

**UNITED STATES DISTRICT COURT  
FOR THE WESTERN DISTRICT OF TEXAS  
SAN ANTONIO DIVISION**

**AQUIFER GUARDIANS IN URBAN )  
AREAS, and PEOPLE FOR )  
EFFICIENT TRANSPORTATION, INC. )**

**Plaintiffs,**

**v.**

**No. Civ. SA-05-CA-1170-XR**

**US FEDERAL HIGHWAY )  
ADMINISTRATION, and MICHAEL W. )  
BEHRENS, Executive Director, Texas )  
Department of Transportation, )**

**Defendants.**

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**DECLARATION OF DR. GEORGE VENI**

I, George Veni, hereby declare:

1. On behalf of the Save Our Springs Alliance, this affidavit is my evaluation and professional opinion on the potential impacts to groundwater and rare and endangered karst species by the Texas Department of Transportation and the Federal Highway Administration (collectively "TxDOT") proposal to widen U.S. Highway 281 over the Edwards Aquifer recharge zone in north Bexar County, Texas.
2. My qualifications in conducting this evaluation are that I am a hydrogeologist specializing in caves and karst terrains. I received my Master's degree from Western Kentucky University in 1985. My Master's thesis was on the effects of urbanization on the quality and quantity of water recharging the Edwards Aquifer in Bexar County (Veni, 1985), which includes the highway project area. In 1994, I received my Ph.D. from the Pennsylvania State University. My doctoral dissertation was on the hydrogeology of the nearby and

hydrogeologically related karstic Lower Glen Rose Aquifer in Bexar, Blanco, Comal and Kendall counties, Texas (Veni, 1997a). Since 1987, I have owned and served as principal investigator of George Veni and Associates, providing karst hydrogeological, biological, and environmental research and consultation services. My firm's expertise with karst hydrogeology has frequently made it the preferred choice of the U.S. Fish and Wildlife Service, the Texas Parks and Wildlife Department, U.S. Department of Defense, and many private firms for regional and site-specific geological and biological assessments of karst areas. Several of my projects have been to hydrogeologically and biologically evaluate TxDOT highway construction projects as a subcontractor for intermediary firms. In addition, I am the President of the Texas Speleological Survey, a non-profit corporation that serves as the database for Texas cave and karst information, Adjunct Secretary to the Governing Bureau of the International Union of Speleology, and until July 2005, Executive Secretary of the National Speleological Society's Section of Cave Geology and Geography for 11 years. Thus, I have detailed knowledge of caves and karst systems locally and around the world. As a result of my contributions to cave biological research, three cave-dwelling species have been named in my honor. I hold U.S. Fish and Wildlife Service Permit TE026436-0 (currently under renewal) to collect and study federally listed endangered Texas karst invertebrate species. My complete, current vita is attached by e-mail to this affidavit.

3. The highway project area is located in northern Bexar County, Texas. It extends from about 640 m north of Loop 1604 along U.S Highway 281 northward for about 5,470 m to the intersection with Marshall Road and encompasses the highway and areas along either side proposed for expansion and/or modification by the conversion of the existing highway into a

toll road. All of this area is located over the Edwards Aquifer recharge zone and Karst Zones 1 and 2, which are areas known respectively to contain federal listed endangered invertebrate karst species or have a high probability of containing such species.

4. The Edwards Aquifer is a complex hydrologic system within the Edwards Limestone in the Balcones Fault Zone. It is divided into four segments: San Antonio, Barton Springs, Northern Balcones, and Washita Prairie (Yelderman, 1987). A drainage divide, an incised valley, and a gap of Edwards Limestone outcrop within the fault zone respectively separate the segments. The San Antonio Segment of the Edwards is divided into four zones: drainage or contributing zone, recharge zone, artesian or confined zone, and saline zone. The drainage zone is the upgradient non-Edwards Limestone area from which streams flow onto or cross the recharge zone, the exposure of Edwards Limestone within the fault zone where water enters the aquifer; the highway project area is entirely within the recharge zone in the aquifer's San Antonio Segment. The artesian zone is that area where the Edwards Limestone is down-faulted into the subsurface, and its groundwater is confined between upper and lower less permeable formations. The aquifer's largest springs occur where groundwater rises along fractures to discharge in stream valleys that intersect the potentiometric surface. The "bad water line" is the downgradient boundary of the artesian zone with the saline zone, where total dissolved solids in the groundwater exceed 1,000 mg/l. Groundwater flow in Bexar County is complicated but generally down-dip southward, then east or northeastward along strike. Studies of the aquifer are too many to mention in this affidavit. For a detailed listing of Edwards Aquifer investigations, see the bibliography by Esquilin (2004).

5. The Edwards is a karst aquifer, internationally recognized as the aquifer type most vulnerable to pollution. Texas' Groundwater Protection Unit (1989) supported this view by recognizing the Barton Springs and San Antonio segments of the Edwards as the aquifers most susceptible to contamination in the state. Karst aquifers have complex flowpaths that allow rapid, unfiltered movement of contaminants from source areas to water supplies through caves, solutionally enlarged fractures, and related conduits. This behavior is best studied and demonstrated by a method known as "tracer testing," which usually involves injecting a non-toxic fluorescent dye into a recharge feature or well and monitoring the time and concentration in which it appears at springs or other wells. The dye delineates groundwater flowpaths and also functions as a surrogate for the distribution and impact of possible contaminants that might enter the aquifer. Hauwert's et al. (1998) dye tracing studies in the Barton Springs Segment of the Edwards Aquifer demonstrated velocities up to 800 m/day during normal flow conditions and more than 6,400 m/day during high flow. I have conducted groundwater traces in Bexar County which demonstrated groundwater velocities of up to 4,054 m/day (Schindel et al., 2005). I have also conducted tracer studies that show rainfall on a typical fractured limestone surface in this region vertically penetrates the Edwards Limestone at rates as fast as 18 m/hour (Shade and Veni, 2005). I performed these studies in parts of the Edwards Aquifer recharge zone that are only 4-9 km west of and hydrogeologically identical to the highway project area.
6. The U.S. Environmental Protection Agency (EPA) promotes tracer studies as the most effective means of delineating groundwater flowpaths in karst areas (Schindel et al., 1996). The American Society for Testing and Materials (ASTM), a not-for-profit

organization founded in 1898, which provides global consensus standards for, among other things, quality systems for studies, has provided standards for environmental impact analyses of karst aquifers. Over 100 nations, including the United States, are members of ASTM International. As with the EPA, dye tracing studies are an important component of the ASTM standards for studying the movement and effects of pollutants in karst areas and delineating protection areas.

7. In contrast to these nationally and internationally accepted standards, the State of Texas uses a geological assessment procedure based solely on looking at a possible recharge feature and using geological experience and untested criteria to determine the feature's potential hydrological significance and vulnerability to contaminants. A professionally published and peer-reviewed study I conducted (Veni, 1999a) found that the geologic assessment method required at that time by the State was only 33.7% accurate, and underestimated the significance of 57.1% of karst features; that method has been revised, but not reevaluated to determine its efficacy. No survey for and/or geological assessment of recharge features was conducted during the 1984 or 2000 environmental assessment of the highway project area (Texas State Department of Highways and Public Transportation, 1984; Turner, Collie, and Braden, 2000), and apparently none was conducted during the 2004 environmental assessment (unknown author, 2004).
8. The vulnerability of the Edwards Aquifer to contamination is illustrated by pollutants appearing in water wells with apparently increasing frequency in the San Antonio area where urban development over the recharge zone is greatest. The U.S. Geological Survey associated most contaminants in the aquifer with urban activities in San Antonio (Ging et

al., 1997). Since then, additional reports of contaminants in aquifer water continue to be recorded and monitored by the Edwards Aquifer Authority and other agencies.

9. In addition to occurring over the Edwards Aquifer recharge zone, the highway project area also extends through an area known to contain karst invertebrate species federally listed as endangered. In December 2002, the U.S. Fish and Wildlife Service listed nine invertebrate species, known only from northern Bexar County, as endangered due primarily to adverse impacts associated with the area's urbanization (USFWS, 2000). The northern 4,120 m (75.3%) of the project area extends through Karst Zone 1 where the listed species are known to occur; the southern 1,350 m (24.7%) of the project area extends over Karst Zone 2 where there is a high probability of the species being present. I originally delineated these zones for the U.S. Fish and Wildlife Service in 1994 (Veni and Associates, 1994) and updated them in 2002 (Veni, 2002). In that latter study I reported:

The intent of the distinction between Zone 1 and Zone 2 areas [in the 1994 mapping] was that Zone 2 was where no reason was known to preclude the presence of the listed species, but that the listed species were not known. In most cases, Zone 2 areas were locations where caves were not known and/or biological surveys in the caves had not been conducted. It has since been found that in areas where adequate biological surveys for the species have been conducted in Zone 2, listed species have been found to redesignate them as Zone 1.

10. While caves are known in Karst Zone 2 near the project area, no known biological surveys have been conducted to determine if the listed species are present. At least 13 caves in Karst Zone 2 within 2 km of Highway 281 have been destroyed or filled by road and urban construction and none were biologically evaluated (Texas Speleological Survey, unpublished data). The species most likely to occur in the project area are the ground beetles *Rhadine exilis* and *Rhadine infernalis*. These species are known to occur only in caves and related interstitial voids. Seven caves known to contain these species occur within 2.9 km of

the project area, with the closest cave located within 380 m (Veni, 2002). Listed species with a low likelihood of being present are the Madla's cave spider *Cicurina madla*, found 11.9 km to the west (USFWS, 2000), and *Eurycea tridentifera* (Comal Blind Salamander), currently on the Texas list of threatened species (Campbell, 1995). Its nearest known localities are 10.2 km to the southwest and 18.4 km to the northwest (Veni, 1988; Chippindale et al., 2000), with an unconfirmed possible sight record only 2.9 km west of the highway project area (James Loftin, personal communication 2000). The remaining listed karst species are not known to occur near the study area.

11. To the best of my knowledge, three environmental assessments (EAs) were conducted for the highway project. The first was conducted in 1984 by the Texas State Department of Highways and Public Transportation. The second and third were reevaluations conducted in 2000 and 2004 respectively by Turner, Collie and Braden and by an author not listed in the complete body of the EA made available to me.
12. The 1984 and 2000 EAs are general summaries of the project but offer little or no data or analyses to support their claims that the project will produce no significant environmental impacts. At best, these EAs might serve as summaries of findings, but since they do not appear based on any in-depth research of the highway project area, they fail as reliable sources of information. Neither EA cites any research to support its conclusions. The most egregious fact in each EA is that they both conclude the highway project will produce no significant environmental impacts yet both state they have not conducted all of their research. If the research is not complete, conclusions cannot be justifiably drawn. In the 2000 EA is the further error in the conclusion that "there have not been any significant changes in the assessed area" since the 1984 EA, yet the 2000 EA recognizes the extension

of the project through Karst Zone 2 where there is a high potential for endangered species to be found (the species were candidates for listing at that time and had not been considered for listing in 1984).

13. The 2004 EA is superior to the earlier EAs, yet is still inadequate. It analyzes and cites some census data for the region but does not cite or present any information relative to the aquifer and endangered species protection that can be reviewed and used to justify its conclusions. There is no discussion of a geological assessment for recharge features, yet the EA finds no significant impacts even though a water pollution abatement plan, which in large part is based on a geological assessment, has not been completed. I found no discussion on the installation of sedimentation, filtration, or other structures to reduce the adverse quality of runoff from the highway. Nor did I find any plans to install hazardous materials traps to keep spills of hazardous material on that high-traffic roadway from entering Mud Creek, tributaries creeks, and the Edwards Aquifer. Further, there is no indication that the authors of the report recognize the limitations of these water pollution prevention methods, especially in karst areas. Highway water quality studies at The University of Texas at Austin have found that different structural controls have different rates of pollutant removal; some methods that reduce certain contaminants may increase others (Barrett et al., 1995; Tenney et al., 1995). All structural controls require regular maintenance to be effective, but a large percentage in Bexar County are out of compliance and apparently ineffective, despite State and local oversight (according to newspaper reports circa 2002-2003, as best as I recall). This is critical in karst because data from several studies clearly demonstrate that because of karst aquifers' high vulnerability to pollution, the presence of contaminants over a karst recharge zone is the most critical factor in assessing the risk of groundwater contamination,

not the presence or absence of observed individual recharge features as current required by the State of Texas (e.g. Ogden et al., 1991).

14. The 2004 EA reports that surveys were conducted for karst features that may provide habitat for endangered invertebrate species, but those reports are not presented or even cited for reference and review. It is not possible to assess the quality of those surveys with the information presented. This is important because some of the information presented suggests they were conducted by personnel with limited expertise in karst. For example: a) The nearest known locality for the listed species is given as 2.4 km (1.5 miles) to the east, when in fact, five caves with endangered species are known within that distance from the highway project area, with the closest locality only 380 m to the west. b) No request was made of the Texas Speleological Survey for information on caves and karst features in that area to be certain that no important information was overlooked and that all relevant endangered karst species localities were considered. This step is recommended by the U.S. Fish and Wildlife Service (2004), which has written its guidance in large part based on my reports and research (I authored or co-authored all seven reports cited in that guidance). c) The conclusion that “the origin of all of the voids appears to be related to Cretaceous paleokarst that predates the origin of the endangered species” is highly unlikely. Even if true, the age of the voids has no bearing on the presence or absence of the species.
15. The most important deficiency in the 2004 EA is the stark contrast to the Highway 183A TxDOT toll road project near Austin, Texas. That highway project is functionally identical in that it extends across the recharge zone of the Edwards Aquifer and through Karst Zone 1 and Karst Zone 2 for related endangered invertebrate species. In that case, extensive research and consultation led to the biological opinion by the U.S. Fish and Wildlife Service

which required issuance of an incidental take permit under the condition that the following actions occur during the construction of the highway:

1. During any land clearing or excavation (trenching, scraping, bulldozing, etc...) in Karst Zones 1 and 2 a qualified karst geologist will remain on-site to ensure detection of any caves, karst features, or subterranean voids that may be encountered. Excavation on the remainder of the project will not require a site geologist be present, but the procedures below will still be followed if any caves, karst features, or subterranean voids are encountered.
2. If any caves, karst features, or subterranean voids are encountered during construction, then construction work within 200 feet of the encountered voids will halt until project environmental consultants have completed necessary evaluations. A qualified karst geologist will respond immediately to evaluate the void geologically to determine if it has the potential to contain endangered karst invertebrate habitat. If the potential for habitat is evident, the Service will be notified immediately. FHWA / TxDOT / CTRMA will have the feature examined by a Service-permitted biologist for the presence of the listed karst invertebrates, following Service protocols. At a minimum, three biological collection surveys will be conducted on three separate days over a period not greater than one week to determine the presence or absence of the listed invertebrates or other species of concern. Between surveys, voids should be covered to prevent drying, but still allow nutrient input. A report of the surveys, including climate data inside and outside of the cave, will be submitted to the Service.
3. If no endangered or threatened species are determined to be present in an encountered feature, environmental consultants will issue specific instructions in accordance with standard practices accepted by Texas Commission on Environmental Quality, as applicable, for any particular void. Whether sealed or not, voids will not allow any contamination into the karst ecosystem. Construction activity will then resume with the carrying out of those specific instructions.
4. If endangered, threatened or species of concern are determined to be present within an encountered feature, FHWA / TxDOT / CTRMA will consult with the Service to determine the best available measures to avoid or minimize impacts to the feature, if possible. Reinitiation of section 7 consultation may be required if impacts to listed species are beyond those authorized in the biological opinion.

16. It is important to point out that this biological opinion (Pine, 2005) required these monitoring actions (which benefit Edwards Aquifer protection as well as endangered species) and issuance of an incidental take permit only after considerable study of the

highway and potential alternate routes were conducted before construction. This included detailed searches for karst and recharge features, excavation of features to determine their hydrological and biological significance (e.g. Raba-Kistner-Brytest, 1996; Veni, 1997b, 1998, 1999b; Veni and Reddell, 2003), and consideration of the results in planning avoidance and mitigation measures, which included the purchase and protection of unimpacted land containing the listed species. These studies and actions were conducted in accordance with U.S. Fish and Wildlife Service guidance available at that time on evaluating and protecting caves with endangered species (USFWS 2001a,b,c).

17. The proposed Highway 281 project occurs entirely on the recharge zone of the Edwards Aquifer, which is a federally designated sole source aquifer and the primary public water supply for the City of San Antonio and associated communities. It also occurs entirely within zones known to contain federally listed endangered species or which have a high probability of containing such species, with the nearest locality situated only about three highway right-of-way widths from the project area. The highway project under these conditions individually, and certainly when combined, constitutes a major federal action with potentially significant adverse environmental effects considering the high vulnerability of these natural resources to degradation and the potential for public health impacts. Even if the EAs were not wholly or partly inadequate, an environmental impact statement is needed to properly assess the proposed project, its alternatives, and means of mitigation which should at least equal the superior evaluation, monitoring, permitting, and mitigation actions of the similar Highway 183A project which involves similar endangered karst species and less crucial groundwater protection issues since that segment of the Edwards is not federally designated as a sole source aquifer.

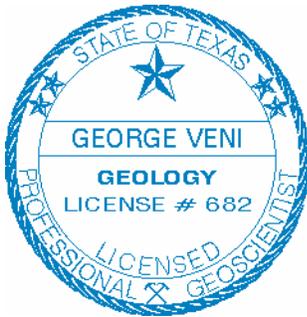
Pursuant to 28 U.S.C. § 1764, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Dated this 13th day of December 2005.

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George Veni, Ph.D.

In accordance with the Texas Board of Professional Geoscientists rules at 22 Texas Administrative Code, Part 39, Chapter 851, Subchapter C, §851.156, this report is signed and sealed to assure the user that the work has been performed by or directly supervised by the following professional geologist who takes full responsibility for this work

The computer-generated seal appearing on this document were authorized by George Veni, Ph.D., P.G. 682, on 13 December 2005.



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George Veni, Ph.D., Texas Professional Geoscientist No. 682

13 December 2005

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