SOIL SCOUT

Golf Courses

Sports Stadiums

# SPORTS TURF & GOLF

**Soil Scout provides the most advanced fully buried real-time underground wireless soil sensor and monitoring solution for sports turf professionals.**

@Soil_Scout

@SoilScout

# Gain A **Deeper View!**

## The most advanced wireless soil moisture sensor for sports turf professionals



# **Real-time** soil data

Soil Scout provides the most advanced wireless underground soil sensors capable of transmitting moisture, temperature and salinity data in real-time out-of-sight performance from up to 2 metres / 6 feet below the surface, for up to 20 years, maintenance free.

Understanding what's happening below the soil surface is critical for the sports turf industry. Soil Scout takes monitoring to the next level by providing a detailed view into in-field variation, enabling sports turf professionals to expand the precision approach to their daily challenges, be that irrigation control or turf quality optimisation.

Previous solutions for measuring environmental conditions are based on wires and cables or a single observation pole, which are impractical, inefficient and labour-intensive. Soil Scout provides critical insight into data from deep below the surface wireless, enabling 365x24 insight and profiling which allows our customers to perform better, understand their operations deeper and critically reduce water and energy use.

GROUNDS MANAGEMENT ASSOCIATION
Corporate

# With **Soil Scout** you can...

- Observe peak turf disease conditions
- Take a proactive, agronomic approach to turf development
- Understand fertiliser and water consumption
- Optimise irrigation to prevent overwatering and significantly reduce nutrient leaching
- Use accurate soil temperature measurements to optimise fertiliser usage and ensure enhanced plant uptake
- Improved consistency of turf quality with real-time data via remote access
- Analyse trends to predict future plant stress
- Understand if moisture, temperature, salinity or a combination of these factors may result in turf decline
- Understand soil conditions to verify aeration practices


**Did you know?**

**4,000+**
**Hydra Scout sensors buried around the world**

"With Soil Scout, you're seeing it in real-time, and it's continuous whether it's midnight or four in the morning; It's a continuous stream of data"

**Steve Wilson**
Business Development Manager,
Bernhard Turf Technologies

"I would recommend the Soil Scout system to anyone who is thinking about it, and just wants that extra bit of reassurance in helping them understand their pitch"

**Pete Ashworth**
Head Groundsman,
Preston North End FC

"There can be times when the greens are drying out or getting too wet, and being able to check that takes a lot of pressure off you"

**John McLoughlin**
Course Manager,
Wallasey Golf Club

Golf Courses

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# **Key** features

Moisture, temperature and salinity

Fully buried sensors

10 cm - 200 cm

Measure soil at any depth

Real-time soil data

No cellular network

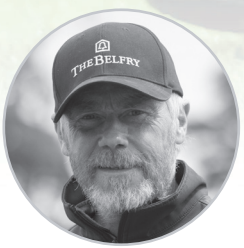
Easy to expand system

20 years battery life maintenance free

**1-2-3**

Quick and easy installation

Web and mobile dashboard




"Being able to monitor the various data we get from the Soil Scout solution helps us become a lot more streamlined with our irrigation usage"

**Angus MacLeod**
Director of Golf Courses and Estates at The Belfry Hotel & Resort

"Data is highly important to me, and every groundsman you speak to will say the more data you can get the more insight you have into your pitch"

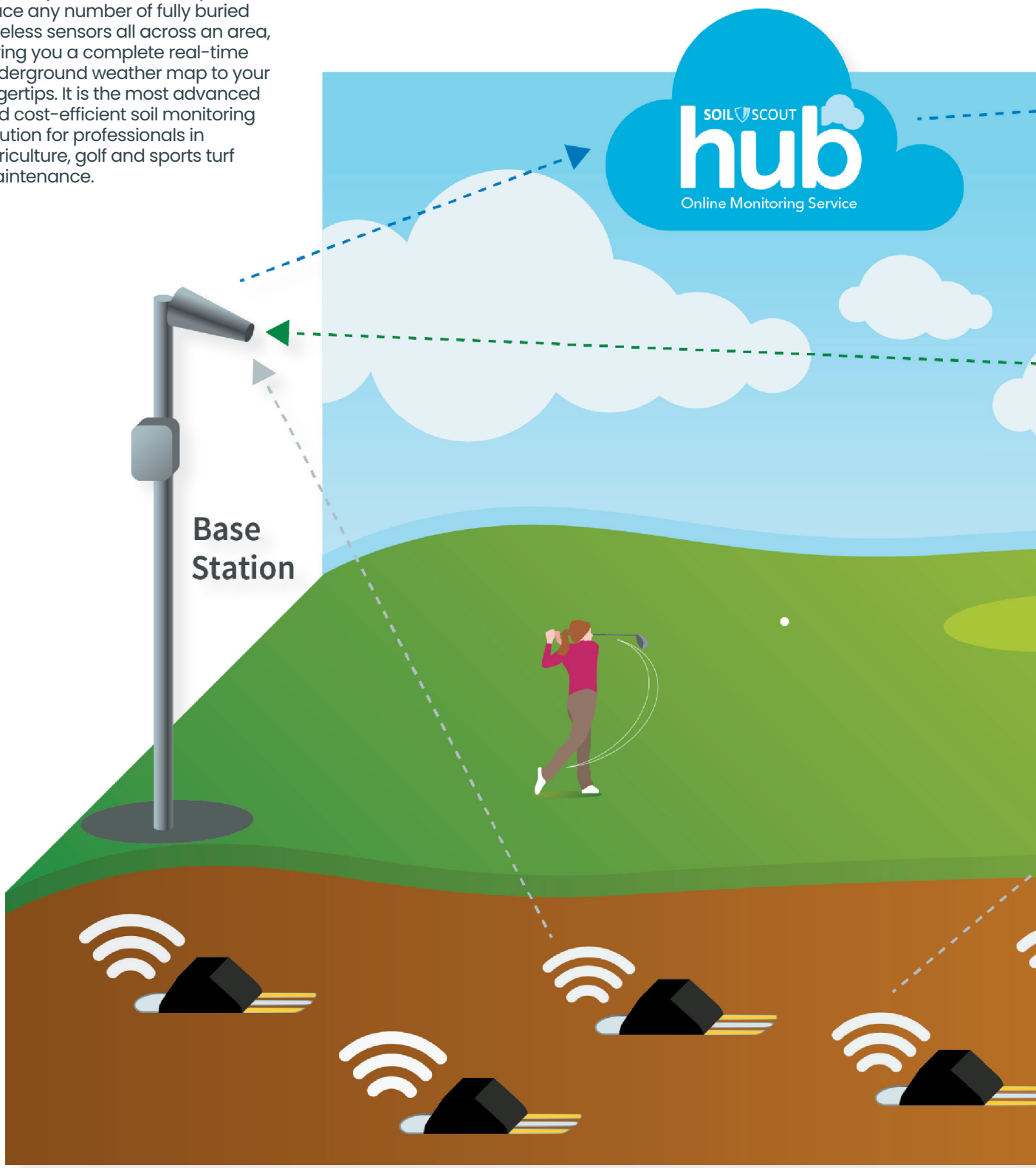
**Steve Honey**
Grounds Manager, Brentford FC

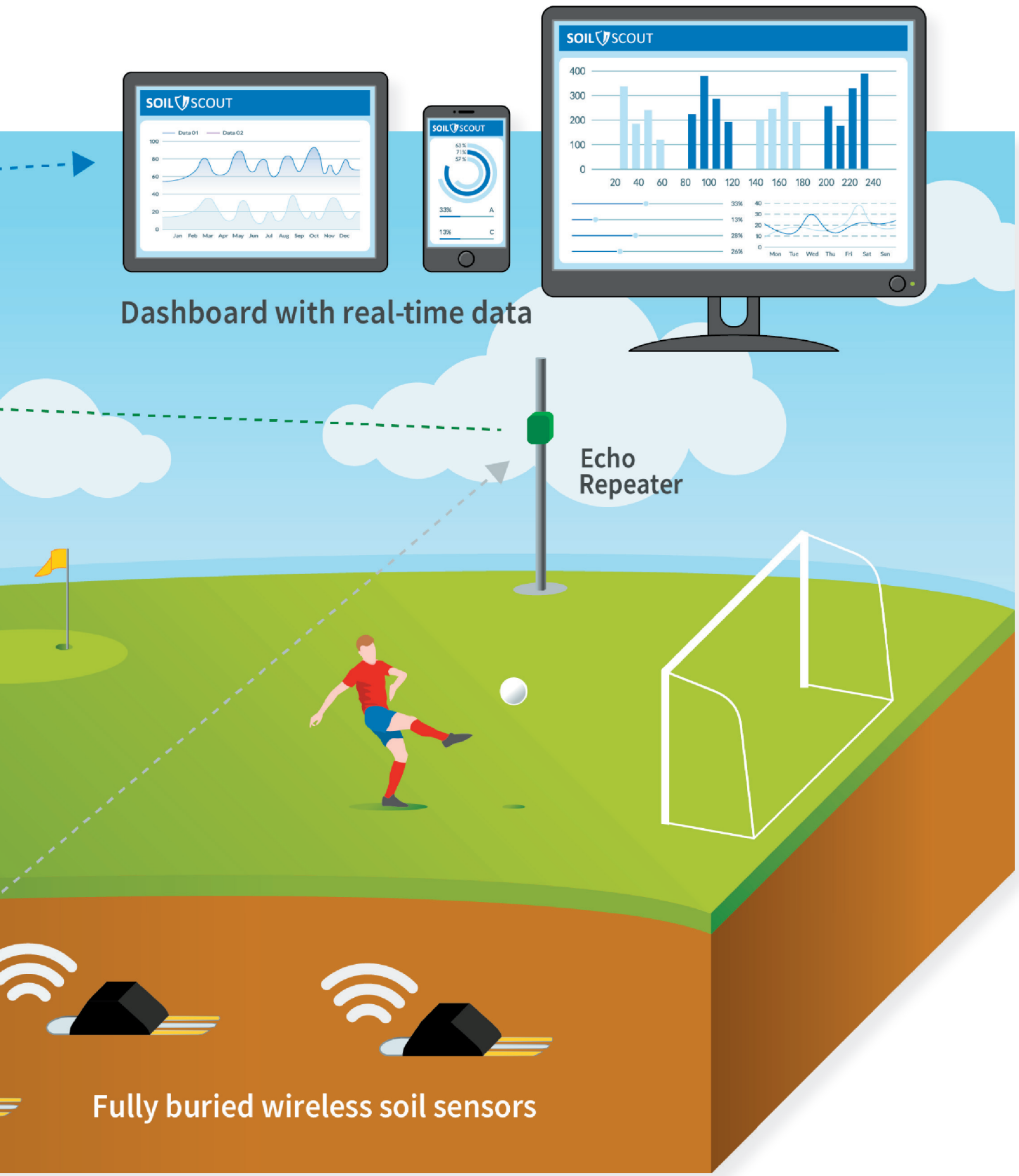
"I'm all about tech and understanding data, without the knowledge of this technology, then you can't improve. It is good to have skills but you still need data"

**Andrew Johnston**
General Manager & Director of Agronomy, Sentosa Golf Club

# **Soil Scout** – a sensor system like no other

Soil Scout is the first-ever soil sensor system that allows you to place any number of fully buried wireless sensors all across an area, giving you a complete real-time underground weather map to your fingertips. It is the most advanced and cost-efficient soil monitoring solution for professionals in agriculture, golf and sports turf maintenance.




SOIL SCOUT
Data 01
Data 02
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
SOIL SCOUT
63 %
71 %
57 %
33% A
13% C
SOIL SCOUT
400
300
200
100
0
20 40 60 80 100 120 140 160 180 200 220 240
33%
13%
28%
26%
Mon Tue Wed Thu Fri Sat Sun
Dashboard with real-time data
Echo
Repeater
Fully buried wireless soil sensors

# **Soil Scout** solution

## Hydra Scout

A small, robust, wireless buried sensor that was specifically designed to transmit from up to two metres below ground.

The Hydra Scout measures and transmits raw data to the network hourly for up to 20 years, including:

- Capacitive Moisture
- Temperature
- Electric Conductivity

Proprietary calculus is used to convert raw measurement data to Moisture content, Temperature and Salinity at the Soil Scout Hub Monitoring Service.

## Base Station

Receives the signals from Scouts via a Receiving Antenna and uploads data to the Soil Scout Hub server using a cellular modem.

Typically pole or building mounted, it can provide up to 1,000m range for sensors [1].

The antenna type is chosen according to the specific needs of the site. Each Base Station can handle more than 1,000 Scouts.

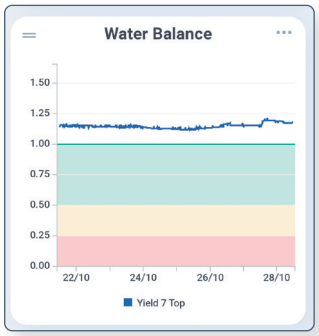
## Echo Repeater

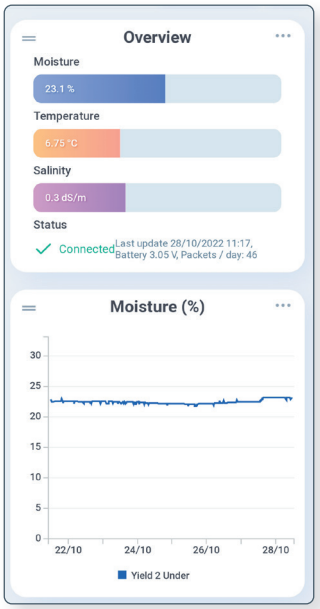
When direct transmission to the Base Station is not possible because of distance or topographical barriers, one or more solar powered Echo Repeaters can be used to forward the signal. Range over 5km line of sight.

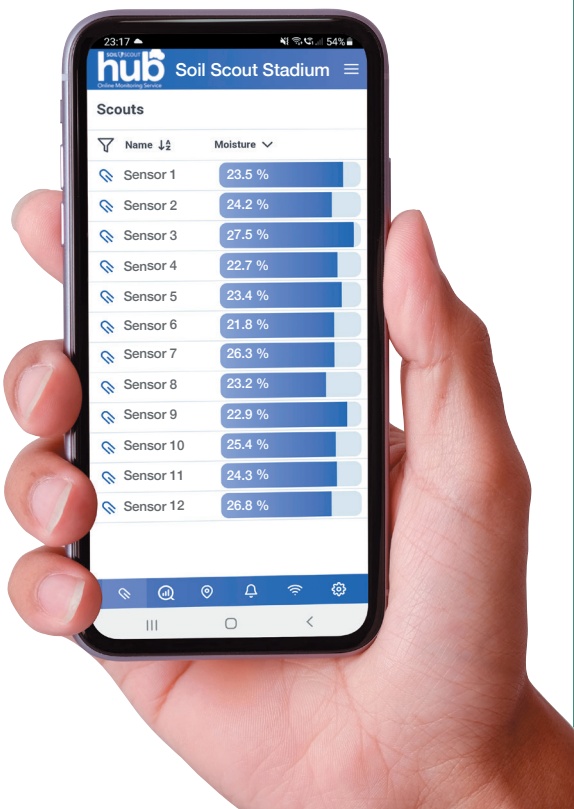
[1] Underground to air range depends heavily on receiver antenna type and elevation, soil type, topography, vegetation, etc. See www.soilscout.com/user-guides for more guidance on indicative ranges.

# Monitoring Service

The sensors automatically upload soil data to the cloud-based server – you can access the real-time Dashboard using a smartphone, tablet or laptop. View current status, history, trends, and compare different areas. Perform analytics and set alerts.



# **Hydra Scout** sensor

At the heart of the Soil Scout solution is the Hydra 100 Scout sensor. Measuring soil at any depth from 10cm to 2m / 6ft below the ground.
The Hydra 100 Scout has a battery life of up to 20 years of underground operation without maintenance.

Data for three critical soil parameters: moisture, salinity and temperature uploads to the Soil Scout Hub cloud in regular intervals (choose between every 5-55 minutes).

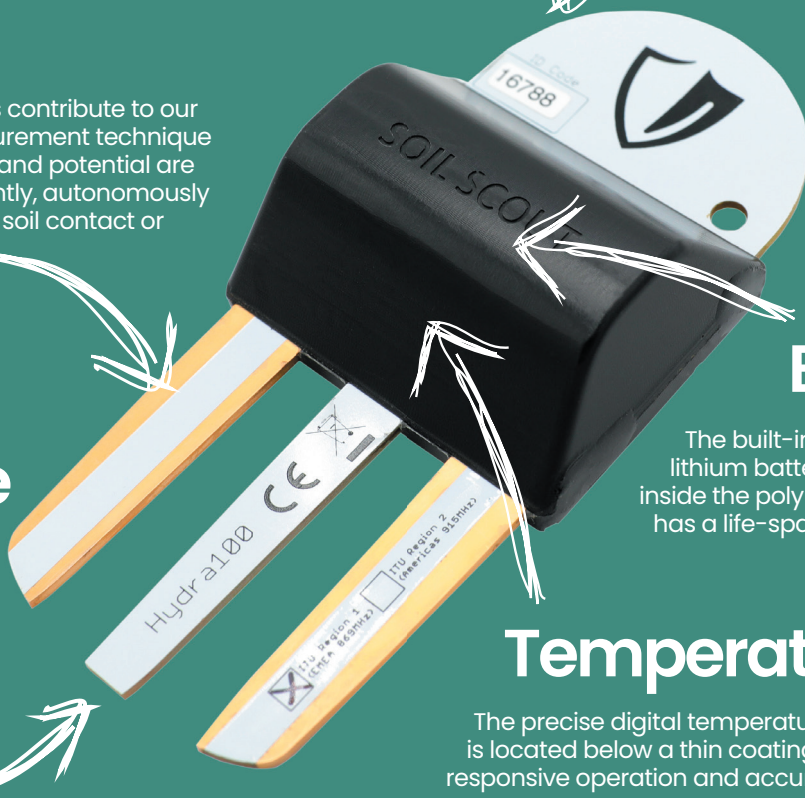
The Hydra Scout sensors do not need cellular network, SIM card, or a data plan.

## Antenna

The patented underground antenna has the unique capability of communicating efficiently in all soil types by autonomously adapting to current soil conditions.

## Salinity

All four hard gold pads contribute to our field-proven EC measurement technique where electric current and potential are measured independently, autonomously compensating for any soil contact or corrosion effects.




## Battery

The built-in maintenance free lithium battery is encapsulated inside the polyurethane body and has a life-span of up to 20 years.

## Moisture

The centre prong measures volumetric soil water content by sensing capacitance while the adjacent prongs provide grounding for the measurement.

## Temperature

The precise digital temperature sensor is located below a thin coating layer for responsive operation and accurate data.

# Dual Depth Sensor

NEW!

The ground-breaking Dual Depth sensor (DDS), gives the well-known Hydra sensor an additional sensing head, interconnected with a cable.

You can now monitor your soil at two depths in one hole with the new Soil Scout Dual Depth sensor.

# FAQ


## What do we do when we want to do our normal aeration practices?

This is the primary question that we are always asked, as it is another essential part of your turf management strategy. There are numerous ways of overcoming this issue.

1. Locate and remove whilst aeration takes place. As you will have learnt, the install is very quick and simple, so removal and replacement is a quick process.
2. Install sensors a measurable distance from objects that you normally avoid when aerating.

## How many sensors do we need?

To this question, there is no right or wrong answer. There are so many variables and reasons to measure but as a start off rule of thumb we recommend three sensors per green in golf. This allows you to monitor your best area, worst area, and average area, which gives you the ability to average your data out over the three reference points.

In a stadium environment, there are several simple ways to make a decision regarding the amount of sensors, mainly by identifying how many individual sectors the turf field is split into, then either have one or two sensors in each region. If two, the power of data gives a different degree of awareness, as it is very simple to reduce or manage your wetting agent usage by monitoring speed of water through the profile.

## Do Soil Scout provide installation services?

We can do by all means, but generally the instructions are simple to follow, enabling the process, to be quick, simple, and comprehensive for a self install.

For all major installs it is recommended to have one of the Soil Scout team on site with you for a smooth, simple installation.

## How accurate is the data?

The data is extremely accurate, due to the nature of our patented, permanently retuning, underground antenna, which is constantly reconfiguring to the current soil conditions. The accuracy is all viewable on the tech info page, but briefly summarises as:

- EC (salinity) +/- 0.2dS/m
- Moisture +/- 1% dependant on correct installation and correct soil type entered
- Temperature +/- 0.1degree C

## How often do the sensors need replacing?

One of our big selling points, is our very long battery life. The sensor is pretty much bury and forget item, with battery life-scale of up to 20 years, dependant on the model and timed transmissions.

Golf Courses

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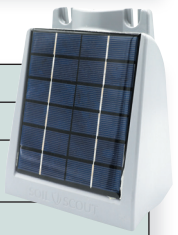
# **Technical** specifications

| HYDRA100 Scout | |
|---|---|
| Radio power | 27.0 dBm (500 mW) ERP, Bandwidth <250 kHz, duty cycle <0,001%. |
| Frequency Variants | 869.525 MHz (ITU-1) Europe & selected other markets<br>921.700 MHz (ITU-2) Americas, Australia, NZ & selected other markets<br>920-925 MHz (FHSS) Hong Kong, China<br>Custom Information upon request |
| Battery capacity | 3000 mAh, encapsulated primary lithium |
| Life expectancy | Up to 20 years @ 1 cycle per 20 minutes |
| Encapsulation | Black polyurethane molding |
| Dimensions (L x W x H) | 129 x 59 x 25mm (5.1" x 2.3" x 1.0") |
| Sensors | Temperature<br>Three-prong integrated Capacitive (moisture content) and Resistive (EC / salinity) |
| Moisture Acuracy | ± 2 % mean error (1% with correct soil type, 1% installation repeatability) |
| EC Accuracy | ± 0.2 dS/m mean error, Typical resolution 0.1 dS/m, Range 0 to 20 dS/m |
| Dielectric Accuracy | + 2 % mean error, Resolution 0.5 to 1.5 ε , Range 1 to 135 ε |
| Temperature Accuracy | Range -40 to +80 °C / -40 to 176 °F Accuracy: +/- 0.1 °C / 0.18 °F |
| Resolution | -40 to -11 °C 1.00 °C -40 to 12 °F 1.80 °F<br>-10 to +10 °C 0.25 °C -12 to +50 °F 0.45 °F<br>+10.5 to +80 °C 0.50 °C +50 to +176 °F 0.90 °F |



| Base Station 200 | |
|---|---|
| Receiver RF sensitivity | -100 dBm, BNC connector |
| Frequency Variants | Same as HYDRA100 Scout |
| Operating Voltage | 10-24 VDC, 500 mA<br>In-built 2Wp solar panel and 50Wh Li-ion battery (3 days) |
| Dimensions (L x W x H) | 175 x 140 x 100 mm (6.9" x 5.5" x 3.9") [1] |
| Mounting | 50 mm (2") pole mount / wall mount |
| Data interface | 4G modem / Custom [2] |
| Power Supply | 100-240 VAC with 5 m (16'4") lead (included) |
| Receiving Antenna (External) | Wide selection of Omni-directional / Directional antennas are compatible |

| Echo Repeater | |
|---|---|
| Receiver RF sensitivity | -100 dBm, BNC connector |
| Frequency Variants | Same as HYDRA100 Scout |
| Operating Voltage | 10-24 VDC, 500 mA<br>In-built 2Wp solar panel and 40Wh Li-ion battery (10 days) |
| Radio transmit power | 27 dBm (500 mW) ERP, Bandwidth <250 kHz, duty cycle <0,1% |
| Power Supply | Mains power supply available as accessory (same as used for Base Station) |
| Transmit Range | 10km / 6-mile line-of-sight from Echo to Base Station / another Echo [3] |
| Dimensions (W × H × D) | 175 × 140 × 100 mm (6.9" x 5.5" x 3.9") |
| Mounting | 50 mm (2") pole mount / wall mount |

1) Excluding interface ports
2) SIM-card is supplied for most regions
3) Any obstacles (vegetation, hills, buildings) between the radios will decrease range. Base Stations and Repeaters dynamically daisy chain.

*Specifications subject to change without notice*

SOIL SCOUT


# How to find out more

For more information on the Soil Scout solution and to request all relevant pricing options please contact the Soil Scout sales team via email or your nearest reseller.

**Soil Scout Oy**
Lapinlahdenkatu 16
00180 Helsinki
Finland

**sales@soilscout.com | www.soilscout.com**

## The Soil Scout Story

**2000** — Johannes wrote an essay on future farming at University

**2004** — Development of a unique underground antenna

**2005** — Johannes and Jussi produced their first wireless soil sensor

**2013** — Soil Scout is founded and welcomes first Angel investor

**2015** — Release of the latest HYDRA100 sensor

**2019** — Husqvarna becomes the latest to invest in Soil Scout