

SOIL CONSERVATION AUTHORITY

**REPORT ON
A PROPOSED LAND USE DETERMINATION
FOR THE
TYERS RIVER CATCHMENT**

PREPARED FOR CONSIDERATION BY
THE SOIL CONSERVATION AUTHORITY
AND
THE LAND CONSERVATION COUNCIL

FEB. 1975

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1. INTRODUCTION

(i) Proclamation

The Catchment of the Tyers River, upstream of the Latrobe Valley Water and Sewerage Board's pumping station was proclaimed under the provisions of the *Soil Conservation and Land Utilization Act 1958* on the 30th January 1963. The proclamation was published in the Victoria Government Gazette, No. 16, dated 6th March 1963.

The Moondarra Reservoir is the major collection and storage structure which feeds into the Board's reticulation system. However, the downstream pumping station acts as the emergency supply and hence the proclaimed area was taken down to this point.

This report now proposed a land use determination for the Tyers River Water Supply Catchment and recommends the form which the various categories of the determination should take. It is presented after detailed field work and after discussion with individual landholders and representatives of the Forest Commission, State Electricity Commission, Shire of Narracan and the Latrobe Valley Water and Sewerage Board.

(ii) Water Supply Systems

Water from the Tyers River and its tributaries is harvested by the Moondarra Reservoir, constructed just below the confluence of the Tyers River and Jacob's Creek. The distribution system from the Reservoir consists of 1500 mm diameter pipeline which divides near the Latrobe River into a 450 mm diameter pipeline to Traralgon and a 1050 mm diameter pipeline to Morwell and Churchill. There are branch lines off these two mains to APM, SEC and the Morwell Char Plant.

The total amount of water supplied from the Reservoir is between 55 000 and 65 000 megalitres per annum of which about 90% is used for industrial purposes (see Table 1). The reservoir holds 34 500 megalitres, about half the annual supply.

Within the catchment area there is a separate water supply system for the township of Erica. This consists of a diversion weir just below the Mt Erica Road about 1.6 km from the Thomson Valley Road on a tributary to the East Tyers River. A 100 mm AC pipeline delivers from the diversion weir to Erica along the alignment of the Thomson Valley Road.

Recently the MMBW has made a connection to this line to supply water for the temporary construction camp (Thomson River Project) at Amors, which is on the catchment boundary.

(iii) Stream Flow

At the present time Moondarra Reservoir and the associated distribution system are fully utilized. Twice the capacity of the reservoir is supplied annually to the reticulation system and some industrial users have at time had restrictions applied on the amount of water supplied.

It is highly likely that within the next five to ten years, another large storage will be constructed on the Tyers River at a site selected just above the tailwaters of the existing reservoir. This would mean that the Tyers River would then be regulated to about 85% of the mean annual flow.

The Snowy Mountains Engineering Corporation prepared a yield study of the catchment to Moondarra Reservoir in 1971, "in order to determine the probabilities of failure, assuming various rates of demand." This study showed that a uniform monthly demand of 195 ML/day, the failure frequency is 7 months in a 500 year sequence. (Refer Moondarra Reservoir Yield Study.) The months of March to June inclusive show the greatest likelihood of demand exceeding supply. Planned expansion of industry in the Latrobe Valley will depend largely on the availability of sufficient high quality water from the Tyers, Tanjil and Latrobe Rivers.

Stream flow data is available for several sites along the Tyers River Systems e.g. Jacob's Creek at O'Tooles, Tyers River at Brown's, Tyers River at Morgan's Mill, Tyers River at Boola, Tyers River at Gould, and some of this data has been collected since 1920.

Table No. 2 gives peak flows of the Tyers River recorded at Gould. It should be noted that these records do not go beyond 1960 as the Township of Gould was submerged on construction of the Moondarra Reservoir.

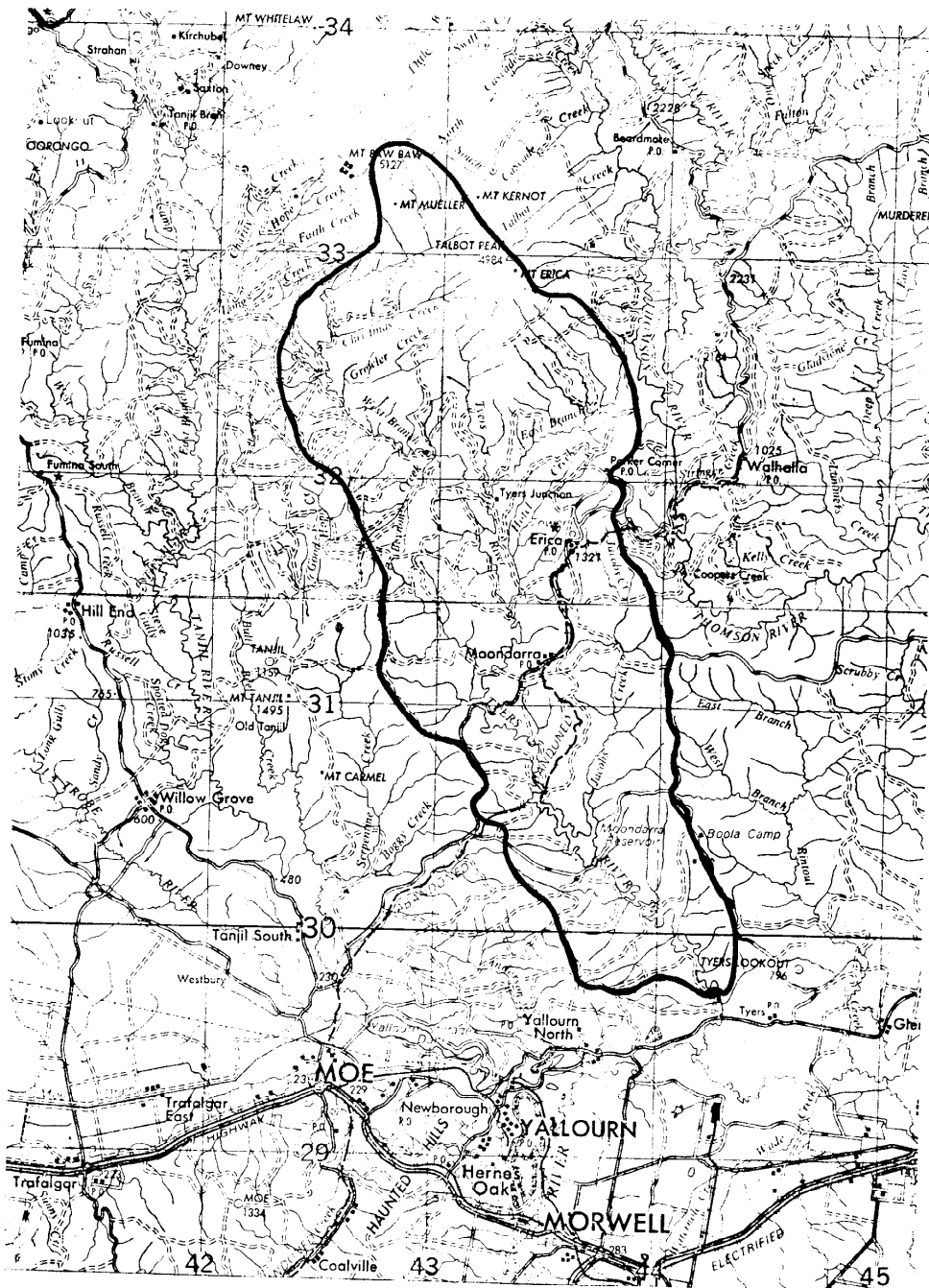
(iv) Water Quality

Water quality has been regularly monitored by the Board since the Reservoir was constructed in 1961. Generally the water is of good quality, but at times there have been complaints by consumers regarding water quality. From the sampling results, turbidity and dissolved solids have occasionally exceeded excessive levels. It is reported that Jacob's Creek and Ti-tree Creek tributaries consistently contribute the poorest quality water.

Plans are presently in hand to treat the domestic water supplied to Morwell, Traralgon, Tyers, Glengarry and Rosedale at a total capital cost approaching \$2 million. Pilot plants have been established to determine the feasibility and costs.

Apart from detention, the bulk of the water harvested from the catchment at present is supplied to consumers without treatment. The aim of the proposed land use determination is to ensure that the water quality is not allowed to deteriorate because of unwise land use.

Figure 1 - Locality Plan



SCALE 1: 250,000

LOCALITY PLAN

TYERS RIVER WATER
SUPPLY CATCHMENT

II CATCHMENT DESCRIPTION

(i) *General*

The Moondarra Reservoir is located on the Tyers River at its confluence with the Jacob's Creek, approximately 18 km north of Moe. The emergency pumping station is 8 km downstream of the reservoir. Total catchment area to the pumping station is 317 square km.

The Catchment is 38 km long and has an average width of 12 km. Elevation ranges from 45 metres at the pumping station to 1520 metres on the Baw Baw plateau.

The Tanjil river Catchment adjoins the western boundary and the Thomson River catchment the eastern and northern boundaries.

Erica Township is located within the catchment on the Moe-Walhalla Road. It has a population of approximately 200 people. Sawmilling and tourism provide its main source of revenue. The small Moondarra Reservoir Township also lies within the proclaimed area, housing the Reservoir works staff.

A full description of the catchment and its characteristics is contained in:-

- (i) The Latrobe Valley Water Sewerage Board publication "Report on the Tyers River Catchment".
- (ii) The Land Conservation Council's Melbourne Study Area Report.
- (iii) The Soil Conservation Authority Report by G T Sibley "A study of the land in the Tyers River Catchment", to be published shortly. (This is summarised in Table No. 6 and the accompanying plan.)

(ii) *Climate*

Average annual rainfall ranges from 900 mm at the pump station to over 1600 mm on the Baw Baw plateau. The average monthly and average annual rainfall records for the Moondarra Reservoir, Erica and Tanjil Bren meteorological stations are given in Table No. 4.

Pluviograph records are available for the Moondarra Reservoir and Erica Stations with records going back to 1961. Falls up to 32 mm in 10 minutes and 48 mm in 60 minutes have been recorded at Moondarra Reservoir. Table No. 3 lists all the 1 hour intensities greater than 10 mm which have been recorded at this station. The rainfalls of highest intensity occur during the summer and autumn periods.

Snow lies on the ground for most of the winter months on the Baw Baw plateau and snow frequently falls on Erica. Snow falls have occasionally been recorded at Moondarra.

Over the last 15 years, Erica has had an average of 186 wet days per year, and this period of time is regarded as abnormally dry. (The average runoff for the period 1960-1970 was 114 000 ML compared to 133 000 ML for the period 1901-1970.)

The net loss from the reservoir due to evaporation in an average year is estimated to be about 25 mm. In a dry year (for example 1967) it could be as high as 350 mm (LVQ & SB estimates).

At Erica there is sufficient moisture available for vegetative growth for practically every month of the year. The growing season is reduced to about 9 months on average because of the low temperatures during the winter months (see Table No. 5). Occasional dry periods during the summer months do reduce the growing season from time to time.

(iii) Geology

1. Silurian & Devonian Sediments

Mudstones, shales and fine sandstones of the Silurian and Devonian age are the oldest and most widespread of rocks in the catchment. Conglomerates and limestones of the same age are of lesser occurrence.

2. Upper Devonian Granodiorite

The Mt Baw Baw - Mt Erica massif intruded the Silurian-Devonian sediments in the Upper Devonian age. Because of its greater resistance to geological erosion it stands out as an erosion residual high above the surrounding sedimentary rocks.

3. Jurassic Sediments

Restricted exposure of Jurassic Sediments at the southern end of the catchment show a sequence of sedimentary rocks in which coarse conglomerates at the base of the sequence are overlain by a succession of sandstones.

4. Early and Late Tertiary Sediments

Unconsolidated clays, sands and gravels occur in the southern half of the catchment. However Early Tertiary deposits are mostly covered by basalt and later sediments and outcrops are restricted to narrow strips on some hillsides.

5. Mid-Tertiary Basalt

This remnant of the Older Volcanic flows in Victoria occupies a broad area between Moondarra and Parker's Corner. As it is more resistant to erosion than the surrounding Silurian-Devonian sediments, it is higher and far less dissected than much of the surrounding country.

6. Recent Alluvium

A few small river flats mainly from Tyers Junction to Phillips Bridge consist of recent alluvium.

(iv) Geomorphology

The main geomorphological features of the catchment are the dissected Baw Baw and Moondarra Plateaux and the erosional slopes below each of them.

The Baw Baw Plateau at elevations of between 1370 m and 1550 m above sea level is moderately dissected with a rolling to hilly topography. It is separated from the Moondarra plateau by the mountain slopes of the Mt Erica - Mt Baw Baw massif.

The Moondarra Plateau at elevations of between 150 m and 450 m above sea level is maturely dissected by the Tyers River and its tributaries and is preserved only as narrow ridge tops below which there are steep sided valleys.

Undulating and rolling landscapes with moderate slopes are restricted to the basaltic area in the centre and to broad ridges covered with Tertiary sediments in the centre and south of the catchment.

There are no extensive areas of flat land apart from narrow strips of alluvium along the Tyers River.

(v) Land Classification

Distinct types of land with differing capabilities for development and use occur within the catchment. Sibley in his report "A Study of Land in the Tyers River Catchment" has documented these units of land. A brief tabular summary is presented as Table No. 6, which is accompanied by a land unit plan.

The Baw Baw land unit (The High Plains) though limited in areas is an important contributor to the volume and regularity of the flow of the Tyers River particularly during the drier months of the year. The drainage valleys contain bogs of sphagnum moss which hold much of the snow melt and gradually

release it as summer flow. It is essential to protect these bog areas so that their capacity to store and slowly release water is maintained

The Upper Tyers Land Unit (Mountain Slopes) has a much larger area than the Baw Baw land unit. The soils are stable well structured and highly absorbent, largely as a result of the high levels of organic matter and the thick mat of plant litter. The area is highly productive in terms of water yield and timber yield.

The remaining land units (jointly forming the foothills) are less important as contributors of regular flows of water. However they are more important as potential sources of silt and pollution. This is due to the combination of lower rainfall, poorer soil structure, lower water absorption and storage capacity, and less dense vegetative cover. Poor land use practices in the foothills can have definite deleterious effects on the quality of water draining from the higher parts of the catchment.

(vi) Land Tenure

The approximate land tenure breakdown for the catchment is as follows:

Reserved Forest including		
2 000 ha of Alpine Reserve	239 sq km	75%
Freehold	38 sq km	12%
LVW & SB Land	25 sq km	8%
State Electricity Commission	9 sq km	3%
Crown Land	6 sq km	2%
TOTAL	317 sq km	100%

III DISCUSSION ON LAND USE

(i) Forestry

Much of the catchment land is forested, with the majority of it under the control of the Forests Commission of Victoria. The remaining timbered land is controlled by either the Board, APM Forests, Kauri Timber or private individuals.

The types of forest operations that are carried out in the catchment are as follows:

- (a) Extraction of mill logs - mainly Mountain Ash (*E. regnans*) 1939 regrowth from the Upper Tyers land unit.
- (b) Clearfelling and removal of ash pulpwood followed by
 - (i) ash regeneration in the Upper Tyers land unit,
 - (ii) burning slash and regeneration of mixed species (mainly Silvertop (*E. sieberi*) and Messmate (*E. obliqua*)).
- (c) Thinning of mixed species forest leaving an even aged stand of predominantly Silvertop
- (d) Clearfelling mixed species degenerate forest for pine conversion.
- (e) Thinning pine plantations established by APM and the Board.

Forest operations in Reserved Forest are carried out in accordance with Forest Management Prescriptions developed by the District Forester. These prescriptions are at present under review by the Commission and once this is completed it is intended that the Soil Conservation Authority ratify these (with amendment if necessary) and have them apply to all forest operations in the catchment.

Generally the determination should have only a minor effect on the extent of the forest land being utilized or proposed for utilization in the catchment. Thus the total amount of timber or logs should not

be reduced significantly, but the conditions of management applying to various types of land may require modification.

APM Forests owns approximately 560 hectares of land in the catchment. They have selectively logged this land and are working towards conversion of this land to pine forest. Clearing and cultivation is expected to start in the near future. Particular care will be needed with this operation because of the proximity of all of their land to both Moondarra Reservoir and the Tyers River.

(ii) Agriculture

As mentioned previously, the catchment contains 38 square kilometres of freehold land. Approximately 21 square kilometres of this has been cleared for agriculture and grazing. Without counting housing blocks, the freehold is divided into about 60 properties with only a small percentage of these being agriculturally viable. The remaining properties are either worked on a part time basis or solely used as holiday blocks.

The basalt areas around Erica and Moondarra (Erica Land Unit) support all of the cropping operations and much of the grazing which is carried out in the catchment. Other areas which have been cleared for grazing are the alluvial flats of the Tyers River (Tyers Junction Sub-Unit) and parts of the sedimentary country (Lower Tyers Land Unit) which adjoins either of the above areas.

The land of the Erica Unit is particularly suited to intensive agricultural operations with moderate slopes and fertile, well structured and friable red clay loam soils. Potato cropping is the major cropping enterprise involving about 16 landholders. In the past few years the total area planted was approximately 80 ha with a total annual yield in the order of 2 000 tonne. However the high potato prices of the past season has resulted in a much greater area being sown this season.

In this area the potatoes are sown about October and lifted from March to August depending on labour availability and market demand. The cropping rotation is usually 3 years crop and 2-3 years pasture with the smaller properties having the shorter pasture phase. Approximately 1 500 kg/ha of complete fertilizer is applied per crop and it is usual for 4 or 5 irrigations to be carried out during the summer period. Ground preparation and weed control is commonly carried out by rotary hoeing and as each crop may receive up to 5 cultivations the effect on soil structure can be severe. Row layout is at right-angles to the contour and as slopes of 20% and higher are presently cropped on a regular basis, the erosion hazard is high, especially during the summer months when soils are bare and thunderstorm activity is high. Many of the landholders with insufficient land for cropping lease from part-time farmers and in many cases overcrop this land with very short rotations. The land use determination will reduce the area available for cropping by about 40%.

There are 5 dairy farms in the catchment which supply bulk milk to the Moe Dairy Co-operative. These farms generally have a small whole milk contract and the bulk of their production is sold as butterfat. Even though much of the production is sold as butterfat, the Dairy Co-operative collects whole milk and not cream. The largest dairy farm in the catchment is 300 ha in size and milks over 300 cows. The disposal of effluent from one poorly located dairy on this property creates problems to the water supply, and a second dairy has recently been constructed in a better position at the other end of the property.

Most of the properties graze some beef cattle and there are a number of properties whose sole enterprise is beef cattle raising. The stocking rate is about 1 beast per hectare and the potential carrying capacity is thought to be 2 beasts per hectare. The difference is due to the potential for pasture improvement, and increased fertilizer application.

There are no intensive animal industries operating in the catchment at present, although one of the landholders has indicated his intention to establish a 10 000 bird poultry enterprise on 37 ha in the upper reaches of the Hotel Creek. Previously there were in excess of 10 piggeries in the catchment which utilized skim milk from the dairying operations. However since the Dairy Co-operative has been collecting whole milk and not cream, all of the pig raising operations have been abandoned.

Stream bank erosion is active along the alluvial flats of the Tyers River. For example, at one site adjacent to the Caringal Scout Camp an estimated loss of 250 m³ of soil occurred between March 1974 and October 1974. Such erosion is primarily related to the amount of clearing which has been carried

out immediately adjacent to the river bank, and secondarily related to obstructions to river flow which deflect flows against the banks. A case is now being prepared by Narracan Shire for a Rivers and Streams Fund grant to pay for corrective works at this particular site. Such erosion is one of the most significant problems in the catchment because of the amount of sediment and turbidity which is supplied to the river. It appears that the long term technical solution is to cancel the water frontage licences which exist in this area and revegetate the immediate stream frontage area.

The co-operation and expertise of the State Rivers and Water Supply Commission in this field will be sought to tackle the problem once the Land Use Determination is Gazetted.

A public meeting was held at the Erica hall in April 1974 following invitations forwarded to all landholders to come and discuss the objectives of land use determination. The response to these invitations was excellent. At the meeting, with at least 75% of all landholders attending, the landholders indicated they understood the need to protect the catchment and would give full co-operation, provided that the determination would not involve them in excessive or non-productive expenditure.

During the course of the subsequent investigations most landholders were visited on their properties and these visits provided evidence of reasonable co-operation from most.

The Land Use Determination will disadvantage a number of individuals in its aim to produce the benefit to the community as a whole. The disadvantage will occur to a number of potato growers who will have steep land taken out of intensive production. These farmers although small in number must be given time to adjust to the provisions of the Land Use Determination. Where economic viability is altered by the determination some assistance may have to be provided.

The Valuer-General's office has been asked to assist the Authority in determining the loss of value on all affected properties, and the Minister has been briefed on the need for substantial amounts of compensation payments.

(iii) Recreation

The close proximity of many scenic, historical and natural attractions to a large population in the Latrobe Valley and Melbourne is subjecting this catchment to an ever-increasing population pressure.

A survey conducted by the FCV indicates that the majority of tourists use the main road through the catchment to visit Walhalla, an old gold mining town which is being continually developed to attract tourists. A large percentage of these tourists use roadside parking areas such as at the Tyers River bridge for picnicking and rest spots.

During the winter, a large number of tourists use the Thomson Valley Road as an eastern approach to the Baw Baw snow plains. There is continuing pressure to connect this eastern approach to the Baw Baw snow village despite vigorous projects by conservationists. The Mt Erica to Mt Baw Baw section of the Tri-State Walking Track is being upgraded by the FCV and provides excellent views, vegetation and wildlife. This track will be subjected to much greater use in the future. The Jack McMahon Ski Lodge is located in Reserve Forest along this track.

The Narracan Shire would like to see Erica township developed as a ski resort and are in favour of the Baw Baw Road being completed.

Stage 3 of the Thomson River project is expected to increase the tourist population both during construction and when the dam is completed. Also the MMBW favours the construction of their new works camp at a site known as Amors, part of which will be in the Tyers River catchment. Development here would more than double the population of Erica and it is proposed, once construction is completed, that the camp should remain as a tourist village.

There are two scout camps in the catchment. Caringal Scout Camp is the headquarters of the McDonald District, and is well established at the confluence of the three branches of the Tyers River. The Scout Association owns 8.1 ha freehold and leases 5.7 ha from the FCV. On special occasions, this scout camp entertains up to 1,000 scouts and their parents.

The Connan Park Scout Camp off Boola Road is a less established camp, and is run by the Strezlecki District Scout Association which leases 36 ha from the SEC.

It is envisaged that this scout camp will become part of the Wirilda Project which is being planned by a local consortium of interested people as a natural amenity and recreation area for the Latrobe Valley. This group wishes to obtain control over about 845 ha owned by the SEC, and also use a large area of Reserved Forest and land owned by LVWSB to establish walking, riding and vehicular tracks to points of interest.

The streams in the catchment are renowned for good trout, eels and freshwater crayfish fishing and damage to stream banks is occasionally caused by fishermen. There is also some deer shooting in the upper reaches of the catchment.

Trail bikes and four wheel drive vehicles have caused damage during the winter especially along forest tracks.

Many of the landholders in the catchment live elsewhere and have a "hideaway" block for weekends and holidays. As yet there has been little pressure on the land for subdivision of larger blocks but it can be expected that this activity will increase in the future. At present the Shire of Narracan has no Planning Scheme or Interim Development Order to regulate such activity, and until planning controls are introduced the Shire has agreed to forward proposed sub-divisions to the Authority for comment.

In 1959, a Committee of Management of the Mt Baw Baw Alpine Resort was set up under Section 50 of the *Forests Act*. The Alpine Resort at first comprised only 990 ha around the Ski Clue and Mt Baw Baw, but in 1963 this area was extended to include all land on the Baw Baw plateau above the 1 220 m contour (subject to SCA approval). This is an area of 8 080 ha and includes 5 250 ha of Reserved Forest and 2 222 ha of Crown land. More recently, this area was extended to cover the Tanjil Bren Village and the road to the Ski Village. In 1974 the Narracan Shire declared about 2 020 ha as an Alpine Resort under part XLVA of the *Local Government Act*, which enables the Shire to enter into agreements with the Forests Commission for works and services in that area.

About 2 000 ha of the Alpine Reserve consisting mainly of Reserved Forest falls into the Tyers River catchment. However, there is little intensive development within the catchment. Part of the Tri-State Alpine Walking Track follows the catchment boundary from Mt Baw Baw to Mt Erica. The Forests Commission has recently been involved in upgrading this track.

There was some cattle grazing within the reserve and some damage has been caused to bogs and walking tracks by cattle. Since the gazettal of Land Use Determination for the Thomson River (Stages 1, 1A, 2) Catchment, grazing licences for Crown Land in the Baw Baw area have not been renewed, so there are no current grazing licences for Crown Land in the upper parts of the Tyers catchment.

Because of the vulnerable nature of the environment, the general approach should be towards retention of native condition, and any proposed changes should be thoroughly examined at the planning stages before being approved.

(iv) Mining, Quarrying, Extractive Industries

There is very little active mining or quarrying in the catchment at the moment, but there has been a great deal of activity in the past and there are several current applications for mining leases.

Gold mining has been carried out in the past in this area and at Walhalla (not in the catchment), the Long Tunnel Mine on Cohen's Reef was the richest in Victoria. There is still some interest in gold mining within the catchment, and there is a recent application to explore a reef near the West Tyers River. Panning for alluvial gold is carried out on several streams in the area, including Johns Creek and Neanders Creek. Mining Lease applications are referred to this Authority for comment but Miner's Rights applications are not.

Limestone has been mined downstream of the Reservoir on the forest track W3 and the remains of the old lime kilns can still be seen. There has been recent applications to mine this limestone again as it is considered to be of high quality.

White pipe clay is abundant in the Lower Tyers Land Unit and is to be mined along W3 in the near future. (Refer SCA file E1/202), by Monier Great Eastern Brick Co Pty Ltd.

Roadmaking material is taken from several sources in the catchment, but these are generally small operations which are not causing any hazards to the water supply. Two large bluestone quarries in the catchment are not operating at present, but initial enquiries have been made as to the possibility of opening one of them again for the Thomson Dam project.

(v) Roadworks

Within the catchment there are 17.7 km of Country Roads Board roads, 294 km of Forest Commission roads, 52.3 km of Shire roads, LVW & SB roads and various private roads and access tracks. In general all of these roads contribute significant amounts of turbidity to streams immediately following rainfall. This is due to erosion of road surfaces, table drains and roadside batters coupled with the tendency to drain the roads directly into major drainage lines. The steep nature of much of this land demands that a high standard of road construction and maintenance be provided if turbidity and sedimentation problems are to be avoided. A major improvement on the situation could be achieved by providing more frequent culverts and cut offs and maintaining a crown on the road surface so that runoff is rapidly removed from the roads and table drains. It may be necessary to provide some financial assistance in the form of grants to upgrade roads in the catchment.

IV PROPOSED CATEGORIES

CATEGORY NUMBER	LAND IN CATEGORY	CONDITIONS OF CATEGORY
1	Land to be retained in an undisturbed state for the protection of water courses, streams and reservoirs. Covers land - within 200 metres of Moondarra Res. foreshore - within 200 metres of the Erica Waterworks Trust Diversion Weir. - within 40 metres of the Tyers River up to the Tyers Junction, and Jacob's Ck, to the Walhalla Road. - within 20 metres of all other streams and drainage lines.	A. No further clearing, cultivation, earthworks, buildings or construction of stream crossings will be permitted without the specific approval of the Soil Conservation Authority. B. Improvements in the location and design of existing stream crossings may be required by the Soil Conservation Authority.
2	Land of elevation greater than 1220 metres which shall be used and managed primarily for water catchment purposes. Low intensity forms of use such as recreation are suitable provided the area is retained in a basically undisturbed state.	No change in land use will be allowed without the specific approval of the Soil Conservation Authority.
3	Land to be retained as forest. This land is generally suitable for hardwood timber production and low intensity recreation and parts may be suitable for more intensive forestry and recreational uses.	Forestry and other developmental operations may be carried out only in accordance with management conditions made or approved by the Soil Conservation Authority.
4	Land primarily suitable for forest operations - parts of which may be suitable for development for grazing or cropping purposes.	A. Forestry operations may be carried out only in accordance with forest management conditions approved by the Soil Conservation Authority. B. Soil Conservation Authority approval is required before any part of this category is developed for grazing or agriculture.

CATEGORY NUMBER	LAND IN CATEGORY	CONDITIONS OF CATEGORY
		C. Soil conservation practices will be specified when necessary.
5	Land suitable for grazing (Low intensity agriculture)	Cultivation for pasture establishment and maintenance will be permitted subject to conditions which may include the length of the rotation and soil conservation practices where necessary.
6	Land suitable for cropping (high intensity agriculture, and other intensive uses as approved).	From time to time, conditions may be imposed and may include specifications of length of rotation and soil conservation practices where necessary.

CONDITIONS APPLYING TO ALL CATEGORIES

- Prior SCA approval is necessary before any development associated with residential use or recreation is carried out.
- Prior SCA approval is necessary before any earthworks, including roadworks and mining, are carried out within the catchment.
- From time to time the SCA may require that existing roads in the catchment be upgraded.
- Subdivision of land requires SCA approval.

P N King

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Catchment Investigations Officers

Table 2 - Peak Flows in Tyers River at Gould (now submerged by Moondarra Reservoir)

YEAR	MONTH	GAUGE HEIGHT	M³/SEC
1935	April	5.2 m	252 m ³ /sec
1936	June	5.0 m	235 m ³ /sec
1952	June	5.2 m	181 m ³ /sec
1951	February	4.5 m	142 m ³ /sec
1937	October	3.8 m	122 m ³ /sec
1947	March	-	109 m ³ /sec
1954	November	5.0 m	109 m ³ /sec
1933	December	3.6 m	97 m ³ /sec
1927	October	4.3 m	97 m ³ /sec
1953	October	-	92 m ³ /sec

Table 3 - Maximum 1 hour Rainfall Intensities, recorded at Moondarra Reservoir

			mm
1973	Dec	15	10.6
	Feb	21	16.5
	Jan	12	13.7
1972	Nov	24	16.5
1972	Dec	25	17.0
	Feb	1	32.2
	Jan	25	11.4
1970	Dec	27	23.9
	March	10	15.2
		30	12.2
	Feb	3	10.6
		22	10.4
1969	Dec	11	13.4
	March	10	15.2
		30	12.2
	Feb	3	10.6
1968		22	10.4
	Dec	23	13.0
		26	11.9
	March	11	47.7
1966	Feb	14	11.7
		15	11.2
1965	Nov	24	12.7
1961	Dec	17	11.7
1960	Nov	12	14.5
	April	9	16.0
	Jan	31	12.7
1959	Dec	11	12.7
		25	16.0
	Nov	26	13.0

Table 4 - Mean Monthly & Annual Rainfall Records (mm)

STATION	PERIOD	NO. OF YEARS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
Moondarra Reservoir	1958-1973	16 years	67	71	77	74	105	66	86	108	99	95	94	93	1039
Erica	1933-1973	41 years	84	84	84	103	98	97	82	105	100	125	119	117	1199
Tanjil Bren	1943-1960	18 years	89	107	103	140	168	150	151	167	166	193	184	141	1751

Table 5 - Average & Extreme Temperatures (Monthly) at Erica - Altitude 426 m

DATA	NUMBER OF YEARS OF RECORD	MONTHLY FIGURES												YEAR
		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
Average Max. Temp	15	23.0	22.0	20.4	16.1	13.2	10.6	10.5	11.3	13.9	16.0	17.8	21.0	16.3
Average Min. Temp	15	11.3	11.7	10.5	7.8	6.5	4.6	4.0	4.1	5.5	6.8	7.8	9.7	7.5
Average Mean Temp	15	18.3	18.0	15.5	12.0	9.8	7.6	7.2	7.7	9.8	11.3	12.8	15.3	12.0
Highest on Record	23	40.1	35.5	37.2	29.8	22.8	21.2	18.1	20.1	30.6	31.2	35.3	36.7	40.1
Lowest on Record	23	2.4	2.3	2.3	2.3	-0.5	-1.0	-1.7	-2.5	-3.1	-0.5	1.3	2.3	-3.1

Table 6 - Summary of Land Unit Descriptions, from G T Sibley*

See also accompanying plan

Unit (Sub-Unit)	% of Total Area	Climate	Parent Materials	Relief	Soils	Characteristic Vegetation	Present Land Use
Baw Baw	4	Average annual precipitation = 1900 + mm. Snow lies on ground throughout winter. Severe exposed situation.	Upper Devonian granodiorite	High Plain of elevation 1370 to 1500 m. Rolling to Hilly with flat bottomed valleys.	Alpine humus soils, acid brown earths and peats.	Snow gum woodland on ridges. Sphagnum bog in valleys. Sod-tussock grassland elsewhere.	The most important water producing unit. Some grazing and recreational use.
Upper Tyers	27	Average annual precipitation = 1270 - 1900 mm. Snow common.	Upper Devonian granodiorite	Mountain slopes of Baw Baw plateau elevation range 450 - 1370 mm.	Transitional alpine humus soil and acid brown earths. Red earths on the lower slopes. Soil in sequence with altitude.	Wet sclerophyll forest of Mountain ash and Shining gum.	Important water and hardwood producing area.
Lower Tyers	40	Average annual precipitation = 1000 - 1270 mm	Silouro-Devonian mudstones, shales, fine sandstones and some limestone (Base rock of area).	Foothills. Steep hills and valley with narrow ridges.	Clay leptopodzols (Yellowish brown clay loams) weakly structured and of poor coherence. Of highest erosion hazard in the catchment.	Northerly aspect: Dry sclerophyll forest of Silvertop, Messmate and Prickly stringybark. Southerly aspect: Wet sclerophyll forest of Mountain grey gum, Messmate and Narrow leaf peppermint.	Hardwood forest predominantly. Important for maintaining water quality rather than quantity.
Tyers Junction	1	Average annual precipitation = 1140 mm	Recent Alluvium	Small alluvial flats in steep valleys.	Brown clay loams.	Originally wet sclerophyll forest of Candlebark, Messmate and Mountain grey gum.	Grazing and recreational uses.
Blairs Hill	3	Average annual precipitation = 1000 mm	Jurassic conglomerates and sandstones.	Deeply dissected narrow ridges and very steep slopes.	Skeletal red-brown clay loams.	Sheltered Slopes: Wet sclerophyll forest of Mountain grey gum, Messmate and Narrow leaf peppermint. Exposed Slopes: Red box, Prickly stringybark and Apple box.	Protection forest.

Unit (Sub-Unit)	% of Total Area	Climate	Parent Materials	Relief	Soils	Characteristic Vegetation	Present Land Use
Erica	9	Average annual precipitation = 1020 mm	Mid Tertiary basalt. Remnant of Victorian older Basalt flows.	Rolling to undulating plain with long moderate to steep slopes. Elevation 300 - 425 m.	Krasnozems (friable dark red-brown clay loams). Well structured and have the highest levels of fertility in the catchment. Low erosion hazard under pasture, but cultivation of steeper sections leads to sheet erosion and rilling.	Originally Silver top, Messmate and Mountain grey gum.	Grazing Cropping Residential Use
Leslies Track	14	Average annual precipitation = 890 - 1270 mm	Loose unconsolidated Tertiary sands gravels and clays capping ridges and hill slopes.	Broad, gently undulating ridges.	Podzolized duplex soils in general. Soils of low fertility and poor internal drainage.	Dry sclerophyll forest of Prickly stringybark, Silver top Messmate and Brown stringybark.	Forestry with some areas of grazing.
Coopers Turnoff	2	Average annual precipitation = 1140 mm	Tertiary sediments, capping ridges and hillslopes.	Broad, gently undulating ridges.	Brown acidic clay soils with large pieces of quartz grave in the profile. Quite porous soils.	Most variant of Dry sclerophyll forest of Silver top, Messmate, Mountain grey gum and Narrow leaf peppermint.	Forestry

Figure 2 - Land Units - Tyers River Catchment

