



Australian Government

Department of Education, Employment and Workplace Relations

MSS025007A Perform sampling and testing of soils

Release: 1

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Modification History

Not applicable.

Unit Descriptor

This unit of competency covers the ability to obtain soil samples in accordance with a defined sampling plan, prepare the samples for testing, conduct in-field and laboratory testing of the samples and report the results. Personnel are required to check the validity and reliability of data, recognise atypical test data, and troubleshoot common test procedures and equipment problems.

Application of the Unit

This unit of competency is applicable to environmental technicians in a range of industry sectors, such as:

- environmental services (e.g. sampling and monitoring of air quality, water and soil)
- environmental compliance, auditing and inspection
- groundwater and clean water (e.g. catchments, supply and environmental flows)
- solid and hazardous waste management
- management of contaminated sites
- site remediation or rehabilitation
- geotechnical services and civil engineering
- natural resource management.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MSS024008A Recognise common geological landforms and samples

Employability Skills Information

Not applicable.

Elements and Performance Criteria Pre-Content

Not applicable.

Elements and Performance Criteria

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| 1 | Confirm soil sampling and testing requirements with supervisor | 1.1 | Review available site information, such as site plan, sampling/testing locations and history of sampling/testing |
| | | 1.2 | Confirm the sampling locations, numbers and types of samples, timing and frequency of sampling from enterprise or client's sampling plan |
| | | 1.3 | Check that all sampling/testing procedures are in accordance with client or enterprise requirements, relevant standards and guidelines |
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| 2 | Prepare for soil sampling | 2.1 | Identify site and sampling hazards and review enterprise safety procedures |
| | | 2.2 | Liaise with relevant personnel to arrange site access and obtain all clearances and/or permits, as necessary |
| | | 2.3 | Select sampling equipment and conditions to achieve representative samples and to preserve sample integrity during collection, storage and transit |
| | | 2.4 | Select field test equipment/instruments and check operation and calibration, as required, in accordance with procedures and manufacturer instructions |
| | | 2.5 | Assemble and check all sampling equipment, field test equipment, materials, containers and safety equipment |
| | | 2.6 | Arrange suitable transport to, from and around site, as required |

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| 3 | Conduct sampling and log soil samples | 3.1 | Locate sampling points and any services at the site |
| | | 3.2 | Work effectively with other site personnel during drilling and excavation operations to collect and log reliable samples, as necessary |
| | | 3.3 | Conduct representative sampling in accordance with sampling plan and defined procedures for field and/or laboratory testing, as required |
| | | 3.4 | Record all information and label samples in accordance with traceability requirements |
| | | 3.5 | Record environment and any conditions or atypical observations made during sampling that may impact on sample representativeness or integrity |
| | | 3.6 | Transport all samples back to base according to enterprise procedures and relevant codes |
| 4 | Prepare soil samples for testing | 4.1 | Prepare sub-samples and back-up sub-samples that are representative of the source |
| | | 4.2 | Label all sub-samples to ensure traceability and store in accordance with enterprise procedures |
| | | 4.3 | Follow defined preparation and safety procedures to limit hazards or contamination to samples, self, work area and environment |
| | | 4.4 | Distribute sub-samples to required destinations for testing, maintaining sample integrity, traceability and chain of custody requirements |
| 5 | Conduct physical and chemical soil tests in the field | 5.1 | Obtain sample or subsample for designated field test |
| | | 5.2 | Check that all equipment, instruments and reagents are fit for purpose |
| | | 5.3 | Set up and calibrate instruments, as necessary, to ensure safe operation and valid results |

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| | | 5.4 | Operate equipment/instruments in accordance with test method requirements |
| | | 5.5 | Perform tests/procedures/observations on all samples and standards, if appropriate, in accordance with specified methods |
| | | 5.6 | Record all field observations and results and ensure that they are accurately transferred to enterprise information management system |
| 6 | Conduct physical and chemical soil tests in the laboratory | 6.1 | Obtain sample or subsample for designated laboratory test |
| | | 6.2 | Check that all equipment, instruments and reagents are fit for purpose |
| | | 6.3 | Set up and calibrate instruments, as necessary, to ensure safe operation and valid results |
| | | 6.4 | Operate equipment/instruments in accordance with test method requirements |
| | | 6.5 | Perform tests/procedures on all samples, blanks and standards, if appropriate, in accordance with specified methods |
| | | 6.6 | Record test data noting atypical observations |
| | | 6.7 | Process the data for samples, standards and blanks in accordance with enterprise procedures |
| | | 6.8 | Enter approved information into enterprise information management system |
| 7 | Review results and assess soil suitability for specific purposes | 7.1 | Review results in relation to legislative and/or client requirements |
| | | 7.2 | Compare data with required/established/desired parameters to establish suitability for purpose |
| | | 7.3 | Determine need for remedial action and report to client |

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| 8 | Maintain a safe work environment | 8.1 | Rehabilitate sampling site to render it safe and to minimise environmental impact |
| | | 8.2 | Clean all equipment, containers, work area and vehicles according to enterprise procedures |
| | | 8.3 | Check serviceability of all equipment before storage |
| | | 8.4 | Use defined safe work practices and personal protective equipment to ensure personal safety and that of others |
| | | 8.5 | Minimise the generation of wastes and environment impacts |
| | | 8.6 | Ensure the safe collection of all hazardous wastes for appropriate disposal. |

Required Skills and Knowledge

Required skills

Required skills include:

- planning and preparing for field and laboratory activities
- site observational and descriptive skills
- researching and summarising existing data and reports
- communicating effectively and writing/compiling concise and accurate reports
- field sampling and monitoring procedures, including labelling and traceability
- demonstrating correct and safe use of field instruments and/or equipment under laboratory and field conditions, including field calibration
- identifying and rectifying basic instrument faults
- collecting representative samples in accordance with a sampling plan
- using appropriate techniques to preserve the integrity of samples
- identifying atypical materials and samples and taking appropriate action
- maintaining sampling equipment
- completing sampling records
- seeking advice when issues/problems are beyond scope of competence/responsibility
- following requirements for the disposal of waste and the preservation of the environment
- working safely

Required knowledge

Required knowledge includes:

- appropriate scientific terminology for soils and soil science
- soil classifications
- fundamentals of soil science, including:
 - soil morphology
 - mineralogy
 - physical, chemical and biological properties
- soil formation processes
- soil function within ecosystems
- land use and soil systems (interactions and impacts)
- principles of representative samples
- principles and procedures for random, systematic and stratified sampling, and consistency of sampling procedures
- preservation of the integrity of samples
- maintaining identification of samples relative to their source, enterprise and/or legal

traceability requirements

- cost-effectiveness of sampling
- characteristics of soils to be sampled and likely contaminants
- links between quality control, quality assurance, quality management systems and sampling procedures
- enterprise procedures dealing with legislative requirements for the handling, labelling and transport of hazardous goods
- links between correct occupational health and safety (OHS) procedures and personal and environmental safety particularly at high risk sites

Evidence Guide

Overview of assessment	Competency must be demonstrated in the ability to perform consistently at the required standard.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently apply the skills covered in this unit of competency in new and different situations and contexts. Critical aspects of assessment and evidence include: • collecting and preserving sufficient representative soil samples to enable all processing and testing to occur and storage of back-up samples • identifying atypical materials and samples and taking appropriate action • labelling samples and sub-samples to satisfy enterprise/legal traceability requirements • applying sampling and test methods/procedures to accurately prepare and test samples • safely operating and maintaining sampling equipment and test instruments to enterprise standards and/or manufacturer specification • interpreting gross features of data, and identifying atypical results as out-of-normal range or an artefact • preparing calibration graphs and calculating results using appropriate units and precision • making valid conclusions about soil suitability • reporting results and completing sampling records using enterprise procedures • working safely and following relevant legislative requirements for the disposal of waste and the

	preservation of the environment.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or a simulated workplace environment. Assessment should emphasise a workplace context and procedures found in the candidate's workplace. This unit of competency may be assessed with: • <i>MSL974003A Perform chemical tests and procedures</i> • <i>MSS025006A Collect and evaluate groundwater data</i> • <i>MSS025014A Perform sampling and testing of contaminated sites.</i> The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. Resources may include: • variety of sample types • sampling plans • sampling containers and sampling equipment • equipment/instruments for in-field and laboratory soils testing.
Method of assessment	The following assessment methods are suggested: • inspection of soil samples collected by the candidate • review of sampling/testing documentation completed by the candidate • feedback from peers and supervisors that the candidate consistently follows enterprise procedures, sampling/testing procedures and works safely • questioning to assess underpinning knowledge of soil sampling, soil testing equipment and methods • observation of the candidate collecting and testing a range of soil samples. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work-like

	environment.
Guidance information for assessment	

Range Statement

Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
Legislation, standards, codes, procedures and/or enterprise requirements	Legislation, standards, codes, procedures and/or enterprise requirements may include: • federal legislation, such as: • Environment Protection and Biodiversity Conservation Act 1999 • state/territory government legislation and regulations and local government by-laws, policies, and plans dealing with: • land use, acquisition, planning and protection • environmental protection • soil conservation • pollution and contaminated sites • Australian and international standards, such as: • Standards Australia HB 160 Soils testing • AS 1289 series Methods of testing of soils for engineering purposes • AS 1726:1993 Geotechnical site investigations • AS 1199 series Sampling procedures for inspection by attributes • AS 1678 series Emergency procedure guide -Transport • AS 4433.2:1997 Guide to the sampling of particulate materials - Preparation of samples • enterprise and/or client sampling schemes and sampling plans • enterprise recording and reporting procedures • material safety data sheets (MSDS) • methods and procedures which may be written to meet enterprise, client and/or regulatory/certifying body requirements • site plans, maps and specifications

Fundamentals of soil science	Fundamentals of soil science include: • soil morphology: • soil profiles and soil horizons • soil structure and texture • mineralogy • (Australian) soil classification: • order and suborder • great group, subgroup and family • pedology and soil formation: • pedogenesis • pedosphere • Climate, Organisms, Relief, Parent Material or Lithography, Time (CLORPT) • edaphology: • plant-soil interactions • agricultural soil science (soil fertility) • environmental soil science (soil contamination and remediation) • geomorphology: • erosion and mass wasting • transportation and deposition (sedimentation) • fluvial, aeolian, hillslope and weathering processes • soil chemistry: • soil solids (composition and structure) • solid (solution equilibria) • acid-base equilibria (acid sulfate soils) • oxidation-reduction equilibria • anion and cation exchange • soil salinity • complexiometric equilibria • sorption phenomena on soils • physical/engineering soil properties: • colour (Munsell chart) • liquid and plastic limits • linear shrinkage • soil particle density • particle size distribution • dispersion and Emerson class number
Basic principles of sampling	Basic principles of sampling include: • sampling plans and site selection • representative samples

	• preservation of integrity of samples • maintaining identification of samples relative to their source, enterprise and legal traceability • cost-effectiveness of sampling • consistency of sampling procedures • sampling principles, including random, systematic stratified and composite sampling
Materials sampled	Materials sampled may include: • solid samples, such as soil and sediments • natural, agricultural and engineered soils • solid wastes • soil water • soil gas/vapour
Types of samples	Types of samples may include: • discrete samples • composite samples • quality control samples • research or one-off samples • environmental or survey samples
Sampling tools and equipment	Sampling tools and equipment may include: • maps, global positioning system (GPS) unit and compass • shovels and crow bars • metal-free scoop and cleaning brush • folding rulers and tape measures • hand and power augers • pry bars and files (auger maintenance) • push tubes • sampling tubes, dip tubes, spears and syringes • front-end loader, backhoe, excavator and drill rig • sample bottles or containers, plastic bags/containers and disposable buckets • lysimeters • soil gas probes • sample splitters • graters and mills • mortar and pestles
Testing equipment and instruments	Testing equipment and instruments may include: • sieves and sieve shakers • digital camera

	• hand lenses and microscopes • Munsell colour chart • pH meter and soil pH test kit • conductivity meter • tensiometer (moisture measurements) • ultraviolet/visible (UV/Vis) spectrophotometer • atomic absorption spectrophotometer • gas chromatographs (GC) and GC-MS • infrared spectrophotometer • diffuse reflectance accessories • inductively coupled plasma (ICP) spectrometers and ICP-MS • X-ray fluorescence (XRF) spectrometers • radiation monitor (e.g. Geiger-Muller counter) • drying ovens • balances • laboratory glassware
Site and sampling hazards	Site and sampling hazards may include: • solar radiation, dust and noise • wildlife, such as snakes, spiders and domestic animals • biohazards, such as microorganisms and agents associated with soil • chemicals, such as acids and hydrocarbons • aerosols • sharps and broken glassware • manual handling of heavy sample bags and containers • crushing, entanglement and cuts associated with moving machinery and hand tools • vehicular and pedestrian traffic
Safety procedures	Safety procedures may include: • use of MSDS • use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gowns, body suits, respirators and safety boots • use of biohazard containers and laminar flow cabinets • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS,

	manufacturer instructions, and enterprise procedures and regulations • regular cleaning and/or decontaminating equipment and work areas • machinery guards • signage, barriers, service isolation tags, traffic control and flashing lights • lock-out and tag-out procedures
Chemical soil tests	Chemical soil tests may include: • electrical conductivity • pH • alkalinity • cation exchange capacity • organic carbon • available phosphorus • nutrients and micronutrients • sulfate • carbonate • nitrate and total nitrogen • metals, including heavy metals • organics, including pesticides and other hazardous chemicals
Physical soil tests	Physical soil tests may include: • soil profile description • soil colour (Munsell) • soil texture • soil resistivity • liquid limit • plastic limit (plasticity index) • Atterberg limits • standard penetration test • cone penetration test • soil moisture content • compaction • infiltration • volume expansion • linear shrinkage • particle size analysis • dispersibility (Emerson class number) • water repellence • radioactivity

OHS and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health
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Unit Sector(s)

Environmental

Custom Content Section

Not applicable.