

**LAND CAPABILITY STUDY
IN THE
SHIRE OF TUNGAMAH**

**EROSION RISK ASSESSMENT
OTHER LAND 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 needs 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 Department of Conservation, Forests and Lands is able to provide land capability information for a range of uses and at different scales to meet the various needs of planning. The 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, economic and other factors which may influence the planning have not been considered. Such factors may be the subject of further input by the Department of Conservation, Forests and Land.
- * 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. 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 Department of Conservation, Forests and Lands.

Part 1 – Summary and Conclusions

Outline of the study

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

Tungamah Shire (see locality plan) has an area of approximately 1,114 km² and varies from flat plains at about 110 metres elevation up to hill country at 275 metres elevation, with average annual rainfall ranging from 500 to 550 millimetres.

Most of the Shire is freehold land, but does contain many small blocks of Public Land. The study concentrates on the freehold land and is less detailed on the public land.

Areas of Special Interest to the Department of Conservation, Forests and Lands are the Wilby – Almonds Group Conservation Area (part) and the Boweya Group Conservation Area (part). These are detailed in Part 2.

Conclusions

General management guidelines are presented in Table 2. The main conclusions and recommendations are summarised below.

- (i) Land with severe erosion risk (Class 5[#]). 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 Department of Conservation, Forests and Lands 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).
 - * Intensive small-lot subdivision and clearing should be discouraged.
 - * It is recommended that all proposals for development of land in Erosion Risk Class 4 be referred to the Department of Conservation, Forests and Lands for specific advice on soil conservation requirements at the earliest possible stage.

[#] No class 5 land has been mapped in the Shire, as any that may exist is considered to be of insufficient proportions for inclusion at the mapping scale adopted.

- (iii) Land with a moderate erosion risk (Class 3). Development of most of the moderate risk land should be possible without causing increased erosion provided specialised techniques and 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 development should be carefully planned.

- * Advice on the need for specialised design and construction techniques and follow-up management should be sought from the Department of Conservation, Forests and Lands prior to approval of any development.

- (iv) Although land in Erosion Classes 2 and 1 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 on the map. Where such areas become apparent, the Department of Conservation, Forests and Lands should be consulted for advice on appropriate management.

Locality Plan – Shire of TUNGAMAH

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 slope, soils and native vegetation on similar rock types and with a limited range of climate are identified. Such areas are referred to as land units.

Within the Shire, twenty three land units have been identified.

The land unit information has been used together with local knowledge of the erosion risk of the various land types to categorise each of these units into erosion risk classes.

The land unit 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 prolonged wetness or having poor effluent disposal or water holding characteristics can be identified. Where these constraints may exist they are referred to in the Constraints section of the tables in Appendix A.

Warning:

The information provided in the Constraints sections of Appendix A has been compiled by field observation only and needs to be confirmed by appropriate field and/or laboratory tests.

Assessment of Erosion Risk

Erosion risk is best defined as a means of rating the potential of land to erode if subjected to poor management or soil disturbance. Factors considered in this rating for each land unit are: Steepness of the land, erodibility of the soil, soil depth, permeability and structure and soil/water balance.

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

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, areas of land are nominated for intensive development, the need for further detailed mapping at a much larger scale be recognised.

Table 1 – Erosion Risk Classes

Class	Erosion Risk	General Limitations on Development
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. Careful planning, and use of standard specifications for site preparation, construction and follow up management should be satisfactory to minimise erosion.
3	Moderate	Moderation erosion risk exists which may lead to difficulties during and after construction, but they can be overcome. Specialised design, construction 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	Severe	Severe erosion risk and/or danger of large landslides is prevalent. Any development will cause instability which cannot be practically overcome.

Management Guidelines

There are considerable variations in standards of land management which can substantially effect 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 type and levels of management considered necessary to guard against unacceptable land deterioration within each erosion risk map unit.

Table 2 – Land Management Guidelines

Class	Erosion Risk	Management Guidelines
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>Road which cross drainage lines where high lows are likely should be designed with adequate culvert capacity or low profile floodway fords. Crossings should be as near as practicable at right angles to the flow to minimise cost and erosion potential.</p> <p>When siting farm dams in drainage lines which carry large flows, off-stream storages are recommended to avoid problems with spillways.</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</p>

Class	Erosion Risk	Management Guidelines
		<p>drainage, or be aligned directly up and down the slope with drainage water dispersed laterally.</p> <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 with the criteria above.</p>
3	Moderate	<p>Specialised land management techniques are required to minimise soil erosion. Moreover, localised areas of higher 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 pasture establishment.</p> <p>Locate roads and fences on contour, along ridges or directly up and down slope. 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.</p> <p>Subdivision into areas of small lots could cause increased erosion unless due consideration is given to topographical features. Planning of fence locations</p>

Class	Erosion Risk	Management Guidelines
		should also take into account these features so that it is possible to conform with the above criteria.
<p><u>It is recommended that:</u></p> <p>Advice on the need for specialised design and construction techniques and follow up management should be sought from the Department of Conservation, Forests and Lands 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 higher risk occur in which any development should be avoided.</p> <p>Employ contour cultivation or aerial seeding for pasture establishment. Specialised management techniques for grazing are required. Cropping is not advisable. Department of Conservation, Forests and Lands advice should be sought.</p> <p>A vigorous vegetative ground cover should be maintained throughout this unit. Further forest clearing is undesirable and tree planting should be encouraged.</p> <p>All clearing or earthworks, including dam construction, roading and other construction works, should employ conservation specifications suitable for each site and include topsoil saving, revegetation, and other soil stabilisation measures and maintenance.</p> <p>Limited subdivision may be possible with due consideration to topographical features. Department of Conservation, Forests and Lands advice should be sought at the earliest planning stage.</p> <p>Planning of fence locations should take into account topographical features to avoid stock concentration in hazardous areas. Department of Conservation, Forests and Lands advice should be sought.</p>
<p><u>It is recommended that:</u></p> <p>All proposals for development of land in Unit 4 be referred to the Department of Conservation, Forests and Lands for specific advice on soil conservation requirements</p>		

Class	Erosion Risk	Management Guidelines
<p>at the earliest possible stage.</p> <p>Intensive small-lot subdivision and clearing should be discouraged and tree planting should be encouraged.</p>		
5	Severe	<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 should be strictly controlled and consultation with the Department of Conservation, Forests and Lands 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. Some areas in this unit should not be disturbed under any circumstances.</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 Department of Conservation, Forests and Lands 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 topographical features to minimise erosion by stock trafficking. Department of Conservation, Forests and Lands advice should be sought.</p>
<p>It is recommended that:</p> <p>Subdivision of land in this map unit should not be permitted unless the developer can demonstrate to the satisfaction of the Department of Conservation, Forests and Lands that the development will not cause increased soil erosion or land deterioration.</p> <p>Permanent clearing of land should be permitted and reforestation actively encouraged.</p>		

Class	Erosion Risk	Management Guidelines
In general the area should be regarded as being best used for forestry, passive recreation and strictly controlled grazing.		

Areas of Special Conservation Interest

These have been outlined on the map and assigned Roman numerals as designated below.

- I. Wilby Almonds Group Conservation Area (part only)
- II. Boweya Group Conservation Area (part only)

Group Conservation Areas are projects that have the aim of controlling existing erosion, preventing erosion, and utilizing land to its maximum potential. These projects are co-operative schemes involving the Landowners, Shires and the Department of Conservation, Forests and Lands.

References

Land Systems map of Victoria – Soil Conservation Authority (1975)

Report on the Murray Valley Area – Land Conservation Council (1983)

APPENDIX A – LAND UNIT DESCRIPTIONS - SHIRE OF TUNGAMAH

Land Unit Name - Boosey

Geology	Quaternary Alluvium
Map Symbol	BF
Erosion Risk Rating	1
Land Form	Plain
Slope %	0-3
Soils	Yellow Duplex, Red-brown Duplex, Uniform Sands, Grey uniform clays in drainage and wet areas.
Native Vegetation	Grey Box, Buloke, Yellow Box, White Cypress Pine, Black Box, River Red Gum
Constraints	<p>Water storage in earthen tanks is generally favourable, but deep sand leads may be encountered near streams</p> <p>Some of the area is subject to flooding caused by stream outflow and some flat areas are subject to prolonged periods of inundation.</p> <p>This unit is not erosion prone except in water courses and depressions.</p> <p>Disposal of septic effluent may pose a problem because of low permeability of some of the soils.</p>

Land Unit Name - Invergordon

Geology	Quaternary Alluvium
Map Symbol	IF
Erosion Risk Rating	1
Land Form	Plain
Slope %	0-3
Soils	Red Duplex with Yellow Duplex in wet and drainage areas.
Native Vegetation	Grey Box, Buloke, White Cypress Pine
Constraints	<p>Water storage in earthen tanks is generally favourable, but deep sand leads may be encountered near streams.</p> <p>Some of the area is subject to flooding caused by stream outflows; some flat areas are subject to prolonged periods of inundation and many areas have a perched water table.</p> <p>The unit is not erosion prone, except in water courses and depressions.</p> <p>Septic effluent disposal may pose a problem because of low permeability of some of the soils and the perched water table.</p>

Land Unit Name - Murray

Geology	Quaternary Alluvium
Map Symbol	MF
Erosion Risk Rating	1
Land Form	Plain
Slope %	0-3
Soils	Variable – but mainly yellow-grey mottled gradational with some sand deposits.
Native Vegetation	River Red Gum
Constraints	<p>Occurrences of sand seams can make storage of water in earthen tanks impracticable, soil testing is necessary.</p> <p>Most of the area is subject to flooding caused by stream outflow and some areas are subject to prolonged periods of inundation.</p> <p>This unit is not erosion prone except in water courses and depressions.</p> <p>Septic effluent disposal may be hazardous in some of the soils due to the low permeability of some of the soils and the high percolation rate in some of the alluvial soils near streams.</p>

Land Unit Name – Katandra

Geology	Cambrian Greenstone, Diabase, Tuff, Chert					
Map Symbol	KG	KH	KM	KR	KS	KU
Erosion Risk Rating	2	3	3	2	4	1
Land Form	Gentle slopes	Moderate to steep slopes	Moderate slopes	Gentle to Moderate slopes	Steep slopes	Flat to Gentle slopes
Slope %	3-8	12-25	8-20	5-12	20-35	2-5
Soils	Uniform clays	Stony Red Gradational	Uniform Stony Loam; Stony Red Gradational	Uniform Clays; Stony Red Gradational	Stony Red Gradational	Uniform Clays
Native Vegetation	Yellow Box, Grey Box, White Cypress Pine					
Constraints	<p>Water storage in earthen tanks in these units is extremely difficult due to shallow soils over rock on the steeper upper slopes and the presence of shrink/swell clays which crack open when dry.</p> <p>Problems with building foundations may exist because of the prevalence of shrink/swell clays.</p> <p>Septic effluent disposal is a problem due to the low permeability of most of the soils when wet.</p> <p>Generally stable soils, but they may erode if mismanaged.</p>					

Land Unit Name – Pendle

Geology	Silurian Granite					
Map Symbol	PG	PH	PM	PR	PRc	PU
Erosion Risk Rating	2	4	3	3	3	2
Land Form	Gentle slopes	Moderate to Steep slopes	Moderate slopes	Gentle to Moderate slopes	Rolling rocky crests	Flat to Gentle slopes
Slope %	3-8	12-25	8-20	5-12	5-12	2-5
Soils	Yellow Duplex	Red Duplex	Red Duplex	Red Duplex	Red Duplex; Shallow Uniform Sands and Rock	Yellow Duplex
Native Vegetation	Grey Box; Yellow Box; White Cypress Pine; Buloke; Some Stringybark and Blakelys Red Gum.					
Constraints	<p>The ability of soils to hold water in earthen tanks is variable and unpredictable. Soil testing is necessary.</p> <p>These units are susceptible to rapid erosion is the soil is disturbed or mismanaged.</p> <p>Surface springs occur throughout these units.</p> <p>Septic effluent disposal may be hazardous in some of the soils in these units due to shallowness of permeable soils over rock or other impervious materials.</p>					

Land Unit Name – Tungamah

Geology	Ordovician sediments					
Map Symbol	TG	TH	TM	TR	TS	TU
Erosion Risk Rating	2	3	3	2	4	1
Land Form	Gentle slopes	Moderate to Steep slopes	Moderate slopes	Gentle to Moderate slopes	Steep slopes	Flat to Gentle slopes
Slope %	3-8	12-25	8-20	5-12	20-35	2-5
Soils	Yellow Duplex	Red Duplex; stony gradational	Red Duplex	Red Duplex; Yellow Duplex	Stony gradational	Yellow Duplex
Native Vegetation	Grey Box; Red Box; Long leaf Box; Red Stringybark; Yellow Gum					
Constraints	<p>Storage of surface water in earthen tanks can be difficult in the TH and TS units because of steepness and rockiness.</p> <p>Some areas are susceptible to sheet and tunnel erosion because of highly dispersible subsoils.</p> <p>High runoff poses a problem for land immediately downslope.</p> <p>Septic effluent disposal may be hazardous in some of the soils due to highly dispersible subsoil.</p>					

Land Form Unit – Wilby

Geology	Quaternary Alluvium
Map Symbol	WF
Erosion Risk Rating	1
Land Form	Plain
Slope %	0-3
Soils	Red or Yellow Duplex
Native Vegetation	Grey Box; Yellow Box; White Cypress Pine
Constraints	<p>Water storage in earthen tanks is generally favourable, but deep sand leads may be encountered near streams.</p> <p>Some of the area is subject to flooding caused by stream outflow and some flat areas are subject to prolonged periods of inundation.</p> <p>This unit is not erosion prone except in water courses and depressions.</p> <p>Disposal of septic effluent may pose a problem because of low permeability of some of the soils.</p>

Land Form Unit – Yabba

Geology	Quaternary Alluvium
Map Symbol	YF
Erosion Risk Rating	1
Land Form	Plain
Slope %	0-3
Soils	Red Duplex; Grey Uniform Clays
Native Vegetation	Grey Box; Red Gum; Yellow Box
Constraints	<p>Water storage in earthen tanks is generally favourable, but deep sand leads may be encountered near streams.</p> <p>Some of the area is subject to flooding caused by stream outflow and some of the flat areas are subject to prolonged periods of inundation.</p> <p>This area is not erosion prone except in water courses and depressions.</p> <p>Salting is present in some depressions which is itself a restraint on development and may lead to acceleration of erosion.</p> <p>Septic effluent disposal may pose a problem because of low permeability of some of the soils.</p>