FIN Finniss Land System

Gentle slopes and flats adjacent to the lower Finniss River and the Finniss Estuary

Area: 65.0 km^2

Annual rainfall: 460 – 610 mm average

Geology: There are five distinctive components to the land system. The oldest materials are glacial sandy clays and sands which accumulated adjacent to the basement rock rises marking the eastern margin of the Mount Lofty Ranges. These sediments are at or near the surface over about 45% of the Land System. Streams in relatively recent times cut through the glacial sediments, and resulted in beds of clayey sands and sandy clays (Currency Creek Formation) being deposited. These occupy about 23% of the System. More recently, a different sequence of sediments was deposited by the Finniss River, as it in turn cut through the older materials. The Finniss sediments (Pooraka Formation) are characteristically silty. They occupy about 25% of the landscape. Miscellaneous sediments of modern watercourses (including the Finniss) occupy a further 5% of the land. Aeolian sands, reworked from sandy glacial deposits, account for less than 2% of the Land System.

Topography: The topography of the Finniss Land System reflects its geological components. It is a piedmont deposit of fluvio-glacial sediments, dissected by the action of the Finniss River and Giles Creek, as they flowed out of the ranges into the lake system. This process also involved the deposition of alluvial sediments as flood plains and outwash fans. Dissection of the glacial sediments produced gently undulating slopes grading up to the ranges to the west. The two main watercourses lie in steep sided drainage depressions, incised between 10 and 30 m into the slopes. The Currency Creek sediments occupy flats, which are eroded where more recent watercourses have cut through them. The landscapes associated with the younger Pooraka Formation sediments are complex, reflecting progressive falls in sea levels, and associated downcutting by the Finniss River and Giles Creek. The main alluvial plain is extensive and lies about 15 m above the current water level in the estuary. Subsequent falls in sea level resulted in the formation of a complex series of terraces and banks adjacent to the Finniss and its tributaries. Low lying flats adjacent to the river grade to the waters of the estuary.

Elevation: 0 m at lake level to 126 m on a relict ironstone crest in the north

Relief: The dissected glacial sediment landscape has relief of up to 50 m. Watercourses are incised up to 30 m.

Soils: Texture contrast soils dominate the System. Loose sandy and hard sandy loam surfaces both occur, usually with poorly structured subsoil clays. Deep gradational loamy soils and deep sands are minor overall.

Main soils

G4a Sand over poorly structured clay formed on sediments of old glacial valleys
D2 Loam over red clay formed on alluvial sediments

Minor soils

Soils formed on sediments of old glacial valleys
D5a Hard loamy sand over red clay
F1 Sandy loam over brown clay
F2a Sandy loam over poorly structured brown sandy clay

F2b Sandy loam over poorly structured brown clay
G5 Sand over acid clay
J2 Ironstone soil

Soils formed on older alluvium (Currency Creek Formation) and Blanchetown Clay

D3a Loam over poorly structured red clay
D5b Hard loamy sand over red clay
F2c Sandy loam over poorly structured brown clay
G3 Thick sand over clay
G4b Sand over poorly structured clay

Soils formed on younger alluvium (Pooraka Formation)

D3b Loam over poorly structured red clay on medium to coarse grained alluvium
D3c Loam over poorly structured red clay on fine grained alluvium
M2 Black clay loam to clay
F2d Sandy loam over poorly structured brown clay
F2e Loam over poorly structured dark clay
G1a Sand over red sandy clay loam
G1b Sand over poorly structured red sandy clay
M3 Deep gravelly sandy loam

Soils formed on sandhills

H3 Bleached siliceous sand

Main features: The Finniss Land System is typically flat to gently sloping, but within this overall topography, are deeply incised watercourses with steep banks. The soils are variable, but texture contrast soils predominate. Most have soft sandy or hard sandy loam surfaces with poorly structured dispersive clay subsoils. These impede drainage and root growth. The sandy surface soils are low in natural fertility, so overall productive potential is low. Most soils are susceptible to water erosion, due to their high erodibility. The alluvial flats of the Finniss are the exception, having mostly deep, well drained and fertile soils, although they usually have poor surface structure. Erosion in the incised watercourses is active in places and control measures are needed.

Soil Landscape Unit summary: 35 Soil Landscape Units (SLUs) mapped in the Finniss Land System:

SLU	% of area	Main features #
DaC	0.2	Undulating to gently rolling low rises and footslopes formed on basement rocks. Slopes are generally less than 10%, but are occasionally steeper to 16%. Relief is invariably less than 30 metres. There is minor to limited rock outcrop. Drainage depressions are shallow and broad and watercourses are moderately well defined and are sometimes gullied. **DaC** Undulating rises and gently inclined footslopes with relief to 30 m and slopes of 3-10%. Main soils: sandy loam over red clay - **D1** (E) with shallow loamy sand / sandy loam - **L1a/L1b** (L) and calcareous loam - **A2** (L). On lower slope outwash areas, profiles are deeper, the typical soil being sandy loam over red clay - **D2a** (L) over localized alluvium. These soils are moderately fertile and productivity potential is largely determined by soil depth and water storage capacity. Most have poorly structured hard setting surfaces which shed water and readily erode.
DiC	0.2	Undulating to gently rolling low hillslopes and occasional relatively flat summit surfaces formed on weakly calcified metasandstones, metagreywackes, phyllites and schists of the Tappanappa, Backstairs Passage and Tunkalilla Formations. Slopes range from about 3-16%, relief is up to 50 m. Rock outcrop is sporadic. Watercourses are well defined and sometimes gullied. **DiC** Gently inclined slopes with relief of 20-40 m and slopes of 3-8%. The soils invariably have loamy surfaces overlying clayey subsoils forming in weathering rock. There are variations in the type of clay and the amount of carbonate in the lower subsoil. Main soils: Acidic sandy loam over red clay on rock - **K3a** (E) Acidic loam over red to brown clay on rock - **K2** (L)

		Shallow sandy loam over red clay on rock - **D1a** (C) Shallow soils on rock - **L1c** / **L1d** (L) on steeper slopes These soils are inherently fertile although prone to acidification. They are moderately well to well drained and have moderate to high waterholding capacities. There is potential for water erosion due to the moderate slopes, and watercourse erosion caused by excessive runoff in the past is locally a problem. There is minor salting on lower slopes.
FiB	0.2	Crests formed on lateritized glacial sands, with up to 10% surface ironstone fragments. Main soil: Ironstone soil - **J2** (D) These small isolated crests have infertile soils with variable waterholding capacity depending on depth to and concentration of ironstone.
GOC GOI GOJ	33.3 0.9 0.5	Gentle rises and dissection slopes formed on glacial sandy clays, veneered by aeolian carbonates. **GOC** Weakly dissected slopes of 2-5%. **GOI** Moderately steep to steep banks of Giles Creek where it has cut through thick beds of glacial sandy clays. Erosion gullies are common. **GOJ** Eroded watercourses with steep banks, cut into thick beds of glacial sandy clays. Main soils: Sand over poorly structured clay - **G4a** (E) Hard loamy sand over red clay - **D5a** (C) Sandy loam over poorly structured brown sandy clay - **F2a** (L) Sand over acid clay - **G5** (L) These soils are predominantly infertile with poorly structured dispersive subsoils which perch water and prevent strong root growth. The sandy types are prone to wind erosion, and most of the land is susceptible to water erosion. The steep slopes of GOI and GOJ are particularly fragile.
GRB	0.7	Flats and gentle slopes formed on clayey sand to sandy clay sediments. **GRB** Gentle slopes. Main soils: Sand over poorly structured clay with rubble - **G4b** (V) Sand over poorly structured clay with rubble - **G4a** (L) Thick sand over clay - **G3** (L) Shallow sand over clay on calcrete - **B7** (M) These soils have low natural fertility and restricted waterholding capacities due to the often shallow depth to dispersive clayey subsoils and hostile carbonate layers. They are susceptible to wind erosion, and slopes are prone to water erosion. Most have marginally saline subsoils. Thicker sands are prone to acidification.
GeA	2.6	Flats formed on older alluvium (Currency Creek Formation). Main soil: Sand over poorly structured clay - **G4b** (D) These soils are infertile, imperfectly drained and restrict good root development due to the sandy surface and tight sodic clay layer at shallow depth.
HZA HZE	0.5 1.6	Depressions, flats and shallow drainage depressions underlain by older alluvium (Currency Creek Formation) within a metre, calcified by aeolian carbonates. Slopes are less than 2%. **HZA** Depressions and flats. **HZE** Shallow drainage depressions. Main soils: Sandy loam over poorly structured brown clay - **F2c** (E) Sand over poorly structured brown clay - **G4b** (C) Loam over poorly structured red clay - **D3a** (L) Thick sand over sandy clay - **G3** (L) Although deep, these soils are generally imperfectly drained and have poor root growth conditions due to their dispersive clay subsoils and possible boron toxicity. Natural fertility levels are moderate (loamy soils) to low (sandy soils).
HaB HaC HaG HaH HaJ HaJJ	9.6 0.8 3.0 2.5 1.3 0.2	Variably dissected outwash fans formed on Currency Creek Formation alluvium. **HaB** Very gentle slopes of 1-3%. **HaC** Gentle slopes of 3-6%. **HaG** Very gentle slopes of 1-3% with eroded watercourses. **HaH** Gentle slopes of 3-6% with eroded watercourses. **HaJ** Drainage depressions with eroded watercourses. **HaJJ** Drainage depressions with severely eroded watercourses. Main soils: Loam over poorly structured red clay - **D3a** (E) Sand over poorly structured clay - **G4b** (E) Sandy loam over poorly structured brown clay - **F2c** (L) Hard loamy sand over red clay - **D5b** (M) Black clay loam to clay - **M2** (M) The common feature of virtually all soils is a poorly structured dispersive clayey subsoil. These

		restrict drainage, prevent optimal root growth and increase soil erodibility. Runoff is high, and a consequent feature of these landscapes is watercourse erosion, which is severe in places. Fertility is variable, the loamier types being moderately fertile, and the sandier types being less fertile.
JgA	10.7	Plains formed on younger alluvium. Slopes are 1-2%. Main soils: Loam over red clay - **D2** (V) Loam over poorly structured red clay - **D3b**/**D3c** (C) Sand over poorly structured red clay - **G1b** (M) The predominant soil is fertile, moderately well drained and deep, although surface soils are usually hard setting and prone to compaction. They are potentially highly productive. The soils deteriorate in the order listed above, as surface soils become sandier and less fertile, and subsoils become more sodic and hostile to root growth and water movement.
JhA	2.1	Flats associated with **JgA**, but less well drained. Main soils: Loam over poorly structured red clay - **D3c/D3b** (V) Loam over red clay - **D2** (L) Sand over poorly structured red sandy clay - **G1b** (M) Drainage, root growth conditions and fertility are all more limiting than in JgA.
JjAD JjD JjI JjJ	3.9 3.6 2.2 0.5	Dissection slopes, banks, terraces and watercourses associated with modern alluvial activity of the Finniss River and its estuary. Where extensive enough, individual slopes and watercourses have been mapped out. Elsewhere, the pattern of banks, terraces and watercourses is too complex to map at this scale. **JjAD** Complex of terraces and banks, comprising a series of steps between the flats of **JgA** and the watercourses. **JjD** Moderately steep dissection slopes. **JjI** Moderately steep eroded dissection slopes. **JjJ** Eroded watercourses. Main soils on terraces: Loam over red clay - **D2** (E) Loam over poorly structured red clay - **D3c** (L) Deep gravelly sandy loam - **M3** (L) Sand over red sandy clay loam - **G1a** (M) Main soils on slopes and banks: Loam over poorly structured red clay - **D3c** (E) Sand over red sandy clay loam - **G1a** (C) Sandy loam over poorly structured brown clay - **F2d** (L) Sand over poorly structured red sandy clay – **G1b** (L) The terraces are generally similar to the flats of **JgA**, with few soil limitations. However, the complexity of the landscape in which they occur limits their potential. The soils of the banks and slopes are more limiting, with poor structure and lower fertility. In addition, erosion potential is high.
KoA	1.4	Clay flats formed on fine grained younger alluvium. Main soils: Black clay loam to clay - **M2** (V) Sandy loam over poorly structured brown clay - **F2d** (L) Loam over poorly structured dark clay - **F2e** (L) These soils are deep and inherently fertile (especially the heavy black soils). Waterlogging is a potential problem in the texture contrast soils due to their poorly structured subsoils, but overall productive potential is high.
O-B O-C O-g	0.1 1.2 0.2	Sandhills formed from reworked Molineaux Sands. **O-B** Dunes formed on reworked glacial sands. **O-C** Jumbled dunes overlying alluvial flats. **O-g** Sandhills on dissection slopes adjacent to the Finniss Estuary. Main soil: Deep siliceous sand - **H3** (D) These soils are infertile and susceptible to water repellence and wind erosion.
PrD	0.3	Slopes and rises formed on sandy glacial sediments (partly reworked), with slopes of 2-20%. Soils are predominantly sandy. Main soils: Bleached siliceous sand - **H3a** (E) Sand over acid clay - **G5** (C) Imperfectly drained highly leached sand - **I2a** (L) Highly leached sand - **I1** (L) Wet highly leached sand - **I2b** (M) on lower slopes These soils are all characterized by leached highly infertile and acidic sandy surfaces. Impeded drainage is a problem in places. Water repellence can also be a problem in some seasons. Productive potential is low, although results can be achieved with intensive nutrition management.

PsC PsH	6.5 0.9	Undulating rises formed on massive glacial sands and sandy clays. Slopes are 3-11%. **PsC** Slopes. **PsH** Slopes with eroded watercourses. Main soils: Sand over acid clay - **G5** (D) Sandy loam over brown clay - **F1** (M) These soils are strongly leached, acidic and infertile. They are prone to water repellence and wind erosion. However they are physically favourable soils, and with appropriate nutrition and acidity control, they can be productive.
PtC	2.4	Slopes of 4-8% formed on glacial calcareous clays and sandy clays. Main soil: Sandy loam over poorly structured brown clay - **F2b** (D) These soils are deep and moderately fertile, but have dispersive clay subsoils at shallow depth. These impede drainage and root growth. Surface soils are highly erodible, so potential for water erosion is moderately high, even though slopes are gentle.
THA	0.5	Flat plains and swales underlain at shallow depth by Blanchetown Clay. Gilgai microrelief is characteristic of these landscapes. Soils vary considerably over short distances as a result of seasonal clay movement. Main soils: Grey-brown cracking clay - **E3** (E) Sandy loam over poorly structured brown clay - **F2** (C) Sand over poorly structured clay - **G4b** (L) Gradational calcareous clay loam - **A6** (L) Impeded drainage, poor root growth conditions, uneven land surface, workability problems, boron toxicity and marginal salinity combine to affect the productive potential of this land.
Vt-	0.3	Miscellaneous minor flats adjacent to the Finniss Estuary. Deep coarse textured soils are extensive.
XRL XYK XZJ	1.7 1.0 2.4	Flats of modern watercourses. These are highly variable areas, split into three groups: **XRL** Flats at the mouth of the Finniss River, before it enters its estuary. Main soils: black clays over sandy sediments within 100 cm, and thick dark sandy loams over black sandy clay subsoils. Water tables occur at about 100 cm. Use of these flats is restricted by waterlogging, flooding and marginal salinity, but fertility is high, providing valuable grazing. **XYK** Modern alluvial flat formed on clayey sediments. Surface soils vary from very thick sands, to brown loams to brown clays, but all have grey and brown mottled clayey subsoils at depth. These soils are subject to waterlogging, but are generally fertile. **XZJ** Flats of the Finniss River and Giles Creek, usually with sandy and / or gravelly sediments at depth. Main soils have thick sandy loam surfaces overlying brown sandy clay loam to sandy clay subsoils. Although these flats are up to 200 m wide in places with potential for intensive development, they are usually narrow and susceptible to flooding and erosion.

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:

D2 Loam over red clay (Sodic, Calcic, Red Chromosol)
Medium thickness reddish brown loamy sand to clay loam with a pink A2 horizon, overlying a dark reddish brown well structured clay with soft calcareous segregations (Class I or III A carbonate) from 55 cm. The profile grades to brown clayey sand to silty clay loam alluvium from 70 cm.

D3a Loam over poorly structured red clay (Calcic, Subnatric, Red Sodosol)
Medium thickness reddish brown massive sandy loam to fine sandy clay loam with a paler A2 horizon, overlying a reddish brown and greyish brown mottled clay with strong blocky structure and soft Class I carbonate segregations from 55 cm. The soil overlies a dark brown mottled clay with decreasing amounts of carbonate.

D3b Loam over poorly structured red clay (Calcic, Subnatric, Red Sodosol)
Medium thickness reddish brown loamy sand to sandy clay loam with a bleached A2 horizon, overlying a dark reddish brown sandy clay loam to clay with columnar structure, grading to a coarsely blocky clay, calcareous with depth (Class I or III A carbonate). Clayey sand to silty clay loam alluvium underlies the soil at 65 cm.

D3c Loam over poorly structured red clay (Calcic, Subnatric, Red Sodosol)
Medium thickness reddish brown massive loamy sand to loam with a pink A2 horizon, overlying a red and brown mottled sandy clay with coarse columnar structure becoming more clayey and prismatic with depth. Soft calcareous segregations (Class I carbonate) from 55 cm.

D5a Hard loamy sand over red clay (Calcic, Subnatric, Red Sodosol)
Medium thickness brown sand to light sandy clay loam with a pink A2 horizon, overlying a red sandy clay to heavy clay with strong blocky structure grading to a yellowish very highly calcareous clayey sand to clay, forming in brown and red sandy clay to clay at 75 cm.

D5b Hard loamy sand over red clay (Hypocalcic, Subnatric, Red Sodosol)
Thick reddish brown loamy sand to sandy loam with a pink and sandier A2 horizon, overlying a red firm sandy clay loam to sandy clay with coarse prismatic structure and minor soft carbonate segregations at depth. The profile is formed in red clayey sand to sandy clay alluvium.

F1 Sandy loam over brown clay (Bleached, Eutrophic, Brown / Red Chromosol)
Medium thickness grey loamy sand to sandy loam with a bleached A2 layer overlying a brown and red strongly structured clay grading to indurated clayey sand to sandy clay at about 60 cm.

F2a Sandy loam over poorly structured brown sandy clay (Eutrophic, Mottled-Subnatric, Brown Sodosol)
Thick grey brown hard loamy sand to sandy loam with a bleached A2 horizon, overlying a yellow brown, brown and red massive sandy clay loam to sandy clay with coarse columnar structure, grading to clayey sand to clay at 100 cm.

F2b Sandy loam over poorly structured brown clay (Hypocalcic, Mottled-Subnatric, Brown Sodosol)
Medium thickness dark brown sand to sandy clay loam with a bleached and hard A2 horizon, overlying a dark grey brown and yellow brown mottled heavy clay with strong prismatic structure, grading to a light grey, yellow and red massive sandy clay to clay with minor soft carbonate segregations from 85 cm.

F2c Sandy loam over poorly structured brown clay (Calcic, Mottled-Subnatric, Brown Sodosol)
Medium thickness grey brown massive loamy sand to sandy clay loam with a paler and sandier A2 horizon, overlying brown, grey and yellow heavy clay with strong blocky structure, highly calcareous from 50 cm (Class I carbonate layer). The carbonate grades to Blanchetown Clay at 70 cm.

F2d Sandy loam over poorly structured brown clay (Calcic, Mesonatric, Brown Sodosol)
Medium thickness dark brown massive loamy sand to loam with a pale grey A2 horizon, overlying a dark brown and yellowish brown mottled sandy clay to heavy clay with strong coarse prismatic structure and soft Class I carbonate from 45 cm.

F2e Loam over poorly structured dark clay (Hypocalcic, Subnatric, Black Sodosol)
Medium thickness dark brown silty loam to clay loam, overlying a black silty clay to medium clay with strong blocky structure, becoming yellowish mottled and calcareous (Class I carbonate) from 65 cm.

G1a Sand over red sandy clay loam (Eutrophic, Red Chromosol)
Thick reddish brown sand to light sandy loam with a gravelly pink A2 horizon, overlying a red sandy clay loam to sandy clay, becoming sandier and more gravelly with depth.

G1b Sand over poorly structured red sandy clay (Hypocalcic, Subnatric, Red Sodosol)
Thick reddish brown sand to loamy sand with a pink, hard and gritty A2 horizon, overlying a red and brown sandy clay to clay with coarse prismatic structure, grading to clayey sand to sandy clay with minor soft calcareous segregations from 70 cm.

G3 Thick sand over clay (Eutrophic, Brown Sodosol)
Thick dark brown sand to sandy loam with a bleached A2 layer, over a yellowish brown sandy clay with strong coarse columnar structure, becoming prismatic and more clayey with depth, grading to a brown, red and yellow massive clayey sand to sandy clay at 80 cm.

G4a Sand over poorly structured clay (Calcic, Mottled-Mesonatric, Brown Sodosol)
Medium thickness brown sand with a bleached A2 horizon, overlying a brown, yellow and red sandy clay with strong coarse columnar structure, more clayey and calcareous with depth, grading to sandy clay or soft sandstone at 80 cm.

G4b Sand over poorly structured clay (Calcic, Mottled-Mesonatric, Brown Sodosol)
Medium thickness brown sand to light sandy clay loam with a bleached A2 horizon, sharply overlying a yellowish brown, greyish brown and red mottled clay with strong columnar structure, grading to a Class I carbonate layer of soft calcareous segregations at 45 cm. This grades to a non calcareous sandy clay to heavy clay with depth.

G5 Sand over acid clay (Bleached, Mesotrophic, Brown Kurosol)
Thick grey sand to light sandy loam with a bleached A2 horizon containing variable quartz, sandstone and ironstone gravel, overlying a yellow and brown massive sandy clay loam to light clay, grading to weakly indurated yellow, grey and red sandstone.

H3 Bleached siliceous sand (Arenic, Bleached-Orthic Tenosol)
Thick bleached sand with an organically darkened surface grading to yellow loose sand continuing below 100 cm and usually overlying a buried soil.

J2 Ironstone soil (Bleached-Ferric, Red Chromosol)
Medium thickness loamy sand with a bleached and ironstone gravelly A2 layer over a red and brown weakly structured sandy clay loam to light clay with ironstone gravel, becoming greyer (kaolinitic) with depth over ferricrete within 100 cm.

M2 Black clay loam to clay (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 soft calcareous segregations.

M3 Deep gravelly sandy loam (Clastic Rudosol)
Medium thickness gravelly loamy sand to sandy loam over stone and boulder beds.

Further information: DEWNR Soil and Land Program