Groundwater Supply Pollution Risk Assessment and Management - Managua, Nicaragua

- Groundwater is vital for domestic, industrial and agricultural water-supply in the region around Managua (population in excess of 1.5 million). Deep municipal and private boreholes draw from the major volcanic aquifer system located south of Lake Managua.

- The volcanic formations include lava flows from the Masaya volcano, interbedded with pyroclastic deposits. Little soil development on the most recent flows and no surface run-off result in high rates of rainfall infiltration/groundwater recharge. Despite the relatively deep water-table (ranging from 25 m bgl to more than 100 m bgl close to the volcano), the area is highly-vulnerable, except where alluvial-volcanic deposits of lower permeability occur at the surface.

- The main existing wellfield, providing 195 Ml/d, is located in the urban fringe east of Managua City, but a new wellfield at a more rural location some 10 km south of the city is under investigation and development.

- The entire area, including the groundwater capture zone of the proposed new wellfield of 70 Ml/d, has been the subject of systematic groundwater resource risk evaluation, including aquifer vulnerability mapping and subsurface contaminant load survey. In this work there was a clear policy to involve all stakeholders; not only the major users but also the potential polluters of groundwater.

- The capture zone of the existing wellfield encompasses various industries including tanneries, metal workshops and textile manufacturers, fuel and chemical storage at the international airport and a number of developing periurban towns with in-situ sanitation. There are also several small air strips in the area, which were historically used for pesticide storage and loading for aerial spraying of agricultural land. In the past 30 years there was intensive cotton cultivation using various persistent pesticides, including Toxaphene and DDT.

- The modelled capture zone of the new wellfield is classified as moderate vulnerability, with areas of high vulnerability where soil cover is absent through erosion. A number of potential point sources of contamination from industry, fuel filling stations and waste disposal sites includes only one industrial site with underground storage tanks classified as high potential contaminant load.

- The general aquifer catchment is more predominantly agricultural. There, the frequent use of mobile pesticides (such as the carbamate insecticides) are likely to pose the major pollution threat. Control over agricultural activity will be needed in the interests of municipal water-supply if significant additional treatment costs are to be avoided.

Groundwater pollution assessment mapping for Managua groundwater system (eastern area)