

TECHNICAL REPORT NO. 12
Delineation of Surface Water Protection Zones
for the Wala Dam

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Summary

The Wala dam was constructed during the years 1999 to 2003, at the same time as the Mujib dam. Impoundment started in winter 2002/03. The function of the Wala dam is to facilitate groundwater recharge to the underlying aquifers, which are being used for drinking water supply to Amman some 9 km downstream of the dam in the Wala/Heidan wellfield. The maximum storage capacity of the Wala dam is 9.3 MCM. Mean annual inflow was estimated at 17.7 MCM and is believed to constitute the annual safe yield. It is currently proposed to raise the dam by 15 m, which would result in a storage capacity of 26.3 MCM. Average annual abstraction from the Heidan wellfield is around 14 MCM. From the surrounding private wells, which are mainly used for irrigation, approximately another 2.3 MCM are abstracted. Due to sediment inflow (siltation) the bottom of the reservoir was raised considerably since dam completion and it is estimated that around 1.5 – 2 MCM of storage capacity have been lost. The bottom gate and lower draw-off pipe are covered by sediment so that water cannot be released anymore from the dam in an emergency. The water analyses conducted by WAJ and RSS show frequent bacteriological contamination of the reservoir. The main reasons are watering of animals at the reservoir and seepage of wastewater from cesspits in nearby villages to the reservoir. The proposed surface water protection zones aim to improve the water quality of the Wala Dam. The Wala dam is an artificial recharge dam for the Wala wellfield, located downstream of the dam. Water from this wellfield is used to for drinking water supply to Amman, Madaba and villages near the dam. Because the groundwater flow path from the dam to the wellfield is short water at the dam needs to be protected against pollution. The proposed surface water protection zones also may serve as a tool for an improved landuse planning in the catchment area as well as an example for selection of

dam sites based on existing landuses and landuse planning in general in such an environment. A number of landuse restrictions are proposed to reduce contamination risks, especially pertaining to wastewater collection and treatment, agricultural management, livestock farming and mining. Protection zone 1 covers an area of 2.3 km², of which 0.8 km² is covered by the reservoir itself, extending from the highest possible level of the reservoir to 100 m in the upstream direction. The existing fence, erected by JVA at the boundary of the land acquired during construction of the dam, in many cases meets this criterion. However, this fence does not exist in all parts of protection zone 1. JVA needs to enforce the ban on public access in all parts of the new protection zone 1. It must be enforced that animals do not have access to zone 1. Watering ponds for animals may be established in zone 2. Protection zone 2 covers an area of 64.3 km². The area of zone 2 is very hilly so that in much of the area discharging to the dam the slope angle exceeds 2°. Because under such circumstances surface water flow rather fast accumulates and will reach the reservoir after short travel time, zone 2 was German-Jordanian Technical Cooperation - Groundwater Resources Management Delineation of Surface Water Protection Zones for the Wala Dam extended to the maximum limit of 5 km. The main landuse restrictions proposed in this area comprise: - the establishment of a wastewater collection and treatment system for the villages near the dam, especially and with highest priority for Mleh. For smaller villages other appropriate solutions should be evaluated to

safeguard the water quality; - farming and settling should not be allowed in the valley area and on the hills in close proximity to the dam; it is recommended to relocate certain farms and chicken farms in this area. Protection zone 2 was delineated according to the proposed amendment of the 'Drinking Water Resources Protection Guideline' (MARGANE & SUBAH, 2007) because there would remain a high risk of pollution for the reservoirs' water if the existing 'Drinking Water Resources Protection Guideline' would be applied instead. Following the existing guideline the protection zone 2 would only be 26.7 km² large and some residential areas near the dam would not be included. Protection zone 3 covers the entire surface water catchment area and measures about 1,788 km² in size. The existing landuses, especially the numerous and scattered industrial sites south of Jiza, some 15-18 km to the NE of the dam, are considered to constitute an elevated risk to the surface water resources of the Wala reservoir. Most of them have no wastewater treatment plants and much of the waste seems not to be dumped according to standard procedures. Also the wastewater treatment plants currently under construction (Jiza-Talbiyah) and in planning (S-Amman) might put the surface water resources of the Wala dam in grave danger, if treatment is not effective and the reuse option is not implemented. In order to protect the Wala/Heidan wellfield it is recommended to prepare groundwater protection zones for these wells through a separate study. Since for many of the Wala/Heidan wells zone 1 is insufficiently protected, it is recommended to begin with the establishment of protection zone 1 immediately.

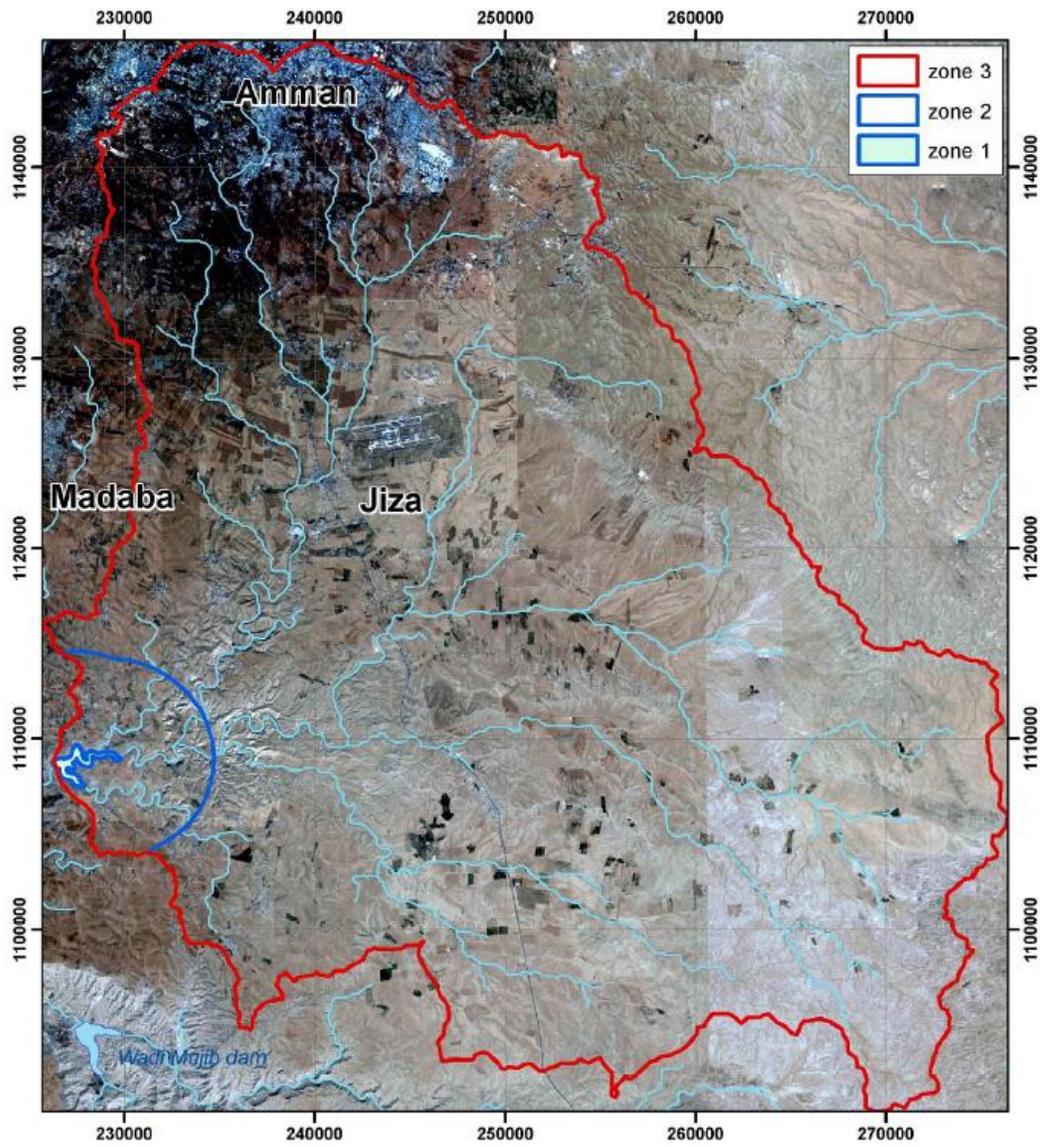


Figure 83: Surface Water Protection Zone 3