

# MDU Mundunnie Land System

Complex of eroded low hills, rises and outwash fans between the Belalie Valley and Brown Hill Range

**Area:** 162.9 km<sup>2</sup>

**Annual rainfall:** 425 – 545 mm average

**Geology:** Siltstones and fine sandstones of the Tapley Hill Formation, with strata of calcareous rocks particularly on the eastern side. Substantial deposits of locally derived fine to medium grained alluvium occur between the basement rock highs. Both rocks and sediments are mantled by a veneer of aeolian carbonates as soft or nodular segregations in the lower soil profile and upper half to one metre of the weathering rock or sediment.

**Topography:** The Land System is a complex of rises and low hills formed on basement rocks, and outwash fans and drainage depressions formed on sediments eroded from the basement rock highs. The parent rocks are relatively soft and easily weathered, so the degree of erosion of the underlying rocks is high. Although there are some resistant strata forming moderately steep low hills, and some steep dissection slopes, most of the land is undulating to gently rolling with slopes in the range 5 - 20%. The rises grade to fans with slopes mostly in the range 2 - 8%. The most striking feature of the landscape is the evidence of past erosion; significant gully erosion being most obvious. Sporadic scalding due to high surface salt concentrations, or exposure of sodic subsoils is also apparent.

**Elevation:** 750 m in the north to 300 m in the south

**Relief:** Maximum local relief is 80 m. More common relief range is 20 - 40 m

**Soils:** Shallow to moderately deep loams (some calcareous, others with red clayey subsoils) over weathering rock are the most common soils. On lower slopes and flats are deeper loams over red clay.

## Main soils

*Soils formed over basement rocks on rises and low hills*

- A2** Shallow calcareous loam
- L1** Shallow stony sandy loam to loam
- D1** Hard loam over red clay on rock

*Soils formed over alluvium on outwash fans and drainage depressions*

- D3** Hard loam over dispersive red clay

## Minor soils

*Soils formed over alluvium on outwash fans and drainage depressions*

- D2** Hard loam over well structured red clay
- C3** Gradational loam

*Soils formed over basement rocks on rises and low hills*

- C2** Shallow gradational loam on rock



**Main features:**

This is a complex Land System comprising a range of landscapes including steep rocky hills, moderately steep and rocky semi arable slopes, undulating arable rises, gently sloping outwash fans and severely eroded drainage depressions. All facets of the System are highly erodible, and erosion control is probably the over-riding management requirement. Sporadic scalding caused by high surface salt concentrations or exposed sodic subsoils may be linked to past erosion. Maintaining adequate cover on the shallow stony soils of the steeper ground is necessary to reduce run off, and ameliorating the poor structure on the common soils of the gentler slopes will improve infiltration rates, reduce run off, and provide better physical conditions for plant growth generally.

**Soil Landscape Unit summary:** 27 Soil Landscape Units (SLUs) mapped in the Mundunnie Land System:

SLU	% of area	Main features #
AAC AAD AAI AAJ AAi AAj	8.8 0.5 5.2 0.6 3.3 0.8	<p>Rocky low hills and ridges formed mainly on siltstones with some interbedded quartzites and tillites.</p> <p><b>AAC</b> Low hills with slopes of 10-30% and relief to 80 m.</p> <p><b>AAD</b> Steep slopes and ridges of 20-50%, up to 80 m high.</p> <p><b>AAI</b> Low hills with slopes of 10-30%, relief to 80 m, eroded watercourses and minor scalding.</p> <p><b>AAJ</b> Steep slopes of 25-40%, up to 60 m high with eroded watercourses and minor scalding.</p> <p><b>AAi</b> Strongly dissected slopes of 15-50%, up to 50 m high, with eroded watercourses and 5-10% of land affected by scalding.</p> <p><b>AAj</b> Steep slopes of 25-40%, up to 60 m high with eroded watercourses and 5-10% of the land affected by scalding.</p> <p>Main soils: <u>shallow stony sandy loam to loam</u> - <b>L1</b> (E) and <u>shallow calcareous loam</u> - <b>A2</b> (E) with <u>hard loam over red clay on rock</u> - <b>D1</b> (L). This land is largely inaccessible, due to steep slopes and rockiness. Pasture productivity is limited mainly by shallow soils and the difficulty in undertaking improvements (sowing, fertilizing etc). There is considerable potential for erosion and landslip. Watercourses are generally eroded and there is evidence of scalding on many slopes. These previously eroded areas are extremely susceptible to further degradation.</p>
DCC	6.8	<p>Very gently to gently undulating rises between 10 and 30 m high with slopes of 3-10%, formed on siltstones of the Tapley Hill Formation.</p> <p>Main soils: <u>hard loam over red clay on rock</u> - <b>D1</b> (E) with <u>shallow calcareous loam</u> - <b>A2</b> (C) and <u>shallow gradational loam on rock</u> - <b>C2</b> (L), generally overlying weathering rock within 100 cm. <u>Shallow stony sandy loam to loam</u> - <b>L1</b> (L) occurs where rock strata are hard. These soils are moderately fertile, well drained and have moderately high waterholding capacities. The slopes are mostly arable (except for minor rocky outcrops and dissected areas). Gradients are moderate with a consequent potential for water erosion. This is exacerbated by the predominant hard setting, poorly structured soil type which tends to seal over and shed water. Other limitations caused by poor structure are difficulty in working and patchy emergence.</p>
EFC EFD EFI	6.8 4.5 2.6	<p>Undulating to moderately steep rises and spurs formed on calcareous rock strata within the Tapley Hill Formation. Rocky outcrops are common.</p> <p><b>EFC</b> Rises and slopes of 3-10% with relief to 30 m.</p> <p><b>EFD</b> Rises and slopes of 10-20% with relief to 50 m.</p> <p><b>EFI</b> Slopes of 10-20%, with relief to 50 m and eroded watercourses.</p> <p>Main soils: <u>shallow calcareous loam</u> - <b>A2</b> (E) and <u>shallow stony loam</u> - <b>L1</b> (E). The soils are well drained and well structured, but are shallow and only moderately fertile due to their relatively low clay content. Erosion control is a key management issue, particularly on the steeper slopes where cropping is very risky.</p>



EGB EGD EGH	0.3 3.7 4.5	<p>Undulating rises and low hills formed on basement rock</p> <p><b>EGB</b> Low rises less than 10 m high with slopes of 2-3%.</p> <p><b>EGD</b> Rises and low hills to 40 m high with slopes of 10-20%, minor rock outcrop, and minor watercourse erosion and scalding.</p> <p><b>EGH</b> Undulating rises to 30 m high with slopes of 3-12%, limited rock outcrop and watercourse erosion, and minor scalding.</p> <p>Main soils: <u>shallow calcareous loam</u> - <b>A2</b> (V), with <u>hard loam over red clay on rock</u> - <b>D1</b> (L) and <u>shallow gradational loam on rock</u> - <b>C2</b> (L). The land is mostly arable (except for minor outcrop and occasional short steep slopes), but because most of the soils are relatively shallow, moisture shortages may limit crops in dry finishes. Reduction of water loss and erosion through runoff is the main management issue, together with fertility maintenance. Sporadic scalding where surface salt levels are high, or where sodic subsoils are exposed probably resulted from past erosion.</p>
ESC ESD ESI	1.9 8.5 5.5	<p>Hillslopes, ridges and crests formed on basement rock, with rocky reefs occupying about 20% of the land surface where harder rock strata occur.</p> <p><b>ESC</b> Rises to 30 m high with slopes of 5-12%.</p> <p><b>ESD</b> Rises up to 30 m high with slopes of 10-20% and minor watercourse erosion and scalding.</p> <p><b>ESI</b> Slopes and rises to 30 m high with slopes of 10-20% (some short steeper sections), eroded watercourses and minor scalding.</p> <p>Main soils: <u>shallow calcareous loam</u> - <b>A2</b> (E) and <u>shallow stony sandy loam to loam</u> - <b>L1</b> (E) with <u>hard loam over red clay on rock</u> - <b>D1</b> (L) and <u>shallow gradational loam on rock</u> - <b>C2</b> (L). Rocky reefs, shallow stony soils and sometimes moderate slopes limit cropping of these areas. The arable land is generally confined to strips between the reefs of rock. Water erosion is a potential problem because of the high runoff from the shallow soils and rocky areas. Saline scalded patches are scattered across the landscape.</p>
EZH	1.5	<p>Complex of basement rock rises (75% of area) and outwash fans formed on alluvium (25% of area). Rises are 10-20 m high with slopes of 5-20%. Fans have slopes of 5-10%. Watercourses are eroded.</p> <p>Main soils: <u>shallow calcareous loam</u> - <b>A2</b> (E) and <u>shallow stony sandy loam to loam</u> - <b>L1</b> (E) on rises, and <u>hard loam over dispersive red clay</u> - <b>D3</b> (M) with <u>hard loam over well structured red clay</u> - <b>D2</b> (M) and <u>gradational loam</u> - <b>C3</b> (M) on fans. The complex landscape of this unit makes management difficult. Shallow, stony, well structured mainly calcareous soils (rises) are mixed with deeper, poorly structured non calcareous soils on fans.</p>
JCB JCC JCE JCG JCH JCHA JCJ JCJA	4.9 2.2 3.4 2.3 8.0 0.5 4.1 3.5	<p>Outwash fans and drainage depressions formed on locally derived alluvium.</p> <p><b>JCB</b> Very gentle slopes of 1-3% with minor water course erosion.</p> <p><b>JCC</b> Gentle slopes of 3-8% with minor watercourse erosion.</p> <p><b>JCE</b> Drainage depressions with moderate water course erosion.</p> <p><b>JCG</b> Very gentle slopes of 2-3% with eroded watercourses.</p> <p><b>JCH</b> Gentle slopes of 3-8% with eroded watercourses.</p> <p><b>JCHA</b> As for JCH but with severe watercourse erosion.</p> <p><b>JCJ</b> Drainage depressions with eroded watercourses.</p> <p><b>JCJA</b> Severely eroded drainage depressions, usually with branching gullies. 10-50% of the land surface is affected.</p> <p>Main soils: <u>hard loam over dispersive red clay</u> - <b>D3</b> (V), with <u>hard loam over well structured red clay</u> - <b>D2</b> (L) and <u>gradational loam</u> - <b>C3</b> (L). These soils are deep and potentially fertile, but generally have poor physical characteristics. Excessive runoff, erosion, workability problems and patchy emergence / poor root growth are common on this land. However with careful management to ameliorate deteriorating soil structure, the soils can be quite productive. Protection of fragile watercourses is important. These areas have eroded in the past and will always be vulnerable to further degradation. JCE and particularly JCJ are at most risk. Subsoil salinity, sodicity and boron may cause yield reductions in places.</p>



JYC	2.9	Complex of outwash fans formed on alluvium (75% of area) and low basement rock rises (25% of area). <b>JYC</b> Slopes of 5-10%. <b>JYJ</b> Severely eroded lower slopes and drainage depressions with slopes of 10-20%. Main soils: <u>hard loam over dispersive red clay</u> - <b>D3</b> (E) with <u>hard loam over well structured red clay</u> - <b>D2</b> (L) and <u>gradational loam</u> - <b>C3</b> (L) on fans and in drainage depressions, and <u>shallow calcareous loam</u> - <b>A2</b> (L) and <u>shallow stony sandy loam to loam</u> - <b>L1</b> (L) on rises and lower slopes. Amelioration of poor soil structure and run-off / erosion control are the main issues in JYC. In JYJ, stabilization and prevention of further erosion is paramount.
JYJ	2.4	

# 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:

- A2** Shallow calcareous loam (Paralithic, Hypercalcic / Supracalcic Calcarosol)  
Calcareous loam over a layer of soft to rubbly carbonate grading to weathering rock at about 50 cm.
- C2** Shallow gradational loam on rock (Calcic, Red Dermosol)  
Medium thickness loam to clay loam grading to a well structured red clay, calcareous with depth over weathering rock within 100 cm.
- C3** Gradational loam (Calcic, Red Dermosol)  
Loam to clay loam grading to a well structured red clay with soft carbonate at depth, over alluvium continuing below 100 cm.
- D1** Hard loam over red clay on rock (Calcic, Red Chromosol)  
Medium thickness hard setting sandy loam to clay loam abruptly overlying a well structured red clay, calcareous with depth over weathering rock within 100 cm.
- D2** Hard loam over well structured red clay (Calcic, Red Chromosol)  
Hard sandy loam to clay loam abruptly overlying a well structured red clay with soft carbonate accumulations at depth, over alluvium continuing below 100 cm.
- D3** Hard loam over dispersive red clay (Calcic, Red Sodosol)  
Hard sandy loam to clay loam abruptly overlying a poorly structured dispersive red clay with soft carbonate accumulations at depth, over alluvium continuing below 100 cm.
- L1** Shallow stony sandy loam to loam (Lithic, Leptic Tenosol / Rudosol)  
Shallow stony sandy loam to loam over hard rock, often calcareous in fissures.

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

