**Department of Sustainable Natural Resources**

# SOIL SURVEY STANDARD TEST METHOD

# ELECTRICAL CONDUCTIVITY

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| **ABBREVIATED NAME** | EC |
| **TEST NUMBER** | C1 |
| **TEST METHOD TYPE** | A |
| **VERSION NUMBER** | 3 |

## SCOPE

The electrical conductivity indicates the amount of soluble (salt) ions in soil.

## PRINCIPLE

The determination of electrical conductivity (EC) is made with a conductivity cell by measuring the electrical resistance of a 1:5 soil:water suspension.

## SPECIAL APPARATUS

- Conductivity meter and cell.
- Shaking bottles.

# REAGENTS

**Distilled or deionised water**

The water is to have an electrical conductivity of <1 µS/cm and have a $CO_2$ concentration no more than atmosphere equilibrium.

**0.01M Potassium Chloride Reference Solution**

Dissolve 0.746 g KCl AR (previously dried at 105 °C for 2 hours and make volume to 1 L with $CO_2$ free deionised water. This solution has an electrical conductivity of 1.413 dS/m at 25 °C.

# PROCEDURE

1. Prepare a 1:5 soil:water suspension by weighing 10 g air-dry soil (<2 mm) into a bottle. Add 50 mL deionised water. Mechanically shake at 15 rpm for 1 hour to dissolve soluble salts.

2. Calibrate the conductivity meter according to the manufacturer's instructions using the KCl reference solution to obtain the cell constant.

3. Rinse the cell thoroughly. Measure the electrical conductivity of the 0.01M KCl at the same temperature as the soil suspensions.

4. Rinse the conductivity cell with the soil suspension. Refill the conductivity cell without disturbing the settled soil. Record the value indicated on the conductivity meter. Rinse the cell with deionised water between samples.

## CALCULATIONS

If the meter is not equipped for automatic temperature compensation, carry out the following calculations:

**If the meter reads directly in conductivity values, then calculate $EC_{25}$**

$$EC_{25}(dS/m) = \frac{S\ x 1.413}{K}$$

Where:
S = Measured EC of suspension
K = Measured EC of KCl solution

**If the meter reads resistance value, then calculate $EC_{25}$**

$$EC_{25}(dS/m) = \frac{K}{S\ x 0.708}$$

Where:
S = Measured resistance of suspension
K = Measured resistance of KCl solution

## REFERENCES


Piper, CS 1942, *Soil and Plant Analyses*. University of Adelaide.

Rayment, GE & Higginson, FR 1992, *Australian Laboratory Handbook of Soil and Water Chemical Methods*, Melbourne, Inkata Press. (Australian Soil and Land Survey Handbooks, vol 3)


## NOTE

There is no clear relationship between electrical conductivity (1:5 soil:water) and total soluble salts due to the different ionic conductivities of the various salts and the influence of the soil particles. An approximate value for the percentage total soluble salts is obtained by multiplying the electrical conductivity at 25 °C (dS/m) by 0.34.