

# MOT Montarra Land System

Undulating to rolling low hills on the eastern edge of Sellicks Hill Range and Meadows and Mount Magnificent area

**Area:** 74.5 km<sup>2</sup>

**Annual rainfall:** 770 – 935 mm average

**Geology:** The landscape is underlain by interbedded siltstones, sandstones, fine grained schists, slates and quartzites of the Saddleworth, Stonyfell and Balhannah Formations and the Belair Subgroup. These rocks are deeply weathered in places, and in the western areas in particular, there are extensive areas of deeply weathered lateritic material, remnants of an ancient land surface. Locally derived alluvial sediments occur in the valleys.

**Topography:** The main part of the Montarra Land System is a belt of low hills up to 60 m high abutting the eastern side of the Sellicks Hill Range. This is an old land surface which has been moderately dissected by streams flowing eastward off the range to form a sequence of undulating to gently rolling low hills capped by flat topped summit surfaces (old land surfaces), and separated by narrow valleys. The smaller section of the Montarra Land System between Meadows and Mount Magnificent is more strongly dissected, with greater relief (up to 100 m) and steeper slopes (up to 30%). These areas have a lower proportion of deep weathering summit surfaces.

**Elevation:** 250 m to 430 m

**Relief:** Up to 100 m but usually less than 60 m

**Soils:** The majority of soils are moderately deep to deep over weathering basement rock. They have sandy loam to loam surfaces over red or brown clayey subsoils; texture, colour and structure variations determined by differences in the rock. There are some shallow stony soils on steeper slopes. There are extensive ironstone soils on the lateritic remnants, and deep texture contrast or gradational soils on alluvium.

## Main soils

*Soils formed in weathering basement rock*

**K2c** Acidic loam over red mottled clay

**K4** Acidic sandy loam over brown clay

**K1c** Acidic gradational red loam

*Ironstone soils*

**J2** Acidic ironstone soil – sandy loam (**J2a**) or loam (**J2b**)

## Minor soils

*Soils formed in weathering basement rock*

**K1** Acidic gradational loam – on deeply weathered rock (**K1a**) or brown loam (**K1b**)

**K2** Acidic loam over clay – red clay (**K2a**) or brown clay (**K2b**)

**K3** Acidic sandy loam over red clay

**L1** Shallow stony soil – loamy (**L1a**) or sandy loam (**L1b**)

*Soils formed on alluvial sediments or deeply weathered rock*

**F1** Sandy loam over brown mottled clay – on deeply weathered rock (**F1a**), on fine grained alluvium (**F1b**) or coarse grained alluvium (**F1c**)

**M1** Deep sandy loam

**M2** Deep clay loam



**Main features:** The Montarra Land System is dominated by broad undulating to gently rolling low hills and ironstone crests extending from Pages Flat through Hope Forest to Kuitpo. The soils are sandy to loamy surfaced overlying thick clayey subsoils. These are moderately well drained with high water holding capacities. Inherent fertility is low to moderate and all soils are prone to acidification. The soils are erodible and all slopes are susceptible to erosion if soils are disturbed. Saline seepages (probably linked to the deep weathering profiles of the higher ground) occur sporadically. A smaller occurrence of the Land System to the east is steeper and mostly non-arable. Valleys with deep but imperfectly drained loamy texture contrast soils occupy less than 10% of the area.

**Soil Landscape Unit summary:** 14 Soil Landscape Units (SLUs) mapped in the Montarra Land System:

SLU	% of area	Main features #
AqD	0.2	<p>Moderately inclined to steep strike ridges, generally with well defined north-south lineation. Parent rocks are metamorphosed sandstones and quartzites of the Stonyfell and Mitcham Quartzite Formations. Slopes are 15% to 75% and relief is up to 100 metres. Creek lines are well defined and narrow, usually unmappable.</p> <p><b>AqD</b> Steep rocky hillslopes and prominent ridges with relief to 100 m and slopes of 30-75%. The soils usually have gravelly sandy to sandy clay loam surfaces and variably coloured and structured clay subsoils, formed on fresh weathering or deeply weathered and kaolinitic micaceous sandstones. Shallow stony soils are common on steeper or rocky slopes. Deeper texture contrast soils occur on lower slopes.</p> <p>Main soils: <u>Acidic sandy loam over brown clay on rock</u> - <b>K4</b> (E)  <u>Acidic sandy loam over red clay on sandstone</u> - <b>K3b</b> (L)  <u>Shallow sandy loam on rock</u> - <b>L1a</b> (C) on steeper rocky slopes  <u>Acidic gradational sandy loam</u> - <b>K5</b> (L) on upper slopes and crests</p> <p>Soil depth varies considerably as rocky reefs alternate with deeply weathered strata. Most soils are moderately well drained but inherent fertility is generally low and susceptibility to acidification is high. Slopes are usually too steep for uses other than grazing. Erosion potential is high to extreme.</p>
AvC AvD	22.4 2.9	<p>Rolling to steep low hills formed on interbedded sandstones and siltstones of the Stonyfell and Balhannah Formations.</p> <p><b>AvC</b> Rolling low hills with relief to 80 m and slopes of 16-30%.</p> <p><b>AvD</b> Steep rocky hills with relief to 120 m and slopes of 30-75%.</p> <p>Main soils are texture contrast types on weathering rock. They are:</p> <p><u>Acidic loam over red mottled clay</u> - <b>K2c</b> (E)  <u>Acidic sandy loam over brown clay</u> - <b>K4</b> (C)  <u>Acidic gradational brown loam</u> - <b>K1b</b> (C)  <u>Acidic gradational red loam</u> - <b>K1c</b> (L)  <u>Shallow loam and sandy loam</u> - <b>L1a/L1b</b> (M) on steeper and rocky slopes  <u>Ironstone soils</u> - <b>J2a/J2b</b> (M) on crests  <u>Loam over thick brown clay</u> - <b>F1a</b> (M) on lower slopes</p> <p>Although most soils are moderately deep and relatively fertile, the land is too steep for cultivated agriculture. It is well suited to perennial crops and pastures.</p>
AwC	1.8	<p>Low ridges of Stonyfell Quartzite up to 40 m high with slopes 15-30%. Up to 20% surface stone and minor outcrop. Soils have sandy loam surfaces and are shallow to moderately deep over rock.</p> <p>Main soils: <u>Acidic sandy loam over brown clay on rock</u> - <b>K4</b> (E)  <u>Shallow sandy loam on rock</u> - <b>L1b</b> (E)</p> <p>These isolated ridges are moderately steep with stony soils of variable depth, low fertility, and prone to acidification.</p>
AxC	5.5	<p>Moderately steep slopes formed on phyllites, fine grained schists, slates and metasiltstones of the Saddleworth Formation, with interbedded quartzites and metasandstones. Slopes are generally in the range 20% to 30%. Relief is up to 50 m. The dominant soils have loamy surfaces and clay subsoils with variable colours and structure depending on the type of parent rock.</p> <p>Main soils: <u>Acidic loam over red clay on rock</u> - <b>K2a</b> (C)  <u>Acidic sandy loam over red clay on rock</u> - <b>K3</b> (C)</p>



		<p><u>Acidic loam over brown clay on rock</u> - <b>K2b</b> (L)  <u>Shallow loam on rock</u> - <b>L1a</b> (L) on steeper rocky slopes  <u>Acidic gradational loam</u> - <b>K1a</b> (M) on upper slopes  <u>Acidic sandy loam over brown clay on rock</u> - <b>K4</b> (L) on quartzites</p> <p>These soils are generally moderately deep, inherently fertile and moderately well drained. The main limitation is the topography which is too steep for cultivation (erosion hazard), but generally suitable for well managed perennial crops.</p>
BbD	3.0	<p>Moderate slopes of 10-20% formed on phyllites, fine grained schists, slates and metasiltstones. The dominant soils have loamy surfaces and clayey subsoils with variable colours and structure depending on the type of parent rock.</p> <p>Main soils: <u>Acidic loam over red or brown clay on rock</u> - <b>K2a / K2b</b> (E) on fine grained rocks  <u>Acidic sandy loam over red or brown clay on rock</u> - <b>K3 / K4</b> (E) on quartzitic and coarser grained rocks  <u>Acidic gradational loam</u> - <b>K1a</b> (L) on upper slopes  <u>Shallow loam on rock</u> - <b>L1a</b> (M) on steeper rocky slopes</p> <p>These soils are generally moderately deep, inherently fertile and moderately well drained. Although they are inherently productive and used intensively, they are highly susceptible to erosion, so rigorous soil conservation management is needed. The land suites perennial crops.</p>
BhC BhD	7.1 27.3	<p>Rises and low hills formed on siltstones, sandstones and quartzites, deeply weathered in places, of the Saddleworth and Balhannah Siltstones/Shales, the Belair Subgroup and the Stonyfell Quartzite. Most of the land is undulating (along the eastern side of the Sellicks Hill Range), but in the Blackfellows Creek area the slopes are steeper. Rock and stone are only significant on the steeper slopes. Saline seepages occur sporadically on lower slopes and in drainage depressions.</p> <p><b>BhC</b> Undulating rises and gentle slopes with relief to 30 m and slopes of 4-10%.  <b>BhD</b> Gently rolling low hills with relief from 40-60 m and slopes of 10-18%.</p> <p>Most soils have sandy loam to loam surfaces overlying clayey subsoils grading to weathering rock at about a metre. Variations in surface texture and subsoil structure and colour are related to rock type. On lower slopes, soils are deeper over local alluvium or deep weathering profiles. On upper slopes, loamy ironstone soils with gradual increases in clay content with depth are common.</p> <p>Main soils: <u>Acidic loam over red mottled clay on rock</u> - <b>K2c</b> (E)  <u>Acidic sandy loam over brown clay on rock</u> - <b>K4</b> (C)  <u>Acidic gradational red loam</u> - <b>K1c</b> (C)  <u>Sandy loam over brown clay on deeply weathered rock</u> - <b>F1a</b> (M) on lower slopes  <u>Sandy loam over brown clay</u> - <b>F1b</b> (M) in creek flats  <u>Acidic, deep sandy loam ironstone soil</u> - <b>J2a</b> (M) on crests</p> <p>These soils are generally moderately deep to deep with high waterholding capacities. Natural fertility is low to moderate - some soils are quite sandy, but others are heavy loams, and all are susceptible to acidification. Most of the land is well suited to more intensive development, although salinity should be monitored and erosion control measures are essential wherever soils are disturbed.</p>
CaD	0.2	Low ridges similar to and associated with AwC, but with gentler slopes. Same comments apply.
FaZ	22.2	<p>Very gently undulating upper slopes and plateaux (summit surfaces) - remnant deeply weathered land surfaces. Underlying materials are kaolinized and lateritized sandstones and siltstones.</p> <p>Main soils: <u>Ironstone soils</u> - <b>J2a / J2b</b> (V)  <u>Acidic gradational loam</u> - <b>K1a</b> (C)</p> <p>These soils are deep but imperfectly drained due to thick subsoil clays, and infertile due to strong leaching and high concentrations of phosphate fixing ironstone gravel. Exposure on crests further reduces productive potential. Deeply weathered substrate materials often contain high amounts of salt which are dissolved and mobilized if watertables rise. Minimization of recharge through increased water use efficiency is critical on this land.</p>
FcZ	0.3	<p>Isolated summit surfaces (as for FaZ), but formed on siltstones.</p> <p>Soils are: <u>Loamy ironstone soils</u> - <b>J2b</b> (E)  <u>Acidic gradational loam</u> - <b>K1a</b> (E)  <u>Acidic loam over red clay</u> - <b>K2a</b> (C)</p> <p>The land is similar to <b>FaZ</b>, but soils are more fertile.</p>
LFB	0.9	<p>Lower slopes of 1-3%, formed on gravelly clays derived from the erosion of lateritic (ironstone) materials from adjacent hills. Watercourses are moderately well defined in broad, shallow depressions. Most soils have texture contrast profiles with sandy to loamy surfaces, often with</p>



		ironstone gravel, and yellow or brown mottled subsoil clays. Main soils: <u>Sandy loam over brown clay</u> - <b>F1a / F1b</b> (D) These soils are deep but usually imperfectly drained due to slowly permeable subsoils and position in landscape. Fertility is moderate to low, and soils are prone to acidification. There is minor salinity.
LdE	1.4	Creek flats formed on clayey alluvium. Main soils: <u>Sandy loam over brown clay</u> - <b>F1b</b> (E) <u>Deep clay loam</u> - <b>M2</b> (E) These soils are deep and moderately to highly fertile, but imperfectly drained. Productive potential is high although irrigation must be carefully managed to avoid waterlogging. Sporadic salinity should be monitored.
LtE	4.8	Drainage depressions formed on medium to coarse grained locally derived alluvium. Soils have thick sandy to loamy surfaces overlying mottled clayey subsoils. Main soils: <u>Sandy loam over brown clay</u> - <b>F1c</b> and <b>F1b</b> (V) <u>Deep sandy loam</u> - <b>M1</b> (C) These soils are deep and moderately fertile, but prone to waterlogging. Water courses are well defined and susceptible to erosion if banks are exposed.

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

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

### Detailed soil profile descriptions:

*Soils formed in weathering basement rock*

**K1a** Acidic gradational loam (Mesotrophic, Red Dermosol)

Thick fine sandy loam with minor ironstone grading to a brownish or reddish coarsely blocky clay loamy to clayey subsoil, siltier with depth, grading to kaolinized phyllite or siltstone, continuing to depths of 200 cm or more.

**K1b** Acidic gradational brown loam (Eutrophic, Brown Dermosol)

Medium thickness loamy surface soil, becoming clay loamy and gravelly with depth, overlying an orange, friable clay subsoil, grading to soft shale or siltstone.

**K1c** Acidic gradational red loam (Eutrophic, Red Dermosol)

Medium thickness dark brown loam with a paler coloured clay loamy A2 horizon containing abundant ferruginous rock fragments, overlying a red clay with polyhedral structure and increasing rock fragments with depth, grading to soft weathering siltstone at about 100 cm.

**K2a** Acidic loam over red clay on rock (Eutrophic, Red Kurosol)

Medium thickness reddish loam to clay loam with a gravelly and paler coloured A2 horizon, overlying a red, very well structured clay grading to weathering phyllite or siltstone from about 100 cm.

**K2b** Acidic loam over brown clay on rock (Mottled, Eutrophic, Brown Kurosol)

Thick loam with a paler coloured gravelly A2 horizon, overlying a dark brown, yellowish brown and red mottled, coarsely structured clay subsoil, grading to weathering metasiltstone or phyllite deeper than 100 cm.

**K2c** Acidic loam over red mottled clay on rock (Bleached-Mottled, Eutrophic, Red Kurosol)

Thick sandy loam to loam surface soil with a bleached and gravelly A2 horizon, overlying a red, yellowish brown and brown well structured clay grading to weathering siltstone or fine sandstone by 100 cm.

**K3** Acidic sandy loam over red clay on rock (Bleached-Mottled, Eutrophic, Red Chromosol)

Medium thickness sandy loam with a paler or bleached A2 horizon, overlying a dark red and brown mottled prismatic structured clay, grading to weathering schist or phyllite by 100 cm.



- K4** Acidic sandy loam over brown clay on rock (Bleached, Mesotrophic, Brown Kurosol)  
Medium to thick, gravelly loamy sand to sandy loam surface soil, with a bleached and very gravelly A2 horizon, overlying a yellowish brown, red and brown sandy clay to clay subsoil grading to weathering medium to fine sandstone by 100 cm.
- L1a** Shallow loam on rock (Paralithic, Leptic Tenosol)  
Thick, stony sandy loam to loam, forming in weathering schist or phyllite at 50 cm or less.
- L1b** Shallow sandy loam on rock (Acidic, Paralithic, Bleached-Leptic Tenosol)  
Thick, very gravelly loamy sand to sandy loam, overlying a brown gravelly clayey sand, grading to weathering sandstone by 50 cm.

#### *Ironstone soils*

- J2a** Acidic, deep sandy loam ironstone soil (Ferric, Mesotrophic, Brown Kandosol)  
Medium thickness loamy sand to sandy loam with abundant ironstone gravel, grading to a brownish yellow and red clay with ironstone fragments, over light grey and red kaolinitic clay at about 100 cm.
- J2b** Acidic, deep loamy ironstone soil (Ferric, Eutrophic, Red Chromosol)  
Medium thickness dark brown loam with a pink A2 horizon containing abundant fragments of ferruginized siltstone, overlying a red and yellow brown clay with blocky structure, grading to grey mottled kaolinitic silty clay. Hard siltstone is deeper than 200 cm.

#### *Hard loamy soils with deep brown clayey subsoils*

- F1a** Sandy loam over brown clay on deeply weathered rock (Bleached-Mottled, Mesotrophic, Brown Kurosol)  
Thick grey loamy sand to sandy clay loam with a gravelly and bleached A2 horizon, overlying a brown, yellowish brown and red coarsely prismatic sandy clay to clay, becoming siltier and greyer (kaolinitic) with depth. Profile grades to soft weathering metasandstone kaolinitic and ironstone gravelly clay below 100 cm.
- F1b** Sandy loam over brown clay (Bleached-Mottled, Hypocalcic, Brown Chromosol)  
Thick loamy sand to sandy clay loam with a strongly bleached A2 horizon, overlying a yellowish brown, grey and red mottled clay grading to fine grained alluvium, weakly calcareous at base.
- F1c** Sandy loam over brown clay (Bleached-Mottled, Eutrophic, Brown Chromosol)  
Thick dark brown loamy sand to light sandy clay loam with a bleached A2 horizon, overlying a yellow brown and grey brown sandy clay with coarse prismatic structure, grading to a grey, brown and yellow mottled clayey sand.

#### *Deep uniform to gradational soils*

- M1** Deep sandy loam (Regolithic, Brown-Orthic Tenosol / Eutrophic, Brown Kandosol)  
Thick brown sandy loam, overlying a grey to brown silty sand to silty clay loam with weak prismatic structure, grading to variable sandy, gritty and clayey alluvial sediments.
- M2** Deep clay loam (Melanic, Calcic, Grey Dermosol)  
Thick black clay loam with granular structure, overlying a dark grey to black heavy clay with strong blocky structure. The clay is yellower and weakly calcareous with depth.

**Further information:** [DEWNR Soil and Land Program](#)

