

Drill & Drop Probe Installation Manual

Drill!



Drop!



Done!



Sentek
technologies

'proven quality, enduring value'

Solutions for soil moisture and salinity management



Please Read This Manual Before installing the Drill & Drop Probe

- This manual was created to provide you with the knowledge to install the Drill & Drop probe in a fast and correct manner.
- Reading this manual will assist you with the choice of the right tools and procedures. This should save you time and ensure a good installation quality of the probe.

List of Contents

Section	Page
Introduction to the Drill & Drop Probe	4
Safety Instructions	11
Installation Equipment Required	15
Recommended Installation - Heavy Soil Type Example	23
Installation in Mounded Rows	41
Advanced Installations: Duplex Soils	50
Advanced Installations: Subsurface	55
Drill and Drop Probe Extraction	75



Introduction to The Drill & Drop Probe

- Need for a rapid direct installation method.
- Uses a new fully sealed probe.
- Rugged construction.
- Uses a rigid tripod to maintain the augered hole integrity.
- Uses a tapered auger to suit the tapering of the probe.
- Ease of removal and reuse.

What is it?

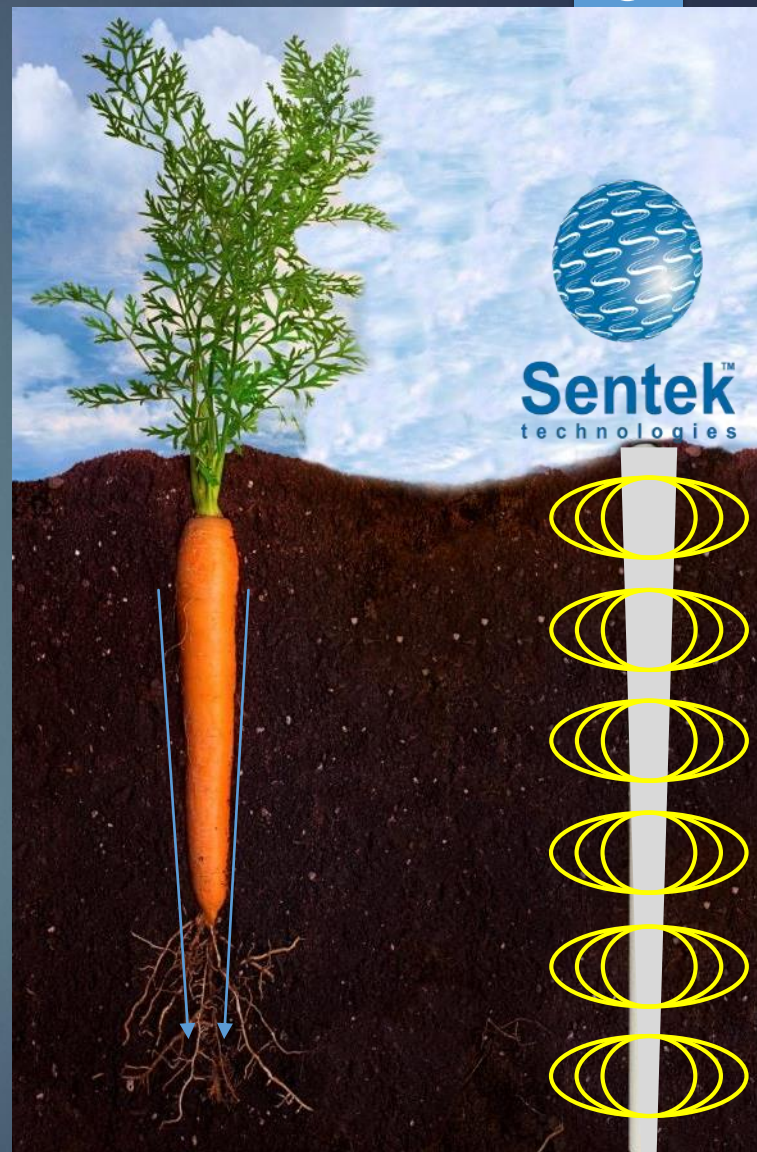
OUR NEW INNOVATION:

The SENTEK Drill & Drop

The tapered Drill & Drop multi-sensor profiling probe measures:

- ▶ Soil Moisture
- ▶ Salinity
- ▶ Temperature

It is wider at the top than it is at the bottom to ensure an agronomically correct slurry-free, snug fit and super-fast probe installation.



Why did we create it?

6



- ▶ Soil moisture probes are difficult and time-consuming to install – existing soil moisture probes require a lot of time and energy, especially when inserting down to 1.2 m (48”) ... until **NOW!!**
- ▶ The Drill & Drop measures an undisturbed soil medium, not a soil slurry that fills the air gap between soil and probe, which is being used by most soil moisture probe manufacturers.
- ▶ The slurry invites preferential path flow of water along the probe, providing misleading and potentially crop damaging information to the irrigator.

How does this solve the problem?

7

▶ **Step 1:** Drilling tapered hole in soil.

▶ **Step 2:** Dropping in a tapered probe.

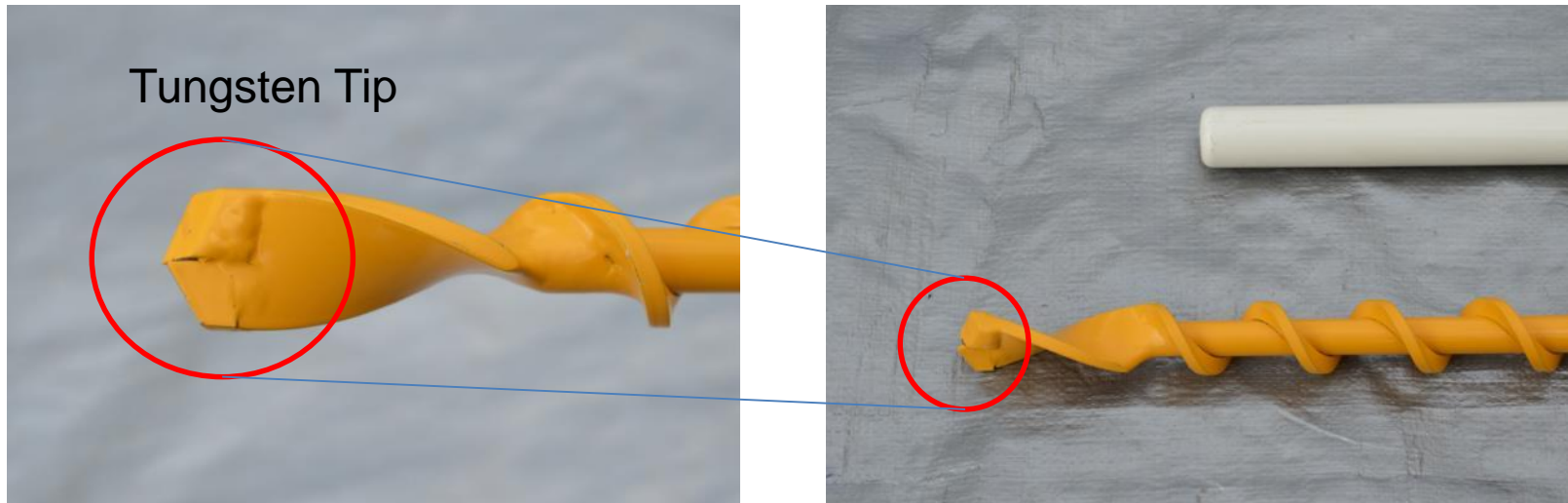
▶ **Step 3:**



You
Tube

See "Sentek Videos"

Tapered Auger & Tapered Probe



The auger is a little bit longer than the probe. The tapered soil opening created by the auger is therefore deeper compared to the length of the probe body. The resulting soil cavity below the bottom of the probe is designed to accept soil accumulating at the bottom of the cavity during the augering process. Otherwise soil accumulation could obstruct the insertion of the probe body to its full length.

Drill & Drop Auger is Fitted With a Tungsten Tip



Quality of the Drilled Hole for Probe Insertion



It is not possible to achieve the quality and integrity of the drilled hole (as shown in the picture above) without using the Sentek stabilization tripod for the conical auger.

Warning: Not using the tripod can lead to air gaps, potentially causing preferential path flow of water and misleading readings.

Safety Instructions

Warning!

- Read and follow all safety instructions in this *Drill & Drop Installation Manual* and the safety instructions in the respective manuals of the recommended power tools documented in this manual.



Safety Precautions and Working Techniques

- A power drill is a high-torque, petrol – or electrically powered tool, some special precautions must be observed to reduce the risk of personal injury.
- It is important that you understand and observe the following safety precautions and warnings. Read this installation manual and the respective manuals for the tools recommended in this manual. Careless or improper use of any power drill may cause serious or fatal injury.

Danger

- Drilling into or contact with electrical wires may cause severe shock, burns or death. Obtain information about buried power cables.

Warning

- Striking a hard object in the soil with the turning auger and the resulting slowing or stoppage of the auger creates reactive forces. The transfer of rotational (reactive) forces can cause the auger powerhead and handles to rotate suddenly in oppositely the original direction and can result in loss of control or cause the handle to hit the operator resulting in injury. Always use auxiliary handles supplied with the tool.

Warning

- Minors should never be allowed to use a power drill. Bystanders, especially children and animals should not be allowed in the area where a power drill is being used. Never let the power drill run attended.



Safety Precautions and Working Techniques

Warning

- Do not lend or rent your power drill without the respective owner manual and this installation manual. Be sure that anyone using your power drill understands the information contained in the relevant manuals.

Warning

- When using an electric power drill and a generator as a power source in the field, hold the power tool by insulated gripping surface when drilling where the auger may contact buried wiring or its own cord. Contact with a “live” wire will make exposed metal parts of the tool “live” and shock the operator. Ensure the cord does not get wrapped around the spinning auger.

Warning

- Always wear certified safety protection. Wear ear and eye protection when operating power drills.

Warning

- To reduce the risk of injury, the operator should wear proper protective apparel. Clothing must be snug-fitting, but allow complete freedom of movement. Avoid loose fitting jackets, flared or cuffed pants or anything that could be drawn into the boring tool. Wear overall or long pants to protect your legs. Do not wear shorts. Use gloves when handling the power drill.

Warning

- Always use the side handle supplied with the tool. Keep a firm grip on the tool at all times. Do not attempt to operate this tool without holding it with both hands. Operating this tool with one hand will result in loss of control when striking hard pans or stones.

Safety Precautions and Working Techniques

Warning

- To reduce the risk of falling as a result of the forces created by the power drill, good footing is most important. Wear sturdy shoes with nonslip soles. Steel-toed safety boots are recommended.
- Warning
- Power drill noise may damage your hearing. Wear sound barriers (ear plugs or ear muff) to protect your hearing.

Warning

- Do not expose an electric power drill to rain or wet conditions.

Warning

- When operating an electrical power drill outdoors, use an extension cord suitable for outdoor use.

Please refer to respective detailed user manuals and their safety instructions for the recommended tools in this manual:

- Operation of generator
- Operation of electrical power drill with auger
- Operation of petrol powered power drill with auger

Installation Equipment Required

Installation Tools for Light Soils



Stabilization Tripod with Screw Pins

Bucket for excavated soil

Tapered Auger

Drill & Drop Probe

Trowel

2 sheets of Newspaper

Pressurized Water Bottle

Battery Drill

Socket for Screw Pins

'proven quality, enduring value'



Do Not Use a Battery Operated Drill for Heavy Soils



Installation Tools for Heavy Clay

1.6 KVA Generator

Stabilization Tripod with Screw Pins



Bucket for excavated soil

Tapered Auger

Drill & Drop Probe

Socket for Screw Pins

Trowel

2 sheets of Newspaper

740 Watt DEWALT Drill

Pressurized Water Bottle

Electrical Extension Cord



Recommended Tools Important!



A Honda EU20 i 1.6 KVA Generator and a 740 Watt DEWALT Drill have been intensively tested to drill holes in some very heavy textured soils. These tools have not failed in the course of many installations. They are highly recommended.

Recommended Tools Important!



Alternatively, a motorized power head may be used to drive the tapered auger. The one shown is an ECHO EDR-2400 2-stroke engine drill by Yamabiko Corporation.

Recommended Tools Important!



DISPLACEMENT	27.2 cc (1.6 cu. in.)
ENGINE POWER	0.8 kW (1.07 bhp)
WEIGHT	4.8 kg (10.5 lbs.)
FUEL TANK CAPACITY	250 cc (8.5 oz.)
DRILL SPEED	1st Gear: 910 rpm 2nd Gear: 2,710 rpm Reverse: 810 rpm
POWER SOURCE	Petrol/Oil Mix

Drill & Drop Tool Kit

Extension Foot for
hill crops
optional

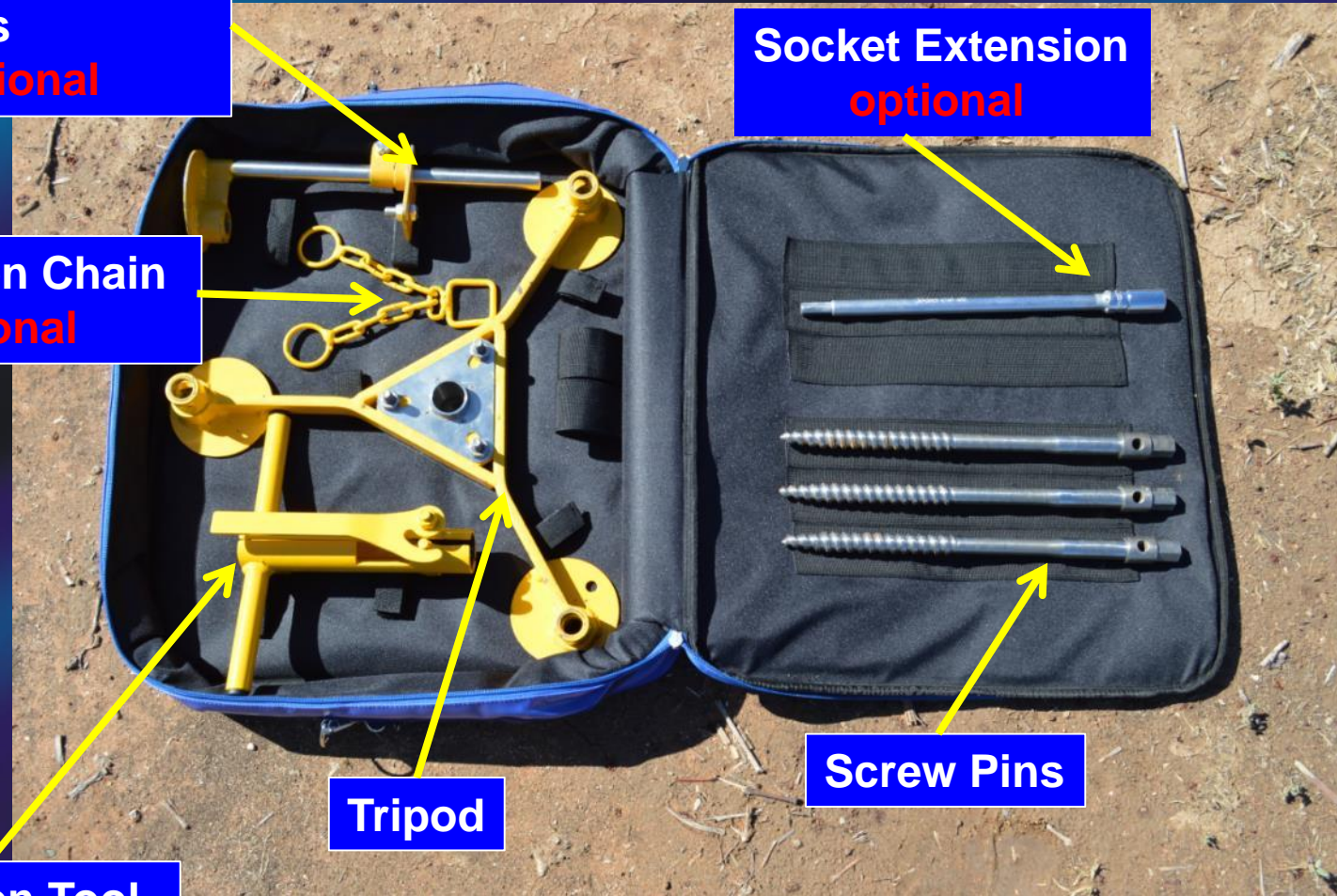
Socket Extension
optional

Extraction Chain
optional

Extraction Tool
optional

Tripod

Screw Pins



Recommended Installation

Heavy Soil Type Example

1. Tripod Installation

Place 2 sheets of newspaper beneath the Stabilization Tripod. This allows easy removal of the augured soil later.



2. Prepare Screw Pins for Drilling



3. Place Socket into Drill

Tighten socket with drill chuck key.



4. Drill Screw Pins into Soil



Place one foot onto the centre of the tripod, position the socket onto the screw pin and keep drilling until the head end of the pin comes to rest on top of the tripod. Repeat with the remaining 2 pins and then check the tripod stability.

5. Insert Tapered Auger into Drill



6. Augering

Insert the auger into the centre of the tripod keeping it as straight as possible. Start the drill and move the auger constantly and gently 10 – 15 cm up and down during the drilling process. This enables movement of the soil from the auger flight upwards and out of the drilled hole.



7. Wetting the Auger

When the going gets tough in heavy clay, spray some water onto the auger and into the augered hole. This makes the drilling process easier by allowing the lubricated clay ribbons to travel up the auger flight and out of the hole.



In sand, the water serves to maintain the integrity of the hole being augered (stops wall collapse).



8. Augering to Depth



9. Test Depth of Hole Before Probe Insertion



Now reintroduce the auger carefully with the drill switched off. Push auger until the top end of the flight is level with the hole of the tripod. If the auger will not go down to this level, give the auger a quick spin to take up the soil at the bottom of the hole, then stop the drill, remove it from the hole and clean it once again.

Important: Repeat the process until you can fully insert the auger without spinning into the hole. Only then is the hole **ready** to accept the probe.

10. Removal of Screw Pins

Use the drill in reverse mode to unscrew the pins.



11. Inspect Quality of Hole



Remove the tripod and inspect the quality of the hole. It should be smooth-sided and free of air pockets.

Carefully remove the augered soil from the site using the newspaper.

12. Prepare Small Trench for Probe Cable



Use a small trowel to dig a trench to accept the probe cable. During excavation place your finger over the hole to prevent the soil falling into it.

13. Preparation for Probe Insertion



Use the spray bottle to wet the probe and the upper walls of the hole. This is particularly useful as lubrication in clay soils.

14. Probe Insertion



Insert the probe carefully into the hole pushing it all the way down until the top of the probe is level with the soil surface. The first sensor will now be located at 5cm depth.

15. Final Probe Seating



If the probe protrudes above the soil surface and you cannot push it any further by hand, gently step on it and use your body weight to push it into final position.

16. Drill & Drop Probe Interface Box



The interface box can be laid on the ground for convenient connection of a probe configuration cable, should the need arise. It may also be buried for protection from passing farm machinery or animal interference. Ensure that the probe connection port is tightly sealed with the cap provided. The probe installation is now complete and ready for connection to the logger.

17. Probe Installation Completed



The (almost) completed installation of the probe should look like this. The probe should be in firm contact with the soil and you should not be able to push it in any further by hand.

Last thing: The channel for the cable should be filled with soil.

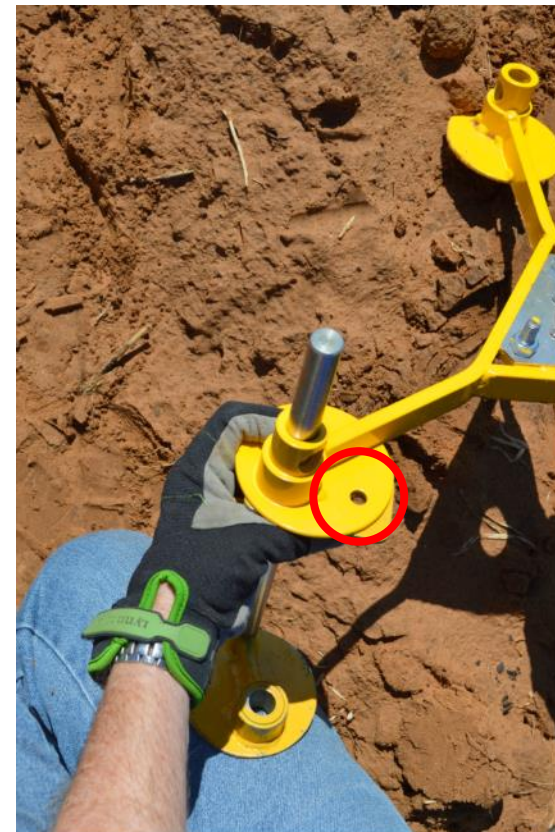
Installation in Mounded Rows

Extension Foot for Tripod Stabilization on Hills



When installing the Drill & Drop probe in crops grown on hills an extension foot (circled) is used to stabilize the tripod on the hill ridge.

1. Extension Foot Insertion



Insert the extension foot into of the tripod foot. Use the foot with the pre-drilled hole (circled).

2. Securing the Extension Foot



Align holes of tripod and extension foot, place bolt through the holes and tighten with the nut.

3. Extension Foot Height Adjustment



Loosen the nut and bolt of the height clamp (circled) and slide the leg to the desired height.

4. Extension Foot Height Adjustment



Re-tighten the nut and bolt (circled).

5. Tripod Levelling



Use a levelling bubble to position the tripod correctly.

6. Pin Insertion into Tripod



Insert screw pins into holes of tripod legs and extension foot and use electric drill to secure two tripod feet on the hill ridge and the extension foot in the furrow.

7. Completed Hill Installation



Two tripod feet are secured on top of the hill, while the tripod extension foot is secured at the bottom of the furrow.

Advanced Installations

Duplex Soils

Installation into Duplex Soils



Installation of the Drill & Drop probe into soils with a strong textural difference in the A and B horizons requires pre-drilling of the hole with an undersized non-tapered auger first, followed by the tapered one.

This is done to prevent the deposition of clay shavings transported up the flight auger into the sandy A horizon (or vice-versa). The sensor should only be measuring the sandy texture without any dispersed clay shavings within it.

1. Use a 24mm Non – Tapered Auger to Pre-Drill the Hole



Collar

Clay

Sand

Pre-level the tripod first

2. Finish the Job With the Tapered Auger



Continue with Step 6
of the Augering Process

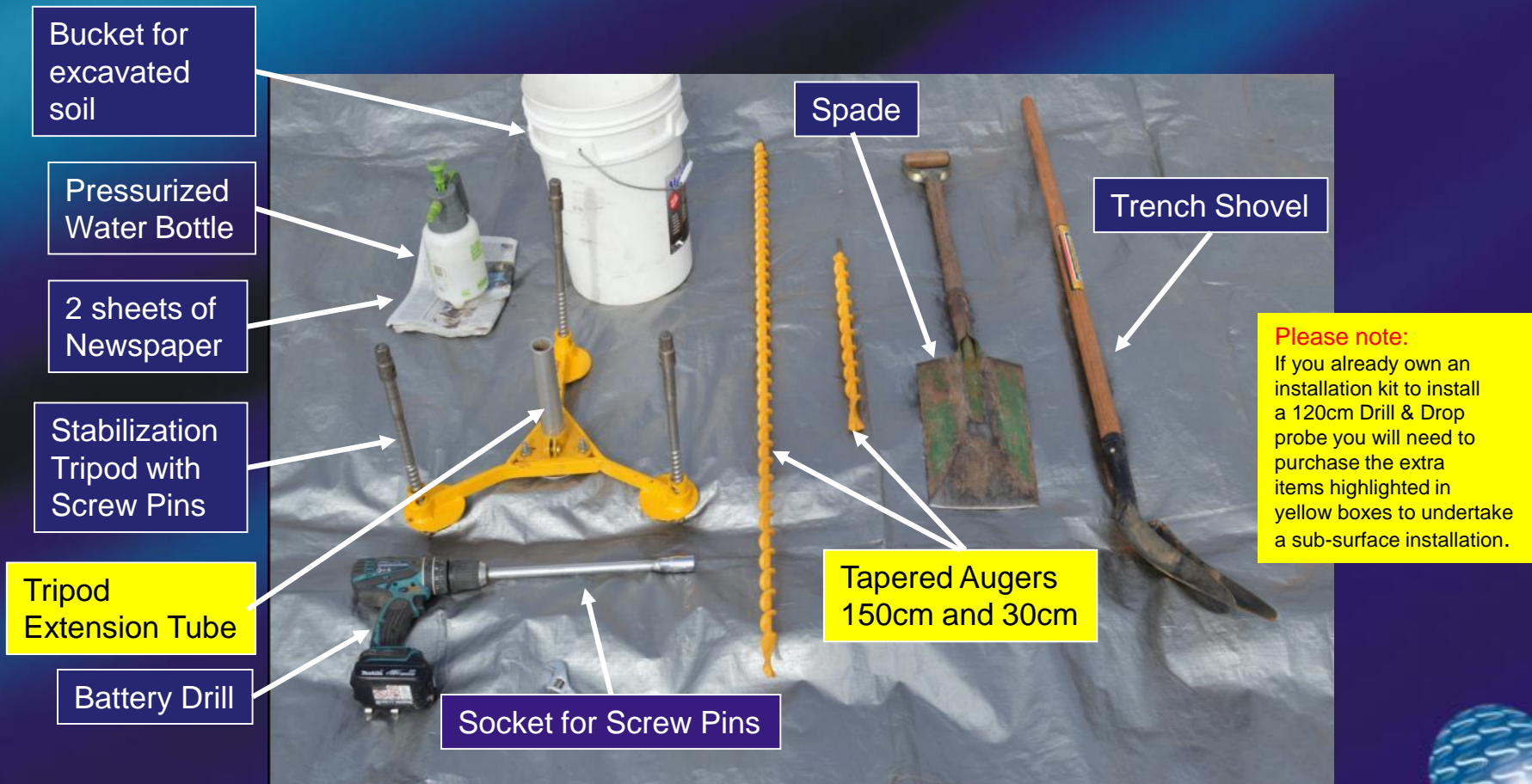
Advanced Installations

Subsurface

Subsurface Installations

- To hide the probe for aesthetic or protective purposes.
- To allow cultivation or harvest above the probe.
- To monitor lower soil depths.
- To insulate the probe from high surface temperature variations.

Drill & Drop Subsurface Installation Tools



Tripod Extension Tube

Tripod Extension Tube can be lowered into the soil opening for probe sub-surface installation. This tube serves as stabilization and centralization of the Drill & Drop auger.



Sentek
technologies

Solutions for soil moisture and salinity management

'proven quality, enduring value'

1. Loosening the Extension Tube Nut



Loosen the Extension Tube nut to release the tube.

2. Adjusting the Extension Tube Depth



Adjust the Extension Tube to the desired depth of probe below ground and tighten the Extension Tube nut.

3. Excavation and Positioning



Excavate the soil to the correct depth. Ensure that the bottom of the hole is level.

4. Positioning the Tripod



Position the Extension Tube in the centre of the excavated hole and install the Tripod Pins.

5. Augering the Soil



Use the extended 150cm subsurface auger. Measure and mark the auger at the required depth. Allow for the tripod centre height of 4cm.

6. Augering the Soil



Use a water spray bottle to lubricate and pick up the drilled soil. Auger in short stages (30 – 50cm at a time), clearing the auger flights regularly. The excavated soil should be moist to maintain the integrity of the hole. Dry soil will collapse inward and lead to air gaps and failure of probe insertion.

7. Auger Insertion Test



Drill to your auger mark, then carefully take the auger out, remove any soil from it and re-insert it back into the hole without rotating it. If you can insert it all the way then the hole is deep enough to receive the probe. If not then carefully auger more soil out and retest until sufficient depth is reached.

8. Removing the Tripod



Before removing the tripod, remove any soil that may have landed in the hole around the Extension Tube. This will protect the augered probe hole during disassembly.

9. The Opening of the Soil for the Probe



The augered hole should be circular with smooth sides visible near the top.

10. Excavation of Probe Cable Trench



Place a finger carefully inside the augered hole to prevent soil entering and use a trowel to make a shallow 3cm deep trench to accommodate the probe cable.

11. Probe Insertion



Spray water onto the surface of the probe and a little directly into the augered hole. Then immediately and smoothly insert the probe to maximum depth by hand.

12. Probe Insertion Complete



If the insertion is incomplete, then apply smooth body pressure through your foot to insert the probe to full depth. In the above example, the probe top is located 20cm below the soil surface.

13. Trenching the Probe Cable



The entire cable is placed in a 20cm deep trench to protect it from cultivation tyres.

14. Installation of the 30cm Probe



Use the 30cm Installation Auger and Tripod.

As before, check the hole depth, make a 3cm deep channel for the probe cable next to the probe, lubricate the probe with a little water and insert it.

The cable may also be installed in a 20cm deep trench, but is more conveniently left on the surface so that the probe may be removed to one side temporarily at harvest and planting times.

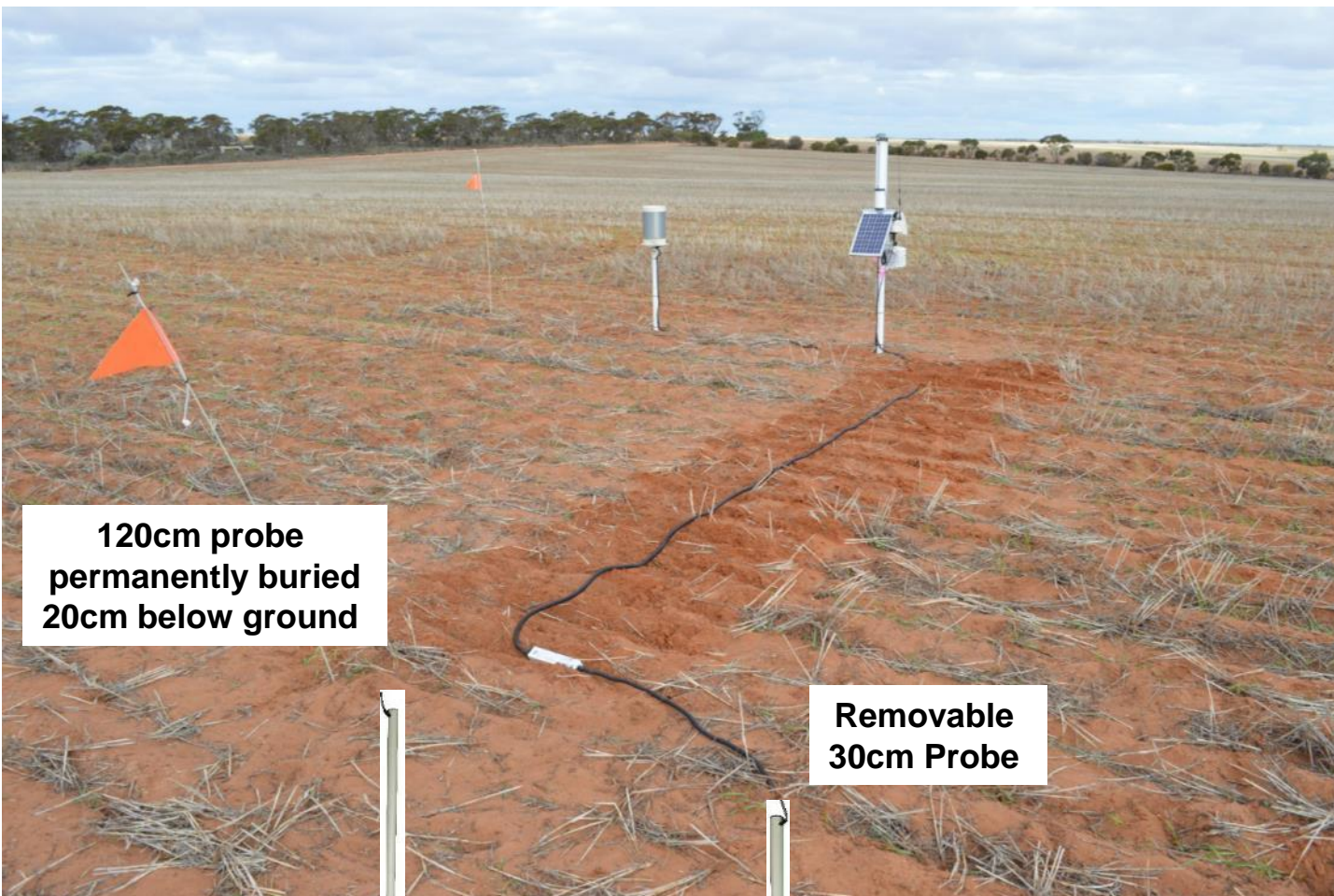
15. Installation of the 30cm Probe



The almost-completely installed 30cm probe. The probe cable can be fitted with protective electrical cable conduit and buried adjacent to the probe. The greater length of cable can be left on the surface for convenient removal at times of farm machinery traffic.

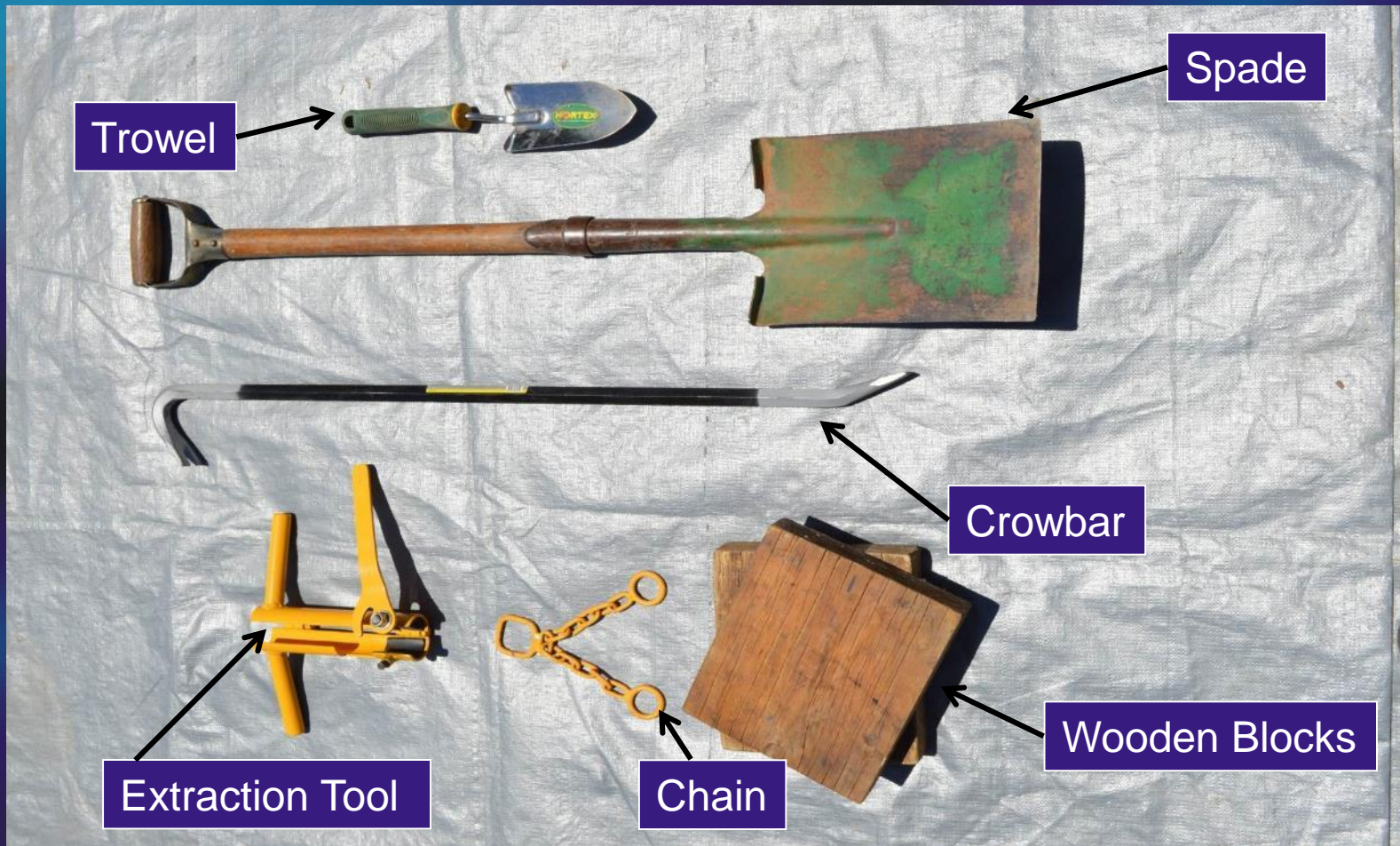


EnviroSCAN MULTI with Split-system Sentek probes (5-25 & 25-135cm), rain gauge and ET₀ gauge



Drill & Drop Probe Extraction

Probe Extraction Tools



1. Excavate Soil Adjacent to Probe



Excavate soil adjacent to the probe to a depth of 20 cm.
Wipe any soil or water from the probe using a piece of cloth.

2. Fitting the Extraction Tool



Fit the Extraction Tool around the excavated top of the probe with the probe cable located in the square opening of the extraction tool. Fold the cable down and line it up with the slit formed in the tool.

3. Fitting the Extraction Tool



Fit the Extraction Tool around the probe so that it is at least 2 cm below the cable entry point.

4. Correct Positioning of the Probe Cable



In close-up:

Locate the probe cable in the square opening of the extraction tool and hold it against the probe body below the tool lever as shown. Line the probe cable up with the split in the Extraction Tool. This is done so that in the event of tool slippage, the cable will not be sheared off.

5. Tightening the Extraction Tool



Move the lever of the tool from right to left as far as possible and then grab the tool handle and pull with a gentle twisting motion to remove the probe.

6. Fitting the Chain



If you cannot remove the probe by hand, fit the Extraction Chain onto the Extraction Tool, one circular ring for each handle and place wooden blocks next to the probe as shown.

7. Positioning the Crowbar and Blocks of Wood



Locate the square ring on the crowbar and apply tension.

8. Breaking the Bond Between Probe and Soil



Apply downward force to the crowbar until the probe lifts a little bit and the tight bond between probe and soil is broken. Adding a little water to the probe and allowing it to infiltrate will aid removal.

9. Probe Extraction



Gently remove the Drill & Drop Probe when it becomes free of the soil.

10. Probe Extraction in Clays



If it is not possible to remove the probe with a crowbar and blocks of wood, a High Rise Car Jack may be used.