THEORY OF OPERATION and DEFINITIONS

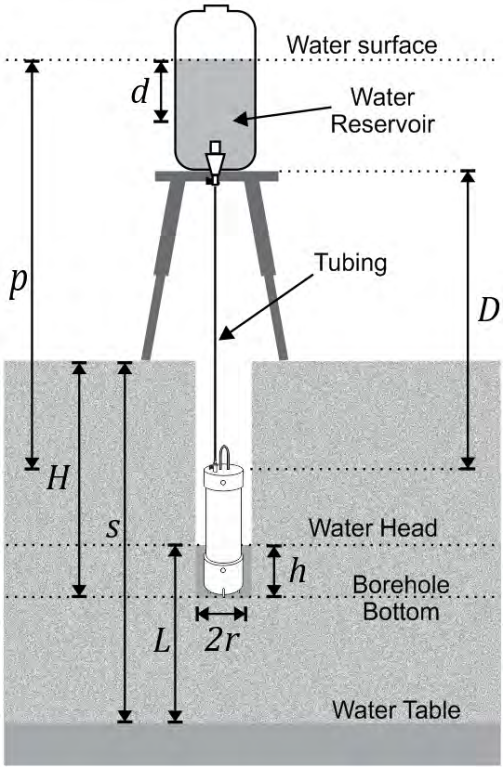

Fig. 6. Schematic of a Standard Setup of an Aardvark Permeameter. Where d is drop in reservoir water level, D is vertical distance between Reservoir and APM, H = borehole depth, r = borehole radius, h = constant water head height in borehole, p = vertical distance between water surface in reservoir and constant water head, s = water table depth and L = the vertical distance between constant water head and water table / impervious layer.

Saturated hydraulic conductivity (K_{sat}) is an indicator of water flow rate in soil and is a key parameter for studying water flow and chemical transport through a soil profile. These measurements can be vital to scientific and engineering studies. For example, it can be used in leach line placement in rural sewer systems and determine limits of rain/runoff conditions, and the ability of holding ponds to retain water.

The Aardvark is a constant-head permeameter. It means that the depth of water in borehole (h) does not change during the measurement period (Fig. 6). As a result, the measurement conditions remain constant during the measurement period. The rate of water supplied corresponds to soil infiltration rate from the bottom and side surfaces of the testing borehole.

The Aardvark Permeameter estimates soil hydraulic conductivity using the amount of supplied water (determined using d) measured at equal time intervals (Fig. 6). This is equivalent to the amount of water that was infiltrated by soil. Soil-water infiltration rate is the amount of percolated water over time which is equivalent to the reservoir flow rate (see equation below).

$$reservoir\ flow\ rate = \frac{reservoir\ water\ change}{time}$$

The measurement ends when the reservoir flow rate (soil-water infiltration rate) does not change over several consecutive readings. Soil hydraulic conductivity (K_{sat}) then can be calculated using this steady flow rate (Q). For more details see section "*Calculations and Applications*".

Operating Model 2840K1PC and Model 2840K2PC

(Automated Readings Using a PC)

Performing measurements are much more accurate and easy using the PC Kits. These kits contain a 2840K1 kit (for Shallow Measurements) or a 2840K2 kit (for Deep Measurements) as well as a Digital Scale (Model 7201W10). See kit components in Fig. 2 and Fig. 3.

The Digital Scale is connected to a personal computer or laptop (not included) using a USB port and records the measurements automatically. The accuracy of measurements for water flow rate is 0.2 gram (one gram is equivalent to one ml (cc or cm^3) of volume for pure water). Once the steady flow rate is established in the Borehole, the software calculates K_{sat} automatically and there is no need to continue the measurements (although it is possible). This kit is ideal for automated and accurate measurements in the laboratory and outdoors (when a personal computer is available).

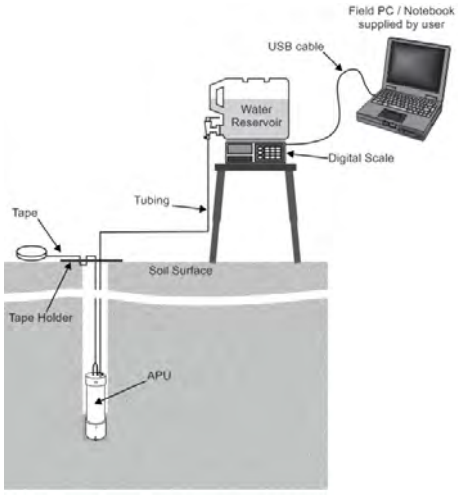

Fig. 22. Schematic of Model 2840K1PC setup and arrangement.

In case a PC is not available, the 2840K1PC and 2840K2PC can still be used as a more accurate version of the Basic Aardvark. The SimplyDATA Scale operates on batteries. Therefore it can be used wherever needed.

The Installation procedure is similar to Model 2840K1. Refer to the section “Operating Model 2840K1 and Model 2840K2” for instructions about assembling and placement of the Aardvark Table; components; assembling and installing the Aardvark Permeameter Module (APM) in a Borehole and assembling the Aardvark Reservoir Unit (RU).

After preparing a Borehole and Installing the APM, follow these steps:

Place Scale and Reservoir on the Table and make sure that they are centered with the Table legs (Fig. 23). Note that the Reservoir is relatively heavy and if it is not centered with Table legs, it may tip over.

Connect the Scale to your PC using the USB cable provided in the kit. Please refer to the USB Digital Scale (Model 7201) operating Instructions for more details and illustrations.

Install the SimplyDATA Software Suite on your computer (if not already installed). Please refer to the SimplyDATA Software Suite (Model 8010SFAGB02) Operating Instructions for more details.

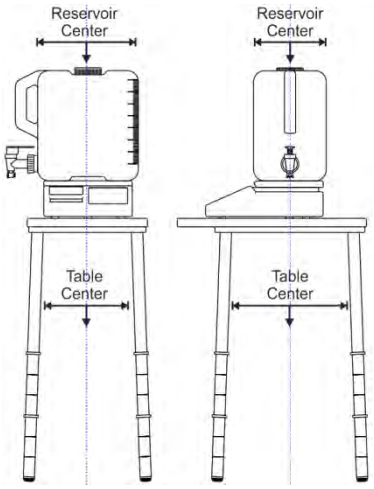

Fig. 23. How to center Scale and Reservoir with Table.

CALCULATIONS AND APPLICATIONS

Using the SimplyDATA Software Suite for manually recorded data

The Aardvark Permeameter kit contains a flash drive with the SimplyDATA Software Suite. The software performs all the necessary calculations required for calculating soil hydraulic conductivity. To use the software you will need a personal computer. Simply enter the raw measurements data and it calculates K_{sat} as well as some other useful parameters and graphs. Please refer to the "SimplyDATA Software Suite Operating Instructions" for more details. If you are using the Model 2840K#PC connected to a computer or Model 2840K#RIF, the software performs all the measurements and calculations automatically. Please refer to the SimplyDATA Software Suite Operating Instructions for more details.

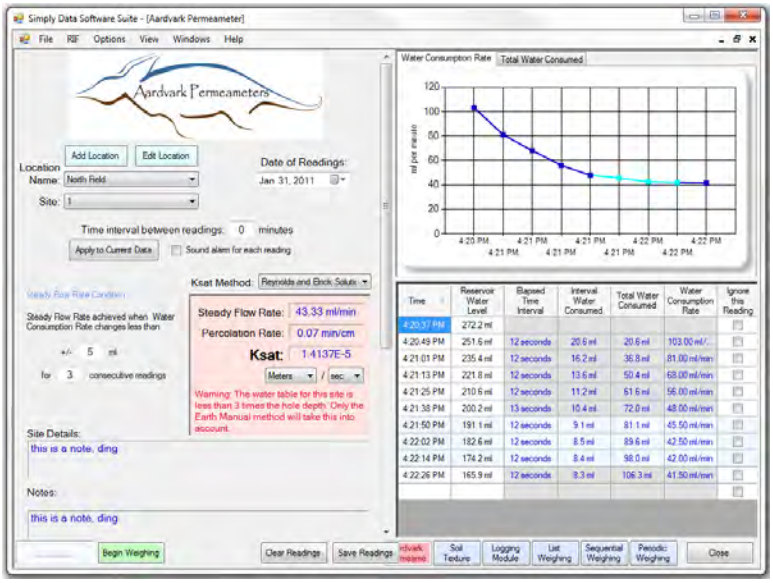

Fig. 28. Permeameter application of the SimplyDATA Software Suite.