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Where is all the groundwater flow coming from into the Barton Springs Pool? A geophysical case study

The Main Barton Springs is a major discharge site for the Edwards Aquifer and is located in Zilker Park in Austin, Texas. The spring discharges into the Barton Springs pool near the diving board at an obvious fault line (Barton Springs fault). The thin bedded unit on the southwest side of the fault is the Regional Dense Member and the lower Georgetown Formation of the Edwards Group is exposed on the northeast side of the fault. The offset of the fault is in between 40 and 70 feet. It was geologically assumed that the groundwater recharged from the Barton Spring Segment, which is located several miles to the south-west of the Barton Springs pool area, follows the Barton Springs Fault strike and empties into the pool.

To test this hypothesis geophysical surveys [2D and 3D resistivity imaging, natural potential (NP), seismic refraction tomography, induced polarization, and ground penetrating radar] were performed across the Barton Springs fault and in the southern part of the Zilker Park. Only NP surveys were allowed within the boundaries of the pool because of endangered species of Barton Springs Salamander. The purpose of the surveys was multi-folded: 1) to locate the precise location of the Main Springs on the south banks of the Barton Springs pool; 2) to determine the potential location of caves and active flow paths beneath the spring; 3) to characterize the geophysical signature of the fault crossing the Barton Springs pool.

Geophysical results indicate a significant fault in the south part of the pool that was not known prior to this work. This new fault displaces the Georgetown Formation against the Edwards Aquifer units with an offset of 45 feet. It appears that the groundwater flow follows the fault line where it strikes the Main Barton Springs where the groundwater empty to the pool. NP results on the southern and northern banks of the Pool indicate significant anomalies. However, NP results do not indicate any fault-like or spring anomaly (positive) over the Barton Springs Fault. In addition, NP results over the Barton Springs Fault, outside and to the west of pool, do not indicate any significant anomaly. Furthermore, two resistivity profiles along the same NP profiles indicate a fault throw of about 20 feet, not 40 to 70 feet.

Geophysical results altogether, thus, suggest that significant amount of groundwater flow follows the path to the south of the fault along a fracture/fault zone that appears to coincide with the Springs location emptying into the pool within the Georgetown Formation.

Location of Geophysical Profiles at the vicinity of Barton Springs Pool, Austin, Texas

