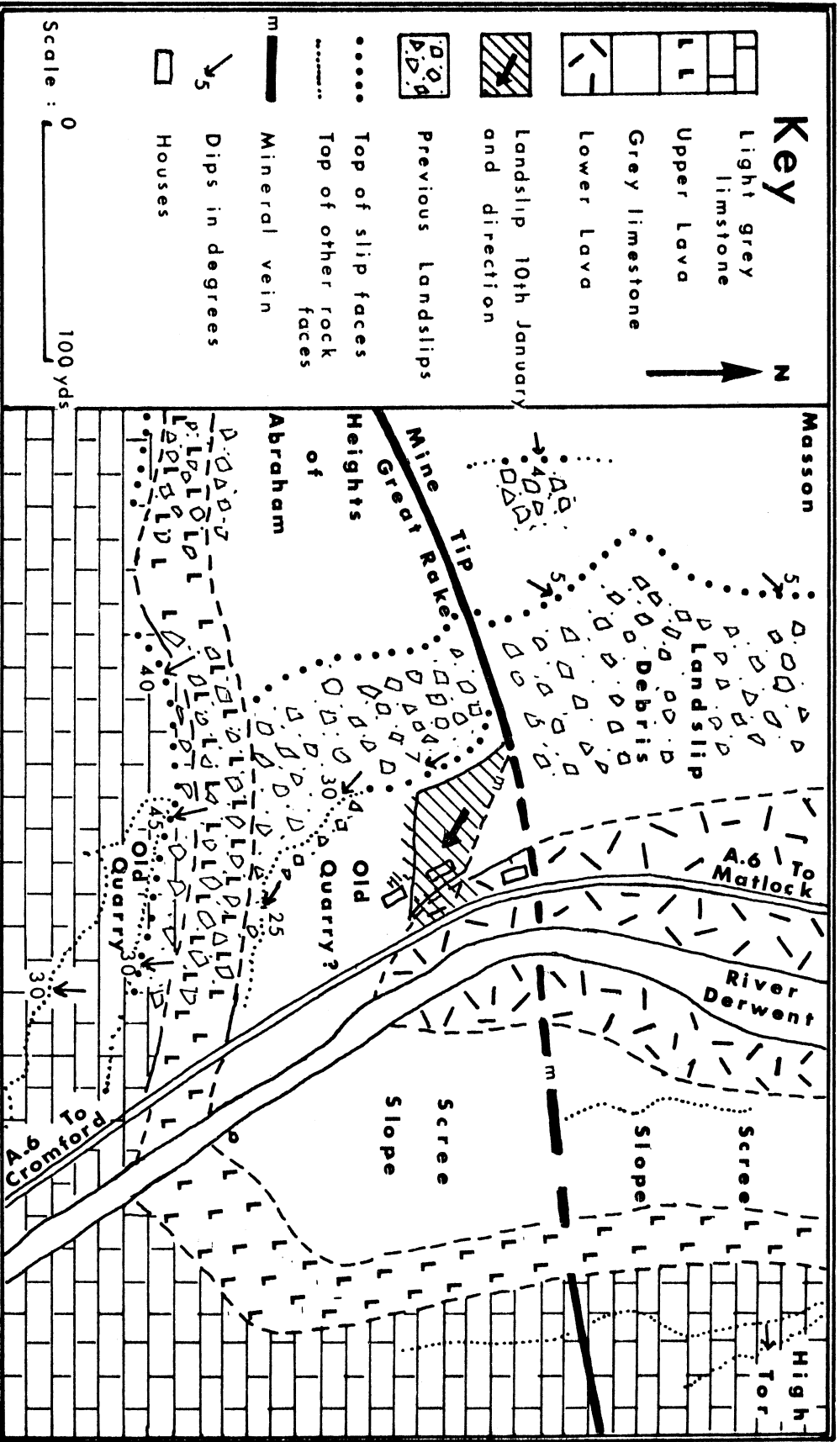
### Summary

The geological investigation of a landslide at Matlock has indicated all the attributes of a classic slip. These included steep gradients, dip into the valley, clay slip layers, well jointed competent strata above the clay, and abundant water. The slip of January 10th 1966, and minor movements since, are shown to be the latest movements in a well established landslip area. Records are also included of a number of road slips in Derbyshire at the beginning of 1966.

### Introduction

Early on the morning of the 10th January 1966, ominous creaks and splintering noises were heard at the rear of a pair of semi-detached houses on Dale Road, Matlock Bath, Matlock (SK 295587). The houses, built close to an old slip face, began to be compressed from the rear by the south-east face of a large mass of limestone. It is not clear if the foundations of the houses moved at this stage, possibly a little as indicated by movement on a stairway leading up to the houses from the main road. At least 10 hours elapsed between the warning noises and the ultimate collapse of the houses. By 11 a.m., the rear of the houses began to collapse and shortly afterwards the houses were completely destroyed. (Plate 21 fig. 1) Fortunately there was no loss of life, but the debris threatened the closure of the road (A.6 Trunk Road) and single line working operated all that day whilst the debris was removed from the road.

The photograph (Plate 21 fig. 1), taken two days after the slip, shows the demolished houses at the foot of the slipped mass of rock and debris. Note the forward leaning lamp-post and the dark line close to the detached house (bottom right) which marks a gully at the north edge of the slip. The fresh rock scar (top right) was mainly the result of rock fall after the main slip had taken place and had left the exposed face unsupported. The blocks from this scar fell towards the semi-detached houses (bottom left) and one very large block which crashed down 24 hours after the main slip, can be seen behind the roof of these houses. The scars (top centre and left centre) are possible old quarry faces or previous land slip faces.



Text-Fig. 1 The geology of the landslip area, Matlock

The road itself has shown little signs of movement and neither have the adjacent houses, this despite the continued irregular creep of the slipped mass. This slipped material has now moved outwards about 20 feet (the width of the house).

The rocks involved in the slip belong to the Carboniferous Limestone Series, and to that part of the sequence which occurs above the Lower Lava of Matlock (D<sub>2</sub> sub-zone). These rocks have been referred to as the Upper Lathkill Limestones by Shirley (1959) and the Matlock Group by Eden et al. (1958).

There appears to be no written account of landslips in the Matlock area, although a landslip in 1922 is said to have swept across the main road and into the River Derwent at some unspecified point.

### Geographical Factors

The slip has occurred at the foot of a steep valley cut through the limestone by the River Derwent. The road (A.6), just above the river, is at a height of about 300 feet above O.D. To the west, the valley side rises to the general plateau surface of the Heights of Abraham and Masson Hill at about 1,000 feet. High Tor, 600 feet above O.D., on the east side of the valley, rises almost vertically 300 feet above the river. Although not quite so steep, the west side of the valley has a slope frequently in excess of 1 : 1 (45°) for the first 350 feet, becoming less steep to the top of the valley.

The previous months (latter half of 1965) had shown rainfall in excess of average and, during the early days of December, snow accumulated thickly in the upper reaches of the River Derwent. Heavy rain, accompanied by a rapid thaw, on December 9th caused excessive run-off with flooding of the Derwent Valley below the Ladybower Reservoirs. The floods reached Matlock that evening, attaining the highest level on Friday December 10th. The main road at the foot of the slip area was flooded with several feet of water.

This flood may be a coincidence, as far as the landslip is concerned, but the excessive rainfall is surely one of the main factors for the slip, the flood water ensuring that the lower levels of the valley and the bottom of the slip were completely water-logged.

Excessive rain continued throughout January and February, many localities recording twice the February average and five times that received during the last two previous Februaries.

At a later stage it was found that water had been emerging from the foot of the slip as a spring and was draining off under the main road.

### Geological Factors

The geology of the area is shown in Text-fig. 1. The details of the sequence are:-

Carboniferous	(	Thinly bedded light coloured limestones	
	(		
Limestone	(	The Upper Lava of Matlock	75 feet approx.
	(		
Series,	(	More thickly bedded limestones, grey	
	(	in colour. Thin green clay seams.	140 feet approx.
	(		
Sub-zone D <sub>2</sub>	(	The Lower Lava of Matlock, with	
	(	green clay on the top.	

These rocks can be examined in quarries and natural sections adjacent to the slip area, and above, up to the Heights of Abraham. The frequent occurrence of clay seams in limestones of this age is unusual and is more characteristic of limestones of the Lower Dibunophyllum (D<sub>1</sub>) Subzone. The clay seams can be seen in the entrance to, and in the old workings above, the Rutland Cavern (SK 293585).

The general inclination of the rocks in the vicinity of the slip is south-easterly, obliquely, towards the river, although south of the slipped area the beds dip more to the south and more steeply. The change in the dip occurs within the area of slipped rock. Dips below the Heights of Abraham show variations because of previous slips. Some of these are very old and appear to be stable at the moment. The positions of three slip faces are shown on the text-fig. Below each slip face, represented by up to 20 feet of Limestone, is a mass of irregular blocks loosely joined by vegetation. At the foot of this area is the limestone which has most recently moved. The beds in this block are horizontal.

The limestones rest on the Lower Lava, which floors the valley in the immediate area of the slip and to the north. To the south, the southerly dip takes the lava below the valley very quickly; a twenty feet bore-hole drilled behind the houses (semi-detached houses south of the collapsed ones) failed to locate the lava. Above the lava, there is a few feet of green clay, which was exposed in the debris at the foot of the slip during further excavations in the area during March 1966.

The Great Rake crosses the River Derwent from High Tor (SK 297689) to the Heights of Abraham. The rake can be traced from old workings and outcrop material from the Masson Cavern (SK 291586) at the Heights of Abraham, down to the Derwent Valley at a point close to the house immediately north of the slip. From the main vein, a number of flyers and flats have been located. One of these was followed northwards from the Masson Cavern and a number of shafts connect it to the surface.

There has been little mining for lead in recent years, since the activities of the 15th and 16th Century miners. In the last few years, however, a considerable amount of debris rich in fluor spar has been removed from the veins. This has resulted in a local reversal of drainage and the establishment of an underground reservoir to the north of the Masson Cavern. Fluctuations in the level of this small reservoir suggest that alternative outlets have been found. A feature of the Masson Cavern is the winter water flow through the veins towards the Great Rake.

The northern limit of the slip can be traced in a straight line from road level up towards the Great Rake. At this point a mineral vein can clearly be seen. At road level, abundant mineral debris was excavated from this side of the slip. It would seem that a small mineral vein forms the northern limit of the slip, striking towards the Great Rake in a north westerly direction. It was thought originally that this might be the Great Rake, but, when mapped, the outcrops of the latter appears to occur to the north and a considerable change of hade or strike would be needed to turn it in the required direction.

There are no major faults in the area. On the face of the old quarry adjacent to the slip oblique slickensides can be seen indicating previous movement parallel with the grooves. A small fault striking N. 140°E. may run immediately east of the slipped area controlling the line of the R. Derwent and forming a feature to the north-west.

The rocks are well jointed, with widely spaced master joints producing large blocks. The principal directions for the vertical or near vertical joints are N. 105°E, and N. 350°E.

#### Other Derbyshire Landslips

During the early months of 1966, many roads in Derbyshire were reported unsafe due to landslips. Excessive movement was observed on the Castleton - Chapel-en-le-Frith road (A 625) below Mam Tor, with wide longitudinal cracks developing along the carriage-way. Similar cracks were seen on the

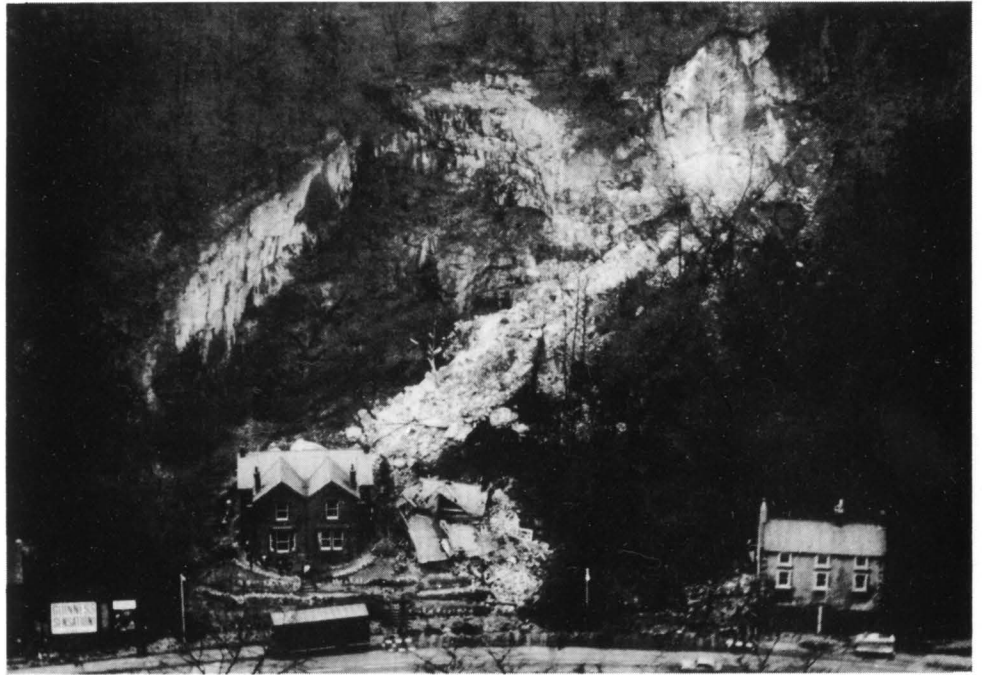


Fig 1. The landslide at Matlock Bath (for explanation see page 351).

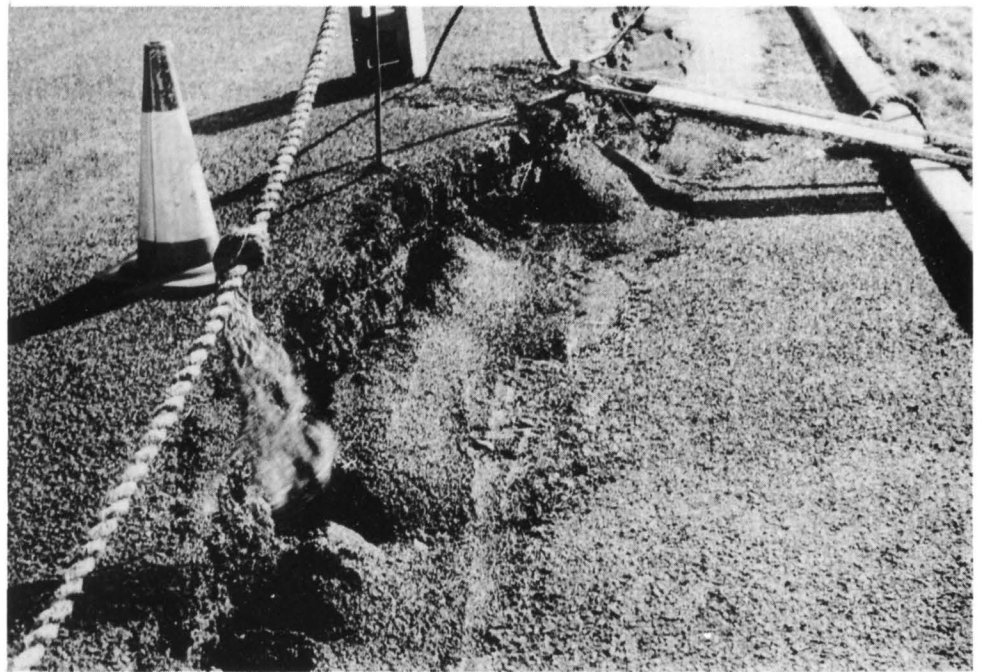


Fig 2. The roadslip at Starkholmes, Matlock.



Starkholme Road, between Matlock Green and Cromford, resulting in a drop of several feet at the edge of the road. (Plate 21 fig. 2). At Bolehill, above Cromford, a similar situation has resulted in the closure of a little-used road. Again at Stanton Lees, on the Birchover - Stanton in the Peak road, single line traffic was necessary due to severe cracking. In all these cases the roads have been built over old slip material consisting essentially of sandstone and shale debris. This material is the result of previous collapse of sandstone beds overlying shales. These beds lie above the Carboniferous Limestone Series and are part of the Edale Shale succession. Excessive rainfall has caused the further movement of the debris downhill.

### Conclusions

Heavy rain and unstable geological conditions combined to produce a number of landslips during the early months of 1966. Those affecting the roads were rather more severe than previous minor movements which had occurred with some regularity in the past, but the one which demolished the houses in Matlock Bath was unexpected and occurred in an area which had not experienced landslips for many years.

The geological investigations, however, showed that landslips have been a feature of this area since the deep incision of the river valley was completed, probably after the end of the Pleistocene. In this instance, only the foot of the slip has moved, effectively reducing the support for the hillside behind. Whilst small outward movement may be expected from time to time - there was movement recorded in May 1966 - it may be many years before the next major slip is experienced. On the other hand, climatic and geological conditions could combine to provide a very spectacular slip indeed in the near future.

### Acknowledgements

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