QUO Quorn Land System

Area: 184.2 km^2

Landscape: Undulating rises and pediments with red or black, clay to clay-loamy soils over weathered rock or fan alluvium. Some highly calcareous soils occur on calcareous weathered rocks. Named from township of Quorn, which is in the land system.

Annual rainfall: 275 - 450 mm average range, but over 80% of land receives 300 - 350 mm

Geology: Willochra Subgroup (Nfr, Nhw) siltstones or sandstones and Rhynie Sandstone (Por) and associated rocks and derived alluvium.

Topography: The topography varies from undulating rises and pediments adjacent to ranges on the west and south, to gently sloping alluvial plains where the land system extends beyond the ranges to the broader expanse of the Willochra plain to the east.

Elevation: Elevations are up to 540 m asl in the valley floors of the ranges in the south and generally decline to around 200 m in the east of the land system.

Relief: Relief on rises near hills may be as much as 40 m, but the general relief along the valley floors and alluvial plains is mostly less than 5m.

Typical soils: Red clay soils (Dermosols) occur on pediment plains, they are calcareous at depth and may contain gypsum.
Loam over red clay on weathered rock (Chromosols/Sodosols) are common on rises where they are often in association with:
Calcareous loamy soils grading to highly calcareous clay loam, often gravelly over weathered sandstone/quartzite are typical soils on rises.

Main soils:

D2	(18%) Loam over red clay	(Calcic-Hypercalcic Red Chromosol-Sodosol)
D4	(16%) Loam over pedaric red clay	(Pedaric Red Sodosol-Dermosol)
A5	(11%) Rubbly calcareous loam on clay	(Supracalcic-Lithocalcic Calcarosol on clay)
C3	(11%) Friable gradational clay loam	(Calcic-Hypercalcic Red Dermosol-Calcarosol)

Minor soils:

D1	(7%) Loam over clay on rock	(Shallow Calcic-Hypercalcic Red Chromosol)
L1	(6%) Shallow soil on rock	(Rocky Rudosol-Tenosol)
E2	(6%) Red cracking clay	(Red Vertosol)
A2	(4%) Calcareous loam on rock	(Paralithic Calcarosol)
A3	(4%) Deep moderately calcareous loam	(Calcic Calcarosol)

Summary: The Quorn Land System is a valley floor complex within the Flinders Ranges near the town of Quorn. It occupies a few adjacent linked valleys, which merge to form a broad alluvial plain to the east. The land varies from rises and pediments adjacent to the ranges to broad valley floors and alluvial plains where it eventually merges with the alluvial plain of Willochra Creek.

Soil Landscape Unit summary: Quorn Land System (QUO)

SLU	% of area	Component	Main soils	Prop#	Notes
DGC	0.2	Undulating pediments	D2D1	D	Undulating pediments with shallow red duplex soils over Brachina formation shale. The soils have sandy clay loam surface textures. Relief is less than 9m, slopes are 3-10%. Main soils: Sandy Clay Loam over red clay - **D2** and Sandy Clay loam over pedaric red clay on rock - **D1**.
DJn	1.4	Rolling rises	D4D6C3	D	Rolling rises with shallow red duplex soils associated with deeply weathered kaolinised and ferruginised rocks. 5-10% of land is scalded and 10-20% is gullied. Relief is 9-30m, slopes are 10-30%. Main soils: Loam over pedaric red clay - **D4**, Ironstone-gravelly sandy loam over red clay- **D6** and Friable gradational sandy clay loam - **C3**
DNB	0.8	Gently undulating rises	D1	D	Rises with shallow texture contrast soils formed on fine-grained rocks, typically Brachina Shale Formation. The soils have clay loam surface textures. **DNB** Gently undulating rises. Slopes: 1-3%, relief is less than 30m. **DNC** Undulating rises. Relief 9-30m, slopes 3-10%. **DNH** Undulating rises; 10-20% of land is gullied. Relief is 9-30m, slopes are 3-10%. Main soils: Sandy Clay Loam over red clay - **D2** and Sandy Clay loam over pedaric red clay on rock - **D1**.
DNC	1.7	Undulating rises	D2D1	D	
DNH	0.5	Undulating rises	D2D1	D	
DQG	0.2	Gently undulating rises	D1A4B6	D	Rises with pale brown silty, sodic texture contrast soils on rock. **DQG** Gently undulating rises with 5-10% of land affected by gullying and with 0-5% scalded. Slopes are 1-3%, relief is less than 30m. **DQm** Undulating rises with 5-10% of land scalded and 10-20% gullied. Relief is 9-30m, slopes are 3-10%. **DQn** Rolling rises with 10-50% of land is scalded and more than 20% is gullied. Relief <30m, slopes are 10-30%. Main soils: Sandy Loam over clay on rock- **D1**, Deep (rubbly) calcareous sandy loam - **A4** and Shallow sandy loam over red-brown clay on calcrete - **B6**.
DQm	1.2	Undulating rises	D1A4B6	D	
DQn	1.6	Rolling rises	D1A4B6	D	
DXB	4.5	Gently undulating rises	D1L1	V	Soils formed on basement rock in complex with soils formed in outwash materials. Gently undulating rises with red duplex soils over basement rock or saprolite within one metre of the surface. More than 20% of soils are formed on outwash sediments, that is pediments occupy >20% of the soil landscape unit. Surface textures are loamy. ***Rises:*** Rocky rises have shallow red duplex soils on rock. ***Pediments:*** Pediment slopes have red duplex and gradational soils. Main soils: Clay loam over pedaric red clay on rock - **D1**, Loam over red clay - **D2**, Loam over pedaric red clay - **D4** and Friable gradational clay loam - **C3**.
		Pediments	D2D4C3	C	
EBD	0.5	Rolling rises	L1	D	Rolling rises with shallow, mostly calcareous, soils formed on quartzites and siltstones of the ABC Range Quartzite. Relief is less than 30m, slopes are 10-30%. Main soils: Shallow stony soils on rock **- L1**.
EFC	0.1	Undulating rises	A2D7L1	D	Rises with shallow, mainly calcareous loamy soils formed on calc-siltstones of the Wonoka or Tapley Hill Formations typically. **EFC** Undulating rises. Relief is less than 30m, slopes are less than 10%.
EFH	1.9	Undulating rises	L1	D	

EFV	1.1	Gently undulating rises	A2L1	D	**EFH** Undulating rises with gullies affecting 5-10% of land. Relief is 9-30m, slopes are 3-10%. **EFV** Gently undulating rises with 5-10% of land scalded. Slopes are 1-3%, relief is less than 30m. Main soils: Calcareous loam on rock – **A2**, Loam over poorly structured clay on rock - **D7** and Shallow stony soils on rock **- L1**.
ERB	0.3	Gently undulating rises	A2L1RR	D	Rises with shallow dark brown clay loamy calcareous soils on calc-siltstones and shales typically Willochra Formation. **ERB** Gently undulating rises. Slopes are 1-3%, relief is 9-30m. **ERC** Undulating rises. Relief is 9-30m, slopes are 3-10%. Main soils: Calcareous clay loam on rock – **A2** and Shallow stony soils on rock **- L1**. Bare rock – **RR** is common.
ERC	2.8	Undulating rises	A2L1RR	D	
ESH	3.7	Undulating rises	A2A5	V	Hills and rises with shallow loamy surface soils on calcareous shales and limestone rocks of the Wonoka Formation. **ESH** Undulating rises with rocky outcrops. Up to 20% of land is affected by gullying. ***Undulating rises:*** More than 20% of land within this component is gullied. Slopes are 3-10%, relief is 9-30m. ***Rocky outcrops:*** The rocky outcrops have no gullying. Main soils: Calcareous loam on rock – **A2** and Rubbly calcareous loam on clay - **A5**.
		Rocky outcrops	RR	C	
EWm	3.7	Undulating rises	C2L1RR	D	Undulating rises with shallow red, uniform or gradational texture soils formed on tillite, siltstone or quartzite. Rocky outcrops are common. Ironstone gravelly sometimes. Relief is 9-30m, slopes are 3-10%. Main soils: Gradational loam on rock -**C2** and Shallow stony soils on rock **- L1**. Bare rock – **RR** is common.
JAG	1.4	Gently undulating pediments	D4E2C3	D	Pediments and outwash plains with clay loam surface textures on texture contrast and gradational soils. Red clays are also common. **JAG** Gently undulating pediments. Slopes are 1-3%, gullying affects 10-20% of the land. **JAH** Undulating pediments. Slopes are 3-10%. Gullying affects 5-10% of land. **JAI** Rolling rises. 10- 20% of land is gullied. Relief is 9-30m, slopes are10-30%. Main soils: Loam over pedaric red clay - **D4**, Red cracking clay - **E2** and Friable gradational clay loam - **C3**. **D4** and **C3** soils have surfaces which are highly susceptible to water erosion.
JAH	4.5	Undulating pediments	D4E2C3	D	
JAI	1.9	Rolling rises	D1E2C3	D	
JBB	0.8	Gently undulating pediments	D5	D	Soil-landscapes formed on outwash sediments with sandy-surfaced texture contrast soils containing carbonate somewhere in the profile. **JBB** Gently sloping pediment. Slopes are 1-3%, relief is less than 9m. **JBC** Undulating pediment. Slopes are 3-10%, relief is less than 9m. Main soils: Hard loamy sand over red clay – **D5**.
JBC	2.4	Undulating pediments	D5	D	
JEC JEH	1.1	Undulating pediments	D2C3	D	Pediments with clay-loam surfaced, texture contrast soils formed in alluvium. **JEC** Undulating pediments; slopes are 3-10% **JEH** Undulating pediments; slopes are 3-10%, Gullying affects 10-20% of land. Main soils: Loam over red clay - **D2** and Friable gradational clay loam - **C3**.
	6.7	Undulating pediments	D2C3	D	
JGJ	3.4	Watercourse	D3D4D2		Watercourse with sandy clay loam surfaced red duplex soils formed in alluvium. 5-10% of the land is gullied. Main soils: Loam over poorly structured red clay - **D3**, Loam over pedaric red clay - **D4** and Loam over red clay - **D2**.

JME	0.8	Creek flat	D2D4A6	D	Pediments, plains and creek flats with stony, pedaric, red, texture contrast soils with quartz gravel on the surface. **JME** Creek flat with stable banks. **JMJ** Creek flat with unstable banks; 5-10% affected by active gullying. Main soils: Loam over red clay - **D2**, Loam over pedaric red clay - **D4** and Gradational calcareous clay - **A6**.
JMJ	0.4	Creek flat	D2D4A6	D	
JNA	0.8	Plains	D4D2A5	D	Pediments with non-stony pedaric, texture contrast soils with calcareous subsoils. Surface textures are clay loamy most commonly. **JNA** Plains. **JNB** Gently sloping pediments. Slopes are 1-3%, relief is less than 9m. **JNo** Creek flat 10-20% affected by gullying and 40-50% scalded. Scalding may be more than 50% locally. **JNU** Level plain; 5-10% scalded. **JNV** Gently sloping pediments. Scalding affects 10-50% of land. Slopes are 1-3%, relief is less than 9m. Main soils: Loam over red clay - **D2**, Loam over pedaric red clay - **D4** and Rubbly calcareous loam on clay - **A5**. Red clay soils occur in minor association.
JNB	2.9	Gently sloping pediments	D4D2A5	D	
JNo	10.5	Creek flats	D4D2A5	D	
JNU	3.8	Plains	D4D2A5	D	
JNV	10.2	Gently sloping pediments	D4D2A5	D	
JXH	0.7	Undulating pediments	D2	V	Pediments with texture contrast soils in complex with rocky rises. Most soils have clay loam surfaces. **JXH** Undulating pediments in complex with rocky rises. Slopes are 3-10%, Gullying affects 10-20% of land. **JXl** Gently undulating pediments in complex with rocky rises. Gullying affects 10-20% of land on pediments, and <5% on rises. Scalding affects around 10% of pediments and < 50% in places. Rocky rises have <5% scalded land. Slopes: 1-3%. **JXm** Undulating pediments in complex with rocky rises. Gullying affects over 20% of land on pediments, and 5-10% on rises. Scalding affects around 10% of pediments and up to 50% in places. Rocky rises have < 5% scalded land. Slopes: 3-10%. Main soils on pediments: Loam over red clay - **D2**; with Loam over clay on rock- **D1** soils associated with rocky rises.
		Rocky rises	D1	C	
JXl	0.8	Undulating pediments	D2	V	
		Rocky rises	D1	C	
JXm	5.2	Undulating pediments	D2	V	
		Rocky rises	D1	C	
JZo	0.3	Creek flat	D4A5	D	Pediment-basement rock complex with pediments with red texture contrast soils and 20-30% rocky rises with shallow texture contrast soils. **JZo** Creek flat with rocky outcrops. Over 20% of the creek banks have unstable gullies and more than 50% of the banks are scalded. The rocky outcrops are not scalded or gullied. ***Pediments and plains:*** Main soils: Loam over pedaric red clay - **D4**, Loam over clay on rock- **D1** and Loam over red clay - **D2** with minor Rubbly calcareous loam on clay - **A5**. ***Rocky rises:*** Main soils: Loam over clay on rock- **D1** with 10-30% bare rock.
		Rocky outcrops	RR	C	
KCB	4.4	Gently undulating pediments	C3A3	D	Plains and pediments of outwash sediments with gradational soils with sandy clay loam surface textures. Soils are mostly not calcareous throughout. **KCB** Gently undulating pediments **KCE** Creek line. **KCH** Undulating pediments, with 10-20% gullied and minor scalding, up to 5%. Slopes are 1-3%. **KCU** Plains with 5-10% scalded land. Main soils: Friable gradational sandy clay loam - **C3** and Deep moderately calcareous sandy loam - **A3**. Additionally, Deep gravelly soil -**M3** is found associated with creek flats.
KCE	1.4	Creek line	C3A3M3	D	
KCH	1.8	Undulating pediments	C3A3	D	
KCU	2.5	Plains	C3A3	D	

KHJ	0.7	Drainage line	A4D4C1	D	Drainage line formed on outwash with red gradational sandy soils, calcareous at depth. Banks are unstable and gullying affects more than 20% of the area. Main soils: Deep (rubbly) calcareous sandy loam **-A4**, Loam over pedaric red clay - **D4** and Gradational sandy loam - **C1**.
KIB	0.2	Pediment	C1A2	V	Pediment-basement rock complex with mostly gradational soils. Soils which have carbonate free surfaces are dominant. Soils which are calcareous throughout are common but not dominant. **KIB** Gently sloping pediment-with undulating basement rises. **KIV** Gently sloping pediment-with undulating basement rises. 5-10% of land on pediments is scalded. ***Pediment:*** Pediment slopes are 1-3%. Main soils: Gradational sandy loam - **C1**, Calcareous loam on rock – **A2** and Clay Loam over red clay - **D2**. ***Rises:*** Gently undulating basement rises with shallow rocky soils. Relief is 9-30m, slopes are 1-3%. Main soils: Shallow stony soils on rock **- L1**, Gradational sandy loam - **C1** and Calcareous loam on rock – **A2**.
		Gently undulating rises	L1C1A2	L	
KIV	1.3	Pediment	C1A2	V	
		Gently undulating rises	L1C1A2	L	
KLB	0.4	Gently undulating pediment	A5	D	Gently undulating pediment with clay loamy calcareous soils. Slopes are 1-3%, relief is less than 9m. Main soils: Rubbly calcareous clay loam on clay - **A5**. Minor soils include: Calcareous clay loam on rock – **A2**, Gradational red-brown clay loam over rock-**C2** and Shallow calcareous loam on calcrete – **B2**.
XHS	0.4	Drainage line	M1C1C3	D	Drainage lines with mostly coarse textured soils. **XHS** Stable banks predominantly. **XHT** More than 20% of banks are eroded. Main soils: Deep alluvial loam - **M1**, Gradational sandy loam - **C1** and Friable gradational sandy clay loam - **C3**.
XHT	2.4	Drainage line	M1C1C3	D	

PROPORTION codes assigned to Soil Landscape Unit (SLU) components:

- 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:

A2/L1 Shallow calcareous loam (Paralithic, Hypercalcic / Lithocalcic Calcarosol)(**A2**) or Shallow stony loam (Calcareous, Paralithic, Leptic Tenosol)(**L1**)

A3 Deep moderately calcareous (sandy) loam (Calcic Calcarosol)
Calcareous (sandy) loam topsoil grading into loamy-clay loamy subsoil without a significant CO_3 buildup in the subsoil (<20% CO_3 in subsoil). Pediment type Calcarosols.

A4 Deep (rubbly) calcareous loam (Hypercalcic-Lithocalcic Calcarosol)
Calcareous sandy-clay loamy topsoil grading into loamy-clay loamy subsoil with a significant CO_3 buildup in the subsoil. Often rubbly. Soil usually >120 cm in depth

A5 Rubbly calcareous loamy sand on clay (Supracalcic-Lithocalcic Calcarosol on clay)
Calcareous loamy sand topsoil grading into loamy-clay loamy subsoil on a clayey substrate. Usually rubbly. Clayey substrate occurs at >60 cm and <120 cm.

A6 Gradational calcareous clay loam (Pedal Hypercalcic-Lithocalcic Calcarosol on clayey subsoil)
Calcareous loams to clay loams grading into brown-red clay. Often rubbly.

B6 Shallow loam over red-brown clay on calcrete (Petrocalcic Red Chromosol-Kandosol)
Shallow texture contrast or gradational soil. Usually hard setting loamy to clay loamy (sometimes sandy) topsoil over a red clayey (sometimes clay loamy) subsoil on calcrete. Surface soil can be slightly calcareous.

C1 Gradational sandy loam (Calcic-Hypercalcic Kandosol-Calcarosol)
Friable sandy to loamy topsoil grading into massive red-brown alkaline loamy to clay loamy subsoil.

C2 Gradational loam on rock (Calcic / Hypercalcic Red Dermosol)
Loam to clay loam grading to a friable red clay with soft Class I carbonate within 50 cm, grading to weathering rock within 100 cm.

C3 Gradational clay loam (Calcic / Hypercalcic Red Dermosol)
Loam to clay loam grading to a friable red clay with soft Class I carbonate within 50 cm, grading to alluvium within 100 cm

D1 Loam over red clay on rock (Hypercalcic / Calcic, Red Chromosol / Sodosol)
Medium thickness hard gravelly loam over a red clay, friable and finely structured (D1), to hard, coarsely structured and dispersive (D7), calcareous with depth, grading to weathering basement rock within 100 cm.

D2 Hard loam over red clay (Calcic / Hypercalcic, Red Chromosol)
Hard setting sandy loam to clay loam (with variable quartzite stones) abruptly overlying a well structured red clay with soft Class I carbonate at depth.

D3 Hard clay loam over dispersive red clay (Calcic, Red Sodosol / Sodic, Calcic, Red Chromosol)
Medium thickness hard clay loam with up to 50% quartzite stones over a coarsely prismatic dispersive red clay, calcareous with depth over stony and clayey alluvium.

D4 Loam over red friable clay (Calcic, Pedaric, Red Sodosol)
Thin to medium thickness fine sandy loam to loam over a finely structured friable red clay, calcareous from about 50 cm, grading to fine or medium grained alluvium.

D5 Hard loamy sand over red clay (sandy Calcic-Hypercalcic Red Chromosol-Sodosol)
Hard setting loamy sand to light sandy loam with a poorly structured red alkaline clayey to clay loamy subsoil.

D6 Ironstone gravelly sandy loam over red clay (Ferric(?) Red Chromosol)
Loamy texture contrast soil with some ironstone gravel and a red alkaline clayey subsoil.

D7 Loam over dispersive red clay on rock (Calcic / Hypercalcic, Red Sodosol)
Medium to thick hard sandy loam to clay loam sharply overlying a coarsely structured dispersive red clay, calcareous with depth, grading to highly weathered kaolinized siltstone.

E2 Red cracking clay (Epicalcareous, Epipedal, Red Vertosol)
Dark strongly structured clay grading to a well structured red calcareous medium to heavy clay continuing below 100 cm. Often containing gypsum segregations in subsoil.

L1 Shallow stony loam (Paralithic, Leptic Tenosol)
Shallow stony loam, often calcareous throughout or with depth, overlying weathering rock shallower than 50 cm.

M1 Alluvial loam (Orthic Tenosol)
Very thick loam with variable gritty or more-clayey lenses, formed over recent alluvium.

M3 Deep gravelly soil (Gravelly Kandosol-Tenosol)
Deep uniform loamy alluvial soils with at least 50% gravel in the major part of the profile.

RR Bare rock.

Further information: DEWNR Soil and Land Program