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USACE Project No. SWF-2009-00057
Consultation # 21450-2009-F-0084

Dear Mr. Brooks:

Thank you for your March 25, 2009, letter regarding the proposal by New Braunfels Utilities (NBU) to repair an exposed water pipeline in the bed of the Comal River. This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion for the proposed concrete erosion protection for an NBU water pipeline crossing the Comal River in New Braunfels, Comal County, Texas. Authorization would be made by the U.S. Army Corps of Engineers (Corps) under section 404 of the Clean Water Act. In accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (Act), the Corps has determined this project is not a major construction activity as defined in 50 CFR § 402.02. The fountain darter (*Etheostoma fonticola*) occurs in the Comal River and is federally-listed as endangered. The Corps has provided information on the project and requested formal consultation in a March 25, 2009, letter, based on likely effects to the fountain darter.

This biological opinion is based on information from: (1) information in letters and e-mails from NBU, (2) conversations with the Corps, (3) conversations and correspondence with Ian Taylor of NBU and Nathan Pence of the City of New Braunfels, (4) field investigations by the Service and BIO-WEST, Inc., (5) a site visit by the Service on March 10, 2009, and (6) other sources of information in our files. The abbreviations and acronyms herein are listed in Appendix A. A complete administrative record of this consultation is on file at our office.

Consultation History

August 19, 2004 — The City of New Braunfels began dialogue with the Corps and Service regarding the need to address areas of erosion along the New Braunfels Utilities water pipeline (water main) in the Comal River just upstream from San Antonio Street. The City of New Braunfels subsequently filled in areas of erosion on the left side (looking downstream) near the USGS weir and built a chute for tubers on the same side.

February 3, 2009 — The Service received a letter (dated February 2, 2009) from Ian Taylor of NBU discussing the need to remedy erosion near the main with authorization from the Corps and requesting the Service to consult with the Corps on the project.

TAKE PRIDE IN AMERICA

March 10, 2009 Patrick Connor and Randy Gibson of the Service met with Nathan Pence of the City of New Braunfels and Ian Taylor of NBU to survey the project site.

March 20, 2009 Patrick Connor had a phone conversation with Neil Lebsock of the Corps regarding potential impacts and potential occurrence of fountain darters in the project area.

March 27, 2009 The Service received a letter requesting formal consultation on the project. The project was assigned consultation number 21450-2009-F-0084 by the Service.

Species and Critical Habitat Not Part of this Biological Opinion
The proposed action will not affect the Comal Springs riffle beetle (*Heterelmis comalensis*), Comal Springs dryopid beetle (*Stygoparnus comalensis*), or the Peck's cave amphipod (*Stygobromus pecki*). While these species occur in the Comal River system (upstream of the project in Landa Lake), they do not occur in the action area. The proposed action will not affect critical habitat within the Comal Springs system for these three invertebrate species. Critical habitat for the Comal Springs invertebrates is, at its closest point, about 4,724 ft (1440 m) northwest and upstream of the proposed project.

BIOLOGICAL OPINION

I. Description of Proposed Action
The Comal River downstream of Landa Lake is divided between the original (old) channel of the Comal River and the new channel that was excavated for a power mill sometime in the 1800s (Figure 1). The new channel of the Comal River effectively captures the lowest reach of Dry Comal Creek and joins the old channel at Prince Solms Park in New Braunfels. The proposed project is located on the left half (northeastern side) of the wetted channel of the Comal River (looking downstream), just below the weir used by the U.S. Geological Survey (USGS) to measure Comal River discharge (Figure 2).

The purpose of the proposed project is to stop erosion along a potable water pipeline crossing the Comal River. The proposed work entails: (1) blocking most of the flow through the tube chute, (2) clearing the area of fish and any aquatic plants, and (3) pouring concrete on both sides of the pipeline to a point where the entire pipe is covered. An estimated 6 cubic yards (4.6 m^3) of fill will be placed in the river, resulting in the permanent alteration of 80 ft^2 (7.4 m^2) of aquatic habitat. Construction is estimated to take about ten days. Storm runoff could result in a delay of construction by several days.

II. Status of the Fountain Darter

Distribution and Status
The fountain darter was listed as endangered on October 13, 1970. Critical habitat was designated on July 14, 1980, for the upper San Marcos River in Hays County and includes

Spring Lake and the San Marcos River downstream to about 0.5 mile (805 m) below the Interstate Highway 35 bridge. There is no critical habitat designated for this species in the Comal Springs system.

Historic and present distributions of the fountain darter are presented in the *San Marcos & Comal Springs and Associated Aquatic Ecosystems (Revised) Recovery Plan* (Recovery Plan) (Service 1996). The current range of the fountain darter is restricted to the Comal and upper San Marcos rivers. The current and historic distribution of the fountain darter in the Comal River includes all of the spring runs, Landa Lake, the old and new channels of the Comal River, and the Comal River (proper) downstream to its confluence with the Guadalupe River. Nearby areas of the Guadalupe River may also be occupied, particularly near aquatic vegetation. Historically within the San Marcos River, the fountain darter is known from the headwaters (Spring Lake) down to the vicinity of Martindale in Caldwell County (Service 1996). The current San Marcos fountain darter distribution extends from Spring Lake to a point between the San Marcos Wastewater Treatment Plant outfall and the confluence with the Blanco River.

Habitat and Life History

The fountain darter is a small, reddish brown fish, averaging about 1.14 inches (29 mm) total length. Habitat requirements described in the Recovery Plan (Service 1996) include: undisturbed stream floor habitats; a mix of submergent plants, in part for cover; clear and clean water; a food supply of living organisms; constant water temperatures within the natural and normal river gradients; and adequate springflows.

Fountain darters feed primarily during daylight in response to visual cues (Schenck and Whiteside 1977*a*). Bergin (1996) investigated the fountain darter's diet in detail. The food items selected depended on the size of the individual, but primarily included copepods, dipteran (fly) larvae, and emphemeropteran (mayfly) larvae (Bergin 1996).

Fountain darters use and prefer a mix of submergent vegetation including algae, mosses (e.g., *Riccia* sp.), and vascular (higher) plants such as Texas wild-rice (*Zizania texana*) (Schenck and Whiteside 1976; Linam *et al*. 1993; G. Linam 1993; L. Linam 1993; Connor 1996, unpublished raw data; BIO-WEST 2007, 2009). Schenck and Whiteside (1976) found that young fish prefer vegetated habitats in areas with little water velocity.

Although natural populations of fountain darters spawn year-round (Schenck and Whiteside 1977*b*), they appear to have two peak spawning periods, in August and late winter to early spring (Schenck and Whiteside 1977*b*). Bonner *et al*. (1998) described the effects of temperature on egg production and early stages of the fountain darter. In their assessment, water temperatures higher than spring ambient (27°C (80.6°F) and 29°C (84.2°F)), resulted in lower egg production, percent hatch, and larval production. McDonald *et al.* (2006) determined that younger fountain darters (larval and juvenile fish) were more susceptible than adults to mortality from the exotic trematode *Centrocestus formosanus*. McDonald et al. (2007) evaluated the effects of fluctuating temperatures and trematode exposure on fountain darter reproduction. They found that water temperatures greater than 25°C (77.0°F) reduced larval production and water temperatures greater than 26°C (78.8°F) reduced egg production in the fountain darter.

Abundance and Trends

The original population of fountain darters in the Comal River was extirpated (Schenk and Whiteside 1976). The primary cause of extirpation is thought to be the 1956 drought, when springflow ceased for 144 days. Cessation of flow probably caused large temperature fluctuations in residual downstream pools. In 1954, rotenone, a piscicide, was applied to remove non-native and exotic fish from Landa Lake and the Comal River. Although fountain darters were seined and held during rotenone application, the total number of fountain darters was probably reduced since all fountain darters were not caught before application of rotenone (Ball *et al*. 1952, Service 1996). The Comal population was re-established by Prof. Bobby Whiteside of Texas State University – San Marcos (with about 500 individuals from the San Marcos River) in 1975 and 1976, and the species now occupies Landa Lake downstream to the vicinity of the confluence of the Comal and Guadalupe rivers. Linam *et al*. (1993) estimated that the Comal River fountain darter population above Clemens dam was about 168,078 individuals. Clemens Dam is about 394 ft (120 m) upstream of the USGS weir.

The population of fountain darters in the San Marcos River was estimated to be about 103,000 by Schenck and Whiteside (1976). Lee Ann Johnson Linam (1993) estimated the San Marcos River population of fountain darters to be 45,900 downstream of (and excluding) Spring Lake. Fountain darter densities appear to be highest in the upper segments of the river where aquatic plant coverage is high and decrease markedly in the San Marcos River below Cape's Dam (Linam 1993, Whiteside *et al*. 1994).

Recovery Needs

The Executive Summary in the Recovery Plan (Service 1996) lists the actions needed for recovery of subject species, including the fountain darter:

1. Assure sufficient water levels in the Edwards aquifer and flows in Comal and San Marcos Springs to maintain habitat for all life stages of the five listed species and integrity of the ecosystem upon which they depend.
2. Protect water quality.
3. Establish and maintain populations of all five listed species in their historic habitats.
4. Conduct biological studies necessary for successful monitoring, management, and restoration.
5. Encourage partnerships with landowners and agencies to develop and implement conservation strategies.
6. Develop and implement a regional Aquifer Management Plan.
7. Develop and implement local management and restoration plans to address multiple threats.
8. Promote public information and education.

On a regional scale, management of the Edwards aquifer is the responsibility of the Edwards Aquifer Authority (EAA) and the Texas Commission on Environmental Quality (TCEQ). In May 2007, the 80th Session of the Texas Legislature passed Senate Bill (SB) 3 that required the EAA to: (1) raise the total of Edwards aquifer withdrawal permits to 572,000 acre-feet per year; (2) establish new critical period management rules by January 1, 2008, using specified well

levels and Comal/San Marcos springflows as triggers; and (3) develop a recovery implementation program (RIP) for federally-listed threatened and endangered species associated with the Edwards aquifer. SB 3 was signed into law on June 16, 2007, by the Governor of Texas.

The Edwards Aquifer Recovery Implementation Program (EARIP) was initiated in 2007, prior to passage of SB 3. Recovery Implementation Programs are voluntary, multi-stakeholder initiatives that seek to balance water use and development with the recovery of threatened and endangered species. The implementation of an aquifer management plan that significantly influences the magnitude and duration of springflows of Comal and San Marcos springs is considered to be among the most important actions needed.

The cities of New Braunfels and San Marcos could respectively develop and implement a Comal River Management Plan and a San Marcos River Management Plan to address local threats to Edwards aquifer dependent species. Other actions needed include control of certain limiting factors such as non-native species. Significant control of non-native species would help minimize and/or eliminate threats from these species, such as loss or alteration of essential habitat, increased predation, disruption of normal behaviors, or hybridization.

Threats

The Recovery Plan (Service 1996) identifies several local and regional threats to the aquifer and spring systems, and to the threatened and endangered species dependent on these ecosystems, including the fountain darter. The main regional threats are related to the quality and quantity of aquifer and spring water. Cessation of springflows threatens the survival of the fountain darter and other listed aquatic species associated with the Edwards aquifer. Activities that may pollute the Edwards aquifer and its springs and streamflows may also threaten or harm these species.

Significant additional threats also occur on the more local scale and include effects from increased urbanization near the rivers, recreational activities (Breslin 1997), alteration of the rivers (e.g., sediment deposition, dredging, contaminants in stormwater runoff), habitat modification (e.g., dams, bank stabilization, flood control), predation, competition, introduced parasites, and habitat alteration by non-native species (Bowles and Bowles 2001, Service 1996). Problematic non-native species include: suckermouth catfish (family Loricariidae) (Hoover *et al.* 2004), elephant ears (*Colocasia* spp.) (Arsuffi *et al.* 2000), giant ramshorn snails (*Marisa cornuarietis*) (Horne *et al.* 1992), nutria (*Myocastor coypus*) (USGS 1999), and tilapia (*Oreochromis* spp.) (Canonico et al. 2005).

USGS and EAA reports indicate a high water quality for the springflows and aquifer in general. However, there are increasing risks of aquifer, springflow, and streamflow contamination. Pollution threats include:

1. groundwater pollution of the Edwards aquifer from land-based hazardous material spills, leaking underground storage tanks, and firefighting on, or near, the recharge zone;
2. cumulative effects of urbanization (e.g., road runoff, leaking sewer lines, residential pesticide, and fertilizer use);

3. increased effect of contaminants due to decreased dilution from smaller volumes of water in the aquifer and springflows; and,
4. surface, stormwater, and point and nonpoint source discharges into the streamflows.

In 2007, part of the Edwards aquifer in Bexar County was placed on the National Priority (Superfund) List by the U.S. Environmental Protection Agency (EPA). A TCEQ investigation identified the presence within the Edwards aquifer of tetrachloroethene (PCE) and trichloroethene (TCE) in concentrations above the EPA's Safe Drinking Water Maximum Contaminant Level (MCL) of 5.0 parts per billion (ppb). Contaminated water wells are currently being treated with carbon filtration.

Although the aquifer is generally not contaminated to such an extent that it exceeds Federal drinking water standards, certain contaminants have been found at greater frequency in the aquifer in recent years. Many of the threats to aquifer water quality by urbanization also threaten spring-based streamflows. Runoff from streets, highways, and commercial and residential landscapes, and potential spills of hazardous materials (above and below ground) pose the greatest risks to streamflow quality. Ockerman *et al*. (1999) characterized stormwater runoff in the Edwards aquifer recharge zone in Bexar County for selected watersheds. They found that land use and percent impervious cover in a watershed were factors in mass yield of contaminants such as lead, zinc, copper, and chromium. Ogden *et al*. (1986) investigated stormwater runoff water quality including nutrients and fecal coliform bacteria. They found that fecal group bacteria increased in the San Marcos River after precipitation events. The recharge zone for the Edwards aquifer in Bexar County presents multiple opportunities for contaminants to enter the flow path to Comal Springs. In March 2009, Elm Waterhole Cave received about 15,000 gallons (56.8 m^3) of untreated sewage from a failed sewage pipeline. This Edwards aquifer recharge feature is about 18 miles (29 km) west-southwest of Comal Springs.

A serious parasite threat to the fountain darter has been documented by Salmon (2000), Mitchell *et al*. (2000), Cantu (2003), Mitchell *et al*. (2005), and McDonald *et al*. (2006). Their research shows that the exotic trematode *Centrocestus formosanus* is attacking fountain darters in the Comal and San Marcos river systems. Since 1996, virtually every fountain darter collected in the Comal system has been found with this trematode encysted in its gill cartilage and lamellae. To date, the San Marcos system has not seen the same widespread presence of this trematode, with less than 5 percent parasitism rate noted among fountain darters examined. However, a serious threat is presented by the potential movement of green herons (*Butorides virescens*) infected with the trematode to Spring Lake (or elsewhere in the San Marcos River headwaters) where the presence of: (1) intermediate snail hosts (red-rimmed melania, *Melanoides tuberculatus*), (2) intermediate fish hosts (sunfish, *Lepomis* spp. and black bass, *Micropterus* spp.), and (3) definitive bird hosts will enable its establishment. The risks posed by these parasites will likely increase during stressful periods of low spring discharge (Cantu 2003) and parasite effects may be greater to younger fountain darter life-stages (McDonald *et al*. 2006).

III. Environmental Baseline

Historical Hydrology of the Edwards Aquifer (Balcones Fault Zone), Comal Springs, and Comal River

The Edwards aquifer is a large carbonate aquifer found in south central Texas (Maclay and Land 1988) and currently provides drinking water to more than 1.7 million people in the San Antonio region (EAA 2008; http://www.edwardsaquifer.org). Reference to the Edwards aquifer herein refers to the aquifer in the San Antonio region (Balcones Fault Zone) that reaches from Kinney County in the west to the vicinity of Kyle in Hays County in the northeast. Lindgren *et al.* (2004) provided a review of hydrology and new model that simulates levels in the Edwards aquifer and Comal Springs discharge.

<u>Comal Springs Hydrology</u>

Springflow at Comal Springs is part of a regional system and its discharge rates are inseparably tied to water usage from the southern (San Antonio) segment of the Edwards aquifer. The discharge of groundwater from wells in the aquifer decreases the flow of water from the springs. Generally, total withdrawal from the aquifer has increased since 1934 when total well discharge was 101,900 acre-feet and it reached a maximum of about 542,400 acre-feet in 1989.

Population growth is anticipated for counties depending on the southern segment of the Edwards aquifer. The likelihood of insufficient springflow regime at Comal and San Marcos springs will increase if water from the Edwards aquifer is used to meet new water demands. Land use changes (urbanization) associated with growth in the recharge and contributing zones could adversely affect the water quality of runoff and recharge.

Precipitation in the Edwards aquifer contributing and recharge zones varies from an annual mean 22 inches in the west to 35 inches in the east (Edwards Aquifer Authority 2008).

A number of studies have modeled aquifer levels and springflows at Comal and San Marcos springs (Klemt *et al.* 1979, Thorkildsen and McElhaney 1992, Wanakule 1988, Wanakule 1990, Wanakule and Anaya 1993, Kabir *et al*. 1999, and LBG-Guyton Associates 2000). Thorkildsen and McElhaney (1992) made further refinements to the model of record at the time, GWSIM-IV. The most recent generation of models was initially developed by the USGS using MODFLOW-2000 (Lindgren *et al*. 2004). The San Marcos springflows simulated by Lindgren *et al.* compared favorably to output from the GWSIM-IV model (Thorkildsen and McElhaney 1992) for the periods 1947-59 and 1978-89.

Loáiciga *et al*. (2000) used GWSIM-IV and the lumped-parameter model from Wanakule and Anaya (1993) to investigate the effects of climate-change scenarios on the Edwards aquifer. Two climate scenarios were simulated with a general circulation model developed by the National Aeronautics and Space Administration: (a) climatic conditions consistent with atmospheric carbon dioxide (CO_2) in the reference year 1990 and (b) climatic conditions with twice the 1990 levels of CO_2. Each scenario had estimates of precipitation, streamflow, temperature, and Edwards aquifer recharge. The simulations used groundwater pumping levels varying from none to 636,000 acre-feet per year. The authors cautioned that climate conditions

with 2 × CO_2 will: (1) intensify water shortages, (2) increase groundwater pumping (e.g., 440,000 to 550,000 acre-feet per year), and (3) result in significantly decreased springflows.

As part of a February 1, 1993, Judgement (as amended on May 26, 1993) in the case of Sierra Club vs. Secretary of the Interior (No. MO-91–CA-069, U.S. Dist. Ct., W.D. Texas), the Service used its best professional judgement and available information to determine minimum springflows needed to prevent take, jeopardy, or adverse modification to critical habitat of listed species. Determinations of take and jeopardy vary from species to species depending on each species' unique requirements, ecology, and life-history. In addition, factors associated with the specific action such as magnitude, timing, duration, frequency, and extent also affect a specific take or jeopardy determination. Table 1 contains the Service's determination of minimum springflows necessary to prevent take, jeopardy, or adverse modification of critical habitat for the Edwards aquifer dependent endangered and threatened species (the specifics are contained in our letters dated April 28, 1993, and June 25, 1993). These analyses will be updated as part of the Edwards Aquifer Recovery Implementation Program process, particularly in review of any habitat conservation plan proposing management for the Edwards aquifer.

Water Quality of the Comal Springs and Comal River

Fahlquist and Slattery (1997) summarized water quality in the Comal River. The springflows are described as among the most pristine in Texas and are similar in water quality to San Marcos Springs (Slattery and Fahlquist 1997). Water produced by the springs has concentrations of ions characteristic of limestone aquifers.

Data gathered by the USGS in 1993 and 1994 show that Comal and San Marcos springs had little natural variation in water quality. Their data show that parameters like temperature, specific conductivity, total dissolved solids, and major ions generally vary less than 10 percent and usually less than 5 percent from the mean. Groeger *et al*. (1997) found that temperature near the springs was close to the findings of Hannan and Dorris (1970).

Factors Affecting Species Environment Within the Action Area

The action area is based on consideration of all direct and indirect effects of the proposed agency action [50 CFR 402.02 and 402.14(h)(2)]. The Service considers the action area for this project to be the Comal River from Clemens Dam downstream to the confluence with the Guadalupe River (Figure 3). The pipeline encasement will involve pumping concrete into the Comal River and result in some turbidity in the river downstream. Turbidity is expected even though efforts will be made to reduce water flowing over the eroded areas near the pipe.

Factors affecting the fountain darter in the action area include, but are not limited to water withdrawals from the Edwards aquifer, pollution in stormwater, water recreation, sparse plant cover, and effects from non-native species.

IV. Effects of the Action

This section includes an analysis of the direct and indirect effects of the proposed action on the species and its interrelated and interdependent activities.

Factors to be considered
The river stage (water surface elevation) in the project area is largely determined by Comal Springs discharge, runoff from tributaries upstream, and the backwater from the notched (Camp Warnecke) weir on the Comal River between San Antonio Street and Garden-Lincoln Street. The daily mean Comal River discharge is currently about 260 cubic feet per second (CFS) (USGS provisional data). River stage is a major determinant of fountain darters habitat in any given section of the river.

The project is estimated to take less than two weeks. We expect work will begin within 60 days of finalization of this biological opinion (conclusion of formal consultation). Work in the river (project initiation) is also contingent on authorization from the Corps under section 404 of the Clean Water Act.

Analyses for effects of the action
The following analyses are based on the extent of various effects of the action and the densities of fountain darters in the Comal River between the USGS gauge weir and the Camp Warnecke notched weir. Densities are based on best available information, including Service research on the fountain darter, research by BIO-WEST, Inc. (2007, 2009), and the limited coverage of macrophytes (few aquatic plants in the area) at and near the project.

<u>Effects to the fountain darter</u>
Fountain darters may be harmed, injured, and killed in several ways during the erosion repairs: (1) fountain darters may hide in the gravel and cobble near the water pipeline that would preclude capture with nets; (2) water quality effects such as construction related turbidity, although temporary, would likely impair fountain darter feeding; and (3) the habitat along the sides of the pipeline created by erosion will be replaced with a concrete cap, resulting in a reduction in habitat.

Bell (1986) described avoidance "as a reluctance or refusal of fish to move from one place or situation to another." Fish may not recognize areas as dangerous and may enter and remain in a location "whether good or bad" (Bell 1986). Fountain darters observed while snorkeling appear generally to move less than three meters before stopping. Fountain darters in the work area may or may not leave the area when it is filled with concrete. If the area is occupied by fountain darters, some will likely remain among the gravel and cobble near the pipe and die.

Turbidity would interfere with fountain darter feeding since they are known to select microcrustacean prey based on visual cues. Feeding would be interrupted as long as turbidity interfered with visual cues. Additionally, fish are known to swim into silty and turbid areas. Once in turbid areas, fish may remain until turbidity subsides. Turbidity resulting from concrete encasement is not expected to be significant in the area affected or long in duration. In the Comal River, flow would be expected to dissipate turbidity within several hours.

<u>Fountain Darter Incidental Take</u>
We estimate that about 80 feet^2 (7.4 m^2) of marginally suitable fountain darter habitat will be destroyed as a result of the proposed concrete fill along the pipeline. This area has no rooted

aquatic plants. However, liverwort (*Riccia fluitans*) and other plants may be caught among the substrate and woody debris in the eroded area. We estimate this kind of habitat in the Comal River to have fountain darter density of 0.1 individuals per meter square. We estimate the area to be filled with concrete will result in take (in the form of death) of about 7 fountain darters (7.4 m^2 x 0.1 individuals per m^2).

Fountain darter density may vary greatly over small spatial domains. Effectively, fountain darters have a clumped distribution and appear to have highest densities in nursery and prey-rich microhabitats. Although not anticipated based on available data for the proposed project area, it is possible that our density value (used in evaluating take) will underestimate the number of fountain darters covered by the concrete encasement. If, for example, there are mosses such as *Riccia* sp. undetected beneath the water main or in nearby areas, the number of fountain darters may be more than twice that estimated to be taken. We assume 100 percent of fountain darters trapped by concrete will be killed by construction efforts.

Turbidity may increase during the pouring of concrete. The feeding behavior for an unknown number of fountain darters downstream may be hindered temporarily by the proposed project.

We anticipate that very few if any fountain darters will recolonize the area above the pipeline when the proposed project is finished. The encased water main will lack cover from predators and focal (nose) water velocities will likely exceed the range suitable for and preferred by fountain darters. However, the water main will eventually need to be replaced. When NBU designs the pipeline replacement, we recommend using methods that avoid disturbance of the river bed, such as supporting the main on or near San Antonio Street bridge. When the water main with this project is no longer needed, we recommend restoring natural substrates in the project area.

Effects Summary

The number of fountain darters potentially affected by the project represents less than one percent of the Comal River population downstream of the USGS gauge weir. We estimate that seven fountain darters may be incidentally taken during construction. About 7.4 m^2 of marginal aquatic habitat will be degraded as concrete substrate is less suitable fountain darter habitat compared to gravels and cobble.

V. Cumulative Effects

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

One important project expected to be studied, funded, and built in the next decade is a highway project encircling New Braunfels called the outer loop. The significance to the fountain darter and its conservation is that about 22,873 acres (9,256 hectares) of the New Braunfels Outer Loop

study area is over the Edwards aquifer recharge zone. Surface water quality and karst aquifer groundwater quality are inextricably linked (Alley *et al*. 1999). The vulnerability for groundwater contamination is heightened in parts of the Edwards aquifer recharge zone where faults and sinkholes occur (Clark 2000, Clark 2003). The Outer Loop project may be partially or fully analyzed under a separate consultation under section 7 of the Act.

The Recovery Plan for the fountain darter (and other species) (Service 1996) discusses the various regional and local threats to these species. Overpumping from the Edwards aquifer remains one of the most significant regional threats. Given current aquifer conditions, we believe that the Comal springs discharge is not likely to fall below our springflow determinations for the late Judge Lucius Bunton (Table 1) during the next six months. Comal Springs discharge currently is 261 ft^3/sec (7.39 m^3/sec), which is below the long-term mean of 290 ft^3/sec (8.21 m^3/sec) for the period November, 1932 through September, 2006. We expect Comal springflows will be adequate to maintain habitats during the project assuming the water main is encased before July 1, 2009.

Habitat conservation planning is progressing on regional (EARIP) and local (Comal County) fronts. The EARIP is pursuing a section 10(a)(1)(B) permit for impacts to threatened and endangered Edwards aquifer dependent species resultant from its management of wells producing Edwards aquifer water in the region. SB 3 directs the EAA, TCEQ, Texas Department of Agriculture, Texas Parks and Wildlife Department (TPWD), and Texas Water Development Board to develop program documents that may be used in support of a section 10(a)(1)(B) permit. The City of San Marcos and Texas State University – San Marcos have submitted a draft Habitat Conservation Plan for certain activities in the upper San Marcos River.

VI. Conclusion

After reviewing the current status of the fountain darter, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the measures to stop further erosion along the water pipeline in the Comal River is not likely to jeopardize the continued existence of this species. This is based on the limited extent of the project effects relative to the areas currently occupied by the fountain darter.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any authorization issued to the applicant (NBU), as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement.

If the Corps: (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the effect of incidental take, the Corps must report the progress of the action and its effect on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take Anticipated

The Service anticipates that no more than 7 fountain darters will be incidentally taken during encasement of the NBU water main in the Comal River.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the effects of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Effect of the take

In the accompanying biological opinion, we have determined that the level of anticipated take is not likely to result in jeopardy to the species because the expected number of fountain darters adversely affected by the project represents less than 1 percent of the Comal River population. The length of the Comal River considered part of the action area is 6,562 ft (2,000 m). That length represents about 25 percent of the occupied habitat in the Landa Lake – Comal River system. However, most of the action area is expected to only briefly be impacted by turbidity from the project and no fountain darter mortalities are expected outside the immediate area of concrete work.

REASONABLE AND PRUDENT MEASURES

Pursuant to section 7(b)(4) of the Act, we believe the following reasonable and prudent measures (RPM) are necessary and appropriate to minimize effects of incidental take on fountain darters.

1. Spatial and temporal disturbance of the (a) substrates, (b) water quality, (c) plants, and (d) animals of the Comal River due to construction shall be avoided when possible and reduced to the maximum extent practicable where disturbance is unavoidable.

2. The applicant shall coordinate with the Corps and Service on all site work.

Terms and conditions

To be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements. The applicant shall be responsible for complying with these terms and conditions, which are non-discretionary.

Terms and conditions that implement RPM # 1:

a. Work will be actively monitored by the applicant (NBU), to ensure that actions taken on-site are consistent with approved plans and this biological opinion.
b. The applicant will ensure: (a) equipment will be readied and mobilized to minimize the duration of disturbance, and (b) equipment will be demobilized if a precipitation event and runoff is likely to flood the area.
c. Work by the applicant and its contractor shall be done with careful staging of heavy equipment by the river and inspections are required for leakage of fuels, hydraulic fluids, coolants, and any other fluids. If fluid leakage is detected, equipment must be repaired and cleaned prior to working in or along the river.
d. Fountain darters captured near the pipeline will be removed and released in a manner that avoids predation by larger fish. Fountain darters shall be released with aquarium nets near plant cover downstream in the Comal River. Persons involved in these efforts should have proper equipment and authorizations/permits from the Service (section 10(a)(1)(A) research/recovery permit) and TPWD (Scientific Permit pursuant to Texas Parks and Wildlife Code Chapter 43, subchapter C).
e. Aquatic habitat near the water pipeline will be swept with small dipnets to salvage fountain darters immediately prior to concrete filling (within two hours of pouring concrete). The amount of time that netted fountain darters are out of the water must be kept to a minimum. Fountain darters will be released immediately in submerged plants as described above. Persons involved in these efforts should have proper equipment and authorizations/permits from the Service and TPWD.
f. Turbidity will be visually monitored daily during construction.

Terms and conditions that implement RPM # 2:

g. The applicant shall contact the Corps and the Service's Austin Ecological Services Field Office at: (a) the beginning of work, (b) the end of work, and (c) within 24 hours of any notable or unforeseen event that may affect the aquatic community in a manner not considered in this biological opinion. An example of a notable event would be flooding. Contact with the Service can be made through facsimile (512/490-0094) and/or e-mail (Patrick_Connor@fws.gov). Similarly, if it is deemed necessary to disturb aquatic

habitats in a manner not described in the project description, the applicant will contact the Corps and Service prior to any ground disturbing activities and receive approval of the project modification prior to commencement. In addition, the applicant shall provide a one-page summary report of construction activities to the Corps and Service no later than 30 days after construction is complete.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We provide the following conservation recommendations:

1. Restore native macrophytes in the Comal River.
2. Provide permanent signage near the USGS weir to inform recreationists not to disturb aquatic plants in the Comal River.
3. Implement tasks to support fountain darter recovery in the current Recovery Plan.

Regarding conservation recommendation No. 1, the opportunity to support restoration of native aquatic plants in the Comal River (including Landa Lake) may be afforded: (1) joining efforts by the Edwards Aquifer Recovery Implementation Plan, (2) development of an Aquatic Ecosystem Restoration project for the Comal River under section 206 of the Clean Water Act, or (3) coordination with the Service, City of New Braunfels' Parks and Recreation Department, New Braunfels Utilities, and others in the development and implementation of a Comal River restoration plan. Regarding preparation of signs, we would appreciate the opportunity to review the specific text of signage. We request notification of the implementation of any conservation recommendations that minimize or avoid adverse effects or benefit the fountain darter or its habitats.

Reinitiation Notice

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. If the final action to be carried out differs from the proposed action, the Corps shall communicate with the Service to be sure the anticipated effects to the fountain darter and amount of take are not exceeded. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions about this biological opinion for the proposed encasement of the water pipeline crossing the Comal River, please contact Patrick Connor at (512) 490-0057, extension 227. Thank you for your interest in conserving our Nation's natural resources.

Sincerely,

/s/

Adam Zerrenner
Field Supervisor

Enclosures

cc: Neil Lebsock, Corps, Fort Worth District

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TABLE 1.

Federally Listed Threatened and Endangered Species	Spring – System Case	Take of Animal Species and Damage to & Destruction of Plant Species Springflow Determination Cubic Feet per Second	Appreciable Reduction of Survival & Recovery Springflow Determination Cubic Feet per Second	Adverse Modification of Critical Habitat Springflow Determination Cubic Feet per Second
Texas Wild-Rice	San Marcos ❷	100	100	100
Texas Wild-Rice	San Marcos ❷ ≈		< 100 ⏲	< 100
Fountain Darter	Comal ❶	200		n a
Fountain Darter	Comal ❶ ◘	150		n a
Fountain Darter	Comal ❷		150 ⏲	n a
Fountain Darter	Comal ❷ ◘		60 ⏲	n a
Fountain Darter	San Marcos ❷	100	100	100
Fountain Darter	San Marcos ❷		< 100 ⏲	< 100 ⏲
San Marcos Gambusia	San Marcos ❶	100		
San Marcos Gambusia	San Marcos ❷		100 ⏲	100 ⏲
San Marcos Gambusia	San Marcos ❷ ≈		< 100	< 100
Texas Blind Salamander	Edwards Aquifer ❶	50 ●		n a
Texas Blind Salamander	Edwards Aquifer ❷		50 ●	n a
San Marcos Salamander	San Marcos ❶	60		
San Marcos Salamander	San Marcos ❷		60	60

❶ 15 April 1993 Letter

❷ 15 June 1993 Letter

◘ With Control of snail *Marisa*

⏲ For Short (Undefined) Periods of Time

≈ With Edwards Aquifer Management Plan & Control of Exotics

Notes: (1) These springflow determinations are taken from two letters from 1993 and based on conditions at that time; & (2) These determinations predate the Federal listing of the Comal Springs riffle beetle, Comal Springs dryopid beetle, and Peck's cave amphipod as endangered species.

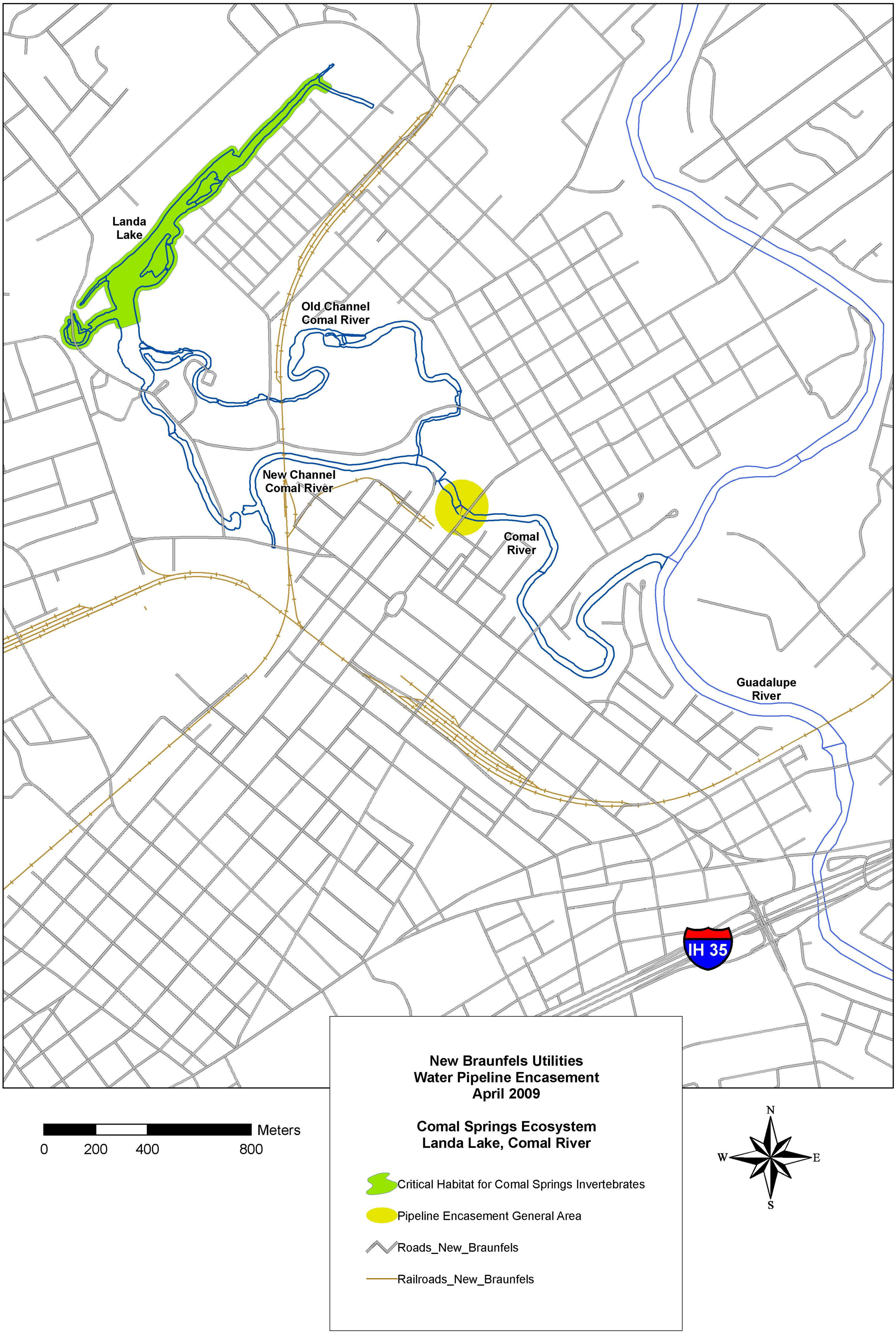
Annotated Table of U.S. Fish and Wildlife Service's Springflow Determinations for Judge Lucius Bunton, U.S. District Court for Western District of Texas, in Sierra Club et al. v. Lujan et al. (MO-91-CA-069)

Appendix A.

Abbreviations and Acronyms

Carbon Dioxide	CO_2
Centigrade	C
Code of Federal Regulations	CFR
Cubic Feet	ft^3
Cubic Feet per Second	ft^3/sec
Cubic Meters	m^3
Cubic Meters per Second	m^3/sec
Edwards Aquifer Authority	EAA
Edwards Aquifer Recovery Implementation Program	EARIP
Endangered Species Act of 1973 as amended	Act
Federal Emergency Management Agency	FEMA
Feet	ft
Groundwater Simulation Program	GWSIM
Kilometer	km
LBG	Leggette, Brashears, & Graham, Inc.
Maximum Contaminant Level	MCL
Meters	m
Millimeters	mm
MODFLOW	Modular three-dimensional finite-difference ground-water flow model
New Braunfels Utilities	NBU
Parts Per Billion	ppb
Reasonable and Prudent Measures	RPM
Recovery Implementation Program	RIP
Senate Bill	SB
Specific Name	sp.
Specific Name (plural)	spp.
Square Feet	ft^2
Square Meters	m^2
Tetrachlorethene	PCE
Texas Commission for Environmental Quality	TCEQ
Texas Parks and Wildlife Department	TPWD
Trichloroethene	TCE
U.S. Army Corps of Engineers	Corps
U.S. Code	U.S.C.
U.S. Fish and Wildlife Service	Service
U.S. Geological Survey	USGS

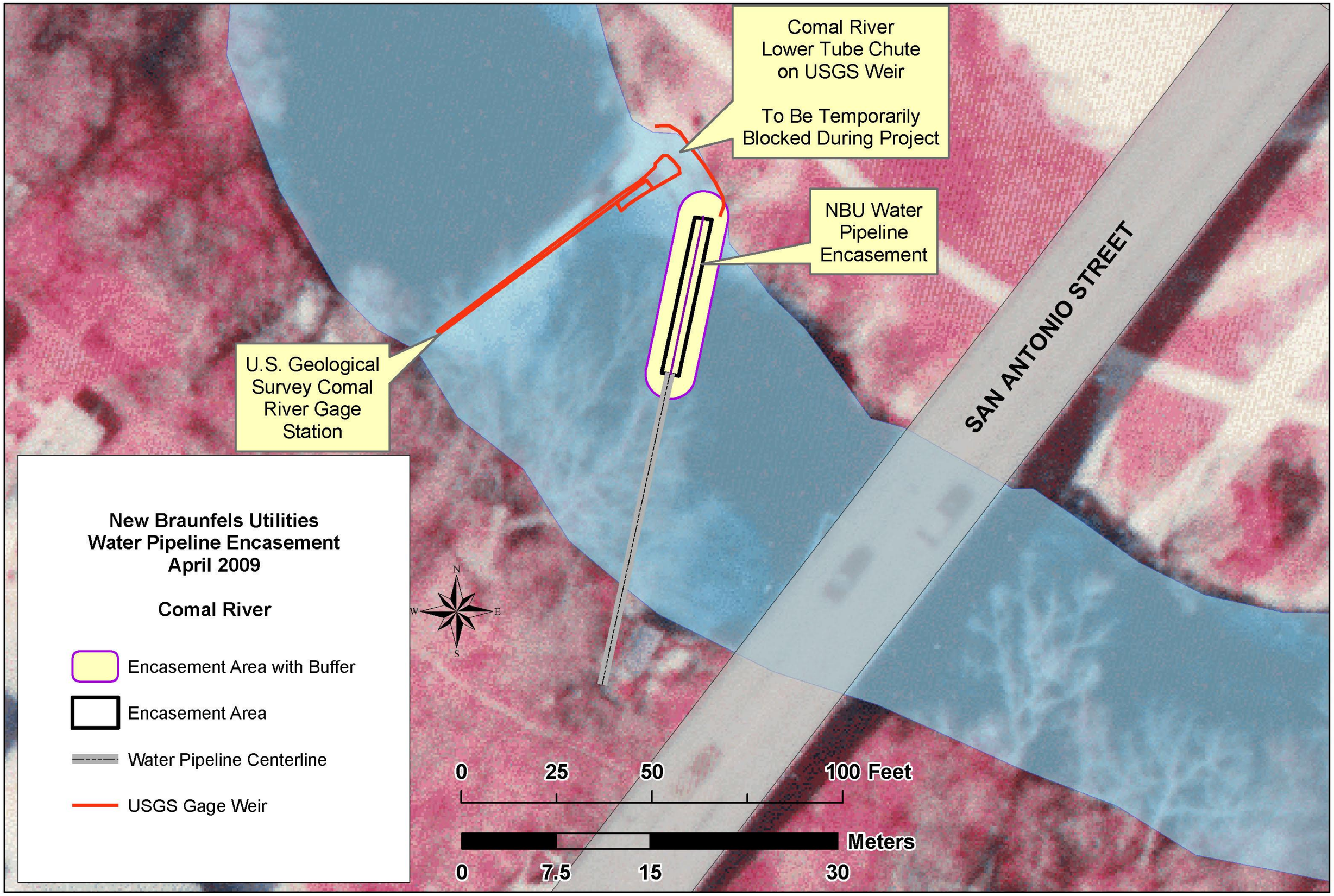
Figure 1.



New Braunfels Utilities
Water Pipeline Encasement
April 2009

Comal Springs Ecosystem
Landa Lake, Comal River

Figure 2.


Comal River
Lower Tube Chute
on USGS Weir
To Be Temporarily
Blocked During Project
NBU Water
Pipeline
Encasement
SAN ANTONIO STREET
U.S. Geological
Survey Comal
River Gage
Station
New Braunfels Utilities
Water Pipeline Encasement
April 2009
Comal River
Encasement Area with Buffer
Encasement Area
Water Pipeline Centerline
USGS Gage Weir
N
W
E
S
0
25
50
100 Feet
Meters
0
7.5
15
30

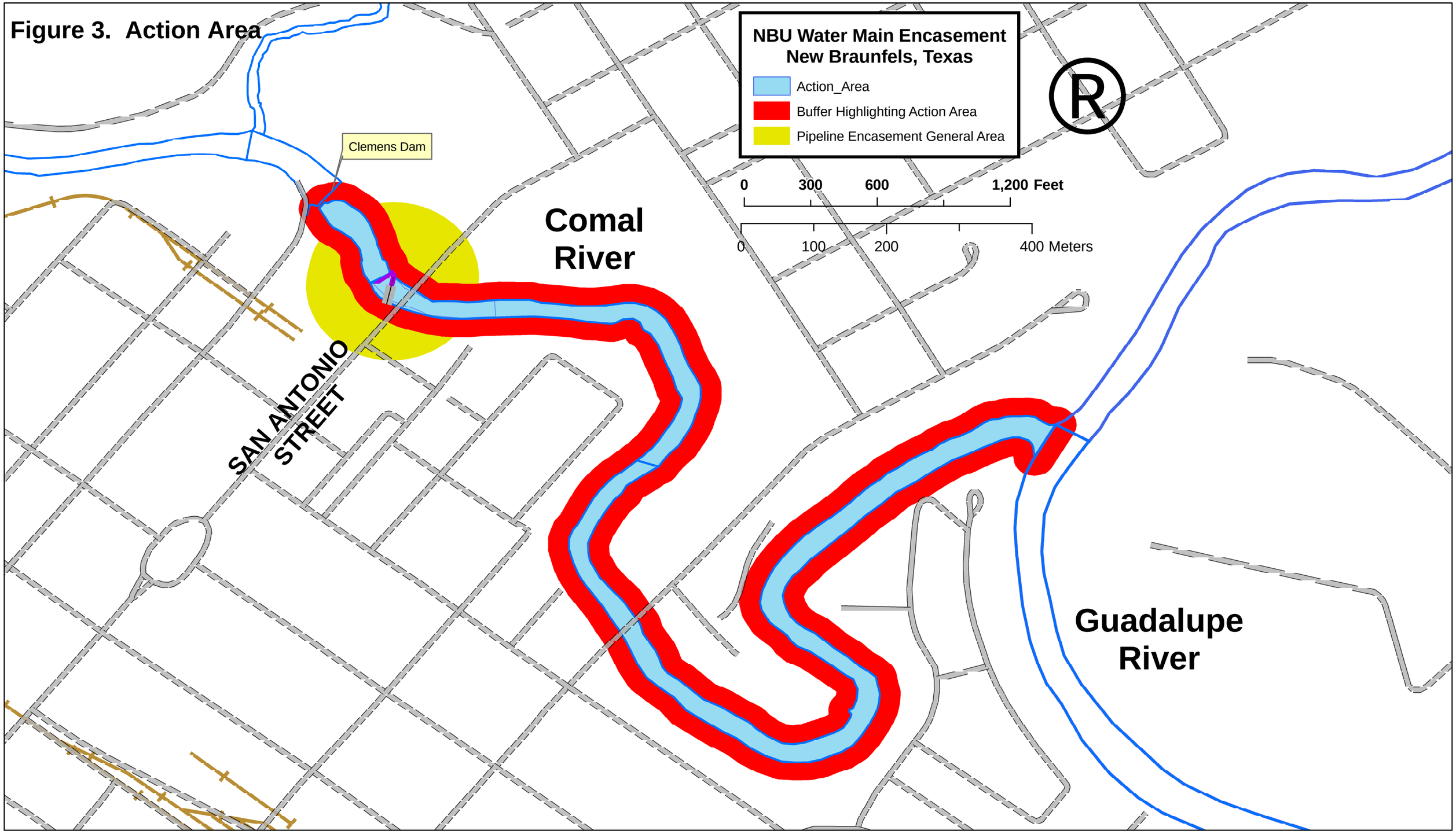


Figure 3. Action Area
NBU Water Main Encasement
New Braunfels, Texas
Action_Area
Buffer Highlighting Action Area
Pipeline Encasement General Area
0
300
600
1,200 Feet
0
100
200
400 Meters
Clemens Dam
Comal River
SAN ANTONIO STREET
Guadalupe River