ARS Ardrossan Land System

Coastal slopes, plains, rises, and creeklines

Area: 27.4 km^2

Landscape: Coastal slopes, plains, rises, and creeklines. The soils of this system are underlain by a variety of sediments. The most common underlying sediment is Quaternary age Hindmarsh Clay equivalent, especially in the northern and southern parts of the system. This is a red blocky clay which is probably an ancient outwash sediment. (In the coastal cliffs at Ardrossan, the unconsolidated red Hindmarsh Clay equivalent layers are underlain by consolidated red and green mottled 'Ardrossan Clays and Sandrock'.) To the southeast of the BHP dolomite quarry, in the central part of the system, is an area of coastal slope where it is presumed soils overlie Cambrian age limestone-dolomite bedrock – grey to yellow Kulpara Limestone. (It is believed Kulpara Limestone underlies most of the centre and north of this system, but mostly at considerable depth (Crawford, A.R., 1965).) In the area around Rogues Point and extending south to Muloowurtie Point, many soils are underlain by red and yellow sandy clay loams to sandy light clays, or yellow structured clays – these are probably Tertiary age Muloowurtie Clays (Crawford, A.R., 1965). Some of the red clayey subsoils in the south of the system are underlain by red-orange sandstone – probably Tertiary age Blanche Point Formation equivalent sediments (Crawford, A.R., 1965).

The vast majority of the system is overlain by wind-deposited calcareous loess (Woorinen Formation). The whole area was blanketed in relatively recent geological times, however, some has since been removed by water action. These deposits are relatively thin, and range from tens of centimetres to several metres thick. Hard carbonate rubble is found in many profiles formed from such deposits, while calcrete layers have formed in some profiles (Bakara Calcrete).

The landscape consists of plains, slopes and rises. The system is regularly dissected by creeklines which mostly originate in the higher land to the west.

Annual rainfall: 345 – 405 mm average

Main soil:

A4-**A5** Calcareous loam (around 76% of area: mostly A4 soil)

Minor soils:

A6 Gradational calcareous loam (around 8% of area)
D3 Loam over red clay (around 8% of area)
B2 Shallow calcareous loam on calcrete (around 5% of area)

Main features: This land system area is mostly arable. The vast majority of soils are gradational to uniformly textured calcareous loams. However, texture contrast soils become common in the south of the system.

Soils are mostly calcareous throughout, with loamy topsoils and loamy to light clayey subsoils. There is an accumulation of finely divided carbonate, and often hard carbonate rubble, in the subsoil. The presence of hard carbonate rubble reduces effective water holding capacities and hence potential production. Calcareous soils restrict the availability of certain nutrients: deficiencies of the major nutrient phosphorus and the trace element zinc are common, while deficiencies of the trace elements manganese and iron are possible. Temporary trace element deficiencies can occur in cold and wet conditions with susceptible crops. This is particularly the case for soils with highly calcareous surfaces.

Surface soils are usually friable, but also have potential for wind erosion when bare.

Soils are generally well drained, however, some soils have clayey subsoils or substrates which restrict internal drainage. Many clay loamy to clayey subsoils are dispersive, further limiting internal drainage.

Soils on sloping land have potential for water erosion, particularly when underlain by restrictive clayey to clay loamy subsoils. Creeklines and drainage lines are prone to erosion and gullying.

There is little to no surface expression of salinity, however, many soils have raised subsoil salinity especially in the south of the system. It is likely that many lower subsoils and substrates have toxic levels of sodium, and to a lesser extent boron, especially in soils with restrictive subsoils.

Soil Landscape Unit summary: Ardrossan Land System (ARS)

SLU	% of area	Main features
EIB	2.2	Land dominated by calcareous soils formed over calcreted limestone-dolomite and in calcareous loess. The limestone-dolomite is grey to yellow coloured Cambrian age Kulpara limestone. Main soils: moderate depth to shallow *calcareous loam on calcreted limestone* **A2**, and including deeper *calcareous loam* **A4**-**A5**. Many soils contain hard carbonate rubble and/or limestone fragments. **EIB** – slopes with some drainage lows (slopes 0-2.5%).
HMH	1.1	Land dominated by soils formed in clayey sediments. Main soils: *loam over red clay* **D3** grading to *gradational calcareous loam* **A6**. With limited to common areas of *calcareous loam* **A4**-**A5**. Probably with some *shallow calcareous loam on calcrete* **B2** on very low relict coastal dunes. **HMH** – coastal slopes and drainage lines (slopes 3-15%).
IOE IOJ	0.4 1.5	Land dominated by calcareous soils formed in clayey sediments and calcareous loess. Main soils: *gradational calcareous loam* **A6** grading to *loam over red clay* **D3**. And extensive areas of *calcareous loam* **A5**-**A4**. **IOE** – narrow creeklines (slopes 0-10%). **IOJ** – narrow creeklines with signs of significant erosion (slopes 0-10%).
SDB SDC SDH	3.0 2.8 0.9	Land dominated by soils formed in calcareous loess and clayey sediments. Main soils: *calcareous loam* **A4**-**A5**. And extensive areas of *loam over red clay* **D3** grading to *gradational calcareous loam* **A6**, in lows. **SDB** – slopes with drainage lows/drainage ways (slopes 1 - 3.5%). **SDC** – slopes (slopes 1 - 6%). **SDH** – slopes and rises with drainage ways/drainage lines (slopes 1 - 6%).
SMA SMB SMBg	20.0 3.8 15.4	Land dominated by soils formed in calcareous loess. Main soils: *calcareous loam* **A4**-**A5**. With minor areas of *shallow calcareous loam on calcrete* **B2**. **SMA** – coastal plains/rise surfaces with some drainage lows (slopes 0 - 1%). Includes coastal cliffs topped by very low calcreted relict coastal dunes with **B2** soils in northern-most unit. **SMB** – slopes with minor drainage lines (slopes 0 - 2.5%). **SMBg** – slopes with drainage lines and some signs of water erosion (slopes 0 - 4%).
SOA SOB SOCg SOH	2.3 22.0 10.2 10.6	Land dominated by soils formed in calcareous loess. Main soils: *calcareous loam* **A4**-**A5**. With limited to common areas of *gradational calcareous loam* **A6** grading to some *loam over red clay* **D3**. **SOA** – elevated coastal plains and slopes with some drainage lows (slopes 0 - 2%). **SOB** – rise surfaces and slopes with some drainage lows (slopes 0 - 2%). **SOCg** – rises and slopes with drainage lows and drainage lines (slopes 0 - 3.5%). **SOH** – rises and slopes with creeklines and drainage ways (slopes 1 - 5%).

QlA QlB	1.0 2.6	Land dominated by shallow soils on calcrete. Main soils: *shallow calcareous loam on calcrete* **B2** grading to *shallow sandy loam over red clay on calcrete* **B6**-**B7**. With limited to common areas of *loam over red clay* **D3** possibly including some *gradational calcareous loam* **A6**, in lows. And some *calcareous loam* **A5**-**A4**. **QlA** – rise surface (slopes 0 - 1%). **QlB** – slopes and rises with drainage ways (slopes 0.5 - 3.5%).
WAA	0.4	**WAA** – lower creek gullies (slopes 0-30%).

Detailed soil profile descriptions:

Main soil:

A4-**A5** *Calcareous loam* [Regolithic Hypercalcic-Lithocalcic Calcarosol]
Grey brown to brown medium thickness calcareous fine sandy loam to sandy loam topsoil grading to brown, yellow brown or red brown loamy to light clayey subsoil with abundant fine carbonate. Profiles often contain abundant carbonate rubble. Profiles are underlain by calcareous loess (soil **A4**), or clayey sediments (soil **A5**). Subsoils are typically strongly alkaline, and clay loamy to light clayey subsoils are typically dispersive. Comparable moderate depth soils with grey limestone-dolomite fragments can overlie calcreted limestone-dolomite (soil **A2**).

Minor soils:

A6 *Gradational calcareous clay loam* [Pedal Hypercalcic-Lithocalcic Calcarosol]
Calcareous grey brown to brown thick to medium thickness loamy topsoil grading to clayey subsoil with abundant fine carbonate. Fine carbonate content increases with depth. Subsoils are typically dispersive. These profiles are generally underlain by clayey sediments. Profiles often include hard carbonate rubble.

D3 *Loam over red clay* [Sodic-Effervescent Hypercalcic-Lithocalcic Red Sodosol-Chromosol]
Brown medium thickness to thin sandy loam to clay loamy, or occasionally loamy sand topsoil overlying red clayey subsoil grading to clayey or clay loamy lower subsoil with abundant fine carbonate. Lower subsoils are typically dispersive. These profiles can be underlain by weathered sandstone or clayey to clay loamy sediments. Profiles can include hard carbonate fragments. Topsoils can be calcareous. Typically found in the south of the system, mostly in drainage lows. These soils can grade to *shallow sandy loam over red clay on calcrete* **B6**-**B7**.

B2 *Shallow calcareous loam on calcrete* [Petrocalcic Calcarosol]
Grey brown to brown calcareous loams overlying calcrete at shallow depth. Profiles can contain abundant hard carbonate rubble. Subsoils can be as heavily textured as light clay. These soils can grade to *shallow sandy loam over red clay on calcrete* **B6**-**B7** in the south of the system. In the centre of the system it is likely that there are comparable shallow soils with grey limestone-dolomite fragments overlying calcreted limestone-dolomite (soil **A2**).

References: Crawford, A.R. (1965). `The Geology of Yorke Peninsula'. *Bull. geol. Surv. S. Aust., 39*.

Further information: DEWNR Soil and Land Program