LOG Logan Gap Land System

Valley - ridge system east of the Tothill Range in the Logan Gap area

Area: 111.0 km^2

Annual rainfall: 385 – 540 mm average

Geology: The Land System consists of two broad valleys lying parallel to each other with a NNW - SSE orientation. The western valley is underlain by Appila Tillites and Tapley Hill siltstones, and the eastern valley by Saddleworth Formation siltstones. The two valleys are separated by a ridge of Gilbert Range Quartzite. There are minor beds of Skillogalee Dolomite associated with the siltstones. The rocks in the valleys are partly covered by alluvial sediments creating a complex of basement rock highs and valley flats and outwash fans. The alluvium is mixed clayey and sandy.

Topography: The three components in the Logan Gap Land System are directly linked to the geology:

i) The western valley (formed on Appila Tillite) contains the south flowing Stony Creek and the north flowing Logan Creek. The topography comprises moderately steep low hills and undulating rises on basement rocks, grading to fans and valley flats adjacent to the two main watercourses. The two creeks join at Logan Gap, where they have cut through the central quartzite ridge.

ii) The quartzite ridge is steep and rocky and rises abruptly between 40 and 70 m above the valleys either side. This is a continuation of the ridge of Gilbert Range Quartzite which bisects the Burra Creek Land System.

iii) The eastern valley (formed on Saddleworth Formation siltstones) is mainly undulating to gently undulating rises, the relief being much more subdued than in the western valley.

Elevation: 550 m at the headwaters of Stony Creek in the north west, to 400 m where Logan Creek flows out of the system in the east.

Relief: 80 m in the western valley, 40 m in the eastern valley and 70 m on the quartzite ridge.

Soils: Hard gravelly sandy loams with poorly structured clay subsoils are characteristic. They are associated with shallow stony and calcareous soils, and deep gradational sandy loams.

Main soils

Soils formed on basement rocks

L1 Shallow stony sandy loam - steeper and/or stony slopes

D1 Hard loam over friable red clay on rock - slopes (Saddleworth Formation)

D7 Hard gravelly sandy loam over dispersive red clay on rock - slopes (Appila Tillite)

Soils formed on alluvium

D3 Hard sandy loam over dispersive clay

Minor soils

A2 Shallow calcareous loam - slopes (on Skillogalee Dolomite)

M4 Gradational massive sandy clay loam (on alluvium)

C3 Gradational clay loam (on alluvium)

Main features: The western valley (Stony and Logan Creek catchments) consists of roughly equal proportions of moderately steep rocky semi to non arable slopes, undulating rises with less than 10% rocky non arable land, and outwash fans and valley flats which are fully arable except where affected by salinity. The soils are predominantly massive sandy loams, either over dispersive clay subsoils, or shallow over rock. Both have moderately low fertility and are poorly structured and highly erodible. The eastern valley has a higher proportion of arable land (about 95%), but the soils although moderately fertile and well structured are often shallow. The quartzite ridge has little agricultural value other than rough grazing and stock shelter where tree cover remains. Productive cropping in the System relies on management practices which improve soil structure and control erosion, and on favourable spring rainfall to compensate for the low waterholding capacity of many of the soils.

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

SLU	% of area	Main features #
ALC	5.1	Moderately steep rocky low hills formed on tillites. Slopes are 15-30%, and relief is up to 60 m. There is 10-20% rock outcrop and 20% or more surface stone. Main soils: shallow stony sandy loam - **L1** (V) with hard gravelly sandy loam over dispersive red clay on rock - **D7** (C). This land is moderately steep and rocky with shallow soils. Where tree cover remains, it provides useful stock shelter.
AQC AQD	1.8 1.7	Abrupt rocky ridges formed on Gilbert Range Quartzite. There is up to 50% surface quartzite and up to 20% reefs of outcropping quartzite. **AQC** Moderately steep ridge to 40 m high with slopes of 10-25%. **AQD** Steep ridge, 70 m high with slopes of 25-50%. Main soils: shallow stony sandy loam - **L1** (V) with hard gravelly sandy loam over dispersive red clay on rock - **D7** (L). This land is steep, stony, exposed and with mainly shallow soils. Agricultural use is restricted to rough grazing.
DBB DBC	10.4 21.9	Undulating rises formed on siltstones and fine sandstones of the Saddleworth and Tapley Hill Formations with some interbedded Skillogalee Dolomites. There is about 5% linear rock outcrop scattered throughout. **DBB** Gently undulating low rises with slopes of 1-4% and relief to 10 m. **DBC** Undulating rises with slopes of 3-10% and relief to 30 m. Main soils: hard loam over friable red clay on rock - **D1** (V) with shallow stony sandy loam - **L1** (C) on rocky areas, and shallow calcareous loam - **A2** (L) on calcareous rock strata. The soils are moderately fertile and well structured but are often shallow, reducing their capacity to store moisture. Most of the land is arable (although at risk of erosion) and should be productive in seasons with extended spring rainfall to overcome soil moisture shortages.
DHC DHH	1.7 2.5	Rises formed on medium to coarse grained rocks of the Appila Formation. Up to 20% of the surface is covered by rocky reefs and stone. **DHC** Rises to 40 m high with slopes of 3-12%. **DHH** Slopes of 5-12% with eroded watercourses. Main soils: hard gravelly sandy loam over dispersive red clay on rock - **D7** (E) and shallow stony sandy loam - **L1** (E). This land is semi arable, with rocky outcrop and moderate slopes reducing cropping opportunities in places. The main soils are poorly structured, only moderately fertile and often shallow, further reducing productive potential. The soils are highly erodible, so even moderate slopes are at risk of erosion. The slopes of DHH, adjacent to steep quartzite ridges are particularly vulnerable due to the high run off from the ridges.
DTC	1.5	Undulating slopes of 3-8% underlain by siltstones and fine sandstones, with sporadic linear reefs of rock outcrop. There is minor watercourse erosion. Main soils: hard sandy loam over friable red clay on rock - **D1** (E) with shallow stony sandy loam - **L1**(C), shallow calcareous loam - **A2** (C) and hard gravelly sandy loam over dispersive red clay on rock - **D7** (L). The slopes are 90% arable (rocky reefs and water courses accounting for the other 10%). The soils are moderately deep to shallow; the deeper types with clayey subsoils are fertile but have poorly structured surfaces. They are prone to erosion.

DZC	12.6	Complex of rises formed on Appila Tillites and associated alluvial fans. Slopes are 3-10%. There is 2-5% rocky outcrop as linear reefs and up to 20% surface quartzite. Main soils: hard gravelly sandy loam over dispersive red clay on rock - **D7** (C) and shallow stony sandy loam - **L1** (C) on rises, and deep hard sandy loam over dispersive clay - **D3** (E) on fans. The predominant soils have low to moderate fertility and are poorly structured. This causes excessive runoff, high erodibility and poor establishment/early growth conditions for plants. Management strategies to improve soil structure and control erosion are essential.
EFH	1.1	Rises to 30 m high and slopes of 5-10% formed on mainly fine grained rocks with about 5% outcrop. The landscape is characterized by eroded watercourses. Main soils: shallow calcareous loam - **A2** (V) with shallow stony loam - **L1** (C). This land is mostly arable, although the soils are shallow, often stony and have moderately low fertility.
ETD	9.7	Rocky rises, ridges and low hills, 20-50 m high with slopes of 10-20%, formed on medium to coarse grained rocks of the Appila Formation. There is 10-20% rocky outcrop and up to 50% surface quartzite and sandstone. Main soils: shallow stony sandy loam - **L1** (E), with hard gravelly sandy loam over dispersive red clay on rock - **D7** (E). The extent of rocky outcrop and the moderate slopes limit cropping potential of this land. Soils are generally shallow and erosion potential is high. Whilst useful arable areas occur, overall this is grazing country.
EUI	4.7	Complex of rocky rises formed on Appila Tillites and associated alluvial fans. Slopes are 10-20%. Watercourses are commonly eroded. Main soils: shallow stony sandy loam - **L1** (E) with hard gravelly sandy loam over dispersive red clay on rock - **D7** (C) on rises, and deep hard sandy loam over dispersive clay - **D3** (E) on fans. This land is largely undeveloped due to its irregular topography, rocky ground and moderate slopes. On the parts that are cropped, the land must be worked around rocky reefs and watercourses. The soils are poorly structured and highly erodible, and the shallow types run out of moisture early in spring. The remaining areas with tree cover provide useful stock shelter.
JHA JHJ JHK	15.5 1.9 1.3	Valley flats and drainage depressions formed on alluvium. **JHA** Valley flats associated with Logan and Stony Creeks. Slopes are less than 2%. Watercourses are well defined with some stream bank erosion. **JHJ** Narrow drainage depressions with slopes of 2-4%. Watercourses are usually eroded. **JHK** Marginally saline creek flats. Main soils: deep hard sandy loam over dispersive clay - **D3** (V) with gradational massive sandy clay loam - **M4** (C) and gradational clay loam - **C3** (L). These soils are deep, but are poorly structured and have low to moderate natural fertility. The surface soils are usually massive gritty sandy loams which set hard and often prevent satisfactory emergence and early growth. Poorly structured subsoils prevent drainage, so sub-surface waterlogging is likely to be a problem in wet years. On sloping ground, these soils are highly erodible. However, management practices which improve structural condition and fertility can make this land productive. Soil salinity and acidity should be monitored.
JWB	6.6	Very gently inclined outwash fans of 2-3% with very low basement rock rises. Main soils: deep hard sandy loam over dispersive clay - **D3** (E) with gradational massive sandy clay loam - **M4** (L) and gradational clay loam - **C3** (M), and hard gravelly sandy loam over dispersive red clay on rock - **D7** (E) on low rises. This land is similar to the JHA flats but of higher elevation and greater slope, with consequent improvement in drainage.

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 Shallow calcareous loam (Paralithic, Hypercalcic / Calcic Calcarosol)
Calcareous siltstone gravelly loam over light brown soft silty carbonate grading to highly calcareous dolomite or calcareous siltstone.

C3 Gradational clay loam (Hypercalcic, Red Dermosol)
Medium thickness clay loam grading to a well structured red clay, highly calcareous with depth over alluvium.

D1 Hard loam over friable red clay on rock (Calcic, Red Chromosol)
20 - 40 cm hard siltstone gravelly loam to sandy loam abruptly overlying a well structured red clay, usually calcareous with depth grading to weathering siltstone within 100 cm.

D3 Hard sandy loam over dispersive clay (Hypocalcic / Calcic, Red / Brown Sodosol)
20 - 50 cm massive sandy loam to sandy clay loam with a bleached A2 layer, abruptly overlying a thick red or brown mottled coarsely structured dispersive clay with variable (but usually minor) carbonate over alluvium.

D7 Hard gravelly sandy loam over dispersive red clay on rock (Eutrophic / Calcic, Red Sodosol)
20 - 35 cm hard sandy loam with abundant quartzite and sandstone gravel, abruptly overlying a coarsely structured dispersive red clay, grading to weathering quartzitic or coarse grained rock within 100 cm. Minor carbonate may occur in rock fissures.

L1 Shallow stony sandy loam (Paralithic / Lithic, Leptic Tenosol / Rudosol)
Up to 40 cm very stony sandy loam to loam directly overlying soft to hard basement tillite, sandstone, or siltstone.

M4 Gradational massive sandy clay loam (Eutrophic, Brown Kandosol)
Medium thickness sandy loam to sandy clay loam grading to a poorly structured brown mottled sandy clay over alluvium.

Further information: DEWNR Soil and Land Program