

GNSS Receivers

The Global Navigation Satellite System consists of satellites, ground control stations, and receivers. Receivers acquire and track signals from constellations of satellites. The geodetic information coded in the signals is processed to resolve the absolute geospatial location of the receiver.

Locator One GNSS Sensor

The Locator One is a compact, self-powered sensor that combines a GNSS receiver, a ground-facing radar distance sensor, and cloud connectivity. It autonomously transmits its geodetic data to the Cloud.

The receiving cloud server processes the data, applies adjustments, and outputs absolute coordinates. Changes from baseline coordinates reveal the magnitude and direction of displacements.

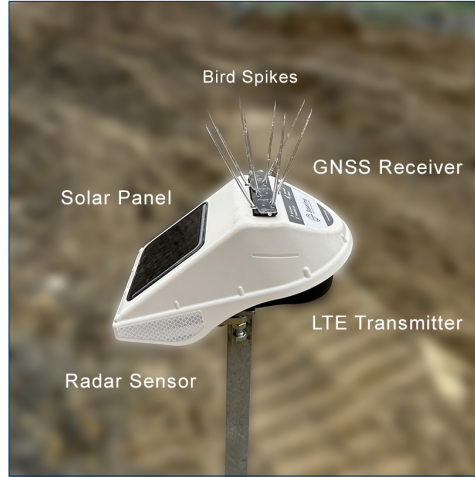
A GeoCloud website presents the data visually in map views and graphs and generates alerts if displacements exceed alarm thresholds.

Locator One Applications

- Monitoring settlement plates.
- Monitoring potential displacement and settlement of buildings and utilities near excavation and tunneling projects.
- Monitoring movement of earth retention structures such as MSE walls or sheet pile walls.
- Monitoring slope stability at open pit mines, tailings dams, and highway cuts.

Locator One Advantages

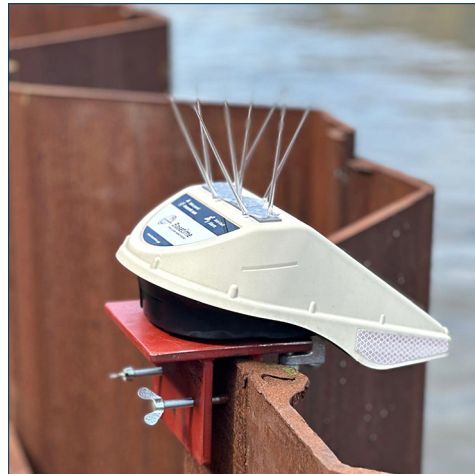
- High-precision 3D measurements aligned to the project coordinate grid.
- Less equipment needed on site compared to AMTS systems or networked sensors.
- No line-of sight or distance issues.
- No problems with fog, rain, or snow.
- Simple to install, simple to use.
- Customer installs possible.
- Very little maintenance required.



Locator One is a self-powered, weatherproof, GNSS sensor with Cloud connectivity.



Locator One is ideal for monitoring settlement plates. Radar sensor monitors distance to ground.



Locator One is easily installed on dams, bridges, aqueducts, storage tanks, and retaining walls.



Locator One can monitor slope stability at open pit mines, tailings dams, embankments, and road cuts.



Locator One can be installed on vertical walls if elevated above obstructions.



Locator One can monitor structures for adverse effects of tunneling or excavation activity

Specifications

Observation Technique: Fast-static, with 186 channels available for recording observations at 1Hz for 5 minutes. Observation time can be modified as needed.

Maximum Baseline: 4 km. Baseline is the distance between the sensor at a reference point and the sensors at monitoring points.

Satellite Constellations: Compatible with GPS, GLOSNASS, Galileo, QZSS, and BeiDou satellites.

Post-Processed Precision:
± 2mm horizontal, ±4 mm vertical.

Signal Collection: GPS, GLOSNASS, Galileo, QZSS, and BeiDou satellites.

Daily Measurements:
6 measurements per day is standard. Up to 24 measurements per day is possible at ideal locations.

Environmental: -4 to 140 °F, IP 65.

Power: Supercapacitor charged by built-in solar panel. Fully charged supercapacitor can provide 8 months of power without solar.

Ground-Facing Radar: Millimeter precision measurements of the distance between the bottom of the sensor and the ground surface below. Range is 13 feet.

specifications courtesy of Basetime B.V.

Installation

Cellular Connection: Cellular connectivity is required. Each sensor connects independently via its built-in universal SIM.

Reference Point: One sensor is installed at a stable location outside the zone of influence.

Measured Points: Locator One sensors are mounted settlement plate risers or structures.

Clear Horizon: Ideal locations for the sensor have a clear horizon with no obstacles above an elevation of 10°. This is especially important for the reference point, which contributes to half of the baseline precision.

Coordinate System: Reported measurements can be tied to the project grid. This requires knowledge of the coordinate system used and the precise location of the reference point within that system.

Typical Mounting Hardware

Bottom of sensor has two built-in clamps for a mounting plate.

Mounting Plate for Pipe: Connects sensor to 1-inch diameter pipe. Bell adaptor used to fit 2-inch diameter riser pipe.

Mounting Plate with Clamp: Clamps sensor to vertical elements such as a sheet pile.

Base Plate for Standoff Pipe: Plate has threaded fitting for 1-inch pipe and four holes for anchor bolts.

Standoff Pipe: Elevates sensor for better view of the sky. 1-inch diameter pipe, threaded at one or both ends. Supplied to required length or sourced locally.

Settlement Plates: Standard settlement plate components. Includes threaded mounting plate above.



Hörbranz Landslide

In the Austrian municipality of Hörbranz, a slope has been moving since April 2023, causing the destruction of several houses. Engineers are attempting to stabilize the slope and prevent further damage.

Monitoring Requirements

Engineers needed regular updates on slope movement at multiple locations. The monitoring devices had to be self-powered and communicate wirelessly.

Implementation

Locator One sensors were installed at six locations across the slide area. The sensors obtain GNSS readings every hour and transmit them to the Cloud via an LTE cell network. Post-processing of the measurements by a Cloud server provides the exact position of the monitoring points with sub-centimeter precision. A website presents the data in the required coordinate grid. With this information, engineers can calculate the magnitude and direction of movement.

Prediction and Impact

After a few months of stability, significant new movement emerged. Locator One units revealed significant movement over a 12-hour period: 1.2 meters one point and nearly 5 meters at another point.

The Locator One units proved to be an important addition to the previous measurement methods and enabled a proactive response to changes in the slope's behavior.