TAKUWA

Listens to the sound in the ground and diagnoses the health of the earth

Groundwater Aeration Sound Measuring Device

GAS-03

You can hear the sound in the ground which you have never heard before

Compact, lightweight, and easy to operate

General Disaster-Prevention Sensor Manufacturer

TAKUWA

TAKUWA CORPORATION
http://www.takuwa.co.jp/english/

By listening to underground sound, the site of water path, which has never been able to be discovered, can be easily detected

■Overview

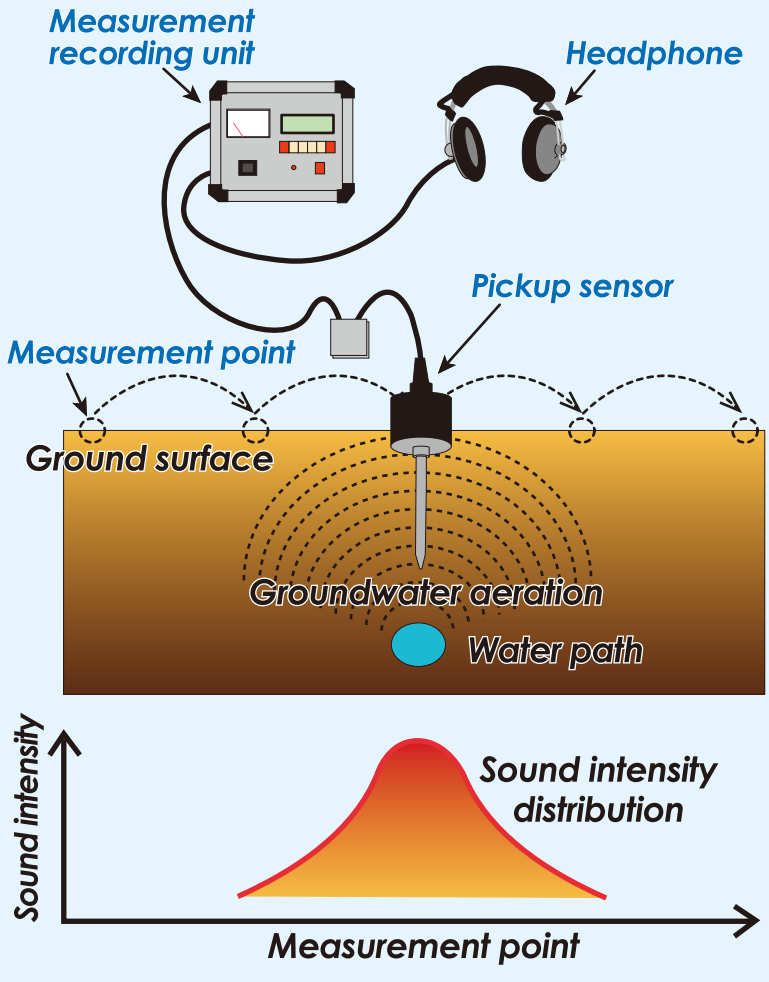
In the ground, there exists the sound of groundwater flowing, frictional sound of sand gravel, sound of the wind, sound of a moving insect, and other various sounds. The ground sound measuring device can reduce various noises in the ground by a noise cut filter and sound volume adjustment and can take out the sound of ground water flowing in the ground.
It is called a water path that is a place where groundwater gathers and flows. The underground sound tends to become the strongest in the vicinity of water path. This ground sound measuring device identifies the location of water path by looking for the place where the strongest underground sound is heard. The device is expected to be applied to various scenes where places in which groundwater flows become problematic.

■Features

- The location of water path can be instantly judged on site.
- The device can alleviate noise and facilitate listening to small sounds in the ground.
- Compact, lightweight and easy to carry about.
- The sound in the ground is put into digital data and imported into a personal computer.
- The device operates on dry batteries (8 AA batteries) which can be easily got even at general convenience stores.

■Measuring image

This device comprises a pickup sensor, measurement recording unit, and headphone



The strongest sound can be heard in the vicinity of a water path

■Measurement method

1. Drive the pickup sensor into the ground surface
2. Adjust the noise cut filter and sound volume
3. Listen to the sound in the ground and confirm the sound intensity by meter or LCD screen
4. Press the record button and record the sound in the ground at the measurement point
5. Move the point you want to measure next and repeat collecting and recording the sound in the ground
6. Aggregate the recorded data and identify the place with the strongest sound (= water path)

Picture of measurement

When locations of water paths are found, the device can be used for various applications

Disaster-prevention measures of slopes

- Prediction of dangerous areas of slope failure
- Increased accuracy of hazard maps
- Design and installation of pore pressure meters, soil moisture measuring systems, etc.
- Design and work execution of catchment wells and horizontal boring

Disaster-prevention measures of roads

- Prediction of dangerous areas of road slope failure
- Prediction of dangerous areas of forest road slope failure
- Design and work execution of retaining wall weep hole locations
- Design of forest roads and other routes

Disaster-prevention measures of dams and levees

- Detection of water leak points of dams, etc.
- Prediction of dangerous areas of bank collapse

Other interesting applications...

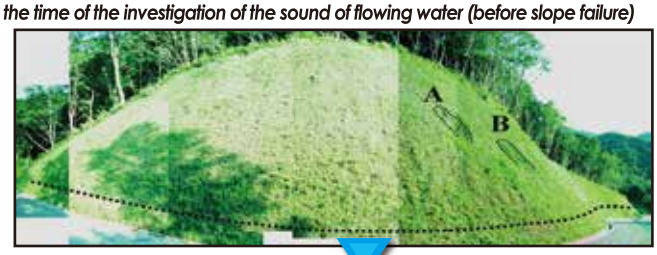
- Finding of ground water and water well locations
- Nature observation such as heartbeat of trees, etc.

■Examples of actual measurements

•Prediction of dangerous areas of slope failure

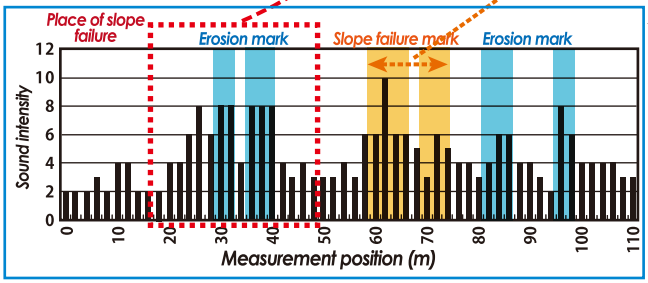
During a low-rainfall season, locations where groundwater gathered were identified and a place with high danger where slope failure might occur was predicted. Slope failure actually occurred at the predicted place by heavy rains thereafter.

At the time of the investigation of the sound of flowing water (before slope failure)



After a typhoon passed (after slope failure)

Measurement data on the sound of flowing water (processing example)

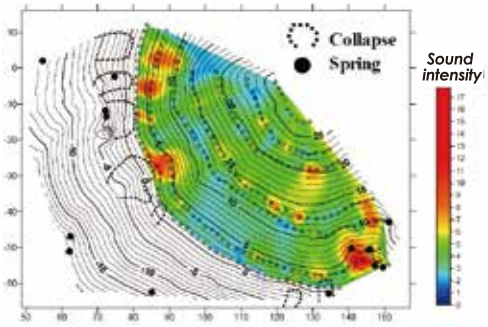


Source: Yasuyuki Tada, Masaharu Fujita, Daizo Tsutsumi, Kan Koyama, Takayuki Kawai, Takenobu Okumura, and Naomasa Honda: Relation of a ground water path to a slope failure occurring place, International Journal of Erosion Control Engineering, Vol. 60, No. 4, p. 3-11, 2007.12

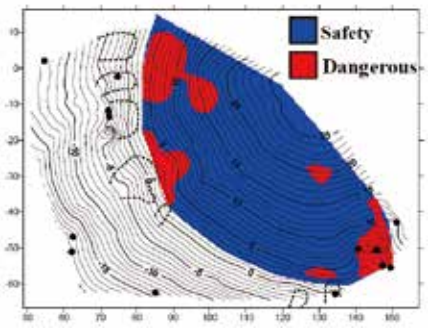
•Creation of slope failure hazard maps

Distribution of the sound of flowing water

(The red portions of the figure on the right show the portions with the strong sound of flowing water)

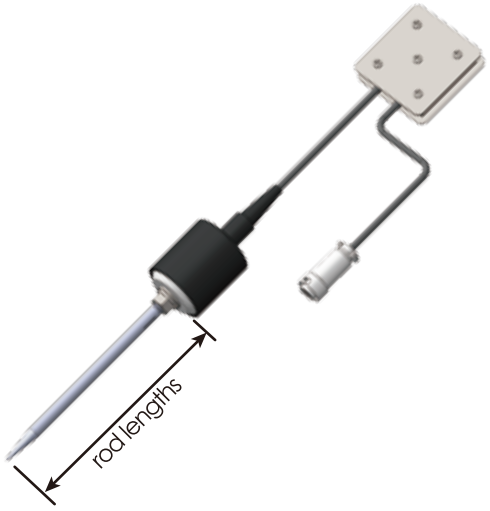


Identified dangerous areas



Source: DPRI Annual Meeting 2005 "Creation of Slope Failure Hazard Map by the Distribution of the Sound of Flowing Ground Water"

■Pickup sensor



Measurement	Piezoelectric system
Sensor rod	Three types of rod are attached (three types with varying rod lengths are able to be exchangeably used) ϕ8×100mm ϕ8×150mm ϕ8×200mm
Cable	4-conductor shielded cable 4.8 mm in diameter x about 1.5m long
Material	SUS304 (with rubber cover)
Dimensions	43 mm in diameter x about 49.5 mm long (sensor proper)
Mass	About 0.5 kg

■Measurement recording unit

Input	Input for special-purpose pickup
Output	Headphone output (compatible plug: 6.34 mm diameter stereo phone plug) LINE output (compatible plug: 3.5 mm diameter stereo phone plug) RS-232C output (A crossover cable connects the recording unit to PC, etc.) *Special-purpose application software for importing collected data attached
Display	Analog level meter LCD device (16 digits x 2 lines, with back light)
Functions	Clock function Data memory (for 400 data) Filter function • Low Cut Filter, at 200, 300, and 400 Hz • High Cut Filter, at 600, 800, and 1200 Hz Gain changing function (10 steps)
Power source	8AA dry battery
Dimensions	200 (W) × 150 (H) × 75.4 (D) mm
Mass	About 1.2 kg (excluding battery)

■Headphone

System	Sound-isolating headphone
Mass	About 0.4 kg

※Information in this document is subject to change without notice

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