
User Manual



Intelligent Water Loss Management

NELOW USER MANUAL



Introduction of NELOW

“ **NELOW (Never Lose Water)** Intelligent Water Loss Management System ”



Sonic GL

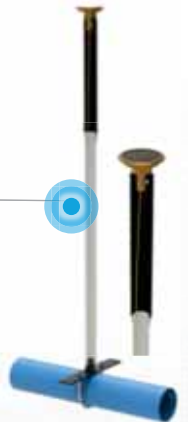
- ✓ ARM MCU, 16 bit codec, Bluetooth 5.0
- ✓ Rechargeable Lithium Polymer Battery
- ✓ 16G Micro SD memory
- ✓ 3 Days usage with 100% charged



NELOW Mobile & Web

Sonic T1

- ✓ Sound Transmitter
- ✓ Easy to install



Sonic M2

- ✓ ARM MCU, 16 bit codec
- ✓ Bluetooth 5.0
- ✓ Non-rechargeable High Capacity Battery
- ✓ LTE, CAT M1, GSM Modem
- ✓ IP 67, 16G Micro SD memory
- ✓ 4 year battery is guaranteed



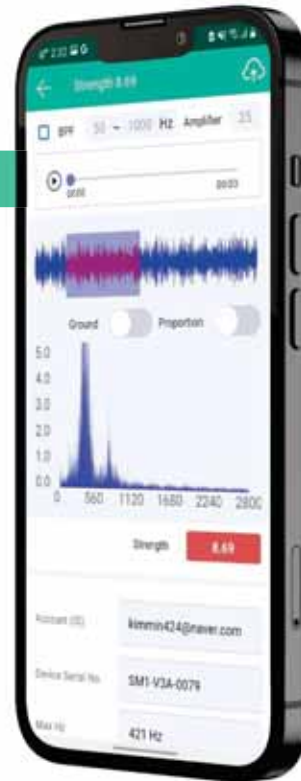
Introduction of NELOW

“ NELOW's cloud-based software will help to **manage water loss for not only managers but also engineers** ”

NELOW | App Android 8.0

General Function

- ✓ GIS management
- ✓ Water leak management
- ✓ Water pressure management
- ✓ Maintenance management
- ✓ DMA monitoring



NELOW | Web JAVA Script Node.js Open Layers



Sonic GL for Facility Inspection

Sonic GL(F) helps to inspect a water leak from facilities with low cost and high performance

Leak Inspection

Inspecting a leak from all water meters and valves



Sonic GL for Ground Detection

Sonic GL(G) helps to pinpoint a exact leak location by detecting a sound from the ground

Leak Detection

Pinpointing a exact leak location

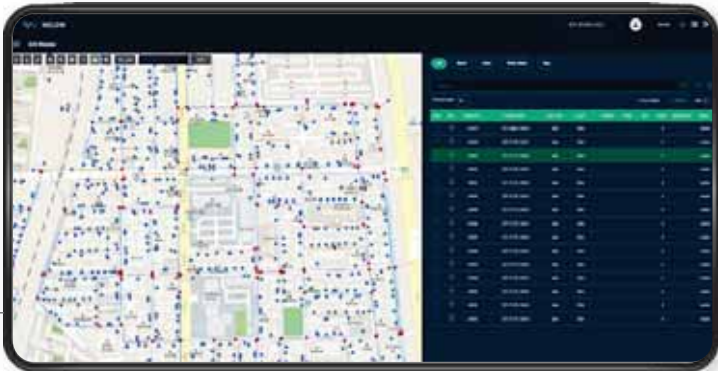


NELOW Software

// **NELOW Software** provide Integrated functions for water loss management //

GIS management, flow monitoring, water pressure monitoring, leak recovery history management etc.

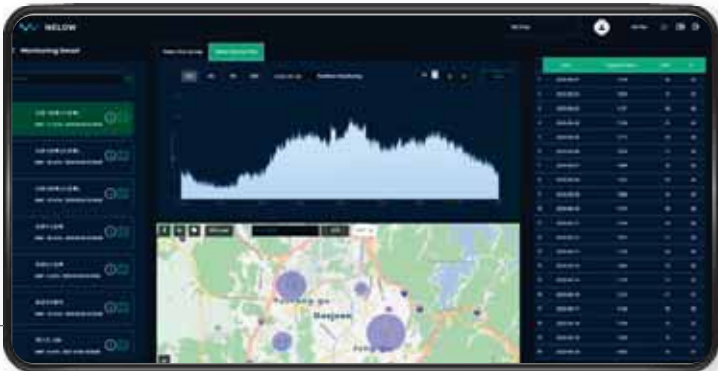
GIS Management
Leak Management



Flow Monitoring



Pressure Monitoring



Leak Recovery
History
Management



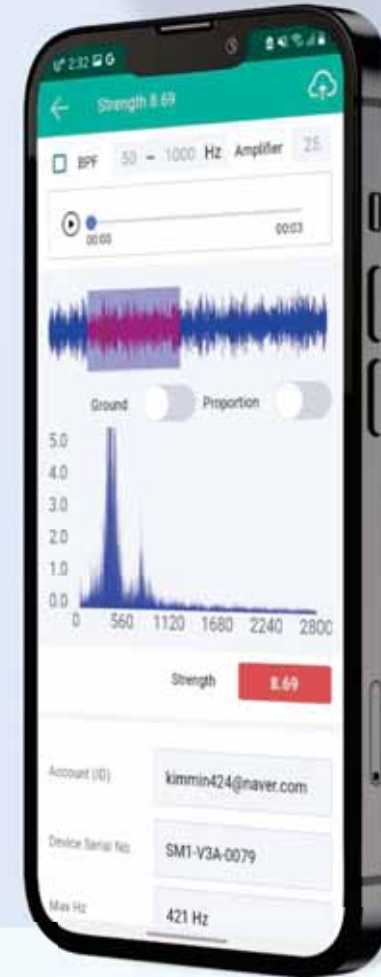


Water Leak Data Collection

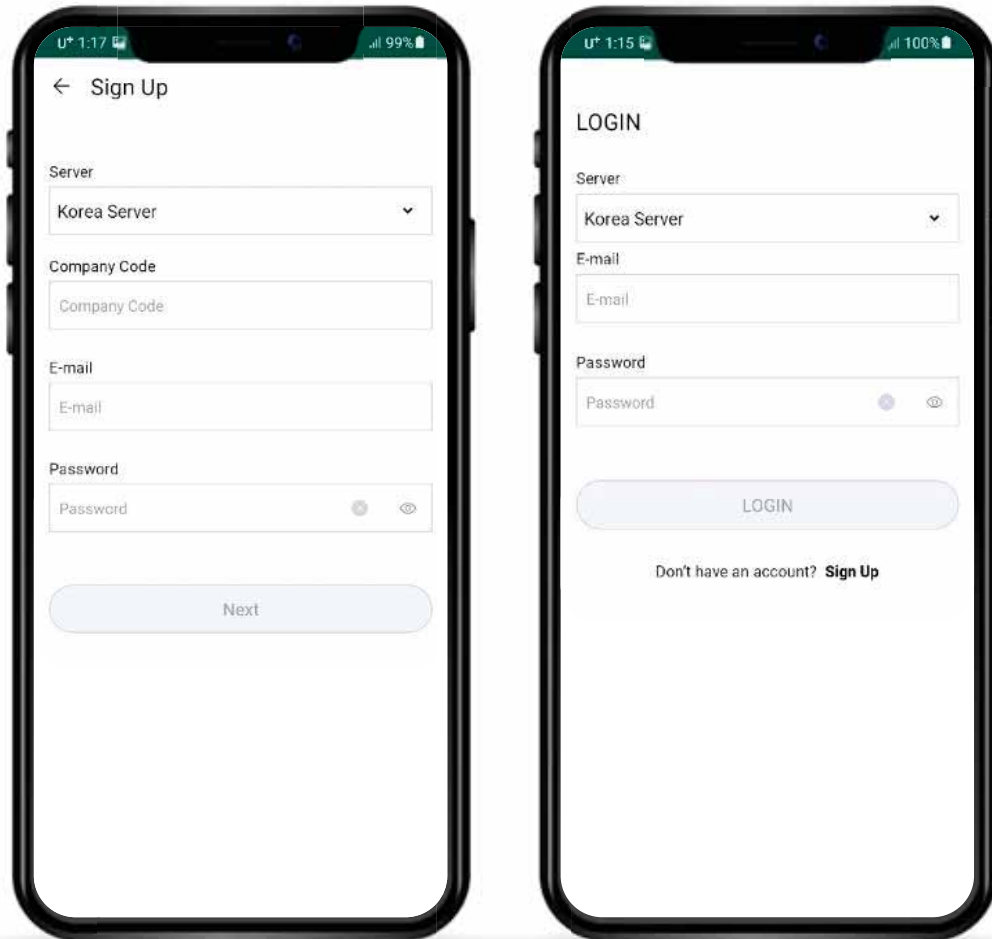
- Sign up
- Leak Inspection using Sonic GL - F
- Leak Detection using Sonic GL - G
- Leak sound data logging using Sonic GL
- Important Notes

I Water Leak Data Collection

Sign up for NELOW



Sign up for NELOW



The image displays two smartphone screens side-by-side. The left screen is the 'Sign Up' page, featuring a back arrow, a 'Server' dropdown menu set to 'Korea Server', a 'Company Code' input field, an 'E-mail' input field, and a 'Password' input field with a toggle for visibility. A 'Next' button is at the bottom. The right screen is the 'LOGIN' page, featuring a 'Server' dropdown menu set to 'Korea Server', an 'E-mail' input field, a 'Password' input field with a toggle, a 'LOGIN' button, and a link that says 'Don't have an account? Sign Up'.



Sign up & Log in

- 1 Install the NELOW app from the Google Play Store and Open the app
- 2 Tab 'Sign up' button
- 3 Select the country server
- 4 Enter the customer code provided by the WI.Plant
- 5 Enter email address, password, name and contact information
- 6 Check the agreement to the terms of service and privacy policy
- 7 Upon approval of account by a manager(or WI.Plant), the account will be activated.

 Water Leak Data Collection

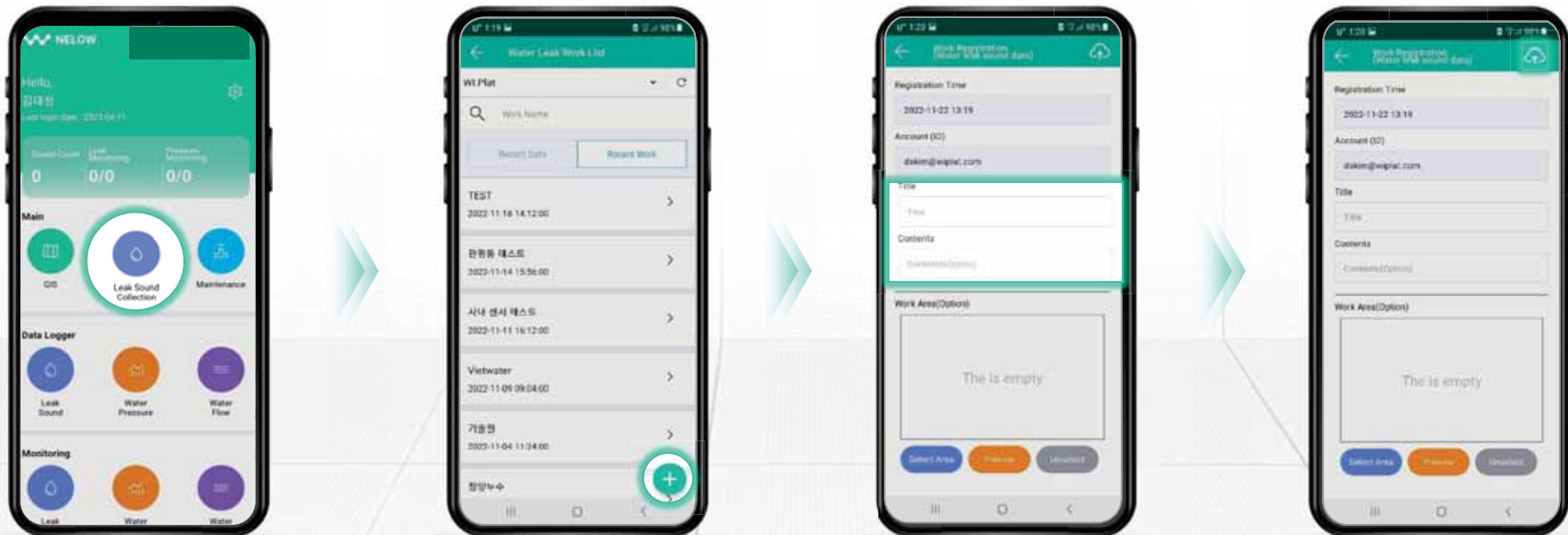
Leak Inspection using Sonic GL - F



Leak Inspection using Sonic GL

Create a new workspace for each steps

- 1 Create workspace for each steps of leak detection.
- 2 The leak detection process usually takes 2~3 steps until the pin-pointing.



Leak Inspection using Sonic GL

Connecting Sonic M1 device with NELOW app

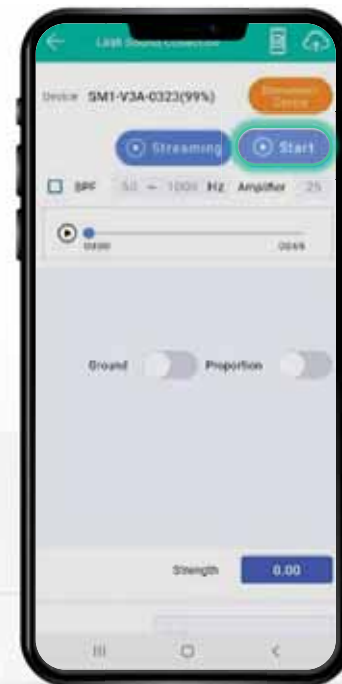
- 1 Go to the workspace created for the work of the day and tap 'map' button.
- 2 Tab 'Save' > 'Connect' > find and tab the serial number of the device ※Serial number is on the top of Sonic GL
- 3 The Serial number of the device will be appear in next to the 'Device' section



Leak Inspection using Sonic GL

Save leak sound data

- 1 Once the device is connected, go to the map and find the target GIS data by tapping 'GIS' button on the left bottom.
- 2 Place the green pointer to the target GIS facilities matching with onsite facility then tab 'Save' button.
- 3 Place the sensor part of the Sonic GL to the facility and tab start button then tab 'Save' button once the leak sound data appears on the screen.

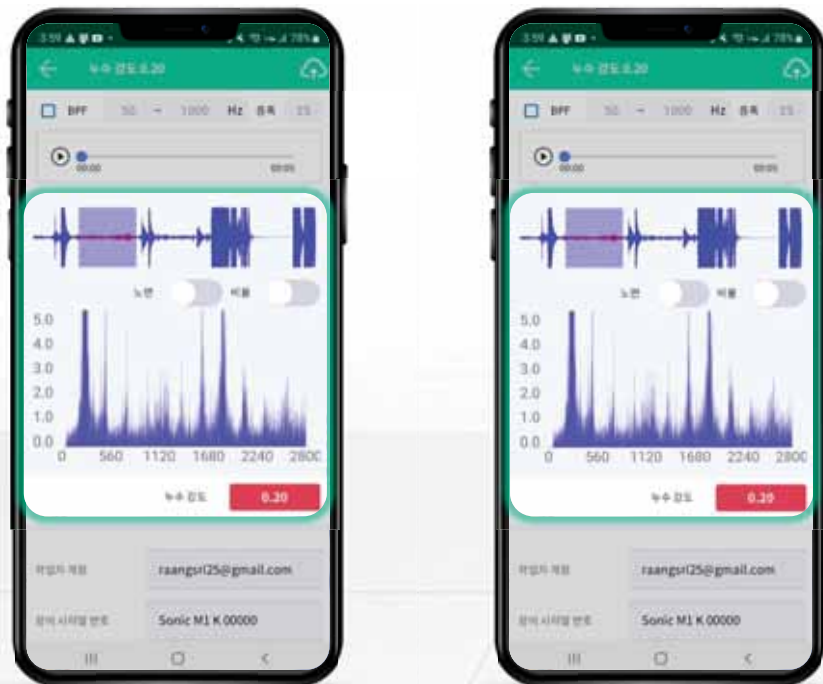


Leak Inspection using Sonic GL

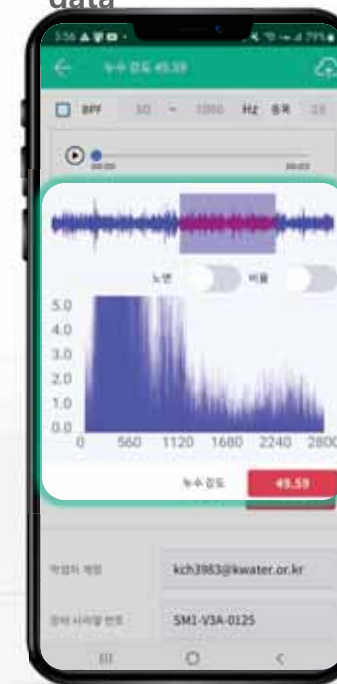
Examples of leak data

- 1 Leak sounds typically exhibit the characteristic of showing a wave energy of 1.0 or higher in the 300-500 Hz band.
- 2 If the collected sound does not meet the above criteria or if there is suspicion of leak, please repeat the data collecting process 2-3 times more.

Examples of improperly collected leak sound data



Usual leak sound data



Normal data - No leak



Water Leak Data Collection

Leak Detection using Sonic GL-G



Leak Detection using Sonic GL-G

Ground Detection Process

- ✓ The Process of using NELOW app for ground detection is the same as leak inspection process using Sonic GL- G

Detection for leak spots



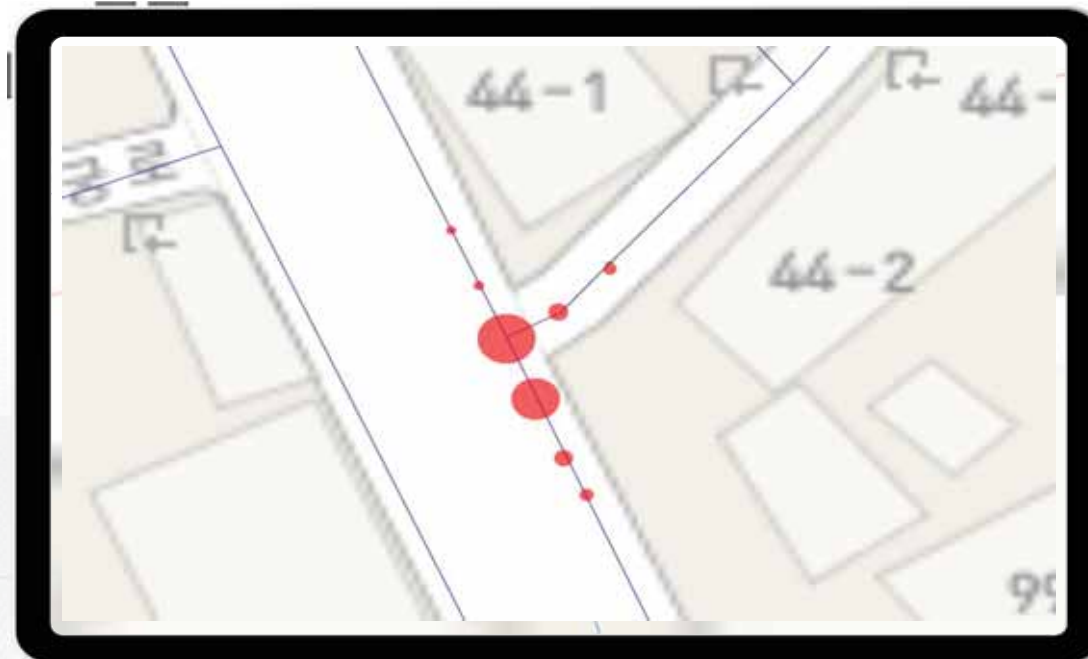
After leak inspection, several suspicious points will be verified. To pin-point exact leak spots of the pipeline, ground detection above the pipeline need to be executed for pinpoint the leak spots using Sonic GL - G.



Leak Detection using Sonic GL-G

Examples of leak data

- 1 When detecting with Sonic GL-G for pin-pointing, collect data with 0.5 meter intervals along the pipeline. Please collect data precisely above the pipeline as possible.
- 2 As described above, detect as accurately as possible along the pipeline at regular intervals.
- 2 Please see below map for the reference



Water Leak Data Collection

Leak sound logging using Sonic GL - G



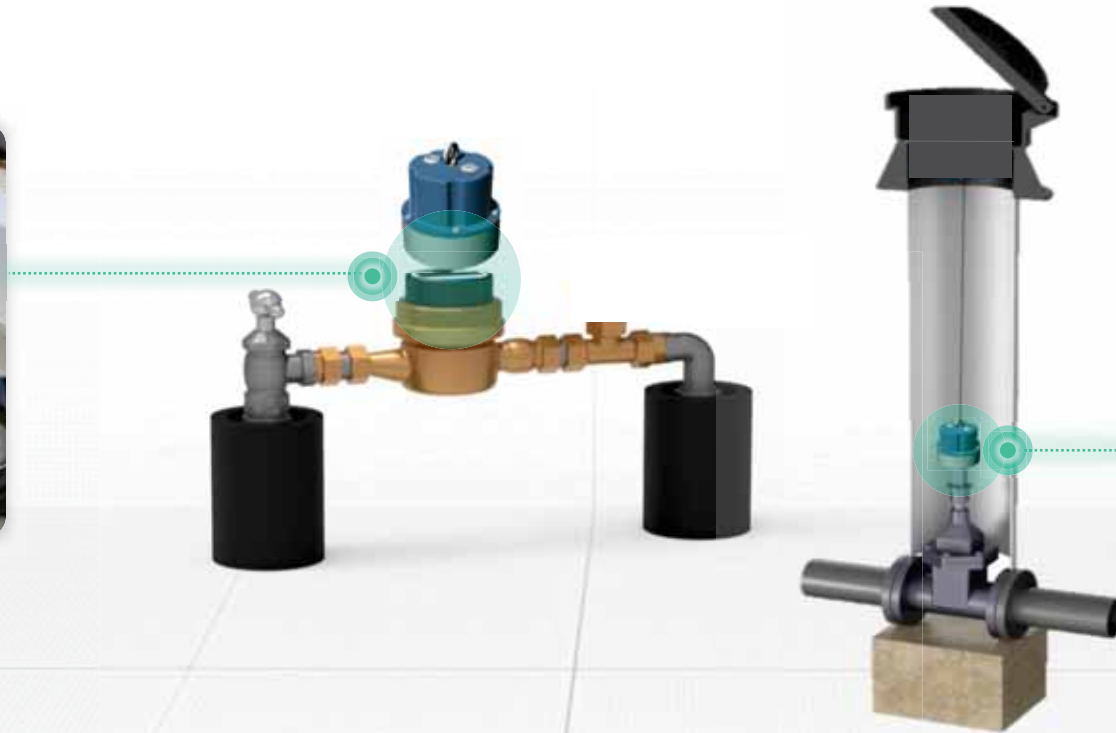
Leak sound logging using Sonic GL

Installation

- ✓ The bottom part of the Sonic GL sensor has a magnet that allows it to attach to facilities such as valves and water meters. After turning on the device, simply place it on the metal part of the facility.



Water meter

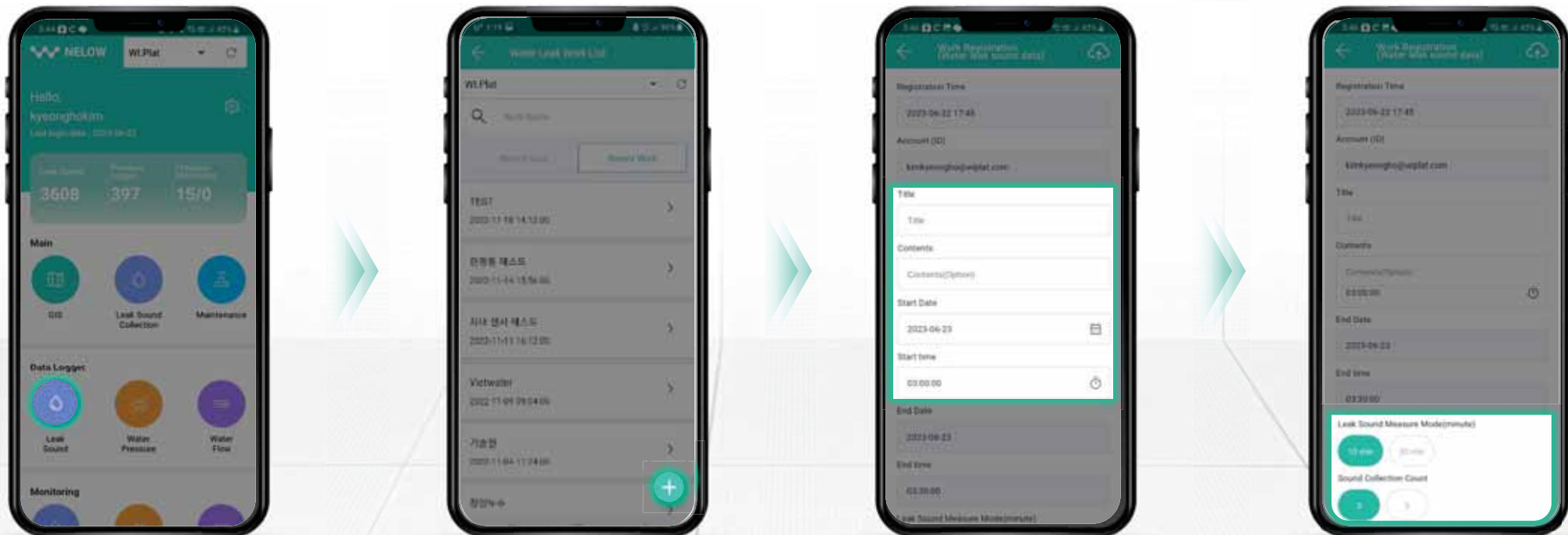


Valve

Leak sound logging using Sonic GL

Installation

- ✓ After Device Installation, open NELOW app.
Go to Leak sound under the Data Logger. Create a new work space.



Leak sound logging using Sonic GL

Installation

- 1 The user automatically access to the 'Map' page of the work space newly created of the user can re-access to the work space from the list.
- 2 Tab 'GIS' to check facility nearby then place the green pointer on the target facility.
- 3 Then, tab 'Install' and connect the device.
Once the device is connected, tab 'Test' to check if the device working without a problem.



Leak sound logging using Sonic GL

Uploading logged data to NELOW server

- 1 Go back to the facility where the device was installed, go to the work space created for the installation.
- 2 Red point will be appear on the map, tap the red pointer then connect the device.
- 3 After connecting device, tab 'Loading data' to download the data to NELOW server.
- 4 Be sure to tab 'Save', the button on the top right side.



How to use IWLMS- Leak sound logging using Sonic GL

Uploading logged data to NELOW server

- 1 After saving the logged data, Green (Or red if it is analyzed as leak suspicious sound) will appear on the map.
- 2 Uninstall the device once the data logging is done.





Water Pressure Data Collection

- Installation & Setting-up Sonic M2
- Data Collection of Sonic M2
- i-Logger usages

IV

System Analysis

- NELOW Web Setting
- Leak Data Analysis
- Water Pressure Data Analysis

IV System Analysis

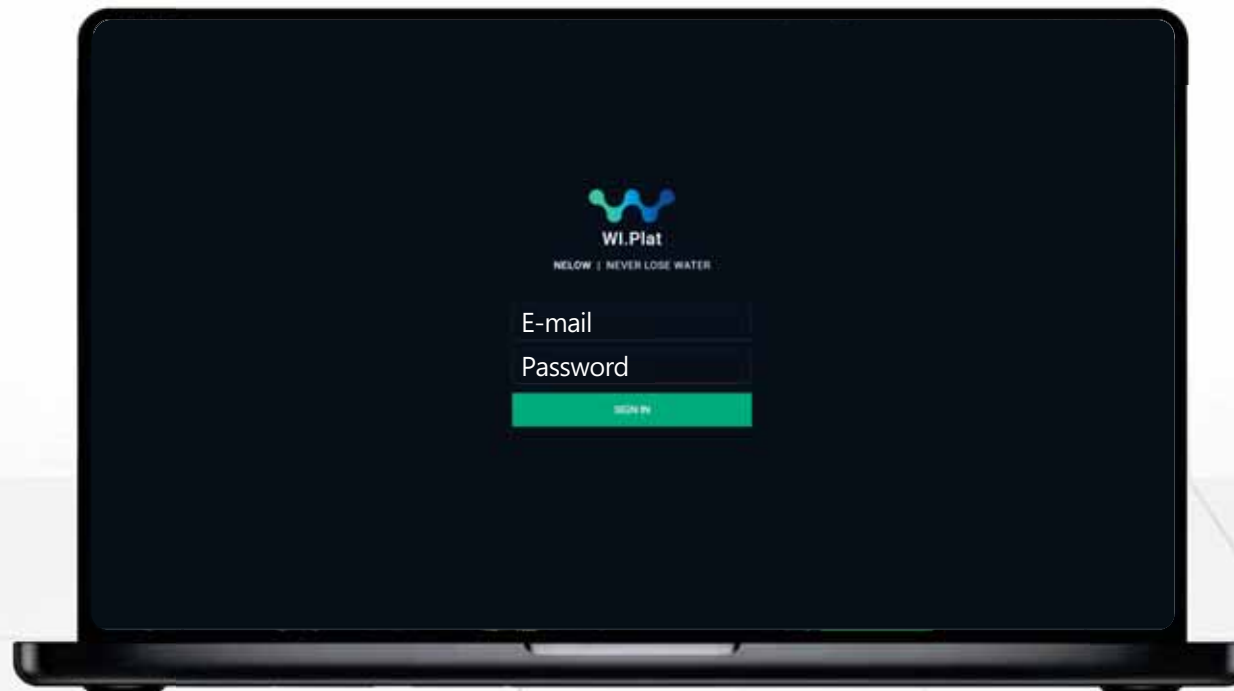
NELOW Web Setting



NELOW Web Setting

Log in

- 1 Once the account is activated, users can log-in to mobile app and web software.
- 2 Go to 'id.neverlosewater.com'



NELOW Web Setting

Setting before use

- 1 Click 'Setting' on the top-right side of the browser.



NELOW Web Setting

Setting before use

1

Choose 'Bing' for background map and 'Standard' for Map type.



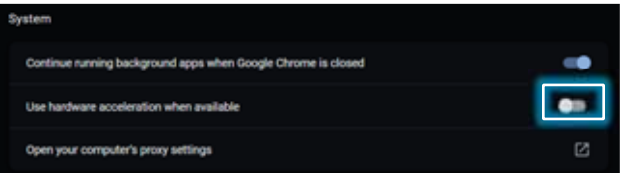
2

The 'Layer' menu is to select GIS layers the user would like to see particularly.



3

For stable traffic of the internet while using NELOW software, go to setting of the internet browser and turn off function ' Use hardware acceleration when available'.



IV System Analysis

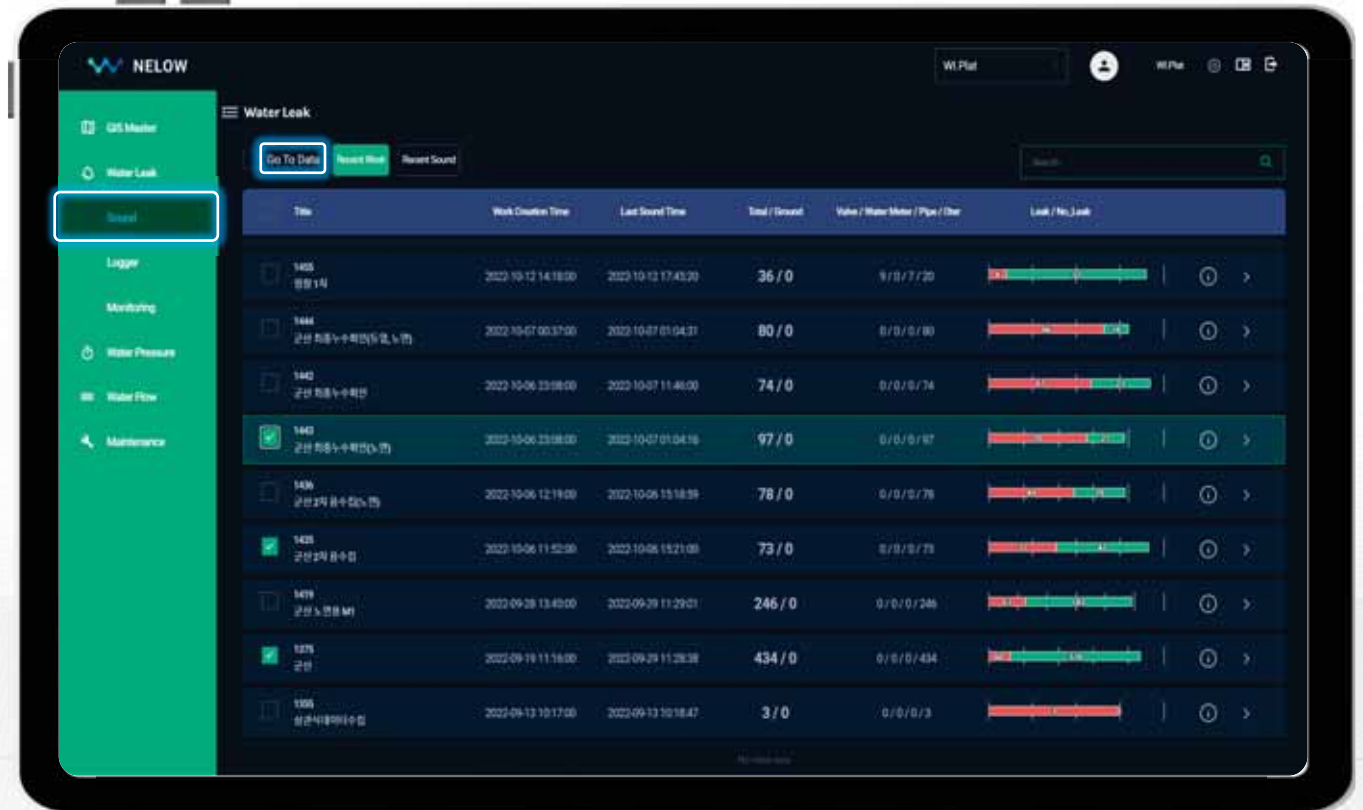
Leak Data Analysis



Leak Data Analysis

Access to the workspace

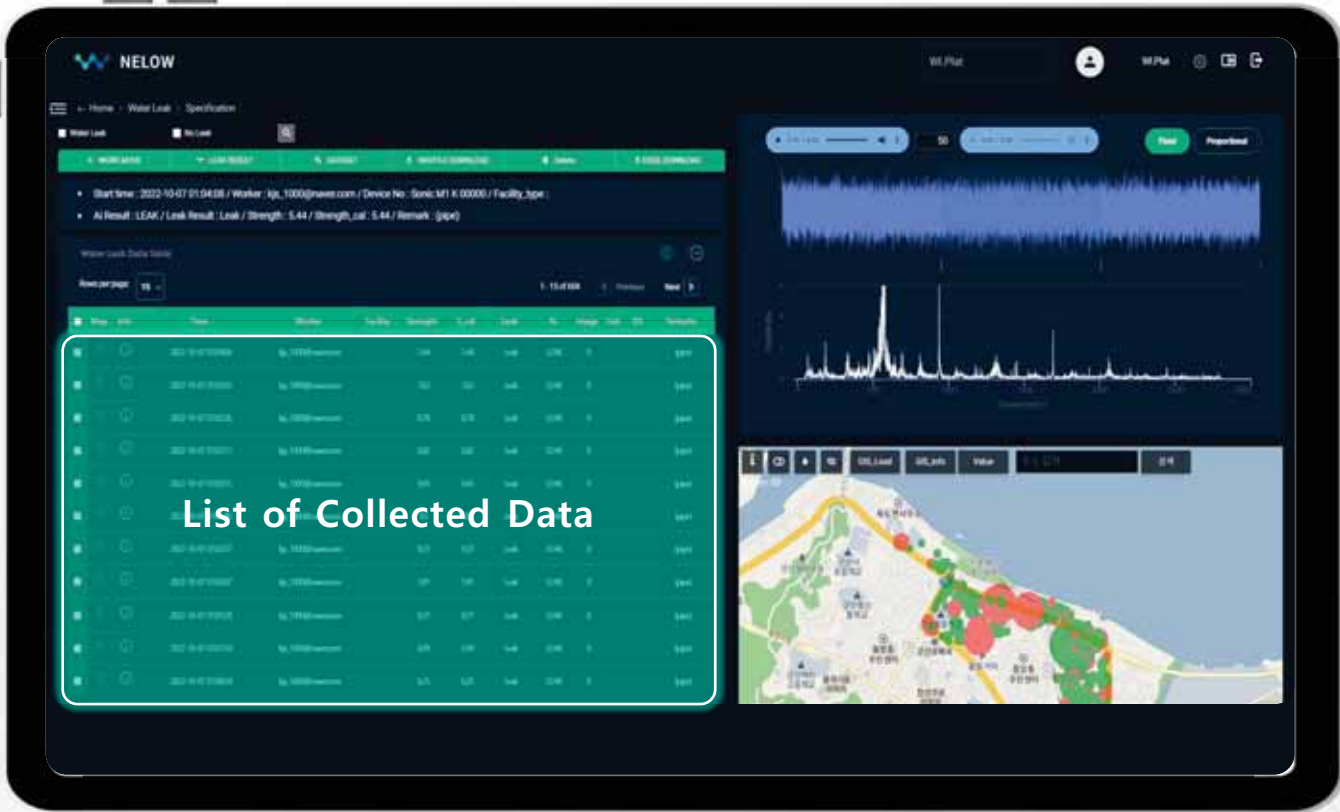
- 1 Go to 'Water Leak' > 'Sound' from the menu bar.
- 2 Choose the workspace for data analysis.
- 3 Click 'Go To Data' button.



Leak Data Analysis

Check the list of data

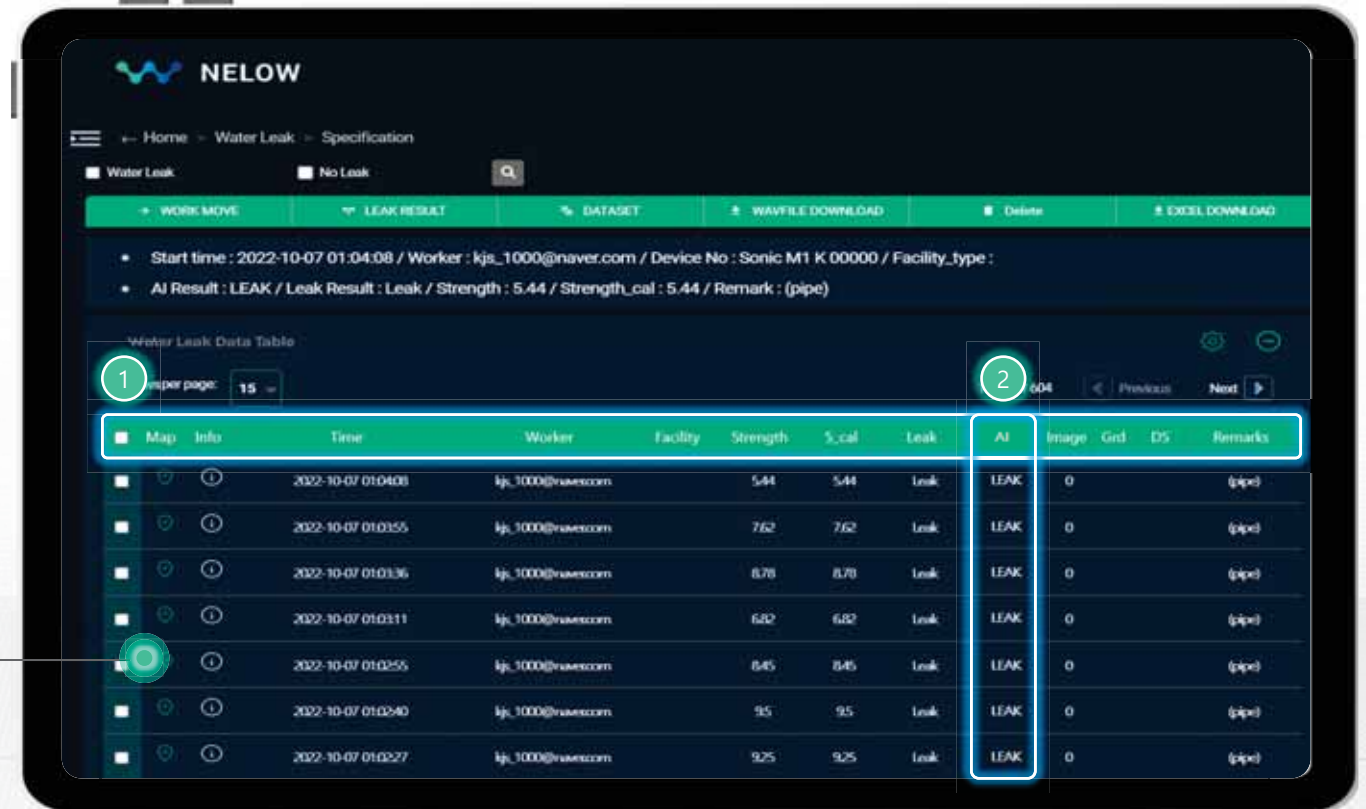
- 1 The table list of collected data can be seen in the left side.
- 2 The frequency chart and the map can be seen in the right side.



Leak Data Analysis

Access to the workspace

- 1 The data can be filtered of each criteria of the table.
- 2 The column heading 'AI' is the part the AI model of NELOW verify the leak data.

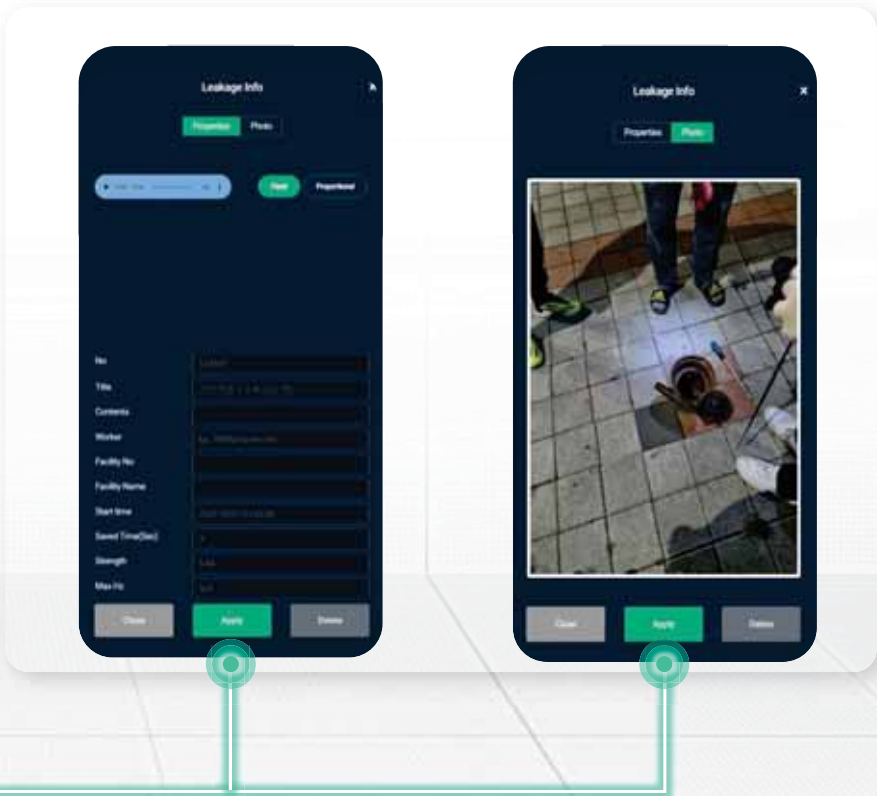
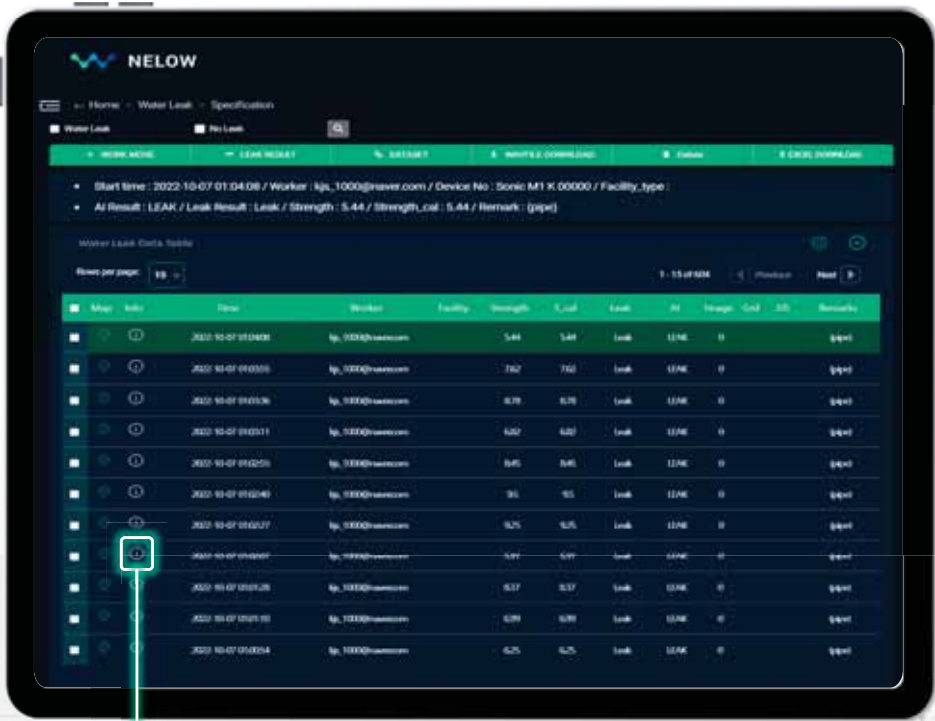


Click this button to locate the map to the spot of the collected data

Leak Data Analysis

Check the list of data

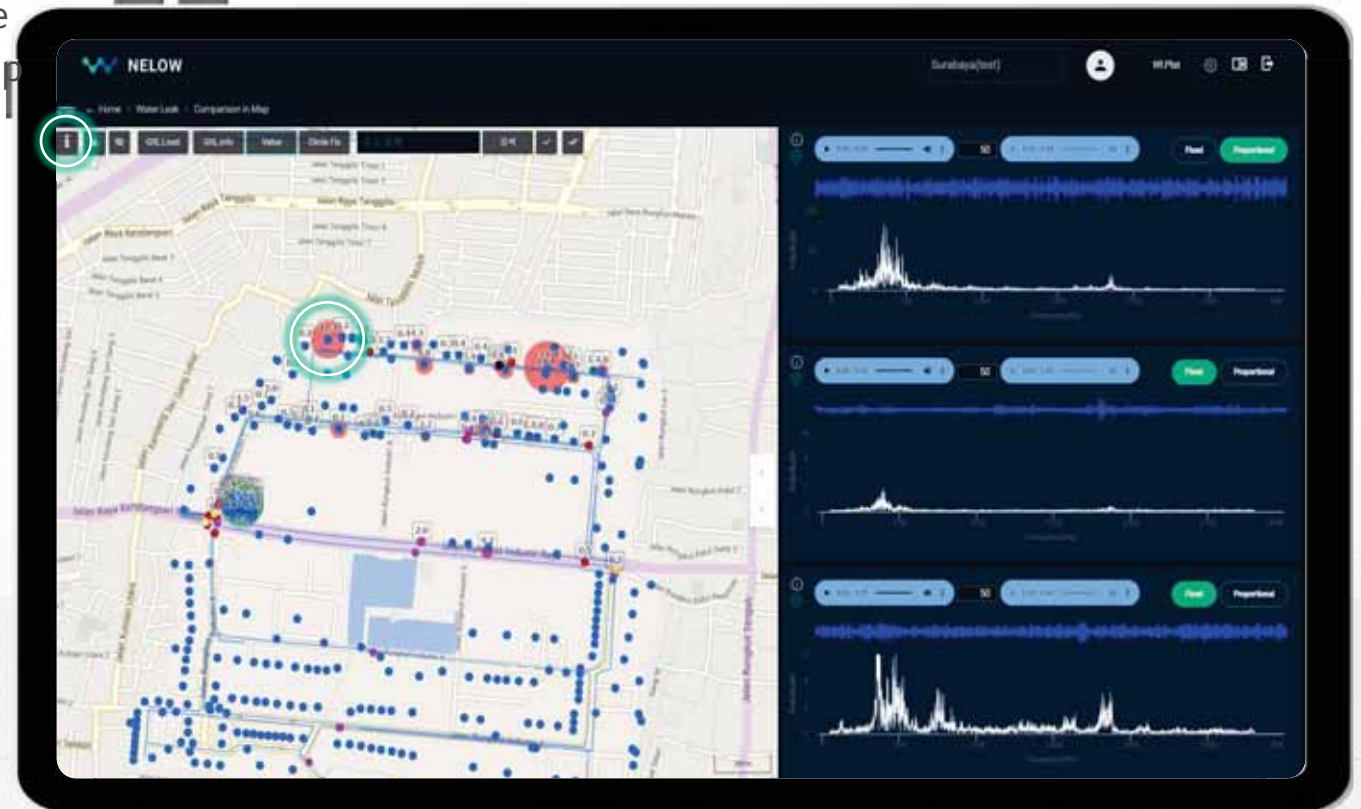
- ✓ For detailed information of the data-collected facility, click 'i' button.



Leak Data Analysis

Check the list of data

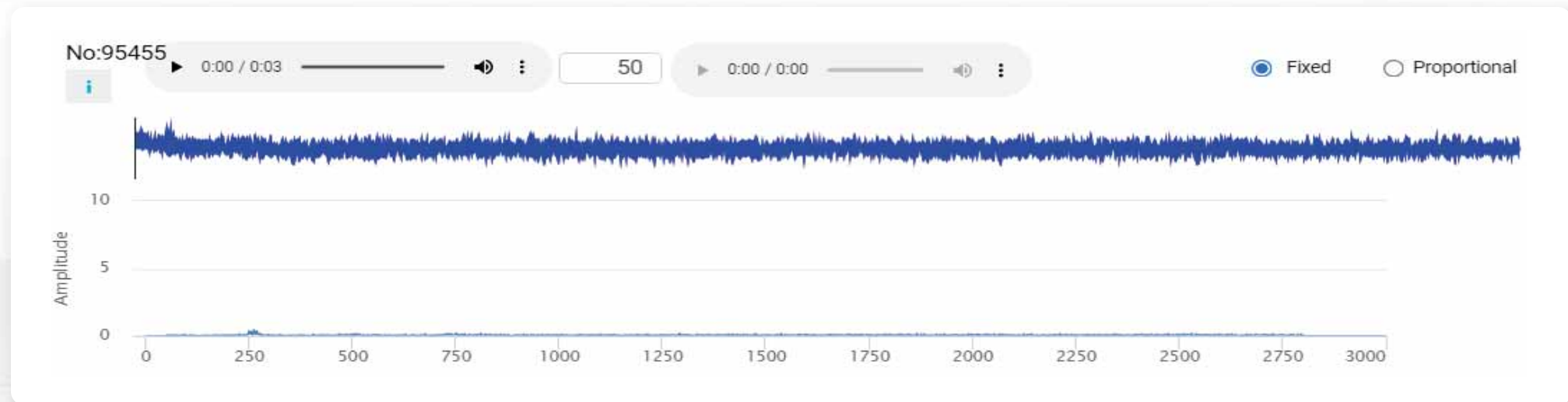
- 1 Enlarge map to check collected data by places and directly see frequency charts.
- 2 To check the frequency chart from the data on the map, click 'i' button on the top-left side of the map and click the collected data showing on the map.



Leak Data Analysis

Data without leaks

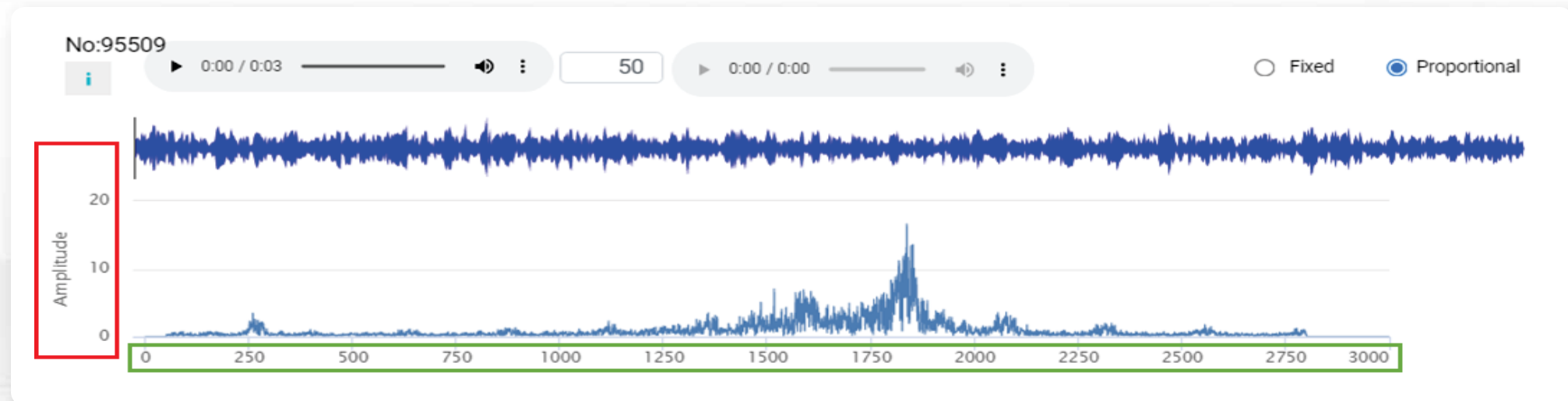
- 1 The sound pattern is consistent when there is no leaks, there is no specific characteristics in frequency chart.



Leak Data Analysis

Leak classification by pipe material

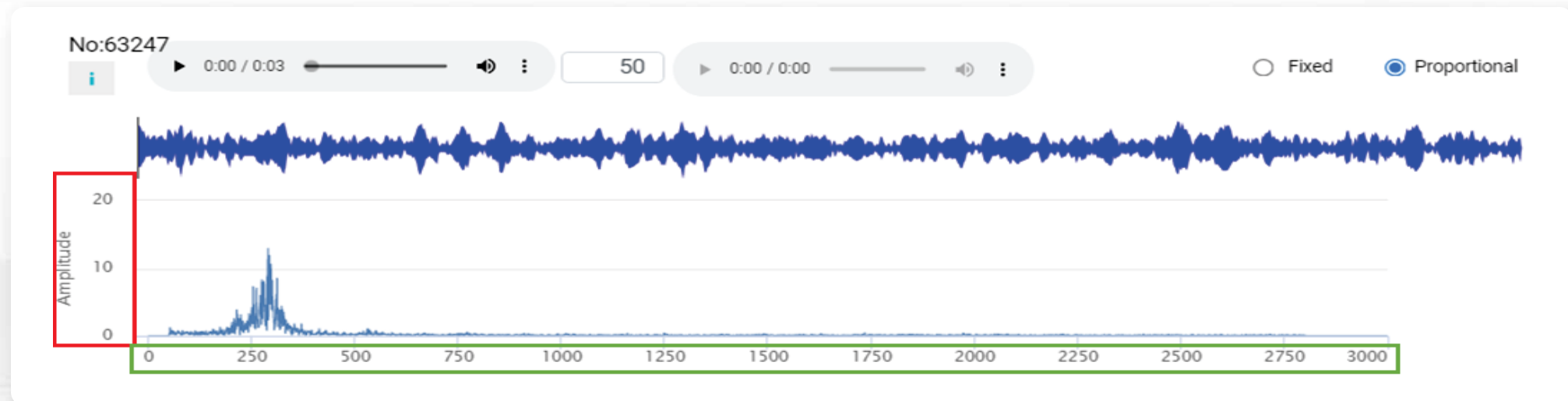
- 1 Metal pipe data pattern under 0.5ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 1800 Hz and 2000 Hz.
 - The usual strength should be over 0.7 to be verified as leak.



Leak Data Analysis

Leak classification by pipe material

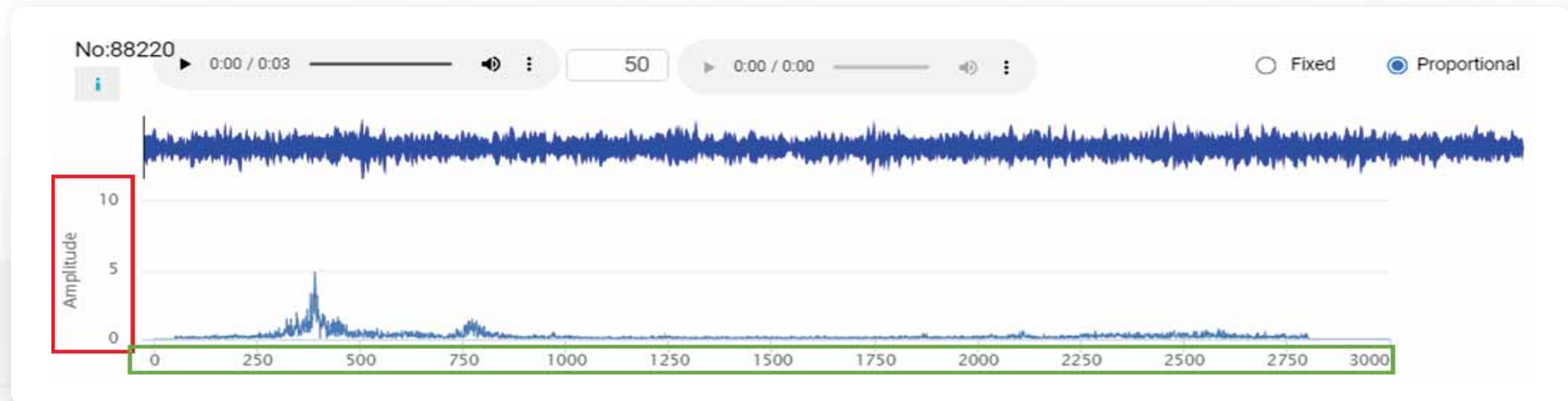
- 1 Metal pipe data pattern over or the same 0.5ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 200 Hz and 400 Hz.
 - The usual strength should be over 0.7 to be verified as leak.



Leak Data Analysis

Leak classification by pipe material

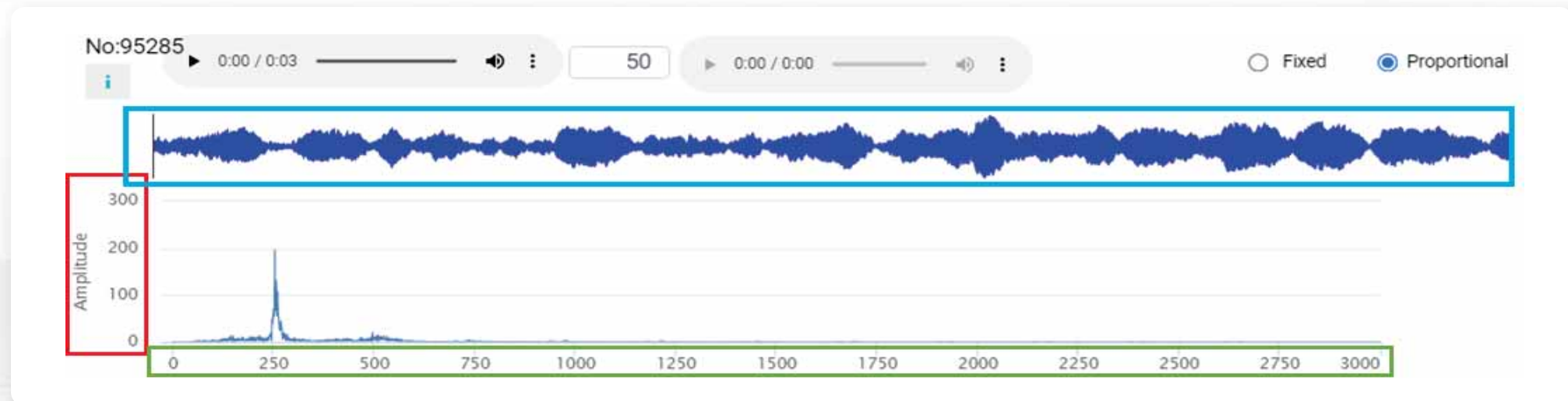
- 1 Non-metal pipe data pattern under 0.5ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 200 Hz and 500 Hz.
 - The usual strength should be over 0.7 to be verified as leak.



Leak Data Analysis

Leak classification by pipe material

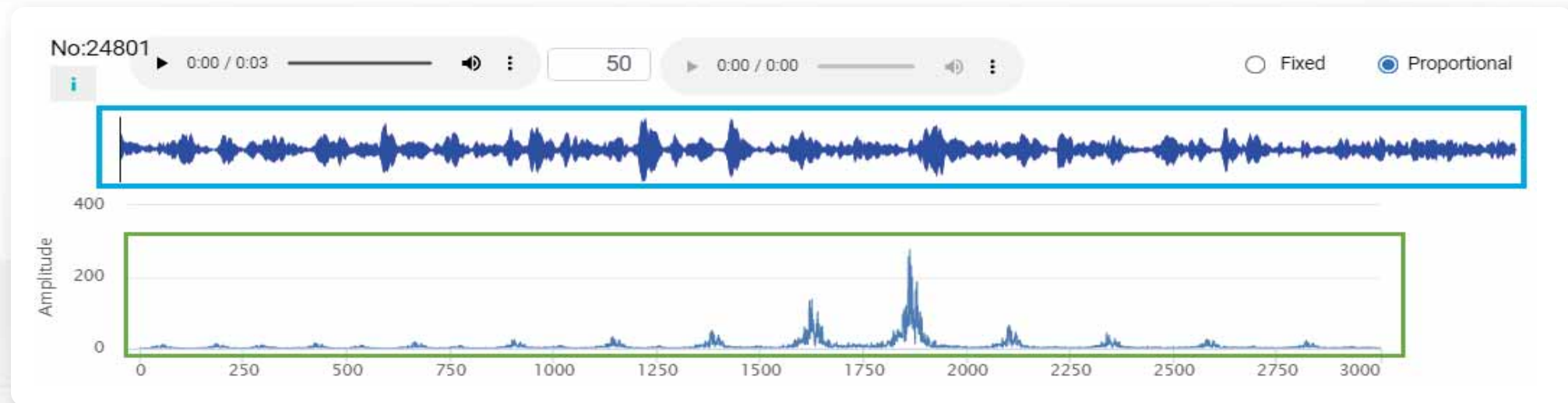
- 1 Non-metal pipe data pattern over or the same 0.5 ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 200 Hz and 400 Hz.
 - Non-metal pipe has a low molecular density so it cannot transmit the sound far away, approximately 20M is the limitation. In addition, as in blue square in the above picture, loosen formation of molecules makes the wave irregular.
 - The usual strength should be over 30 to be verified as leak with more than 0.5 ton/h.



Leak Data Analysis

Other patterns

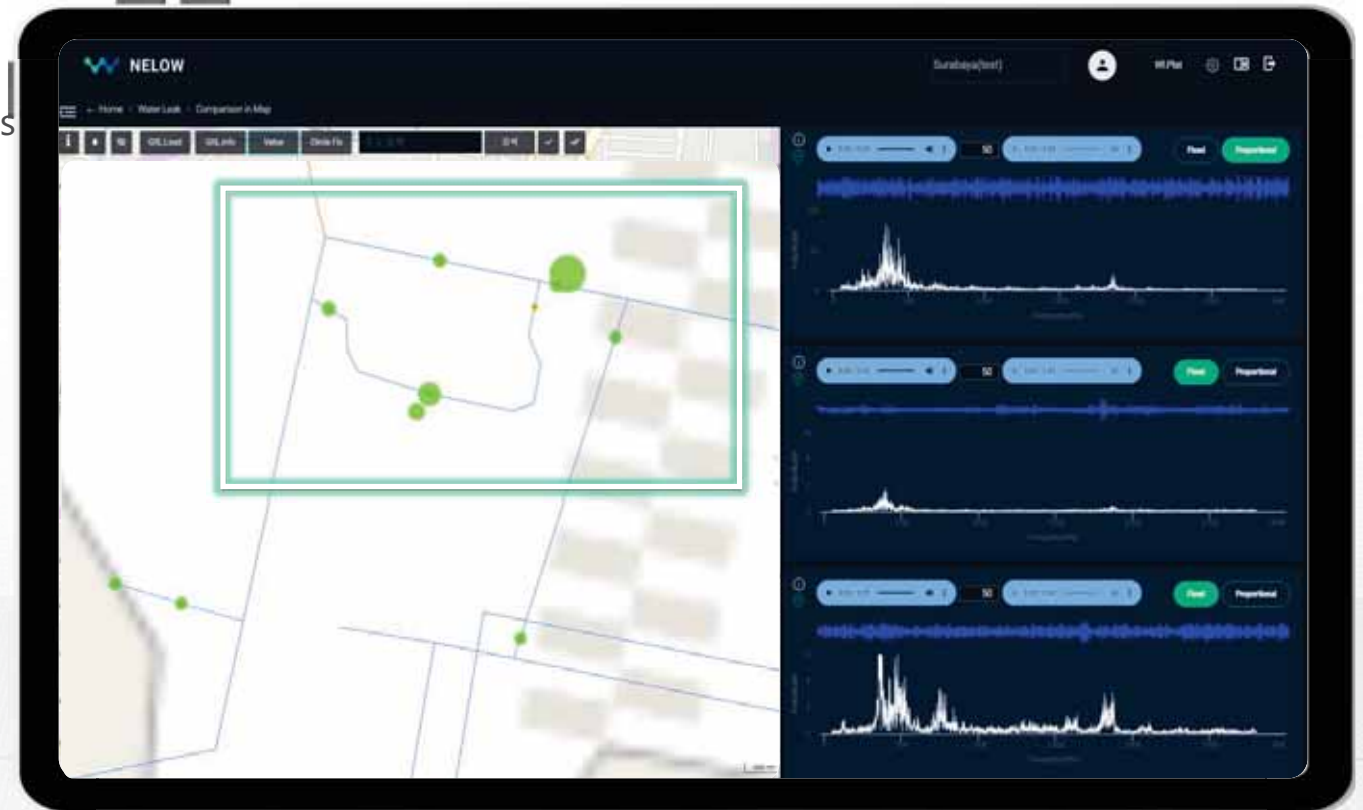
- 1 Pattern when the water meter is running.
 - When the water is being used while detecting, the strength value is very high.
 - The frequency looks like wave and it can be distinguished with the sound of running water meter.



Leak Data Analysis

Patterns near pump, decompression and the flow meter room facility

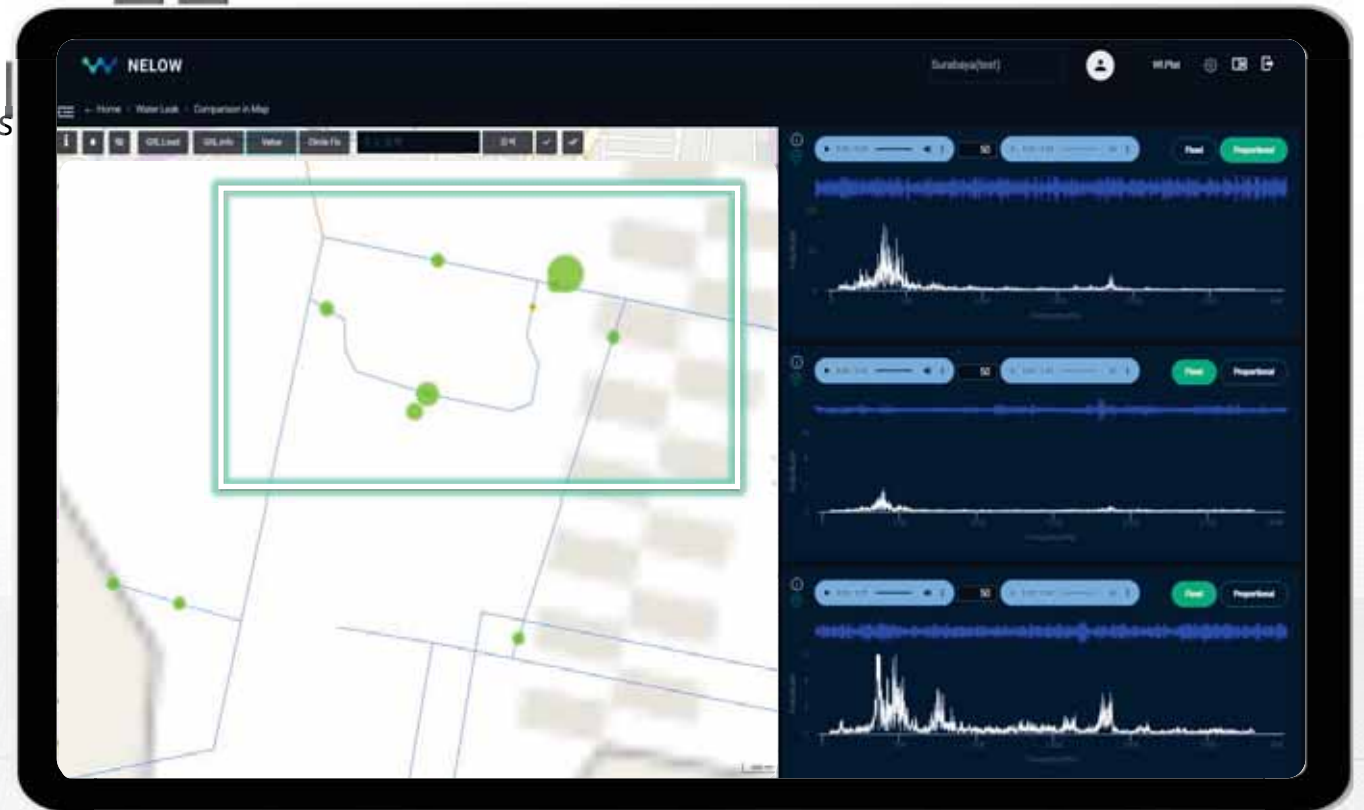
- 1 When there is a pump or decompression near facility, it is difficult to differentiate from the actual water leak sound by looking at the pattern.
- 2 The inspection of pipe GIS data or visiting onsite is inevitable in this case.



Leak Data Analysis

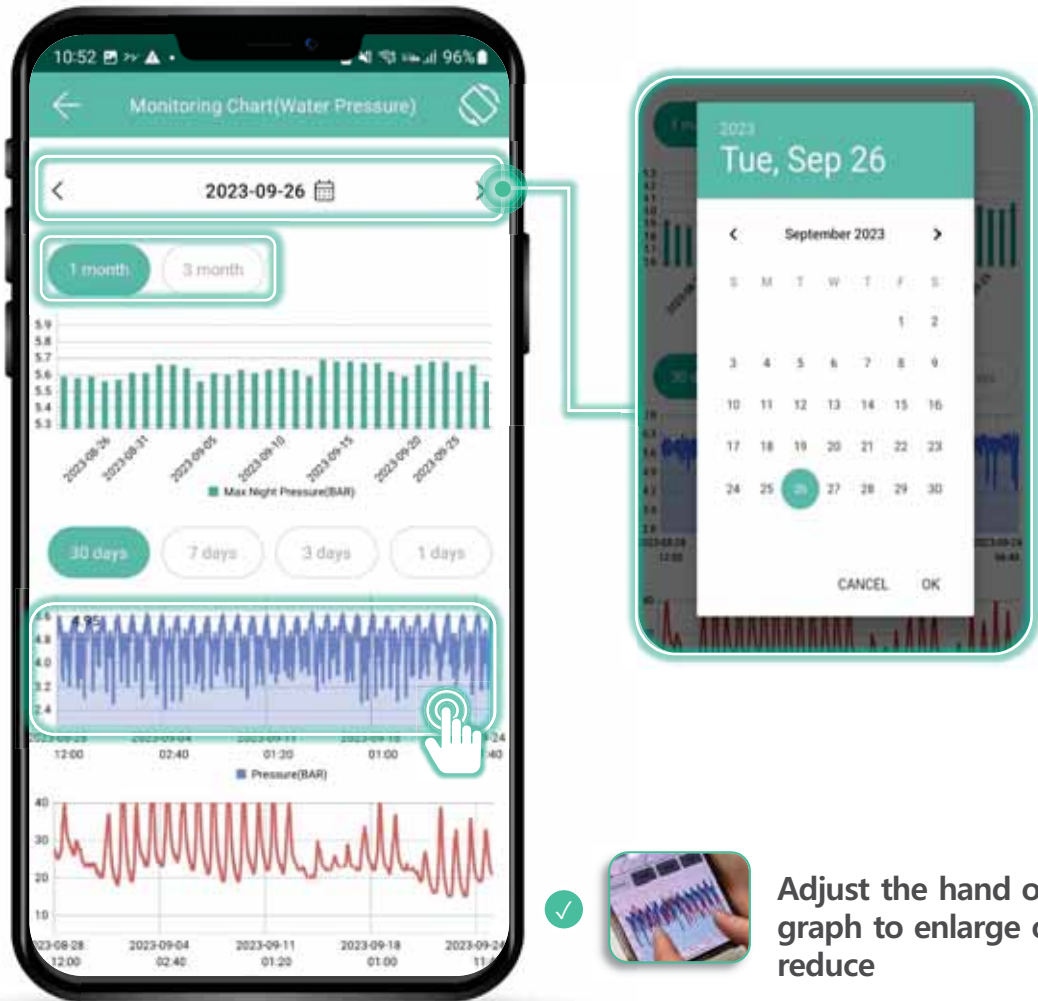
Patterns near pump, decompression and the water meter room facility

- 1 When there is a pump or decompression near facility, it is difficult to differentiate from the actual water leak sound by looking at the pattern.
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Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



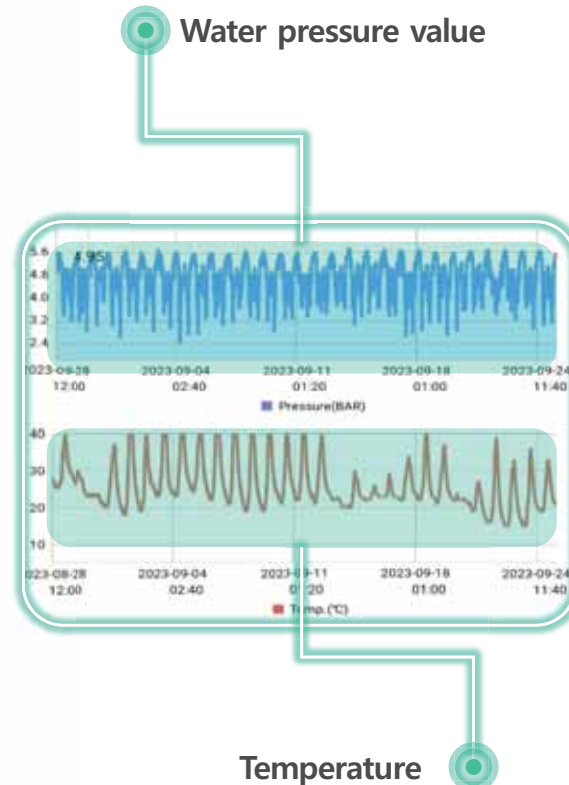
Checking the water pressure data

- 1 Press the  icon to check the data of a specific date (Press the arrow < > icons to move one day at a time)
- 2 Select   to view one month or three-months data
- 3 Select from     to view by the desired number of days.

[Go to the next page](#)

Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



Daily pressure inquiry graph

- ✓ Aggregating the time data to create a daily graph for checking (Changes over a short period)
- Possible to use the temperature information to monitor the site as the pipe may burst from freezing in the winter season

Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



Checking the water pressure data from the NELOW web

- 1 Click "Water Pressure → Monitoring" on the menu
- 2 Use the point name to search for the water pressure monitoring data (in case there are many installation points)
- 3 Click the > icon to check the detailed information of the installation point
- 4  : Pressure value of the installation point expressed on a map

Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



Checking the water pressure data from the NELOW web

1 ⓘ : Detailed information and settings of the installation point

2 **Properties**

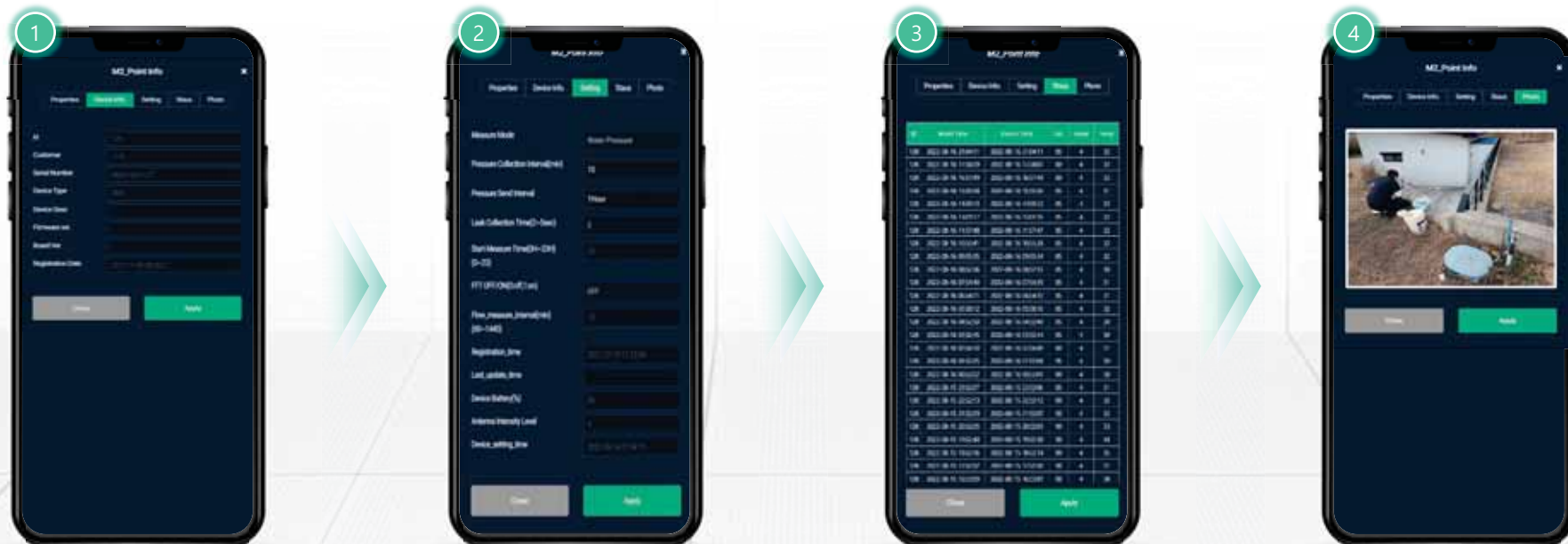
- a. Possible to change the point name
- b. Possible to change the point address
- c. Enter additional detailed information
- d. Enter or revise the elevation value
- e. Set the minimum value of the maximum nighttime pressure to give alarm a warning

[Go to the next page](#)

Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Device info: Information of the device installed on the point
- 2 Setting: Possible to set the communication information of the device
- 3 Status: Possible to check the device battery and communication status for one month
- 4 Photo: Possible to check any uploaded photo



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Installation point list (Possible to search from the search window on the top)
- 2 Check the daily water pressure data in a graph
- 3 Check the water pressure data on a map
- 4 Comprehensive water pressure data table (Maximum/Average/Minimum/MNF)



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Select the graph period among 1/2/3/6 months
- 2 Change the search date
- 3 Go to the detailed data chart page
- 4 Calculate the hydraulic head value and indicate on the map



- 1 Indicate the location point name on the map
- 2 Search the location to find on the map
- 3 Select the standard water pressure value on the map from among
- 4 Icon to enlarge the map to a full view



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Go to Monitoring detail → Detailed data chart page



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Click Chart on the previous screen → Click Pressure by time
- 2 Graph indicating the pressure data by time (Short-term changes)
- 3 Put the mouse pointer above the graph to see the precise value
- 4 Change the search date and graph period into months (Long-term changes)
- 5 Download the data values in an Excel file
- 6 Temperature values
- 7 Water pressure data
- 8 Drag to enlarge the graph to view in more detail



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

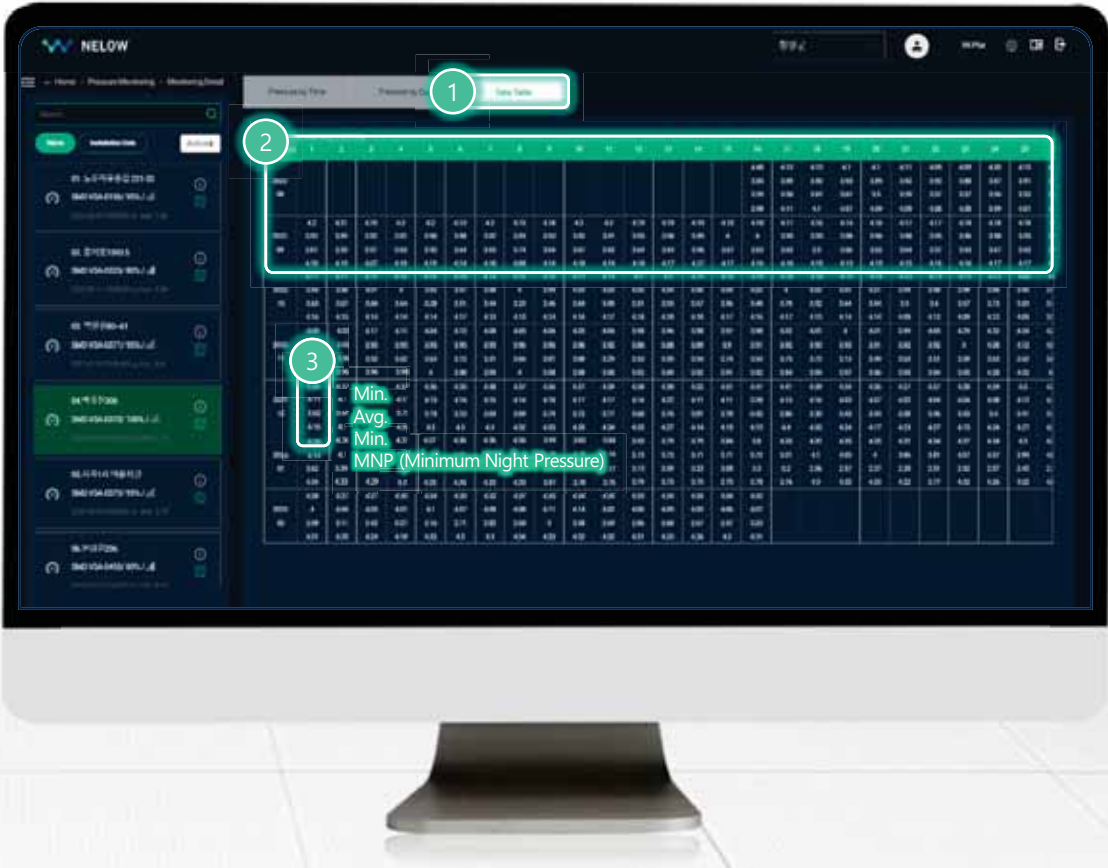
- 1 Click Pressure by Day on the previous screen
- 2 Check the daily water pressure data values on the graph
- 3 Minimum, average and maximum values are indicated in polygonal lines on the graph and MNP is expressed as bar graphs
- 4 Change the search date and graph period to months
- 5 Download the data values in an Excel file



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Click Data Table on the previous screen
- 2 Check the daily water pressure data values on the table
- 3 Water pressure values are displayed in the order of maximum, average, minimum and MNP values



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

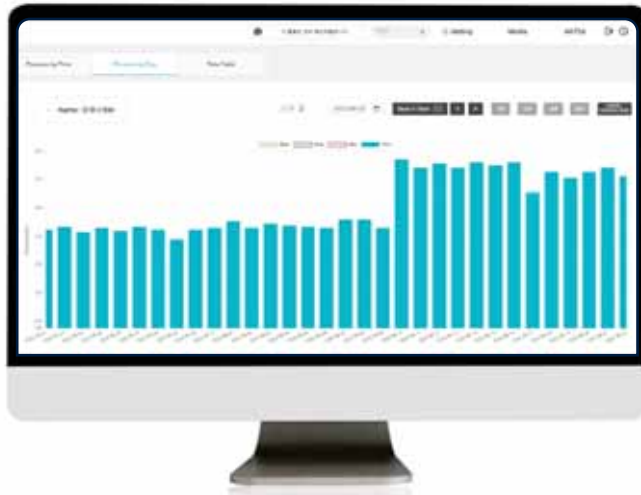
- 1 Click the ⓘ icon → Click the purple circle on the map
→ Possible to check up to three graphs on the right
- 2 Set to view/hide the GIS data (map)
- 3 Check the installed point name on the map
- 4 Indicate the GIS data (facility) on the map
- 5 Select the standard water pressure value on the map
from among the average/minimum/maximum/MNP values
- 6 Change the hydraulic head value and pressure data unit
- 7 Use the arrows to set the data indication into 10-minute or 1-day units

Click the Enlarge map icon on the previous screen (See page 81)



Water Pressure Data Analysis

Case Study: Pressure Management Through Water Pressure Monitoring



- 1 Suspected Leak Areas > Leak Recovery
- 2 Verification of Pressure Increase After Leak Recovery (3.4 bar → 3.9 bar)



- 1 Confirmation of Pressure Anomaly Through Pressure Monitoring (4.5 bar → 9.0 bar)
- 2 Abnormal Pressure Alert Provided
- 3 Business Branch Pressure Reduction Valve Abnormality Detected and Restored (10.0 bar → 4.5 bar)

V System Analysis

Important Notes



Important Notes

Always wear a **Safety Uniform**



Always work as a **pair** for **safety on road**



Important Notes

Always **explain what is the purpose of the work kindly** to the local residents when asked.



Follow **rules & precautions** from training material and follow manager's directions.



FCC Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Intelligent Water Loss Management

NELOW USER MANUAL

THE END

