Title: Surface water-quality, flow data, and soil infiltration study of Flint Ridge Cave and Barker Ranch#1, Tabor WQPL Tract, South Travis County Texas

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Components

Study Component	lead investigator	Existing Reports	Projected Reports
Surface flow and water quality to Flint Ridge	Roger Glick, COA WQM	Hydron Database	continuous
Soil infiltration/cave drip study	Brian Cowan, UT JSG	Cowan et al, 2007	May 2010
Geophysical surveys	Jack Holt, UTIG		
Recharge and Groundwater Flow	Nico Hauwert, COA WPD	Hauwert, 2009	GW flow-March 2010

Update:

Flint Ridge Cave is included on a federal permit held by the City of Austin and Travis County for the preservation karst species of concern. State Highway 45 is proposed to cross the Tabor Tract within 150 feet of Flint Ridge Cave entrance, will overlie the largest cave drip, and bisect the surface catchment to Flint Ridge. Existing reports and presentations by TxDOT have reflected that Flint Ridge Cave has a small catchment of only 0.75 acres, that recharge entering the cave likely would not recharge the aquifer, that soils on the site are relatively impermeable for transmitting rainfall to the subsurface, and that the largest drip in Flint Ridge Cave is fed by Bear Creek rather than rainfall infiltrated through overlying soils. While these results are unlikely, (given casual inspection of shallow drips and formations in the caves on the sites all indicate soil infiltration and the well-defined channels and flood debris to Flint Ridge Cave point to a large catchment) detailed information about recharge and infiltration are necessary to protect this cave. Furthermore, the findings from these investigations can be applied across the BCP permit area and to karst worldwide.

Flow to Flint Ridge Cave has been continuously measured since July 2004. Water-quality of the surface runoff, through grab samples and automatic samplers have been infrequently collected since 1997. Data collected prior to 2008 was used by Hauwert (2009; **http://drop.io/NHdissertation**) to measured average discrete runoff to Flint Ridge Cave (as 3% discrete recharge from rainfall) and water quality data was used to measure diffuse recharge through chloride balance. In 2007 three sets of soil traces were conducted over three rain events near Barker Ranch #1 Cave by UT graduate student Brian Cowan and COA hydrogeologist Nico Hauwert. By comparing surface runoff quality at Flint Ridge Sinkhole with the breakthrough of naturally occurring constituents at Barker Ranch #1 Cave Drip, we seek to measure the attenuation of natural levels of various constituents. However, an additional soil trace was required to complete the analysis, and in 2008 rain became very infrequent and the cave drips eventually dried. We hope to regain funding and complete the final series of soil traces in early 2010. In

summer 2008, the flow station at Flint Ridge sinkhole was improved by replacing the rotting weir walls and placing a flume in place of a weir at drainage 3. The flow data is now received real-time by the COA WPD Water-Quality Management hydrologists led by Roger Glick and runoff quality is periodically sampled using permanent automatic samplers. Aquifer-wide tracing was conducted on the Tabor tract in 2007 in order to test the hypotheses (1) presented in the 1989 TxDOT EIS report that rainfall on the site would not recharge the aquifer but would discharge from seeps and springs along Bear Creek and (2) that the Drip Pit in Flint Ridge Cave is lower than Bear Creek and therefore must be fed by Bear Creek. All four traces (2 on the Tabor tract) arrived at Barton Springs between 2 to 3 days and tracers poured in Bear Creek was not detected in the Flint Ridge Drip Pit. Geophysical surveys were completed as part of a fieldclass in Fall 2008 to examine the effectiveness of various geophysical tools to locate known caves and survey portions of the site for possible caves. A report of the geophysical surveys has not been prepared.

Over the last year (Oct 2008-Oct 2009), due to lack of rainfall no new activity in soil tracing, groundwater tracing, or runoff measurement occurred. The upper level cave drips in Flint Ridge dried within this period. The Tabor site was used for education of regulatory staff from various agencies on September 16 and October 28, 2009. Many of the agencies involved (including City of Austin, Texas Commission on Environmental Quality, Travis County, US Fish and Wildlife, Lower Colorado River Authority, Barton Springs/Edwards Aquifer Conservation District) play important roles in protecting Flint Ridge Cave. During the two trips, 43 attendants toured the Tabor tract and 23 of these toured the inside of Flint Ridge Cave. The field trips focused on recharge but included a component on cave invertebrate ecosystems, taught by cave biologists Dr. Jean Krejca and Mark Sanders.

Cowan, B.C., Banner, J.L, Hauwert, N.M., and Musgrove, M.L., 2007, Geochemical and physical tracing of rapid response in the vadose zone of the Edwards karst aquifer: Geological Society of America Annual Meeting Paper no. 69-3.

Hauwert, Nico M., 2009, Groundwater Flow and Recharge within the Barton Springs Segment of the Edwards Aquifer, Southern Travis County and Northern Hays Counties, Texas: Ph.D. Diss., University of Texas at Austin, Texas. 328 p.

Hauwert, Nico M., Hiers, Scott, and Beatty, Heather, 2009, Field Trip guidebook: Understanding upland recharge for geologic assessments: printed by City of Austin Watershed Protection Department. 84 p.