SECTION 3 - APPENDICES

Appendix 1 – Glossary of Terms

Alluvial Plain (AP): A level plain that borders a stream and is subject to flooding; also referred to as a flood plain.

Alluvium: Material such as sand, silt or clay deposited on land from flowing water.

Aplite: A light-coloured igneous rock with a fine, even-grained texture, free from dark minerals, usually found as dykes.

Attenberg Limits: In a sediment, the water-content boundaries between the semi-liquid and plastic states (known as the liquid limit) and between the plastic and semi-solid state (known as the plastic limit).

Basalt: Dark-coloured, fine-grained extrusive igneous rock.

Bedrock: A general term for the rock, usually solid, that underlies oil or other unconsolidated, superficial material.

Biotite: An important rock-forming mineral of the mica group.

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

Calcareous: Implies that a considerable percentage (up to 50%) of the rock is calcium carbonate.

Chert: A hard, extremely dense, indistinctly crystalline sedimentary rock consisting predominantly of silica. Flint is essentially synonymous.

Clay: As a soil: mineral particles in the soil, having a diameter less than 0.002 mm. As a soil texture class: soil material that is 40% or more clay, less than 45% sand, and less than 40% silt.

Coarse Textured (Light Textured) Soil: Sand or loamy sand.

Colluvium: A deposit of rock fragments and soil material accumulated near the base of slopes as a result of gravitational action.

Concretion: A local concentration of a chemical compound, such as calcium carbonate or iron oxide, in the form of a grain or nodule of varying size, shape, hardness and colour.

Covered Plain (CP): A flat flood plain incorporating slow migrating deep alluvial channels.

Crests (Cr): Smooth, rocky and gravelly convex to essentially flat crests which stand above all other terrain elements. Surface character generally dictated by geology and individual slopes.

Dispersibility: The dissociation of clay particles from a soil sample immersed in water.

Dissected Terrain (DT): A complex topographic unit comprising of escarpments, precipitous slopes, steep slopes, moderate slopes, dissected hills, and incised drainage courses.

Drainage Complex (DC): Broad complexes of smooth concave or rocky incised drainage lines. Depending upon position or geology these topographic units may be linear or meandering.

Drainage Line: The course or channel of a clearly defined stream in a drainage complex.

Dunes (D): A single or complex of moderately inclined to very steep sand ridges (or hillock) built up by the wind.

Duplex Soil: A soil in which there is a sudden change in texture in the profile.

Erosion: The weathering away of the land surface by running water, wind, ice and other agents such as gravitational creep.

Factual Key: An alpha-numeric coding designated to a profile to distinguish it from other soil forms.

Fan (F): A large gently inclined to level landform with radial slope lines inclined away from a point, resulting from aggrading by channelled often braided stream flow. Found on the moderately steep terrain.

Ferruginous: Pertaining to or containing iron. Refers to a rock having a rust colour due to the presence of ferric oxide.

Fine Textured (Heavy Textured) Soil: Sandy clay, silty clay and clay.

Flat Plain (FP): A large non-sloping, level land form which lacks any associated land form elements, however minor stream channels may occur.

Flooding: The temporary covering of soil with water from over flowing streams and runoff from adjacent slopes.

Flood Risk: Precise data is difficult to obtain on the frequency of flood events and the classes given here were determined by observations on landform, catchment geometry and soil types which reflect recent sediment deposition.

Flood 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

Foot Hills (FH): Lower slopes which form finger-like projections off mountainous and hilly terrain. They are typically smooth and rounded with gentle gradients of less than 15%.

Foot Slopes (FS): Moderate to very gently inclined smooth waning slopes off hilly and mountainous terrain. The units are essentially formed from erosional creep. Gradients are usually less than 10% typically less than 5%.

General Descriptions: A brief statement given to indicate the predominant conditions which characterise each map unit.

Gentle Slopes (GS): Sloping terrain with gradients ranging from 3% - 10%. Generally, flat non-undulating areas which may be smooth or rocky depending upon geology in specific areas.

Gradational Soil: A soil in which there is a gradual change in texture down through the soil profile.

Granodiorite: Similar in appearance to a granite, but contains more plagioclase feldspar at the expense of alkali feldspar.

Granite: A light-coloured plutonic rock in which quartz constitutes 20 to 60% of the light-coloured minerals and in which the ratio of alkali feldspar to total feldspar is between 35 and 90%.

Gravel: Rounded or angular fragments of rock ranging from 2 mm to 75 mm in diameter.

Graywacke: A dark coarse-grained sandstone of poorly sorted fragments of quartz and feldspar plus finer-grained material. Thinner layers show marked graded bedding. It generally requires an environment in which erosion, transportation, deposition and burial are so rapid that complete chemical weathering does not occur, as in an orogenic belt, where sediments derived from recently elevated source areas were “poured” into a geosyncline.

Greenstone: Basic igneous rock, predominantly lavas.

Gully Erosion: Erosion of soil or soft rock material by running water that forms distinct channels that are larger and deeper than rills and that usually carry water only during and immediately after heavy rain.

High Rise (HR): Smooth rounded isolated high rises in flat or undulating terrain with relative relief up to 20 m and sideslopes to 10%.

Hills (H): Isolated high element with gently inclined to precipitous slopes. Relief is from 90 – 300 m, typically 100 m. Units are continually being eroded by colluvial wash. Typical associated elements include crests, moderate slopes, foot slopes and fans.

Igneous: A rock or mineral that has solidified from molten material. 'Igneous' rocks constitute one of the three main classes into which rocks are grouped (that is, igneous, metamorphic, sedimentary).

Infiltration: The downward entry of water into the soil.

Lacustrine: Pertaining to, produced by, or formed in a lake.

Land Component: Is an area of land, distinct from surrounding terrain, having an integrated assemblage of particular classes of geological material landform, soil and native vegetation.

Lava: A general term for a molten extrusive – also for the rock that is solidified from it.

Leaching: The removal of soluble material from the soil by water percolation.

Levees (L): Long low smooth ridge, like topography immediately adjacent to a stream or river, having been built up by over-bank flow.

Light Texture Soil: Sand and loamy sand.

Liquid Limit: See under Attenberg Limits.

Loam: Soil material that is 7 to 27% clay particles, 28 to 50% silt particles and less than 52% sand particles.

Low Hills (LH): Low (rounded) hills rising to a relative relief of 50 m with gentle to moderately inclined smooth slopes. These topographic units incorporate crests, slopes and minor drainage courses. Side slopes to 8%.

Low Rise (LR): Smooth rounded isolated low rises in flat or undulating terrain with relative relief up to 9 m and sideslopes with gradients of 2 – 3%.

Lunette (Lu): An elongated, gently curved, low ridge built up by wind on the margin of a lake or depression. Slopes towards the lake are steeper than those of the outer slope.

Map Unit: The name and mapping symbol shown for each recognised type of land.

Metamorphic Rock: Rock of any origin altered by heat and pressure from an intrusive flow (below the zone of weathering), in mineralogical composition, chemical composition or structure.

Moderate Slopes (MS): Smooth or rocky slopes which typically show slope gradients from 10-30%. Units with this land form are practically situated above foot slopes and foot hills but below the crests.

Mottling, Soil: Irregular spots of different colours that vary in number and size. Mottling generally indicates poor aeration and impeded drainage.

Open Depressions (OD): Low smooth open drainage depressions with very gentle side slopes and flat (often sandy) floors. Some very minor incised drainage courses may occur.

Ped: An individual natural soil aggregate.

Peneplain (PP): A level to gently undulating land form pattern with very low relief and sparse slowly migrating non directional stream channels.

Permeability: The ease with which liquids pass through a soil or layer of soil. Since different soil horizons vary in permeability, the particular horizon under question is often designated.

Permeability Class: This indicates the ability of a soil to absorb and transmit water. There are often large variations in permeability within a map unit. The classes quoted are the most commonly recorded values as determined by maintaining a constant head at 20 cm in a saturated 5 cm diameter auger hole 50 cm deep.

Permeability Class	Approx. Percolation Rate
Very good	> 1.0 m/day
Good	1.0 to 0.5 m/day
Fair	0.5 to 0.2 m/day
Poor	0.2 to 0.05 m/day
Very poor	<0.05 m/day

pH, Soil: A measure of the acidity or alkalinity of the soil expressed as the negative logarithm of the hydrogen-ion activity of a soil. A pH of 7.0 is neutral, higher values indicate increasing alkalinity and lower values indicate increasing acidity.

Photo-Interpretation: The art of identifying and describing objects imaged on a photograph.

Plain: Any flat area, large or small, having few if any prominent surface irregularities.

Porphyritic: Pertaining to the texture of an igneous rock in which larger crystals (phenocrysts) are set in finer groundmass.

Profile, Soil: A vertical section of the soil extending through all its horizons and into the parent material.

Pyroclastic: Pertaining to a rock composed of broken fragments derived from a pre-existing rock by volcanic explosion or aerial explosion from a volcanic vent.

Rhyolite: A group of extrusive igneous rocks generally porphyritic and exhibiting flow textures (bands) with phenocrysts or quartz and alkali feldspar in a glassy groundmass; the extrusive equivalent of granite.

Sand: As soil particles with a diameter range of 0.02 – 2 mm. As a soil textural class: Soil material containing 85% or more of sand.

Salting: Harmful accumulation of salts in the soil.

Seasonal Water Table: Is the depth at which water persists for substantial periods of the year and where soil aeration is adversely affected by waterlogging.

Sedimentary Rock: A rock resulting from the consolidation of loose sediment deposited from suspension or precipitated from solution.

Self Mulching Soil: A soil in which the surface layer becomes so well aggregated that it does not crust and seal under the impact of rain, but instead serves as a surface mulch upon drying.

Shrink-Swell Potential: Shrink-swell potential or Linear Shrinkage is related to the amount of swelling clays that are present in a soil. Class 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: As a soil: mineral particles having a diameter in the range of 0.002 – 0.02 mm. As a soil textural class of soil material, containing 8% or more of silt.

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 potion of water runs off; very small portion enter soil. Water runs off as it is added. Soils 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. Soils either nearly level, gentle 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).

Slope: The inclination of the land surface from the horizon.

Soil: The unconsolidated material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

Soil Drainage Class: This is related to soil type, gradient, rainfall and position in the landscape.

Soil Drainage Class	Definition
Well Drained	Soils never waterlogged – no reduction in the profile. Usually bright, whole coloured soils in freely draining locations.
Moderate Well Drained	Soils 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 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

Soil Horizon: A layer of soil approximately parallel to the surface having distinct characteristics produced by soil forming processes.

Mineral horizons consisting of:

(i) horizons of organic matter accumulation formed or forming at or adjacent to the surface.
(ii) concentration of quartz or other resistant mines of sand or silt size; or
(iii) horizons dominated by (i) or (ii) above but transitional to an underlying B or C horizon.

A2. **Mineral horizons** in which the feature emphasised is loss of clay, iron, or aluminium, with resultant concentration of quartz or other resistant minerals in sand and silt sizes.

B. **Mineral horizons** in which the dominant feature or features is one or more of the following:

(i) an alluvial concentration of silicate clay, iron, aluminium, or humus, alone or in combination;
(ii) a residual concentration of sesquioxides or silicate clays, alone or mixed, that has formed by means other than solution and removal of carbonates or more soluble salts;
(iii) coating of sesquioxides adequate to give conspicuously darker, stronger or redder colours than overlying and underlying horizons.

(C) **Mineral horizon or layer**, excluding bedrock, that is either like or unlike the material from which the solum is presumed to have formed, relatively little affect by pedogenic processes, and lacking properties diagnostic of A or B but including material modified by:

(i) weather outside the zone of major biological activity;
(ii) reversible cementation, development of brittleness, development of high bulk density and other properties characteristic of fragipans;
(iii) gleying;
(iv) accumulation of calcium or magnesium carbonate or more soluble salts;
(v) cementation by accumulation of calcium or magnesium carbonate or more soluble salts;
(vi) cementation by alkali-soluble siliceous material or by iron and silica.

Soil 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, structureless (weak, moderate and strong).
(2) Class, expressing size.
(3) Form, expressing shape.

Soil Texture: The relative proportion of sand, silt and clay particles in a mass of soil.

Solum: The upper and most weathered part of the soil profile; the A and B horizons.

Steel Slopes (SS): Very steep to precipitous slopes with gradients of >30%. Generally the areas are rocky and stoney and exhibit various degrees of colluvial creep. Escarpments are included in this topographic class.

Swamps (S): An almost level closed depression which is commonly permanently waterlogged. Landforms are aggraded by wash from adjacent terrain.

Topography: Shape and steepness of landform within each map unit.

Undulating Hills (UH): A series of low hills which are not distinct units. They incorporate saddle elements tying individual hill crests. Units include drainage courses, minor fans, moderate slopes and foot slopes.

Undulating Low Hills (ULH): A complex and continuum of Low Hills with smooth rounded cross sections incorporating narrow drainage courses.

Undulating Terrain (UT): Smooth, wavy low rolling terrain comprising very low rounded crests, very gentle slopes and narrow drainage courses.

Unified Soil Group: 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.

Group Symbol	Typical Names
GW	Well graded gravel, gravel and sand mixtures, little or no fines (less than 5%)
GP	Poorly graded gravel, gravel and sand mixtures, little or no fines (less than 5%)
GM	Silty gravel, gravel, sand and silt mixtures.

Group Symbol	Typical Names
GC	Clayey gravel, gravel, sand and clay mixtures.
SW	Well graded sands, gravelly sands with little or no fines (less than 5%)
SP	Poorly graded sands, gravelly sands with little or no fines (less than 5%)
SM	Silty sands, sand and silt mixtures
SC	Clayey sands, sand and clay mixtures
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays, low liquid limit
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
CH	Inorganic clays of medium to high plasticity, organic silts
PT	Peat and other highly organic soils.

Uniform Soil: A soil in which the texture is much the same all the way down through the profile.

Very Gentle Slopes (VGS): Sloping terrain with gradients ranging from 1 – 3%. Generally part of a continuum into steeper gradient slopes. Similar in relief to the Gentle Slopes.

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 persist 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.

Appendix 2 – Land Capability Tables upon which assessment was made

LAND CAPABILITY FOR THE EROSION RISK ASSOCIATED WITH CROPPING: Areas capable of being used for production of crops such as wheat, oats and barley. It is assumed that commonly used management techniques will be applied, including adequate fertilization and clean cultivation for weed controls.

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	Less than 3%	3% to 5%	5% to 8%	8% to 12%	More than 12%
FLOODING (2)	None	5-10 times in 100 years	10-20 times in 100 years	20-100 tines in 100 years	More than once in 1 year
BOULDERS (Fragments over 250 mm on surface) (3)	None	Less than 0.01%	0.01% to 0.05%	0.05% to 1%	More than 1%
ROCK OUTCROP (3)	None	Less than 0.01%	0.01% to 0.05%	0.05% to 1%	More than 1%
SITE DRAINAGE (4)	Well drained	Moderately well drained	Imperfectly drained, Excessively well drained	Poorly drained	Very poorly drained
DEPTH TO SEASONAL WATER TABLE	More than 30 cm	25 to 30 cm	20 to 25 cm	15 to 20 cm	Less than 15 cm
DEPTH TO HARD ROCK (7)	More than 60 cm	50 to 60 cm	40 to 50 cm	30 to 40 cm	Less than 30 cm
STONES (Fragments 75 mm to 250 mm in soil profile)	Less than 1%	1% to 5%	5% to 10%	10% to 25%	More than 25%
GRAVEL (Fragments 2 mm to 75 mm in soil profile)	Less than 1%	1% to 5%	5% to 10%	10% to 25%	More than 25%
DEPTH OF TOPSOIL (10)	More than 20 cm	10 to 20 cm	8 to 10 cm	5 to 8 cm	Less then 5 cm
TOPSOIL TEXTURE (11)	SL L ORG-L	LS CL LFS	ORG-C C LC MC S	-	-

LAND CAPABILITY FOR THE EROSION RISK ASSOCIATED WITH GRAZING: Grazing 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 500 – 750 mm pa).

LAND FEATURES AFFECTING USE	CAPABILITY CLASS				
	1	2	3	4	5
SLOPE (1)	Less than 10%	10% to 20%	20% to 30%	30% to 45%	More than 45%
FLOODING (2)	None	-	-	-	More than once in 1 year
BOULDERS (Fragments over 250 mm on surface) (3)	Less than 2%	2% to 15%	15% to 25%	25% to 40%	More than 40%
ROCK OUTCROP (3)	Less than 2%	2% to 15%	15% to 25%	25% to 40%	More than 40%
SITE DRAINAGE (4)	Well drained, moderately well drained	Imperfectly drained	Excessively well drained, poorly drained	Very poorly drained	-
DEPTH TO HARD ROCK (7)	More than 100 cm	60 to 100 cm	30 to 60 cm	15 to 30 cm	Less than 15 cm
DEPTH OF TOPSOIL (10)	More than 15 cm	10 to 15 cm	8 to 10 cm	5 to 8 cm	Less than 5 cm
TOPSOIL TEXTURE (11)	L SL CL FSL ORG-L	SCL LS LFS	C LC MC ORG-C	-	S
Gravel (Fragments 2 mm to 75 mm in soil profile)	Less than 5%	5 to 10%	10 to 20%	20 to 40%	More than 40%

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 then 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 250 mm 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 0.05%	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 4%	4 to 12%	12 to 20%	More than 20%	-
DEPTH TO SEASONAL WATER TABLE	More than 150 cm	90 to 150 cm	60 to 90 cm	30 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 100 cm	75 to 100 cm	40 to 75 cm	15 to 40 cm	Less than 15 cm
STONES (Fragments 75 mm to 250 mm in upper 50 cm 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 250 mm 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 150 cm	120 to 150 cm	90 to 120 cm	80 to 90 cm	Less than 80 cm
DEPTH TO ROCK OR IMPERVIOUS LAYER (7)	More than 200 cm	150 to 200 cm	100 to 150 cm	75 to 100 cm	Less than 75 cm
STONES (Fragments 75 mm to 250 mm in upper 50 cm of soil profile)	Less than 2%	2 to 10%	10 to 30%	30 to 60%	More than 60%
PERMEABILITY (8)	Faster than 1.0 m/day	1.0 to 0.3 m/day	0.3 to 0.1 m/day	0.1 to 0.02 m/day	Slower than 0.02 m/day
GRAVEL (Fragments 2 mm to 75 mm 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 earthmoving 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 to10%	10 to 25%	More than 25%
FLOODING (2)	None	-	-	Less than once in 100 years	More than once in 100 years
BOULDERS (Fragments over 250 mm 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, 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 120 cm	80 to 120 cm	50 to 80 cm	30 to 50 cm	Shallower than 30 cm
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 120 cm	80 to 120 cm	30 to 80 cm	Less than 30 cm	-
STONES (Fragments 75 mm to 250 mm in upper 50 cm of 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 250 mm 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 300 cm	200 to 300 cm	150 to 200 cm	80 to 150 cm	Less than 80 cm
STONES (Fragments 75 mm to 250 mm in upper 50 cm of soil profile)	Less than 5%	5 to 20%	20 to 50%	50 to 75%	More than 75%
PERMEABILITY (8)	Slower than 0.1 l/m^2 day	0.1 to 1 l/m^2 day	1 to 5 l/m^2 day	5 to 10 l/m^2 day	Faster than 10 l/m^2 day
DISPERSIBLE CLAY (9)	2 to 6%	6 to 10%	10 to 16%	More than 16% or less than 2%	-
DEPTH OF TOPSOIL (10)	10 to 25 cm	25 to 50 cm	50 to 100 cm 0 to 10 cm	100 to 200 cm	More than 200 cm
THICKNELL OF CONSTRUCTION MATERIAL	More than 200 cm	100 to 200 cm	75 to 200 cm	30 to 75 cm	Less than 30 cm

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 250 mm 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 200 cm	150 to 200 cm	120 to 150 cm	90 to 120 cm	Shallower than 90 cm
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 200 cm	150 to 200 cm	120 to 150 cm	80 to 120 cm	Less than 80 cm
STONES (Fragments 75 mm to 250 mm in upper 50 cm of soil profile)	Less than 10%	10 to 20%	20 to 40%	40 to 70%	More than 70%

NOTES

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

(2) FLOODING: Upgrade by one class if floods 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 1 m^2 per 5 000 m^2
0.05% is 1 m^2 per 2 000 m^2
0.1% is 1 m^2 per 1 000 m^2
0.5% is 1 m^2 per 200 m^2
1% is 1 m^2 per 100 m^2
2% is 1 m^2 per 50 m^2
5% is 1 m^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 earth-moving 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 60 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.

(11) TOPSOIL TEXTURE: Symbols as those used in; Northcote, K.H. (1979). "A Factual Key for the Recognition of Australian Soils". 4th Edn. Rellim Tech. Publ. Glenside, SA.

SYMBOLS USED IN LAND CAPABILITY ASSESSMENT: Symbols are used in conjunction with the "Capability Class" so as to identify the "Land Features" which limit the considered land use.

Land Characteristics	Land Features	Symbols
SOIL CHARACTERISTICS		
	Stones and/or gravel	Ss
	Unified soil group	Su
	Soil reaction	Sa
	Shrink-swell potential	Sl
	Dispersible clays	Sd
	Soluble salts	Sn
	Soil texture	St
	Organic matter	So
DETH OF MATERIAL		
	Depth to hard rock	Dr
	Overburden depth	Do
	Deposit thickness	Dd
	Soil depth	Ds
WETNESS OR DRAINAGE	Soil profile permeability	Wp
	Depth to watertable	Wg
	Site drainage	Wd
SLOPE		G
LANDSLIP HAZARD		L
FLOODING		
	Flash floods	Ff
	Inundation	Fi
ROCKINESS		
	Rock outcrop	Ro
	Boulders	Rb

Appendix 3 – Photography and Maps used

Photos used in Aerial Photographic Interpretation

Area	Run No.	Photo Nos	Year	Scale
Ballarat	1	398 to 408	1979	1:82,500
Ballarat	2	438 to 450	1979	1:82,500
Ballarat	3	458 to 470	1979	1:82,500
Hamilton	2	20 to 34	1965	1:86,000
Hamilton	3	242 to 252	1966	1:86,000
Hamilton	4	134 to 148	1966	1:86,000
Horsham	7	96 to 100	1963	1:86,000
Horsham	8	22 to 40	1963	1:86,000
St Arnaud	8	198 to 214	1964	1:86,000

Aerial photographs were obtained from the Commonwealth Division of National Mapping, Belconnen, ACT, through Air Photographs Pty Ltd, Auburn, Vic.

Geology Maps used:

Ballarat	(1973)	1:250,000	Sheet number SJ 54-8
Hamilton	(1971)	1:250,000	Sheet number SJ 54-7
Horsham	(1974)	1:250,000	Sheet number SJ 54-3
St Arnaud	(1976)	1:250,000	Sheet number SJ 54-4

Maps supplied by Department of Minerals and Energy, Melbourne, Vic.

Topography Maps used:

Ararat	(1970)	1:100,000	Sheet number 7423 Series R652
Balmoral	(1969)	1:100,000	Sheet number 7223 Series R652
Beaufort	(1981)	1:100,000	Sheet number 7523 Series R652
Grampians	(1983)	1:100,000	Sheet number 7323 Series R652
Horsham	(1976)	1:100,000	Sheet number 7324 Series R652
Natimuk	(1979)	1:100,000	Sheet number 7224 Series R652
Rupanyup	(1976)	1:100,000	Sheet number 7424 Series R652
St Arnaud	(1977)	1:100,000	Sheet number 7524 Series R652

Topography maps were supplied by Department of Conservation, Forests and Lands, Melbourne, Vic.