

# **LAND CAPABILITY STUDY IN THE SHIRE OF CHILTERN**

Erosion Risk Assessment: Other Land Use

Constraints: Land Management Guidelines

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## **PREFACE**

Three requirements for sound land use planning are:

- \* An understanding of the extent to which the use will be limited by the natural characteristics of the land,
- \* The effect the use will have on the land and the water derived from it,
- \* The need for special land management or structural design to overcome limitations or to restrict the impacts to acceptable levels.

Land capability assessment is a rational and systematic means of obtaining this information.

The Soil Conservation Authority is able to provide land capability information for a range of uses and at different scales to meet the various needs of planning. This information provides a relatively stable base on which to superimpose other planning considerations.

## **THE SCOPE AND LIMITATIONS OF THE REPORT**

- \* This report is based on an assessment of the physical characteristics of the land. Social or economic factors have not been considered.
- \* The scale of the assessment has necessitated some generalization. Site – specific data will be required for detailed planning.
- \* The precision with which boundaries are mapped is affected by the scale of the map. Subsequent enlargement of the map does not improve the precision and may be misleading.
- \* The boundaries on the maps usually represent readily seen changes in the land. However, where an important land characteristic changes gradually, the boundary indicates approximately where there is a significant change in the effect on land use.
- \* No material may be extracted from the report for publication without the written permission of the Soil Conservation Authority.

## **PART 1      SUMMARY AND CONCLUSIONS**

### ***Outline of the study***

The study was undertaken at the request of the Town and country Planning Board for use as an aid to planning and development at a broad scale. The report describes erosion risk and other characteristics of the land which may impose constraints on land development in the Shire.

The Chiltern Shire (see locality plan) has an area of approximately 498 square kilometers and varies from flat plains in the north at about 160 m elevation receiving about 625 mm annual rainfall, to very steep hills in the east and south, up to 550 m elevation, where annual rainfall is up to 1 000 mm.

Approximately two thirds of the Shire is freehold land (340 km<sup>2</sup>) the remainder being largely forested public land. The study concentrates on the freehold land and is less detailed on the public land.

Areas of special interest to the Soil Conservation Authority are:-

- \* Natural catchment to the Chiltern WWT Reservoir and an unnamed creek in the vicinity of Mt Barambogie.
- \* Public land in the whole of the Shire has been investigated by the Land Conservation Council, and described in its report of North Eastern Study Area Districts 3, 4 & 5.

### ***Conclusions***

The erosion risk classes in the Shire are shown on Map 2. The general management guidelines are presented in Table 2. The main conclusions and recommendations are summarised below.

- (i) Land with severe erosion risk (Class 5) comprises 4% of the Shire, however a large proportion of the severe risk land is freehold. This land is considered highly hazardous and should have strong limitations placed upon its development.
  - \* It is recommended that subdivision of land in erosion risk Class 5 should not be permitted unless the developer can demonstrate to the satisfaction of the Soil Conservation Authority that the development will not result in increased soil erosion from the area.
  - \* Permanent clearing of Class 5 land should be prohibited and reforestation should be actively encouraged. In general, such land should be considered as best used for forestry and passive recreation.
- (ii) Land with a high erosion risk (Class 4) comprises only 13% of the Shire but about 50% of the high risk land is freehold.
  - \* Intensive small lot subdivision and clearing should be discouraged and reforestation should be encouraged.

- \* It is recommended that all proposals for development of land in erosion risk Class 4 be referred to the Soil Conservation Authority for specific advice on soil conservation requirements at the earliest possible stage.
- (iii) Land with a moderate erosion risk (Class 3) comprises 42% of the Shire and most of the land in this risk class is freehold. Development of most moderate risk land should be possible without causing increased erosion provided specialised techniques and careful management, which take account of the natural characteristics of the land are adopted.
- In particular, areas where water naturally concentrates should not be disturbed, and disposal of water which would be concentrated by the development should be carefully planned.
- \* Advice on the need for specialised design and construction techniques and follow up management should be sought from the Soil Conservation Authority prior to approval of any development.
- (iv) Land with a low erosion risk (Classes 1 and 2) comprises 40% of the Shire and most of the land in these classes is freehold. Although land in erosion risk classes 1 and 2 is not generally regarded as presenting significant erosion problems there may be small areas of higher risk, which would require special management, within the areas shown in those classes in Map 2. Where such areas become apparent, the Soil Conservation Authority should be consulted for advice on appropriate management.



Locality plan – Shire of Chiltern

## **PART 2      TECHNICAL ASPECTS OF THE STUDY**

### ***Outline of the Methods***

In order to identify and map areas of land with differing land capability, a systematic study of the natural characteristics of the land has been made. Areas of land which have consistent patterns of landforms, soils and native vegetation on similar rock types and with a limited range of climate are identified. Such areas are referred to as land systems.

Within the Shire, seven land systems have been identified on a variety of rock types. These are shown on Map 1.

Because land systems consist of sequence of land types which are not uniform, there may be a range of erosion risk within each. The land systems information has been reinterpreted on the basis of local knowledge of the erosion risk of the various land types to produce a map of erosion risk classes. (Map 2).

The land system descriptions (Appendix A) provide a range of information which can be adapted for use by planners for purposes other than erosion control. In particular, areas subject to flooding or having poor effluent disposal or water holding characteristics can be identified. Where these constraints exist they are referred to in the Constraints section of the tables in Appendix A.

### ***Assessment of Erosion Risk***

The components of the land systems are assessed for the risk of erosion of all types if the land is subjected to poor management or to disturbance such as exposure of bare soil during development. The steepness of the land, the erodibility of the soil, including soil depth, permeability and structure, and the effect of increased soil-water accumulation if plant cover is altered are taken into consideration.

The erosion risk is assessed in five classes – Class 5 being highest. Definitions of the classes are presented in Table 1.

For each of the five erosion risk classes, the proportions which fall into each land system are determined and these are indicated in bar-chart form in the tables of Appendix A.

It should be realized that because of the broad scale of mapping (1:50 000) the map units can only represent a general level of erosion risk over relatively large areas. Obviously at a more detailed level, local variation will be found. It is important therefore, that where areas of land are nominated for intensive development, such as small lot subdivision, the need for further detailed mapping at a much larger scale is recognized.

**Table 1 – Erosion Risk Class**

<b>Class</b>	<b>Erosion</b>	<b>General limitations of development</b>
1	None to very slight	Erosion risk does not occur or is very slight. Standard designs and installation techniques and normal site preparation and management should be possible without risk of erosion.
2	Slight	Slight erosion risk exists. Areas of high erosion risk may be avoided by not disturbing drainage lines and steeper slopes. Careful planning, and use of standard specifications for site preparation, construction and follow up management should be satisfactory to minimise erosion.
3	Moderate	Moderate to high erosion risk exists which may lead to difficulties during and after construction but which can be overcome. Specialised design, construction and techniques and follow up management are necessary to minimise erosion.
4	High	High erosion risk. Avoidance of erosion during and after construction is difficult and long term problems may occur. Adverse effects may be inflicted upon adjoining land. Extensively modified design and installation techniques, exceptionally careful site preparation and management would be necessary.
5	High	Sever erosion risk and/or danger of large landslides is prevalent. Any development will cause instability which cannot be particularly overcome.



## **Management Guidelines**

There are considerable variations in standards of land management which can substantially affect stability, particularly in areas with high erosion risk. Similarly, techniques of earthwork construction and follow-up treatment can vary considerably with possible significant or drastic effect upon stability where these are inadequate or inappropriate.

The guidelines in Table 2 outline the kind and levels of management considered necessary to guard against unacceptable land deterioration within each erosion risk map unit.

**Table 2 – Land Management Guidelines**

<b>Class</b>	<b>Erosion</b>	<b>Management Guidelines</b>
1	None to very slight	<p>Generally no specific conservation management practices are required in this map unit, except along drainage lines where erosion may occur.</p> <p>To minimise the danger of erosion in drainage lines, avoid disturbance and maintain a protective vegetative cover.</p> <p>Roads which cross drainage lines where high flows are likely should be designed with adequate culvert capacity or alternatively low profile floodway fords. Crossing should be as near as practicable at right angles to the flow to minimise the cost and erosion potential.</p> <p>To avoid problems with spillways when siting farm dams in drainage lines which carry large flows, off-stream storages are recommended.</p>
2	Slight	<p>Generally only limited special management inputs are required in this map unit to prevent soil erosion, except along drainage lines where erosion is likely to occur.</p> <p>To minimise the danger of erosion in drainage lines, avoid disturbance and maintain a protective vegetative cover.</p> <p>Roads which cross drainage lines where high flows are likely, should be designed as for Unit 1 above. In addition, roads should be aligned close to contour and have adequate surface and/or subsurface cross drainage or be aligned directly up and down the slope with drainage water dispersed laterally.</p>

Class	Erosion	Management Guidelines
		<p>Disturbed areas caused during construction works should be revegetated by topsoiling and sowing.</p> <p>To avoid problems with spillways when siting farm dams in drainage lines which carry large flows, off-stream storages are recommended.</p> <p>Planning for fence locations should take account of significant topographical features so that it is possible to conform to the criteria above.</p>
3	Moderate	<p>Specialised land management techniques are required to minimise soil erosion. Moreover, localised areas of severe risk occur in which intensive development of any kind should be avoided.</p> <p>To minimise the danger of erosion in drainage lines, avoid disturbance and maintain a protective vegetative cover.</p> <p>Employ contour cultivation or minimum tillage techniques for cropping and contour cultivation for pasture and establishment.</p> <p>Locate roads and fences on contour, along ridges or directly up and down slopes. Disperse water from roads at frequent intervals by surface or subsurface drainage. Design roads as recommended under Unit 1 above.</p> <p>Take care to minimise disturbed areas during construction and undertake adequate soil conservation measures. Conserve topsoil for respreading after construction. Revegetation of these areas may require special treatment as well as sowing and adequate maintenance.</p> <p>All dams constructed in this unit will require careful siting, design and construction techniques.</p> <p>Generally a vigorous vegetative ground cover should be maintained throughout this unit. Existing timbered areas should remain and reforestation should be encouraged in the more hazardous areas.</p> <p>Subdivision into areas of small lots could cause increased erosion unless carefully planned, and due consideration is given to topographical features. Planning of fence locations should</p>

Class	Erosion	Management Guidelines
		also take into account these features so that it is possible to conform to the above criteria.
<p><b><u>It is recommended that:</u></b>            Advice on the need for specialised design and construction techniques and follow-up management should be sought from the SCA prior to approval of any development.</p>		
4	High	<p>High inputs of specialised land management techniques are required to minimise soil erosion and/or landslides. Localised areas of severe risk occur in which any development techniques for grazing are required. Cropping is not advisable. SCA advice should be sought.</p> <p>A vigorous vegetative ground cover should be maintained throughout this unit. Prevention of further forest clearing is very desirable and reforestation should be encouraged.</p> <p>All earthworks, including dam construction, roading and other construction works, should employ conservation specifications suitable for each site and include topsoil saving, rapid revegetation, and other soil stabilisation measures and maintenance.</p> <p>Limited subdivision may be possible with careful planning and due consideration to topographical features.</p> <p>SCA advice should be sought at the earliest planning stage.</p> <p>Planning of fence locations should take into account topographic features to avoid stock concentration in hazardous areas. SCA advice should be sought.</p>
<p><b><u>It is recommended that:</u></b>            All proposals for development of land in Unit 4 be referred to the SCA for specific advice on soil conservation requirements at the earliest possible stage.</p> <p>Intensive small-lot subdivision and clearing should be discouraged, and reforestation should be encouraged.</p>		
5	High	<p>Any land disturbance will require extremely high levels of specialised management input to minimise soil erosion and/or landslides. Intensive development of any kind is undesirable and should be avoided.</p> <p>Cultivation is inadvisable. Pastures should be</p>

Class	Erosion	Management Guidelines
		<p>sown by aerial seeding only and maintained as a vigorous ground cover.</p> <p>Grazing should be strictly controlled and consultation with the SCA on grazing management is highly recommended.</p> <p>Clearing of timber should be prohibited unless for timber harvesting and then should be strictly controlled and the area reforested immediately after. Reforestation of existing cleared areas should be actively encouraged.</p> <p>Earthworks of any kind should be discouraged except for emergency or fire protection purposes. In these instances strict attention to design specifications according to SCA requirements should be mandatory.</p> <p>Subdivision should be discouraged. However, isolated areas may be suitable for limited development. Such areas would require detailed terrain evaluation due to the severe risks involved.</p> <p>Planning of fence locations should take into account topographic features to minimise erosion by stock trafficking. SCA advice should be sought.</p>
<p><b><u>It is recommended that:</u></b></p> <p>Subdivision of land in this map unit should not be permitted unless the developer can demonstrate to the satisfaction of the SCA that the development will not cause increased soil erosion or land deterioration.</p> <p>Permanent clearing of land should be prohibited and reforestation actively encouraged.</p> <p>In general the area should be regarded as being best used for forestry and passive recreation.</p>		

### ***Areas of special conservation interest***

This area has been outlined on Map 2 in Roman Numerals as numbered below:

#### **I Barambogie Springs Catchment**

Natural catchment to the Chiltern WWT Reservoir on an unnamed creek in the vicinity of Mt Barambogie. This location is referred to as Barambogie Springs in the Land Conservation Council final recommendations report for North Eastern Study Area Districts 3, 4, & 5.

That report recommends proclamation of this catchment under the provisions of the Soil Conservation and Land Utilisation Act. Whilst Chiltern now draws most of its town water supplies from bores, this catchment is regarded as an area in which careful land use decisions should be made as one means of protecting the town water supply.

#### ***Reference***

Soil Conservation Authority (1975) – Land Systems Map of Victoria.

## Appendix A – Land Systems Descriptions

<b>Land System Number</b>	413134	413142
<b>Erosion Risk Rating</b>	3	4
<b>Location</b>	North and south-east of Chiltern	East of Barnawartha, near Mt. Lady Franklin
<b>Landform</b>	Irregularly dissected hills with depressions	Deeply dissected hills
<b>Rainfall/Slope</b>	625 – 750 mm / 5 30%	625 – 750 mm / 14 – 40%
<b>Geology</b>	Ordovician sedimentary rocks with some areas of metamorphism	Metamorphic rocks
<b>Soils</b>	Variable soil types, often gravelly loams or clay loam of moderate permeability	Loams and gravelly loams, soils of moderate permeability
<b>Native Vegetation</b>	Open forest – Ironbark and various Box species	Open forest – Stringybark and various Box species
<b>Constraints</b>	Intensive development is limited by topographical constraints in steeper areas.	Inherently unstable due to steep slopes. Desirable to prohibit small lot development and encourage tree cover under any management system.

<b>Land System Number</b>	421244	521242
<b>Erosion Risk Rating</b>	4	5
<b>Location</b>	Mt. Lady Franklin, and upper parts of Indigo Creek valley	In the south of the Shire
<b>Landform</b>	Hilly	Undulating to steep hills with plateaux
<b>Rainfall/Slope</b>	625 – 750 mm / 10 -35%	750 – 1000 mm / 10 -25%
<b>Geology</b>	Granitic and metamorphic rocks	Devonian granite
<b>Soils</b>	Sandy loams with moderate to high permeabilities	Generally well drained; soils have sandy loam surface texture
<b>Native Vegetation</b>	Open forest of Stringybark and various Box species	Open forest – Stringybark and various Box species
<b>Constraints</b>	<p>Springs and seepage areas in granitic country offer constraints to some forms of intensive subdivisions. Erodible nature of granitic soils requires careful planning and development considerations. Granitic soils may present difficulties in water holding for earthen dams.</p> <p>Intensive development is limited by topographical restraints in steeper areas. Desirable to encourage tree cover under any management system.</p>	

<b>Land System Number</b>	453129			453116		453118
<b>Erosion Risk Rating</b>	2	3	4	1	2	1
<b>Location</b>	Middle and upper valleys of Indigo and Black Dog Creeks			Near Barnawartha		Adjacent to Murray River
<b>Landform</b>	Undulating to low hilly valley			Flat to gently sloping plain and terraces		
<b>Rainfall/Slope</b>	625 – 750 mm / 3 – 17%			625 – 750 mm / 1 – 3%		625 – 750 mm / 0 – 2%
<b>Geology</b>	Alluvium and hillwash material			Alluvium and hillwash material		Alluvium
<b>Soils</b>	Variable soil types; often sandy loams. Soils of moderate permeability			Vary considerably depending upon position. Surface texture range from loams to sandy loams. Moderate permeability		Loams and sandy loams of moderate permeability
<b>Native Vegetation</b>	Stringybark, Red gums and various Box species			Woodland of Red gum and various Box specie		Red gum woodland
<b>Constraints</b>	<p>Floodplain areas are subject to waterlogging and localised flooding. Hence flooding is the prime determinant for small lot development, particularly adjacent to major streams – e.g. Murray River.</p> <p>Septic effluent disposal may be hazardous in some of the soils in these units due to the high percolation rate of alluvial soils near streams.</p>					