

# BKR Breakneck River Land System

This land system covers a major drainage area which lies within Flinders Chase National Park, in the west of Kangaroo Island. It includes the river valleys of Breakneck River/Bull Creek, Sandy River, the river feeding into West Bay, and the upper and middle Rocky River. These rivers dissect the surrounding ironstone plateau.

**Area:** 150.9 km<sup>2</sup>

**Annual rainfall:** 615 – 820 mm average

**Geology:** Most of this land system lies below the level of the surrounding ironstone plateau. The rivers traversing the system have cut down into basement rock: exposing early Cambrian age metasediments to soil forming processes. Kanmantoo Group Middleton Sandstone (a medium grained grey metasandstone) and Petrel Cove Formation (which can include sandstones, siltstones and mudstones) are found, especially on steeper valley slopes. On isolated remnant plateau surfaces and on some upper slopes, ironstone gravelly soil forming on deeply weathered clayey sediments can be found. Colluvial deposits of ironstone can sometimes occur below these areas. Loams and sands overlying clayey sediments predominate in the drainage depressions themselves. The loams or sands can be relatively thick and of recent alluvial origin, or, relatively thin over clay, often having developed in situ, and generally lacking ironstone gravel which has been 'dissolved' by the constant wetness. A few of what are probably peaty deposits occur in very swampy river beds.

**Topography:** This system consists of river valleys which drain and dissect the surrounding ironstone plateau remnants. Features include: well-watered river flats and lower valley slopes with tall eucalypt forests; poorly drained upper drainage depressions; swampy upper drainage areas; swampy and peaty river beds; stony and rocky valley slopes; and upper slopes and isolated rises with ironstone gravel. Drainage lines include Breakneck River/Bull Creek, Sandy River, the river feeding into West Bay, and upper and middle Rocky River: these rivers dissect the surrounding ironstone plateau. Drainage is predominantly to the south and south west, with some westward near where rivers enter the sea. All rivers eventually feed into the sea on Kangaroo Island's west coast, where they exit through recent coastal sand deposits (which are part of the Cape Borda Land System).

**Elevation:** From 300 m in the very north east of the system, to around 10 m in the lower reaches of the river flowing into West Bay, Breakneck River and Sandy River.

**Relief:** Relief varies from around 20 m in the more gently sloping upper reaches of this river system, to 70 m in the steepest river gullies.

**Main soils:**

<b>F1-G5</b>	Sandy loam to loamy sand over acid clay
<b>K4</b>	Stony texture contrast soil
<b>M1-H3</b>	Deep loamy to sandy soil
<b>J2a</b>	Ironstone soil

**Minor soils:**

<b>I2</b>	Wet highly leached sand
<b>M3</b>	Deep loamy soil with ironstone gravel
<b>L1</b>	Shallow rocky soil
<b>J2b</b>	Shallow ironstone soil on mottled clayey substrate
<b>N1</b>	Peat
<b>J3</b>	Shallow soil on ferricrete



**Main features:**

This system is swathed by native vegetation, and is part of Flinders Chase National Park, so nature conservation is the main issue. The native vegetation is diverse: from moderate sized eucalypt woodland on rocky slopes; to tall eucalypt forest in the well-watered river valleys; to tall stringybark stands in the better drained upper reaches; to low waterlogging tolerant plants in the poorly drained upper drainage depressions; to sedges, etc in swampy river beds; to sparse low mallee and banksia on the infertile ironstone plateau remnants. Some of the major rivers on the Kangaroo Island are included in this system. Many areas are quite wet, especially poorly drained upper drainage depressions and swampy river beds. Relatively better drained and well-watered river flats and lower slopes feature tall eucalypt forest. Topsoil textures are typically loamy; less often sandy. Subsoils or substrates are typically clayey and often dispersive: restricting soil drainage and increasing susceptibility to waterlogging. Many soils have weathered rock at moderate to shallow depth and are stony or rocky, especially on steeper slopes. Soil pHs are acidic to strongly acidic. Valley slopes can be quite steep.

**Soil Landscape Unit summary:** Breakneck River Land System (BKR)

SLU	% of area	Main features #
AOm	13.9	<p>Creek gullies and gully slopes with rocky soils. Main soils: stony texture contrast soil <b>K4</b> (<i>Brown Chromosol-Sodosol-Kurosol</i>). With some shallow rocky soil <b>L1</b> (<i>rocky Tenosol</i>). Loamy to sandy texture contrast soil <b>F1-G5</b> (<i>Brown Sodosol-Chromosol-Kurosol</i>) dominates in the sluggishly drained short side-arm tributaries and can occur elsewhere. Deep sandy loam <b>M1</b> (<i>loamy Tenosol</i>) occurs on some lower slopes and along gully drainage lines with tall eucalypts. Ironstone soil <b>J2a</b> (<i>Ferric Brown Chromosol-Sodosol-Kurosol</i>) can also occur, especially on upper slopes.</p> <p><b>AOm</b> creek gullies and gully slopes. Often including the main creek or river bed and/or side gullies. There may also be some sluggishly drained short side-arm tributaries showing a few patches of salinity (slopes 5-50%, 5-6e, 2-3w, 2g, 1-2s°, 1-2f).</p> <p>Summary: rocky and stony gully slopes with mallee-eucalypts and eucalypts. A few saline seeps occur along the drainage lines of sluggishly drained short side-arm tributaries. Native vegetation is dominated by mallee-eucalypt.</p>
CEC CEE	0.2 0.5	<p>River valley lower slopes and upper drainage depressions with stony texture contrast soil formed on weathered rock and deeper texture contrast soils. Main soils: stony texture contrast soil <b>K4</b> (<i>Brown Chromosol-Sodosol-Kurosol</i>) and deeper loamy to sandy texture contrast soil <b>F1-G5</b> (<i>Brown Sodosol-Chromosol-Kurosol</i>) especially in concave drainage areas. Minor to extensive areas of ironstone soil <b>J2a</b> (<i>Ferric Brown Chromosol-Sodosol-Kurosol</i>) can occur on slopes.</p> <p><b>CEC</b> lower slopes with some sloping drainage depressions (slopes 2-8%, 3-2e, 4w) <b>CEE</b> sloping upper drainage depressions (slopes 1-5%, 3-2e, 4-5w)</p> <p>Summary: relatively wet slopes and drainage depressions with some stones. Patches of tall eucalypts occur in better drained parts. [Steeper and stonier variant of 'PKE' areas.]</p>
CFA CFC CFE	0.4 0.3 0.1	<p>Areas with stony soils. Main soils: texture contrast soil <b>K4</b> (<i>Brown Chromosol-Sodosol</i>). With minor to limited areas with ironstone soil <b>J2a</b> (<i>Ferric Brown Chromosol-Sodosol</i>).</p> <p><b>CFA</b> raised plain and some slopes (slopes 0-3%, 1-2e, 2-3w, 3y) <b>CFC</b> slopes (slopes 3-12%, 3e, 3w, 1-2y) <b>CFE</b> low lying plains and drainage areas (slopes 0-2%, 1-2e, 3-4w, 2y)</p> <p>Summary: areas dominated by stony soils.</p>
CBA CBB CBBw CBC	0.05 3.4 3.4	<p>Slopes and rises with mostly stony soils. Main soils: stony texture contrast soil <b>K4</b> (<i>Brown Chromosol-Sodosol-Kurosol</i>); various ironstone soils <b>J2a-M3</b> (<i>Ferric Brown Chromosol-Sodosol-Kurosol</i> and/or <i>Ferric Tenosol</i>);</p>



CBD	14.8 0.8	loamy to sandy texture contrast soil <b>F1-G5</b> ( <i>Brown Sodosol-Chromosol-Kurosol</i> ) many with thick or very thick topsoils; and deep sandy loam to deep sand <b>M1-H3</b> ( <i>loamy to sandy Tenosol</i> ) in some lows.  <b>CBA</b> plains (slopes 0-2%, 1e, 4-3w) <b>CBB</b> slopes and rises (slopes 1-4%, 2e, 3-4w) <b>CBBw</b> wetter slopes (slopes 1-3%, 2-1e, 4w) <b>CBC</b> slopes and rises (slopes 3-12%, 3-2e, 3-4w) <b>CBD</b> slopes (8-20%, 4e, 3w)  Summary: relatively well drained areas with native vegetation dominated by stringybark or sometimes mallee.
FnB	0.6	Mostly high level plateau surfaces with shallow ironstone soils. Main soils: shallow ironstone soil underlain by 'mottled zone' clayey substrate material <b>J2b</b> ( <i>Ferric Brown Kurosol</i> ); which can include some more typical ironstone soil <b>J2a</b> ( <i>Ferric Brown Kurosol-Chromosol</i> ). (Weathered rock may occur at around a metre on some slopes: soils on these areas will have some quartz and even some metasandstone fragments in the profile.) With limited areas of shallow ironstone soil on ferricrete or very dense and thick ironstone gravel <b>J3</b> ( <i>Petroferric Tenosol</i> ). Minor to limited areas of loamy texture contrast soil where the ironstone has been 'dissolved' <b>F1</b> ( <i>Brown Kurosol-Chromosol</i> ).  <b>FnB</b> isolated remnant plateau surfaces and rises (slopes 1-4%, 2-1e, 3w, 2y)  Summary: strongly acidic, highly leached and infertile high plateau surfaces with high bushfire frequencies. The ironstone can be relatively thin in these areas because over the ages it has been transported to adjacent lower lying plateau areas. These areas often have a gibber type pavement of ironstone gravel on the land surface: sometimes small quartz fragments are also evident, especially on sloping ground. Shallow topsoils exacerbate the effects of waterlogging, and shallow soils have low water holding capacities. These areas are typically dominated by banksia and/or very low mallee: bullock also occurs.
FVAx FVB FVBw FVBx FVEx FVZ	0.1 2.0 5.4 0.1 0.3 0.4	Areas with ironstone and stony soils. Main soils: ironstone soil <b>J2a</b> ( <i>Ferric Brown Chromosol-Sodosol-Kurosol</i> ), with some deeper variants <b>M3</b> ( <i>Ferric Tenosol</i> ) especially in 'FVBw' areas; and stony texture contrast soil <b>K4</b> ( <i>Brown Chromosol-Sodosol-Kurosol</i> ). There may be some ironstone soils which are shallow on ferricrete <b>J3</b> ( <i>Petroferric Tenosol</i> ).  <b>FVAx</b> raised coastal plain (slopes 0-1%, 1e, 2-3w, 3y) <b>FVB</b> inland rises and summit surfaces (slopes 1-3%, 2-1e, 3-4w, 2-1y) <b>FVBw</b> wetter inland upper slopes (slopes 1-3%, 2-1e, 4w, 1-2g) <b>FVBx</b> coastal slopes (slopes 2-4%, 2e, 2-3w, 3y) <b>FVEx</b> low lying coastal plain and drainage areas (slopes 0-2%, 1-2e, 3-4w, 2y) <b>FVZ</b> remnant plateau surface (slopes 0-4%, 2-1e, 3-4w)  Summary: areas with soils typically containing ironstone gravel. Native vegetation typically dominated by low mallee.
MiD	0.04	Mostly shallow to moderate depth soil on calcrete. Main soils: shallow depth sandy soil on calcrete <b>B8-B7</b> ( <i>Petrocalcic Tenosol-Sodosol</i> ): soils may be loamy sands on calcrete, or loamy sands over sandy clay loams on calcrete. Minor to limited areas of stony texture contrast soil may occur <b>K4</b> ( <i>Brown Chromosol-Sodosol</i> ).  <b>MiD</b> old dune core topography (slopes 8-20%, 4-3e, 1w, 2-3y).  Summary: calcarenite rock is evident on landscape surface.
PkE PkEr PkO PkOr PkZ PkZs	4.4 0.4 2.3 0.1 1.3 0.3	Poorly drained upper drainage depressions and other areas with mainly texture contrast soils. Main soils: loamy to sandy texture contrast soil <b>F1-G5</b> ( <i>Brown Sodosol-Chromosol-Kurosol</i> ). Other soils can include wet highly leached sand <b>I2</b> ( <i>Podosol</i> ) where sand has accumulated in poorly drained lows; and deep loamy soil <b>M1</b> ( <i>loamy Tenosol</i> ) especially in and beside creek beds. Minor to common areas of stony texture contrast soil <b>K4</b> ( <i>Brown</i>



		<p><i>Chromosol-Sodosol-Kurosol</i>) can occur especially on the sloping margins of these areas. Some peat <b>N1</b> (<i>Organosol</i>) can occur in lowest lying and wettest parts. Various ironstone soils can occur <b>J2a-M3</b> (<i>Ferric Brown Chromosol-Sodosol-Kurosol</i> and/or <i>Ferric Tenosol</i>): these are more commonly encountered on the low lying plateau surface areas.</p> <p><b>PkE</b> poorly drained upper drainage depressions often with swampy patches (slopes 0-5%, 2e, 2-1g, 7-5w, 2-1s, 1-2f)</p> <p><b>PkEr</b> steeper poorly drained upper drainage depressions often with swampy patches (slopes 4-10%, 3e, 2-1g, 5w, 1-2s, 1-2f)</p> <p><b>PkO</b> poorly drained upper drainage depressions with some patches of salinity, often with swampy patches (slopes 0-4%, 1-2e, 2-1g, 3-2s<sup>+</sup>, 7-5w, 1-2f).</p> <p><b>PkOr</b> steeper poorly drained upper drainage depressions, with patches of salinity (slopes 2-8%, 3-2e, 2-1g, 5w, 2-3s<sup>o</sup>, 1-2f)</p> <p><b>PkZ</b> poorly drained low lying plateau surfaces (0-2%, 1-2e, 5-4w)</p> <p><b>PkZs</b> poorly drained low lying plateau surface with patches of salinity along drainage lines (0-3%, 2-1e, 5-4w, 2-3s<sup>o</sup>)</p> <p>Summary: poorly drained upper drainage depressions and other areas with low banksia, cup gum, low mallee, low bullock, reedy grasses and/or melaleuca. Taller mallee-eucalypt habit trees occur in the better drained patches (see 'PjE').</p>
PjE PjZ	2.0 0.5	<p>Relatively well drained drainage and other areas with mainly texture contrast soils. Main soils: thick loamy to sandy texture contrast soil <b>F1-G5</b> (<i>Brown Sodosol-Chromosol-Kurosol</i>). Minor to common areas of stony texture contrast soil <b>K4</b> (<i>Brown Chromosol-Sodosol-Kurosol</i>) can occur especially on the sloping margins of these areas and in the steeper drainage depressions. Various ironstone soils can occur <b>J2a-M3</b> (<i>Ferric Brown Chromosol-Sodosol-Kurosol</i> and/or <i>Ferric Tenosol</i>).</p> <p><b>PjE</b> relatively well drained upper drainage depressions/areas (slopes 0-5%, 2-1e, 4-3w, 1-2s, 1-2g, 1-2f)</p> <p><b>PjZ</b> relatively well drained low lying plateau surfaces (slopes 0-2%, 1e, 3-4w)</p> <p>Summary: relatively well watered and well timbered, relatively fertile drainage depressions and other areas, mostly with tall stringybark eucalypts.</p>
XNS XNSw XNU XNV	24.0 6.4 7.4 1.1	<p>Loamy and sandy river valley deposits. Main soils: deep sandy loam <b>M1</b> (<i>loamy Tenosol</i>). And loamy to sandy texture contrast soil <b>F1-G5</b> (<i>Brown Sodosol-Chromosol-Kurosol</i>) occur: those with thinner topsoils on the margins of river valleys and in upper and side-arm drainage depressions (some with moderate salinity levels); and those with thicker topsoils on valley floors. Stony texture contrast soil <b>K4</b> (<i>Brown Chromosol-Sodosol-Kurosol</i>) commonly occur, especially on lower slopes at margins of these river valleys and on steeper slopes. Wet highly leached sand <b>I2</b> (<i>Podosol</i>) can occur on valley floors. Bedrock can be exposed along creek beds; wash-deposits of ironstone gravel also occur. Areas of peat <b>N1</b> (<i>Organosol</i>) occur in very poorly drained swampy valley bottoms.</p> <p><b>XNS</b> well watered river valleys (slopes 0-20%, 3-2e, 4w with some swampy patches of 7w, 2-1f, 2-1s)</p> <p><b>XNSw</b> wetter river valleys with swampy areas with sedges (slopes 0-2%, 5-7w, 2e, 2-1f, 2-1s).</p> <p><b>XNU</b> wet river valleys (slopes 0-2%, 7-5w, 2e, 2-1f, 2-1s).</p> <p><b>XNV</b> wetter river valleys with swampy patches and patches of salinity especially in side-arm drainage depressions (slopes 0-3%, 5-7w, 3-2e, 2-1f, 3-2s<sup>+</sup>).</p> <p>Summary: well watered and well timbered, relatively fertile river valleys with tall eucalypt in valley flats and often tall stringybark eucalypts on valley slopes. Swampy patches with sedges occur.</p>
XuU	2.6	<p>Swampy drainage depressions. Main soils: wet highly leached sand <b>I2</b> (<i>Podosol</i>); thick to very thick loamy to sandy texture contrast soil <b>F1-G5</b> (<i>Brown Sodosol-Chromosol-Kurosol</i>); and/or deep sandy loam <b>M1</b> (<i>loamy Tenosol</i>). Some peat <b>N1</b> may occur.</p> <p><b>XuU</b> swampy drainage depressions: usually upper or more steeply sloping drainage areas (slopes 0-3%, 1-2e, 7-8w, 1-2s)</p>





		Summary: mostly swampy depressions with sedges.
XxU	0.4	Very swampy organic-rich soil in valley bottoms. Main soils: peat <b>N1</b> ( <i>Organosol</i> ), probably overlying highly leached sand <b>I2</b> ( <i>Podosol</i> ).  <b>XxU</b> very swampy drainage depression areas (slopes 0-2%, 1e, 7-8w, 2f, 1-2s)
		Summary: very swampy and peaty watercourse flats.

# Classes in the 'Soil Landscape Unit summary' table (eg. 2-1e, 3w, 2y, etc) describe the predominant soil and land conditions, and their range, found in Soil Landscape Units. The number '1' reflects minimal limitation, while increasing numbers reflect increasing limitation. Letters correspond to the type of attribute:

a - wind erosion	e - water erosion	f - flooding	g - gullyng
r - surface rockiness	s - salinity	w - waterlogging	y - exposure

## Detailed soil profile descriptions:

### Main soils:

- F1-G5** Sandy loam to loamy sand over acid clay (*Brown Sodosol-Chromosol-Kurosol*). Medium thickness to very thick sandy loam, loamy sand, or sometimes clay loam, often with a bleached subsurface layer, overlying clayey subsoil. There may be a clay loamy to light clayey transition layer between topsoil and subsoil. Subsoils are yellow brown to olive brown to olive grey to grey, depending on wetness (grey colours indicate wet soils). Lower subsoils and substrates are grey with red and yellow brown mottles in wetter areas, and yellow brown to olive yellow with red and grey mottles in relatively 'drier' areas. Subsoils are often sodic/dispersive. Minor quartz or ironstone can occur in the profile. Extensive, but especially found in poorly drained upper drainage depressions, sluggishly drained short side-arm drainage depressions, and on some slopes. Native vegetation varies from eucalypts, to stringybarks (quite tall in the better drained uplands), to waterlogging tolerant plants like cup gums, sedges, very low bullocks, banksias, melaleucas, etc in poorly drained upper drainage depressions.
- K4** Stony texture contrast soil (*Brown Chromosol-Sodosol-Kurosol*). Medium thickness to thick sandy loam, or sometimes loamy sand, sometimes with a bleached subsurface layer, over clayey subsoil which can be silty and which often contains weathered rock fragments, overlying weathered rock which can be rich in mica. Topsoils typically contain metasandstone, sandstone and/or quartz fragments, and sometimes ironstone. Subsoils are yellow brown to olive brown with mottling increasing with depth. Upper subsoils can be sodic / dispersive. Typically found on valley slopes. Native vegetation dominated by eucalypt, eucalypt-mallee, mallee or stringybark.
- M1-H3** Deep loamy to sandy soil (*loamy to sandy Tenosol*). Typically deep to moderate depth sandy loam, loam, or sometimes loamy sand. Bleached subsurface layers often occur and can be quite thick. Some loamy soils on valley floors are dark coloured and organic-rich throughout. Subsoils are typically brown to yellow brown and can grade into sandy clay loams. Underneath are clayey substrates, or sometimes weathered rock. Typically found in river beds, terraces, valley floors, on lower slopes, and in some upper drainage depressions. Native vegetation varies from tall eucalypts in relatively well drained valley floors and lower slopes to low waterlogging-tolerant plants like sedges and very low bullocks in poorly drained upper drainage depressions.
- J2a** Ironstone soil (*Ferric Brown Kurosol-Chromosol-Sodosol*). Medium thickness topsoil with ironstone gravel, overlying yellow brown clayey subsoil. Red and grey mottling increases with depth until a 'mottled zone' substrate is encountered, dominated by red and grey soil colours. There can be a clay loamy to light clayey transition layer between topsoil and subsoil which typically contains ironstone gravel. Found on upper slopes and isolated remnant plateau surfaces and rises. Native vegetation is typically dominated by low mallee or sometimes stringybark.



**Minor soils:**

- I2** Wet highly leached sand (*Podosol*). Deep to moderate depth bleached light sandy loam to loamy sand. Subsoil layer with dark brown accumulations of organic matter, iron and aluminium. These dark brown accumulations may occur as distinct segregations or as an entire layer. A clayey substrate occurs below this. Found in wet areas where sand has accumulated such as swampy drainage depressions and swampy valley floors. The native vegetation is typically dominated by banksia, low mallee, very low bullock and/or sedges. Stringybark often occurs on better drained valley floor areas.
- M3** Deep loamy soil with ironstone gravel (*Ferric Tenosol*). Deep light sandy loam to sandy loam, sometimes grading into a clay loam, with thick ironstone gravel in the subsoil. These soils overlie mottled clayey substrates. Found on concave slopes where there has been an accumulation of loamy soil and ironstone.
- L1** Shallow rocky soil (*rocky Tenosol*). Sandy loam, often grading into silty clay loam, over weathered rock which can be mica-rich. Numerous metasandstone, sandstone and quartz fragments occur in the profile. Found on the steepest valley slopes. Native vegetation is typically dominated by mid-sized eucalypts or eucalypt-mallees.
- J2b** Shallow ironstone soil on mottled clayey substrate (*Ferric Brown Kurosol*). Thin to medium thickness topsoil with ironstone gravel. The topsoil consists of a surface soil which is typically a sandy loam, and a subsurface layer of sandy loam to clay loam. This subsurface layer is often a transitional layer between surface soil and subsoil. The subsoil is typically a yellow brown to bright yellow clay. Red, olive brown, yellow brown, grey and/or yellow, very hard 'mottled zone' silty clay substrate occurs at around 50 cm depth, which effectively defines the lower soil boundary. The surface is typically blanketed by a pavement of ironstone. Found on isolated plateau surfaces and rises. Native vegetation is often sparse and is typically dominated by low banksia, low bullock and very low mallee.
- N1** Peat (*Organosol*). Dark coloured highly organic soil found in very swampy river beds. Probably overlying highly leached sands and light sandy loams.
- J3** Shallow soil on ferricrete (*Petroferric Tenosol*). Shallow sandy loam to loamy sand on ferricrete (boulder or sheet 'laterite'). Found in small patches on remnant plateau surfaces and rises, and upper slopes with sparse and low native vegetation.

**Further information:** [DEWNR Soil and Land Program](#)

