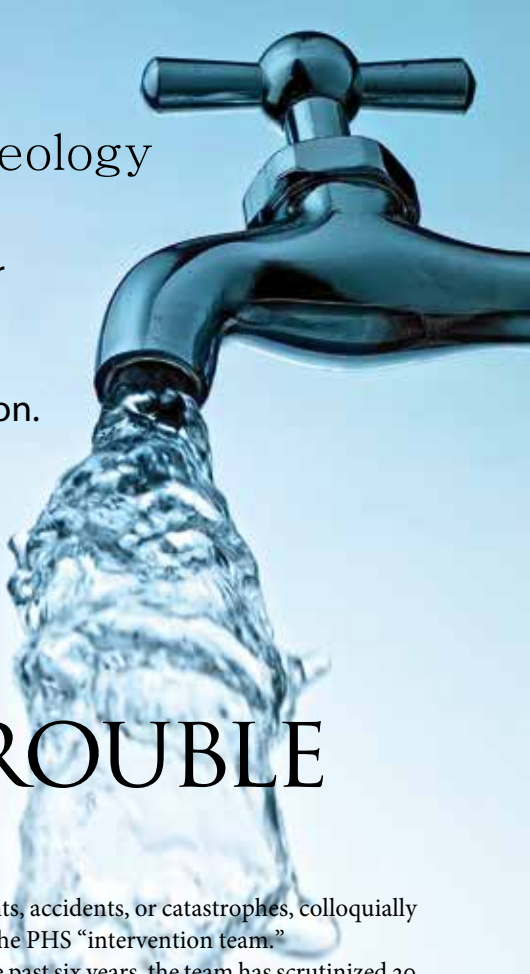

People rarely consider where their tap water comes from, or how much of it is actually available. At the same time, it is people who are most often responsible for water pollution. Problems involving the contamination of water-supply areas in Poland are scrutinized by an "intervention team" of experts at the Polish Hydrogeological Survey.

Tap-Water Trouble

Małgorzata Woźnicka, Ph.D., a hydrogeologist, is responsible at the Polish Geological Institute for the performance of the tasks of the Polish Hydrogeological Survey. She conducts projects involving the protection of groundwater and analyzing factors threating groundwater quality.

malgorzata.woznicka@pgi.gov.pl

Małgorzata Woźnicka
Rafał Janica

Polish Geological Institute
– National Research Institute

Incidents in which the water supply for a given area becomes contaminated to an extent that it becomes unfit for human consumption are most often caused by human activity. Most of them involve historical pollution, resulting from past human activity in the water-supply zone. In such situations, it is hard to clearly identify any particular "perpetrator" that is to blame for the environmental damage, much less force them to pay for the cleanup. Nevertheless, it is still crucial to identify the actual source of pollution, because without such a diagnosis the water-supply zone may not function properly in the longer-term perspective.

Poland has a special unit at the its Polish Hydrogeological Survey (PHS) tasked with studying such difficult and hard-to-resolve cases.

Called to action

The main task of the PHS is to monitor, evaluate, and protect groundwater sources so that they may be harnessed for the use of society and the economy (Article 102 of the Water Act). In 2003, the PHS began taking reports of situations resulting in restricted drinking water access for residents of a particular area, or the exclusion of particular water tables from use due to pollution. Because such situations usually involved pollution from a source that was difficult to identify, in 2009 the Survey set up a dedicated unit for studying the scope of groundwater pollution as a result of incidental events, accidents, or catastrophes, colloquially known as the PHS "intervention team."

Over the past six years, the team has scrutinized 20 different cases. Seventeen of them ended in an official report being submitted to the supervisory authorities (these are the National Water Management Authority (KZGW) and the Ministry for the Environment on the central level, and municipal or regional government administrations on the more local level). In one case, despite attempts made and despite correspondence exchanged with the administrator of the area, PHS personnel were not permitted to access a site where a catastrophe had occurred (a train derailment involving the breaching of tanker cars carrying petroleum products). Two other reported incidents were disregarded, because they did not fall under the team's jurisdiction or the situations described in them proved untrue. The interventions that were carried out in the rest of the cases allow certain conclusions to be drawn concerning the nature of the hydrogeological problems that are currently most prevalent in Poland.

The largest number of such incidents (eight) involved improper and unlawful waste management, which can detrimentally affect groundwater. In such cases, it is important for action to be taken fast, bringing matters to the attention of law-enforcement bodies and units responsible for the observance of Poland's Environmental Protection Act, before "potential" impact turns into "permanent" damage. Two other categories, with three cases each, involved the identification of pollution in groundwater, and also changes in the water regime as a result of inadvertent flooding and drying of areas and buildings. Three other categories, with one case each, involved the following: the harnessing of mineral resources having an impact on groundwater, the storage of fuels and the accompanying pollution, and incidental pollution.

It is interesting to consider the breakdown of who reports problems to the SHS for scrutiny by the intervention team. These have primarily been reported by local government bodies (six cases), followed by the National Water Management Authority, Environment Ministry, and also public organizations (three cases each). It is worth stressing that in two cases the PHS was approached by private individuals. There is also a separate category of cases that no one wants to deal with, even though they involve widely known problems that are potentially very dangerous.

Fieldwork requires cooperation and assistance from local government officials, without which it is typically hard to achieve much. This is especially true in that water-source areas are usually administrated by utility companies controlled by the local municipality, and the municipalities are also typically the owners of the surrounding land where drilling or probing may need to be carried out. Assistance from a municipal government employee is often the only "ticket" facilitating access to sampling points on private lands, whose owners do not always want to trust unfamiliar, city-slicker geologists.

The case study of Borne Sulinowo

One of the most difficult studies carried out by the SHS intervention team was in 2010–2011, when the water supply area in Borne Sulinowo was found to be polluted with halogenated compounds. Prior to WWII the town was situated in Germany, and in the 1930s it was under military jurisdiction. Until 1945 it was administered by the German army, serving as barracks, a firing-range facility, and the location of the Wehrmacht's Artillery School. In 1945–1993 the town had a large contingent of Soviet troops stationed there: a mechanized division and two mechanized regimens, a tank regiment and battalion, an artillery regiment, plus sapper, logistics, medicine and reconnaissance battalions, and also a tactical missile brigade with a depot of fuels and lubricants. The garrison numbered around 25,000 soldiers and administered a military range of 18,000 hectares.

The water supply system in Borne Sulinowo was first created in the interwar period (between WWI and WWII). It consists of 12 drilled wells situated along a line perpendicular to the direction of groundwater flow in the water table, located in a fenced-in forested area in the southern part of the town. To the east, it borders on a lumber processing plant. The system uses a syphon configuration, with water from the wells channeled to a single reservoir and then pumped into the pipeline system.

In May 2009 routine water testing discovered that some of the wells were contaminated with the halogenated compounds tri- and tetrachloroethylene. The Sanitary Inspector in Szczecinek therefore issued a decision to discontinue use of the polluted wells. The water from them was instead pumped into the wastewater system, a move meant to protect the other wells from becoming polluted. The fundamental question therefore became whether the water supply zone could continue to be utilized by the town.

The PHS personnel first gathered archival data concerning the water supply zone and the history of its management. They made a field visit, which included identifying potential pollution sources nearby. They also analyzed the hydrogeological conditions: the depth of the water table, the type of water-bearing stratum, the direction of groundwater flow, and how well the water-bearing strata are isolated by impermeable strata. Based on this data they constructed a hydrodynamic model for simulating the spread of pollutants in the water-bearing stratum. At the same time, they carried out laboratory tests on subterranean water samples taken from the wells, as well as from boreholes that were drilled in locations chosen based on the hydrodynamic model. Given that the water supply region did not offer appropriate points facilitating groundwater sampling (wells or piezometers) and scrutiny of the geological structure and hydrogeological conditions proved insufficient for identifying the pollution source, the PHS intervention team needed to drill a large number of boreholes in this case (a total of more than 30, through both hand drilling and mechanical means).

After potential sources of pollution were identified, the most important task was to identify areas with the highest identified pollutant content and to pinpoint the area where the pollution had most likely entered the ground and then the groundwater, before further migrating into the town's water-supply zone.

The team concluded that the pollution discovered in some of the wells was most likely caused by improper management of waste containing halogenated compounds, and their illegal dumping or burial in areas neighboring on the water-supply zone. We should stress that it is not certain that this practice was related to the operation of the lumber plant. However, despite many remaining uncertainties, this information, especially the pinpointing of the location where the pollutants most likely penetrated into the water table, made it possible for the local authorities to take measures enabling the water system to operate safely (establishing how the individual wells are to be used).

The work done by the intervention team therefore had a direct impact on reinstating the proper functioning of the town's water supply system and guaranteeing stable supplies of potable water. This would not have been possible without identifying the sources of the pollution, delineating the polluted zone, and evaluating the overall magnitude of the pollutant source. As a result of the work done by the team, it did not prove necessary for the town to build an entirely new water-supply zone. ■

Rafał Janica, MS, a hydrogeologist and geological engineer, leads the Polish Hydrogeological Survey's intervention team. He serves as a court expert on geology and environmental protection.

rafal.janica@pgi.gov.pl