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OCT 18 2012

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SWF-2012-00180
Consultation No. 02ETAU00-2012-F-0238

Dear Mr. Brooks:

This transmits the U.S. Fish and Wildlife Service's (Service) final biological opinion for the U.S. Army Corps of Engineers (USACE) proposed authorization under section 404 of the Clean Water Act (CWA)(33 U.S.C. 1251 – 1376) for structural repairs to the Gazebo Circle Bridge in Landa Park, New Braunfels, Comal County, Texas. The USACE is proposing authorization of bridge repairs entailing fill in the Comal River under a CWA Nationwide Permit. The proposed repair work in the Comal River (Spring Run 2) will involve placement of grout and riprap rock in a scour hole beneath the bridge's western abutment.

The City of New Braunfels Parks and Recreation Department (City) proposes to: (1) make structural repairs to the Gazebo Circle Bridge over Comal Springs Spring Run 2; and (2) remove four concrete footings from two pedestrian bridges nearby in Landa Lake. In accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act), the USACE has determined this project may affect four listed endangered species: Peck's cave amphipod (*Stygobromus comalensis*), Comal Springs dryopid beetle (*Stygoparnus comalensis*), Comal Springs riffle beetle (*Heterelmis comalensis*), and fountain darter (*Etheostoma fonticola*). In addition, the USACE has determined the project may affect federally designated critical habitat of Peck's cave amphipod, Comal Springs dryopid beetle, and Comal Springs riffle beetle.

The USACE is the Federal agency authorizing this project. The USACE has provided a biological evaluation (BE) of the project prepared by the City in a May 17, 2012, e-mail. This biological opinion is based on information from: (1) the BE, (2) information from the USACE and the City, (3) field investigations by the Service, and (4) other sources of information. A complete administrative record of this consultation is on file at our office.

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Consultation History

April 11, 2012	Service received a set of drawings from the City showing the repair plans.
May 17, 2012	Biological Evaluation transmitted by e-mail from USACE to Service.
May 31, 2012	Service receives USACE request for formal consultation. Service acknowledges request and initiation of formal consultation.
July 20, 2012	The City provides information on proposed removal of footings for two pedestrian bridges nearby.
October 4, 2012	Service sent draft biological opinion to USACE.
October 16. 2012	USACE provides comments on the draft biological opinion.

BIOLOGICAL OPINION

The BE lists 18 species considered threatened or endangered by the Service and/or the State of Texas in reviewing the Gazebo Circle Bridge repair project. However, the only federally listed species known to occur in the Comal Springs ecosystem near the three bridges in the project are the four species that the USACE determined may be affected by the project (Comal Springs riffle beetle, Comal Springs dryopid beetle, Peck's cave amphipod, and fountain darter). Table 1 in the BE included a column regarding the presence of the 18 species and their respective habitat in the study area. Contrary to the information in Table 1 of the BE, Peck's cave amphipods, Comal Springs dryopid beetles, and their respective habitat are known from the study area. The BE list included the Texas blind salamander. The Service is reviewing information that may result in a revision of the recognized range of the Texas blind salamander, *Eurycea* (= *Typhlomolge*) *rathbuni,* to include springs and wells associated with the Edward aquifer in Comal County, including Panther Canyon Well and Comal Springs. However, since that review is incomplete, this biological opinion will only address the Peck's cave amphipod, Comal Springs dryopid beetle, Comal Springs riffle beetle (collectively, the Comal Springs invertebrates), their respectively designated critical habitats (CH), and the fountain darter. The fountain darter does not have designated CH in the Comal Springs system.

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification of critical habitat" at 50 CFR 402.02. Instead, we have relied on the statutory provisions of the Endangered Species Act to complete the following analysis with respect to critical habitat.

I. Description of Proposed Action

The City proposes to repair the western abutment of Gazebo Circle Bridge by: (1) using temporary abutment supports, (2) installing four support piers beneath the abutment and wingwalls, (3) filling the scour hole with grout (exposed face to be formed), and (4) placing rock riprap near each wingwall. Figure 1 shows an overview of the Gazebo Circle Bridge project area. The work area will be dewatered with two temporary dams (sandbag walls with a 6 to 8 mil (mil = 0.001 in) polypropylene liner) to manage water upstream and downstream of the bridge and a water pump. The work area will be dewatered at least four weeks, but probably no more than six weeks. Four new support piers (two for abutment and two for wingwalls) would be constructed with reinforced concrete in permanent casings formed in 2 ft diameter boreholes drilled to an estimated 35 to 55 ft below the bridge pavement (Halff Associates, Inc. Sheet 3.3). The City has provided the following elevations (in ft above mean sea level) for features of interest: (a) roadway pavement of Gazebo Circle Bridge, 629.5 ft; (b) lowest point in scour hole beneath western abutment, 617.0 ft; and (c) bottom of new boreholes and piers, 574.5 to 594.5 ft, depending on where load bearing stratum is hit. Water from inside the temporary dams would be pumped to a 2,500 gallon tank and water from upstream of the bridge would bypass the construction area through temporary plastic pipes (1 to 1.5 ft diameter) along the eastern abutment of the bridge (i.e., left bank of Spring Run 2 looking downstream)(Figure 2). The bypass pipes are designed to handle a discharge of up to 10 cubic feet per second (CFS), which is more than twice the average springflow from upper Spring Run 2.

The sequence of construction for the Gazebo Circle Bridge repair is presented in four phases:

Phase 1. Install temporary shoring beneath abutment and bridge deck, then dewater the area for construction access.

Phase 2. Install piers and pier caps beneath western abutment and wingwalls.

Phase 3. After concrete for piers and pier caps has cured 14 days (minimum), remove temporary shoring beneath abutments and install formwork and fill scour hole with grout. Exposed face of grout shall be formed.

Phase 4. After grout beneath abutment and wingwalls has cured a minimum of 7 days, remove formwork and install riprap and remove temporary shoring beneath bridge deck.

More construction details are available in the documents prepared by M2 Federal, Inc. and Halff Associates.

In addition to repairing the Gazebo Circle Bridge, the City proposes to remove the footings of two pedestrian bridges in Landa Park (Bridges 1 and 2). The City has indicated that Bridge 1 footings (piers) would be removed by lifting the footings with either a crane or a manual fulcrum device. The crane or fulcrum would be placed on the river bank and not in aquatic habitat. Bridge 2 footings would be removed with a crane. The removal of the footings for both Bridge 1 and 2 is expected to take less than two weeks.

Description of the Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion, the action area includes: (1) Landa Park within 200 m of the Gazebo Circle Bridge, (2) aquatic habitats in Landa Lake downstream of Pecan Island (the downstream boundary of Landa Lake is Landa Park Boulevard Bridge), (3) critical habitat of the Comal Springs invertebrates downstream of Pecan Island, and (4) roads and bridges in Landa Park used to transport materials and equipment for the project. The action area is shown in Figure 3 with the aquatic and non-aquatic areas highlighted.

II. Status of the Species and Critical Habitat

Regarding the Settlement Agreement on Critical Habitat of the Comal Springs Invertebrates
On July 17, 2007, the Center for Biological Diversity, Citizens Alliance for Smart Expansion, and Aquifer Guardians in Urban Areas provided the Service with a 60-day notice of intent to sue on the final critical habitat rule for Peck's cave amphipod, Comal Springs dryopid beetle, Comal Springs riffle beetle, and other listed invertebrate species. On January 14, 2009, the plaintiffs filed suit in U.S. District Court for the Western District of Texas on issues related to sections 3(5)(A) and 4(b)(2) of the Act. On December 18, 2009, the parties filed a settlement agreement where the Service agreed to submit to the *Federal Register*: (1) a revised proposed rule for designation of critical habitat for the Comal Springs invertebrates on or before October 17, 2012, and (2) a final rule for critical habitat on or before October 13, 2013. The currently designated critical habitat will be used until any subsequent final rule (that may revise critical habitat) becomes effective.

A. Peck's Cave Amphipod

Species Description and Life History
Peck's cave amphipod was listed as endangered on December 18, 1997 (Service 1997). Critical habitat units were designated at Comal and Hueco springs in Comal County, Texas on July 17, 2007 (Service 2007).

This small subterranean aquatic species was first collected by Peck in 1964 at Comal Springs. Peck's cave amphipod has adaptions typical of cave-dwelling fauna. It is eyeless and unpigmented. Subterranean amphipods may feed on fragments of dead vegetation and biofilm on submerged surfaces (Pennak 1989) and available evidence suggests Peck's cave amphipod is an omnivore. In the Edwards aquifer, it may act as a scavenger and a detritovore. Little is known about Peck's cave amphipod reproduction and life span in the wild. Limited and intermittent reproduction has occurred with captive stock in aquaria at the San Marcos National Fish Hatchery and Technology Center.

The Peck's cave amphipod occurs in both aquifer habitats (at depths greater than 60 ft below the surface) and alluvial spring runs. However, it also occurs among substrates in surface water near springs as well as in groundwater. Groundwater food webs lack light energy and rely on the transport of resources from the surface. Tree roots may grow in groundwater-filled voids near

springs and tree roots have been shown to support a diverse groundwater fauna (Jasinska et al. 1996). Gibson et al. (2008) found Peck's cave amphipod in gravel, rocks, and organic debris (leaves, roots, wood) immediately inside of or adjacent to springs, seeps and upwellings of Comal Springs and their impoundment, Landa Lake.

Historic and Current Distribution
The species is known primarily from Comal Springs. Comal Springs is the largest spring system in Texas and most of the recharge occurs at great distances from the springs. A few specimens have been collected from Panther Canyon Well (in Landa Park) and Hueco Springs. The current distribution is similar to 1997, when it was listed. The only extension of its range since 1997 is Panther Canyon Well, which is about 105 m from the head of Spring Run 2 (Comal Springs). The lack of specimens from a survey of 22 other wells (Barr 1993) suggests that this species may be confined to the groundwater conduits in the vicinity of spring openings as opposed to generally inhabiting the aquifer at large.

Gibson et al. (2008) found the rate of Peck's cave amphipods caught at Comal Springs (9.2 individuals per day) to be similar to the results (9.6 per day) of Barr (1993). The rate of Peck's cave amphipods captured by Gibson ranged from 0.2 per day to 9.6 per day. In 2010, Gibson found three Peck's cave amphipods at a site just downstream from the wading pool on Spring Run 2. He also found one Peck's cave amphipod on the right bank (looking downstream) of Spring Run 3 less than 6 m from the Landa Park gazebo. Gibson has also reported Peck's cave amphipods from Spring Run 2 in the first spring going upstream from Gazebo Circle Bridge (on the western side or right bank looking downstream).

Reasons for Decline and Threats to Survival
The main threat to this species is a reduction or loss of water in its habitat due primarily to human withdrawal of water from the San Antonio segment of the Edwards aquifer. This species requires adequate dissolved oxygen, therefore, a reduction or cessation of spring flows, even if standing water remains around the spring openings, may suffocate amphipods. Peck's cave amphipods may be removed from their subterranean habitats when entrained into water wells near Comal and Hueco springs. This species is also threatened by groundwater pollution. Another threat is the potential introduction of non-native species which may prey upon amphipods or compete for resources (Service 2007).

Range-wide Survival and Recovery Needs
The chief recovery need for this and other Edwards aquifer dependent species is implementation of an aquifer management plan that maintains adequate habitat to sustain populations. Maintenance of habitat includes: (1) continuous natural springflow at Comal and Hueco springs and (2) adequate water quality of groundwater and springwater.

Status of Peck's Cave Amphipod Critical Habitat
Critical habitat for Peck's cave amphipod (72 FR 39248) was designated July 17, 2007. Two units of critical habitat were designated: Comal Springs (38.1 acres)(ac) and Hueco Springs (0.4 ac). The Comal Springs unit of Peck's cave amphipod critical habitat includes parts of Landa Lake and the spring runs in Landa Park. The designated critical habitat of the amphipod at both springs comprises habitat within 15.2 meters (m)(50 ft (feet)) of the spring orifices. Critical

habitat does not include other areas of the lake bottom where springs do not occur. A separate unit of critical habitat is designated at Hueco Springs about 3.2 miles north of Comal Springs.

The Service identified three primary constituent elements: (1) high quality water with no or minimal levels of pollutants such as detergents, heavy metals, pesticides, fertilizers, and organic contaminants, (2) aquifer water temperatures between 20 to 24°C, and (3) food supplies including detritus, leaf matter, living plant material, algae, fungi, bacteria and other microorganisms, and decaying roots. Water quality in the aquifer and spring habitats occupied by Peck's cave amphipod may be related to springflow rates. Access to Hueco Springs for surveys has been unavailable for several years. The status of the Peck's cave amphipod population associated with Hueco Springs is unknown.

B. Comal Springs Dryopid Beetle

Species Description and Life History

Comal Springs dryopid beetle was listed as endangered on December 18, 1997 (Service 1997) and two critical habitat units were designated at Comal Springs in Comal County and Fern Bank Springs in Hays County, Texas (Service 2007).

The Comal Springs dryopid beetle is the only known subterranean member of the Dryopidae family. Barr and Spangler (1992) described this genus and species based on its unique morphological distinctions including vestigial (poorly developed and non-functioning) eyes and wings. Mature larvae are typically 6 to 8 mm long. Little is known about its life history and pupae for this species have not been described. Adult dryopids generally feed on biofilm (microorganisms and detritus) scraped from various surfaces, including rocks, wood, and vegetation (Brown 1987).

Habitat requirements of the larvae are unknown. Other larvae in the family Dryopidae do not have gills and are considered terrestrial or semi-aquatic. Some adult Comal Springs dryopid beetles have survived 21 months in captivity but its lifespan in the wild is unknown.

Historic and Current Distribution

The Comal Springs dryopid beetle is known primarily from Comal Springs. The first Comal Springs dryopid beetles were collected in 1987 in Comal County, Texas, from Comal Springs Spring Run 2 (Barr and Spangler 1992). Barr collected specimens at Comal Springs Spring Runs 3 and 4 and documented the species at Fern Bank Springs (20 miles northeast of Comal Springs in Hays County) in the summer of 1992 (Barr 1993). Collections made from 2003 to 2009 further extended the known range of the beetle within the Comal Springs system to: (1) Comal Spring Runs 1 - 5, (2) seeps along the western shoreline of Landa Lake, (3) Landa Lake upwellings in the Spring Island area, and (4) Panther Canyon Well, located about 105 m from the head of Comal Spring Run 2 (BIO-WEST 2007; BIO-WEST 2011; J.R. Gibson, pers. comm., 2012). The species has been confirmed at Fern Bank Springs once since 2003, when a single larva was collected after 305 hours of sampling spring orifices with drift nets (Gibson et al. 2008).

Reasons for Decline and Threats to Survival
The listing rule states that reduction or loss of water of adequate quality and quantity constitutes the main threat to this species. Contamination from a variety of sources including, but not limited to, human waste (particularly from septic tanks), agricultural chemicals, urban runoff, and transportation of hydrocarbons and other potentially harmful materials throughout the Edwards aquifer recharge zone and watershed are identified threats to water quality. Water withdrawal from the San Antonio segment of the Edwards aquifer and drought are believed to be the primary threats to water quantity (Service 2007).

Range-wide Survival and Recovery Needs
Additional information is needed to direct and assist in completing recovery actions. A better understanding of Comal Springs dryopid beetle habitat requirements, reproduction, survivorship, and distribution is needed. The chief recovery need for this and other Edwards aquifer dependent species is implementation of an aquifer management plan that maintains adequate habitat to sustain populations. Maintenance of habitat includes: (1) continuous natural springflow at Comal and Fern Bank springs and (2) adequate water quality of groundwater and springwater.

Status of Comal Springs Dryopid Beetle Critical Habitat
Critical habitat for Comal Springs dryopid beetle (72 FR 39248) was designated July 17, 2007. Two units of critical habitat were designated: Comal Springs (38.1 ac) and Fern Bank Springs (1.4 ac). Comal Springs dryopid beetle critical habitat includes parts of Landa Lake and the spring runs in Landa Park. The critical habitat unit designated at Fern Bank Springs (near the Blanco River in Hays County) is about 20 miles north of Comal Springs. Four primary constituent elements were identified: (1) high quality water with no or minimal levels of pollutants such as detergents, heavy metals, pesticides, fertilizers, and organic contaminants, (2) aquifer water temperatures between 20 to 24°C, (3) a hydrologic regime with adequate springflow and dissolved oxygen, and (4) food supplies including detritus, leaf matter, living plant material, algae, fungi, bacteria and other microorganisms, and decaying roots. Water quality in the aquifer and spring habitats occupied by Comal Springs dryopid beetle may be related to springflow. Access to Fern Bank Springs for surveys has been unavailable for more than 7 years. Fern Bank Springs discharge is unknown.

C. Comal Springs Riffle Beetle

Species Description and Life History
Comal Springs riffle beetle was listed as endangered on December 18, 1997 (Service 1997) and critical habitat was designated at Comal Springs in Comal County and San Marcos Springs in Hays County, Texas (Service 2007).

The Comal Springs riffle beetle is a small aquatic beetle known from Comal and San Marcos springs (Bosse et al. 1988). This species was first collected in 1976 and described in 1988 (Bosse et al. 1988). Adult Comal Springs riffle beetles are reddish-brown and range in length from 1.7 - 2.1 mm. The hind wings of Comal Springs riffle beetle are short and non-functional (Bosse et al. 1988) making this species incapable of flying.

Larval and adult populations at Comal Springs reach their greatest densities (about 5 per m^2) in late fall through winter, but all life stages can be found throughout the year suggesting multiple broods in a season with overlapping generations (Bowles et al. 2003). The number of larval instars among species in the family Elmidae ranges from 5 to 8 (Brown 1987), but the specific number of instars for Comal Springs riffle beetle is unknown. The incubation period of elmid eggs typically ranges from 5 to 15 days, and the larval stages may last from 3 to 36 months (Brown 1987) before pupation occurs. Brown (1987) noted that mature elmid larvae pupate in protected areas above the water line. Adult Comal Springs riffle beetles, collected in the wild, have been kept alive for over one year in aquaria at the San Marcos National Fish Hatchery and Technology Center.

Historic and Current Distribution

Historically, the Comal Springs riffle beetle is known from Comal Springs and from a single specimen was collected at San Marcos Springs (Barr 1993). Arsuffi (1993) searched for the Comal Springs riffle beetle at several central Texas springs, but only found specimens at Comal Spring Run 3. Currently, Comal Springs riffle beetles are found at Comal Spring Runs 1, 2, and 3, at several spring outflows and seeps along the northwestern shore of Landa Lake, and near springs in Landa Lake and on Spring Island. J.R. Gibson (pers. comm. 2012) sampled the upper part of Spring Run 2 and found about 350 Comal Springs riffle beetles on a single cloth lure. Gibson et al. (2008) collected Comal Springs riffle beetles at San Marcos Springs from the springs along the escarpment by the Aquarena Center and at a few springs in upper Spring Lake.

In December 2011, BIO-WEST's surveys in Comal Spring Run 3 and at several Landa Lake locations (western shoreline and upstream of Spring Island) documented occupation of historic sites by Comal Springs riffle beetle. The Comal Springs riffle beetle is not known from any other locations outside of the Comal Springs in New Braunfels and San Marcos Springs in San Marcos.

Gonzales (2008) surveyed molecular genetic variation at seven Comal Springs riffle beetle localities (six at Comal Springs – Landa Lake and one at San Marcos Springs). She found four of the seven collection sites (Spring Runs 1, 2, and 3 and Backwater Spring near Spring Island) were invariant for mitochondrial DNA, hypothetically the result of a severe population bottleneck or founder effect. Three of the populations (Western shoreline, Spring Island, and San Marcos Springs) were found to have high levels of mitochondrial DNA variation and Gonzales recommended each be considered a separate evolutionarily significant unit (ESU) within *Heterelmis comalensis*.

Reasons for Decline and Threats to Survival

The 1997 listing rule states that reduction or loss of water of adequate quality and quantity constitutes the main threat to this species. Surface water and groundwater contamination throughout the Edwards aquifer recharge zone and contributing zone are identified as threats to water quality.

The presence of non-native species may affect the continued existence of the Comal Springs riffle beetle. Non-native species (such as the snails *Thiara granifera, Melanoides tuberculata*, and *Marisa cornuarietis*), which may compete directly or indirectly for food resources, have

been identified as an ongoing threat to the continued survival of the Comal Springs riffle beetle throughout all or a significant portion of its range (Service 1997).

Range-wide Survival and Recovery Needs
Additional information is needed to direct and assist in completing recovery actions. A better understanding of Comal Springs riffle beetle habitat requirements, reproduction, survivorship, and distribution is needed. The chief recovery need for this and other Edwards aquifer dependent species is implementation of an aquifer management plan that maintains adequate habitat to sustain populations. The conservation and maintenance of Comal Springs riffle beetle habitat includes: (1) continuous natural springflow at Comal and San Marcos springs and (2) adequate water quality of groundwater and springwater.

Status of Comal Springs Riffle Beetle Critical Habitat
Critical habitat for Comal Springs riffle beetle (72 FR 39248) was designated July 17, 2007. Two units of critical habitat were designated: Comal Springs (19.8 ac) and San Marcos Springs (10.5 ac). San Marcos Springs is about 18 miles northeast of Comal Springs.

The designated critical habitat of the Comal Springs riffle beetle encompasses all spring outlets in Landa Lake and Spring Lake (San Marcos). Critical habitat for the Comal Springs riffle beetle is centered on springs and includes habitat within a 15.2 m radius of spring outlets. Comal Springs riffle beetle designated critical habitat at Landa Lake does not include areas adjacent to aquatic habitat.

Comal Springs riffle beetle critical habitat includes parts of Landa Lake and the spring runs in Landa Park. Critical habitat does not include man-made structures (such as buildings, roads, and other paved areas) that existed before August 16, 2007. Critical habitat is only designated for areas where springs occur and does not include areas of the lake bottom beyond a radius of 50 ft (15.2 m) from the spring outlet. A separate unit of critical habitat is designated at San Marcos Springs. Five primary constituent elements were identified: (1) high quality water with no or minimal levels of pollutants such as detergents, heavy metals, pesticides, fertilizers, and organic contaminants, (2) aquifer water temperatures from 20 to 24°C, (3) a hydrologic regime with adequate springflow and dissolved oxygen, (4) food supplies including detritus, leaf matter, living plant material, algae, fungi, bacteria, other microorganisms, and decaying roots, and (5) bottom substrate in surface water habitat that is free of sand and silt, and composed of gravel and cobble ranging from 8 to 127 millimeters (mm). Water quality in the aquifer and spring habitats occupied by Comal Springs riffle beetle may be related to springflow.

D. Fountain Darter

Species Description and Life History
The fountain darter was listed as endangered on October 13, 1970 (35 FR 13507). The Endangered Species Act went into effect on December 28, 1973. The fountain darter was incorporated into the list of endangered wildlife on September 26, 1975 (40 FR 44412). Though there were two fountain darter populations (Comal River including Landa Lake, and San Marcos River including Spring Lake) when critical habitat was designated for the fountain darter (45 FR 47355, July 14, 1980), critical habitat was only designated in the San Marcos River (including

Spring Lake).

The fountain darter is a small benthic, reddish-brown fish. Adult fountain darters range in length from 19 to 38 mm. Fountain darter habitat requirements as described in the San Marcos and Comal Springs and Associated Aquatic Ecosystems (Revised) Recovery Plan (Service 1996) include: undisturbed stream floor habitats; a mix of submergent plants (algae, mosses, and vascular plants), in part for cover; clear and clean water; invertebrate food supply of living organisms; constant water temperatures within the natural and normal river gradients; and adequate springflows.

Historic and Current Distribution
The historic range of the fountain darter includes the San Marcos and Comal rivers in central Texas (Service 1996). In 1884, Jordan and Gilbert (1886) collected the type specimens of *E. fonticola* in the San Marcos River from immediately below the confluence of the Blanco River.

The fountain darter is found in Spring Lake and the San Marcos River downstream to an area just below the emergency spillway to the Smith Ranch impoundment. The population of fountain darters in the San Marcos River was estimated to be approximately 103,000 by Schenck and Whiteside (1976) and 45,900 (downstream of and excluding Spring Lake) by Linam (1993). Fountain darter densities appear to be highest in the upper segments of the San Marcos River and decrease markedly below Cape's Dam (Linam 1993).

In the Comal River, Evermann and Kendall (1894) collected 43 *E. fonticola* specimens in 1891, the first collection record for that locality. It appears the fountain darter was extirpated from the Comal Springs ecosystem when flow at Comal Springs ceased for six months in 1956 (Schenck and Whiteside 1979). Intensive surveys for the fountain darter were made from 1973 to 1975 with negative results supporting the hypothesis that the fountain darter was extirpated from the Comal Springs ecosystem for nearly 20 years. In 1975, Whiteside and others took adult fountain darters from San Marcos and stocked them into Landa Lake and its spring runs (Schenk and Whiteside 1976). Within months of the stocking, fountain darter reproduction in the Comal Springs ecosystem was evident when juvenile fountain darters were found.

Presently, the fountain darter is found in Landa Lake, accessible parts of Comal spring runs, and throughout the Comal River system downstream to the confluence with the Guadalupe River (Service, unpublished data, 1996).

Reasons for Decline and Threats to Survival
The Recovery Plan (Service 1996) identifies several threats to the fountain darter. The primary threats are related to the quality and quantity of aquifer and spring water. Drought conditions, groundwater use, and lower than average springflows threaten the species recovery. Activities that may pollute the Edwards aquifer and its springs and streamflows may also threaten or harm the species (Service 1996) and pollution events may be more serious during low springflows. Additional threats include effects from increased urbanization near the rivers, recreational activities, alteration of the rivers, habitat modification (e.g., dams, bank stabilization, flood control), predation, competition, habitat alteration by non-native species, and introduced

parasites (Service 1996).

The trematode parasite *Centrocestus formosanus* was discovered to infect the gills of the fountain darter in the Comal Springs ecosystem in 1996. Multiple researchers have documented that this parasite threatens the health of fountain darters (Mitchell et al. 2000, McDonald et al. 2006). The adverse effect of this parasite on darters is likely to increase during stressful periods of low spring discharge (Cantu 2003) and the parasite's adverse effects may be greater to younger fountain darter life-stages (McDonald et al. 2006). It appears that the only aquatic habitat in the Comal Springs system where fountain darters are free from parasites (including *Centrocestus*) is found in the spring runs (T. Brandt, pers. comm., 2011). This trematode is also present in certain reaches of the upper San Marcos River. The experimental removal of the snail host (*Melanoides tuberculata*) appears to have slightly lowered the abundance of the trematode near Spring Island (Service and BIO-WEST 2011). However, more research is needed to determine if snail removal is beneficial to fountain darters in the Comal Springs ecosystem.

One of the local threats is habitat degradation caused by non-native fish species including suckermouth catfish (Loricariidae) that burrow extensively into river banks (Hoover et al. 2004, Pound et al. 2010). In addition, recreational use of the river adversely impacts aquatic vegetation. Fountain darters have reduced densities (or are absent) in areas lacking submergent vegetation (BIO-WEST 2007). One recovery task calls for the enhancement of habitats and for the fountain darter, this would include restoration of native submerged aquatic plants in the Comal and upper San Marcos rivers. Rooted submergent plants are an important component of fountain darter habitat. Aquatic plants provide: (1) surface area for egg attachment (breeding); (2) nursery habitats; (3) habitat for prey species such as amphipods; and (4) cover from predators. One recovery need involves managing river recreation ingress-egress areas to help reduce damage to aquatic plants.

Range-wide Survival and Recovery Needs
There are numerous actions listed in the Recovery Plan regarding specific regional and local recovery efforts. The Recovery Plan recommends region-based recovery efforts aimed at maintaining adequate springflows, protecting water quality, and reducing local threats to fountain darter habitat.

Status of Fountain Darter Critical Habitat
Designated critical habitat includes the San Marcos River, including Spring Lake downstream to approximately 805 m below the Interstate Highway 35 Bridge (45 FR 47355). Important elements of fountain darter habitat include: (1) flow in the San Marcos Springs and River, (2) unpolluted water, and (3) undisturbed aquatic plants and substrates.

The springflow element of fountain darter critical habitat is dependent on Edwards aquifer levels and pumping from the Edwards aquifer. The water quality in the upper San Marcos River is generally recognized as good. However, a gradient of increasing turbidity as one moves downstream is notable, particularly during daylight hours in the months of May through September. Aquatic plants have been mapped and highest densities are found in the uppermost reaches. Below Interstate Highway 35 and particularly below Capes Dam, aquatic plants in the San Marcos River become less dense. Thus, overall, there is a decreasing trend to elements of

fountain darter critical habitat moving downstream from Spring Lake to the Cape Dam and this trend continues downstream to the lower boundary of critical habitat near the defunct U.S. Geological Survey river gauge station.

III. Environmental Baseline

This section is analysis of the effects of previous and ongoing factors (natural and anthropogenic) leading to the current status in the action area. The primary factor affecting all of the Comal Spring invertebrates and the fountain darter is the recharge, management, and use of the Edwards aquifer. The level of the Edwards aquifer affects groundwater near Comal Springs and discharge from Comal Springs. The Edwards aquifer level is dynamic because of annual and seasonal variation in recharge and discharge. Water quality of the Edwards aquifer in the New Braunfels area has generally been good. A secondary factor is human disturbance of surface water habitats.

Status of the Species with the Action Area

This section describes the status of the Peck's cave amphipod, Comal Springs dryopid beetle, Comal Springs riffle beetle, fountain darter, and their respective federally designated critical habitats in the action area. For the Comal Springs invertebrates, we estimated the size of local populations based on surveys of Bowles, Stanford, and BIO-WEST. The area of habitat, densities, and local population size for known surface populations were estimated for the Comal Springs system.

Peck's Cave Amphipod
The status of Peck's cave amphipod in the action area is similar to its status when listed in 1997. Bowles and Stanford sampled extensively in the action area from July 1993 through April 1994. They reported Peck's cave amphipods from Comal Spring Runs 1, 2, and 3. Using cloth lures and drift nets, J.R. Gibson has reported Peck's cave amphipods from Spring Runs 1, 2, and 3 over the period from 2004 to 2011. Figure 4 shows the location of collection sites for Peck's cave amphipods in the action area. Gibson recently (September 10, 2012) collected cotton lures set one month previously in Spring Run 2. He found 2 Peck's cave amphipods in a spring about 30 ft upstream from Gazebo Circle Bridge on the western side of Spring Run 2.

Based on the number of collection sites and Peck's cave amphipod abundance at those sites, we estimate the surface population of Peck's cave amphipod in the action area is about 17,844. This represents about 72 percent of the estimated surface population for the Comal Springs system (24,875). Based on the numbers of Peck's cave amphipods collected and distribution of spring habitat of Peck's cave amphipod in the Comal Springs system, Spring Runs 1 and 3 are estimated to support about 77 percent of the Comal system surface population. Spring Run 2 is estimated to support about 804 individuals (about 3 percent of the Comal system surface population). Almost all of the collections outside Spring Runs 1, 2, and 3 are from sites sampled by Gibson elsewhere in Landa Lake (western shoreline, near Spring Island, and Spring Runs 4, 5, and 6). There are no clear imminent threats to Peck's cave amphipod in the action area and this species is considered stable.

Peck's Cave Amphipod Critical Habitat
The aquatic habitat in the action area includes 7.1 ac of the designated critical habitat in the Comal Springs unit. The aquatic subset of the action area represents about 36 percent of the Peck's cave amphipod critical habitat (19.7 ac, not considering the riparian areas). The Peck's cave amphipod critical habitat primary constituent elements are: (1) high quality water, (2) aquifer water temperatures from 20 to 24°C, and (3) food supplies. All three of these PCEs are present in the action area. The work area for Gazebo Circle Bridge repair is about 41 m^2, which is about 0.1 percent of designated critical habitat in the Comal Springs unit.

Comal Springs Dryopid Beetle
Recovery criteria for the Comal Springs dryopid beetle are not available as the Recovery Plan for this species is being drafted. To ensure healthy and self-sustaining populations of each Comal Springs invertebrate species, various actions such as monitoring the population size and genetic variability will be needed. To maintain a healthy population, abundance in the wild needs to remain above some yet to be determined level. Spring Run 2 consists of small springs (seeps) that produced about 3 percent of all Comal Springs dryopid beetles collected by Bowles and Stanford (1994). Data on the vagility (ability to move) in the wild of Comal Springs dryopid beetles are not available.

The status of the Comal Springs dryopid beetle in the action area is similar to its status when listed in 1997. Bowles and Stanford sampled extensively in the action area from July 1993 through April 1994 (Bowles and Stanford, unpublished data, 1994; Bowles et al. 2003). With the exception of Spring Run 4, Bowles and Stanford did not sample areas surveyed by Gibson (2011) elsewhere in Landa Lake (western shoreline, near Spring Island, and Spring Runs 5 and 6). They collected a total of 164 Comal Springs dryopid beetles (larvae and adults) and 132 (80 percent) of those came from Spring Run 1. Gibson has reported Comal Springs dryopid beetles from Spring Runs 1, 2, and 3 for sampling efforts with cloth lures and drift nets for period 2004 - 2011. Figure 5 shows the location of collection sites for Comal Springs dryopid beetles in the action area.

Barr and Spangler (1992) noted that collections of this species in Spring Run 2 were primarily in the headwater outlets and outlets beneath either bank. Bowles et al. (2003, and unpublished data) found 120 adults and 44 larvae in their surveys of Spring Runs 1 through 4. The highest density of Comal Springs dryopid beetles found was in Spring Run 1, 1.0 individual per m^2, (132 larvae and adults in 132 samples). Gibson recently (September 10, 2012) collected cotton lures set one month previously in Spring Run 2. He found 3 Comal Springs dryopid beetles in a spring about 30 ft upstream from Gazebo Circle Bridge on the western side of Spring Run 2.

Based on the number of collection sites and Comal Springs dryopid beetle abundance at those sites, we estimate the surface population of Comal Springs dryopid beetles in the action area is about 1,527. This represents about 83 percent of the estimated surface population for the Comal Springs system (1,839). Based on the numbers of Comal Springs dryopid beetles collected and distribution of springs and seeps, the upper part of Spring Run 1 is estimated to support 1,310 Comal Springs dryopid beetles (71 percent) of the surface population for the Comal Springs system. There are no apparent threats on a local scale impacting the Landa Park population of Comal Springs dryopid beetles and this species in the action area is considered stable.

Comal Springs Dryopid Beetle Critical Habitat
The aquatic habitat in action area includes 7.1 ac of the designated critical habitat in the Comal Springs unit. The Comal Springs dryopid beetle critical habitat primary constituent elements are: (1) high quality water, (2) aquifer water temperatures (20 to 24°C), (3) hydrologic regime with adequate springflow and dissolved oxygen, and (4) food supplies. All four of these PCEs are present in the action area.

Comal Springs Riffle Beetle
The status of the Comal Springs riffle beetle in the action area is similar to its status when listed in 1997. Bowles and Stanford sampled extensively in the action area from July 1993 through April 1994 (Bowles et al. 2003). They collected a total of 875 Comal Springs riffle beetles (larvae and adults) and 435 (50 percent) of those came from Spring Run 1. Gibson (2011) has reported Comal Springs riffle beetles from Spring Runs 1, 2, 3, and 6 from cloth lures and drift nets for period sampling from 2004 through 2011.

Based on the number of collection sites and Comal Springs riffle beetle abundance at those sites, we estimate the surface population of Comal Springs riffle beetles in the action area is about 10,127. This represents about 92 percent of the estimated surface population for the Comal Springs system (10,959). In terms of numbers of Comal Springs riffle beetles collected by Bowles and Stanford, Spring Runs 1, 2, and 3 produced all of the riffle beetles; none were found in Spring Run 4. Gibson (Service 2011) has regularly surveyed for Comal Springs riffle beetles but in the action area that effort has been focused primarily on Spring Run 2 above Gazebo Circle Bridge and Spring Run 3. Gibson recently (September 10, 2012) collected cotton lures set one month previously in Spring Run 2. He found more than 50 Comal Springs riffle beetles in a spring about 30 ft upstream from Gazebo Circle Bridge on the western side of Spring Run 2. Figure 6 shows the location of collection sites for Comal Springs riffle beetles in the action area.

There are no apparent threats on a local scale impacting the Landa Park population of Comal Springs riffle beetles and this species in the action area is considered stable.

Comal Springs Riffle Beetle Critical Habitat
The aquatic habitat in the action area includes 6.8 ac of the designated critical habitat in the Comal Springs unit. The Comal Springs dryopid beetle critical habitat primary constituent elements are: (1) high quality water, (2) aquifer water temperatures (20 to 24°C), (3) hydrologic regime with adequate springflow and dissolved oxygen, (4) food supplies, and (5) a gravel and cobble substrate free of silt and sand. All five of these PCEs are present in the action area. The results of Gibson's regular surveys for Comal Springs riffle beetles in Spring Run 3 (in the action area) support the premise that the PCEs are functional (Service 2011).

Fountain Darter
The fountain darter occupies virtually all of the action area. The only habitats not likely to support fountain darters are the upper reach of Spring Run 2, which has little vegetation. In the case of Spring Run 2, the wading pool weir acts as a fish barrier. One factor that degrades the fountain darter habitat in lower Spring Run 1 and the embayment of Landa Lake is the intense herbivory by non-native (and native) waterfowl, which has eliminated most rooted macrophytes and reduced fountain darter habitat suitability. Figure 7 shows the local distribution of fountain

darters in the project area. The areas in blue are where fountain darter have been collected in contrast to Spring Run 2, shown in purple, where no fountain darters have been found.

The Service and cooperators surveyed for fountain darters in the action area from July 1993 to April 1994, and in July 1996. The fountain darter abundances in Spring Runs 1, 2, and 3 were low compared to nearby habitat in Landa Lake and Comal River new channel. Dammeyer (2010) conducted a mark and recapture study in the Comal River old channel and estimated the number of fountain darters in a 100 m section as 2,732. Assuming homogeneity of channel width, habitat quality, and fountain darter density throughout the Comal River old channel (the old channel is 2,550 m long), the fountain darter population in the old channel is estimated at 6,967.

The Edwards Aquifer Recovery Implementation Program used a STELLA® model to estimate fountain darter numbers in the Comal system for average to low springflow. The median (50th percentile) discharge for monthly springflow at Comal Springs is 295 CFS. For the U.S. Geological Survey's period of record for Comal Springs (1932 to present), a discharge of 225 CFS falls near the 23rd percentile. At 225 CFS total springflow, the model estimates an average of 114,837 fountain darters (EARIP 2012). The status of the fountain darter in the Comal system is considered stable.

Factors Affecting Species Environment within the Action Area

Factors affecting these species and their respective habitats can be divided into two classes: regional and local. As previously mentioned, the regional factors include effects to the hydrology and water quality of the Edwards aquifer. Local factors include, but are not limited to, effects to the species and their habitats such as storm water pollution, water recreation effects to habitats, and competition and predation from non-native and exotic species. In the summer, turbidity appears to increase during daylight hours in reaches downstream of water recreation, particularly tubing. Water recreation in part of Landa Lake is managed by the City. The City rents paddleboats on Landa Lake. Wading and swimming in the spring runs (except certain parts of Spring Run 2), Landa Lake, and upper part of the new channel are prohibited.

Water Quantity

Edwards Aquifer (Southern Segment)
The Edwards aquifer underlies portions of Texas from Kinney and Uvalde counties (on its western edge) to the Kyle groundwater divide in Hays County (on its northeastern boundary). The Edwards aquifer stretches for about 290 km with a width varying from about 8 to 64 km. Water within the Edwards aquifer generally flows from areas of higher elevation in the southwest to areas of lower elevation to the northeast. The Edwards aquifer is the primary water source for municipal, industrial, agricultural, and domestic uses for over two million people throughout the region.

The Edwards aquifer has three distinct zones, each with unique hydrogeological characteristics. The contributing zone consists of about 13,986 km^2 and includes portions of Kinney, Edwards, Real, Uvalde, Bandera, Medina, Kerr, Kendall, Bexar, Comal, Blanco, and Hays counties. The

contributing zone is composed of the watersheds of the creeks and streams that cross the recharge zone, thereby providing most of the water entering the aquifer.

The recharge zone consists of about 3,237 km^2 of porous Edwards limestone that lies exposed at the ground surface. Recharge takes place as runoff infiltrates the exposed geologic strata in this zone. Creeks and streams flowing generally south and east across central Texas often lose much or all of their baseflow to the aquifer as they cross the recharge zone. Water enters the Edwards aquifer by infiltration through the soils and rock strata overlying the aquifer, by percolation through upland recharge features (caves, sinkholes, faults, fractures, and other open cavities), by percolation through recharge features in creeks that cross the recharge zone, and by cross-boundary flow from the Trinity aquifer (Jones 2011).

The artesian zone of the Edwards aquifer is characterized by several large and many smaller springs. Springflow results from the hydraulic pressure of the confined waters in this zone. The porous water bearing strata of the Edwards aquifer are surrounded in the artesian zone by less permeable geology that confines waters flowing down gradient from the recharge zone. Faults and fissures through these overlaying strata allow these pressurized waters to be released at the surface in numerous springs and seeps. Johnson and Schindel (2008) defined fault blocks near Comal and San Marcos springs. The Artesian fault block (Figure 9, Johnson and Schindel 2008) appears to be the main source of the Comal Springs, particularly when Comal Springs discharge is less than 100 CFS. Dye tracing efforts in March 2002 indicated that some of Comal Springs flow (specifically small springs in Spring Run 3) comes from the Comal Springs fault block. However, Johnson and Schindel (2008) indicated that during dry periods the Comal Springs fault block does not contribute to springflow.

Springflows at Comal (and San Marcos) springs are directly related to water use from the Edwards aquifer. The average discharge at Comal Springs from 1927 to 2009 was about 291 CFS. Comal Springs ceased flowing for 144 consecutive days in 1956 during the extended drought period referred to as the drought of record. These springflow conditions likely affected the Comal Springs invertebrates, Comal population of fountain darters, and their habitat. There are no records of population distribution or abundance for the Comal Springs invertebrates prior to, during, or after the drought of record event (until various efforts by biologists; Holsinger 1967; Barr and Spangler 1992; Bosse et al. 1988; Bowles et al. 2003; and, Gibson et al. 2008).

The Edwards aquifer has a high capacity for rapid recharge, and rainfall over the contributing and recharge zones can quickly increase water levels within the aquifer. The Edwards aquifer can also experience rapid drops in water levels due to pumping, especially during drought periods.

Continued population growth in the region and associated increases in water demand may exacerbate declining springflows if future water needs are met by increased pumping from the Edwards aquifer. Water conservation programs that reduce per capita water use and overall Edwards aquifer water demand help to maintain springflows.

An underground water authority, the Edwards Aquifer Authority (EAA) was created (Chapter 626, Laws of the 73rd Texas Legislature, 1993, as amended by Chapter 621, Laws of the 74th

Texas legislature, 1995), to manage and issue permits for the withdrawal of groundwater from the Edwards aquifer for the purposes of water conservation and drought management. The EAA was designated a special regional management district and charged with protecting terrestrial and aquatic life, domestic and municipal water supplies, the operation of existing industries, and the economic development of the State of Texas.

The EAA is mandated to pursue all reasonable measures to conserve water; protect water quality in the aquifer; protect water quality of surface streams provided with springflows from the aquifer; maximize the beneficial use of water available to be drawn from the aquifer; protect aquatic and wildlife habitat; protect threatened and endangered species under Federal or State law; and provide for instream uses, bays and estuaries.

Formal Consultations pursuant to Section 7 of the Act
We have completed formal consultation with the Department of Defense related to the operation of its missions in the San Antonio region and use of the Edwards aquifer (January 11, 2008). We consulted with the USACE on the encasement of a New Braunfels Utilities water main crossing the Comal River (May 21, 2009). We have consulted with the Service's Fisheries Program on their use of the Edwards aquifer as a water supply for the San Marcos National Fish Hatchery and Technology Center and Uvalde National Fish Hatchery and have finalized a biological opinion covering those Service activities (March 1, 2010). Comal County has applied for a regional HCP – incidental take permit (TE-223267-0) for land-use changes affecting the golden-cheeked warbler (GCWA) and black-capped vireo (BCVI). We will conduct an intra-Service consultation on the proposed issuance of that permit including the Comal Springs invertebrates and fountain darter as well as the covered species (GCWA and BCVI).

Formal consultations over the past decade have authorized take associated with their respective actions. Since February 2002, there have been seven biological opinions for projects where the action area included the Comal Springs ecosystem. Those biological opinions determined the total incidental take of fountain darters at 3,683. The last biological opinion for bank stabilization in Landa Park (March 16, 2012) accounts for 3,168 fountain darters in that total.

In the past decade, there have been three formal consultations that have included the Comal Spring invertebrates: National Fish Hatchery use of Edwards aquifer water (March 1, 2008), Department of Defense use of Edwards aquifer water (January 11, 2008), and USACE authorization for bank stabilization in Landa Park (March 16, 2012). The first two of these biological opinions did not quantify or authorize incidental take of Comal Springs invertebrates. The March 16, 2012, biological opinion determined the following incidental take totals (n) for the Comal Springs invertebrates: Comal Springs riffle beetle (174), Comal Springs dryopid beetle (52), and Peck's cave amphipod (414). None of these biological opinions involved jeopardy to any listed species. None of these biological opinions involved a determination of adverse modification to any designated critical habitat.

IV. Effects of the Action

Factors to be considered

In Spring Run 2, the water surface elevation (stage) is normally determined by: (1) flow from Spring Run 2; (2) local runoff from Panther Canyon during periods of precipitation; and (3) the weir settings for the wading pool. Water in the work area for Gazebo Circle Bridge repair appears to be affected by the weir settings (stoplog or plank configuration).

A Texas Parks and Wildlife Department (TPWD) effort (with collaborators) to map, name, and characterize the myriad Comal Springs is underway. As the results of that effort become available, better estimates of the quantity of spring-influenced habitat in the Comal Springs ecosystem will be possible. Preliminary results indicate that no springs were identified in the Gazebo Circle Bridge work area. However, the substrates in work area and areas downstream (e.g., the wading pool) are spring-influenced and known to support Comal Springs invertebrates.

The setting for the proposed actions contains the largest spring complex (in terms of average discharge) in Texas. Caves and karst features are known from Landa Park and Panther Canyon. There is a possibility drilling for the new piers will encounter voids or unknown karst feature(s). According to Halff Associates, the piers may have to be drilled to a depth of 55 ft below the bridge pavement. The City and its contractors may encounter voids when drilling for the new piers. Permanent casing is proposed for the pier boreholes. Drilling may intersect a water-filled conduit that may be associated with nearby springs. Smaller preliminary boreholes at the pier sites may help determine the likelihood of encountering a karst feature or a groundwater conduit.

Analyses for effects of the action

The effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. For analyses of effects to listed species, we review changes in demographics and distribution. For analyses of effects to critical habitat, we review changes to the primary constituent elements to resolve the action's impact on the function and conservation role of critical habitat in the future. Peck's cave amphipod and Comal Springs dryopid beetle designated critical habitat included an area within 15.2 m of aquatic habitat specifically to include woody vegetation (PCE 4, food supply). Roots near springs may have an extensive surface area and biofilm (microbial) production. The proposed action involves conservation of the woody vegetation (with their roots) and the following analyses focus on aquatic habitat with the assumption that the woody vegetation near springs will remain unchanged by the action.

The following analyses are based on the exposure of Peck's cave amphipods, Comal Springs dryopid beetles, Comal Springs riffle beetles, their respectively designated critical habitat (CH), and fountain darters to effects of the action. The estimated amphipod, dryopid beetle, riffle beetle, and fountain darter densities are based on best available information including Service, TPWD, and BIO-WEST research on the fountain darter. The City provided drawings of the Gazebo Circle Bridge repair plans and photographs of the pedestrian bridge piers to be removed.

Effects to Peck's Cave Amphipod
The Gazebo Bridge repair work area is a small (about 41 m^2) subset of the action area. The project effects to Peck's cave amphipod are expected to occur primarily in the immediate area of the bridge repair (the work area). The City plans to maintain water in Spring Run 2 downstream of the work area and we anticipate any Peck's cave amphipods downstream of the work area will not be harmed or killed there. Slight changes in turbidity may occur downstream of the work area but this change in water quality would not be expected to affect Peck's cave amphipods, which are typically found in the gravel interstices.

On June 30, 2011, Gibson collected 10 lures in Spring Run 3 that were placed on May 31, 2011. This effort resulted in 5 positively identified Peck's cave amphipods and 21 amphipods identified only to genus (*Stygobromus*). Generally, about half of the smaller unidentified amphipods in Comal Spring Runs are estimated to be *Stygobromus pecki*, the other half are likely *Stygobromus russelli* (J.R. Gibson, pers. comm, 2012). We estimate the density of Peck's cave amphipods in Spring Run 3 at 6.6 individuals per m^2. We use this density to estimate to the number of Peck's cave amphipods in the areas to be dewatered in Spring Run 2.

The proposed bridge construction involves temporary dams and dewatering part of Spring Run 2. Peck's cave amphipod mortality in Spring Run 2 due to dewatering associated with temporary dam is not easily quantified since Spring Run 2 in the work area and downstream has not been adequately surveyed. We anticipate that use of a sandbag wall and liners will temporarily eliminate amphipod habitat in the work area, estimated at 40.7 m^2. When repairs are finished and additional substrates (including riprap rock) are in place, we anticipate suitability of amphipod habitat will return to the pre-repair state.

The temporary sandbag wall with liner will alter the movement of water into substrate at the gravel-membrane interface. However, we are uncertain how many Peck's cave amphipods will be affected in Spring Run 2 in the work area. Dewatering is expected to result in the death of all Peck's cave amphipods in the dewatered zone, about 269 individuals (based on an estimated density of 6.6 individuals per m^2 and an area of 40.7 m^2). Peck's cave amphipods may be entrained into pumps when a work area has water removed. Some Peck's cave amphipods may remain in the dewatered gravel and die as the area is disturbed or from a lack of water among the gravel interstices. Nice and Ethridge (2011) stated that "for aquatic organisms such as *Stygobromus*, connectivity of habitable space varies with space and time because water level and direction of flow changes with changing hydrological conditions". Some unknown but presumed small fraction of Peck's cave amphipods inside the temporary dams may succeed in moving down to lower interstitial zones that remain saturated with water. Some unknown number of Peck's cave amphipods will be harmed by disturbance (e.g., compression of gravel substrate) associated with setting up, maintaining, and removing the sandbag wall. No Peck's cave amphipods are known from the immediate vicinity of the footings for Bridges 1 and 2 and no adverse effects to this species are expected from footing removal.

We estimate that Spring Run 2 supports about 804 Peck's cave amphipods, which is about 3 percent of the total population in the Comal Springs system (about 24,875). The proposed action will result in the loss of 269 amphipods, about 1 percent of the total population.

Effects to Peck's Cave Amphipod Critical Habitat

Habitat Quantity
The construction of the sandbag wall will negatively affect about 41 m^2 of spring influenced habitat in designated Peck's cave amphipod critical habitat. About 41 m^2 of spring-influenced critical habitat in Spring Run 2 and nearby areas downstream of Spring Run 2 will be affected by temporary dams, dewatering, grouting, and riprap scour protection. The Comal unit of critical habitat for the Peck's cave amphipod has a total area of about 81,520 m^2 but that includes parts of Landa Lake not within 15.2 m of a spring opening. The action will reduce habitat quantity (41 m^2) in this Comal Springs critical habitat unit for two months.

Habitat Quality and Primary Constituent Elements
Habitat quality in Spring Run 2 outside of the sandbag walls (work area) is expected to be maintained if water is maintained (depth greater than 3 cm) over its substrates outside the work area. Outside of Spring Run 2, no degradation of habitat quality or PCEs is anticipated

It is anticipated that the critical habitat that is dewatered will remain unsuitable and unoccupied for an unknown period (weeks or months) after construction is completed. The PCE 1 (high-quality water) and PCE 2 (water temperatures ranging from 20 to 24°C) would be restored to the dewatered zone sometime after construction, but we do not know how long it will take for Peck's cave amphipods to colonize the disturbed areas. Spring-dominated habitats in the Comal Springs system comprising Peck's cave amphipod critical habitat are estimated at 3,297 m^2. The project will degrade about 41 m^2 of spring-influenced habitat in Spring Run 2. However parts of the area affected such as the scour hole appear to not provide suitable habitat currently for any of the Comal Springs invertebrates. Post-construction, we are uncertain as to extent of use by Peck's cave amphipods of various sized riprap rocks placed at the base of the abutment.

Effects to Comal Springs Dryopid Beetles
The density of Comal Springs dryopid beetles in Spring Run 2 work area is estimated as 1.0 individual per m^2. The proposed temporary dewatering of part of Spring Run 2 is expected to result in the loss of all Comal Springs dryopid beetles present when construction begins. We do not know how may Comal Springs dryopid beetles currently on surface that will be able to survive disturbance in the work area. We estimate about 41 Comal Springs dryopid beetles will be killed in the work area (1.0 individual per m^2 and dewatering of 41 m^2 of habitat). Some Comal Springs dryopid beetles may be entrained into pumps when the work area is dewatered. However, this species tends to hang on to substrate or organic material and typically does not occur in the water column.

No other areas involved with proposed action (footings removal) are expected to have Comal Springs dryopid beetles. The proposed action is estimated to result in the loss of a total of 41 Comal Springs dryopid beetles or about 2 percent of the estimated total surface population of the Comal Springs system (about 2,071). Actual loss may be less than 41 individuals if the density of Comal Springs dryopid beetles in the work area is less than 1.0 individual per m^2. Scouring may be a factor that has reduced dryopid beetle habitat suitability in the work area. Losing less than 2 percent of the Comal Springs population is not considered likely to have a serious negative effect on this species. This species has a small range and it occurs at a lower density

and abundance relative to the Comal Springs riffle beetle and Peck's cave amphipod. Scant information is available on its distribution, abundance, and density below the surface. However, construction methods have been developed to limit impacts in Spring Run 2 by minimizing the work area.

We anticipate that Spring Run 2 (post-construction) will continue to maintain a local population of Comal Springs dryopid beetles similar to the size inferred from the Bowles and Stanford study, roughly about 53 individuals. Post-construction, we anticipate that the local population upstream of the work area will be a source of individuals that will recolonize the bridge area in areas where habitat is suitable.

Effects to Comal Springs Dryopid Beetle Critical Habitat

Habitat Quantity
Similar to Peck's cave amphipod critical habitat effects, the construction (bridge repair) will negatively affect about 41 m^2 of Comal Springs dryopid beetle critical habitat. About 41 m^2 of spring-influenced critical habitat will be temporarily degraded from placement of sandbag walls with polypropylene liner and dewatering during the bridge repair.

The Comal unit of critical habitat for the Comal Springs dryopid beetle has a total area of about 81,520 m^2 but that includes parts of Landa Lake not under the influence of springs. The project will reduce the Comal Springs dryopid beetle critical habitat in the Comal Springs critical habitat unit for two months by 41 m^2.

Habitat Quality and Primary Constituent Elements
Habitat quality in Spring Run 2 (outside the work area) is expected to be maintained in the work area where there is at least 3 cm of water flowing over its substrates throughout construction.

It is anticipated that the critical habitat that is dewatered will remain unsuitable and unoccupied for an unknown period (perhaps months) after construction is completed. The PCEs 1 and 2 would be restored to the dewatered zone post-construction, but we do not know how long it will take for Comal Springs dryopid beetles to colonize the disturbed areas. Spring-dominated habitats in the Comal Springs system comprising Comal Springs dryopid beetle critical habitat are estimated at 3,297 m^2. The project will degrade about 41 m^2 of spring-influenced critical habitat. We anticipate critical habitat will not be permanently degraded. Critical habitat would be degraded for a minimum of one month. With springflows (PCE 3) restored (post-construction), PCE 1 (water quality with low salinity, low turbidity) and PCE 2 (water temperatures between 20 and 24°C) are expected to return. After several weeks of normal springflows, we anticipate biofilm production (food supply or PCE 4) will return and all critical habitat PCEs will be present.

Effects to Comal Springs Riffle Beetles
Comal Springs riffle beetle densities were estimated for distinct parts of Spring Runs 1, 2, and 3 from unpublished data by Bowles and Stanford (1994). The proposed work in Spring Run 2 is expected to result in the death of all Comal Springs riffle beetles in the dewatered zone, totaling 134 (about 1 percent of the total Comal system surface population). Actual deaths of Comal

Springs riffle beetles from the proposed work may be less than the estimated 134 if the average density of riffle beetles in the work area is less than 2.9 individuals per m^2. Scour in the work area may have reduced habitat quality for riffle beetles. Drift net sampling has occasionally resulted in the capture a Comal Springs riffle beetles. A few Comal Springs riffle beetles may be entrained into pumps when a section is dewatered but this species is rarely found in the water column. While this species may move down in the substrates to remain in water, we do not know how far this species will move or if the conditions at lower elevation will provide suitable habitat.
We are uncertain if the riprap rock to be placed along the bridge foundation will be suitable Comal Springs riffle beetle habitat. We do not know if Comal Springs riffle beetles will use the riprap. Initially, this rock will lack the epilithic microbial community on which elmids feed but some of the riprap may become suitable and habitable over time.

Effects to Comal Springs Riffle Beetle Critical Habitat

Habitat Quantity
The Gazebo Circle Bridge repairs will negatively affect about 41 m^2 of spring-influenced Comal Springs riffle beetle critical habitat in Spring Run 2. Spring Run 2 outside of the work area should be maintained to a water depth of at least 3 cm. We anticipate maintenance of water continuously about the substrates will maintain suitable habitat within the substrates. Outside of Spring Run 2, the project will impact about 25 m^2 of spring-influenced critical habitat in lower Spring Run 1 where Bridge 1 footings will be removed. However, we do not have any surveys for Comal Springs invertebrates near Bridge 1 footings. The aquatic invertebrate work of Bowles and Stanford surveyed the upper part of Spring Run 1 and their sampling stopped about 20 m upstream of Bridge 1. There are no known springs within 16 m of the Bridge 1 footings. However, based on the work of Bowles and Sanford, it appears that the Comal Springs riffle beetle and dryopid beetle occur near the surface in gravel substrates (alluvium) associated with springflow or spring-ambient water. Bowles and Sanford collected listed beetles in Spring Run 1 at distances greater than 16 m from identifiable springs.

The Comal unit of critical habitat for the Comal Springs riffle beetle has a total area of about 81,520 m^2 but the area of habitat near springs within that area is about 3,297 m^2. The project will reduce the Comal Springs riffle beetle critical habitat in the Comal Springs critical habitat unit for several months by 41 m^2.

Habitat Quality and Primary Constituent Elements
Habitat quality throughout most of Spring Run 2 will be maintained. Outside of Spring Run 2, dewatering will degrade four of the five Comal Springs riffle beetle PCEs by adversely affecting water quality, water temperature, the flow regime, and food supply. Lack of water during the proposed three weeks of construction removes the value of critical habitat for Comal Springs riffle beetles for those three weeks and some unknown period after construction.

It is anticipated that the critical habitat that is dewatered will remain unsuitable and unoccupied for an unknown period after construction is completed. PCE 1 (high-quality water with low salinity and low turbidity), PCE 2 (water temperatures between 20 and 24°C), and PCE 3 (an adequate springflow regime) would be restored to the dewatered zone post-construction after the

temporary dams are removed. In several weeks after springflows return, we anticipate the food supply (biofilm and particulate organic matter) will return, re-establishing PCE 4. The proposed grouting of the scour hole with addition of riprap rock will return the scour area to conditions similar when the Comal Springs riffle beetle was listed 1997. We do not know how long it will take for Comal Springs riffle beetles to colonize the riprap rocks after the sandbag walls are removed, but within a month the riprap rocks should be covered with biofilm that riffle beetles feed upon.

The Comal Springs system has about 3,300 m^2 of spring-dominated habitat fitting the description of Comal Springs riffle beetle critical habitat. This project would negatively affect about 41 m^2 of spring-influenced critical habitat during construction. Post-construction, this habitat is expected to return to current suitability for the Comal Springs riffle beetle.

Effects to the Fountain Darter
The project will dewater part of Spring Run 2. However, we have no evidence that fountain darter have colonized this part of the Comal Springs system. A fish barrier exists in the form of the weir that maintains water levels in the wading pool.

The fountain darter is most common in parts of Landa Lake with submerged aquatic vegetation. Landa Lake is effectively a large spring run and with a large and diverse submergent plant community, it likely supports a very large population of fountain darters (greater than 200,000). The proposed action includes the removal of the footings for Bridges 1 and 2. We estimate the areas that will be disturbed when the footings are removed as 25 m^2 for Bridge 1 and 50 m^2 for Bridge 2. The area near Bridge 1 footings, which is in the lower part of Spring Run 1, has virtually no vegetation and we estimate fountain darter density in this area at 0.1 individuals per m^2. The area near Bridge 2 footings is vegetated and we estimate fountain darter density in this area at 2.8 individuals per m^2. The number of fountain darters estimated to die during Bridge 1 footing removal is 3, while the number killed during Bridge 2 footing removal is 141.

Most of the fountain darter deaths (144) are expected around Bridge 2 in the Landa Lake. Given the reproductive potential of fountain darters and assuming an adequate Comal Springs flow regime is maintained during the project, we expect that nearby habitat in Landa Lake will be a source of fountain darters that will colonize areas currently occupied by the footings. The footing removal will leave holes but in time, sediment is expected to fill them.

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. 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. The USACE, Service, Federal Highway Administration, Federal Emergency Management Agency, and the U.S. Environmental Protection Agency are the most likely Federal agencies to authorize or fund projects warranting section 7 review in New Braunfels, Texas.

Regional Factors

The Recovery Plan for the fountain darter (Service 1996) discusses the various regional and local threats to these species. Overpumping from the Edwards aquifer remains the most significant regional threat. Given current aquifer conditions and seasonal drought forecast, we believe Comal Springs discharge in 2012 is likely to remain near or below average. Management of the Edwards aquifer (with implementation of conservation management actions to benefit the fountain darter and Comal Springs invertebrates) is the crux of the Edwards Aquifer Recovery Implementation Program (EARIP) and proposed Edwards Aquifer Habitat Conservation Plan (2012).

Habitat conservation planning is progressing at a regional level for Edwards aquifer species through the EARIP. The EARIP is a collaborative consensus-based process that involves many stakeholders. An objective of the EARIP is to receive by December 31, 2012, an incidental take permit pursuant to section 10(a)(1)(B) of the Act to address the effects of Edwards aquifer management (which includes pumping) on federally listed threatened and endangered species dependent on the Edwards aquifer. The HCP application is currently under review by the Service. One of the goals of the proposed HCP is to maintain adequate and continuous springflow at Comal Springs even during a drought with the duration and intensity of the 1951 – 1956 drought.

Local Factors

Ongoing impacts from water recreationists remain a serious local threat to fountain darter habitat. Invasive non-native mollusk and fish species are adversely affecting habitat suitability in the Comal Springs ecosystem. Additional future introductions (unintentional or not) and establishment of other non-native plants seem likely to occur. Flooding, varying from mild to severe, is expected in the action area during the life of the project. Flood control projects in the Comal area have reduced the severity of flooding in the action area. However, as the immediate watershed becomes more developed, the stormwater hydrograph and water quality are expected to be altered. Comal Springs invertebrates and fountain darters, and other biota of the Comal River may be affected by contaminants associated with land-use near the river.

Cumulative Effects to Designated Critical Habitat

The magnitude of the effects of future non-Federal actions on the primary constituent elements depends on: (1) implementation of regional and local water conservation efforts (including diversification of water supply), and (2) the intensity and duration of the next drought. Regional efforts that effectively manage Edwards aquifer pumping would reduce the effects of drought on Comal Springs discharge and the water-related primary constituent elements. If cumulative use of the Edwards aquifer is not effectively managed by the EARIP HCP, flow at Comal Springs will fail. If springflows fail, the function and value of critical habitat for the Comal Springs invertebrates will be diminished or lost. We do not know how long each of the listed Comal Springs invertebrates species can survive if Comal Springs fails. Comal Springs associated with Spring Runs 1, 2, 3, and 4 failed to flow for almost 6 months in 1956. We do not know what the population sizes were before or after that event. If the populations were large before springs failed, potentially they were reduced to a moderate population size after spring failure. Alternatively, they could have been reduced to a low number of individuals, and under those circumstances, they managed to recruit young and eventually colonize available suitable habitats.

However, we are unaware of any means to determine the likelihood that the listed spring-dependent invertebrate species would survive a similar event in the timeframe for the proposed action (late 2012).

VI. Conclusion

Jeopardy Determinations
The following analysis relies on the following components: (1) the status of the species, (2) the environmental baseline, (3) the effects of the action, and (4) the cumulative effects. After reviewing the current status of the Peck's cave amphipod, Comal Springs dryopid beetle, Comal Springs riffle beetle, and 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 proposed repair of Gazebo Circle bridge and removal of footings for Bridges 1 and 2 will not jeopardize the continued existence of the Peck's cave amphipod, the Comal Springs dryopid beetle, the Comal Springs riffle beetle, or the fountain darter. This is based on: (1) the current stable status of these species, (2) the number of individuals likely to be killed by the project as proposed, and (3) the expected persistence of an adequate population of Peck's cave amphipods, Comal Springs dryopid beetles, Comal Springs riffle beetles, and fountain darters in areas not affected by the project.

The reduction of the habitat in Spring Run 2 for the Comal Springs invertebrates is a function of the duration of construction and the area impacted by construction. This proposed project would adversely affect about 41 m^2 of Comal Springs invertebrate habitat for two months.

Adverse Modification Determinations
The proposed actions - project will not adversely modify designated critical habitat of the Peck's cave amphipod, Comal Springs riffle beetle, or Comal Springs dryopid beetle. Although small percentage of critical habitat for these species will be degraded during bridge repair, we anticipate the loss of the primary constituent elements will be temporary. Restoration of four of the primary constituent elements (water quality, water temperature, springflow regime, and food supply) is expected within several months of completion of construction. The primary constituent element (PCE 5) for the Comal Springs riffle beetle involving gravel and cobble substrate will be temporarily affected where suitable substrate is covered with a polypropylene liner. However, PCE 5 will be maintained in outside of the Gazebo Circle Bridge repair during and after construction.

This conclusion is based in part on the small percent of critical habitat for each species that would be adversely affected by temporary sandbag walls and dewatering. PCE 1 (water quality) would be impaired and habitat would no longer be expected to support listed dryopid and riffle beetles for the duration of the project and for some unknown period afterwards. Little to no water in critical habitat may subject the exposed spring run to higher than normal temperatures in Summer, and cooler than normal temperatures in Winter (PCE 2). The dewatering would interrupt the natural hydrologic regime (PCE 3). Dewatering would reduce food supplies (PCE 4), which require water for biofilm production. However, the restoration of springflow over the dewatered zone should result in a return of habitat suitability over an unknown period of time.

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 USACE so that they become binding conditions of any authorization issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The USACE has a continuing duty to regulate the activity covered by this incidental take statement. If the USACE: (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 USACE 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

Incidental Take

The following table summarizes the incidental take of Peck's cave amphipod, Comal Springs dryopid beetle, Comal Springs riffle beetle, and fountain darter. It is based on the assumption that the effects of the project are limited primarily to the immediate work areas. The incidental take totals do not include any effects to groundwater flowpaths or groundwater quality changes that may result from the drilling of boreholes for the abutment and wingwalls of Gazebo Circle Bridge. The City expects to encounter groundwater when drilling these piers. However, we do not have any information on the likelihood of potential effects to listed species and their habitats presented by drilling four 2 ft nominal diameter boreholes to a depth of 35 to 55 ft below the roadway surface for Gazebo Circle Bridge.

Table 1. Incidental take for Consultation 2012-F-0238

Species	**Area**	**Incidental Take**
Peck's cave amphipod	Spring Run 2	269
Comal Springs dryopid beetle	Spring Run 2	41
Comal Springs riffle beetle	Spring Run 2	134
fountain darter	Bridge 1	3
fountain darter	Bridge 2	141

Total estimated incidental take of fountain darters is 144. Moving fountain darters near Bridge 2 out of harm's way is probably not feasible. Similarly, it is probably not practicable to attempt to capture and relocate Comal Springs invertebrates in the Spring Run 2 work area. We assume 100 percent of the amphipods, beetles, and darters remaining in affected areas will be killed. While it is likely that some of the darters in the area near the footings to be removed will escape, we are uncertain how many will successfully colonize nearby habitats.

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 USACE 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 for the reasons stated in Section VI above.

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.

(1) Disturbance of the (a) substrate, (b) water quality, (c) plants, and (d) animals of the Comal Springs, Landa Lake, and Comal River due to bridge repair and pier removal shall be avoided when possible and reduced to the maximum extent practicable where disturbance is unavoidable.

(2) The applicant shall monitor the project and ensure appropriate and relevant information (as specified below) on the project is provided in a timely manner to the USACE and Service. In particular, if drilling for piers hits a karst feature or void that produces springflow or otherwise affects Comal Springs springflow, drilling will stop and the USACE and Service will be notified within 24 hours.

Terms and conditions

To be exempt from the prohibitions of section 9 of the Act, the USACE must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required 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 No. 1:

(1) The USACE will ensure project-related work will be actively monitored by the applicant (City and its contractors), who will help ensure that actions taken on-site are consistent with approved plans and this biological opinion.

(2) The USACE will require the applicant to ensure: (a) equipment will be readied and mobilized in a manner to minimize the duration of disturbance, (b) equipment will be demobilized if a precipitation event and runoff is likely to flood the area, and (c) flow in Spring Run 2 (springflow and runoff) will be controlled by a sandbag wall (with liner) and a set of bypass pipes. Water will be maintained at least 3 cm above the substrate in Spring Run 2 below the work area.

(3) Work by the applicant and the contractor shall be done with careful staging of heavy equipment by the river and inspections for leakage of fuels, hydraulic fluids, coolants, and any other fluids are required. If fluid leakage is detected, equipment must be repaired and cleaned prior to working in or along the river. Care must be taken to prevent material falling into the river.

(4) Turbidity will be visually monitored daily during construction including from pumped water. If construction-related turbidity in Landa Lake is greater than 5 nephelometric turbidity units for a period longer than 24 hours, the applicant will contact the Service to discuss measure to abate the turbidity. If indicated, additional measures to reduce turbidity may be recommended.

Terms and conditions that implement RPM No. 2:

(5) The USACE will ensure that the applicant contact the USACE and the Service's Austin Ecological Services Field Office at: (a) the beginning of work, (b) the end of work, and (c) any notable or unforeseen event that may affect the aquatic community in a manner not considered in this biological opinion. Examples of notable events would be flooding or encountering a groundwater flowpath when drilling. Contact with the Service can be made by phone (512 490-0057), facsimile (512 490-0094), or by 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 USACE 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 USACE 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 USACE with the following conservation recommendations:

(1) In coordination with the Service, plan and implement a study to assess the current (pre-project) status of Comal Springs invertebrates in Spring Run 2. Re-assess post-construction to determine the extent of colonization of disturbed habitat by Comal Springs invertebrates. If feasible, allow Service biologists to sample pumped water from boreholes for Comal Springs invertebrates to help resolve their potential occurrence in groundwater near Spring Run 2.

(2) Assist with restoration and protection of native trees in Spring Run 2. Assist with restoration of macrophytes in Landa Lake and the Comal River. Assist with the removal of waterfowl (including ducks and swans) from Landa Park (Landa Lake, its spring runs, Comal River).

(3) Assist with efforts to reduce the likelihood of traffic accidents and contaminant spills on Gazebo Circle, especially near Spring Runs 2 and 3.

(4) Assist with the implementation of recovery tasks for the fountain darter in the revised Recovery Plan and when the next revision to the Recovery Plan is finalized, assist with implementation of recovery tasks for the Comal Springs invertebrates.

We request notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their 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 that our opinion is based on, the USACE

needs to communicate with the Service to make sure the effects to species and the amount of take are not changed. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. Reinitiation would be indicated if final plans differ from the proposed action in a manner that additional aquatic habitats or species numbers are affected. Regarding item 4, if a revision to the designated critical habitat for the Comal Springs invertebrates results in a determination that implementation of this project would adversely modify critical habitat, then any activities causing such effects must stop, until a subsequent formal consultation is complete. We will keep the USACE and City apprised of proposed and final rules published in the *Federal Register* related to any revision of the designated critical habitat for the Comal Springs invertebrates.

If you have any questions about this biological opinion for the Gazebo Circle Bridge repair and pedestrian bridge pier removal in Landa Park, please contact Patrick Connor at (512 334-8419). Thank you for your interest and help in conserving our Nation's natural resources.

Sincerely,

Adam Zerrenner
Field Supervisor

cc: Scott Kelly, U.S. Army Corps of Engineers, Fort Worth, Texas
Stacey Laird Dicke, Parks and Recreation Dept., City of New Braunfels, Texas

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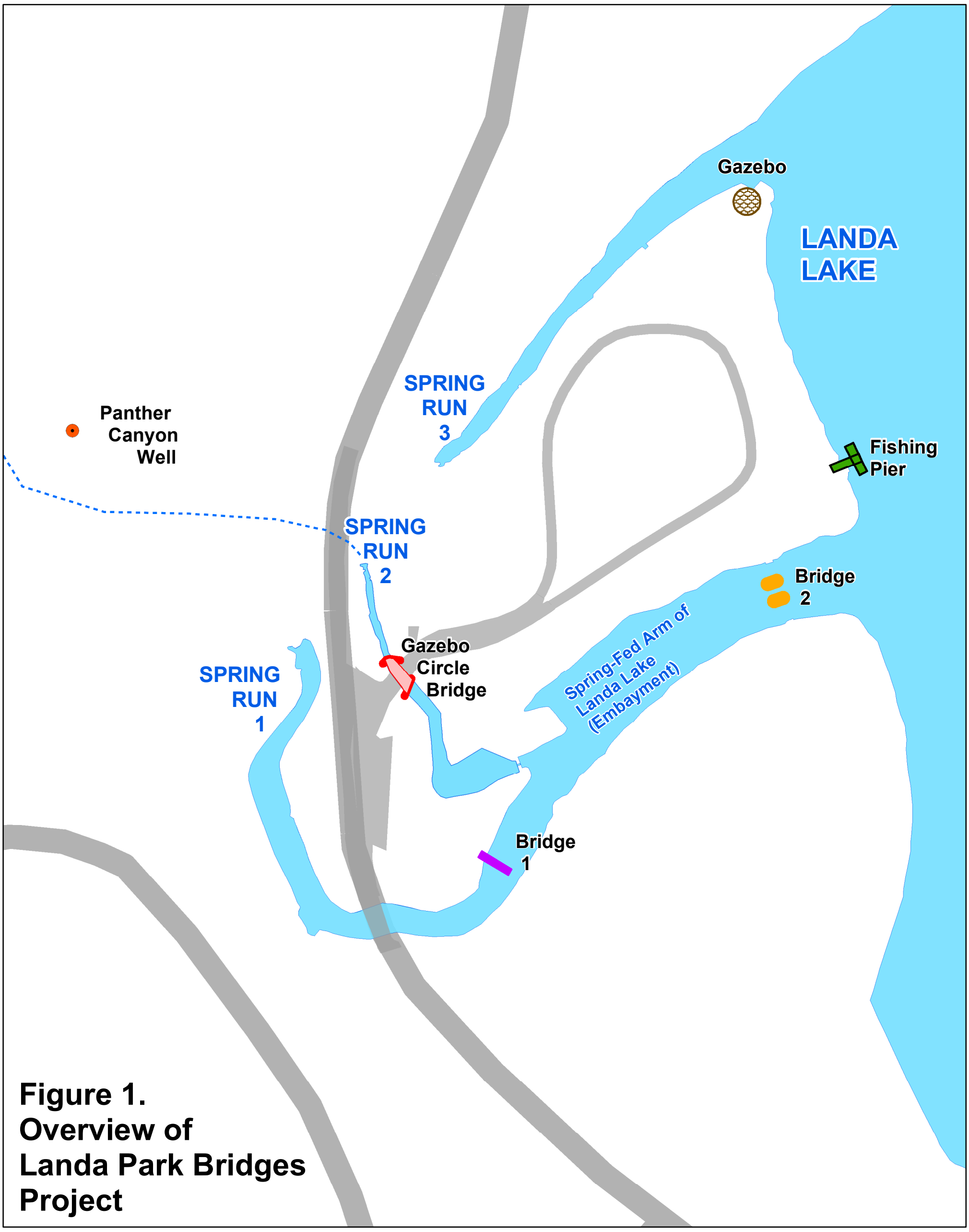

Figure 1. Overview of Landa Park Bridges Project

U.S. Army Corps of Engineers
Project No. SWF-2012-00180
Landa Park, New Braunfels, Texas

- Gazebo Circle Bridge Work Area
- Bridge 1 Work Area
- Bridge 2 Work Area

0 60 120 240 Feet

0 20 40 80 Meters

N

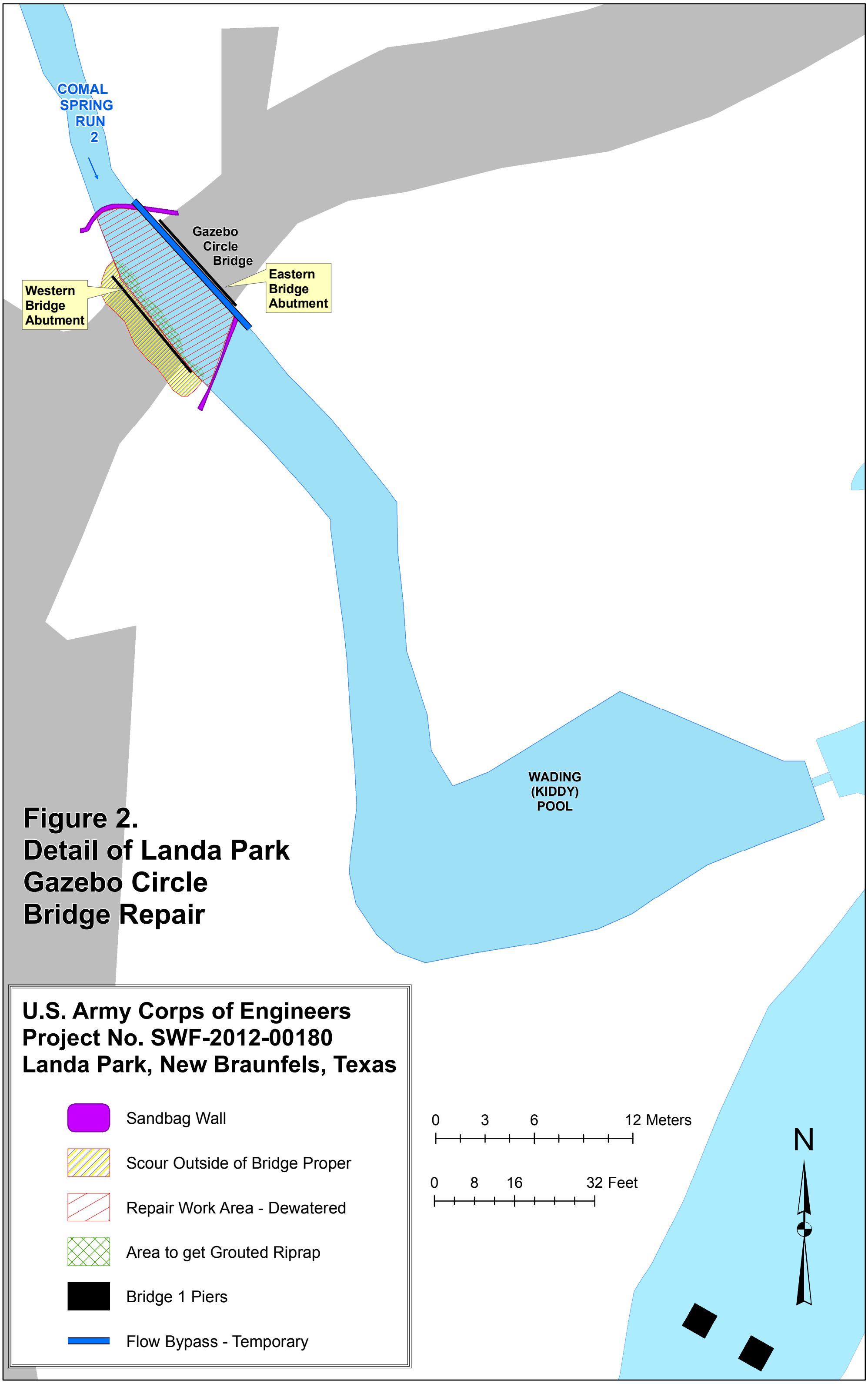

Figure 2.
Detail of Landa Park
Gazebo Circle
Bridge Repair

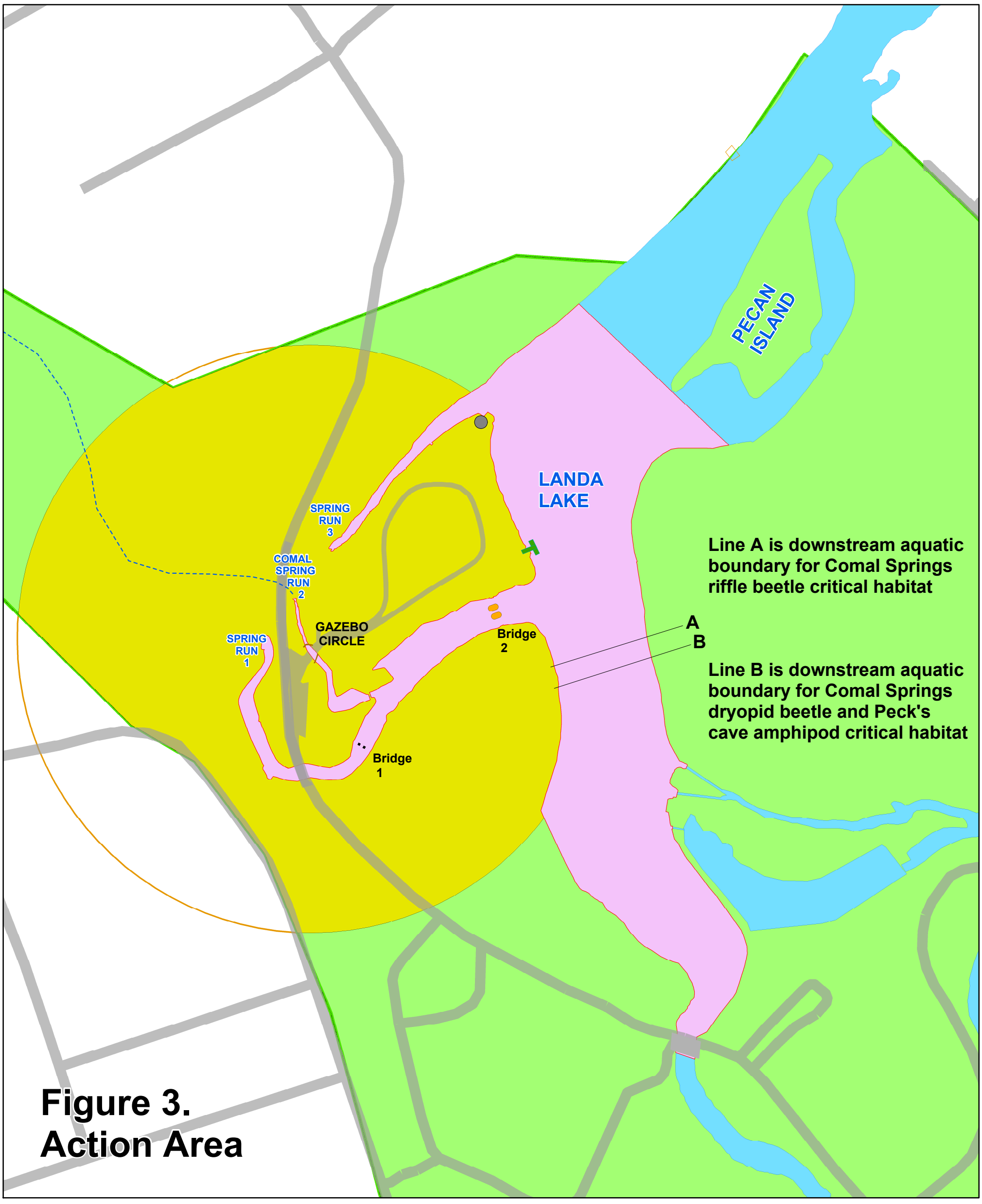

Figure 3.
Action Area

U.S. Army Corps of Engineers
Project No. SWF-2012-00180
Landa Park, New Braunfels, Texas

Action Area - Non-Aquatic

Action Area - Aquatic

Landa Park Boundary

N

0 150 300 600 Feet

0 50 100 200 Meters

Figure 4
PECK'S CAVE AMPHIPOD SITES & GAZEBO CIRCLE BRIDGE REPAIR

U.S. Army Corps of Engineers
Project No. SWF-2012-00180
Landa Park, New Braunfels, Texas

Repair Work Area - Dewatered

PECK'S CAVE AMPHIPOD SITE

0 20 40 80 Meters

N

Figure 5.
COMAL SPRINGS DRYOPID BEETLE SITES & GAZEBO CIRCLE BRIDGE REPAIR

U.S. Army Corps of Engineers
Project No. SWF-2012-00180
Landa Park, New Braunfels, Texas

Repair Work Area - Dewatered

STYGOPARNUS COMALENSIS SITE

0 20 40 80 Meters

N

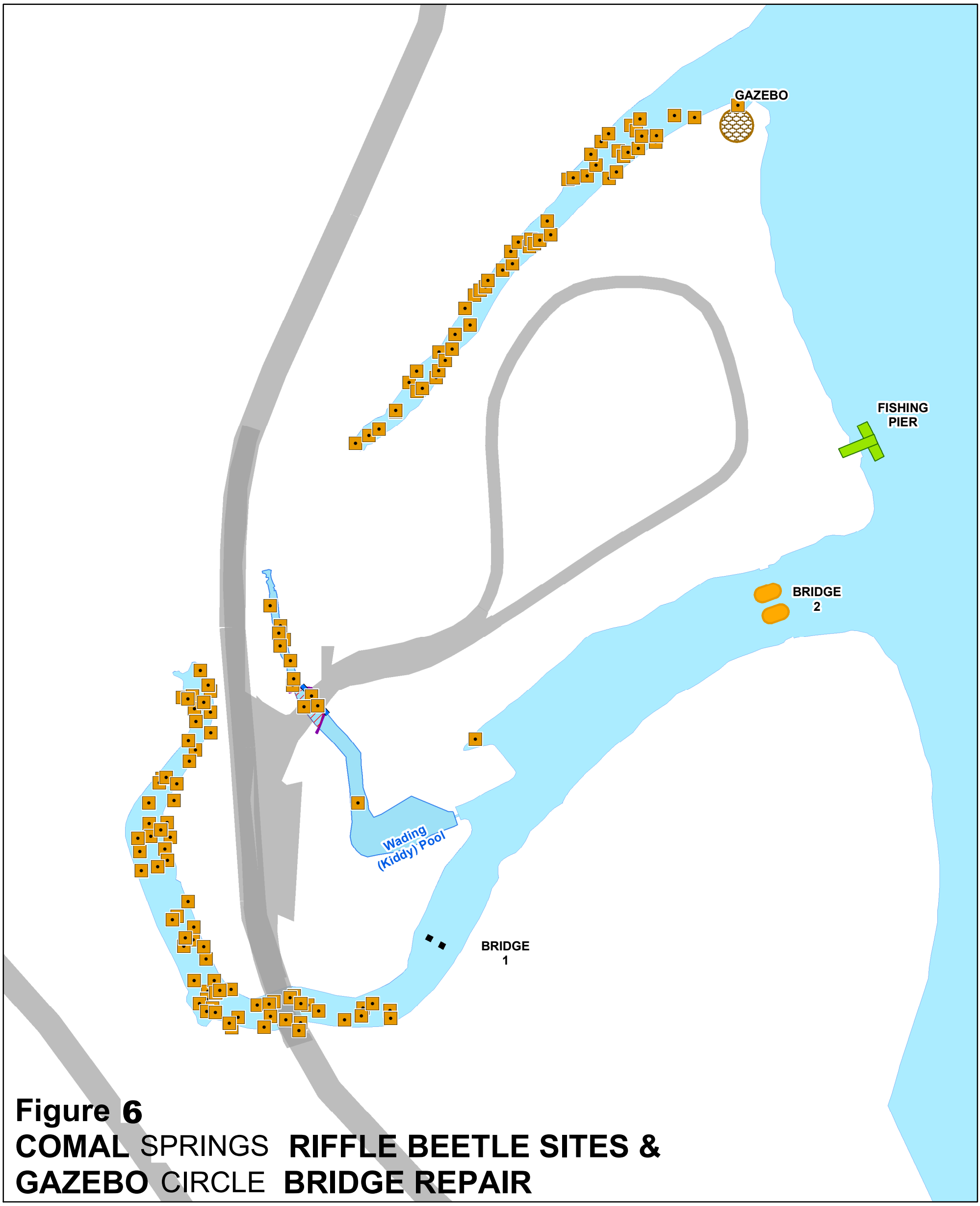

Figure 6
COMAL SPRINGS **RIFFLE BEETLE SITES &**
GAZEBO CIRCLE **BRIDGE REPAIR**

0 20 40 80 Meters

N

U.S. Army Corps of Engineers
Project No. SWF-2012-00180
Landa Park, New Braunfels, Texas

Repair Work Area - Dewatered

COMAL SPRINGS RIFFLE BEETLE SITE

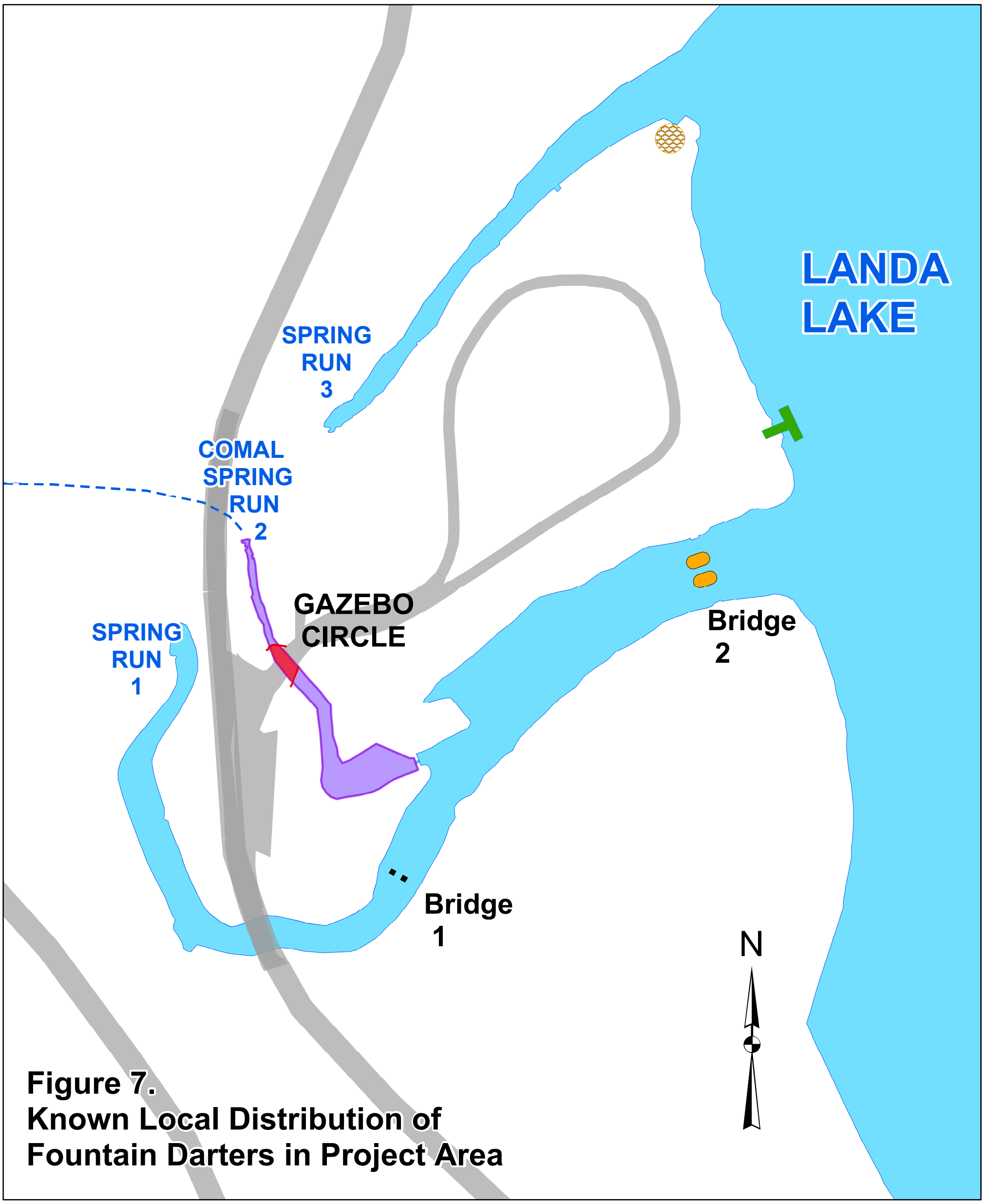

Figure 7.
Known Local Distribution of Fountain Darters in Project Area

U.S. Army Corps of Engineers
Project No. SWF-2012-00180
Landa Park, New Braunfels, Texas

- Repair Work Area - Dewatered
- Fountain Darters Known From Areas in Blue
- No Darters Known from Spring Run 2

0 80 160 320 Feet

0 20 40 80 Meters