SHIRE OF KORUMBURRA

A SOIL INVENTORY AND LAND CAPABILITY ASSESSMENT

Prepared by

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PREFACE

The information in this report is for board-scale planning only and should not be reproduced without the written approval of the Department of Conservation, Forests and Lands (Land Protection Service).

The report does not make any recommendations for development in the area and no allowance has been made for social, economic or political considerations which may influence planning proposals. Nevertheless the report does provide a physical data base into which these considerations may be incorporated to achieve a suitable basis for land development.

The contents of this report do not necessarily represent the official views of the Department of Conservation, Forests and Lands.

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INTRODUCTION

This report provides details of the land and soil characteristics within the Shire of Korumburra.

This study was undertaken at a scale of 1:50,000 following requests made to the Land Protection Service (LPS) in June 1984 by the Department of Planning and Environment on behalf of the Shire. No definitive guidelines were set for the study, however the Shire was seeking assistance with its land planning programs. The LPS sought information that would be of assistance to the planning of field operations for land degradation control and farm development proposals.

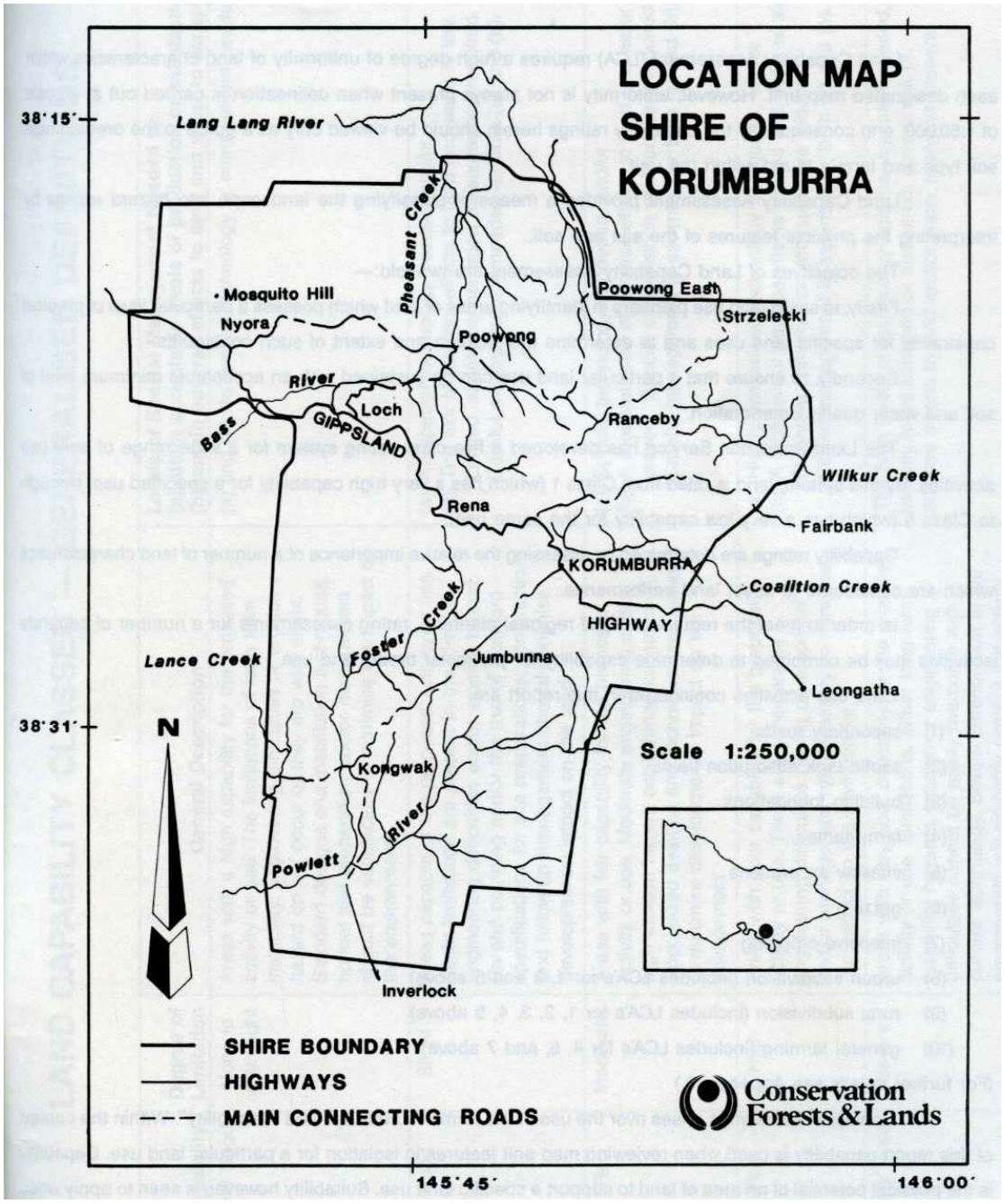
The purpose of the study was therefore to –

1. Provide a land/soil inventory at an appropriate scale that would be of practical assistance for future planning needs;
2. Provide broad-scale information on the soil, landscape stability and erosion status.
3. Provide sound land capability guidelines which would serve as a basis for further, more detailed work.

The Land Capability Assessment Section was given the responsibility of preparing the land inventory and presenting its findings in a useable form.

It should be appreciated that the information was gathered over a 3 week period in October 1984 and as such only a cursory overview has been gained. The approach relied heavily upon aerial photography interpretation of topographic information. This initial mapping was supported by field inspection to gather soil information. The aerial photography used was 1967 Warragul black and white prints. The soil data was gathered from roadside cuttings, quarry faces and from selected sites using a 10 cm diameter hand auger taken to a depth of 150 cm. (For further details of photography and geology maps used see Appendix 1).

It should be noted that due to the map scale used, units which give a resolution less than 3 mm on the final map (equivalent to 150 m on the ground) have not been highlighted. As a consequence a number of the small topographic features such as drainage lines, rises, small sandy crests and alluvial terraces have not been drawn out. For detailed planning, the present and location of these features should be highlighted, and so mapping at a scale of 1:10,000 or larger may be necessary.



Location map – Shire of Korumburra

LAND CAPABILITY ASSESSMENT SYSTEMS

Land Capability Assessment (LCA) requires a high degree of uniformity of land characteristics within each designated map unit. However, uniformity is not always present when delineation is carried out at a scale of 1:50,000, and consequently the capability ratings herein should be viewed only as a guide to the predominate soil type and terrain found within the unit.

Land Capability Assessment provides a means of classifying the landscape into hazard ratings by interpreting the physical features of the site and soil.

The objects of Land Capability Assessment are two-fold:-

Firstly, to assist land use planners in identifying areas of land which possess a particular level of physical constraints for specific land uses and to determine the location and extent of such constraints.

Secondly, to ensure that a particular land use can be sustained with an acceptable minimum level of soil and water quality deterioration.

The Land Protection Service has developed a five class rating system for a wide range of land use activities. By this system, land is rated from Class 1 (which has a very high capability for specified use) through the Class 5 (which has a very low capability for the same use).

Capability ratings are determined by assessing the relative importance of a number of land characteristics which are considered to affect land performance.

In order to meet the requirements of regional planning, rating assessments for a number of separate activities may be combined to determine capability for particular board land use.

Land use activities considered in this report are:

(1) secondary roads
(2) septic tank absorption fields
(3) building foundations
(4) farm dams
(5) shallow excavations
(6) grazing
(7) intensive cropping
(8) urban subdivision (includes LCA's for 1, 3 and 5 above)
(9) rural subdivision (includes LCA's for 1, 2, 3, 4, 5 above
(10) general farming (includes LCA's for 4, 6, and 7 above)

(For further details see Appendix 3).

Confusion sometimes arises over the use of the terms "suitability" and "capability". Within the context of this report capability is used when reviewing map unit features in isolation for a particular land use. Capability is the physical potential of an area of land to support a specific land use. Suitability however, is seen to apply when other social, economic and political aspects are considered in conjunction with land capability. For example, an area of land may have a high capability (Class 1, no soil limitation factors) for building foundations and urban development but may be totally unsuitable of the inaccessibility for power and/or supply of water.

LAND CAPABILITY CLASSESS – GENERALISED DEFINITIONS

Land Capability Class	Capability	Degree of Limitation	General Description	Levels of Special Management Needed to: (a) attain acceptable levels of production or satisfaction from the use; (b) contain adverse effects to land and water to acceptable levels
1	Very Good	None to very slight	Areas with a high capability for the proposed activity or use. The limitations of long term instability, engineering difficulties or erosion hazard do not occur or they are very slight. Standard designs and installation techniques, normal site preparation and/or management should be satisfactory to minimise the impact on the environment.	a) and (b). No special technology or management needed.
2	Good	Slight	Areas capable of the proposed activity or use. Slight limitations are present in the form of engineering difficulties and/or erosion hazard. Careful planning and/or the use of standard specifications for site preparations, construction and follow-up management should minimise developmental impact on the land	(a) No special technology needed, and/or (b) The risk of adverse effects to land and water is low. Limited, simple conservation measures are required. Careful management is needed for both (a) and (b)
3	Fair	Moderate	Areas with fair capability for the proposed activity or use. Moderate engineering and/or high erosion hazard exist during construction. Specialized designs and techniques are required to minimise developmental impact on the environment.	(a) Special technology is needed, and/or (b) A moderate risk of adverse effects to land and water is always present. Special conservation measures are required. Careful management is essential for both (a) and (b)
4	Poor	High	Areas with poor capability for the proposed activity or use. These are considerable engineering difficulties during development and/or management are necessary to minimise the impact on the environment.	(a) Highly specialised technology is required, and/or (b) A high risk of adverse effects to land and water is always present. Extensive conservation measures are required. Skilled management is essential for both (a) and (b).
5	Very Poor	Severe	Areas with very poor capability for the proposed activity or use. Limitations, either long term instability hazards, erosion or engineering difficulties cannot be easily overcome with current technology. Severe deterioration of the environment will probably occur if the activity or use is attempted in these areas.	The high levels of technology and management are needed, are unlikely to be achieved or sustained. Severe risk of adverse effects to land and/or water is always present.

MAP UNIT DESCRIPTION AND EVALUATION

INTRODUCTION

Individual map units are characterised by an alpha-numeric coding. The primary alpha code describes a specific topographic element such as – SS for steep slope or Cr for crest, whilst the numeric code indicates the soil type.

UNITS ASSOCIATED WITH SOIL TYPE 1

Undulating terrain (UT1)

LANDFORM AND OCCURRENCE

This undulating terrain occurs in the east of the project area, and includes that land towards Ruby and Fairbank with some isolated patches occurring to the south east of Outtrim. The unit components comprise rounded crests, moderate to gentle sideslopes, steep slopes, non-incised drainage courses and alluvial flats. Components are not included on the base map due to scale constraints, however, individual land capability assessments have been made. It is well cleared and is used primarily for dairying and beef production.

SOILS

Soils are typically well structured, deep friable clays with mottle apparent at depth. The unit involves fractions of two tertiary geologies which cannot be individually highlighted at this scale.

(i) Soils of basaltic origin similar to the red soils near Leongatha (Tvo). They are usually deep, well structured, friable, gradational, red clays which show some mottling at depth. Surface material may extend to a depth of 40 cm and comprises a dark brown, friable, acidic, silty clay loam with strong crumb structure with a gradual to diffuse transition to a brown, to reddish brown, firm, silty medium clay. Subsoils show strong angular blocky, rough faced peds with yellow and yellowish brown mottling becoming more dominant with depth. Field tests indicate that both surface and subsurface soils show little dispersibility, however they do slake. Following wet periods, land slips may become apparent on the steeper slopes and lower slope terrain. Denuded and well grazed areas may become slippery when wet making trafficability difficult.

(ii) Soils derived from sub basaltic (Tec) geologies show a number of similarities to (i). They are typically deep, well structured sometimes mottled gradational brown earths with some yellow (to brown) duplex soils. Surfaces are again friable rough faced crumb peds but textures may show some sandy character. With depth colours are dark brown to dark yellowish brown with textures increasing to a (gritty) medium clay – some show a silty character. Subsoils are typically rough faced with a subangular-blocky structure but some profiles show crumb structure throughout. Beyond 100 cm smooth faced peds become more apparent. Subsoil material shows moderate slaking in the field but relatively stable dispersion properties. Again, following very wet periods some slumping may occur with surfaces also becoming very slippery.

As the majority of native vegetation has been stripped over the past 150 years the unit has little surface litter build up and shows good runoff characteristics. Soils are usually “tight” below 50 cm and would be expected to exhibit slow permeabilities.

GEOLOGY

Variable, including olivine Tertiary basalts and associated pyroclastics (Tvo), together with sub-basaltic alluvial and lacustrine deposits comprising sand, clay and conglomerate of the early Tertiary period (Tec).

HAZARDS

Land slip and slumping is common on steep slopes and lower slopes. Overgrazed and denuded areas may suffer topsoil loss from sheet erosion.

AREA

2 km^2 (0.5%)

SOILS INFORMATION

(i) Factual key Gn 4.53
(ii) Unified Soil Group: CL
(iii) Shrink-swell potential: Moderate to low
(iv) Land slip potential: High on steep and moderate slopes
(v) Permeability class: Fair
(vi) Site drainage: Moderate to rapid
(vii) Flood risk: Nil (Drainage courses carry water in wetter periods)

LAND CAPABILITY ASSESSMENT FOR ALLUVIAL FLATS AND DRAINAGE LINES

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	5	Inundation, soil drainage, water table depth
2. Septic tank absorption fields	5	Inundation, soil drainage, water table depth
3. Building foundations	5	Inundation, soil drainage, water table depth
4. Farm dams	5	Inundation, soil drainage, water table depth
5. Shallow excavations	5	Inundation, soil drainage, water table depth
6. Grazing	4	Inundation, soil drainage, water table depth
7. Intensive cropping	4	Inundation, soil drainage, water table depth
8. General farming	4 (5)	
9. Urban subdivision		
10. Rural subdivision		

LAND CAPABILITY ASSESSMENT FOR MODERATE SLOPES

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	4	Slope, soil drainage, USG of B horizon
2. Septic tank absorption fields	4	Slope, soil drainage, USG of B horizon
3. Building foundations	4	Slope, soil drainage, USG of B horizon
4. Farm dams	5	Slope, soil drainage, USG of B horizon, permeability
5. Shallow excavations	4	Slope, soil drainage
6. Grazing	3	Slope
7. Intensive cropping	3	Slope
8. General farming	3 (5)	
9. Urban subdivision	4	
10. Rural subdivision	4 (5)	

LAND CAPABILITY ASSESSMENT FOR STEEP SLOPES

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	5	Slope, soil drainage
2. Septic tank absorption fields	5	Slope, soil drainage, permeability
3. Building foundations	5	Slope, soil drainage, permeability
4. Farm dams	5	Slope, soil drainage, permeability
5. Shallow excavations	5	Slope, soil drainage, permeability
6. Grazing	4	Slope, soil drainage, permeability
7. Intensive cropping	4	Slope, soil drainage, permeability
8. General farming	4 (5)	
9. Urban subdivision	5	
10. Rural subdivision	5	

LAND CAPABILITY ASSESSMENT FOR CRESTS

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	3	Soil drainage, USG of B horizon
2. Septic tank absorption fields	3	Soil drainage, permeability
3. Building foundations	3	Soil drainage
4. Farm dams	2	Slope
5. Shallow excavations	3	Soil drainage
6. Grazing	2	Soil drainage
7. Intensive cropping	3	Slope, soil drainage
8. General farming	2 (3)	
9. Urban subdivision	3	
10. Rural subdivision	3	

UNITS ASSOCIATED WITH SOIL TYPE 2

Alluvial Flats (AF2), Drainage Lines (DL2)

LANDFORM AND OCCURRENCE

This flat terrain and non-incised drainage lines occur in the west and north west of the project area, and is formed primarily from alluvial wash of the Quaternary and Tertiary sandstone and gravel. As a consequence there is some degree of variability with regard to the soils – with some gravel patches and minor sand rises occurring. At present the area is under improved pasture, with grazing and dairying the chief agricultural enterprises.

SOILS

Soil are principally deep, dark-brown to brown alluvial sandy clay. They exhibit an organic crumb structured surface, overlying a massive to weak, rough-faced subangular blocky pale brown, greyish brown and brown mottled clay subsoil. Beyond 5 cm soils are often very wet with textures and structures difficult to determine. Horizon boundaries are diffuse to gradual; at dept faint red brown and yellowish brown mottling is common. Soils exhibit acid soil reaction trends with pH levels of 5.5 to 6.5 throughout. The surface soils exhibit no dispersion properties but show a rapid slaking potential due to their sandy nature. The spewy nature of the subsoil when wet, highlights this instability.

Minor areas show evidence of some now non-active stream courses which include small, low depressions that are wet and non trafficable throughout the wetter months. The permanently wet areas are highlighted by thick stands of *Melaleuca* (Paper bark) and *Leptospermum* (Tea-tree) which form some protection against stock-related erosion. In the drier months of the year the water table would be expected to drop, with surfaces drying out and overgrazing leading to soil instability, with a potential for sheet erosion to occur. Considerable erosion will also occur near gateways and roads where there has been no consolidation by way of rock-fill.

GEOLOGY

Dominantly sand, ferruginous sand and clay, with minor gravels of later Tertiary – early Quaternary periods (Tph). Minor complexes of beach deposits, estuarine sand, shell beds, aeolian sand sheets (Qrd), high level river terraces, abandoned swamps and flood plain deposits (Qpa) also occur.

HAZARDS

Generally minor sand wash and windsheeting following cultivation or overgrazing.

AREA

9.0 km^2 (1.5%)	AF2 3.5 km^2; 0.5%
	DL2 5.5 km^2; 1.0%

SOILS INFORMATION

(i) Factual Key: Gn 2.84
(ii) Unified Soil Group: CL; ML (minor SP areas)
(iii) Shrink-swell potential: Low
(iv) Land slip potential: None
(v) Permeability class: Slow to moderately low
(vi) Site drainage: Slow to ponding
(vii) Flood risk: Very high

LAND CAPABILITY ASSESSMENT FOR ALLUVIAL FLATS (AF2)

Proposed Activity	**Rating**	**Limiting factor(s)**
1. Secondary roads	5	Inundation, soil drainage
2. Septic tank absorption fields	5	Inundation, soil drainage
3. Building foundations	5	Inundation, soil drainage
4. Farm dams	5	Inundation, soil drainage
5. Shallow excavations	5	Inundation, soil drainage
6. Grazing	3	Inundation
7. Intensive cropping	3	Inundation
8. General farming	3 (4)	
9. Urban subdivision	5	
10. Rural subdivision	5	

Land Capability Assessment for Drainage Lines (DL2) is not applicable.

UNITS ASSOCIATED WITH SOIL TYPE 3

Sandy Rise (R3), Undulating Terrain (UT3)

LANDFORM AND OCCURRENCE

This includes undulating terrain and low minor, essentially isolated, convex sandy rises occurring within the alluvial flat terrain in the south of the project area principally around Kongwak. The units in their undisturbed state sustain a Tea-tree scrub.

SOILS

Soils are deep acidic and sandy loams over relatively impermeable clays. Typically profiles comprise a shallow black to very dark grey, weak crumb structured, friable sand to sandy loam surface. With a diffuse transition these surfaces grade into a greyish brown (sandy) clay loam which incorporates yellow-brown mottling and weak to moderate subangular block rough faced peds. The (medium) clay subsoils usually occur below 60 cm and comprise fine to medium strong angular blocky smooth faced peds. Although they display a stronger mottling character than the surface material, these subsoils are distinctly paler with grey to light brownish grey colouring.

Although technically not duplex these soils do show some “duplex-like” characteristics, e.g. surfaces exhibit moderate-rapid to rapid permeabilities; whilst with depth the subsoil clays exhibit moderately slow to slow permeability features. By virtue of the slope of these units (ranging from 2-5% with 4% being common) the site drainage is considered good with trafficability being essentially unrestricted throughout the year.

Field tests indicate that soil dispersibility is low whilst the sandy nature of the surface material leads to rapid slaking. At depth individual peds are quite stable.

It is expected that sheet erosion could occur in the drier months following overgrazing or other mismanagement practices. Some areas show scalloped and dished out areas which are the result of isolated pugging by cattle.

GEOLOGY

Sand, ferruginous sand and clay, with minor gravels of the late Tertiary-early Quaternary periods (Tph). Some Baxter Sandstone sequences may be included.

HAZARDS

Severe sheet erosion possible in dry summers or following cultivation.

AREA

4.60 km^2 (8.0%)	UT3 44.0 km^2; 7.5%
	R3 2.0 km^2; 0.5%

SOILS INFORMATION

(i) Factual key: Gn 3.90
(ii) Unified Soil Group: SP/GC
(iii) Shrink-swell potential: Low
(iv) Land slip potential: None
(v) Permeability class: Extremely rapid
(vi) Site drainage: Extremely well
(vii) Flood risk: Ni.

LAND CAPABILITY ASSESSMENT FOR SANDY RISES (R3)

Proposed Activity	**Rating**	**Limiting factor(s)**
1. Secondary roads	2	USG of the B horizon
2. Septic tank absorption fields	2	Permeability
3. Building foundations	2	USG of the B horizon
4. Farm dams	3	USG of the B horizon
5. Shallow excavations	3	USG of the B horizon
6. Grazing	2	Texture of A horizon
7. Intensive cropping	2	Texture of A horizon
8. General farming	2 (3)	
9. Urban subdivision	2 (3)	
10. Rural subdivision	2 (3)	

Land Capability Assessment for the Undulating Terrain (UT3) is similar to that shown for R3 above. However, minor depressions and low lying situations which are waterlogged in the winter months have a land capability rating of 5 for all proposed activities due to flooding and soil drainage.

UNITS ASSOCIATED WITH SOIL TYPE 4

Alluvial Flats (Af4), incorporating minor levees and relic channels.

LANDFORM AND OCCURRENCE

These include flat to slightly undulating narrow plains with some evidence of old fluviatile landforms. The map unit found to the north of Poowong consists of relic but relatively young levees and infilled stream channels. This area can be quite wet due to runoff from the adjacent hills but does not remain so throughout the year.

SOILS

Soils are typically deep, well structured silty alluvials, which show little or no gravel content. They are well drained and moderate to moderately rapid permeability. At the time of survey the water table was encountered at approximately 100 cm.

Surfaces are shallow (usually 15 cm deep) very dark grey to black, friable silty clay loams with rough faced crumb structured peds. Generally these surface soils are neutral to slightly acid, with pH ranging between 6-6.5. Field tests indicate instability with crumb peds showing slight dispersion but slow to moderate slaking potential.

Subsoils gradually increase in texture to silty light clays with a dark brown colour becoming dominant. Their structure, fabric and consistence is similar to the surface "horizons". However in contrast to surface soils, subsoil materials show an acidic pH, commonly to 4.5. In addition, these soils although showing little or no dispersion character, do exhibit rapid slaking tendencies when examined in the field.

GEOLOGY

Dominantly late Quaternary stream alluvium flood plain and low level deposits of sand, silt, clay and gravel (Qra) with minor fan and colluvial deposits from surrounding sandstone terrain (Kls).

HAZARDS

Low sheet erosion with some stream bank and gully degradation following flooding or heavy post-cultivation rains.

AREA

5.5 km^2 (1.0%)

SOILS INFORMATION

(i) Factual key: Uf 5.12, Gn 4.31
(ii) Unified Soil Group: CL
(iii) Shrink-swell potential: Low
(iv) Land slip potential: None
(v) Permeability class: Moderately rapid
(vi) Site drainage: Moderate to slow
(vii) Flood risk: Very high

LAND CAPABILITY ASSESSMENT FOR ALLUVIAL FLATS (AF4)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	3	USG of B horizon
2. Septic tank absorption fields	4	Inundation, depth to water table
3. Building foundations	5	Inundation
4. Farm dams	3	Inundation, permeability, depth to water table, USG of B horizons
5. Shallow excavations	3	Inundation
6. Grazing	2	Inundation
7. Intensive cropping	2	Inundation
8. General farming	2 (3)	
9. Urban subdivision	4 (5)	
10. Rural subdivision	3 (4)	

UNITS ASSOCIATED WITH SOIL TYPE 5

Alluvial Flat (AF5), Drainage Lines (DL5), Undulating Terrain (UT5), Foot Slopes (FS5), Rises (R5), and Crests (Cr5)

LANDFORM AND OCCURRENCE

The units dominate the north western areas of the project area, including the undulating to low hilly terrain which incorporates rounded topography and intervening small sandy flats. The units consist of well vegetated slopes and broad rounded crests. Slopes are generally 15%, rarely to 25%. The unit occurs at the margins of the steeper Cretaceous sandstones of the Strzelecki group. Extensive use has been made of these areas by way of gravel extraction and as a refuse disposal area.

SOILS

Soils are strongly dependent upon the associated Tertiary gravel geology which itself may be variable.

Principally the surface soils exhibit shallow sometimes gravelly light grey, pale brown and brownish yellow acid sands and loamy sands. At approximately 50 cm these overlie a varying brown coloured sandy clay hardpan.

These soils exhibit very weak soft crumb to single grained structure and are porous and well drained throughout.

Subsoils are typically coarse gravelly brownish yellow sandy clays, the gravels are often scattered with ferruginous inclusions. It is these gravel deposits that are being quarried.

Although soils in some areas may extend below two metres, in most situations beyond 100 cm the profiles overlie coarse often blocky and fractured grey clay well interspersed with ferruginous inclusions and sand lenses.

Because of their topography and sandy surfaces the units are always well drained (with all-season trafficability) even where clay subsoils exist. Land use is essentially restricted to conservation and recreation where the extractive industries are absent.

GEOLOGY

Variable, with Tertiary sand, gravels, ferruginous sand and clay, including variants of Baxter Sandstones similar to those found at Cranbourne (Tph).

HAZARDS

The areas are subject to wind erosion if cleared and unprotected. The soils lack cohesion and dry out and drift unless precautions are taken. Limited sheet erosion is expected as surface infiltrations are high, along cuttings some wash was observed where batters were set too steeply.

AREA

62.0 km^2 (11.0%)	UT5 27.0 km^2; 4.5%	R5 1.0 km^2; 0.5%
	DL5 2.0 km^2; 0.5%	AF5 8.5 km^2; 1.5%
	FS5 20.5 km^2; 3.5%	UT5-7 12.5 km^2; 2.0%
	Cr5 3.0 km^2; 0.5%	

SOILS INFORMATION

(i) Factual key: Db 4.11; Uc 1 with pan
(ii) Unified Soil Group: SP-SC/GC
(iii) Shrink-swell potential: Low
(iv) Land slip potential: None
(v) Permeability class: Extremely rapid
(vi) Site drainage: Extremely well
(vii) Flood risk: Nil (Drainage courses carry water in wetter periods)

LAND CAPABILITY ASSESSMENT FOR SANDY RISES (R3)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	5	Inundation, depth to water table
2. Septic tank absorption fields	5	Inundation, gravel and stone
3. Building foundations	5	Inundation, depth to water table, gravel and stone
4. Farm dams	5	Inundation, permeability, gravel and stone
5. Shallow excavations	5	Inundation, gravel and stone
6. Grazing	3	Inundation, gravel and stone
7. Intensive cropping	3	Inundation, gravel and stone
8. General farming	3 (5)	
9. Urban subdivision	5	
10. Rural subdivision	5	

LAND CAPABILITY ASSESSMENT FOR UNDULATING TERRAIN (UT5), RISES (R5) AND CRESTS (Cr5)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	2	Stone
2. Septic tank absorption fields	3	Stone and gravel
3. Building foundations	3	Stone
4. Farm dams	4	Gravel and stone, permeability
5. Shallow excavations	2	Stone
6. Grazing	2	Gravel and stone
7. Intensive cropping	2	Gravel and stone
8. General farming	2 (4)	
9. Urban subdivision	3 (2)	
10. Rural subdivision	3	

LAND CAPABILITY ASSESSMENT FOR FOOT SLOPES (FS5)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	2 (3)	Stone
2. Septic tank absorption fields	3	Gravel and stone
3. Building foundations	3	Stone
4. Farm dams	4	Gravel and stone, permeability
5. Shallow excavations	2	Stone
6. Grazing	2	Gravel and stone
7. Intensive cropping	2	Gravel and stone
8. General farming	2 (4)	
9. Urban subdivision	3 (2)	
10. Rural subdivision	3	

UNITS ASSOCIATED WITH SOIL TYPE 6

Alluvial Flats (AF6)

LANDFORM AND OCCURRENCE

This flat alluvial and low undulating terrain originates from sandstone hills within the Kongwak district.

The unit essentially extends from Kongwak to Leongatha, and is bounded in the south by the Powlett River.

SOILS

Soils are typically greyish brown to brown, gradationals and functional duplexes with significant amounts of silt. Although profiles show little horizon development they do display a minimum layering character. Surfaces are generally smooth except for the marked pugging from cattle which occurs in the winter months. The surface layers show moderate to strong, rough faced, friable, crumb structured peds. Textures are clay loams to loams with silt clearly evident from field examination. With depth there is a clear to abrupt transition to the massive faintly mottled medium clay subsoil. The subsoil material is presumed to show very weak structure, however as the material was wet and hand augered, no structure was evident.

Soils are acid throughout ranging from pH 5 in the surface to pH 4.5 at depth. All soils sampled showed rapid slaking features but little or no dispersion character.

When comparing these soils to those of the alluvial flats in the north west, two features become obvious. Firstly, these areas do not exhibit any sandy and/or gravelly characteristics typical of the Nyora West areas. Secondly, no water table was encountered above 120 cm. The latter difference may be a reflection of surface drainage that has occurred or else may indicate local differences in rainfall. It is however, expected that during the mid to later winter period these areas would become totally untrafficable.

Isolated depressions hold water well into the summer months and these sub-units (often too small to highly on the mapping scale used) are often distinguished by stands of *Melaleuca* and *Leptospermum* scrub.

GEOLOGY

Mostly, stream alluvium, flood plain and low level deposits comprising sand, silt and clay (Qra), which has basically arisen from alluvial wash from the Strzelecki mudstones to the north (Kls).

HAZARDS

Generally none; some very minor stream bed erosion.

AREA

47.0 km^2 (7.5%)

SOILS INFORMATION

(i) Factual Key: Gn 2.81
(ii) Unified Soil Group: CL
(iii) Shrink-swell potential: Low to moderate
(iv) Land slip potential: None
(v) Permeability class: Slow
(vi) Site drainage: Slow to ponding
(vii) Flood risk: Moderate to very high

LAND CAPABILITY ASSESSMENT FOR ALLUVIAL FLATS (AF6)

Proposed Activity	**Rating**	**Limiting factor(s)**
1. Secondary roads	4	Inundation, soil drainage
2. Septic tank absorption fields	5	Inundation, soil drainage, permeability
3. Building foundations	5	Inundation, soil drainage
4. Farm dams	5	Inundation, soil drainage
5. Shallow excavations	4	Inundation, soil drainage
6. Grazing	3	Inundation, soil drainage
7. Intensive cropping	4	Inundation, soil drainage
8. General farming	3 (5)	
9. Urban subdivision	5	
10. Rural subdivision	5	

UNITS ASSOCIATED WITH SOIL TYPE 7

Crests (Cr7), Steep Slopes (SS7), Moderate Slopes (MS7), Foot Slopes (FS7), Undulating Terrain (UT7), Alluvial Flats (AF7) and Drainage Lines (DL7).

LANDFORM AND OCCURRENCE

The unit as a whole is complex and includes crests, steeply sloping terrain, foot slopes, undulating low hills and drainage courses. Generally the terrain is rounded with side slopes exhibiting the effects of periodic land slumping, this being prevalent in areas south of the South Gippsland Highway to Kongwak. Side slope gradients are commonly 30% but may reach 60%. Areas to the north west and west of Poowong tend to show more rounded, less dissected and less steeper topography.

SOILS

A wide range of soils exist throughout the unit but due to map scale and available survey time the entire range is unable to be represented. In general, they are deep, moderately well structured, gradational (sometimes duplex) soils, showing a dark brown to brown base colour with mottling common at depth.

Surfaces are usually shallow (normally 30 cm deep) comprising firm, strong, rough faced, moderate angular blocky, sandy loams and sandy clay loams. Foot slopes tend to exhibit the darker soils with crumb structure common.

With depth, there is a gradual to diffuse transition to a greyish brown, hard, massive, light sandy clay which is often bleached. This portion of the profile is distinctive and tends to be somewhat resistant to erosion and is often seen protruding to roadside cuttings. On some lower slopes (near Kongwak) this “A2” horizon may show some angular blocky structure. On steeper slopes and in the north eastern sections, the hardsetting material may form the surface layer to the effects of erosion. This tends to produce high runoff which leads to substantial erosion along adjacent roads and paddocks.

Beyond 50 cm there is a gradual transition to the grey, brown and dark yellowish brown, moderately well structured, rough faced angular blocky, clay material. Mottling also increases with red, brown, yellowish brown and yellow colours forming with some hydrophobic character.

Tests in the field also indicate that there is only a slight dispersion tendency but slaking is variable between sites, reaching moderate levels in areas north of Poowong.

Generally the soils are poorly drained however they do not become waterlogged because of the topographic situation. Soil permeability would be expected to be moderately slow to slow.

A large portion of the landscape in the north of the Shire has a thin veneer of sand. This generally rests on the crests of the moderately sloping, undulating terrain north of Poowong but cannot be mapped at the scale presented. The sand is generally less than 50 cm thick and consist of a black surface over a pale brown light grey or white subsoil. A bracken fern understorey typifies the landscape where this veneer exists and does not appear to suffer from waterlogging or drainage problems.

GEOLOGY

Variable lacustrine and marine Cretaceous sediments incorporating the Strzelecki mudstones, sandstones and conglomerate materials (Kls). Some minor inclusions of sub-basaltic quartzite, sand and gravels (Tec), together with fractions of olivine basaltic wash (Tvo) also occur.

HAZARDS

The area is subject to a high incidence of land slip and slumping. Cleared denuded areas should be expected to suffer sheet erosion. Gullying and creek bank erosion also occur.

AREA

430.5 km^2 (70.0%)

UT7 50.0 km^2; 8.0
MS7 179.0 KM^2; 29.0%
SS7 151.5 km^2; 24.5%
DL7 1.0 km^2; 0.5%
Cr7 35.0 km^2; 6.0%
FS7 9.0 km^2; 1.5%
AF7 5.0 km^2; 0.5%
UT5-7 12.5 km^2; 2.0%

SOILS INFORMATION

(i) Factual Key: Gn4.71, Db 4.11 and Db 4.21
(ii) Unified Soil Group: CL (SW for sandy crest areas)
(iii) Shrink-swell potential: Low
(iv) Land slip potential: High
(v) Permeability class: Moderately slow to slow
(vi) Site drainage: Moderate to rapid
(vii) Flood risk: Nil (Drainage courses become wet and untrafficable in winter months)

LAND CAPABILITY ASSESSMENT FOR ALLUVIAL FLATS (AF6)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	5	Inundation, soil drainage
2. Septic tank absorption fields	5	Inundation, soil drainage
3. Building foundations	5	Inundation, soil drainage
4. Farm dams	5	Inundation, soil drainage, permeability
5. Shallow excavations	5	Inundation, soil drainage
6. Grazing	3	Inundation, soil drainage
7. Intensive cropping	3 (4)	
8. General farming	5 (4)	
9. Urban subdivision	5	
10. Rural subdivision	5	

LAND CAPABLITY ASSESSMENT FOR UNDULATING TERRAIN (UT7)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	2 (3)	Soil drainage, USG of B horizon
2. Septic tank absorption fields	2	Soil drainage, permeability
3. Building foundations	2 (3)	Soil drainage, USG of B horizons
4. Farm dams	2	Soil drainage
5. Shallow excavations	2 (3)	Soil drainage
6. Grazing	2	Soil drainage
7. Intensive cropping	2	Soil drainage
8. General farming	2	
9. Urban subdivision	2 (3)	
10. Rural subdivision	2 (3)	

LAND CAPABILITY ASSESSMENT FOR FOOF SLOPES (FS7)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	3	Slope, soil drainage
2. Septic tank absorption fields	3	Slope, soil drainage
3. Building foundations	2 (3)	Slope, soil drainage
4. Farm dams	3	Soil drainage
5. Shallow excavations	3	Soil drainage, slope, USG of B horizons
6. Grazing	1	
7. Intensive cropping	2	Slope
8. General farming	2	
9. Urban subdivision	3	
10. Rural subdivision	3	

LAND CAPABILITY ASSESSMENT FOR MODERATE SLOPES (MS7)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	4	Slope, soil drainage
2. Septic tank absorption fields	4	Slope, soil drainage
3. Building foundations	4	Slope, soil drainage
4. Farm dams	4	Slope
5. Shallow excavations	4	Slope, soil drainage
6. Grazing	3	Soil drainage
7. Intensive cropping	4	Slope, soil drainage
8. General farming	4	
9. Urban subdivision	4	
10. Rural subdivision	4	

LAND CAPABILITY ASSESSMENT FOR STEEP SLOPES (SS7)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	5	Slope
2. Septic tank absorption fields	5	Slope
3. Building foundations	5	Slope
4. Farm dams	5	Slope
5. Shallow excavations	5	Slope
6. Grazing	5	Slope
7. Intensive cropping	5	Slope
8. General farming	5 (4)	
9. Urban subdivision	5	
10. Rural subdivision	5	

LAND CAPABILITY ASSESSMENT FOR CRESTS (Cr7)

Proposed Activity	Rating	Limiting factor(s)
1. Secondary roads	3	Soil drainage
2. Septic tank absorption fields	3	Soil drainage, permeability
3. Building foundations	2 (3)	Soil drainage
4. Farm dams	3	Soil drainage
5. Shallow excavations	3	Soil drainage
6. Grazing	1	
7. Intensive cropping	3	Soil drainage
8. General farming	3 (2)	
9. Urban subdivision	3	
10. Rural subdivision	3 (2)	

Appendices

1 DETAILS OF PHOTOGRAPHY AND GEOLOGY MAPS USED

2 BRIEF GLOSSARY OF TERMS USED IN THIS REPORT

3 LAND CAPABILITY TABLES UPON WHICH ASSESSMENT WAS MADE

APPENDIX 1 – DETAILS OF PHOTOGRAPHY AND GEOLOGY MAPS USED

(a) Aerial photography is black and white taken through a lens with 88 mm focal length

District	Run	Date	Altitude	Numbers
Warragul	3	18.4.67	25 000’	162-203 (190-198)
Warragul	4	18.4.67	25 000’	218-226 (218-226)
Warragul	5	27.4.67	25 000’	50-90 (80-86)
Warragul	6	3.5.67	25 000’	17-54 (48-50)

APPENDIX 2 – A BRIEF GLOSSARY OF TERMS USED IN THIS REPORT

A horizons – Surface mineral horizons which may be subdivided into an A1, A2 and A3 sub horizon (Northcote 1979).

B horizons – Subsurface horizons which generally show the strongest colours in the profile or a maximum concentration of clay. They may be subdivided into a B1, B2 and B3 sub-horizon (Northcote 1979).

Bleached horizons – Horizons or layers within the profile which are very much paler than adjacent layers.

Clay – A soil particle of diameter less than 0.002 mm.

Deep profiles – Those profiles greater than 100 cm deep.

Dispersion - The extent to which the clay from a soil particle will dissipate in a phial of distilled water when viewed over a ten minute period.

Duplex – A profile where soil textures (clay contents) increase quickly through a depth of less than 10 cm.

Factual Key – This is a coding developed by K H Northcote in 1960 from which a soil profile can be broadly described. The coding is based principally on the horizons or layers in each profile, their structure, their textural trend and colour.

Flood Risk – Flooding can be a problem on land with very low gradients and within confined drainage ways. Precise data is difficult to obtain on the frequency of flood events and the classes given here were determined by observations of land form, catchment geometry and soil types which reflect sediment deposition.

Flooding Class	**Estimated Return Period**
Nil	More than 100 years
Low	25 to 100 years
Moderate	5 to 25 years
High	1 to 5 years
Very high	Seasonal flooding

Horizon – A layer within a soil profile which exhibits particular properties of colour, structure, texture, different from those layers which occur below and/or above it.

Landslip Hazard – this is related to a slope and soil type. Deep permeable soils with low wet strengths are the most susceptible and risk increases with gradient. Evidence of past landslips is the main determinant of the degree of landslip hazard, however, it is difficult to predict an occurrence precisely. More detailed geo-technical investigations are needed to examine specific development proposals in the areas assessed as landslip prone.

The classes of landslip potential are:

Landslip Class	**Definition**
Ni	No evidence of landslips
Low	Some evidence of landslips, most probably old
Moderate	Evidence of slips fairly common
High	Obvious evidence of slips with signs of recent activity

Moderately Deep – A profile which is greater than 60 cm and less than 100 cm deep.

Mottle - Masses, blobs or blotches of subdominant colours which occur within a horizon. If profiles contain less than 10% mottling they are considered to be whole coloured. Mottles may indicate that the soil is subject to waterlogging.

Permeability Class – This is the rate at which water will move through the soil. It is often inferred from the features of structure, texture, shrink-swell properties, porosity, etc. This report highlights a five class rating.

Very good	(hydraulic conductivity of 1 m/day or greater)
Good	(hydraulic conductivity of 0.5-1 m/day)
Fair	(hydraulic conductivity of 0.2-0.5 m/day)
Poor	(hydraulic conductivity of 0.05-0.2 m/day)
Very poor	(hydraulic conductivity of 0.05 m/day or less)

Sand – A soil particle of diameter less than 2.0 mm but greater than silt size (0.02 mm diameter).

Shallow profiles – Those profiles less than 60 cm deep.

Shrink-Swell Potential – Shrink-swell potential or Linear Shrinkage is related to the amount of swelling clays present in a soil. Such clays swell on wetting and shrink when drying and can severely damage foundations and earthworks. The risk is largely independent of slope and is related to soil type.

Cass limits for shrink-swell potential are:

Shrink-swell Potential	**Linear Shrinkage**
Low	Less than 4%
Moderate	4% to 12%
High	12% to 20%
Very High	More than 20%

Silt – A soil particle of diameter less than 0.02 mm but greater than 0.002 mm diameter.

Site Drainage – The east with which water will leave a site after heavy rainfalls. It is largely determined by slope, surface cover, and soil infiltration rate:

- very rapid (Very large proportion of water runs off; very small proportion enters soil. Water runs off as fast as it is added. Soil usually have steep to very steep slopes and low infiltration rates)
- rapid (Large proportion of water runs off; small proportion enters soil. Water runs off nearly as fast as it is added. Soil have moderate to steep slopes and low infiltration rates.)
- moderate (Free water on surface for short periods only)
- slow (Free water on surface for significant periods. Sols either nearly level, gently sloping or relatively porous.)
- very slow – ponding (Free water on surface for long periods. Soils usually level or nearly so.)
- transmitting/collecting (Drainage lines, lakes or depression areas.)

Slaking – The extent to which a soil particle crumbles when placed in a phial of distilled water for ten minutes:

- none
- slow (few particles break away)
- moderate (steady fall of particles)
- rapid (quick destruction of soil ped)

Soil Drainage Class – This is related to soil type, gradient, rainfall and position in the landscape. Flatter areas and areas which receive runoff are more likely to have high water tables and drainage problems unless the soil is permeable at depth. Drainage problems on crests and areas which shed water will be less severe. Clayey subsoil in a profile may cause a perched water table by restricting downward percolation and waterlogging may occur for a limited period after heavy rain (see Waterlogging).

Soil Drainage Class	Definition
Well drained	Soils never waterlogged – no reductio in the profile. Usually bright permeable, whole coloured soils in freely draining locations.
Moderately well drained	Soil rarely waterlogged except at depth. Fairly bright coloured, moderate permeable with mottling deeper in the profile.
Imperfectly drained	Soils frequently waterlogged at depth – rarely at the surface. Duller coloured soils: often mottled B horizons
Poorly drained	Seasonally waterlogged, watertable often coming close to the surface. Pallid mottled, impermeable B horizons. Rootline oxidation in surface layers.
Very Poorly Drained	Permanently waterlogged or seasonally inundated soils. Grey colours, often with organic surface layers – marshy soils.

Structure – Concerned with the arrangement of soil particles and may be described in terms of three characteristics:

(1) Grade, expressing the degree and strength of soil aggregation, e.g. structureless, weak, moderate and strong
(2) Class, expressing size
(3) Form, expressing shape

Subsoil – The 'B' horizons or heavier texture clayey layers within the profile.

Surface Soil – The 'A' horizons in the profile.

Texture – This is the size distribution and grading of soil particles less than 2 mm. In Australia the grading relies on 19 textural grades (Northcote 1979).

USG – Unified Soil Group, often known as the Unified Soil Classification. Unified Soil Groups are an engineering soil classification based on soil texture and plasticity. They indicate the likely stability of soil for such activities as construction of foundations, roads and embankments. A summary of the classification is given below:

The symbols give the following information

Coarse textured	G	Gravel	W	Well graded range of coarse particles – few or no fines
	C	Sand	C	Well graded with excellent clay binder
			M	Poorly graded coarse particle/clay mixtures
			P	Poorly graded – few or no fines
Fine textured	M	Silt		
	C	Clay	H	High liquid limit
	O	Organic	L	Low liquid limit
	Pt	Peat		

Waterlogging Class – Defined upon the presence of a seasonal water table. This phenomenon occurs in areas low in the landscape and where an impermeable soil layer impedes the downward movement of water. Waterlogging classes were determined by observation of depth to water table in saturated soils and by inferences drawn from profile characteristics in soils which were dry when inspected.

Waterlogging classes	**Definition**
Nil	Water table drops below 1 m within 24 hours after heavy rain
Temporarily ponded	Local areas of minor ponding persists for several days after rain – little, if any inhibition of plant growth
Temporarily waterlogged	Water table perches on an impermeable soil layer causing waterlogging which may persists for a week or so after heavy rain. Plant growth may be inhibited to a limited extent.
Seasonally waterlogged	Water table within pasture root zone for about one month after heavy rain. Surface ponding common. Plant growth may be inhibited to some extent
Water table seasonally at surface	Water at soil surface for several months during winter. Plant growth is inhibited.

REFERENCE ASSOCIATED WITH GLOSSARY

Northcote K H (1979). 'A Factual Key for the Recognition of Australian Soils.' 4 Ed. Rellim Technical Publications, Glenside SA, CSIRO Aust, ISBN 0 9599989 O X

APPENDIX 3 – LAND CAPABILITY TABLES UPON WHICH ASSESSMENT WAS MADE

LAND CAPABILITY TABLES UPON WHICH ASSESSMENT WAS MADE

LAND CAPABILITY RATING FOR SECONDARY ROADS: Areas capable of being used for the construction of roads with sealed surfaces for light vehicles and with drainage and kerbing. It is assumed that commonly used earthmoving equipment is available.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	Less than 4%	4% to 8%	8% to 12%	12% to 25%	More than 25%
FLOODING (2)	None	—	—	Less than once in 10 years	More than once in 10 years
BOULDERS (Fragments over 250mm on surface) (3)	Less than 0.1%	0.1% to 0.5%	0.5% to 5%	5% to 30%	More than 30%
ROCK OUTCROP (3)	Less than 0.5%	0.05% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
SITE DRAINAGE (4)	Excessively well drained, Well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
SHRINK-SWELL POTENTIAL (5)	Less than 4%	4% to 12%	12% to 20%	More than 20%	—
DEPTH TO SEASONAL WATER TABLE	More than 150cm	90cm to 150cm	60cm to 90cm	30cm to 60 cm	Less than 30 cm
UNIFIED SOIL GROUP (SUB SURFACE) (6)	GP, GW, SW, GC	SM, SC, GM	SP, CL, CH, MH, ML	OL, OH	Pt
DEPTH TO HARD ROCK (7)	More than 100cm	75cm to 100cm	40cm to 75cm	15cm to 40cm	Less than 15cm
STONES (Fragments 75mm to 250mm in upper 50cm of soil profile)	Less than 10%	10% to 20%	20% to 40%	40% to 70%	More than 70%

LAND CAPABILITY RATING FOR ON-SITE SEPTIC TANK EFFLUENT DISPOSAL — Areas capable of being used for on-site soil absorption of all-waste septic tank effluent from a single family dwelling.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	0 to 5%	5% to 8%	8% to 15%	15% to 30%	More than 30%
FLOODING (2)	None	—	—	Less than once in 25 years	More than once in 25 years
BOULDERS (Fragments over 250mm on surface) (3)	Less than 0.02%	0.02% to 0.2%	0.2% to 2%	2% to 10%	More than 10%
ROCK OUTCROP (3)	Less than 0.01%	0.01% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
SITE DRAINAGE (4)	Excessively well drained, Well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
SHRINK-SWELL POTENTIAL (5)	Less than 4%	4% to 12%	12% to 20%	More than 20%	—
DEPTH TO SEASONAL WATER TABLE	More than 150cm	120cm to 150cm	90cm to 120cm	60cm to 90 cm	Less than 60 cm
DEPTH TO ROCK OR IMPERVIOUS LAYER (7)	More than 200cm	150cm to 200cm	100cm to 150cm	75cm to 100cm	Less than 75cm
STONES (Fragments 75mm to 250mm in soil profile)	Less than 2%	2% to 10%	10% to 30%	30% to 60%	More than 60%
PERMEABILITY (8)	Faster than 1.0m/day	1.0m/day to 0.3m/day	0.3m/day to 0.1m/day	0.1m/day to 0.02m/day	Slower than 0.02m/day
GRAVEL (Fragments 2mm to 75mm in soil profile)	Less than 5%	5% to 20%	20% to 40%	40% to 75%	More than 75%

LAND CAPABILITY RATING FOR BUILDING FOUNDATIONS (Slab Construction): Areas capable of being used for the construction of structures with one or two storeys. It is assumed that commonly used earth moving equipment is available. The table considers factors which affect both construction and the capability of the immediate site for activities closely related to dwellings. Effluent disposal, ease of servicing and access are considered separately.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	Less than 2%	2% to 5%	5% to 10%	10% to 25%	More than 25%
FLOODING (2)	None	—	—	Less than once in 100 years	More than once in 100 years
BOULDERS (Fragments over 250mm on surface) (3)	Less than 0.2%	0.2% to 1%	1% to 10%	More than 10%	
ROCK OUTCROP (3)	Less than 0.05%	0.05% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
SITE DRAINAGE (4)	Excessively well drained. Well drained.	Moderately Well drained	Imperfectly drained	Poorly drained	Very poorly drained
SHRINK-SWELL POTENTIAL (5)	Less than 12%	12% to 20%	More than 20%	—	—
DEPTH TO SEASONAL WATER TABLE	Deeper than 120cm	80cm to 120cm	50cm to 80cm	30cm to 50cm	Shallower than 30cm
UNIFIED SOIL GROUP (SUB-SURFACE) (6)	GW, SW, GP, GM, SP, SC, SM, GC	CL, CH, MH	ML, OL	OH	Pt
DEPTH TO HARD ROCK (7)	More than 120cm	80cm to 120cm	30cm to 80cm	Less 30cm	—
STONES (Fragments 75 to 250mm in soil profile)	Less than 10%	10% to 20%	20% to 40%	More than 40%	—

LAND CAPABILITY RATING FOR EARTHEN DAMS — Areas capable of being used for the construction of small water storages with earthen embankments.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	2% to 5%	5% to 10%	0-2% or 10-15%	15% to 20%	More than 20%
FLOODING (2)	None	—	—	Less than once in 25 years	More than once in 25 years
BOULDERS (Fragments over 250mm on surface) (3)	Less than 0.05%	0.05% to 0.1%	0.1% to 1%	1% to 5%	More than 5%
ROCK OUTCROP (3)	Less than 0.02%	0.02% to 0.05%	0.05% to 0.5%	0.5% to 2%	More than 2%
SHRINK-SWELL POTENTIAL (5)	Less than 4%	4% to 12%	12% to 20%	More than 20%	—
UNIFIED SOIL GROUP (SUB SURFACE) (6)	GC, GM, SC	SM, CL (PI < 15)	CL (PI > 15) ML, CH	OL, MH, OH	SP, SW, GP, GW, Pt
DEPTH TO HARD ROCK (7)	More than 300cm	200cm to 300cm	150cm to 200cm	80cm to 150cm	Less than 80cm
STONES (Fragments 75mm to 250mm in construction material)	Less than 5%	5% to 20%	20% to 50%	50% to 75%	More than 75%
PERMEABILITY (8)	Slower than 0.1 l/m² day	0.1 to 1 l/m² day	1 to 5 l/m² day	5 to 10 l/m² day	Faster than 10 l/m² day
DISPERSIBLE CLAY (9)	2% to 6%	6% to 10%	10% to 16%	More than 16% or less than 2%	
DEPTH OF TOPSOIL (10)	10cm to 25cm	25cm to 50cm	50cm to 100cm 0 to 10cm	100cm to 200cm	More than 200cm
THICKNESS OF CONSTRUCTION MATERIAL	More than 200cm	100cm to 200cm	75cm to 100cm	30cm to 75cm	Less than 30cm

LAND CAPABILITY FOR SHALLOW EXCAVATIONS: Areas capable of being used for excavations for level construction sites and for trenches to a depth of 2 metres. It is assumed that commonly used earthmoving equipment is available.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	Less than 2%	2% to 5%	5% to 10%	10% to 25%	More than 25%
FLOODING (2)	None	—	—	Less than once in 10 years	More than once in 10 years
BOULDERS (Fragments over 250mm on surface) (3)	Less than 0.1%	0.1% to 1%	1% to 5%	5% to 30%	More than 30%
ROCK OUTCROP (3)	Less than 0.05%	0.05% to 0.1%	0.1% to 0.2%	0.2% to 1%	More than 1%
SITE DRAINAGE (4)	Excessively well drained, Well drained	Moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained
DEPTH TO SEASONAL WATER TABLE	Deeper than 200cm	150cm to 200cm	120cm to 150cm	90cm to 120cm	Shallower than 90cm
UNIFIED SOIL GROUP (SUB SURFACE) (6)	CL(PI<15), GC, GM, SC	ML, SM CL(PI>15),OL	GW, SW	GP, SP, CH, OH	Pt
DEPTH TO HARD ROCK (7)	More than 200cm	150cm to 200cm	120cm to 150cm	80cm to 120cm	Less than 80cm
STONES (Fragments 75mm to 250mm in upper 50cm of soil profile)	Less than 10%	10% to 20%	20% to 40%	40% to 70%	More than 70%

LAND CAPABILITY FOR GRAZING: Grazing cattle (including dairy cattle) and sheep, on largely unimproved pastures which may include volunteer improved grass and clover species, both annual and perennials: occasional topdressing with superphosphates: fencing for stock control: control of rabbits by 1080 poisoning, (Rainfall Zone 750 mm p.a.)

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	less than 10%	10% to 19%	20% to 34%	35% to 50%	more than 50%
ASPECT	ENE	SE NW W	N SW S	—	—
SOIL GROUP (Northcote p.p.f.)	Gradational soils; Um soils	Duplex soils with A horizon thickness 15-60 cm	Other duplex soils: Uf, Ug soils: Uc soils with impeding layer within 100 cm	Uc soils with no impeding layer within 100 cm	
DEPTH TO HARDROCK (7)	more than 100 cm	60-100 cm	30-60 cm	10-30 cm	less than 10 cm
SITE DRAINAGE (4)	Well drained	Moderately or excessively well drained	Imperfectly or poorly drained	Very poorly drained	
ROCK OUTCROP (3)	2%	2-14%	15-24%	25-40%	more than 40%

NOTES

(1) **Slope**: Downgrade by one class in slope failure hazard areas.

(2) **Flooding**: Upgrade by one class if flood are low velocity, shallow and easily diverted with banks. For septic tanks and building foundations make no such alteration.

(3) Boulders and Rock Outcrop:

0.02% is 1m^2 per 5000 m^2
0.05% is 1m^2 per 2000 m^2
0.1% is 1m^2 per 1000 m^2
0.5% is 1m^2 per 200 m^2
1% is 1m^2 per 100 m^2
2% is 1m^2 per 50 m^2
5% is 1m^2 per 20 m^2

(4) **Site Drainage:** For secondary roads up grade by one class if construction is carried out when conditions are dry.

(5) **Shrink-swell Potential:** Determined for material to be used for bank construction

(6) **Unified Soil Group:** This is determined at the sides and base of excavation. Topsoil is ignored.

(7) **Depth to Hardrock:** Material which cannot be excavated by normal earthmoving equipment.

(8) **Permeability:** This test is carried out in material at the expected depth of the base of the excavation. A rate of 10 l/m^2 day is approximately 0.5 cm drop in head per hour in a 5 cm diameter test hole after thorough wetting. Values are based upon determination of hydraulic conductivity, "K". Where K exceeds 6.0 m/day, risk of polluting water bodies must be considered.

(9) **Dispersible Clay:** Determined for material to be used for bank construction.

(10)**Depth of Topsoil**: Material to be stockpiled for re-spreading.