SOIL CONSERVATION AUTHORITY

AN ECOLOGICAL AND LAND USE SURVEY

OF THE

TRAWALLA CREEK CATCHMENT

For Consideration by the Soil Conservation Authority
and Land Utilization Advisory Council

SUMMARY

An ecological and land use survey of the catchment of Trawalla Creek has been done to assist in the formulation of a policy of future land use for the catchment.

The catchment is within hilly country composed of Ordovician sediments and is adjacent to the Great Dividing Range near Beaufort. Rainfall ranges between 28 and 30 inches on the average each year and the soils are mainly red and yellow solodics. Erosion is not a problem. Gullying and sheet erosion are infrequent and catchment salting is common but not serious. This favourable situation is considered to be due partly to the extensive forests remaining within the catchment and which surround Trawalla Creek. These forests are mainly Reserved Forests under the control of the Forests Commission and are of little commercial value as sources of hardwood. Their present role is mainly one of protection for the soil and native plants and animals and to regulate stream flow. Portion of the forests are under consideration as sites for pine plantation.

Interest must be extended outside the catchment to include Mt. Emu Creek into which Trawalla Creek flows. Mt. Emu Creek continues for many miles towards Warrnambool across the Western District Plain. It is used for stock and domestic water by a number of landholders but is a saline stream due to the extensive areas of basalt plain within its catchment. The only sources of fresh water are those tributaries draining sedimentary hills and Trawalla Creek is the biggest of these streams. The high quality of the waters in Trawalla Creek must therefore be maintained and it is considered that the future management of the catchment is all-important in this respect. Management must be aimed at preventing any increase in the salted areas since it has been shown elsewhere in western Victoria that catchment salting contributes saline water to reservoirs and streams. Trawalla Creek's catchment must be well maintained not only for tis own sake but also in the interests of people outside its borders.

For these reasons it is considered advisable to disallow any further clearing and to concentrate on both hardwood and softwood forestry.

INTRODUCTION

The subject of this report is an ecological and land use survey of Trawalla Creek Catchment and the report is divided into six parts.

Part I gives an abbreviated description of the catchment dealing mainly with its environmental features but also its location and land tenure. In order to place the survey within the Soil Conservation Authority's programme of State-wide surveys, an appendix to the report is included in which more details of the environment and land unit diagrams are to be found.

Part II deals with the condition of Trawalla Creek and its catchment and includes present and alternative forms of land use and erosion status.

Trawalla Creek is a tributary of Mt. Emu Creek and Part III discusses Mt. Emu Creek and its role as a source of stock and domestic water.

In Part IV, the relationship of Trawalla Creek to Mt. Emu Creek is reviewed with an emphasis on water supply and land use in the catchment.

The conclusions of the survey are dealt with in Part V and Part VI lists the recommendation.

PART 1 - DESCRIPTION OF TRAWALLA CREEK CATCHMENT

1. LOCATION

The headwaters of Trawalla Creek rise on the southern slopes of the Great Dividing Range to the north of Beaufort in the Central Highlands Region. After flowing for ten miles in a south-easterly direction it empties into Mt. Emu Creek near Trawalla on the Western Highway. The catchment covers 42 square miles and is in the shape of a rectangle roughly eight miles long and five miles wide (See Map 1). Parts of the Shires of Ripon and Lexton and of the Parishes of Langi kal kal, Raglan and Beaufort, are included within the catchment.

2. ENVIRONMENT

(i). Rainfall

There are no rainfall stations within the catchment, but from information presented in the Resources Survey of the Central Highlands Region (Central Planning Authority) the average annual rainfall appears to vary from approximately 30 inches along the Great Dividing Range down to about 27 inches at the southern end of the catchment.

Rainfall stations at Trawalla and Beaufort have average annual figures of 26 and 28 inches, respectively, and both places show a maximum precipitation in winter and early spring with average monthly falls of 2½ inches. The driest months, January and February, each receive 1½ inches.

(ii) Geology and Topography

Geology and topography present a simple pattern. Hills of Ordovician shales and mudstones have been maturely dissected by Trawalla Creek and its tributaries and are now separated by alluvial flats built up by successively younger deposits of unconsolidated clays and sands. Along the north-western boundary is a small area of granite.

The catchment is sharply defined on the east, north and west by high ridges from which spurs and lower hills gradually drop in elevation until the plain of Trawalla Creek is reached in the centre of the catchment (see Map 2). The northern ridge is part of the Great Dividing Range whose elevation above sea level is generally between 1500 feet and 1700 feet culminating in Ben Major at 2000 feet. The northern half of the eastern ridge is almost as high with peaks reaching 1700 and 1800 feet but the southern half of this ridge is considerably lower. No definite height figures can be quoted for the western ridge but they are of the same order as the southern half of the eastern ridge, namely 1100 feet to 1200 feet. Towards the mouth of Trawalla Creek is a broad, flat plain over which Yam Holes Creek also flows and the two catchments are poorly defined.

Hill slopes on the ridges and spurs are usually within the range of 10 to 17%. Two extremes of slope are found along the Great Divide; around Ben Major are slopes of 42% and in other parts they are as gentle as 5%. The narrow flats along the tributaries of the main stream have slopes of 1 to 3% whilst the broader flats of Trawalla Creek itself are either flat or have slopes of 1% and less. The distribution of these slope classes is indicated on Map 2.

(iii) Soils

Throughout the survey, solodic soils are the dominant soil group. They are divisible into two sub-groups, namely, red solodics and yellow solodics.

Red solodic soils are associated with the Ordovician hill slopes. They derive their name from the red to reddish-brown clay of the subsoil which underlies a light brown, gravelly, sandy loam. A characteristic feature of these soils is the large amounts of quartz stone in the upper horizons, the stones being particularly noticeable on those profiles exposed along road cuttings. Sometimes red podzolics are found which differ from red solodics in having clay loam horizon between the sandy loam and clay.

Yellow solodics are confined to the alluvial flats along Trawalla Creek and its tributaries. Shades of yellow and brownish-yellow are the overall impressions of colour when looking at the profile and they differ further from the red solodics in being deeper to the subsoil clay, in lacking quartz stones and in having loams and silty loams in the A horizon.

A minor sub-group are brown solodics which closely resemble the yellow solodics in all respects except colour and occur in the same situations.

Skeletal soils occur on the steepest hill slopes beneath Ben Major and on the highest peaks along the eastern ridge. Here shallow loams have developed between pieces of rock.

(iv) Native Vegetation

Associated with the Ordovician hills and red solodic is a mixed dry sclerophyll forest of messmate, red stringybark, narrow-leaf peppermint, long leaf box and apple box. The understorey consists of occasional shrubs of blackwood with native grasses providing a light and often sparse ground cover.

The second eucalypt community is associated with the alluvial flats and yellow solodics, namely, tall woodland dominated by candlebark and also containing yellow ox and narrow-leaf peppermint. Candlebark is also found on the lowermost Ordovician slopes just above the alluvial flats.

3. TENURE

Unlike neighbouring catchments, Trawalla Creek's catchment has a relatively high proportion of Reserved Forest amounting to 18 square miles or 43% of the area. Map 1 shows Ben Major Forest along the Great Divide and Waterloo Forest along much of the eastern ridge. There is also a small unmarked area west of Waterloo along the western ridge.

Freehold areas are not greatly in excess of Reserved Forest and cover 21½ square miles or 51% of the catchment.

The remaining 2½ square miles are held as Crown Land and are located on the western ridge.

PART II - LAND USE AND EROSION IN THE CATCHMENT OF TRAWALLA CREEK

1. LAND USE

(i) Grazing

The cleared freehold areas are confined to the creek flats and the lower hills flanking Trawalla Creek. All properties graze sheep for wool production. There is no regular cropping programme although the widespread evidence of old "ploughing lands" on the lower slopes and flat strongly suggests that intensive cropping occurred at one time.

Both unimproved and improved pastures are found, the latter being composed of mid-season strains of subterranean clover. There is still considerable room for improvement in the carrying capacity of the pastures. Those paddocks already improved can be brought to a further stage by the use of perennial species such as perennial ryegrass and Phalaris, and in the wetter paddocks on the creek flats by using white and strawberry clovers. The unimproved paddocks, particularly on the hills, are littered with dead timber, both fallen and standing, and inadequately covered by a thin sparse native pasture. Improvement must come to these areas.

There is no cheap or easy method of pasture improvement on the hills. Tree stumps have to be grubbed out or burnt and the abundant supply of quartz stones and rock adds to the difficulty of ploughing or chiselling. On the hill property, the stones and rocks have been laboriously placed into heaps to assist in the establishment of an improved pasture. On the lesser slopes, ploughing is practicable but as the slopes increase, chiselled implements are required.

No information was sought regarding the use of fertilisers. It is assumed superphosphate at least is used on both improved and unimproved pastures. Experimental work by the Department of Agriculture on very similar soils near Beaufort and elsewhere in the Central Highlands Region has indicated the need for molybdenum on those surface soils of pH 5.5 to 6 and molybdenum plus lime where the pH is less than 5.5.

(ii) Hardwood Forestry

Forests Commission Officers at Beaufort have stated that the eucalypt forests within the catchment are at present of little commercial value beyond supplying firewood and fenceposts, and that pine plantations, if successful, would provide a higher revenue per acre. The forests can only be regarded as protection forests, that is, they provide a protective cover for the soil and native plants and animals and help to supply a steady flow of clear water to the streams.

It should be noted that Trawalla Creek is surrounded on three sides by the forests and that the cleared areas are on the lower hills and creek flats. In fact, Ben Major Forest extends from the Great Divide right down to Trawalla Creek and covers considerable areas of flats and gentle slopes along its southern boundary. The value of these protective forests in surrounding Trawalla Creek is dealt with during the discussion of erosion.

(iii) Pine Plantations

With the aim of raising the productivity of the Reserved Forests, the Forests Commission Offices at Beaufort have considered the possibility of establishing pine plantations It is considered that only in the southern parts of Ben Major Forest are there sizeable areas of suitable pine sites. Site quality assessment involving a study of the soils and topography has yet to be done. It is these areas that offer the best prospects for development as sheep farms and which have attracted the attention of the Shire of Lexton.

One of the conclusions of this survey is that the forests should be retained as either hardwood or softwood areas rather than allowing further clearing.

2. EROSION

As far as the actual stream channels are concerned. Trawalla Creek and its tributaries give little cause for concern in their present condition. It is true that some of the drainage lines, even within the forests, are entrenched in vertical walls of bar soil and Trawalla Creek is similarly placed in numerous places. However, the sides of the channels are usually no more than two feet high and show little evidence of active bank erosion.

Gullying is uncommon, only three gullies were seen in the entire catchment, and sheet erosion on both cleared and forested slopes has not advanced to serious proportions.

Catchment salting is the commonest form of erosion but even so is not serious, although it does give a clear warning of what would happen if, by further forest clearing, it was encouraged to spread rapidly. Numerous salt patches wee seen in the cleared farming areas at the bases of small hillside catchments and some of the low-level land bordering Trawalla Creek between Chute and Waterloo Swamp is also salted. However, none of the individual salted areas are extensive; they are usually between two and four square chains in area and are all of the wet pan type, that is, they are moist and covered with salt-tolerant species such as buckshot plantain. For reasons unknown, some of the cleared hillsides do not have salt patches below. No evidence of incipient salting was seen inside the forests.

Catchments with closely similar environments adjoin Trawalla Creek's catchment and the opportunity was taken to compare the erosion status one with the other. Tow the west, around Raglan, a number of sub-catchments feeding into Fiery Creek are badly salted. Here the salt patches are more extensive and many have advanced to the hardpan stage in which a hard, salty crust has formed and all vegetation has been killed. Catchments east of Trawalla Creek are in a similar condition, notably Burn Bank Creek flowing towards Lexton.

Thus, erosion in Trawalla Creek's catchment is not serious and compares favourably with the condition of surrounding catchments. A suggested reason for this situation is the presence of timbered slopes in the Reserved Forests and unoccupied Crown Land which surround Trawalla Creek to its east, north and west. Clearing has been more extensive in the neighbouring catchments.

PART III - MT. EMU CREEK AND WATER SUPPLY

Water supply ad quality of stream water is the concern of this part of the report and attention must be extended beyond the boundaries of the catchment to Trawalla Creek to Mt. Emu Creek into which Trawalla Creek flows (see Map 3). Mt. Emu Creek is used as a source of stock and domestic water by the properties through which it flows. Does Trawalla Creek have any influence on this source of water and if so, what is its nature and extent? The following summary of information was obtained during discussions with officers of the State Rivers and Water Supply Commission who can supply further details.

To introduce the subject of quality of stream water, information relating to Woady Yalloak River must be presented. The catchment to Woady Yalloak River covers 450 square miles and adjoins the catchment to Mt. Emu Creek on the east (see Map 3). The headwaters of Woady Yalloak River and its upper tributaries rise in and flow through Ordovician sedimentary hill country which is very similar to the hills of Trawalla Creek's catchment. However, the rainfall received is less; the yearly average ranges from 20 inches down to 24 inches. Woady Yalloak River then leaves the hills and flows across a basalt plain before emptying into Lake Corangamite downstream of Cressy.

A study has been made of the quality of the water in the river by taking samples at the gauging station at Cressy and analysing them for their levels of salinity. High and low levels of salinity determine the quality of the water for stock and domestic purposes. The conclusions drawn from this study are of particular interest to this report are as follows.

Taken on the long term, say a yearly basis, the waters of Woady Yalloak River are of comparatively high salinity although daily and seasonal figures do vary from high to low levels. The waters are generally less saline during winter than during summer. It is believed that the waters of high salinity drain into the river from the basalt plain whilst those of low salinity come from Ordovician hills. That is, the salty water derives from the basalt and the fresh water from the sedimentary hills. Furthermore, a simple relationship, applying to this catchment and probably to others like it, appears to exist between the salinity of the river waters and the geology of the catchment. That is, the proportion of Ordovician sediments to basalt gives a guide to the quality (salinity or freshness) of the river water. Basalt covers 53% of the catchment to Woady Yalloak River and Ordovician sediments 47%.

It is considered to be a reasonable extrapolation to apply these findings to Mt. Emu Creek and its catchment. Mt. Emu Creek rises in gently undulating basalt country along the Great Divide east of Trawalla Creek. It then flows south across the basalt plain of the Western District for many miles and finally joins with Hopkins River near Cudgee, north-east of Warrnambool. The catchment covers 1200 square mils and its average annual rainfall varies from 30 inches along its northern boundary down to 22 inches at Pura Pura in the central part and then rises to 28 inches in the south at Garvoc.

Mt. Emu Creek flows across basalt throughout its entire length and its catchment has a far greater area of basalt than the catchment to Waody Yalloak River. Basalt covers 85% of the catchment and Ordovician sediments on 15%. It is to be expected therefore that the salinity levels of its waters are high and certainly higher than the waters of Woady Yalloak River. A few sport analyses agree with this conclusion. It may be that during the dry months of the year and for a longer period in dry years, the water in the creek is too salty for stock and certainly for domestic use. Definite information from landholders is required on this point. In any event, it is very undesirable to run the risk of raising the salinity of the creek waters and land use in the catchment should be undertaken with this point in mind.

PART IV - RELATIONSHIP OF TRAWALLA CREEK TO MT. EMU CREEK

Having discussed some of the characteristics of Mt. Emu Creek and its catchment it now remains to consider the contribution made by Trawalla Creek and to highlight the probable effects on that contribution of present and future systems of land use within the catchment.

The contribution made by Trawalla Creek includes both the quantity of water and its quality. Officers of the State Rivers and Water Supply Commission have summed up what they believe to be the situation by saying that the quality of water from Trawalla Creek is of greater importance to Mt. Emu Creek than the quantity.

Gaugings of the discharge of Trawalla Creek have not been made and so only estimates can be given. These given an approximate figure of 9000 acre feet for the average annual flow which is 17% of the average annual flow of Mt. Emu Creek as measured at Skipton. This figure would be much smaller if the flow at downstream places like Garvoc and Panmure was considered. The important point here is that Trawalla Creek drains the area of highest rainfall within Mt. Emu Creek's catchment.

There is only about 15% of Ordovician sedimentary country in the catchment of Mt. Emu Creek and Trawalla Creek's catchment is entirely within this area. In fact its catchment is the largest of those tributaries draining the Ordovician hills. Trawalla Creek thus contributes most of the good quality water that enters Mt. Emu Creek and diminution of this quality will increase the salinity of Mt. Emu Creek. Does the manner of utilising the catchment have any effect on the quality as well as the quantity of water in Trawalla Creek?

In some areas of Victoria there is little doubt that catchment salting contributes saline water to the main stream via its tributaries. This problem is of present concern to the Soil Conservation Authority and State Rivers and Water Supply Commission in the Glenelg River Catchment were increasing levels of salinity in the river are thought to originate from many salted areas in properties on the Dundas Tableland. It has been necessary to flush the river by releasing additional water from Rocklands Reservoir. Koonongwootong Reservoir near Coleraine has rising levels of salinity from similar sources.

This consideration must not be forgotten when thinking of Trawalla Creek. It has been stated earlier in the report that erosion in general and salting in particular are not serious and that one contributing factor to this situation could well be the high proportion of forested land surrounding the creek. Catchment salting should not be allowed to increase otherwise the fresh water flowing into Mt. Emu Creek would be replaced by water of increasing salinity and Mt. Emu Creek would lose its main supply of fresh water. Disallowing any expansion of the cleared areas will achieve this objective. Thus the question of land use in the catchment itself and the landholders within it but also affects the livelihood of landholders downstream along Mt. Emu Creek.

PART V - CONCLUSIONS

The main conclusion arising from the survey is that the policy of future land use in the catchment of Trawalla Creek should be towards the maintenance of a tree cover over the present forested areas rather than allowing further areas to be alienated and cleared for sheep grazing. Therefore, the Forests Commission should not be expected to excise portions of their Reserved Forests and the uncleared Crown Lands should not be leased to applicants. Also, the owners of the uncleared freehold areas should not be allowed the right to clear such areas indiscriminately. If they cannot be persuaded to retain the forest cover, then supervision of clearing operations to ensure an adequate retention of trees should be exercised.

If a greater productivity and revenue from the forests is desired, then the Forests Commission could well investigate the likely success of pine plantations. It should be pointed out, however, that pine plantations and the present eucalypt forests may not use equivalent amounts of soil water and its should not be assumed that they do. If pines use less water than eucalypts the replacement of the forests with plantations would result in greater volumes of sub-surface water moving downslope and a subsequent increase in the salted areas. What we can be sure of is that such an increase, if it did happen, would be far less severe than the increase due to a replacement of the eucalypt forests with shallow-rooted pastures.

PART VI - RECOMMENDATIONS

The following recommendations are presented to the Soil Conservation Authority for its consideration:

1. The catchment to Trawalla Creek should be proclaimed under the provisions of the *Soil Conservation and Land Utilization Act*.

2. The policy of future land use in the catchment to Trawalla Creek should be towards the maintenance of a tree cover over the present forested areas rather than allowing further areas to be alienated and cleared for sheep grazing.

3. In pursuance of the above recommendation and in view of the low productivity and revenue arising from the present eucalypt forests, the Forests Commission should be asked to investigate the suitability of the Reserved Forests for pine plantations as an alternative tree cover to the present eucalypt forests.

(G. T. Sibley)
Research Officer

APPENDIX I

In order to place this survey within the Soil Conservation Authority's programme of State-wide surveys, the Trawalla Creek Catchment has been divided into three land units using geological differences as the main criterion (see Map 4).

Beaufort Land Unit

Beaufort land unit comprises the hills of Ordovician sediments. Because of this it can be linked with the Grampians Survey and placed within the Ararat land system. The important feature that distinguishes it from the other land units within Ararat land system is its climate (higher rainfall) and this in turn creates concomitant differences in native vegetation and introduced pastures.

1. Climate

The climate data now given applies to all three land units and has been taken from the Resources Survey of the Central Highlands Region (Central Planning Authority).

(i) Rainfall

The average yearly and monthly rainfall figures for Beaufort and Trawalla are listed with also the percentage probability of Trawalla receiving the monthly averages.

Table 1

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct6.	Nov.	Dec.	Year
Trawalla	145	145	171	223	242	264	235	270	274	246	207	193	2615*
	39%	38	38	47	45	53	42	44	44	44	44	40	
Beaufort	167	188	174	232	224	260	286	289	253	273	228	213	2787*

* Points

These figures show a maximum precipitation in winter and early spring with average monthly falls of 2½ inches. The driest months, January and February, each receive 1½ to 1¾ inches. However, Trawalla's rain is not very reliable because all months except June can expect to receive their monthly average less than once very two years.

(ii) Effective Rain and Length of Growing Season

The percentage chances of receiving rainfall equal to or greater than the effective amount for Trawalla are listed in Table 2.

Table 2

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
19%	33	45	79	95	98	98	98	98	88	57	46

The Commonwealth Bureau of Meteorology makes the assumption that the 50% chance approximates to the beginning and end of the growing season. On this basis, the growing season at Trawalla commences in late March or early April and finishes late November or early December. Isochrones (lines of equal dates of commencing and finishing the growing season) published by the Bureau confirm this assessment by giving 21st March and 1st December for Trawalla.

2. Geology and Topography

These features have received adequate treatment in the body of the report.

3. Soils

A short verbal description of red sodolics found on the Ordovician sediments has been given earlier and a profile description is now listed.

A1	0 - 1½"	Dark brown (10YR 3/3 moist) loam; apedal breaking to sub-angular blocky; friable; quartz and mudstone gravel present.
A2	1½ - 9"	Reddish brown (5YR 5/4 moist) gritty, gravelly; fine sandy loam with considerable amounts of quartz and mudstone gravel and small stones.
B1	9A+	Red (2.5YR 5/6) clay; mod. med. And fine, sub-angular blocky; soft; scattered with quartz pieces.

Between the hills are narrow drainage lines which gradually join to form the tributary streams flowing into Trawalla Creek. In the drainage lines are the yellow solodics briefly described in Part 1 of the report. A profile description is given in Waterloo land unit.

The skeletal soils on the steepest slopes beneath Ben Major are stony loams. Here is a typical profile on a 21% slope.

0 - 3"	Dark brown (10YR 2/2 to 3/3 moist) loam; and fine angular blocky; friable.
3 - 10"	Light brown (10YR 5/4 moist) loam; mod. fine angular blocky; friable.
10" rock	Large pieces of shale litter the ground and are throughout the soil.

4. Vegetation

The eucalypt species occurring in the dry sclerophyll forests have already been named but here their scientific names are also given. They are messmate (*E. obliqua*), red stringybark (E. macrorhyncha), narrow-leaf peppermint (*E. radiata*), long leaf box (*E. elaeophora*) and apple box (*E. aromaphloia*).

Similarly the tall woodlands in the drainage lines consist of candlebark (*E. rubida*), yellow box (*E. melliodora*) and narrow-leaf peppermint.

The environmental and land use features of Beaufort land unit are illustrated and summarised in the accompanying land unit diagram.

Waterloo Land Unit

The alluvial flats of Trawalla Creek and its larger tributaries are grouped into Waterloo land unit.

1. Climate

A description of the climate has been given in the previous land unit.

It should be added that the data contained therein is a general statement and of necessity cannot take into account local variation in micro-climates arising from variations in topography. Thus the hillslopes in Beaufort land unit are drier sites with a shorter growing season compared to the general statement whilst the alluvial flats of Waterloo land unit are wetter sites with a longer growing season.

2. Geology and Topography

These features have been described in Part 1 of the report.

3. Soils

A typical profile of yellow solodic soils found throughout the land unit is as follows.

A1	0 - 5"	Dark greyish brown (10YR 4/2 moist) loam; strong, fine, subangular blocky; friable.
A2	5 - 18½"	Off-white (10YR 7/3 dry) with streaks of yellowish-brown (10YR dry) loam; apedal breaking to angular blocky; slightly hard.
B1	18½ - 24"	Mottles of yellowish-brown (10YR 5/4 dry) and pale yellowish-brown (10YR 6/3 dry) light clay; weak, fine, sub-angular blocky; slightly hard.
B2	24"+	Greyish-brown (10YR 5/3 dry) clay; weak, fine, sub-angular blocky; slightly hard.

Occasionally brown solodic soils are found which are very similar in all respects except colour.

4. Vegetation

On the broader flats of Trawalla Creek there was, before settlement, a tall woodland of almost pure candlebark. On the flats o the tributaries candlebark is associated with yellow box and narrow-leaf peppermint.

The environmental and land use features of Waterloo land unit are illustrated and summarised in the accompanying land unit diagram.

Along the north-eastern boundary of the catchment is a small area of granite rising to a peak known as Granite Hill. This constitutes the third land unit within the catchment but no study of it has been attempted.

APPENDIX II - LAND USE CLASSES

The land use classes used by the Soil Conservation Authority are another means of describing areas of land to the reader in addition to their main purpose of implementing the best systems of agriculture. The following are the land use classes commonly found in the cleared freehold areas in the catchment.

Classes 2a and 3

These classes are bulked to include the broad alluvial flats of Trawalla Creek where the land is either flat or has slopes of 1% or less.

Class 3 refers to low-level flats flanking the creek along parts of its course where it is too wet in most years to contemplate cropping but where sheep have little difficulty in grazing. The definition of the class is "land suitable for grazing without the need for erosion control measures".

Class 2a refers to those areas of the creek flats that are at a slightly higher elevation and may or may not have a sight gradient and where the soil is dry enough in most years to crop if the farmer so desires. Its definition is "land suitable for cropping but in need of erosion control measures. No mechanical works are needed but broad rotations and/or special cultivation practices are required".

Class 2b

This class includes the narrow alluvial flats along the tributaries of Trawalla Creek. The flats have gradients of 1 to 3% and it is here that the three gullies in the catchment have developed. Also included in this class are the restricted areas of gently sloping Ordovician country found at some places between the hills and creek flats. The definition of the class is "land suitable for cropping but in need or erosion control measures, namely, the contour principle involving contour cultivation alone or together with closed banks or graded banks and waterways".

Class 4

The cleared hills used for grazing have been designated as Class 4 although there may be small areas of Class 5 on some of the steepest slopes. Gradients are generally between 10 and 17% and the lesser slopes can be thought of as Class 4a whilst the steeper slopes fit into Class 4b.

Class 4a is defined as "land suitable for grazing but in need of erosion control measures. It can be ploughed for pasture improvement and can be contour banked, furrowed or ripped".

Class 4b is defined as "land suitable for grazing but in need of erosion control measures. It cannot be ploughed but can be surfaced worked for pasture improvement and can be contour furrowed or ripped".

Class 5 is defined as "land suitable for strictly controlled grazing where no mechanical erosion control measures can be undertaken and a vegetative cover must be carefully maintained".

Most salt patches in the catchment are found at the break of slope between Classes 4a and 2b, Classes 4a and 2a and between Classes 2b and 2a.