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**Endangered Karst Invertebrate Impacts  
Assessment and Proposed Pre-Enforcement  
Settlement Terms for the Heritage Oaks  
Subdivision, Georgetown, Texas**

Prepared for  
Shel-Jenn, Incorporated

Prepared by  
SWCA Environmental Consultants

September 2012  
SWCA Project Number 23820





# **Endangered Karst Invertebrate Impacts Assessment and Proposed Pre-Enforcement Settlement Terms for the Heritage Oaks Subdivision, Georgetown, Texas**

## **Introduction**

Under construction since 2005, the Heritage Oaks residential subdivision in Georgetown, Texas is located north of the intersection of Williams Drive and Shell Road approximately 1.5 miles north of the Lake Georgetown dam. The tract sits roughly on the drainage divide between the North San Gabriel River and Berry Creek and is within the Edwards aquifer recharge zone. It is underlain by Edwards limestone bedrock which is known to be cavernous in the area. Between April and June of 2012 a series of six karst voids were encountered during utility excavation activities. On 25 April 2012, based on information reported to the U.S. Fish and Wildlife Service by a local resident, the Service issued a letter to Mr. Jimmy Jacobs (President of Shel-Jenn, Incorporated) informing him that Heritage Oaks is located within an area likely to contain endangered karst invertebrate species (*Texella reyesi* and *Batrisodes texanus*) and that development activities may be regulated under the Endangered Species Act. In the letter the Field Supervisor of the Austin Ecological Services Office (Adam Zerrenner) advised that incidental take coverage could be provided by either an individual permit or through participation in the Williamson County Regional Habitat Conservation Plan (Wilco RHCP). The Wilco RHCP was approved in 2008 and was not available at the time construction began at Heritage Oaks.

Shortly after the Services' letter was issued, Mr. Jacobs engaged SWCA Environmental Consultants to study the voids and to determine whether habitat for endangered karst invertebrates is present. This report presents the results of those investigations as well as proposed conservation measures intended to offset any potential impacts to endangered karst invertebrate habitat.

## **Endangered Karst Invertebrate Background and Recovery Status**

Due to their restricted range and threats from urban expansion, 16 species of troglobitic karst invertebrates have been added to the endangered species list in central Texas, including the two above-mentioned species occurring in north Williamson County. Troglobites are obligate cave-dwelling organisms characterized by a number of anatomical and physiologic adaptations to cave life collectively referred to as troglomorphy. Troglomorphic characters include loss of pigment and loss of sclerotization (hardening) in the exoskeleton, reduction or loss of eyes, elongation of appendages, lengthened life span, modified fecundity (i.e., decreased number of eggs), and metabolic adaptation to nutrient-poor habitat conditions. Because of their cryptic nature and subterranean habitat little specific information is available about their ecology and lifestyle. As a result, most management guidelines for the species are drawn from assumptions and generalizations from the realm of conservation biology or from proxy species from the troglobitic community such as cave crickets whose behavior can be observed at the surface. Quantifying impacts to karst invertebrate populations remains difficult.

Due to the lack of light for photosynthesis most cave communities lack primary producers. Instead they rely on nutrient input from the surface ecosystem, and as such they are an extension

of the surface ecosystem. Nutrients are introduced into the subsurface in the form of plant detritus washed in by surface waters, micro- and macro-organisms that enter caves under their own power, and the eggs and waste of troglone species. Troglones are species that have adapted to the cave environment sufficiently that they complete part of their life cycle in a cave, but must return to the surface to feed and thus retain adaptations for surface life. These types of cave communities are essentially decomposer communities (Culver 1982); they break down organic debris into simpler components (i.e., molecules and compounds) that are then available for other functions within the cave ecosystem.

In central Texas, cave crickets (*Ceuthophilus* spp.) are troglones that provide nutrient and energy input into cave system. Cave crickets utilize cave systems for shelter, as a daytime roost, and to complete their reproductive cycle. Cave cricket eggs, feces, and dead bodies provide a source of nutrient input to the cave ecosystem on which troglone species depend. At night, cave crickets forage on the surface, ingesting a variety of plant and animal materials. Taylor et al. (2005) studied cave cricket foraging distances from Big Red Cave in Coryell County, Texas, and relocated approximately 51 percent of cave crickets within 131 feet (40 meters) of the cave entrance, and 92 percent of cave crickets within 263 feet (80 meters) of the entrance. The maximum distance a cave cricket was found foraging away from the cave entrance was 344 feet (105 meters). This cricket foraging distance is assumed to be an important factor in determining the amount of aboveground habitat required for maintaining the nutrient base in the belowground cave environment (Taylor et al. 2005).

To date, about 700 caves are known to exist within Williamson County. Of these caves, approximately two-thirds have natural open entrances at the ground surface, and the remaining one-third were first opened to the surface during excavations associated with construction activities. Caves encountered during construction tend to be small and only rarely are found to contain endangered karst invertebrates due to the lack of a surface connection for the ingress and egress of troglone species and the nutrient input they provide.

After listing several karst invertebrate species as endangered in 1988, the Service commissioned a study that attempted to determine the likelihood of various geological units in Williamson and Travis counties to contain karst features with potential habitat for cave-dwelling invertebrates (George Veni and Associates 1992).<sup>1</sup> The study resulted in delineation of zones based on lithology, distributions of known caves and cave fauna, and geologic controls on cave development. The zones were delineated as follows:

- Zone 1 - contains endangered cave species;
- Zone 2 - high probability of endangered or endemic cave fauna;
- Zone 3 - low probability of endangered or endemic cave fauna; and
- Zone 4 - does not contain endangered or endemic cave fauna.

The difference between Zones 1 and 2 is largely an artifact of limited sampling. Zones 1 and 2 together reflect the potential distribution of cavernous rock exposed at the surface that may

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<sup>1</sup> These zones are currently being revised.

harbor karst invertebrates. It is on the basis of that study that the Service believes that development activities at Heritage Oaks have the potential to adversely affect listed species.

The study also discussed the overall karst geography of the Austin region, potential geologic and geographic barriers to karst invertebrate dispersal, and limits of species distribution. Eight karst fauna regions (KFR) were delineated in Travis and Williamson counties: South Travis County, Rollingwood, Central Austin, and Jollyville in Travis County, and McNeil/Round Rock, Cedar Park, Georgetown, and North Williamson County in Williamson County (George Veni and Associates 1992). KFRs were also delineated for similar species in Bexar County using the same criteria. Heritage Oaks is located within the North Williamson County KFR with surface area classified as Zones 1 and 2. The North Williamson County KFR is known to contain the Bone Cave harvestman (*Texella reyesi*) Ubick and Briggs 1992 and Coffin Cave mold beetle (*Batrisodes texanus* + *Batrisodes cryptotexanus*) Chandler 1992 Chandler and Reddell 2001.<sup>2</sup>

In order to assess the relative magnitude of potential impacts to the listed species from activities at Heritage Oaks it is first useful to consider their current recovery status. The recovery status of those species is determined by the criteria detailed in the *Recovery Plan for Endangered Karst Invertebrates in Travis and Williamson Counties, Texas* (USFWS 1994). The recovery strategy centers on establishing a minimum number of recovery preserves known as Karst Fauna Areas (KFAs). In the recovery plan and in subsequent five-year reviews of the species, a KFA is envisioned as a discrete, protected unit of occupied habitat that would be officially designated and preserved for the recovery of listed troglobitic species. The two major recovery criteria include establishing KFAs (Criteria 1) and monitoring them for at least five years to ensure that the karst invertebrate populations are stable (Criteria 2). Three KFAs per KFR are required for downlisting from Endangered to Threatened status. Among the biological goals of the Wilco RHCP are to recover the karst invertebrates by exceeding the downlisting criteria and establishing at least four KFAs per KFR. The Williamson County Conservation Foundation (WCCF) has gone through the scientific documentation and review process required to designate three KFAs in the North Williamson County KFR. They include the Priscilla's Well KFA, The Twin Springs KFA and the Cobbs Cavern KFA. Review of an additional KFA is also in process. In the recent Biological Opinion for improvements to State Highway 195 the Service recognized that recovery criteria 1 would be satisfied for *Texella reyesi* in the North Williamson County KFR with the acquisition of the Cobbs Cavern KFA, and that recovery criteria 1 would be satisfied for the Coffin Cave mold beetle with the acquisition of an additional KFA for *Batrisodes* sp.

### **Karst Invertebrate Habitat and the Heritage Oaks Subdivision**

SWCA Environmental Consultants commenced karst invertebrate due-diligence studies in the Heritage Oaks Voids in May of 2012. Pursuant to SWCA's scientific permit for conducting research on endangered karst invertebrates (TE800611) all investigations were conducted

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<sup>2</sup> Please see Section 3.1 of the Williamson County Regional Habitat Conservation Plan (RHCP) (SWCA 2008b) for a discussion of the biology, distribution, and status of the Bone Cave harvestman and Coffin Cave mold beetle.

according to methods prescribed by the USFWS<sup>3</sup> and other generally accepted methods for investigating voids encountered during construction. The full biological survey report will be submitted with SWCA's annual karst report at the end of 2012.

The features consist of three small caves and three humanly inaccessible solution cavities. All were discovered in a series of utility trenches with ceiling heights ranging between 3 and 6 feet below the original surface grade. In general the voids consist of low, wide void spaces formed by dissolution along bedding plane surfaces with a relatively high degree of encrustation by speleothems. Appendix A contains sketch maps and photos of the voids. Void 1 and voids 3 through 6 exhibited no air flow, contained no signs of a significant surface connection prior to excavation activities, and exhibited no signs of biological activity other than surface species such as field crickets and surface spiders that entered the voids through the utility trenches. These features were actively searched for cave fauna on multiple occasions as well as bait trapped. All features were covered with tarps and or plywood between surveys to maintain cool dark conditions to the extent practicable. No cave fauna were detected in any of them.

Unlike the other features void 2 is a small cave with an active troglobite community and clear signs of a surface connection. It was found to contain the endangered species *Texella reyesi*. Specimen identification was confirmed by James Reddell of the University of Texas, Texas Memorial Museum. As can be seen in figures A2-4 and A2-5, the floor is coated with a dark layer of cricket guano. Figure A2-5 shows a talus pile spilling into the cave through a hole in the ceiling. Although daylight cannot be seen this is presumably the point of troglone ingress and egress.

### **Heritage Oaks Biological Survey Summary:**

**Void 1:** The feature consists of a small cave passage measuring roughly 20 feet long by 10 feet wide exposed on its west end in the bank of a drainage trench. As a result the feature seems to have taken floodwater and some organic material during several storms prior to and during our period of investigation. No signs of cave fauna have been observed in this feature. The feature had been uncovered for more than a week prior to the first inspection and all fauna in the cave appear to have entered during that time. Bait trapping yielded only species common to surface leaf litter. No air flow was detected

SWCA conducted the first biological survey of the feature on 22 May 2012. During the initial survey the ambient outside temperature was 89.7°F and relative humidity was 63%. The internal temperature within the feature was 83.8°F and relative humidity was 62.3%. Biota observed during the survey include harvestman *Lieobunum* sp. (30+), *Achaearanea* sp. (20+), *Cicurina varians* (3), *Lycosid* sp. (2), other surface spider sp. (10+), isopods (barklice) (10+), and *Ceuthophilus* sp. (15+ nymphs). SWCA conducted the second survey on 17 July 2012 and the ambient outside temperature was 91.4°F and

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<sup>3</sup> USFWS (2011), Section 10(a)(1)(A) Scientific Permit Requirements for Conducting Presence/Absence Surveys for Endangered Karst Invertebrates in Central Texas. USFWS, Austin Ecological Services Field Office, Austin, Texas. Available on-line at: [http://www.fws.gov/southwest/es/Documents/R2ES/Karst\\_Survey\\_Protocols\\_20110908.pdf](http://www.fws.gov/southwest/es/Documents/R2ES/Karst_Survey_Protocols_20110908.pdf)

relative humidity was 58%. The internal temperature within the feature was 81.3°F and relative humidity was 73.7%. Biota observed during the survey includes *Ceuthophilus* sp. (4 adults, 25+ nymphs), *Collembola* sp. (20+), *Cicurina varians* (5), *Achaearana* sp. (7), and isopods (1).

**Void 2:** This is the largest feature encountered with a footprint measuring roughly 50 feet by 30 feet and a maximum depth of approximately 10 feet below the surface. This feature clearly had a surface connection prior to trenching as evidenced by a large population of at least two cave cricket species. Habitat conditions were quite good with higher humidity and lower temperature than the other voids and air flow was noticeable from several impassible cavities in the western wall of the cave. Unlike the other features organic material is relatively abundant in the form of both cricket guano and large tree roots. At least three troglobitic species have been documented including the Bone Cave Harvestman (*Texella reyesi*), *Cambala* sp. millipedes, and *Cicurina* spiders, probably *C. vibora*.

SWCA conducted the first biological survey of the feature on 22 May 2012. During the initial survey the ambient outside temperature was 89.3°F and relative humidity was 64%. The internal temperature within the feature was 81.3°F and relative humidity was 70.4%. Biota observed during the initial survey include *Texella reyesi* (8), *Texoreddellia* sp. silverfish (10+), *Collembola* sp. (100+), *Cicurina varians* (15+), *Achaearana* sp. (5), surface spider sp. (2), *Cambala* sp. millipedes (6), fleas (20+), and *Ceuthophilus* sp. (15+ nymphs). SWCA conducted the second survey on 17 July 2012 and the ambient outside temperature was 93.0°F and relative humidity was 56.1%. The internal temperature within the feature was 82.9°F and relative humidity was 79.5%. Biota observed during the survey include *Texella reyesi* (2), *Collembola* sp. (100+), *Cicurina varians* (3), *Cicurina* sp. (blind) (2), *Cambala* sp. (8), fleas (20+), and *Ceuthophilus* sp. (3 nymphs), *Pseudouroctonus* sp. scorpions, (1), and Annelid sp. (2).

**Void 3:** This small cave is the deepest of the encountered voids with a footprint measuring approximately 10 feet by 15 feet but descending to about 20 feet below the surface. Perhaps because of its depth and apparent lack of a prior surface connection no cave fauna were detected. The single passage is heavily encrusted with speleothems and no airflow was detected. No organic material was present other than leaves that fell in from the trench.

SWCA conducted the first biological survey of the feature on 15 June 2012. During the initial survey the ambient outside temperature was 88.6°F and relative humidity was 59.4%. The internal temperature within the feature was 86.5°F and relative humidity was 61.2%. Biota observed during the initial survey includes surface spider sp. (2) and isopods (12). SWCA conducted the second survey on 17 July 2012 and the ambient outside temperature 95.4°F and relative humidity was 49.0%. The internal temperature within the cave was 88.9°F and the relative humidity was 71.8%. Biota observed during the survey includes *Cicurina varians* (3), and an unidentified surface spider sp. (1). Bait trapping yielded no fauna.

**Void 4:** The feature consists of a small inaccessible void measuring a few feet in diameter exposed in a trench wall. No airflow or any sign of a prior surface connection could be detected. The feature was heavily encrusted with speleothems and contained no cave fauna or organic material.

SWCA conducted the first biological survey of the feature on 15 June 2012. Since the feature is not large enough to allow human entry, the visible portion of the void was surveyed and then bait traps were set. No species were visibly observed, and no species were discovered during the bait trapping effort. The second survey of the feature was conducted by SWCA on 17 July 2012. Visual observations of *Cicurina varians* (3) and *Achaearanea* sp. (1) were noted, and bait traps were again placed within the feature.

**Void 5:** The feature consists of a small inaccessible void measuring a few feet in diameter exposed in a trench wall. No airflow or any sign of a prior surface connection could be detected. The feature was heavily encrusted with speleothems and contained no cave fauna or organic material.

SWCA conducted the first biological survey of the feature on 15 June 2012. Since the feature is not large enough to allow human entry, the visible portion of the void was surveyed and then bait traps were set. No species were visibly observed, and no species were discovered during the bait trapping effort. The second survey of the feature was conducted by SWCA on 17 July 2012. Visual observations of isopods (1) and *Achaearanea* sp. (1) were noted, and bait traps were again placed within the feature.

**Void 6:** The feature consists of a small inaccessible void measuring a few feet in diameter exposed in a trench wall. No airflow or any sign of a prior surface connection could be detected. The feature was heavily encrusted with speleothems and contained no cave fauna or organic material.

SWCA conducted the first biological survey of the feature on 15 June 2012. Since the feature is not large enough to allow human entry, the visible portion of the void was surveyed and then bait traps were set. No species were visibly observed, and no species were discovered during the bait trapping effort. The second survey of the feature was conducted by SWCA on 17 July 2012. No species were visibly observed and bait traps were again placed within the feature.

## **Voluntary Conservation Measures**

In order to offset potential impacts to karst invertebrates at the Heritage Oaks site, the project proponents would become participants in the Wilco RHCP through a combination of land donation and monetary support to cover the cost of long-term monitoring and management of two cave conservation areas containing listed species. Monetary support would include funding of the annual monitoring and management costs to be incurred by the WCCF at the rate of \$900 per cave per year for 24 years (the remaining number of years in the Williamson County Regional Habitat Conservation Plan permit), and a one-time donation of \$25,000 to the WCCF. Shel-Jenn, Incorporated would dedicate two conservation areas located in the Woodland Park

subdivision approximately 2.3 miles northwest of the Heritage Oaks site to the WCCF. The conservation areas for Cat Cave is 4.55 acres in size and contains the entire surface drainage area of the cave. The conservation areas for Duckworth Bat Cave is 5.67 acres in size and contains the entire surface drainage area of the cave. Both caves are known to contain *Texella reyesi*. Both conservation areas contain the majority of the surface troglodene foraging areas as proposed by Taylor (Taylor et al. 2005). Appendix B contains aerial images of conservation areas, cave maps, photos, and descriptions of the caves as given by Mike Warton and Associates in 1999.

Dedication of these conservations areas to the WCCF would provide the following benefits to *Texella reyesi* and Williamson County karst conservation:

- Assist in recovery criteria 2 by providing the opportunity to monitor smaller preserves the results of which may be used to track the performance of the larger KFAs
- The 10.22 acres surrounding the caves may be counted toward the WCCFs RHCP goal of protecting a total of 700 acres county-wide for karst invertebrate conservation
- Enhanced management of the 10.22 acres by the WCCF would provide a conservation benefit to a population the Georgetown Salamander (*Eurycea naufragia*) at Cowan Spring
- The tax increment finance benefit from enrollment of Heritage Oaks would provide ongoing financial benefit to the WCCF and the Wilco RHCP for future KFA acquisition and management throughout western Williamson County

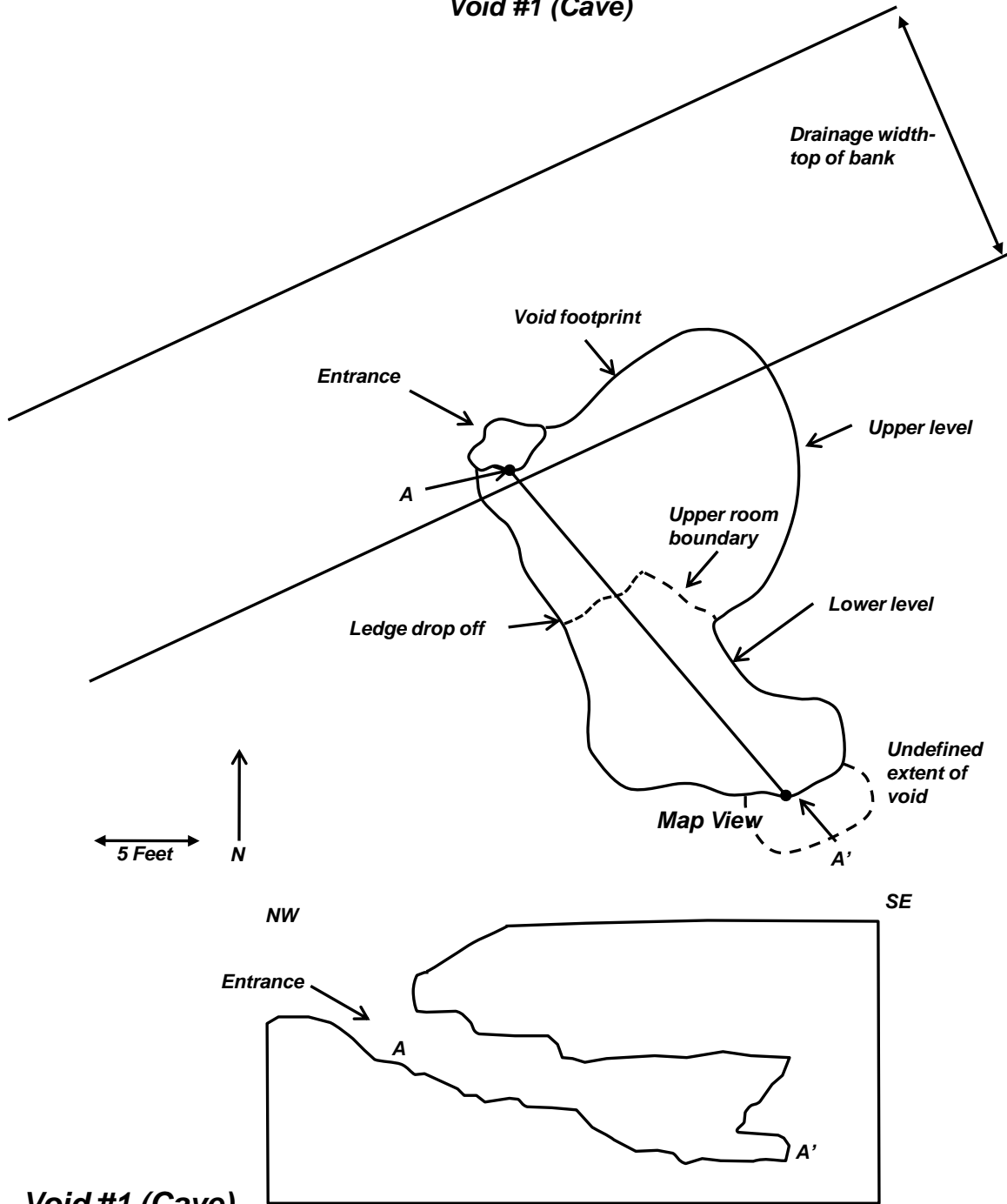
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## **Appendix A**

### **Graphics for Heritage Oaks On-site Voids**

**Heritage Oaks  
Void #1 (Cave)**



**Void #1 (Cave)**

**Cross Section**

Rangefinder and compass survey by Bryan Parker 6/15/12. Map drafted by Bryan Parker on 6/21/2012. Survey and drafting supervised by Craig Crawford, P.G.



Figure A1-1



Figure A1-2

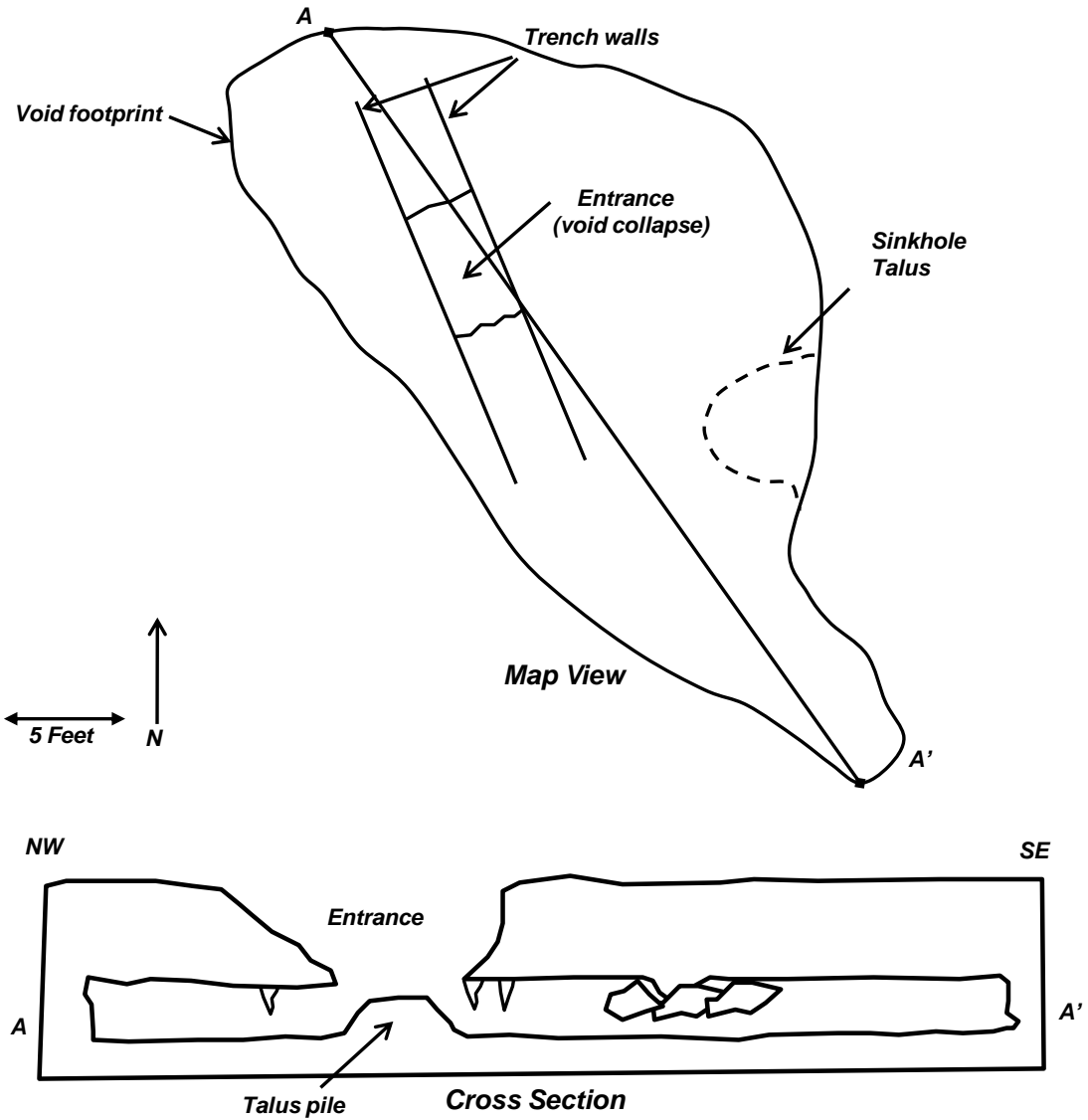


Figure A1-3



Figure A1-4

**Heritage Oaks  
Void #2 (Cave)**



**Void #2 (Cave)**

Rangefinder and compass survey by Bryan Parker 6/15/12. Map drafted by Bryan Parker on 6/21/2012. Survey and drafting supervised by Craig Crawford, P.G.



Figure A2-1



Figure A2-2



Figure A2-3

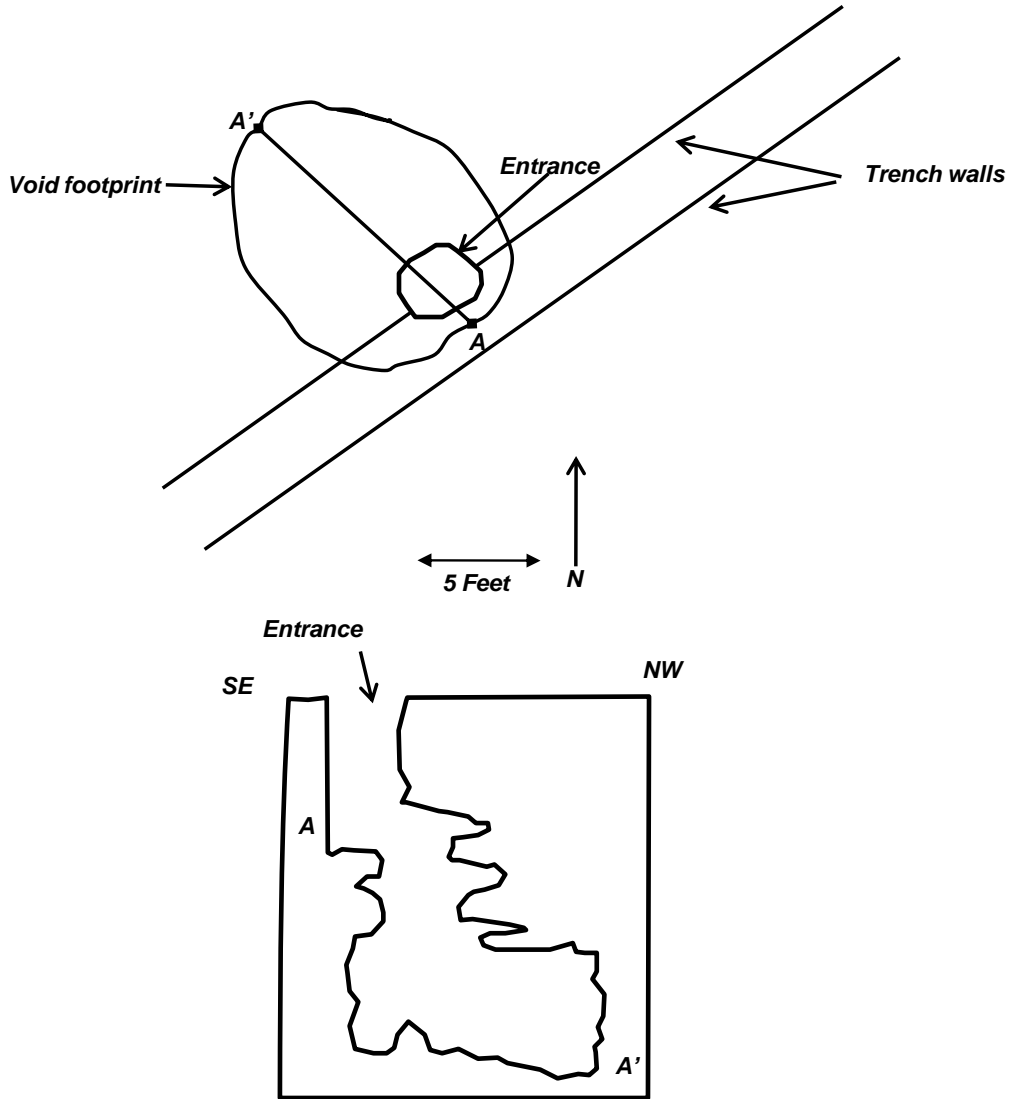


Figure A2-4



Figure A2-5

**Heritage Oaks  
Void #3 (Cave)**



**Void #3 (Cave)**

Rangefinder and compass survey by Bryan Parker 6/15/12. Map drafted by Bryan Parker on 6/27/2012. Survey and drafting supervised by Craig Crawford, P.G.

Figure A3-1



Figure A3-2

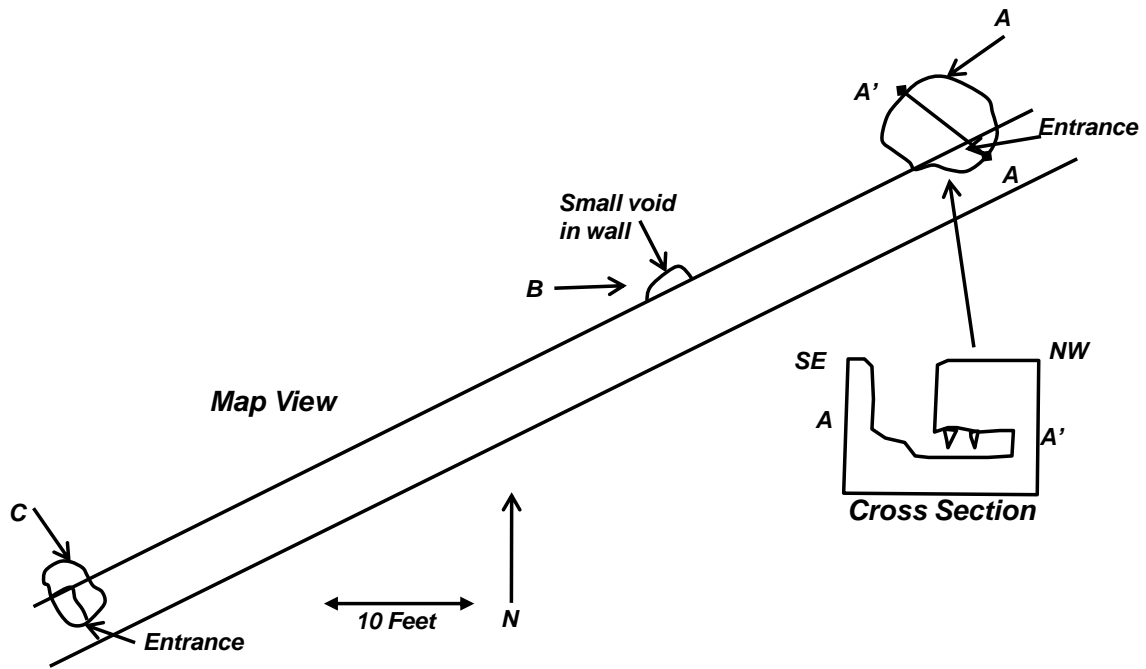


Figure A3-3



FigureA3-4

# Heritage Oaks Void #4



## Void #4

Rangefinder and compass survey by Bryan Parker 6/15/12. Map drafted by Bryan Parker on 6/27/2012. Survey and drafting supervised by Craig Crawford, P.G.

Figure A4-1

**Void #4A**



Figure A4-2



Figure A4-3

**Void #4B**



Figure A4-4



Figure A4-5

**Void #4C**

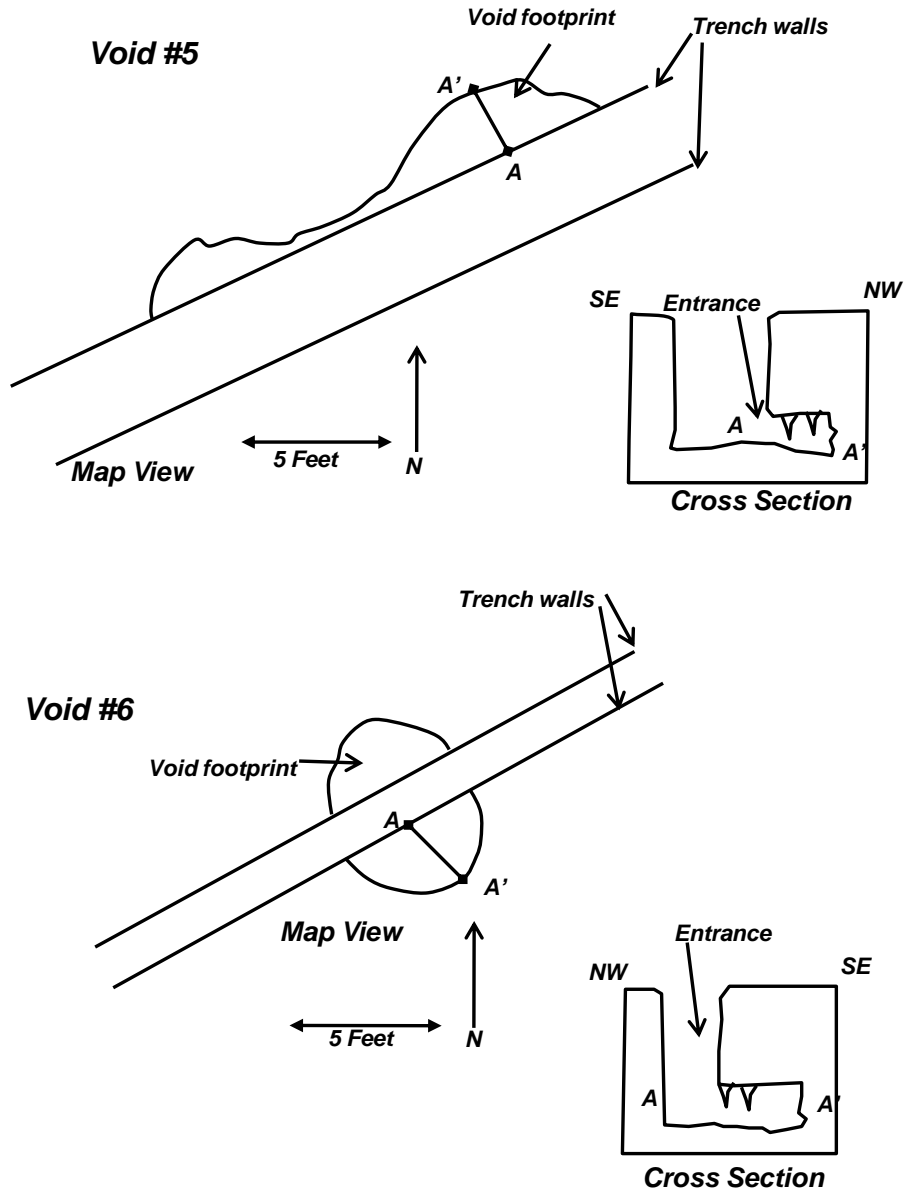


Figure A4-6



Figure A4-7

**Heritage Oaks  
Void #5,6**



**Void #5,6**

Rangefinder and compass survey by Bryan Parker 6/15/12. Map drafted by Bryan Parker on 6/27/2012. Survey and drafting supervised by Craig Crawford, P.G.



Figure A5-1

**Void #5**



Figure A5-2



Figure A5-3



Figure A5-4

**Void #6**



Figure A6-1



Figure A6-2



Figure A6-3

## **Appendix B**

### **Graphics for Off-Site Caves**



Figure B-1  
4.55 acre Conservation Area for Cat Cave



**Karst Feature No. 3 ( f-3): " CAT " CAVE**

**History:** In researching the history of this cave from the Texas Speleological Survey files ( TSS files ), An entry for this cave was made during the early 1960's. It was entered as an actual cave, entered for a short distance into a low wide room. Along the back West wall of the room was a narrow slot in the floor between a breakdown slab & the wall from which a strong air-flow conductivity issued, but was too small to enter. Then, during a property survey in 1994, the cave was re-found, briefly entered, and this description confirmed. In APRIL of 1999, the cave was explored, surveyed & mapped, and found to contain the Endangered Invertebrate Species " *Texella Reyesi* " or " BONE CAVE HARVESTMAN ". During this project on the cave, TWO (2) interior excavations were preformed, of which opened up the main body of the cave for study.

**Description:** The cave's entrance is located beneath the canopy of a Giant Cedar Elm Tree. The surface sink depression measures approximately 30' feet in diameter with gentle slopes that funnel into a solid rock rimmed portal approx. 8' feet in diameter. The portal is largely filled with naturally eroded materials. An opening slopes into the entrance room beneath the headwall along the West side of the sink. The entry-way has been enlarged to allow for a comfortable size " hands & knees " entry passage. The entrance room is low and wide (approx. 40' x 30' feet) and gradually declines toward the back West wall. The flooring is composed of dry dark gray soils & rocks washed in from the surface over long periods of time. Caution should be used during entries, as snakes have been observed to be present upon occasion. Ceiling heights range from 1' foot up to 4' feet at the Southwest corner ( lowest area ) of the room. Along the West wall and in the floor, is a narrow crevice between a breakdown slab and the wall, too small to enter, but issues a very strong air-flow conductivity. This opening was enlarged to access the cave's extents beyond ( the " Mouse hole " ). Beneath a 5' foot drop, a low room 20' feet wide extends to the Northwest for approx. 30' feet to 2 small holes along the Southwest wall. One of these holes ( " Switch back " Pit ) was enlarged enough to proceed ahead down an offsetting 10' drop. At the bottom, a long 20' to 30' wide room/ passage continues Northwest ( the " El Tigre " Room ). This room is floored with numerous thin rock slabs, and a crevice in the floor that follows along the Southern wall ( lower level ). Ceiling heights vary from 2' to nearly 6' high along the middle of the passage. The room extends for about 65' feet before the roof begins to lower. Toward the back of this room, numerous holes are present along the Southern wall that drop to a lower level parallel passage. A single similar hole along the Northwest wall drops 10' feet into a lower level room ( the " Chiquita " Room ), of which is a similar paralleling passage. This passage extends both ways along the wall, but eventually becomes too small to continue. Ahead in the main room/ passage, the roof lowers as the floor slopes down to a point where upper & lower levels converge into a crawlway at the lower level depth. This passage extends for about 15' feet to a small constricted opening or window that was too small to enter. Beyond, a much larger space and open extent could be seen. This opening was enlarged by hand excavation. Ahead, another low wide room was entered. This room is well decorated with speleothems, and flowstone floorings. It measures approx. 30' feet wide by 45' feet long by 2' to 3.5' feet high, and extends up a slope at the back of the room. The slope rises for several feet up into a final low wide chamber ("El Gato Grotto"). At the far end of this room, the passage becomes too low to continue, extending more than 25' feet ahead, but only 4" inches high. Along the roof level, in the Northwest side of the room, is a very low passage extending to the Northwest for around 25' feet before becoming too low to follow as well. Along the back wall, a live racoon was found huddled into a small space, apparently not wanting to be found

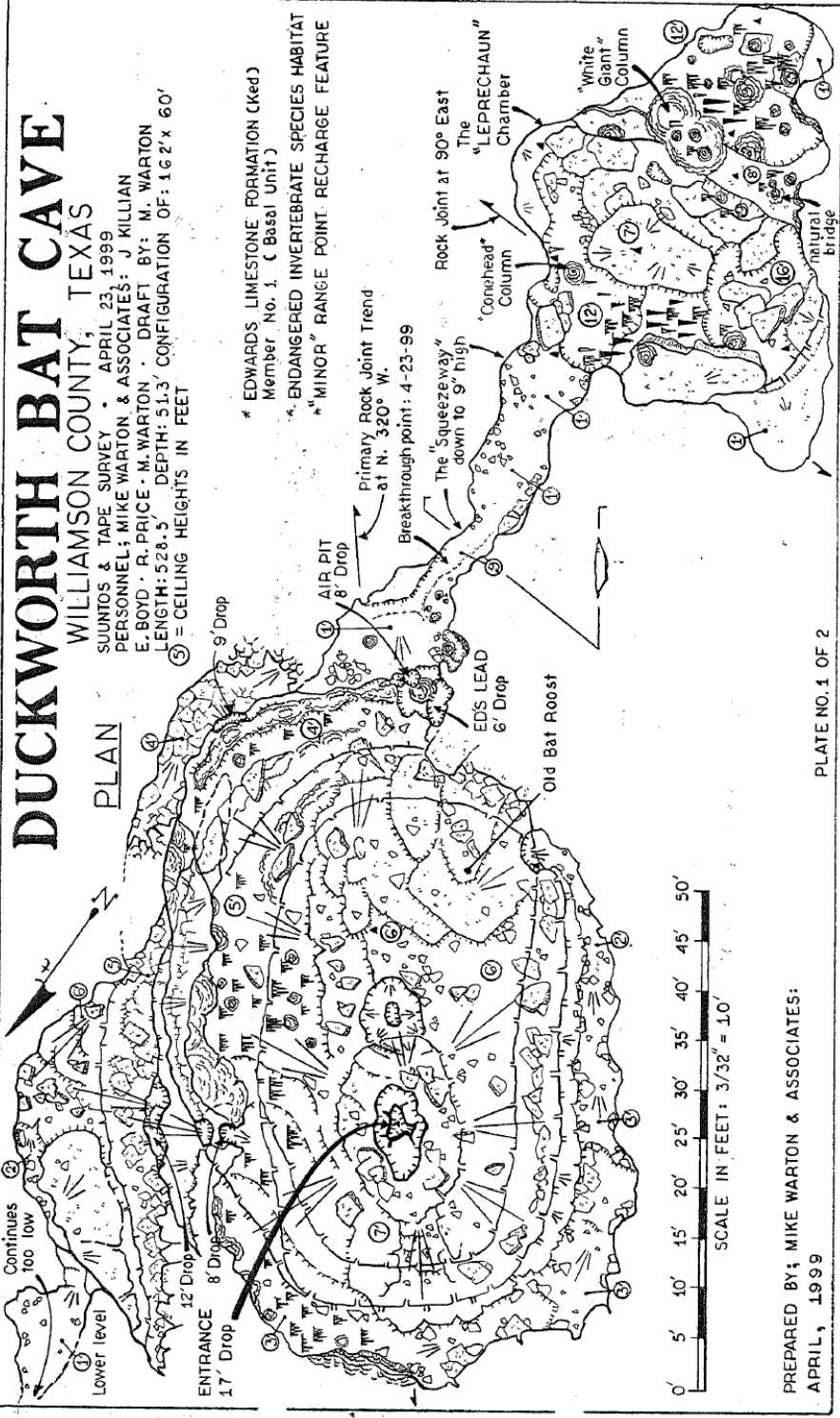


Figure B-3. Entrance of Cat Cave



# DUCKWORTH BAT CAVE

WILLIAMSON COUNTY, TEXAS  
 SUUNTOS & TAPE SURVEY - APRIL 23, 1999  
 PERSONNEL; MIKE WARTON & ASSOCIATES: J. KILLIAN  
 E. BOYD · R. PRICE · M. WARTON · DRAFT BY: M. WARTON  
 LENGTH: 528.5' DEPTH: 51.3' CONFIGURATION OF: 162' x 60'  
 ⑤ = CEILING HEIGHTS IN FEET



\* EDWARDS LIMESTONE FORMATION (Ked)  
 Member No. 1 (Basal Unit)  
 \* ENDANGERED INVERTEBRATE SPECIES HABITAT  
 \* "MINOR" RANGE POINT: RECHARGE FEATURE

PREPARED BY: MIKE WARTON & ASSOCIATES:  
 APRIL, 1999

PLATE NO. 1 OF 2

Figure B-5 Map of Duckworth Bat Cave.

**Karst Feature No. 9 (f-9): " DOCKWORTH BAT " CAVE**

**History:** In researching the history of this cave from the Texas Speleological Survey Files ( TSS files ), An entry for this cave was made during the early 1960's. It was entered as a rumored cave only, and that it was located somewhere in a field to the West of the property owners house ( same owner as " Cat " Cave ). An intensive search for it failed to find the cave. At this time, the feature was referred to as the " Well " Cave, as it's entrance supposedly resembled that of a well. Nothing more was known about this cave.

Apparently, the cave remained unfound until 1994, when the property was investigated for karst features by Mike Warton & Associates. The cave was found at that time, entered briefly, but not explored or documented until recently. When first observed by Mike Warton in 1994, a large pile of asphalt roof shingles lay beside the vertical entrance of the cave. Another large pile was found at the bottom of the 17' foot deep entrance shaft. In APRIL of 1999, the cave was explored, surveyed and mapped, and found to contain the Endangered Invertebrate Species " *Texella Reyesi* " or " BONE CAVE HARVESTMAN ". It was determined in 1994, that the cave had previous usage as a Bat Habitat. At that time, the cave's name was justifiably changed from " WELL " CAVE, to the more appropriate name of " DOCKWORTH BAT " CAVE after the property owners.

**Description:** The cave's entrance is formed along a strong rock joint at N. 320 degrees W. A surface sinkhole measuring approx. 10' feet in diameter funnels into an open rock rimmed vertical shaft approx. 6.0' feet by 4.0' feet. The rim edges of entrance are lined on all sides by large loose slab rocks that have shifted positions angling towards the open shaft. The entrance drops vertically for 17' feet, however is free-climbable to the floor below. Part way down the shaft is an open bedding plane space around all wall areas of the shaft. This space is approx. 2.0' feet high with dark soil floors, and extends back for several feet in all directions. Snakes are periodically observed in this space area. The entrance shaft drops into a large room at the bottom extending back in all directions. The floor below the entrance is littered with ranch trash, refuse, and blue shingles. Ceiling heights in this main chamber range from 2' feet up to 6' feet. The longer extent of the room extends to the East and Southeast, where a tape distance read 42' feet to a back wall. The floor of the main chamber is essentially a large mounded collapse pile of breakdown materials. The floor declines around all edges of the room. Numerous leads and passages were found potentially leading outwards from the main room. A lower level section of the cave was discovered to the North, descending to a sizable room at 50' feet beneath the entrance. Several other small passages and pits were found around the periphery of the main chamber. During the exploration and survey of the cave, I noticed a particular lead at the far South end of the chamber that contained a strong air-flow conductivity issuing from it. An excavation at this point lasted for approx. 3 hours, resulting in a breakthrough, and more cave extent. An 8' foot deep drop is entered at the back South wall. At the bottom, are 2 leads. One of these is a low bedding plane space that leads on toward the South. It became very low, but was enlarged enough to squeeze through after much toiling. A space only 9" inches high had to be passed through. This low crawlway is 36' feet long. At the end of it, the floor drops away sharply into a large extremely well decorated room ( the " Leprechaun " chamber.). This room is approx. 45' feet long by 30' feet wide, and ceiling heights range from 12' feet to 16' feet high. A large boulder the size of a large truck, and natural rock bridge stretches across the central part of the room. The chamber is very impressively decorated with large white flowstones, stalactites up to 5' feet long, stalagmites up to 6' feet tall, and unusual helectites up to 2.5' feet long. It is truly a remarkably beautiful display.

The cave's survey yielded a length of 528.5' feet, and a depth of 51.3' feet, making this cave one of the deeper caves of the Northern plateau in Williamson County.



Figure B-6. Gate and Entrance of Duckworth Bat Cave.



Figure B-7. Entrance Pit of Duckworth Bat Cave.

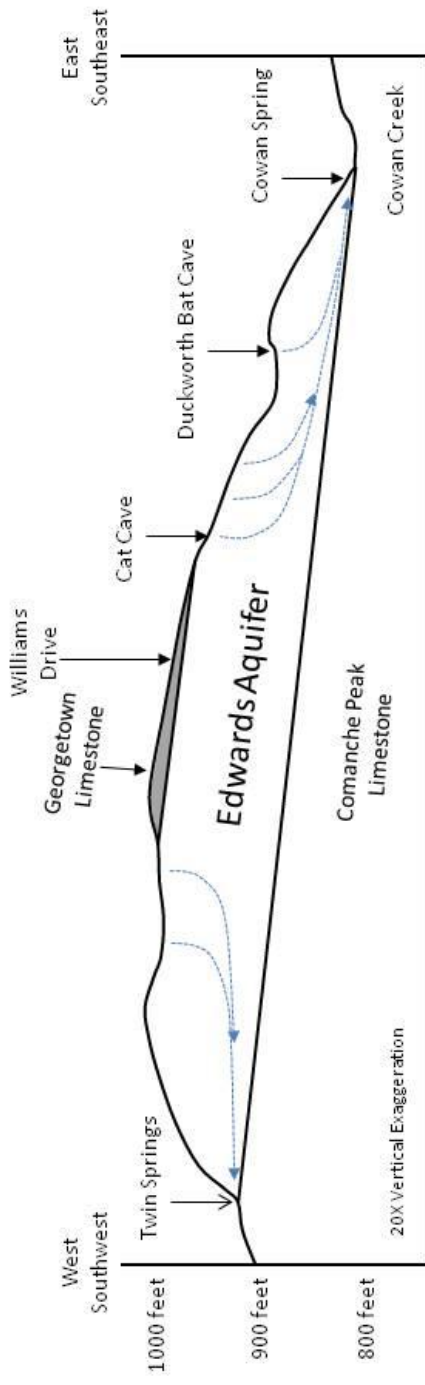


Figure B-8 Main room.



Figure B-9. Interior Conditions of Duckworth Bat Cave.

**Hydrogeologic Cross Section of the North San Gabriel River / Cowan Creek Drainage Divide within the Edwards Aquifer Recharge Zone**



**Figure B-10 Hydrogeologic Setting of Cat and Duckworth Bat Caves and Local Springs**