

KPD Kapunda Land System

Undulating rises with some steeper ridges in the Kapunda district

Area: 164.2 km²

Annual rainfall: 445 – 605 mm average

Geology: The Land System is formed on a range of basement rock formations which have been faulted and folded to produce a complex pattern. The main geological formations are Appila Tillite, Tapley Hill Siltstone, Tarcowie Siltstone, Mintaro Shale and Ulupa Siltstone. Interbedded with these are beds of Gilbert Range and ABC Quartzites, and Angaston Marble, which, being resistant to weathering, form prominent ridges in the landscape. The western side of the system is marked by an abrupt range comprising a sequence of steeply dipping rock formations including Gilbert Range Quartzite, Mintaro Shale and Appila Tillite. In places, remnant Tertiary age sandy clays or conglomerates form a thin veneer over the rocks. There are extensive deposits of locally derived alluvial sediments, mostly fine grained, but with silty and sandy beds, particularly near watercourses. Most of the rocks and sediments are mantled by soft aeolian carbonates. The exception is the outcrop of Appila Tillite in the north west of the System.

Topography: The Kapunda Land System is an area of undulating to rolling rises and low hills bounded on the west by an abrupt ridge, and on the east by a low discontinuous range of Angaston Marble. The Light River flows from east to west across the centre of the System. To the north of the river, the topography is characterized by irregular rises with abrupt rocky ridges, dissected by south flowing water courses including Hawker, Ross and Allen Creeks. South of the River the land surface is more rounded and dissected by north flowing creeks.

Elevation: 450 m in the north west (Light) to 200 m where the Light River cuts through the western quartzite ridge.

Relief: Maximum relief is 100 m but 30 - 50 m is more common

Soils: Soils include loam over red clay on rock on slopes and similar but deeper soils on lower slopes and flats. Gradational loams and shallow stony soils are common.

Main soils

Soils formed on basement rock

D1 Loam over red clay on calcareous rock

D7b Loam over dispersive red clay on rock

L1b Shallow stony loam

Soils formed over alluvium

D3 Sandy loam over dispersive red clay

D2 Loam over red clay

Minor soils

Soils formed on basement rock

K2 Loam over red clay on non calcareous rock

K3 Gravelly sandy loam over red clay on non calcareous rock

C2 Shallow gradational clay loam on rock

D7a Sandy loam over dispersive clay on rock



- L1a** Shallow stony loamy sand
A2 Calcareous light clay on rock
B4 Gradational loam over limestone
Soils formed on alluvium
M2 Gradational clay loam
M4/A3 Gradational sandy loam
F1 Sandy clay loam over brown mottled clay
E2/E1 Cracking clay

Main features: The Kapunda Land System is an irregular landscape of undulating to rolling rises and low hills with extensive gently inclined outwash fans and drainage depressions. There is an extensive ridge system along the western side and scattered moderately steep rocky ridges elsewhere, all of which are non arable. These areas are often exposed, further limiting productive potential. There are significant areas of moderate slopes with sporadic rock outcrop which are semi arable. The majority of the land is arable although sloping, with associated potential for water erosion. The soils are predominantly texture contrast types. About 60% have loamy or clay loamy surfaces, the rest have gritty sandy loam surfaces which are highly erodible. Extensive watercourse erosion is evidence of considerable degradation in the past. Although most arable soils are moderately deep and fertile, surfaces are often hard setting with a tendency to seal over. Apart from run off and erosion, this condition makes the soil difficult to work and restricts seedling emergence and early growth. There is some evidence of saline seepage on lower slopes, but only minor areas are affected.

Soil Landscape Unit summary: 19 Soil Landscape Units (SLUs) mapped in the Kapunda Land System:

SLU	% of area	Main features #
AQD	2.1	Very rocky steep slopes of 30-50% formed on Gilbert Range Quartzites and Appila Tillites. There is up to 20% rock outcrop and up to 50% surface quartzite and sandstone. Main soils: <u>shallow stony loamy sand</u> - L1a (E) and <u>gravelly loamy sand over red clay on non calcareous rock</u> - K3 (E). This land is too steep and rocky for any agricultural uses other than rough grazing.
ARC ARD ARI	5.5 2.5 0.7	Rocky ridges, low hills and slopes formed on interbedded siltstones, tillites and quartzites. There is up to 10% outcropping quartzite and 20-50% surface quartzite stone. ARC Ridges and slopes to 40 m high with slopes of 15-30%. ARD Ridges to 60 m high with slopes of 25-50%. ARI Dissected hillslopes of 20-30% with eroded watercourses. Main soils: <u>loam over red clay on calcareous rock</u> - D1 (E) and <u>shallow stony loam</u> - L1b (E), with <u>loam over dispersive red clay on rock</u> - D7b (L), <u>sandy loam over dispersive clay on rock</u> - D7a (L), <u>loam over red clay on non calcareous rock</u> - K2 (L), <u>gravelly loamy sand over red clay on rock</u> - K3 (L) and <u>shallow stony loamy sand</u> - L1a (M). Although moderately steep to steep and rocky, the soils on this land are often reasonably deep and fertile. However, pasture production potential is limited by exposure and difficulty in accessing rocky slopes. Substantial areas have not been cleared - these are useful as shelterbelts.
BBI	9.1	Irregular rolling low hills to 50 m high with slopes of 8-20%. There is 10-50% surface cover of quartzite, siltstone and ironstone. Abrupt linear crests with up to 50% rock outcrop and eroded watercourses are characteristic of the landscape. There are significant areas of outwash fans formed on localized alluvium which are too small to map out. Main soils: <u>loam over red clay on non calcareous rock</u> - K2 (E) and <u>gravelly sandy loam over red clay on rock</u> - K3 (E), with <u>loam over red clay on calcareous rock</u> - D1 (C) and <u>sandy loam over dispersive clay on rock</u> - D7a (L) on slopes, <u>shallow stony loamy sand to loam</u> - L1a/L1b (L) on crests, and <u>sandy loam over dispersive red clay</u> - D3 (L) and <u>sandy clay loam over brown mottled clay</u> - F1 (M) on fans. This land is semi arable due to moderate slopes, frequent rocky outcrop and highly erodible soils. Poor soil structure with associated low infiltration rates, high runoff and



		patchy emergence are typical of the most extensive soils. Moderate to low fertility is also characteristic. Surface quartzite and ironstone are highly abrasive.
DEC DED DEH	29.8 2.2 2.9	<p>Rises and slopes formed on mainly fine grained rocks of the Tapley Hill, Ulupa and Tarcowie Formations.</p> <p>DEC Undulating rises to 40 m high with slopes of 4-12%, and occasional unmappable steep peaks (such as Mt. Allen).</p> <p>DED Moderate slopes of 10-20%.</p> <p>DEH Undulating rises to 40 m high with slopes of 4-12% and eroded watercourses.</p> <p>Main soils: <u>loam over red clay on calcareous rock</u> - D1 (E), with <u>loam over dispersive red clay on rock</u> - D7b (L), <u>shallow stony loam</u> - L1b (L), <u>shallow gradational clay loam on rock</u> - C2 (L) and <u>gradational loam over limestone</u> - B4 (M). <u>Sandy loam over dispersive red clay</u> - D3 (M) and <u>gradational clay loam</u> - M2 (M) occur on lower slopes and drainage depressions. These soils are moderately deep and fertile, and generally arable (except on some short steep rises). Most soils have hard setting and sealing surfaces which shed water, are difficult to work and restrict early crop growth. Gypsum will often help this condition, together with modified surface management practices. There is a moderate potential for water erosion throughout.</p>
DHC DHD DHI	3.3 8.8 2.4	<p>Rises formed on medium to coarse grained rocks of the Appila Tillite Formation. Up to 20% of the surface is covered by rocky reefs and stone.</p> <p>DHC Rises to 30 m high with slopes of 3-12% - 95% arable.</p> <p>DHD Rises to 40 m high with slopes of 10-20%, linear rock outcrop - about 75% arable.</p> <p>DHI Rises to 40 m high with slopes of 10-20%, eroded watercourses - about 75% arable.</p> <p>Main soils: <u>loam over red clay on calcareous rock</u> - D1 (E) and <u>sandy loam over dispersive clay on rock</u> - D7a (E), with <u>loam over red clay on non calcareous rock</u> - K2 (C), <u>shallow stony loamy sand</u> - L1a (C), <u>gravelly loamy sand over red clay on rock</u> - K3 (L) and <u>loam over dispersive red clay</u> - D7b (M). This land is mostly arable, with rocky outcrop and moderate slopes reducing cropping opportunities in DHD and DHI. The main soils are poorly structured, only moderately fertile and often shallow, further reducing productive potential. Excessive runoff, waterlogging on lower slopes, workability difficulties and patchy early crop growth are consequences of poor soil structure. The soils are highly erodible, so even moderate slopes are at risk of erosion.</p>
DSC DSD DSI	0.3 1.0 0.5	<p>Moderate slopes formed on siltstones with interbedded quartzitic reefs.</p> <p>DSC Gentle slopes of 6-10%.</p> <p>DSD Moderate slopes of 10-20%.</p> <p>DSI Moderate slopes of 10-20% with eroded watercourses.</p> <p>Main soils: <u>loam over red clay on calcareous rock</u> - D1 (E) and <u>shallow stony loam</u> - L1b (E), with <u>shallow gradational clay loam on rock</u> - C2 (L). The soils are generally moderately deep and fertile but slopes restrict cropping because of the erosion potential. Rocky outcrops further reduce the area of arable land.</p>
EMC EM D	2.6 2.0	<p>Rises formed on Angaston Marble and associated Cambrian rocks of the Hawker Group.</p> <p>EMC Rises with slopes of 4-12% and up to 20% surface marble and siltstone.</p> <p>EMD Rises with slopes of 10-25% and up to 50% surface marble and siltstone.</p> <p>Main soils: <u>loam over red clay on calcareous rock</u> - D1 (E), with <u>calcareous light clay on rock</u> - A2 (C), <u>shallow stony loam</u> - L1b (C) and <u>gradational loam over limestone</u> - B4 (L). These soils are generally well structured, well drained and fertile, but often very shallow. EMD particularly is largely non arable due to shallow, stony soil and moderate slopes.</p>
JBC JBH JBJ	2.0 20.8 1.5	<p>Outwash fans and drainage depressions formed on locally derived medium to fine grained alluvium.</p> <p>JBC Fans with slopes of 4-10%.</p> <p>JBH Fans and drainage depressions with slopes of 2-5% and moderate to severe water course erosion.</p> <p>JBJ Drainage depressions with eroded watercourses.</p> <p>Main soils: <u>sandy loam over dispersive red clay</u> - D3 (E) and <u>loam over red clay</u> - D2 (C), with <u>gradational clay loam</u> - M2 (L), <u>gradational sandy loam</u> - M4/A3 (L), <u>sandy clay loam over brown mottled clay</u> - F1 (L) and <u>cracking clay</u> - E2/E1 (M). The soils are deep and moderately fertile, but generally poorly structured. Hard setting and sealing surfaces are common, leading to runoff and erosion, working difficulties and weak early crop growth. Waterlogging in the D3 soils, due to perching of water on the dispersive subsoil is an additional physical problem. High boron concentrations are common in deep subsoils, and toxicity symptoms are seen in dry seasons. The land is potentially productive, provided that surface soils are improved and erosion is controlled.</p>



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** Calcareous light clay on rock (Hypercalcic Calcarosol)
Calcareous light clay grading to a highly calcareous well structured brown clay overlying fine grained calcareous rock.
- B4** Gradational clay loam over limestone (Petrocalcic, Red Dermosol)
15 - 35 cm loam to light clay grading to a red well structured clay overlying sheet or rubbly calcrete at about 40 cm. Weathered basement rock or Tertiary sediments underlie the calcrete.
- C2** Shallow gradational clay loam on rock (Calcic, Red Dermosol)
20 - 50 cm friable clay loam to light clay grading to a red well structured medium to heavy clay, calcareous from 55 cm and grading to weathering rock within 100 cm.
- D1** Loam over red clay on calcareous rock (Hypercalcic, Red Chromosol)
15 - 35 hard siltstone gravelly loam to clay loam abruptly overlying a well structured red clay with abundant soft carbonate from 55 cm grading to weathering fine grained rock at 80 cm.
- D2** Loam over red clay (Calcic, Red Chromosol)
20 - 50 cm hard loam to clay loam abruptly overlying a well structured red clay with soft carbonate from 70 cm grading to alluvium.
- D3** Sandy loam over dispersive red clay (Calcic, Red Sodosol)
25 - 50 cm hard sandy loam to loam with a bleached A2 layer, abruptly overlying a coarsely structured dispersive red clay with soft carbonate from 70 cm grading to alluvium.
- D7a** Sandy loam over dispersive clay on rock (Hypercalcic, Red Sodosol)
20 - 40 cm hard quartz gravelly sandy loam with a bleached A2 layer, abruptly overlying a red coarsely structured dispersive clay with abundant soft carbonate from 50 cm grading to weathering tillite, sandstone or quartzite from 75 cm.
- D7b** Loam over dispersive red clay on rock (Calcic, Red Sodosol)
10 - 30 cm hard loam to clay loam abruptly overlying a coarsely structured dispersive red clay, calcareous from 65 cm grading to weathering shale from 100 cm.
- E2/E1** Cracking clay (Red / Black Vertosol)
Dark strongly structured seasonally cracking clay becoming more clayey, coarser structured and calcareous with depth.
- F1** Sandy clay loam over brown mottled clay (Eutrophic, Brown Chromosol)
Thick hard sandy loam to clay loam with a bleached and quartz gravelly A2 layer, abruptly overlying a brown, yellow and red mottled strongly structured medium to heavy clay.
- K2** Loam over red clay on non calcareous rock (Eutrophic, Red Chromosol)
20 - 40 cm hard quartz gravelly fine sandy loam to clay loam, with a pink A2 layer, abruptly overlying a coarsely structured orange to red clay grading to fine grained quartzitic rock at 50 cm.



- K3** Gravelly sandy loam over red clay on non calcareous rock (Eutrophic, Red Chromosol / Sodosol)
30 - 50 cm quartz gravelly loamy sand to sandy loam abruptly overlying a coarsely structured red clay grading to weathering quartzite or sandstone at 60 cm.
- L1a** Shallow stony loamy sand (Lithic, Leptic Tenosol / Rudosol)
20 - 60 cm stony gritty loamy sand to sandy loam with a bleached A2 layer directly overlying basement rock.
- L1b** Shallow stony loam (Calcareous / Basic, Paralithic, Leptic Tenosol)
25 - 35 cm siltstone gravelly loam over weathering rock with clay and / or soft carbonate in fissures.
- M2** Gradational clay loam (Calcic, Red Dermosol)
20 - 30 cm clay loam grading to a well structured red clay, weakly calcareous from 60 cm.
- M4/A3** Gradational sandy loam (Calcic, Red Kandosol / Hypocalcic Calcarosol)
50 - 70 cm loamy fine sand to silty loam becoming more clayey with depth, calcareous from 90 cm, sometimes moderately calcareous throughout.

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

