

WLG Willunga Land System

Gently sloping outwash fans adjacent to the Willunga Escarpment, extending from McLaren Flat to Sellicks Beach

Area: 75.5 km²

Annual rainfall: 550 - 750 mm average

Geology: The land is underlain by unconsolidated sediments derived from the rocks of the Willunga Escarpment. These are mostly fine grained, so the sediments are silty to clayey. The sediments tend to become more clayey towards the sea. There are extensive stone bands within the finer material, especially adjacent to the escarpment, and associated with creek lines. Aeolian carbonates have been leached into the sediments, and generally there are minor accumulations in the lower subsoil. Minor Tertiary remnants (as for McLaren Vale Land System) protrude through the sedimentary cover.

Topography: The topographic pattern is a simple outwash fan, with moderately steep and stony slopes at the foot of the escarpment, gradually flattening out towards the sea. The northern part drains to the sea via Pedlar, Maslin and Aldinga Creeks. The southern part drains into a flat discharge area inland from Silver Sands, and eventually to a small coastal swamp. This discharge flat is moderately saline. Watercourses are well defined on the upper slopes of the fans where they are commonly deeply eroded, but tend to lose definition further down slope. Except for a narrow band adjacent to the escarpment, slopes are less than 8%.

Elevation: 0 m along the coast to 220 m along the base of the Willunga Escarpment

Relief: The land is a more or less uniform slope with little relief other than occasional Tertiary remnants up to 15 m high, and erosion gullies up to 5 m deep.

Soils: The soils are all deep over alluvium. Most are texture contrast types with loamy or more commonly silty loam surfaces and red clayey subsoils. Also common are sandy loam soils with poorly structured brown subsoils. There are limited areas of heavy black soils.

Main soils

- D2a** Silty loam over red clay
- F2** Sandy loam over poorly structured brown clay
- F1** Silty loam over brown clay
- D2b** Stony silty loam over red clay
- M2** Dark gradational clay loam

Minor soils

- E1** Black cracking clay
- D3** Sandy loam over poorly structured red clay
- C3** Gradational red loam
- M1** Deep sandy loam
- C5** Gradational grey loam (marginally saline)
- N2** Wet saline soil



Main features: The Willunga Land System is a gently sloping to flat outwash fan. Except for some eroded watercourses, the coastal strip and a small area of saline flats and swamps, it is fully arable. The soils are characterized by hard silty loam to silty clay loam surfaces overlying clayey subsoils. On the more favourable areas, the subsoils are red, well structured and moderately well drained. Elsewhere, they tend to be mottled brown and dispersive, with waterlogging problems. There are significant areas of black clay loamy to clayey soil with high fertility. The soils are generally suitable for horticulture and viticulture, although waterlogging and salt/sodicity build up will occur unless irrigation and soil management is of a high standard. The black soils are excellent cropping soils, but less favoured for horticulture/viticulture. Without drainage, the marginally saline soils in the discharge flats of the south west have little potential for sustainable intensive use and are better suited to salt tolerant pastures.

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

SLU	% of area	Main features #
GAC GFB	1.7 0.3	<p>Undulating to gently rolling rises formed on massive clayey sands to sandy clays, commonly indurated to weak sandstones, with characteristic bright red, yellow and grey colourings. Slopes are usually less than 16%, but occasionally reach 20%. Maximum relief is 40 metres. Watercourses are only weakly defined. There are minor patches of surface ironstone and no rock outcrop.</p> <p>GAC Undulating rises with relief to 30 m and slopes of 3-8%. GAD Gently rolling rises with relief to 40 m and slopes of 8-16%.</p> <p>The soils generally have sandy surfaces, but there is a range of subsoils including friable sandy clay, sodic heavy clay, ironstone rich clay and loose sand.</p> <p>Main soils: <u>Bleached sand over sandy clay loam</u> - G2 (E) } on rises <u>Deep bleached sand</u> - H3 (C) } <u>Thick loamy sand over red and brown clay</u> - D5/G3 (M) } <u>Thick ironstone gravelly sand over clay</u> - J2 (M) } <u>Loamy sand over dispersive clay</u> - G4 (M) } <u>Sandy loam over red sandy clay</u> - D2 (M) } on lower slopes <u>Thick sand over clay</u> - G3 (L) } <u>Sandy loam over dispersive brown clay</u> - F2b (M) }</p> <p>These soils are generally infertile and erodible with variable drainage conditions, although the most common types are well drained. They are generally not well suited to cropping, but have high horticultural potential if appropriately managed. Acidification, erosion and water repellence must be controlled, fertility maintained, and irrigation carefully scheduled for sustained productivity.</p>
JBB JBC JBD JBH JBJ JBP	23.9 10.0 0.5 11.4 1.9 5.0	<p>Very gently to gently inclined outwash fans, grading to moderately inclined footslopes adjacent to the Willunga Escarpment, formed on calcified sandy clays and clays derived from the erosion and deposition of soil and rock materials from the escarpment. Slopes range from 1.5% to 8% on the gentler slopes, to 16% adjacent to the escarpments. Well defined watercourses cross the landscape.</p> <p>These are eroded in places.</p> <p>JBB Very gently inclined slopes of 1.5-3%. JBC Gently inclined slopes of 3-8%. JBD Short moderately steep footslopes with slopes of 8-16%. JBH Gently inclined slopes of 3-8% with eroded watercourses. JBJ Eroded watercourses JBP Low lying alluvial flats, salinized by near surface saline water tables. Slopes are less than 1%. Most soils have texture contrast or gradational profiles with silty loam to silty clay loam surfaces, and usually red clayey subsoils. These are usually calcareous with depth. There are some soils with brown mottled clay subsoils. The soils of JBP are mostly gradational clay loams.</p> <p>Main soils: <u>Silty loam over red clay</u> - D2a (E) throughout <u>Stony silty loam over red clay</u> - D2b (C), mainly near escarpment in JBD, JBC, JBH <u>Silty loam over brown clay</u> - F1 (C) throughout <u>Sandy loam over poorly structured red clay</u> - D3 (L) throughout <u>Dark gradational clay loam</u> - M2 (M) on flats <u>Deep sandy loam</u> - M1 (E) near creeks (JBJ) & escarpment (JBD), minor elsewhere</p>



		<p><u>Gradational red loam</u> - C3 (E) in JBP, minor elsewhere <u>Gradational grey loam</u> - C5 (E) in JBP</p> <p>These soils are deep and inherently fertile. The main limitations are linked to poor structure, due to the high silt content of surface soils and susceptibility of the upper part of the profile to compaction. Sodicity build-up under irrigation is also an issue. This land is the mainstay of the almond industry in the district, due to adequate drainage, good waterholding capacity and natural fertility. Marginally saline soils of JBP have little horticultural potential without substantial improvements in drainage.</p>
JRA JRB JRC JRJ	4.8 6.0 9.7 2.4	<p>Very gently to gently inclined outwash fans, valley flats and drainage depressions. The underlying sediments are calcified sandy clays to clays, derived from soil and rock materials from the escarpment to the east. Slopes are 2% to 10%. Well defined watercourses flow across the fans in the drainage depressions. They are sometimes eroded.</p> <p>JRA Flats with slopes of 0-1.5%. JRB Very gently inclined fans with slopes of 1.5-3%. JRC Gently inclined fans with slopes of 3-10%. JRJ Eroded watercourses.</p> <p>The main soils have sandy loam to clay loam surfaces over clayey subsoils which are usually poorly structured. Most soils have at least minor fine carbonates in the deep subsoil. Main soils: <u>Sandy loam over poorly structured brown clay</u> - F2 (V) <u>Silty loam over brown clay</u> - F1 (L) <u>Sandy loam over poorly structured red clay</u> - D3 (M)</p> <p>Predominant soils are imperfectly drained due to their slowly permeable dispersive subsoil clays. The soils with deeper surfaces are manageable, but where depth to clay is less than 30 cm, waterlogging and salt accumulation under irrigation are likely to be problems. The soils are generally less fertile than the dominant soils of the associated JB* soil landscapes. They are also highly erodible.</p>
KSA	15.6	<p>Flat to very gently undulating plain formed on clayey alluvium, mantled by fine grained carbonates. Slopes are less than 2%. There is no defined surface drainage pattern. The dominant soils have black clay loamy to clayey surfaces with heavy clay subsoils. Some are seasonally cracking.</p> <p>Main soils: <u>Dark gradational clay loam</u> - M2 (V) <u>Black cracking clay</u> - E1 (L) <u>Gradational red loam</u> - C3 (L)</p> <p>These soils are deep and inherently highly fertile, although they become very sticky and difficult to work when wet. They are excellent cropping soils, but less favourable for irrigated horticulture and viticulture, due to deep drainage restrictions, and to establishment problems possibly caused by difficulty in maintaining sufficient available water levels and surface cracking. They also tend to cause excessive vigour in vines. However they are being increasingly developed for viticulture.</p>
KUA KUE	4.0 0.6	<p>Valley flats and drainage depressions with well defined watercourses, formed on alluvial loams to clays, mantled by fine grained carbonates. Slopes in channels are less than 2%, but on margins adjacent to rising ground, slopes are up to 10%. There are occasional waterlogged areas.</p> <p>KUA Valley flats with slopes of 0-2%. KUE Drainage depressions with slopes of 1-5%.</p> <p>The dominant soils are deep clay loams to sandy loams, usually with increasing clay contents with depth.</p> <p>Main soils: <u>Dark gradational clay loam</u> - M2 (E) <u>Deep sandy loam</u> - M1 (C) <u>Silty loam over brown clay</u> - F1 (L)</p> <p>These soils are deep and moderately to highly fertile. Drainage is variable, from well to imperfectly drained. Provided that waterlogged areas are avoided, this land has high potential for horticultural crops.</p>
TMA	1.2	<p>Level plains to gently undulating rises, invariably in elevated positions in the landscape, formed on Hindmarsh Clay, calcified by low to moderate amounts of aeolian carbonate. Slopes range from 0% to 5%, but are usually less than 3%. There are no defined surface drainage patterns. There is gilgai microrelief in non cultivated areas. The dominant soils have medium to fine textured surfaces and heavy clay subsoils.</p> <p>Main soils: <u>Black to grey cracking clay</u> - E1/E3 (E) <u>Dark gradational clay loam</u> - M2 (C) <u>Clay loam over dark clay</u> - F2c (L) <u>Sandy loam over dispersive brown clay</u> - F2a (L) <u>Sandy loam over dispersive red clay</u> - D3a (L)</p>



		The soils are deep and inherently fertile, but are difficult to work and become intractable when wet. They are excellent cropping soils, but are less well suited to horticulture.
WA-	0.5	Unconsolidated coastal cliffs of calcarenites, sands and clays, variably calcified and partially indurated. They are not always mappable due to their limited horizontal extent. The height of the cliffs varies from 20 to 50 metres and slopes are usually more than 100%. They are frequently very unstable.
WEa	0.1	Beaches along the Aldinga Bay coast.
ZA-	0.4	Tidal swamp underlain by estuarine clays. This is the discharge area for the southern part of the Land System. The swamp is partially inundated. Main soil is: <u>Wet saline soil - N2</u> This land is too wet and saline for agriculture, but has wetland value.

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:

- C3** Gradational red loam (Sodic, Calcic, Red Dermosol)
Medium to thick friable reddish brown clay loam grading to a reddish moderately well structured light clay, becoming moderately calcareous with depth.
- C5** Gradational grey loam (Sodic, Calcic, Grey Dermosol)
Thick friable dark brown clay loam grading to a dark grey moderately well structured light clay overlying a red calcareous medium clay as shallow as 60 cm to deeper than 100 cm. Marginally saline throughout.
- D2a** Silty loam over red clay (Sodic, Calcic, Red Chromosol / Dermosol)
30 - 60 cm hard silty loam grading to a massive paler coloured and slightly gravelly silty clay loam at the base, over a well structured red light to medium clay, weakly calcareous from about 70 cm, and sometimes overlying a red heavy clay as shallow as 70 cm.
- D2b** Stony silty loam over red clay (Sodic, Calcic, Red Chromosol)
Thick reddish brown silty loam with up to 20% quartzite and slate stones and a paler very gravelly silty clay loam A2 horizon, over a dark reddish brown stony well structured light clay, moderately calcareous deeper than 80 cm.
- D3** Sandy loam over poorly structured red clay (Calcic, Red Sodosol)
Medium to thick hard massive sandy loam to sandy clay loam with a bleached A2 horizon, abruptly overlying a red dispersive coarsely prismatic medium clay, calcareous from about 60 cm.
- E1** Black cracking clay (Self-mulching, Black Vertosol)
Medium thickness very dark grey moderately calcareous light to medium clay with fine blocky structure, overlying a black to dark grey coarsely prismatic heavy clay becoming paler coloured and more calcareous with depth. Hindmarsh Clay from about 70 cm.
- F1** Silty loam over brown clay (Calcic, Brown Chromosol)
25-60 cm hard massive grey brown silty loam with a bleached silty clay loam A2 horizon, overlying a dark brown, yellowish brown and red strongly prismatic medium clay with variable fine carbonate from about 70 cm, although not always present.
- F2** Sandy loam over poorly structured brown clay (Calcic, Brown Sodosol)
20-50 cm firm greyish brown sandy loam with a massive sandier bleached A2 horizon, overlying a yellowish brown, dark brown and grey mottled clay with strong blocky structure and fine Class I carbonate segregations from about 75 cm.



M1 Deep sandy loam (Basic, Regolithic, Brown-Orthic Tenosol)

Thick brown sandy loam to clay loam, overlying a grey to brown silty loam to clay loam with weak prismatic structure, weakly calcareous with depth. The soil is formed in variable sandy, gritty and clayey alluvial sediments.

M2 Dark gradational clay loam (Calcic, Black Dermosol)

Medium thickness black clay loam to light clay with strong granular structure, overlying a very dark clay with blocky structure and variable amounts of fine calcareous segregations.

N2 Wet saline soil (Dermosolic, Salic Hydrosol)

30 cm soft dark grey clay loam grading to a black light clay, becoming greyer and moderately calcareous from 45 cm. Buried red soils (C3) may underlie the soil within 100 cm. Soil is wet and saline throughout.

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

