SUD Sudbury Land System

Elevated plains, with some rises and drainage areas. The drainage areas include the lower section of the Winulta Creek valley.

Area: 22.8 km^2

Landscape: Elevated plains, with some rises and drainage areas. The drainage areas include the lower section of the Winulta Creek valley. The land system is underlain by various geological components. The elevated plains, rises and slopes in the very south of the system are underlain by Hindmarsh Clay. The Rise on the eastern edge of the system is underlain by Tertiary age yellow sandstone and quartzitic sandstone (a Blanche Point Formation equivalent) – which can be found on hilltops of the Ardrossan-Price scarp (Crawford, A.R., 1965).

It is uncertain what underlies the central and northern parts of the land system. The elevated central part of the land system is unusual in that soft powdery scalds are common (rarely seen on Yorke Peninsula). These soft saline scalds are apparently not associated with a saline watertable. Raised salinity levels are probably the result of a buildup of cyclic salts in profiles, due to the nature of underlying sediments and low annual rainfall, and there is the possibly of salt contributions from underlying saline sediments. These sediments could be Tertiary age clays (Muloowurtie Clay). The rise to the east may also contribute by blocking the process of salt-flushing to the sea.

Accessions of wind-deposited carbonate dust have infused into profiles. Most profiles are calcareous throughout, and some include hard carbonate fragments. Wind-deposited calcareous loess (Woorinen Formation) overlies older sediments in many areas, and calcrete also occurs in a few places (Bakara Calcrete).

Annual rainfall: 340 - 375 mm average

Main soils:

A4-**A5**	*calcareous sandy loam*
D3	*sandy loam over red clay*
D2	*sandy loam over red clay loam to clay*

Minor soils:

D7-**D1**	*sandy loam over clay on rock*
A6	*gradational calcareous sandy loam*
B2	*shallow calcareous sandy loam on calcrete*

Main features: The land system is mostly arable, however, some soils are marginally to highly saline which limits cropping opportunities. The most common soils are deep to moderate depth calcareous loams, and texture contrast soils with sandy loams topsoils overlying clayey or clay loamy subsoils.

High salinity levels and strongly alkaline conditions are a feature of many soils. These conditions are found in surface soils where soft scalding occurs. Most roots have difficulty growing in such conditions. In addition, 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 true for soils with highly to very highly calcareous surfaces. Many surface soils are powdery or loose, with textures of loamy sand, sandy loam, or loam, these have the potential for wind erosion when unprotected.

Drainage is restricted in soils with clayey subsoils, especially if subsoils are dispersive. Dispersive clay loamy subsoils also restrict drainage. When these soils occur in low lying situations waterlogging can be a significant issue, especially if subsoils are clayey.

Toxic accumulations of boron and sodium often occur in subsoils or substrates, particularly in soil layers where drainage is restricted. Very high levels of boron were measured in some clayey lower subsoils (eg 21 and 34 ppm). Toxic levels of sodium tend to occur higher in profiles than toxic levels of boron.

Some water erosion is possible on sloping land, particularly where topsoils are loose and are underlain by restrictive clayey layers. Flooding is a possibility in very wet years in drainage depressions and in the closed in the centre of the land system.

Soil Landscape Unit summary: Sudbury Land System (SUD)

SLU	% of area	Main features
DJL	5.8	Land dominated by texture contrast soils formed over Tertiary age sandstone. Main soils: non calcareous to calcareous *sandy loam over clay on rock* **D7**-**D1**. With *calcareous sandy loam* **A4**-**A5**. **DJL** – rise: slopes and crest with minor soft powdery scalding (slopes 0-4%).
HHM HHz HHO HHOg	3.8 7.5 4.3 8.5	Land dominated by calcareous texture contrast soils formed in clayey sediments. *Rises and Slopes – with soils mostly formed in Hindmarsh Clay:* Main soils: calcareous *sandy loam over red clay* **D3**, possibly with some *gradational calcareous sandy loam* **A6**. And limited to common areas of *calcareous sandy loam* **A4**-**A5**. With minor areas of *shallow calcareous sandy loam on calcrete* **B2**. **HHM** – slopes (slopes 1-4%). **HHz** – elevated coastal plain/rise surface (slopes 0-1%). *Drainage Depressions:* Main soils: calcareous to non calcareous *sandy loam over red clay loam to clay* **D2** probably grading to *sandy loam over red clay* **D3**: it is likely that many of these soils are formed over weathering sandstone and so grade to *sandy loam over clay on rock* **D7**-**D1**. Possibly with some *gradational calcareous sandy loam* **A6**. And limited to common areas of *calcareous loam* **A5**-**A4**. With minor areas of *shallow calcareous sandy loam on calcrete* **B2**. **HHO** – drainage depressions (slopes 0-1%). **HHOg** – drainage depression with a central drainage line in parts: the lower part of Winulta Creek (slopes <1%).
IOKg	11.9	Land dominated by calcareous soils formed in clayey sediments (Hindmarsh Clay). Main soils: *gradational calcareous sandy loam* **A6**, possibly with some calcareous *sandy loam over red clay* **D3**. And extensive areas of *calcareous sandy loam* **A5**-**A4**. **IOKg** – gently undulating coastal plain with drainage ways/drainage depressions (slopes 0-1.5%).
SMM	1.3	Land dominated by soils formed in calcareous loess. Main soils: *calcareous sandy loam* **A4**. **SMM** – slopes (slopes 1-8%).
SOK SOKd SOLd SOMd SOPd SOzd SOT SOTw	9.2 1.5 5.8 1.6 32.2 0.5 2.0 0.6	Land dominated by soils formed in calcareous loess which overlie clayey sediments. Main soils: *calcareous sandy loam* **A4**-**A5**. With limited to common areas of mostly calcareous *sandy loam over red clay loam to clay* **D2** grading to *sandy loam over red clay* **D3**, especially in lows. With minor areas of *shallow calcareous sandy loam on calcrete* **B2**. *Slopes, Plains and Rises:* **SOK** – low lying plain with vague drainage lows (slopes 0-1%). **SOKd** – low lying plains possibly with minor soft powdery scalds (slopes 0-1%). **SOLd** – slopes and lower slopes with drainage lows and with minor soft powdery scalds (slopes 0.5-2.5%). **SOMd** – slopes with drainage lows and a vague drainage line and possibly minor soft powdery scalds (slopes 1-6%).

		SOPd – gently undulating elevated plain with drainage lows/depressions and significant areas of soft powdery scalding (slopes 0-1%). **SOzd** – rise surface possibly with minor soft powdery scalds (slopes 0-1%). *Depressions:* **SOT** – drainage depression (slopes <1%). **SOTw** – closed depression: a solution hole? (slopes <1%).
SRL	3.3	Land dominated by soils formed in calcareous loess. Main soils: *calcareous sandy loam* **A5**-**A4**. With some areas of *shallow calcareous sandy loam on calcrete* **B2**, and possibly some *gradational calcareous sandy loam* **A6** grading to calcareous *sandy loam over red clay* **D3**. **SRL** – low rise (slopes 0.5-3%).

Detailed soil profile descriptions:

Main soils:

A4-**A5** *calcareous sandy loam* [Regolithic Hypercalcic-Lithocalcic Calcarosol]
Loose, or powdery and sometimes hardsetting, grey brown to brown highly calcareous sandy loam, loamy sand, or loam topsoil grading to a brown or orangey very highly calcareous loamy, clay loamy or light clayey subsoil often with hard carbonate rubble. Profiles can be underlain by a clayey substrate within 120cm of the surface (soil **A5**). Clay loamy and light clayey subsoils are often dispersive, especially in lower layers.

D3 *sandy loam over red clay* [Effervescent Hypercalcic Red-Brown Sodosol]
Medium thickness brown, grey brown or red brown sandy loam to loamy sand topsoil overlying red to brown clayey subsoil which is usually dispersive and have increasing fine carbonate contents with depth. Topsoils are often calcareous and can range from loose to hardsetting. These profiles are typically underlain by clayey substrates.

D2 *sandy loam over red clay loam to clay* [Effervescent Hypercalcic Red-Brown Sodosol]
Medium thickness to thick brown, grey brown or red brown sandy loam to loamy sand topsoil overlying red to brown sandy clay loam or sandy light clay subsoil; or else thick topsoils overlying clayey subsoil. Subsoils are usually dispersive and have increasing fine carbonate contents with depth. Topsoils are often calcareous and can range from loose to hardsetting. These profiles are typically underlain by clayey substrates. Commonly found in drainage depressions. (This soil is basically a variant of **D3** with deeper topsoil, or lighter textured subsoil).

Minor soils:

D7-**D1** *sandy loam over clay on rock* [Sodic-Effervescent Red-Brown Chromosol-Sodosol]
Medium thickness brown, grey brown or brown sandy loam to loamy sand overlying red to brown clayey subsoil Subsoils are often dispersive, have increasing fine carbonate contents with depth, and typically include some rock fragments. Topsoils are often calcareous and can range from loose to hardsetting. Profiles are underlain by sandstone or quartzitic sandstone. Found on eastern rise and possibly some other areas in this system (eg drainage depressions). (These soils are basically variants of **D3** and **D2** soils underlain by rock).

A6 *gradational calcareous sandy loam* [Pedal Hypercalcic-Lithocalcic Calcarosol]
Calcareous grey brown to brown medium thickness to thick sandy loam, loam or loamy sand topsoil grading to yellowish clayey subsoil with abundant fine carbonate. Fine carbonate content increases with depth. Subsoils are often dispersive. These profiles are underlain by clayey sediments (Hindmarsh Clay). Profiles can include some hard carbonate fragments. Found in the south of the system and possibly in a few places elsewhere.

B2 *shallow calcareous sandy loam on calcrete* [Petrocalcic Calcarosol]
Grey brown to brown calcareous loams, sandy loams or loamy sands overlying calcrete at shallow depth. Profiles can contain abundant hard carbonate rubble. Of minor extent.

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

Further information: DEWNR Soil and Land Program