PND Pendleton Land System

Gently undulating flats with stony ridges in the Hundred of Pendleton

Area: 250.2 km^2

Annual rainfall: 465 – 510 mm average

Geology: The Land System includes three major geological materials:
- Old coastal dunes, hardened to calcarenite, on ridges.
- Plains of clayey and limestone deposits lying between the ridges of the old coastal dunes.
- Siliceous sands deposited and reworked by the wind into parallel dunes, draped over both calcarenite ridges and plains.

Reworking of calcareous materials from the calcarenite ridges and the limestones of the plains has resulted in the formation of rubbly and soft forms of secondary carbonates in subsoils over much of the area.

Topography: The Pendleton Land System comprises a series of three roughly north - south parallel calcarenite ridges, between which are very gently undulating plains and depressions formed on clayey and limestone sediments. Sporadic dunefields are draped over these features. The dunes are low and usually linear with a pronounced east - west orientation.

Elevation: 50 - 90 m

Relief: 5 - 25 m

Soils A wide range of soils occurs, reflecting parent material variation. Sandy texture contrast soils, deep sands and sandy loam texture contrast soils are most common. Shallow sandy loams to sands on calcrete, and cracking clays are less extensive.

Main soils

G4	Sand over dispersive brown clay – sandy flats
H3	Deep bleached sand – sandy rises
B7	Sand over brown clay on calcrete – stony flats

Minor soils

Loamy and clayey flats

F1	Sandy loam over brown clay
E3	Hard grey cracking clay
F2	Hard loam over dispersive brown clay

Sandy flats and rises

G2	Sand grading to sandy clay loam
G3a	Thick sand over clay on limestone
G3b	Thick sand over clay

Stony flats and rises

B3	Shallow stony loamy sand on calcrete
B6	Loamy sand over red sandy clay on calcrete
A4/B2	Red-brown stony calcareous loam
B8	Bleached sand on calcrete

Vegetation: Mallee, mallee heath, broombush, stringybark, pink gum on rises, with mallee heath, mallee, mallee broom, blue gum, pink gum on flats.

Main features: The Pendleton Land System has three distinctly recognizable components.
The ridges are characterized by shallow stony soils, variably covered by recent drift sand deposits in dunes. The ridges are well drained with moderately low to very low soil fertility, restricted waterholding capacity and erosion/water repellence problems.

The undulating flats and depressions are generally imperfectly drained due to clayey soils or dispersive subsoils, which also impede root growth. Fertility is moderately low to moderate. Flooding in depressions can be significant.
Sand ridges have well drained deep soils which are very infertile and subject to severe water repellence and wind erosion.

Soil Landscape Unit summary: 8 Soil Landscape Units (SLUs) mapped in the Pendleton Land System:

SLU	% of area	Main features #
GaA	20.3	Flat to very gently undulating plains, with minor (less than 5%) sandy rises formed on calcified clays of the Padthaway Formation. Main soils: sand over dispersive brown clay - **G4** (E), thick sand over clay - **G3b** (E) and sandy loam over brown clay - **F1** (E). Key properties: Drainage: Imperfect (G4) to moderate (F1). Clayey subsoils perch water. Fertility: Moderately low to moderate, due to low clay content surface soils. Physical condition: Surface soils are loose to soft with no limitations. Root growth in subsoils is slightly restricted in F1 soils, and significantly limited in G4 soils. AWHC: Moderate. Salinity: Moderately low. Erosion potential: Water: Low. Wind: Moderately low to moderate. Water repellence: Moderately low. Rockiness: Nil. Other: Acidification potential. Summary: Sand to sandy loam over clay soils with moderately low fertility and impeded drainage.
GbA	14.7	Flat to very gently undulating plains, with up to 25% low east - west trending longitudinal sand rises formed on calcified clays of the Padthaway Formation, partially overlain by Molineaux Sand. Main soils: sand over dispersive brown clay - **G4** (E) and thick sand over clay - **G3b** (E) on flats, with deep bleached sand - **H3** (C) on rises. Key properties: Drainage: Imperfect on flats (dispersive clay subsoils). Rapid on rises. Fertility: Moderately low (flats). Very low (rises). Physical condition: Sandy surface soils (non limiting). Fair to poor in subsoils on flats (dispersive clays). No subsoil restrictions on rises. AWHC: Moderate (flats). Low to moderately low (rises). Salinity: Moderately low (flats). Low (rises). Erosion potential: Water: Low. Wind: Moderately low (flats). High (rises). Water repellence: Moderately low to moderate (flats). High (rises). Rockiness: Nil. Other: Acidification potential. Summary: Imperfectly drained sand over clay soils with moderately low fertility on flats, and deep infertile water repellent sands on rises.

MJC	24.8	Low discontinuous ridges (relict coastal dunes) with a NNW-SSE orientation, veering to a north - south orientation in the south. The ridges are up 25 m high, with slopes of 3-8%. They are partially overlain by low parallel east - west sand dunes, which tend to be more common in the north. There is variable surface stone on the non-sandy slopes. Main soils: shallow stony loamy sand on calcrete - **B3** (L), bleached sand over calcrete - **B8** (L) and loamy sand over red sandy clay on calcrete - **B6** (L) on stony areas, deep bleached sand - **H3** (C) and sand grading to sandy clay loam - **G2** (C) on sand dunes, and thick sand over clay - **G3b** (L) on lower slopes. Key properties: Drainage: Rapidly to well drained. Fertility: Moderately low on stony soils, to very low on deep sands. Physical condition: Surface soils are soft to loose and do not restrict root growth. Where subsoils occur they are friable and not restrictive to root growth. AWHC: Very low to low on stony soils, due to shallow depth to hard calcrete. Moderate on sandy soils. Salinity: Low. Erosion potential: Water: Low to moderate, depending on slope. Wind: Moderately low on stony ground to high on sand spreads. Water repellence: Low to slight on stony land. Strong on sand spreads. Rockiness: Variable to 50%, usually less than 20%. Nil on sand spreads. Other: The higher rises are exposed. Summary: Shallow stony soils of marginal fertility with deep low fertility water repellent and erodible sands.
NAA	13.4	Flat to very gently undulating plains formed on calcreted sediments of the Padthaway Formation. Main soils: sand over brown clay on calcrete - **B7** (E), red-brown stony calcareous loam - **A4/B2** (E) and thick sand over clay on limestone - **G3a** (L). Key properties: Drainage: Well to moderately well drained. Fertility: Moderately low to moderate. Physical condition: Good. AWHC: Moderately low. Salinity: Moderately low to moderate in subsoil. Erosion potential: Water: Low. Wind: Low to moderately low. Water repellence: Nil. Rockiness: Up to 5% calcrete surface stone. Summary: Well drained marginally fertile soils with limited water holding capacity.
NFH	8.8	Lower slopes associated with the ranges of Soil Landscape **MJC**, formed on calcreted calcarenite and calcified sandy to sandy clay outwash sediments. Main soils: sand over brown clay on calcrete - **B7** (E), thick sand over clay on limestone - **G3a** (E) and sand over dispersive brown clay - **G4** (E). Key properties: Drainage: Well drained generally, but G4 soils are imperfectly drained due to dispersive clay subsoils. Fertility: Moderately low to low due to sandy surfaces. Physical condition: Surface soils are sandy and soft. No restrictions on root growth. Subsoils are well structured except in the case of the G4 soils where root growth is impeded. AWHC: Moderately low to moderately high depending on depth to calcrete. Salinity: Low. Erosion potential: Water: Low. Wind: Low to moderately low. Water repellence: Slight. Rockiness: Less than 2% surface calcrete. Summary: Sandy, often shallow soils with marginal fertility and generally satisfactory drainage.

OBJ	5.9	Gently undulating plains with between 25% and 75% low longitudinal sandy rises formed on calcified clays of the Padthaway Formation, substantially overlain by Molineaux Sand. Main soils: deep bleached sand - **H3** (E) on rises, with sand over dispersive brown clay - **G4** (C) and thick sand over clay - **G3** (C) on flats. Key properties: Drainage: Imperfectly (G4 soils) to well drained (G3 soils) on flats. Rapidly drained (rises). Fertility: Moderately low on flats. Very low on rises. Physical condition: Good (sandy surface soils). Subsoil structure on flats is fair (G3 soils) to poor (G4 soils). No subsoil limitations on rises. AWHC: Moderately low on rises to moderate on flats. Salinity: Moderately low on flats. Low on rises. Erosion potential: Water: Low. Wind: Moderately low to moderate (flats) to high (rises). Water repellence: Moderate on flats, high on rises. Rockiness: Nil. Summary: Sandy, moderately low (on flats) to very low (on rises) fertility soils throughout, with subsoil restrictions to drainage and root growth on flats.
TTA	11.9	Gilgai flats, adjacent to the eastern slopes of the ridges of **MJC**, formed on weakly to moderately calcified heavy clays. Main soils: hard grey cracking clay - **E3** (E), sand over dispersive brown clay - **G4** (E) and hard loam over dispersive brown clay - **F2** (E). Key properties: Drainage: Imperfectly to poorly drained due to dispersive clays at or near the surface. Fertility: Moderate (clayey soils) to moderately low (sandy soils). Physical condition: Surface soil varies from sandy (no limitations to root growth) to hard setting (causing patchy emergence and impeded root growth). Subsoil structure is poor - all soils are dispersive, restricting root growth. AWHC: Moderate to high. Salinity Moderate in subsoils. Erosion potential: Water: Low. Wind: Low. Water repellence: Low to moderate. Rockiness: Up to 2% surface calcrete stone. Other: Land is subject to extensive flooding. Gilgai hollows are especially susceptible. Summary: Poorly structured and imperfectly to poorly drained clay and sand over clay soils with moderate fertility. Marginal salinity.
Xq-	0.2	Fresh to marginally saline swamps, at least seasonally inundated.

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:

A4/B2 Red-brown stony calcareous loam (Regolithic / Petrocalcic, Lithocalcic Calcarosol)
Calcareous red brown sandy clay loam, becoming redder and more clayey with depth overlying rubbly to sheet calcrete within 30 cm. The calcrete grades to limestone or calcareous sandy clay with depth.

B3 Shallow stony loamy sand on calcrete (Petrocalcic, Leptic Tenosol)
Loamy sand to loam with variable rubble and slight clay increase with depth overlying calcreted calcarenite shallower than 50 cm.

B6 Loamy sand over red sandy clay on calcrete (Petrocalcic, Red Chromosol)
Medium thickness loamy sand with slight ironstone gravel overlying a weakly structured reddish brown sandy clay on calcarenite.

B7 Sand over brown clay on calcrete (Petrocalcic, Brown Chromosol)
Medium thickness sand overlying yellow brown firm to friable clay on limestone or calcreted sandy clay within 50 cm.

B8 Bleached sand on calcrete (Petrocalcic, Bleached-Leptic Tenosol)
Thick bleached sand over calcarenite.

E3 Hard grey cracking clay (Epipedal, Grey Vertosol)
Hard coarse blocky seasonally cracking grey clay, calcareous and prismatically structured at depth.

F1 Sandy loam over brown clay (Hypercalcic, Brown Chromosol)
Medium thickness loamy sand to sandy loam abruptly overlying a brown and yellow friable clay grading to Class III A or III B carbonate.

F2 Hard loam over dispersive brown clay (Hypercalcic, Brown Sodosol)
Medium thickness hard setting loamy sand to loam abruptly overlying a coarsely structured grey brown, yellow and red clay grading to soft carbonate.

G2 Sand grading to sandy clay loam (Mesotrophic, Yellow Kandosol)
Thick bleached sand, organically darkened at surface, grading to a yellow and red friable massive sandy clay loam.

G3a Thick sand over clay on limestone (Hypercalcic / Petrocalcic, Brown Sodosol / Chromosol)
Thick to very thick bleached sand to loamy sand with an organically darkened surface abruptly overlying a coarsely structured yellowish brown and red sandy clay, grading to soft, semi-hard or hard carbonate.

G3b Thick sand over clay (Eutrophic / Calcic, Brown Sodosol)
Thick bleached sand to loamy sand with an organically darkened surface abruptly overlying a coarsely structured yellowish brown mottled sandy clay to clay, continuing below 100 cm.

G4 Sand over dispersive brown clay (Hypercalcic, Brown Sodosol)
Thin to medium thickness sand sharply overlying a brown and yellow or grey mottled dispersive clay with strong columnar structure, calcareous with depth.

H3 Deep bleached sand (Basic, Arenic, Bleached-Orthic Tenosol)
Thick to very thick bleached sand, organically darkened at the surface over yellow sand continuing below 100 cm.

Further information: DEWNR Soil and Land Program