ROG Rogues Gully Land System

Rises, slopes and drainage depressions

Area: 97.7 km^2

Landscape: Rises, slopes and drainage depressions. The named drainage depressions are Pavy Creek and Rogues Gully in the south of the system. Drainage throughout the system is toward to east and southeast, then onward to St Vincent Gulf. Significant surface flows along drainage depressions in living memory are rare, for example, such flows occurred in the upper part of Pavy Creek in 1948 and 1989. The system is defined by scarp slopes in the east and gentle slopes, rises and plains in the west. The system is underlain by various bedrock types, with many soils directly underlain by rock or weathered rock: Cambrian age limestone-dolomite (Kulpara Limestone and some Parara Limestone) of which there are fairly extensive outcrops southwest of Ardrossan; a range of Proterozoic and Tertiary age sandstones, some of which outcrop directly north of the BHP dolomite quarry to the southwest of Ardrossan; and older pre-Adelaidean system Proterozoic age hard metamorphosed bedrock, especially to the west and northwest of Ardrossan. Some soils are underlain by clays which have formed in situ from the latter rock types. Similarly, some soils are underlain by alluvial clays in drainage depressions.

Accessions of wind-deposited carbonate dust have infused into profiles in relatively recent geological times. Many profiles are calcareous throughout; and many include hard carbonate fragments. Wind-deposited calcareous loess (Woorinen Formation) overlies older sediments in many areas, as does calcrete (Bakara Calcrete). Many soils in the west and south of the system are underlain by calcrete. Calcrete layers are often underlain by highly calcareous wind-deposited loamy or even sandy sediments, but can be directly underlain by older sediments such as hard rock. Calcareous loess and calcrete have been 'dissolved' and removed by water action from many low lying areas where water flow has concentrated.

Annual rainfall: 355 - 415 mm average

Main soils:

D3	*Loam over red clay* (these grade to *loam over clay on rock* **D1**-**D7**, *loam over clay loam* **D2**, and *shallow loam over clay on calcrete* **B6**)
A4-**A5**	*Calcareous loam* (these grade to *calcareous loam on rock* **A2**)
B2	*Shallow calcareous loam on calcrete* (these grade to *shallow loam over clay on calcrete* **B6** and *shallow loam on calcrete* **B3**)

Minor soils:

L1	*Shallow rocky soil*
A6	*Gradational calcareous clay loam*

Main features: The land system is mostly arable, however, some soils are too stony and shallow, or are on slopes which are too steep, to be cropped. The most common soils are uniformly to gradationally textured calcareous loams, texture contrast soils, and various soils overlying calcrete at shallow depth. Loamy surface soils are the most common throughout the system, however, sandy surfaces are common in the very north and the very south of the system. Many soil profiles contain hard carbonate fragments, while rock fragments also occur in some soils. Rock and hard carbonate fragments, and calcrete or rock at shallow depth, limit the waterholding capacity of a soil and hence it's productive potential.

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 calcareous surfaces.

Numerous soils have clayey subsoils, which are often dispersive, and many clay loamy to light clayey subsoils are dispersive – such subsoils result in restricted internal drainage and can lead to temporary waterlogging, especially when situated in low lying areas.

Soils on sloping land, those adjacent to sloping land, and those in drainage depressions have the potential for water erosion. Care needs to be taken with surface management in these areas to minimise the risk of water erosion, especially with texture contrast soils. Flooding may occur in drainage depressions. Saline seepage, or an accumulation of cyclic salt, affects some soils – but typically only results in raised subsoil or substrate salinity levels. There is a moderately low to moderate potential for wind erosion on soils across much of the system.

Toxic accumulations of boron were not found to be a significant issue. However, toxic levels of sodium in lower subsoils and substrates are likely to be relatively common.

Soil Landscape Unit summary: Rogues Gully Land System (ROG)

SLU	% of area	Main features
AWA AWB AWH AWI	0.3 0.2 0.1 1.3	Non arable land dominated by shallow to very shallow rocky soils: underlying and outcropping rocks are mostly Cambrian age limestone-dolomite – Kulpara Limestone with some younger Parara Limestone in the upper slopes of the 'AWI' land unit. Also Tertiary age (?) quartzitic sandstone occurs in the '**AWH**' land unit. Main soils: *shallow rocky soil* **L1**, grading to *calcareous loam on rock* **A2**, *gradational loam on rock* **C2**, *shallow calcareous loam on calcrete* **B2** overlying rock and some bare rock outcrop. **AWA** – non arable rocky slopes and rises with drainage lines (slopes 0-20%). **AWB** – non arable rocky slopes and rises with drainage lines (slopes 0-40%). **AWH** – non arable rocky outcrops: rise surface and slopes with drainage lines (slopes 0-30%): quartzitic sandstones and limestone-dolomite. **AWI** – non arable rocky gullied slopes, rises and low hills, and incl. part of Pavy Ck (slopes 0-100%).
DDC	9.8	Land dominated by texture contrast soils overlying weathered rock. Main soils: *loam over clay on rock* **D1**-**D7**, grading to *loam over red clay* **D3** (especially in lows). With common areas of *calcareous loam on rock* **A2** grading to *shallow calcareous loam on calcrete* **B2** overlying rock, *gradational loam on rock* **C2** and *calcareous loam* **A4**-**A5**. **DDC** – gently undulating to undulating slopes with drainage lows and a few drainage lines, and with 2-10% rocky outcrop (slopes 0.5-3.5%).
EIC EIZ	3.7 1.7	Land dominated by calcareous soils overlying weathered rock. Main soils: *calcareous loam on rock* **A2**, most of which are rubbly, grading to *shallow calcareous loam on calcrete* **B2** and *calcareous loam* **A4**. With some *loam over red clay* **D3** in lows. **EIC** – slopes and rises with drainage lines and a few rock outcrops (slopes 1-6%). **EIZ** – rise surface (slopes 0-1.5%).
HHB HHBw HHC HHZ	5.8 0.6 3.2 3.5	Land dominated by soils formed in clayey sediments. Main soils: *loam over red clay* **D3**, probably with some *loam over clay on rock* **D7**-**D1**. With common to extensive areas of *calcareous loam on rock* **A2** grading to *calcareous loam* **A4**-**A5**, and *shallow calcareous loam on calcrete* **B2** grading to *shallow loam on calcrete* **B3** and *shallow loam over clay on calcrete* **B6**. Minor areas of *gradational calcareous clay loam* **A6** may occur. **HHB** – slopes and rises with drainage lows (slopes 0-2.5%): often somewhat low lying in relation to adjacent land. **HHBw** – lower slopes (slopes 0-2%). **HHC** – slopes and rises with vague drainage lows and drainage lows, and even a drainage line in one concave section (slopes 1-4%). **HHZ** – rise surfaces and upper slopes with vague drainage lows (slopes 0-2%).

HMA HME HMEa	0.6 6.1 1.6	Land dominated by soils formed in clayey sediments. Main soils: *loam over red clay* **D3**. With limited to common areas of *calcareous loam* **A5**-**A4**, and possibly some *gradational calcareous clay loam* **A6**. **HMA** – low lying plain (slopes 0-1%). **HME** – drainage depressions (slopes 0-1.5%): relatively major drainage depressions. **HMEa** – drainage depressions (slopes 0-1.5%): relatively minor drainage depressions which tend to have lighter textured surfaces than more major depressions which experience more frequent washing.
QAA	1.0	Land dominated by shallow calcareous soils on calcrete. Main soils: *shallow calcareous loam on calcrete* **B2**. With extensive areas of *calcareous loam* **A5**-**A4** grading to *calcareous loam on rock* **A2**. With minor areas of *loam over red clay* **D3** possibly grading to *gradational calcareous clay loam* **A6**, in lows. **QAA** – elevated plains with some drainage lows (slopes 0-1%).
QfA QfB QfBa QfC QfZ QfZa QfZr	3.6 6.4 1.6 0.7 2.5 0.1 2.0	Land where the most common soil is a shallow calcareous soil on calcrete. Main soils: *shallow calcareous loam on calcrete* **B2** possibly including some *shallow loam on calcrete* **B3** and grading to *shallow loam over clay on calcrete* **B6**. With limited to extensive areas of *loam over red clay* **D3** grading to *loam over clay on rock* **D7**-**D1**or occasionally including some *gradational calcareous clay loam* **A6**, and limited to common areas of rubbly *calcareous loam* **A4**-**A5** grading to *calcareous loam on rock* **A2**. **QfA** – gently undulating elevated plains with drainage lows (slopes 0-1%). **QfB** – slopes and rises with some drainage lows (slopes 0.5-3%). **QfBa** – slopes and rises with vague drainage lows (slopes 0-3%): sandy surfaces dominate. **QfC** – slopes with a few drainage ways (slopes 1-4%). **QfZ** – rise surface (slopes 0-1%). **QfZa** – rise surface (slopes 0-1%): sandy surfaces dominate. **QfZr** – gently undulating rise surface (slopes 0-2%): many soils overlie weathered rock.
QlA QlB QlC QlZ QlZr	1.9 4.1 1.9 0.4 1.1	Land dominated by shallow calcareous soils on calcrete. Main soils: *shallow calcareous loam on calcrete* **B2** grading to *shallow loam over clay on calcrete* **B6** and *shallow loam on calcrete* **B3**. With limited to common areas of *loam over red clay* **D3** grading to *loam over clay on rock* **D7**-**D1**. With minor to limited *calcareous loam* **A4**-**A5** grading to *calcareous loam on rock* **A2**. **QlA** – low rises and plains (slopes 0-1%). **QlB** – slopes, rises and low rises with some drainage lows/drainage ways (slopes 0.5-3%): often with some non arable very stony land. **QlC** – slopes (slopes 1-6%): often with some non arable very stony land. **QlZ** – rise surface (slopes 0-1%). **QlZr** – rise surface (slopes 0-1.5%).
QqB	1.0	Land dominated by shallow soils on calcrete. Main soils: *shallow calcareous loam on calcrete* **B2** grading to *shallow loam over clay on calcrete* **B6** and possibly to *shallow loam on calcrete* **B3**. With minor to limited areas of *loam over red clay* **D3**, possibly grading to *gradational calcareous clay loam* **A6**, in lows. **QqB** – low stony rises with a few drainage lows (slopes 0.5-2.5%): 20-50% non arable very stony land.
QRA QRB QRC QRD QRI QRZr	1.9 2.3 4.4 1.5 1.0 0.6	Land dominated by shallow calcareous soils on calcrete. Main soils: *shallow calcareous loam on calcrete* **B2**, grading to *shallow loam on calcrete* **B3**, and *shallow loam over clay on calcrete* **B6** – and with calcrete outcrops. Minor areas of *loam over red clay* **D3** may occur in drainage ways. **QRA** – stony elevated plains and low rises (slopes 0-1%): typically 30% or more non arable very stony land. **QRB** – slopes and low rises (slopes 0-3.5%): 30% or more non arable very stony land. **QRC** – stony slopes and rises with some drainage ways (slopes 1-6%): 30% or more non arable very stony land. **QRD** – stony slopes and rises (slopes 5-30%): mostly non arable very stony land. **QRI** – slopes with some gullies (slopes 1-100%, mostly 5-20%): greater than 50% non arable very stony land. This are includes part of the Rogues Gully drainage depression. **QRZr** – gently undulating to undulating rise surface (slopes 0-2%): typically 30% or more non arable very stony land.
RHA	1.0	Land dominated by shallow soils on calcrete. Main soils: *shallow loam over clay on calcrete* **B6**. And common to extensive areas of *loam over red*

		clay **D3**. With limited to common areas of *calcareous loam* **A5**-**A4**. **RHA** – low lying plain with drainage lows (slopes 0-1%).
RJB	0.1	Land dominated by shallow soils on calcrete. Main soils: *shallow loam over clay on calcrete* **B6** possibly grading to *shallow loam on calcrete* **B3** and *shallow calcareous loam on calcrete* **B2**. **RJB** – stony rises (slopes 0-2%): mostly non arable.
RKA RKB	0.5 0.9	Land dominated by shallow soils on calcrete. Main soils: *shallow loam on calcrete* **B3** grading to *shallow loam over clay on calcrete* **B6**. With common to extensive areas of *loam over red clay* **D3**. **RKA** – low rise surface (slopes 0-1%). **RKB** – slight slopes with drainage lows (slopes 0.5-2%).
RRC	0.6	Land dominated by shallow soils on calcrete. Main soils: *shallow loamy sand over clay on calcrete* **B7** grading to *shallow loam over clay on calcrete* **B6**, and probably with some *shallow loam on calcrete* **B3** grading to *shallow calcareous loam on calcrete* **B2**. With minor areas of *loam over red clay* **D3** in drainage lows. **RRC** – slopes and rises with a few vague drainage lows (slopes 1-7%): approximately 20-30% non arable very stony land.
SDB SDC SDCg SDZ	1.1 0.3 1.1 0.8	Land dominated by soils formed in calcareous loess. Main soils: *calcareous loam* **A4**-**A5**, grading to *calcareous loam on rock* **A2** and *loam over clay loam* **D2**. Minor areas of *shallow calcareous loam on calcrete* **B2** may occur. **SDB** – slopes (slopes 0.5-2.5%). **SDC** – slopes (slopes 1-4.5%). **SDCg** – lower slopes with a few drainage lines (slopes 1-2.5%). **SDZ** – rise surface (slopes 0-1.5%).
SbC	2.5	Land dominated by soils formed in rubbly calcareous loess. Main soils: rubbly *calcareous loam* **A4**-**A5**. With common to extensive areas of *loam over red clay* **D3** possibly including some *gradational calcareous clay loam* **A6**. With minor areas of *shallow calcareous loam on calcrete* **B2** grading to *shallow loam on calcrete* **B3**. **SbC** – slopes with vague drainage lows (slopes 1-8%, but mostly 1-4%).
SdA SdB SdZ	1.0 6.4 1.7	Land dominated by soils formed in rubbly calcareous loess. Main soils: rubbly *calcareous loam* **A4**-**A5**. With limited to common areas of *loam over red clay* **D3** possibly including some *gradational calcareous clay loam* **A6**, and *shallow calcareous loam on calcrete* **B2** grading to *shallow loam on calcrete* **B3**. **SdA** – gently undulating plains (slopes 0-1.5%). **SdB** – slopes and rise surfaces with vague drainage lows (slopes 0-3%). **SdZ** – rise surfaces with a few vague drainage lows (slopes 0-1%).
SRB SRC SRZ	0.4 1.9 0.5	Land dominated by soils formed in calcareous loess. Main soils: *calcareous loam* **A4**-**A5**, grading to *calcareous loam on rock* **A2** and *loam over clay loam* **D2**. With limited to common areas of *shallow calcareous loam on calcrete* **B2**. **SRB** – upper slopes with vague drainage lows (slopes 1-2.5%). **SRC** – slopes with some drainage lows (slopes 1-3.5%). **SRZ** – rise surface (slopes 0-1.5%).
U-D	0.1	Isolated mallee sand dunes. Probably formed from the reworking of local sandy topsoils. Main soils: *siliceous sand* **H2**. **U-D** – non arable low sand dunes (5a).
-Q-	0.5	**-Q-** – dolomite quarry with some spoil heaps. The original geological layers of the quarry consisted of Cambrian age grey Kulpara Limestone with an uneven surface, eroded under karst-like conditions, overlain and in-filled by pale grey or white kaolinitic clays, which in turn was overlain by Tertiary age current-bedded quartz sands, in part cemented by secondary silicifaction (Crawford, A.R., 1965). The sands are comparable to the quartz sands underlying much of the Yaringa Land System – in a similar elevated setting to the north. The quarry was capped by a relatively thin layer (typically from one to four metres) of Quaternary age calcareous loess with some calcrete.

Detailed soil profile descriptions:

Main soils:

D3 *loam over red clay* [Sodic-Effervescent-Haplic Hypercalcic-Lithocalcic Red-Brown Chromosol-Sodosol]

Red brown to brown medium thickness loamy sand to fine sandy clay loam topsoil overlying red to red brown clayey subsoil grading to clay with abundant fine carbonate. Subsoils, and especially lower subsoils, are often dispersive. Profiles often include hard carbonate fragments, often include fine quartz fragments, and sometimes include other rock fragments. Topsoils can be calcareous and tend to be hardsetting. These profiles are typically underlain by calcareous light clayey sediments. Found on rising land, in drainage lows, and drainage depressions.

Loam over clay on rock (soil **D1**-**D7**) occurs where texture contrast soils are underlain by rock or weathered rock at shallow to moderate depth: usually these profiles include fine quartz fragments and other rock fragments. Typically found on rising land or relatively steep slopes.

Loam over clay loam (soil **D2**) occurs where subsoils are clay loamy and profiles are texture contrast.

Shallow loam over clay on calcrete (soil **B6**) occurs where similar texture contrast profiles to those above are underlain by calcrete at shallow depth.

A4-**A5** *calcareous loam* [Regolithic-Paralithic-Lithic Hypercalcic-Lithocalcic Calcarosol]

Grey brown to brown medium thickness calcareous loamy or sometimes sandy or sandy clay loam topsoil grading to loamy to light clayey subsoil with abundant fine carbonate. Profiles often contain abundant carbonate rubble. Profiles are underlain by calcareous loess, or sometimes clayey sediments (soil **A5**). Subsoils are typically strongly alkaline and are often dispersive.

Calcareous loam on rock (soil **A2**: Paralithic-Lithic Lithocalcic-Hypercalcic Calcarosol) occurs when uniformly to gradationally textured soils similar to that described above are underlain by weathered rock or rock at shallow to moderate depth. The underlying rock may be an inherently calcareous rock (limestone-dolomite), or calcareous soil may overlie inherently non calcareous rock, the upper layer/s of which has been infused with fine carbonate. These profiles often have abundant hard carbonate fragments in the soil layer directly overlying the weathered rock or hard rock (these grade to **B2** soils where a calcrete layer overlies the weathered rock or hard rock), and can contain rock fragments (often carbonate coated). Some types are pinkish in colour with hardsetting fine sandy loam surfaces (these grade to **D2** texture contrast soils). These soils are relatively common in this system.

B2 *shallow calcareous loam on calcrete* [Petrocalcic Calcarosol-Chromosol]

Grey brown to brown calcareous loamy or sometimes clay loamy or sandy soil overlying calcrete at shallow depth. Profiles often contain abundant hard carbonate rubble. Subsoils can be as heavily textured as light clay. Typically found on rising ground or low rises.

Shallow loam over clay on calcrete (soil **B6**: Petrocalcic Red-Brown Chromosol) occurs where texture contrast profiles with clayey subsoils are underlain by calcrete at shallow depth. Such profiles can be calcareous throughout. Typically found on rising ground and low rises, and in some low lying areas.

Shallow loam on calcrete (soil **B3**: Petrocalcic Tenosol) occurs where sandy to loamy soils overlie calcrete at shallow depth, and profiles are not calcareous throughout. Typically found on rising ground or low rises.

Minor soils:

L1 *shallow rocky soil* [Lithic-Paralithic Rudosol]

Very shallow to shallow loamy to sandy soil underlain by hard rock or weathered rock. Such profiles are non arable and rocky, and are associated with rock outcrops. Found on rises and relatively steep slopes.

A6 *gradational calcareous clay loam* [Pedal Hypercalcic-Lithocalcic Calcarosol]

Calcareous grey brown to brown medium thickness to thin clay loamy to loamy topsoil grading to clayey subsoil with abundant fine carbonate. Fine carbonate content increases with depth. Subsoils are typically dispersive. Profiles are generally underlain by clayey sediments, and can include some hard carbonate fragments. Mostly found in drainage lows. These grade to **D3** texture contrast soils.

Further information: DEWNR Soil and Land Program