

SC/C/96.2

**SOIL CONSERVATION AUTHORITY  
REPORT ON  
LAKE MERRIMU (LERDERBERG RIVER)  
WATER SUPPLY CATCHMENT**

Prepared for consideration by the  
Soil Conservation Authority  
and  
Land Conservation Council

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## **1. INTRODUCTION**

The development of the Lake Merrimu water supply scheme has been planned in three stages.

Stage 1, which has been completed, involved construction of the 18 500 megalitre reservoir on Coimadai Creek and diversion into it of the Goodman's Creek via a tunnel. The catchments to Coimadai Creek and Goodman's Creek were proclaimed in 1965 and 1968 respectively, and both catchments have been land use determined.

Stage 2 involves the diversion of water from the Lerderderg River to Goodman's Creek and the purpose of this report is to recommend the proclamation of the catchment to the diversion site on the Lerderderg River.

A third stage is proposed to increase the capacity of the reservoir to at least 50 000 megalitres by increasing the height of the dam wall.

The water is used for irrigation, industrial and domestic uses in the Werribee, Melton and Bacchus Marsh areas. With the proposed rapid increase in the population of Melton, it is likely that an increasing proportion of the water supply will be used for domestic purposes. The water supplied to Melton will be treated by clarification and chlorination.

The State Rivers and Water Supply Commission on the 25<sup>th</sup> November, 1969, requested the Land Utilization Advisory Council to recommend that the Governor-in-Council proclaim this catchment.

## **2. CATCHMENT DESCRIPTION**

### **(a) General**

The catchment area of 218 square kilometres extends from the diversion weir site on the Lerderderg River upstream of the junction with Goodman's Creek, to Mt. Blackwood, Edwards Hill to the west, the Main Dividing Range in the North and just south of Trentham Township, and abuts onto the Goodman's Creek catchment in the east.

The catchment is predominantly timbered but includes the expanding Townships of Barry's Reef and Blackwood, as well as small areas of cleared land.

### **(b) Geology**

The base geological type in the catchment is Ordovician siltstone, slate, sandstone and claystone. The formation of the Rowsley fault during the late Pliocene and early Pleistocene eras rejuvenated the Lerderderg River and because the Ordovician rocks were fairly resistant to erosion, the gorge of the Lerderderg River is precipitous. This steep sided gorge is an extremely popular scenic area.

Subsequent eruptions of volcanic material from Blue Mountain, Mt. Wilson, Mt. Blackwood, Green Hills and near Trentham, produced tongues of basaltic lava which now remain as small areas of basalt caps within the catchment.

### **(c) Relief**

The area is renowned for the strongly dissected terrain where the Lerderderg River and its tributaries cross the fault scarp. To the west and north of the catchment the area is less strongly dissected and ridges capped with basalt are only gently undulating.

The highest peak in the area is the scoria cone of Blue Mountain at 873 m elevation.

The degree of dissection has been and will remain a strong influence on forest utilization in the area.

**(d) Climate**

**(i) Precipitation**

The headwater creeks of the Lerderderg River drain southern slopes of the Great Dividing Range. At this northern end of the catchment Blue Mountain and Mt. Wilson are in a region of high rainfall with an annual average of about 1120 mm. The elevation at the proposed weir site is 230 m, and the annual rainfall is approximately 660 mm.

The most central rainfall recording station in the catchment is Blackwood (610 m). There are also Forests Commission records for Blue Mountain and Mt. Blackwood but these are less complete.

Monthly and yearly rainfall data for Blackwood is shown in Table I. The average annual rainfall (from 1949-68) is 1060 mm on 148 wet days, a medium to high rainfall compared with other Victorian catchments.

The range of annual rainfall is from 574 mm in 1967 to 1430 mm in 1952, and the variability is 20.1%.

The highest monthly falls occur in May, July and August, with the pattern of rainfall being a rough single peak distribution, the maximum being in late winter (Table II).

**Storms**

An average of eight falls in excess of 25 mm in 24 hours are recorded each year at Blackwood, and these are most frequent in February, April, May and August. From Table III the proportion of storms to wet days in February is 13.8%, much higher than any other month and the yearly average of 5.6%.

The highest 24 hour rainfalls recorded over 86 years at Blackwood are 12.1, 12.0 and 11.9 cm in January, February and March respectively. Summer storms, generally of higher intensity than the steadier but greater winter falls, are more frequent than in the adjacent Rosslynne Reservoir Catchment.

**(ii) Temperature**

There is no temperature recording station in the catchment. However there is at Mt. Macedon, at 914 m elevation in similar country, and figures from there have been used and corrected for altitude (2.2<sup>0</sup>C for each 300 m lower elevation added to daily maximum figures, 1.6<sup>0</sup>C added to daily minimum figures) to approximate temperatures at Blackwood (610 m) in Table IV.

**(iii) Evaporation**

Evaporation figures are not available within the catchment, but have been estimated from Bureau of Meteorology potential evaporation maps, in Table V. January has the highest potential evaporation, the lowest average rainfall, and is the only month with less than a 50% probability of receiving rainfall effective for crop growth.

**(iv) Growing Season**

The growing season at Blackwood is ten months long, from early February to the end of December. This is calculated for the period median rainfall is greater than effective rainfall. Moisture therefore is not a limiting factor with respect to plant growth.

The mean calculated daily temperature is below 12.8<sup>0</sup>C for five months, restricting plant growth from late autumn to early spring, and below 10<sup>0</sup>C for the winter months, severely limiting growth.

**(e) River Gauging Data**

There are two relevant gauging stations on the Lerderderg River; one 0.8 km downstream of the Sardine Creek junction; the other just out of the catchment, 1.6 km upstream of the Goodman's Creek junction. Annual gauging data for these two appear in Table VI.

In the past river flow has stopped almost completely during drought; for example, for five months over summer and autumn 1967-68 there was no discharge measured. The maximum annual discharge at the Goodman's Creek gauge (between 1956 and 1970) was  $10.7 \times 10^7$  cubic metres in 1956-57.

The area of catchment for the Goodman's Creek gauge is 233 km<sup>2</sup> only 12.2 km<sup>2</sup> of which is outside the weir catchment, and for the Sardine Creek gauge is 153 km<sup>2</sup>. Mean annual discharges are  $3.57 \times 10^7$  m<sup>3</sup> and  $2.69 \times 10^7$  m<sup>3</sup> respectively. Thus the average runoff equivalent in annual rainfall is 15.3 cm for the larger area and 17.6 cm for the higher rainfall northern area only. These runoff figures represent a high proportion of the rainfall of 112 cm in the north decreasing to 66 cm in the south of the catchment.

All these points indicate the inability of the catchment to produce a sustained yield of water throughout the year.

(f) *Vegetation*

Along the Divide the dominant eucalypts are Messmate stringybark and Narrow-leaf peppermint, which have been utilized for pulp and hardwood logs. On drier sites, Brown stringybark and Mountain grey gum are found in association with the Messmate and peppermint.

On the stony slopes and ridge tops of the Blackwood Ranges and Lerderderg Gorge area, Broad-leaf peppermint, Red stringybark, Narrow-leaf peppermint, Long-leaf box, Stunted candlebark, Messmate and occasional Red ironbark are found. Also in this area there is a rich understorey of wattles, bush peas, gold-fields grevillea, bushy needlewood, rosy baeckea, tea tree, guinea flowers, heaths, tussock grass and in places austral grass tree, horny conebush and hairy boronia.

The rich vegetation, scenic views and low forest productivity combine to make this area highly suitable for recreational and educational uses.

(g) *Soils and Erosion Hazard*

The area is predominantly covered with acidic duplex soils with grey sandy clay loam over yellow or mottled clay. These soils have a high erosion hazard and are extremely dispersible in water. On the steeper slopes there is little soil development and the soils could be described as shallow skeletal soils with fractured rock at the surface.

Where the annual rainfall is greater than 800 mm, the soils on sedimentary parent material are generally yellow gradational soils with a moderate to high erosion hazard.

On the tongues of basalt near Trentham, red to red brown soils with a fairly high fertility and low erosion hazard have developed. These soils are generally used for agriculture and are quite productive.

There are small patches of krasnozem like soils formed on mudstone parent material near areas of volcanic soils and these soils are typically a dark brown sandy loam over friable red brown loam to 3-4 metres.

In the higher rainfall areas such as along the Blackwood Ridge Road, there are similar patches of brown sandy loam over light brown to red-brown clay loam with numerous quartz fragments to 10 cm throughout the profile.

The existing erosion in the catchment is limited to roadside erosion problems, minor erosion associated with logging and stream bank erosion. There is little loss of soil from freehold land.

### **3. LAND USE**

(a) *Forestry*

Throughout last century, the Wombat State Forest was heavily exploited for building and mine timbers, and firewood. The area is presently utilized for both mill logs and pulpwood.

Timber quality is variable, the better basaltic soils having good Messmate stands, with Narrow-leaf peppermint and some Candlebark, whereas the Ordovician soils support poorer Messmate with Narrow-leaf

and Broad-leaf peppermint. The south eastern corner of the catchment has some poor, stunted Red stringybark peppermint, and Long-leaf box on the rockier shallow soils.

The method of extraction has been selective logging for mill timber, followed by the taking of smaller and poorer quality trees for pulping. Clear felling, burning, and re-seeding will be used to some extent in the future, with messmate being planted. Forest Management Prescriptions for surrounding catchments are used generally throughout Daylesford and Trentham forest districts, rather than just in the catchments, in order to familiarise contractors with a consistent set of conditions.

The pulpwood is used under contract with the Forests Commission by Hardboards Australia Ltd., who take eighty thousand tonne per year, largely from the Wombat Forest. Output from their Bacchus Marsh factory is to be doubled over the next few years, and their timber needs will therefore increase.

A conflict of interest may occur in the catchment in winter; Hardboards Australia run their plant continuously and need a winter supply of timber, at a time when water quality criteria could be used to justify closing forest roads. A possible solution is for the hardboard manufacturer to use timber stockpiled at less sensitive times of the year, and use mill waste instead of newly cut roundwood, when the catchment is most susceptible to damage.

The Forests Commission plans to convert two hundred hectares per year to softwoods in the Daylesford-Trentham area. A.V. Wehl Industries of Ballarat have an agreement for softwood timber from the area until 1989. Most of this will come from outside the catchment, but a strip within the catchment north of O'Brien's Road, on the Ordovician soils, is to be planted. At present there are only a few hectares of softwoods in isolated plantations in the catchment.

### **(b) Mining**

In the Blackwood area quartz reefs, and deep leads comprising old alluvial deposits with overlying Pleistocene basalt, have been worked extensively for gold in the past. Several recent attempts have been made to reopen old mines and rework the tailings. In the catchment at present there is one granted Mining lease, ML 35, situated at Simmon's Reef west of Blackwood, and two current applications, - ML 110 and ML 248; one Mineral Search License, No. 1110, involving exploratory work for a range of metals other than gold; and one current tailings license application, TL 3936.

The Authority and Forests Commission are given the opportunity of objecting to Mining proposals, in water supply catchments. Conditions under which the licensee or lessee may operate are inserted in the granted applications, and these safeguards include sureties against catchment and road damage.

The Lerderderg valley is a favoured area for gold and gem fossickers, and at present there are approximately fifty Miner's Rights within the catchment. The Mining Registrar covering the area is a Blackwood.

The operation of mining ventures is generally not in the best interests of water quality, and it is hoped that the Lerderderg catchment will in future be excepted from occupation under Miner's Rights, as have the other catchments in the Merrimu scheme, and the Rosslynne and Djerriwarrh catchments.

### **(c) Roads**

The main Trentham-Blackwood-Myrniong Road is sealed and in good condition. Settlement within the catchment at Blackwood, Barry's Reef and Newbury is all close to this road which therefore takes most of the day-to-day traffic.

The ridge roads along the catchment boundary have been recently upgraded, and are now in good condition, except for the Mt. Blackwood road between the main Blackwood road and the mountain, which is only in fair condition with wheel track rilling and poor drainage. On the east side of the catchment Bluegum track, from O'Brien's Track to West No. 5 track, has recently been graded and reformed with several culverts and cutoffs, but from there on is in an extremely poor condition.

Unsealed roads within the catchment present a water quality hazard. The Ordovician duplex soils wash readily when bared, and continual trafficking of log trucks and weekend travelers can cause damage to the roads, leading to siltation and turbid runoff. Placement and maintenance of these roads is not good, as most

have evolved from mine or logging access tracks, and are not always sited along the most stable alignment. Some track sections lie along drainage lines or cross watercourses with makeshift structures, and most of these tracks have insufficient drains and culverts. In winter 1974, several roads to areas being logged were closed by the District Forester to reduce degradation of water quality.

Construction of the access road to the Lerderderg portal of the Lerderderg-Goodmans Creek tunnel, by the State Rivers and Water Supply Commission, has highlighted difficulties caused by the soil type and terrain. Where the road descends to the portal site, both cut and fill batters have slumped badly. The cut slopes are steep of necessity, and will continue to slump, covering the road with rock and soil, but the main fill should settle and stabilise.

The Forests Commission intends to improve the accessibility of the area to weekend use, by providing picnic facilities, signposting roads, and publishing maps. Use of unsealed roads can be expected to increase, particularly along Bluegum Track and the south-eastern Forest Park area. Lerderderg and Hogan tracks provide near access to the river, but are not in good condition, with 30 to 40 cm deep rilled wheel ruts on some steep sections.

A considerable improvement in the standard of roads within the catchment will be necessary to maintain water quality for domestic purposes.

#### ***(d) Agriculture***

The area of agricultural land is 13 square kilometres, most of which is along the divide at the north edge of the catchment. This is undulating country, the only steep area being on Blue Mountain. In the south, the freehold farmland is more hilly on the slopes of Mt. Blackwood.

The Divide country has a quite high rainfall (1100 mm), and remnants of recent basalt flows here have produced well-structured red soils suitable for potato cropping. Within the catchment there is at present only a small area under potatoes, more intensive cultivation occurring further north toward Trentham. Pastures, used for grazing sheep and cattle are generally improved and in good condition. Major drainage lines are still under timber, and this areas overall does not represent a great hazard to water quality.

On the steep south slope of Blue Mountain, about five hectares has been extensively cultivated to bracken. This year only one hectare has been sown, on the lower, flatter slope. There is a wide strip of State forest between this block and the drainage line.

At Mt. Blackwood, in the lower rainfall part of the catchment (700 mm), the soils derived from the basalt have a poorer structure and have a high erosion hazard. Cropping is not carried out here, the land being used for sheep and cattle grazing. Pastures are largely native annuals, undergrazed this year and giving a good cover.

#### ***(e) Recreation***

Recreational use of the Lerderderg Valley and Wombat Forest is high, and will increase with growth in Melbourne's Western suburbs and satellites. The small towns to Blackwood and Barry's Reef have the potential for growth, and many houses have been built or rehabilitated in the last few years by weekend visitors. Resident and tourist pressure on services and recreational facilities in the area will increase, bringing problems with rubbish and effluent disposal and earthworks.

The roads through the forest carry extra traffic at weekends because of pleasure-driving and car rallies. The Forests Commission has set up picnic site fireplaces, benches, and toilets at O'Brien's Crossing, a popular stopping place on the Lerderderg River. Fosters Lookout, Blue Mountain, and other viewing points will similarly have increase use, and the associated traffic on some of the poorly sited unformed roads will cause deterioration and subsequent loss of water quality.

The Forests Commission has set up a 'Forest Park', one kilometre each side of the river, from the gorge mouth to Blackwood. A walking track is to be made for the full length of this which will lead to greater bush walking use along the river.

Future plans include making the steep rocky area of the catchment south of O'Brien's track into a Regional Park for recreation, as timber quality is poor and extraction difficult from the gorge country.

A map of the Forest Park was published in December 1974, detailing access points to the walking track, including several little known forest roads in the south east of the catchment. These are likely to be more heavily used in future, both by picnickers and motorised recreation vehicles. The latter have already been noticed in the area, and their potential for damaging the erodible Ordovician skeletal soils is very high.

**(f) Land Tenure**

Almost all of the Lerderderg Catchment is within the Wombat State Forest covering 193 square kilometres of the catchment total of 218 sq km. Of the forest, 31 sq km is in the Lerderderg Forest Park.

Blackwood and surrounding towns were originally settled by gold-miners, and still have some informality in land ownership. Scattered houses around Barry's Reef and Blackwood are not on surveyed blocks, but the Lands Department are rationalising these by granting a "residential area" or "permissive occupancy" to house owners. Approximately 1.9 sq km is freehold in residential-sized blocks.

Some areas are leased under annual license within the town, for example, the Australian Boy Scout Association has a 4 ha. License at Barry's Reef. There are several unused road licenses, number 31414 in Bullarto South, 54340 at North Blackwood, and 26938 on Mt. Blackwood, and a short length of road at Newbury has been closed.

Freehold land as farms makes up 12.8 sq km. The remaining area is Crown land, 8.3 sq km being unsubdivided town reserves, and 0.2 sq km is miscellaneous reserves.

The surveyed Blackwood-Trentham, Mt. Blackwood, and Golden Point roads, and road reserves in the townships, make up the final 2 sq km.

#### **4. RECOMMENDATIONS**

- 1) That the Land Conservation Council recommend to the Governor-in-Council that the Lerderderg River Water Supply Catchment be proclaimed (as per attached plan) under Section 5(b) of the Land Conservation Act 1970 and Section 22(1) of the Soil Conservation & Land Utilization Act 1958.
- 2) That the Mines Department be requested to except this catchment from occupation under a Miner's Right, under the provisions of Sections 7 and 347 of the Mines Act.
- 3) That a land use determination proceed in this catchment following proclamation.

P.N. King  
S. Ransome  
Catchment Investigation Officers



**TABLE 1 - MONTHLY AND YEARLY RAINFALL TOTALS – BLACKWOOD 1949-68 in mm**

<b>YEAR</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUNE</b>	<b>JULY</b>	<b>AUG</b>	<b>SEPT</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>	<b>Annual cm</b>	<b>Wet Days</b>
1949	25.9	188.5	110.7	21.0	83.3	77.0	62.7	41.9	74.9	152.6	156.5	18.3	101.3	153
1950	16.8	151.4	109.9	114.3	102.3	26.1	91.2	105.7	165.8	114.3	54.9	76.2	113.3	136
1951	18.0	260.6	4.8	221.0	142.2	94.0	144.3	172.7	68.8	114.8	79.2	42.7	126.5	150
1952	24.1	45.7	77.2	125.5	145.8	295.9	118.8	132.6	96.5	153.2	153.4	60.7	143.0	160
1953	68.1	37.6	11.4	49.8	84.1	102.1	130.8	142.2	146.0	106.2	106.4	50.8	103.6	141
1954	98.6	110.0	17.0	113.0	49.5	115.1	43.7	130.3	84.1	104.9	162.0	151.6	117.8	126
1955	34.5	141.7	26.4	34.0	83.8	135.6	75.2	260.8	80.2	95.5	61.2	123.2	115.3	147
1956	63.5	1.0	59.4	135.3	243.6	134.3	110.7	120.6	183.6	138.2	54.3	23.1	126.7	154
1957	6.6	35.3	39.4	48.7	51.3	82.0	174.0	63.2	100.6	107.9	81.5	41.9	83.3	143
1958	19.1	77.0	19.1	22.1	153.9	36.1	124.2	189.5	104.1	114.3	68.1	39.4	97.3	155
1959	22.9	63.0	130.0	15.2	25.1	113.5	59.4	117.3	108.9	102.1	28.7	65.8	85.1	119
1960	34.0	58.0	26.2	177.8	270.5	82.3	151.9	82.8	186.2	38.6	166.1	43.7	131.8	156
1961	30.0	30.2	126.5	104.4	49.0	111.7	120.6	122.7	66.8	62.5	22.8	66.0	91.4	130
1962	51.6	41.9	44.7	61.2	152.6	105.4	90.4	105.2	73.2	137.4	32.0	55.1	95.0	145
1963	172.7	40.0	20.8	76.2	181.3	71.1	165.1	95.5	122.2	90.9	19.3	35.0	109.0	147
1964	10.4	109.0	38.3	148.1	68.6	99.8	205.0	98.8	150.6	120.4	58.4	88.1	117.0	170
1965	5.6	1.3	17.6	124.8	85.8	66.0	137.4	144.0	63.2	37.3	116.1	72.6	87.1	147
1966	22.9	78.7	82.8	56.4	48.5	33.5	148.8	142.2	112.8	100.8	56.4	121.4	100.5	168
1967	20.3	6.35	36.6	29.7	40.1	38.6	73.1	138.2	73.7	27.4	26.9	63.7	57.4	140
1968	42.2	4.06	31.0	96.0	193.5	109.2	117.3	173.7	54.9	132.8	87.1	114.8	115.6	179
MEAN	39.4	73.0	51.6	83.8	112.8	96.5	117.3	129.0	105.9	102.9	79.5	67.8	105.9	148

**TABLE II - MEAN SEASONAL RAINFALL AT BLACKWOOD - 1949-1968 INCLUSIVE (mm)**

<b>AUTUMN</b>		
	<i>MARCH</i>	50.80
	APRIL	83.82
	MAY	111.76
	Subtotal	246.38
<b>WINTER</b>		
	JUNE	96.52
	JULY	116.84
	AUGUST	129.54
	Subtotal	342.90
<b>SPRING</b>		
	SEPTEMBER	106.68
	OCTOBER	104.14
	NOVEMBER	78.74
	Subtotal	289.56
<b>SUMMER</b>		
	DECEMBER	68.58
	JANUARY	38.10
	FEBRUARY	73.66
	Subtotal	180.34
	<b>TOTAL</b>	<b>1059.18</b>

**TABLE III - PROPORTION OF RAIN WHICH FALLS IN STORMS EXCEEDING 25 MM PER DAY  
BLACKWOOD, FOR THE 20 YEAR PERIOD 1949 – 1968 INCLUSIVE**

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
<b>A. No. of Wet Days</b>	110	130	157	219	314	312	374	352	304	298	220	184	2974
<b>B. No. of Storms</b>	9	18	11	18	20	11	15	19	16	12	9	8	166
<b>B/A%</b>	8.2	13.8	7.0	8.2	6.4	3.5	4.0	5.4	5.3	4.0	4.1	4.4	5.6

**TABLE IV - CALCULATED BLACKWOOD DAILY AVERAGE MAXIMUM, MINIMUM AND MEAN TEMPERATURES (°C)**

JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEAR AVER.	
24.1	24.3	21.7	18.6	12.9	9.7	9.0	10.5	13.7	17.4	20.5	23.5	17.0	<b>MAX.</b>
14.6	13.7	11.9	9.5	6.9	5.4	4.4	4.9	6.5	6.2	9.9	11.9	8.9	<b>MIN.</b>
18.5	19.0	16.8	13.1	10.1	7.6	6.7	7.7	10.1	12.8	15.2	17.6	13.0	<b>MEAN</b>

**TABLE V - MONTHLY & ANNUAL EVAPORATION AT BLACKWOOD FROM  
MAP OF AUSTRALIAN POTENTIAL EVAPORATION**

<b>Month</b>	<b>Evaporation (mm)</b>	<b>E/3</b>	<b>Rainfall (mm)</b>
January	178	59	39.4
February	127	42	73.0
March	114	38	51.6
April	76	25	83.8
May	51	17	112.8
June	25	8	96.5
July	25	8	117.3
August	38	13	129.0
September	64	21	105.9
October	89	30	79.5
November	102	34	67.8
December	152	51	105.9
<b>Annual</b>	<b>1041</b>	<b>347</b>	<b>1059.2</b>

**TABLE VI - MONTHLY & ANNUAL AVERAGE STREAM DISCHARGE DATA**

Month	Mean Monthly River Discharge x 10 <sup>6</sup> m <sup>3</sup>	
	Goodman's Creek	Sardine Creek
May	3.00	1.69
June	2.40	1.82
July	6.60	5.13
August	7.49	5.77
September	7.04	5.06
October	4.76	3.49
November	1.61	1.35
December	0.91	0.71
January	1.01	1.03
February	0.10	0.11
March	0.22	0.20
April	0.42	0.41
<b>Annual</b>	<b>35.7</b>	<b>26.9</b>