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**SOILS OF THE VINEYARDS OF  
THE GREAT WESTERN DISTRICT**

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## CONTENTS

<b>ACKNOWLEDGEMENT .....</b>	<b>IV</b>
<b>SECTION 1 - SCOPE AND PURPOSE OF THE INVESTIGATION .....</b>	<b>1</b>
<b>SECTION 2 - GENERAL INFORMATION ABOUT THE AREA.....</b>	<b>3</b>
1.1 Area And Location .....	3
2.2 Climate .....	3
<b>SECTION 3 - SOIL SURVEY METHODS.....</b>	<b>8</b>
3.1 Soil Mapping .....	8
3.2 Sampling.....	8
3.2.1 Soil Sampling .....	8
3.2.2 Water Sampling .....	8
3.3 Analyses .....	8
3.3.1 Soil Analyses .....	8
3.3.2 Water Analyses.....	9
<b>SECTION 4 - SURVEY RESULTS .....</b>	<b>10</b>
4.1 The Soils.....	10
4.2 The Vineyards.....	30
<b>PART 1 - BESTS' VINEYARDS.....</b>	<b>31</b>
<b>PART II - KIMBARRA.....</b>	<b>50</b>
<b>PART III - SEPELT'S GREAT WESTERN VINEYARDS .....</b>	<b>65</b>
<b>PART IV - WESTGATE.....</b>	<b>106</b>
<b>REFERENCES .....</b>	<b>121</b>

## LIST OF FIGURES

Figure G-1: Locality Plan.....	2
Figure G-2: Distribution Of The Annual Rainfall* .....	4
Figure G-3: Average Monthly Temperatures* .....	5
Figure G-4: Average Relative Humidity At Ararat .....	6
Figure G-5: Physical Properties of the Surface Soils (0-7.5 cm).....	29
Figure B-1: Distribution of the Annual Rainfall at Bests' Vineyards.....	31
Figure B-2: Locations of Dams and the areas they currently irrigate on Bests' Vineyards.....	43
Figure K-1: Distribution of the Annual Rainfall at Kimbarra .....	51
Figure K-2: Soil Map of Kimbarra Vineyards Great Western, County of Borung, Victoria .....	60
Figure S-1: Distribution of the annual rainfall at Seppelt's Great Western Vineyards.....	65
Figure S-2: Average Temperatures at Seppelt's Great Western Vineyards.....	66
Figure S-4: Index to Soil Maps of Seppelt's Great Western Vineyards .....	91
Figure S-5: Soil Maps of Seppelt's Great Western Vineyards .....	92
Figure W-1: Distribution of the Annual Rainfall at Westgate (Armstrong).....	107

## LIST OF TABLES

Table G-1 - Average Rainfall at Stawell, Great Western and Ararat.....	3
Table G-2 - Average Temperatures at Stawell and Ararat.....	4
Table G-3 - Average Relative Humidity at Ararat*.....	5
Table G-4 - Average Number of Frost Days Occurring Each Month and Frost-free Periods for Stawell and Ararat* .....	6

Table G-5 - Frequency “number of days” of Strong Wind (> 25 knots) for Stawell and Ararat* .....	6
Table G-6 - Sky Cloudiness Data for Stawell and Ararat* .....	7
Table G-7 - Soil Series and their Corresponding Types and Phases.....	10
Table B-1 - Average* Rainfall at Bests’ Vineyards, Great Western .....	31
Table B-2 - The Main Soils of Bests’ Vineyards.....	32
Table B-3 - Distribution of the Mapping Units on Bests’ Vineyards .....	32
Table B-4 - Analytical Data for Dam Water Samples from Bests’ Vineyards .....	43
Table K-1 - Average* Rainfall at Kimbarra, Great Western .....	50
Table K-2 - The Main Soils of Kimbarra Vineyards .....	52
Table K-3 - Distribution of the Mapping Units on Kimbarra Vineyards.....	52
Table K-4 - Analytical Data for Dam Water Samples from Kimbarra Vineyards.....	59
Table S-1 - Average* Rainfall at Seppelt’s Great Western Vineyards .....	65
Table S-2 - Average* Monthly Temperatures at Seppelt’s Great Western Vineyards .....	66
Table S-3 - The Main Soils of Seppelt’s Great Western Vineyards .....	66
Table S-4 - Distribution of the Mapping Units on Seppelt’s Great Western Vineyards.....	67
Table S-5 - Analytical Data for Dam Water Samples from Seppelt’s Great Western Vineyards.....	88
Table W-1 - Average* Rainfall at Westgate, Armstrong.....	106
Table W-2 - The Main Soils of Westgate Vineyards.....	108
Table W-3 - Distribution of the Mapping Units on Westgate Vineyards .....	109
Table W-4 - Analytical Data for a Water Sample from an Abandoned Mine Shaft on Westgate Vineyards.....	115

## APPENDICES

Appendix B - Analytical Data for representative profiles from Bests’ Vineyards .....	46
Appendix K - Analytical Data for representative profiles from Kimbarra Vineyards .....	62
Appendix S - Analytical Data for representative profiles from Seppelt’s Great Western Vineyards .....	98
Appendix G - Definition of Soil Terms .....	122

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The survey described in this report was carried out by officers of the Soil Section of the Division of Agricultural Chemistry, Department of Agriculture, Victoria. Laboratory analyses of soil and water samples were carried out by chemists of that Division.

The landholders, without exception, freely allowed the soil surveyors access to their properties and provided all the relevant information.

For part of the field survey, the Management of the Seppelt's Great Western Vineyards supplied a vehicle and a field assistant.

Particular mention must be made of Mr. J. J. Martin, Senior Soils Officer and Miss C. Lawson, Typist, for their assistance in the preparation of this report.

The author extends his sincere thanks to all of these people.

# **SOILS OF THE VINEYARDS OF THE GREAT WESTERN DISTRICT**

By Nabil S. Badawy

Soils surveyed by N. S. Badawy and N. B. Lewis

## **SECTION 1 - SCOPE AND PURPOSE OF THE INVESTIGATION**

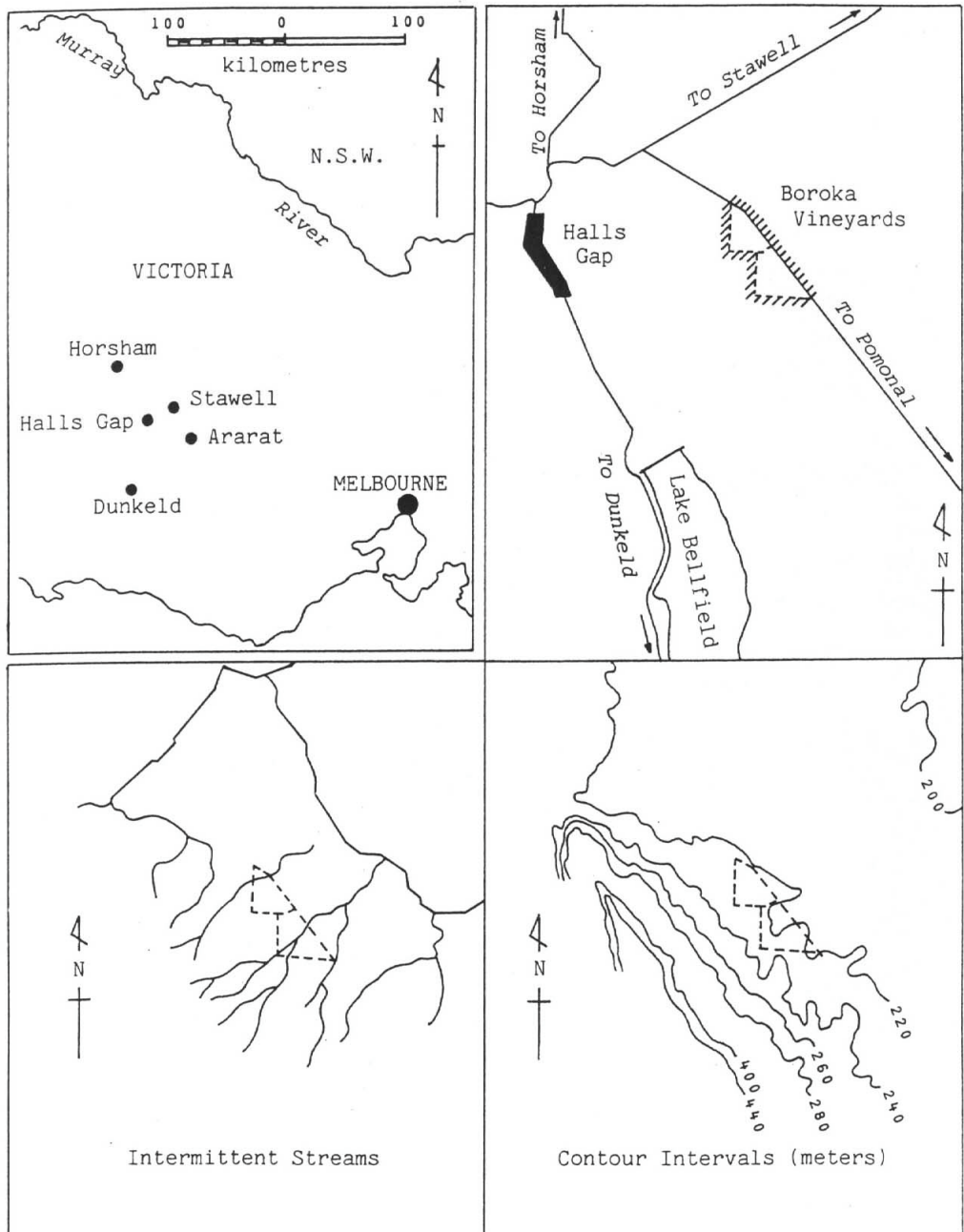
The Great Western and District Viticultural Association, representing the wine-grape growers in the Stawell, Ararat and Avoca districts indicated that the recent few years have been a decline in vine vigour which has, in some cases, severely decreased grape production. Although some of these vines are approaching the end of their economic life, it is well documented that adverse soil properties contributed significantly to the fall in plant productivity. Therefore, evaluation of soil resources in the vineyards concerned provides a valuable guide for future replanting as well as for adopting those management practices which most improve grape production and/or quality.

A soil survey was conducted by the Victorian Department of Agriculture aiming at describing and mapping the distribution of the various soil types used for growing grapevines in the shires of Stawell and Ararat. The field operation of the survey was carried out during autumn and spring, 1980.

The present report summarises the soil data and other relevant information obtained for the vineyards surveyed in the Great Western area. In this survey, 22 different soils supporting vines of various ages, varieties and yielding performances have been recognised and shown on soil maps. In addition to having adverse properties, some of these soil types occur on topographical positions unfavourable for the optimum performance of grapevines.

It is envisaged that the data included in this report will form the basis for initiating future soil-water-plant studies with the overall objectives of maximising wine-grape production in Western Victoria.

Figure G-1: Locality Plan



## SECTION 2 - GENERAL INFORMATION ABOUT THE AREA

### 1.1 Area And Location

The total area included in this survey is about 460 hectares located in the south-east section of the Stawell Shire, County of Borung, approximately 200 kilometres west north-west of Melbourne (Figure G-1). The areas surveyed consisted mainly of varied size vineyards and some pasture lands for which future vine planting is considered. These areas are, commercially, separated into four groups, presented in this report as follows:

- (i) Bests Vineyards
- (ii) Kimbarra
- (iii) Seppelt's Great Western Vineyards
- (iv) Westgate

### 2.2 Climate

In general, moderately dry hot summers and wet mild winters are the common climatic features of the area surveyed.

In addition to rainfall and air temperature other elements including relative humidity, frost, wind, and sunshine are considered to be economically important to the productivity of grapevines. For the purpose of this report, the relevant weather recording stations are Stawell, Ararat and Great Western (rainfall only). Presented below is a summary of the climatic data obtained for these stations from up-to-date computer records supplied by the Bureau of Meteorology, Melbourne.

#### (a) Rainfall

On average, the surveyed area receives about 570 mm of rain annually. Usually 60-65% of these rains fall during the May-October period. January is often the driest month.

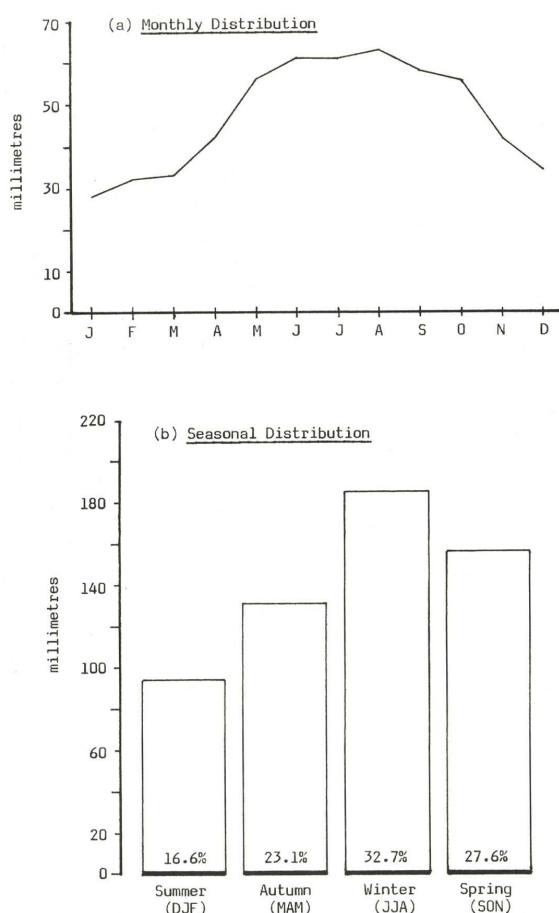
Table G-1 and Figure G-2 below, illustrate the distribution pattern of the long-term average rainfall through the year using the data recorded at selected stations near the surveyed area.

**Table G-1 - Average Rainfall at Stawell, Great Western and Ararat**

Month	STAWELL (116 years)		GREAT WESTERN (89 years)		ARARAT (120 years)	
	Rainfall	Raindays	Rainfall	Raindays	Rainfall	Raindays
	mm	(No.)	mm	(No.)	mm	(No.)
January	26	4	26	3	32	5
February	31	4	31	4	35	6
March	30	5	30	4	39	6
April	40	7	40	6	45	9
May	54	10	54	9	60	13
June	62	12	57	10	65	15
July	57	14	63	13	64	15
August	59	14	63	12	68	15
September	55	11	56	10	63	14
October	52	10	54	9	63	12
November	40	7	39	6	48	9
December	31	6	34	5	37	7
Year	537	104	547	91	619	126



**Figure G-2: Distribution Of The Annual Rainfall\***



\* Using mean long-term averages for Stawell, Great Western and Ararat.

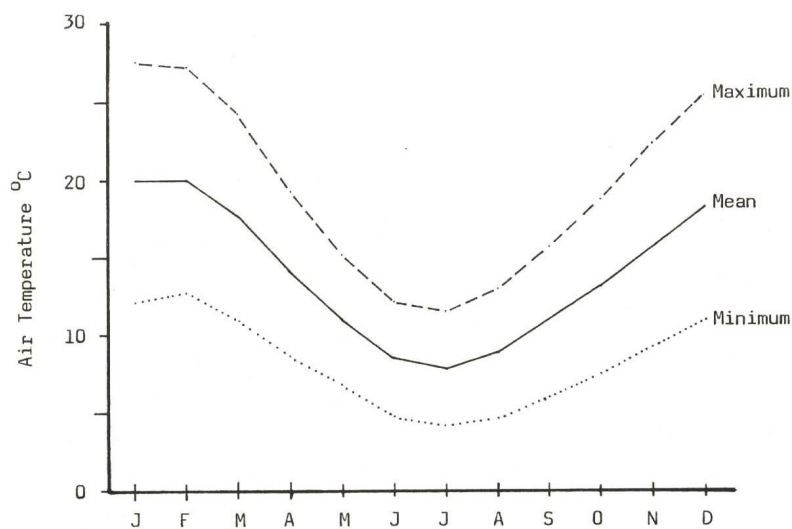
**(b) Temperature**

Generally, the area has cool winters and hot summers. January and February are, usually, the hottest months of the year and July is the coolest. Temperatures fall rapidly during the autumn months and then more gradually with the onset of winter. Distribution pattern of the minimum temperatures through the year usually follows that of the maximum temperatures (Figure G-3). Table G-2, below, lists the long-term average temperature data obtained for the Stawell and Ararat stations.

**Table G-2 - Average Temperatures at Stawell and Ararat**

Month	STAWELL (69 years)		ARARAT (78 years)	
	Maximum	Minimum	Maximum	Minimum
January	28.4	12.8	26.5	11.5
February	28.0	13.2	26.4	12.1
March	25.0	11.5	23.4	10.6
April	19.8	9.0	18.6	8.3
May	15.7	6.9	14.6	6.6
June	12.7	4.8	11.5	4.7
July	12.1	4.1	10.9	4.0
August	13.5	4.8	12.3	4.6
September	16.4	6.1	15.0	5.9
October	19.5	7.7	17.9	7.2
November	22.9	9.6	21.2	8.6
December	26.3	11.4	24.3	10.2

**Figure G-3: Average Monthly Temperatures\***



\* Using mean long-term averages for Stawell and Ararat

**(c) Relative Humidity**

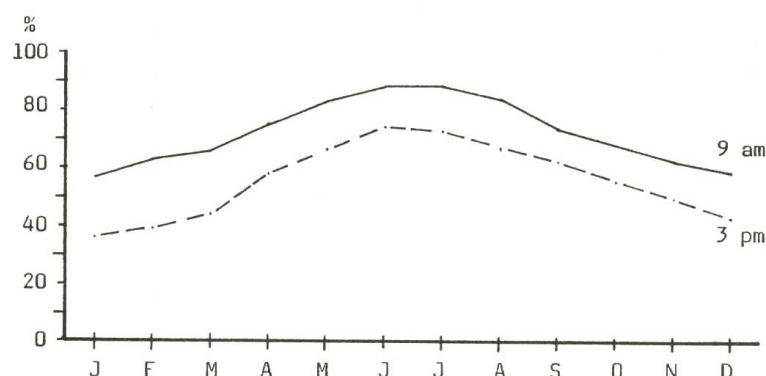
The aridity of the climate depends on total rainfall, temperature, and relative humidity. As for temperature, the relative humidity at 9 am approximates the mean value for the day (24 hours). The relative humidity at 3 pm, occurring around the warmest part of the day on the average, is representative of the lowest daily values. Similarly, the daily maximum relative humidity is usually in the early morning when air temperature is at a minimum.

In the study area, the long-term relative humidity averages were similar for the Stawell and Ararat stations. Table G-3 and Figure G-4 below, illustrate the distribution pattern of the relative humidity averages through the year using the data recorded at Ararat.

**Table G-3 - Average Relative Humidity at Ararat\***

Month	9 am		3 pm	
	Average	Range	Average	Range
	%	%	%	%
January	57	46-74	36	24-68
February	63	43-80	39	23-69
March	66	46-81	44	26-72
April	75	64-85	58	40-86
May	83	68-92	66	51-85
June	88	76-94	74	63-91
July	88	78-96	73	62-87
August	83	69-91	67	50-88
September	74	62-88	62	39-87
October	68	37-87	55	25-85
November	62	49-80	49	31-78
December	58	41-77	42	29-69

**Figure G-4: Average Relative Humidity At Ararat**



**(d) Frost**

Light frosts usually occur when air temperatures drop below 2.2°C, while severe frosts are commonly associated with 0°C or lower. In the study area, several frosts are common each year during the cooler period (May-October), although in some locations light frosts may occur as early as April and as late as November. Severe frosts however, do not usually occur in months other than June, July and August. Air temperature data recorded at Stawell and Ararat indicate that the average frost-free periods are 258 and 240 days for the two stations respectively (Table G-4, below).

**Table G-4 - Average Number of Frost Days Occurring Each Month and Frost-free Periods for Stawell and Ararat\***

J	F	M	A	M	J	J	A	S	O	N	D	Year	Frost-free Period **
<u>STAWELL</u>													
0	0	0	0	2	7	8	5	3	1	0	0	26	258
<u>ARARAT</u>													
0	0	1	2	3	8	10	8	5	5	2	1	45	240

\* Using temperature data (number of days of 2.2°C or lower) available for all years of record since 1962.

\*\* Period between last and first temperature of 2.2°C or lower in two successive years. Data listed in this column are from the Resources Survey, Wimmera Region (1951).

**(e) Wind**

Wind is a highly variable element, especially when blowing over a strongly undulating ground surface similar to that of the area presented in this report. Table G-5, below, lists the yearly average occurrence and distribution of days of strong wind (greater than 25 knots) recorded at the Stawell and Ararat stations. The table also illustrates the variability in the patterns of Strong Wind frequencies at the two stations.

**Table G-5 - Frequency “number of days” of Strong Wind (> 25 knots) for Stawell and Ararat\***

Station	J	F	M	A	M	J	J	A	S	O	N	D	Year
STAWELL	0	1	0	0	0	0	0	0	0	1	1	1	4
ARARAT	1	2	1	1	2	2	1	2	2	3	2	3	22

\* Using available data for all years of record since 1962.

(f) **Sunshine and Radiation**

There is a strong negative correlation between cloudiness and duration of bright sunshine. Also, like sunshine, global (short wave) radiation is affected by cloudiness, but to a different degree. Records of sky cloudiness available for Stawell and Ararat therefore, are summarised below (Table G-6) in order to be used as a guide indicating the intensity and duration of sunshine and radiation in the study area.

**Table G-6 - Sky Cloudiness Data for Stawell and Ararat\***

Station & Element	J	F	M	A	M	J	J	A	S	O	N	D
<b>STAWELL</b>												
Number of clear days $\phi$	12	13	10	8	4	4	3	3	4	6	6	9
Number of cloudy days $\phi \phi$	6	5	7	11	15	14	16	14	12	11	10	8
Mean cloud cover (oktas):												
- @ 9 am	3	3	3	4	4	5	5	4	4	4	4	3
- @ 3 pm	3	3	4	5	5	6	6	6	5	5	4	4
<b>ARARAT</b>												
Number of clear days $\phi$	8	8	8	6	2	3	2	2	2	4	3	5
Number of cloudy days $\phi \phi$	8	7	10	13	17	16	19	17	15	16	14	12
Mean cloud cover (oktas):												
- @ 9 am	3	4	4	4	5	5	5	5	5	5	4	4
- @ 3 pm	3	3	3	4	5	5	5	5	5	5	4	4

\* Using available data for all years of record since 1908.

$\phi$  Less than  $\frac{2}{8}$  cloud cover.

$\phi \phi$  Greater than  $\frac{6}{8}$  cloud cover.