

CALCAREOUS BROWN CLAY LOAM

General Description: *Calcareous brown clay loam over a very calcareous pale clay with hard carbonate nodules.*

Landform: Slightly undulating plains.

Substrate: Calcreted clayey lagoonal sediments (Padthaway Formation).

Vegetation: Mallee

Type Site: Sampling date: 31st August 2011 Annual rainfall: 450 mm
Flat, firm surface with a few calcrete stones present



Soil Description:

Depth (cm)	Description
0-8	Firm, very dark grey brown structureless calcareous clay loam. Some signs of compaction. Some small calcrete rubble present. Many roots present. Clear change to:
8-18	Firm, yellow brown weakly structured calcareous light clay with dark brown mottles. Small calcrete rubble common. Roots common. Gradual change to:
18-35	Friable, porous, brown yellow structureless highly calcareous light clay. Abundant calcrete rubble and soft carbonate. Roots common. Gradual change to:
35-60	Friable, very pale brown highly calcareous light clay with moderate blocky structure. Abundant calcrete rubble and soft carbonate. Roots common. Diffuse change to:
60-95	Friable, light olive grey, mottled yellow brown calcareous heavy clay with coarse prismatic structure. Abundant calcrete rubble and soft carbonate. Roots common. Gradual change to:
95-125	Friable, light olive grey, mottled yellow brown heavy clay with moderate blocky structure. Calcrete rubble and soft carbonate common. Roots few to common. Clear change to:
125-155	Friable, light grey, mottled brown yellow light clay with weak structure. Abundant calcrete rubble and soft carbonate. Few to no roots.



Classification: Endohypersodic, Regolithic, Lithocalcic Calcarosol; medium, moderately gravelly, clay loamy / clayey, moderate

Summary of Properties

Drainage	Well to moderately well drained. Soil is never saturated for more than a week.
Fertility	Inherent fertility is moderate, as indicated by the exchangeable cation data. Potassium and phosphorus levels are well above adequate. Extractable copper and zinc levels were very low at the sampling site (less than 0.05ppm), but are now very high. Extractable manganese marginal.
pH	Alkaline at the surface, strongly alkaline with depth.
Rooting depth	125 cm in pit. A few roots observed at 155cm
Barriers to root growth	
Physical:	Calcrete rubble impedes root growth to a large extent, as does the coarse structure of the lower subsoil.
Chemical:	High pH, high free lime, and high sodicity all many restrict root abundance. Also, high boron at depth.
Water holding capacity	120mm in root zone.
Seedling emergence:	Good, although surface wetness occasionally reduces plant establishment.
Workability:	Fair. Relatively heavy surface is sometimes too wet for effective working.
Erosion Potential	
Water:	Low.
Wind:	Low.
Management:	Gypsum required in topsoil (0-18cm)= 0t/ha. Gypsum to treat 45cm of soil (0-45cm)= 0t/ha. Structureless surface will not repair quickly following compaction from traffic.

Laboratory Data- from a nearby pit sampled in 1992

Depth cm	pH H ₂ O	pH CaCl ₂	CO ₃ %	EC 1:5 dS/m	ECe dS/m	Org.C %	NH ₄ + NO ₃ mg/kg	Col. P mg/kg	Col. K mg/kg	SO ₄ -S mg/kg	React Fe mg/kg	Boron mg/kg	Trace Elements mg/kg (DTPA)				Sum cations cmol (+)/kg	Exchangeable Cations cmol(+)/kg					ESP
													Cu	Fe	Mn	Zn		Ca	Mg	Na	K	Al	
Paddock 0-10	8.5	7.8	4	0.12	0.69	1.3		35	500			1.3	-	4.5	2.8	-	18.5	14.1	2.34	0.06	1.48		0.3
0-8	8.4	7.8	5	0.12	0.68	1.4		29	660			1.1	0.06	6.2	3.3	-	16.8	12.7	2.13	0.05	1.83		0.3
8-12	8.5	7.8	3	0.11	0.41	0.8		8	430			1.1	0.4	10	1.5	0.28	21.9	15.9	3.24	0.14	1.40		0.6
12-45	9.0	8.1	43	0.11	0.47	0.4		4	170			1	0.19	6.4	0.41	0.25	7.7	6.50	2.43	0.14	0.54		1.8
45-70	9.6	8.4	58	0.12	0.57	1.4		<2	180			1	0.09	1.5	0.23	0.08	3.9	2.47	2.90	0.36	0.46		9.2
70-120	9.9	8.5	44	0.38	0.75	1.2		<2	590			6.8	0.13	2.3	0.22	-	16.2	1.57	9.51	4.69	1.61		29.0
120-170	10.0	8.5	17	0.51	0.73	0.3		<2	620			7	0.21	3.5	0.13	-	23.2	1.81	10.9	8.43	1.70		36.3

Very low- may indicate deficiency and/or other limitations

High reading- may indicate toxicity and/or other limitations

Laboratory Data- from this pit 2011

Depth cm	pH H ₂ O	pH CaCl ₂	CO ₃ %	EC 1:5 dS/m	ECe dS/m	Org.C %	NH ₄ + NO ₃ mg/kg	Col. P mg/kg	Total P mg/kg	Col. K mg/kg	SO ₄ -S mg/kg	Cl mg/kg	Boron mg/kg	Trace Elements mg/kg (EDTA)				Sum cations cmol (+)/kg	Exchangeable Cations cmol(+)/kg				ESP
														Cu	Fe	Mn	Zn		Ca	Mg	Na	K	
Paddock 0-10	8.1	7.3	0.56	0.26	0.94	1.7	7	82	298.7	463	4.9	25.9	0.99	3.4	123	12.7	8.17	15.3	12.3	1.6	0.13	1.19	0.9
0-8	8	7.4	2.01	0.17	1.06	1.55	7	60	302	636	4.9	12.8	1.4	1.34	24.1	5.78	8.52	20.9	16.4	2.67	0.11	1.63	0.5

8-18	8.4	7.5	3.88	0.17	0.74	0.6	3	6	60.1	415	8.1	7.9	1.83	0.88	21.1	0	0.63	29.4	22.7	5.08	0.31	1.29	1.1
18-35	8.4	7.5	33.44	0.19	0.72	0.48	18	5	54.6	220	14.4	15	1.46	0.37	13.0	1.97	1.22	26.8	21.4	4.45	0.32	0.58	1.2
35-60	8.6	7.6	36.19	0.24	0.94	0.32	15	3	34.6	310	23.4	24.5	1.83	0.19	6.76	0	1.34	25.0	14.3	9.1	0.68	0.8	2.7
60-95	9	8	12.43	0.31	0.93	0.09	4		28.4	1071	14	14.4	10.73	0.52	11.5	0	0.32	32.3	6.79	17.8	5.04	2.62	15.6
95-125	8.6	8.3	8.4	0.52	1.11	0.09	2		28.1	1071	24	50.8	13.71	0.36	16.3	0	0.36	32.7	4.15	16.1	9.67	2.67	29.6
125-155	8.7	8.1	58.9	0.56	1.19	0.12	7		20.7	677	35.4	109.7	7.34	0.27	13.4	0.62	1.65	24.1	4.11	10.5	7.73	1.73	32.1
Very low- may indicate deficiency and/or other limitations										High reading- may indicate toxicity and/or other limitations													

Note: Paddock sample bulked from cores taken from the same paddock as the pit.

Sum of cations, in a neutral to alkaline soil, approximates the CEC (cation exchange capacity), a measure of the soil's capacity to store and release major nutrient elements.

ESP (exchangeable sodium percentage) is derived by dividing the exchangeable sodium value by the CEC.

SAND OVER YELLOW BROWN CLAY

General Description: *Loamy sand over bleached sand over a yellow brown clay with veins of carbonate at depth, clay delved*

Landform: Slightly undulating plains.

Substrate: Carbonate rich clayey lagoonal sediments (Padthaway Formation).

Vegetation: Mallee

Type Site: Sampling date: 24th August



011 Annual rainfall: 450 mm

Flat, firm surface

Soil Description:

Depth (cm)	Description
0-12	Soft, very dark grey brown structureless loamy sand. Small clay lumps evident. Abundant roots present. Abrupt change to:
12-35	Soft, very pale brown structureless sand. Roots few to common. Sharp change to:
12-45	Delved zone. Uneven mix of top 3 layers. Roots common.
35-50	Friable, light yellow brown sandy medium clay. Weak medium blocky structure. Roots common. Clear change to:
50-65	Friable, olive yellow light medium clay. Medium blocky structure. Roots common. Clear change to:
65-90	Friable, brown yellow, light grey and red sandy light clay. Medium blocky structure. Soft carbonate common. Roots common. Gradual change to:
90-130	Friable, brown yellow and light grey clay loam. Coarse blocky structure. Abundant soft carbonate. Few roots. Diffuse change to:
130-180	Friable, brown yellow and light grey sandy light medium clay. Coarse blocky structure. Some soft and hard carbonate. No roots.



Classification: Bleached-Sodic, Hypercalcic, Brown Chromosol; thick, non-gravelly, sandy /clayey, deep

Summary of Properties

Drainage	Well drained to excessively drained in the surface, becoming poorly drained in the clay subsoil. Water may perch within the bleached sand above the clay for weeks to months following prolonged wet conditions.
Fertility	Inherent fertility of the surface is moderately low, as indicated by the exchangeable cation data. The clay delving has improved fertility of the soil surface as well as the areas of the soil subsurface that have been mixed during the delving process. The clay layers are high in exchangeable cations, including potassium. P, K, S and most traces are all well above adequate in the paddock sample.
pH	Strongly alkaline throughout.
Rooting depth	130 cm in pit, with few roots observable below 90cm
Barriers to root growth	
Physical:	The waterlogging of the layer above the clay will reduce root abundance in this layer and will reduce root growth into the clay. The coarsely structured clay of the lower subsoil will reduce root abundance at that depth.
Chemical:	The very low fertility of the bleached sand layer will reduce root growth. High pH, high free lime, and high sodicity all may restrict root abundance in the lower subsoil.
Water holding capacity	100mm in root zone.
Seedling emergence:	Good.
Workability:	Excellent.
Erosion Potential	
Water:	Low.
Wind:	Moderate.
Management:	Gypsum required in topsoil (0-18cm)= 0t/ha. Gypsum to treat 50cm of soil (0-50cm)= 0t/ha. Structureless surface will not repair quickly following compaction from traffic. Clay added to the surface will improve supply and storage of phosphorus.

Laboratory Data

Depth cm	pH H ₂ O	pH CaCl ₂	CO ₃ %	EC 1:5 dS/m	ECe dS/m	Org.C %	NH ₄ + NO ₃ mg/kg	Col. P mg/kg	Total P mg/kg	Col. K mg/kg	SO ₄ -S mg/kg	Cl mg/kg	Boron mg/kg	Trace Elements mg/kg (EDTA)				Sum cations cmol (+)/kg	Exchangeable Cations cmol(+)/kg				ESP
														Cu	Fe	Mn	Zn		Ca	Mg	Na	K	
Paddock 0-10	8.8	8.2	0.23	0.13	0.94	1.16	4	49	148.4	210	24.4	8.9	0.59	1.53	154	7.48	4.45	8.3	7.03	0.77	0.04	0.49	0.5
0-12	7.7	6.7	0.16	0.04	0.27	0.74	3	47	122.3	97	2	2.2	0.37	0.96	109	6.91	3.12	4.6	3.86	0.51	0.02	0.24	0.4
12-35	7	6	0.13	0.03	0.27	0.08	0	27	40.6	53	4.8	1.4	0.23	0.28	159	0.65	0.53	1.7	1.3	0.24	0.02	0.14	1.2
12-45 ^S	8.2	7.2	0.17	0.09	0.92	0.81	8	47	115.6	118	26.8	2.9	0.37	1	85.8	3.93	2.66	3.9	3.02	0.53	0.03	0.29	0.8
12-45 ^C	7.9	7.1	1.44	0.26	1.29	0.15	6	51	84.1	491	56.2	4	1.21	0.98	40.3	0.82	0.81	16.8	11.5	3.81	0.16	1.3	1.0
35-50	7.8	7	0.28	0.12	0.69	0.11	4	68	97.5	513	10.8	3.7	1.13	0.4	51.0	0.27	0.23	14.3	9.2	3.64	0.15	1.32	1.0
50-65	8.5	7.4	9.68	0.17	0.73	0.15	8	7	35.8	616	13.3	5.3	2.65	0.56	18.8	0.6	0.63	22.8	14.3	6.34	0.46	1.68	2.0
65-90	8.5	7.5	6.26	0.17	1.08	0.09	8		23.8	433	25.6	9	1.79	0.16	8.68		0.58	18.1	10.4	5.55	0.98	1.12	5.4
90-130	8.7	7.7	4.41	0.21	0.95	0.06	3		23.9	518	20.5	8	1.89	0.36	10.4		0.3	20.7	10.6	6.88	1.81	1.33	8.7
130-180	9.1	8.1	3.44	0.27	1.12	0	3		22.6	611	14.6	7.2	3.04	0.43	10.9		0.23	20.2	7.75	7.45	3.41	1.57	16.9

Very low- may indicate deficiency and/or other limitations

High reading- may indicate toxicity and/or other limitations

^S= sandy material from within the delved zone. ^C= clay material from within the delved zone

Note: Paddock sample bulked from cores taken from the same paddock as the pit.

Sum of cations, in a neutral to alkaline soil, approximates the CEC (cation exchange capacity), a measure of the soil's capacity to store and release major nutrient elements.

ESP (exchangeable sodium percentage) is derived by dividing the exchangeable sodium value by the CEC.

SANDY LOAM OVER YELLOW BROWN CLAY

General Description: *Sandy loam over bleached sand over a coarsely structured yellow brown clay with veins of carbonate at depth*

Landform: Slightly undulating plains.

Substrate: Carbonate rich clayey lagoonal sediments (Padthaway Formation).

Vegetation: Mallee

Type Site: Sampling date: 31st August



0
11 Annual rainfall: 450
mm

Flat, firm surface

Soil Description:

Depth (cm)	Description
0-10	Friable, very dark grey brown structureless sandy loam. Many roots present. Abrupt change to:
10-18	Soft, bleached structureless sand. Roots few to common. Sharp change to:
18-45	Firm, yellow brown sandy medium clay. Very coarse columnar structure. Roots common. Clear change to:
45-75	Firm, yellow brown and orange sandy light clay. Medium blocky structure. Carbonate present. Roots common. Gradual change to:
75-110	Hard, yellow brown sandy light medium clay. Weakly structured. Abundant carbonate. Few roots. Gradual change to:
110-150	Hard, yellow brown and light grey sandy medium clay. Very coarse prismatic structure. Carbonate common. No roots.



Classification: Hypercalcic, Subnatric, Brown Sodosol; medium, non-gravelly, sandy /clayey, deep

Summary of Properties

Drainage	Well drained in the surface, becoming very poorly drained in the clay subsoil. Water may perch within the bleached sand above the clay for weeks to months following prolonged wet conditions.
Fertility	Inherent fertility of the surface is moderately low, as indicated by the exchangeable cation data. The clay subsoil layers are high in exchangeable cations, including potassium. Abundance of macro and trace nutrients indicates a strong fertiliser history on the site.
pH	Alkaline at the surface, strongly alkaline with depth.
Rooting depth	110 cm in pit, with few roots observable below 75cm
Barriers to root growth	
Physical:	The waterlogging of the layer above the clay will reduce root abundance in this layer and will reduce root growth into the clay. The coarsely structured clay of the subsoil will reduce root.
Chemical:	The very low fertility of the bleached sand layer will reduce root growth. High pH, high free lime, and high sodicity all may restrict root abundance in the lower subsoil.
Water holding capacity	70mm in root zone.
Seedling emergence:	Good, unless perched water reaches the surface.
Workability:	Good, unless perched water reaches the surface.
Erosion Potential	
Water:	Low.
Wind:	Moderate.
Management:	Gypsum required in topsoil (0-18cm)= 0t/ha. Gypsum to treat 50cm of soil (0-50cm)= 3.5t/ha. However, gypsum is unlikely to move into the coarse clay subsoil efficiently without direct placement. Structureless surface will not repair quickly following compaction from traffic.

Laboratory Data

Depth cm	pH H ₂ O	pH CaCl ₂	CO ₃ %	EC 1:5 dS/m	ECe dS/m	Org.C %	NH ₄ + NO ₃ mg/kg	Col. P mg/kg	Total P mg/kg	Col. K mg/kg	SO ₄ -S mg/kg	Cl mg/kg	Boron mg/kg	Trace Elements mg/kg (EDTA)				Sum cations cmol (+)/kg	Exchangeable Cations cmol(+)/kg				ESP
														Cu	Fe	Mn	Zn		Ca	Mg	Na	K	
Paddock 0-10	7.7	6.7	0.18	0.09	0.58	1.93	11	71	317.6	426	6.6	10	0.95	3.26	154	16.5	7.3	10.0	7.29	1.39	0.21	1.09	2.1
0-10	7.5	6.6	0.19	0.09	0.62	1.25	9	49	190	449	5.2	11.4	0.78	2.52	147	19.7	5.66	9.2	6.78	1.11	0.19	1.15	2.1
10-18	7.3	6.6	0.18	0.04	0.42	0.21	2	19	45.1	118	2.6	7.8	0.32	1.12	121	3.57	1.09	2.4	1.69	0.32	0.13	0.3	5.3
18-45	7.9	6.9	0.22	0.16	1.16	0.17	8	17	50.8	394	5.1	27.2	2.3	0.74	56.1	0.94	0.58	17.9	9.02	6.01	1.55	1.29	8.7
45-75	9	8	3.32	0.27	1.62	0.13	6	6	40.1	345	8.6	78.3	2.47	0.6	16.5	0	0.38	17.3	8.82	5.27	2.36	0.89	13.6
75-110	8.6	8.1	2.52	0.60	4.19	0	0		21.8	396	36.3	468	5.79	0.21	10.6	0	0.46	20.2	5.94	6.95	6.3	1.02	31.2
110-150	8.6	8.1	0.34	0.94	6.4	0	2		25.7	606	96.1	1009.8	6.53	0.72	32.7	5.79	0.21	24.4	3.59	8.99	10.3	1.52	42.2
Very low- may indicate deficiency and/or other limitations												High reading- may indicate toxicity and/or other limitations											

Note: Paddock sample bulked from cores taken from the same paddock as the pit.

Sum of cations, in a neutral to alkaline soil, approximates the CEC (cation exchange capacity), a measure of the soil's capacity to store and release major nutrient elements.

ESP (exchangeable sodium percentage) is derived by dividing the exchangeable sodium value by the CEC.

SANDY CLAY LOAM OVER CLAY AND CARBONATES

General Description: *Sandy clay loam over medium clay. The lower subsoil has been described in two halves- left is a mottled light clay. Right is a series of layers of soft and partially calcreted calcarenite with a light sandy clay loam.*

Landform: Upper slope of a calcreted dune range.

Substrate: Calcreted ancient shelly dunes (Bridgewater Formation).

Vegetation: Mallee



Type Site: Sampling date: 31st August 2011 Annual rainfall: 450 mm
Range, small surface stones common, firm surface

Soil Description:

Depth (cm)	Description
0-10	Friable, dark brown, weakly granular, sandy clay loam. A few small to medium calcrete nodules present. Many roots present. Clear change to:
10-15	Friable, brown yellow, sandy medium clay. Weak blocky structure. A few small calcrete nodules present. Roots common. Sharp to:
15-50 ^A	Soft, pale, structureless, highly calcareous sandy clay loam. Hard calcrete nodules common. Many roots. Diffuse to:
50-90 ^A	Friable, yellow brown and orange, weakly blocky, slightly calcareous light clay. Abundant soft carbonate. Roots common. Diffuse to:
90-140 ^A	Friable, orange and brown yellow, weakly blocky, slightly calcareous light clay. Abundant soft carbonate. Roots common. Clear to:
15-140 ^B	Layered sequences of calcrete, friable to firm porous pink calcarenite, and highly calcareous pale pink light sandy clay loam. Layers repeat every 5-10cm. Many roots in loam, no roots in calcrete. Clear to:
140-160	Friable, red and yellow brown, highly calcareous, light sandy clay loam. Weak blocky structure. Abundant calcrete. Roots common in loam.



Classification: ^A Mottled, Lithocalcic Yellow Chromosol; medium, slightly gravelly, clay loamy /clayey, very deep
^B Effervescent, Petrocalcic, Yellow Chromosol; medium, slightly gravelly, clay loamy /clayey, very deep

Summary of Properties

Drainage	Well drained in the surface, becoming moderately drained in the first clay layer. The horizons below 15cm are likely to be well drained, although drainage will be uneven.
Fertility	Inherent fertility of the surface is moderate, as indicated by the exchangeable cation data. P, K and traces appear above adequate.
pH	Alkaline at the surface, strongly alkaline with depth.
Rooting depth	160 cm in pit, although presence of calcarenite and calcrete creates uneven root distribution.
Barriers to root growth	
Physical:	Root penetration of the soft and porous calcarenite is likely to be limited, and hard calcrete nodules will prevent root growth and water holding within the areas they occupy.
Chemical:	There appear to be few chemical barriers to root growth.
Water holding capacity	Possibly 100-150mm in root zone. The extent to which the roots extract water held in the porous calcarenite is uncertain.
Seedling emergence:	Excellent.
Workability:	Excellent.
Erosion Potential	
Water:	Moderate.
Wind:	Moderate.
Management:	Gypsum required in topsoil (0-18cm)= 0t/ha. Gypsum to treat 50cm of soil (0-50cm)= 0t/ha. A relatively robust soil.

Laboratory Data

Depth cm	pH H ₂ O	pH CaCl ₂	CO ₃ %	EC 1:5 dS/m	ECe dS/m	Org.C %	NH ₄ + NO ₃ mg/kg	Col. P mg/kg	Total P mg/kg	Col. K mg/kg	SO ₄ -S mg/kg	Cl mg/kg	Boron mg/kg	Trace Elements mg/kg (EDTA)				Sum cations cmol (+)/kg	Exchangeable Cations cmol(+)/kg				ESP
														Cu	Fe	Mn	Zn		Ca	Mg	Na	K	
Paddock 0-10	8	7.3	1.7	0.116	0.6	1.61	8	41	193.1	145	3.7	3.4	1.0	0.9	104	19.2	2.9	15.9	14.4	1.1	0.07	0.36	0.4
0-10	8.0	7.3	0.6	0.12	0.8	2.0	6	33	212.9	206	3.5	6.4	1.3	9.1	116	22.6	4.5	17.0	15.1	1.3	0.1	0.5	0.6
10-15	8.2	7.3	1.0	0.12	0.6	0.5	2	9	49.8	115	2.2	4.3	0.9	0.5	60.8	4.2	1.0	16.7	14.9	1.3	0.2	0.3	1.4
15-50 ^A	8.3	7.3	38.2	0.16	0.6	0.8	6	8	59.7	79	13.7	5.5	1.4	0.5	18.0	0.8	1.2	20.8	19.2	1.3	0.2	0.2	1.1
15-50 ^B	8.7	7.7	62.7	0.09	0.4	0.2	2	0	30.7	30	10.4	14.8	0.4	0.5	2.1	1.3	0.2	10.8	10.3	0.4	0.1	0.1	0.7
50-90 ^A	8.5	7.5	32.6	0.15	0.5	0.2	4	0	31.3	84	21.8	7.8	1.4	0.7	5.3	2.6	0.4	22.0	17.2	4.0	0.5	0.3	2.3
50-90 ^B	8.7	7.7	59.2	0.09	0.5	0.2	2	0	31.3	19	14.0	6.5	0.4	0.6	2.5	1.1	0.2	10.0	9.4	0.5	0.1	0.1	0.8
90-140 ^A	8.9	7.9	13.3	0.37	2.1	0.1	2	0	43.1	155	44.7	171.5	3.9	0.3	8.1	2.1	0.4	27.4	14.4	8.0	4.6	0.4	16.7
90-140 ^B	8.8	7.8	57.1	0.14	0.4	0.1	2	0	34.4	30	23.4	12.8	0.5	0.5	2.2	1.6	0.2	10.6	9.1	1.1	0.3	0.1	2.6
140-160	8.7	7.7	16.6	0.30	0.5	0.1	3	0	33.2	174	64.2	98.1	1.6	0.5	4.0	1.7	0.5	26.2	14.9	7.4	3.4	0.5	12.9

Very low- may indicate deficiency and/or other limitations

High reading- may indicate toxicity and/or other limitations

Note: Paddock sample bulked from cores taken from the same paddock as the pit.

Sum of cations, in a neutral to alkaline soil, approximates the CEC (cation exchange capacity), a measure of the soil's capacity to store and release major nutrient elements.

ESP (exchangeable sodium percentage) is derived by dividing the exchangeable sodium value by the CEC.

^A Soil profile A- clayey material to the left of tape. ^B Soil profile B- layered calcrete, soil and carbonate to the right of tape.

SANDY CLAY LOAM OVER CALCAREOUS CLAY

General Description: *Dark brown sandy clay loam over calcareous brown clay that becomes paler and strongly calcareous with depth.*

Landform: Gently undulating plains.

Substrate: Calcreted clayey lagoonal sediments (Padthaway Formation).

Vegetation: Mallee



Type Site: Sampling date: 31st August 2011 Annual rainfall: 450 mm
Low rise on plain, firm surface with a few small calcrete stones

Soil Description:

Depth (cm)	Description
0-10	Friable to firm, dark brown, weakly granular sandy clay loam. Many roots present. Clear change to:
10-20	Friable to firm, strong brown, weakly blocky, calcareous light medium clay. Calcrete nodules common. Roots common. Clear to:
20-35	Friable, brown yellow, structureless, highly calcareous light clay. Abundant calcrete nodules. Roots common. Gradual to:
35-60	Friable, very pale brown, coarsely prismatic, highly calcareous light clay. Abundant calcrete nodules and soft carbonate. Roots common. Diffuse to:
60-105	Friable, light olive grey, coarsely prismatic, non-calcareous medium heavy clay. Abundant calcrete nodules and soft carbonate. Roots common. Diffuse to:
105-150	Friable, light olive grey, highly calcareous light medium clay. Medium blocky structure. Abundant calcrete nodules and soft carbonate. Roots few to common.



Classification: Sodic,,Supracalcic, Brown Chromosol; medium, non-gravelly, clay loamy /clayey, very deep

Summary of Properties

Drainage	Well drained in the surface, becoming moderately to poorly drained in the first clayey layer.
Fertility	Inherent fertility of the surface is moderately high, as indicated by the exchangeable cation data. P, K and S are well above adequate. Traces appear marginal to adequate.
pH	Alkaline at the surface, strongly alkaline with depth.
Rooting depth	150 cm in pit.
Barriers to root growth	
Physical:	Calcrete nodules will prevent root growth where they are encountered. The coarse structure of the lower subsoil will reduce root abundance.
Chemical:	High pH, high free lime, and moderate sodicity all may restrict root abundance in the lower subsoil.
Water holding capacity	100mm in root zone.
Seedling emergence:	Good.
Workability:	Satisfactory when not too wet.
Erosion Potential	
Water:	Moderately low.
Wind:	Moderately low.
Management:	Gypsum required in topsoil (0-18cm)= 0t/ha. Gypsum to treat 50cm of soil (0-50cm)= 0t/ha.

Laboratory Data

Depth cm	pH H ₂ O	pH CaCl ₂	CO ₃ %	EC 1:5 dS/m	ECe dS/m	Org.C %	NH ₄ + NO ₃ mg/kg	Col. P mg/kg	Total P mg/kg	Col. K mg/kg	SO ₄ -S mg/kg	Cl mg/kg	Boron mg/kg	Trace Elements mg/kg (EDTA)				Sum cations cmol (+)/kg	Exchangeable Cations cmol(+)/kg				ESP
														Cu	Fe	Mn	Zn		Ca	Mg	Na	K	
Paddock 0-10	7.9	7.1	0.3	0.22	1.3	1.3	16	45	192.5	335	31.4	22.8	0.9	1.1	109	9.6	1.9	16.1	13.1	1.7	0.4	0.9	2.7
0-10	7.9	7.2	0.4	0.15	1.2	1.5	10	61	230.6	294	3.9	4.2	0.6	1.1	164	13.9	3.8	13.8	12.2	0.7	0.1	0.8	0.4
10-20	8.1	7.3	20.5	0.17	0.6	1.0	5	20	112.1	390	6.7	3.1	1.2	0.4	23.0	0.2	0.8	26.7	23.8	1.8	0.1	1.0	0.5
20-35	8.3	7.4	40.6	0.15	0.6	0.2	4	8	68.4	249	13.6	2.5	1.4	0.5	10.1	0.5	1.0	31.1	27.9	2.3	0.2	0.7	0.6
35-60	8.4	7.4	3.3	0.11	0.5	0.1	0	2	28.2	224	5.3	1.2	0.9	0.7	11.0	0	0.2	23.1	19.3	3.0	0.2	0.6	0.8
60-105	8.8	7.8	3.8	0.34	0.4	0.1	5		35.5	1013	8.4	4.4	3.1	0.5	26.4	0	0.3	44.5	21.0	16.5	4.3	2.8	9.6
105-150	8.6	7.6	71.4	0.19	0.7	0.1	3		18.9	320	5.0	7.6	1.4	0.3	7.5	0.6	0.4	17.1	10.5	3.9	1.8	0.8	10.6
Very low- may indicate deficiency and/or other limitations														High reading- may indicate toxicity and/or other limitations									

Note: Paddock sample bulked from cores taken from the same paddock as the pit.

Sum of cations, in a neutral to alkaline soil, approximates the CEC (cation exchange capacity), a measure of the soil's capacity to store and release major nutrient elements.

ESP (exchangeable sodium percentage) is derived by dividing the exchangeable sodium value by the CEC.

LIGHT SANDY CLAY LOAM OVER BROWN CLAY

General Description: *Light sandy clay loam over coarsely structured brown clay, with strong mottles and veins of carbonate at depth. Clays are non-calcareous.*

Landform: Gently undulating plains.

Substrate: Calcreted clayey lagoonal sediments (Padthaway Formation).

Vegetation: Mallee

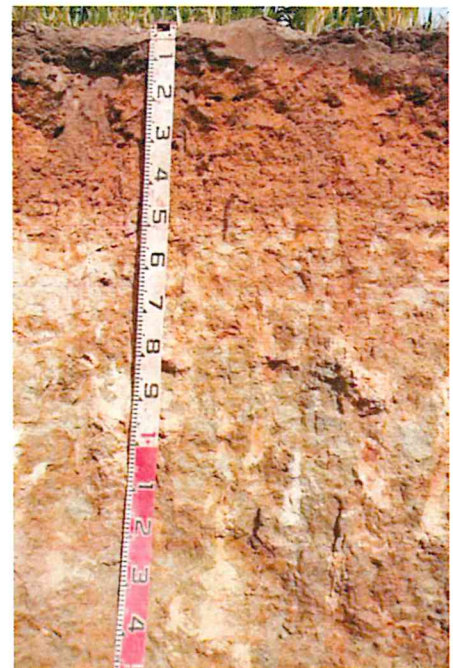
Type Site: Sampling date: 31st August 2011
Flat, firm surface

Annual rainfall: 450 mm



Soil Description:

Depth (cm)	Description
0-10	Friable, very dark grey brown structureless light sandy clay loam. Small clay lumps evident. Many roots present. Sharp change to:
10-40	Firm yellow brown and brown heavy clay. Very coarse columnar structure. Roots common. Gradual to:
40-80	Friable light olive grey and brown medium clay. Very coarse prismatic structure. Some hard and soft carbonate present. Roots common. Diffuse to:
80-120	Friable light olive grey and brown yellow light medium clay. Coarse prismatic structure. Hard and soft carbonate common. Roots common to few. Diffuse to:
120-150	Firm olive grey and yellow brown medium clay. Coarse prismatic structure. Some hard and soft carbonate present. Few roots.



Classification: Hypercalcic, Subnatric, Brown Sodosol; medium, non-gravelly, loamy /clayey, very deep

Summary of Properties

Drainage	Well drained in the surface, becoming poorly drained in the clay subsoil. Water may perch above the clay for weeks to months following prolonged wet conditions.
Fertility	Inherent fertility of the surface is very low, as indicated by the exchangeable cation data. P, K, S and N are all well above adequate. Zn appears high, Cu marginal, and Mn very low.
pH	Acidic to strongly acidic at the surface, strongly alkaline with depth.
Rooting depth	160 cm in pit, with few roots observable below 120cm
Barriers to root growth	
Physical:	The waterlogging of the layer above the clay will reduce root abundance in the surface, and will reduce root growth into the clay. The coarsely structured clay of the subsoil will reduce root abundance.
Chemical:	High pH, high free lime, and high sodicity all may restrict root abundance in the lower subsoil.
Water holding capacity	100mm in root zone.
Seedling emergence:	Good, although prone to waterlogging.
Workability:	Satisfactory when not waterlogged.
Erosion Potential	
Water:	Moderately low.
Wind:	Moderately low.
Management:	Gypsum required in topsoil (0-18cm)= 0t/ha. Gypsum to treat 50cm of soil (0-40cm)= 5.5t/ha. However, gypsum is unlikely to move into the coarse clay subsoil efficiently without direct placement. Structureless surface will not repair quickly following compaction from traffic.

Laboratory Data

Depth cm	pH H ₂ O	pH CaCl ₂	CO ₃ %	EC 1:5 dS/m	ECe dS/m	Org.C %	NH ₄ + NO ₃ mg/kg	Col. P mg/kg	Total P mg/kg	Col. K mg/kg	SO ₄ -S mg/kg	Cl mg/kg	Boron mg/kg	Trace Elements mg/kg (EDTA)				Sum cations cmol (+)/kg	Exchangeable Cations cmol(+)/kg				ESP
														Cu	Fe	Mn	Zn		Ca	Mg	Na	K	
Paddock 0-10	6.3	5.3	0.14	0.12	0.72	1.05	23	88	195.5	169	27.1	6.4	0.44	0.98	287	2.09	3.12	4.8	3.69	0.51	0.13	0.43	2.7
0-10	4.9	4.3	10.66	0.24	0.73	1.16	13	249	363.8	178	109.9	5.2	0.38	0.96	438	1.62	1.25	4.1	3.13	0.42	0.12	0.46	2.9
10-40	7.3	6.3	0	0.18	2.03	0.32	10	9	48.5	349	33.1	31.1	2.3	0.7	94	0	0.26	21.3	10	7.94	2.2	1.08	10.3
40-80	8.5	8	1.67	0.47	1.17	0.09	8	3	29.5	350	58.5	134	3.89	0.94	18.7	0	0.46	21.9	7.59	7.73	5.63	0.96	25.7
80-120	8.5	8	0.8	0.77	2.86	0.07	8		31.7	531	105.4	456.9	6.11	0.57	17.5	0	0.32	27.9	7.22	10.4	8.83	1.4	31.6
120-150	8.7	7.8	0.35	1.65	8.48	0.09	5		41.1	704	212.4	1497.6	7.57	0.63	35.9	1.4	0.11	44.5	9.34	15.9	17	2.19	38.2
Very low- may indicate deficiency and/or other limitations														High reading- may indicate toxicity and/or other limitations									

Note: Paddock sample bulked from cores taken from the same paddock as the pit.

Sum of cations, in a neutral to alkaline soil, approximates the CEC (cation exchange capacity), a measure of the soil's capacity to store and release major nutrient elements.

ESP (exchangeable sodium percentage) is derived by dividing the exchangeable sodium value by the CEC.