MMA Mount Mary Land System

Very gently undulating plains either side of the Eudunda - Morgan road in the Mt. Mary - Bower area

Area: 708.7 km^2

Annual rainfall: 225 – 310 mm average

Geology: The Land System is underlain by clayey sediments derived from the ranges to the west. Near the range the sediments often contain significant quartzite gravel indicating that the clay deposition was associated with stream flow. The amounts decrease with distance from the range. Towards the east the depositional environment appears to have been lacustrine (ie lake bed), as the clays are stone free and often gypseous. The clays were subsequently covered by a layer of calcareous material (probably wind blown), which hardened to calcrete over time. This layer has since been largely removed by stream erosion, re-exposing the older clayey sediments.

Topography: The Mount Mary Land System is a weakly dissected calcreted outwash fan. The original land surface was very gently inclined to level with a slope of less than 1%, overlain by a mantle of calcrete. Streams emanating from the ranges to the west have partially eroded the calcrete cap. The resulting land surface includes alluvial flats where the calcrete cap has been entirely removed, gently undulating plains where it has been partly removed, and stony bench-like rises where it is largely intact. The flats include narrow alluvial drainage depressions (usually nearer the ranges in the west) and broader lacustrine flats in the east. The benches are commonly almost flat with very low relief, but around the old lake systems in the east, the benches have relief of 10-15 m and side slopes of 10% or more. The land is characterized by light mallee scrub and chenopod shrubland.

Elevation: 240 m in the northeast to 70 m in the south

Relief: Maximum relief is 15 m, but usually less than 5 m

Soils: The soils are mostly deep and loamy. Most are calcareous throughout, although often this is due to recent deposition of carbonate dust. Clay content generally increases with depth. Some of the more highly calcareous soils are rubbly, and are underlain by sheet calcrete on rises.

Main soils

A6 Calcareous loam - extensive (flats)
A4 Rubbly calcareous loam - common (rises and flats)
B2 Calcareous loam over sheet rock - limited (rises)
A5 Rubbly calcareous loam on clay - limited (flats)

Minor soils

D4 Loam over red clay - flats, particularly in the east
A3 Deep calcareous loam - flats
C3 Gradational red loam - flats
C1 Gradational red sandy loam - flats
D3 Loam over poorly structured red clay - flats
H2/A4 Calcareous sandy loam - isolated lunette

Main features: The Mount Mary Land System is flat to very gently undulating with predominantly calcareous soils and limited areas of texture contrast soils. Many of the calcareous soils are shallow and rubbly. All soils are alkaline to the surface and strongly alkaline at depth. The over-riding limitation to land use is the low rainfall. Rangeland grazing is the predominant land use, although substantial areas (especially the stony rises) have either not been cleared of mallee scrub, or have regenerated.

Soil Landscape Unit summary: 24 Soil Landscape Units (SLUs) mapped in the Mount Mary Land System:

SLU	% of area	Main features #
JLA JLU	<0.1 0.2	Flats and drainage depressions formed on clayey sediments. **JLA** Non scalded flats. **JLU** Flats with up to 10% of land affected by scalding. Main soils: loam over red clay - **D4** (V), with calcareous loam - **A6** (C) and loam over poorly structured red clay - **D3** (L). These soils are deep and moderately fertile but have often been degraded by sheet erosion (caused by wind and / or water) in the past. Poor surface (and subsoil in the case of D3 soils) structure affect water infiltration and root growth to some extent, and can impede seedling emergence. The depth and fertility of the soils are satisfactory, although subsoil pH levels are very high and subsoil salinity can be moderately high. Low rainfall is the major limitation to productivity.
JPA JPE JPU JPo JPoo JPy	0.2 2.2 8.6 1.1 1.3 0.3	Flats and drainage depressions formed on clayey sediments. These may contain quartzite gravel (especially in western areas near the ranges), or gypsum (more common in the east). **JPA** Broad flats with slopes of less than 2%. **JPE** Drainage depressions with moderately well defined watercourses. **JPU** Flats with slopes of less than 2% and variable scalding. **JPo** Drainage depressions with scalded patches and eroded watercourses. **JPoo** Eroded and scalded watercourses. **JPy** Severely scalded flats with eroded watercourses. Main soils: loam over red clay - **D4** (E) and calcareous loam - **A6** (E) with gradational red loam - **C3** (L) and deep calcareous loam - **A3** (L). Soils are deep and moderately fertile but have often been degraded by sheet erosion (caused by wind and / or water) in the past. In severe cases (some are still visible as scalds), surface soils form crusts, leading to reduced infiltration and impeded seedling emergence. The depth and fertility of the soils are satisfactory; although subsoil pH levels are very high and subsoil salinity can me moderate. Low rainfall is the major limitation to productivity.
KFA KFB	0.5 0.2	Flats formed on alluvial sediments. There is minor scalding and watercourse erosion. **KFA** Level to very gently undulating flats. **KFB** Gently undulating flats. Main soils: calcareous loam - **A6** (E) and loam over red clay - **D4** (E). These soils are deep and moderately fertile, although subsoil pH levels are very high and subsoil salinity can be moderate. Low rainfall is the major limitation to productivity.
KKE	0.1	Old swamps. Main soils: calcareous loam - **A6** (E) and rubbly calcareous loam on clay - **A5** (E). Soils are deep and inherently fertile, but alkaline and possibly saline. Productivity is limited by low rainfall.
KOA KOE KOF	1.9 5.9 1.4	Drainage depressions and flats formed on clayey alluvium. In the west, near the ranges, these sediments often contain quartzite gravel. **KOA** Flats with slopes of less than 2%. **KOE** Drainage depressions with moderately well defined watercourses. **KOF** Lower outwash fans with slopes of 1-2% and some water course erosion. Main soils: calcareous loam - **A6** (V), with deep calcareous loam - **A3** (L), gradational red loam - **C3** (M) and loam over red clay - **D4** (M). These soils are deep, well structured and moderately fertile, although alkaline throughout, and extremely alkaline with depth. Low rainfall is the major limitation to productivity.

KVA	1.1	Flats formed on alluvial sediments, with limited areas of stony rises. Main soils: deep calcareous loam - **A3** (E) and calcareous loam - **A6** (E) on flats, and rubbly calcareous loam - **A4** (L) and calcareous loam over sheet rock - **B2** (M) on rises. The soils of the flats are deep, well structured and moderately fertile, although alkaline throughout, and strongly alkaline and marginally saline with depth. Low rainfall is the major limitation to productivity. The soils of the rises are shallow and stony with low productive potential.
KaE	<0.1	Depression formed on alluvial sediments. Main soils: gradational red loam - **C3** (E) and calcareous loam **- A6** (E) with loam over red clay - **D4** (C). Soils are deep, well structured and moderately fertile, although alkaline throughout, and strongly alkaline and marginally saline with depth. Low rainfall is the major limitation to productivity.
QIA QIB QIP	13.5 7.5 9.5	Low remnant benches where the ancient calcrete capping has been only partially eroded. About half of the unit is underlain by hard calcrete, almost half by rubbly calcrete, and in about 10% of the area (usually depressions), the hard calcrete has gone. Clayey sediments underlie the calcareous materials at variable depths as shallow as 40 cm, but usually deeper than 100 cm. There is a variable cover of surface calcrete and sometimes quartzite, up to 20%. **QIA** Very low benches with slopes of less than 2%. **QIB** Benches up to 10 m high created by downcutting of watercourses. These benches may have breakaway slopes as steep as 10-20%, with up to 50% surface stone. **QIP** Complex of 85% very low benches with slopes of less than 2% and extensive surface stone, and 15% depressions. Main soils: calcareous loam over sheet rock - **B2** (E) and rubbly calcareous loam (on clay) - **A4/A5** (E), with calcareous loam - **A6** (L) and gradational sandy loam - **C1** (L) in solution depressions. This land is very stony with shallow to very shallow soils. Much of it is under native vegetation. The depressions have deeper soils with moderate fertility, but moderate salt levels and high pH limit productive capacity.
QJP QJQ	5.4 2.7	Complex of stony rises and depressions. There is minor scalding in depressions. **QJP** Stony rises with 10-20% depressions. **QJQ** Stony rises with 20-30% depressions. Main soils: calcareous loam over sheet rock - **B2** (E) and rubbly calcareous loam - **A4** (E) on rises, with rubbly calcareous loam on clay - **A5** (M), calcareous loam - **A6** (M) and loam over red clay - **D4** (M) in depressions. Soils over the bulk of the land are shallow and stony with limited potential. Deeper soils (mainly in depressions) are fertile, but alkaline and marginally saline.
SRA SRB	36.0 0.2	Very gently undulating flats formed on clayey alluvium formerly capped by calcrete. The calcrete cap has been largely removed leaving a landscape of flats similar to the KO units with stony rises similar to the QI units, in an unmappable mosaic pattern. There is variable surface calcrete stone - negligible on flats and up to 20% on rises. **SRA** Very gently undulating flats with slopes of less than 2%. **SRB** Gently undulating slopes of 2-3% with isolated scalding. Main soils on flats: calcareous loam - **A6** (V), with rubbly calcareous loam on clay - **A5** (C) and gradational red loam - **C3** (M). Main soils on rises: rubbly calcareous loam - **A4** (V) with calcareous loam over sheet rock - **B2** (L). The main effect of the variability in depth of the soils is on moisture holding capacity. Otherwise, they are almost all calcareous throughout and highly alkaline at depth. Much of the land is undeveloped due to the low rainfall and significant proportion of shallow soils.
ZLS	<0.1	Lunette flanking the eastern side of an old lakebed. Soil (one description only) is calcareous sandy loam - **H2/A4**. This landscape feature is of no agricultural value and is highly susceptible to wind erosion.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

(D) Dominant in extent (>90% of SLU)
(V) Very extensive in extent (60–90% of SLU)
(E) Extensive in extent (30–60% of SLU)
(C) Common in extent (20–30% of SLU)
(L) Limited in extent (10–20% of SLU)
(M) Minor in extent (<10% of SLU)

Detailed soil profile descriptions:

A3 Deep calcareous loam (Calcic Calcarosol)
Calcareous loam to clay loam continuing below 100 cm with only minor increases in clay and carbonate content.

A4 Rubbly calcareous loam (Regolithic, Supracalcic / Lithocalcic Calcarosol)
10 - 20 cm calcareous sandy loam to loam over a rubbly Class III B or III C carbonate layer, over a very highly calcareous light brown sandy clay loam grading to reddish clay alluvium deeper than 100 cm.

A5 Rubbly calcareous loam on clay (Regolithic, Supracalcic / Lithocalcic Calcarosol)
10 - 20 cm calcareous sandy loam to loam over a rubbly Class III B or III C carbonate layer, over a very highly calcareous light brown sandy clay loam grading to reddish clay alluvium within 100 cm.

A6 Calcareous loam (Regolithic / Pedal, Hypercalcic Calcarosol)
10 - 20 cm calcareous loam to clay loam becoming more clayey and calcareous with depth with abundant soft carbonate from 30 cm grading to a reddish clay (older alluvium) from 60 cm. Variable quartzite gravel occurs throughout.

B2 Calcareous loam over sheet rock (Petrocalcic Calcarosol)
10 - 20 cm calcareous sandy loam to loam grading to rubbly sandy loam to sandy clay loam abruptly overlying sheet calcrete at 30 cm.

C1 Gradational red sandy loam (Calcic, Red Kandosol)
10 - 20 cm sandy loam grading to a weakly structured red sandy clay loam to sandy clay, calcareous from 30 cm, grading to medium textured reddish alluvial sediment from 60 cm. Surface soil may be calcareous from carbonate dusting.

C3 Gradational red loam (Calcic, Red Dermosol)
10 - 20 cm loam to clay loam grading to a well structured red clay, calcareous from 30 cm, grading to a reddish alluvial clay from 60 cm. Surface soil may be calcareous from carbonate dusting.

D3 Loam over poorly structured red clay (Calcic, Red Sodosol)
5 - 20 cm sandy loam to loam abruptly overlying a coarsely structured dispersive red clay, calcareous from 30 cm, grading to a reddish alluvial clay from 55 cm. The clay may contain variable quartzite gravel or gypsum crystals. Surface soil may be calcareous from carbonate dusting.

D4 Loam over red clay (Calcic, Pedaric, Red Sodosol)
5 - 20 cm sandy loam to loam abruptly overlying a well structured friable red clay, calcareous from 30 cm, grading to a reddish alluvial clay from 55 cm. The clay may contain variable quartzite gravel or gypsum crystals. The subsoil clay is friable although sodic (Pedaric) due to moderate salt content. Surface soil may be calcareous from carbonate dusting.

H2/A4 Calcareous sandy loam (Hypercalcic Calcarosol)
20 cm calcareous sandy loam grading to a very highly calcareous brown light sandy clay loam, becoming more sandy with depth.

Further information: DEWNR Soil and Land Program