

PEN Penwortham Land System

North south ridge-valley system on the eastern side of the Clare Hills

Area: 99.1 km²

Annual rainfall: 500 – 645 mm average

Geology: Siltstones and calc-siltstones of the Saddleworth Formation and interbedded Auburn/Skillogalee Dolomites, with Rhynie and Watervale Sandstones in the west. Prominent beds of Stonyfell Quartzite provide the characteristic ridge-valley topography of the System. Valley floor accumulations of locally derived fine to medium grained alluvial sediments are common. These are usually mantled by finely divided carbonates.

Topography: The Penwortham Land System comprises a series of north - south quartzite ridges, with undulating rises formed on fine grained rocks in the intervening valleys. The ridges are generally moderately steep to steep (slopes of 10 - 75%) up to 100 m high and rocky, with quartzite reefs and abundant surface stone. The rises are up to 40 m high with slopes of 4-20%. Watercourses which dissect the rises flow mainly parallel to the ridges. However there is significant flow of drainage water from one valley to the next through gaps in the ridges. From the Sevenhill - Penwortham area northwards, drainage is into the Hutt River and White Hut Creek. To the south, water flows into Skillogalee and Watervale Creeks.

Elevation: 524 m near Sevenhill, to 280 m in the south where Skillogalee Creek flows out

Relief: Maximum relief is 100 m

Soils: Loamy to sandy loam texture contrast soils with red or brown clayey subsoils are most common. These are moderately deep over weathering rock or deep over alluvium or weathered rock. Shallow soils over rock (including limestone) are limited in extent.

Main soils

Soils formed over weathering rock

K2 Hard loam over red clay

K3 Hard sandy loam to clay loam over poorly structured red or brown clay

Minor soils

Soils formed over weathering rock

D7 Hard sandy loam to clay loam over poorly structured red clay

L1 Shallow stony sandy loam to loam

B4 Well structured loam over limestone

B3 Loam over limestone

K4 Sandy loam over brown sandy clay

K1 Shallow gradational loam

F2a Sandy loam over brown clay on deeply weathered rock

Soils formed over alluvium

F2b Sandy loam over brown or grey mottled clay

M2 Dark gradational clay loam

F1 Dark loam over brown /black clay

D3 Hard loam over dispersive red clay



Main features: The Penwortham Land System contains a range of land types, with variable horticultural potential. The rocky ridges which dominate the topography have little potential because of steep slopes, extensive surface rock and stone, exposure and shallow and stony or poorly structured soils. The valley floors have deep fertile soils, but structural and drainage characteristics vary. The black loamy soils are more fertile and better drained than the more sandy sodic texture contrast soils. The undulating rises have the greatest potential, but those areas dominated by friable red loam over clay soils and shallow soils over limestone are inherently the most productive. The greatest concentration of these is on the eastern edge. Elsewhere, the interbedding of the rocks results in a patchwork of well structured red loams, shallow soils over limestone and less favourable sandy loam over dispersive clay types. These are more erodible, more susceptible to waterlogging and have inferior root growth conditions compared to the other soils.

Soil Landscape Unit summary: 15 Soil Landscape Units (SLUs) mapped in the Penwortham Land System:

SLU	% of area	Main features #
ASB ASC ASD	1.8 17.1 5.7	<p>North - south trending ridges of interbedded quartzites, sandstones and siltstones with linear rocky outcrops occupying up to 20% of the land surface, and with an extensive cover of quartzite stones on the surface.</p> <p>ASB Low narrow ridges up to 30 m high with slopes of 10-25%. ASC Moderately steep ridges from 30 to 60 m high with slopes of 10-30%. ASD Steep rocky ridges to 100 m high with slopes of 25-75%.</p> <p>Main soils: stony <u>hard sandy loam over poorly structured red or brown clay</u> - K3/D7 (E), and <u>shallow stony sandy loam</u> - L1 (E), with <u>hard loam over red clay</u> - K2 (C), <u>sandy loam over brown sandy clay</u> - K4 (L) and <u>(well structured) loam over limestone</u> - B4/B3 (M). Although most of the soils are moderately deep, they are very stony, often poorly structured and infertile. Moderately steep to steep slopes and extensive surface stone further restrict agricultural use. Most of the ridges are either uncleared, or used for grazing, generally of native pastures.</p>
BAC BAD	10.4 1.6	<p>Undulating to rolling rises formed on siltstones, lying between higher and more resistant quartzite ridges.</p> <p>BAC Undulating rises to 30 m high with slopes of 4-12%. BAD Rolling rises to 40 m high with slopes of 10-20%.</p> <p>Main soils: <u>hard loam over red clay</u> - K2 (V), with <u>hard sandy loam over poorly structured red or brown clay</u> - K3/D7 (L), <u>(well structured) loam over limestone</u> - B4/B3 (M) and <u>shallow stony loam</u> - L1 (M). These soils are fertile (although prone to acidification), and moderately deep. Subsoils are commonly poorly structured, so waterlogging is often a problem. Poor surface structure is widespread, creating excessive runoff and working difficulty. However, provided erosion is controlled, and wetter areas avoided, this land is potentially highly productive.</p>
BCC BCD	14.0 3.2	<p>Undulating to rolling rises formed on siltstones and fine grained calcareous rocks.</p> <p>BCC Rises to 30 m high with slopes of 5-12%. BCD Rises to 30 m high with slopes of 10-20%.</p> <p>Main soils: <u>hard loam over red clay</u> - K2 (V) with <u>(well structured) loam over limestone</u> - B4/B3 (C), <u>shallow gradational loam</u> - K1 (L) and <u>shallow stony loam</u> - L1 (M). Soft to semi hard carbonates are common at depth. The soils have well structured subsoils, and are well drained and naturally fertile. Hard setting, sealing surfaces may cause workability and runoff problems, but these can be rectified. Erosion control is necessary throughout.</p>
BDC BDD	0.7 7.6	<p>Gently to moderately inclined footslopes between quartzite ridges. The slopes are underlain by dolomites / limestones and siltstones. The land occurs as long narrow north - south strips, generally bisected by a central watercourse.</p> <p>BDC 5-10% slope BDD 10-20% slope</p> <p>Main soils: <u>(well structured) loam over limestone</u> - B4/B3 (E), with <u>hard loam over red clay</u> - K2 (L), <u>hard sandy loam over poorly structured red or brown clay</u> - K3/D7 (L), <u>shallow stony loam</u> - L1 (L) and <u>sandy loam over brown clay on deeply weathered rock</u> - F2a (L). These soils are well drained</p>



		and fertile, but usually shallow. Erosion potential is high due to runoff from adjacent steep ridges together with moderate slopes. Although restricted in area, this land has potential for horticultural development.
BnC BnD	17.0 6.0	Undulating to rolling low hills formed on interbedded siltstones, quartzites, dolomites and sandstones. Secondary carbonate accumulation in subsoils is common. BnC Undulating rises to 30 m with slopes of 4-12%. BnD Irregular rises with slopes of 8-20% and sporadic rocky quartzite reefs. Main soils: <u>hard loam over red clay - K2</u> (E) on siltstones, <u>hard sandy loam over poorly structured red or brown clay - K3/D7</u> (C) and <u>sandy loam over brown clay on deeply weathered rock - F2a</u> (L) on quartzitic rocks and lower slopes, <u>(well structured) loam - B4/B3</u> (L) on calcareous rocks and <u>sandy loam over brown sandy clay - K4</u> (L) on sandstones. There are also minor clayey (M2) and shallow stony (L1) soils. Except for the quartzite reefs, the land is fully arable, although moderately steep in places. Despite the range of soils, poor surface structure is widespread except in the soils formed on calcareous rocks. This results in excessive runoff and associated erosion hazard, and workability problems. Impeded drainage is a problem in the F2, K3 and D7 soils, but the other soils are well drained. Natural fertility is low on the sandier soils, and moderate in the others. All soils except those formed on calcareous rocks are prone to acidification.
JSA JSE JSe	2.3 8.9 1.1	Flats and drainage depressions formed on clayey alluvium, with deep subsoil carbonate accumulations. JSA Flats with slopes of less than 1% and well defined, generally stable watercourses. JSE Drainage depressions with slopes of less than 3%. JSe Drainage depressions with slopes of up to 3%, eroded watercourses and sporadic saline seepage. Main soils: <u>dark gradational clay loam - M2</u> (E) and <u>dark loam over brown / black clay - F1</u> (E), with <u>sandy loam over brown or grey mottled clay - F2b</u> (L). The M2 and F1 soils are deep and fertile with high productive potential. They are prone to waterlogging; so wetter sites should be avoided for horticultural uses. Poorly structured surface soils may require some amelioration. The F2 soils have lower fertility and are more prone to waterlogging. Soil salinity levels should be monitored. The areas already affected by saline seepage are best suited to grazing of perennial pastures. These areas are also eroded - watercourse protection is needed.
JTJ	2.6	Drainage depressions formed on clayey alluvium, with sporadic deep subsoil carbonate accumulations. Slopes are up to 5% and watercourse erosion is common. Main soils: <u>sandy loam over brown or grey mottled clay - F2b</u> (E), and <u>hard loam over dispersive red clay - D3</u> (C), with <u>dark gradational clay loam - M2</u> (L) and <u>dark loam over brown / black clay - F1</u> (L). Poor soil structure and associated waterlogging are the main features of this land. Fertility is low on the sandy F2 soils, but the other soils have moderate to high fertility. Acidification is a potential problem.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

- | | |
|--|---------------------------------------|
| (D) Dominant in extent (>90% of SLU) | (C) Common in extent (20–30% of SLU) |
| (V) Very extensive in extent (60–90% of SLU) | (L) Limited in extent (10–20% of SLU) |
| (E) Extensive in extent (30–60% of SLU) | (M) Minor in extent (<10% of SLU) |

Detailed soil profile descriptions:

- B3** Loam over limestone (Petrocalcic, Leptic Tenosol)
15 - 25 cm friable loam to clay loam directly overlying a carbonate pan which is thin over soft highly calcareous weathered siltstone.
- B4** Well structured loam over limestone (Petrocalcic, Red Dermosol)
15 - 25 cm friable loam to clay loam grading to a well structured red clay loam to clay overlying a carbonate pan at depths up to 65 cm. The carbonate pan is thin over soft highly calcareous weathered siltstone.
- D3** Hard loam over dispersive red clay (Calcic, Red Sodosol)
30 - 50 cm hard loam abruptly overlying a coarsely structured dispersive red clay, calcareous with depth on alluvium.



- D7** Hard sandy loam to clay loam over poorly structured red clay (Calcic, Red Sodosol)
20 - 45 cm quartzite gravelly sandy loam to clay loam abruptly overlying a red or brown coarsely structured and dispersive clay, usually calcareous with depth, grading to weathering quartzitic shale or quartzite at depths between 50 and 150 cm.
- F1** Dark loam over brown / black clay (Brown / Black Chromosol)
25 - 50 cm dark loam to clay loam abruptly overlying a brown or brown well structured heavy clay, usually calcareous from about 60 cm.
- F2a** Sandy loam over brown clay on deeply weathered rock (Calcic, Brown Sodosol)
Medium to thick hard sandy loam to sandy clay loam with a bleached A2 layer, abruptly overlying a coarsely structured brown and red mottled heavy clay, calcareous with depth, grading to highly weathered basement rock.
- F2b** Sandy loam over brown or grey mottled clay (Brown / Grey Sodosol)
20 - 60 cm grey brown loamy sand to sandy loam with a bleached A2 layer, abruptly overlying a brown or grey (with red and yellow mottles) dispersive coarsely structured clay, generally calcareous from about 70 cm), on alluvium.
- K1** Shallow gradational loam (Eutrophic, Red Dermosol / Kandosol)
Medium thickness gravelly loam to clay loam grading to a weakly to moderately well structured clay loam to light clay merging with weathering rock within 50 cm.
- K2** Hard loam over red clay (Eutrophic, Red Chromosol)
15 - 40 cm hard loam to clay loam abruptly overlying a well structured red clay, occasionally calcareous with depth grading to weathering siltstone or calc-siltstone at about 60 cm.
- K3** Hard sandy loam to clay loam over poorly structured red or brown clay (Eutrophic, Red / Brown Chromosol / Sodosol)
20 - 45 cm quartzite gravelly sandy loam to clay loam abruptly overlying a red or brown coarsely structured (and commonly dispersive) clay, occasionally calcareous with depth, grading to weathering quartzitic shale or quartzite at depths between 50 and 150 cm.
- K4** Sandy loam over brown sandy clay (Eutrophic, Brown Chromosol)
20 - 50 cm sandstone gravelly sandy loam abruptly overlying a brown, red and yellow sandy clay to clay grading to sandstone at about 65 cm.
- L1** Shallow stony sandy loam to loam (Paralithic / Lithic, Leptic Tenosol / Rudosol)
25 - 50 cm very stony sandy loam or loam directly overlying sandstone or siltstone respectively.
- M2** Dark gradational clay loam (Hypocalcic, Black / Brown Dermosol)
25 - 50 cm black loam to light clay grading to a black or brown well structured heavy clay, usually calcareous from about 60 cm.

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

