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INTERPRETATIONS OF THE ATLAS OF AUSTRALIAN SOILS

Consulting Report to the Environmental Resources Information Network (ERIN)

N. McKenzie and John Hook

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INTRODUCTION

The Environmental Resources Information Network (ERIN) contracted the CSIRO Division to provide interpretations of soil types found in the Atlas of Australian Soils. The Division of Soils agreed to undertake the following tasks.

1. Ensure the consistency of soil type descriptions as supplied by the ERIN Unit (derived from the Atlas of Australian Soils Explanatory Notes).

2. Interpret the dominant soil attributes for each Principal Profile Form (PPF) specified in the Atlas of Australian Soils Explanatory Notes and provide estimates of:

- profile permeability;
- profile water holding capacity;
- soil texture profile;
- soil reaction trend (pH);
- gross nutrient status; and
- soil depth

3. Provide broad estimates of the reliability (mean and range) of the interpretations for each polygon.

4. Provide for each soil landscape unit, digital tables of the data in an interchange format agreed between ERIN and CSIRO Division of Soils (e.g. Ingres or Oracle running under Unix).

METHOD

The Atlas of Australian Soils Explanatory Notes provide descriptions of soils for the 3,060 map units defined by the legend of the Atlas Map. Soils are described using the Factual Key of Northcote (1979) at several levels. Most of the 725 profile classes are at the level of Principal Profile Form although a substantial number are at a more generalized level (e.g. Class, Section, Subdivision and in some instances, Division). Fewer interpretations can be made at the more generalized levels. The rating system used for estimating permeability, profile available water capacity, soil texture profile, soil reaction trend, nutrient status and depth for each taxonomic class is presented in Table 1.

In many cases, the taxonomic distinctions made by the Factual Key do not provide a reasonable basis for interpretation. For example, many of the Uc soils vary in depth from less than 0.5m to greater than 1.5m. Interpretations for Depth and Profile Water Holding Capacity are not therefore possible (the latter is strongly determined by depth). A missing value has been recorded wherever reasonable interpretations cannot be made. A missing value has also been recorded when there was insufficient information.
The primary sources of information for the ratings were Northcote *et al.* (1975) and Stace *et al.* (1968). Interpretations of permeability and profile water holding capacity have drawn from Williams (1983), Talsma (unpub. 1980), Talsma (1983), Talsma and Hallam (1981). The ratings for each of the taxa used in the Atlas of Australian Soils Explanatory Notes are presented in Appendix One.

The interpreted values for each class (Appendix One) were used to generate interpretations for each of the mapping units in the Atlas of Australian Soils. The interpreted value of the dominant soil was taken as the interpreted value for the map unit. The range of interpreted values for each mapping unit was generated using the range of the five most common soils in the map unit. The details of the procedure and the tables generated using the Ingres database are described below. The tables and transfer files are available from the authors at the CSIRO Division of Soils, Canberra.

The table *ppfinterp*, with 725 records, was created to hold values listed in Appendix One and the fields are listed in Table 2.

A record was created for each soil type listed in the ERIN table *map_unit_soil*, enabling attribute values to be associated with map units by joining *ppfinterp* to *map_unit_soil* on the soil_type field.

Table 1: Rating system used for interpreting classes from the Factual Key (Northcote 1979)

Permeability

Four classes to provide a crude estimate of saturated hydraulic conductivity of the least permeable horizon in the upper 0.5m. In some duplex soils with deep A horizons, the estimate applies to the top of the B horizon.

1	<5mm day^{-1}	(0.2mm hr^{-1})	Very Slow
2	5-50mm day^{-1}	(0.2-2mm hr^{-1})	Slow
3	50-500mm day^{-1}	(2-21mm hr^{-1})	Moderate
4	>500mm day^{-1}	(>21mm hr^{-1})	Fast

Profile Water Holding Capacity

1	<50 mm	Very Low
2	50-150mm	Low
3	150-250mm	Medium
4	250-350mm	High
5	>350mm	Very High

Soil Texture Profile

1	Uniform Coarse
2	Uniform Medium
3	Uniform Fine
4	Uniform Cracking
5	Gradational calcareous
6	Gradational
7	Duplex

Soil Reaction Class

1	Strongly acid
2	Acid
3	Neutral
4	Alkaline

Gross Nutrient Status

1	Low	Major responses to N, P and K along with most micronutrients
2	Moderate	Responses to N and P with occasional response to some micronutrients
3	High	Responses to N and P uncommon except after intensive farming

Soil Depth

1	<0.5 m	Shallow
2	0.5 - 1.5m	Moderate
3	>1.5m	Deep

Table 2: *ppfinterp* schema.

column name	column datatype	column length
soil_type	CHAR	10
ks	INTEGER	1
pwhc	INTEGER	1
texture	INTEGER	1
srt	INTEGER	1
nutr	INTEGER	1
depth	INTEGER	1

The generation of dominant and range values for each map unit required the original data to be further condensed. In the Atlas, a variety of soils are listed for each mapping unit and codominants rather than dominants are often indicated. The ERIN data recorded this information in two ways:

- with a sequence number corresponding to the order in which soils are mentioned in the Atlas (earlier mention and lower numbers generally indicated greater dominance);
- with a dominant soil type flag marking all soil types described as being the chief soils of the unit.

The averaging of interpreted values for co-dominant soils is not often meaningful and a single dominant value was obtained using the following principles:

- Where the unit was described under the heading of a specific soil type (in the Explanatory Notes and on the Atlas Legend), that type was accorded dominance;
- Where the grouping of mapping units was at a more general taxanomic level (e.g. Gn2 rather than Gn2.11) but under a heading for which an individual record had been or could be defined in the *ppfinterp* table, the more general category was added to the list of types in that unit, and accorded dominance. In many cases this required a re-ordering of the original ERIN data.
- In the few cases left unresolved by the above, the unit description was examined and a dominant type more or less arbitrarily assigned.

The range values were calculated from the first five soil types described in the Atlas. An upper limit of five was selected to counter the tendency for further variation to depend more on the detail of the description than on the actual nature of the unit. To implement this restriction, the ERIN numbers were revised into an ordered sequence from 1 to 5, and these are retained in the final table.

For all attributes except texture, the range has been calculated as a simple difference between maximum and minimum attribute values for the first five types. For texture, in which the numbers identified classes rather than a numeric progression, the range shows the number of distinct texture classes in addition to that of the dominant soil type.

In the course of this analysis, a number of the classifications supplied in the original ERIN data were amended For example, in several instances the first-mentioned soil type was not the dominant soil but instead was at the top of a catenary sequence with the dominant soil occurring in the mid-slope position. In other cases there were sequence number anomalies such as two zero values.

From this information, a table (*erin_final*) showing dominant and range attribute values was created by the application of relational joins and aggregate operators to the basic table. The data are supplied as an ASCII file with character data enclosed in double quotes, and the fields separated by commas. Null values are shown ,, and there is no comma before the first or after the last field. The schema of *erin_final* is presented in Table 3.

Table 3: *erin_final* schema (transfer file: *erin_final.tfr*)

column name	column datatype	column length
map_unit	CHAR	5
soil_type	CHAR	10
ks	INTEGER	1
r_ks	INTEGER	1
pwhc	INTEGER	1
r_pwhc	INTEGER	1
texture	INTEGER	1
r_texture	INTEGER	1
srt	INTEGER	1
r_srt	INTEGER	1
nutr	INTEGER	1
r_nutr	INTEGER	1
depth	INTEGER	1
r_depth	INTEGER	1

Additional tables supplied are as follows:

Revised equivalent to the erin table *map_unit_soil*

In this table all sequence numbers have been condensed, and soil types originally flagged as dominant but for which this classification has been removed, are identified with the upper-case letter O (for original) in the *dominant_soil_type_flag* field (Table 4).

Table 4: *munitsoil* schema (Transfer file: *munitsoil.tfr*)

column_name	column_datatype	column_length
map_unit	CHAR	5
soil_type	CHAR	10
soil_type_seq_nbr	INTEGER	2
dominant_soil_type_flag	CHAR	1

Table of interpretations for each soil type (ppfinterp)

Table 5: *ppfinterp* schema (Transfer file: *ppfinterp.tfr*)

column_name	column_datatype	column_length
soil_type	CHAR	10
ks	INTEGER	1
pwhc	INTEGER	1
texture	INTEGER	1
srt	INTEGER	1
nutr	INTEGER	1
depth	INTEGER	1

Table of references to each map unit in the guidebooks to the Atlas of Australian Soils.

This information greatly facilitates access to all printed references in the Explanatory Notes to any given map unit (Table 6).

Table 6: *atlasref* schema (Transfer file: *atlasref.tfr*)

column_name	column_datatype	column_length
map_unit	CHAR	5
sheet	INTEGER	1
page	INTEGER	2

REFERENCES

Northcote, K. H., Hubble, G. D., Isbell, R. F., Thompson, C. H. and Bettenay, E. (1975). A description of Australian Soils. (CSIRO: Melbourne)

Stace, H. C. T., Hubble, G. D., Brewer, R., Northcote, K. H., Sleeman, J. R., Mulcahy, M. J. and Hallsworth, E. G. (1968). "A Handbook of Australian Soils.", (Rellim: Glenside, S.A.).

Talsma, T. (1983). Soils of the Cotter Catchment Area, A.C.T.: distribution, chemical and physical properties. Aust. J. Soil Res. 21, 241-255.

Talsma, T. and Hallam, P. M. (1980). Hydraulic conductivity measurement of forest catchments. Aust. J. Soil Res. 30, 139-148.

Williams, J. (1983). Physical properties and water relations. In "Soils: an Australian viewpoint." Division of Soils, CSIRO (CSIRO: Melbourne/Academic Press:London)

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
O	-1	-1	-1	-1	-1	-1
Uc1.1	4	-1	1	4	1	-1
Uc1.11	4	-1	1	4	1	-1
Uc1.12	4	-1	1	4	1	-1
Uc1.13	4	-1	1	4	1	-1
Uc1.14	4	-1	1	4	1	-1
Uc1.2	4	-1	1	3	1	3
Uc1.21	4	-1	1	3	1	3
Uc1.22	4	-1	1	3	1	3
Uc1.23	4	-1	1	3	1	3
Uc1.3	4	-1	1	4	1	-1
Uc1.31	4	-1	1	4	1	-1
Uc1.4	4	1	1	-1	1	1
Uc1.41	4	1	1	-1	1	1
Uc1.42	4	1	1	-1	1	1
Uc1.43	4	1	1	-1	1	1
Uc2.1	4	1	1	-1	1	1
Uc2.11	4	1	1	4	1	1
Uc2.12	4	1	1	3	1	1
Uc2.2	4	2	1	2	1	3
Uc2.20	4	2	1	2	1	3
Uc2.21	4	2	1	2	1	3
Uc2.22	4	2	1	2	1	3
Uc2.23	4	2	1	2	1	3
Uc2.3	4	2	1	2	1	3
Uc2.31	4	2	1	2	1	3
Uc2.32	4	2	1	2	1	3
Uc2.33	4	2	1	2	1	3
Uc2.34	4	2	1	2	1	3
Uc2.35	4	2	1	2	1	3
Uc2.36	4	2	1	2	1	3
Uc3.12	3	1	1	3	1	2
Uc3.2	3	-1	1	-1	1	-1
Uc3.21	3	-1	1	-1	1	-1
Uc3.3	3	-1	1	-1	1	-1
Uc3.31	3	-1	1	-1	1	-1
Uc3.32	3	-1	1	-1	1	-1
Uc3.33	3	-1	1	-1	1	-1
Uc4.1	4	1	1	2	1	1
Uc4.11	4	1	1	2	1	1
Uc4.12	4	1	1	2	1	1
Uc4.2	4	1	1	2	1	1
Uc4.21	4	1	1	2	1	1
Uc4.22	4	1	1	2	1	1
Uc4.23	4	1	1	2	1	1
Uc4.24	4	1	1	2	1	1
Uc4.3	4	1	1	2	1	1
Uc4.31	4	1	1	2	1	1
Uc4.32	4	1	1	2	1	1
Uc4.33	4	1	1	2	1	1
Uc5.1	-1	2	1	-1	1	-1
Uc5.11	4	2	1	3	1	-1
Uc5.12	3	2	1	4	1	-1
Uc5.13	3	2	1	3	1	-1
Uc5.2	4	-1	1	-1	1	-1
Uc5.21	4	-1	1	-1	1	-1
Uc5.22	4	-1	1	-1	1	-1
Uc5.23	4	-1	1	-1	1	-1

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Uc5.3	4	-1	1	-1	1	-1
Uc5.31	4	-1	1	-1	1	-1
Uc5.32	4	-1	1	-1	1	-1
Uc5.4	-1	-1	-1	-1	-1	-1
Uc6.11	4	2	1	3	1	1
Uc6.12	4	2	1	4	1	1
Uc6.13	4	2	1	4	2	1
Uc6.14	4	2	1	3	1	3
Um1.2	4	1	2	4	1	1
Um1.21	4	1	2	-1	1	1
Um1.23	4	1	2	-1	1	1
Um1.3	4	2	2	4	1	1
Um1.32	4	2	2	4	1	1
Um1.4	4	1	2	3	1	1
Um1.41	4	1	2	3	1	1
Um1.42	4	1	2	3	1	1
Um1.43	4	1	2	3	1	1
Um2.12	3	1	2	2	1	1
Um2.2	3	1	2	-1	1	2
Um2.21	3	1	2	2	1	2
Um2.22	3	1	2	-1	1	2
Um2.23	3	1	2	3	1	2
Um2.3	3	1	2	-1	1	-1
Um2.32	3	1	2	3	1	2
Um3.12	3	1	2	4	1	1
Um3.2	3	2	2	3	1	3
Um3.21	3	2	2	3	1	3
Um4.1	3	1	2	2	1	1
Um4.11	3	1	2	2	1	1
Um4.12	3	1	2	2	1	1
Um4.2	3	2	2	2	2	2
Um4.21	3	2	2	2	2	2
Um4.22	3	2	2	2	2	2
Um4.23	3	2	2	2	2	2
Um4.3	3	4	2	3	3	2
Um4.31	3	4	2	3	3	2
Um4.4	4	3	2	2	2	2
Um4.41	4	3	2	2	2	2
Um4.43	4	3	2	2	2	2
Um5.1	3	-1	2	4	1	-1
Um5.11	3	2	2	4	1	1
Um5.12	3	3	2	4	1	2
Um5.2	3	3	2	4	2	2
Um5.22	3	3	2	4	2	2
Um5.3	3	1	2	2	1	1
Um5.31	3	1	2	2	1	1
Um5.4	3	-1	2	3	1	-1
Um5.41	3	1	2	3	1	1
Um5.42	3	2	2	3	1	2
Um5.5	3	-1	2	3	-1	-1
Um5.51	3	1	2	3	1	2
Um5.52	3	3	2	3	2	1
Um5.61	3	1	2	4	1	1

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Um6	3	-1	2	-1	-1	-1
Um6.1	3	3	2	-1	-1	2
Um6.11	3	3	2	4	3	2
Um6.12	3	3	2	2	2	2
Um6.13	3	3	2	2	2	2
Um6.14	3	3	2	2	2	2
Um6.2	-1	2	2	2	2	1
Um6.21	4	2	2	2	2	1
Um6.22	3	2	2	2	2	1
Um6.23	3	2	2	2	2	1
Um6.24	3	2	2	2	2	1
Um6.3	3	3	2	2	2	2
Um6.31	3	3	2	2	2	2
Um6.32	3	3	2	2	2	2
Um6.33	3	3	2	2	2	2
Um6.34	3	3	2	2	2	2
Um6.4	4	2	2	2	2	1
Um6.41	4	2	2	2	2	1
Um6.42	4	2	2	2	2	1
Um6.43	4	2	2	2	2	1
Um7.11	4	4	2	2	1	3
Um7.12	4	4	2	2	1	2
Uf1.13	2	2	3	4	2	2
Uf1.23	2	2	3	3	2	2
Uf1.3	-1	-1	3	4	-1	-1
Uf1.41	2	1	3	3	1	3
Uf1.42	2	2	3	3	1	1
Uf1.43	2	2	3	3	1	1
Uf4.41	4	3	3	2	1	3
Uf4.43	4	3	3	2	1	3
Uf5	4	-1	3	-1	-1	-1
Uf5.11	4	3	3	-1	-1	3
Uf5.12	4	3	3	-1	-1	3
Uf5.21	4	4	3	2	2	3
Uf5.22	4	4	3	2	3	3
Uf5.23	4	-1	3	2	2	-1
Uf5.31	4	3	3	3	3	2
Uf6	-1	-1	3	-1	-1	-1
Uf6.11	3	2	3	3	2	1
Uf6.12	3	2	3	3	2	1
Uf6.13	3	2	3	3	2	1
Uf6.2	3	-1	3	-1	2	-1
Uf6.21	3	-1	3	3	2	-1
Uf6.22	3	-1	3	2	2	-1
Uf6.23	3	-1	3	3	2	-1
Uf6.3	3	2	3	-1	2	2
Uf6.31	3	2	3	4	2	2
Uf6.32	3	2	3	3	2	2
Uf6.33	3	2	3	3	2	2
Uf6.34	3	2	3	3	2	2
Uf6.4	2	3	3	2	2	3
Uf6.41	2	3	3	2	2	3
Uf6.42	2	3	3	2	2	3
Uf6.5	2	1	3	4	1	2
Uf6.51	2	1	3	4	1	2
Uf6.6	2	2	3	3	1	2
Uf6.61	2	2	3	3	1	2
Uf6.62	2	2	3	3	1	2
Uf6.71	3	2	3	3	1	2

Ug3.2	-1	-1	4	-1	-1	-1
Ug5.1	2	-1	4	-1	2	-1
Ug5.11	2	2	4	4	2	2
Ug5.12	2	2	4	4	2	2
Ug5.13	2	3	4	4	2	2
Ug5.14	2	3	4	4	2	2
Ug5.15	2	3	4	4	2	3
Ug5.16	2	3	4	3	2	3
Ug5.17	2	3	4	4	2	3
Ug5.2	2	2	4	4	2	-1
Ug5.22	2	2	4	4	2	2
Ug5.23	2	2	4	4	2	2
Ug5.24	2	2	4	4	2	3
Ug5.25	2	2	4	4	2	3
Ug5.26	2	2	4	4	2	2
Ug5.27	2	2	4	4	2	2
Ug5.28	2	2	4	4	2	3
Ug5.29	2	2	4	4	2	3
Ug5.3	2	2	4	4	2	-1
Ug5.32	2	2	4	4	2	2
Ug5.33	2	2	4	4	2	2
Ug5.34	2	2	4	4	2	3
Ug5.35	2	2	4	4	2	3
Ug5.37	2	2	4	4	2	2
Ug5.38	2	2	4	4	2	3
Ug5.39	2	2	4	4	2	3
Ug5.4	1	2	4	4	2	3
Ug5.5	1	2	4	4	2	3
Ug5.6	1	2	4	4	2	3
Ug6.1	2	2	4	4	2	3
Ug6.2	2	2	4	4	2	3
Ug6.4	1	2	4	4	2	3
Ug6.5	1	2	4	4	2	3
Gc	-1	2	5	4	-1	2
Gc1	-1	2	5	4	1	2
Gc1.1	2	2	5	4	1	2
Gc1.11	2	2	5	4	1	2
Gc1.12	2	2	5	4	1	2
Gc1.2	3	2	5	4	2	2
Gc1.21	3	2	5	4	2	2
Gc1.22	3	2	5	4	2	2
Gc2.11	3	2	5	4	1	2
Gc2.12	3	2	5	4	1	2
Gc2.21	3	2	5	4	2	2
Gc2.22	3	2	5	4	2	2
Gn1.12	3	2	6	3	1	2
Gn1.13	3	2	6	4	1	2
Gn1.19	-1	-1	6	4	-1	-1
Gn1.83	-1	-1	6	4	-1	-1
Gn1.84	-1	-1	6	2	-1	-1

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Gn2.1	-1	-1	6	-1	1	3
Gn2.11	4	3	6	2	1	3
Gn2.12	4	3	6	3	1	3
Gn2.13	4	2	6	4	1	3
Gn2.14	3	3	6	2	1	3
Gn2.15	3	3	6	3	1	3
Gn2.16	3	2	6	4	1	3
Gn2.17	3	2	6	2	1	3
Gn2.18	3	2	6	3	1	3
Gn2.19	3	2	6	4	1	3
Gn2.2	3	2	6	-1	1	2
Gn2.21	3	2	6	2	1	2
Gn2.22	3	2	6	3	1	2
Gn2.23	3	2	6	4	1	2
Gn2.24	3	2	6	2	1	2
Gn2.25	3	2	6	3	1	2
Gn2.3	3	2	6	-1	1	2
Gn2.31	3	2	6	2	1	2
Gn2.32	3	2	6	3	1	2
Gn2.34	3	2	6	2	1	2
Gn2.35	3	2	6	3	1	2
Gn2.4	3	2	6	-1	-1	2
Gn2.41	3	2	6	2	1	2
Gn2.42	3	2	6	3	2	2
Gn2.43	3	2	6	4	2	2
Gn2.44	3	2	6	2	1	2
Gn2.45	3	2	6	3	1	2
Gn2.46	3	2	6	4	1	2
Gn2.51	3	2	6	2	1	2
Gn2.52	3	2	6	3	1	2
Gn2.53	3	2	6	4	1	2
Gn2.54	3	2	6	3	1	2
Gn2.55	3	2	6	4	1	2
Gn2.6	3	2	6	-1	1	2
Gn2.61	3	2	6	2	1	2
Gn2.62	3	2	6	3	1	2
Gn2.63	3	2	6	4	1	2
Gn2.64	3	2	6	2	1	2
Gn2.65	3	2	6	3	1	2
Gn2.7	4	2	6	-1	1	2
Gn2.71	4	2	6	2	1	2
Gn2.72	4	2	6	3	1	2
Gn2.74	4	2	6	2	1	2
Gn2.75	4	2	6	3	1	2
Gn2.8	3	2	6	-1	1	-1
Gn2.81	3	2	6	2	1	-1
Gn2.82	3	2	6	3	1	-1
Gn2.83	3	2	6	4	1	-1
Gn2.84	3	2	6	2	1	-1
Gn2.85	3	2	6	3	1	-1
Gn2.9	3	2	6	-1	1	-1
Gn2.91	3	2	6	2	1	-1
Gn2.92	3	2	6	3	1	-1
Gn2.93	3	2	6	4	1	-1
Gn2.94	3	2	6	2	1	-1
Gn2.95	3	2	6	3	1	-1
Gn2.96	3	2	6	4	1	-1

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Gn3.0	-1	2	6	-1	1	2
Gn3.01	3	2	6	2	1	2
Gn3.02	3	2	6	3	1	2
Gn3.03	3	2	6	4	1	2
Gn3.04	2	2	6	2	1	2
Gn3.05	2	2	6	3	1	2
Gn3.06	2	2	6	4	1	2
Gn3.1	4	-1	6	-1	-1	-1
Gn3.10	4	4	6	1	3	3
Gn3.11	4	4	6	2	3	3
Gn3.12	4	4	6	3	2	3
Gn3.13	4	3	6	4	2	3
Gn3.14	4	3	6	2	2	-1
Gn3.15	4	3	6	3	2	-1
Gn3.16	4	3	6	4	2	-1
Gn3.2	3	2	6	-1	2	2
Gn3.21	3	2	6	2	2	2
Gn3.22	3	2	6	3	2	2
Gn3.23	3	2	6	4	2	2
Gn3.24	3	2	6	2	2	2
Gn3.25	3	2	6	3	2	2
Gn3.32	3	2	6	3	2	2
Gn3.34	3	2	6	2	2	2
Gn3.4	3	2	6	-1	-1	2
Gn3.41	3	2	6	2	3	2
Gn3.42	3	2	6	3	3	2
Gn3.43	3	2	6	4	3	2
Gn3.45	3	2	6	3	2	2
Gn3.46	3	2	6	4	2	2
Gn3.49	3	2	6	4	2	2
Gn3.5	4	2	6	-1	2	2
Gn3.51	4	2	6	2	2	2
Gn3.52	4	2	6	3	2	2
Gn3.53	4	2	6	4	2	2
Gn3.54	4	2	6	2	2	2
Gn3.56	4	2	6	4	2	2
Gn3.6	3	2	6	2	2	2
Gn3.61	3	2	6	2	2	2
Gn3.64	3	2	6	2	2	2
Gn3.7	4	2	6	-1	2	2
Gn3.71	4	2	6	2	2	2
Gn3.72	4	2	6	3	2	2
Gn3.73	4	2	6	4	2	2
Gn3.74	4	2	6	2	2	2
Gn3.75	4	2	6	3	2	2
Gn3.8	3	2	6	-1	1	3
Gn3.81	3	2	6	2	1	3
Gn3.82	3	2	6	3	1	3
Gn3.83	3	2	6	4	1	3
Gn3.84	3	2	6	2	1	3
Gn3.85	3	2	6	3	1	3
Gn3.9	-1	2	6	-1	2	2
Gn3.90	4	2	6	1	2	2
Gn3.91	4	2	6	2	2	2
Gn3.92	4	2	6	3	2	2
Gn3.93	4	2	6	4	2	2
Gn3.94	3	2	6	2	2	2
Gn3.95	3	2	6	3	2	2
Gn3.96	3	2	6	4	2	2

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Gn4.1	4	-1	6	-1	2	-1
Gn4.11	4	3	6	2	2	3
Gn4.12	4	3	6	3	2	3
Gn4.13	4	1	6	4	2	1
Gn4.14	4	3	6	2	2	3
Gn4.3	4	-1	6	-1	2	-1
Gn4.31	4	3	6	2	2	3
Gn4.32	4	3	6	3	2	3
Gn4.33	4	1	6	4	2	1
Gn4.34	4	3	6	2	2	3
Gn4.4	4	2	6	-1	3	2
Gn4.41	4	2	6	2	3	2
Gn4.42	4	2	6	3	3	2
Gn4.5	3	-1	6	-1	2	-1
Gn4.51	3	-1	6	2	2	-1
Gn4.52	3	-1	6	3	2	-1
Gn4.54	3	-1	6	2	2	-1
Gn4.64	3	-1	6	2	2	-1
Dr	-1	-1	7	-1	-1	2
Dr1	-1	2	7	-1	2	2
Dr1.12	2	2	7	3	2	2
Dr1.13	2	2	7	4	2	2
Dr1.16	2	2	7	4	2	2
Dr1.3	3	2	7	-1	2	2
Dr1.31	3	2	7	2	2	2
Dr1.32	3	2	7	3	2	2
Dr1.33	3	2	7	4	2	2
Dr1.42	3	2	7	3	2	2
Dr1.43	2	2	7	4	2	2
Dr1.73	2	2	7	4	2	2
Dr1.82	2	2	7	3	2	2
Dr1.83	2	2	7	4	2	2
Dr2.1	-1	3	7	-1	2	2
Dr2.11	4	3	7	2	2	2
Dr2.12	4	3	7	3	2	2
Dr2.13	3	3	7	4	2	2
Dr2.2	-1	-1	7	-1	2	2
Dr2.21	3	3	7	2	2	2
Dr2.22	2	3	7	3	2	2
Dr2.23	2	2	7	4	2	2
Dr2.31	3	3	7	2	2	2
Dr2.32	3	2	7	3	2	2
Dr2.33	2	2	7	4	2	2
Dr2.4	-1	-1	7	-1	-1	2
Dr2.41	2	3	7	2	2	2
Dr2.42	2	2	7	3	2	2
Dr2.43	1	2	7	4	1	2
Dr2.51	3	2	7	2	2	2
Dr2.52	3	2	7	3	2	2
Dr2.53	3	2	7	4	2	2
Dr2.61	3	2	7	2	2	2
Dr2.62	3	2	7	3	2	2
Dr2.63	2	2	7	4	2	2
Dr2.71	3	2	7	2	2	2
Dr2.72	3	2	7	3	2	2
Dr2.73	2	2	7	4	2	2

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Dr2.81	3	2	7	2	2	2
Dr2.82	2	2	7	3	2	2
Dr2.83	2	1	7	4	1	2
Dr3	-1	-1	7	-1	-1	2
Dr3.11	3	2	7	2	2	2
Dr3.12	3	2	7	3	2	2
Dr3.13	2	2	7	4	2	2
Dr3.21	3	2	7	2	2	2
Dr3.22	3	2	7	3	2	2
Dr3.23	2	2	7	4	2	2
Dr3.3	-1	2	7	-1	-1	2
Dr3.31	3	2	7	2	2	2
Dr3.32	2	2	7	3	2	2
Dr3.33	2	2	7	4	1	2
Dr3.4	2	-1	7	-1	-1	2
Dr3.41	2	2	7	2	2	2
Dr3.42	2	2	7	3	2	2
Dr3.43	2	1	7	4	1	2
Dr3.51	-1	-1	7	2	-1	2
Dr3.61	-1	-1	7	2	-1	2
Dr3.62	-1	-1	7	3	-1	2
Dr3.71	-1	-1	7	2	-1	2
Dr3.72	-1	-1	7	3	-1	2
Dr3.73	-1	-1	7	4	-1	2
Dr3.81	-1	-1	7	2	-1	2
Dr3.83	-1	-1	7	4	-1	2
Dr4.1	4	3	7	-1	3	2
Dr4.11	4	3	7	2	3	2
Dr4.12	4	3	7	3	3	2
Dr4.13	4	3	7	4	3	2
Dr4.2	4	3	7	-1	2	2
Dr4.21	4	3	7	2	2	2
Dr4.22	4	3	7	3	2	2
Dr4.23	4	3	7	4	2	2
Dr4.33	4	3	7	4	2	2
Dr4.41	4	2	7	2	2	2
Dr4.42	4	2	7	3	2	2
Dr4.43	4	2	7	4	2	2
Dr4.53	4	3	7	4	2	2
Dr4.61	4	3	7	2	2	2
Dr4.63	4	3	7	4	2	2
Dr4.72	4	3	7	3	2	2
Dr4.73	4	3	7	4	2	2
Dr4.81	4	3	7	2	2	2
Dr4.82	4	3	7	3	2	2
Dr5.11	4	2	7	2	2	2
Dr5.12	4	2	7	3	2	2
Dr5.21	3	2	7	2	2	2
Dr5.23	3	2	7	4	2	2
Dr5.32	3	2	7	3	2	2
Dr5.33	3	2	7	4	2	2
Dr5.41	3	2	7	2	2	2
Dr5.42	3	2	7	3	2	2
Dr5.43	3	2	7	4	2	2
Dr5.62	3	2	7	3	2	2
Dr5.8	-1	2	7	-1	2	2
Dr5.81	3	2	7	2	2	2

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Db1.1	1	2	7	-1	1	2
Db1.11	3	2	7	2	1	2
Db1.12	3	2	7	3	1	2
Db1.13	3	2	7	4	1	2
Db1.2	3	3	7	-1	2	2
Db1.21	3	3	7	2	2	2
Db1.22	3	3	7	3	2	2
Db1.23	3	3	7	4	2	2
Db1.3	2	2	7	-1	1	2
Db1.31	2	2	7	2	1	2
Db1.32	2	2	7	3	1	2
Db1.33	2	2	7	4	1	2
Db1.4	-1	2	7	-1	1	2
Db1.41	2	2	7	2	1	2
Db1.42	2	2	7	3	1	2
Db1.43	1	2	7	4	1	2
Db1.52	2	2	7	3	1	2
Db1.61	2	2	7	2	1	2
Db1.62	2	2	7	3	1	2
Db1.81	1	2	7	2	1	2
Db2.1	-1	2	7	-1	2	2
Db2.12	3	2	7	3	2	2
Db2.13	2	2	7	4	2	2
Db2.2	2	2	7	-1	2	2
Db2.21	2	2	7	2	2	2
Db2.22	2	2	7	3	2	2
Db2.31	2	2	7	2	1	2
Db2.32	2	2	7	3	1	2
Db2.33	1	2	7	4	1	2
Db2.4	-1	2	7	-1	1	2
Db2.41	2	2	7	2	1	2
Db2.42	1	2	7	3	1	2
Db2.43	1	2	7	4	1	2
Db3.1	4	2	7	-1	2	2
Db3.11	4	2	7	2	2	2
Db3.12	4	2	7	3	2	2
Db3.13	4	2	7	4	2	2
Db3.2	4	2	7	-1	2	2
Db3.21	4	2	7	2	2	2
Db3.22	4	2	7	3	2	2
Db3.23	4	2	7	4	2	2
Db3.32	3	2	7	3	2	2
Db3.41	3	2	7	2	2	2
Db3.43	3	2	7	4	2	2
Db4.1	3	2	7	-1	2	2
Db4.11	3	2	7	2	2	2
Db4.13	3	2	7	4	2	2
Db4.21	3	2	7	2	2	2
Db0.33	1	2	7	4	1	2
Db0.43	1	2	7	4	1	2
Dy1.12	2	2	7	4	2	2
Dy1.32	2	2	7	3	2	2
Dy1.33	1	1	7	4	1	2
Dy1.43	1	1	7	4	1	2
Dy1.63	2	2	7	4	1	2

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Dy2.1	-1	2	7	-1	2	2
Dy2.11	3	2	7	2	2	2
Dy2.12	3	2	7	3	2	2
Dy2.13	2	2	7	4	2	2
Dy2.2	2	2	7	-1	2	2
Dy2.21	2	2	7	2	2	2
Dy2.22	2	2	7	3	2	2
Dy2.23	2	2	7	4	2	2
Dy2.3	-1	-1	7	-1	-1	2
Dy2.31	2	2	7	2	1	2
Dy2.32	1	2	7	3	2	2
Dy2.33	1	1	7	4	2	2
Dy2.4	-1	-1	7	-1	1	2
Dy2.41	2	2	7	2	1	2
Dy2.42	1	2	7	3	1	2
Dy2.43	1	1	7	4	1	2
Dy2.5	3	2	7	-1	1	3
Dy2.51	3	2	7	2	1	3
Dy2.52	3	2	7	3	1	3
Dy2.61	2	2	7	2	1	3
Dy2.62	2	2	7	3	1	3
Dy2.71	2	2	7	2	1	3
Dy2.73	1	2	7	4	1	3
Dy2.8	-1	-1	7	-1	1	-1
Dy2.81	2	2	7	2	1	3
Dy2.82	2	2	7	3	1	3
Dy2.83	1	1	7	4	1	3
Dy2.84	2	1	7	2	1	2
Dy3.1	-1	2	7	-1	2	2
Dy3.11	3	2	7	2	2	2
Dy3.12	3	2	7	3	2	2
Dy3.13	2	2	7	4	2	2
Dy3.2	-1	2	7	-1	2	2
Dy3.21	3	2	7	2	2	2
Dy3.22	3	2	7	3	2	2
Dy3.23	2	2	7	4	2	2
Dy3.3	-1	-1	7	-1	1	2
Dy3.31	2	2	7	2	1	2
Dy3.32	2	2	7	3	1	2
Dy3.33	1	1	7	4	1	2
Dy3.4	1	1	7	-1	1	2
Dy3.41	1	1	7	2	1	2
Dy3.42	1	1	7	3	1	2
Dy3.43	1	1	7	4	1	2
Dy3.53	3	2	7	4	1	2
Dy3.6	2	2	7	-1	1	2
Dy3.61	2	2	7	2	1	2
Dy3.62	2	2	7	3	1	2
Dy3.63	2	2	7	4	1	2
Dy3.71	2	2	7	2	1	2
Dy3.73	2	2	7	4	1	2
Dy3.8	-1	-1	7	-1	1	2
Dy3.81	2	2	7	2	1	2
Dy3.82	2	2	7	3	1	2
Dy3.83	1	2	7	4	1	2
Dy3.84	2	1	7	2	1	2
Dy3.85	1	1	7	3	1	2

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Dy4.1	3	2	7	-1	2	2
Dy4.11	3	2	7	2	2	2
Dy4.12	3	2	7	3	2	2
Dy4.13	3	2	7	4	2	2
Dy4.21	3	2	7	2	2	2
Dy4.22	3	2	7	3	2	2
Dy4.23	2	2	7	4	2	2
Dy4.32	2	2	7	3	2	2
Dy4.33	2	2	7	4	2	2
Dy4.41	2	2	7	2	2	2
Dy4.42	2	2	7	3	2	2
Dy4.43	2	2	7	4	2	2
Dy4.51	2	2	7	2	2	2
Dy4.61	2	2	7	2	2	2
Dy4.81	2	1	7	2	1	2
Dy4.83	1	1	7	4	1	2
Dy5.1	3	2	7	-1	2	2
Dy5.11	3	2	7	2	2	2
Dy5.12	3	2	7	3	2	2
Dy5.2	-1	2	7	-1	2	2
Dy5.21	2	2	7	2	2	2
Dy5.22	3	2	7	3	2	2
Dy5.23	2	2	7	4	2	2
Dy5.3	-1	-1	7	-1	1	2
Dy5.31	2	2	7	2	1	2
Dy5.32	1	2	7	3	1	2
Dy5.33	1	1	7	4	1	2
Dy5.4	1	-1	7	-1	1	2
Dy5.41	1	2	7	2	1	2
Dy5.42	1	2	7	3	1	2
Dy5.43	1	1	7	4	1	2
Dy5.51	3	2	7	2	1	2
Dy5.6	2	2	7	-1	1	2
Dy5.61	2	2	7	2	1	2
Dy5.62	2	2	7	3	1	2
Dy5.63	2	2	7	4	1	2
Dy5.71	2	2	7	2	1	2
Dy5.8	-1	2	7	-1	1	3
Dy5.81	3	2	7	2	1	3
Dy5.82	2	2	7	3	1	3
Dy5.83	2	2	7	4	1	3
Dy5.84	2	2	7	2	1	3
Dy5.91	-1	-1	-1	-1	-1	-1
Dd.1.1	-1	2	7	-1	2	2
Dd1.11	3	2	7	2	2	2
Dd1.12	3	2	7	3	2	2
Dd1.13	2	2	7	4	2	2
Dd1.2	2	2	7	-1	2	2
Dd1.21	2	2	7	2	2	2
Dd1.22	2	2	7	3	2	2
Dd1.23	2	2	7	4	2	2
Dd1.3	-1	2	7	-1	1	2
Dd1.31	2	2	7	2	1	2
Dd1.32	2	2	7	3	1	2
Dd1.33	1	2	7	4	1	2

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth
Dd1.4	-1	-1	7	-1	1	2
Dd1.41	2	2	7	2	1	2
Dd1.42	1	2	7	3	1	2
Dd1.43	1	1	7	4	1	2
Dd1.52	2	2	7	3	2	2
Dd1.81	2	2	7	2	1	2
Dd2.11	2	2	7	2	2	2
Dd2.12	2	2	7	3	2	2
Dd2.13	2	2	7	4	2	2
Dd2.2	2	2	7	-1	-1	2
Dd2.22	2	2	7	3	2	2
Dd2.31	2	2	7	2	1	2
Dd2.32	2	2	7	3	1	2
Dd2.33	1	2	7	4	1	2
Dd2.41	2	2	7	2	1	2
Dd2.42	2	2	7	3	1	2
Dd2.43	1	1	7	4	1	2
Dd3.1	-1	2	7	-1	2	2
Dd3.11	3	2	7	2	2	2
Dd3.12	3	2	7	3	2	2
Dd3.13	2	2	7	4	2	2
Dd3.21	2	2	7	2	2	2
Dd3.32	2	2	7	3	1	2
Dd3.33	1	2	7	4	1	2
Dd3.42	1	2	7	3	1	2
Dd3.43	1	1	7	4	1	2
Dd3.51	3	2	7	2	2	2
Dd4.13	2	2	7	4	2	2
Dd4.23	2	2	7	4	2	2
Dd4.43	1	1	7	4	1	2
Dd4.63	2	2	7	4	1	2
Dg1.41	2	2	7	2	1	3
Dg1.43	1	2	7	4	1	3
Dg1.81	2	2	7	2	1	3
Dg2.21	2	2	7	2	1	3
Dg2.31	2	2	7	2	1	3
Dg2.41	2	2	7	2	1	3
Dg2.42	2	2	7	3	1	3
Dg2.43	1	2	7	4	1	3
Dg2.63	1	2	7	4	1	3
Dg2.81	2	2	7	2	1	3
Dg2.82	2	2	7	3	1	3
Dg2.83	1	2	7	4	1	3
Dg3.43	1	2	7	4	1	3
Dg3.81	2	2	7	2	1	3
Dg4.11	2	2	7	2	1	3
Dg4.13	1	2	7	4	1	3
Dg4.21	2	2	7	2	1	3
Dg4.31	2	2	7	2	1	3
Dg4.41	2	2	7	2	1	3
Dg4.42	2	2	7	3	1	3
Dg4.43	1	2	7	4	1	3
Dg4.8	2	2	7	2	1	2
Dg4.81	2	2	7	2	1	2

PPF	Ks	PWHC	Texture	SRT	Nutr.	Depth	
K-Dy2.21	3	1	7	2	1	2	
K-Gn2.1	-1	-1	6	-1	1	3	
K-Gn2.11	4	2	6	2	1	3	
K-Gn2.12	4	2	6	3	1	3	
K-Uc1	4	-1	1	-1	1	-1	
K-Uc1.21	4	-1	1	3	1	3	
K-Uc1.22	4	-1	1	3	1	3	
K-Uc1.23	4	-1	1	3	1	3	
K-Uc1.4	4	1	1	-1	1	1	
K-Uc1.43	4	1	1	-1	1	1	
K-Uc4.1	4	1	1	2	1	1	
K-Uc4.2	4	1	1	2	1	1	
K-Uc4.22	4	1	1	2	1	1	
K-Uc5.11	4	1	1	3	1	-1	
K-Uc5.21	4	-1	1	-1	1	-1	
K-Um	-1	-1	2	-1	-1	-1	
K-Um1.4	4	1	2	3	1	1	
K-Um1.42	4	1	2	3	1	1	
K-Um1.43	4	1	2	3	1	1	
K-Um4.2	3	1	2	2	1	2	
K-Um5.51	3	1	2	3	1	2	
K-Um6.24	3	1	2	2	1	1	
KS-Dr2.62	3	1	7	3	1	2	
KS-Dr5.81	3	1	7	2	1	2	
KS-Dy2.62	2	1	7	3	1	3	
KS-Dy3.62	2	1	7	3	1	2	
KS-Dy5.81	3	1	7	2	1	3	
KS-Gn2.1	-1	-1	6	-1	1	3	
KS-Gn2.11	4	2	6	2	1	3	
KS-Gn2.12	4	2	6	3	1	3	
KS-Gn2.21	3	1	6	2	1	2	
KS-Gn2.22	3	1	6	3	1	2	
KS-Gn2.24	3	1	6	2	1	2	
KS-Gn2.42	3	1	6	3	1	2	
KS-Gn3.12	4	2	6	3	1	3	
KS-Uc	4	-1	1	-1	1	-1	
KS-Uc1.2	4	-1	1	3	1	3	
KS-Uc1.23	4	-1	1	3	1	3	
KS-Uc1.4	4	1	1	-1	1	1	
KS-Uc1.41	4	1	1	-1	1	1	
KS-Uc1.43	4	1	1	-1	1	1	
KS-Uc2.12	4	1	1	3	1	1	
KS-Uc2.2	4	1	1	2	1	3	
KS-Uc4	4	1	1	2	1	1	
KS-Uc4.1	4	1	1	2	1	1	
KS-Uc4.11	4	1	1	2	1	1	
KS-Uc4.12	4	1	1	2	1	1	
KS-Uc4.2	4	1	1	2	1	1	
KS-Uc5.21	4	-1	1	-1	1	-1	
KS-Uc5.22	4	-1	1	-1	1	-1	
KS-Um5.51		3	1	2	4	1	1

SOME LIMITATIONS OF THE ATLAS OF AUSTRALIAN SOILS AND ITS ASSOCIATED INTERPRETATIONS

NOTES COMPILED BY NEIL MCKENZIE: December 4, 1992

The Division of Soils has prepared a database table to be used with the Digital Atlas of Australian Soils. The table provides simple interpretations of the permeability, water holding capacity, soil texture profile, soil reaction trend, gross nutrient status and soil depth for each Atlas mapping unit. A range and dominant value is presented for each unit. Details of the rating scheme are presented in an unpublished Technical Report (McKenzie and Hook 1992).

These notes have been prepared to encourage sensible use of the data and to describe some of the inherent limitations of the Atlas.

1. The quality of the Atlas mapping varies substantially and an indication of reliability is provided with the original explanatory notes published during the 1960s: it should be heeded.

2. The dominant soil for each unit may occupy a very limited area (perhaps 20%) within that unit. Any analysis based on an interpretation of the dominant soil is therefore of restricted value.

3. It is normal for there to be a very large variation within each map unit. Some units have up to 20 soils listed. It is common for the within unit variation to be as great as the between unit variation - this is an inescapable problem with reconnaissance scale soil mapping.

4. As a consequence, it is essential to use the *range* of soils and their interpreted values when making judgements on soil character and behaviour for any area. Many ranges are presented as missing or null values because reasonable interpretations cannot be made.

5. Many landscape processes (e.g. erosion, salinization etc) do not correlate in a simple way (if at all) with the Atlas units because the description of soils is based on profile morphology. Profile morphology may have a poor or complex relationship with soil processes. Furthermore, landscape processes require far more information before even synoptic predictions can be made.

6. The spatial arrangement of soils within a landscape may have an overriding impact on landscape processes (e.g. erodible soils along streambanks). The Digital Atlas and its associated tables provide no information on spatial arrangement.

7. The interpretations have been prepared using published information supported by limited first hand experience. The interpretations will be revised in the near future. In the interim, they should be treated with an appropriate level of scepticism.

Neil McKenzie.