

# GEM Gemmell Land System

East facing slopes between Gemmells and Mount Barker summit in the eastern Mount Lofty Ranges

**Area:** 47.6 km<sup>2</sup>

**Annual rainfall:** 520 – 775 mm average

**Geology:** The system is underlain by mainly coarse grained metamorphosed sedimentary rocks of the Backstairs Passage Formation. Main rock types are metasandstones, schists and metagreywackes. There is a narrow band of pyrite running through the system. Limited deposits of coarse grained alluvium derived from the slopes have accumulated in valley floors.

**Topography:** The Gemmell Land System is a belt of rolling to steep low hills, dissected by a series of east flowing streams, all of which flow into either Mount Barker or Rodwell Creeks. These have both cut a course through the hills. They eventually flow into the Bremer River. Although there are some gentle slopes, most land is moderately steep to steep and rocky. Drainage depressions are generally narrow. Flat topped ridges occur in places, giving the landscape a characteristic appearance.

**Elevation:** 380 m in the north to 170 m in the east where Mount Barker Creek flows out

**Relief:** 30 - 80 m

**Main soils:** The soils of the hillslopes formed on basement rock have sandy to loamy surfaces depending on the rock type, overlying either red or brown clayey subsoils, or grading directly to weathering rock. In drainage depressions, soils are deep with thick sandy surfaces and variable subsoils.

#### Main soils

*Soils formed on basement rocks*

**K4** Loamy sand over brown clay

**L1b** Shallow stony loamy sand

**K2** Loam over red clay

#### Minor soils

*Soils formed on basement rocks*

**K3** Sandy loam over red or brown clay over sandstone (**K3a**) or pyritic rock (**K3b**)

**K5** Gradational sandy loam

**L1a** Shallow stony sandy loam

*Soils formed on alluvium*

**F2** Loamy sand over brown dispersive clay

**F1/F2** Sandy loam over brown clay

**M1a** Deep alluvial sand

**M1b** Gradational sandy loam

**Main features:** The Gemmell Land System comprises moderately steep to steep rocky slopes with substantial areas of shallow stony sandy loam soils, mixed with a range of sandy loam to loam over brown to red clayey subsoils. These soils are marginally fertile due to their low clay contents. They are prone to acidification, and salinity on some lower slopes. Acid sulfate conditions linked to the pyritic rocks may be associated with saline seepages. Opportunities for cropping are very limited due to the sloping rocky terrain. The soils are highly erodible, so control of grazing pressure is important. Watercourses are particularly vulnerable.



**Soil Landscape Unit summary:** 11 Soil Landscape Units (SLUs) mapped in the Gemmell Land System:

SLU	% of area	Main features #
AhC AhY	14.6 1.9	<p>Low hills with undulating upper slopes, sometimes with relatively flat summit surfaces, and moderately inclined hillslopes formed on greywackes and schists of the Backstairs Passage Formation. Slopes range from 3% on some upper slopes to 30% on steeper slopes. Drainage depressions are well defined throughout. Rock and stone are common, being most extensive on the steepest slopes.</p> <p><b>AhC</b> Rolling low hills with relief of 50 to 80 m and slopes of 18-30%.  <b>AhY</b> Summit surfaces with slopes up to 15% on margins.            Main soils: <u>Loam over red clay</u> - <b>K2</b> (E)  <u>Shallow stony sandy loam</u> - <b>L1a</b> (E)  <u>Sandy loam over red/brown clay</u> - <b>K3a</b> (L)            Although the main soils are moderately deep, there is a significant proportion of shallow stony soils with associated rock outcrop and surface stone. These render even the gentle slopes of <b>AhY</b> non arable. The main limitations to pasture productivity (apart from shallow soil depth and rockiness) are acidity and low fertility.</p>
AmC AmY	27.9 17.1	<p>Rolling low hills and summit surfaces formed on metasandstones and coarse grained schists of the Backstairs Passage Formation. Slopes range from 3% up to 25% and relief ranges from 20 - 60 metres. These landscapes are associated with <b>AnC</b> and <b>AnD</b>, the latter two being significantly rockier.</p> <p><b>AmC</b> Rolling low hills with relief to 60 m, slopes of 12-25% and up to 10% rocky outcrop.  <b>AmY</b> Broad rounded crests with slopes of 3% on central crests to 15% on margins. There is up to 5% rocky outcrop.            Main soils: <u>Loamy sand over brown clay</u> - <b>K4</b> (V)  <u>Shallow stony loamy sand</u> - <b>L1b</b> (E)  <u>Sandy loam over red/brown clay</u> - <b>K3a</b> (M)            The sandy soils have moderately low fertility, are well drained and have variable water holding capacity from very low to high, depending on depth to rock. Some, mainly on lower slopes are imperfectly drained. Surface soils are highly erodible, so maintenance of protective vegetative cover is an important management consideration. Rocky outcrops are limiting in places, but overall are not a major restriction on land use. Drainage depressions are characterized by well defined and sometimes eroded water courses, and sporadic saline seepage and waterlogged areas. These may be associated with acid sulfate conditions.</p>
AnC AnD	2.5 4.0	<p>Rough moderate to steep hillslopes to 50 m high adjacent to Mount Barker Creek. Underlying rocks are metasandstones and coarse grained schists of the Backstairs Passage Formation. Extensive rock outcrop is a feature of the land.</p> <p><b>AnC</b> Slopes of 10-30%.  <b>AnD</b> Slopes of 30-50%.            Soils are typically shallow and stony.            Main soils: <u>Shallow stony loamy sand</u> - <b>L1b</b> (E-V)  <u>Gradational sandy loam</u> - <b>K5</b> (E-C)  <u>Deep alluvial sand</u> - <b>M1a</b> (M) on creek flats            Use of this land is severely limited by rocky outcrop and steep uneven slopes.</p>
ApC	0.3	<p>Low discontinuous ridges up to 20 m high formed on pyritic rocks. Slopes are variable up to 20%. There is up to 25% ferruginized sandstone on the surface.</p> <p>Main soils: <u>Sandy loam over red clay</u> - <b>K3b</b> (E)  <u>Shallow stony sandy loam</u> - <b>L1a</b> (E)            These small areas are non arable but have good grazing potential. Sulfides from the pyrite can leach into drainage depressions and groundwater in adjacent landscapes where they may lead to the development of acid sulfate soils.</p>
CMD	5.4	<p>Gently rolling low hills with relief of 30 to 50 m and slopes of 10-18% formed on schists and metagreywackes.</p> <p>Main soils: <u>Loam over red clay</u> - <b>K2</b> (E)  <u>Sandy loam over red/brown clay</u> - <b>K3a</b> (E)  <u>Shallow stony sandy loam</u> - <b>L1a</b> (L)            These soils are moderately fertile, moderately well drained and sufficiently deep that waterholding capacity is generally not a limitation. The main restriction on productivity are the typically hard setting surfaces prone to acidification. There is a moderate to high</p>



		risk of erosion if the soils are worked.
COD	22.2	Gently rolling low hills to 60 m high with slopes of 6-12% and minor rock outcrop. Underlying rocks are metasandstones and schists of the Backstairs Passage Formation. Soils are sandy to loamy surfaced, usually with clayey subsoils. Main soils: <u>Loamy sand over brown clay</u> - <b>K4</b> (V) <u>Shallow stony loamy sand</u> - <b>L1b</b> (E) <u>Sandy loam over red/brown clay</u> - <b>K3a</b> (M) The sandy soils have moderately low fertility, are moderately well drained and have variable waterholding capacity from very low to high, depending on depth to rock. Some, mainly on lower slopes are imperfectly drained. Surface soils are highly erodible, so maintenance of protective vegetative cover is an important management consideration. Rocky outcrops occur in places, but overall are not a major restriction on land use. Drainage depressions are characterized by well defined and sometimes eroded watercourses, and sporadic saline seepage and waterlogged areas. These may be associated with acid sulfate conditions.
LTE LTJ	2.5 1.6	Drainage depressions (creek flats) infilled with sandy and gritty sediments washed from the adjacent hills. Watercourses are predominant features of this land. <b>LTE</b> Creek flats with mainly stable watercourses. <b>LTJ</b> Creek flats with some water course erosion. Soils are deep and sandy. Main soils: <u>Loamy sand over brown dispersive clay</u> - <b>F2</b> (E) <u>Deep alluvial sand</u> - <b>M1a</b> (C) <u>Sandy loam over brown clay</u> - <b>F1/F2</b> (L) <u>Gradational sandy loam</u> - <b>M1b</b> (L) These soils are deep but of low fertility and highly erodible. Watercourses restrict accessibility and the amount of useable land. Their limited extent further limits their capacity.

# 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:

*Soils formed on basement rocks*

#### **K2** Loam over red clay (Eutrophic, Red Chromosol)

Medium thickness hard setting reddish brown sandy loam to clay loam, with a paler coloured and gravelly A2 horizon, overlying a red strongly polyhedral structured clay grading to weathering schist or micaceous sandstone before 100 cm.

#### **K3a** Sandy loam over red or brown clay (Bleached, Eutrophic, Red / Brown Chromosol)

Medium thickness brown loamy sand to loam with a bleached and gravelly A2 horizon, overlying a reddish brown and brown mottled firm sandy to heavy clay grading to weathering metagreywacke by 100 cm.

#### **K3b** Sandy loam over red clay on pyrite (Eutrophic, Red Chromosol)

Medium thickness reddish brown fine sandy loam with a paler coloured A2 horizon, sometimes with ironstone gravel, overlying a red clay up to a metre thick, with blocky structure and ferruginous rock fragments throughout.



- K4** Loamy sand over brown clay (Bleached-Sodic, Eutrophic, Brown Chromosol / Kurosol)  
Thick grey brown loamy sand with a bleached and gravelly A2 horizon, overlying a dark brown, yellow and red mottled clay with strong blocky structure, grading to weathered sandy schist or micaceous sandstone by 100 cm. The rock is commonly deeply weathered and kaolinized.
- K5** Gradational sandy loam (Mesotrophic, Grey Kandosol)  
Medium thickness grey sand to sandy loam with up to 50% rock fragments, overlying a massive grey brown silty clay loam with abundant rock fragments, grading to weathering schist by 100 cm.
- L1a** Shallow stony sandy loam (Loamy Lithic, Leptic Tenosol)  
Thick stony brown sandy loam to light sandy clay loam with up to 50% quartzite and metasandstone gravel and stone throughout, overlying hard rock by 50 cm.
- L1b** Shallow stony loamy sand (Sandy Lithic, Leptic / Bleached-Leptic Tenosol)  
Up to 50 cm soft gravelly loamy sand with a paler coloured or bleached A2 layer grading to metasandstone.

*Soils formed on alluvium*

- F1/F2** Sandy loam over brown clay (Eutrophic, Brown Chromosol / Sodosol)  
Medium to thick sandy loam with a bleached A2 layer, over a brown mottled clay grading to variable alluvium within 100 cm.
- F2** Loamy sand over brown dispersive clay (Mesotrophic, Brown Sodosol)  
Thick massive grey loamy sand to loam with a bleached and quartz gravelly A2 horizon, overlying a yellow brown and grey brown sandy clay to clay with prismatic structure, grading to medium textured stony alluvium from 100 cm.
- M1a** Deep alluvial sand (Regolithic, Bleached-Leptic Tenosol)  
Thick grey sand with a bleached A2 layer, grading to grey brown sandy alluvium with variable gravel and stone.
- M1b** Gradational sandy loam (Sodic, Grey Kandosol)  
Thick brown sandy loam with a quartz gravelly paler coloured sandy clay loam A2 horizon, grading to a greyish brown and yellowish brown mottled sandy clay loam to sandy clay with weak coarse prismatic structure, grading to a mottled clayey sand from 125 cm.

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

