

# Groundwater Resource Protection in Jordan

## A case study from AWSA and Heedan Well Fields

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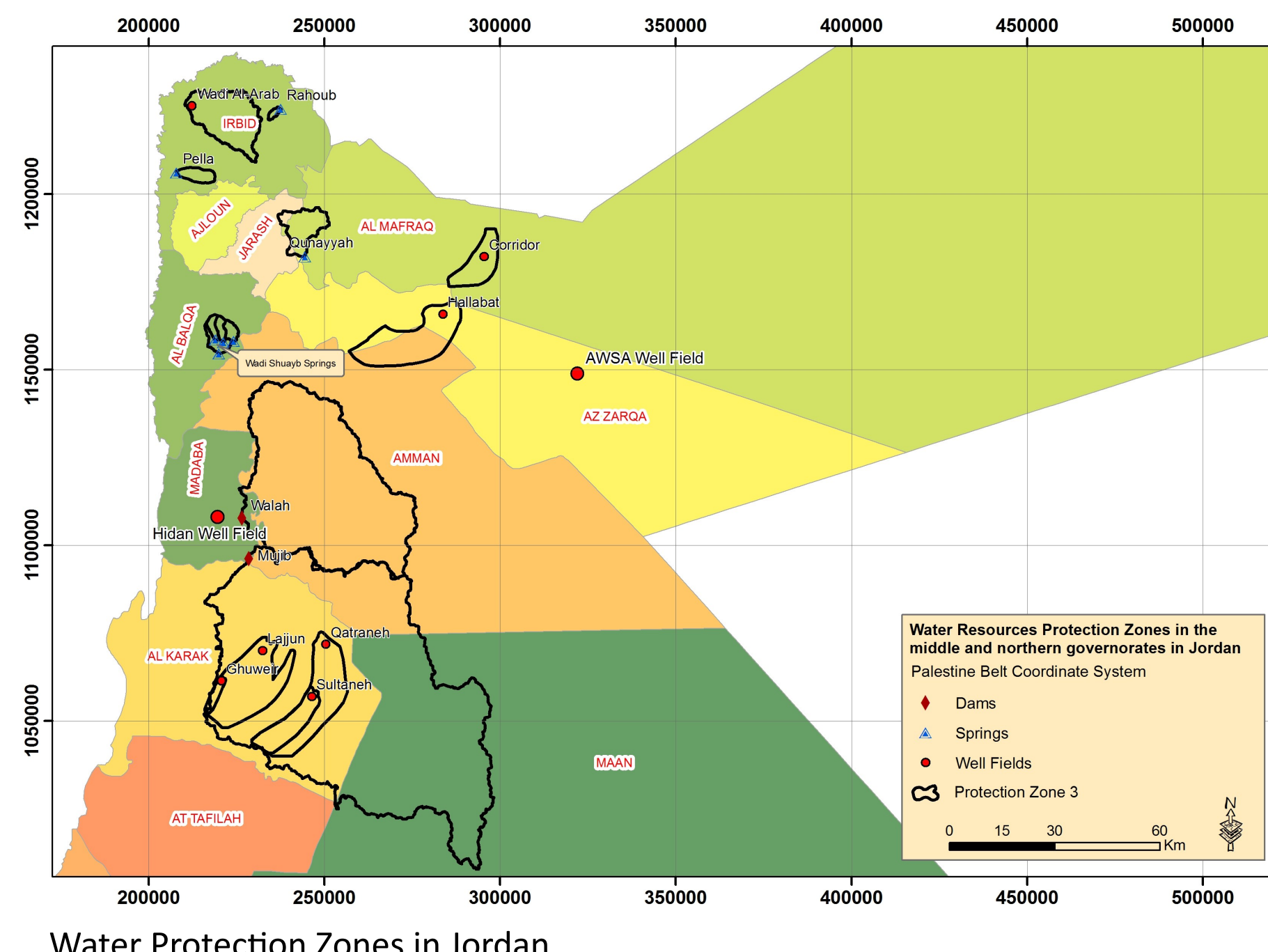
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Water resources are extremely scarce in Jordan. Rapid increase in groundwater development due to high population growth and high agricultural activities has led to groundwater level declines over the past 2 decades (World Bank 2009). In 2009/2010, annual consumption in the country exceeded the safe yield by 182 MCM (MWI 2010). Concerning this situation, regularly occurring contaminations of water resources pose a serious risk to the sustainable supply of drinking water to Jordan.

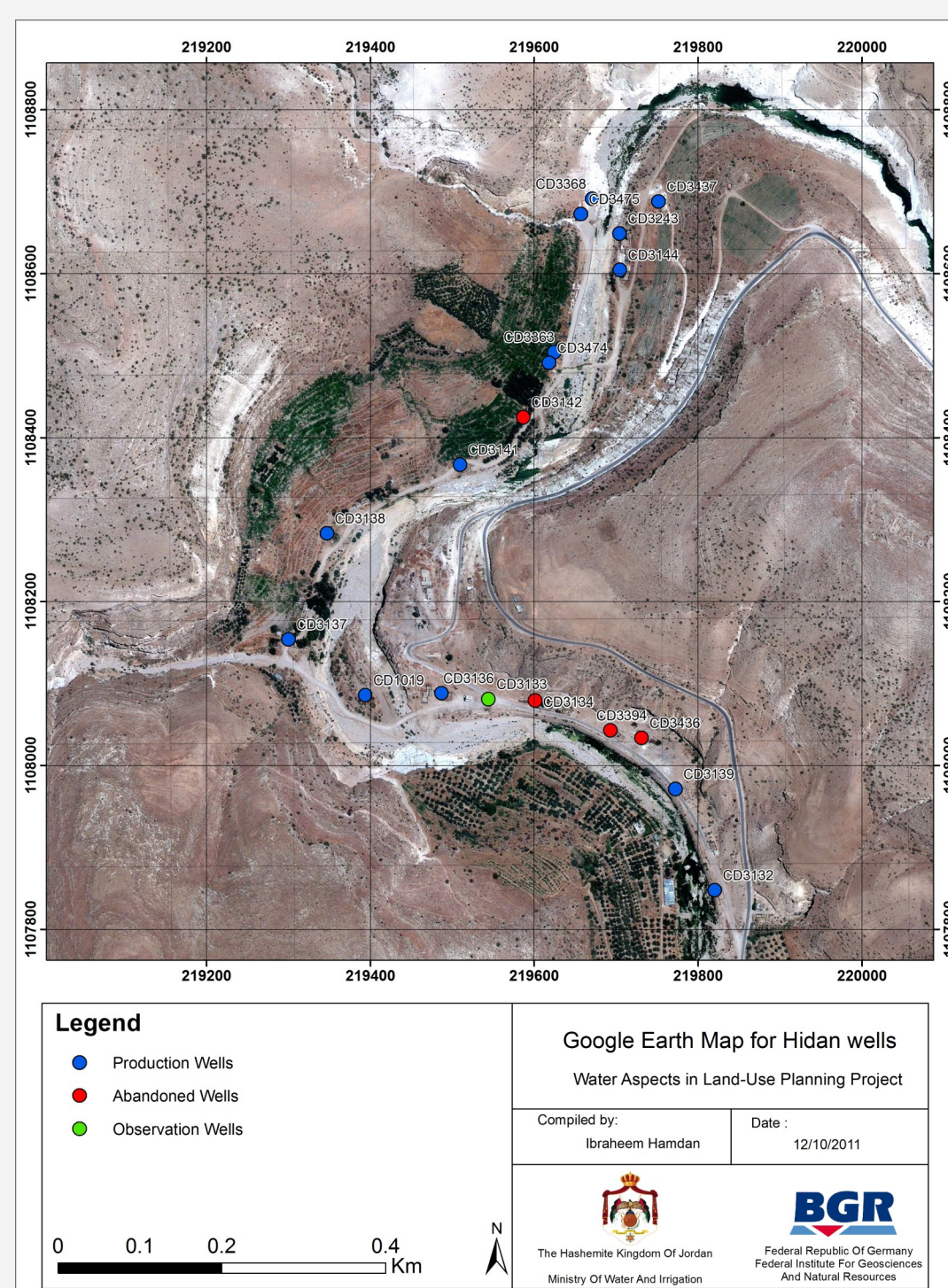
In order to protect available water resources from pollution, the Jordanian Ministry of Water and Irrigation (MWI) and the German Federal Institute for Geoscience (BGR) work together on the establishment of water resource protection zones in selected areas. A national Guideline for Drinking Water Resource Protection was introduced in 2006 and updated in 2011 to strengthen the legal basis for the delineation of water protection zones.

Until now protection zones for 7 well fields, 7 springs and 2 dams have been delineated. Within the current cooperation project 'Water Aspects in Land-Use Planning' (Project Phase: 2009-2014), 2 well fields (Heedan and AWSA well fields) are being observed in respect to groundwater protection.

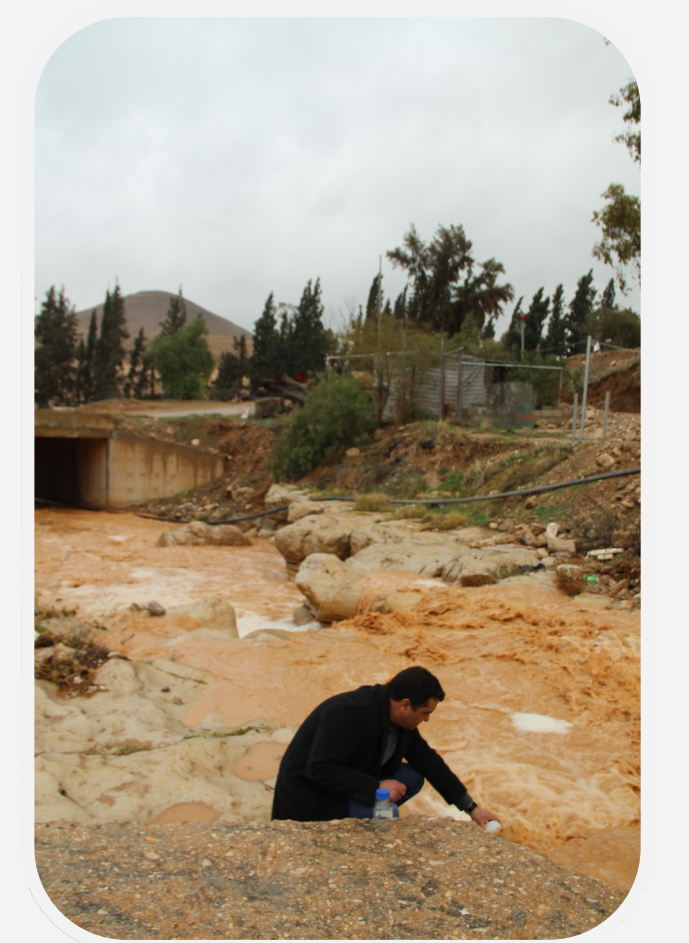


### Heedan Well Field

Heedan Well field is located 45 km southwest of Amman. It produces 12 MCM/a from the A7/B2 limestone aquifer, supplying drinking water to Amman, Madaba and the surrounding region (Margane et al. 2008).



Regular problems of high turbidity and microbiological contamination occur in the well field. Water Quality problems are mainly occurring during the rainy season (November – April (Ta'any & Al Atrash 2010)) and are related to flood events in the Wadi. Measurements of Surface Runoff Water after rain events showed high bacteriological contaminations. Hence a direct connection between surface water and groundwater by seepages along the wadi is obvious. Pollution sources in the catchment area of the Well Field are agricultural areas applying animal manure on their fields, grazing sheep and goats as well as chicken farms. Furthermore, poorly sealed wellheads and abandoned wells in the well field pose a risk for enhanced infiltration of contaminated surface water into the Aquifer.

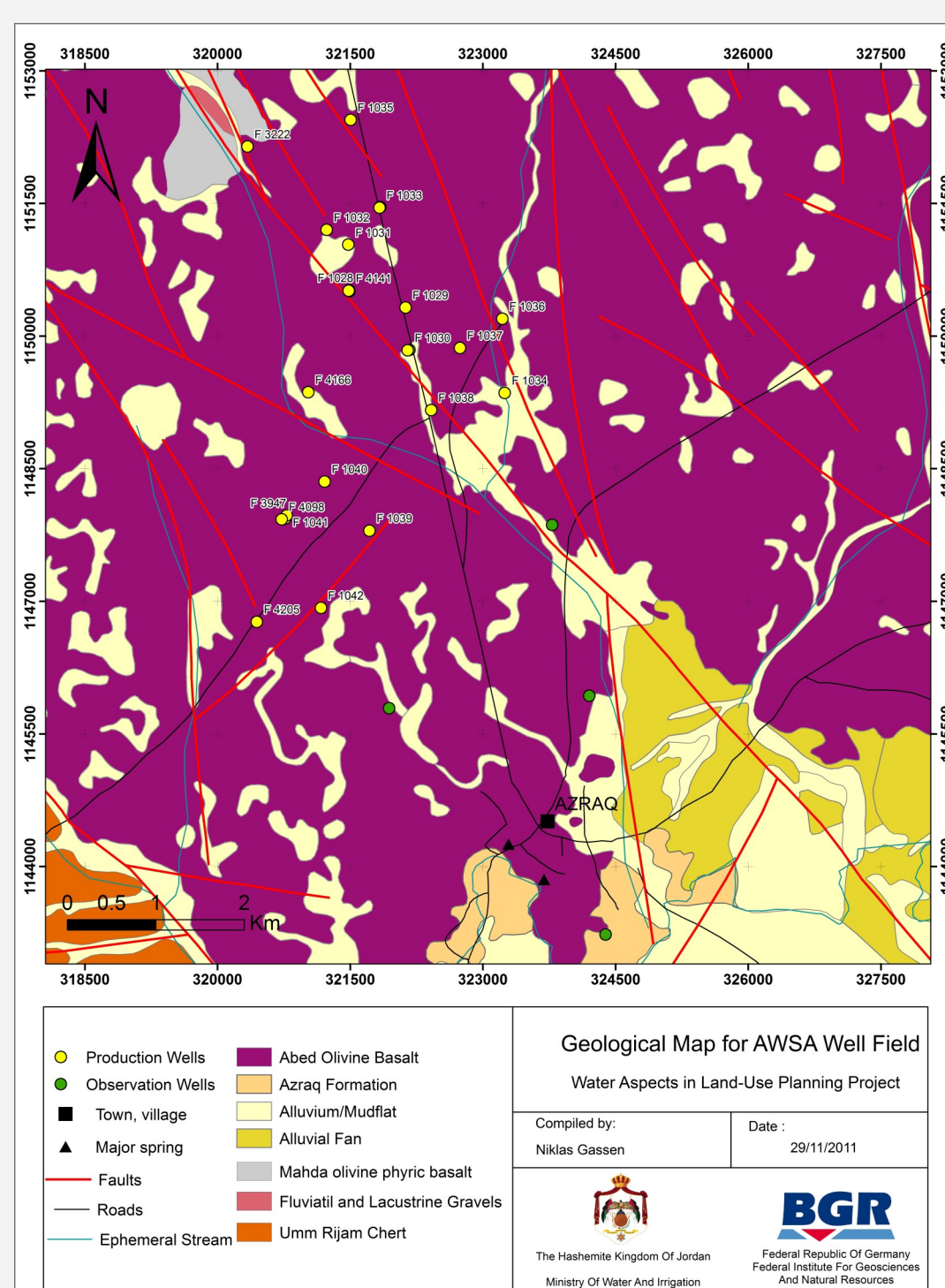


In order to prevent the contamination events leading to a disruption of the water supply, a detailed concept for the delineation of protection zones within the well field is developed in the course of this study. With the help of Tracer Tests infiltration passages can be identified, helping to minimize the restrictions on the local community to the necessary areas

### AWSA Well Field

AWSA Well field is located in the Azraq Area (Zarqa Governorate), 85 km southeast of Amman. It produces 23 -25 MCM/a from the B4/B5 Aquifer.

The B4/B5 Aquifer is hydraulically connected with the overlying Basalt aquifer, which is highly fractured and therefore vulnerable to pollution, making the delineation of protection zones in this area necessary (Ta'any 1996). Furthermore, declining water tables and increasing salinity due to extensive water use by agriculture form a major threat to Groundwater Resources in the Azraq Basin.



References: Margane, A., Borgstedt, A., Hamdan, I., Subah, A., Hajali, Z. (2008): Delineation of Surface Water Protection Zones for the Wala Dam. - Technical Cooperation Project 'Environmental Geology for Regional Planning', Technical Report No. 12, prepared by BGR & MWI, 126 p.; Amman. Ministry of Water and Irrigation (2010): Water Budget 2010 - unpublished arabic internal report.  
 TA'ANY, R.A. & AL ATRASH, M.(2010): Effects of Wala Dam on the Groundwater of Wala Catchment Area. - Unpublished Report prepared at Al Balqa Applied University and Ministry of Water and Irrigation  
 TA'ANY, R.A.(1996): Hydrological and Hydrogeological Study of the Azraq Basin. - A Thesis submitted to the College Of Science University Of Baghdad, in partial fulfillment of the requirements for the degree of Doctor Of Philosophy in Geology (Hydrology).