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Delineation of Groundwater Protection Zones for the Hallabat Wellfield

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Executive Summary

The Hallabat wellfield, located in the northeastern part of Jordan, about 26 km east of Zarqa, is an important source for water supply of Amman and Zarqa as well as for the local villages. A total of 29 wells currently provide 4 MCM/a from the basalt and A7/B2 aquifers.

Because of its importance the German-Jordanian Technical Cooperation project “Groundwater Resources Management” has chosen this wellfield as one of its working areas for the delineation of groundwater protection zones according to the issued Jordanian "Guidelines for Drinking Water Resources Protection" (July 2006). The proposed groundwater protection area has been further subdivided into three zones, which require different degrees of landuse restrictions.

During the field work to this report several risks to the drinking water supply provided by the Hallabat wellfield were identified. They partly arise from deficits in the construction and upkeep of the water supply infrastructure, from a lack of access barriers to the protection zone 1 (partly missing fences), from a lack of awareness of the guards (free access to protection zone 1 through open gate) and from pollution risks in zone 2.

Because some of the wells have already been affected by bacteriological contamination, the report proposes several corrective measures in order to reduce the contamination risk of the drinking water source. It is important that these measures are implemented as soon as possible. Concerning protection zone 1 WAJ will have to enlarge the well perimeter so that the distance from the well to the fence will always be 25 m, as required by the guideline. WAJ also should install an overlapping well cap with a conduit box to avoid direct access to the well, repair the damaged pipe network and physically block entrance to the installations. WAJ employs guards for groups of wells. They usually live right next to a well from where they take electricity and water. But they also grow crops, raise animals and dispose of their wastewater in too close vicinity of the wells. Proper wastewater collection systems should be installed for these guards at a distance of not less than 100 m from the well. These must be regularly emptied. Moreover, the guards must be taught not to keep their animals or grow crops at distances less than 100 m from the wells.

A number of corrective measures have also been proposed for protection zones 2, where the most prominent contamination risks arise from agricultural and cow farming activities. Implementation of these measures should be given high priority. A spreading of cow farming, which is currently mainly concentrated around the village Ad Dhuleil, towards the Hallabat or Corridor wellfields should be avoided under all circumstances and strongly objected by the MWI and WAJ. In collaboration with the Ministry of Environment a solution must be found urgently concerning the safe storage and disposal or treatment of cow dung. In the focus of such a solution should be the need for protection of the groundwater resources.

Another main threat to the drinking water resources is the inappropriate storage and disposal of untreated wastewater. There is currently no public wastewater collection and treatment system in the area. It is recommended that WAJ

installs a wastewater collection and treatment system for the village of Ad Dhuleil, which is growing fast and where there are already numerous industrial sites. Awareness raising which should bring about behavioral change within the population is crucial with regards to wastewater collection and treatment and the BGR-MWI project supports activities in this regard.

Since the implementing agency concerning groundwater protection zones 2 is the Ministry of Environment, the responsible staff will need to control the enforcement of the proposed measures.

In order to avoid further contamination risks in the future, it is seen as important that the landuse planning authorities closely coordinate their activities with the Ministry of Water and Irrigation as well as with the Water Authority of Jordan.

The project will carry out workshops for awareness building and provide training for the implementation agencies.

Protection zone 3 encloses the entire groundwater contribution zone of the wellfield. Environmental sound practices for all activities have to be implemented.

Due to the numerous potential hazards to groundwater and uncontrolled expansion of agriculture and animal farming, groundwater abstraction in the Hallabat area bears many risks. Targets and objectives of abstraction and protection are much easier to be maintained for the Corridor wellfield compared to the Hallabat wellfield. If, however, the decision is taken to maintain abstraction at Hallabat in the long-term, a new concept for abstraction needs to be prepared, which includes all required measures for groundwater protection.

Over the past 10 years a constant decrease in yield in the Western Hallabat wellfield had been noticed. This is caused by the declining groundwater levels and thus the decreasing saturation thickness of the aquifer. The overall saturated thickness, and in particular the saturated thickness of the basalt, which provides the major share of groundwater for the water supply, is much higher in the Eastern Hallabat wellfield than in the Western wellfield. Therefore exploitation should focus on the eastern wellfield and exploitation in the western wellfield should be abandoned in the long-term. It will then be necessary to extend the Eastern Hallabat wellfield and drill more wells towards the north and east of the current wells. In order to protect these future extension areas already now, it must be ensured that potentially hazardous activities, such as agriculture or cow farming, do not spread to these areas. Also the basalt quarry, which was established recently to the north of the East Hallabat wellfield constitutes a major threat for any possible future extension thereof, especially the hydrocarbons used for the operation of the site and maintenance of the vehicles.