CERTIFIED PROFESSIONAL SOIL SCIENTIST

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Certified Professional Soil Scientist Core Competencies for AUSTRALIAN SOIL SURVEYORS

Australian Society of Soil Science Inc
PO Box 1349, WARRAGUL, Victoria 3820

Ph: 03 5635 2370
Email: office@soilscienceaustralia.org

Web: www.cpss.com.au

ABN 96 080 783 106

ASSSI
Australian Society of Soil Science Inc

The Australian Society of Soil Science Inc. was established in 1955 to work toward the advancement of soil science in the professional, academic and technical fields.

The objectives of the Society are to

- promote the field of soil science
- further the expertise in soil science of members
- provide a forum for discussion on soil science
- increase government and community awareness of the importance of soil science
- liaise and cooperate with other organisations in support of mutual interests
- encourage research and extension in soil science and
- promote wise management of the soil resource throughout Australia.

Members of the Australian Society of Soil Science Inc can apply for and maintain professional accreditation within the field of soil science through the Certified Professional Soil Scientist (CPSS) accreditation scheme.

Further details on the Society can be found at www.soilscienceaustralia.org and on professional soil scientist accreditation at www.cpss.com.au .

Core competencies for Australian Soil Surveyors*

Clients requiring soil survey for agricultural and environmental assessment and management in Australia should expect their advisers to have, at least, the qualifications and experience required for membership of the Certified Professional Soil Scientist (CPSS) accreditation program managed by the Australian Society of Soil Science Inc.

CPSS members of the Society are required to observe the Society's Code of Ethics, a public statement of the principles, values and behaviour expected of members of the Society, and the Rules of Conduct.

The recommended core competencies listed below are skills that can be reasonably expected of a professional soil surveyor in Australia.

Core competencies 1 to 4 are the essential skills required in all soil surveying work.

Core competency 5 covers specialist areas

The term 'soil surveyor' is defined here as follows: *'A soil surveyor is able to undertake the systematic examination and assessment of soil for a specific land use purpose.'*

*These competencies will be reviewed by the CPSS Board bi-annually.

CORE COMPETENCY 1: Project planning skills for soil surveyors;

A competent soil surveyor is able to undertake the following, either individually or with suitably qualified colleagues in a team:

- Determine and negotiate the purpose of the survey with the client and then act appropriately to achieve the objectives, i.e., establish a contract to specify what will be delivered when and at what cost. Project planning requires an appreciation of time and cost estimates to achieve project aims and to manage client expectations.
- Obtain pre-existing soil data and land suitability information for a new site via products such as ASRIS (Australian Soil Resources Information System) or relevant state agency sources.
- Interpret geological maps (where available and where appropriate for the scale of land being surveyed) in relation to soil properties and processes, and understand how landscape processes and landscape evolution influence soil patterns.
- Understand the main points of all the chapters in *Guidelines for Surveying Soil and Land Resources, 2nd edition (*known as the *"Blue Book")*[1], including appropriate intensity and depth of soil sampling for surveys of differing scales.
- Adjust soil survey plans following expert interpretation of parent material, geomorphic processes, vegetation patterns and terrain analysis.
- Be able to design a structured survey relevant to the nature of the enquiry. For example, a detailed acid sulfate survey v. a reconnaissance scale grazing lands survey.
- Understand and choose between the various soil assessment options (soil pits, spade inspections, stream and cutting exposures, coring, augering, remote sensing).
- Select specialists (eg. EM/radiometric data providers), if required, to assist with the soil survey project.

CORE COMPETENCY 2: Field investigation skills for soil surveyors

A competent soil surveyor is able to undertake the following, either individually or with suitably qualified colleagues in a team:

- Determine where soil assessment sites should be located with regard to landscape features and pre-existing information e.g. colour air-photos, detailed elevation maps, EM surveys, radiometric data, vegetation maps.
- Operate modern GPS equipment for geo-referencing of sampling sites.
- Obtain the permissions required for site access and obtain appropriate permits to dig.
- Where soil pits are being used, supervise the excavator/backhoe driver so that pits are dug safely and according to specifications; ensure that 'Dial before you Dig' procedures have been followed where appropriate. Encourage landholders to move any livestock from the study area while field work is being carried out.
- Ensure that excavators, vehicles and soil sampling equipment have been thoroughly cleaned and comply with site management requirements to minimise/negate risk of introduction of weeds, pests, diseases and foreign soil materials that might compromise description and analysis of soil profiles, or breach regulations and guidelines related to these matters.
- Align pits to gain maximum information; ensure pits can be safely accessed with minimal risk of collapse.
- Trim soil profile faces with a tool such as a geological pick to remove smears prior to inspection.
- Recognise rock types and understand their relationships to soil formation and soil type.
- Produce good quality scaled digital photographs of key soil profiles that can be included in a report.

[1] See the list of guiding texts on page 6.

- Recognise and describe all soil horizons, using nomenclature in the *Australian Soil and Land Survey Field Handbook, 3rd edition (*known as the "*Yellow Book")*[2].
- Accurately assess soil texture by hand, as well as structure descriptions using a visual-tactile scheme, soil colour, severity of slaking and dispersion, shrink-swell potential, coarse fragment content, depth to parent material (if possible), field pH and salinity, pedogenic concretions, water repellence.
- Identify symptoms of waterlogging (redoximorphic features) in the subsoil.
- Collect soil samples at representative sites for the accurate and meaningful analysis of soil chemical, physical and biological properties in the laboratory. Use methods described in *Soil Chemical Methods – Australasia (*known as the "*Green Book")*[3].or other appropriate peer reviewed methods.
- Use preliminary project data to gain awareness of potentially difficult situations; for example possible presence of acid sulfate soil and contaminated sites – where soil sampling and analysis requires special procedures.
- Understand the relationships between soil physical/chemical properties and land use, in terms of both land capability classification and land suitability assessment.

CORE COMPETENCY 3: Report writing skills for soil surveyors

A competent soil surveyor is able to undertake the following, either individually or with suitably qualified colleagues in a team:

- Clearly and concisely describe, in written form, the field procedures.
- Classify soil profiles according to the Australian Soil Classification (ASC)[4], where appropriate, and briefly explain the relevant soil formation processes. Ensure that this information is presented in a form that is user-friendly to non soil surveyors.
- Interpret laboratory data in a way that meets the objectives of the client and complies with accepted standards applicable to the industry under consideration.
- Report the data that supports the mapping and soil survey observations in a standard database format.

CORE COMPETENCY 4: Map production skills for soil surveyors

A competent soil surveyor is able to undertake the following, either individually or with suitably qualified colleagues in a team:

- Use GIS software – possibly in conjunction with a sub-contractor – to produce soil maps that clearly identify the limitations to accuracy and the interpretations that can be supported. Include map legends that identify soil types, and soil properties appropriate to the investigation and established standard practice.
- Understand implications of scale of data collection, relative to scale of data presentation, to prevent a client from assuming that a soil map is more accurate than it actually is.

[2] See the list of guiding texts on page 6.
[3] See the list of guiding texts on page 6.
[4] See the list of guiding texts on page 6.

REQUIREMENTS FOR SPECIAL SOIL SURVEYS

1. Agricultural land management – *refer to CORE COMPETENCY 5*

CORE COMPETENCY 5: Agricultural land management

A competent soil surveyor is able to satisfy the skills required for CORE COMPETENCIES 1 to 4 as well as be able to apply the following skills in association with other suitably qualified professionals if necessary:

- Be aware of the rooting depths and soil requirements of the plant species/varieties being considered by the client. Input from an agronomy/horticulture/viticulture/forestry expert may be required.
- Provide cost-effective recommendations on soil amelioration, where necessary; e.g. deep loosening of compacted layers and/or clay bands within sandy soil, gypsum to overcome sodicity, lime for acidic soil, mounding and/or drains in zones prone to water-logging, clay application on water repellent soil, fertiliser to deal with nutrient deficiencies, organic amendments to improve soil biological health (see '*Publications that may assist with interpretation of soil survey information*')[5].
- Understand the available options for soil physical assessment described in *Soil Physical Measurement and Interpretation for Land Evaluation'* (known as the "*Brown Book*")[6].
- ***IRRIGATED AGRICULTURE:*** Present actual or estimated soil hydraulic data (water storage capacity, infiltration rates) to allow designers of irrigation systems to define 'Irrigation Management Units,' and the locations to install soil moisture sensors; ***DRYLAND AGRICULTURE:*** Present actual or estimated soil hydra*ulic data (water storage capacity, infiltration rates) to allow as*sessment of the *potential o*f various zones within a farm to produce crops/pasture under a range of climatic conditions.
- Understand the effects of effluent chemistry on the chemical/physical properties of soil profiles to minimise the risks associated with effluent irrigation projects.
- Assess the long term risk of salinity damage and boron toxicity, possibly with modelling and EM survey inputs via sub-contractors. Also consider soil erosion and nutrient leakage hazards.
- If requested, develop on-going plans for the monitoring of soil fertility that are linked to yield mapping and profitability assessment.
- Assist with integration of the soil information into a whole-farm plan that includes the introduction of controlled-traffic farming systems.

[5] See page 6.
[6] See the list of guiding texts on page 6.

Guiding texts for soil surveying work in Australia

'***ASC***': Isbell RF (2002) 'The Australian Soil Classification: revised edition' (CSIRO Publishing: Collingwood)

'***Brown Book***': McKenzie N, Coughlan K, Cresswell H (Eds.) (2002) 'Soil physical measurement and interpretation for land evaluation.' (CSIRO Publishing: Collingwood).

'***Blue Book***': McKenzie NJ, Grundy MJ, Webster R, Ringrose-Voase AJ (Eds.) (2008) 'Guidelines for surveying soil and land resources: second edition.' (CSIRO Publishing: Collingwood).

'***Green Book***': Rayment GE, Lyons DJ (2010) 'Soil chemical methods – Australasia.' (CSIRO Publishing: Collingwood).

'***Yellow Book***': The National Committee on Soil and Terrain (2009) 'Australian soil and land survey field handbook: third edition.' (CSIRO Publishing: Collingwood).

McKenzie N, Jacquier D, Isbell R, Brown K (2004) 'Australian soils and landscapes: an illustrated compendium.' (CSIRO Publishing: Collingwood).

Publications that can assist with interpretation of soil survey information

Sandy soil in WA

Hall D, Lemon J, Oliver Y, Gazey C, Davies S, Russell C, Witham N (2009) 'Managing South Coast sandplain soils to yield potential.' (WA Department of Agriculture and Food: Albany WA).

Mallee Landscapes

Nicholas P (ed.) (2004) 'Grape production series No. 2: Soil, irrigation and nutrition.' (SARDI: Adelaide SA).

Hard-setting red soil

Anderson AN, McKenzie DC, Friend J (eds.) (1999). 'SOILpak for dryland farmers on the red soil of Central Western NSW.' (NSW Agriculture, Orange).

Vertosols

Dalgliesh N, Foale M (1998) 'Soil matters: Monitoring soil water and nutrients in dryland farming.' (APSRU: Toowoomba).

McKenzie DC (ed.) (1998) 'SOILpak for cotton growers: third edition.' (NSW Agriculture, Orange).

General

Anderson A, Kelly J, McKenzie D (eds.) (2007) 'Healthy soils for sustainable vegetable farms: Ute Guide.' (AUSVEG; Land & Water Australia).

Glendinning JS (ed.) (1999) 'Australian soil fertility manual.' (Fertilizer Industry Federation of Australia Inc.; CSIRO Publishing: Collingwood).

Hazelton P, Murphy B (2007) 'Interpreting soil test results: What do all the numbers mean?' (CSIRO Publishing: Collingwood).

Hunt N, Gilkes B (1991) 'Farm monitoring handbook.' (University of Western Australia: Nedlands WA).

Peverill KI, Sparrow LA, Reuter DJ (eds.) (1999) 'Soil analysis: an interpretation manual.' (CSIRO Publishing: Collingwood).