Organisation: Water Development Department

The Germasogeia aquifer challenges: transport of pollutants and effective recharge

The Water Development Department (WDD) is the governmental department that operates according to the following objectives:

- Satisfy the water needs of all users to the maximum extent possible
- Promote the efficient use of water resources
- Safeguard the water quality, and protect the water resources and the aquatic environment

Since 1982, WDD in the district of Limassol has been using water from the Germasogeia dam to recharge the Germasogeia aquifer, with controlled releases from the dam and its spills.

After natural purification (SAT - Soil Aquifer Treatment), the “treated” groundwater is pumped out of the aquifer through boreholes for the domestic water supply of the Limassol greater area. No further water treatment is carried out except chlorination of the water tanks.

The Germasogeia aquifer is a typical unconfined river alluvial aquifer developed along the Germasogeia river valley extending from the Germasogeia dam to the coast. It is 5.5 Km long and has an area of 3 Km2; its width varies from 100 to 800 m, and its depth from 30m upstream near the dam to 55m near the sea. It was the first aquifer in Cyprus used as a natural water treatment plant, and it is also currently the most intensively exploited aquifer in the country. 19 boreholes operate today and the yields of these boreholes vary from 40 to130 m³/hour. The total volume of water abstracted varies from 5 MCM to 7 MCM per year. However, fast urbanization and increase of tourism in the area are leading to the rapid deterioration of this highly susceptible aquifer, and seriously endangering its future.

The aquifer runs through an urbanised area and it crosses the Limassol–Nicosia highway, local important roads, the main Southern Conveyor pipeline, the main pipeline and the irrigation network of the Germasogeia dam, the main pipelines of the Limassol–Amathus raw and treated sewage, the local sewage system, etc. It is, thus, obvious that the aquifer is under constant threat of contamination.

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The main aims we have as organisation regarding the aquifer's "regulation" are: a) to cover drinking water demand with groundwater of acceptable quality, b) to protect the aquifer from sea intrusion, and c) to minimize groundwater losses to the sea.

The challenges we would like to solve during the Study Group are:

1. If we have a sudden leakage from the raw and treated sewage pipe at a random point, what will be the extent of pollution in the aquifer and how fast would the pollutants spread? What would this mean for the quality of the water that we will abstract? What measures should we take to minimise the effect of the pollutants?

2. We would like to maximise the effectiveness of the recharge and abstraction processes. At the moment we have 4 points where we recharge the aquifer and 19 boreholes pumping water out. If we have a depletion of the water table in a certain area where and for how long should we recharge so that we overcome that depletion?

AQUIFER GENERAL INFORMATION/CHARACTERISTICS:

AREA: 3.0 Km², WIDTH: 500m (150-800m), LENGTH: 5.5 km, OUTCROP AREA: 3 Km
THICKNESS: 30m at the dam, 55m at the coast
AVERAGE RAINFALL: Period 1990-2000: 410 mm,
HYDROGEOLOGICAL PARAMETERS:
Average hydraulic conductivity (K) = 130 m/day, (80 - 350m/day)
Average Specific yield (S) = 18 %, (14% - 22%)
BOUNDARIES: East and West: impermeable.
South: Permeable, Sea.
North: Leaking dam.
CONFINED/UNCONFINED: Unconfined.
SUSCEPTIBILITY (NATURAL VULNERABILITY): Very high. Phreatic aquifer.
WATER LEVEL OBS. NETWORK : Yes, every 15 days, 46 boreholes.
WATER QUALITY OBSERV. NETWORK: Yes, conductivity logs of 10 boreholes.
ARE ALL BOREHOLES PLOTTED? : Yes.
EXTRACTION SURVEY: Yes, every month, by water meters.
INPUT RATES AND POINTS: yes

The impervious base of the aquifer consists mainly of the Miocene (Pakhna formation) marls, chalks and chalky marls. The upstream part of the aquifer, i.e. the part near the dam, consists of gravel and coarse sand. The permeability in this section is very high and it gradually reduces downstream because of an increase in the content of fine materials such as fine sands and silts.