Draft Biological Resources Technical Report

SH 130 from SH 45N to SH 71

CSJ: 0440-06-017 & 0440-06-018

Texas Department of Transportation, Austin District
June 2017

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 16, 2014, and executed by FHWA and TxDOT.

Table of Contents

List of Tables

List of Appendices

This page intentionally left blank.

1.0 Introduction

The Texas Department of Transportation (TxDOT) Austin District proposes to widen the existing State Highway (SH) 130 to include additional travel lanes and auxiliary lanes. The proposed project is located on SH 130 and extends from SH 45N to SH 71 for a total project length of approximately 22 miles (see **Figure 1** in **Appendix A**). The proposed project includes adding a mainlane in each direction and auxiliary lanes between ramps (where warranted); widening bridges and culverts; and crossover improvements.

The existing SH 130 facility consists of two to three 12-foot-wide lanes in each direction with 12-foot-wide outside shoulders and 6-foot-wide inside shoulders. Directions of travel are separated by a grassy depressed median, usually 135 feet in width. If completed, the mainlanes of the SH 130 facility would consist of three to five 12-foot-wide lanes in each direction with 12-foot-wide outside shoulders and 10- to 12-foot-wide inside shoulders. Directions of travel would be separated by a grassy median that would vary from 103 to 135 feet in width.

The proposed improvements would be constructed within the existing right of way; therefore, no new right of way would be required. No displacements are anticipated.

2.0 Surrounding Area

2.1 Land Use

The project area is located within portions of the cities of Pflugerville and Austin in eastern Travis County, Texas (see **Figure 1** in **Appendix A**). Land use along SH 130 is mostly rural with large tracts of undeveloped land. The majority of these areas are being used for agricultural purposes including cattle ranching, farming and hay production. Some commercial and residential development occurs at the northern terminus of the project area, within the Pflugerville city limits.

2.2 Natural Setting

The proposed project area occurs within the Blackland Prairies Ecoregion of Texas (see **Figure 2** in **Appendix A**).

The Blackland Prairie covers approximately 11.5 million acres, including the San Antonio and Fayette Prairies. This region is classified as a true prairie and is characterized by gently rolling to nearly level grasslands underlain by dark, fertile soil with rapid surface drainage (Correll and Johnston 1979). Various species of hardwood trees are characteristic of the riparian corridors that traverse this region. As a result of ease of clearing and soil fertility, the majority of the region has been cultivated.

The proposed project area lies within the Colorado River drainage basin. The Colorado River headwaters are located in northeastern Dawson County; from here, the river flows southeast for 862 miles to its final destination in Matagorda Bay. Topography of the proposed project area is rolling, with elevations ranging from approximately 750 feet above mean sea level (MSL) at the northern terminus of the proposed project area to approximately 400 feet above MSL along the Colorado River near the southern terminus of the proposed project area (U.S. Geological Survey [USGS] 1987 and 1988).

3.0 Specific Areas of Environmental Concern

3.1 Vegetation

3.1.1 Description of Vegetation in the Project Area

In accordance with the 2013 Memorandum of Understanding (MOU) between TxDOT and the Texas Parks and Wildlife Department (TPWD), an investigation was conducted to identify and map the vegetation types present and assess the potential effects of construction of the proposed project on native vegetation. The Ecological Mapping Systems of Texas (EMST) GIS database was searched in order to analyze vegetation potentially impacted by the proposed build alternative (TPWD 2014). The EMST categorizes the project area vegetation into thirty different communities, including:

- Edwards Plateau: Live Oak Motte and Woodland;
- Edwards Plateau: Savanna Grassland;
- Edwards Plateau: Shin Oak Slope Shrubland;
- Central Texas: Floodplain Live Oak Forest;
- Central Texas: Floodplain Hardwood / Evergreen Forest;
- Central Texas: Floodplain Hardwood Forest;
- Central Texas: Floodplain Evergreen Shrubland;
- Central Texas: Floodplain Deciduous Shrubland;
- Central Texas: Floodplain Herbaceous Vegetation;
- Central Texas: Riparian Hardwood / Evergreen Forest;
- Central Texas: Riparian Hardwood Forest;
- Central Texas: Riparian Evergreen Shrubland;
- Central Texas: Riparian Deciduous Shrubland;
- Central Texas: Riparian Herbaceous Vegetation;
- Blackland Prairie: Disturbance or Tame Grassland;
- Crosstimbers: Savanna Grassland;
- Post Oak Savanna: Live Oak Motte and Woodland;
- Post Oak Savanna: Post Oak Motte and Woodland;
- Post Oak Savanna: Savanna Grassland;

- Post Oak Savanna: Post Oak / Yaupon Motte and Woodland;
- Barren;
- Marsh;
- Native Invasive: Juniper Woodland;
- Native Invasive: Deciduous Woodland;
- Native Invasive: Juniper Shrubland;
- Native Invasive: Mesquite Shrubland;
- Row Crops;
- Urban High Intensity; and,
- Urban Low Intensity (see **Figures 3-1** to **3-29** in **Appendix A**).

It should be noted that there was a discrepancy between vegetation communities mapped by the EMST and vegetation communities mapped during field investigations of the proposed project area. Twelve different vegetation communities were mapped in the field and include the following:

- Barren
- Blackland Prairie: Disturbance or Tame Grassland;
- Central Texas: Floodplain Deciduous Shrubland;
- Central Texas: Floodplain Hardwood Forest;
- Central Texas: Floodplain Herbaceous Vegetation;
- Central Texas: Riparian Hardwood Forest;
- Post Oak Savanna: Live Oak Motte and Woodland;
- Post Oak Savanna: Post Oak Motte and Woodland;
- Marsh;
- Native Invasive: Deciduous Woodland;
- Native Invasive: Juniper Shrubland; and,
- Urban (see **Figures 4-1** to **4-29** in **Appendix A** and **Table 3.1.1** below).

General EMST descriptions for each of these vegetative communities are provided in the following paragraphs. Project area photographs are provided in **Appendix B.** Total impacts to vegetation are calculated based on direct, permanent impacts that would occur as a result of construction of the proposed project.

Table 3.1-1 Vegetation Potentially Impacted by the Proposed Project

Vegetation Community	MOU Habitat Type[1]	MOU Threshold	Permanent Proposed Additional Lane Impacts (acres)	Permanent Proposed Bridge Extension Impacts (acres)	Total Impacts to Vegetation[2] (acres)
Barren	Agriculture (cleared of vegetation)	10	0	0	0
				Barren Total	**0**

Table 3.1-1 Vegetation Potentially Impacted by the Proposed Project					
Vegetation Community	**MOU Habitat Type[1]**	**MOU Threshold**	**Permanent Proposed Additional Lane Impacts (acres)**	**Permanent Proposed Bridge Extension Impacts (acres)**	**Total Impacts to Vegetation[2] (acres)**
Blackland Prairie: Disturbance or Tame Grassland	Tallgrass Prairie, Grassland	2	56.54	1.83	58.37
				Tallgrass Prairie, Grassland Total	**58.37**
Central Texas: Floodplain Deciduous Shrubland	Riparian	0.1	0	0.20	0.20
Central Texas: Floodplain Hardwood Forest			0	0.08	0.08
Central Texas: Floodplain Herbaceous Vegetation			0.22	2.26	2.48
Central Texas: Riparian Hardwood Forest			0	0.11	0.11
Marsh			0	0.02	0.02
				Riparian Total	**2.89**
Post Oak Savanna: Live Oak Motte and Woodland	Post Oak Savanna	2	0	0	0
Post Oak Savanna: Post Oak Motte and Woodland			0	0	0
				Post Oak Savanna Total	**0**
Native Invasive: Deciduous Woodland	Disturbed Prairie	3	0	0	0
Native Invasive: Juniper Shrubland			0	0	0
				Disturbed Prairie Total	**0**
Urban	Urban	NA	13.78	1.54	15.32
				Urban Total	**15.32**

[1]MOU vegetation types are identified for each vegetation community in accordance with the Threshold Table Programmatic Agreement. See **Section 4.0** for further discussion.
[2]Vegetation impact totals are calculated based on direct, permanent impacts that would occur as a result of construction of the proposed project. Temporary impacts are assumed, but amounts are unknown at this time.

Barren

This vegetation community consists of areas that have been previously scraped and cleared of vegetation, presumably for construction staging (see **Figure 4-25** in **Appendix A**). Little to no vegetation cover exists within these areas. None of this vegetation community would be permanently impacted by the proposed project.

Blackland Prairie: Disturbance or Tame Grassland

This vegetation community occurs throughout the project area and usually consists of non-native grasses such as Bermudagrass (*Cynodon dactylon*), kleingrass (*Panicum coloratum*), King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*) and Johnsongrass (*Sorghum halepense*) (see **Figures 4-1** through **4-29** in **Appendix A**). Weedy forbs such as western ragweed (*Ambrosia psilostachya*) and common broomweed (*Amphiachyris dracunculoides*) are often present. Honey mesquite (*Prosopis glandulosa*) and/or huisache (*Acacia farnesiana*) are often present and may be fairly dense. Important native grasses may include little bluestem (*Schizachyrium scoparium*), silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), Indiangrass (*Sorghastrum nutans*), Texas wintergrass (*Nassella leucotricha*), hairy grama (*Bouteloua hirsuta*), and threeawn species (*Aristida* spp.). Approximately 58.37 acres of this vegetation community would be permanently impacted by the proposed project.

Central Texas: Floodplain Deciduous Shrubland

This vegetation community consist of shrublands within floodplains that are dominated by deciduous shrubs such as possumhaw (*Ilex decidua*), honey mesquite, black willow (*Salix nigra*), roughleaf dogwood (*Cornus drummondii*), and/or common buttonbush (*Cephalanthus occidentalis*) (see **Figure 4-27** in **Appendix A**). This mapped type may also include areas with sparse woodlands composed of typical deciduous overstory species as described above, or sites in early succession dominated by species such as honey mesquite, huisache, sugar hackberry (*Celtis laevigata*), or Chinese tallow (*Triadica sebifera*). Approximately 0.2 acre of this vegetation community would be permanently impacted by the proposed project.

Central Texas: Floodplain Hardwood Forest

This vegetation community generally occurs on Quaternary alluvium along the Colorado River and major tributaries. This floodplain forest occupies relatively broad flats at low topographic positions along large streams (see **Figures 4-18**, **4-21**, **4-27** and **4-28** in **Appendix A**). Canopy dominants may include pecan (*Carya illinoinensis*), cedar elm (*Ulmus crassifolia*), sugar hackberry, American elm (*Ulmus americana*), coastal live oak (*Quercus virginiana*), American sycamore (*Platanus occidentalis*), boxelder (*Acer negundo*), bur oak (*Quercus macrocarpa*), green ash (*Fraxinus pennsylvanica*), and western soapberry (*Sapindus saponaria* var.

drummondii). Especially along river margins, species such as American sycamore, eastern cottonwood (*Populus deltoides*), and black willow may dominate. Approximately 0.08 acre of this vegetation community would be permanently impacted by the proposed project.

Central Texas: Floodplain Herbaceous Vegetation

This vegetation community occurs within floodplains and lacks a significant overstory or shrub canopy, but retains cover in the herbaceous layer (see **Figures 4-5**, **4-11**, **4-12**, **4-17** through **4-24**, and **4-27** through **4-29** in **Appendix A**). Non-native grass species such as Bermudagrass, King Ranch bluestem and Johnsongrass may frequently dominate this vegetation type. Approximately 2.48 acres of this vegetation community would be permanently impacted by the proposed project.

Central Texas: Riparian Hardwood Forest

This vegetation community usually occurs within valleys and along drainages of headwater streams and often contains deciduous species such as cedar elm, sugar hackberry, American sycamore, black willow, green ash, pecan, and eastern cottonwood in the canopy (see **Figures 4-5**, **4-11**, and **4-12** in **Appendix A**). Approximately 0.11 acre of this vegetation community would be permanently impacted by the proposed project.

Marsh

This vegetation community usually includes areas that are small, and consist of wet or alternately wet and dry soils with herbaceous vegetation (see **Figures 4-7**, **4-12**, **4-21**, **4-22**, and **4-23** in **Appendix A**). These are often near tanks or ponds, and may contain cattails (*Typha* spp.), spikerushes (*Eleocharis* spp.), bulrushes (*Schoenoplectus* spp.), other sedges, smartweeds (*Polygonum* or *Persicaria* spp.) and grasses such as Johnsongrass or Bermudagrass as important species. Some shrubs such as common buttonbush and black willow may be important in this mapped type. Approximately 0.02 acre of this vegetation community would be permanently impacted by the proposed project.

Post Oak Savanna: Live Oak Motte and Woodland

This vegetation community includes dominant species such as coastal live oak (see **Figures 4-7**, **4-12**, **4-21**, **4-22**, and **4-23** in **Appendix A**). Post oak (*Quercus stellata*) may be present in these woodlands, but typically only as a minor component of the canopy, or it may be completely absent. Yaupon (*Ilex vomitoria*), American beautyberry (*Callicarpa americana*), greenbrier (*Smilax bona-nox*), gum bumelia (*Sideroxylon lanuginosum*), poison ivy (*Toxicodendron radicans*), mustang grape (*Vitis mustangensis*), Texas persimmon (*Diospyros texana*), and Hercules' club (*Zanthoxylum clava-herculis*) may be present in the shrub layer. None of this vegetation community would be permanently impacted by the proposed project.

Post Oak Savanna: Post Oak Motte and Woodland

This vegetation community is typically dominated by post oak, with blackjack oak (*Quercus marilandica*) and/or plateau live oak (*Quercus fusiformis*) (particularly in the south) also present (see **Figures 4-7**, **4-12**, **4-21**, **4-22**, and **4-23** in **Appendix A**). Black hickory (*Carya texana*) may be a significant component of the overstory, particularly on deep sands. Other species that may be present in the overstory or represented as shrubs include sugar hackberry, honey mesquite, eastern redcedar (*Juniperus virginiana*), and cedar elm. The shrub layer includes species such as American beautyberry, possumhaw, yaupon, gum bumelia, greenbrier, and Hercules' club. None of this vegetation community would be permanently impacted by the proposed project.

Native Invasive: Deciduous Woodland

Dominants within this vegetation community often include mesquite, sugar hackberry, cedar elm, or huisache (see **Figures 4-14**, **4-19**, **4-22** and in **Appendix A**). Other species such as water oak (*Quercus nigra*), black willow and ash (*Fraxinus* spp.) may be important, and to the south and west (outside this project area) species such as granjeno (*Celtis pallida*), colima (*Zanthoxylum fagara*), and Texas persimmon are more common. Live oak or post oak may also be present. None of this vegetation community would be permanently impacted by the proposed project.

Native Invasive: Juniper Shrubland

This vegetation community contains both Ashe juniper (*Juniperus ashei*) and eastern redcedar shrublands (see **Figure 4-14** in **Appendix A**). Ashe juniper shrublands are limited mainly to the northwestern portion in the area underlain by the Edwards Plateau (outside of the project area). Eastern redcedar shrublands are mainly in the northeast and east (within the project area). Species such as live oak, mesquite, huisache, sugar hackberry, and cedar elm may be components in both cases. None of this vegetation community would be permanently impacted by the proposed project.

Urban

The urban vegetation type consists of built-up areas and wide transportation corridors that are dominated by impervious cover or areas that are built-up but not entirely covered by impervious cover (see **Figures 4-1** through **4-29** in **Appendix A**). These areas include most of the non-industrial areas within cities and towns. Approximately 15.32 acres of this vegetation community would be permanently impacted by the proposed project.

3.1.2 Unusual Vegetation and Special Habitat Features

In accordance with the 2013 TxDOT-TPWD MOU, unusual vegetation features or special habitat features occurring within the proposed project area were identified and described during the June 2017 field investigations. Unusual vegetation features are described in the MOU as including:

- Unmaintained vegetation
- Trees or shrubs along a fenceline adjacent to a field (fencerow vegetation)
- Riparian vegetation (particularly where fields/cropland extend up to or abut the vegetation associated with the riparian corridor)
- Trees that are considered historically significant, ecologically significant, or locally important (such as champion trees located on the Texas A&M Forest Service Big Tree Registry [http://txforestservice.tamu.edu/main/article.aspx?id=1336])
- Unusual stands or islands (isolated) of vegetation

Unusual vegetation features identified within the proposed project area include unmaintained vegetation, fencerow vegetation, riparian vegetation, trees that are ecologically significant or locally important, and islands (isolated) of vegetation. Unmaintained vegetation is associated with portions of all the vegetation communities described above except for Barren and Urban. Approximately 61.26 acres of unmaintained vegetation would be permanently impacted by the proposed project. Riparian vegetation is associated with the Central Texas: Floodplain Deciduous Shrubland, Central Texas: Floodplain Hardwood Forest, Central Texas: Floodplain Herbaceous Vegetation, Central Texas: Riparian Hardwood Forest, and Marsh communities also described above. Approximately 2.89 acres of riparian vegetation would be permanently impacted by the proposed project. Large pecans were noted within the project area along the Colorado River, and a group of large post oaks occur within the project area just south of FM 973. Given that most of the project area is within a disturbed grassland setting, these trees are both ecologically significant and locally important. One isolated stand of Native Invasive: Deciduous Woodlands occurs in-between FM 973 and northbound SH 130 but would not be impacted by the construction of the proposed project.

Impacts to vegetation would be avoided or minimized by limiting disturbance to only that which is necessary to construct the proposed project. The removal of native vegetation, particularly mature native trees and shrubs, would be avoided to the greatest extent practicable. An approved seed mix would be used in the landscaping and revegetation of disturbed areas.

Special habitat features are described in the 2013 TXDOT-TPWD MOU as including:

- Bottomland hardwoods
- Caves
- Cliffs and bluffs
- Native prairies (particularly those with climax species of native grasses and forbs)
- Ponds (temporary and permanent, natural, and man-made)
- Seeps or springs
- Snags (dead trees) or groups of snags
- Water bodies (creeks, streams, rivers, lakes, etc.)

- Existing bridges with known or easily observed bird or bat colonies
- Rookeries
- Prairie dog towns

Special habitat features observed during field investigations include bottomland hardwoods, snags, water bodies, and existing bridges with known or easily observed bird or bat colonies. Bottomland hardwoods occur along both banks of Wilbarger Creek, Gilleland Creek, Harris Branch Creek, Decker Creek, Elm Creek, and the Colorado River. These bottomland hardwoods are associated with the Central Texas: Riparian Hardwood Forest and Central Texas: Floodplain Hardwood Forest vegetation communities described above. Snags were noted along the Colorado River and within other wooded areas throughout the proposed project. Multiple waterbodies including six named streams, Wilbarger Creek, Gilleland Creek, Harris Branch Creek, Decker Creek, Elm Creek, and the Colorado River, occur within the proposed project area. Tributaries and associated wetland features to these streams also occur throughout the project area but would not be impacted by the proposed project. Nesting Cliff Swallows (*Petrochelidon pyrrhonota*), Barn Swallows (*Hirundo rustica*) and Eastern Phoebes (*Sayornis phoebe*) were noted under bridges throughout the project area. To avoid or minimize potential impacts to these nesting birds, the following recommended best management practices (BMPs) from the Best Management Practices Programmatic Agreement between TxDOT and TPWD would be implemented:

- Prior to construction, daytime surveys for nests (including under bridges and in culverts) would be performed to determine if nests are active before removal. Nests that are active would not be disturbed.
- The disturbance, destruction, or removal of active nests, including ground nesting birds, during the February 15 through October 1 nesting season would be prohibited.
- The removal of unoccupied, inactive nests would be avoided, as practical.
- The establishment of active nests during the nesting season on TxDOT-owned and operated facilities and structures proposed for replacement or repair would be prevented.
- The collection, capture, relocation, or transportation of birds, eggs, young, or active nests without a permit would be prohibited.

3.2 Wildlife

3.2.1 Endangered Species Act of 1973, State-Listed Species, and Species of Greatest Conservation Need

Databases of sensitive species maintained by the U.S. Fish and Wildlife Service (USFWS) and TPWD identified 20 federally listed threatened, endangered, or candidate species that may occur or have historically occurred in Travis County, including one plant, five mollusks, two

insects, four arachnids, one fish, three amphibians, three birds, and one mammal (see **Appendix C**). Additionally, four state-listed species that are not federally listed could potentially occur in Travis County. These include one mollusk, one reptile, and two birds. The TPWD and USFWS lists vary due to differences in the procedures for collecting and disseminating data on recorded occurrences.

Table 3.2-1 presents the federally and state-listed threatened and endangered species that could occur within Travis County. **Table 3.2-1** also lists species with no regulatory status that are considered species of greatest conservation need (SGCN) or rare in Texas that could occur within Travis County. SGCN are species that, due to limited distributions and/or declining populations, face the threat of extirpation or extinction but lack legal protection. Species listed on the USFWS county list that are to be considered for wind energy projects were not included in **Table 3.2-1**. The current status and habitat requirements for each of the species are also included as well as a determination as to whether the proposed project could potentially impact or have an effect upon them.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
PLANTS					
Arrowleaf milkvine *Matelea sagittifolia*	NL	SGCN	Most consistently encountered in thornscrub in South Texas. Perennial; flowering March-July.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Basin bellflower *Campanula reverchonii*	NL	SGCN	Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July.	No	This species is endemic to the Llano Uplift and only historically known from Travis County, where labels on historic specimens suggest this species historically occurred on sand bars or other alluvial deposits along major rivers (Poole et al. 2007). Vegetation and soils to be impacted by the proposed project have previously been disturbed due to road construction and maintenance. Therefore, the project would have ***no impact*** on this species.
Boerne bean *Phaseolus texensis*	NL	SGCN	Narrowly endemic to rocky canyons in the eastern and southern Edwards Plateau. Occurs on limestone soils in mixed woodlands, on limestone cliffs and outcrops, and frequently along creeks.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Bracted twistflower *Streptanthus bracteatus*	C	NL	Texas endemic; shallow, well-drained gravelly clays and clay loams over limestone in oak juniper woodlands and associated openings, on steep to moderate slopes, and in canyon bottoms; several known soils include Tarrant, Brackett, or Speck over Edwards, Glen Rose, and Walnut geologic formations. Populations fluctuate widely from year to year, depending on winter rainfall. Flowers mid April-late May; fruit matures and foliage withers by early summer.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Buckley tridens *Tridens buckleyanus*	NL	SGCN	Occurs in juniper-oak woodlands on rocky limestone slopes. Perennial; flowering/fruiting April-November.	No	This species is endemic to the southeastern portion of the Edwards Plateau where it grows on rocky slopes along shaded stream banks and the borders of woodlands (Barkworth et al. 2007). The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Correl's false dragon-head *Physostegia correllii*	NL	SGCN	Occurs in wet, silty clay loams on streamsides and in creek beds, irrigation channels, and roadside drainage ditches. Also found in seepy, mucky, sometimes gravelly soils along riverbanks or small islands in the Rio Grande or underlain by Austin Chalk limestone along gently flowing spring-fed creeks in central Texas. Flowering May-September.	Yes	Suitable habitat for this species occurs within the proposed project area. Therefore, the project ***may impact*** this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Glass Mountains coral-root *Hexalectris nitida*	NL	SGCN	Rarely occurring in mixed woodlands in canyons in the mountains of Brewster County, but encountered with regularity, albeit in small numbers, under *Juniperus ashei* in woodlands over limestone on the Edwards Plateau, Callahan Divide, and Lampasas Cut Plain. Perrenial; flowering June-September and fruiting July-September.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Gravelbar brickellbush *Brickellia dentata*	NL	SGCN	Essentially restricted to frequently scoured, gravelly alluvial beds in creek and river bottoms. Perrenial; flowering June-November and fruiting June-October.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Heller's marbleseed *Onosmodium helleri*	NL	SGCN	Occurs in loamy, calcareous soils in oak-juniper woodlands on rocky limestone slopes, often in more mesic portions of canyons. Perennial; flowering March-May.	No	Oak-juniper woodlands on rocky limestone slopes do not occur within the project area. Therefore, the project would have ***no impact*** on this species.
Low spurge *Euphorbia peplidion*	NL	SGCN	Occurs in a variety of vernally moist situations in a number of natural regions. Annual; flowering February-April; fruiting March-April.	Yes	Suitable habitat for this species occurs within the proposed project area. Therefore, the project ***may impact*** this species.
Narrowleaf brickellbush *Brickellia eupatorioides var. gracillima*	NL	SGCN	Occurs in moist to gravelly alluvial soils along riverbanks but also on limestone slopes. Perennial; flowering/fruiting April-November.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Net-leaf bundleflower *Desmanthus reticulatus*	NL	SGCN	Mostly occurs on clay prairies of the coastal plain of central and south Texas. Perennial; flowering April-July and fruiting April-October.	Yes	Suitable habitat for this species occurs within the proposed project area. Additionally, this species has been documented by the TXNDD (EO ID#s 10460 and 10095) to occur in the immediate vicinity of the proposed project. Therefore, the project ***may impact*** this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Plateau loosestrife *Lythrum ovalifolium*	NL	SGCN	Occurs on banks and gravelly beds of perennial (or strong intermittent) streams of the Edwards Plateau, Llano Uplift, and Lampasas Cut Plain. Perennial; flowering/fruiting April-November.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Plateau milkvine *Matelea edwardsensis*	NL	SGCN	Occurs in various types of oak-juniper woodlands. Perennial; flowering March-October and fruiting May-June.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Rock grape *Vitis rupestris*	NL	SGCN	Occurs on rocky limestone slopes and in streambeds. Perennial; flowering March-May and fruiting May-July.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Scarlet leather-flower *Clematis texensis*	NL	SGCN	Usually occurs in oak-juniper woodlands in mesic, rocky limestone canyons or along perennial streams. Perennial; flowering March-July and fruiting May-July.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Stanfield's beebalm *Monarda punctata var. stanfieldii*	NL	SGCN	This species is largely confined to granite sands along the middle course of the Colorado River and its tributaries; perennial.	No	Suitable soils for this species do not occur in the project area. Therefore, the project would have ***no impact*** on this species.
Sycamore-leaf snowbell *Styrax platanifolius ssp. platanifolius*	NL	SGCN	Rare throughout its range, this species usually occurs in oak-juniper woodlands on steep rocky banks and ledges along intermittent or perennial streams, rarely far from some reliable source of moisture. Perennial; flowering April-May and fruiting May-August.	No	Suitable habitat for this species does not occur in the project area. Therefore, the project would have ***no impact*** on this species.
Texabama croton *Croton alabamensis var. texensis*	NL	SGCN	Texas endemic; occurs in duff-colored, loamy clay soils on rocky slopes in forested, mesic limestone canyons. Locally abundant in deeper soils on small terraces in canyon bottoms, often forming large colonies and dominating the shrub layer. Scattered individuals occasionally occur on the margins of such forests.	No	Suitable habitat for this species does not occur in the project area. Therefore, the project would have ***no impact*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas					
Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
			This species is also found in contrasting habitat of deep, friable soils of limestone uplands, mostly in the shade of evergreen woodland mottes. Flowers late February-March with fruit maturing and dehiscing by early June.		
Texas almond *Prunus minutiflora*	NL	SGCN	Wide-ranging but scarce; occurs in a variety of grassland and shrubland situations, mostly on calcareous soils underlain by limestone but occasionally in sandier neutral soils underlain by granite. Perennial; flowering February-May and October and fruiting February-September.	No	The proposed project is outside of the known range of this species. Therefore, the project would have ***no impact*** on this species.
Texas amorpha *Amorpha roemeriana*	NL	SGCN	Occurs on juniper-oak woodlands or shrublands on rocky limestone slopes, and sometimes on dry shelves above creeks. Perennial; flowering May-June and fruiting June-October.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Texas barberry *Mahonia swaseyi*	NL	SGCN	Occurs on shallow, calcareous, stony clay of upland grasslands/shrublands over limestone as well as in loamier soils in openly wooded canyons and on creek terraces. Perennial; flowering and fruiting March-June.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Texas fescue *Festuca versuta*	NL	SGCN	Occurs in mesic woodlands on limestone-derived soils on stream terraces and canyon slopes. Perennial; flowering and fruiting April-June.	Yes	Suitable habitat for this species occurs within the proposed project area. Therefore, the project ***may impact*** this species.
Texas milk vetch *Astragalus reflexus*	NL	SGCN	Occurs on grasslands, prairies, and roadsides in calcareous and clay substrates. Annual; flowering February-June and fruiting April-June.	Yes	Suitable habitat for this species occurs within the proposed project area. Therefore, the project ***may impact*** this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas					
Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Texas seymeria *Seymeria texana*	NL	SGCN	Found primarily in grassy openings in juniper-oak woodlands on dry, rocky slopes but sometimes on rock outcrops in shaded canyons. Annual; flowering May-November and fruiting July-November.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.
Tree dodder *Cuscuta exaltata*	NL	SGCN	Parasitic and found on various species of *Quercus*, *Juglans*, *Rhus*, *Vitis*, *Ulmus*, and *Diospyros* species as well as *Acacia berlandieri* and other woody plants. Annual; flowering May-October and fruiting July-October.	No	This species was not observed during field investigations. Additionally, vegetation and soils to be impacted by the proposed project have previously been disturbed due to road construction and maintenance. The project would have ***no impact*** on this species.
Warnock's coral-root *Hexalectris warnockii*	NL	SGCN	Found in leaf litter and humus in oak-juniper woodlands on shaded slopes and intermittent, rocky creekbeds in canyons. In the Trans Pecos, this species is found in oak-pinyon-juniper woodlands in higher mesic canyons (to 2000 m [6550 ft]). In Terrell County, this species is found under *Quercus fusiformis* mottes on terraces of spring-fed perennial streams, draining an otherwise xeric limestone landscape. On the Callahan Divide (Taylor County), the White Rock Escarpment (Dallas County), and the Edwards Plateau, this species occurs in oak--juniper woodlands on limestone slopes, while in Gillespie County, this species occurs on igneous substrates of the Llano Uplift. Flowers June-September, though individual plants do not usually bloom in successive years.	No	The proposed project is outside of the known range and suitable habitat for this species. Therefore, the project would have ***no impact*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas					
Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
MOLLUSKS					
Golden Orb *Quadrula aurea*	C	T	Almost exclusively in flowing waters in moderate-size streams and rivers; intolerant of impoundment; shells collected on mud, sand and gravel. Brazos (historic), Colorado, San Marcos, Guadalupe, San Antonio, Frio, and Nueces river basins.	Yes	Potential habitat for this species occurs within the Colorado River and associated perennial streams. Therefore, the proposed project ***may impact*** this species.
False Spike *Quadrula mitchelli*	NL	T	Possibly extirpated in Texas; probably medium to large rivers; substrates varying from mud through mixtures of sand, gravel and cobble. One study indicated water lilies were present. Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins.	Yes	Potential habitat for this species occurs within the Colorado River and associated perennial streams. Therefore, the proposed project ***may impact*** this species.
Smooth Pimpleback *Quadrula houstonensis*	C	T	Small to moderate streams and rivers as well as moderate-size reservoirs; mixed mud, sand, and fine gravel. Tolerates very slow to moderate flow rates; appears not to tolerate dramatic water level fluctuations; scoured bedrock substrates or shifting sand bottoms. Lower Trinity (questionable), Brazos, and Colorado River basins.	Yes	Potential habitat for this species occurs within the Colorado River and associated perennial streams. Therefore, the proposed project ***may impact*** this species.
Texas Fatmucket *Lampsilis bracteata*	C	T	Streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and coarse gravel or sand in moderately flowing water. Colorado and Guadalupe river basins.	Yes	Potential habitat for this species occurs within the proposed project area. Additionally, this species has been documented by the TXNDD (EO ID# 9769) to occur in the vicinity of the proposed project. Therefore, the proposed project ***may impact*** this species.
Texas Fawnsfoot *Truncilla macrodon*	C	T	Little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows. Brazos and Colorado River basins.	Yes	Potential habitat for this species occurs within the Colorado River and associated perennial streams. Therefore, the proposed project ***may impact*** this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Texas Pimpleback *Quadrula petrina*	C	T	Mud, gravel, and sand substrates; generally in areas with slow flow rates. Colorado and Guadalupe river basins.	Yes	Potential habitat for this species occurs within the Colorado River and associated perennial streams. Therefore, the proposed project ***may impact*** this species.
CRUSTACEANS					
An amphipod *Stygobromus russelli*	NL	SGCN	Subterranean waters, usually in caves and limestone aquifers; resident of numerous caves in ca. 10 counties of the Edwards Plateau.	No	The project is located outside of the known range of this species. Therefore, the project would have ***no impact*** on this species.
Balcones Cave amphipod *Stygobromus balconis*	NL	SGCN	Aquatic, subterranean obligate amphipod.	No	The project is located outside of the known range of this species. Therefore, the project would have ***no impact*** on this species.
Bifurcated cave amphipod *Stygobromus bifurcatus*	NL	SGCN	Found in cave pools.	No	The project is located outside of the known range of this species. Therefore, the project would have ***no impact*** on this species.
INSECTS					
Kretschmarr Cave mold beetle *Texamaurops reddelli*	E	SGCN	South central and western Texas; small streams and seepages.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (George Veni & Associates [GVA] 2007). Therefore, the project would have ***no effect*** on this species.
Tooth Cave blind rove beetle *Cylindropsis sp 1*	NL	SGCN	One specimen collected from Tooth Cave; only known North American collection of this genus.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no impact*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas					
Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Tooth Cave ground beetle *Rhadine persephone*	E	SGCN	Resident, small, cave-adapted beetle found in small Edwards Limestone caves in Travis and Williamson counties.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no effect*** on this species.
ARACHNIDS					
Bandit Cave spider *Cicurina bandida*	NL	SGCN	Very small, subterrestrial, subterranean obligate.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no impact*** on this species.
Bee Creek Cave harvestman *Texella reddelli*	E	SGCN	Small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no effect*** on this species.
Bone Cave harvestman *Texella reyesi*	E	SGCN	Small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties; weakly differentiated from *Texella reddelli*.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no effect*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Tooth Cave pseudoscorpion *Tartarocreagris texana*	E	SGCN	Small, cave-adapted pseudoscorpion known from small limestone caves of the Edwards Plateau.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no effect*** on this species.
Tooth Cave spider *Neoleptoneta myopica*	E	SGCN	Very small, cave-adapted, sedentary spider.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no effect*** on this species.
Warton's cave meshweaver *Cicurina wartoni*	NL	SGCN	Very small, cave-adapted spider.	No	No caves or karst features were observed in the project area during the field investigations. Additionally, the proposed project lies outside the portions of Travis County that are identified as Karst Zones on maps produced by USFWS (GVA 2007). Therefore, the project would have ***no impact*** on this species.
FISHES					
Guadalupe bass *Micropterus treculii*	NL	SGCN	Endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system.	Yes	Potential habitat for this species exists within the Colorado River and associated perennial streams. Additionally, this species has been documented by the TXNDD (EO ID#s 5159 and 7074) to occur in the vicinity of the proposed project. Therefore, the proposed project ***may impact*** this species.
Smalleye shiner *Notropis buccula*	E	SGCN	Endemic to upper Brazos River system and its tributaries (Clear Fork and Bosque); apparently introduced into adjacent Colorado River drainage; medium to large prairie streams with sandy substrate and turbid to clear warm water. Presumably eats small	No	Potential habitat for this species exists within the Colorado River and associated perennial streams; however, the primary threat to these species is the construction of reservoirs that adversely affect downstream fisheries by altering temperature regimes, flow rates, substrate, water quality, and nutrient availability (USFWS

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
			aquatic intervebrates.		2014). Given that the area of the Colorado River that would be impacted by the proposed project is downstream of Longhorn Dam, this species would be unlikely to occur. Additionally, this species is thought to be extirpated downstream of Possum Kingdom Reservoir.[1] Therefore, the project would have ***no effect*** on this species.
AMPHIBIANS					
Austin Blind Salamander *Eurycea waterlooensis*	E	SGCN	Mostly restricted to subterranean cavities of the Edwards Aquifer; dependent upon water flow/quality from the Barton Springs segment of the Edwards Aquifer; only known from the outlets of Barton Springs.	No	No caves, springs, or recharge features were observed in the project area during the field investigation. Additionally, the project is located outside of the Barton Springs watershed. Therefore, the project would have ***no effect*** on this species.
Barton Springs Salamander *Eurycea sosorum*	E	E	Dependent upon water flow/quality from the Barton Springs segment of the Edwards Aquifer; known from the outlets of Barton Springs and possibly from Cold Springs and Blowing Sink Cave; spring dweller, but ranges into subterranean water-filled caverns.	No	No caves, springs, or recharge features were observed in the project area during the field investigation. Additionally, the project is located outside of the Barton Springs watershed. Therefore, the project would have ***no effect*** on this species.
Jollyville Plateau salamander *Eurycea tonkawae*	T	SGCN	Known from springs and waters of some caves north of the Colorado River.	No	No caves, springs, or recharge features were observed in the project area during the field investigation. Additionally, the project is outside of the known range of this species. Therefore, the project would have ***no effect*** on this species.
Pedernales River Springs Salamander *Eurycea sp. 6*	NL	SGCN	Endemic; known only from springs.	No	No caves, springs, or recharge features were observed in the project area during the field investigation. The proposed project is outside of the known range of this species. Therefore, the project would have ***no impact*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas					
Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
REPTILES					
Spot-tailed earless lizard *Holbrookia lacerata*	NL	SGCN	Associated with central and south Texas and adjacent Mexico in moderately open prairie-brushland and fairly flat areas free of vegetation or other obstructions, including disturbed areas. Feeds on small invertebrates and lays eggs underground.	No	Vegetation and soils to be impacted by the proposed project have previously been disturbed due to road construction and maintenance, and commercial and residential development. Therefore, the project would have ***no impact*** on this species.
Texas garter snake *Thamnophis sirtalis annectens*	NL	SGCN	Wet or moist microhabitats are conducive to the species' occurrence, but this species is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August.	Yes	This species could occur in riparian areas along the Colorado River and associated tributaries. Additionally, this species has been documented by the TXNDD (EO ID# 6167) to occur in the immediate vicinity of the proposed project. Therefore, the project ***may impact*** this species.
Texas horned lizard *Phrynosoma cornutum*	NL	T	Open, arid, and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush, or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September.	No	Suitable habitat for this species does not occur in the vicinity of the proposed project. Additionally, harvester ants, a primary food source, were not observed during field investigations. The project would have ***no impact*** on this species.
BIRDS					
Bald Eagle *Haliaeetus leucocephalus*	DL	T	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter.	Yes	Potential habitat for this species occurs in the vicinity of the proposed project, particularly along the Colorado River. Therefore, the project ***may impact*** this species.
Peregrine falcon *Falco peregrinus*	DL	T	See subspecies below for habitat descriptions.	No	Potential migrant through the project area to and from wintering grounds, but any use would be considered temporary. Therefore, the project would have ***no impact*** on this species.
American Peregrine Falcon *Falco peregrinus anatum*	DL	T	Year-round resident and local breeder in west Texas; also, migrant across state from more northern breeding areas in U.S. and Canada; winters along coast and farther south; occupies wide range of habitats during migration,	No	Potential migrant through the project area to and from wintering grounds, but any use would be considered temporary. Therefore, the project would have ***no impact*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
			including urban, concentrations along coast and barrier islands; low-altitude migrant with stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.		
Arctic Peregrine Falcon *Falco peregrinus tundrius*	DL	NL	Migrant throughout state from subspecies' far northern breeding range; winters along coast and farther south; occupies wide range of habitats during migration, including urban concentrations along coast and barrier islands; low-altitude migrant with stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.	No	Potential migrant through the project area to and from wintering grounds, but any use would be considered temporary. Therefore, the project would have ***no impact*** on this species.
Whooping Crane *Grus americana*	E	E	Potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties.	No	Potential migrant through the project area to and from wintering grounds, but any use would be considered temporary. Therefore, the project would have ***no effect*** on this species.
Mountain Plover *Charadrius montanus*	NL	SGCN	Associated with shortgrass plains and plowed fields; nests on the ground in shallow depressions on high plains or shortgrass prairie. Utilizes shortgrass plains and bare, dirt (plowed) fields when nonbreeding; primarily insectivorous.	No	Potential migrant through the project area to and from coastal wintering grounds, but any use would be considered temporary. Therefore, the project would have ***no impact*** on this species.
Western Burrowing Owl *Athene cunicularia hypugaea*	NL	SGCN	Open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows.	Yes	Suitable habitat for this species occurs within the proposed project area. Therefore, the project ***may impact*** this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
Black-capped Vireo *Vireo atricapilla*	E	E	Found in oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover. Return to same territory, or one nearby, year after year. Deciduous and broad-leaved shrubs and trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer.	No	Habitat of suitable vegetation species, structure, and patch size for this species does not occur in the vicinity of the proposed project. The project would have ***no effect*** on this species.
Sprague's Pipit *Anthus spragueii*	NL	SGCN	Wintering migrant in Texas; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size, avoids edges.	No	Potential migrant through the project area to and from coastal wintering grounds, but any use would be considered temporary. Therefore, the project would have ***no impact*** on this species.
Golden-cheeked Warbler *Setophaga chrysoparia*	E	E	Found in juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long, fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material. Forage for insects in broad-leaved trees and shrubs; nesting late March-early summer.	No	Habitat of suitable vegetation species, structure, and patch size for this species does not occur in the vicinity of the proposed project. The project would have ***no effect*** on this species.

Table 3.2-1 Threatened, Endangered and Rare Species of Potential Occurrence in Travis County, Texas

Species	Federal Status	State Status	Description of Suitable Habitat	Habitat Present?	Effects/Impact Determination
MAMMALS					
Cave myotis bat *Myotis velifer*	NL	SGCN	Colonial and cave-dwelling; also roost in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore.	Yes	Suitable roosting habitat occurs at project area bridges and surrounding areas (such as trees or buildings). The project ***may impact*** this species.
Red wolf *Canis rufus*	E	E	Extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies	No	This species is considered extirpated. The project would have ***no effect*** on this species.
Plains spotted skunk *Spilogale putorius interrupta*	NL	SGCN	Habitat generalist; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie.	Yes	Suitable habitat occurs within the project area. The project ***may impact*** on this species.

E – Endangered
T – Threatened
C – Candidate for Listing
DL – Delisted; DL, M – Delisted, Monitoring
SGCN – Species of Greatest Conservation Need; rare, but with no current regulatory protection
NL – Not Listed; rare, but with no current regulatory protection

Sources:
U.S. Fish and Wildlife Service Endangered Species List. List of Species by County for Texas: Travis County.
https://ecos.fws.gov/ipac/ (accessed June 8, 2017).
Texas Parks and Wildlife Department Annotated County Lists of Rare Species: Travis County, last revision May 16, 2016.
http://tpwd.texas.gov/gis/rtest/ (accessed June 7, 2017).
[1]US Fish & Wildlife Service 2008; Bonner and Runyan 2007.

Texas Natural Diversity Database (TXNDD)

The TPWD's TXNDD maintains a record of observations of tracked rare, threatened, or endangered species and assemblages throughout the state. These observances are called Element of Occurrence Records (EORs) and are defined as areas of land and/or water where a species or ecological community is or was present that has practical conservation value (NatureServe 2002). Considered collectively, the TXNDD results and TPWD and USFWS county lists identify several species that have historically occurred in Travis County. It should be noted that information from the TXNDD cannot be used for presence/absence determinations. The

TXNDD was searched for EORs by TPWD on May 17, 2017, to determine whether any reports of species have occurred within a 1.5-mile radius of the proposed project (see **Table 3.2-2**).

Table 3.2-2 Texas Parks and Wildlife Department Natural Diversity Database Search Results

EO ID[1]	Common/Scientific Name	Listing Status	Distance (miles)
6167	Texas garter snake/ *Thamnophis sirtalis annectens*	SGCN	0
5159	Guadalupe bass/ *Micropterus treculii*	SGCN	0
10460	Net-leaf bundleflower/ *Desmanthus reticulatus*	SGCN	0
11980	Vertisol Blackland Prairie	NL	0
7074	Guadalupe bass/ *Micropterus treculii*	SGCN	0.24
11981	Vertisol Blackland Prairie	NL	0.86
6719	Little Bluestem-Indiangrass series/ *Schizachyrium scoparium-Sorghastrum nutans* series	NL	0.92
11979	Vertisol Blackland Prairie	NL	0.98
9769	Texas Fatmucket/ *Lampsilis bracteata*	C	0.1
10095	Net-leaf bundleflower/ *Desmanthus reticulatus*	SGCN	1.06

[1]EO ID = Element of Occurrence Record Identification Number for species or feature observed
C– Candidate for Federal Listing
SGCN – Species of Greatest Conservation Need
NL– Not Listed

As noted in **Table 3.2-2**, this database search indicated that one candidate for federal listing, Texas Fatmucket (*Lampsilis bracteata*), has been documented to occur approximately 0.1 mile from the proposed project. This species is also state-listed as threatened and is discussed in further detail in the following section. No additional state-listed threatened or endangered species have been documented to occur within 1.5 miles of the proposed project area.

Three SGCNs have also been documented to occur within the vicinity of the proposed project. These include one reptile species (the Texas garter snake [*Thamnophis sirtalis annectens*]); one plant species (net-leaf bundleflower [*Desmanthus reticulatus*]); and one fish (Guadalupe bass [*Micropterus treculii*]). Suitable habitat for these species occurs within the proposed project area and is further discussed below.

Additionally, important remnant vegetation (Vertisol Blackland Prairie) has been documented to occur in the immediate vicinity of the proposed project; however, the project would not impact this vegetation community.

No rookeries were observed in the vicinity of the proposed project during field investigations. No managed areas occur in the vicinity of the proposed project.

Potential Impacts to Federally Listed or Candidate Species

Desktop analysis and field investigations conducted in June 2017 indicate that potential habitat occurs in the vicinity of the proposed project area for five mussel species that are candidates for federal listing. Each of these species and their impact scenarios are discussed in further detail below.

Mussels

Potential habitat for five mussel species that are considered candidates for federal listing and are state-listed threatened, the Golden Orb (*Quadrula aurea*), Smooth Pimpleback (*Quadrula houstonensis*), Texas Fatmucket (*Lampsilis bracteata*), Texas Fawnsfoot (*Truncilla macrodon*), and Texas Pimpleback (*Quadrula petrina*), occurs in the vicinity of the proposed project area.

The Golden Orb is a freshwater mussel with an orange, yellow, or yellowish brown shell with green rays. The habitat for this species seems to be restricted to flowing waters with sand, gravel, and cobble substrates at depths of a few centimeters to over 3 meters. It appears intolerant of excess mud or silt and impoundment. The Golden Orb is restricted to five rivers in Texas, but historically is known from the San Antonio, Guadalupe, Colorado, Brazos, Nueces, and Frio River systems. It is currently known from the Guadalupe, San Antonio, Nueces, and San Marcos River basins (NatureServe 2016).

The Smooth Pimpleback is a freshwater mussel with a yellow-buff or yellow-green shell in juveniles to an ashy-brown and occasionally faintly rayed shell in adults. This species inhabits small to moderate streams and rivers as well as moderate-size reservoirs with mixed mud, sand, and fine gravel bottoms. It is typically found in very slow to moderate flow rates. This species appears to not be tolerant of dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms. The known range for this species is the Colorado, Brazos, and San Jacinto River drainage basins (Howells et al. 1996).

The Texas Fatmucket is a tan to brown freshwater mussel with continuous rays of green-brown, dark brown, or black. This species occupies streams and smaller rivers in the Texas Hill Country and appears to be intolerant of impoundments. It is typically found in water with sand and gravel substrates, however occasionally is found on mud substrates. Only six, very small, declining populations of Texas Fatmucket are known to remain in the Colorado and Guadalupe river basins (NatureServe 2016).

The Texas Fawnsfoot is a freshwater mussel that has varied coloration of gray-green, greenish-brown, and orange-brown to dark brown, with greenish rays, zig-zags, or chevrons. This species occurs in the Colorado, Trinity, and Brazos river systems and appears to prefer rivers and larger streams with sand, gravel, and perhaps sandy-mud bottoms in moderate flows (NatureServe 2016).

The Texas Pimpleback is a freshwater mussel that is tan to brown in color, sometimes with distinctive yellow and bright green markings, and is somewhat glossy. This species occurs in the Guadalupe and Colorado River systems, including reports from the Llano, San Saba, and Pedernales rivers, and inhabits mud, gravel, and sand bottoms in areas of the rivers, with low flow (Howells et al. 1996).

All five of these species have the potential to occur in the Colorado River and perennial tributaries. Based on current design information, work is proposed within the Colorado River and Elm Creek, a perennial tributary to the Colorado River. Therefore, in accordance with the BMP Programmatic Agreement between TxDOT and TPWD, mussel BMPs would be implemented prior to construction activities and would include the following:

- When work is in the water, survey project footprints for state-listed species where appropriate habitat exists.
- When work is in the water and mussels are discovered during surveys, relocate state-listed and SGCN mussels under TPWD authorization and implement Water Quality BMPs.
- When work is adjacent to the water, Water Quality BMPs implemented as part of the SWPPP for a construction general permit or any conditions of the 401 water quality certification for the project will be implemented. No TPWD coordination required.

Potential Impacts to State-listed Species

Potential habitat for one state-listed threatened mussel species that is not a candidate for federal listing, the False Spike (*Quadrula mitchelli*), and one state-listed threatened bird species, the Bald Eagle (*Haliaeetus leucocephalus*) was identified within the proposed project area.

Little information exists on the False Spike, but it is thought to inhabit medium to large rivers with substrates varying from mud to mixtures of sand, gravel, and cobble. It historically occurred in the Brazos, Colorado, and Guadalupe river systems in central Texas and in the Rio Grande river system in New Mexico, Texas, and Mexico. Once common in central Texas, the species is presumed extinct by some because it has not been seen alive in Texas since the mid-1970s. However, two recently dead specimens were found in the central Brazos River in 2000 (NatureServe 2016).

The Bald Eagle occurs throughout the U.S., Canada, and northern Mexico. Bald Eagles are present year-round throughout Texas as spring and fall migrants, breeders, or winter residents. The Bald Eagle population in Texas is divided into two populations; breeding birds and non-breeding or wintering birds. Breeding populations occur primarily in the eastern half of the state and along coastal counties from Rockport to Houston. Non-breeding or wintering populations are located primarily in the Panhandle, central, and east Texas, and in other areas of suitable habitat throughout the state. Suitable habitat primarily occurs near rivers, lakes, and along the coast. Bald Eagles build their nests in tall trees or on cliffs near large bodies of water. In Texas, Bald Eagles nest from October to July. Eggs are typically laid in December and hatched in January. This bird of prey primarily feeds on fish, but also eats waterfowl, other birds, small mammals, and turtles (TPWD 2016).

Habitat for the False Spike occurs within the Colorado River and its perennial tributaries. The Bald Eagle has been observed in the vicinity of the proposed project along the Colorado River (eBird 2012). State-listed species are protected from direct harm, but there is no current regulatory protection for their habitat. As stated above, BMPs would be implemented prior to construction activities for the mussel species and would include the following:

- When work is in the water, survey project footprints for state-listed species where appropriate habitat exists.
- When work is in the water and mussels are discovered during surveys, relocate state-listed and SGCN mussels under TPWD permit and implement Water Quality BMPs.
- When work is adjacent to the water, Water Quality BMPs implemented as part of the SWPPP for a construction general permit or any conditions of the 401 water quality certification for the project will be implemented. No TPWD coordination required.

To avoid potential impacts to Bald Eagles, in accordance with the Best Management Practices Programmatic Agreement between TxDOT and TPWD, bird BMPs would be implemented and include the following:

- Prior to construction, daytime surveys for nests (including under bridges and in culverts) would be performed to determine if nests are active before removal. Nests that are active would not be disturbed.
- The disturbance, destruction, or removal of active nests, including ground nesting birds, during the February 15 through October 1 nesting season would be prohibited.
- The removal of unoccupied, inactive nests would be avoided, as practical.
- The establishment of active nests during the nesting season on TxDOT-owned and operated facilities and structures proposed for replacement or repair would be prevented.

- The collection, capture, relocation, or transportation of birds, eggs, young, or active nests without a permit would be prohibited.

Potential Impacts to Species of Greatest Conservation Need

Additionally, suitable habitat for ten SGCN exists within the proposed project area. These include five plant species, Correl's false dragon-head (*Physostegia correllii*), low spurge (*Euphorbia peplidion*), the net-leaf bundleflower (*Desmanthus reticulatus*), Texas fescue (*Festuca versuta*), and Texas milk vetch (*Astragalus reflexus*); one fish species, the Guadalupe bass; one reptile species, the Texas garter snake; one bird species, the Western Burrowing Owl (*Athene cunicularia*); and two mammal species, the cave myotis bat (*Myotis velifer*) and plains spotted skunk (*Spilogale putorius interrupta*).

Potential impacts to the five plant species (Correl's false dragon-head, low spurge, net-leaf bundleflower, Texas fescue, and Texas milk vetch) would be avoided or minimized by limiting vegetation disturbance to only that which is necessary to construct the proposed project. Because there are no BMPs for these species listed in the Programmatic Agreement between TxDOT and TPWD, coordination with TPWD would be required.

Suitable habitat for the Guadalupe bass occurs within the Colorado River and associated perennial streams. Work is proposed within the water at the Colorado River and Elm Creek crossings; therefore, in accordance with the BMP Programmatic Agreement between TxDOT and TPWD, coordination with TPWD would be required for this species.

The Texas garter snake could occur throughout the project area near areas of permanent sources of water or damp soils. Impacts to the Texas garter snake would be avoided or minimized by implementing the following BMPs:

- Hydromulching or hydroseeding would be applied in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If these applications are not feasible, then erosion control blankets or mats would be utilized. Blankets and mats would contain either 1) no netting or 2) netting that would consist of loosely woven, natural fiber. Plastic netting would be avoided to the extent practicable.
- For open trenches and excavated pits, escape ramps would be installed at an angle of less than 45 degrees (1:1) in areas left uncovered. Excavation areas would be visually inspected for trapped wildlife prior to backfilling.
- Contractors would be informed that if reptiles are found on the project site, they would be allowed to safely leave the project area.
- Disturbance or removal of downed trees, rotting stumps, and leaf litter would be avoided or minimized, where feasible.
- Contractors would be advised of the potential occurrence of this species in the project area, and care would be taken to avoid harming this species if encountered.

The Western Burrowing Owl could occur in areas of suitable habitat throughout the project area. To avoid or minimize impacts to this species, bird BMPs would be implemented and include the following:

- Prior to construction, daytime surveys for nests (including under bridges and in culverts) would be performed to determine if nests are active before removal. Nests that are active would not be disturbed.
- The disturbance, destruction, or removal of active nests, including ground nesting birds, during the February 15 through October 1 nesting season would be prohibited.
- The removal of unoccupied, inactive nests would be avoided, as practical.
- The establishment of active nests during the nesting season on TxDOT-owned and operated facilities and structures proposed for replacement or repair would be prevented.
- The collection, capture, relocation, or transportation of birds, eggs, young, or active nests without a permit would be prohibited.

The plains spotted skunk could also occur in areas of suitable habitat throughout the project area. In accordance with the BMP Programmatic Agreement between TxDOT and TPWD, contractors would be advised of the potential occurrence of this species in the project area, and care would be taken to avoid direct harm to these species as well as unnecessary impacts to skunk dens, if encountered.

The cave myotis bat could utilize the proposed project area bridges and surrounding areas (such as trees or buildings) for roosting. Although habitat for this species occurs within the project area, the project is not likely to negatively impact this species from a range-wide perspective. Additionally, no bat colonies were detected during June 2017 field investigations. In accordance with the BMP Programmatic Agreement between TxDOT and TPWD, contractors would be advised of the potential occurrence of the cave myotis bat in the project area, and care would be taken to avoid direct harm to this species. Impacts to the cave myotis bat would be avoided or minimized by implementing the following BMPs:

- If bats are present or recent signs of occupation (i.e., piles of guano, distinct musky odor, or staining and rub marks at potential entry points) are observed, take appropriate measures to ensure that bats are not harmed, such as implementing non-lethal exclusion activities or timing or phasing of construction.
- Exclusion devices can be installed by a qualified individual between September 1 and March 31. Exclusion devices should be used for a minimum of seven days when minimum nighttime temperatures are above 50°F AND minimum daytime temperatures are above 70°F. Prior to exclusion, ensure that alternate roosting habitat is available in the immediate area. If no suitable roosting habitat is available, installation of alternate roosts is recommended to replace the loss of an occupied roost.

- If feature(s) used by bats are removed as a result of construction, replacement structures should incorporate bat-friendly design, or artificial roosts should be constructed to replace these features, as practicable.
- Conversion of property containing cave or cliff features to transportation purposes should be avoided where feasible.
- Large, hollow trees, snags (dead standing trees), and trees with shaggy bark should be surveyed for colonies and, if found, should not be disturbed until the bats are no longer occupying these features. Post-occupancy surveys should be conducted by a qualified biologist prior to tree removal from the landscape.
- Retain mature, large diameter hardwood forest species and native/ornamental palm trees where feasible.
- In all instances, avoid harm or death to bats. Bats should only be handled as a last resort and after communication with TPWD.

3.2.2 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act was enacted on June 8, 1940, to provide protection for the Bald Eagle and was then later amended to include the Golden Eagle (*Aquila chrysaetos*). This law prohibits the taking, possession, and commerce of these species except under specified circumstances as authorized and permitted by the Secretary of the Interior. In the event that eagles are observed nesting or foraging in close proximity to the proposed project, impacts would be avoided through utilization of the procedures outlined in the National Bald Eagle Management Guidelines, a USFWS publication (2007).

3.2.3 Migratory Bird Treaty Act (MBTA)

The MBTA states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, or egg in part or in whole, without a Federal permit issued in accordance with the Act's policies and regulations. Migratory birds were observed during the June 1 and 2, 2017, field investigations and may arrive in the project area to breed during construction of the proposed project. Nesting migratory birds observed during the field investigations include Cliff Swallows, Barn Swallows and Eastern Phoebes nesting under bridges throughout the project area. Appropriate measures would be taken to avoid adverse impacts on migratory birds and would include the following:

- Prior to construction, daytime surveys for nests (including under bridges and in culverts) would be performed to determine if nests are active before removal. Nests that are active would not be disturbed.
- The disturbance, destruction, or removal of active nests, including ground nesting birds, during the February 15 through October 1 nesting season would be prohibited.
- The removal of unoccupied, inactive nests would be avoided, as practical.

- The establishment of active nests during the nesting season on TxDOT-owned and operated facilities and structures proposed for replacement or repair would be prevented.
- The collection, capture, relocation, or transportation of birds, eggs, young, or active nests without a permit would be prohibited.

3.2.4 Fish and Wildlife Coordination Act (FWCA)

The FWCA, as amended in 1964, was enacted to protect fish and wildlife when Federal actions result in the control or modification of a natural stream or body of water. The statute requires Federal agencies to take into consideration the effect that water-related projects would have on fish and wildlife resources; take action to prevent loss or damage to these resources; and provide for the development and improvement of these resources. The proposed project would not require a U.S. Army Corps of Engineers (USACE) Individual Permit; therefore, coordination under the FWCA would not be required.

3.2.5 Farmland Protection Policy Act (FPPA)

The FPPA, as detailed in Subtitle I of Title XV of the Agricultural and Food Act of 1981, provides protection to prime and unique farmlands, as well as farmlands of statewide or local importance. Prime farmland soils, as defined by the United States Department of Agriculture, are soils that are best suited to producing food, feed, forage, and oilseed crops. Such soils have properties that are favorable for the production of sustained high yields. Prime farmland can include cropland, pastureland, rangeland, or forestland, but does not include land converted to urban, industrial, transportation, or water uses. The proposed project would not require new right of way or permanent easements and is therefore exempt from the provisions of the FPPA.

3.2.6 Executive Order 13112 on Invasive Species

Upon completion of earthwork operations, disturbed areas would be restored and reseeded in accordance with TxDOT's Vegetation Management Guidelines and in compliance with the intent of Executive Order 13112 on Invasive Species. An approved seed mix would be used in the landscaping and revegetation of disturbed areas.

3.2.7 Federal Highway Administration (FHWA) Memorandum on Environmentally and Economically Beneficial Landscaping

The FHWA Memorandum on Environmentally and Economically Beneficial Landscaping was implemented in April 1995 as guidance designed to minimize the adverse effects of landscaping. The practices described in this memorandum apply to Federal facilities and federally funded projects and include implementation, where affordable and practicable, of the following:

- Use regionally native plants for landscaping
- Design, use, or promote construction practices that minimize adverse effects on the natural habitat
- Seek to prevent pollution by, among other things, reducing fertilizer and pesticide use, using integrated pest management techniques, recycling green waste, and minimizing runoff
- Implement water-efficient practices, such as the use of mulches, efficient irrigation systems, audits to determine exact landscaping water-use needs, and recycled or reclaimed water, and the selecting and siting of plants in a manner that conserves water and controls soil erosion
- Create outdoor demonstrations incorporating native plants, as well as pollution prevention and water conservation techniques, to promote awareness of the environmental and economic benefits of implementing this directive

Upon completion of earthwork operations, disturbed areas would be restored and reseeded in accordance with TxDOT's Vegetation Management Guidelines and in compliance with the intent of the FHWA Executive Memorandum on Environmentally and Economically Beneficial Landscape Practices.

4.0 Texas Parks and Wildlife Department Coordination

As detailed in § 2.206 of the 2013 MOU, coordination with TPWD is required for projects that trigger one or more of the following:

1) The project is within range of a state threatened or endangered species or SGCN as identified by the TPWD County List of Rare and Protected Species, and there is suitable habitat, unless BMPs as defined in the MOU are implemented as part of a programmatic agreement.
2) The project may adversely impact important remnant vegetation based on the judgment of a qualified biologist or as mapped in the TXNDD.
3) The project requires a Nationwide Permit with Pre-construction Notification (PCN) or an Individual Permit issued by the USACE.
4) The project includes in the TxDOT right of way or conservation, construction, or drainage easement more than 200 linear feet of stream channel for each single and complete crossing of one or more of the following that is not already channelized or otherwise maintained:
    a) Channel realignment; or
    b) Stream bed or stream bank excavation, scraping, clearing, or other permanent disturbance.
5) The project contains known isolated wetlands outside existing TxDOT right of way that would be directly impacted by the project.

6) The project may impact 0.10 acre of riparian vegetation based on the judgment of a qualified biologist or as mapped in the EMST.
7) The project disturbs habitat in an area equal to or greater than the area of disturbance indicated in the Threshold Table Programmatic Agreement.

The proposed project, including the area abutting the right of way, is within the range and habitat of state listed species and SGCN as identified by the TPWD County List of Rare and Protected Species. These species and BMPs that would be implemented to avoid or minimize impacts are discussed above in **Section 3.2.1**. Because there are no approved BMPs for five plant SGCNs (Correl's false dragon-head, low spurge, net-leaf bundleflower, Texas fescue, and Texas milk vetch) and work would be done within the water at the Colorado River and Elm Creek crossings, TPWD coordination for the plants and Guadalupe bass would be required.

Important remnant vegetation (Vertisol Blackland Prairie; EO ID# 11980) has been documented by the TXNDD to occur in the immediate vicinity of the proposed project; however, the project would not impact this vegetation community. Therefore, coordination with TPWD would not be required for remnant vegetation.

The Threshold Table Programmatic Agreement groups vegetation types into broader MOU types and sets a disturbance threshold for each type by ecoregion that, if met or exceeded, triggers coordination with the TPWD. For projects that have vegetation impacts in multiple ecoregions and the thresholds differ between these regions for a single MOU type, the average of the thresholds for that MOU type is used to determine coordination requirements with the TPWD. A review of the Threshold Table Programmatic Agreement determined that vegetation to be impacted by the proposed project falls into three MOU types: Tallgrass Prairie, Grassland, Riparian, and Urban. The Threshold Table Programmatic Agreement sets a disturbance threshold of 2.0 acres for Tallgrass Prairies, Grassland, 0.1 acre for Riparian, and no threshold for Urban. Vegetation impacts quantified on **Table 3.1-1** above show that the proposed project would exceed the threshold for Tallgrass Prairie, Grassland and Riparian MOU types. Therefore, coordination with TPWD would be required.

Based on current design and preliminary water resources field investigations, permanent fill would be placed below the ordinary high water mark (OHWM) of an unnamed Tributary to Gilleland Creek, Elm Creek and the Colorado River. Impacts to the unnamed tributary to Gilleland Creek and Elm Creek have been previously accounted and mitigated for during the original construction of SH 130. Permanent fill placed within the OHWM of the Colorado River would be authorized under a USACE Section 404 Nationwide Permit 14. Additionally, an overbank wetland on the south bank of the Colorado River was identified and delineated prior to the original construction of SH 130. However, during the June 2017 field investigation, dense vegetation prevented a complete assessment of the potential boundaries and other characteristics of this feature. Further investigations need to be conducted to determine the

extent of this feature within the project area and determine if it may be impacted by the proposed project. Because of this, it is unknown at this time whether or not a PCN would be required.

5.0 Permits and Commitments

The following permits and commitments would be required for the proposed project:

Impacts to vegetation would be avoided or minimized by limiting disturbance to only that which is necessary to construct the proposed project. The removal of native vegetation, particularly mature native trees and shrubs, would be avoided to the greatest extent practicable. An approved seed mix would be used in the landscaping and revegetation of disturbed areas.

Suitable habitat for five mussel species considered candidates for federal listing (the Golden Orb, Smooth Pimpleback, Texas Fatmucket, Texas Fawnsfoot, and Texas Pimpleback), and one state listed threatened mussel (the False Spike) occurs within the Colorado River and associated perennial tributaries. Based on current design information, work is proposed within the Colorado River and Elm Creek, a perennial tributary to the Colorado River. Therefore, in accordance with the Best Management Practices Programmatic Agreement between TxDOT and TPWD, mussel BMPs would be implemented prior to construction activities for either of the build alternative and would include the following:

- When work is in the water, survey project footprints for state-listed species where appropriate habitat exists.
- When work is in the water and mussels are discovered during surveys, relocate state-listed and SGCN mussels under TPWD authorization and implement Water Quality BMPs.
- When work is adjacent to the water, Water Quality BMPs implemented as part of the SWPPP for a construction general permit or any conditions of the 401 water quality certification for the project will be implemented. No TPWD coordination required.

The state-listed threatened Bald Eagle has been observed in the vicinity of the proposed project along the Colorado River and the Western Burrowing Owl, an SGCN, could occur in areas of suitable habitat throughout the project area. Appropriate measures would be taken to avoid adverse impacts on migratory birds, including the Bald Eagle and Western Burrowing Owl, and would include the following:

- Prior to construction, daytime surveys for nests (including under bridges and in culverts) would be performed to determine if nests are active before removal. Nests that are active would not be disturbed.
- The disturbance, destruction, or removal of active nests, including ground nesting birds, during the February 15 through October 1 nesting season would be prohibited.
- The removal of unoccupied, inactive nests would be avoided, as practical.

- The establishment of active nests during the nesting season on TxDOT-owned and operated facilities and structures proposed for replacement or repair would be prevented.
- The collection, capture, relocation, or transportation of birds, eggs, young, or active nests without a permit would be prohibited.

Additionally, in the event that eagles are observed nesting or foraging in close proximity to the proposed project, impacts would be avoided through utilization of the procedures outlined in the National Bald Eagle Management Guidelines, a USFWS publication (2007).

In addition to the Western Burrowing Owl, potential habitat for nine additional SGCN exists within the proposed project area. These include five plant species, Correl's false dragon-head, low spurge, net-leaf bundleflower, Texas fescue, and Texas milk vetch; one fish species, the Guadalupe bass; one reptile species, the Texas garter snake; and two mammal species, the cave myotis bat and plains spotted skunk. Because there are no BMPs for the five plant species listed in the Programmatic Agreement between TxDOT and TPWD, coordination with TPWD would be required.

The Guadalupe bass could occur within the Colorado River and associated perennial streams. Work is proposed within the water at the Colorado River and Elm Creek crossings; therefore, in accordance with the Best Management Practices Programmatic Agreement between TxDOT and TPWD, coordination with TPWD would be required for this species.

The Texas garter snake could occur throughout the project area near areas of permanent sources of water or damp soils. Impacts to the Texas garter snake would be avoided or minimized by implementing the following BMPs:

- Hydromulching or hydroseeding would be applied in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If these applications are not feasible, then erosion control blankets or mats would be utilized. Blankets and mats would contain either 1) no netting or 2) netting that would consist of loosely woven, natural fiber. Plastic netting would be avoided to the extent practicable.
- For open trenches and excavated pits, escape ramps would be installed at an angle of less than 45 degrees (1:1) in areas left uncovered. Excavation areas would be visually inspected for trapped wildlife prior to backfilling.
- Contractors would be informed that if reptiles are found on the project site, they would be allowed to safely leave the project area.
- Disturbance or removal of downed trees, rotting stumps, and leaf litter would be avoided or minimized, where feasible.
- Contractors would be advised of the potential occurrence of this species in the project area, and care would be taken to avoid harming this species if encountered.

The plains spotted skunk could also occur in areas of suitable habitat throughout the project area. In accordance with the Best Management Practices Programmatic Agreement between TxDOT and TPWD, contractors would be advised of the potential occurrence of this species in the project area, and care would be taken to avoid direct harm to these species as well as unnecessary impacts to skunk dens, if encountered.

The cave myotis bat could utilize the proposed project area bridges and surrounding areas (such as trees or buildings) for roosting. In accordance with the Best Management Practices Programmatic Agreement between TxDOT and TPWD, contractors would be advised of the potential occurrence of the cave myotis bat in the project area, and care would be taken to avoid direct harm to this species. Impacts to the cave myotis bat would be avoided or minimized by implementing the following BMPs:

- If bats are present or recent signs of occupation (i.e., piles of guano, distinct musky odor, or staining and rub marks at potential entry points) are observed, take appropriate measures to ensure that bats are not harmed, such as implementing non-lethal exclusion activities or timing or phasing of construction.
- Exclusion devices can be installed by a qualified individual between September 1 and March 31. Exclusion devices should be used for a minimum of seven days when minimum nighttime temperatures are above 50°F AND minimum daytime temperatures are above 70°F. Prior to exclusion, ensure that alternate roosting habitat is available in the immediate area. If no suitable roosting habitat is available, installation of alternate roosts is recommended to replace the loss of an occupied roost.
- If feature(s) used by bats are removed as a result of construction, replacement structures should incorporate bat-friendly design, or artificial roosts should be constructed to replace these features, as practicable.
- Conversion of property containing cave or cliff features to transportation purposes should be avoided where feasible.
- Large, hollow trees, snags (dead standing trees), and trees with shaggy bark should be surveyed for colonies and, if found, should not be disturbed until the bats are no longer occupying these features. Post-occupancy surveys should be conducted by a qualified biologist prior to tree removal from the landscape.
- Retain mature, large diameter hardwood forest species and native/ornamental palm trees where feasible.
- In all instances, avoid harm or death to bats. Bats should only be handled as a last resort and after communication with TPWD.

Upon completion of earthwork operations, disturbed areas would be restored and reseeded in accordance with TxDOT's Vegetation Management Guidelines and in compliance with the

intent of Executive Order 13112 on Invasive Species and the FHWA Executive Memorandum on Environmentally and Economically Beneficial Landscape Practices.

6.0 References

Barkworth, Mary E., Laurel K. Anderton, Kathleen M. Capels, Sandy Long and Michael B. Piep. 2007. Manual of Grasses for North America. University Press of Colorado. 640pp.

Bonner, T., and D.T. Runyan. 2007. Fish Assemblage Changes in the Three Western Gulf Slope Drainages. Final Project Report, Texas Water Development Board, Austin. 46 pp.

Correll, D.S., and M.C. Johnston. 1979. Manual of the Vascular Plants of Texas. University of Texas at Dallas, Richardson, Texas. 1,881 pp.

eBird. 2012. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. Accessed June 7, 2017.

Environmental Protection Agency (EPA). 2012. Level III Ecoregions of Texas. U.S. EPA Office of Research and Development (ORD) – National Health and Environmental Effects Research Laboratory (NHEERL), Corvallis, OR.

George Veni & Associates (GVA). 2007. *Revision of Karst Species Zones for the Austin, Texas, Area.* Report prepared for Texas Parks and Wildlife Department.

Howells, Robert G., Raymond W. Neck, and Harold D. Murray. 1996. Freshwater Mussels of Texas. Texas Parks and Wildlife Press, Austin, Texas. 218 pp.

NatureServe. 2002. EO Definition. http://downloads.natureserve.org/conservation_tools/-element_occurence_data_standard.pdf.

———. 2016. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer (accessed June 8, 2017).

Poole, J. M., W.R. Carr, D.M. Price, and J.R. Singhurst. 2007. Rare Plants of Texas. Texas A&M University Press.

Texas Parks and Wildlife Department (TPWD). 2014. Ecological Mapping Systems of Texas. https://tpwd.texas.gov/gis/data/downloads#EMST

———. 2017. Wildlife Fact Sheet: Bald Eagle. http://tpwd.texas.gov/huntwild/wild/species/-baldeagle/, accessed June 8, 2017.

U.S. Fish and Wildlife Service (USFWS). 2007. National Bald Eagle Management Guidelines. May 2007.

———. 2008. Species Assessment and Listing Priority Assignment Form for the smalleye shiner (*Notropis buccula*).

———. 2017. Species Status Assessment Report for the Sharpnose Shiner (*Notropis oxyrhynchus*) and Smalleye Shiner (*N. buccula*). https://www.fws.gov/southwest/es/-ArlingtonTexas/pdf/20140721%20SSA-Report_Brazos-Shiners.pdf (accessed April 2, 2017).

U.S. Geological Survey (USGS). 1987. 7.5-minute series topographic maps, Pflugerville East and Webberville, Texas, quadrangles.

———. 1988. 7.5-minute series topographic maps, Manor and Montopolis, Texas, quadrangles.

APPENDIX A

FIGURES

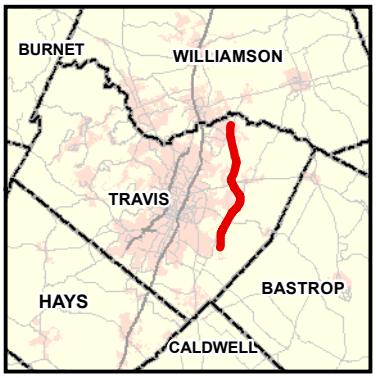
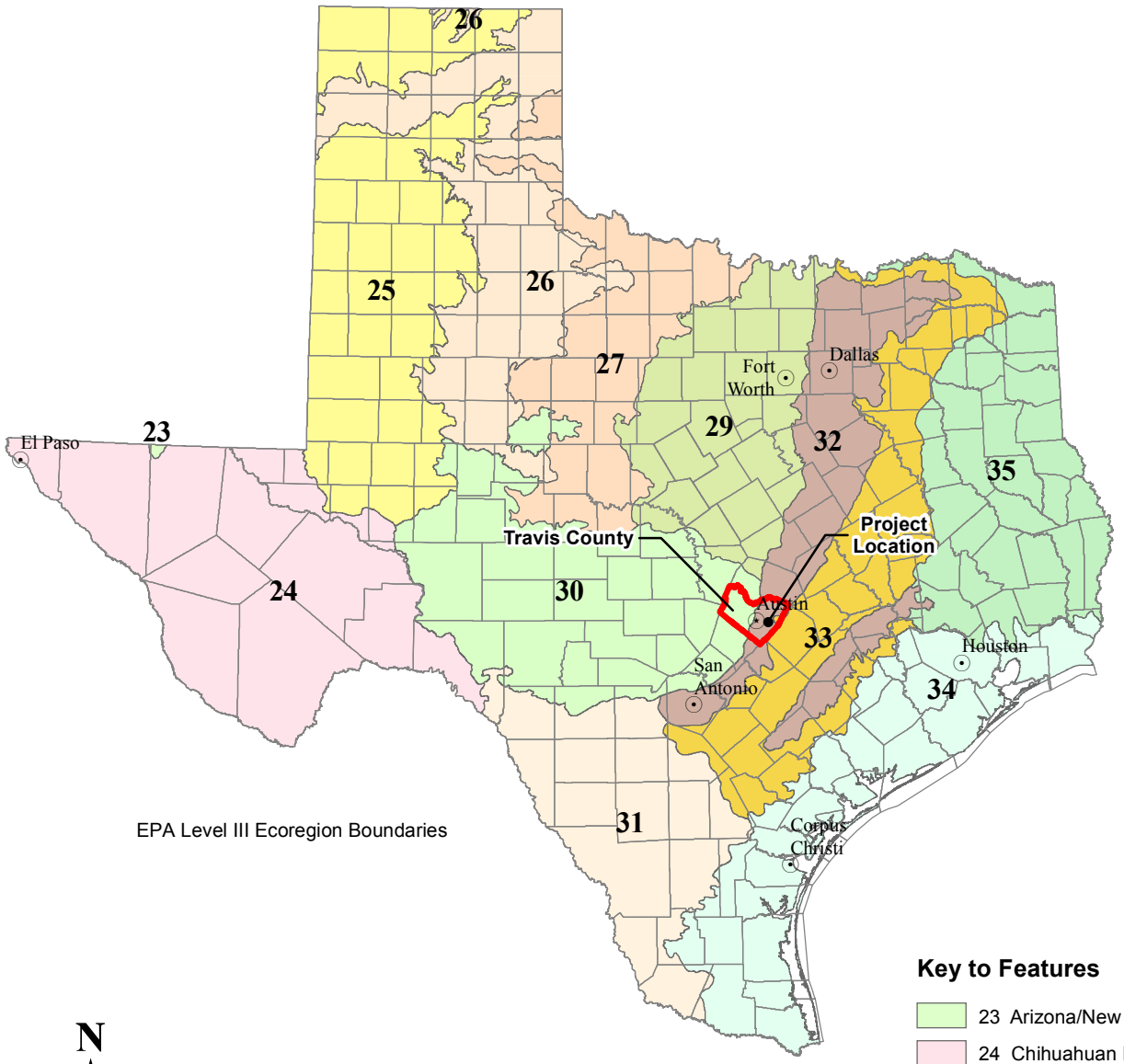
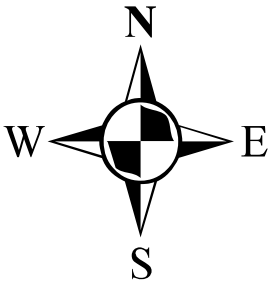


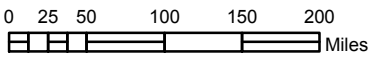
Figure 1
Project Location

SH 130 from SH 45N to SH 71

CSJ: 0440-06-017 and 0440-06-018







Key to Features

- 23 Arizona/New Mexico Mountains
- 24 Chihuahuan Deserts
- 25 High Plains
- 26 Southwestern Tablelands
- 27 Central Great Plains
- 29 Cross Timbers
- 30 Edwards Plateau
- 31 Southern Texas Plains
- 32 Texas Blackland Prairies
- 33 East Central Texas Plains
- 34 Western Gulf Coastal Plain
- 35 South Central Plains

Figure 2

EPA Level III Ecoregions

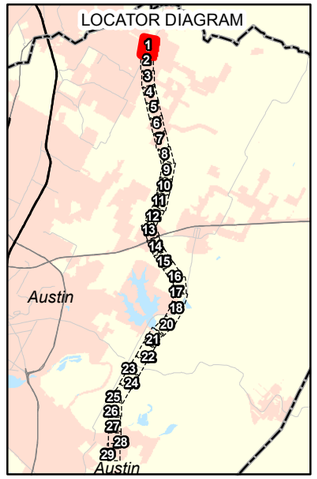
SH 130 from SH 45N to SH 71

CSJ: 0440-06-017 and 0440-06-018

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018

LOCATOR DIAGRAM



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1107 - Edwards Plateau: Savanna Grassland
- 1904 - Central Texas: Riparian Hardwood Forest
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9106 - Native Invasive: Mesquite Shrubland
- 9307 - Row Crops
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

0 150 300 450
Feet

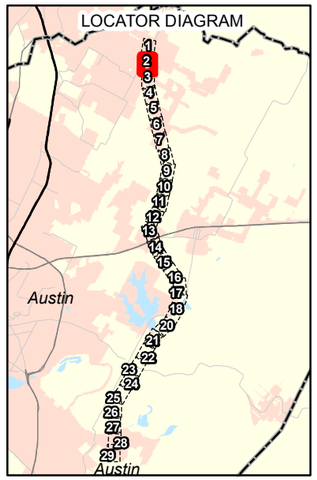
One inch equals 300 ft

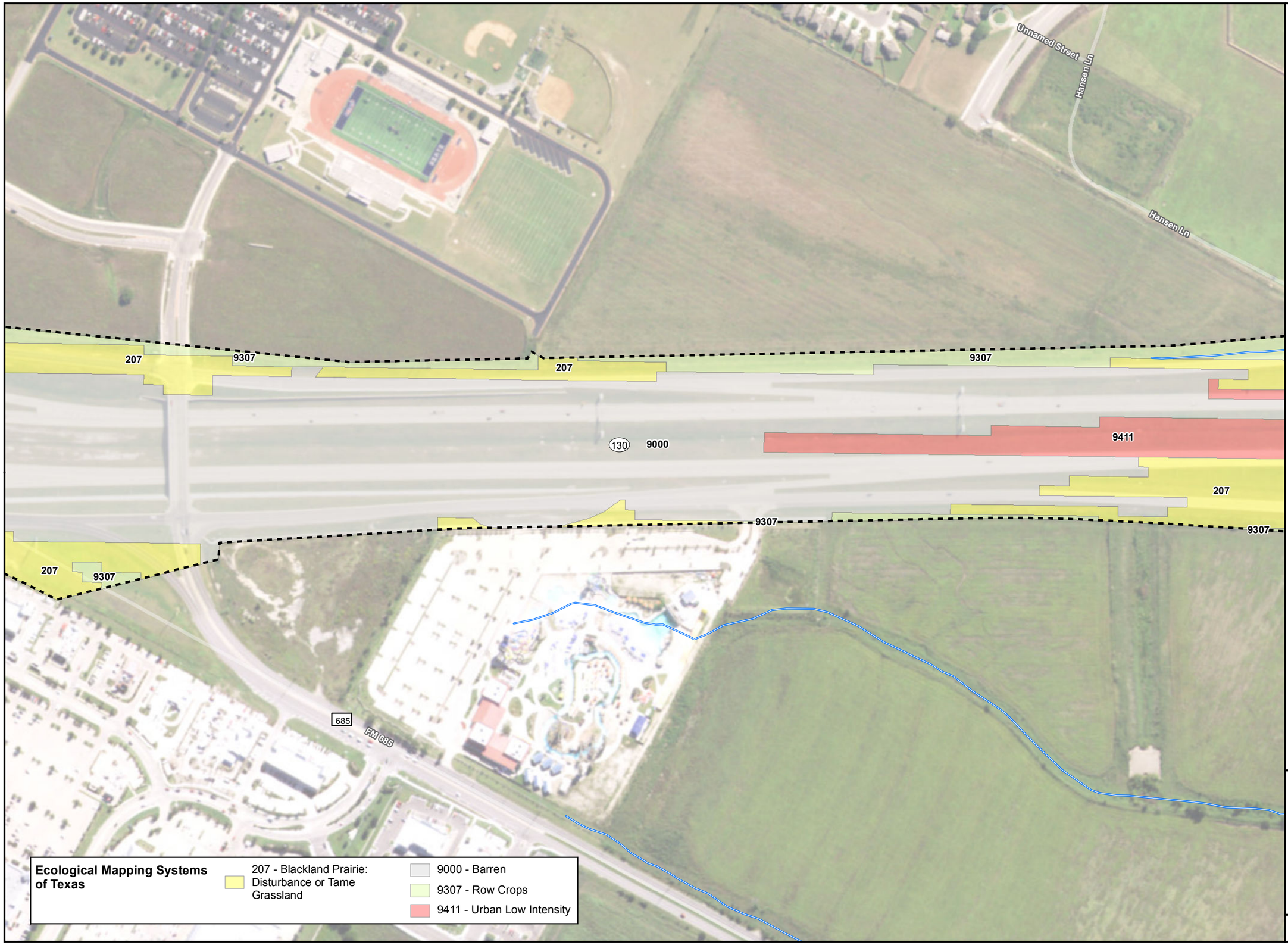
FIGURE 3 - 1

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018

LOCATOR DIAGRAM





Key to Features

- Existing ROW
- Streams (COA)

N

0 150 300 450
Feet

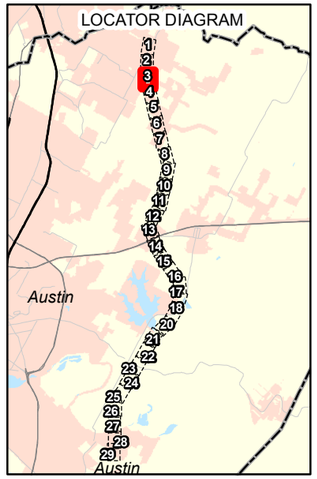
One inch equals 300 ft

FIGURE 3 - 2

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018

LOCATOR DIAGRAM



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9105 - Native Invasive: Juniper Shrubland
- 9307 - Row Crops
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

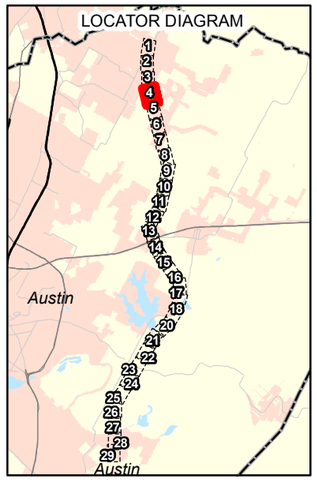
0 150 300 450
Feet

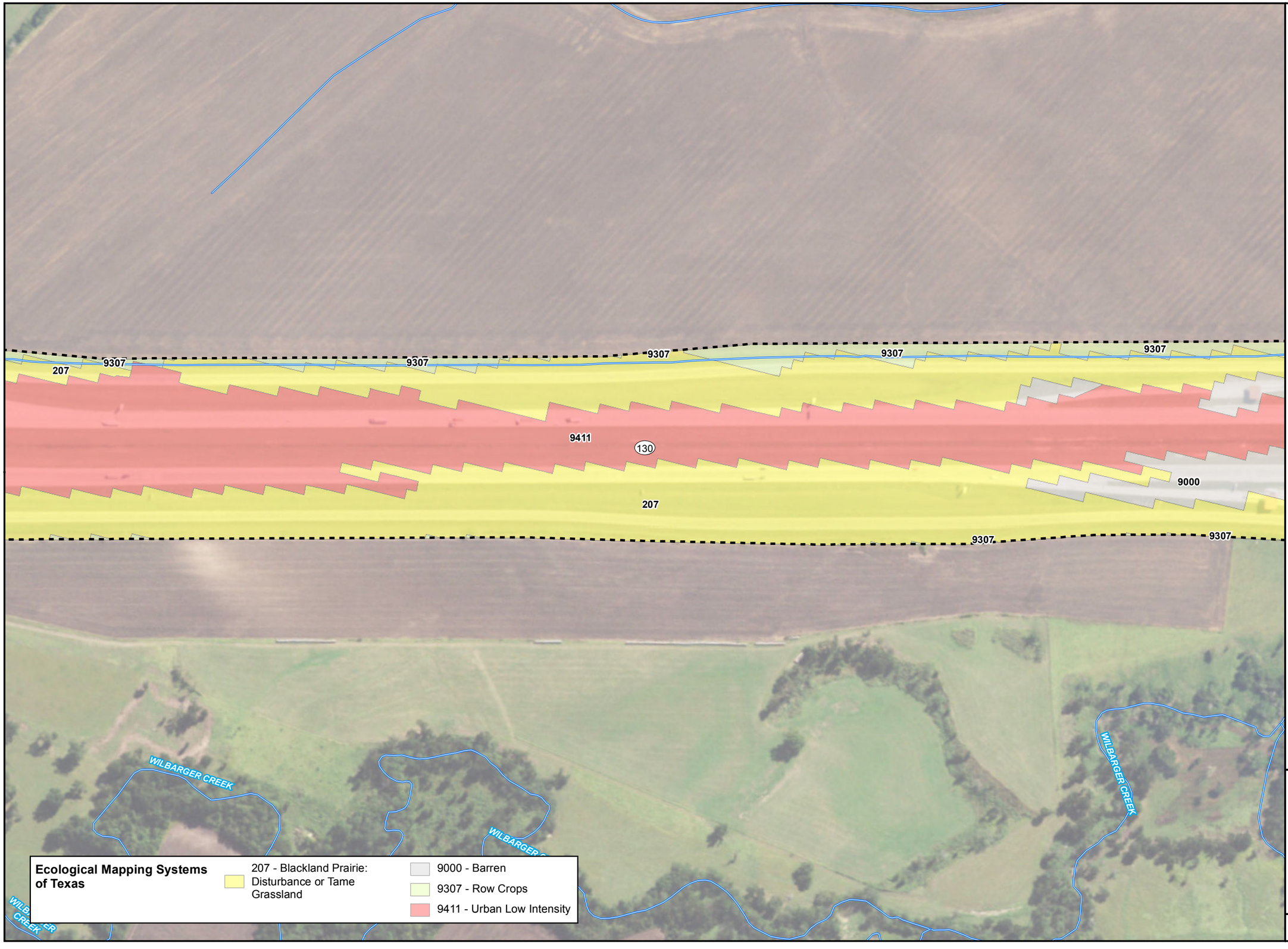
One inch equals 300 ft

FIGURE 3 - 3

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Key to Features

- Existing ROW
- Streams (COA)

N

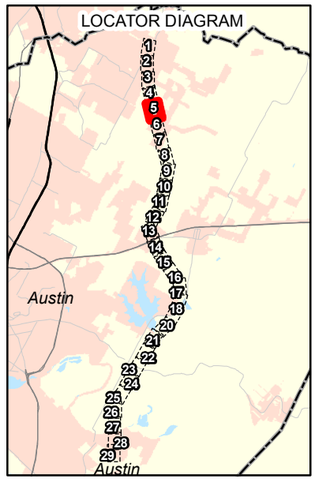
0 150 300 450
Feet

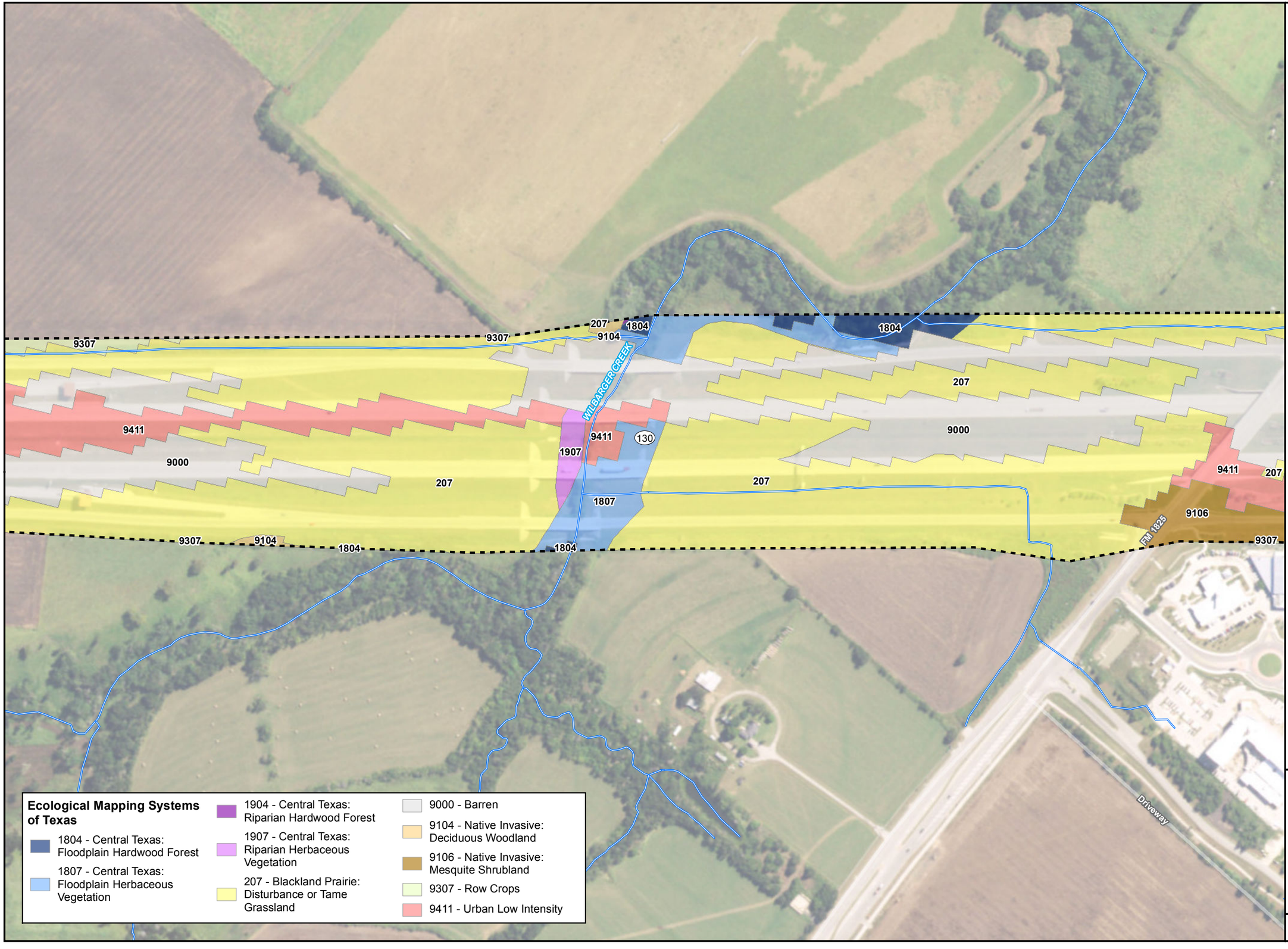
One inch equals 300 ft

FIGURE 3 - 4

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Ecological Mapping Systems of Texas

- 1804 - Central Texas: Floodplain Hardwood Forest
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1904 - Central Texas: Riparian Hardwood Forest
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9106 - Native Invasive: Mesquite Shrubland
- 9307 - Row Crops
- 9411 - Urban Low Intensity

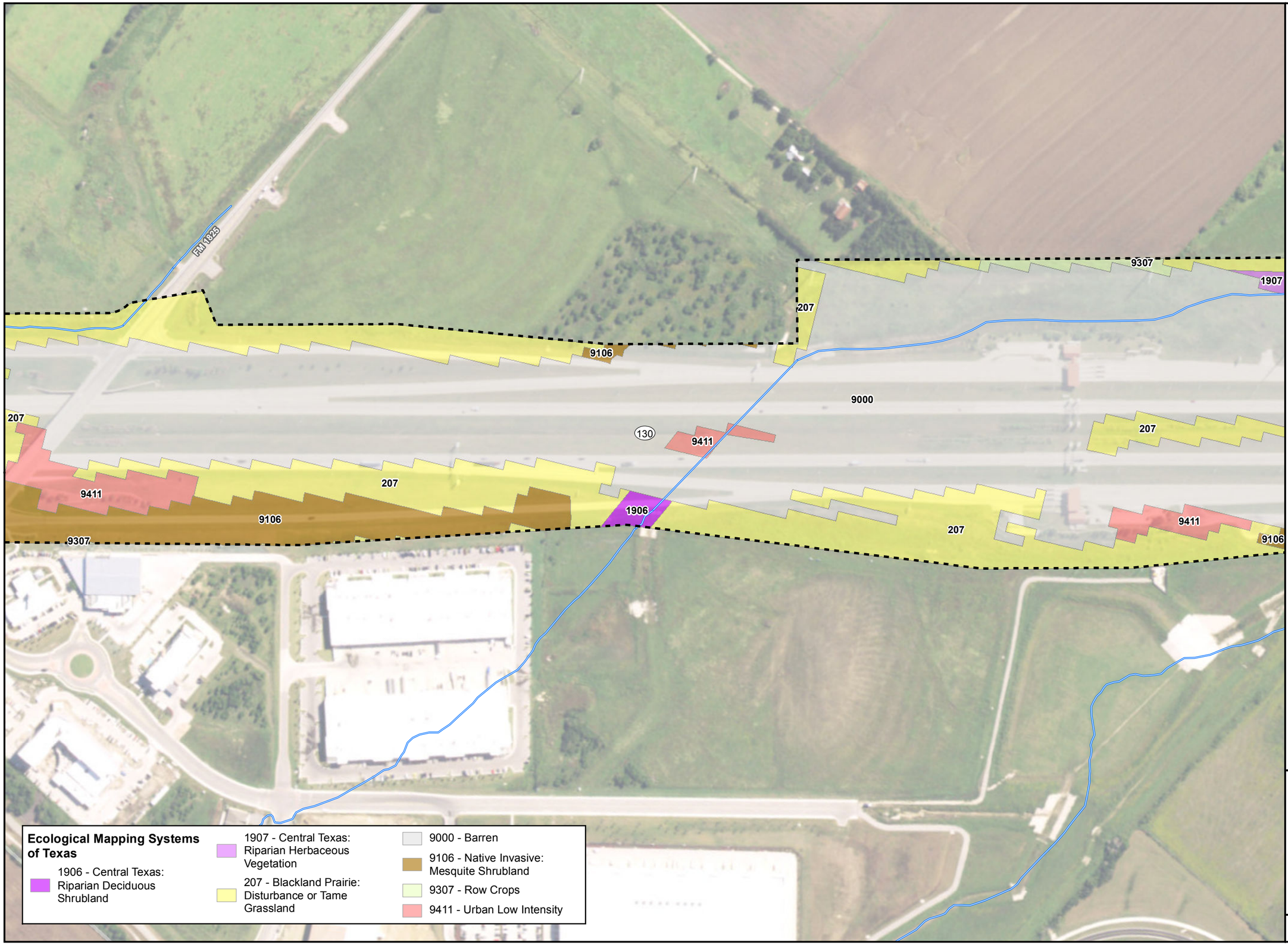
Key to Features

- Existing ROW
- Streams (COA)

0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 5

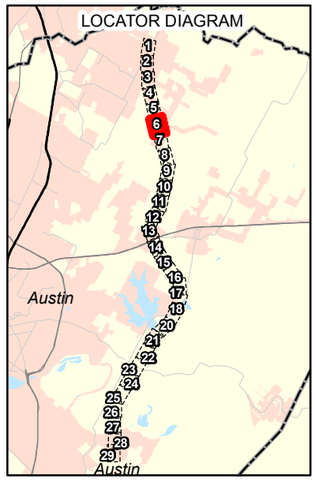


Ecological Mapping Systems of Texas

- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9106 - Native Invasive: Mesquite Shrubland
- 9307 - Row Crops
- 9411 - Urban Low Intensity

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

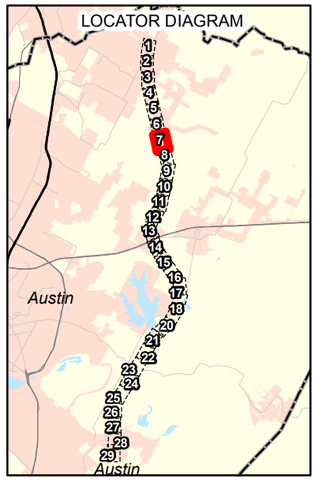
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 6

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9106 - Native Invasive: Mesquite Shrubland
- 9307 - Row Crops
- 9411 - Urban Low Intensity

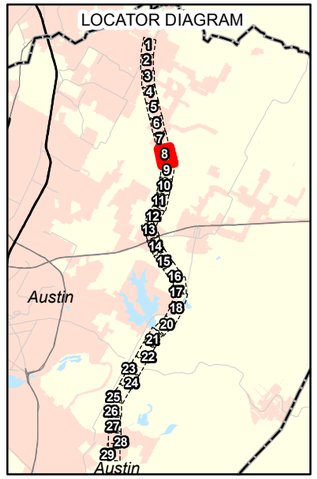
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 7

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9106 - Native Invasive: Mesquite Shrubland
- 9411 - Urban Low Intensity

N

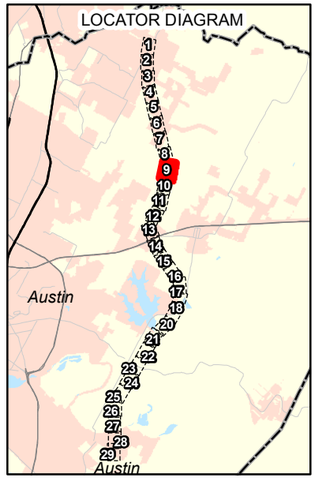
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 8

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9411 - Urban Low Intensity

N

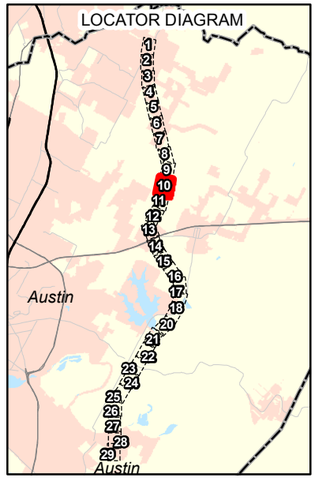
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 9

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Gregg Manor Rd
Hill Ln
130
9307
9106
207
9411

Ecological Mapping Systems of Texas

- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9106 - Native Invasive: Mesquite Shrubland
- 9307 - Row Crops
- 9411 - Urban Low Intensity

Key to Features

- Existing ROW
- Streams (COA)

0 150 300 450
Feet

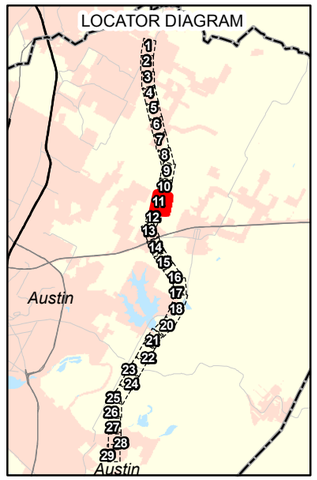
One inch equals 300 ft

FIGURE 3 - 10

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018

LOCATOR DIAGRAM



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1102 - Edwards Plateau: Live Oak Motte and Woodland
- 1804 - Central Texas: Floodplain Hardwood Forest
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9104 - Native Invasive: Deciduous Woodland
- 9106 - Native Invasive: Mesquite Shrubland
- 9411 - Urban Low Intensity

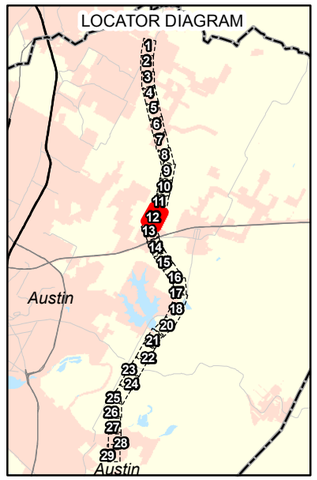
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 11

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



GILLELAND CREEK
HARRIS BRANCH CREEK
GILLELAND CREEK
FM 734
FM 734
130
734
1804
9104
9106
9106
207
1807
9000
9411
9105
9411
9410
207
207
9411
207
9106
1807

Ecological Mapping Systems of Texas

- 1804 - Central Texas: Floodplain Hardwood Forest
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

Key to Features

- Existing ROW
- Streams (COA)

0 150 300 450
Feet

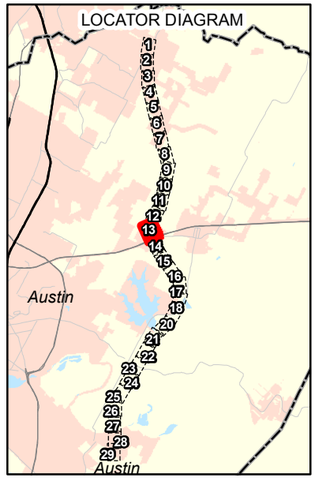
One inch equals 300 ft

FIGURE 3 - 12

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018

LOCATOR DIAGRAM



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9307 - Row Crops
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

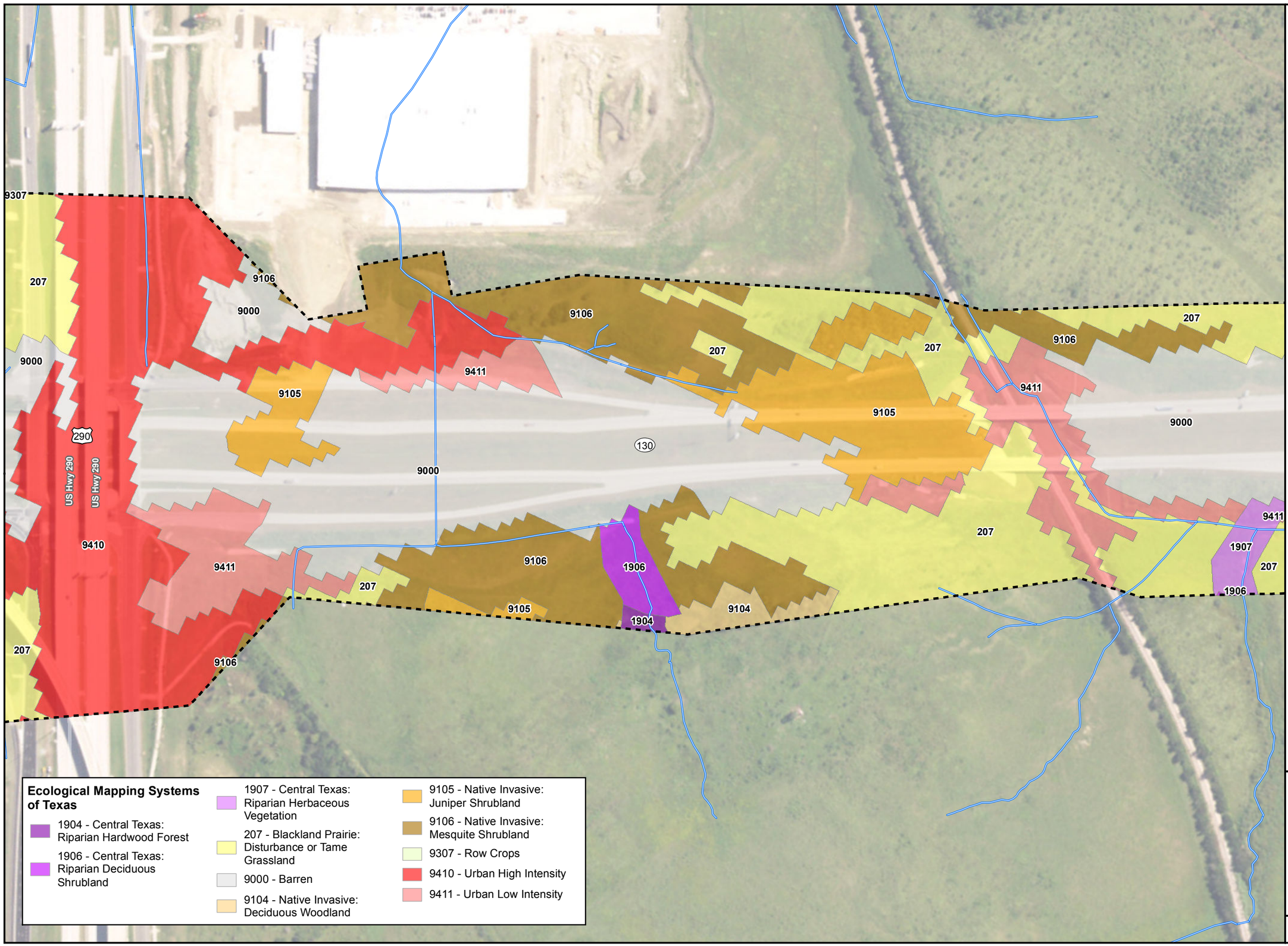
0 150 300 450
Feet

One inch equals 300 ft

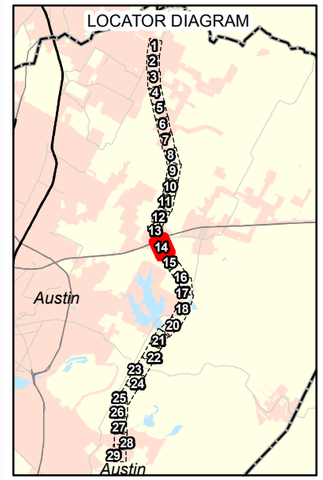
FIGURE 3 - 13

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



LOCATOR DIAGRAM



Key to Features

- Existing ROW
- Streams (COA)

N

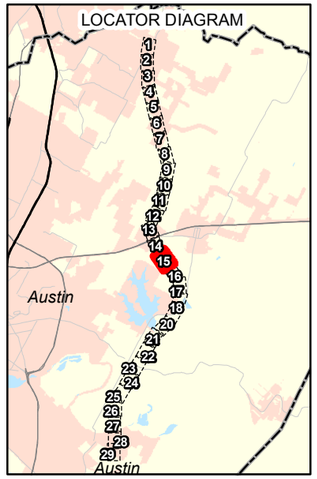
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 14

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1804 - Central Texas: Floodplain Hardwood Forest
- 1805 - Central Texas: Floodplain Evergreen Shrubland
- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

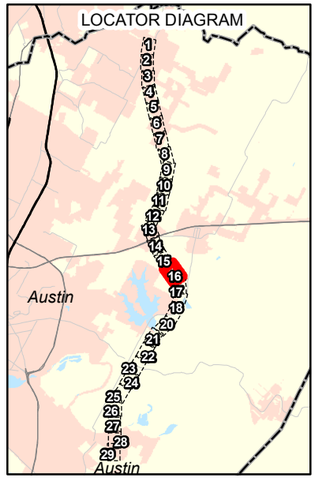
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 15

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

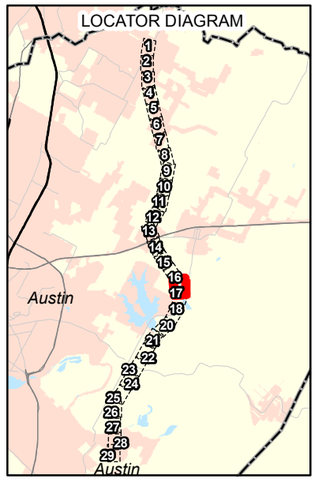
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 16

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



GILLELAND CREEK

GILLELAND CREEK

130

1804 1807 1804 1805 1806 9104 9105 9106 9106 207 1906 9411 9410 207 1906 207 9106 1907 9104 9410 207 1907 9000 9105 9104

Ecological Mapping Systems of Texas

- 1804 - Central Texas: Floodplain Hardwood Forest
- 1805 - Central Texas: Floodplain Evergreen Shrubland
- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

Key to Features

- Existing ROW
- Streams (COA)

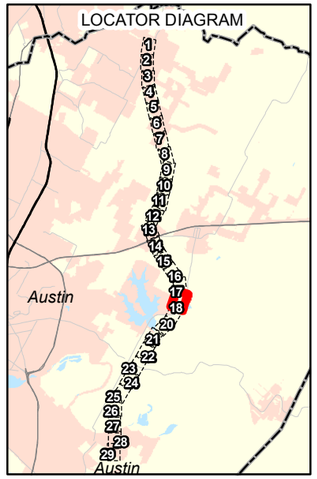
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 17

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1102 - Edwards Plateau: Live Oak Motte and Woodland
- 1226 - Edwards Plateau: Shin Oak Slope Shrubland
- 1803 - Central Texas: Floodplain Hardwood / Evergreen Forest
- 1804 - Central Texas: Floodplain Hardwood Forest
- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1904 - Central Texas: Riparian Hardwood Forest
- 1906 - Central Texas: Riparian Deciduous Shrubland
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

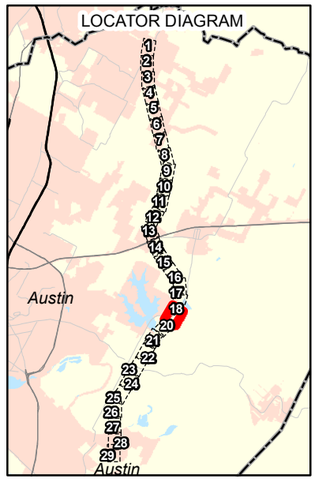
0 150 300 450
Feet

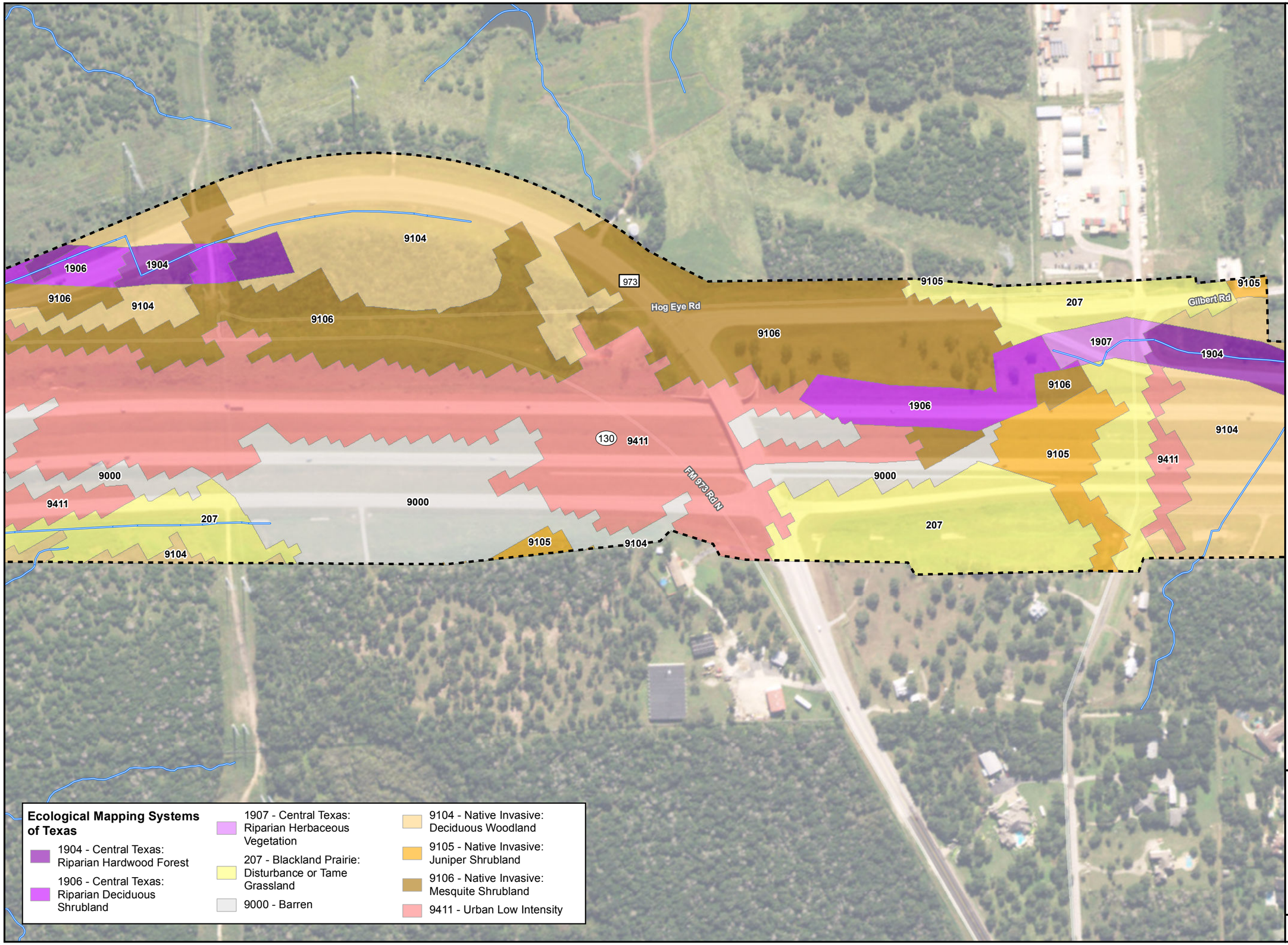
One inch equals 300 ft

FIGURE 3 - 18

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Ecological Mapping Systems of Texas

- 1904 - Central Texas: Riparian Hardwood Forest
- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9411 - Urban Low Intensity

Key to Features

- Existing ROW
- Streams (COA)

N

0 150 300 450
Feet

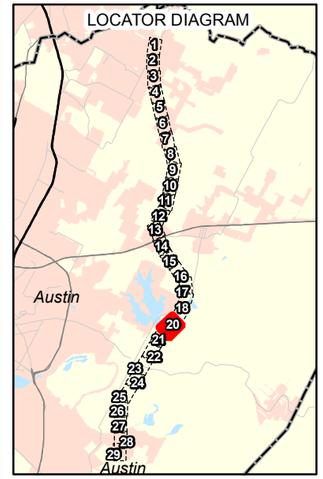
One inch equals 300 ft

FIGURE 3 - 19

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018

LOCATOR DIAGRAM



Nez Perce Trce
Gilbert Rd
DECKER CREEK
Hog Eye Rd
130

Ecological Mapping Systems of Texas

- 1904 - Central Texas: Riparian Hardwood Forest
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

Key to Features

- Existing ROW
- Streams (COA)

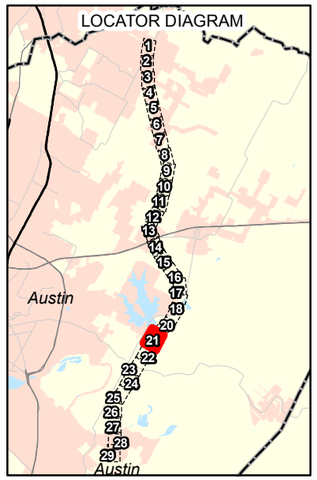
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 20

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1804 - Central Texas: Floodplain Hardwood Forest
- 1904 - Central Texas: Riparian Hardwood Forest
- 1905 - Central Texas: Riparian Evergreen Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 604 - Post Oak Savanna: Post Oak Motte and Woodland
- 607 - Post Oak Savanna: Savanna Grassland
- 613 - Post Oak Savanna: Post Oak / Yaupon Motte and Woodland
- 9000 - Barren
- 9101 - Native Invasive: Juniper Woodland
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9411 - Urban Low Intensity

N

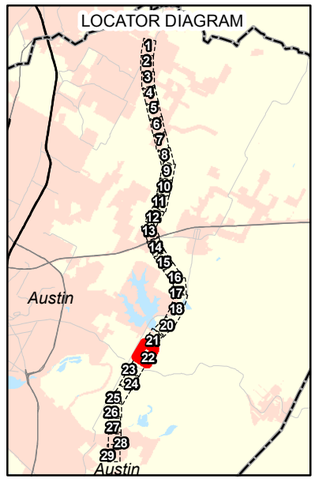
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 21

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1903 - Central Texas: Riparian Hardwood / Evergreen Forest
- 1904 - Central Texas: Riparian Hardwood Forest
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 602 - Post Oak Savanna: Live Oak Motte and Woodland
- 604 - Post Oak Savanna: Post Oak Motte and Woodland
- 607 - Post Oak Savanna: Savanna Grassland
- 613 - Post Oak Savanna: Post Oak / Yaupon Motte and Woodland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

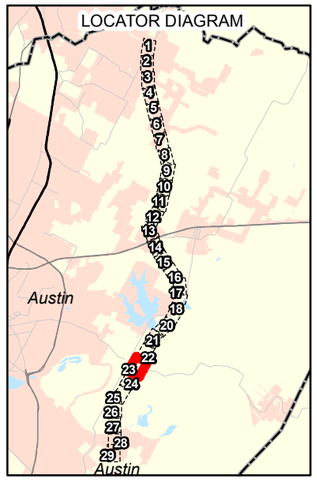
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 22

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

- 1804 - Central Texas: Floodplain Hardwood Forest
- 1805 - Central Texas: Floodplain Evergreen Shrubland
- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 1906 - Central Texas: Riparian Deciduous Shrubland
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 507 - Crosstimbers: Savanna Grassland
- 607 - Post Oak Savanna: Savanna Grassland
- 9000 - Barren
- 9104 - Native Invasive: Deciduous Woodland
- 9105 - Native Invasive: Juniper Shrubland
- 9106 - Native Invasive: Mesquite Shrubland
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

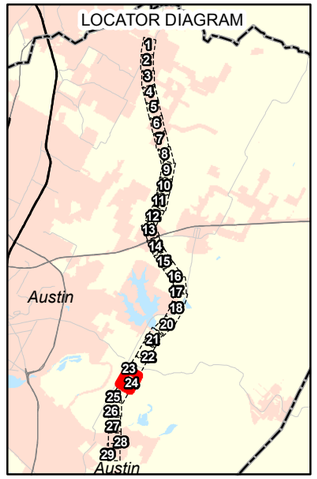
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 23

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



ELM CREEK

9411
9410
1807
9007
9600
1807
9411
1807
9411
1805
9000
130
1805
9410
9411
9411
1806
1807

Ecological Mapping Systems of Texas

- 1805 - Central Texas: Floodplain Evergreen Shrubland
- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 9000 - Barren
- 9007 - Marsh
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity
- 9600 - Open Water

Key to Features

- Existing ROW
- Streams (COA)

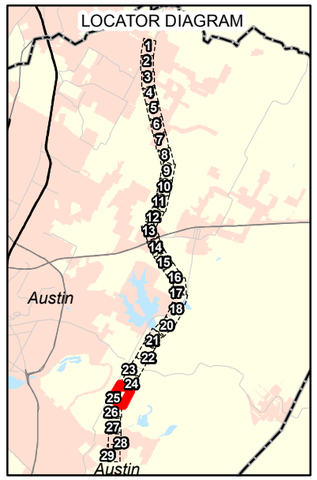
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 24

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Harold Green Dr

1807
1805
1805
9411
9410
9000
130
9410
9411
1805
1807
9411
1807
1806

Ecological Mapping Systems of Texas

- 1805 - Central Texas: Floodplain Evergreen Shrubland
- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 9000 - Barren
- 9410 - Urban High Intensity
- 9411 - Urban Low Intensity

Key to Features

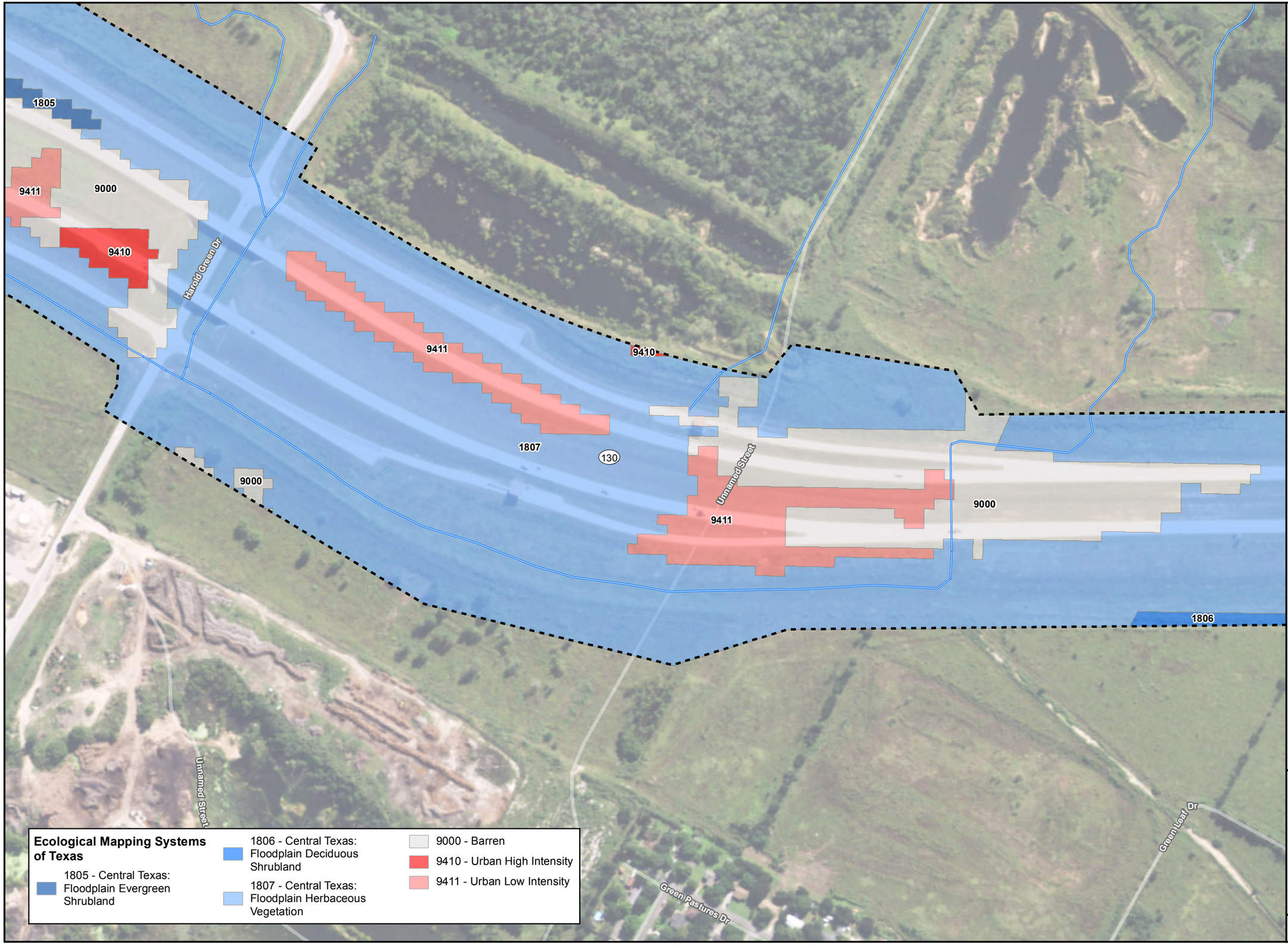
- Existing ROW
- Streams (COA)

N

0 150 300 450
Feet

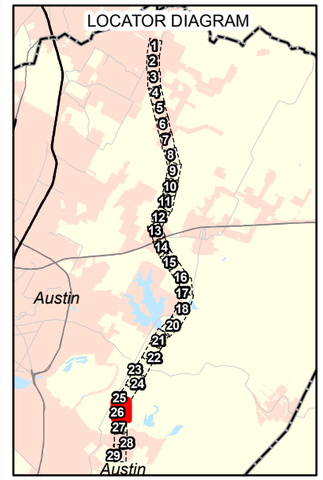
One inch equals 300 ft

FIGURE 3 - 25



PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

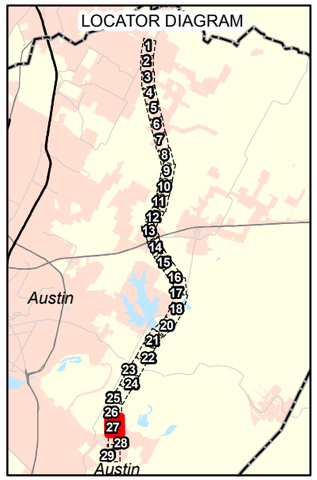
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 26

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



1804 1802 1807 1805 1804 9600 9000 1804 1807 9000 130 1807 9411 1807 1806 1806 1804 COLORADO RIVER Failwell Ln

Ecological Mapping Systems of Texas

- 1802 - Central Texas: Floodplain Live Oak Forest
- 1804 - Central Texas: Floodplain Hardwood Forest
- 1805 - Central Texas: Floodplain Evergreen Shrubland
- 1806 - Central Texas: Floodplain Deciduous Shrubland
- 1807 - Central Texas: Floodplain Herbaceous Vegetation
- 9000 - Barren
- 9411 - Urban Low Intensity
- 9600 - Open Water

Key to Features

- Existing ROW
- Streams (COA)

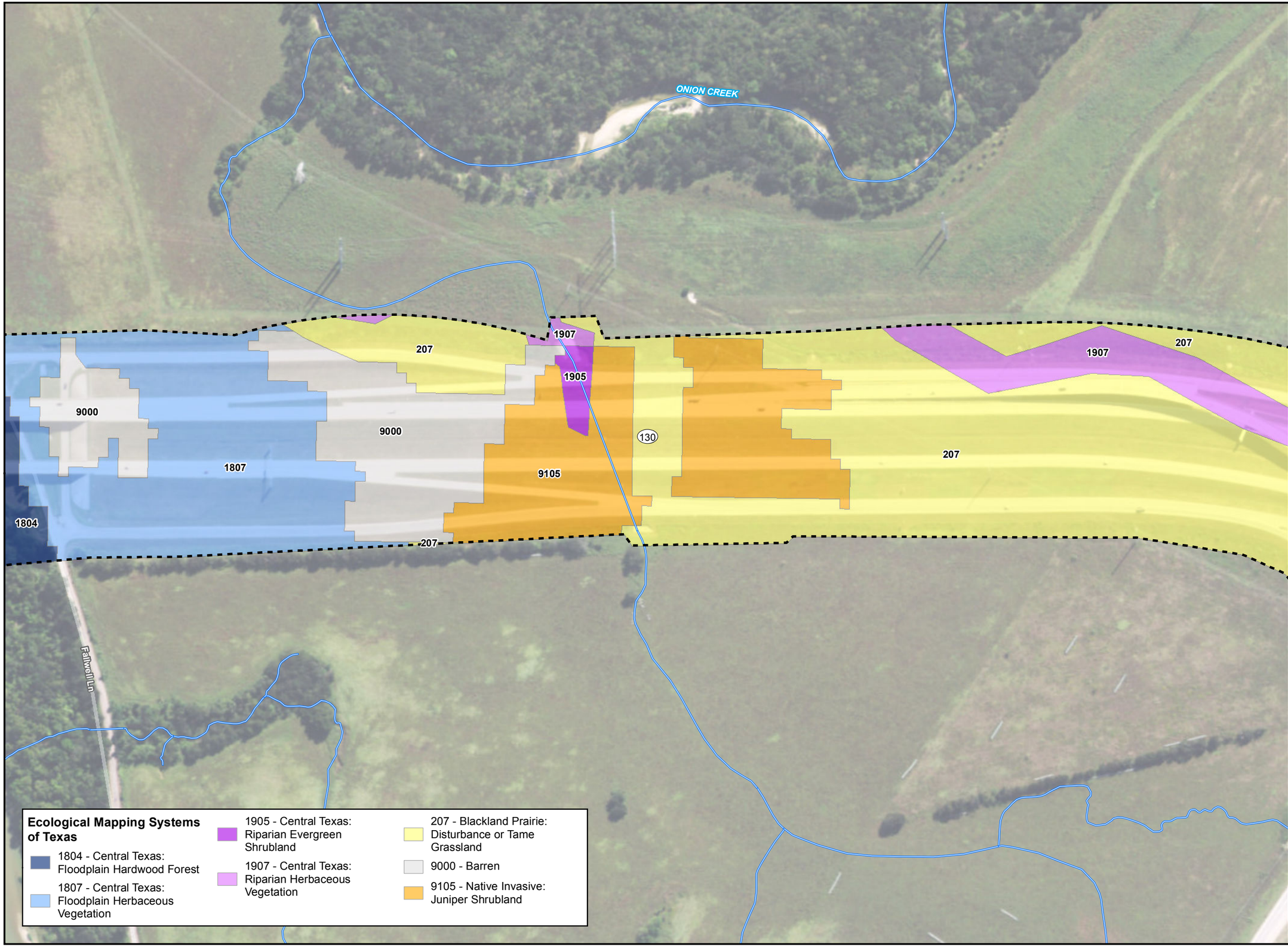
0 150 300 450
Feet

One inch equals 300 ft

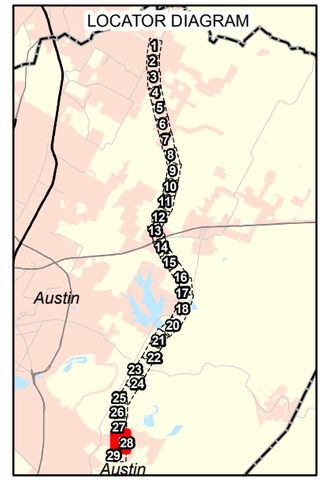
FIGURE 3 - 27

PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



LOCATOR DIAGRAM



Key to Features

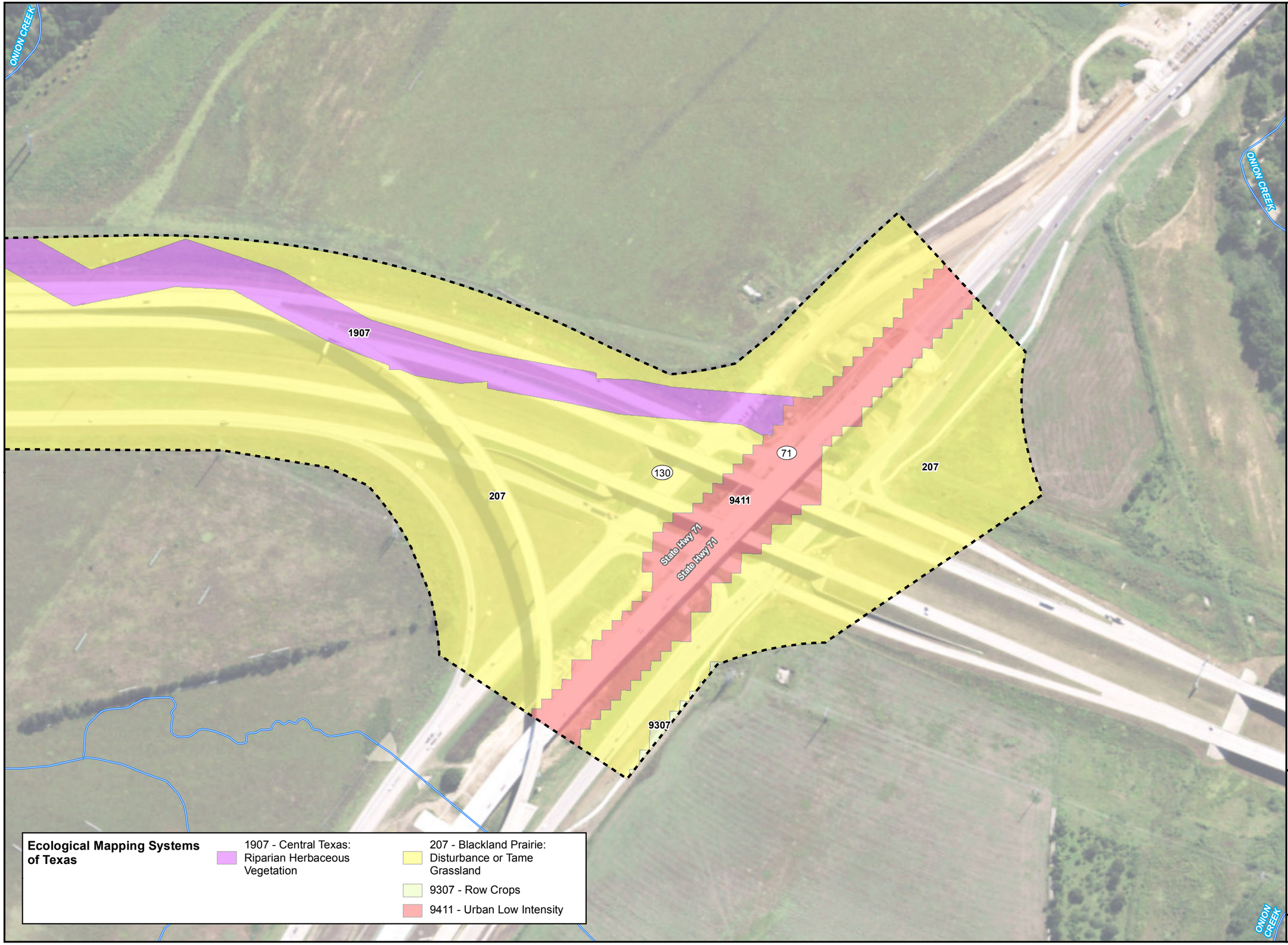
- Existing ROW
- Streams (COA)

N

0 150 300 450
Feet

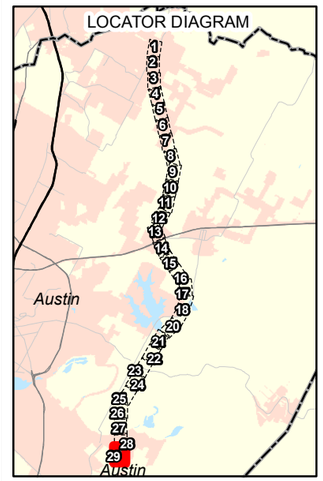
One inch equals 300 ft

FIGURE 3 - 28



PROJECT AREA ECOLOGICAL MAPPING SYSTEMS OF TEXAS

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)

Ecological Mapping Systems of Texas

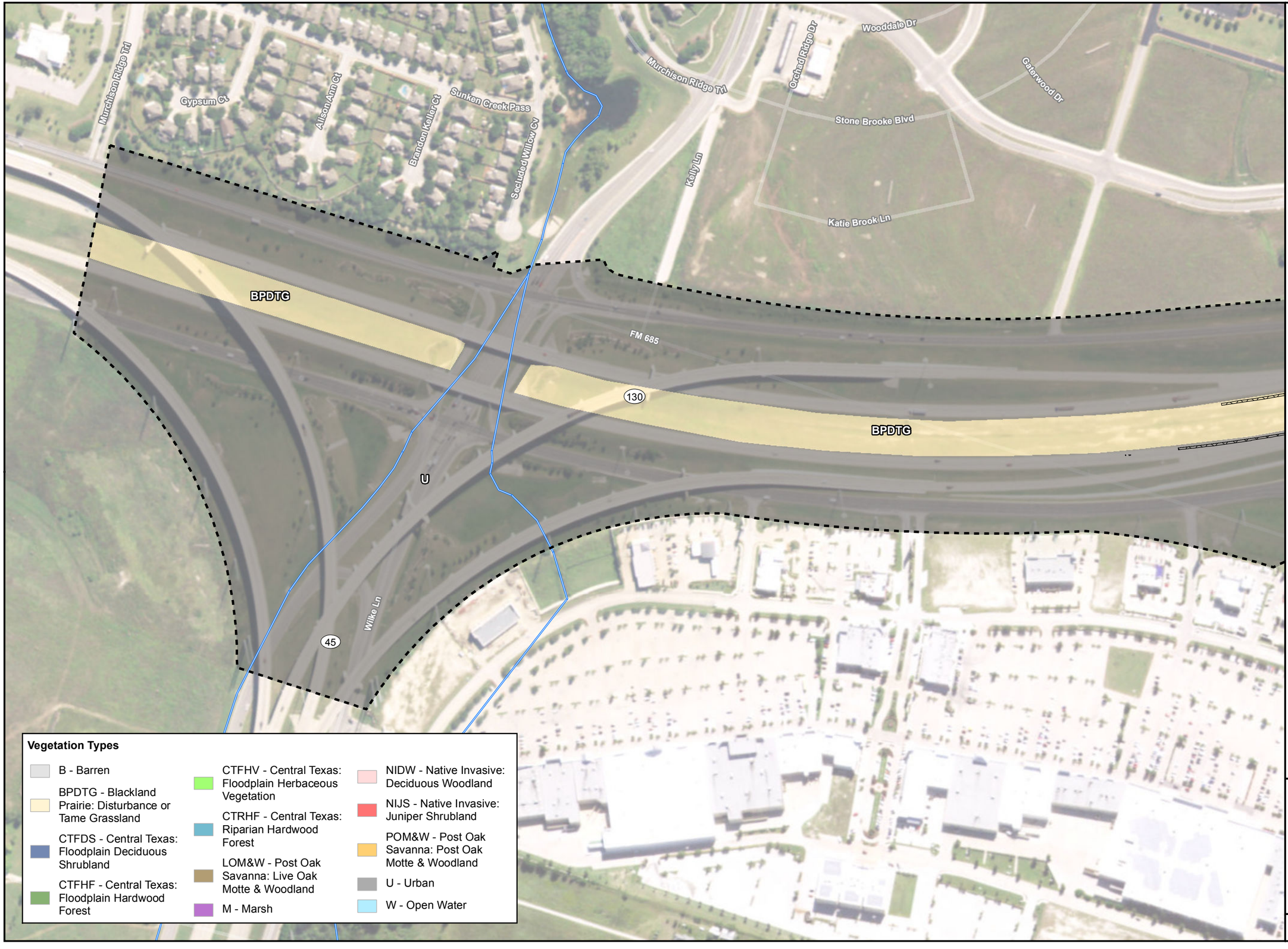
- 1907 - Central Texas: Riparian Herbaceous Vegetation
- 207 - Blackland Prairie: Disturbance or Tame Grassland
- 9307 - Row Crops
- 9411 - Urban Low Intensity

N

0 150 300 450
Feet

One inch equals 300 ft

FIGURE 3 - 29

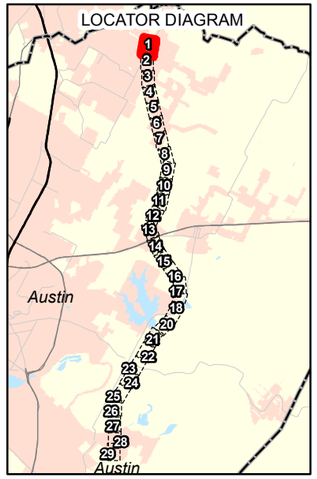


Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

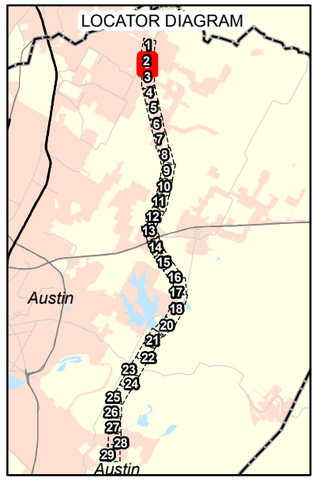
0 150 300 450
Feet

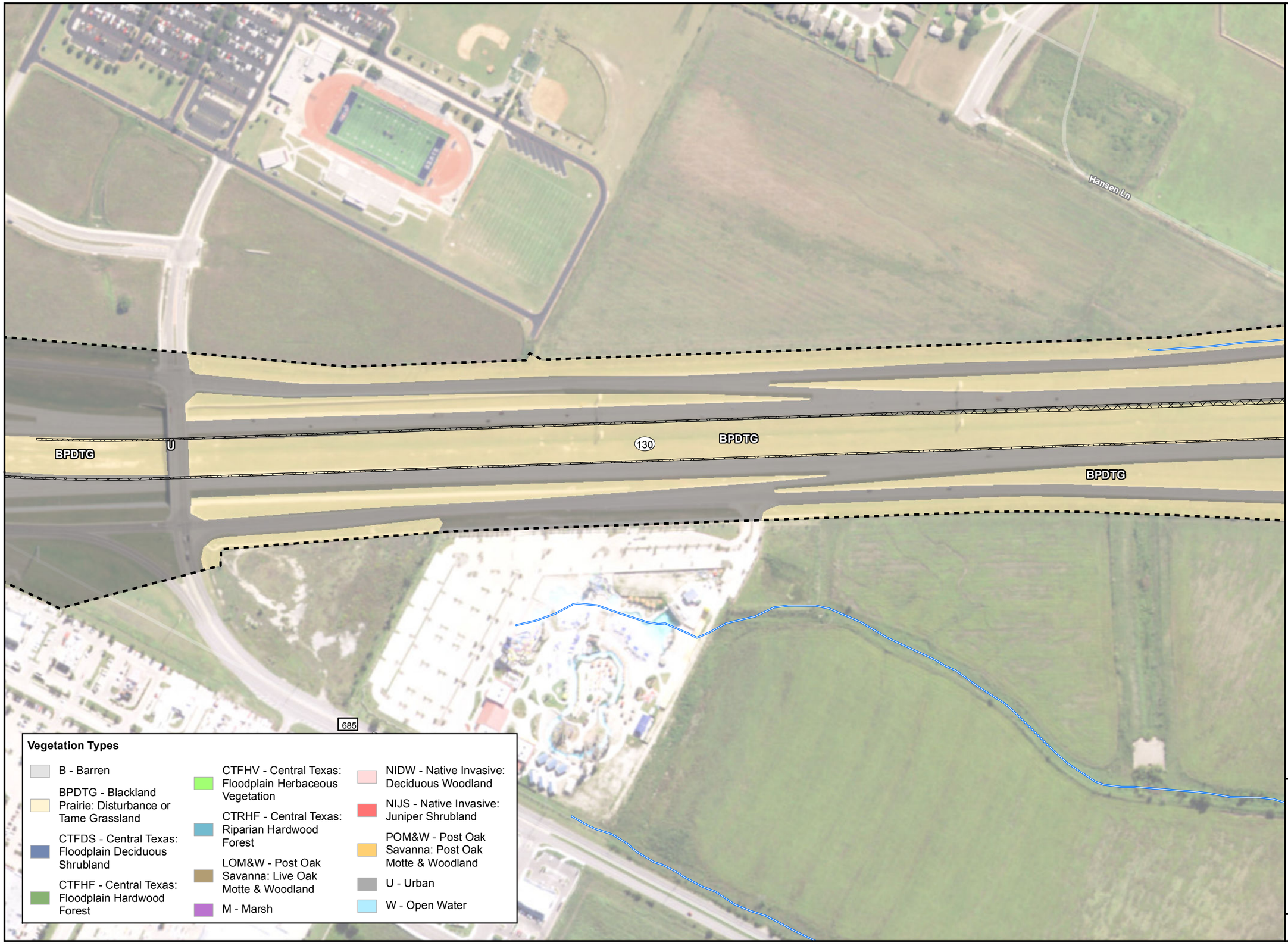
One inch equals 300 ft

FIGURE 4 - 1

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

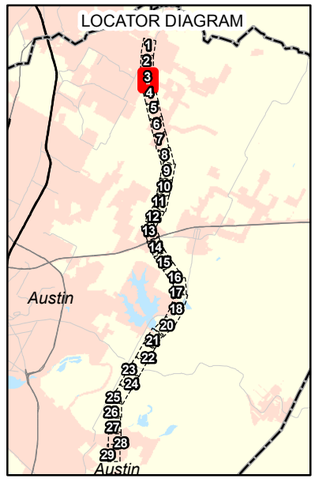
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 2

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Hansen Ln
Pfluger Ln
130
BPDTG
BPDTG
BPDTG
U
ILBARGER CREEK

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

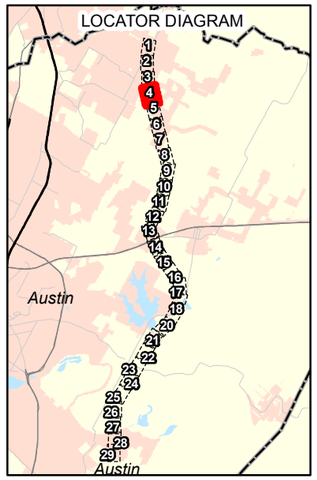
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 3

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



BPDTG

U

130

BPDTG

WILBARGER CREEK

WILBARGER CREEK

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

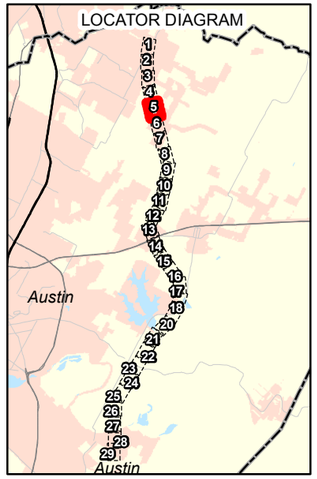
One inch equals 300 ft

FIGURE 4 - 4

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018

LOCATOR DIAGRAM



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

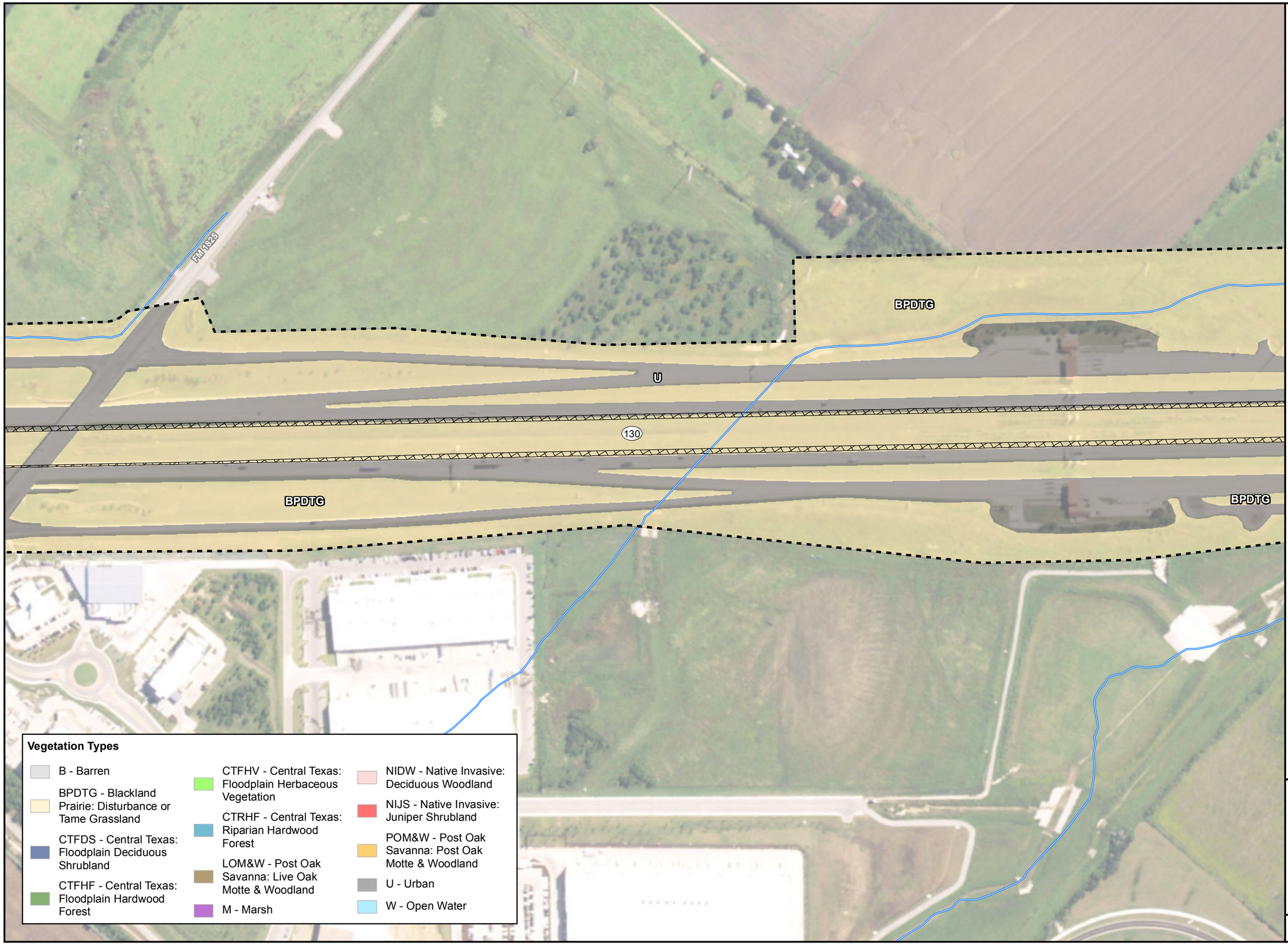
Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 5

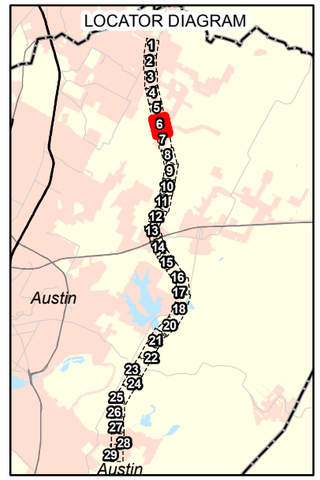


Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

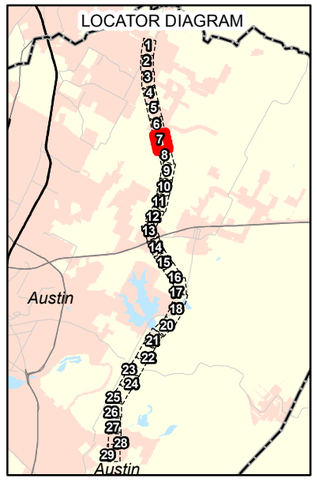
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 6

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



BPDTG
U
BPDTG
130
Cameron Rd
BPDTG
M

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

Vegetation Types

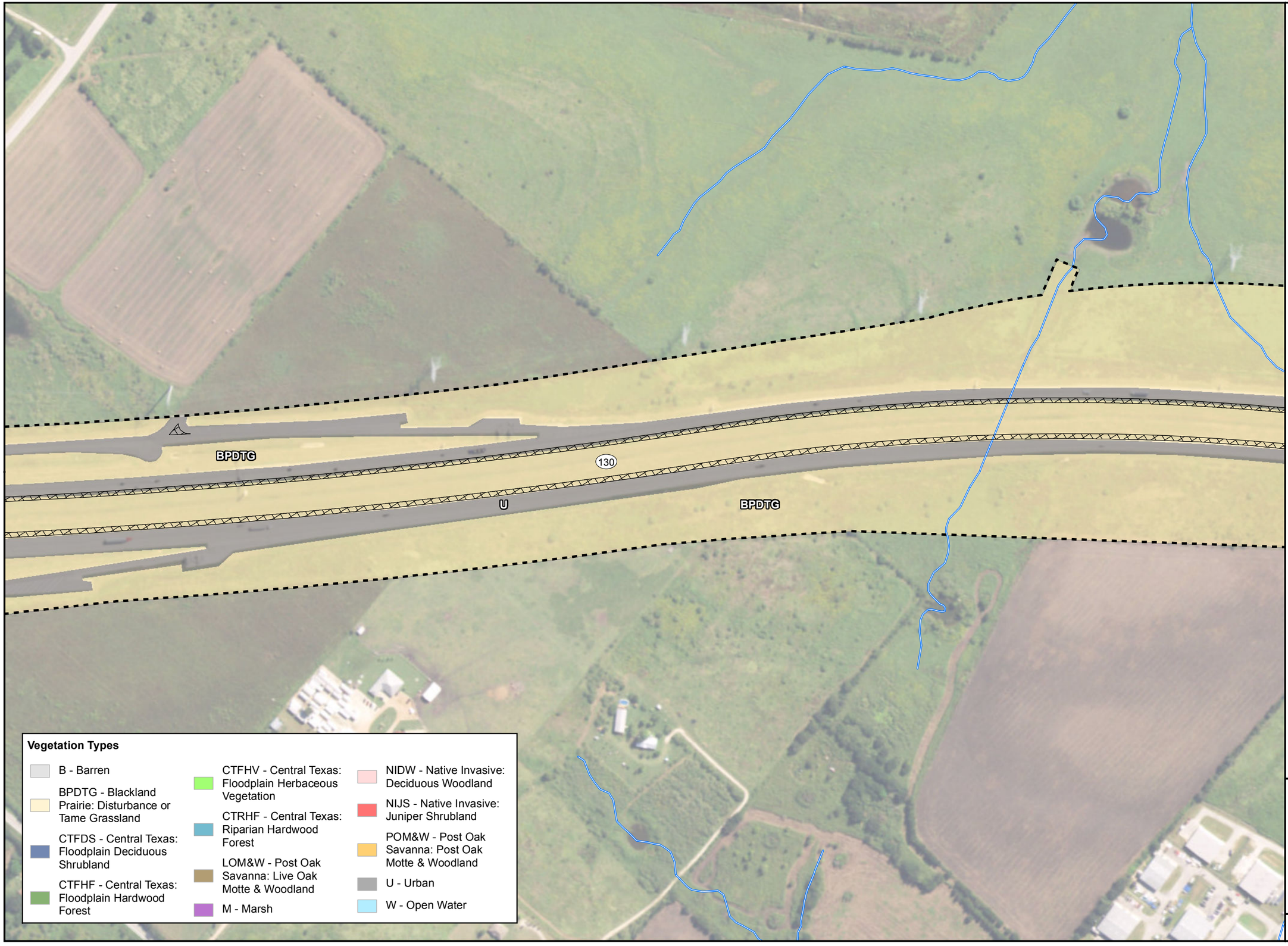
- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

N

0 150 300 450
Feet

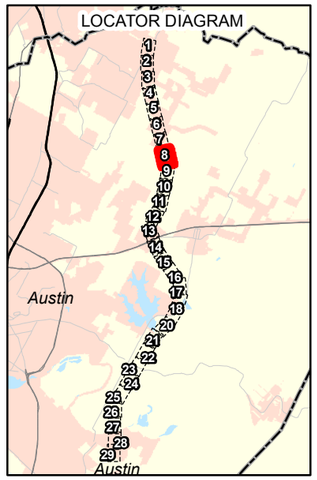
One inch equals 300 ft

FIGURE 4 - 7



PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

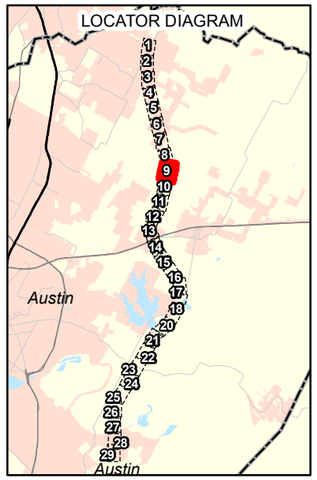
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 8

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



BPDTG
130
U
U
BPDTG

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

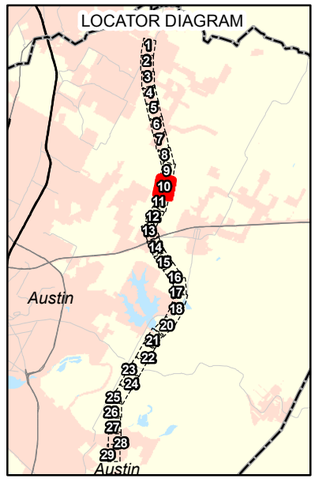
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 9

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



U
BPDTG
U
130
U
BPDTG
Hill Ln

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

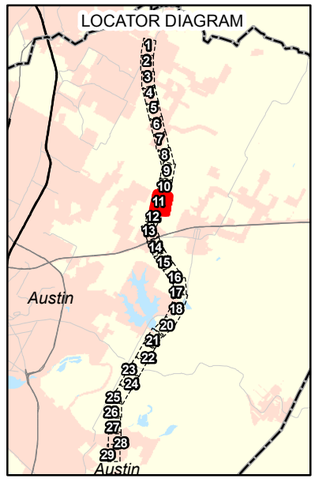
0 150 300 450
Feet

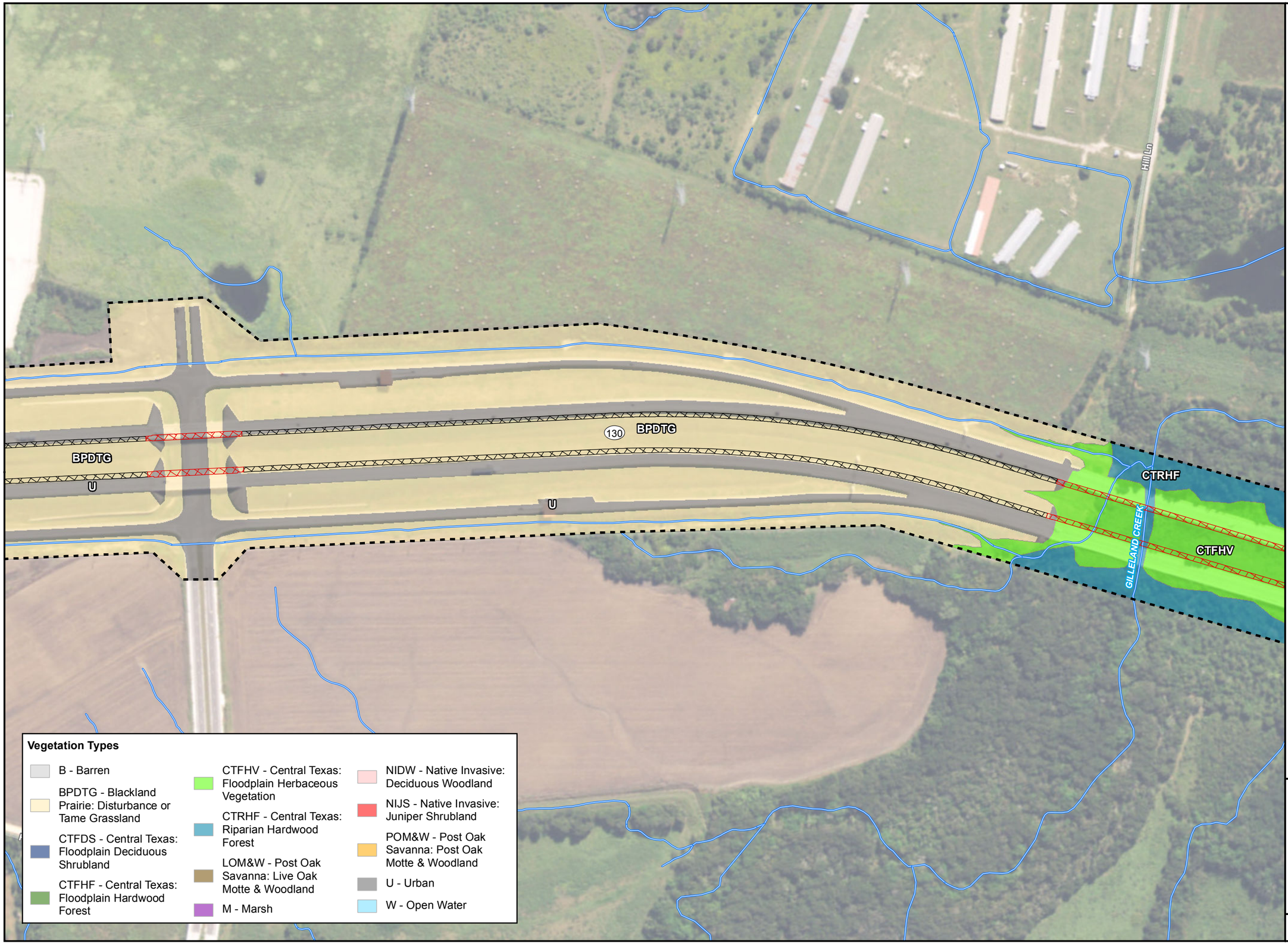
One inch equals 300 ft

FIGURE 4 - 10

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

Vegetation Types

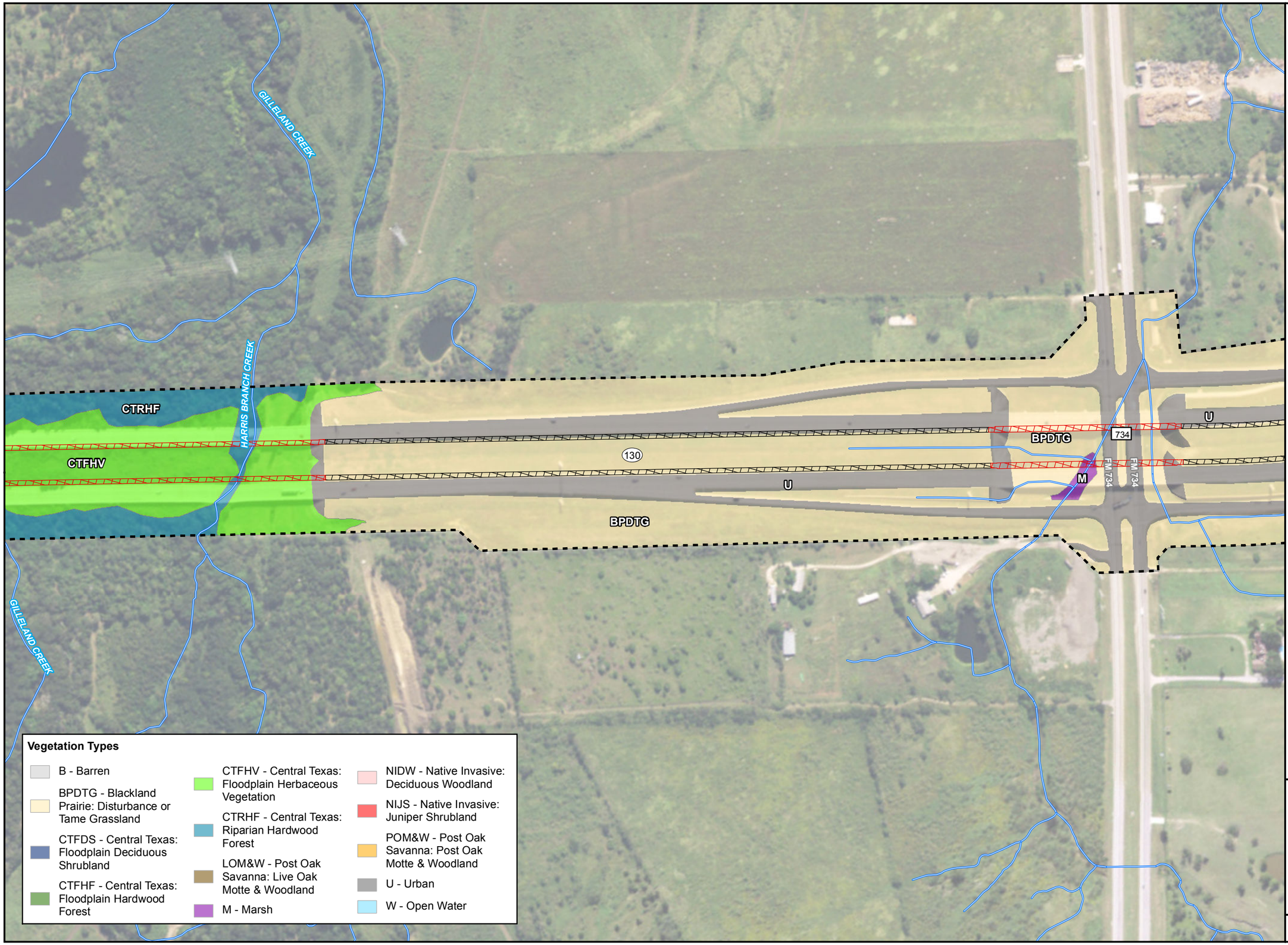
- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

N

0 150 300 450
Feet

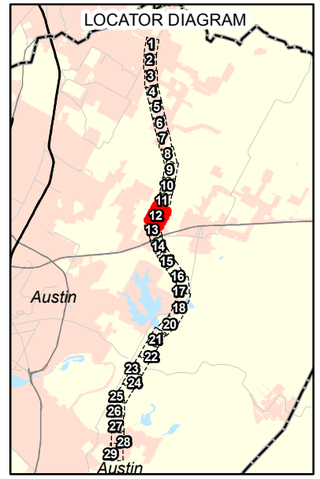
One inch equals 300 ft

FIGURE 4 - 11



PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

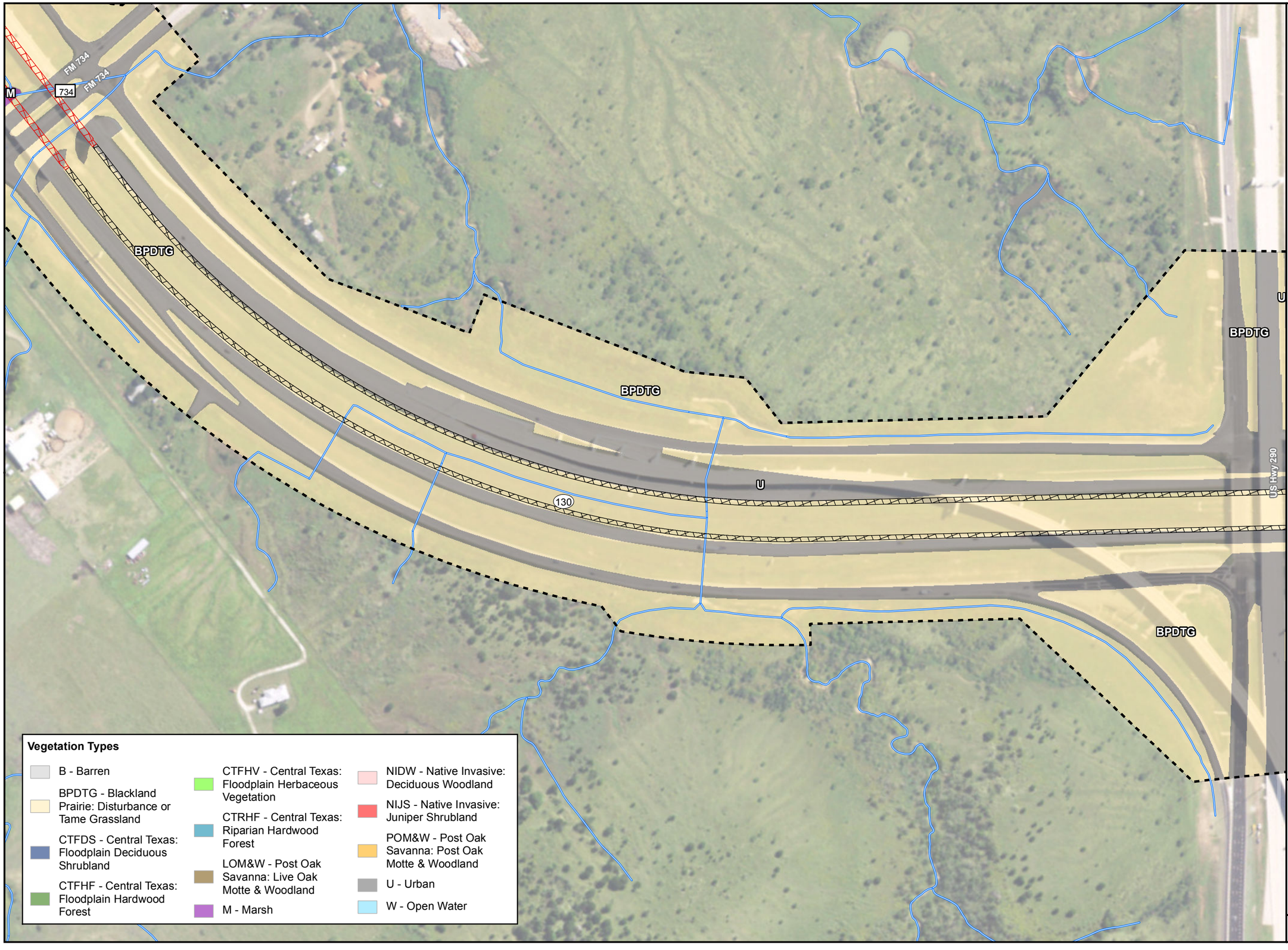
- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

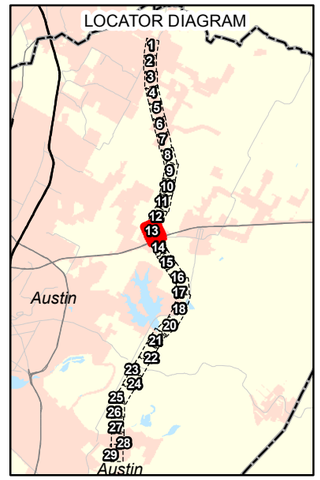
One inch equals 300 ft

FIGURE 4 - 12



PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

N

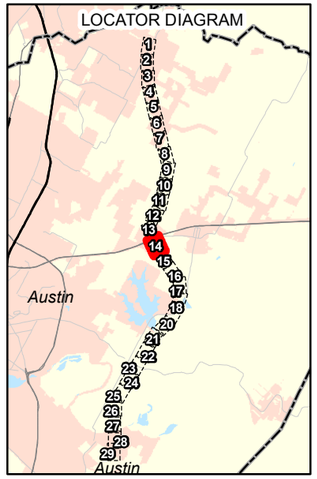
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 13

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



BPDTG
NIJS
NIJS
BPDTG
290
US Hwy 290
US Hwy 290
130
BPDTG
U
U
BPDTG
BPDTG
NIDW

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

N

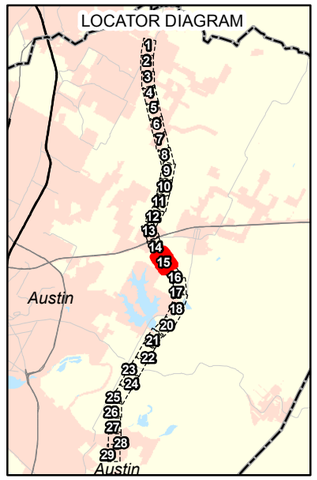
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 14

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Blue Bluff Rd

BPDTG

130

U

U

BPDTG

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

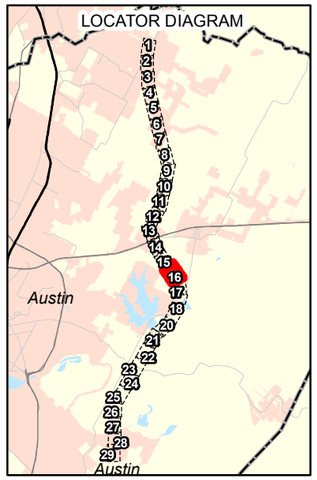
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 15

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



BPDTG

130

U

BPDTG

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

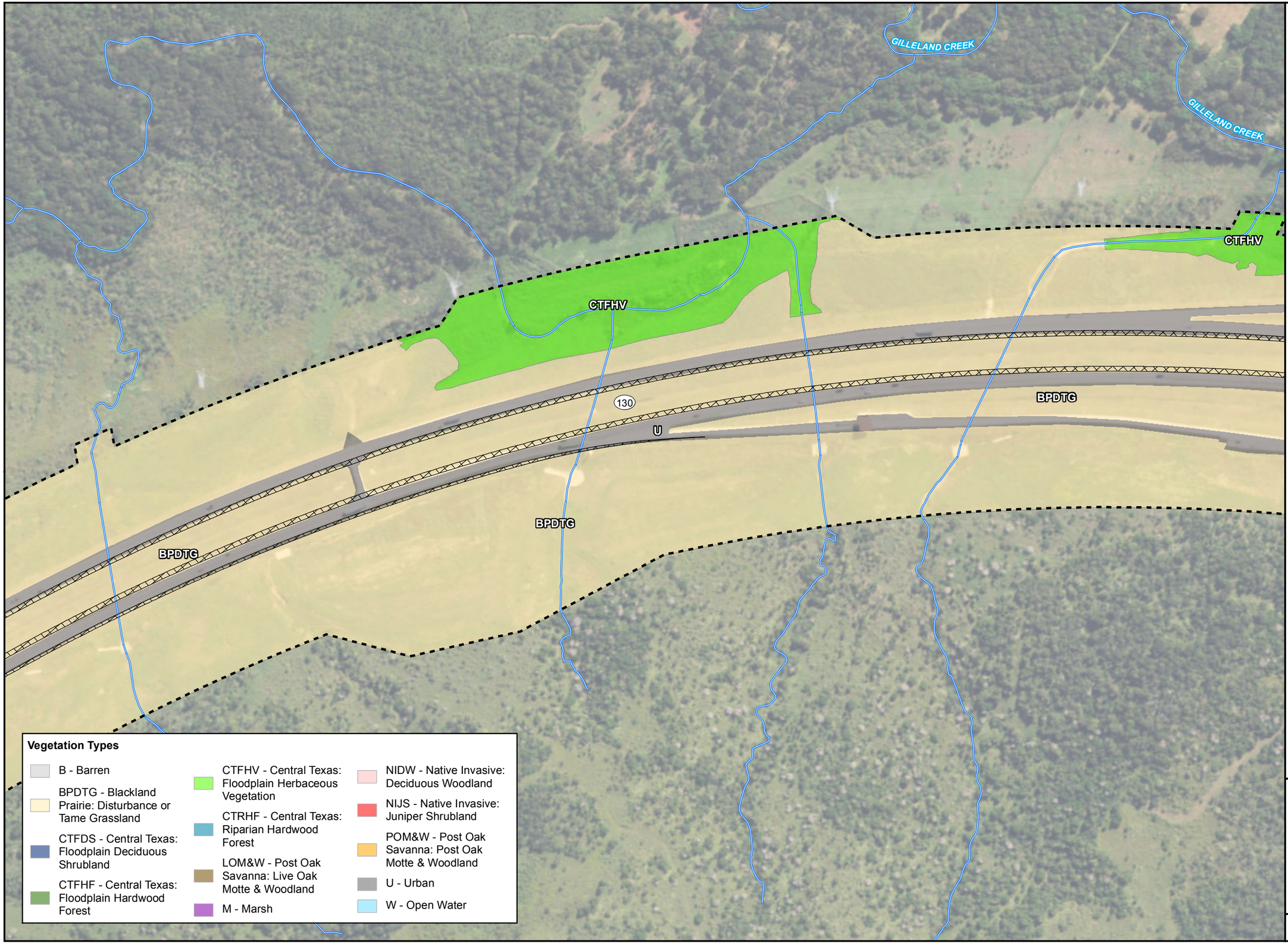
- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

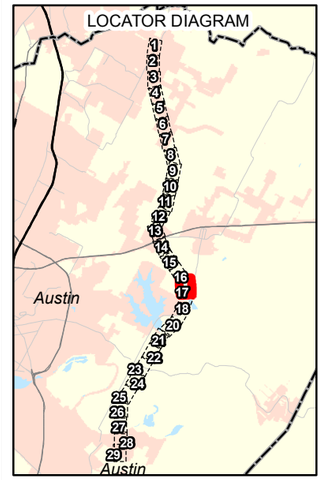
One inch equals 300 ft

FIGURE 4 - 16



PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

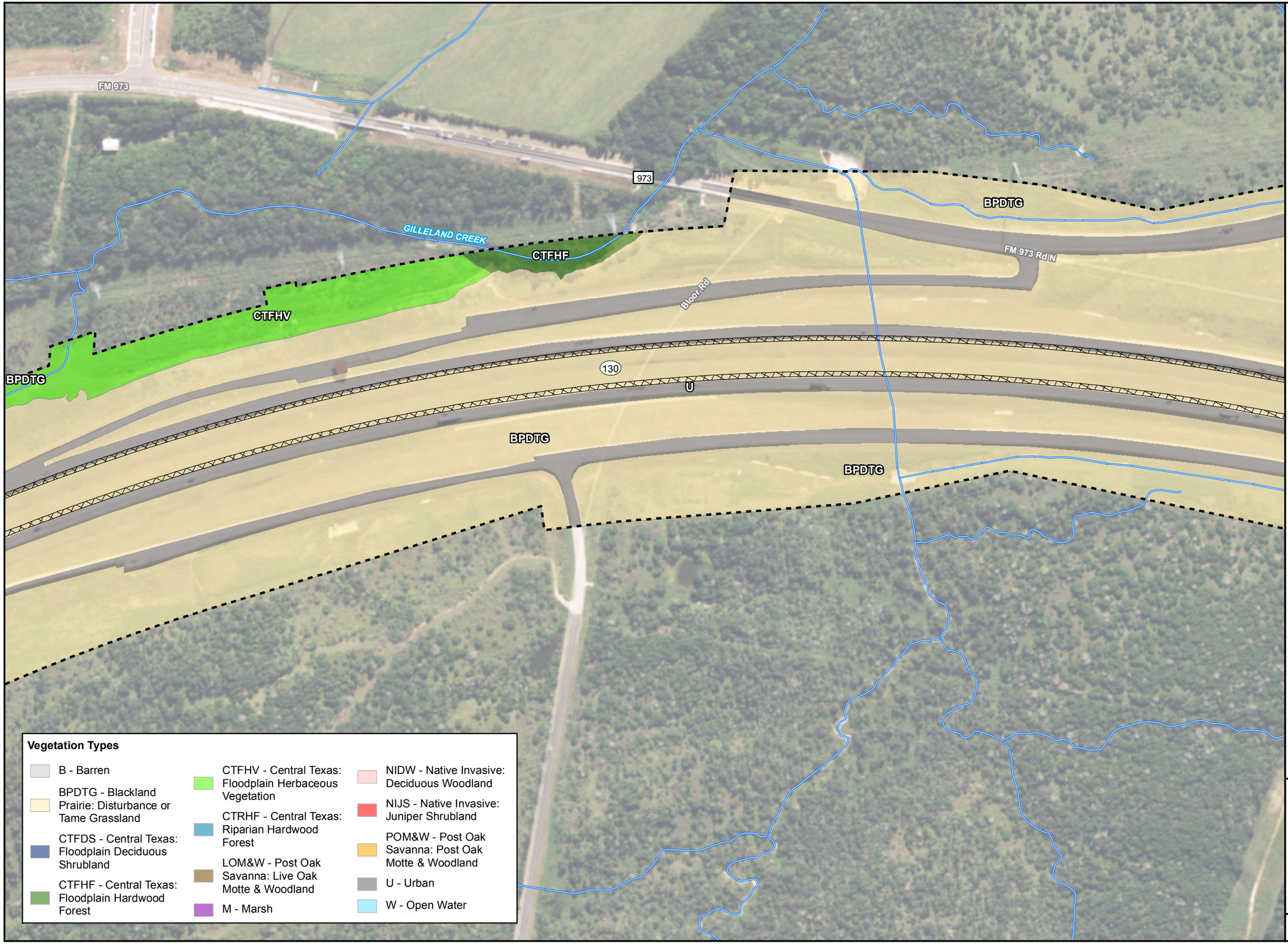
- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

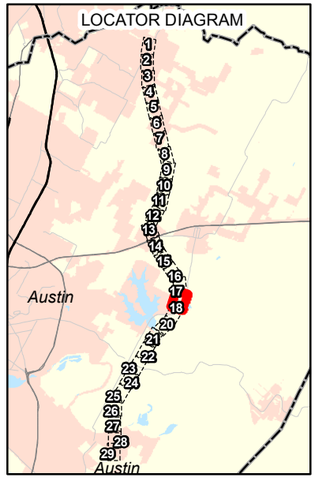
One inch equals 300 ft

FIGURE 4 - 17



PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

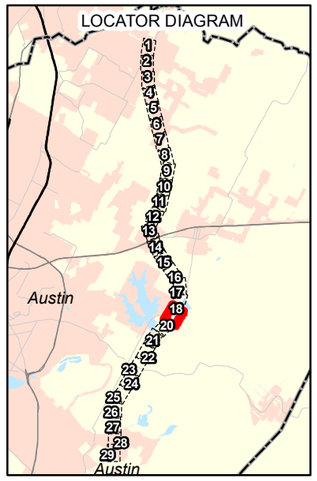
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 18

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



BPDTG
NIDW
BPDTG
FM 973 Rd N
973
Hog Eye Rd
Gilbert Rd
BPDTG
130
U
U
BPDTG
BPDTG

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

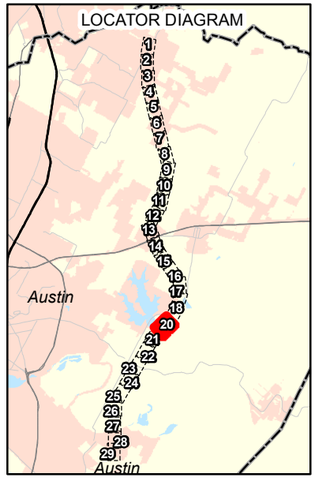
0 150 300 450
Feet

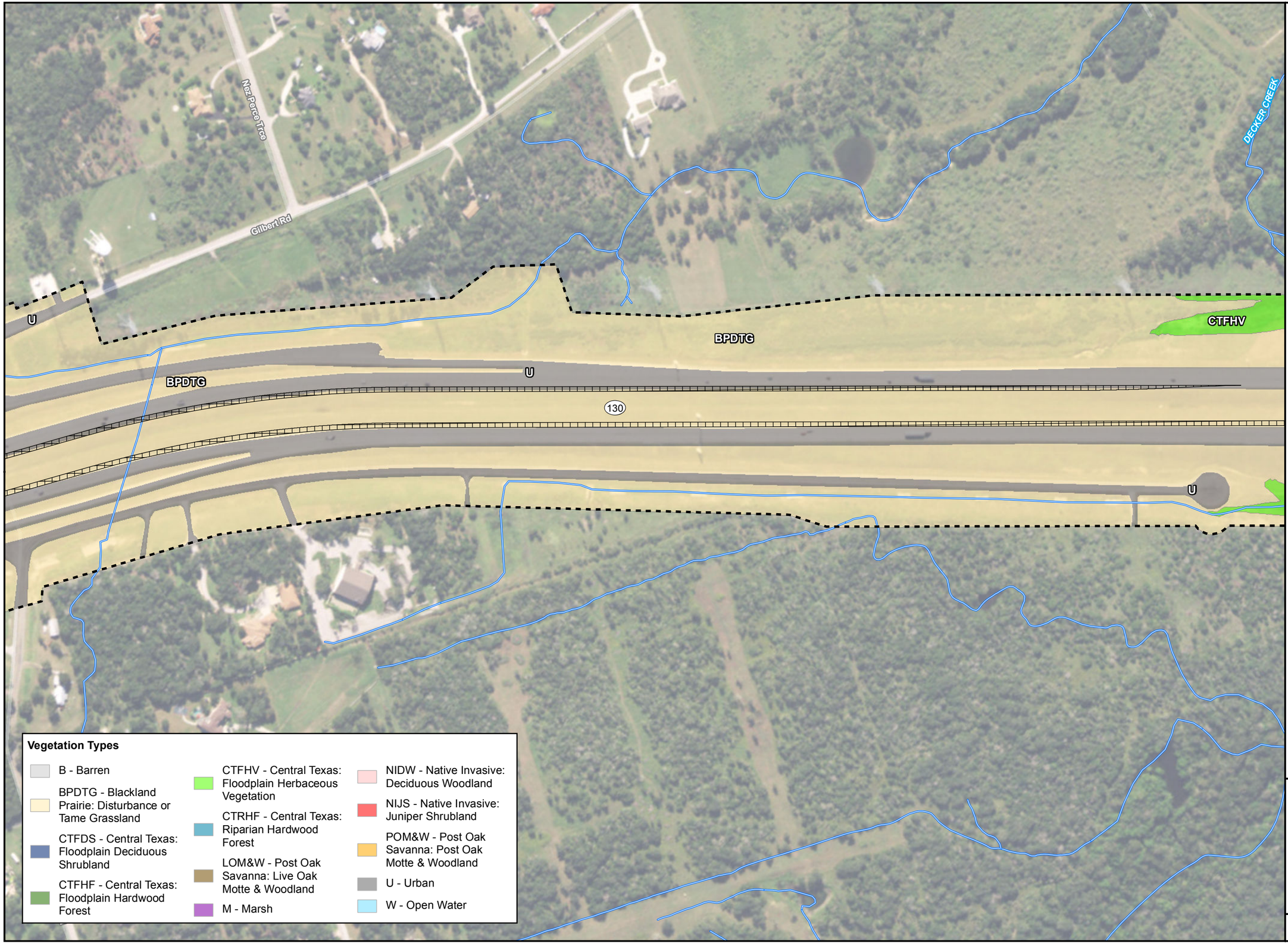
One inch equals 300 ft

FIGURE 4 - 19

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

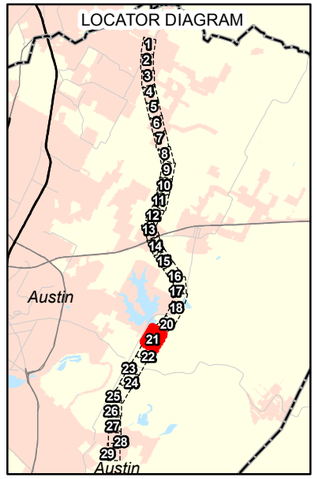
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 20

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



DECKER CREEK

U

CTFHF

BPDTG

BPDTG

CTFHV

BPDTG

130

U

M

U

POM&W

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

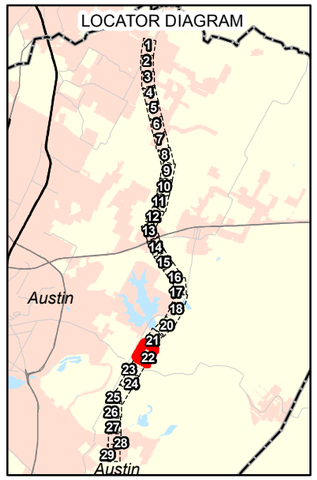
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 21

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



CTFHV
NIDW
BPDTG
BPDTG
U
130
M
M
M
BPDTG
LOM&W
BPDTG
POM&W

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

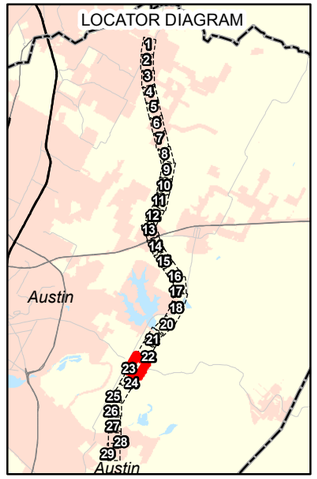
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 22

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

All

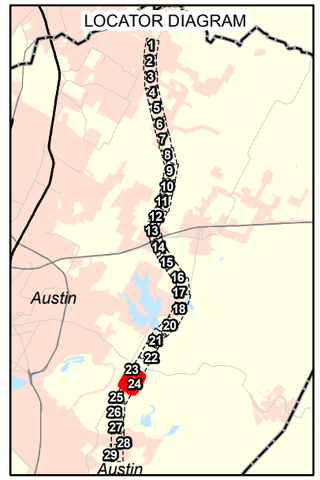
0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 23

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

All

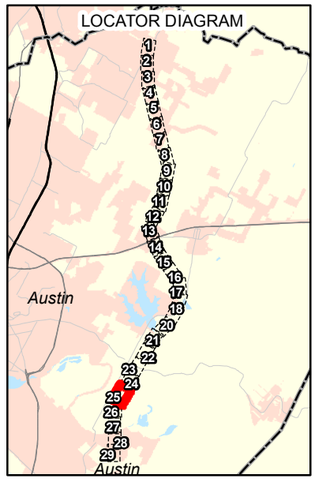
0 150 300 450
Feet

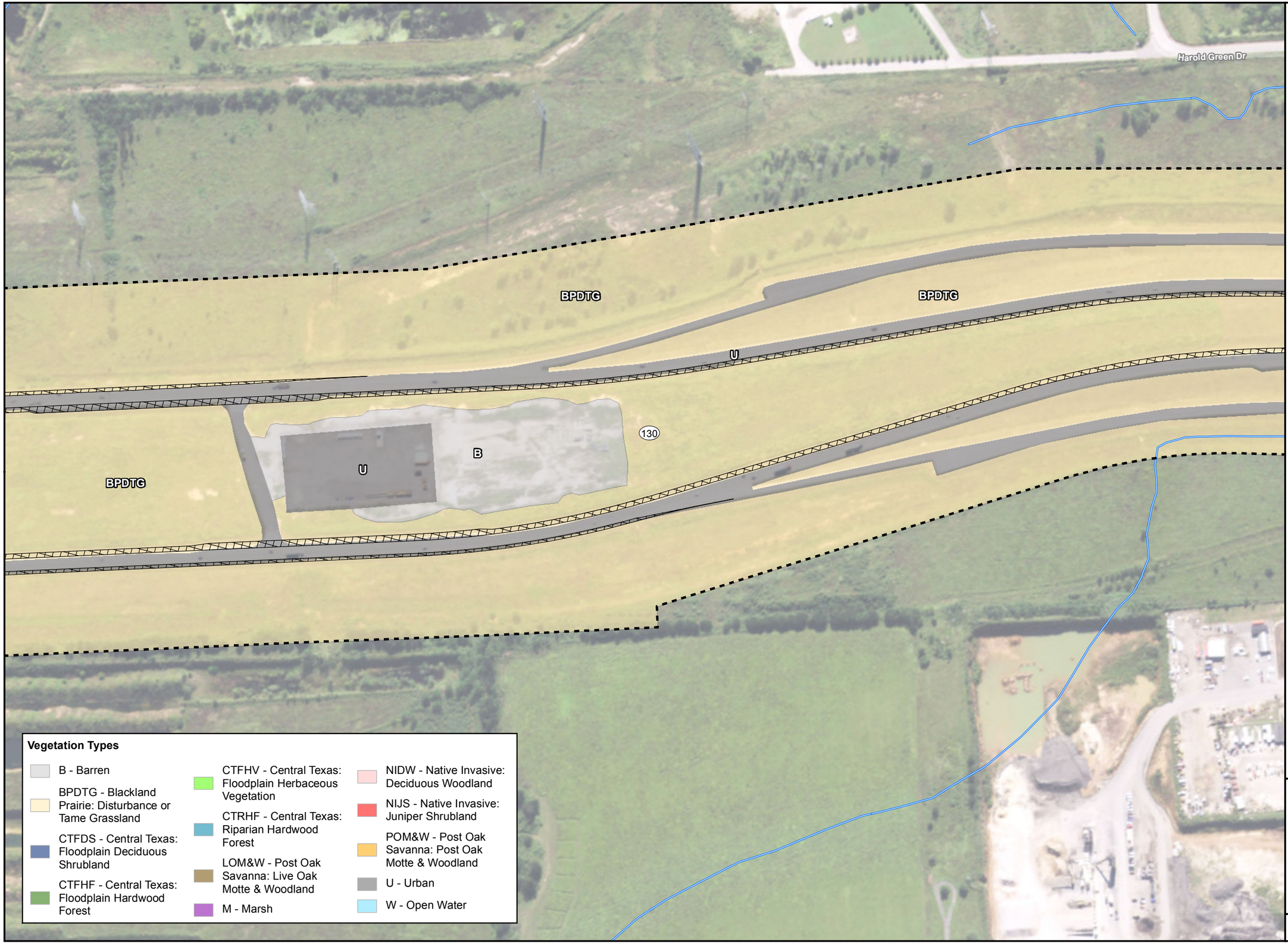
One inch equals 300 ft

FIGURE 4 - 24

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

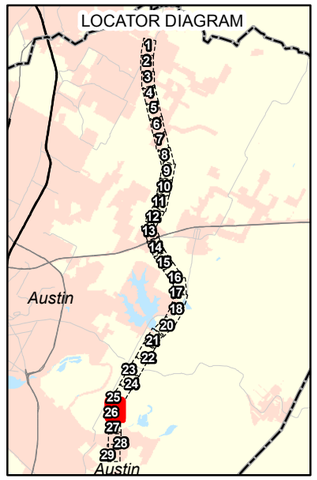
0 150 300 450
Feet

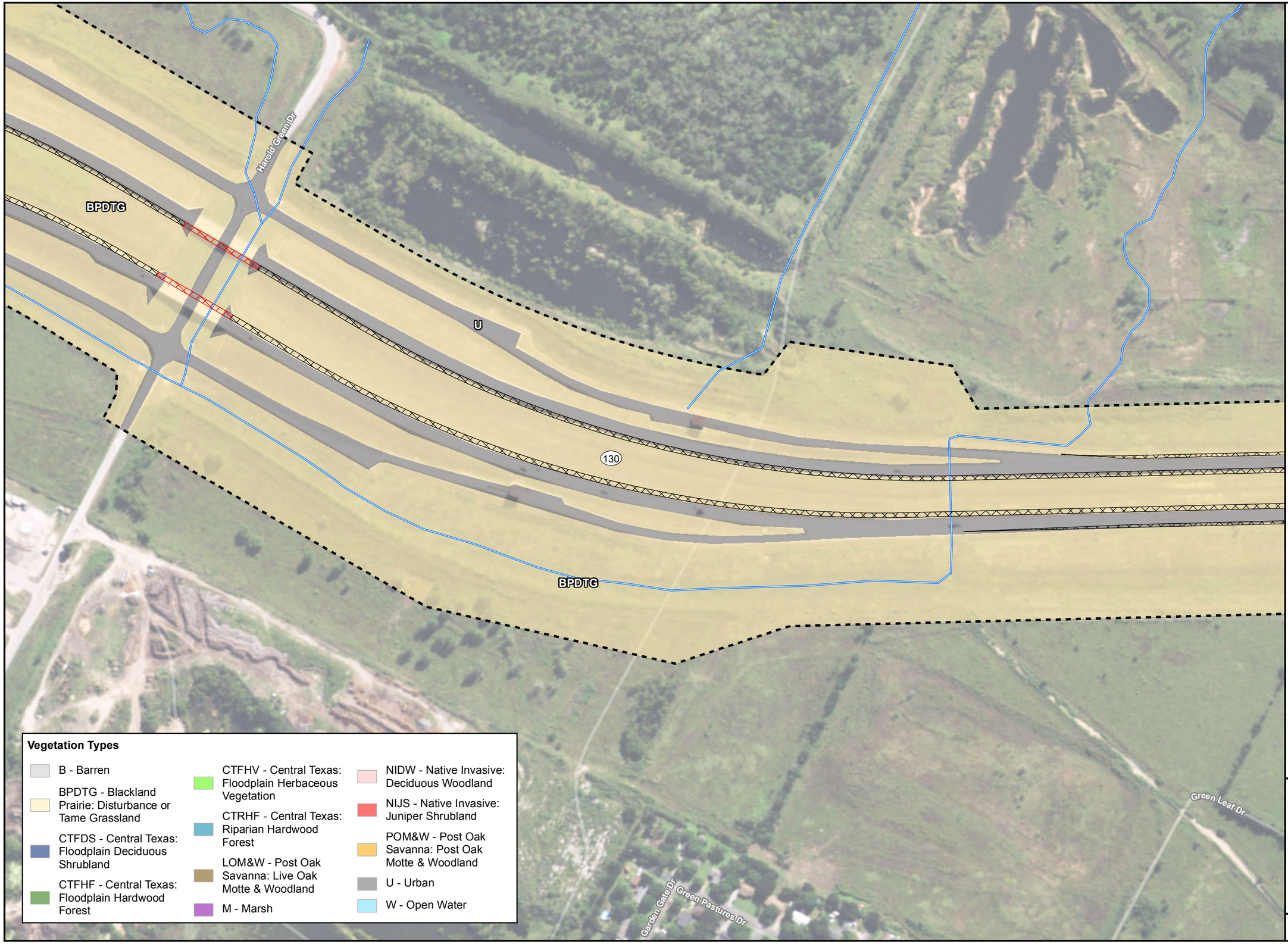
One inch equals 300 ft

FIGURE 4 - 25

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018





Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

Key to Features

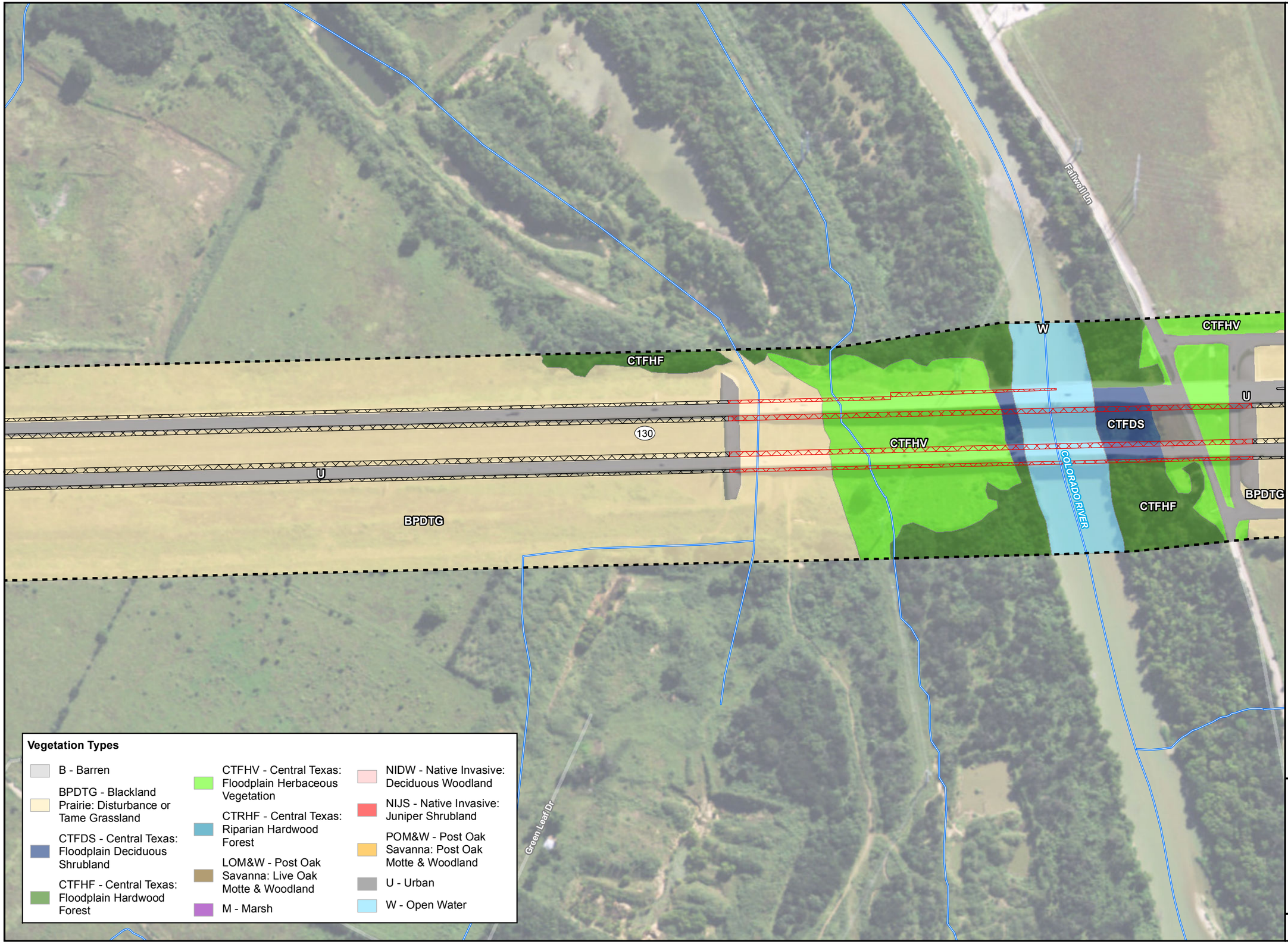
- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 26

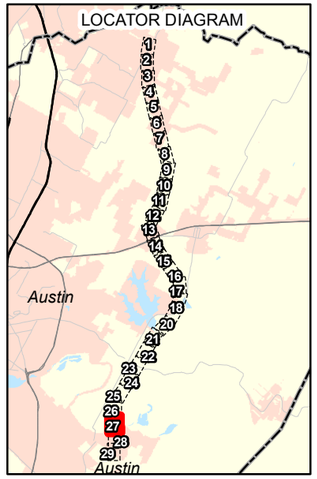


Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

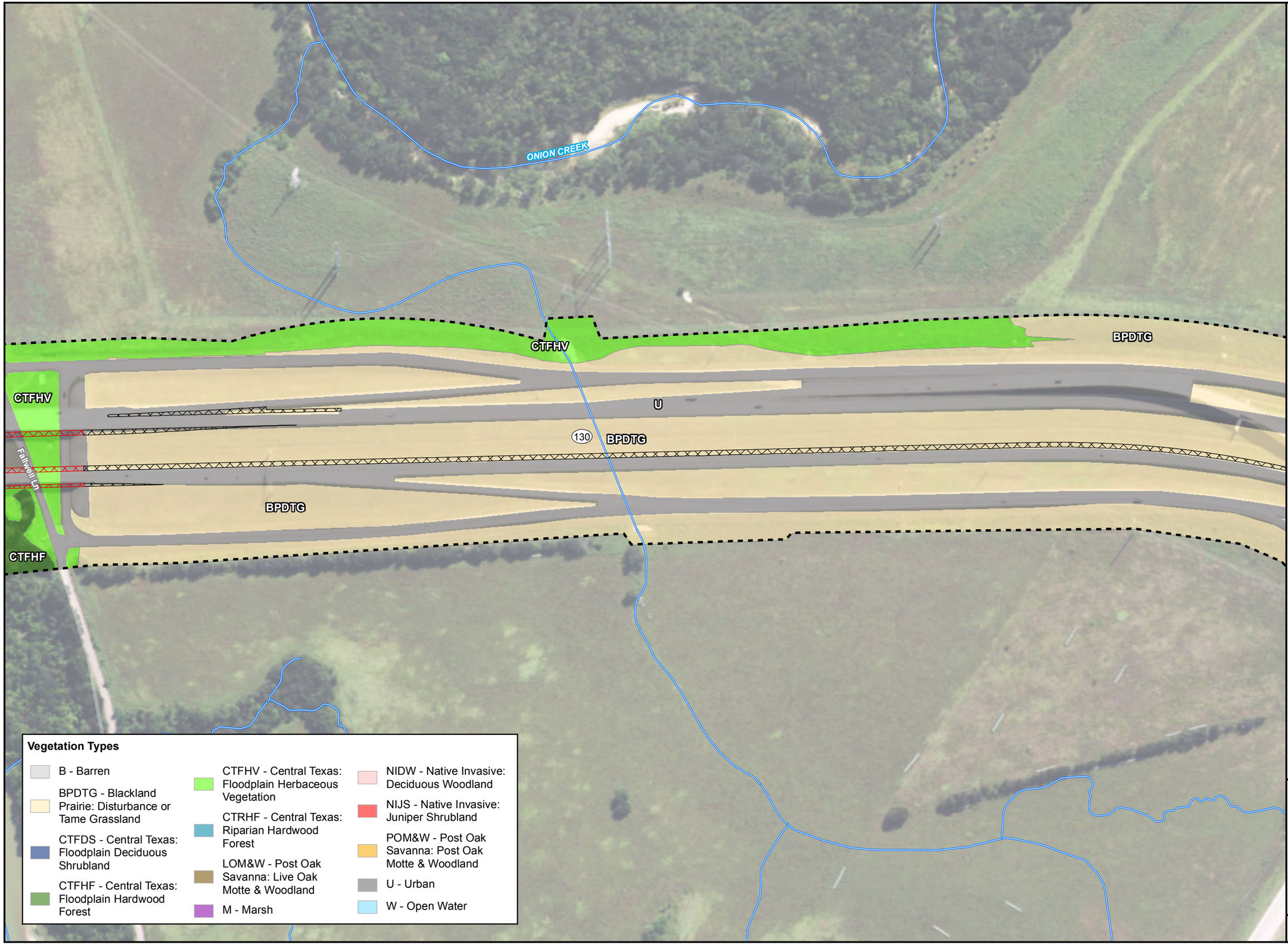
- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 27

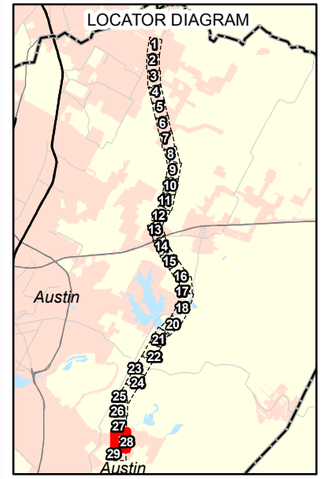


Vegetation Types

- B - Barren
- BPDTG - Blackland Prairie: Disturbance or Tame Grassland
- CTFDS - Central Texas: Floodplain Deciduous Shrubland
- CTFHF - Central Texas: Floodplain Hardwood Forest
- CTFHV - Central Texas: Floodplain Herbaceous Vegetation
- CTRHF - Central Texas: Riparian Hardwood Forest
- LOM&W - Post Oak Savanna: Live Oak Motte & Woodland
- M - Marsh
- NIDW - Native Invasive: Deciduous Woodland
- NIJS - Native Invasive: Juniper Shrubland
- POM&W - Post Oak Savanna: Post Oak Motte & Woodland
- U - Urban
- W - Open Water

PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

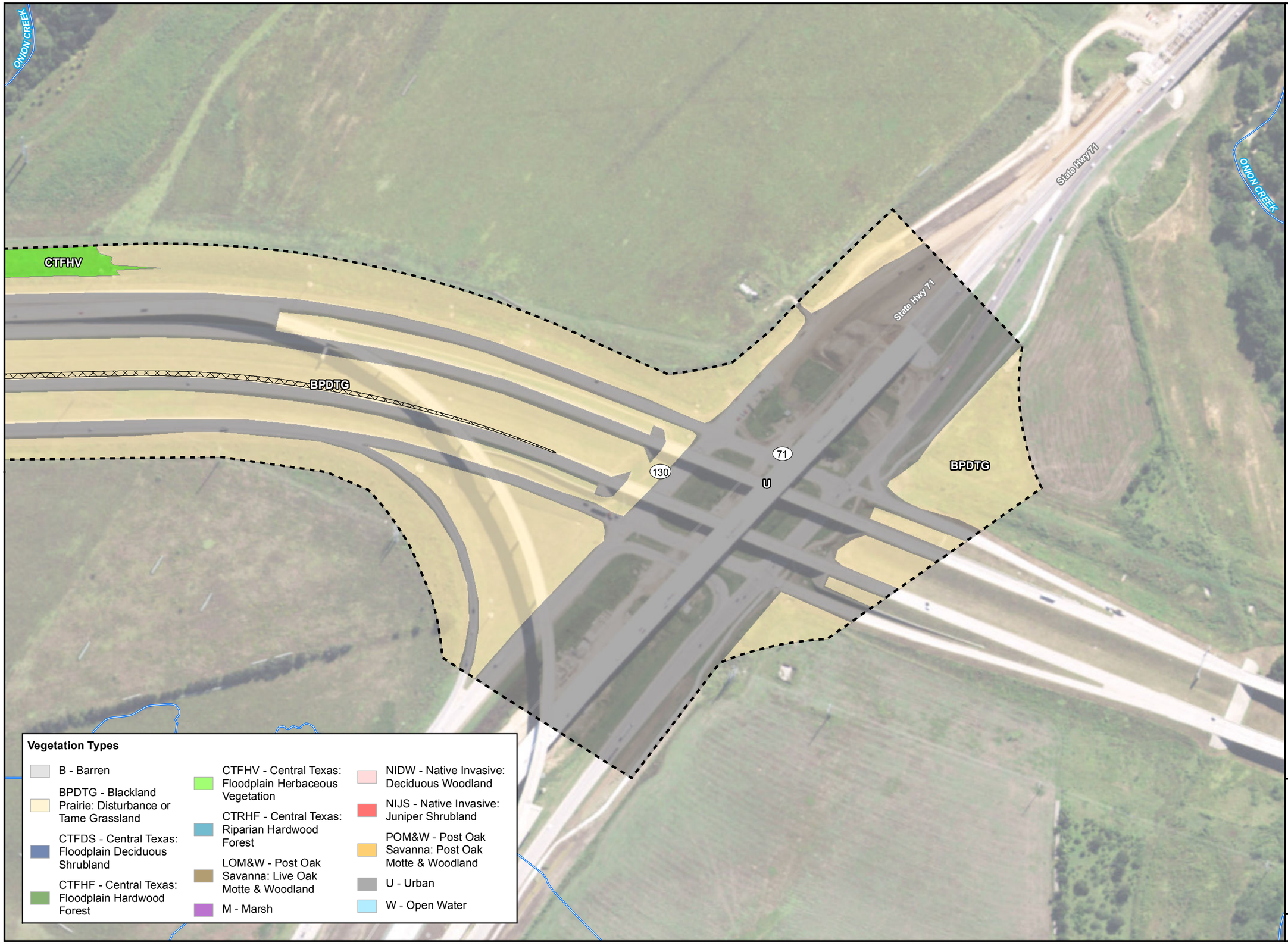
- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

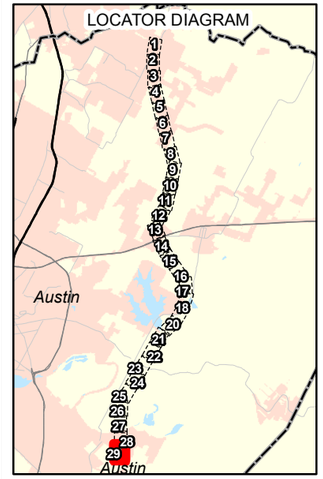
One inch equals 300 ft

FIGURE 4 - 28



PROJECT AREA VEGETATION

SH 130 from SH 45N to SH 71
CSJ: 0440-06-017 and 0440-06-018



Key to Features

- Existing ROW
- Streams (COA)
- Proposed Additional Lane
- Proposed Bridge Extension

N

0 150 300 450
Feet

One inch equals 300 ft

FIGURE 4 - 29

APPENDIX B

PROJECT AREA PHOTOGRAPHS

Photo 1: EMST mapped as Barren. Field mapped as Blackland Prairie: Disturbance or Tame Grassland. Southbound SH 130 frontage road near northern terminus of project area, facing south from FM 685 (see **Figures 3-2** and **4-2**).

Photo 2: EMST mapped as Urban Low Intensity, Central Texas; Riparian Herbaceous Vegetation, and Central Texas: Floodplain Herbaceous Vegetation. Field mapped as Central Texas: Floodplain Herbaceous Vegetation and Central Texas: Riparian Hardwood Forest. North side of Wilbarger Creek, facing south (see **Figures 3-5** and **4-5**).

Photo 3: EMST mapped as Central Texas: Floodplain Hardwood Forest. Field mapped as Central Texas: Riparian Hardwood Forest. South side of Wilbarger Creek on southbound SH 130 frontage road, facing north (see **Figures 3-5** and **4-5**).

Photo 4: EMST mapped as Central Texas: Floodplain Hardwood Forest and Urban Low Intensity. Field mapped as Central Texas: Riparian Hardwood Forest and Central Texas: Floodplain Herbaceous Vegetation. Representative view of these field mapped types throughout the project area. Northbound SH 130 frontage road at Harris Branch and Gilleland Creeks, facing north (see **Figures 3-11**, **3-12** and **4-11**, **4-12**).

Photo 5: EMST mapped as Urban Low Intensity. Field mapped as Central Texas: Riparian Hardwood Forest and Central Texas: Floodplain Herbaceous Vegetation. SH 130 median at Harris Branch and Gilleland Creeks, facing east (see **Figures 3-11**, **3-12** and **4-11**, **4-12**).

Photo 6: EMST mapped as Urban Low Intensity and Central Texas: Floodplain Herbaceous Vegetation. Field mapped as Marsh. Unnamed Tributary to Gilleland Creek; southbound SH 130 frontage road at FM 734, facing south (see **Figures 3-12** and **4-12**).

Photo 7: EMST mapped as Urban Low Intensity. Field mapped as Central Texas: Floodplain Hardwood Forest. Representative view of this field mapped type throughout the project area. Northbound SH 130 frontage road at Decker Creek, facing northeast (see **Figures 3-21** and **4-21**).

Photo 8: EMST mapped as Post Oak Savanna: Post Oak / Yaupon Motte and Woodland Native Invasive: Deciduous Woodland, Central Texas: Riparian Hardwood/Evergreen Forest, Central Texas: Riparian Hardwood Forest, Urban Low Intensity, and Post Oak Savanna: Post Oak Motte and Woodland. Field mapped as Blackland Prairie: Disturbance or Tame Grassland. Southbound SH 130 frontage road, north of Exit 444 for FM 969, facing southwest (see **Figures 3-22** and **4-22**).

Photo 9: EMST mapped as Barren. Field mapped as Marsh and Blackland Prairie: Disturbance or Tame Grassland. Representative view of this field mapped type throughout the project area. Southbound SH 130 median between mainlane and frontage road, just north of Exit 444 for FM 969, facing south (see **Figures 3-22** and **4-22**).

Photo 10: EMST mapped as Urban Low Intensity. Field mapped as Central Texas: Floodplain Herbaceous Vegetation. North bank of Elm Creek, facing southwest (see **Figures 3-23** and **4-23**).

Photo 11: EMST mapped as Central Texas: Floodplain Evergreen Shrubland, Central Texas: Floodplain Herbaceous Vegetation, and Barren. Field mapped as Urban (impervious cover) and Blackland Prairie: Disturbance or Tame Grassland. Northbound SH 130 frontage road west of Harold Green Drive, facing north (see **Figures 3-25** and **4-25**).

Photo 12: EMST mapped as Central Texas: Floodplain Herbaceous Vegetation. Field mapped as Blackland Prairie: Disturbance or Tame Grassland. Northbound SH 130 frontage road north of the Colorado River, facing north (see **Figures 3-27** and **4-27**).

Photo 13: EMST mapped as Central Texas: Floodplain Live Oak Forest, Central Texas: Floodplain Evergreen Shrubland, and Urban Low Intensity. Field mapped as Central Texas: Floodplain Hardwood Forest and Central Texas: Floodplain Herbaceous Vegetation. Northbound SH 130 frontage road north of the Colorado River, facing south towards the river (see **Figures 3-27** and **4-27**).

Photo 14: EMST mapped as Central Texas: Floodplain Live Oak Forest. Field mapped as Central Texas: Floodplain Deciduous Shrubland. SH 130 median on south bank of the Colorado River, facing north (see **Figures 3-27** and **4-27**).

Photo 15: EMST mapped as Native Invasive: Juniper Shrubland and Blackland Prairie: Disturbance or Tame Grassland. Field mapped as Blackland Prairie: Disturbance or Tame Grassland and Urban (impervious cover). Representative view of these field mapped types throughout the project area. SH 130 southbound frontage road south of Falwell Lane, facing south (see **Figures 3-28** and **4-28**).

Photo 16: EMST mapped as Central Texas: Riparian Herbaceous Vegetation. Field mapped as Blackland Prairie: Disturbance or Tame Grassland. SH 130 northbound frontage just north of SH 71 at the southern terminus of project area, facing northeast (see **Figures 3-28** and **4-28**).

Photo 17: Representative photo of the Native Invasive: Deciduous Woodland vegetation community within the project area.

Photo 18: Representative photo of the Post Oak Savanna: Post Oak Motte & Woodland vegetation community within the project area.

Photo 19: Representative photo of the Post Oak Savanna: Live Oak Motte & Woodland vegetation community within the project area.

Photo 20: Representative photo of the Native Invasive: Juniper Shrubland vegetation community within the project area.

APPENDIX C

THREATENED AND ENDANGERED SPECIES LISTS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Austin Ecological Services Field Office
10711 Burnet Road, Suite 200
Austin, TX 78758-4460
Phone: (512) 490-0057 Fax: (512) 490-0974
http://www.fws.gov/southwest/es/AustinTexas/
http://www.fws.gov/southwest/es/EndangeredSpecies/lists/

In Reply Refer To: June 08, 2017
Consultation Code: 02ETAU00-2017-SLI-0961
Event Code: 02ETAU00-2017-E-01803
Project Name: SH 130 from SH 71 to SH 45

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the county of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Please note that new information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Also note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of federally listed as threatened or endangered species and to determine whether projects may affect these species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

While a Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment, the Federal Agency must notify the Service in writing of any such designation. The Federal agency shall also independently review and evaluate the scope and content of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by a federally funded, permitted or authorized activity, the agency is required to consult with the Service pursuant to 50 CFR 402. The following definitions are provided to assist you in reaching a determination:

- No effect - the proposed action will not affect federally listed species or critical habitat. A “no effect” determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.
- May affect, but is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effect. The Federal agency or the designated non-Federal representative should consult with the Service to seek written concurrence that adverse effects are not likely. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.
- Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action. For this determination, the effect of the action is neither discountable nor insignificant. If the overall effect of the proposed action is beneficial to the listed species but the action is also likely to cause some adverse effects to individuals of that species, then the proposed action “is likely to adversely affect” the listed species. The analysis should consider all interrelated and interdependent actions. An “is likely to adversely affect” determination requires the Federal action agency to initiate formal section 7 consultation with our office.

Regardless of the determination, the Service recommends that the Federal agency maintain a complete record of the evaluation, including steps leading to the determination of effect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered

Species Consultation Handbook" at:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF.

Migratory Birds

For projects that may affect migratory birds, the Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of these species. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Migratory birds may nest in trees, brushy areas, or other areas of suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals, nests, or eggs. If project activities must be conducted during this time, we recommend surveying for nests prior to conducting work. If a nest is found, and if possible, the Service recommends a buffer of vegetation remain around the nest until the young have fledged or the nest is abandoned.

For additional information concerning the MBTA and recommendations to reduce impacts to migratory birds please contact the U.S. Fish and Wildlife Service Migratory Birds Office, 500 Gold Ave. SW, Albuquerque, NM 87102. A list of migratory birds may be viewed at https://www.fws.gov/birds/management/managed-species/migratory-bird-treaty-act-protected-spe . Guidance for minimizing impacts to migratory birds for projects including communications towers can be found at:
https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-docume . Additionally, wind energy projects should follow the wind energy guidelines

https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-docume) for minimizing impacts to migratory birds and bats.

Finally, please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan
https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-docume .

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Austin Ecological Services Field Office
10711 Burnet Road, Suite 200
Austin, TX 78758-4460
(512) 490-0057

Project Summary

Consultation Code: 02ETAU00-2017-SLI-0961

Event Code: 02ETAU00-2017-E-01803

Project Name: SH 130 from SH 71 to SH 45

Project Type: TRANSPORTATION

Project Description: Addition of a 3rd lane to SH 130 and direct connectors at US 290.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/30.33485400989411N97.58900992170635W

Counties: Travis, TX

Endangered Species Act Species

There is a total of 21 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area. Please contact the designated FWS office if you have questions.

Birds

NAME	STATUS
Black-capped Vireo *(Vireo atricapilla)*	Endangered
No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5716	
Golden-cheeked Warbler (=wood) *(Dendroica chrysoparia)*	Endangered
No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33	
Least Tern *(Sterna antillarum)*	Endangered
Population: interior pop. No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/8505	
Piping Plover *(Charadrius melodus)*	Threatened
Population: except Great Lakes watershed There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	
Red Knot *(Calidris canutus rufa)*	Threatened
No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	
Whooping Crane *(Grus americana)*	Endangered
Population: Wherever found, except where listed as an experimental population There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758	

Amphibians

NAME	STATUS
Austin Blind Salamander *(Eurycea waterlooensis)* There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5737	Endangered
Barton Springs Salamander *(Eurycea sosorum)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1113	Endangered
Jollyville Plateau Salamander *(Eurycea tonkawae)* There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3116	Threatened

Clams

NAME	STATUS
Golden Orb *(Quadrula aurea)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9042	Candidate
Smooth Pimpleback *(Quadrula houstonensis)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8967	Candidate
Texas Fatmucket *(Lampsilis bracteata)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9041	Candidate
Texas Fawnsfoot *(Truncilla macrodon)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8965	Candidate
Texas Pimpleback *(Quadrula petrina)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8966	Candidate

Insects

NAME	STATUS
Kretschmarr Cave Mold Beetle *(Texamaurops reddelli)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3140	Endangered
Tooth Cave Ground Beetle *(Rhadine persephone)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5625	Endangered

Arachnids

NAME	STATUS
Bee Creek Cave Harvestman *(Texella reddelli)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2464	Endangered
Bone Cave Harvestman *(Texella reyesi)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5306	Endangered
Tooth Cave Spider *(Neoleptoneta myopica)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2360	Endangered
Tooth Cave Pseudoscorpion *(Tartarocreagris texana)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6667	Endangered

Flowering Plants

NAME	STATUS
Bracted Twistflower *(Streptanthus bracteatus)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2856	Candidate

Critical habitats

There are no critical habitats within your project area.

Last Revision: 5/16/2016 5:47:00 PM

TRAVIS COUNTY

AMPHIBIANS

		Federal Status	State Status
Austin blind salamander	*Eurycea waterlooensis*	E	

mostly restricted to subterranean cavities of the Edwards Aquifer; dependent upon water flow/quality from the Barton Springs segment of the Edwards Aquifer; only known from the outlets of Barton Springs (Sunken Gardens (Old Mill) Spring, Eliza Spring, and Parthenia (Main) Spring which forms Barton Springs Pool); feeds on amphipods, ostracods, copepods, plant material, and (in captivity) a wide variety of small aquatic invertebrates

Barton Springs salamander	*Eurycea sosorum*	LE	E

dependent upon water flow/quality from the Barton Springs pool of the Edwards Aquifer; known from the outlets of Barton Springs and subterranean water-filled caverns; found under rocks, in gravel, or among aquatic vascular plants and algae, as available; feeds primarily on amphipods

Jollyville Plateau salamander	*Eurycea tonkawae*	T	

known from springs and waters of some caves north of the Colorado River

Pedernales River springs salamander	*Eurycea sp 6*		

endemic; known only from springs

ARACHNIDS

		Federal Status	State Status
Bandit Cave spider	*Cicurina bandida*		

very small, subterrestrial, subterranean obligate

Bee Creek Cave harvestman	*Texella reddelli*	LE	

small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties

Bone Cave harvestman	*Texella reyesi*	LE	

small, blind, cave-adapted harvestman endemic to several caves in Travis and Williamson counties; weakly differentiated from Texella reddelli

Tooth Cave pseudoscorpion	*Tartarocreagris texana*	LE	

small, cave-adapted pseudoscorpion known from small limestone caves of the Edwards Plateau

Tooth Cave spider	*Tayshaneta myopica*	LE	

very small, cave-adapted, sedentary spider

Warton's cave meshweaver	*Cicurina wartoni*		

very small, cave-adapted spider

TRAVIS COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black-capped Vireo	*Vireo atricapilla*	LE	E

oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous and broad-leaved shrubs and trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer

Golden-cheeked Warbler	*Setophaga chrysoparia*	LE	E

juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer

Interior Least Tern	*Sterna antillarum athalassos*	LE	E

subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony

Mountain Plover	*Charadrius montanus*		

breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Red Knot	*Calidris canutus rufa*	T	

TRAVIS COUNTY

BIRDS

Federal Status State Status

Red knots migrate long distances in flocks northward through the contiguous United States mainly April-June, southward July-October. A small plump-bodied, short-necked shorebird that in breeding plumage, typically held from May through August, is a distinctive and unique pottery orange color. Its bill is dark, straight and, relative to other shorebirds, short-to-medium in length. After molting in late summer, this species is in a drab gray-and-white non-breeding plumage, typically held from September through April. In the non-breeding plumage, the knot might be confused with the omnipresent Sanderling. During this plumage, look for the knot's prominent pale eyebrow and whitish flanks with dark barring. The Red Knot prefers the shoreline of coast and bays and also uses mudflats during rare inland encounters. Primary prey items include coquina clam (Donax spp.) on beaches and dwarf surf clam (Mulinia lateralis) in bays, at least in the Laguna Madre. Wintering Range includes- Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kennedy, Kleberg, Matagorda, Nueces, San Patricio, and Willacy. Habitat: Primarily seacoasts on tidal flats and beaches, herbaceous wetland, and Tidal flat/shore.

Sprague's Pipit *Anthus spragueii*

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Western Burrowing Owl *Athene cunicularia hypugaea*

open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows

Whooping Crane *Grus americana* LE E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

CRUSTACEANS

Federal Status State Status

An amphipod *Stygobromus russelli*

subterranean waters, usually in caves and limestone aquifers; resident of numerous caves in ca. 10 counties of the Edwards Plateau

Balcones Cave amphipod *Stygobromus balconis*

subaquatic, subterranean obligate amphipod

Bifurcated cave amphipod *Stygobromus bifurcatus*

found in cave pools

FISHES

Federal Status State Status

Guadalupe bass *Micropterus treculii*

endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system

TRAVIS COUNTY

FISHES		Federal Status	State Status
Smalleye shiner	*Notropis buccula*	LE	

endemic to upper Brazos River system and its tributaries (Clear Fork and Bosque); apparently introduced into adjacent Colorado River drainage; medium to large prairie streams with sandy substrate and turbid to clear warm water; presumably eats small aquatic invertebrates

INSECTS		Federal Status	State Status
Kretschmarr Cave mold beetle	*Texamaurops reddelli*	LE	

small, cave-adapted beetle found under rocks buried in silt; small, Edwards Limestone caves in of the Jollyville Plateau, a division of the Edwards Plateau

Tooth Cave blind rove beetle *Cylindropsis sp 1*

one specimen collected from Tooth Cave; only known North American collection of this genus

Tooth Cave ground beetle *Rhadine persephone* LE

resident, small, cave-adapted beetle found in small Edwards Limestone caves in Travis and Williamson counties

MAMMALS		Federal Status	State Status
Cave myotis bat	*Myotis velifer*		

colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Hirundo pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore

Plains spotted skunk *Spilogale putorius interrupta*

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Red wolf *Canis rufus* LE E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

MOLLUSKS		Federal Status	State Status
False spike mussel	*Quadrula mitchelli*		T

possibly extirpated in Texas; probably medium to large rivers; substrates varying from mud through mixtures of sand, gravel and cobble; one study indicated water lilies were present at the site; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins

TRAVIS COUNTY

MOLLUSKS

		Federal Status	State Status
Smooth pimpleback	*Quadrula houstonensis*	C	T

small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins

Texas fatmucket	*Lampsilis bracteata*	C	T

streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins

Texas pimpleback	*Quadrula petrina*	C	T

mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins

REPTILES

		Federal Status	State Status
Spot-tailed earless lizard	*Holbrookia lacerata*		

central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground

Texas garter snake	*Thamnophis sirtalis annectens*		

wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

PLANTS

		Federal Status	State Status
Arrowleaf milkvine	*Matelea sagittifolia*		

GLOBAL RANK: G3 ; Most consistently encountered in thornscrub in South Texas; Perennial; Flowering March-July; Fruiting April-July & Dec?

Basin bellflower	*Campanula reverchonii*		

Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July

Boerne bean	*Phaseolus texensis*		

Narrowly endemic to rocky canyons in eastern and southern Edwards Plateau occurring on limestone soils in mixed woodlands, on limestone cliffs and outcrops, frequently along creeks.

TRAVIS COUNTY

PLANTS

Federal Status State Status

Bracted twistflower *Streptanthus bracteatus* C

Texas endemic; shallow, well-drained gravelly clays and clay loams over limestone in oak juniper woodlands and associated openings, on steep to moderate slopes and in canyon bottoms; several known soils include Tarrant, Brackett, or Speck over Edwards, Glen Rose, and Walnut geologic formations; populations fluctuate widely from year to year, depending on winter rainfall; flowering mid April-late May, fruit matures and foliage withers by early summer

Buckley tridens *Tridens buckleyanus*

GLOBAL RANK: G3 ; Occurs in juniper-oak woodlands on rocky limestone slopes; Perennial; Flowering/Fruiting April-Nov

Correll's false dragon-head *Physostegia correllii*

wet, silty clay loams on streamsides, in creek beds, irrigation channels and roadside drainage ditches; or seepy, mucky, sometimes gravelly soils along riverbanks or small islands in the Rio Grande; or underlain by Austin Chalk limestone along gently flowing spring-fed creek in central Texas; flowering May-September

Glass Mountains coral-root *Hexalectris nitida*

GLOBAL RANK: G3; Apparently rare in mixed woodlands in canyons in the mountains of the Brewster County, but encountered with regularity, albeit in small numbers, under Juniperus ashei in woodlands over limestone on the Edwards Plateau, Callahan Divide and Lampasas Cutplain; Perennial; Flowering June-Sept; Fruiting July-Sept

Gravelbar brickellbush *Brickellia dentata*

GLOBAL RANK: G3; Essentially restricted to frequently-scoured gravelly alluvial beds in creek and river bottoms; Perennial; Flowering June-Nov; Fruiting June-Oct

Heller's marbleseed *Onosmodium helleri*

GLOBAL RANK: G3; Occurs in loamy calcareous soils in oak-juniper woodlands on rocky limestone slopes, often in more mesic portions of canyons; Perennial; Flowering March-May

Low spurge *Euphorbia peplidion*

GLOBAL RANK: G3; Occurs in a variety of vernally-moist situations in a number of natural regions; Annual; Flowering Feb-April; Fruiting March-April

Narrowleaf brickellbush *Brickellia eupatorioides var. gracillima*

GLOBAL RANK: G5T3; Moist to dry gravelly alluvial soils along riverbanks but also on limestone slopes; Perennial; Flowering/Fruiting April-Nov

Net-leaf bundleflower *Desmanthus reticulatus*

GLOBAL RANK: G3; Mostly on clay prairies of the coastal plain of central and south Texas; Perennial; Flowering April-July; Fruiting April-Oct

Plateau loosestrife *Lythrum ovalifolium*

GLOBAL RANK: G4; Banks and gravelly beds of perennial (or strong intermittent) streams on the Edwards Plateau, Llano Uplift and Lampasas Cutplain; Perennial; Flowering/Fruiting April-Nov

TRAVIS COUNTY

PLANTS

Federal Status State Status

Plateau milkvine *Matelea edwardsensis*

GLOBAL RANK: G3 ; Occurs in various types of juniper-oak and oak-juniper woodlands; Perennial; Flowering March-Oct; Fruiting May-June

Rock grape *Vitis rupestris*

GLOBAL RANK: G3; Occurs on rocky limestone slopes and in streambeds; Perennial; Flowering March-May; Fruiting May-July

Scarlet leather-flower *Clematis texensis*

GLOBAL RANK: G3; Usually in oak-juniper woodlands in mesic rocky limestone canyons or along perennial streams; Perennial; Flowering March-July; Fruiting May-July

Stanfield's beebalm *Monarda punctata var. stanfieldii*

GLOBAL RANK: G5T3 ; Largely confined to granite sands along the middle course of the Colorado River and its tributaries; Perennial

Sycamore-leaf snowbell *Styrax platanifolius ssp. platanifolius*

GLOBAL RANK: G3T3; Rare throughout range, usually in oak-juniper woodlands on steep rocky banks and ledges along intermittent or perennial streams, rarely far from some reliable source of moisture; Perennial; Flowering April-May; Fruiting May-Aug

Texabama croton *Croton alabamensis var texensis*

Texas endemic; in duff-covered loamy clay soils on rocky slopes in forested, mesic limestone canyons; locally abundant on deeper soils on small terraces in canyon bottoms, often forming large colonies and dominating the shrub layer; scattered individuals are occasionally on sunny margins of such forests; also found in contrasting habitat of deep, friable soils of limestone uplands, mostly in the shade of evergreen woodland mottes; flowering late February-March; fruit maturing and dehiscing by early June

Texas almond *Prunus minutiflora*

GLOBAL RANK: G3; Wide-ranging but scarce, in a variety of grassland and shrubland situations, mostly on calcareous soils underlain by limestone but occasionally in sandier neutral soils underlain by granite; Perennial; Flowering Feb-May & Oct; Fruiting Feb-Sept

Texas amorpha *Amorpha roemeriana*

GLOBAL RANK: G3; Juniper-oak woodlands or shrublands on rocky limestone slopes, sometimes on dry shelves above creeks; Perennial; Flowering May-June; Fruiting June-Oct

Texas barberry *Berberis swaseyi*

GLOBAL RANK: G3; Shallow calcareous stony clay of upland grasslands/shrublands over limestone as well as in loamier soils in openly wooded canyons and on creek terraces; Perennial; Flowering/Fruiting March-June

Texas fescue *Festuca versuta*

GLOBAL RANK: G3; Occurs in mesic woodlands on limestone-derived soils on stream terraces and canyon slopes; Perennial; Flowering/Fruiting April-June

TRAVIS COUNTY

PLANTS

Federal Status State Status

Texas milk vetch *Astragalus reflexus*

GLOBAL RANK: G3; Grasslands, prairies, and roadsides on calcareous and clay substrates; Annual; Flowering Feb-June; Fruiting April-June

Texas seymeria *Seymeria texana*

GLOBAL RANK: G3; Found primarily in grassy openings in juniper-oak woodlands on dry rocky slopes but sometimes on rock outcrops in shaded canyons; Annual; Flowering May-Nov; Fruiting July-Nov

Tree dodder *Cuscuta exaltata*

GLOBAL RANK: G3; Parasitic on various Quercus, Juglans, Rhus, Vitis, Ulmus, and Diospyros species as well as Acacia berlandieri and other woody plants; Annual; Flowering May-Oct; Fruiting July-Oct

Warnock's coral-root *Hexalectris warnockii*

in leaf litter and humus in oak-juniper woodlands on shaded slopes and intermittent, rocky creekbeds in canyons; in the Trans Pecos in oak-pinyon-juniper woodlands in higher mesic canyons (to 2000 m [6550 ft]), primarily on igneous substrates; in Terrell County under Quercus fusiformis mottes on terrraces of spring-fed perennial streams, draining an otherwise rather xeric limestone landscape; on the Callahan Divide (Taylor County), the White Rock Escarpment (Dallas County), and the Edwards Plateau in oak-juniper woodlands on limestone slopes; in Gillespie County on igneous substrates of the Llano Uplift; flowering June-September; individual plants do not usually bloom in successive years