

2. THE NATURE OF THE LAND

2.1 *History of Settlement and Land Use*

“The great majority of the earliest settlers had absolutely no farming experience, much less knowledge of bush work, to help them in their stupendous undertaking, and only those who have lived through it or had an intimate knowledge of the forest as it was then can place the right value on the physical endurance, dogged perseverance, and almost blind optimism that characterised the early pioneers.” (Holmes, 1920).

The Strzelecki Ranges are named after Paul Edmund de Strzelecki, a Polish explorer, who added the title of “Count” to his name. In 1840, Strzelecki organized an expedition to search for good grazing land and a route from north-eastern Victoria to the south coast settlements. After crossing the Latrobe River he climbed into the hills and struggled for 22 days along the approximate route of the present day Grand Ridge Road. Strzelecki noted “wide and deep valleys to the north-west, and hills and ranges to the south and south-west, innumerable creeks, and the exuberant vegetation of a moist, untouched soil.” Famished and exhausted after struggling through a wet mountain ash forest with an understorey of hazel, musk, wattle, swordgrass and wiregrass, Strzelecki’s party eventually reached Western Port at the Corinella settlement.

For almost 40 years, the difficult terrain, the high rainfall and the dense forests of the Strzelecki Ranges discouraged settlement. The first established access into the area was McDonalds Track in 1862, which started near Lang Lang (Tobinyallock) and followed the ridges through Allambee, Childers, 1 km south of Thorpdale, then onto Moe and Morwell. Within the study areas the track is now a road and carries its original name except for the Allambee Childers Road section. Coverdale (1920), describes the construction of McDonalds Track through the “heart of the big scrub country” as a “monument to the skill and perseverance of the man who, after more than two yeas of difficult tedious exploring, completed it.” However, it was not until the construction of the Gippsland Railway in 1878, the development of the townships of Yarragon, Trafalgar and Moe, and the railway line to Thorpdale in 1888; that the Strzelecki Ranges were settled.

The early years of settlement involved extreme hardship. To survive, the settlers had to clear their land of the dense rain forest. Their only equipment for the task was an axe, saw and shovel. Many of the eucalypts were over 90 metres tall with girths up to 25 metres. Holmes (1920), describes how the process of “nicking” in “scrub country” became popular. When a large area is ready, a tree with a large spreading top is started off (felled), perhaps near the top of the hill, and this, crashing into the niched trees in front, soon becomes a vast, thundering avalanche of falling timber!” The fallen timber was then stacked into heaps and burnt. Many of the stumps were either grubbed or burnt out, while others were left to rot. It took almost 10 years before areas were ready for cultivation. Ultimately the settlers achieved their ambition, and the forest was cleared, almost to the last tree. Subsequently, a gentle farm landscape evolved, forming a strong contrast with the luxurious forest once encountered by Strzelecki, McDonald and other early explorers and settlers.

Today the land is used mainly for dairying and the production of beef cattle. The fertile red soils of the Older Volcanics and the Childers Formation are used extensively for potatoes and other crops. Several changes in land use have occurred in recent years. Land which was only marginally suited to dairying, often because of steepness, has in places been acquired by the Forests Commission, Victoria for reforestation. The Commission reports that the new forests have stabilised steep hillsides once prone to landsliding (Noble, 1977). Another change is the trend to subdivide farms into smaller “hobby farms” and “rural retreats” of 1-15 hectares. All such changes in land use will influence slope stability to various degrees.

Another factor related to land use and slope stability is the development of roads in the area. The early road system developed partly from the original tracks and routes such as McDonald’s Track. In the 1870’s the government planned roads for the area on a grid system. These so called “sectional roads” were often aligned along creeks and up very steep slopes. They were so unsuited to the local topography that the settlers had to work out their own road alignments.

They attempted to follow the ridges and spurs to avoid expensive earth works. Grade of 1 in 6 were common, but the hillside cuttings which were to become a feature of the modern roads were avoided, a few landslides occurred.

The Country Roads Board of Victoria was established in 1913 and funds were made available for road improvements. The Yarragon to Leongatha Road was completed in 1917 with grades of 1 in 19 instead of the old 1 in 5 grade. A new road was also constructed from Trafalgar to Thorpdale in 1920. A grade of 1 in 20 was achieved by following the contours and cutting through the spurs. Most of the other roads in the study area were

built in the 1920's and 1930's. These so called "developmental roads" are described by Adams (1978). "A new road was made to link Trafalgar South with the new Thorpdale Road and Hayne's Road connected the district with the Sunny Creek Road. A further new road was the Yarragon to Thorpdale Road and another linked Thorpdale and Childers, together with a greatly improved Yarragon-Allambee to Childers Road. A later road was the Thorpdale to Mirboo North road, while the Dingley Dell Road and road from Thorpdale to the Tarwin River were completed by the early 1930s. To the east of Thorpdale the main roadworks were the connecting road with Morwell via Narracan East and another road connecting Darlimurla and Ten Mile Creek with Thorpdale, under construction in 1924. An improved road to Coalville from Moe was built in 1920 and named Branigan's Drive for some time but the continuation of the road to Narracan was not completed until 1929."

The Childers Settlement Road was also built in the 1930's. These roads are shown on Figure 2.1 on the following page.

A characteristic of the new roads was the extensive cutting of hillsides to achieve gentle grades and to avoid "switch backs". A consistent demand has existed ever since to widen these roads thereby cutting even further into the hillsides. It is significant that most of the landslides reported in the local papers occur where a road or railway cutting has disturbed the equilibrium of the slope. Selected newspaper references to such landslides are attached as Appendix 2.1. Improved road grades carried the penalty of increased landslide activity.

2.2 Geology and Geomorphology

2.2.1 General Geology

The study area lies entirely within the Strzelecki Ranges or the Narracan Block of the South Gippsland Highlands. The Narracan Block consists essentially of an uplifted and subsequently dissected block of Lower Cretaceous rocks with a gently southerly tilt. To the north, the ranges terminate abruptly along the Yarragon Monocline which forms the boundary with the low lying Moe Swampland. To the south the high topographic relief diminishes less abruptly along the Hallston and Allambee faults as shown in Figures 2.2 and 2.3.

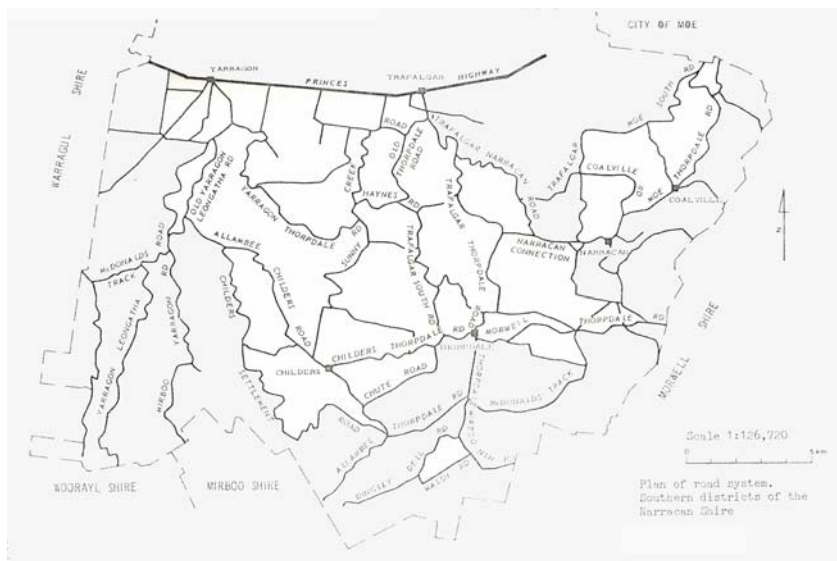


Figure 2.1 – Plan of road system. Southern districts of the Narracan Shire.

Over much of the study area, the Lower Cretaceous rocks are overlain by the Childers Formation sediments which in turn are usually capped by the Tertiary Older Volcanics. The Haunted Hills Gravels (Pliocene) which overlie the Older Volcanics, occur in only a few isolated locations within the study area and are not involved in landsliding. They will not be discussed any further in this report. The distribution of the geological units is shown in Figure 2.4.

2.2.2 Lower Cretaceous Strzelecki Groups (Kls)

Douglas (1979) describes these rocks as non-marine feldspathic sandstone and mudstone with associated siltstone, basal conglomerates and black coal, which accumulated in the Gippsland Basin. The rocks have been subdivided on the basis of fossil plant remains such as those shown in Figure 5.6. A palynological examination by Archer (1979, Appendix 2.2) of a carbonaceous clay from bore 3 at 1.85 and 3.60 metres indicates that the sample represents the D. speciosus Zone (Dettman 1963, Douglas 1969) i.e. middle Neocomian to Upper Aptian age (Lower Cretaceous). The sample was obtained from landslide debris consisting mainly of Childers Formation, into

which some basal Lower Cretaceous material has been incorporated. The examination confirms that the Lower Cretaceous rocks in the study area belong to the younger (K1s) unit of the Strzelecki Group.

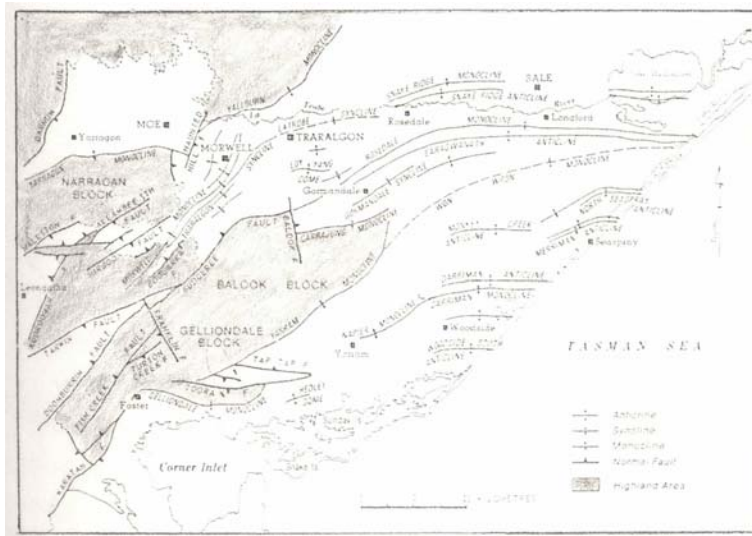


Figure 2.2 – Gippsland basin structure map (Abele et al 1976)



Figure 2.3 - Distant view of the study area, looking NE from the Leongatha-Mirboo North Road.

The rocks weather to sandy silty clays and sandy clayey silts of a characteristic buff and grey colour. The clays are predominantly montmorillonite. A detailed description of the soils is given in Section 5.2.3 and 5.3.

2.2.3 Childers Formation (Tec)

This formation was described from near Childers where it unconformably overlies the Strzelecki Group and is overlain by the Thorpdale Older Volcanics. In the study area, it consists of up to 35 metres of non-marine sandy silty clays and clayey silts which are often gravelly. Minor brown coal seams also occur (Gloe, 1976). The dominant clay mineral is kaolinite, sometimes with halloysite admixed. A more detailed description of the soils of the Childers Formation is given in Section 5.2.2 and 5.3.

2.2.4 Tertiary Older Volcanics (Tvo)

These rocks are described by Douglas (1979) as olivine and augite basalt of Late Oligocene to Early Miocene age. In the Thorpdale area, the Thorpdale Volcanics overlie the Childers Formation and are up to 60 metres thick, Douglas considers that the basalts may have been cut through in the deeper valleys around Thorpdale, however this is difficult to ascertain because the valleys are commonly filled with landslide material. The best known exposure of relatively fresh basalt occurs at the Narracan Falls, which are located approximately 1.5 kilometres SW of Narracan. Elsewhere, mainly in road cuttings, the basalt is exposed in its completely weathered form of red-brown

basaltic clay. Kaolinite and halloysite are the dominant clay minerals. A more detailed description of the soils is given in Sections 5.2.1 and 5.3.

2.2.5 Geomorphology

Grant and Ferguson (1978), subdivide the topography of the Strzelecki Group in the study area into terrain patterns consisting of strongly undulating surfaces and/or steep dissected slopes from 20o to 40o. The Childers Formation is described as a distinct terrain pattern consisting of dissected slopes which are mostly capped by the overlying Tertiary Older Volcanics, which in turn are subdivided into 2 terrain patterns; namely an undulating topography with slopes to 10o, and a strongly undulating topography with slopes to 40o on which landslides are common. The terrain patterns are described in more detail in Sections 5.2.1, 5.2.2 and 5.2.3 and their areal distribution is shown in Figure 2.4.

Aerial views of the study area show a dissected, hilly, cleared landscape characterised by the presence of large and small landslides on the steeper slopes, as shown for instance in the oblique photograph on the cover of this report. The landslides have carved arcuate depressions in the slopes and deposited lobate masses of landslide debris down the hillside and into the valleys. The debris is commonly hummocky, stepped and may contain small pools in backward sloping areas. Tussocks, leptospernum thickets and luxurious grass growth sometimes occur due to ground water retention. Some of these features are shown in Figure 2.5. The sharp topographic expression of fresh landslides is greatly subdued within a few decades by weathering and more quickly by intentional ploughing, though the red and buff coloured earth scars on the main scarp often remain as dominant features for longer periods. Another diagnostic feature is the irregular shadow patterns which result from the many changes in slope.

2.3 Rainfall

“Heavy and continuous rain has fallen throughout this district during the past few days. There was a great snow storm on Monday night, and on Tuesday there were alternate showers of rain and snow with scarcely an interval. The Strzelecki hills have since been covered with a dazzling white mantle of snow.....quite a reminder of “home”.....snowballing was a great feature of sport during the day, and quite an event amongst young Australia”.

(Yarragon, Trafalgar and Moe Settlement News, Thursday 5 August 1909)

The correlation between landslide activity and precipitation has been documented by many authors. For example, Záruba and Mencl (1969) show that recurrent slope movements occur in years of exceptionally high rainfall. Rain and melt water soak into the soil causing an increase in pore-water pressure with a corresponding decrease in shear strength. The newspaper article above describes one of the many short periods of intense precipitation which occur. In this case, 103 mm was recorded in 5 days at Thorpdale. Landslides in the Strzelecki Ranges are common during these periods of intense rainfall.

Daily rainfall records for the study area were obtained from the Victorian Bureau of Meteorology. The records were collected from seven recording stations during 1883. Occasions when the total monthly rainfall exceeded 200 mm have been plotted on Figure 2.6 for each of these stations.

In general, monthly rainfalls in excess of 200 mm occur most frequently during the 7 months from April to October. Of these months, May is usually the wettest, but April, June and July are also very wet. In November, December and January, it is very unusual to have monthly rainfalls over 200 mm. The maximum monthly rainfall recorded occurred in 1952 when 290 mm was recorded at Trafalgar. The driest period on record occurred in 1923 when less than 18 mm were recorded over the entire study area for 3 months from 3 February to 5 May. Heavy rain followed this drought; 228 to 255 mm fell in May in the hills, with 110 to 121 mm falling between 20 to 26 May. Local people recall that landslides were triggered by the heavy rains which followed the drought.



Figure 2.4 – Geological Map and Derived Terrain Patterns 1:126 720



Figure 2.5 – Landslide debris showing hummocky terrain, pool in small basin of internal drainage and tussocks.

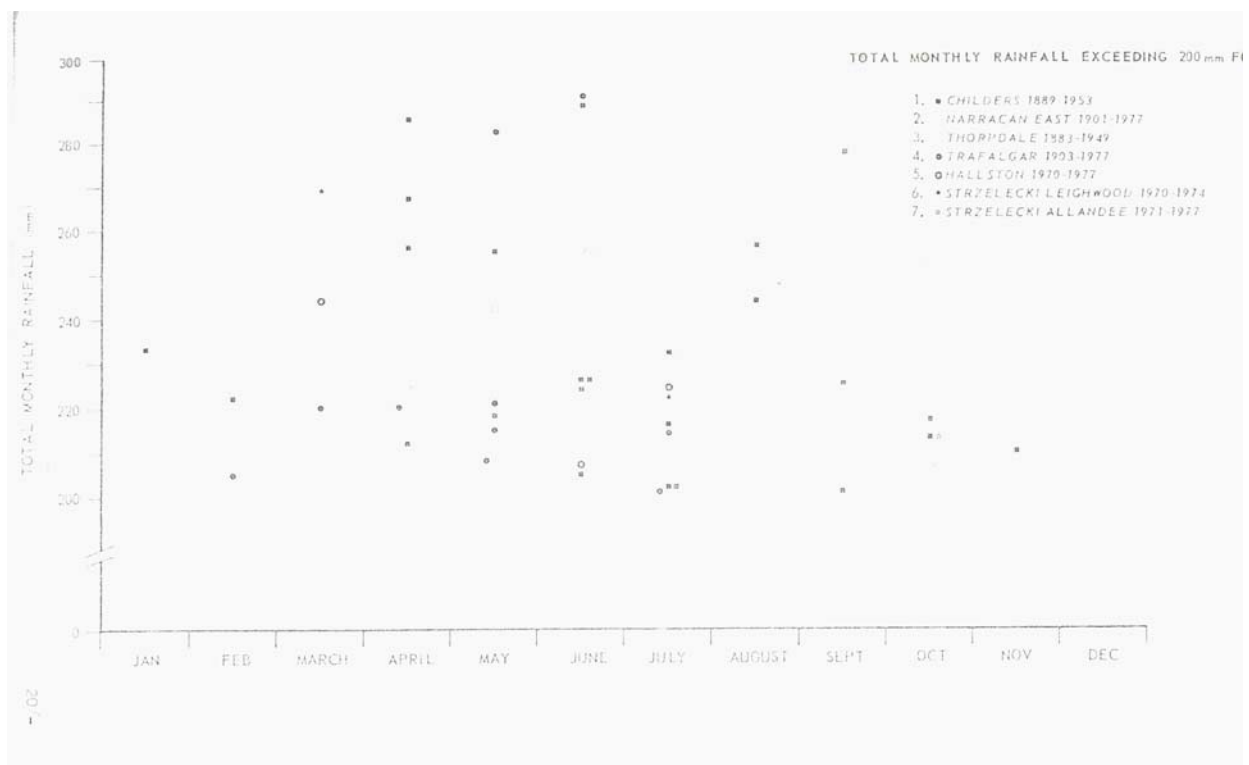


Figure 2.6 – Total monthly rainfall exceeding 200 mm

Periods of significant rainfall have been tabulated for Childers, Narracan East and Thorpdale, in Tables 2.1, 2.2 and 2.3, respectively. The tables are attached as Appendix 2.3. Occasions when the total monthly rainfall exceeded 200 mm are given together with shorter periods of intense rainfall exceeding 100 mm over a few consecutive days. The most intense period of rain on record occurred from 30 November to 2 December 1934, when 224 mm was recorded at Narracan East. Disastrous flooding occurred in the Moe Swampland (Adams, 1978), and according to local people a number of landslides occurred in the Ranges.

Local newspapers dating back to 1887 occasionally refer to landslides, all of which occurred during or immediately following periods of intense rainfall. In most cases, the landslides are also associated with road or rail cuttings. Some typical newspaper reports of damage and inconvenience caused by landslide are given in Appendix 2.1. The Shire Engineer, Mr D Thege, also reports that most landslides occur in the wet winter months.

The annual rainfall ranges from less than 700 mm to over 1,600 mm. The high ridge areas commonly receive more than 1,000 mm per year. Annual rainfall values dating from 1883 to 1977 are given in Table 2.4, which is included in Appendix 2.3.

2.4 Seismicity

The study area lies within a seismically active area. The Earthquake Risk Map of Australia (Appendix 2.4), shows a cluster of earthquake epicenters in the South Gippsland Highlands. Minor seismic events (earth tremors, earthquakes) occur quite frequently, but are most unlikely to trigger landslides. However, earthquakes of significant magnitude do occasionally occur, such as the 20 June 1969 Gippsland Earthquake of magnitude 5.9 (Richter). Clay slopes in a critical state of equilibrium could well be triggered by earthquakes of this magnitude, especially if the event coincided with a period of intense rainfall. The author has been unable to find information which suggests that any of the landslides within the study area were induced by earthquakes, but the possibility that some landslide activity is related to seismic activity, should not be overlooked.