WOK Wokurna Land System

Dunefields in the Wokurna area. These dunes overlie plains and a few small rises; there are only a few plains and flats which are not overlain with dunes. The land system covers the low-lying coastal area from Mundoora Channel to just north of Tickera Channel (south of this the coastline rises to form cliffs), then extends inland or eastward to Wokurna, and then runs southward to Ninnes as a narrow band of dunes between the Bute plateau and the dunefields beside the footslopes of the Hummocks Range.

Area: 397.0 km^2

Annual rainfall 330 - 415 mm average

Geology: The land system comprises three distinctive geological materials. Tertiary age reddish heavy clay (Hindmarsh Clay) underlies the area and is exposed in some broad depressions between dunefields, and in depressions and flats in many swales. These clayey sediments are overlain in places by a relatively thin layer of highly calcareous medium textured wind deposited material (Woorinen formation), which can include hard carbonate rubble and calcrete. However, there are only a few remnant patches of calcrete and soils with abundant hard carbonate rubble. Woorinen sediments are thickest in the west of the system, and dominate a few plains that have little sand cover. These older sediments have been partially covered by Molineaux Sand, which has been reworked by the wind into more or less parallel dunes (running NW-SE). Wind erosion events since clearing and settlement have resulted in areas of irregular/jumbled low sandy rises, and thin spreads of sand in swales covering former soil surfaces.

Topography: The land system consists of gently undulating plains, and a few rises, with a very extensive cover of dunefields. Dunes are oriented in a NW-SE direction, and are generally 5-10m high, with some dunes over 10m high. A few areas of irregular low sandy rises occur where much movement of sand has occurred since clearing and settlement. There is a very gentle general slope downwards from SE to NW, however, the system has no defined surface drainage. There are a few plains and depression areas not covered with dunes. Slightly raised areas are exposed to winds and often appear to have had former defined sand dunes flattened or even completely removed. This is also seen on the rises of the adjacent Bews-Glenayr Land System.

Elevation: 160 m in the SE corner of the system to 2 m by the coast.

Relief: Mostly less than 10 m, and never more than 20 m. The dunes are typically 5 - 10 m, but some are some up to 15 m high.

Main Soils:

Soils of sand dunes and sandy rises

H2a Calcareous siliceous sand (*sandy Calcarosol*)
H2b Siliceous sand (*sandy Tenosol*)
G1-**D5** Loamy sand over red clay loam or clay (*sandy Red Chromosol*)
C1 Gradational red sandy loam (*sandy Red Kandosol*)

Soils of swales and non sandy rises

A4a Calcareous loam (*Lutaceous Hypercalcic Calcarosol*
D2 Loam over red clay (*Red Chromosol*)
A4b Rubbly calcareous loam (*Lutaceous Supracalcic-Lithocalcic Calcarosol*)
A5 Calcareous loam on clay (*Argillaceous Hypercalcic-Lithocalcic Calcarosol*)
G4 Loamy sand spreads on red clay (*sandy Red Sodosol-Chromosol*)

Soils of broader flats

A6 Gradational calcareous clay loam (*Argillaceous Hypercalcic Calcarosol*)
D3 Loam over poorly structured red clay (*Hypercalcic Red Sodosol*)

Main Features: The Wokurna Land System is dominantly dune - swale country. Deep to moderately deep low fertility sandy soils dominate dunes and sandy rises. These are prone to wind erosion. Various rubbly and non rubbly calcareous soils typify the swales and lower slopes. Sub optimal fertility is the main issue, along with subsoil chemical barriers to root growth. On broader flats where soils are more clayey and substrate clays are closer to the surface, high subsoil boron and sodium, and high pH are more of a problem.

Soil Landscape Unit summary: Wokurna Land System (WOK)

SLU	% of area	Main features #
IAA	3.9	Level to very gently undulating flats between 200 and 2000 m wide, formed on coarsely structured reddish heavy clayey sediments (Hindmarsh Clay). Main soils: gradational calcareous clay loams **A6** [*Argillaceous Hypercalcic Calcarosol*] (V), with loams over poorly structured red clay **D3** [*Hypercalcic Red Sodosol*] (L), and rubbly calcareous loam on clay **A5** [*Argillaceous Supracalcic-Lithocalcic Calcarosol*] (L). Summary: The soils are medium to fine textured and alkaline with a heavy, impermeable clay at depths as shallow as 60 cm. Average boron concentration in the 70-100 cm zone is 28 ppm (double the toxic level). These concentrations are associated with moderate salinity, high sodicity and pH. The soils have high productive potential, provided that these limitations are deeper than about 75 cm. Slight limitations include: waterlogging, waterholding capacity, surface physical condition, fertility, and salinity. Moderate limitations include: subsoil physical condition, and subsoil toxicities.
QHA	0.03	Level coastal bench with shallow calcareous soil on calcrete. Main soils: Shallow calcareous loam on calcrete **B2** or calcareous loam **A4a** on calcrete - medium thickness calcareous sandy or loamy topsoil over loamy subsoil on calcrete at shallow to moderate depth [Petrocalcic Calcarosol; sandy-loamy/loamy, shallow-moderate]. Summary: the land is arable: cropping and some grazing are the main land uses. The main limitations are waterholding capacity, and nutrient availability problems through soils being calcareous throughout. Slight limitations include: alkalinity, salinity, wind erosion potential, and rockiness. Moderate limitations include waterholding capacities and fertility.
SCK	0.1	Plains with calcareous soils formed in medium textured wind deposited sediments with minor rubble which overlie brown alluvial clayey sediments. **SCK** - gently undulating low lying plain with slopes of 1-2%, situated between dunefields and a coastal samphire flats. Dominated by calcareous soils with loamy topsoil and minor hard carbonate rubble which grades into light medium clayey subsoil. About 2% of area is saline. Main soils: A variant of gradational calcareous clay loam **A6** - medium to thick calcareous loamy topsoil grading into brown alluvial light medium clay with abundant fine carbonate [*Argillaceous Hypercalcic Calcarosol; loamy/clayey*]. Formed in brown alluvial clays (probably laid down in an old river mouth) which are younger than the reddish Hindmarsh clays which more commonly underlie these soils in this system. Slight limitations include: waterholding capacity, subsoil toxicities, and alkalinity. Moderate limitations include fertility and salinity. Summary: the land is almost all arable. Cropping and some grazing are the main land uses. Nutrient availability problems arise through these soils being calcareous throughout. There are a few saline patches with most soils having raised subsoil salinity levels; and subsoil toxicities are likely to occur.
SFA	0.5	Slightly raised plain with calcareous soils formed in medium textured wind deposited sediments with minor rubble, and with some soils formed in reddish clayey sediments. **SFA** - gently undulating plain with slopes of 1-3%, with mostly calcareous soils with loamy or sandy topsoil over clay loamy subsoil, and with 10-20% calcareous soils clay loamy topsoil over reddish clayey subsoil in depressions. There is evidence that there has been removal/spreading of former sandy rises or low sand dunes on this land unit. Main soils: Calcareous loam **A4a** - thick calcareous loamy or sandy topsoil over clay loamy subsoil with abundant fine carbonate: (V) [*Lutaceous Hypercalcic Calcarosol; loamy-sandy/clay loamy*].

		Gradational calcareous clay loam **A6** - medium to thick clay loamy topsoil over reddish clayey subsoil with abundant fine carbonate: (L) small depressions [*Argillaceous Hypercalcic Calcarosol; clay loamy/clayey*]. Summary: the land is arable: cropping and some grazing are the main land uses. The main limitations are nutrient availability problems through the soils being calcareous throughout, and the potential for wind erosion. Patches of seasonal waterlogging can occur. Slight limitations include: waterholding capacity, subsoil toxicities, alkalinity, and wind erosion potential. Moderate limitations include fertility.
SGA	3.6	Raised plain with calcareous soils formed in medium textured wind deposited sediments with minor rubble, and with some calcareous soils formed in reddish clayey sediments, and some sandy rises. **SGA** - gently undulating slightly raised plain with slopes of 1-3%, with calcareous soils with loamy or sandy topsoil over clay loamy subsoil, with about 25% calcareous soils with clay loamy topsoil over reddish clayey subsoil in depressions, and about 25% vaguely longitudinal sandy rises. It appears that this raised area has experienced much sand removed in wind erosion events, possibly largely before settlement. Main soils: Calcareous loam **A4a** - medium to thick calcareous loamy topsoil (some sandy) over clay loamy or loamy subsoil with abundant fine carbonate: (E) [*Lutaceous Hypercalcic Calcarosol; loamy-sandy/clay loamy-loamy*]. Gradational calcareous clay loam **A6** - medium thickness calcareous loamy topsoil over reddish clayey subsoil with abundant fine carbonate: (C) small depressions [*Argillaceous Hypercalcic Calcarosol; loamy/clayey*]. Calcareous siliceous sand **H2a** or sandy calcareous loam **A4a** - thick to very thick calcareous sandy topsoil over loamy or clay loamy subsoil with abundant fine carbonate: on sandy rises [*Lutaceous Hypercalcic Calcarosol; sandy/loamy-clay loamy*]. Summary: the land is arable: cropping and some grazing are the main land uses. The main limitations are nutrient availability problems through soils being calcareous throughout, and the wind erosion potential of the lighter textured soils. Some patches of seasonal waterlogging can occur. Slight limitations include: waterholding capacity, subsoil toxicities, alkalinity, wind erosion potential, and water repellence (sandy rises). Moderate limitations include: waterholding capacity (sandy rises), fertility, and wind erosion potential (sandy rises).
SSA	0.2	Gently undulating plains with slopes of less than 2% formed on highly calcareous medium textured wind deposited sediments (Woorinen Formation). About 20% of the land surface is overlain by low sand dunes. Main soils: rubbly calcareous loams **A5**-**A4b** [*Lutaceous Supracalcic-Lithocalcic Calcarosol*] (E), and calcareous loams **A4a** [*Lutaceous Hypercalcic Calcarosol*] (E), with some calcareous siliceous sands **H2a** [*sandy Calcarosol*] (L) on dunes. Summary: this land is generally moderately productive, the limitations being caused by the predominantly calcareous soils and interspersed sandy rises. The former have slight limitations due to sub-optimal waterholding capacity and fertility, moderate levels of subsoil boron (23 ppm ave. concentration in 50-100 cm depth zone), salinity and alkalinity, and some potential for wind erosion. The sandy rises have low fertility and waterholding capacity and are prone to wind erosion. Slight limitations include: waterholding capacity (swales), possibly some subsoil toxicities, alkalinity, wind erosion potential (swales), water repellence (dunes), and surface rubble (swales). Moderate limitations include: waterholding capacity (dunes), fertility, and wind erosion potential (dunes).
U-C	0.1	Isolated parallel sand dunes and rises, 5-10 m high. Main soils: calcareous siliceous sands **H2a** [*sandy Calcarosol*] (V) and siliceous sands **H2b** [*sandy Tenosol*] (C). Summary: this land consists almost entirely of deep, low fertility sands in exposed dunes, which are susceptible to wind erosion.
UEE UEF UEG UEI	2.4 3.6 5.3 23.1	Plains overlain by more than 30% sand dunes. Swales mostly have soils formed in reddish clayey sediments, with some formed in calcareous medium textured wind deposited sediments. There has been much redistribution of sand from dunes since clearing and settlement. **UEE** - gently undulating plains overlain by more than 60% high longitudinal sand dunes (greater

UEJ UEK UEX	9.8 5.4 0.1	than 10m high). Dunes are non arable to semi-arable. **UEF** - gently undulating plains overlain by more than 60% longitudinal sand dunes (5-10m high). Dunes are generally arable, but usually have semi-arable strips along their ridges. Swale have calcareous and non calcareous sandy to clay loamy topsoils over loamy to clayey subsoils. Clayey subsoils often have high boron and sodium levels. There are minor patches with shallow soil on calcrete in swales. **UEG** - gently undulating plains overlain by more than 60% somewhat disturbed longitudinal low sand dunes (less than 5m high). Dunes are mostly arable. Swales have calcareous (with some non calcareous) sandy or loamy (some clay loamy) topsoil over loamy to clayey subsoils. Clayey subsoils often have high boron and sodium levels. **UEI** - gently undulating plains overlain by 30-60% longitudinal sand dunes (5-10m high). Dunes are generally arable, but usually have semi-arable strips along their ridges. Swales have calcareous and non calcareous sandy to clay loamy topsoils over loamy to clayey subsoils. Clay subsoils often have high boron and sodium levels. There are minor patches of shallow soil on calcrete in swales. **UEJ** - gently undulating slightly raised plain overlain by 30-60% longitudinal low sand dunes and sandy rises which have often been quite disturbed (less than 5m high). (In many areas there has been much redistribution of sand since clearing and settlement.) Dunes are mostly arable. Swales have calcareous (with some non calcareous) sandy or loamy topsoils over loamy to clayey subsoils. Clayey subsoils often have high boron and sodium levels. There are patches of calcrete and rubbly soils in swales. **UEK** - gently undulating slightly raised plain covered with about 30% irregular sandy rises. The usual longitudinal sand dune pattern is only vaguely discernible here, due to considerable sand redistribution since clearing and settlement. The sandy areas are mostly arable. Swales have calcareous (with some non calcareous) sandy or loamy topsoils over loamy to clayey subsoils. Clayey subsoils often have high boron and sodium levels. There are possibly a few patches of calcrete and rubbly soils in swales. **UEX** - low lying level near coastal plain with about 30% sandy rises. About 10% of the swale areas are saline and the rest are marginally saline. Swales have calcareous sandy (with some loamy) topsoils over clay loamy or clayey subsoils. Swale subsoils have high boron and sodium levels. Dune and sandy rise soils: Siliceous sand **H2b** - medium to very thick non calcareous to slightly calcareous reddish sand topsoil over sandy (or occasionally loamy) subsoil with abundant fine carbonate: (E) on dunes [*Calcareous Arenic-Arenaceous Orthic Tenosol; sandy/sandy*]. Calcareous siliceous sand **H2a** - deep calcareous brown siliceous sand: (E-C) on dunes [*Arenaceous Hypercalcic Calcarosol; sandy/sandy*]. Loamy sand over red clay loam or clay **G1**-**D5** – medium to thick non calcareous to moderately calcareous sandy topsoil over clay loamy or clayey subsoil with abundant fine carbonate: (E-C) mainly on lower dune slopes, sandy rises, and slight slopes [*Sodic-Effervescent Hypercalcic-Calcic Red Chromosol; sandy/clay loamy-clayey*]. Gradational red sandy loam **C1** - thick non calcareous loamy sand grading to a calcareous red clayey sand to light sandy clay loam over a lower subsoil with a variable accumulation of fine carbonate: (L) on lower dune slopes, sandy rises, and some dunes [*sandy Red Kandosol*]. Sandy calcareous loam **A4a** - medium to thick sandy topsoil over loamy to clay loamy subsoil with abundant fine carbonate over a very highly sandy clay loam: (L) on lower slopes and low sandy rises [*Lutaceous Calcarosol*]. Swale soils: Gradational calcareous clay loam **A6** - medium thickness calcareous loamy topsoil (some clay loamy) over reddish clayey subsoil with abundant fine carbonate [*Argillaceous Hypercalcic Calcarosol; loamy-clay loamy/clayey*]; and loamy sand spreads over red clay **G4**, loam over poorly structured red clay **D3** or loam over red clay **D2** - medium thickness non calcareous to slightly calcareous sandy or loamy topsoil over reddish clayey subsoil with abundant fine carbonate [*Sodic Hypercalcic-Calcic Red Chromosol-Sodosol; sandy-loamy/clayey*]. (E-V in swales) mainly flats and depressions. Calcareous loams **A5**-**A4a** or rubbly calcareous loams **A5**-**A4b** - medium to thick calcareous sandy or loamy topsoil over loamy or clay loamy subsoil with abundant fine carbonate: (L-E in swales) mainly on gently undulating land [*Argillaceous-Lutaceous Hypercalcic-Lithocalcic Calcarosol; sandy-loamy/loamy-clay loamy*]. Shallow calcareous soil on calcrete **B2** and shallow sandy loam on calcrete **B3** - shallow to moderate

		depth calcareous to non calcareous loamy to sandy soil on calcrete: (M) stony patches in swales [Petrocalcic Calcarosol and Petrocalcic Orthic Tenosol]. Summary: the land is arable, except for many semi-arable dune ridge strips. Cropping and grazing are the main land uses. This is a typical dune-swale landscape with the inherent problem of frequent changes in soil types across the landscape. Control of wind erosion is the main concern on dunes and sandy rises, along with fertility maintenance and the need to encourage deep rooting to maximize water use efficiency. Fertility is the main issue on the flats/swales, although chemically unfavourable subsoils have localized effects. These include boron toxicity (average concentrations in the 60-100 cm zone of 20 ppm in Sodosols), and sodium toxicity. Lighter textured swale soils are prone to wind erosion. Some seasonal waterlogging can occur in swales. Slight limitations include: waterlogging (swales), waterholding capacity (swales), surface soil physical condition (swales), subsoil physical condition (swales), fertility (swales), alkalinity, wind erosion potential (swales), and water repellence (dunes). Moderate limitations include: waterholding capacity (dunes), fertility (dunes), subsoil toxicities (swales), salinity (swales **UEX**), and wind erosion potential (dunes). The high limitations of wind erosion potential occurs on high sand dunes (**UEE**).
UKF UKG UKJ	4.3 0.1 1.2	Land which is overlain by at least 30% sand dunes. Swales have dominantly sandy topsoil which has been deposited over reddish clayey sediments which form the subsoil. **UKF** - gently undulating plain overlain by 80% longitudinal sand dunes. Dunes are often quite broad, and are so closely positioned, that they often converge, resulting in the swales which form closed depressions. Dunes are generally arable, but have semi-arable dune ridge strips. Swale soils have been formed by sand deposition over clayey sediments: sandy topsoils overlie calcareous reddish light clayey or clayey subsoil, which overlies red heavy clay. **UKG** - an undulating to gently undulating rise with slopes of 1-5% overlain by about 40% disturbed sandy rises. These sandy rises are often very broad. Sandy rises are mostly arable. Swale soils have been formed by sand deposition over clayey sediments: sandy topsoils overlie calcareous reddish clay loamy or clayey subsoil, which overlies red heavy clay. There are a few patches of soil with remnant abundant hard carbonate rubble or calcrete overlying the clayey sediments at shallow depth. **UKJ** - a gently undulating rise with slopes of 1-3% overlain by about 80% disturbed sandy rises. These sandy rises are quite broad. The sandy rises are mostly arable. Swale soils have been formed by sand deposition over clayey sediments: sandy topsoils overlie calcareous reddish clay loamy or clayey subsoils, which overlie red heavy clay. Dune and sandy rise soils: Calcareous siliceous sand **H2a** - deep calcareous siliceous sandy soil [*Arenaceous Hypercalcic-Calcic Calcarosol; sandy/sandy*]. Siliceous sand **H2b** or gradational red sandy loam **C1** - medium to thick non calcareous sandy topsoil over sandy or loamy soil with abundant fine carbonate [*Calcareous Arenic-Lutaceous Orthic Tenosol; sandy/sandy-loamy* or *Red Kandosol; sandy/loamy*]. Swale soils: Loamy sand spreads over red clay **G4** with some loam over poorly structured red clay **D3**, loam over red clay **D2**, gradational red sandy loam **C1** or gradational calcareous clay loam **A6** - medium to thick sandy topsoil (some loamy) over reddish clay loam or clay over reddish clay with abundant fine carbonate. Some of these soils are calcareous throughout (usually moderately calcareous surface soil), while some have non calcareous to slightly calcareous surface soil: (D-V in swales) [*Sodic-Effervescent Hypercalcic Red Chromosol-Kandosol; sandy-loamy/clayey-clay loamy* with some *Hypercalcic Argillaceous Calcarosol; sandy-loamy/clayey*]. Calcareous loams **A5**-**A4b,a** - medium calcareous sandy topsoil (some loamy) over loamy subsoil with abundant fine carbonate and maybe some hard carbonate rubble: (M-L in swales) [*Hypercalcic-Lithocalcic Lutaceous Calcarosol; sandy-loamy/loamy*]. Summary: this land is arable, except for many semi-arable dune ridge strips. The main land uses are cropping and grazing. The main limitations of the sand dune soils are caused by their wind erosion potential and low fertility. Swale soils also have fertility and wind erosion potential limitations. Patches of seasonal waterlogging can occur in swales. Slight limitations include: waterholding capacity (swales), alkalinity, and water repellence (dunes). Moderate limitations include: waterholding capacity (dunes), subsoil physical condition (swales), fertility, subsoil toxicities (swales), and wind erosion potential.

ULf ULF ULI ULP ULQ ULT ULU ULW	0.1 15.7 13.5 1.0 1.8 1.8 1.5 0.9	Plains, low lying plains, and slopes overlain by more than 30% sand dunes. Swales have dominantly calcareous soils formed in non rubbly medium textured wind deposited sediments. **ULf** - gently inclined near coastal slopes of 3-6%, overlain by about 30% longitudinal low sand dunes and sandy rises. The dunes are mostly arable. Swales soils are dominantly calcareous with sandy topsoil over loamy or clay loamy subsoil. Minor water channelling (rilling) occurs down swale slopes. **ULF** - gently undulating plains overlain by 60-70% longitudinal sand dunes. The dunes are generally arable, but typically have semi-arable dune crests. Swales soils are dominantly calcareous with sandy or loamy topsoil over loamy or clay loamy subsoil. **ULI** - gently undulating plains overlain by about 50% longitudinal sand dunes. The dunes are generally arable, but often have semi-arable strips along their ridges. Swales soils mostly calcareous to slightly calcareous with sandy or loamy topsoil over loamy or clay loamy subsoil; there are some soils with hard carbonate rubble, and some underlain by calcrete at depth. (Patches of surface rubble occur.) There are only a few places where the reddish clayey sediments occur close to the surface. **ULP** - gently undulating near coastal plains, overlain by about 50% longitudinal sand dunes. The dunes are generally arable, but typically have semi-arable dune crests. Swales soils are dominantly calcareous with sandy topsoil over loamy or clay loamy subsoil. About 1% of swale area is non arable saline land; raised subsoil salinity levels are usual in the remaining swale area. **ULQ** - gently undulating near coastal plains overlain by about 50% longitudinal low sand dunes. (The dunes have been somewhat disturbed as sand has been redistributed by wind erosion events since clearing and settlement.) The dunes are mostly arable. Swales soils are dominantly calcareous with sandy topsoil over loamy or clay loamy subsoil. About 2% of the swale area is non arable saline land; raised subsoil salinity levels are usual in the remaining swale area. **ULT**. Southern unit: low lying level near coastal plains overlain by about 70% longitudinal sand dunes in the southern unit. About 10% of the swale area is saline and the rest is marginally saline. Some dune soils are underlain by calcrete. Northern unit: low lying gently undulating plains overlain by 50-60% mainly low sand dunes. Much of the swale area is marginally saline. Southern and northern units: dunes are generally arable, but often have semi-arable strips along their ridges. Swales soils are dominantly calcareous with sandy topsoil (some loamy) over clay loamy or loamy subsoil (which is sometimes underlain by calcrete). There are only a few places where the reddish clayey sediments occur close to the surface. Subsoil boron and sodium levels are often high in swale subsoils. **ULU** - low lying gently undulating near coastal plains overlain by 60-70% longitudinal low sand dunes. The dunes are mostly arable. Swales soils are dominantly calcareous with sandy topsoil over loamy or clay loamy subsoil. About 30% of swale area is non arable saline land. **ULW** - low lying gently undulating plain overlain by 35-40% mainly longitudinal low sand dunes. The dunes are generally arable, but often have semi-arable strips along their ridges. Much of the swale area is marginally saline. Swales soils are dominantly calcareous with sandy topsoil (some loamy) over clay loamy or loamy subsoil (which is sometimes underlain by calcrete). There are only a few places where the reddish clayey sediments occur comes close to the surface. Subsoil boron and sodium levels are often high in swales. Dune soils: Calcareous siliceous sand **H2a** - deep calcareous brown siliceous sand: most dunes [*Arenaceous Calcarosol; sandy/sandy*]. Siliceous sand **H2b** or gradational red sandy loam **C1** - non calcareous to slightly calcareous reddish sand over sand with abundant fine carbonate: common on dunes [*Hypercalcic-Calcic Arenaceous Orthic Tenosol; sandy/sandy-loamy* or *Red Kandosol; sandy/loamy*]. Swale soils: Calcareous loam **A4a**-**A5** with some rubbly calcareous loam **A4b**-**A5** - medium to very thick calcareous to slightly calcareous sandy topsoil (some loamy) over loamy or clay loamy subsoil with abundant fine carbonate and sometimes with hard carbonate rubble. (These soils mainly result from sandy deposition upon loamy soils.) (V in swales.) [*Lutaceous-Argillaceous Hypercalcic-Lithocalcic Calcarosol; sandy (-loamy)/loamy-clay loamy*]. Loamy sand spreads over red clay **G4**, loam over red clay **D2** or loam over poorly structured red clay **D3** - medium to thick calcareous to non calcareous sandy or loamy topsoil over clay loamy or clayey upper subsoil over reddish clay lower subsoil with abundant fine carbonate (possibly with some hard

		carbonate rubble): (M in swales) [*Effervescent-Sodic Hypercalcic Red-Brown Chromosol-Sodosol; sandy-loamy/clay loamy-clayey*]. Shallow calcareous loam on calcrete **B2** or rubbly calcareous loam **A4b** - shallow to moderate depth calcareous loamy and sandy soil on calcrete or over abundant hard carbonate rubble: (M in swales) [*Petrocalcic-Lithocalcic Calcarosol*]. Summary: this land is arable, except for many semi-arable dune ridge strips, and some saline swales near the coast. The main land uses are cropping and grazing. The main limitations of the dune soils are caused by their wind erosion potential and low fertility. The main limitations of swale soils are their potential for nutrient availability problems due to being calcareous throughout, and their wind erosion potential. Some of the low lying coastal swales are saline; and there is some toxic subsoil accumulation of boron and sodium, especially in coastal land units. Isolated patches of seasonal waterlogging can occur where subsoils are clayey. The sloping **ULf** land unit has a slight potential for water erosion. Slight limitations include: waterholding capacity (swales), subsoil toxicity (swales), alkalinity, salinity (swales **ULf**), water erosion risk (swales **ULf**), wind erosion potential (swales), and water repellence (dunes). Moderate limitations include: waterholding capacity (dunes), fertility, salinity (swales **ULP**, **ULQ**, **ULT**, **ULU**, **ULW**), and wind erosion potential (dunes).
WO-	0.1	Samphire flats. **WO-** – near coastal saline swale depressions, dominated by samphire vegetation. Soils have calcareous sandy to clay loamy topsoil over clay loamy to clayey subsoil. Main soils: saline soil **N2** - medium to thick calcareous sandy to clay loamy topsoil over clay loamy to clayey subsoil with abundant fine carbonate [Hypervescent-Haplic Lutaceous-Argillaceous Hypercalcic Calcarosol; sandy-clay loamy/clay loamy-clayey]. Summary: these areas are too saline to be arable due to a shallow saline water table. Moderate limitations include fertility and alkalinity. High to severe limitations include: effective waterholding capacities, subsoil toxicities, and salinity.

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:

Main Soils:

Soils of Sand Dunes and Sandy Rises

H2a Calcareous siliceous sand (*sandy Calcarosol*)
Thick to very thick calcareous brown siliceous sand over sand with abundant fine carbonate. The maximum accumulation of fine carbonate occurs from about 100cm. Found on dunes.

H2b Siliceous sand (*sandy Tenosol*)
Medium to very thick non calcareous reddish sand over sand with abundant fine carbonate. The maximum accumulation of fine carbonate occurs from about 100cm. Found on some dunes.

D5-**G1** Loamy sand over red clay loam or clay (*sandy Red Chromosol*)
Medium to thick loamy sand over a red massive sandy clay, or sometimes clay loam, with fine carbonate and often hard carbonate rubble from about 45 cm. Firm to hard medium thickness topsoils overlie very hard sandy clay on undulating to gently undulating land within dunefields and some lower dune slopes. Looser and thicker sand overlies sandy clay loam on sandy rises and some dune slopes.

C1 Gradational red sandy loam (*sandy Red Kandosol*)
Thick non calcareous loamy sand grading to a calcareous red clayey sand to light sandy clay loam over a lower subsoil with a variable accumulation of fine carbonate. Occurs on low rises and lower dune slopes.

Soils of Swales and Non Sandy Rises

A4a Calcareous loam (*Lutaceous Hypercalcic Calcarosol*)
Medium to thick calcareous loamy to light sandy clay loam topsoil (some with a thin covering of sand) over loamy to clay loamy subsoil with abundant fine carbonate (and up to 20% hard carbonate rubble) from about 50cm, over a very highly sandy clay loam. Occasionally underlain by calcrete. The soils typically become more clayey with depth.

D2 Loam over red clay (*Red Chromosol*)
Medium to thick non calcareous to moderately calcareous sandy loam topsoil (some with a thin covering of sand) over well structured reddish clayey subsoil with abundant fine carbonate from about 60cm, and sometimes with hard carbonate rubble. Formed in Hindmarsh Clay.

A4b Rubbly calcareous loam (*Lutaceous Supracalcic-Lithocalcic Calcarosol*)
Calcareous sandy to light sandy clay loam topsoil (some with a thin covering of sand) grading to subsoil with abundant hard carbonate rubble from about 40cm, over a very highly calcareous sandy clay loam. Occurs on flats and low rises.

A5 Calcareous loam on clay (*Argillaceous Hypercalcic-Lithocalcic Calcarosol*)
Calcareous sandy to light sandy clay loam topsoil (some with a thin covering of sand) grading to subsoil, often with abundant hard carbonate rubble from about 40cm, over a subsoil of very highly calcareous sandy clay loam. This is underlain by heavy clay (Hindmarsh Clay) within 120 cm of the surface. Occurs on flats and low rises.

G4 Loamy sand spreads on red clay (*sandy Red Sodosol-Chromosol*)
Usually medium thickness sand spreads (derived from wind eroded dunes) overlying older soils formed in heavy red clayey sediments. The typical profile sequence has brown calcareous to non calcareous sand, abruptly overlying red brown light to medium clay, which grades into a light coloured reddish clay with an abundant accumulation of fine carbonate, which is underlain by block red heavy clay (Hindmarsh Clay sediments). Found in dense dunefields in narrow swales (flats).

Soils of Broader Flats

A6 Gradational calcareous clay loam (*Argillaceous Hypercalcic Calcarosol*)
Medium to thick calcareous clay loamy to loamy topsoil over reddish clayey subsoil with abundant fine carbonate from about 35cm. Usually formed in the reddish and blocky Hindmarsh clay, however, near Port Broughton these soils can be formed in brown and massive alluvial clays which where probably laid down in old river channels/mouths. Can be overlain by thin spreads of sand, especially when situated in narrow swales.

D3 Loam over poorly structured red clay (*Hypercalcic Red Sodosol*)
Medium thickness often hardsetting sandy loam to clay loam sharply overlying a coarsely structured red dispersive clay, with abundant fine carbonate from about 50 cm, and grading to heavy clay from about 100 cm. Formed in Hindmarsh clay.

Further information: DEWNR Soil and Land Program