

# SUG Sugarloaf Land System

Rises, pediments and associated drainage lines formed on limestones and calc-siltstones. Named from Watt Sugarloaf, a prominent hill in the adjacent Black Jack Range southwest of Hawker.

<b>Area:</b>	126 km <sup>2</sup>
<b>Rainfall:</b>	250 - 325 mm annual average (mostly 275 - 300 mm)
<b>Geology:</b>	Predominantly calcareous rocks including limestones, calc-siltstones and calcareous shales of the Hawker Group of the northern Flinders Ranges. Included are occurrences of calc-siltstones typical of the Tapley Hill Formation.
<b>Elevation:</b>	Over 550 m asl on hills in the northeast, grading to 240m on valley floors in the southwest. Most of the land system has elevations in the 250-350m range.
<b>Relief:</b>	Mostly around 10 - 20 m, with the exception of hills in the northeast where relief is up to 70 m.
<b>Soils:</b>	Shallow rocky soils and calcareous loamy soils on rock occupy three quarters of the land system, with rubbly calcareous gradational soils typical on gentle rises and pediment slopes.
<b>Main soils:</b>	<p><b>L1a</b> Shallow stony loam (on rock)</p> <p><b>A2</b> Calcareous loam to sandy loam (on rock)</p> <p><b>A5</b> Rubbly calcareous loam to sandy loam on clay (on outwash)</p>
<b>Minor soils:</b>	<p><i>On rock</i></p> <p><b>B2</b> Shallow calcareous loam on calcrete</p> <p><b>C2</b> Gradational sandy loam to clay loam on rock</p> <p><b>D1</b> Loam to clay loam over clay on rock</p> <p><b>D7</b> Loam over poorly structured clay on rock</p> <p><b>G1</b> Moderately deep sand</p> <p><b>L1b</b> Shallow stony sandy loam</p> <p><b>L1c</b> Shallow stony loamy sand</p> <p><b>L1d</b> Shallow stony clay loam</p> <p><b>L1e</b> Shallow drift sand</p> <p><b>RR</b> Rock outcrop</p> <p><i>On outwash or reworked deposits</i></p> <p><b>A3</b> Deep moderately calcareous sandy loam to loam</p> <p><b>A4</b> Deep (rubbly) calcareous sandy loam</p> <p><b>A6</b> Gradational calcareous clay loam</p> <p><b>C1</b> Gradational sandy loam</p> <p><b>C3</b> Friable gradational clay loam</p> <p><b>D4</b> Clay loam over pedaric red clay</p> <p><b>D5</b> Hard loamy sand over red clay</p> <p><b>E2</b> Red cracking clay</p> <p><b>M3</b> Deep gravelly sandy loam</p>



**Summary:**

Limestones and calc-siltstones underlie the rolling to undulating landscape. Shallow calcareous gradational soils are common on the rises, with deeper calcareous soils formed on pediments and outwash sediments.

**Soil Landscape Unit summary:** 45 Soil Landscape Units (SLUs) mapped in the Sugarloaf Land System

SLU	% of area	Component	Main soils	Prop#	Notes
AAD	2.9	Steep low hills	L1	D	Dissected rocky steep rises to steep low hills formed on limestone and calc-siltstone with very shallow sandy loam to loam soils. <b>AAD</b> Steep low hills. Relief is 30-90m, slopes are 30-50%. <b>AAS</b> Dissected rolling rises. Scalding & sheet erosion are common. Soils are mostly shallow, but occasionally, moderately deep in drainage lines. Relief is 9-30m, slopes are 10-30%. <b>AAV</b> Steep rises forming a low west-facing scarp. Extensive rock outcrop. Relief is 9-30m, slopes are 30-56%. Main soils: <u>shallow stony loam and sandy loam</u> - <b>L1a</b> & <b>L1b</b> , and <u>shallow calcareous loam</u> - <b>A2</b> .
AAS	5.4	Rolling rises	L1	D	
AAV	1.2	Steep rises	L1	D	
ADB	12.6	Rolling rises	L1	D	Rocky rises with thin soil cover formed on limestone and calc-siltstone with very shallow loamy soils. <b>ADB</b> Rolling rises formed on calcareous fine-grained Wonoka Formation siltstone, shale and limestone. Relief is 9-30m, slopes are 10-30%. <b>ADg</b> Dissected and gullied gently undulating rises on calcareous Wonoka Formation. Slopes are 1-3%, relief is less than 30m. <b>ADJ</b> Steep rises on Cambrian Hawker Group limestone. Relief is 9-30m, slopes are 30-56%. Main soils: <u>shallow stony loam</u> - <b>L1a</b> , with <u>gradational loam on rock</u> - <b>C2</b> , <u>shallow calcareous loam</u> - <b>A2</b> and <u>loam over clay on rock</u> - <b>D1</b> .
ADg	0.1	Gently undulating rises	L1	D	
ADJ	2.3	Steep rises	L1C2 A2	D	
AQA	0.3	Undulating rises	L1	D	Rises and low hills formed on Pound Quartzite with very shallow rocky soils and rocky outcrops. <b>AQA</b> Undulating low foothills. Relief < 30m, slopes are 3-10%. <b>AQC</b> Rolling low hills. Relief is 30-90m, slopes are 3-10%. Main soils: <u>shallow stony loamy sand</u> - <b>L1c</b> , with <u>gradational sandy loam on rock</u> - <b>C2</b> .
AQC	0.4	Rolling low hills	L1	D	
DMH	1.6	Lower slopes and rises	D1D7 M3	D	Undulating lower slopes and rises adjacent to Kanyaka Hill. Soils overlie Hawker Group calcareous shales and limestone. Gullying affects 10-20% of the land. Soils are generally saline, especially subsoils. Relief is less than 30m, slopes are 3-10%. Main soils: <u>clay loam over (pedaric) clay on rock</u> - <b>D1</b> , <u>loam over poorly structured clay on rock</u> - <b>D7</b> and <u>deep gravelly sandy loam</u> - <b>M3</b> , with <u>shallow stony loam</u> - <b>L1a</b> .
DOG	0.2	Plateau	E2C3 D4	D	Gently undulating crest or plateau remnant on Hawker Group calcareous fine grained rocks. Relief is less than 9m, slopes <3%. Main soils: <u>red cracking clay</u> - <b>E2</b> , <u>friable gradational clay loam</u> - <b>C3</b> and <u>clay loam over pedaric red clay</u> - <b>D4</b> .
DSm	2.8	Undulating rises	D1C2 D7	V	Undulating rises with shallow clay loamy surfaced soils over rock with >20% outcropping rock. Relief < 30m, slopes 3-10%. Main soils: <b>Rises:</b> <u>clay loam over (pedaric) clay on rock</u> - <b>D1</b> , <u>gradational clay loam on rock</u> - <b>C2</b> and <u>loam over poorly structured clay on rock</u> - <b>D7</b> <b>Rocky areas:</b> <u>shallow stony loam</u> - <b>L1a</b> and <u>rock outcrop</u> - <b>RR</b> .
		Rock outcrops	L1RR	C	



EFB	1.4	Rises	A2L1	D	<p>Rises and plains with moderately shallow soils overlying hard calcareous rocks, typically Hawker Group siltstones and limestones.</p> <p><b>EFB</b> Gently undulating rises with minor scalding. Slopes are 1-3%, relief is less than 30m.</p> <p><b>EFC</b> Undulating rises with minor scalding. Relief is less than 30m, slopes are 3-10%.</p> <p><b>EFD</b> Rolling rises with minor scalding. Relief is 9-30m, slopes are 10-30%.</p> <p><b>EFm</b> Undulating rises with 25% scalding and 10% affected by gullyng. Relief is less than 30m, slopes are 3-10%.</p> <p><b>EFn</b> Rolling rises with 25% scalding and 10% affected by gullyng. Relief is less than 30m, slopes are 10-20%.</p> <p><b>EFu</b> Low rises and footslope plains with severe (60%) scalding and up to 20% affected by gullyng. Rises have slopes of 1-3% and relief of less than 30m. Slopes on plains are less than 1%.</p> <p><b>EFV</b> Gently undulating rises with up to 50% scalding on lower slopes. Rocky reefs common between scalded areas. Slopes are 1-3%, relief is less than 30m.</p> <p><b>EFv</b> Low rises and plains with gullyng and extreme levels of scalding. Slopes on rises are 1-3%, relief is less than 30m. Slopes on plains are less than 3%.</p> <p><b>EFW</b> Broadly undulating rises on calc-siltstone, with moderately scalded surfaces. Relief is less than 30m, slopes are 3-10%.</p> <p><b>EFX</b> Rolling rises on calc-siltstone, with moderately scalded surfaces. Relief is 9-30m, slopes are 10-30%.</p> <p>Main soils:  <b>Rises:</b> <u>shallow calcareous loam - A2</u> and <u>shallow stony loam - L1a</u>  <b>Plains:</b> <u>shallow calcareous loam - A2</u>, <u>loam over poorly structured clay on rock - D7</u> and <u>shallow stony loam - L1a</u>.</p>
EFC	4.4	Rises	A2L1	D	
EFD	1.0	Rises	A2L1	D	
EFm	0.1	Rises	A2L1	D	
EFn	0.9	Rises	A2L1	D	
EFu	0.3	Low rises	A2L1	V	
		Plains	A2D7 L1	L	
EFV	6.9	Gentle rises	A2L1	D	
EFv	0.4	Low rises	A2L1	V	
		Plains	A2D7	L	
EFW	5.2	Rises	A2L1	D	
EFX	0.2	Rises	A2L1	D	
EHk	1.6	Rises	A2L1	V	
		Pediment slopes	A2	C	
EHI	4.1	Rises	A2	D	
EHm	1.5	Rises, crests	A2	V	
		Lower slopes	A2L1	C	
EHn	0.8	Rises	A2L1	D	
EHr	1.9	Rises and pediment slopes complex	A2	D	
ESD	0.2	Rises	L1A2 A5	D	
ESI	4.6	Rises	A2A5	D	
ESm	4.4	Rises	A2A5	D	



ESN	9.1	Rises	A2A5	V	<b>ESI</b> Gently undulating rises, with up to 20% of land gullied and 10-50% scalded. Relief is 9-30m, slopes are 1-3%.
		Lower slopes	A2A5	L	
ESn	6.3	Rises	A2A5	D	<b>ESm</b> Undulating rises. Minor scalding and gullyng. Relief is 9-30m, slopes are 3-10%
					<b>ESN</b> Rolling rises and lower slopes with salinity patches affecting 10-50% of land. 5-10% of lower slopes are scalded and more than 20% gullied. Relief is 9-30m, slopes are 10-20%.
					<b>ESn</b> Dissected rolling rises. Minor scalding and gullyng. Relief is 30-90m; slopes are 10-30%. Main soils: <u>shallow calcareous loam</u> - <b>A2</b> and <u>rubbly calcareous loam on clay</u> - <b>A5</b> , with <u>shallow stony loam</u> - <b>L1a</b> .
ETD	0.4	Low hills	A2L1 RR	D	Rolling low hills with very shallow soils and more than 20% outcrop on ABC Range Quartzite Formation (includes siltstones and quartzites). Main soils: <u>shallow calcareous loam</u> - <b>A2</b> , <u>shallow stony sandy loam</u> - <b>L1b</b> and <u>rock outcrop</u> - <b>RR</b> .
EUC	0.2	Undulating rises	L1C2 A2	D	Undulating rises formed on fine grained rocks. Relief is less than 30m, slopes are 3-10%. Main soils: <u>shallow stony loam</u> - <b>L1a</b> , <u>gradational clay loam on rock</u> - <b>C2</b> and <u>shallow calcareous loam</u> - <b>A2</b> .
EYB	4.4	Rises	A2L1	D	Rises formed on Hawker Group (Ch) limestones and sandstones on which occur low red sand dunes and sand sheets. The sand may be locally derived and reworked or it may be an outlier of the dunefields to the west of the Flinders Ranges in the Lake Torrens area. <b>EYB</b> Gently undulating rises with shallow red sand on limestones and calcareous shales. Relief is 9-30m, slopes are 1-3%. <b>EYC</b> Undulating rises. Relief is 9-30m, slopes are 3-10%. <b>EYm</b> Undulating rises. Up to 20% of land is gullied and 10-50% scalded. Relief is 9-30m, slopes are 3-10%. Main soils: <b>Rises:</b> <u>shallow calcareous sandy loam</u> - <b>A2</b> and <u>shallow stony sandy loam</u> - <b>L1b</b> , with <u>rubbly calcareous sandy loam on clay</u> - <b>A5</b> . <b>Sand spreads:</b> <u>shallow sand</u> - <b>L1e</b> and <u>moderately deep sand</u> - <b>G1</b> .
EYC	0.2	Rises	A2	D	
EYm	1.1	Rises	A2	D	
JBo	0.9	Drainage depressions	D5	D	Drainage depressions and pediments formed on outwash sediments.
JBv	0.6	Pediment and rises	D5	D	<b>JBo</b> Drainage depressions with up to 20% of land gullied and 10-50% scalded. <b>JBv</b> Gently sloping pediments with up to 20% of land gullied and minor scalding. Main soil: <u>hard loamy sand over red clay</u> - <b>D5</b> .
JII	0.9	Pediments	D4D1 A5	D	Pediments and plains formed on fine grained rocks and outwash deposits.
JII	2.5	Plain	D4D1 A6	D	<b>JII</b> Rolling pediments adjacent to Black Jack Range with some low stony rises. Slopes are 10-30%, relief is less than 9m. Main soils: <u>loam over pedaric red clay</u> - <b>D4</b> , <u>loam over clay on rock</u> - <b>D1</b> , <u>rubbly calcareous loam on clay</u> - <b>A5</b> , with <u>deep moderately calcareous loam</u> - <b>A3</b> and <u>shallow calcareous loam on calcrete</u> - <b>B2</b> . <b>JII</b> Plain adjacent to and including creeks at the confluence of Kanyaka, Crows Nest and Wirreanda Creeks. Slopes are 1-3%, relief is less than 9m. Main soils: <u>loam over pedaric red clay</u> - <b>D4</b> , <u>loam over clay on rock</u> - <b>D1</b> and <u>gradational calcareous clay loam</u> - <b>A6</b> , with <u>deep moderately calcareous loam</u> - <b>A3</b> and <u>deep gravelly sandy loam</u> - <b>M3</b> .



KAJ	0.9	Drainage depressions	C1A2	D	Drainage depressions and plains formed on medium to fine grained outwash sediments. Moderate gullyng (20% affected) and minor scalding (5% affected.) Main soils: <u>gradational sandy loam</u> - <b>C1</b> and <u>shallow calcareous loam</u> - <b>A2</b> .
KDH	0.2	Undulating pediments	C3A5	D	Undulating pediments with some landslips, adjacent to, and derived from, a range of Pound Quartzite formation rocks. Slopes are 3-10%. Main soils: <u>friable gradational clay loam</u> - <b>C3</b> and <u>rubbly calcareous loam on clay</u> - <b>A5</b> , with <u>clay loam over pedaric red clay</u> - <b>D4</b> and <u>loam over clay on rock</u> - <b>D1</b> .
KPC	0.4	Pediments and rises	A3A4	D	Dissected undulating pediment adjacent to range southwest of Kanyaka, with calcareous sandy loam soils. Slopes are 3-10%. Main soils: <u>deep moderately calcareous sandy loam</u> - <b>A3</b> and <u>deep (rubbly) calcareous sandy loam</u> - <b>A4</b>
KTH	1.9	Pediments	E2C3 D4	D	Moderately sloping pediments, often with coarse surface stone cover. Gullyng affects 10-20%. Soils are generally saline and gypseous, especially subsoils. Relief < 10m, slopes 3-10%. Main soils: <u>red cracking clay</u> - <b>E2</b> , <u>friable gradational clay loam</u> - <b>C3</b> and <u>clay loam over pedaric red clay</u> - <b>D4</b> , with <u>deep moderately calcareous loam</u> - <b>A3</b> .
KZB	0.3	Drainage depressions	A5C1	D	Drainage depression with gravelly calcareous soils. Main soils: <u>rubbly calcareous sandy loam on clay</u> - <b>A5</b> and <u>gradational sandy loam</u> - <b>C1</b> , with <u>deep moderately calcareous sandy loam</u> - <b>A3</b> .

# PROPORTION codes assigned to Soil Landscape Unit (SLU) components:

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 to sandy loam (Paralithic, Hypercalcic / Lithocalcic Calcarosol)  
Calcareous stony loam to sandy loam grading to soft or rubbly carbonate over weathering dolomite or calc-siltstone within 50 cm.
- A3** Deep moderately calcareous sandy loam to loam (Regolithic, Calcic Calcarosol)  
Calcareous loam to sandy loam grading to a loamy to clayey subsoil without a significant carbonate accumulation in the subsoil, grading to medium to fine grained alluvium.
- A4** Deep (rubbly) calcareous sandy loam (Regolithic, Hypercalcic / Lithocalcic Calcarosol)  
Calcareous sandy loam grading to a very highly calcareous sandy clay loam to light clay with variable rubble, continuing below 120 cm.
- A5** Rubbly calcareous loam to sandy loam on clay (Regolithic, Supracalcic / Hypercalcic Calcarosol)  
Calcareous loam to sandy loam grading to a very highly calcareous rubbly sandy clay loam to light clay, over a clayey substrate deeper than 60 cm, but within 120 cm.
- A6** Gradational calcareous clay loam (Pedal, Hypercalcic / Supracalcic Calcarosol)  
Calcareous clay loam grading to a well structured very highly calcareous (sometimes rubbly) clay, over a red clayey substrate within 120 cm.
- B2** Shallow calcareous loam on calcrete (Petrocalcic, Calcic / Lithocalcic Calcarosol)  
Stony calcareous loam, often with a very highly calcareous more clayey subsoil, over sheet calcrete within 50 cm. This grades to rubbly carbonate over weathering basement rock within 150 cm.



- C1** Gradational sandy loam (Hypercalcic, Red Kandosol)  
Friable sandy to loamy topsoil grading to massive red-brown alkaline loamy to clay loamy subsoil, highly calcareous with depth, over alluvium.
- C2** Gradational sandy loam to clay loam on rock (Calcic / Hypercalcic Red Dermosol)  
Sandy loam to clay loam grading to a friable red clay with soft Class I carbonate within 50 cm, grading to weathering rock within 100 cm.
- C3** Friable gradational clay loam (Calcic / Hypercalcic Red Dermosol)  
Clay loam grading to a friable red clay with abundant soft Class I carbonate within 50 cm, overlying alluvium within 100 cm.
- D1** Loam to clay loam over clay on rock (Hypercalcic / Calcic, Red Chromosol)  
Medium thickness hard gravelly loam to clay loam over a friable and finely structured red clay, calcareous with depth, grading to weathering basement rock within 100 cm.
- D4** Clay loam over red friable clay (Calcic, Pedaric, Red Sodosol)  
Thin to medium thickness clay loam over a finely structured friable red clay, calcareous from about 50 cm, grading to fine or medium grained alluvium.
- D5** Hard loamy sand over red clay (Calcic / Hypercalcic Red Chromosol / Sodosol)  
Hard setting loamy sand to light sandy loam with a poorly structured red alkaline clayey to clay loamy subsoil.
- D7** Loam over poorly structured clay on rock (Calcic / Hypercalcic, Red Sodosol)  
Medium to thick hard loam sharply overlying a coarsely structured dispersive red clay, calcareous with depth, grading to highly weathered kaolinized siltstone or quartzite.
- E2** Red cracking clay (Epicalcareous, Epipedal, Red Vertosol)  
Dark strongly structured clay grading to a well structured red calcareous medium to heavy clay continuing below 100 cm. Often contain gypsum segregations in subsoil.
- G1** Moderately deep sand (Hypercalcic, Red Sodosol)  
Thick reddish brown sand to loamy sand, over a thin reddish brown massive sandy clay loam, highly calcareous at the base, overlying weathering rock at about 100 cm.
- L1a** Shallow stony loam (Paralithic, Leptic Tenosol)  
Shallow stony loam, often calcareous with depth, overlying weathering fine grained rock shallower than 50 cm.
- L1b** Shallow stony sandy loam (Paralithic, Leptic Tenosol)  
Shallow stony sandy loam, often calcareous with depth, overlying weathering fine to medium grained sandstone or tillite shallower than 50 cm.
- L1c** Shallow stony loamy sand (Paralithic, Leptic Tenosol)  
Shallow stony loamy sand, often calcareous with depth, overlying quartzite or coarse grained rock shallower than 50 cm.
- L1d** Shallow stony clay loam (Paralithic, Leptic Tenosol)  
Shallow stony clay loam to light clay, often calcareous with depth, overlying weathering very fine grained rock shallower than 50 cm.
- L1e** Shallow drift sand (Basic, Paralithic, Leptic Tenosol)  
Medium thickness loose reddish sand overlying rock or buried shallow rocky soil.
- M3** Deep gravelly sandy loam (Basic, Fluvic, Clastic Rudosol OR Basic, Regolithic, Red-Orthic Tenosol)  
Thick to very thick loam to sandy loam with more than 50% quartzite stones overlying stony alluvium.
- RR** Rock outcrop.

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

