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Assessment of agricultural quality of land in Gippsland

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1. INTRODUCTION

This assessment of the agricultural quality of land in Gippsland, Victoria, provides an agricultural input to land use planning. Gippsland extends from Westernport Bay in the west to the New South Wales Border in the east, and from Bass Strait to the Great Dividing Range. (See Map of Gippsland).

Development is affecting several key areas of Gippsland, such as the Westernport catchment in West Gippsland, the Latrobe Valley in Central Gippsland and the Gippsland Lakes of East Gippsland. Such development has consequences for agricultural industries. This assessment was carried out so that planning decisions can be based on sound information about the agricultural resources of Gippsland.

The assessment has been carried out at a reconnaissance level and mapped at a scale of 1:250,000. Consequently, the maps indicate the general pattern of the agricultural quality of land in Gippsland, but are not suitable for detailed planning purposes.

The assessment has been based on the best existing data. No surveys of soil or other environmental conditions have been carried out. The data used have been analysed and interpreted specifically for this assessment. Because of data limitations some degree of subjective assessment has been necessary.

The method used to rate the agricultural quality of the land is based on inherent characteristics which are stable over time. Only fundamental change in circumstances will change the rating. Examples of such change would be new irrigation schemes in rainfall deficient areas or large drainage schemes in swampy areas which remove the limiting effect of water logging.

The use of inherent characteristics means the assessment is relevant to agricultural activities which rely on the

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SUMMARY

This report provides an assessment of the agricultural quality of land in Gippsland, Victoria. The assessment is based on inherent land and climate characteristics which are considered in terms of their effect on versatility and inherent productivity for agricultural use.

The assessment is time stable unless there are major social, economic or technological changes. Highly rated areas will maintain an advantage over lower rated areas; good, naturally fertile soils with low to moderate slopes and a reliable and suitable climate will remain more capable of agriculture than areas with less of these attributes.

The assessment provides a basic input for planning on the agricultural quality of land in Gippsland, Victoria. Authorities that wish to encourage agricultural use of land can use the policy guidelines in the final section of the report.

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Assessment of agricultural quality of land in Gippsland

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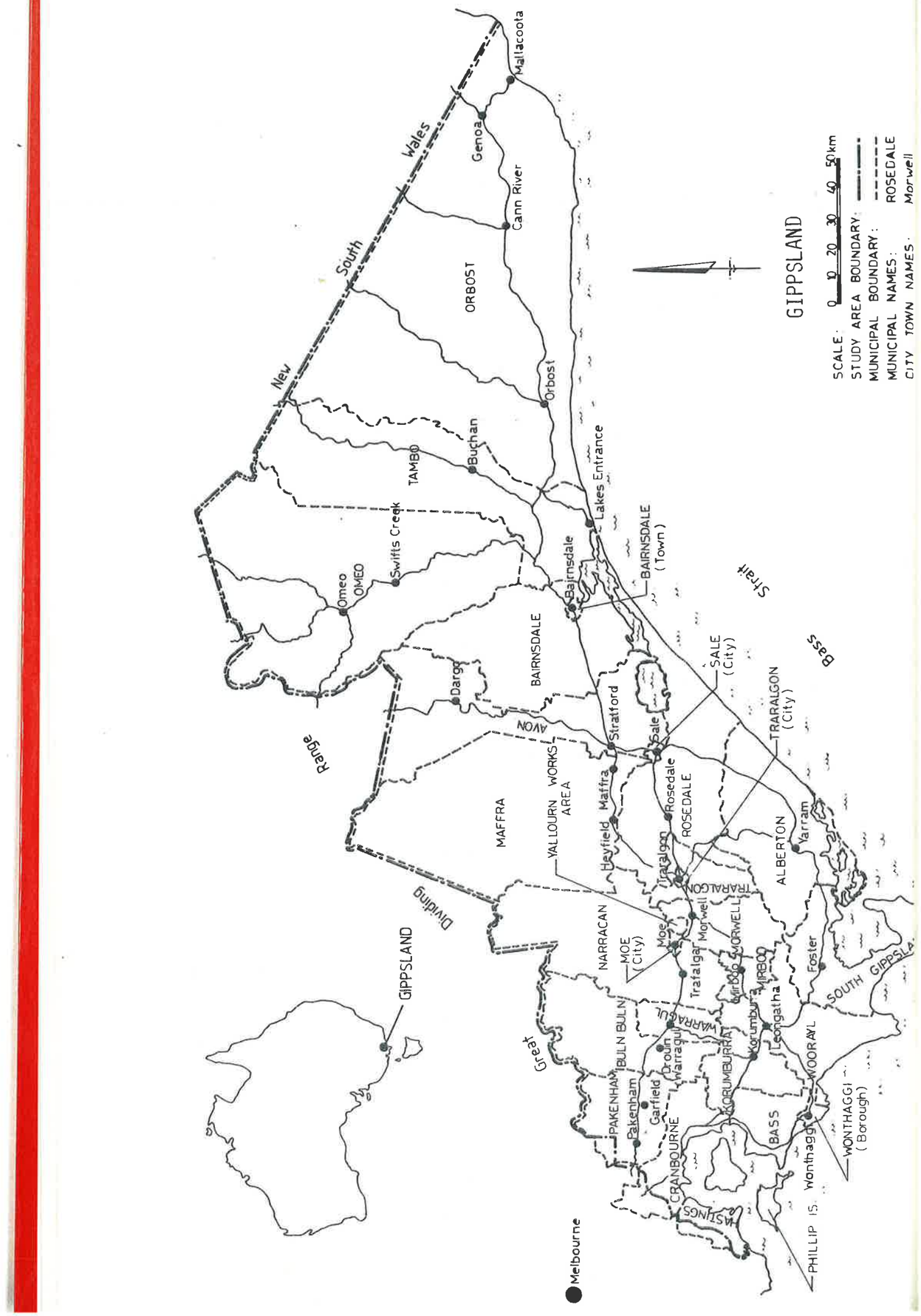


interaction between land and climate. The assessment is therefore not relevant to activities such as housed poultry and pig enterprises, or production of crops in glasshouses.

Some agricultural enterprises require specific and unusual conditions. For example, rice requires water logged soils and can grow on land that is of little value for other agricultural uses. Such land, although generally being of low agricultural quality, can be important to a specific agricultural industry.

It is important to realize that extensive agricultural industries are usually based on large areas of land of lower agricultural quality. In Victoria, some of these industries, such as wool growing, are significant at the local and State level. Thus, land with a low rating can be the base for an important agricultural industry.

The assessment of agricultural quality has been based on the range of environmental conditions in Gippsland. It is considered that the principles are applicable throughout Victoria, providing consideration is given to any specific, regional features of the land and climate.

2. ASSUMPTIONS

In developing the method of assessing the agricultural quality of land in Gippsland a number of assumptions were made. These are important to remember when interpreting the maps and using the results of the assessment.

(i) Management of the land is assumed to be similar on all land and consistent with mechanised agricultural systems. This assumption recognises that nearly all soils have some degree of nutrient limitation, that climate conditions are not optimal all the time and that steepness creates management problems. The management inputs on flat or moderately sloping land with naturally fertile soil, good rainfall and suitable temperatures will achieve higher production than the same management on land with lesser attributes.

(ii) The land within each agricultural quality class is similar in terms of the degree of restriction imposed on agricultural use and production but the cause of the restriction could be soil, slope or climate. For example, an area with good soils and climate may be of restricted agricultural quality because of very steep slopes. Alternatively, slope and soil may be satisfactory but the climate limits agricultural quality.

(iii) Socio-economic factors such as accessibility to markets land ownership patterns and supporting infra-structure are not incorporated in the assessment. These factors affect the suitability of the land for agricultural use Because of changes in these factors over time, they are properly considered when planning decisions are made.

(iv) Public irrigation schemes are assumed to increase productivity to an extent that the land is automaticall classified in the best category.

(v) The climatic suitability of any area is based on the growing season for pastures of a temperate climate. It is assumed that this measure of climatic suitability is indicative generally of the suitability for other agricultural crops and for farm animals.

3. ASSESSMENT OF AGRICULTURAL QUALITY

The assessment of agricultural quality required the selection of indicators which reflect the inherent quality of the land.

The capability of the land for a wide range of agricultural uses is a good indicator of agricultural quality. This is referred to as *versatilty*, as it allows agricultural use to be flexible in the face of changing circumstances.

Another main indicator of agricultural quality is the inherent ability of the land and climate to contribute to the growth and development of plants and animals. Some areas are inherently more capable of agricultural production than others. These areas are naturally fertile, have soils able to hold water without becoming waterlogged, have a reliable and suitable climate, and are able to be cultivated regularly without destroying soil structure. *Inherent productivity* was selected as the second key indicator of agricultural quality.

These two key indicators of agricultural quality are a function of the combined effect of soils, topography and climate. In combination these three factors, when considered in terms of the effect on versatility and inherent productivity, show areas of natural advantage. Areas with such an advantage are inherently more productive, more capable of a variety of agricultural uses and thus of higher agricultural quality.

The assessment of the agricultural quality of the land has considered land *capability* and partially considered the *suitability* of the land for agriculture. These terms are defined in the following paragraphs.

The capability of the land was mainly assessed on the basis of bio-physical factors. These bio-physical factors are a function of the biological and physical processes which affect the land and are inherent features of the land and climate. The inherent features of the land can be affected by human actions such as the development of irrigation schemes. Consequently socio-economic factors can be important in some instances when land capability is assessed.

The suitability of land for agricultural use is a function of the land's capability plus the consideration of additional socio-economic factors which have significant effect on the use of land for agriculture. Such socio-economic factors have been considered to be land uses which preclude agricultural use of land.

The key bio-physical factors were selected because in combination they explain most of the differences in the inherent capability of the land. The socio-economic factors selected account for the major modifications to inherent capability, or account for the non-availability of the land for agriculture. An important pre-requisite in selection of factors was that they are relatively stable over time, and together give a good, comparative assessment of the agricultural quality of the land.

The key factors selected are:

Bio-physical factors

(i) Soils
(ii) Topography
(iii) Climate

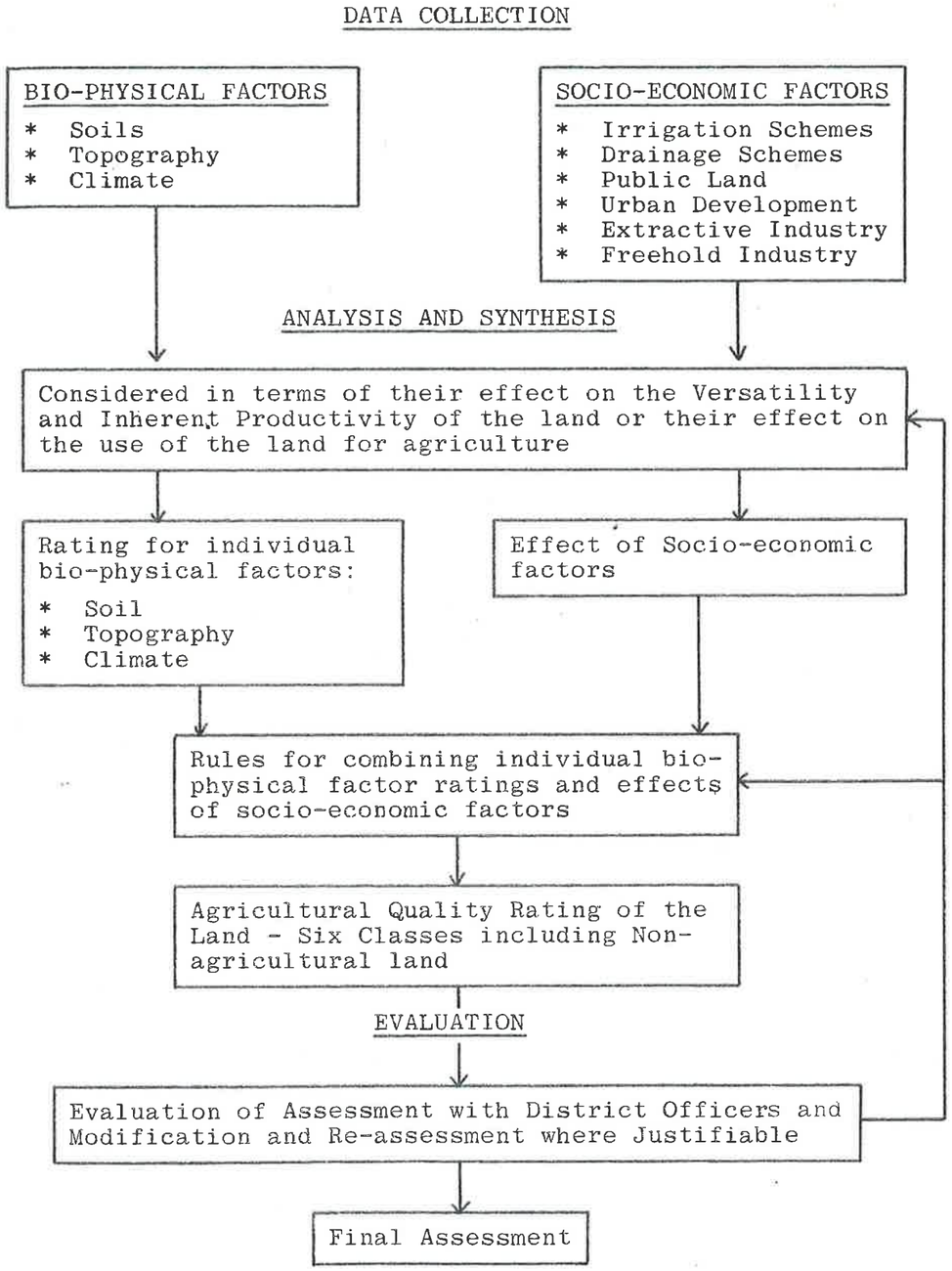
Socio-economic factors

(i) Irrigation Schemes
(ii) Drainage Schemes
(iii) Urban Development
(iv) Extractive Industry
(v) Public Land
(vi) Freehold Forestry

The usefulness of these factors for assessing the agricultura quality of land was checked by evaluating the results. The evaluation involved consultation with experienced agriculturalists in Gippsland, allowing the appropriate emphasis to be placed on each factor.

Diagram One sets out the process that was followed in assessing the agricultural quality of land.

Diagram One: ASSESSMENT PROCESS



The assessment required data on soils, slopes and growing seasons. The individual data maps were then combined by overlay procedures to form a land unit map. Each individual land unit was then described in terms of soilgroup, slope class and length of growing season.

The combination process involved some degree of manipulation of boundaries on the soil, slope and growing season maps. For example, where soil and slope boundaries were similar the soil boundary was moved to coincide with the slope boundary. In deciding which boundary to move, the reliability of the data was taken into account. Because of the limitations of the soil data, soil boundaries were relocated rather than slope boundaries. It was assumed that the soil boundaries were likely to coincide with changes in slope.

The growing season boundaries were less definite than the soil boundaries. Consequently growing season boundaries were fixed by the combination of slope and soil boundaries unless the line dissected a large area. In these instances the growing season boundary was used to form the boundary of a new land unit.

This factor combination method of preparing a base map means that reconsideration of original data maps is necessary when the combination map is produced. The combination of slope and a map of dominant soils for example, may mean that an area described as a particular soilgroup is no longer adequately described. Consequently land unit descriptions were reconsidered after combination of the three factors to ensure that the agricultural quality class allocated to the land unit would accurately represent the situation.

The agricultural quality class for land is based on the combined affect of soil, slope and growing season. The lowest rating for one factor in any location usually determines the class.

The exceptions to this rule are based on the interaction between two or more factors. If slope is the limiting factor but the

soil is particularly stable and resistant to erosion, then the effect of slope is not so significant. Thus, the agricultural quality class rating is higher than the rating for slope. Alternatively, very steep slopes in association with very thin, skeletal soils mean the the combined effect produces a lower agricultural quality class than the rating that applies to the soil or slope individually.

These combination rules are stated in the footnotes to Tables Three and Four.

3.1 BIO-PHYSICAL FACTORS

3.1.1 Soils

Versatility and inherent productivity, the two indicators of agricultural quality, were used as guides for assessing the soils. The limited soil data and lack of precise knowledge about the inter-relationships between different soil attributes meant that the assessments were based on a subjective consideration of soil attributes.

The soil attributes considered when making an assessment of the key indicators and their effect on the soil ratings were:

* arability
* moisture status
* fertility
* effective rooting depth
* rockiness/stoniness
* erodibility

Soils with major limitations to versatility and inherent productivity in terms of these attributes were downgraded, whereas soils that were free from limiting factors were considered to be the highest rating soils. The soil groups and their relationship with agricultural quality classes are contained in Table One.

Table One : SOIL GROUPS AND AGRICULTURAL CLASSES

Soil* Group	Agricultural Quality					
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
1(a)				X	X	X
2(a)				X	X	X
3(a)				X	X	X
4(a)				X	X	X
5					X	X
6				X	X	X
7(a)	X	X	X	X	X	X
8				X	X	X
9(a)		X	X	X	X	X
10(a)			X	X	X	X
11(a)		X	X	X	X	X
12(a)		X	X	X	X	X
13(a)	X	X	X	X	X	X
14(a)		X	X	X	X	X
15			X	X	X	X
16				X	X	X
17			X	X	X	X
18(a)			X	X	X	X
19(a)			X	X	X	X
20			X	X	X	X
21			X	X	X	X
22(a)	X	X	X	X	X	X
23(a)		X	X	X	X	X
24(a)			X	X	X	X
25(a)		X	X	X	X	X

* Soil Groups are described in Appendix One.

(a) Arable soil and indicates capability for Agricultural Quality Class 3a or 4a rating:

Class 3a equals Soils 7 and 13 in conjunction with Slope Classes 1, 2, 3 or 4 or Soils 10, 12, 14, 18, 19, 24 or 25 in conjunction with Slope Classes 1, 2 or 3 providing the growing season is not limiting.

Class 4a equals Soils 1, 2, 3 or 4 in conjunction with Slope Classes 1, 2 or 3 providing the growing season is not limiting.

X means that a soil group satisfies the requirements of an agricultural quality class providing slope and growing season are also satisfactory.

The data base used to produce the soil ratings was primarily Northcote's (1960) Sheet 2 from the Soil Atlas of Australia. In addition, several other soil surveys at larger scales of various areas throughout Gippsland were used to provide more detail. The other soil surveys used were Sargeant's (1975) Soil Survey of Westernport Bay Catchment and Ward's (1977) Geomorphology and Soil Survey of the Stratford-Bairnsdale Area. Further soil data were extracted from Newell (1966), Reconnaissance of Soils for Irrigation in East Gippsland, Skene and Walbran's (1948 and 1949) Soil Surveys of the Macalister River Irrigation Scheme Area and Skene's (1954 and 1968) contributions to the Central Planning Authority's Resource Surveys of West Gippsland and East Gippsland.

The main limitations of the soil survey data were:

i) the extension of Northcote's Map to a scale of 1:250,000 from 1:2,000,000;

ii) the units shown on Northcote's Map describe dominant soils and are generalised extensively;

iii) the variation in reliability depending on whether the map was based on:

* field soil surveys;
* extrapolation from aerial photographs, geological, topographical and ecological maps;
* restricted field inspections; or
* general knowledge;

iv) the judgement required to establish compatibility between the different soil surveys.

These limitations mean that the soil data are indicative generally of the soils throughout the region but are not necessarily accurate at a specific local scale. Thus, planning decisions should not be made at a site specific level based on the assessment unless the soil data is checked at the site.

3.1.2 Topography

The topography of the land is an important factor for determining agricultural quality. The most critical topographical factor is slope because of its effect on such things as erosion, drainage, management and machinery operation. Factors such as aspect and relief were not considered because at the scale of mapping adopted they were much less critical than slope.

Slope was assessed by the method developed by the Division of Land Use Research, CSIRO (R. Bischoff, personal communication) The method provides a general representation of the most dominant slope in a given area. It does not provide site specific assessments of slope because of the scale of the assessment.

The CSIRO method was modified to allow the definition of six slope classes as shown in Table Two.

Table Two: SLOPE CLASS AND PERCENTAGE SLOPES

Slope Class	Percentage Slope
1	Less than 1%
2	1 - 6%
3	6 - 12%
4	12 - 20%
5	20 - 30%
6	Greater than 30%

Slope Class 1 was determined by tracing the Recent Quarternary Stream Alluvial and Flood Plain Deposits (Qra) and the Swamp and Lagoonal Deposits (Qrm) from the 1:250,000 scale geological survey maps of Gippsland. As such, it is not strictly a slope class based on contour intervals, but it is flat land. More importantly this slope class indicates the land that is more likely to be subject to flooding and water logging.

The Slope Classes 2 to 6 have been derived from 1:100,000 scale topographical base maps which have either 20 or 40 metre

contour intervals. Field checking of the slope assessment was made and it is considered that the different classes adequately represent the stated slope classes. These classes give a good representation, in terms of slope, of the relative difference in agricultural quality.

Areas with minimal slopes are more versatile and more cost effective in terms of production because management is easier. Thus, the lower slopes were given the higher ratings. The exception is Slope Class 1 which is likely to have inundation and water logging problems and therefore be less versatile and productive.

Table Three relates each slope class to an agricultural quality class. There are some qualified ratings when slope classes are combined with particular soils, and these are explained in the footnotes.

Table Three: SLOPE AND AGRICULTURAL QUALITY CLASSES

Slope Class	Agricultural Quality					
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
1		#	#	#	#	X
2	X	X	X	X	X	X
3	*	X	X	X	X	X
4		*	X	X	X	X
5				@	X	X
6					X	X

X means that a slope class satisfies the requirements of an agricultural quality class providing soils and growing seasons are also satisfactory.

assumes that swamps such as Koo-Wee-Rup or Moe have been drained but some flooding and drainage problems still exist.

* suitable for Class 1 and 2 only when combined with soil 13

@ is not suitable for Class 4 if combined with soil 16.

3.1.3 Climate

The effect of climate on the agricultural quality of the land was measured by the growing season for pastures at various locations in Gippsland. The pasture growing season is also indicative generally of climatic suitability for other agricultural crops that are, or can be grown in Gippsland.

Two climatic factors are key measures of the growing season, rainfall and temperature. The other important climatic factor sunlight, was not considered because the data available indicated little variation throughout the region.

The relationship between rainfall and evaporation is extremely important because the amount of evaporation influences the effectiveness of the rainfall. Effective rainfall is defined as the minimum amount of rain necessary to start germination and maintain growth above wilting point and is determined by the following formula (Prescott, 1949):

$$ER = 1.43E_o^{0.7} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots ($$

where ER = effective rainfall (mm)

E_o = evaporation from a free water surface (mm

The growing season [1] is defined as those months where there is at least a fifty per cent chance of receiving effective rainfall providing the mean daily temperature for any month is greater than 6.0°C.

1. A common definition of the growing season is those months with a fifty per cent chance of effective rainfall plus one month at the end to allow for moisture carryover in the soil. Calculations based on this method tended to over estimate the growing season in Gippsland. Consequently, the one month carry over has not been used. Additionally, the definition of the growing season used here incorporates temperature restrictions in the winter months.

This growing season is the period when at least minimum growth will occur. Maximum growth requires rainfall greater than effective rainfall or irrigation, and temperatures warmer than 6.0°C. However, the growing season, when measured this way, shows the relative difference between areas of Gippsland.

Rainfall and evaporation were assessed from monthly records. The use of monthly rainfall for calculating effective rainfall can be misleading if the rain occurs on only one or two days of the month, because much of this rain may be lost as run off. Thus, effective rainfall calculated for areas where rainfall occurs on one or two days a month is only a general estimate of rainfall suitability. In Gippsland this tends to be the case east of the Strzelecki Ranges.

The use of monthly effective rainfall throughout Gippsland has produced useful assessment of the relative differences between areas. The use of the mean daily temperature of 6.0°C also gives relative differences throughout the region.

The rainfall, evaporation [1] and temperature records for various locations throughout Gippsland were used to estimate the growing season. These estimates were then extrapolated to surrounding areas.

In considering the restriction imposed by poor rainfall the availability of underground water that can be readily utilised

1. Evaporation records were available for a number of locations throughout Gippsland, but estimates were necessary for the majority of locations. These estimates were made by Fitzpatrick's (1963) method which used the relationship between the saturation vapour pressure deficit and evaporation to estimate evaporation. Detailed information on this method is contained in Swan and Volum (1982).

over broad areas was taken into account. Where such a significant natural resource existed the restrictive effect of low rainfall was discounted by one month.

The length of the growing season was then considered in terms of each class of agricultural quality. Table Four shows the relationship between agricultural quality classes and growing seasons.

Table Four : GROWING SEASON AND AGRICULTURAL QUALITY CLASSES

Growing Season (Months)	Agricultural Quality					
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
12	X	X	X	X	X	X
11	*	X	X	X	X	X
10		*	X	X	X	X
9			*	X	X	X
9				*	X	X

X means that the growing season shown meets the requirements of the agricultural quality class providing soils and slope are also satisfactory.

* suitable for this class rating only when combined with utilised underground water and providing moisture is the limitation on the growing season.

3.2 SOCIO-ECONOMIC FACTORS

Significant and relatively time stable socio-economic factors have been considered. The socio-economic factors used are those which have significantly modified the inherent capability of the land or those which preclude agricultural use of the land.

The socio-economic factors used in the assessment of agricultural quality are:

* Irrigation Schemes
* Drainage Schemes
* Freehold Forestry
* Extractive Industry
* Urban Development
* Public Land

Irrigation and drainage schemes enhance the agricultural quality of the land; whereas freehold forestry, urban development, extractive industry and Public Land detract from that quality because the land is unable to be used for agriculture. Although some Public Land is used for grazing on a lease basis this land has not been given an agricultural quality class rating because of its public ownership. The majority of this land is in the mountainous areas of Gippsland and is mainly low or marginal agricultural quality.

Although irrigation and drainage schemes enhance the agricultural quality of the land, they require additional management inputs. For example, irrigation water must be applied and paid for, channels and drains need to be maintained. The annual costs of these extra inputs are assumed to be outweighed by the increases in production.

The socio-economic factors were included in the assessment by considering the consequence of each factor on general agricultural use. Areas with publicly provided irrigation schemes

were assumed to be very productive and automatically included in the best class, even though the soils may not be capable of regular cultivation. Land that is naturally subject to water logging, such as the Koo-Wee-Rup and Moe Swamps and major river valleys,were assumed to be drained sufficiently for agricultural use and water logging problems were not considered a major impediment. Urban areas and major extractive industry areas being unavailable to agriculture were considered to be non-agricultural land.

The other major socio-economic factor in Gippsland that affects the availability of land for agriculture is the use of freehold land for forestry. As forestry is a long term use of land freehold forested areas were considered unavailable and thus non-agricultural land.

3.3 CLASSES OF AGRICULTURAL QUALITY

The agricultural quality of land is divided into five agricultural classes and one non-agricultural class. The five agricultural classes range from high quality land (Class 1) which has capability for a wide range of agricultural uses and high levels of inherent productivity, through to marginal agricultural land (Class 5). Subdivisions within Classes 3 and 4 are made for soils which can withstand regular cultivation but require greater inputs to achieve high productivity. These inputs include irrigation, high rates of fertilizer or measures to prevent erosion.

The following are detailed descriptions of each class of agricultural quality. A definition of the classes is given in Table Five.

Agricultural Quality Class 1

Class 1 land is highly versatile and inherently very productive It is flat but not subject to inundation, or low to moderately

sloping. It has soils that are easily maintained in good tilth and able to be regularly cultivated using normal management techniques.

The soils are very fertile, well aerated, deep, well drained with moderate to good moisture holding capacity, have no significant rock or stone content and have a low susceptibility to erosion.

The climate, as represented by the growing season, is a 12 month season, or 11 months where readily utlized underground water is available.

Areas with Public Irrigation Schemes are classified as Class 1 because of the very high levels of production that irrigation allows. This classification holds even if the soils are unsuitable for regular cultivation.

Agricultural Quality Class 2

Class 2 land is versatile and inherently productive but less so than land designated as Class 1. It is flat and may be subject to inundation, or it is low to moderately sloping. The soils are able to be maintained in good tilth and able to be regularly cultivated providing care is given to the maintenance of good structure and the prevention of erosion.

The soils are generally fertile, well aerated, reasonably deep, well drained with moderate to good water holding capacity. They have no significant rock or stone content and have a low susceptibility to erosion. The main difference between Class 2 and Class 1 soils, where slope and climate are similar, is the tendency of Class 2 soils to require higher management inputs to achieve similar levels of production.

The growing season is slightly limiting in Class 2 land with a growing season of 11 months or 10 months where readily utilized underground water is available.

Agricultural Quality Class 3

Class 3 land is either inherently productive but limited in terms of versatility, or moderately versatile but of limited inherent productivity. The limited versatility is due to the loss of tilth under regular cultivation or shallow soils. The land is capable of all grazing enterprises, as well as more intensive uses, such as orchards, where regular cultivation is not required.

Class 3a land, a sub-class of Class 3 land, has soils that can withstand regular cultivation but due to moderately steep slopes or short growing season is less desirable than Class 1 or 2 land.

Class 3 land includes a wide range of land that extends from restricted arable but very good pastoral land, through to pastoral land that is reasonably good but dependent on moderate to high levels of fertilizer application to maintain productivity.

Class 3 land has a growing season of 10 months, or 9 months where readily utilized underground water is available.

Agricultural Quality Class 4

Class 4 land is of limited versatility and low in terms of inherent productivity. It includes steep land that is difficult to manage but quite productive providing high levels of management are maintained.

The soils in Class 4, if slope and climate are non-limiting, are generally problem soils. These soils include coarse sands of low fertility, low water holding capacity and erosion susceptibility, or soils which are shallow with moderate rock or stone content.

Class 4a, a sub-class of Class 4 land, has soils that can withstand regular cultivation but are of very low inherent

productivity. High inputs of fertilizer, supplementary irrigation, and in some cases measures to prevent erosion are required to achieve reasonable productivity.

Class 4 land can also include land with quite good soils and low to moderate slopes but with agricultural potential being limited by a 9 month growing season or 8 months if readily ulilized underground water is available.

Agricultural Quality Class 5

Class 5 land is marginal agricultural land due to very steep slopes, very poor soils that have significant rockiness or stoniness or thin skeletal soils. The land in this class is suitable for limited grazing purposes. Class 5 land can have reasonable soils and gentle slopes, but be restricted because it has a growing season of 8 months or less.

Non-agricultural Land Class 6

Class 6 land is unavailable for agriculture. It includes Public Land and urban areas, and land used for large scale extractive industry or freehold forestry.

In Gippsland, the majority of Public Land has limited agricultural potential and is of low to marginal agricultural quality.

Table Five: DEFINITION OF AGRICULTURAL QUALITY CLASSES

Class	General Character
1	Class 1 land is the most versatile with the highest inherent productivity. It is capable of the majority of agricultural uses or is very highly productive pasture land under flood irrigation. The growing season is 12 months or 11 months with readily utilized underground water.
2	Class 2 land is highly versatile but has a lower level of inherent productivity than Class 1. It is capable of the majority of agricultural uses but requires greater inputs than Class 1 land to achieve high production. The growing season is at least 11 months or 10 months with readily utilized underground water.
3	Class 3 land generally is of limited versatility but is very good dairying and grazing land. It is sometimes suitable for orchards and extensive area cropping but not suitable for intensive uses such as vegetable growing. Sub-class 3a is suitable for more intensive uses providing particular care is taken to prevent soil erosion, or supplementary irrigation overcomes moisture limitations in the summer. The growing season is at least 10 months or 9 months with readily utilized underground water.
4	Class 4 land is capable of extensive grazing but is generally unsuitable for cropping. Sub-class 4a land is suitable for intensive market gardening but supplementary irrigation, high levels of fertilizer and erosion prevention measures are necessary. The growing season is at least 9 months or 8 months with readily utilized underground water.
5	Class 5 land is marginal agricultural land either because of steep slopes and thin skeletal soils, very steep slopes or a growing season of less than 9 months.
6	Class 6 land is non-agricultural land because it is unavailable for agriculture.

4. USING THE ASSESSMENT

The maps included with this report show the agricultural quality of land in Gippsland.

The maps are of use to anyone with an interest in the agricultural resources of Gippsland. In particular, planning authorities at a local, regional and State level will find the map a useful basic assessment of agricultural resources in Gippsland. However, the boundaries between classes of agricultural quality on the map are approximate and are not suitable for statutory planning purposes.

The selected mapping scale does not permit representation of some small areas of land that vary from the surrounding land. Thus, land classes may contain small, atypical areas. Use of the assessment for detailed, local planning may require the characteristics of the site to be reviewed. A detailed summary of points to consider when using the assessment is contained in Appendix Two.

The assessment of agricultural quality is a partial assessment in that inherent bio-physical factors plus significant socio-economic factors have been used as the main determinants of quality. These factors have been selected because they are relatively stable over time. At any time when planning decisions are to be made it is necessary to consider a number of additional factors such as:

* the location of the land in regard to markets;
* the provision of supporting infra-structure and the effect that changing land uses may have on the infra-structure;
* the state of agricultural industries, markets vary over time;
* changes in technology; for example, zero tillage or variations in the cost of inputs such as fertilizers and water;
* the attitudes of farmers and other agriculturalists to changes in land use;
* agricultural uses which have specific and unusual requirements of the land;

* agricultural uses that do not rely greatly on the interaction between land and climate;
* important agricultural uses which are located on lower quality agricultural land;
* identification of accepted agricultural practices that have consequences for other land uses;
* the demand for land for agricultural and non-agricultural use

The maps show areas of different agricultural quality. Often land that is highly rated for agriculture is also highly rated for other uses. These areas of land are subject to most development pressure. In these areas of land the choice about which use or development occurs is a planning choice and is essentially politically based. There is no absolutely 'correct' decision and judgements about preferable uses of the land need to be made.

The assessment should not be used in isolation when making policy decisions in rural areas. The determination of policy requires the consideration of the potential of the land for many different land uses.

Agriculture is a very important land use in Gippsland. Section 4.1 sets out a number of policy guidelines that can be used in rural areas where planning authorities wish to encourage agriculture.

4.1 PLANNING GUIDELINES FOR AGRICULTURAL AREAS

From an agricultural point of view, preference should be given to allocating non-agricultural uses to land of lower agricultural quality. Where non-agricultural uses are chosen for existing agricultural land the question of compatibility between uses should be considered.

There are certain agricultural practices which make farms uncomfortable neighbours with other land users, especially residential users. For example, the noise, dust or odour of some agricultural practices can cause tension between commercial farmers and adjoining residents. Also residential development

is often an uncomfortable neighbour with agriculture. Increased fire risk, dogs chasing stock, trespassing and pilfering of produce are examples of these problems.

The establishment of hobby farms in an area is not necessarily a disadvantage to established agriculture. Hobby farms can be as technically efficient as commercial farms, may introduce alternative enterprises and usually provde extra business for the supporting infrastructure.

To remain efficient commercial agriculture needs to respond to market forces. It is undesirable for agriculture to be constrained by planning regulations which affect the adjustment of the size, location and type of farms to the needs of the farmers and the needs of the market. Subdivision controls for agricultural reasons only, are difficult to justify. The critical factor is the use to which the subdivided land is put, not the size of subdivision.

Viable agricultural industries are based on groups of farms and a scale of production able to support the necessary infrastructure. It is important to see agriculture in terms of general areas within a region rather than as a fragmented, 'pocket-handkerchief' type distribution. From an agricultural point of view it is preferable that non-agricultural land uses do not fragment agricultural areas to such an extent that the effectiveness of the infrastructure is reduced.

A planning policy that encourages agriculture should consider:

* identifying the poorer land over which agriculture has little claim;
* maintaining sizeable areas of land of higher inherent agricultural quality;
* recognizing the dynamic nature of agricultural industries;
* using 'farm rate' and 'urban farm rate' provisions for the rating of rural land and the separation of the value of the farm house from rural land;
* assisting the adjustment of farmers either to leave farming or to move to new farming areas without economic and social penalties when farming land is to be acquired for other uses;

* accommodating the agricultural need for varying sized parcels of agricultural land.

A planning policy, where possible, should avoid:

* using agricultural zoning to achieve non-agricultural planning goals;
* designating specific agricultural uses to land;
* restricting the flexible adjustment of agriculture to change;
* restricting the use of accepted farm practices;
* allocating land to agriculture against obvious and natural market forces;
* fragmenting the distribution of farms to the extent of significantly disrupting the supporting infra-structure;
* causing social and/or economic hardship to farmers;
* making assumptions about agricultural industries that are invalidated by changes in markets and technology.

APPENDIX ONE: SOIL DESCRIPTIONS

The following soil descriptions are taken from Northcote et al (1975), Northcote (1974) and Sargeant (1975). Other soils surveys that have also been used for reference are Ward (1977), Newell (1966), Skene and Walbran (1948 and 1949) and Skene (1954).

The rating applied to each soil group represents a subjective assessment of the agricultural quality of the soil in terms of the versatility and inherent productivity. The key attributes of the soils taken into account are arability, moisture status, fertility, effective rooting depth, rockiness/stoniness and erodibility.

SOIL GROUP NO.1

DOMINANT SOIL: Uc 1.11

ASSOCIATED SOILS: Small areas of Uc 6.13 and intervening low lying areas of Uc 2.3; some swampy areas of undescribed soil.

DESCRIPTION OF DOMINANT SOIL

Type: Calcareous sands with little or no pedologic development; uniform, coarse textured profile.

Texture Group: Sands

Profile:

A1 horizon - sand, loamy sand or sandy loam. possibly some accumulation of organic matter, dark grey to grey, grey brown, brown or dark brown in colour, apedal and loose but sometimes very weakly bonded to form soft crumbs, highly permeable and excessively drained.

Sub-surface soil - up to 3m of shelly sands but may be as thin as 10 - 40 cm over other soil or rock formations, greyish white to pale yellow in colour, calcereous with carbonate contents of 10 to greater than 80 per cent of the fine earth, highly permeable and excessively drained.

Moisture Status: Highly permeable and excessively drained, very low available water capacity.

Fertility: Deficiencies in cobalt, copper, zinc, boron, iron and manganese as well as nitrogen, phosphorus and potassium have been reported; yields are increased markedly by copper, zinc and manganese in addition to usual dressings of nitrogen and phosphorus. The soil being deficient in cobalt and copper, has meant that stock are subject to "coast" disease.

Effective Rooting Depth: Well aerated soil with no restriction to root growth and development. Often exceeding 3m in depth but may be as little as 10 - 40 cm when overlying other soil or rock formations.

Rockiness/Stoniness: No rocks or stones present in the soil.

Erodibility: Wind erosion is a serious hazard where these soils have little vegetative cover.

Arability: These soils are arable but often associated with dune formations and unsuitable for cultivation for that reason.

SOIL GROUP NO.1 (cont.)

DESCRIPTION OF DOMINANT SOIL

Occurrence: Coastal sand hills and plains, Wonthaggi to Wilson's Promontory

Land Use: Some sheep and cattle grazing, lucerne is also now being grown in come areas.

Summary: An arable, versatile soil but subject to serious wind erosion when cultivated. Significant inputs of fertilizer, water and management are required to achieve high production; inherently very poor soils.

Rating: Satisfies the requirements of agricultural quality classes 4, 5 or 6.

SOIL GROUP NO.2

DOMINANT SOIL: Uc 1.21 and Uc 1.22

ASSOCIATED SOILS: Dunes of Uc 2.2 plus small plains of Dy 5.8 further inland, some swampy areas of organic soil of which some are saline, other undescribed soils.

DESCRIPTION OF DOMINANT SOIL

Type: Siliceous sands with little or no pedologic development; uniform, coarse textured profile.

Texture Group: Sands

Profile:

A1 horizon - fine to coarse sand, sometimes gritty or gravelly, occasionally clayey sand and loamy sand particularly with the Uc 1.22 soil, some accumulation of organic matter possible, brownish grey to grey brown in colour, apedal and loose, highly permeable and excessively drained.

Sub-surface soil - loose sand to clayey sand, pale yellow to grey to almost white in colour for Uc 1.21; yellowish brown, brown or yellowish red for Uc 1.22, deeper forms of Uc 1.22 may show slight increases of clay with depth, variable depth ranging from 60 cm to 6m in Uc 1.21, shallow soils may be underlain by limestone or sandstone, in deeper soils humic deposits including peat may be present.

Moisture Status: Highly permeable and excessively drained, very low available water capacity.

Fertility: Known deficiencies are phosphorus, nitrogen and zinc, deficiencies in calcium and magnesium may occur with intensive use.

Effective Rooting Depth: Well aerated soil with no restriction to root growth and development. These soils vary in depth, from 60 cm to 6m for Uc 1.21, some Uc 1.22 soils are underlain by limestone below 1 - 3 metres.

Rockiness/Stoniness: No rocks or stones present in the soil.

Erodibility: Wind erosion is a serious hazard if vegetative cover is removed.

Arability: These soils are arable but associated with dune formations and thus unsuitable for cultivation for that reason.

Occurrence: Coastal sand dunes and beach formations, Ninety Mile Beach.

SOIL GROUP NO.2 (cont.)

DESCRIPTION OF DOMINANT SOIL

Land Use: Sparse grazing for sheep and cattle is possible.

Summary: An arable, versatile soil but not suitable for cultivation because of dune location and associated wind erosion problems, inherently very poor soils and significant inputs of fertilizer, water and management are required for high production.

Rating: Satisfies the requirements of agricultural quality classes 4, 5 or 6.

SOIL GROUP NO.3

DOMINANT SOIL: Uc 2.21 and Uc 2.22

ASSOCIATED SOILS: Uc 2.33 and Uc 2.36, small plains of Dy 5.4 and Dy 5.8 with some swampy areas of undescribed soils.

DESCRIPTION OF DOMINANT SOIL

Type: Bleached sands with colour B horizons; uniform, coarse textured profile

Texture Group: Sands

Profile:

A1 horizon - brownish grey to black sand or loamy sand with some discrete organic particles giving strong speckled appearance, apedal and loose but moist sites usually show some coherence, generally 30 cm thick but range from 10 to 80 cm, highly permeable when moist but may be difficult to when when dry.

A2 horizon - whitish sands, loose when dry weakly coherent when moist, 10 cm to 1 - 2 m thick, colour may change to very pale yellow to brown forming a very diffuse boundary with the B horizon.

B horizon - sand or clayey sand whole coloured or mottled, usually more coherent than A2 horizon but not forming a hardpan, 30 cm - 1 m thick.

Moisture Status: Highly permeable when moist but surface may be difficult to wet when dry, Uc 2.21 soils are free draining to depth but Uc 2.22 soils are subject to seasonal water tables of varying duration in and above the B horizon.

Fertility: Very low amount of plant nutrients, acute phosphorus deficiency, very low potassium and calcium status, low nitrogen content and a range of other nutrient deficiencies particularly sulphur, molybdenum, copper and zinc; surface soils are usually weakly acid and the B horizons are moderately to strongly acid.

Effective Rooting Depth: Well aerated soil with no restriction to root growth and developme varying in depth from 1 m to 6 m

Rockiness/Stoniness: No rocks or stones present in the soil.

Erodibility: Severe wind and water erosion are fairly common especially when vegetation is removed by disturbance, fire or overgrazing.

Arability: Arable and versatile soils.

OIL GROUP NO.3 (cont.)

ESCRIPTION OF DOMINANT SOIL

ccurrence: Low sub coastal hills around Gormandale and Rosedale

and Use: Largely undeveloped because of low nutrient status and moisture regimes which range from droughtiness to seasonal water logging, some grazing or native pastures; heavy fertilizer applications required for more intensive use.

ummary: An arable and versatile soil but limited in productivity because of low nutrient status, potential erosion problems which require additional management inputs to ensure that the soil resource is not depleted.

ating: Satisfies the requirements of agricultural quality classes 4, 5 or 6.

SOIL GROUP NO.4

DOMINANT SOIL: Uc 2.3

ASSOCIATED SOILS: Undescribed soils including saline kinds.

DESCRIPTION OF DOMINANT SOIL

Type: Bleached sands with pan; uniform, coarse textured profile.

Texture Group: Sands

Profile:

A1 horizon - sand or loamy sand brownish grey to black in colour generally with some discrete organic particles giving highly speckled appearance, apedal and loose, mildly to strongly acid, highly permeable usually 30 cm thick but ranging from 10 cm to > 60 cm.

A2 horizon - white sand, loose when dry weakly coherent when moist, between 20 cm and 1 metre thick generally but can be up to 5 metres thick.

B horizon - strongly compacted or cemented sand to sandy loam, extremely hard pan when dry, widely varying in colour from yellow to red brown to light grey brown.

Moisture Status: The A1 horizon is highly permeable, the A2 horizon fragipans and B horizon pans are only slowly permeable resulting in seasonally perched water of varying duration depending on rainfall incidence and the site; the coarse sandy texture can mean that the available water capacity of the soil is very low but this is dependent on the presence of pans which restrict water loss because of their effect on drainage and permeability.

Fertility: Strongly leached with very low inherent fertility, very low phosphorus, potassium, calcium and magnesium; low nitrogen; a range of minor element deficiencies notably sulphur, copper, zinc, molybdenum and cobalt; mildly to strongly acid surface, with acid pans.

Effective Rooting System: Well aerated when well drained but water logging can lead to poor aeration, effective depth tends to be limited by the depth of the soil to the hard pan which can be as little as 30 cm and as much as 5 metres.

Rockiness/Stoniness: No presence of rocks or stones but hard pans have been described as "coffee rock"

Erodibility: The erosion potential of this soil is a function of wind; the clearing of vegetation and denuding of the surface being catalysts for wind erosion.

GROUP 4 (cont.)

CRIPTION OF DOMINANT SOIL

ility: These soils are quite arable generally but the presence of a hardpan can be a limiting factor.

rrence: These soils occur in the swampy coastal plains north west of Wilson's Promontory and around Cranbourne.

Use: Largely undeveloped providing sparse grazing of native herbage; high yielding legume pastures can be established with adequate fertilizer and with some shallow surface drainage; Cranbourne sands have been drained and used for vegetable production but heavy applications of farmyard and mineral fertilizers have been necessary; supplemetary watering is also necessary for such intensive use.

ary: An arable, versatile soil but significant inputs of fertilizer, water and management are required to achieve high production; inherently very poor soils.

ng: Satisfies the requirements of agricultural quality classes 4, 5 or 6.

SOIL GROUP NO.5

DOMINANT SOIL: Uc 4.11

ASSOCIATED SOILS: Fc 2.33 flanks this soil in some areas, other undescribed soils are likely

DESCRIPTION OF DOMINANT SOIL

Type: Pale sands showing pedologic development including a pale but not bleached A2 horizon; uniform, coarse textured profile.

Texture Group: Sands

Profile:

A1 horizon - sand to sandy loam, commonly loamy sand, dark grey-brown to dark reddish brown in colour, sometimes with a peaty surface, sands are apedal and loose when dry but mostly the sandy loams are massive and hard setting.

A2 horizon - loamy sand to light sandy clay loam paler in colour than A1 horizon ranging from brownish grey to grey brown, usually massive, porous and hard when dry and with depth they rapidly grade to weathered rock or overlie hard pans, B horizons are either absent or only weakly developed.

Moisture Status: low available water capacity, droughty for most of the year.

Fertility: Moderately leached weakly to moderately acid soils with low inherent fertility, low phosphorus and nitrogen, low to moderate potassium status and commonly deficient in the trace elements molybdenum and copper.

Effective Rooting Depth: Soil is shallow and restrictive to plant growth and development

Rockiness/Stoniness: Rock fragments present in varying amounts and surface stone and rock outcrops are fairly common.

Erodibilty: These thin, skeletal soils are associated with hilly to mountainous locations and this association tends to increase the potential for erosion.

Arability: Non-arable soils due to shallowness and rockiness mainly.

Occurrence: Steep mountainous areas of Wilson's Promontory

Land Use: Undeveloped for agriculture due to National Park status of land, but been used for limited grazing of sparse native vegetation.

Summary: Inherently of very low agricultural capability, shallowness, rockiness, low moisture status and low fertility status are the main limiting factors.

Rating: Satisfies the requirements of agricultural quality classes 5 or 6.

SOIL GROUP NO.6

DOMINANT SOIL: Um 5.51

ASSOCIATED SOILS: Um 4.2, Um 5.41 and Uc 6.11 with smaller areas of Gn 2.44 and Um 7.11, small open flats and valley plains of Ug 5.1, other areas of undescribed soils.

DESCRIPTION OF DOMINANT SOIL

Type: Earthy loams, uniform, medium textured profile which is less than 60 cm deep.

Texture Group: Loams

Profile:

A1 horizon - weakly developed horizon, sandy loam to clay loam, brown reddish brown and grey in colour, may have a thin crust of weak platy structure often covered with gravel, massive to very weak blocky structure, hard setting when dry, no A2 horizon and a gradual change to the B horizon.

B horizon - weakly developed horizon, loam clay loam or less commonly light clay, dark brown, brown, red brown or red in colour, massive and porous with an earthy fabric, hard consistence when dry but friable when moist, abruptly overlying rock or indurated remnants of buried soils or indurated mottled-zone materials.

Moisture Status: Moderately permeable soils.

Fertility: Moderately acid to neutral soils, occasionally alkaline with carbonate nodules in the subsoil, variable nutrient status with nitrogen and phosphorus levels low generally.

Effective Rooting Depth: Soil is shallow 20 - 60 cm in depth but well aerated.

Rockiness/Stoniness: May contain ironstone nodules or gravel and grit may be present, boulders are common in some surface soils.

Erodibility: Erosion risk with these soils is mainly a function of slope.

Arability: Restricted due to shallowness, hard consistence when dry and in some instances presence of boulders.

Occurrence: Crests and slopes of broad ridges, low hilly plateau remnants and steep hills, near head of Murray River.

Land Use: Grazing of sparse native herbage by sheep and cattle.

Summary: Inherently of low agricultural capability, shallowness, stoniness and rockiness being main limiting factors.

Rating: Satisfies the requirements of agricultural quality classes 4, 5 or 6.

SOIL GROUP NO.7

DOMINANT SOILS: Um 6 and Um 6.14

ASSOCIATED SOILS: Um 6 - Uc and Um 5 soils on the better drained positions and Uf 6 and Ug 6 on the poorly drained positions

Um 6.14 - Um 4.1 and small areas of Gn 4.3 and Gn 4.5 particularly in the eastern portion of the unit and By 3.21 particularly in the western portion of the unit; minor areas of Gn 4.1 on some hilltops; small incised stream valleys of undescribed soils.

DESCRIPTION OF DOMINANT SOILS

Type: Friable loams; uniform, medium textured soils

Texture Group: Loams

Profile:

A1 horizon - silty or fine sandy loam, silty clay loam or clay loam; black, dark grey-brown, dark brown or dark reddish brown in colour; distinctly organic and characteristically pedal; crumb, granular or fine blocky structure; friable when dry or moist; usually between 10 and 20 cm thick with clear boundary to B horizon.

B horizon - loam or clay loam; black to yellowish brown in colour; compound structural units which are prismatic to coarse blocky but readily break down to finer blocky or polyhedral units; friable when moist but may be firm to hard when dry; gradually becoming paler and coarser in structure with depth but remaining friable when moist.

Moisture Status: Permeable and free draining on sloping land but drainage may be poor on flat, river flood plain positions.

Fertility: Moderately fertile, most being mildly acid to neutral with Um 6.11 becoming neutral to alkaline at depth; some areas of Um 6.11 soils may not require phosphatic fertilizers; marked responses to manganese, sulphur, potassium and nitrogen have been obtained on some Um 6.12 and Um 6.13 soils.

Effective Rooting Depth: Usually 60 cm to 1.5 m thick grading into underlying parent material, no restriction to root growth and development.

Rockiness/Stoniness: No rocks or stones present in soil.

SOIL GROUP NO.7 (cont.)

DESCRIPTION OF DOMINANT SOILS

Erodibility: Low erosion risk generally but steep slopes and flood plain positions can mean erosion is a problem especially when soils are cultivated.

Arability: Arable and versatile soil generally suitable for regular cultivation providing sensible management practices are followed.

Occurrence: Flood plains, young river terraces, alluvial fans and on moderate to steep slopes. Snowy, Cann, Mitchell and Nicholson River flats, Poowong and Loch Hills in the western portion of the Strzelecki Ranges.

Land Use: Sheep and cattle grazing on improved pastures, irrigated in some areas; suitable for crops such as sorghum, maize, potatoes onions and some horticultural crops.

Summary: An arable and versatile soil with a moderate to good level of inherent productivity.

Rating: Satisfies the requirements of agricultural quality classes 1 to 6 inclusive.

SOIL GROUP NO.8

DOMINANT SOIL: Um 7.11

ASSOCIATED SOILS: Small areas of Um 4.2 and Uc soils with small swampy valley plains of organic and various Um soils, small plains in deeply incised valleys of Um and other undescribed soils.

DESCRIPTION OF DOMINANT SOIL

Type: Organic loamy soil; uniform, medium textured profile.

Texture Group: Loams

Profile:

O1 horizon - surface litter of undecomposed and/or partially decomposed material 1 - 3 cm thick.

A1 horizon - friable loam, peaty laom or clay loam with a distinct accumulation of well-humified organic matter; crumb or granular structure; thick, ranging from 20 cm to over 1 m; gradually merging to B horizon.

B horizon - friable loam or clay loam; red-brown, brown or yellow brown, granular or blocky but rapidly changing with depth to weak blocky or apedal structure; varying from relatively thin to very thick with a general tendency for clay content to decrease slightly with depth.

Moisture Status: Permeable with a tendency to become saturated with water.

Fertility: Low generally, acid throughout profile.

Effective Rooting Depth: Variable depth

Rockiness/Stoniness: Boulder strewn ridges and high plains; stoney rises on some plateau remnants; mountains, hills and hilly ridges at high elevation of bare rock or boulder strewn slopes.

Erodibility: Erosion hazard if overgrazed.

Arability: Non-arable because of presence of boulders and stones.

Occurrence: In alpine and sub-alpine areas of the Great Dividing Range.

Land Use: Summer grazing for sheep and cattle but this can through over grazing lead to erosion.

Summary: A non-arable soil generally that is of limited agricultural potential because of low fertility, association with steep slopes problems with erosion and the presence of boulders and stones.

Rating: Satisfies the requirements of agricultural quality classes 4, 5 or 6.

SOIL GROUP NO.9

DOMINANT SOIL: Uf 6.4

ASSOCIATED SOILS: Gn 2.8 on levees and better drained positions of the flood plain with Ug 6.1 and organic soils in poorly drained areas with Ug 5 soils on terrace remnants.

DESCRIPTION OF DOMINANT SOIL

Type: Non-cracking dense pedal clays; uniform, fine textured profile.

Texture Group: Clay loams to light clays.

Profile:

A1 horizon - surface layer of decaying organic matter may be present in natural conditions or surface may be bare and occassionally salt encrusted; heavy clay loam, silty heavy clay loam, light clay or peaty clay increasing to clay or silty clay usually before 10 cm; black to very dark grey-brown or grey; crumb to medium blocky structure; with a consistence that is friable when moist but hard when dry; 20 cm approximately thick grading into the sub-soil.

B horizon - clay; yellow-grey with rusty brown mottles to black to very dark grey with light grey and yellow brown mottles; blocky or prismatic structure breaking to blocky; sticky consistence when wet but tough to hard when dry; 60 cm to 1 m thick.

Moisture Status: Relatively impermeable naturally but this depends on the amount of organic matter present; extensive drainage of these soils has occurred through drainage schemes thus removing this as a limiting factor.

Fertility: Natural fertility levels vary but phosphate contents are usually low; acid to neutral.

Effective Rooting Depth: Comparatively deep, upper solum varies between 80 cm and 1.2 m in depth.

Rockiness/Stoniness: No rocks or stones present in the soil.

Erodibility: Associated usually with flat land which is sometimes flood prone, erosion risk is minimal except when heavy flooding occurs and soil is cultivated and loose.

Arability: Moderately arable generally.

Occurrence: Wet alluvial plains of the Latrobe Valley.

SOIL GROUP NO.9 (cont.)

DESCRIPTION OF DOMINANT SOIL

Land Use: Because of draining capable of dairying, fat cattle and some vegetables such as potatoes.

Summary: Arable soil that is moderately versatile, inherently quite productive because drainage is provided.

Rating: Satisfies the requirements of agricultural quality classes 2 to 6 inclusive.

SOIL GROUP NO.10

DOMINANT SOIL: Gn 2.11 and Gn 2.14

ASSOCIATED SOILS: Dy 3.41 on drier slopes some Um 7.11 at the highest altitudes.

DESCRIPTION OF DOMINANT SOILS

Type: Red massive earths; gradational textured profile.

Texture Group: Sands to loams

Profile:

A1 horizon - some plant litter may be present on surface of Gn 2.14 soil; sand or loamy to sandy clay loam or loam; dark grey brown to dark red in colour, Gn 2.14 may be very dark due to relatively high organic matter content; some loamy sands are loose while others set to a hard structureless but porous mass; some Gn 2.14 with more organic surfaces have weak to moderate crumb structure; 10 - 20 cm thick.

A2 horizon - Gn 2.14 only - may be slightly more clayey than A1 horizon; light reddish brown in colour; 10 - 20 cm thick.

B horizon - sandy clay loam to clay; medium clays may have blocky structure; red massive earthy material which is highly porous, usually hard when dry and friable when moist; some soils have red pedal clay with smooth faced peds; 1 m approximately thick.

Moisture Status: Highly permeable although drainage may be impeded at depth.

Fertility: Low to very low nutrient status; surface soils being mildly acid to neutral with acidity remaining fairly constant with depth; exchange capacities are low to very low; phosphorus contents generally low, nitrogen usually low to very low, potassium contents very low to moderate, NPK deficiencies are common; sulphur and molybdenum deficiencies likely in leguminous plants; trace element deficiencies including copper, zinc, molybdenum and boron have been recorded in horticultural crops.

Effective Rooting Depth: Well aerated porous soils with deep profile generally although a massive nodular ironstone horizon may underlie solum at less than 1 m.

Rockiness/Stoniness: Ironstone nodules frequently occur at varying depths and sometimes as a scatter on the surface.

Erodibility: No particular erosion risk characteristic.

SOIL GROUP NO.10 (cont.)

DESCRIPTION OF DOMINANT SOILS

Arability:	An arable soil capable of regular cultivation.
Occurrence:	Mountain areas of moderate elevation north east of Tambo Crossing.
Land Use:	Mainly used for grazing of sparse native pasture, with heavy applications of fertilizer and water suitable for crops, vegetables, fruit and improved pasture.
Summary:	An arable and versatile soil but of inherently very low productivity.
Rating:	Satisfies the requirements of agricultural quality classes 3 to 6 inclusive.

SOIL GROUP NO.11

DOMINANT SOIL: Mainly undescribed but including Gn 2.8

ASSOCIATED SOILS: Undescribed soils on terrace remnants.

DESCRIPTION OF DOMINANT SOIL

Type: Grey massive earths; gradational textured profile.

Texture Group: Sands to clay loams.

Profile:

A1 horizon	- sand to clay loam; grey through grey-brown to dark grey-brown but may be brown in colour; sandy surfaces are loose whereas other surfaces are massive or very weak blocky setting hard when dry but dis-intergrating to fine powder with continual traffic; fairly thin but may be as thick as 25 cm grading into the B horizon, or A2 horizon if present.
A2 horizon	- slightly more clayey than A1 horizon; paler in colour; massive and porous; usually thicker than A1 horizon grading into the B horizon.
B horizon	- sandy or silty clay loam to sandy light or medium clay, dominantly grey to light grey but ranging from light grey brown to light olive brown in colour and usually mottled with bright yellow-brown and/or red; massive and porous but in some instances having a few vertical fissures.

Moisture Status: Permeability of the surface soil varies with texture from moderate to low and decreases rapidly with depth, seasonal water logging with many of these soils but extensive drainage schemes have removed this limiting factor.

Fertility: Nutrient status is very low and where these soils have been developed for improved pastures nitrogen, phosphorus, potassium sulphur, molybdenum, copper and zinc deficiencies have been recorded.

Effective Rooting Depth: Deep to moderately deep soils but may underlain by cemented gravelly pans.

Rockiness/Stoniness: Ironstone and/or manganiferous nodules frequently occur through the profile and may increase with depth.

Erodibility: Some erosion risk due to flooding.

SOIL GROUP NO.11 (cont.)

DESCRIPTION OF DOMINANT SOIL

Arability:	Arability of the soils vary depending on texture and organic matter content; some quite arable with others not suitable for regular cultivation.
Occurrence:	Moe River floodplain.
Land Use:	Dairying, grazing with cultivation for row crops in areas with more arable soils.
Summary:	Some of the soils associated with this group are arable and versatile whereas others are more suited to improved pasture; productivity is quite high providing adequate fertilizer is applied.
Rating:	Satisfies the requirements of agricultural quality classes 2 to 6 inclusive.

SOIL GROUP NO.12

DOMINANT SOILS: Gn 3.14, Gn 3.24 and Gn 3.54

ASSOCIATED SOILS: Um 4.2 on upper slopes; small areas of Um 7.11 at highest altitudes; Dy 4.21 and Dr 4.21 on lower slopes; largely undescribed soils in narrow stream valleys and small floodplains but including Um 5, Um 6 and Uc soils; other soils also likely.

DESCRIPTION OF DOMINANT SOILS

Type:	Gn 3.14 red smooth ped earths; gradational textured profile	
Texture Group:	Loam to clay loam	
Profile:	A1 horizon	- loam or clay loam; dark brown to reddish brown in colour, may be very dark in colour with large contents of organic matter, strong fine crumb to fine blocky structure; very friable consistence.
	A2 horizon	- clay loam to light clay; yellowish brown to reddish brown in colour, paler than the surface and subsoil.
	B horizon	- light to medium clay in upper portion of horizon to heavy clay lower portion; red, dark red or yellowish red in colour; highly pedal with strong polyhedral or blocky structure; dense peds with smooth, usually shiny surfaces, friable to very friable consistence.
Moisture Status:	Permeable, freely draining soils.	
Fertility:	In natural state moderate to high levels of nitrogen but phosphorus is mostly low; both decline rapidly with clearing and intensive use; moderately to slightly acid surface but subsoils usually strongly acid; acid soil reaction trend.	
Effective Rooting Depth:	Deep soils 1 - 3 m thick generally.	
Rockiness/Stoniness:	Manganiferous or ferruginous nodules 2 - 5 mm may occur in small amounts.	
Erodibility:	No particular erosion risk characteristic.	
Arability:	An arable soil capable of regular cultivation.	
Occurrence:	Located generally in hills surrounding the Cann River Valley.	

SOIL GROUP NO.12 (cont.)

DESCRIPTION OF DOMINANT SOILS

Land Use: Mainly used for forestry in this area with some grazing.

Summary: Arable and versatile soils that are inherently quite productive and capable of a wide range of agricultural use; tends to be associated with steep slopes in this region and thus development has been restricted.

Type: Gn 3.24; brown smooth ped earths; gradational textured profile.

Texture Group: Loam to clay loam

Profile:

A1 horizon - loam or clay loam; dark grey-brown to dark brown in colout; strong crumb to granual structure.

A2 horizon - slightly more clayey than A1 horizon, usually clay loam; brown in colour; less organic content than A1 horizon; fine to medium blocky structure.

B horizon - light to medium clay; dark brown, brown or yellowish brown in colour; moderate to strong polyhedral or blocky structure consisting of interlocked finer primary units 3 - 6 mm in diameter, friable when moist.

Moisture Status: Moderately permeable.

Fertility: Generally moderately fertile; copper and molybdenum deficiencies have been reported in some areas.

Effective Rooting Depth: Can be restricted by weathered rock at 0.5 to 1.5 m.

Rockiness/Stoniness: Ferro-manganiferous segregations and concretions common in some B horizons.

Erodibility: No particular erosion risk characteristic.

Arability: Generally arable and capable of regular cultivation.

Occurrence: Located generally in hills surrounding the Cann River Valley

Land Use: Used mainly for forestry in this area with some grazing.

SOIL GROUP NO.12 (cont.)

DESCRIPTION OF DOMINANT SOILS

Summary: Arable and versatile soils that may, however, be restricted by depth in some instances; inherently reasonably productive.

Type: Gn 3.54; mottled brown and red smooth-ped earths; gradational textured profile.

Texture Group: Loam to clay loam

Profile:

A1 horizon - loam, clay loam or silty clay loam, brown to dark grey-brown in colour; strong crumb, granular or sub angular blocky structure grading into A2 horizon.

A2 horizon - clay loam or light clay; light brown, yellowish brown or reddish yellow in colour paler than the A1 horizon; weak to moderate blocky structure.

B horizon - medium or heavy clay, brownish red, brown or dark yellowish brown with mottles commonly being red, red-brown, reddish yellow, yellow-brown and grey brown; moderate to strong blocky or polyhedral structure with smooth faced peds which are often strongly interlocked forming fairly coherent horizons; ped consistence is firm to very firm when moist.

Moisture Status: Generally permeable.

Fertility: Low to moderate inherent fertility; nitrogen and phosphorus levels are usually low; marked pastures responses have been obtained from nitrogen, phosphorus and molybdenum.

Effective Rooting Depth: Generally about 1 m with recorded depths of 46 cm to 150 cm.

Rockiness/Stoniness: Low amounts of small brown hard ironstone nodules occur throughout the profile; low amounts of soft black ferro-manganiferous segregations may be present in A2 horizons.

Erodibility: No particular erosion risk characteristic.

Arability: Limited arability due to firm consistence.

SOIL GROUP NO.12 (cont.)

DESCRIPTION OF DOMINANT SOILS

Occurrence:	Located generally in hills around the Cann River Valley.
Land Use:	Mainly used for forestry in this area with some grazing.
Summary:	Capable of dairying and grazing on improved pastures providing reasonably high levels of fertilizer applications are made.
Rating:	This group in combination satisfies the requirements of agricultural quality classes 2 to 6 inclusive.

SOIL GROUP NO.13

DOMINANT SOILS: Gn 4.11, Gn 4.14, Gn 4.31 and Gn 4.34

ASSOCIATED SOILS: a wide variety of other soils are associated with these soils.

DESCRIPTION OF DOMINANT SOILS

Type:
- Gn 4.11 and Gn 4.14; red rough ped earths; gradational textured profiles.
- Gn 4.31 and Gn 4.34; brown rough ped earths; gradational textured profiles.

Texture Group: Loam to clay loam

Profile:

A1 horizon - loam to clay loam or less commonly light clay; dark grey-brown and dark brown to dark reddish brown in colour; fine medium or large crumb structure but may be granular; very friable consistence when moist; relatively high organic matter content.

A2 horizon - Gn 4.14 and Gn 4.34 only - clay loam or light clay; brown to reddish brown in colour; fine blocky structure.

B horizon
- Gn 4.11 and Gn 4.14 - clay; dark reddish to dark red in colour; blocky structure which separates readily to finer peds with earthy porous surfaces, ultimate peds often 3 - 6 mm in size although peds twice this size occur.
- Gn 4.31 and Gn 4.34 - clay, increasing to medium and heavy clay with depth; dark brown in colour; blocky structure with porous earthy peds; friable consistence.

Moisture Status:	Very permeable, free draining soils.
Fertility:	Fertile in natural state but levels of organic matter, nitrogen and phosphorus decline rapidly with intensive use; responses to nitrogen, phosphorus, sulphur, molybdenum and potassium have been obtained; acid at surface with acid reaction trends.
Effective Rooting Depth:	Deep to very deep profiles that may exceed 2 m.
Rockiness/Stoniness:	No significant presence of rocks or stones in the profile.
Erodibility:	No particular erosion risk characteristic.

SOIL GROUP NO.13 (cont.)

DESCRIPTION OF DOMINANT SOIL

Arability:	Very arable soils, able to withstand regular cultivation; free draining character means cultivation is possible soon after rain; very friable when moist and friable when dry; stable aggregate.
Occurrence:	Rolling country around Warragul, Thorpdale and Leongatha, broad crests of ridges Neerim South and Gelantipy, steeper slopes in the Great Dividing Range.
Land Use:	Developed extensively for improved pastures especially for dairying; also used for grazing and a wide range of horticulture, including potatoes, maize and carrots; floricultural crops are also grown on these soils.
Summary:	These soils are very versatile and arable and capable of a wide range of agricultural uses; inherently very productive and responsive to fertilizers.
Ratings:	Satisfies the requirements of agricultural quality classes 1 to 6 inclusive.

SOIL GROUP NO.14

DOMINANT SOIL: Gn 4.31

ASSOCIATED SOILS: Gn 4.51 and minor localized areas of Gn 4.11 and other Gn soils; narrow incised stream valleys of undescribed soils.

DESCRIPTION OF DOMINANT SOIL

Type:	Brown, rough ped earths; gradational textured profiles.	
Texture Group:	Loam to clay loam	
Profile:	A1 horizon	- as for Soil Group No.13
	B horizon	- clay, increasing to medium and heavy clay with depth; dark brown to dark yellowish brown in colour; blocky structure with porous earthy peds; friable consistence.

The remainder of this description is the same as that for Soil Group No.13 because of limited information about Gn 4.3 soils and the soils of the Strzelecki Ranges. It is generally considered[1] however, that the brown and grey-brown soils of the Strzelecki Ranges are not as versatile and arable as the red soils and consequently this soil group has been down graded notwithstanding a similar description to Soil Group No.13.

Rating: Satisfies the requirements of agricultural quality classes 2 to 6 inclusive.

1. Departmental Officers from District Offices

SOIL GROUP NO.15

DOMINANT SOIL: Gn 4.13 and Gn 4.33

ASSOCIATED SOILS: Um 6 and shallow forms of Dr 2.23; minor areas of Gn 4.11 on upper and middle slopes; Dr 2.31 and other undescribed soils on lower slopes; dissected by streams with small flood plains of undescribed soils.

DESCRIPTION OF DOMINANT SOILS

Type: Gn 4.13 - red rough ped earths, gradational textured profiles.

Gn 4.33 - brown rough ped earths, gradational textured profiles.

Texture Group: Loam to clay loam.

Profile:

A1 horizon - loam to clay loam or less commonly light clay; dark grey-brown and dark brown to dark reddish brown in colour; fine medium or large crumb structure but may be granular; very friable consistence when moist; relatively high organic matter content.

B horizon - Gn 4.13 - clay; dark reddish brown to dark red in colour; blocky structure which separates readily to finer peds with earthy porous surfaces, ultimate often 3 - 6 mm in size although peds twice this size occur.

- Gn 4.33 - clay increasing to medium and heavy clay with depth; dark brown to dark yellowish brown in clour; blocky structure with porous earthy peds; friable consistence.

Moisture Status: Very permeable, free draining soil.

Fertility: Fertile in natural state but levels of organic matter, nitrogen and phosphorus decline rapdily with intensive use; responses to nitrogen, phosphorus, sulphur, molybdenum and potassium have been obtained; acid at surface with alkaline soil reaction trend.

Effective Rooting Depth: Shallow profiles with weathered rock at 30 - 35 cm.

Rockiness/Stoniness: Outcropping limestone occurs.

Erodibility: No particular erosion risk characteristic.

Arability: Restricted by shallowness and rock outcrop.

Occurrence: Steep rounded hills around Buchan.

Land Use: Improved pasture for grazing.

Summary: Inherently quite fertile but versatility is limited by shallowness and rock outcrop.

Rating: Satisfies the requirements of agricultural quality classes 3 to 6 inclusive.

SOIL GROUP NO.16

DOMINANT SOIL: Dr 2.21 and Dr 2.22

ASSOCIATED SOILS: associated with a wide range of soils, particularly Dy 3.41 soils.

DESCRIPTION OF DOMINANT SOILS

Type: Hard pedal red soils; duplex textured profiles.

Texture Group: Sandy loams to loams.

Profile:

A1 horizon - most commonly sandy loam to loam; dark grey-brown through brown and dark brown to reddish brown and dark reddish brown in colour; massive, hardsetting surface when dry but may show weak blocky, polyhedral or platy structure when moist; 8 - 50 cm thick most commonly 20 - 30 cm thick; gradual or clear change to A2 horizon.

A2 horizon - similar texture to A1 horizon; light brown through light reddish brown to light grey brown in colour; massive, with very hard consistence when dry, friable when moist; clear or abrupt boundary with B horizon.

B horizon - medium or heavy clay, less commonly light clay or sandy clay; red-brown or red in colour, slight mottling may be present; macrostructure is polyhedral, blocky or prismatic breaking to fine blocky or polyhedral peds 5 - 20 mm; shiney smooth faced peds that may have patches or brown or grey-brown cutans; consistence is hard when dry, friable to firm when moist and slightly sticky when wet.

Moisture Status: Moderate permeability.

Fertility: Many of these soils have low to very low phosphorus and nitrogen contents and most respond well to fertilizers; potassium levels are moderate; molybdenum deficiency associated with Dr 2.21 soils.

Effective Rooting Depth: Ranging from 60 cm to 2 m thick, most commonly 1 m thick.

Rockiness/Stoniness: Rock outcrops occur.

Erodibility: No particular risk characteristic.

SOIL GROUP NO.16 (cont.)

DESCRIPTION OF DOMINANT SOILS

Arability:	Not suitable for regular cultivation.
Occurrence:	Steep southern slopes of the Great Dividing Range.
Land Use:	Some sheep and cattle grazing mainly Crown Land in this region.
Summary:	Moderately fertile soil that is limited in versatility by shallowness and rock outcrop.
Rating:	Satisfies the requirements of agricultural quality classes 4, 5 or 6.

SOIL GROUP NO.17

DOMINANT SOILS:
- Dy3.41, Dy 3.42 and Dy 3.43
- Dy 3.61 and Dy 3.81
- Dy 5.41 not described with this group, see Soil Group 18.

ASSOCIATED SOILS: many and varied

DESCRIPTION OF DOMINANT SOILS

Type: Dy 3.4 soil; Hard pedal mottled-yellow soil; duplex textured profiles.

Texture Group: Sand to loams

Profile:

A1 horizon - loamy sand to clay loam; dark grey through light brownish grey and grey brown to brown in colour; relatively low organic matter content; massive and hard when dry but may show weak platy, polyhedral or blocky structure when moist; hard setting ranges from weak in loamy coarse sands to very strong in loams, sandy clay loams and clay loams; 5 - 60 cm thick most commonly around 30 cm.

A2 horizon - similar or slightly more coarse texture than A1 horizon; conspicuously bleached, becoming paler with depth to very pale brown or yellow to dull white; usually massive, are brittle and hard when dry with many fine pores; yellow-brown or rusty flecks indicate periodic water logging; boundary with B horizon is abrupt to clear and may be uneven or undulate except for some Dy 3.41 soils with thick sandy A horizons which have a gradual boundary.

B horizon - clay loam to clay; mottled but varying widely in colour and degree of mottling; commonly grey-brown, yellow-brown and brownish grey in colour with red, yellow and light grey being the common mottles; structure grade and ped size varies greatly with peds ranging from interlocked fine blocky and polyhedral to coarse blocky, prismatic and columnar units many of which break to smaller peds; acid soils (Dy 3.41) generally have finer structure than alkaline soils (Dy 3.43) with neutral soil (Dy 3.42) being intermediate; with increasing depth subsoil clays tend to become yellower, paler and grade into C horizons of weathered rock to clayey alluvium or colluvium; small to moderate amounts of soft and hard carbonate

SOIL GROUP NO.18 (cont.)

DESCRIPTION OF DOMINANT SOIL

Arability:	Moderately arable soils.
Occurrence:	Widespread throughout the plains of Gippsland.
Land Use:	Cattle and sheep grazing.
Summary:	Moderate to low inherent productivity with some potential for for cropping.
Rating:	Satisfies the requirements of agricultural quality classes 3 to 6 inclusive.

SOIL GROUP NO.19

DOMINANT SOIL: Dy 5.61

ASSOCIATED SOILS: Dy 3.61; probably many other undescribed soils especially in wet areas.

DESCRIPTION OF DOMINANT SOIL

Type:	Sandy apedal mottled yellow soils; duplex textured profiles.	
Texture Group:	Sandy to sandy loam.	
Profile:	A1 horizon	- sand to light sandy loam; usually brownish grey but varying from dark grey to grey brown in colour gradual colour change to A2 horizon; usually loose when dry but some are weakly coherent.
	A2 horizon	- sand to light sandy loam; yellow or yellow-brown in colour paler than A1 horizon.
	B horizon	- light to medium clay or sandy clay; brownish yellow to yellowish brown in colour with grey, red, yellow or brown mottles; apedal and massive with some vertical cracks; diffuse change to clay sediments, deeply weathered clays or weathered parent rock at one to over two metres.
Moisture Status:	Surfaces of many of these soils accept water slowly dry but are highly permeable when moist; drainage is restricted by clay sub-soils which results in seasonal cultivation.	
Fertility:	Low and deficiencies of phosphorus, nitrogen, copper, zinc and molybdenum are common; surface horizons are mildly acid to neutral.	
Effective Rooting Depth:	Generally deep soils 1 - 2 m or greater in depth; most commonly 1 m approximately.	
Rockiness/Stoniness:	Ironstone nodules occur as trace to large amounts frequently concentrated in A2 horizon.	
Erodibility:	No particular erosion risk characteristic.	
Arability:	Moderately arable soils.	
Occurrence:	Coastal plains around Inverloch.	
Land Use:	Sheep and cattle grazing.	
Summary:	Moderate to low inherent productivity, moderate to low versatility.	
Rating:	Satisfies the requirements of agricultural quality classes 3 to 6 inclusive.	

SOIL GROUP NO.17 (cont.)

DESCRIPTION OF DOMINANT SOILS

- segregations commonly occur in lower B horizons of alkaline soils (Dy 3.43): consistence is very hard when dry, firm when moist and very sticky when wet.

Moisture Status: Sandy surface soils are moderately permeable; loamy types have low infiltration rates and run-off can be high with heavy rain; subsoils have much lower permeability than A horizons resulting in intermittent perched water and partial saturation of B horizons in wet seasons; tend to be severely waterlogged.

Fertility: Low to very low fertility; generally severely deficient in phosphorus and nitrogen; some coarse sandy types have low content of exchangeable potassium; Dy 3.41 soils commonly have very low calcium status; responses to molybdenum, sulphur, copper and zinc are known; surface soils mildly acid to neutral; many subsoils are sodic to strongly sodic with exchangeable sodium percentages of more than 6 percent to as much as 30 percent; salt contents often rise to moderate or high amounts in Dy 3.43 soils; Dy 3.41 has an acid reaction trend; Dy 3.42 has a neutral reaction trend and Dy 3.42 has an alkaline reaction trend.

Effective Rooting Depth: Moderately deep soils

Rockiness/Stoniness: Slight to moderate amounts of ironstone nodules, quartz gravel and rock fragments may occur and are frequently concentrated in lower A2 horizon; fine black manganiferous nodules are also often present generally concentrated in lower A2 horizon but often extending into top of clay subsoil.

Erodibility: When cultivated on sloping sites erosion is a hazard and has been most severe when Dy 3.43 soils have been disturbed or overgrazed.

Arability: Not generally suitable for regular cultivation.

Occurrence: Widespread occurrence throughout Gippsland.

Land Use: Cattle and sheep grazing and dairy farming in higher rainfall areas; apple and pear orchards.

Summary: Moderate to low inherent productivity ; moderately versatile.

Rating: Satisfies the requirements of agricultural quality classes 3 to 6 inclusive.

SOIL GROUP NO.18

DOMINANT SOILS: - Dy 5.41, Dy 5.42
- Dy 3.4 soils described with Group 17

ASSOCIATED SOILS: Many and varied

DESCRIPTION OF DOMINANT SOILS

Type: Sandy pedal mottled-yellow soils, duplex textured profiles.

Texture Group: Sands to sandy loams

Profile:

A1 horizon - sand to light sandy loams; light brownish grey to dark grey brown in colour becoming paler with depth; loose with single grain structure when dry although some are weakly coherent.

A2 horizon - sandy texture; strongly bleached and may show ochorous root tracings and some mottles, particularly after wet periods; white, very pale brown or yellowish in colour; up to 50 cm thick.

B horizon - sandy, light to heavy clay; strongly mottled light brownish grey or yellowish-brown with subsidiary mottling in red, yellow or brown; moderate or strong structure; Dy 5.41 soils have polyhedral units < 5 cm in size.

Moisture Status: The surface of some Dy 5.4 soils accept water slowly when dry but is highly permeable when moist; short term saturation and perched water tables can occur following heavy rain.

Fertility: Inherent fertility is low. A horizons have low organic matter contents, very low phosphorus contents, usually low base status, generally deficient in zinc, copper and molybdenum; surface horizons are mildly acid; the top of clay subsoil may be moderately acid to neutral, deep subsoils range from strongly acid to neutral many soils have sodic B horizons; Dy 5.41 soils have only small amounts of sodium, magnesium and calcium whereas Dy 5.42 soils have larger amounts.

Effective Rooting Depth: Generally deep soils grading into weathered parent material between one and two metres.

Rockiness/Stoniness: Ironstone nodules occur in some Dy 5.4 soils particularly at the A/B horizon boundary.

Erodibility: No particular erosion risk characteristic.

SOIL GROUP No.20

DOMINANT SOIL: Dy 3.11; Gn 3.91

ASSOCIATED SOILS: Dy 3.41, Dy 3.21

DESCRIPTION OF DOMINANT SOILS

Type: Dy 3.11; hard pedal mottled yellow, duplex textured profile.

Texture Group: Loams to clay loams.

Profile:

A1 horizon - loam to clay loam, sometimes light clay; grey, brownish grey or dark brownish grey in colour; 20 cm to 30 cm thick.

B horizon - medium to heavy clay, mottled yellow brown, mottled grey, yellow-brown or light grey in colour; 150 to 160 cm thick.

Moisture Status: Moderately slow to slow surface drainage slow to very slow sub surface drainage;ponding may occur.

Fertility: Low to moderate fertility, strongly acid to occassional moderate acidity.

Effective Rooting Depth: 20 to 30 cm.

Rockiness/Stoniness: Some grittiness evident in some locations.

Erodibility: No particular erosion risk characteristic.

Arability: Non-arable soils generally.

Occurrence: Western Port sunklands.

Land Use: Grazing on improved pastures.

Summary: Moderate to good inherent productivity once drained, low versatility.

Type: Gn 3.91; grey smooth ped earths; gradational textured profiles.

Texture Group: Clay loams to light clays.

Profile:

A1 horizon - clay loam, occassional very fine sandy clay loams or light clays; grey in colour.

B horizon - light to medium clay; mottled light brownish grey and yellow brown in colour.

SOIL GROUP NO.20 (cont.)

DESCRIPTION OF DOMINANT SOILS

Moisture Status: Moderately slow to slow-draining surface, slow draining subsoil.

Fertility: Low to moderate generally, moderately acid to very strongly acid.

Effective Rooting Depth: Shallow to moderately deep.

Rockiness/Stoniness: No significant presence of rocks or stones.

Erodibility: No particular erosion risk characteristic.

Arability: Not arable generally although capable of withstanding occassional cultivation.

Occurrence: River flood plains of Western Port Bay catchment.

Land Use: Mainly used for cattle grazing on improved pastures; occassional crops of maize and potatoes have been grown.

Summary: Moderate to good inherent productivity,limited versatility.

Rating: This group in combination satisfy the requirements of agricultural quality classes 3 to 6 inclusive.

SOIL GROUP NO.21

DOMINANT SOIL: Uf 6.32 (non-peaty phase).

ASSOCIATED SOILS: None noted.

DESCRIPTION OF DOMINANT SOILS

Type:	Non-cracking friable clays with smooth ped frabric; uniform textured profile.
Texture Group:	Medium - heavy clays.
Profile:	- medium or heavy clay; very dark grey in colour; strong, fine crumb structure; high organic matter content; heavy clay throughout profile.
Moisture Status:	Moderately slow surface soil drainage; slow sub surface drainage.
Fertility:	Highly fertile generally but some soils are moderately saline with extremely saline soils near the shoreline; very strongly acid.
Effective Rooting Depth:	Deep soils to 1.8 m.
Rockiness/Stoniness:	No significant rock or stone content.
Erodibility:	No particular erosion characteristic.
Arability:	Not suitable for regular cultivation.
Occurrence:	Western Port sunklands.
Land Use:	Grazing of sown pasture.
Summary:	Inherently quite productive providing artificial drainage is constructed but of limited versatility.
Rating:	Satisfies the requirements of agricultural quality classes 3 to 6 inclusive.

SOIL GROUP NO.22

DOMINANT SOIL: Uf 6.32 (peaty phase)

ASSOCIATED SOILS: None noted.

DESCRIPTION OF DOMINANT SOILS

Type:	Non-cracking friable clays with smooth-ped fabric; uniform textured profile.
Texture Group:	Medium - heavy clays.
Profile:	- medium or heavy clay; very dark grey in colour; strong fine crumb structure; high organic matter content; highly friable peaty clay from about 60 cm to 80 cm.
Moisture Status:	Moderately drained in both the surface and sub-surface.
Fertility:	Inherently highly fertile; very strongly acid.
Effective Rooting Depth:	Deep soils to 1.8 m.
Rockiness/Stoniness:	No significant rock or stone content.
Erodibility:	No particular erosion characteristic.
Arability:	Highly suited to regular cultivation.
Occurrence:	Western Port sunklands.
Land Use:	Intensive market gardening and some grazing.
Summary:	Inherently highly productive and very versatile.
Rating:	Satisfies the requirements of agricultural quality classes 1 to 6 inclusive.

SOIL GROUP NO.23

DOMINANT SOIL: Uf 6.22

ASSOCIATED SOILS: Non noted

DESCRIPTION OF DOMINANT SOIL

Type:	Non-cracking crumbly clays; uniform textured profiles.	
Texture Group:	Clay loams.	
Profile:	A1 horizons	- clay loam; brown in colour; high amounts of peat or organic matter; 30 cm deep.
	A2 horizon	- medium or heavy clays; dark grey in colour.
	B horizon	- medium or heavy clays; mottled grey, light grey and yellow-brown in colour; this continues to at least 180 cm.
Moisture Status:	Stream levee banks are gravelly and drain rapidly in the surface soil and moderately in the sub-surface soil; soils off the levee banks are moderately draining in the surface soil and moderately slow in the sub-surface soil.	
Fertility:	Moderate to high inherent fertility; very strongly acid passing to strongly acid.	
Effective Rooting Depth:	Deep soils at least 180 cm.	
Rockiness/Stoniness:	No significant presence of rocks or stones although gravelly soils occur on stream levees.	
Erodibility:	Peat content has been depleted since draining through shrinkage, burning and blowing.	
Arability:	Moderately arable soils.	
Occurrence:	Western Port Bay sunklands.	
Land Use:	Grazing on improved pastures with some potatoes.	
Summary:	Moderately to highly productive soils with moderate versatility.	
Rating:	Satisfies the requirements of agricultural quality classes 2 to 6 inclusive.	

SOIL GROUP NO.24

DOMINANT SOILS: Db 2.41, Db 2.21

ASSOCIATED SOILS: None noted.

DESCRIPTION OF DOMINANT SOILS

Type:	Hard pedal mottled brown soils; duplex textured profiles.	
Texture Group:	Clay loams.	
Profile:	A1 horizon	- clay loam or very fine sandy clay loam; dark brownish grey in colour; about 20 cm thick.
	A2 horizon	- Db 2.41; bleached with some iron concretions. Db 2.21; A2 horizon is not bleached; 10 to 20 cm thick.
	B horizon	- heavy clay ; mottled grey-brown, yellow brown and brown in colour.
Moisture Status:	Moderate drainage in surface soil; slow drainage in sub-surface soil.	
Fertility:	Moderate to low inherent fertility; moderately acid.	
Effective Rooting Depth:	Deep to very deep soils generally up to 2 m although on crests or steep slopes rock may be encountered before 180 cm.	
Rockiness/Stoniness:	Some iron concretions in A2 horizon.	
Erodibility:	No particular erosion risk characteristic.	
Arability:	Friable soils capable of regular cultivation; more friable soils occur on crests and steeper slopes.	
Occurrence:	Undulating and hilly country north of Flinders; also on Phillip Island.	
Land Use:	Grazing on improved pastures and apple and cherry orchards.	
Summary:	Moderately productive soils and versatile soils.	
Rating:	Satisfies the requirements of agricultural quality classes 3 to 6 inclusive.	

SOIL GROUP NO.25

DOMINANT SOILS: Gn 4.11, Dr 2.21, Db 2.41, Db 2.21

ASSOCIATED SOILS: Non noted.

DESCRIPTION OF DOMINANT SOILS

Gn 4.11 described in Soil Group No.13

Db 2.41 and Db 2.21 described in Soil Group No.24

Type:	Dr. 2.21; Hard pedal red soil; duplex textured profile.	
Texture Group:	Clay loam	
Profile:	A1 horizon	- clay loam or fine sandy clay loam; reddish grey brown colour; 20 cm thick.
	A2 horizon	- light clays or clay loams; reddish greyish brown in colour; 20 cm thick.
	B horizon	- medium or heavy clays; mottled reddish grey brown in colour; at about 100 cm the soils are dominantly yellow-brown with increasing red brown mottles; heavy clays extend to decomposing pasalt.
Moisture Status:	Moderately drained surface soil; moderately to moderately slow drained sub-surface soil.	
Fertility:	Very low inherent fertility.	
Effective Rooting Depth:	Deep soil; 180 cm at least.	
Rockiness/Stoniness:	No significant presence of rocks or stones.	
Erodibility:	No particular erosion risk characteristic.	
Arability:	Limited arability.	
Occurrence:	Rolling to hilly topography at Red Hill and Phillip Island.	
Land Use:	Grazing of improved pasture; apples are the main horticultural crop but there are a range of horticultural and vegetable crops grown.	
Summary:	Inherently moderately productive; highly versatile.	
Rating:	Satisfies the requirements of agricultural quality classes 2 to 6 inclusive.	

APPENDIX TWO: SUMMARY OF POINTS TO CONSIDER WHEN USING THE ASSESSMENT

The main points to consider when using the assessment are listed below. These points are also mentioned in the appropriate sections of the report.

a. The assessment is an interpretation of the combined effects of soil, slope, rainfall and temperature with agricultural quality being rated on an ordinal scale. Consequently, it is not possible to be precise about the scale of the difference between classes but Class 1 land will be better than Class 2 land and so on.

b. The land within each agricultural quality class is similar in terms of the degree of restriction imposed on agricultural use and production but the cause of the restriction could be soil, slope or climate. For example, an area with good soils and climate may be of restricted agricultural quality because of very steep slopes. Alternatively, slope and soil may be satisfactory but the climate limits agricultural quality.

c. Agricultural quality is based on inherent land and climate characteristics and significant human changes to these characteristics. Such changes include major drainage or irrigation schemes, large scale extractive industry or extended urban areas. Where such change occurs in the future, reassessment will be necessary.

d. Specific agricultural activities with unusual requirements of the land may be located on land that is of low agricultural quality. Therefore, this land may still be important agriculturally.

e. The scale of the assessment means that small areas within larger areas will not always conform to the criteria for the class at which they are rated.

f. The map boundaries between agricultural quality classes are generalised and not suitable for detailed planning purposes.

g. The climatic assessment is based on the extrapolation of data from specific locations. Judgements were made as to the extent that this data describes surrounding areas. The use of monthly data means no consideration is given to the distribution of rainfall within the month. However, the variation in growing season reflects the relative difference between areas.

h. The soil assessment is based on subjective consideration of the key soil criteria: arability, moisture status, fertility, effective rooting depth, rockiness/stoniness and erodibility.

i. The slope assessment provides a general representation of the dominant slope in a given area. It does not provide site specific assessments of slope because of the scale of the assessment.

j. Management is assumed to be similar on all land and consistent with mechanised agricultural systems. This assumption recognises that nearly all soils have some degree of nutrient limitation, that climate conditions are not optimal all the time and that steepness creates management problems. The management inputs on flat or moderately sloping land with naturally fertile soils, good rainfall and suitable temperatures will achieve higher production that the same management on land with lesser attributes.

k. Socio-economic factors such as accessibility to markets, land ownership patterns and supporting infra-structure are not incorporated in the assessment. These factors affect the suitability of the land for agricultural use. Because of changes in these factors over time, they are properly considered when planning decisions are made.

l. Public irrigation schemes are assumed to increase productivity to such an extent that the land is automatically classified in the best agricultural quality class.

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FURTHER INFORMATION

This report is an overview of the agricultural quality of land in Gippsland prepared by the Department of Agriculture, Victoria. Further information about this report can be obtained from:

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Ian Swan	:	Planning Officer (Agriculture), Warragul District Office.
ADDRESS	:	State Government Offices, 70 Smith Street, WARRAGUL. 3820
TELEPHONE	:	(056) 23 1227

Further information on local agriculture and related planning issues in Gippsland can be obtained from the Department of Agriculture's District Offices at:

Bairnsdale	:	Telephone (051) 52 4138
Leongatha	:	Telephone (056) 62 2219
Maffra	:	Telephone (051) 47 1533
Warragul	:	Telephone (056) 23 1227

F D Atkinson Government Printer Melbourne

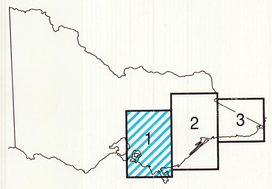
AGRICULTURAL QUALITY OF LAND IN GIPPSLAND, VICTORIA

Map 1 of 3

CLASSES OF AGRICULTURAL QUALITY.

CLASS 1 (Highest Quality)	Class 1 land is the most versatile with the highest inherent productivity. It is capable of the majority of agricultural uses or is very highly productive pasture land under flood irrigation. The growing season is 12 months or 11 months with readily utilized underground water.
CLASS 2	Class 2 land is highly versatile but has a lower level of inherent productivity than Class 1. It is capable of the majority of agricultural uses but requires greater inputs than Class 1 land to achieve high production. The growing season is at least 11 months or 10 months with readily utilized underground water.
CLASS 3	Class 3 land generally is of limited versatility but is very good dairying and grazing land. It is sometimes suitable for orchards and extensive area cropping but not suitable for intensive uses such as vegetable growing. Sub-class 3a is suitable for more intensive uses providing particular care is taken to prevent soil erosion, or supplementary irrigation overcomes moisture limitations in the summer. The growing season is at least 10 months or 9 months with readily utilized underground water.
CLASS 3a	
CLASS 4	Class 4 land is capable of extensive grazing but is generally unsuitable for cropping. Sub-class 4a land is suitable for intensive market gardening but supplementary irrigation, high levels of fertilizer and erosion prevention measures are necessary. The growing season is at least 9 months or 8 months with readily utilized underground water.
CLASS 4a	
CLASS 5 (Lowest Quality)	Class 5 land is marginal agricultural land either because of steep slopes and thin skeletal soils, very steep slopes or a growing season of less than 9 months.
CLASS 6 (Non-agricultural)	Extractive Industry
	Freehold Forestry
	Public Land — Class 6 land is non-agricultural land because it is unavailable for agriculture.
	Urban Areas
	Swamps

Index to adjoining sheets



"Study Area Boundary Limited by Available Data – Boundary Not Consistent with Municipal Boundaries."

Study Area Boundary

Municipal Boundary

MIRBOO — Municipal Name

SCALE 1: 250,000

Kilometres 0 5 10

Hectares 100 400 900

NOTE • This map should not be used for the precise definition of boundaries.

• Additional information on the interpretation of this map is available from the Department of Agriculture, Victoria.

These maps form part of the report on the Agricultural Quality of land in Gippsland by Ian R. Swan and Andrew G. Volum, published by the Department of Agriculture, Victoria as Research Project Series, Report No. 134, 1984. © Department of Agriculture, Victoria, 1984.

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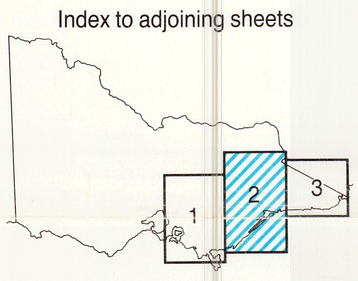
AGRICULTURAL QUALITY OF LAND IN GIPPSLAND, VICTORIA

Map 2 of 3

Index to adjoining sheets



OMEO

MAFFRA

BAIRNSDALE

TAMBO

AVON

ROSEDALE

ALBERTON

Benambra
Omeo
Cobungra
Swifts Creek
Ensay
Timbarra
Gillingall
Butchers Ridge
Tambo Crossing
Buchan
Dargo
Bruthen
Nowa Nowa
Lindenow
Swan Reach
Bairnsdale
Fernbank
Lake Tyers
Metung
Lakes Entrance
Paynesville
Bengworden
Boisdale
Glenmaggie
Maffra
Stratford
Heyfield
"Macalister Irrigation District"
"Macalister irrigation District"
SALE
Rosedale
Gormandale
Seaspray
Darriman
Won Wron
Woodside
Yarram
Alberton
Port Albert

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Freehold Forestry	
Public Land	
Urban Areas	
Swamps	

Study Area Boundary

Municipal Boundary

TAMBO Municipal Name

SCALE 1: 250,000

Kilometres 0 5 10

Hectares 100 400 900

NOTE • This map should not be used for the precise definition of boundaries.

• Additional information on the interpretation of this map is available from the Department of Agriculture, Victoria.

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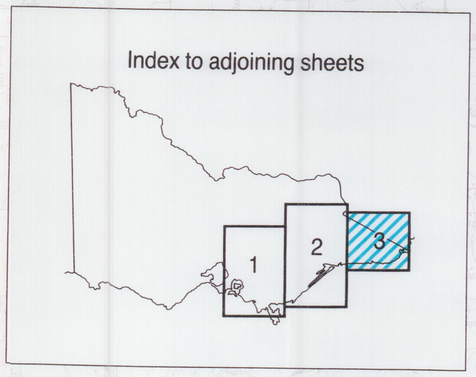
BASS STRAIT

AGRICULTURAL QUALITY OF LAND IN GIPPSLAND, VICTORIA

Map 3 of 3



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	Swamps

Tubbut
Bendock
Bonang
Goongerah
Combienbar
ORBOST
Genoa
Cann River
Mallacoota
Murrungowar
Orbost
Cabbage Tree Creek
Bemm River
Marlo

Study Area Boundary

Municipal Boundary

ORBOST Municipal Name

SCALE 1: 250,000

Kilometres 0 5 10

Hectares 100 400 900

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