

LIN Linwood Land System

Dissected slopes and outwash fans of the Light River catchment in the Bethel - Fords - Linwood area

Area: 80.4 km²

Annual rainfall: 430 – 540 mm average

Geology: The majority of the area is underlain by fine grained rocks of the Saddleworth Formation. Along the eastern edge is a strip of Bethel Shale, distinctive because of its characteristic blue colour. There are extensive areas of alluvial sediments derived from erosion and deposition of materials from the basement rock highs. All rocks and sediments are mantled by a veneer of aeolian carbonates. In places these are cemented into sheet calcrete.

Topography: The Linwood Land System is undulating with basement rock rises separated by alluvial outwash fans and drainage depressions. Slopes are usually less than 12%. Exceptions are i) where the Light River has cut through the underlying rocks, creating a gorge 50 m deep with dissection slopes of 20 - 75%, and ii) a minor ridge of resistant rock with slopes of 15 - 30%. The Land System is bounded on its eastern side by the abrupt ridge of the Kapunda Land System. Most of the surface drainage emanates from the base of this ridge, with watercourses coalescing as they flow towards the main stream.

Elevation: 340 m in the north east to 110 m where the Light River flows out of the System

Relief: Maximum local relief is 50 m

Soils: Loam over red clay soils are dominant. Some are dispersive, some are not. Related gradational clay loams are common. Shallow loamy soils over basement rock are restricted to rising ground. Cracking clays are minor.

Main soils

Soils formed on basement rock on rises

D1 Hard loam over red clay on rock

L1 Shallow stony loam

Soils formed on alluvium on lower slopes and flats

D2/D3 Hard loam over (dispersive) red clay

Minor soils

Soils formed on basement rock on rises

B4 Gradational clay loam over calcreted rock

C2a Shallow gradational clay loam

A2 Shallow calcareous loam

C2b Shallow grey loam

D7 Hard loam over dispersive red clay on rock

Soils formed on alluvium on lower slopes and flats

E2/E3 Cracking clay

C3 Gradational clay loam

M4 Gradational loam



Main features: The Linwood Land System consists for the most part of moderately deep, fertile and well drained soils on an undulating land surface. The main limitations to agricultural production are caused by poor soil structure. Hard setting surfaces are common on the predominant loam over red clay soils. These restrict infiltration; increase susceptibility to erosion and affect emergence and early plant growth. Modifications to surface management practices can overcome the problem. In places where the Light River has cut through the bedrock, and on some minor ridges, slopes are too steep and rocky for cultivation. Watercourse erosion is significant in places and measures are needed to prevent further damage.

Soil Landscape Unit summary: 16 Soil Landscape Units (SLUs) mapped in the Linwood Land System:

SLU	% of area	Main features #
AAn	5.7	Strongly dissected rocky slopes up to 50 m high adjacent to sections of the Light River. Slopes are mostly 20-30%, up to 75% in places. There is 20-50% rock outcrop and surface stone. Main soil: <u>shallow stony loam</u> - L1 (D). This land is steep and rocky and not suited to any agricultural uses other than rough grazing.
ABB	2.1	Low rocky ridges up to 30 m high formed on interbedded siltstones and quartzites. Slopes are 15-30% with up to 20% rock outcrop and 20% surface quartzite and siltstone. Main soils: <u>shallow stony loam</u> - L1 (E) and <u>shallow calcareous loam</u> - A2 (E). These ridges are largely non arable due to slope, rockiness and exposure. The soils are shallow and stony with low moisture holding capacity and moderately low fertility. The land provides useful stock shelter where tree cover has been retained.
DEB DEC DEH	7.3 34.3 2.7	Undulating rises formed on siltstones of the Saddleworth Formation. DEB Low rises and very gentle slopes of 2-3%. DEC Rises and gentle slopes of 3-12%. DEH Rises with slopes of 5-12% and some watercourse erosion. Main soils: <u>hard loam over red clay on rock</u> - D1 (E), <u>gradational clay loam on calcreted rock</u> - B4 (C) and <u>shallow gradational clay loam</u> - C2a (C), with <u>cracking clay</u> - E2/E3 (L), <u>hard loam over dispersive red clay on rock</u> - D7 (M), deep <u>hard loam over red clay</u> - D2/D3 (M), <u>shallow calcareous loam</u> - A2 (M) and <u>shallow stony loam</u> - L1 (M). These soils are generally moderately deep, inherently fertile and well drained. Hard setting, sealing surfaces are widespread, particularly in the D1 and D2/D3 soils, and these result in excessive runoff and erosion, as well as workability difficulties and emergence/early growth problems. The gradational C2a soils are well structured, and are the best soils, but the B4 and L1 soils are shallow. The clayey soils are very fertile, but difficult to work. Boron toxicity is associated with some loamy texture contrast and clay soils on lower slopes. Overall, provided that erosion is controlled, this land is potentially highly productive.
EFC EFD EFI	2.1 1.7 1.4	Rises and low hills formed on Bethel Shale. EFC Undulating rises to 30 m high with slopes of 5-10% with some isolated steeper conical peaks. EFD Moderately steep footslopes to 40 m high with slopes of 10-25%. EFI Dissected low hills to 40 m high with slopes of 10-20%, eroded watercourses, scalded patches and 5-10% rock outcrop. Main soils: <u>shallow grey loam</u> - C2b (E) and <u>shallow calcareous loam</u> - A2 (C) with <u>shallow stony loam</u> - L1 (L). These soils are commonly a characteristic blue-grey colour. They are generally moderately shallow with marginal fertility. Much of the land is semi to non arable due to the slope, associated erosion potential and previously eroded areas.
ESD ESI	6.4 1.4	Moderately steep slopes formed on Saddleworth Formation siltstones. The land is characterized by rocky reefs occupying 20% or more of the land surface. ESD Low hills to 50 m high with slopes of 10-20%. ESI Eroded slopes of 10-20%. Main soils: <u>shallow calcareous loam</u> - A2 (E), <u>shallow stony loam</u> - L1 (E), with and <u>hard loam over red clay on rock</u> - D1 (L) and <u>hard loam over dispersive red clay on rock</u> - D7 (L). This land is semi arable due to the extent of rock outcrop and moderate slopes. The soils are generally shallow and have moderate to low fertility. Erosion control is critical.



JAG	3.3	Outwash fans and drainage depressions formed on clayey alluvium.
JAH	5.2	JAG Drainage depressions and fans with slopes of 2-4% and minor watercourse erosion.
JAJ	6.4	JAH Drainage depressions and fans with slopes of 3-6% and moderate watercourse erosion. JAJ Drainage depressions with slopes of 2-3% and moderate watercourse erosion. Main soils: deep <u>hard loam over red (dispersive) clay</u> - D2/D3 (V) with <u>gradational clay loam</u> - C3 (C) and <u>cracking clay</u> - E2/E3 (L). These soils are deep and fertile, although often poorly structured. The D3 soils particularly have hard setting surfaces which restrict infiltration and emergence, and have limited working opportunities. Dispersive subsoils cause waterlogging by preventing downward percolation of water. With the use of gypsum and modified surface management practices, these soils are highly productive.
JEB	4.7	Outwash fans formed on fine to medium grained alluvium.
JEG	5.4	JEB Fans with slopes of 2-3%. JEG Fans with slopes of 2-4% and some watercourse erosion. Main soils: deep <u>hard loam over red (dispersive) clay</u> - D2/D3 (E) with <u>gradational clay loam</u> - C3 (C) and <u>gradational loam</u> - M4 (L). These soils are deep and inherently fertile, but most are prone to hard setting, sealing surfaces. They are difficult to work and are prone to waterlogging and emergence / early growth problems. Watercourse erosion is common in JEG. Although there is no obvious salinity, soil salt levels should be monitored.
JXH	9.9	Complex of outwash fans and drainage depressions formed on clayey alluvium, and low rises on basement siltstones. Slopes are 2-4%. Watercourses are commonly eroded. Main soils on fans: deep <u>hard loam over red (dispersive) clay</u> - D2/D3 (E) with <u>gradational clay loam</u> - C3 (C), and on rises are <u>hard loam over red clay on rock</u> - D1 (E), <u>shallow gradational clay loam</u> - C2a (C) and <u>gradational clay loam on calcreted rock</u> - B4 (C) with <u>shallow stony loam</u> - L1 (M). This land has characteristics in common with JEG and DEC. Watercourse erosion is severe in places - management strategies should aim at minimizing further damage.

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 Calcarosol)
15 - 20 cm calcareous loam grading to highly calcareous light brown silty loam to clay loam over weathering siltstone at about 50 cm.
- B4** Gradational clay loam over calcreted rock (Petrocalcic, Red Dermosol)
15 - 25 cm loam grading to a well structured red clay loam to light clay abruptly overlying hard calcrete at about 40 cm, with weathering siltstone at depth.
- C2a** Shallow gradational clay loam (Calcic, Red Dermosol)
10 - 40 cm clay loam grading to a well structured red clay, calcareous from about 50 cm grading to weathering siltstone within 100 cm.
- C2b** Shallow grey loam (Calcic, Grey Kandosol)
15 cm grey loam grading to dark grey silty clay loam, calcareous from about 30 cm, over weathering blue shale at about 60 cm.
- C3** Gradational clay loam (Calcic, Red Dermosol)
10 - 40 cm clay loam grading to a well structured red clay, calcareous from about 50 cm grading to clayey alluvium at about 110 cm.
- D1** Hard loam over red clay on rock (Hypercalcic, Red Chromosol)



15 - 35 hard loam to clay loam abruptly overlying a well structured red clay with soft carbonate from about 55 cm grading to weathering siltstone at about 85 cm.

D2/D3 Hard loam over (dispersive) red clay (Calcic, Red Chromosol / Sodosol)

30 - 50 cm hard loam to clay loam abruptly overlying a red well structured (50%) or coarsely structured and dispersive (50%) clay, calcareous from about 65 cm, grading to clayey alluvium.

D7 Hard loam over dispersive red clay on rock (Hypercalcic / Calcic, Red Sodosol)

25 - 40 cm hard loam to clay loam with quartzite gravel, over a hard coarsely structured dispersive red clay, calcareous from about 65 cm, on quartzitic siltstone from about 90 cm.

E2/E3 Cracking clay (Red / Brown Vertosol)

Dark well structured seasonally cracking clay grading to a coarsely structured red, brown or black heavy clay with soft carbonate from about 60 cm.

L1 Shallow stony loam (Lithic, Leptic Tenosol / Rudosol)

Up to 50 cm stony loam to clay loam directly overlying basement rock, often with clay pockets in cleavages.

M4 Gradational loam (Calcic, Red Kandosol)

Up to 50 cm hard loam to clay loam grading to a hard weakly structured red clay with minor soft or rubbly carbonate.

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

