



## **The risk of supply of Surface/groundwater in the Laja River Basin in the State of Guanajuato, Mexico**

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Water supply in Laja River Basin, located in an arid, semi-arid area of Central Mexico, is dependent primarily on groundwater. Although multiple users depend on this groundwater, the majority of the groundwater is used for commercial irrigation. The water table is swiftly being lowered, as the result of a rapidly growing population, expanding industries and increased commercial agriculture production in the State of Guanajuato. The average historic drawdown rate, measured in various wells across the aquifer, is  $\sim 1$  m/yr; some wells approach 4 m/yr. Hydraulic heads are lower in wells in the central, low-lying areas of the basin, near the main branch of Laja River, than in wells located along the outer edges of the basin. The resulting water depth ranges from 70-130 m in most of the area. As wells are drilled deeper, at increased costs, to access the falling groundwater table, toxic levels of fluoride (F) and arsenic (As) are being reported for these wells. These increases in toxicity are possibly caused by induced upwelling of deeper groundwater. Based on analysis of the water, we suggest that the groundwater is fresh and suggest that the reservoir rock is not very reactive or the groundwater is young. Unfortunately, F and As were found to exceed Maximum Contaminant Levels (MCL) in several wells. Concentrations of F and As were correlated to Total Dissolved Solids (TDS) suggesting a mixing with older, deeper groundwater.

Mapping of the watershed and channel geomorphology indicates that the Laja River tends to be gravel bedded in some locations and sand-bedded in other locations with highly erodible banks. At multiple sample locations, as many as four terraces were present, suggesting an actively down-cutting channel. Geophysical measurements suggest the river is well connected to the alluvial aquifer. Thus, prior to intensive pumping in the 1950's the Laja River may have been recharged by aquifers. Whereas the discharge in the Laja River is decreasing yearly, a resulting sharp decrease in supply to the downstream reservoir, Ignacio Allende, is occurring.

Both quantity and quality of water in the Laja River Basin is at a high risk not only in the short-term, but also the future.