Abstract of the City Council note submitting the Groundwater Management Plan for Stuttgart

01.07.2015
The Groundwater Management Plan for the inner city of Stuttgart was established within the project „MAGPlan - Management plan to prevent threats from point sources on the good chemical status of groundwater in urban areas“. This project was funded by the LIFE programme of the European Union.

As a result, the Groundwater Management Plan compiles crucial measures to restore the natural purity of the mineral water. The development of this plan is based on the integral groundwater investigation, implemented to detect the origin of the volatile chlorinated hydrocarbons (CHC), discovered in the mineral springs and certified spas of Stuttgart-Bad Cannstatt and -Berg in the 1980ies.

For this purpose extensive documents and data were exploited and additional investigation measures performed. 18 additional groundwater monitoring wells down to the depth of 92 m were built and innovative techniques like isotope fingerprinting, tracer tests and microcosmic investigations were applied.

Based on the results achieved, a three-dimensional conceptual hydrogeological model was compiled to visualise the hydro-geological characteristics of the groundwater system and the occurring processes. By means of a numerical groundwater flow and contaminant transport model, the complexe flow and transport mechanisms were simulated, assumptions checked and natural attenuation processes identified and quantified. As an additional output, the simulation results were visualised by the web-based tool MAG-IS. This tool also was developed to support the administrative contaminated sites management.

The project area of 26 km² comprises the city centre of Stuttgart and parts of the suburb Stuttgart-Bad Cannstatt, which are directly located in the upstream or in the discharge area of the mineral springs and certified spas.

Basic achievements of the integral groundwater investigation are:

- The CHC plumes of the eight affected aquifers were identified.
- The vertical and the lateral contamination pathways downstream the single sites were detected and delimited. The interaction between contamination sources and plumes were shown.
- The five contaminated sites which are most relevant for the CHC contamination of the mineral water were identified and their impact on the mineral water quality was detected.
- The entry and the discharge of contaminants with impact on the groundwater in the project area were balanced.
- The dimensions of natural attenuation processes were quantified, which are important for the determination of the remediation needs.
- The inevitable framework conditions for the concerted remediation of contaminated sites and their relevant impacts on mineral water were established.

These results were summarized in the Groundwater Management Plan, comprising remediation concepts and a monitoring programme. The remediation concepts are available for each single site with negative effects on the mineral water. Combined
with a prioritisation of the remediation measures, the plan aims at a significant improvement of the quality of the second largest mineral water resource in Europe within the next 10 years.

Another important result of the MAGPlan project is the confirmation that the past and the ongoing investigation and remediation activities at the contaminated sites were suitable and necessary to reduce the negative impacts. The continuation of the current pump&treat-measures secure the status quo and prevent a potential deterioration. The contamination plumes of the city centre won’t spread out further into the direction of the mineral springs. On the other side, the situation of the mineral springs won’t be improved significantly in the foreseeable future. On the other hand, the CHC plume originating from the city centre is proved not to extend in the direction of the mineral springs and certified spas.

The MAGPlan results facilitate the optimization of the remediation by additional decontamination measures. Thus the duration of remediation activities can be shortened significantly which saves financial resources.

The measures and the costs calculated by the experts will be allocated in the years 2016 to 2026. The next steps after project closure focuses on the high prioritised contaminated sites (priority 1 – mineral springs, priority 2 – mineral water).

Hence additional investigation activities to prepare the decontamination activities have to be executed in the years 2016 and 2017, which are estimated with total costs of 1.3 Mio. EUR. On this basis, pilot actions with innovative decontamination techniques will be implemented on the three sites which are in the responsibility of the City of Stuttgart to test the applicability of the Groundwater Management Plan. The costs for pilot actions (2018/2019) are estimated with 1.5 Mio. EUR, the costs for remediation (2020 until 2025) with about 10.2 Mio. EUR. Further investigations on two private properties are necessary.

The existing monitoring programme for the mineral springs and certified spas needs to be updated and amended. Hence a one-time charge of 220,000 EUR is required and annual additionally 25,000 EUR for the monitoring.

Altogehter costs of 13.5 Mio EUR are expected for the years 2016 to 2026. As a consequence, the reserves for the investigation and remediation of contaminated sites in the municipal budget need to be adapted accordingly. For each single site the acquisition of subsidies will be checked and utilised. The proposed agenda is a very cost and time efficient approach to restore the natural purity of the mineral water in a foreseeable future.

A comprehensive description of all measures and project results is edited in the book “Chlorierte Kohlenwasserstoffe im Grundwasser – Untersuchungsmethoden, Modelle und ein Managementplan für Stuttgart” (Chlorinated hydrocarbons in the groundwater – investigation methods, modelling and a management plan for Stuttgart), edited by the publisher Springer-Viehweg (in German language, an English abstract is available on www.magplan-life.eu in the subcategory project documents/technical reports).