

LEI Leighton Land System

Rises and outwash fans bordering the eastern side of the Booborowie Creek valley

Area: 180.7 km²

Annual rainfall: 400 – 495 mm average

Geology: Mainly siltstones and fine sandstones of the Tapley Hill Formation, with Saddleworth Formation siltstones, Appila Tillites and reefs of Leasingham Quartzite. Most rocks are mantled by a veneer of aeolian carbonates, usually as soft accumulations in the weathering rock - soil interface, but sometimes as hard nodules or sheets. Most of the rock types are easily weathered and eroded away, so there is considerable locally derived alluvium between the rock outcrops. In the west are some isolated relict Tertiary age sandy clays, characterized by mustard and red colours. The alluvial and Tertiary deposits are also mantled by soft carbonates.

Topography: The Land System is a dissected footslope abutting the steep range (Cartapo Land System) to the east, and grading to the flats of Booborowie and Gum Creeks to the west. The north - south trending belt of underlying rocks is generally soft and easily eroded, so the slopes have a high proportion of alluvial fans between the basement rock highs. The latter are mostly smooth undulating rises and low hills with slopes of less than 12%, but there are steeper and rockier ridges and low hills formed on more resistant rock types such as the Leasingham Quartzite. Steeper, rocky land also occurs in more strongly dissected areas which have slopes of 10 - 30%. Outwash sediments occur on broad fans on the western side of the System, where slopes are less than 10%, and in narrow drainage depressions between basement rises and low hills. Watercourse erosion is common in these areas.

Elevation: 350 m in the west to 600 m in the north east

Relief: Maximum local relief is 60 m

Soils: The characteristic soils are poorly structured texture contrast types with sandy loam to loam surfaces and red (often dispersive) clay subsoils. They are mixed with shallow loams over rock, gradational loams and cracking clays.

Main soils

Soils formed over basement rocks on rises and low hills

- D1** Hard loam over red clay on rock
- A2** Shallow calcareous loam
- D7** Hard loam over dispersive red clay on rock

Soils formed over alluvium on outwash fans

- D3** Hard loam over dispersive red clay
- D2a** Hard loam over well structured red clay

Minor soils

Soils formed over basement rocks or Tertiary sediments on rises and low hills

- L1** Shallow stony sandy loam to loam
- D2b** Sandy loam over red clay

Soils formed over alluvium on outwash fans

- E2** Red cracking clay
- C3** Gradational loam



Main features:

The characteristic feature of the Leighton Land System is the poor structure of the main soil types, leading to a range of problems such as excessive run off, increased erosion potential, difficulty in working, patchy emergence and poor root growth. These problems can be largely overcome with appropriate management. The soils are potentially productive as they are usually moderately deep to deep with reasonable natural fertility. Steeper and rockier areas are either semi or non arable, and can be a particular erosion hazard if over-grazed. Tapley Hill Formation rocks are associated with elevated boron levels, which can be reflected in toxic subsoil concentrations.

Soil Landscape Unit summary: 20 Soil Landscape Units (SLUs) mapped in the Leighton Land System:

SLU	% of area	Main features #
AAC AAH AAI	0.1 0.1 1.3	<p>Moderately steep to steep rocky rises and low hills.</p> <p>AAC Moderately steep rocky slopes of 20-30%.</p> <p>AAH Moderately steep short eroded rocky slopes of 20-30%.</p> <p>AAI Moderately steep eroded rocky low hills with slopes of 10-30%.</p> <p>Main soils: <u>shallow stony sandy loam to loam</u> - L1 (E) and <u>shallow calcareous loam</u> - A2 (E) with <u>hard loam over red clay on rock</u> - D1 (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 - watercourses are highly susceptible.</p>
ABC	0.4	<p>Moderately steep rocky ridges 40-60 m high with slopes of 20-30% formed on Leasingham Quartzite.</p> <p>Main soils: <u>shallow stony sandy loam</u> - L1 (V) with <u>shallow calcareous loam</u> - A2 (L) and <u>hard loam over dispersive red clay on rock</u> - D7 (L). The hills are non arable due to the roughness of the terrain, moderate slopes and shallow stony soils. Rocky outcrops limit accessibility in places. Runoff is rapid and exposure is high, so a significant proportion of rainfall does not infiltrate the soil. Watercourses are particularly susceptible to erosion. However, areas of deeper soils are potentially productive for grazing.</p>
DBB DBC DBH	2.0 31.8 6.2	<p>Rises and low hills formed on Tapley Hill and Appila Formation basement rocks.</p> <p>DBB Low rises 10 m high with slopes of 2-3%.</p> <p>DBC Undulating rises and low hills, 20-50 m high with slopes of 3-12%.</p> <p>DBH Undulating rises 20-50 m high with slopes of 4-10%, eroded water courses and minor scalding.</p> <p>Main soils: <u>hard loam over red clay on rock</u> - D1 (E) and <u>hard loam over dispersive red clay on rock</u> - D7 (C) with <u>shallow calcareous loam</u> - A2 (L) and <u>red cracking clay</u> - E3 (M). <u>Shallow stony sandy loam to loam</u> - L1 (M) occurs on harder rock strata. Although the predominant soils are moderately deep and fertile, they are poorly structured, have low infiltration rates, high erodibilities, poor workability and unfavourable root growth conditions. Erosion control is critical on these soils, which are particularly susceptible to rilling. However with careful management to improve soil structure, they can be productive. High subsoil boron is sometimes a feature of soils formed on Tapley Hill Formation rocks.</p>



DCB DCC	0.5 6.5	<p>Undulating rises with sporadic rock outcrop formed on siltstones of the Saddleworth Formation.</p> <p>DCB Low rises to 10 m high with slopes of 2-3%. DCC Rises 10-30 m high with slopes of 3-10%.</p> <p>Main soils: <u>hard loam over red clay on rock</u> - D1 (E) and <u>shallow calcareous loam</u> - A2 (E), generally overlying weathering rock within 100 cm. <u>Shallow stony sandy loam to loam</u> - L1 (L) occurs where rock strata are hard. The soils are moderately fertile, well drained and have moderately high waterholding capacities. The land is mostly arable with few rocky areas. Gradients are moderate in places, but slopes are short, so erosion potential is relatively low. However, soil surfaces are poorly structured, set hard and tend to seal over and shed water. Other limitations caused by poor structure are difficulty in working and patchy emergence.</p>
ESC ESD	0.1 11.3	<p>Rocky rises and mid to upper slopes formed on basement rocks.</p> <p>ESC Rises to 40 m high with slopes of 5-10% and up to 20% rocky reefs. ESD Slopes of 10-20% with 20-50% rocky reefs.</p> <p>Main soils: shallow <u>hard loam over red clay on rock</u> - D1 (E) and <u>shallow calcareous loam</u> - A2 (E). <u>Shallow stony sandy loam to loam</u> - L1 (E) occurs in rocky areas on harder rocks. 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.</p>
HKC	1.9	<p>Rises to 20 m high with slopes of 4-12% formed on Tertiary sediments.</p> <p>Main soil: <u>sandy loam over red clay</u> - D2b (D). This land is fully arable with the main limitation being poor surface soil condition. This causes low infiltration, excessive runoff and working difficulties. Water erosion potential on steeper grades is moderate. The lighter soils of these landscape are prone to wind erosion.</p>
JCA JCB JCC JCG JCH JCJ	0.7 16.4 3.8 4.8 7.3 0.8	<p>Outwash fans formed on locally derived alluvium.</p> <p>JCA Flats with slopes of less than 1%. JCB Very gentle slopes of 1-2%. JCC Gentle slopes of 3-6%. JCG Very gentle slopes of 2-4% with eroded watercourses. JCH Gentle slopes of 3-8% with eroded watercourses. JCJ Severely eroded drainage depressions.</p> <p>Main soils: <u>hard loam over dispersive red clay</u> - D3 (E) and <u>hard loam over well structured red clay</u> - D2a (E), with <u>gradational loam</u> - C3 (C) and <u>red cracking clay</u> - E2 (L). These soils are deep and potentially fertile, but generally have poor physical structure. 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. Elevated subsoil levels of salinity, sodicity and boron are likely over much of the area.</p>
JXC JXH	0.6 3.4	<p>Complex of fans formed on alluvium, and rises formed on basement rocks, forming an apron with slopes of 3-10% between the steep slopes of the Cartapo Land System and the flats of the Booborowie Land System. Watercourses in JXH are eroded, but stable in JXC.</p> <p>Main soils: <u>hard loam over dispersive red clay</u> - D3 (E) and <u>hard loam over well structured red clay</u> - D2a (E) on fans, and <u>hard loam over red clay on rock</u> - D1 (L), with <u>hard loam over dispersive red clay on rock</u> - D7 (M) and <u>shallow calcareous loam</u> - A2 (M) on rises. The land has features common to both DBC and JCH - a high proportion of poorly structured soils, especially on fans, moderately deep to deep fertile profiles, and a moderately high erosion potential.</p>

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:

- A2** Calcareous loam (Paralithic, Hypercalcic / Supracalcic Calcarosol)
Calcareous loam over a layer of soft to rubbly carbonate grading to weathering rock at about 50 cm.
- C3** Gradational loam (Hypercalcic, Red Dermosol)
Loam to clay loam grading to a well structured red clay with soft carbonate at depth, 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 grading to soft carbonate merging with weathering rock within 100 cm.
- D2a** 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, grading to alluvium.
- D2b** Sandy loam over red clay (Hypercalcic, Red Chromosol)
Medium thickness hard gritty sandy loam over a well structured red clay with soft carbonate at depth, merging with Tertiary sandy clay at about 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, grading to alluvium.
- D7** Hard loam over dispersive red clay on rock (Calcic, Red Sodosol)
Medium thickness hard setting sandy loam to clay loam abruptly overlying a poorly structured and dispersive red clay grading to soft carbonate merging with weathering rock within 100 cm.
- E2** Red cracking clay (Red Vertosol)
Self-mulching seasonally cracking clay, becoming more clayey, coarser structured and calcareous with depth, overlying a heavy clay.
- 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](#)

