

# NAN Nantawarra Land System

Undulating rises and dunefields in the Nantawarra area

**Area:** 63.1 km<sup>2</sup>

**Annual rainfall:** 370 – 450 mm average

**Geology:** The land system lies between outcrops of basement rock which to some extent control the topography but do not outcrop or influence soil formation. The majority of the system is directly underlain by sandy to heavy clay sediments of Tertiary age. These are commonly within a metre of the surface, especially on lower lying ground. The sediments are covered by a layer of highly calcareous medium textured windblown deposits (Woorinen Formation), hardened to rubbly or sheet calcrete in places. This in turn is covered over much of the area by dunefields of Molineaux Sand.

**Topography:** The Nantawarra Land System comprises gently undulating to undulating dunefields and rises fringing the low hills of Kangaroo and Middle Ranges. The underlying sediments form a gently inclined apron around these basement rock highs. The calcareous and sandy materials which dominate the System have been deposited on this apron. The three distinctive elements of the landscape are:

- Gently to undulating rises formed on Woorinen Formation.
- Dunefields of Molineaux Sand superimposed on the rises.
- Calcrete and clay flats in the lowest areas, formed directly over the older Tertiary sediments.

**Elevation:** 160 m to 90 m

**Relief:** Up to 60 m

**Soils:** Deep sands or sand over clay soils dominate the rising ground, while calcareous loams and loamy texture contrast soils are more characteristic of lower lying land.

#### Main soils

*Soils of flats and non-sandy rises*

**A4a** Rubbly calcareous loam

**A6** Calcareous clay loam

*Soils of sandy dunes and rises*

**G1** Loamy sand over red sandy clay

**H2** Deep sand

#### Minor soils

*Soils of flats and non-sandy rises*

**A4b** Calcareous sandy loam

**A5** Calcareous sandy clay loam over clay

**D3** Sandy clay loam over dispersive red clay

**B2** Calcareous sandy loam over sheet calcrete

**C3** Gradational red clay loam

*Soils of sandy dunes and rises*

**H3** Deep bleached siliceous sand

**G4** Sand over dispersive brown clay

**Main features:** The Nantawarra Land System is dominated by dunefields with a mixture of sandy soils on rises and heavier types on flats. The sandy soils comprise both calcareous and non-calcareous types, and some with clayey subsoils and some without. All have low fertility and are highly susceptible to wind erosion. The flats and low rises have a range of soils varying from deep fertile clay loamy profiles with few limitations other than boron toxicity, to shallow rubbly soils with restricted waterholding capacity. Generally the soils of the flats and low rises are potentially productive.



**Soil Landscape Unit summary:** 9 Soil Landscape Units (SLUs) mapped in the Nantawarra Land System:

SLU	% of area	Main features #
IAE	8.2	Drainage depressions and lower slopes with gradients of 0-2% formed over coarsely structured red clay. Main soils: <u>calcareous clay loam</u> - <b>A6</b> (V) with <u>rubbly calcareous loam</u> - <b>A4a</b> (C) and <u>sandy clay loam over dispersive red clay</u> - <b>D3</b> (L). The soils are medium to fine textured and alkaline with a heavy impermeable clay at depths ranging from 70 to 100 cm. Where this clay is shallow, waterlogging and reduced water holding capacity are limitations. Average boron concentration in the deep subsoil is 30 mg/kg (toxic), and is associated with moderate salinity, high sodicity and pH. These areas may be at risk of rising saline water tables. The soils have high productive potential, provided that these limitations are deeper than about 75 cm.
OIb OIf	20.3 8.8	Dunefields superimposed on slopes of 3-5% and underlain by clayey sediments. <b>OIb</b> Complex of 60% moderate sand dunes and 40% swales. <b>OIf</b> Complex of 40% low dunes and 60% swales. Main soils: <u>deep bleached siliceous sand</u> - <b>H3</b> (E), <u>sand over dispersive brown clay</u> - <b>G4</b> (E) and <u>loamy sand over red sandy clay</u> - <b>G1</b> (E) on dunes and rises, and <u>calcareous clay loam</u> - <b>A6</b> (E) and <u>sandy clay loam over dispersive red clay</u> - <b>D3</b> (E) with <u>rubbly calcareous loam</u> - <b>A4a</b> (L) in swales. The dune soils are infertile and highly susceptible to wind erosion - most dunes in OIb have not been cleared. The swales have heavier more fertile soils, but only occur as narrow strips between the dunes, making management difficult. There is a higher proportion of swale soils in OIf and the dunes are less prone to erosion.
QJA	3.2	Stony flats with slopes of less than 1% and variable surface calcrete cover up to 20%, formed on sheet and rubbly calcrete. Main soils: <u>calcareous sandy loam over sheet calcrete</u> - <b>B2</b> (E) and <u>rubbly calcareous loam</u> - <b>A4a</b> (E). Although arable, the productivity of this land is limited by its predominantly shallow, stony soils. The variable stone content and depth to calcrete results in patchiness which is more evident in a dry season. Less significant limitations: fertility, workability (affected by surface stone) and mild salinity.
SSA SSB SSC	5.8 15.9 7.1	Rises formed on highly calcareous medium textured Woorinen Formation deposits with variable rubble content. <b>SSA</b> Gently undulating rises with slopes of 1-3%. <b>SSB</b> Undulating rises with slopes of 3-5%. <b>SSC</b> Undulating rises with slopes of 5-10%. Main soils: <u>rubbly calcareous loam</u> - <b>A4a</b> (E), with <u>calcareous sandy clay loam over clay</u> - <b>A5</b> (C), <u>calcareous sandy loam</u> - <b>A4b</b> (L) and <u>deep sand</u> - <b>H2</b> (M). The land is fully arable, although there is some potential for both wind and water erosion, due to the relatively light texture of the soils and the slope of the land. Productive potential is good, with only minor limitations due to water holding capacity, fertility, boron toxicity and alkalinity.
UIb UIf	25.7 5.0	Dunefields, superimposed on gently undulating rises, underlain by medium textured, mixed non rubbly and rubbly calcareous deposits. <b>UIb</b> 60-90% moderate sandhills. <b>UIf</b> 30-60% low sandhills. Main soils: <u>deep sand</u> - <b>H2</b> (C) with <u>loamy sand over red sandy clay</u> - <b>G1</b> (L) on sandhills, and <u>calcareous sandy loam</u> - <b>A4b</b> (E), with <u>rubbly calcareous loam</u> - <b>A4a</b> (C), <u>calcareous sandy clay loam over clay</u> - <b>A5</b> (L), <u>gradational red clay loam</u> - <b>C3</b> (L) and <u>calcareous sandy loam over sheet calcrete</u> - <b>B2</b> (M) in swales, lower slopes and low rises. Soil conditions change rapidly across the dune-swale landscape. All land is arable, but the dunes have moderate limitations due to low fertility, restricted water holding capacity, and wind erosion potential. The heavier textured swales are more fertile with minor limitations due to boron toxicity, wind and water erosion potential and moderate fertility.

# 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:**

- A4a** Rubbly calcareous loam (Regolithic, Supracalcic / Lithocalcic Calcarosol)  
Calcareous sandy loam to clay loam grading to Class III B or III C carbonate rubble at about 30 cm, overlying a very highly calcareous light clay.
- A4b** Calcareous sandy loam (Regolithic, Hypercalcic Calcarosol)  
Calcareous sandy loam grading to a very highly calcareous sandy clay loam over soft (less than 20% rubble) Class III A carbonate at about 50 cm.
- A5** Calcareous sandy clay loam over clay (Regolithic, Supracalcic Calcarosol)  
Up to 30 cm calcareous sandy loam to sandy clay loam over rubbly Class III B carbonate grading to a very highly calcareous sandy clay loam to light clay, over heavy clay from about 100 cm.
- A6** Calcareous clay loam (Pedal, Hypercalcic Calcarosol)  
Calcareous clay loam, loam or clay grading to a highly calcareous reddish well structured clay with soft Class I carbonate from about 40 cm, over substrate clay at about 90 cm.
- B2** Calcareous sandy loam over sheet calcrete (Petrocalcic, Lithocalcic Calcarosol)  
Calcareous sandy loam to clay loam with abundant calcrete fragments and nodules over sheet calcrete at about 25 cm.
- C3** Gradational red clay loam (Calcic, Red Dermosol)  
10 - 20 cm friable clay loam grading to a well structured red medium clay, calcareous from about 70 cm.
- D3** Sandy clay loam over dispersive red clay (Hypercalcic, Red Sodosol)  
Hard medium thickness sandy loam to clay loam sharply overlying a dispersive red clay with soft Class I carbonate from about 40 cm grading to clay from 100 cm.
- G1** Loamy sand over red sandy clay (Lithocalcic / Hypercalcic, Red Chromosol)  
Medium thickness loamy sand abruptly overlying a massive red sandy clay loam to sandy clay with soft to rubbly Class III A, B or C carbonate from about 45 cm.
- G4** Sand over dispersive brown clay (Calcic / Lithocalcic Brown Sodosol)  
15 - 20 cm loamy sand with a bleached A2 layer abruptly overlying a coarsely structured dispersive brown clay with soft to rubbly carbonate from 30 cm, grading to Tertiary sandy clay within 100 cm.
- H2** Deep sand (Hypocalcic Calcarosol)  
Thick calcareous sand grading to a highly calcareous clayey sand at depths ranging from 50 to 100 cm.
- H3** Deep bleached siliceous sand (Calcareous, Arenic, Bleached-Orthic Tenosol)  
40 - 50 cm loose sand with a pronounced bleached A2 layer over a yellowish red clayey sand, calcareous with depth, continuing below 100 cm.

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

