



Case Study

Municipal Water Management Act improves groundwater decision-making in Hellevoetsluis

CHALLENGE

Achieve greater insight in the groundwater system to comply with the Dutch Water Act.

SOLUTION

Install, automate and maintain a groundwater monitoring network consisting of 26 monitoring locations. Collect, validate and manage groundwater data on a quarterly basis and publish results on a public web portal.

RESULTS

A better understanding of the groundwater system helped the municipality to detail its groundwater policy, improve communication with their residents about groundwater related issues, and act as a basis for additional studies.



Legislation calls for better insight in the groundwater system

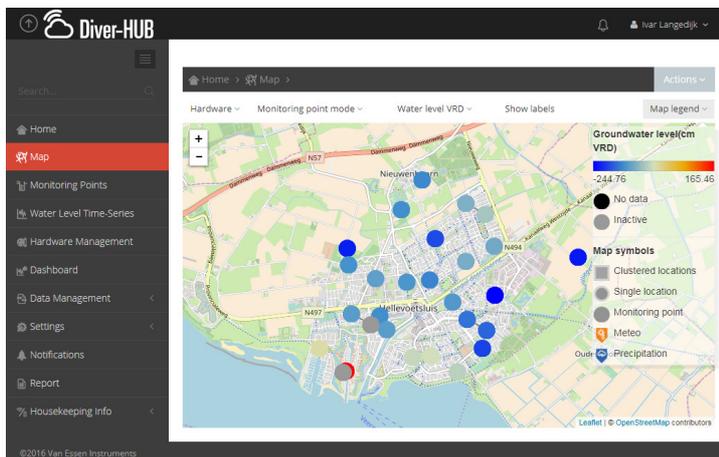
Hellevoetsluis is a Dutch municipality with 40,000 inhabitants on the island of Voorne-Putten, 20 km southwest of Rotterdam. From the beginning of the 17th century until the beginning of the 20th century, Hellevoetsluis was an important naval base. With a sea lock and dry dock, water always played and still plays an important role within the municipality.

In 2009, the Municipal Water Management Act merged into the Water Act. Under this new law, the municipalities became responsible for a duty of care for rainwater and groundwater. All municipalities must develop policies to show they comply with the Water Act. Also, municipalities have been given additional tasks to handle complaints and answer questions from residents about groundwater. The first step Hellevoetsluis took was an analysis of their groundwater system. Hydrogeological research characterized the soil composition and aquifers get a better understanding of horizontal and vertical groundwater flows and the dewatering depth. The soil in Hellevoetsluis consists of approximately 20 m of Holocene clay, sand and peat deposits. An aquifer consisting of coarse fluvial sand deposits is below these Holocene deposits. Upward vertical flow and seepage takes place between the aquifer and upper aquitard. In addition, horizontal flow takes place in the Holocene sandy layers.

In addition to the analysis of the groundwater system, a groundwater survey conducted with residents showed that in several neighborhoods residents experienced groundwater issues because of high groundwater levels. These high groundwater levels caused basement and garden flooding.

High-frequency groundwater monitoring

Based on the hydrogeological investigation and the survey results, a municipal groundwater monitoring network was designed in 2011. The purpose of the monitoring network is to gain a better understanding of the cause of these issues, to quantify them, and to determine the baseline situation in case of future developments. The final design of



Web portal with map of the city of Hellevoetsluis with monitoring locations



the groundwater monitoring network consists of 26 phreatic monitoring wells. Van Essen Instruments installed the monitoring network in early 2012. The average depth of the screens is 2.5 meters below ground level. The monitoring wells are automated with Diver dataloggers suspended on communication cables. Depending on the salinity of the groundwater, Diver dataloggers with a stainless-steel housing, Mini-Divers, or with a corrosion proof ceramic housing, Cera-Divers, were installed in the monitoring wells. Initially, the measuring frequency of the Diver dataloggers set to 4x per day. After the first year, measuring frequency increased to 24x per day to better capture the changes in groundwater levels caused by precipitation.

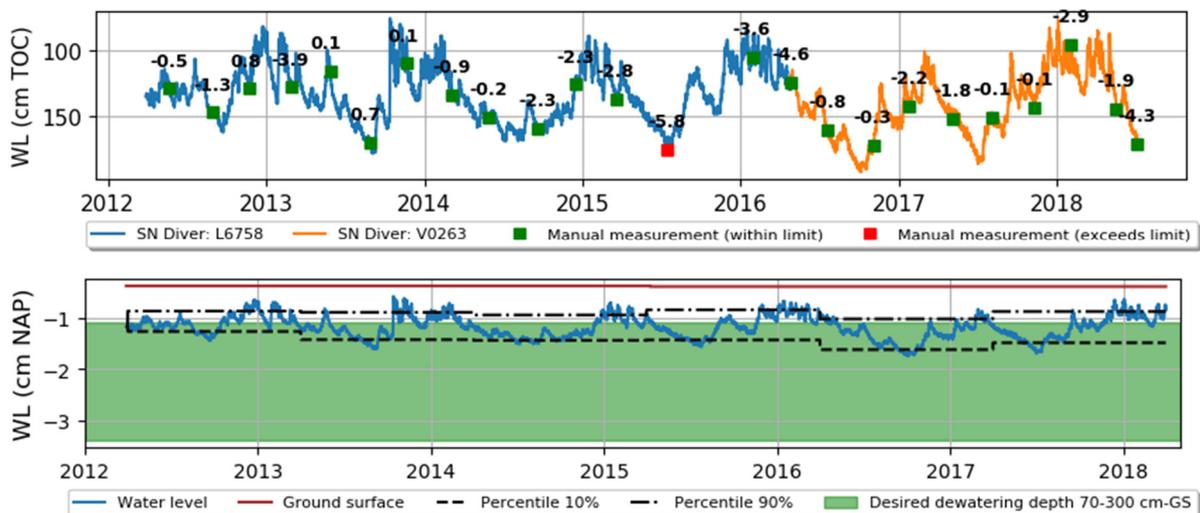
Van Essen Instruments manages the groundwater monitoring network and every quarter a data collection round is performed to readout the Diver dataloggers. In addition, in the field a real-time Diver measurement compares with the manual measurement to ensure the data accuracy and reliability. Finally, maintenance work is carried out to ensure that the monitoring points remain in good condition. In the office the collected Diver data is validated and reported to the municipality. In addition, the validated groundwater levels are published on a dedicated public web portal to inform residents: www.grondwaterinhellevoetsluis.nl.

Improved decision-making with high quality groundwater data

The groundwater monitoring network has collected groundwater levels of high quality and high frequency for 6 years. During this period, more than 1 million groundwater levels recorded during relatively wet years and dry years. The groundwater data has helped the municipality of Hellevoetsluis to comply with the Water Act in the following ways:

- Fine-tuning of the municipal groundwater policy. To determine whether there are groundwater issues, it is important to have detailed knowledge of the groundwater system. The monitoring network helps the municipality distinguish between natural conditions and deviations. In general, the groundwater levels in Hellevoetsluis are high. Flooded basements will not immediately be classified as a groundwater issue, the groundwater levels are within the natural regime. In these cases, the municipality has limited resources to solve the issue.
- Improved communication with their residents about groundwater levels and possible issues. The monitoring network helps the municipality to explain the cause of the complaints residents have about groundwater below and around their homes and to come up with solutions. The residents feel heard and reassured when they gain insight into the groundwater levels in their neighborhood and the fluctuations through the seasons and years. To summarize, by having detailed knowledge of the groundwater system, the municipality can better communicate with its residents!
- Developing an area-oriented approach to minimize groundwater issues. Based on a combination of groundwater levels, complaints, location and condition of the sewer system, storm water runoff analysis, and the type and age of building foundation the municipality has defined areas of attention / risk areas for groundwater issues. In the coming years, additional research needs to be carried out in these areas to decide whether to take measures.

The municipality aims to continue monitoring groundwater levels in the future. The monitoring network will be extended to get a better understanding of groundwater levels at specific attention areas. Furthermore, some monitoring points will be upgraded to a telemetry solution to get near-real time information.



Validated water levels of monitoring point B37C1729-01 in relation to manual measurements and desired dewatering depth