Wildlife Crossing Feasibility Study

US 27

Venus Wildlife Crossing

FPID 449144-2

Highlands County

Prepared For:

Florida Department of Transportation

District One

January **2022**

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1 INTRODUCTION

The Florida Department of Transportation (FDOT) is conducting a feasibility study for opportunities to enhance the passage of wildlife across US 27 in southern Highlands County near the community of Venus. A five-mile segment of US 27 was identified to study locations and design concepts for enhanced wildlife passage. The study segment begins at the Highlands-Glades County line to approximately 0.1 miles south of Hendry Road/Harrell Road**.** The southern three miles of the project are adjacent to the Fisheating Creek/Smoak Groves Conservation Easement (FCSGCE) to the east. The Platt Branch Wildlife Management Area (PBWMA) is about 1.7 miles to the west, west of Detjens Dairy Road. See Figure 1.

This segment was identified for study due to its location within areas mapped as important to both the Florida black bear (*Ursus americanus floridanus*) and the Florida panther (*Puma concolor coryi*). The Florida Fish and Wildlife Conservation Commission (FWC) created a map of Florida black bear ranges in 2018. The mapping classified four levels of occurrence and seven subpopulations of bear. This study segment occurs within an area mapped as Frequent (the highest occurrence ranking) for the Glades/Highlands subpopulation. Reviewing agency data (FWC, 2021) through the current year, Florida black bear mortalities were recorded between 1985 and 2015. Telemetry data has been studied by others and is discussed in Section 3.6.

The U.S. Fish and Wildlife Service's (USFWS) has mapped lands immediately to the east of US 27 as the North Panther Focus Area. A Focus Area signifies areas the agency has designated as having landscape components important to Florida panther habitat conservation. The North mapping unit consists of lands vital to facilitate the dispersal of panthers and future populations to areas north of the Caloosahatchee River. Expanding the breeding population is a critical recovery objective for sustaining the population of Florida panthers (USFWS, 2008). Telemetry data indicate panther movement in the region as presented in Section 3.6.

The USFWS Panther Recovery Implementation Team (PRIT) transportation sub-team maintains a Southwest Florida Roads Hot Spots Map (Transportation Sub-Team to PRIT, 2018) to identify roadway segments within which Florida panther mortalities occur due to vehicle collisions. A portion of this study segment has been mapped as a Hot Spot with a blue ranking. Blue signifies up to two Florida panther deaths occurred here due to vehicle collisions. The Hot Spot was mapped between County Road (CR) 731 north to south of Perry Road and the mortalities were recorded in 1999 and 2016.

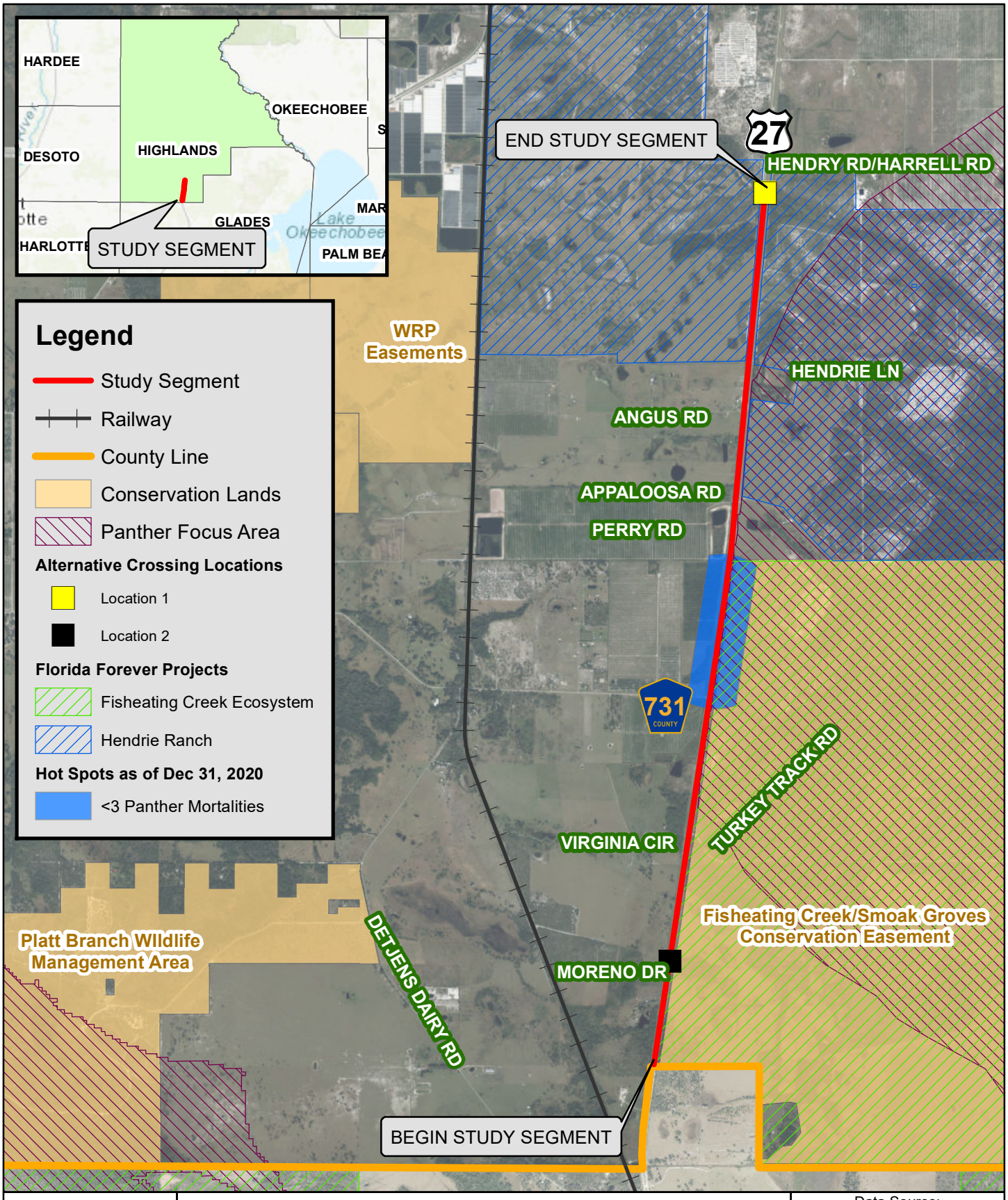


Figure 1 - Project Location

FPID 449144-2
US 27 Wildlife Crossing Feasibility Study
Highlands County, FL

Data Source:
- FDA - FNAI - FDEP
- ESRI - USFWS

1 inch = 4,000 feet
0 2,000 4,000
Feet

Coordinate System: NAD 1983
Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 1 - Project Location.mxd

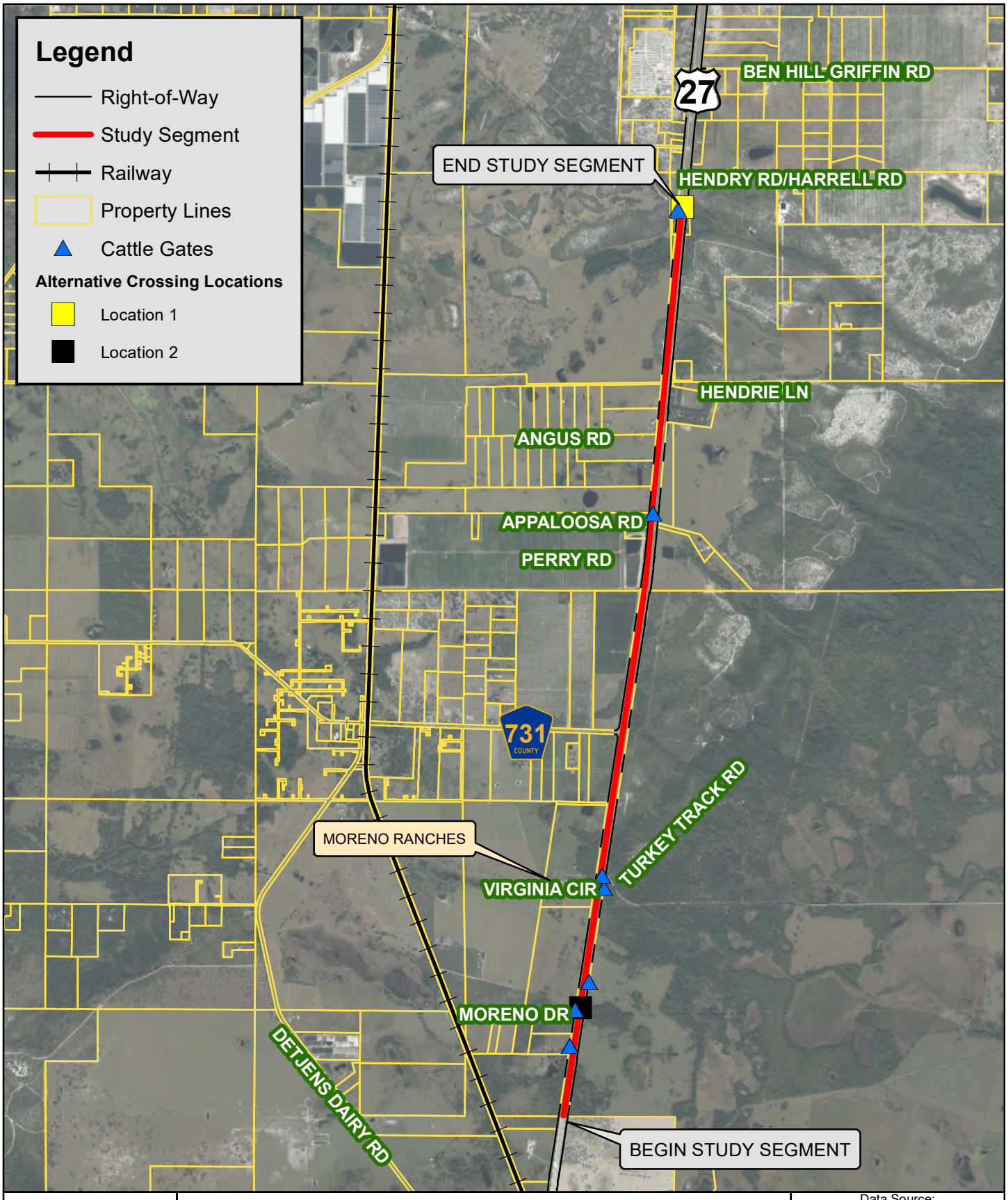
Given the important habitats mapped by agencies, documented use by Florida panthers and Florida black bears, and mortalities due to vehicles within this segment, five potential locations were investigated for enhancement to provide safe wildlife passage across US 27. Field reviews, data analysis, and interagency coordination were conducted to ultimately select two of the locations for closer review (Figure 1). At both alternative locations, three alternative design concepts for wildlife passage over or under the roadway were evaluated and are discussed in greater detail in Section 4 and Section 5 respectively.

2 EXISTING ROADWAY

This segment of US 27 is a four-lane roadway in a rural area of southern Highlands County. At the time of field reviews conducted in October 2021, the roadway was undergoing construction for the addition of 13-foot left turn lanes in the existing grass median as a part of the on-going FDOT resurfacing project along US 27 from Glades County line to south of Horn Road in Highlands County (FPID 441519-1-52-01). Referencing plans from that project, the roadway has four 12-foot travel lanes, four-foot paved outside shoulders, unpaved inside shoulders, and a 40- to 65-foot-wide grass median. The existing right-of-way varies between 184 and 330 feet. The posted speed limit is 65 mph.

Intersecting roads and driveways are located along this segment of US 27. Some driveways and roadways are not compatible with wildlife-proof gate options; therefore, the location of these features is important to the selection of the final alternative crossing location and fence plan. Wildlife fencing is a crucial component of a successful crossing location, and the use of wildlife-proof gates could be used as part of a fencing plan.

Moreno Drive is a gated rural road located about 0.55 miles north of the southern terminus of the study segment. Virginia Circle is a driveway leading to Moreno Land and Cattle LLC; it is located about 1.21 miles north of the southern terminus of the study segment. Turkey Track Road on the east side of US 27 is a gated dirt road that leads into the FCSGCE, located about 1.34 miles north of the southern terminus of the study segment. CR 731 is located approximately 2.1 miles north of the county line and approaches US 27 from the west. Hendrie Lane is a residential road located approximately 0.98 miles south of the northern terminus of the study segment. Hendry Road/Harrell Road is an unpaved road located approximately 0.15 miles north of the northern terminus of the study segment. Overall, many of the roads and driveways appear to be access points to agricultural lands and are shown in Figure 2. Typical sections are provided in Appendix A.



FDOT

Figure 2 - Existing Roadway

FPID 449144-2
US 27 Wildlife Crossing Feasibility Study
Highlands County, FL

Data Source:
- FDA -ESRI - FDOT
-Highlands County
Property Appraiser

1 inch = 3,400 feet

0 1,700 3,400

Feet

Coordinate System: NAD 1983
Florida State Plane East

N

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 2 - Existing Roadway.mxd

3 ENVIRONMENTAL SETTING

Land use immediately surrounding the study segment is largely undeveloped and agriculturally related. Active cattle pastures are located on both sides of the road in addition to citrus groves to the west. There are few businesses and private residencies located directly adjacent to US 27. Photo pages are provided in Appendix B.

3.1 Existing Land Use

3.1.1 South Florida Water Management District

The South Florida Water Management District (SFWMD) Florida Land Use, Cover and Forms Classification System (FLUCCS) code system for this area was reviewed (Figure 3). Mapped land cover adjacent to the study segment was reviewed at the 1000 level to provide a regional view of the major land covers. The analysis indicates that in the regional setting, the major land cover consists of agricultural uses to the west of US 27 and upland forested/non-forested areas to the east of US 27. Wetlands are interspersed in the landscape. Site visits confirmed the mapped land cover codes are accurate on a large scale.

3.1.2 Florida Natural Areas Inventory

The Florida Natural Areas Inventory (FNAI) Cooperative Land Cover (CLC) code system was also reviewed. The FNAI CLC is useful for focusing on land cover on a very detailed scale (Figure 4). Mapped land cover adjacent to the study segment includes:

- 1210, Scrub
- 1311, Mesic Flatwoods*
- 1312, Scrubby Flatwoods
- 18311, Rural Open Forested
- 22211, Hydric Pine Flatwoods
- 183313, Improved Pasture*
- 183314, Unimproved Woodland Pasture*
- 183321, Citrus*

Dominant land cover is marked with an asterisk. Land cover immediately around Alternative Location 1 is scrub (1210), hydric pine flatwood (22211), mesic flatwoods (1311), improved pasture (183313) and unimproved woodland pasture (1830). Land cover immediately around Alternative Location 2 is improved pasture (183313) and freshwater forested wetlands (2200). Site visits confirmed the mapped land cover codes are accurate on a large scale.

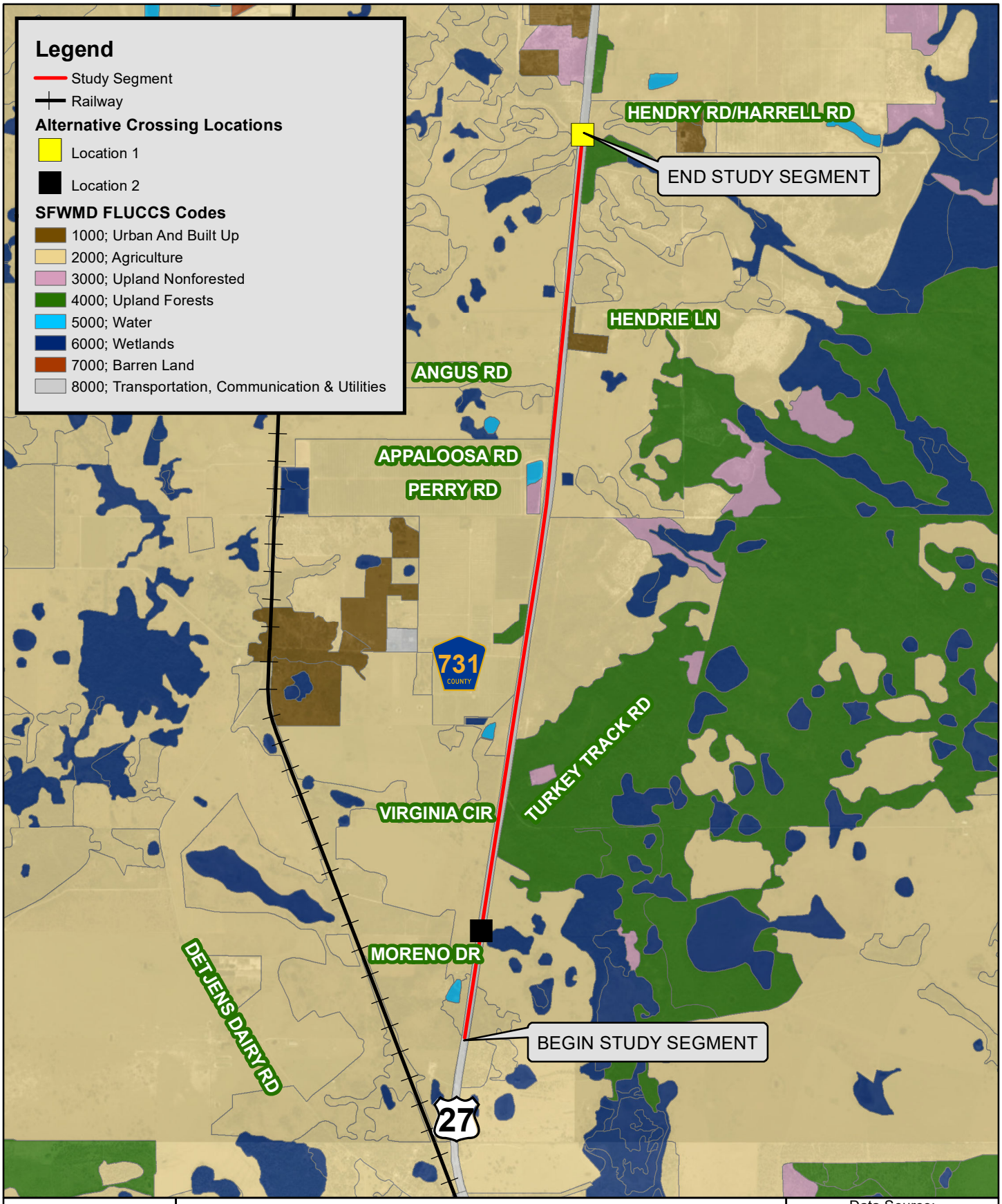


Figure 3 - SFWMD Land Use

FPID 449144-2

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA - SFWMD
- ESRI

1 inch = 3,400 feet

0 1,700 3,400 Feet

Coordinate System: NAD 1983 Florida State Plane East

N

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 3 - SFWMD Land Use.mxd

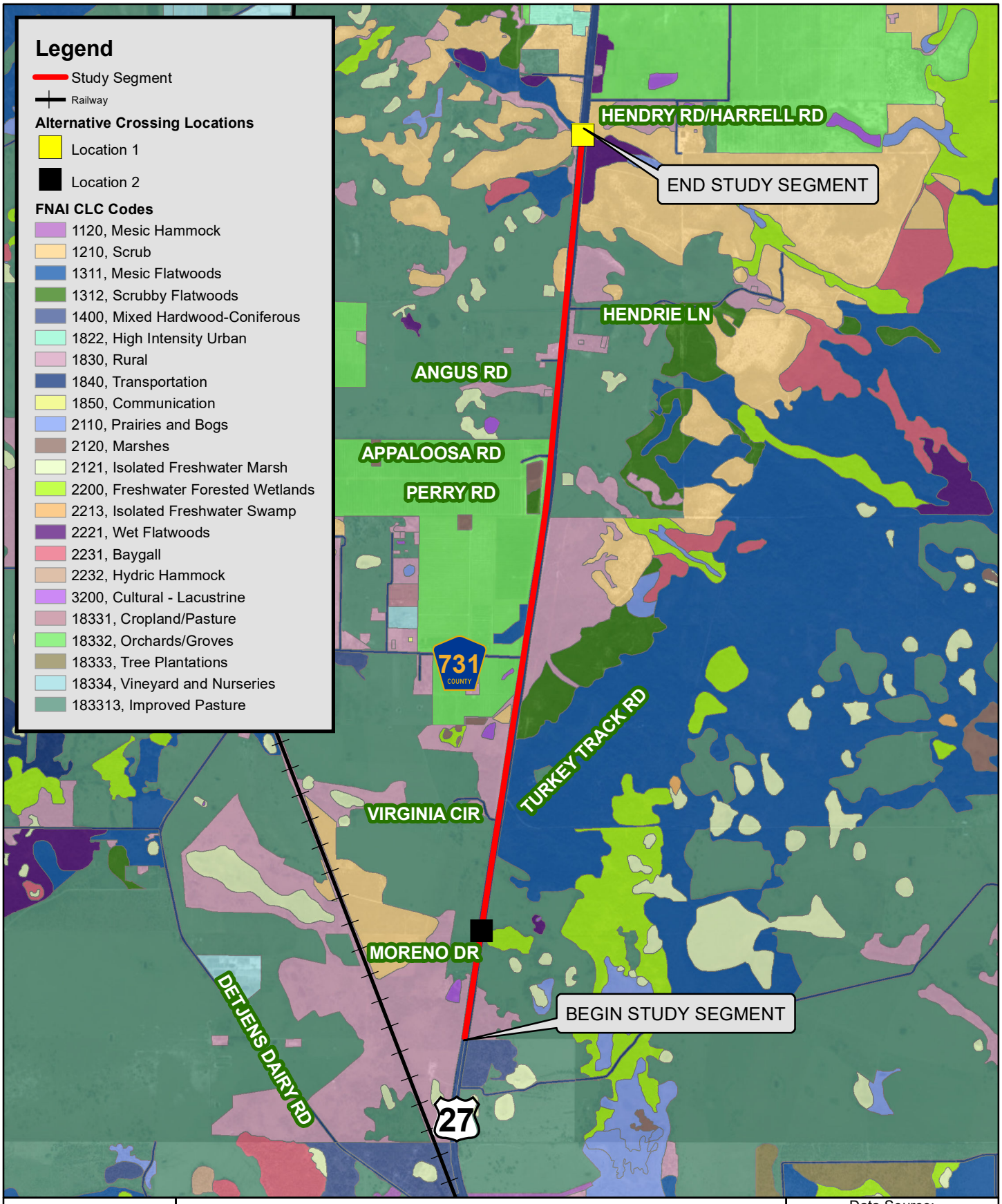


Figure 4 - FNAI Cooperative Land Cover

FPID 449144-2

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA - FNAI
- ESRI

1 inch = 3,400 feet

0 1,700 3,400 Feet

Coordinate System: NAD 1983 Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 4 - FNAI Cooperative Land Cover.mxd

3.2 Conservation Lands

Directly adjacent to the study segment is the FCSGCE to the east. The boundary begins at the southern terminus of the study segment and goes north for approximately 2.58 miles. About 1.7 miles to the west of the study segment is the PBWMA. This area is located west of the railroad and Detjens Dairy Road and is closest to the southern terminus of the study segment. Additionally, to the west of the project is a trio of Wetland Reserve Program (WRP) easements that are about 1.46 miles west of the northern terminus of the study segment and west of the railroad. The WRP was a voluntary program offered by the United States Department of Agriculture's Natural Resources Conservation Service that gave landowners technical and financial support for wetland restoration efforts (USDA, n.d.). Refer to Figure 2 for existing conservation lands.

3.3 Florida Forever

The Florida Forever (FF) program is the current governmental land acquisition method in place for protecting and conserving natural resources throughout the state. It is authorized by the Florida Forever Act that was implemented in 2000. The program includes varying goals such as, "environmental restoration; water resource development and supply; increased public access; public lands management and maintenance; and increased protection of land by acquisition of conservation easements" (FDEP, 2021). Adjacent to the study segment are two planned FF properties: Lake Wales Ridge Ecosystem – Hendrie Ranch (hereinafter referred to as Hendrie Ranch) and Fisheating Creek Ecosystem. The acquisition of both properties would contribute to the conservation of natural lands and critical habitat for many native flora and fauna. Refer to Figure 2 for the location of Hendrie Ranch and the Fisheating Creek Ecosystem properties.

3.3.1 Hendrie Ranch

Hendrie Ranch is a part of the Lake Wales Ridge Ecosystem, a designated high priority Critical Natural Lands area under FF (Appendix C, 2021 FF Five-Year Plan Abstract). The Hendrie Ranch property is a less-than-fee proposal that covers both sides of US 27 near the northern terminus of the study segment and shares its southern boundary with the FCSGCE on the east side of the road. Property acreage is about 7,200 acres. The addition of the property to the FF program would create a 125,000-acre stretch of connected conservation lands (Appendix C, Hendrie Ranch FF Project Evaluation Report).

3.3.2 Fisheating Creek Ecosystem

Fisheating Creek, located about 7.6 miles south of the study segment is the only undammed tributary of Lake Okeechobee (Appendix C, 2021 FF Fisheating Creek Ecosystem Five Year Plan). The Fisheating Creek Ecosystem

encompasses a variety of habitat types including dry prairies and flatwoods, freshwater marshes, prairie hammocks, hydric hammocks, bottomland forests, and floodplain swamps. The proposed land acquisition would incorporate the existing FCSGCE and add an additional 182,363 acres both on the east and west sides of US 27. Additionally, within the project area are large tracts of active improved pasture and both former and current plantations. This site was designated as a high priority less-than-fee in the FF 2021 Five-Year Plan (Appendix C).

3.4 Strategic Habitat

A majority of the study segment and FF projects lie within Florida Fish and Wildlife Conservation Commission (FWC) Strategic Habitat Conservation Areas (SHCA). These SHCAs were originally identified in a FWC commissioned report, *Closing the Gaps in Florida's Wildlife Habitat Conservation System* (Cox et al., 1994) and then re-evaluated and updated in *Wildlife Habitat Conservation Needs in Florida – Updated Recommendations for Strategic Habitat Conservation Areas* (Endries et al., 2009), a technical report by FWC's Fish and Wildlife Research Institute (FWRI).

SHCAs are lands in need of protection due to their position in maintaining the natural communities and viable populations of many indicator species that represent the state's biological diversity (Endries et al., 2009). The SHCAs within the study segment area provide good habitat for Florida panthers, Florida black bears, Florida scrub jays, wading birds, burrowing owls, and gopher tortoises, all of which have been documented in the area Appendix C, Hendrie Ranch FF Project Evaluation Report). Figure 5 shows the SHCA for the species that the habitat is most useful for within the project area.

3.5 Florida Panther Focus Area

The Panther Focus Area (PFA) is the documented breeding range of the Florida panther which is currently south of the Caloosahatchee River. Any changes to the land within the PFA will require mitigation based on the Panther Habitat Assessment Methodology, a system developed by USFWS used to determine the ecological significance of panther habitat. Habitat is classified into four zones (primary, dispersal, secondary, and other) that represent how valuable the land is to panther conservation. Primary and dispersal zones are the most vital. Furthermore, habitat is classified by a ranking system on a scale of zero to 10 with 10 being the best quality. These values are used to calculate Panther Habitat Units for each acre of land and are used in mitigation for development of land within the PFA. The PFA to the east of US 27 in the study segment is not currently ranked but is a predicted expansion zone for the Florida panther (Pienaar and Kreye, 2016). Refer to Figures 1 and 6, for PFA location.

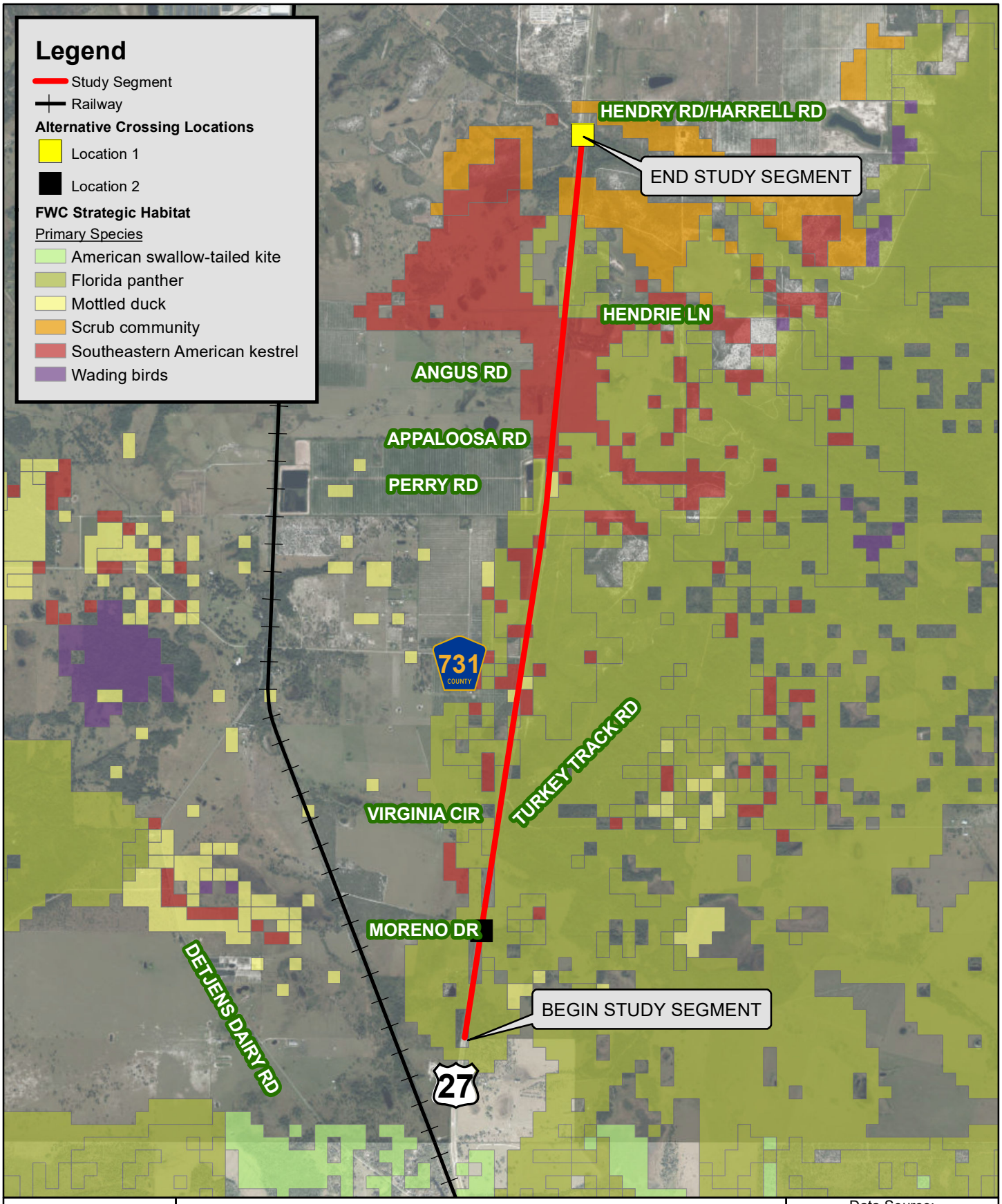


Figure 5 - Strategic Habitat Conservation Areas
FPID 449144-2
US 27 Wildlife Crossing Feasibility Study
Highlands County, FL

Data Source:
- FDA - FWC
- ESRI
1 inch = 3,400 feet
0 1,700 3,400
Feet
Coordinate System: NAD 1983
Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 5 - Strategic Habitat Conservation Areas.mxd

3.6 Florida Black Bear Habitat

The region surrounding this segment of US 27 is important habitat for Florida black bears. As previously described, the FWC has delineated this area to be a Bear Range with Frequent occurrences of bears belonging to the Glades/Highland subpopulation. Research conducted by others has mapped home ranges for Florida black bears and is discussed in Section 3.7 below.

3.7 Documented Wildlife Use

Documented wildlife usage in the study segment includes telemetry data for Florida black bear and Florida panther (FWC, 2021), panther mortalities due to vehicle collisions (FWC, 2021), black bear mortalities due to vehicle collisions (FWC, 2021), photo documentation, and Florida panther Hot Spots as identified by the Southwest Florida Roads Hot Spots Mapping (PRIT Transportation Subteam, 2020). Telemetry and other research have been conducted for Florida black bears by non-governmental researchers in the region. Figure 6 documents wildlife use within the surrounding area.

3.7.1 Telemetry Data

Although there is abundant evidence of documented bear activity in the region due to the high number of recorded mortalities, telemetry data from agencies is somewhat limited. There is only one point of telemetry data for black bears on the west side of US 27 more than two miles away compared to 16 mortalities located in the study segment on US 27. It is noted that the telemetry was recorded just outside the PBWMA in 1986. However, researchers at the Archibold Biological Station have tracked and collected data on the movements of 20 individual GPS-collared bears in this region. Home ranges for the bears was calculated based on the telemetry data and were mapped within the FCSGCE, proposed Hendrie Ranch conservation lands and PBWMA. This research supports crossing enhancements at the two alternative locations within this feasibility study. These maps are provided in Appendix D.

Conversely, there is more panther telemetry from agencies within the surrounding area ranging from 1988 to 2006 from three different panthers. All but one of the observed panther telemetry points occur on the east side of US 27 in the Hendrie Ranch and FCSGCE areas. Panther FP074 had telemetry data beginning on the west side of US 27 that moved east after nine days. About three months later, it was a hit by a car and is one of the recorded deaths in the study segment. It is presumed it was trying to cross the road to head west.

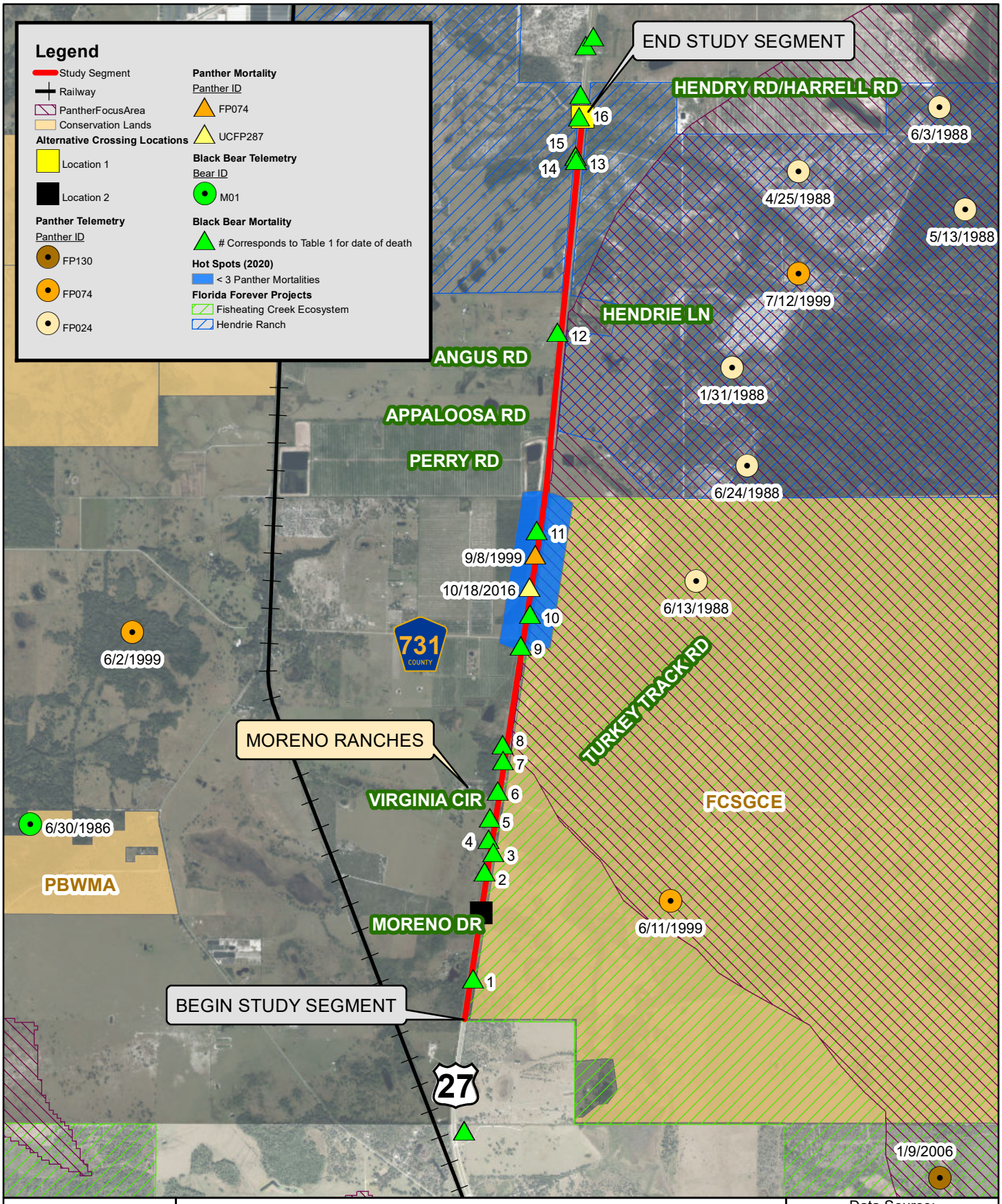


Figure 6 - Wildlife Utilization

FPID 449144-2

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA - FWC - FDEP
- ESRI - FNAI

1 inch = 3,400 feet

0 1,700 3,400

Feet

Coordinate System: NAD 1983 Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 6 - Wildlife Utilization.mxd

3.7.2 Mortalities Due to Vehicle Collisions

Reviewing agency data that records panther and bear mortalities due to vehicle collisions, it was observed that two panther-vehicle collisions occurred in 1999 and 2016; both resulted in panther deaths. There were 16 Florida black bear mortalities within the study segment that occurred between 1985 and 2015 as depicted on Figure 6. In addition to the 16 deaths in the segment, cumulatively five additional deaths were recorded just north and south of the study segment. Table 1 below provides the dates for the deaths occurring within the study segment.

Table 1: Dates of Bear Deaths in Study Segment

Location Number from Figure 6	Date of Bear Death
1	11/5/2011
2	7/13/2009
3	10/11/2010
4	8/20/1998
5	10/29/1990
6	12/6/1997
7	11/15/2008
8	7/8/1985
9	10/3/2015
10	6/26/2011
11	11/4/1996
12	9/7/2001
13	9/30/2006
14	4/27/1994
15	4/27/1994
16	6/4/1997

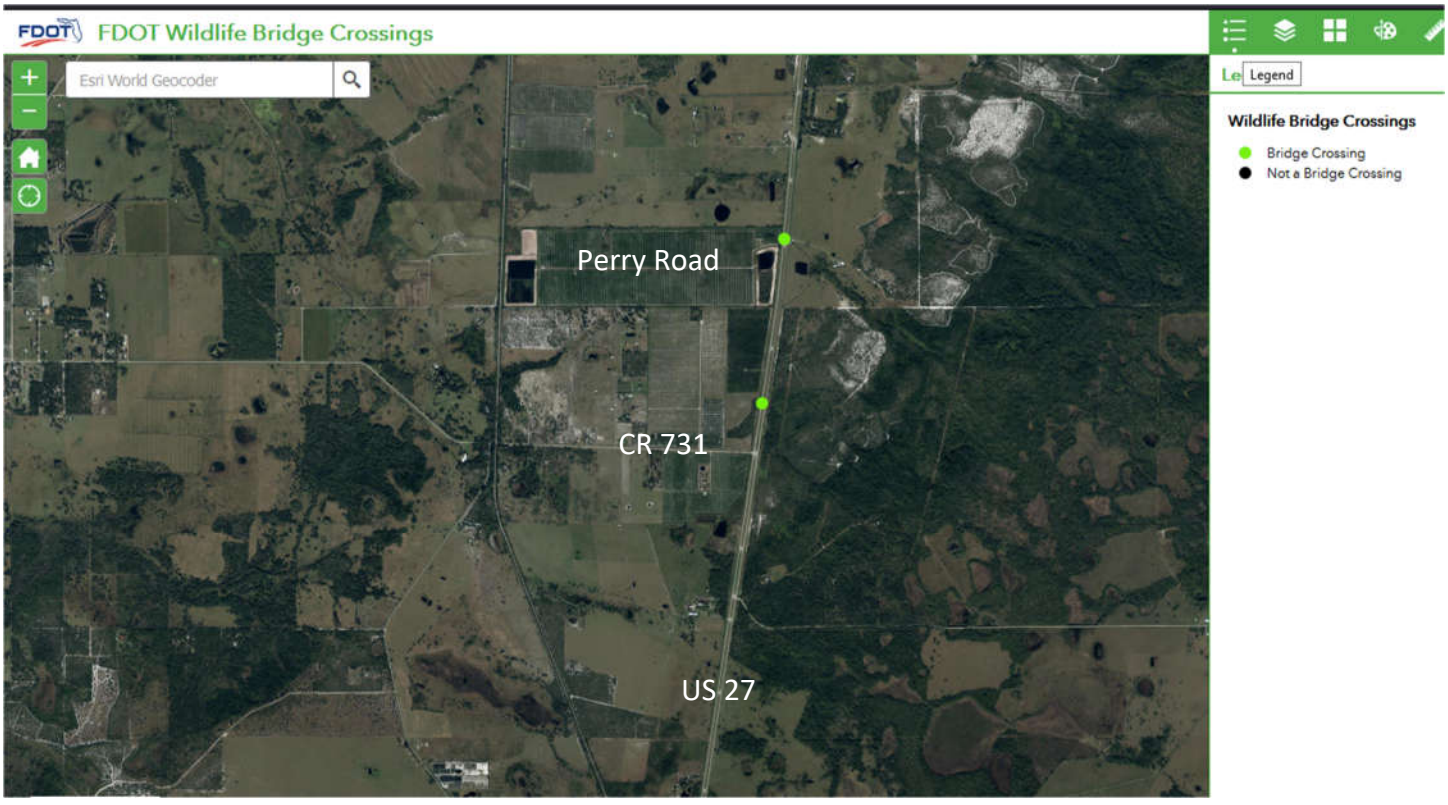
Throughout the study segment, the bear mortalities appear to be clustered into three groups (Figure 6). One group is in the southern portion of the study segment north of Moreno Drive near Virginia Circle and Turkey Track Road and range from 1985 to 2010. The second group is the cluster in the Panther Hot Spot, north of CR 731 and adjacent to orange groves. The third cluster located north of Hendrie Lane, is a group of five mortalities recorded between 1993 and 2006, four of which occur within the study segment. According to the data, two different bears died on the same day in the same spot on April 27, 1994. Additionally, another bear died at the existing culvert at the northern terminus of the study segment three years later.

3.7.3 Southwest Florida Roads Hot Spots

Hot Spots are classified based on the number of panther deaths that occur within a segment of road. Currently, Hot Spots are broken up into four groups based on number of deaths ranging from one to 12 and are also represented on a color scale consisting of blue (one to two deaths), green (three to five deaths), orange (six to eight deaths), and red (more than eight deaths). The Hot Spot within the study segment is classified as blue and represents the two mortalities that happened in this area.

3.7.4 Photo Documentation

Two wildlife cameras along US 27 have historically captured wildlife such as racoons, opossums, rabbits, and alligators using the existing triple barrel box culverts north of CR 731 and adjacent to Perry Road (FDOT, 2021). These cameras are not currently in place, however the camera locations from the FDOT Wildlife Bridge Crossings map are shown below. The FDOT is coordinating with non-governmental organizations (NGO) for footage of trail cameras within adjacent lands.



Screenshot 1: FDOT Wildlife Bridge Crossings ArcOnline Map

4 ENHANCED CROSSING ALTERNATIVE LOCATIONS

The analysis of two locations for wildlife crossing enhancements was conducted based on the previously provided information. Generally, factors important to developing suitable locations for enhancement include land use, public or privately-owned lands, nearby roads or driveways, and land cover types. Often existing drainage culverts are reviewed for potential crossing locations. Five existing culverts along the study segment were initially identified to be reviewed within this corridor of US 27. Each location was reviewed in the field and analyzed using ArcMap v 10.7 after data collection. Additionally, an interagency meeting with FDOT, FWC, and USFWS was held on November 5, 2021, to discuss the potential crossing locations. See Appendix E for meeting minutes and the locations of the existing culverts that were reviewed.

From the original five locations identified, three were eliminated. Although a Hot Spot occurs in the study segment, locations for potential crossing enhancements within the mapped Hot Spot were removed due to their proximity to CR 731. As a publicly open road, the consensus was CR 731 would serve as another obstacle to animals trying to cross US 27 in this area. Additionally, there are no current or proposed conservation lands to the west of US 27 near CR 731 near the Hot Spot. Furthermore, although adjacent orange groves could serve as good cover for animals to pass through, there is potential for future development. The remaining potential crossing areas were eliminated due to less suitable off-site land cover. Ideally, selected crossing locations provide suitable natural vegetation coverage for animals to pass through on either side of the crossing.

The two selected alternative crossing locations were chosen due to their proximity to current conservation lands, proposed future conservation lands (FF projects), recorded mortalities, documented telemetry, and few nearby public roads. Location 1 occurs in the northern portion of the study area. Location 2 is located at the south end of the study area[1]. Refer to Figure 1 for selected locations in relation to the study segment.

[1] Note that transitioning from a list of five areas to the two selected for analysis resulted in a change in nomenclature. For consecutive naming purposes the area called "Location 3" in meeting minutes and exhibits in Appendix E was renamed to be Location 1; and "Location 1" in Appendix E was renamed to Location 2 for the study.

4.1 Alternative Location 1

Alternative Location 1 is an existing eight-foot by four-foot concrete box culvert, located at approximately station 360+50, just south of Hendry Road/Harrell Road. A 15- to 20-foot wide canal flows through the culvert approaching from the northwest, flowing to the east with water depths greater than 18-inches. This location was selected for its positioning to the FF lands for the Hendrie Ranch property on both sides of US 27, the cluster of multiple black bear mortalities in the area, Florida panther telemetry to the east, vegetation coverage in adjacent properties, lack of active driveways and roads, and the designation of the existing canal as a Least-Cost Pathway (LCP) (Smith, 2021). An LCP is a landscape model used to predict potential paths animals may take to facilitate movement from one area to another by avoiding obstacles within the existing land area (Swanson et al., 2008). Land cover adjacent to this existing culvert is agriculture (FLUCCS code 2000) and upland forests (FLUCCS code 4000). Additionally, out of the group of black bear mortalities, one occurred directly at the culvert location in 1997. Figure 7 provides a closer look at Alternative Location 1.

On the west side of US 27 is fencing 10-feet west of the right-of-way, cattle gates on the existing driveway and across the canal, overhead utilities, and BFOC to the south of the driveway. The driveway is unpaved, unnamed, gated, and appears to serve as access to the property. The east side of the culvert also has right-of-way fencing crossing the canal that extends beyond to the north and south. There are no overhead utilities but there is BFOC to the north of the canal. Fish and alligators were observed in this part of the canal during the October field reviews. A seasonal high water (SHW) was set at the culvert on the east side of the road at elevation 130.18 feet. Vegetation growing at either end of the culvert was primarily herbaceous species such as primrose (*Ludwigia peruviana* and *L. octovalvis*), flat sedge (*Cyperus odoratus*), water hyacinth (*Eichhornia crassipes*), and other herbaceous grass species. The vegetation located between the canal and right-of-way fencing appeared to be recently treated with herbicide. Refer to photographs in Appendix B for visual representation of the existing culvert and surrounding area. The on-going resurfacing project is adding left turn lanes in the grass median at this location that may be affected by the selected design alternative concept.

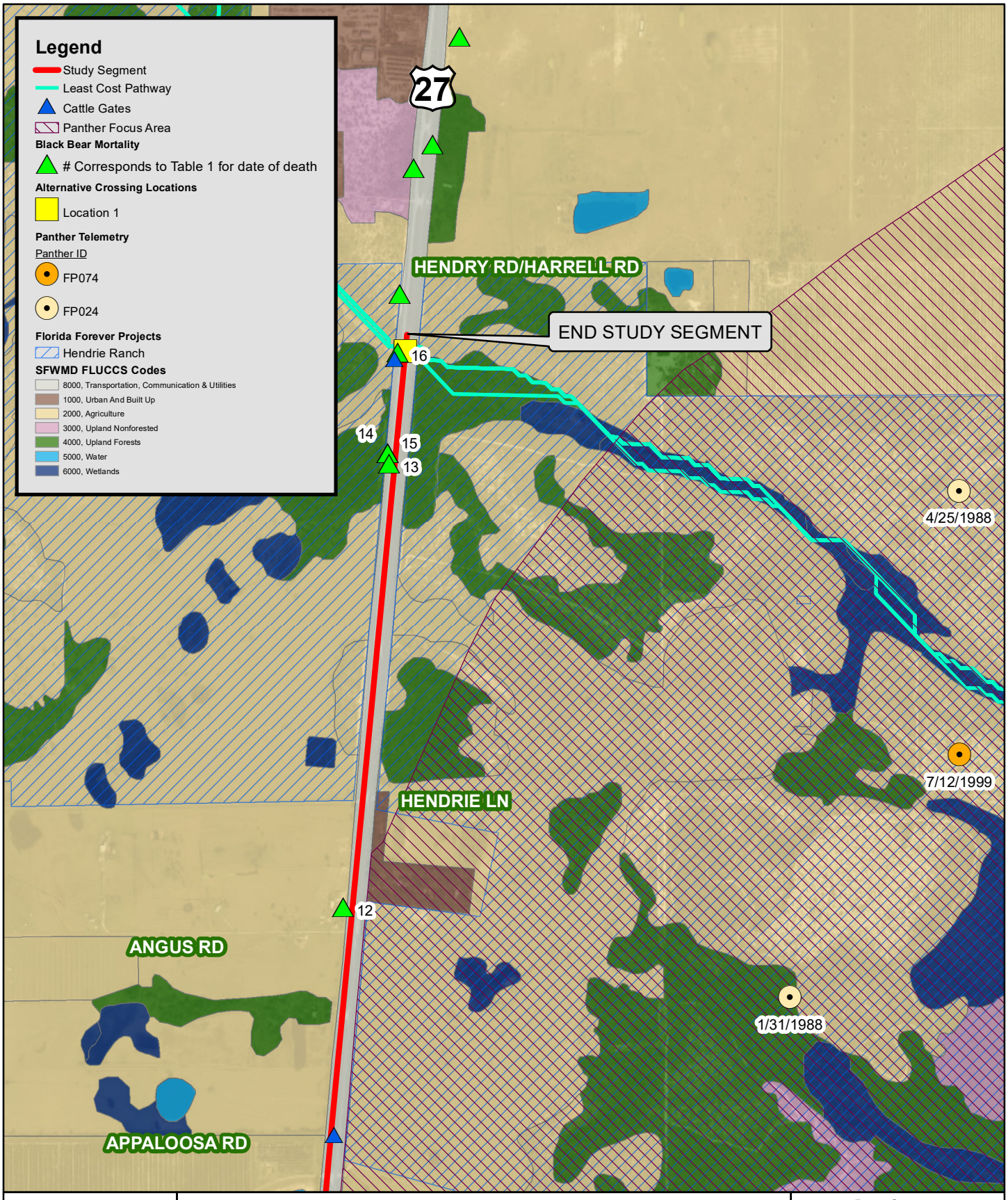


Figure 7 - Alternative Location 1

FPID 449144-2

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA - FWC
- ESRI - USFWS

N

1 inch = 1,500 feet

0 750 1,500 Feet

Coordinate System: NAD 1983 Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 7 - Alternative Location 1.mxd

4.2 Alternative Location 2

Alternative Location 2 is a double 24-inch reinforced concrete pipe (RCP) with a plastic liner. This drainage structure is located at approximately station 154+60, 1.35 miles south of CR 731 (Figure 1). This location was selected due to its close positioning to the PBWMA, 1.7 miles west of the study segment, the presence of the FCSGCE to the east, freshwater marsh land (FLUCCS code 6000), and the cluster of black bear mortalities just north of the culvert. On the west side of US 27, there is fencing 10-feet west of the right-of-way, buried fiber optic cable, and overhead utilities. Two cattle gates are located at Moreno Drive and between the culvert and driveway. Land cover directly adjacent to this end of the culvert is agriculture (FLUCCS 2000). The opening of the culvert is overgrown with primrose and castor bean (*Ricinus communis*) with an approximate surface water depth at the time of field reviews of three inches. A SHW was set at the culvert at elevation 66.29 feet. Figure 8 provides a closer look at Alternative Location 2.

The east side of the culvert also has right-of-way fencing, but no overhead or buried utilities. Rip-rap is placed in front of the pipes. Additionally, the culvert connects to a 15- to 20-foot wide ditch that flows southeast. The right-of-way fencing crosses the canal in addition to a floating turbidity barrier. Land cover directly adjacent to this end of the culvert includes agriculture (FLUCCS code 2000) and wetlands (FLUCCS code 6000). The opening of the culvert between the headwall and right-of-way fencing consisted primarily of primrose. Surface water depth was greater than six inches at the time of the October field reviews. The SHW was set at the culvert at elevation 65.59 feet. Photos of this location can be found in Appendix B. The on-going resurfacing project is not adding left turn lanes in the grass median at this location; however, there are two being constructed approximately 790-feet to the south and 460-feet to the north.

There are seven property owners that are located along Moreno Drive in the 1.7-mile-long corridor between Location 2 and the PBWMA (Figure 9). A conservation easement would need to be created along this stretch of land in order to create a protected pathway for animals to cross unhindered between FCSGCE and PBWMA. The conservation easement would be essential in ensuring a undeveloped passageway between the two conservation properties.

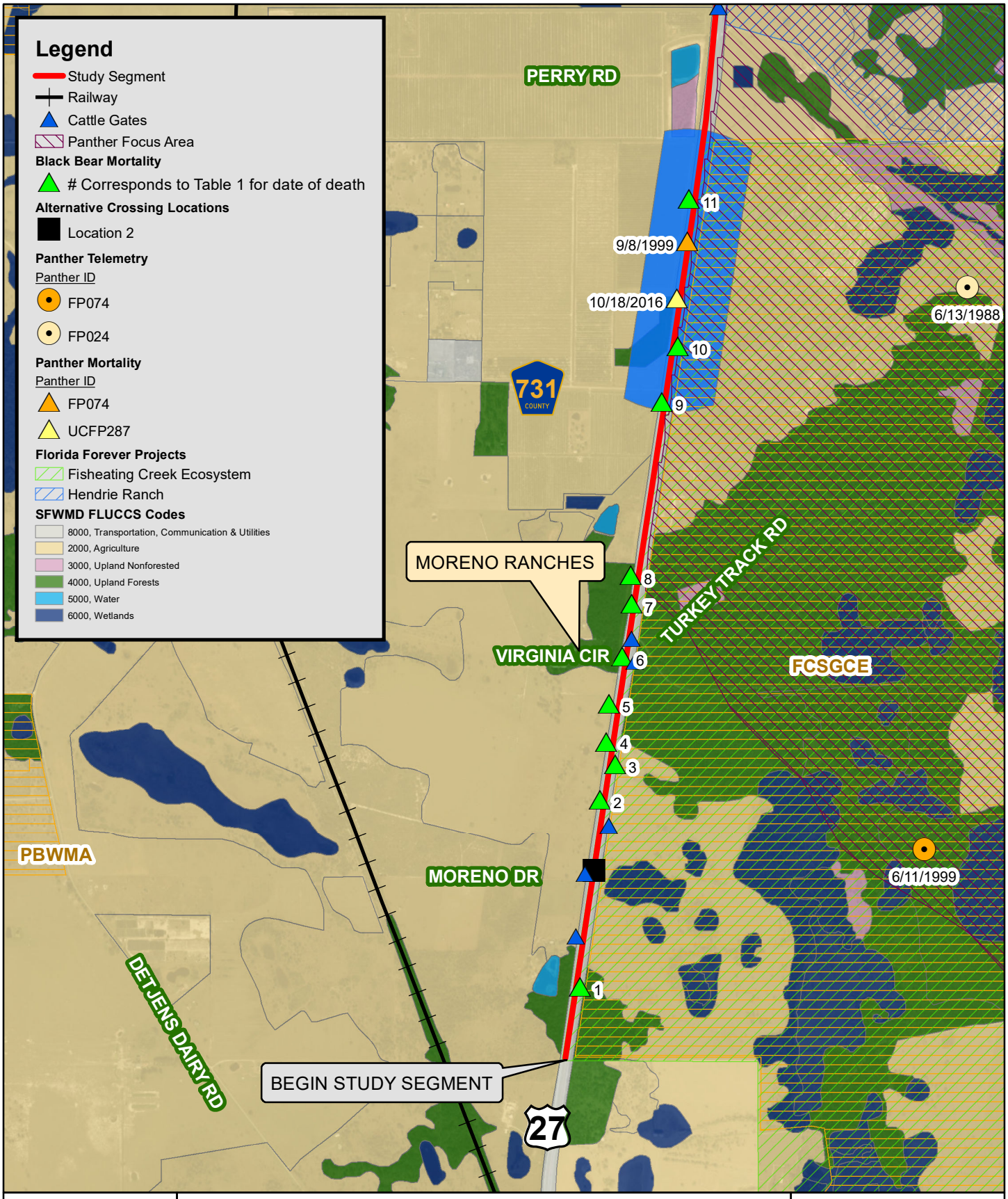


Figure 8 - Alternative Location 2

FPID 449144-2

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

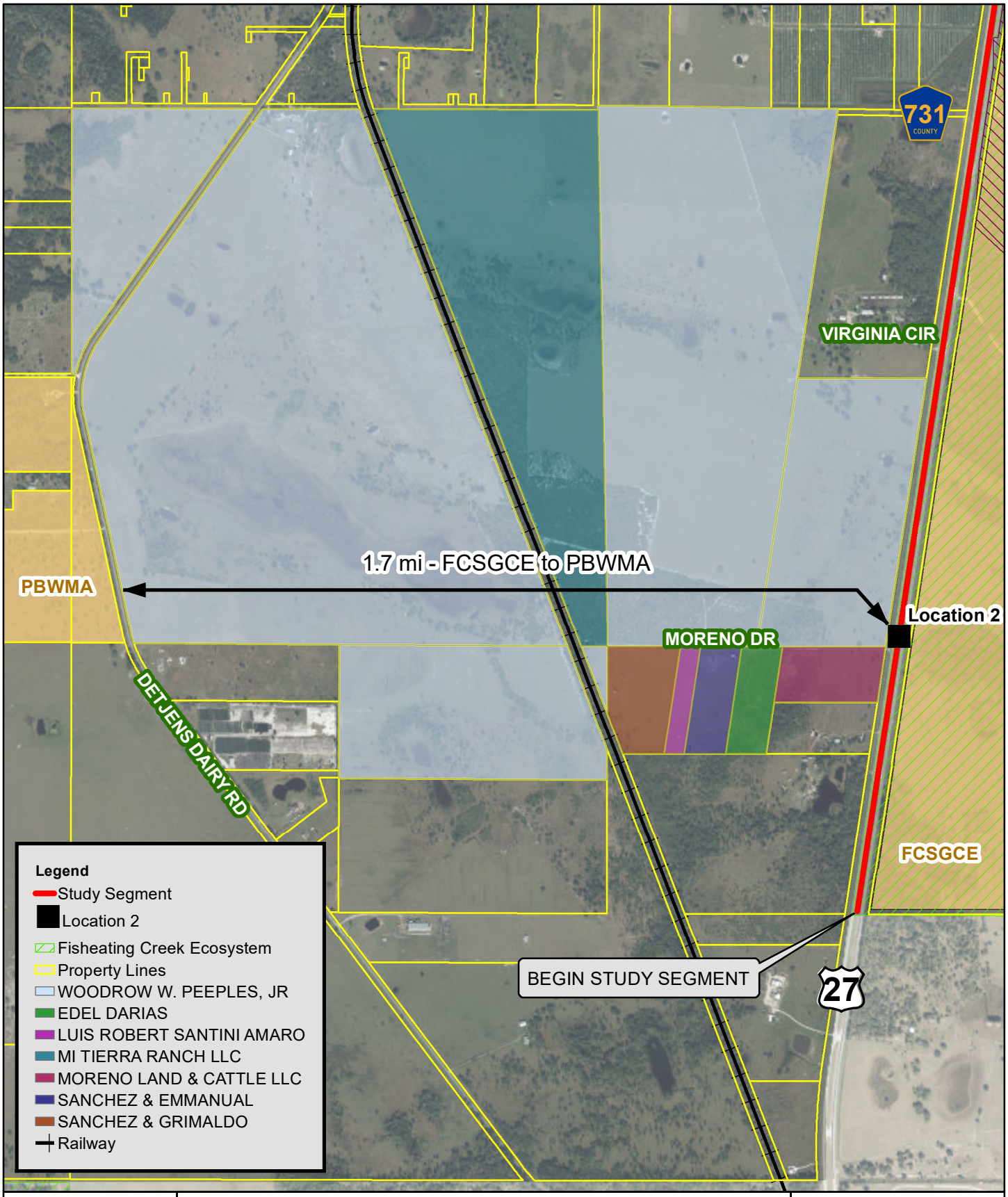
Data Source:
- FDA - FWC
- ESRI - USFWS

1 inch = 2,200 feet

0 1,100 2,200 Feet

Coordinate System: NAD 1983 Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 8 - Alternative Location 2.mxd



FDOT

Figure 9 - Alternative Location 2 - Property Owners
FPID 449144-2
US 27 Wildlife Crossing Feasibility Study
Highlands County, FL

Data Source:
- FDA - FWC
- ESRI - USFWS

N

1 inch = 1,500 feet
0 750 1,500
Feet

Coordinate System: NAD 1983
Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 9 - Alternative Location 2 Property Owners.mxd

5 ENHANCED CROSSING DESIGN ALTERNATIVES

Alternative structural designs were considered to provide a safer method for wildlife to pass over or under US 27. Three different crossing configurations were evaluated at each of the selected alternative locations including two underpass and one overpass options. Structural designs included dry a box culvert, bridge with wildlife shelves, and an overpass across US 27. Table 1 below summarizes the design alternatives for each assessed crossing location.

Table 2: Summary of Design Alternatives

Alternative	Crossing Type	Description
Design Alternative A	Underpass	Dry concrete box culvert adjacent to existing drainage structure
Design Alternative B	Underpass	Bridge with two 5 ft. dry shelves on either side of the existing ditch
Design Alternative C	Overpass	44 ft.-wide vegetated overpasses across US 27 with angled MSE walls

For Design Alternatives A and B at each location, the wildlife crossing will be constructed 1 ft. above the seasonal high water (SHW) elevation. Alternative C will span over US 27 and is therefore not impacted by SHW levels. SHW elevations at each of the proposed locations were established using stain lines on the existing culverts and were determined to be:

- Location 1: elevation 130.18 ft. (only measured on the east side)
- Location 2: elevation 65.59 ft. on the east side of US 27, and 66.29 ft. on the west side

5.1 Design Alternative A – Dry Box Culvert

Design Alternative A evaluates the existing grade of US 27 and using a 10 ft. x 8 ft. concrete box culvert to provide a wildlife underpass beneath the roadway. To ensure the box culvert would remain dry, even during the rainy season, the proposed invert elevation was set to 1 ft. above the SHW elevation. To accommodate a vertical clearance of 8 ft., the existing US 27 roadway profile would have to be raised approximately 8 ft. at Location 1, and 7 ft. at Location 2. Wingwalls will be used to elevate the grade of the approaching roadway leading to the underpass. While a 10-ft. x 8-ft. concrete box culvert was selected for this study as likely the largest size needed, the ultimate size will be further refined during the design phase of the project.

5.1.1 Alternative Location 1

The existing drainage structure, consisting of a single 8 ft. x 4 ft. concrete box culvert, has an invert elevation approximately 2.3 ft. below the SHW elevation. This structure appears to carry water throughout the year and raising the invert elevation above SHW levels is expected to impede hydraulic conveyance. To avoid obstruction of channel flow, existing box culvert and drainage conditions will be maintained. The existing box culvert will be evaluated for increased fill loading (resulting from elevating the roadway), and either remain in place, or be replaced by a new structure of similar dimensions.

For this analysis, we assumed the proposed wildlife crossing would be positioned adjacent to the existing box culvert and share a combined wingwall at the begin and end locations. The headwall for both structures would be located outside the proposed shoulder gutter and guardrail, 15.5 ft. from the edge of travel, resulting in a total length of 147 feet. An inlet in the median would provide natural lighting. The estimated structure cost of this alternative at Location 1 is $448,612, if the existing 8 ft. x 4 ft. box culvert remains in place, or $621,518 if the culvert requires replacement. Refer to Figure 10 for an elevation view of this alternative. During design, it is anticipated that other culvert designs will be investigated including a single culvert with shelves inside and providing a gap in the culvert in the median of US 27 and provide fencing.

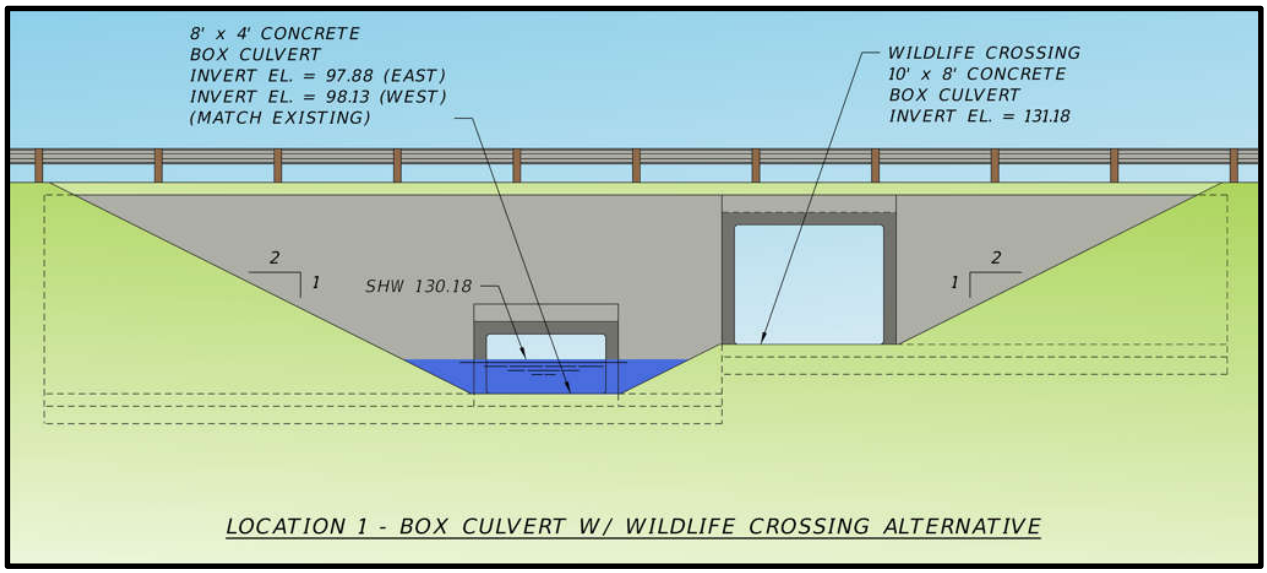


Figure 10: Design Alternative A at Location 1

5.1.2 Alternative Location 2

The existing drainage structure, consisting of a double 24 in. RCP with a plastic liner, is located approximately 1 ft. below SHW levels on the east end, and 0.5 ft. below SHW levels on the west end. This location is adjacent

to Moreno Drive which is a driveway to agricultural related buildings. It is recommended that the current drainage conditions be maintained. The driveway will be maintained at its current location at the right-of-way line, and the US 27 connection will be relocated 600 feet south via a paved driveway parallel to US 27 to maintain sight distance. Due to the increased loading on the structure caused by elevating the roadway, it is recommended that the existing CPP structures be replaced.

The proposed wildlife crossing would be positioned adjacent to the drainage pipes and share a combined wingwall at the begin and end locations. The headwall for both structures would be situated outside the proposed shoulder gutter and guardrail, 15.5 ft. from the edge of travel, resulting in a total length of 147 feet. An inlet in the median would provide natural light. The estimated structure cost of this alternative at Location 2 is $460,802. Refer to Figure 11 for an elevation view of this alternative. Culvert alternatives including providing a gap in the culvert within the median of US 27 will be further investigated during design.

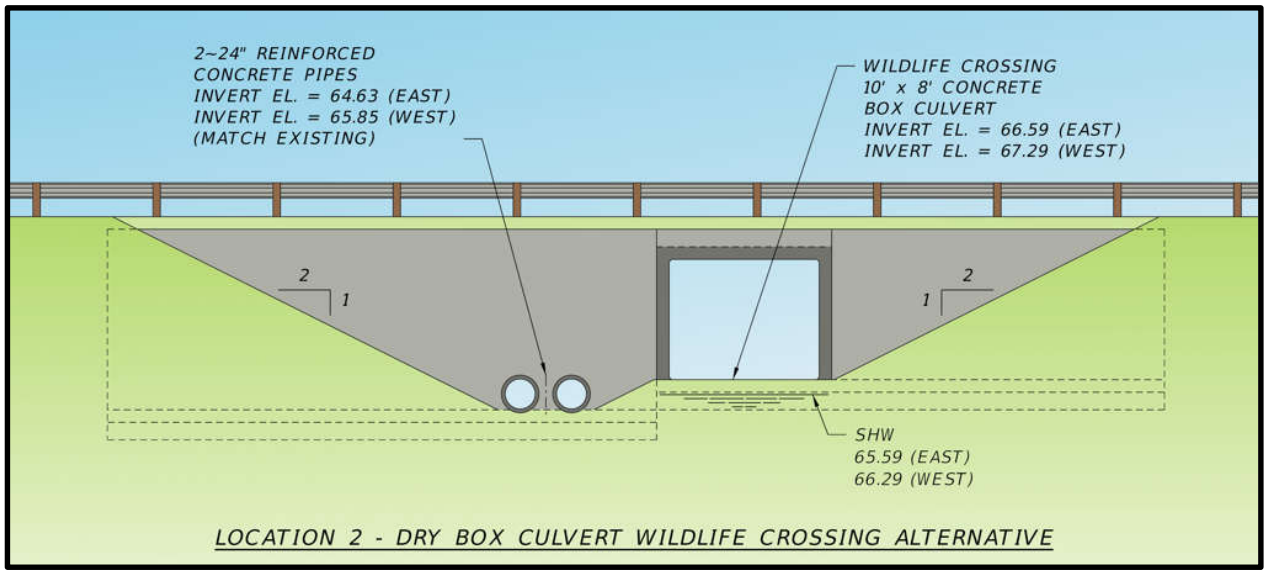


Figure 11: Design Alternative A at Location 2

5.2 Design Alternative B – Bridge with Wildlife Crossing Shelves

Design Alternative B evaluates elevating the existing grade of US 27, and using two separate, Florida Slab Beam bridges to provide 10 ft. of wildlife shelf width beneath the roadway. To ensure the wildlife shelf would remain dry year-round, the proposed shelf elevation was set to 1 ft. above the SHW elevation. The overall height of the proposed bridge, and roadway profile above the crossing, was determined by providing a minimum 6.5 ft. of vertical clearance between the wildlife shelf elevation and the low member of the bridge. To accommodate this

vertical clearance, the existing US 27 roadway profile would have to be raised approximately 6-feet at either location.

A Florida Slab Beam superstructure was selected for this alternative over a reinforced concrete slab due to its ability to span the entire length of the wildlife crossing, avoiding an intermediate bent. By utilizing a flat slab superstructure (and minimizing the total structure depth), impact to the existing roadway profile could be mitigated, while still providing a minimum of 6.5 ft. of vertical clearance for the wildlife crossing shelves.

5.2.1 Alternative Location 1

To maintain existing drainage conditions, a ditch will be required to convey hydraulic flow in place of the existing drainage structure. On either side of the proposed canal, 5 ft. wildlife shelves will be provided. A total bridge length of 54 ft. would be required at this location. The estimated structure cost of this alternative at Location 1 is $1,506,994. Refer to Figure 12 for an elevation view of this alternative.

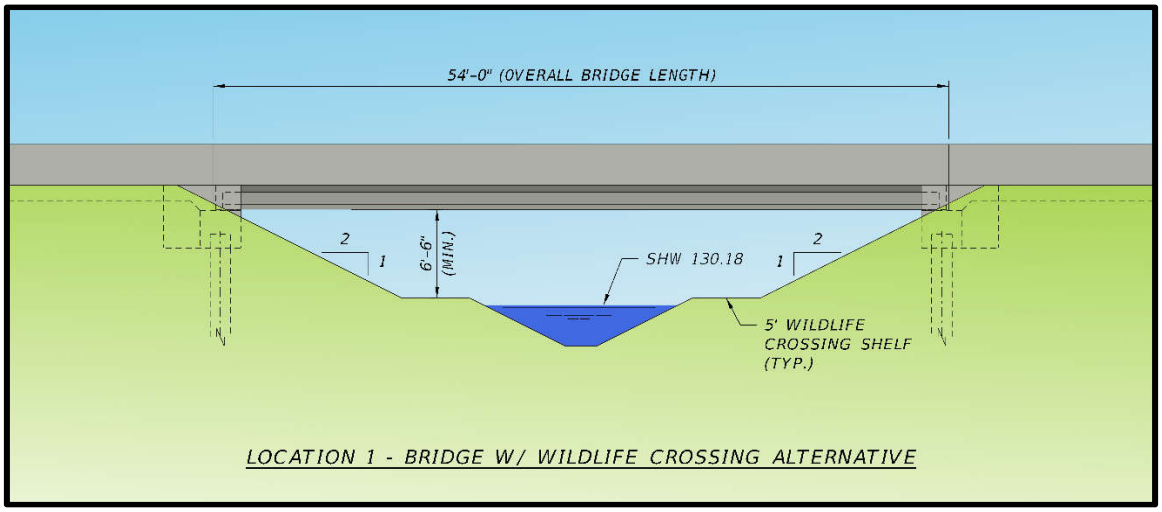


Figure 12: Design Alternative B at Location 1

5.2.2 Alternative Location 2

At Location 2, a ditch will also be required to maintain existing drainage conditions. On either side of the proposed canal, 5 ft. wildlife shelves will be provided. This would result in a total structural length of 48 feet. Since the invert elevation of the existing drainage structure is higher at this location, a soil slope of less than 1:2 would be required to meet the proposed canal depth, resulting in a shorter bridge length than Location 1. The estimated construction cost of this alternative at Location 2 is $1,406,736. Refer to Figure 13 for an elevation view of this alternative.

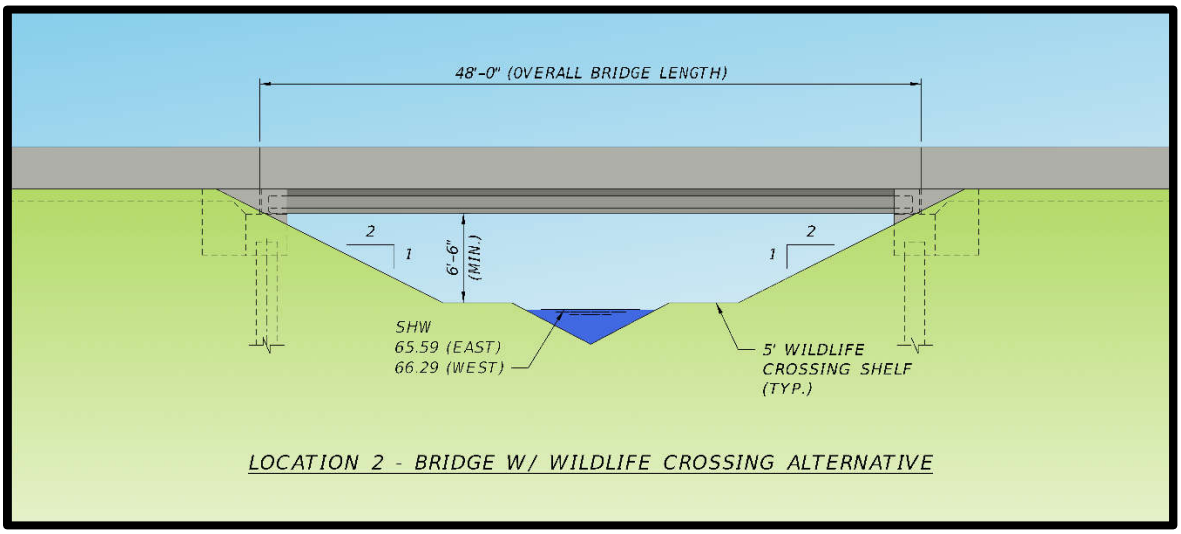


Figure 13: Design Alternative B at Location 2

5.3 Design Alternative C – Wildlife Overpass

Design Alternative C evaluates using a prestressed concrete bridge to provide a wildlife crossing overpass above US 27. The begin and end bridge limits were established by providing a minimum clear zone of 36-feet from the edge of travel. This resulted in an overall bridge length of 197 ft. with a pier centered within the US 27 median. The height of the bridge was determined by providing a 17'-6" minimum vertical clearance above US 27. Angled MSE walls are proposed at the begin and end abutments, providing a more open entrance to the overpass structure. Local vegetation can be incorporated on the approaches to integrate the structure with the adjacent surroundings. A total bridge width of 44 ft. is utilized. Refer to Figures 14 and 15 for a depiction of the proposed plan and elevation view. Location 1 is shown in the figures; however, the overpass at Location 2 is geometrically similar. At both Location 1 and 2, this alternative has been positioned approximately 200 ft. north of the existing drainage structure. This will allow for construction of the proposed wildlife crossing and approach soil slopes, while maintaining the existing hydraulic flow through the area.

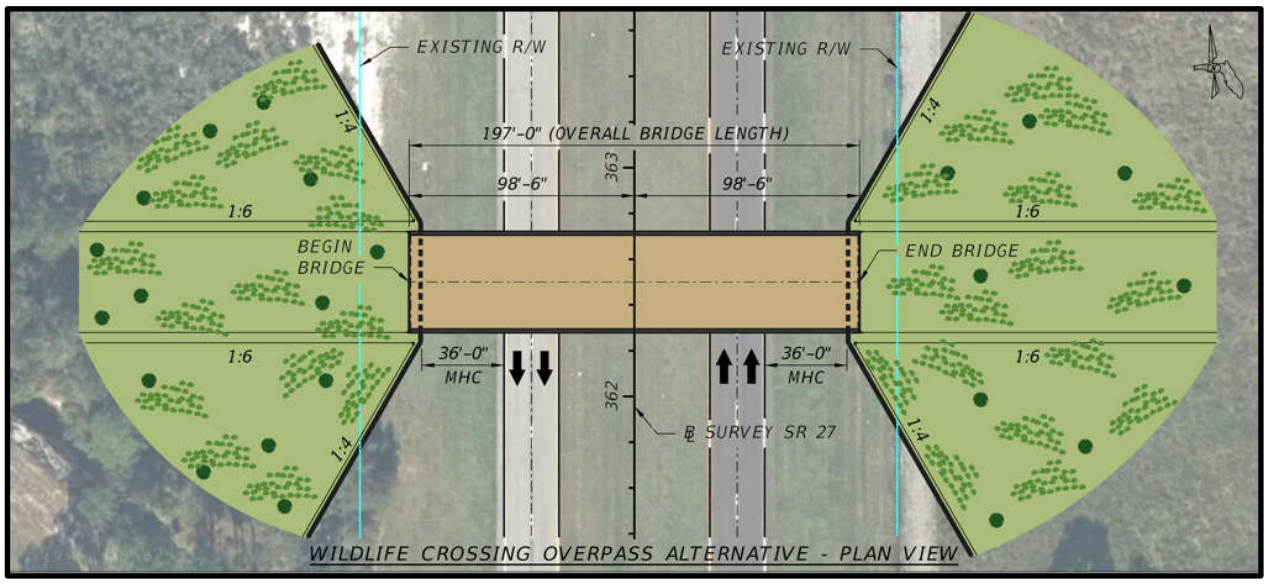


Figure 14: Design Alternative C (Plan View)

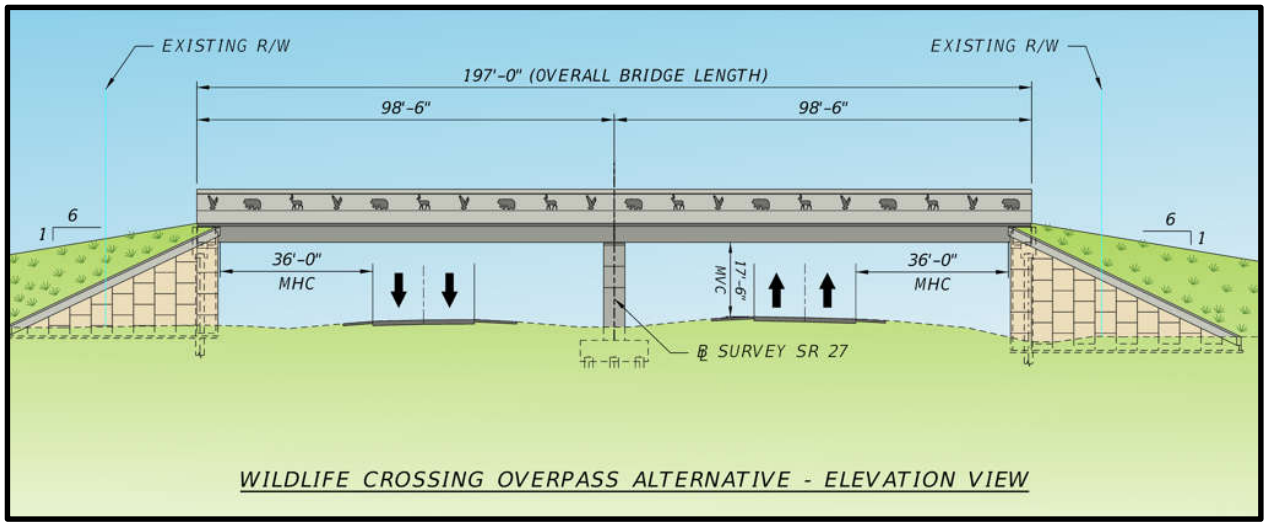


Figure 15: Design Alternative C (Elevation View)

To best simulate the natural terrain of the area, a 1 ft. minimum layer of soil substrate would be employed over the bridge deck, with further elevated humped sides to create natural shelves along the exterior of the bridge. To reduce noise and light produced from vehicular traffic, 8 ft. tall noise walls are proposed along the length of the bridge. Refer to Figure 16 for a depiction of the proposed bridge typical section.

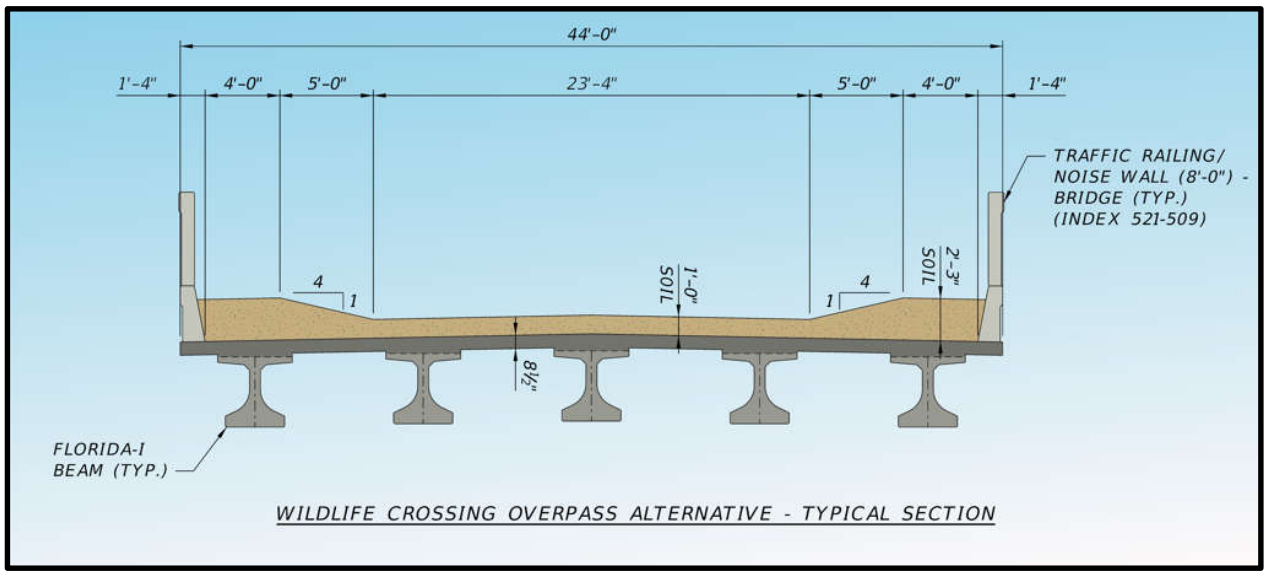


Figure 16: Design Alternative C Wildlife Overpass Typical Section

The cost estimate for Design Alternative C at either location includes the bridge, walls, and fill over the bridge and approach slopes. The total cost between locations only varies due to estimated MSE wall lengths and fill volume. The total construction cost estimate for this alternative is $1,995,541 at Location 1, and $1,978,084 at Location 2.

5.4 Maintenance of Traffic Operations

US 27 design Alternatives A and B propose to raise the roadway elevation above the existing grade. This will require reconstruction to accommodate the proposed profile changes. All three alternatives will utilize two main maintenance of traffic phases. Standard Plans Index 102-620 will divert one direction of traffic and reduce the Work Zone Speed to 55 MPH. Advanced warning signs, including PCMS boards, are proposed to alert the driver of the diversion and speed reduction. In the first phase, Northbound traffic will be shifted to the existing inside lane of southbound pavement using a temporary median crossover and temporary pavement while the proposed northbound work is constructed. The temporary diversion will include four 11-foot lanes, four foot outside shoulders and a temporary barrier wall between opposing lanes. Phase I work includes half of the CBC and NB reconstruction pavement for Alternative A, NB bridge and NB reconstruction pavement for Alternative B, and the center pier and overpass bridge over NB pavement in Alternative C. In the second phase, traffic is shifted to the newly constructed NB pavement (Alternatives A & B) or the existing NB pavement (Alternative C) while the construction is completed in the southbound direction. Existing median crossovers affected by the

traffic diversion will be closed during construction and existing driveway connections will be maintained. Costs for the Temporary Detour are included in the Roadway Cost Analysis table in Appendix F.

6 WILDLIFE FENCING ANALYSIS

Wildlife fencing is proposed north and south of both selected crossing locations. Fence alternatives were considered to address not only the enhancement of the locations, but to also help reduce the wildlife-vehicle mortalities throughout the study segment.

6.1 Fencing Alternative 1

FDOT wildlife crossing guidelines recommend providing adequate fencing to guide wildlife for a sufficient distance to the wildlife crossing feature. Type B fence, ten feet in height with barbed wire, in the Standard Plans Index 550-002 is recommended and would match the existing wildlife fencing to the south. Often a length of 1,000 feet north and south (2,000 feet total per side) is adequate to guide wildlife to crossing features.

This fence length was mapped at Alternative Locations 1 and 2 to visualize the potential effect. Figure 18 is a depiction of what the 2,000-foot per side of roadway looks like in relation to the study segment and the mapped mortalities in the vicinity. It is noted that there are cattle gates and roads adjacent to both locations that would require coordination with appropriate landowners for the installation of wildlife-proof gates at the various access points and Moreno Drive. For this study segment, 1,000 feet north and south of one crossing enhancement location did not seem to adequately address the needs of the corridor given the high concentration of mortalities along the study segment, particularly along the stretch of road adjacent to the FCSGCE. Following this conclusion, two other fence options were evaluated.

6.2 Fencing Alternative 2

Fencing alternative 2 proposes extending wildlife fencing at Location 1 by an additional 1,000 feet on both sides of the road, beginning at Hendry Road/Harrell Road and continuing south for 3,000 feet. Extending the fence would account for the bear mortalities in 1994 and 2006. Additionally, fencing will be located entirely adjacent to the Hendrie Ranch FF property for the benefit of coordination with a single landowner. At Location 2, the fencing will be extended by an additional 1,490 feet with the southern terminus ending before the residential drive where the southernmost cattle gate is. The northern terminus of the fence will end at the existing property line shown in Figure 19, just south of Virginia Circle. Extending the fence would account for the four black bear

mortalities north of the existing culvert at Location. Coordination with the appropriate landowners would be required to replace existing cattle gates with wildlife proof gates.

6.3 Fencing Alternative 3

At Location 1, wildlife fencing will extend from the Hendrie Ranch FF property from Hendry Road/Harrell Road to Hendrie Lane on the east and west sides of US 27. Figure 20 is a depiction of the proposed wildlife fencing for this alternative. Coordination will be needed to install wildlife-proof gates at driveways and access points to properties located along the proposed fencing installation such as Turkey Track Road, Moreno Drive, Virginia Circle, and any existing cattle gates.

Along the study segment, it is observed that 13 of the 16 black bear mortalities and both panther vehicle mortalities occur along the section of US 27 that is adjacent to the FCSGCE. This accounts for nearly half the southern length of the study segment, approximately 2.5 miles. At Alternative Location 2, Fencing Alternative 3 proposes installing wildlife fencing along the entirety of the FCSGCE property on both sides of US 27 which would incorporate the section of US 27 designated as a Hot Spot. However, since CR 731 is an public road, wildlife fencing and wildlife-proof gates cannot be installed across the road. In order to address this issue, wildlife fence is proposed for 500 feet on the north and south sides of CR 731 at the intersection with US 27. Due to the necessary break in the fence barrier for the CR 731 intersection wildlife “jump-outs” are proposed. One jump-out will be placed on either side of US 27 between CR 731 and the northern fence limit to allow animals an escape route. Table 3 summarizes the fencing alternatives.

Table 3: Summary of Fencing Alternatives

Location Alternatives	Fencing Alternatives	Total Length (Feet)	12-foot Gates to Replace Existing Cattle Gates
1	1	4,000	1 single (See Figure 17)
2	1	4,000	2 single (See Figure 17)
1	2	6,000	1 single (See Figure 18)
2	2	6,980	2 single (See Figure 18)
1	3	10,732	1 single (See Figure 19)
2	3	24,375	4 single (See Figure 19)

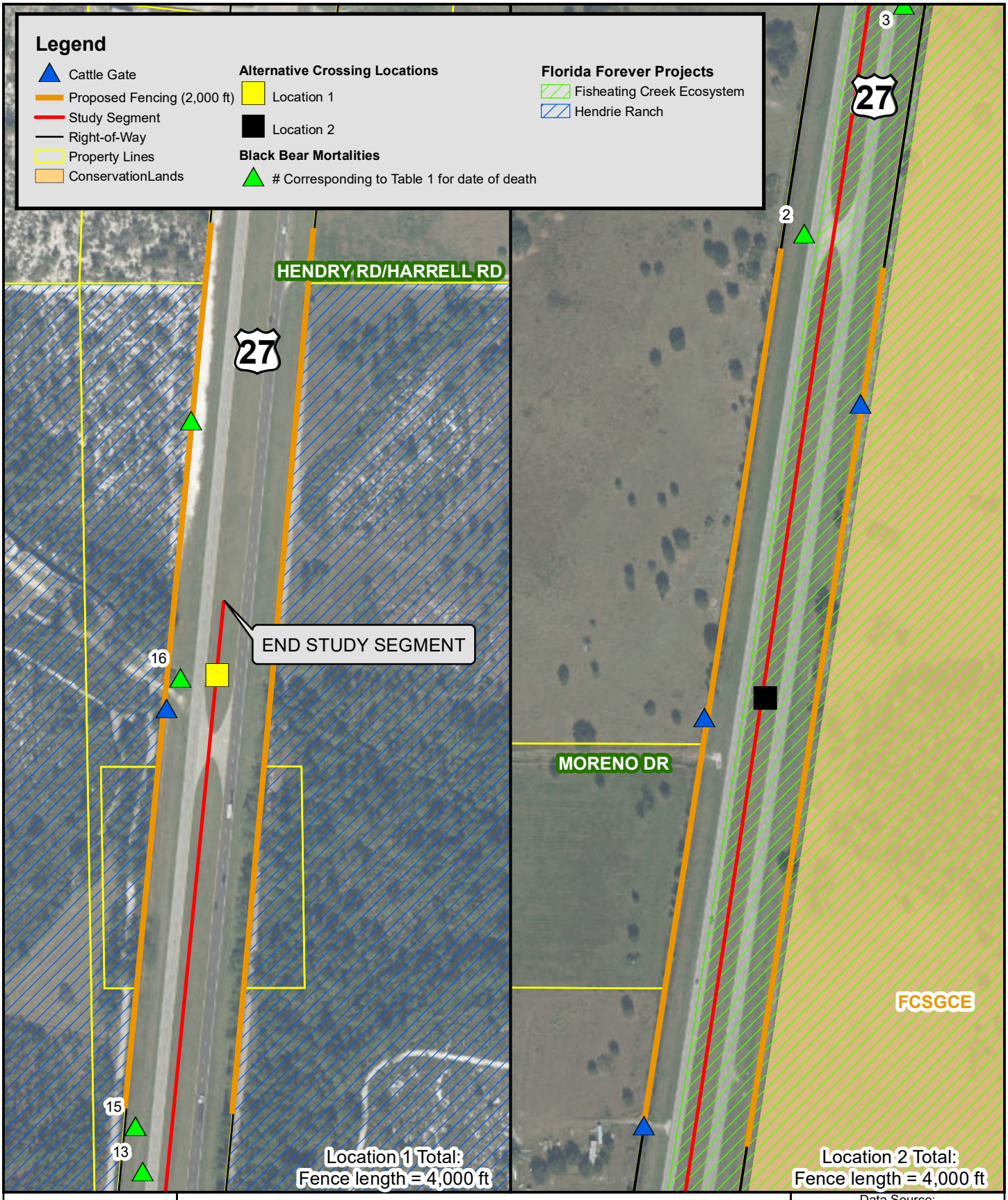


Figure 17 - Fencing Alternative 1

FPID 449144-1

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA - FWC - ESRI
- Highlands County Property Appraiser

1 inch = 300 feet

0 150 300 Feet

Coordinate System: NAD 1983 Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 17 - Fence Alternative 1.mxd

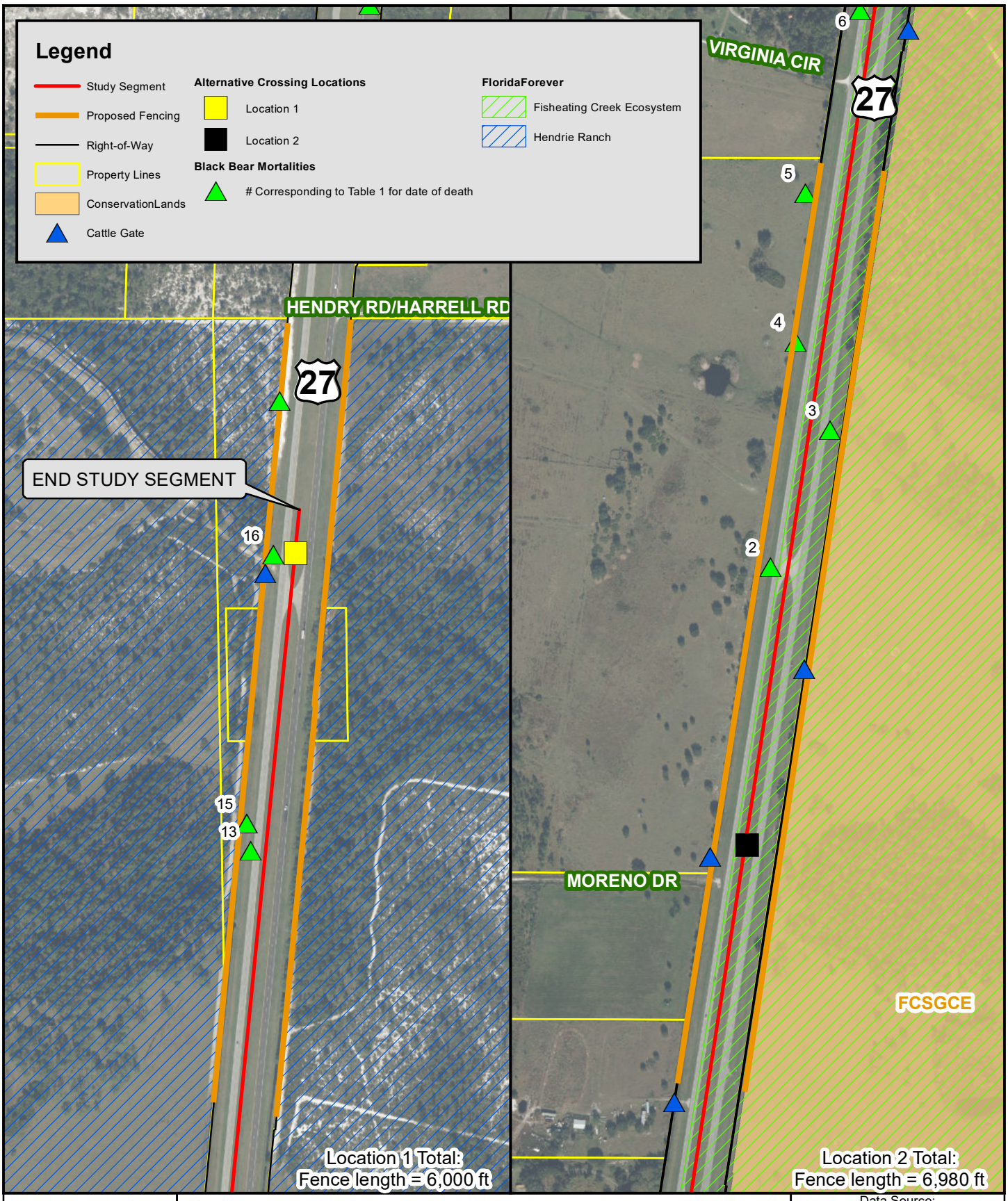


Figure 18 - Fencing Alternative 2

FPID 449144-2

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA - FWC - ESRI
- Highlands County Property Appraiser

1 inch = 500 feet

0 250 500 Feet

Coordinate System: NAD 1983 Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 18 - Fence Alternative 2.mxd

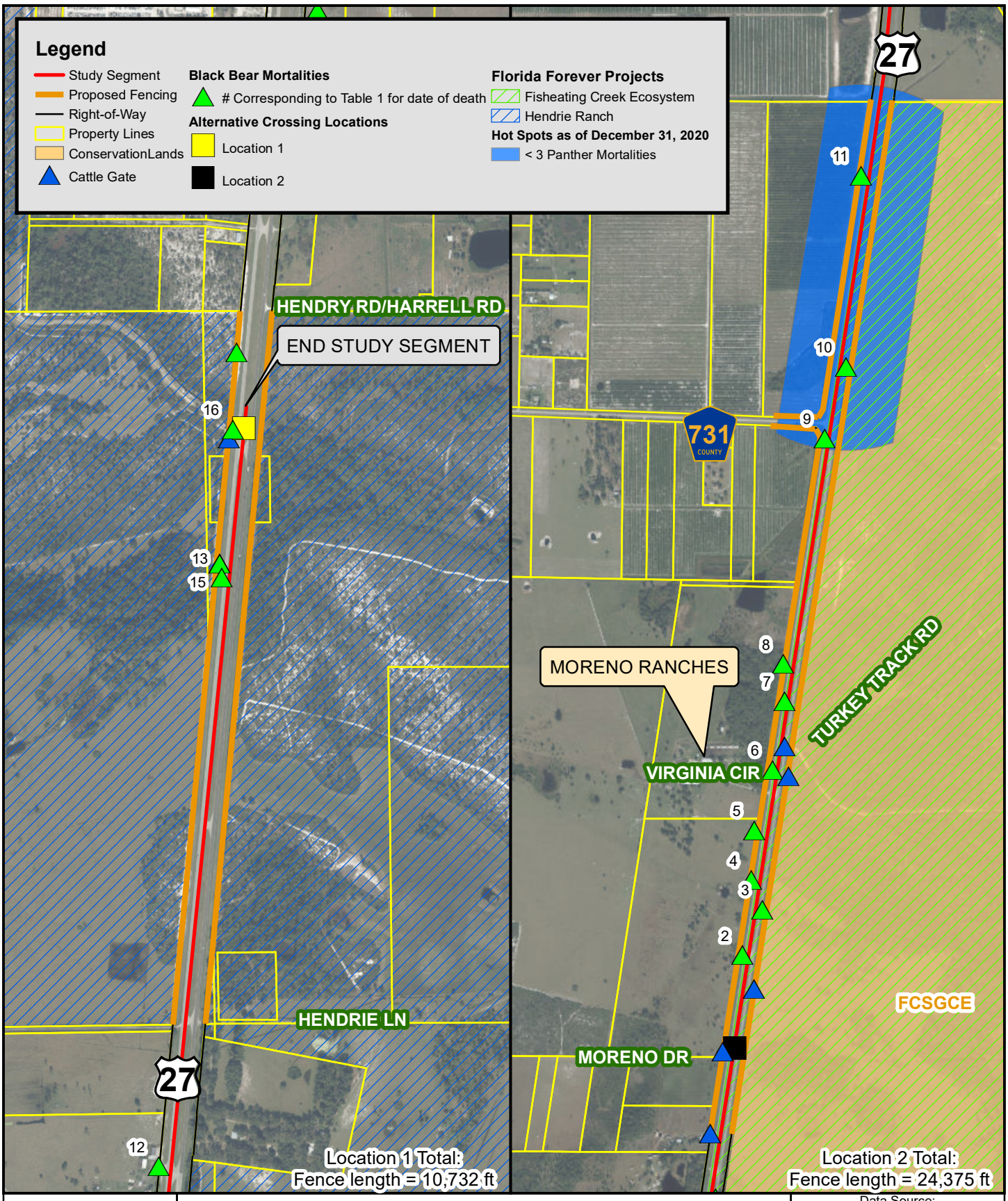


Figure 19 - Fencing Alternative 3

FPID 449144-2

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA - FWC - ESRI
- Highlands County Property Appraiser

1 inch = 1,000 feet

0 500 1,000 Feet

Coordinate System: NAD 1983 Florida State Plane East

Path: \\TPAFILE02\Data\CADD\Projects\55210\449144-2_US 27\Data - GIS\mxd\Figure 19 - Fence Alternative 3.mxd

Alternative costs analysis

6.4 Design Concept Alternatives

The various costs by design concept alternative are provided below in Table 4. Structural design concepts include a dry box (A), a bridge with dry shelves (B), and a wildlife overpass (C). Separate costs for structures, roadway and fencing are included in Appendix E.

Table 4: Summary of Cost Analysis

Structures Design Concept	Alternative Location	
	Location 1	Location 2
A – Existing Cross Drain Remains	$448,612	--
A – Replace Existing Cross Drain	$621,518	$460,802
B	$1,506,994	$1,406,736
C	$1,995,541	$1,978,084

6.5 Roadway Cost Analysis

Roadway costs vary based on structure design concepts and includes maintenance of traffic, mobilization, and project unknowns. Right-of-way or easement acquisition costs are not included. The only structural design concept that would require right-of-way acquisition is the wildlife overpass (Design Concept C). Location 1 would require an additional 1.03 acres of additional right-of-way and 0.96 acres would be needed for location 2. Table 5 provides a summary of the roadway costs.

Table 5: Roadway Costs Summary

Location	Design Concept	Cost
1	A – Dry Box Culvert	$1,650,079
1	B – Bridge with Shelves	$1,153,174
1	C – Wildlife Overpass	$411,301
2	A – Dry Box Culvert	$1,767,199
2	B – Bridge with Shelves	$1,163,479
2	C – Wildlife Overpass	$416,006

6.6 Wildlife Fencing Alternatives

The various costs of alternative fencing concepts are summarized in Table 6. It is noted that Alternative 1 is the minimum recommended amount of fencing and has the least number of gates. Alternatives 2 and 3 both have more fencing and gates throughout the proposed locations. Costs for fencing are included in Appendix F.

Table 6: Wildlife Fencing Cost Summary

Location Alternative	Fencing Alternative	Fence*	Single Gates	Total
1	1	$240,000	$1,259	$241,259
2	1	$240,000	$2,517	$242,517
1	2	$360,000	$1,259	$361,259
2	2	$418,800	$2,517	$421,317
1	3	$643,920	$1,259	$645,179
2	3	$1,462,500	$5,035	$1,467,535

*Engineer's estimate (see Appendix F)

7 RECOMMENDATION

Both alternative crossing locations are viable options for enhancement of wildlife passage across US 27. Location 1 is located in between the proposed future conservation lands of the Hendrie Ranch FF project and is approximately 0.6 miles west of the USFWS North Panther Focus Area. Furthermore, this location is located at an LCP (Smith, 2021) and has ample evidence of documented wildlife usage. For example, there is a cluster of four bear black bear mortalities near the existing culvert that lie within the study segment, with one having occurred at the existing culvert in 1997. There is panther telemetry located to the east of US 27 from two panthers, FP074 and FP024.

There are no overhead utilities on either side of US 27, but there is BFOC cable on either side of US 27. The on-going resurfacing project will be adding median left-turn lanes at the existing opening in the median and may be impacted by some of the design concepts for wildlife crossings. Lands on either side of the property are primarily agriculture (FLUCCS 2000) and upland forests (FLUCCS 4000) and belong to a single property owner. Other than Hendry Road/Harrell Road to the north and the cattle gate on the west side of US 27 south of the

existing canal, there are no other intersecting roads or driveways within the immediate vicinity of the existing culvert at Location 1.

Location 2 also has documented wildlife usage within the area to the east and west of US 27 based on telemetry data from Florida panthers and black bears. Additionally, there is a cluster of eight black bear mortalities near this crossing ranging from 1985 to 2011, with the latest one occurring to the south of the proposed crossing location. An LCP (Smith, 2021) is also located approximately 1.26 miles south of the existing cross drain. Furthermore, the proximity of the FCSGCE/Fisheating Creek Ecosystem FF project and the PBWMA is extremely favorable since these lands will not be developed in the future. However, the 1.7-mile gap between these areas would require animals to cross through privately-owned active agricultural lands, a rail line and Detjens Dairy Road in order to move between these two conservation lands.

Six different landowners have property that abut Moreno Drive between US 27 and the railway; however, only two are directly adjacent to US 27 and are currently classified as agriculture (FLUCCS 2000). These six landowners have ten parcels between US 27 and the PFWMA. Other than Moreno Drive, no other intersecting roads or driveways are located within the immediate vicinity of the existing drainage structure at Location 2. Utilities within the area include overhead power lines and BFOC on the west side of US 27.

Of the two locations, Location 1 is the preferred alternative with the assumption that the Hendrie Ranch FF properties will be acquired within the foreseeable future. The proposed conservation lands at Location 1 would contribute to an unbroken chain of 125,000 acres of conservation lands. On the other hand, while Location 2 has many benefits for enhanced wildlife passage, obtaining a conservation easement from multiple property owners to close the 1.7-mile gap and create a protected corridor between FCSGCE and PBWMA would be challenging.

At Location 1, the dry box culvert (Design Concept A) is the recommended design alternative. This design will not only cost the least, but also have the least amount of permitting and construction footprint. Additionally, no extra right-of-way will need to be purchased for this structure concept. The left turn lanes included in the current resurfacing project will be reconstructed. Additionally, the existing culvert will not need to be replaced.

The recommended fencing design is Alternative 3 which provides wildlife fencing from Hendry Road/Harrell Road south to Hendrie Lane. This alternative plan will fence the entire west portion of Hendrie Ranch FF property that abuts US 27. Fencing on the east side will run the entire length of the FF property until Hendrie Lane. This fencing alternative will encompass the four bear mortalities located along this stretch of US 27. Additionally,

there are still relatively few property owners, no additional roads or driveways, and no extra existing cattle gates to factor in the cost and coordination of installing fence with this alternative. Further coordination should take place to include property owners fencing access for proposed wildlife gates and fence installation. The recommended location, design, and fence alternative including costs are summarized in Table 7.

Table 7: Recommended Alternatives and Total Cost

Alternative	Cost
Location 1	--
Design Concept A	$2,271,597
Fencing Alternative 3	$645,179
Total Cost	**$2,916,776**

The total cost of the recommended alternatives is an estimated $2.9M. The US 27 structure and roadway reconstruction account for about $2.3M with the fence alternative representing the remaining $0.6M. The alternatives were recommended by balancing ecological need with cost. This recommendation is located adjacent to proposed future conservation lands on both sides of US 27. It is further recommended that coordination with the Florida Forever program continue for updates related to acquisition. It is anticipated that the wildlife fencing alternative will divert wildlife away from active intersections and driveways and funnel them to the new crossing.

8 REFERENCES

Cox, J., Kautz, R., MacLaughlin, M., & Gilbert, T. (1994). Closing the gaps in Florida's wildlife habitat conservation system. *FWC.* http://ufdc.ufl.edu/UF00000128/00001

Endries, M., Stys, B, Kratimenos, G., Langley, S. Root, K., & Kautz, R. (2009). Wildlife habitat conservation needs in Florida: Updated recommendations for Strategic Habitat Conservation areas. *Fish and Wildlife Research Institute Technical Reports, TR-15,* 7. https://myfwc.com/research/gis/applications/articles/fl-wildlife-habitat-conservation/

FDEP. (2021). *Florida forever 2021.* FDEP. https://storymaps.arcgis.com/stories/5f11bebd7bb847939541616d3f5578e2

FDOT. (2021). *FDOT wildlife bridge crossings.* [Interactive Map]. FDOT. https://www.arcgis.com/apps/webappviewer/index.html?id=a105b26615f64b19b543eb9ab61fe197

FNAI. (2018). *Florida conservation lands.*

FNAI. (2019). *Cooperative land cover, V 3.3.* [Shapefile]. FWC.

FWC. (2021). *Black_bear_road_mortality_locations_in_Florida_2021.* [Shapefile]. FWC.

FWC. (2021). *Black_bear_telemetry_2021.* [Shapefile]. FWC.

FWC. (2021). *Florida_panther_mortality_2021.* [Shapefile]. FWC.

FWC. (2021). *Florida_panther_telemetry_2021.* [Shapefile]. FWC.

Pienaar, E. & Kreye, M. (2016). Government efforts to protect habitat for the Florida panther on private lands. *UF Department of Wildlife Ecology and Conservation.* (WEV368). https://edis.ifas.ufl.edu/publication/UW413

PRIT Transportation Subteam. (2020). *Southwest Florida Road Hot Spots.* Bartow: PRIT Transportation Subteam.

SFWMD. (2019). *SFWMD_land_cover_land_use_20172019.* [Shapefile]. SFWMD.

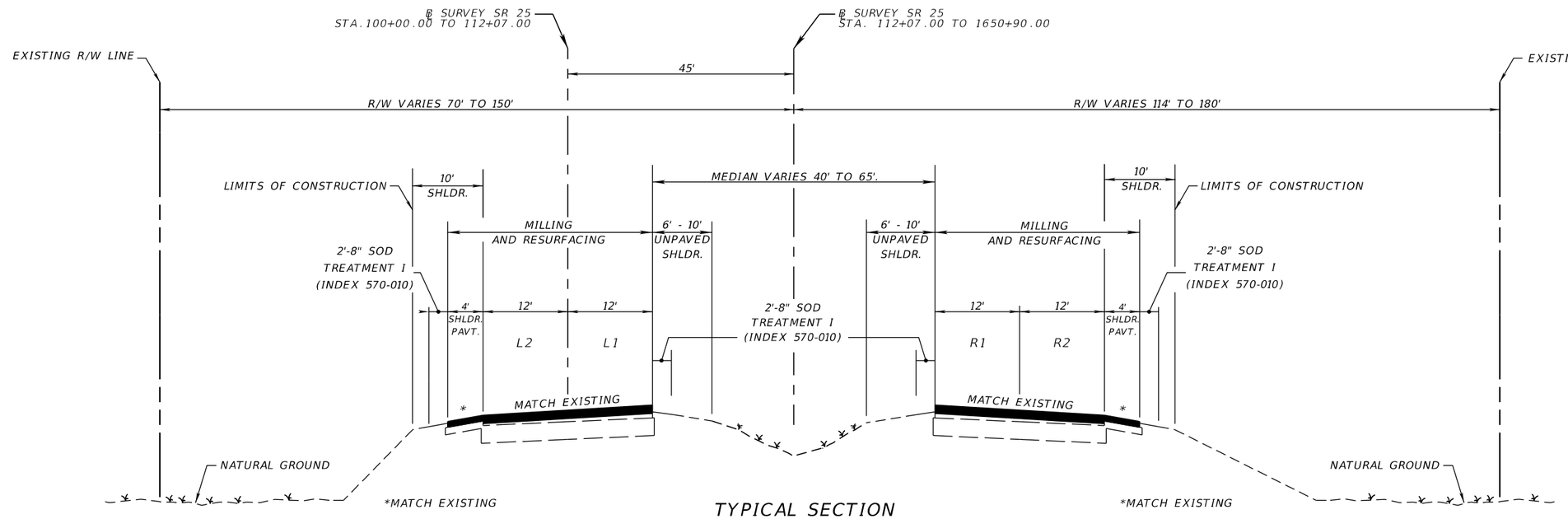
Smith, Dan (2021). *Least Cost Pathways North of the Caloosahatchee River to North of I-4* [Shapefile]. Department of Biology, University of Central Florida.

Swanson, K., Land, D., Kautz, R., & Kawula, R. (2008). Use of Least-Cost Pathways to Identify Key Road Segments for Florida Panther Conservation. *FWC Fish and Wildlife Research Institute Technical Reports, TR-13.*

United States Department of Agriculture's Natural Resource Conservation Services. (n.d.). *Wetlands Reserve Program.* https://www.nrcs.usda.gov/wps/portal/nrcs/detail/fl/home/?cid=nrcs143_008419

Appendix A

Typical Section and Straight Line Diagram



TYPICAL SECTION
SR 25 (US 27)

STA. 100+00.00 TO STA. 269+91.32 BK
STA. 269+94.18 AH TO STA. 419+46.93 BK
STA. 1625+00.00 AH TO STA. 1650+28.15

CONSTANT DEPTH MILLING AND RESURFACING

TRAFFIC DATA

CURRENT YEAR = 2020 AADT = 6900
ESTIMATED OPENING YEAR = 2020 AADT = 6900
ESTIMATED DESIGN YEAR = 2038 AADT = 9100
K = 9.5% D = 61.8% T = 36.1% (24 HOUR)
DESIGN HOUR T = 18.05%
POSTED SPEED = 65 MPH
DESIGN SPEED = 70 MPH

NORTHBOUND MAINLINE, SHOULDERS, TURN LANES

MILLING

MILL EXISTING ASPHALT PAVEMENT FOR DEPTH (2.75")

RESURFACING

TYPE SP STRUCTURAL COURSE (TRAFFIC C) (2") (PG 76-22)
AND FRICTION COURSE FC-5 (TRAFFIC C) (0.75") (PG 76-22)

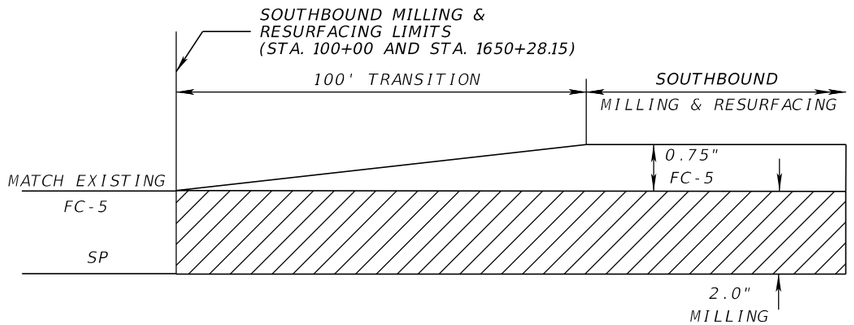
SOUTHBOUND MAINLINE, SHOULDERS, TURN LANES

MILLING

MILL EXISTING ASPHALT PAVEMENT FOR DEPTH (2")

RESURFACING

TYPE SP STRUCTURAL COURSE (TRAFFIC C) (2") (PG 76-22)
AND FRICTION COURSE FC-5 (TRAFFIC C) (0.75") (PG 76-22)



SOUTHBOUND MAINLINE
MILLING & RESURFACING TRANSITION DETAIL

NOT TO SCALE

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD:
KELLIE F. SPURGEON, P.E.
P.E. LICENSE NUMBER 66484
FLORIDA DEPARTMENT OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 25	HIGHLANDS	441519-1-52-01

TYPICAL SECTION

SHEET NO. 5

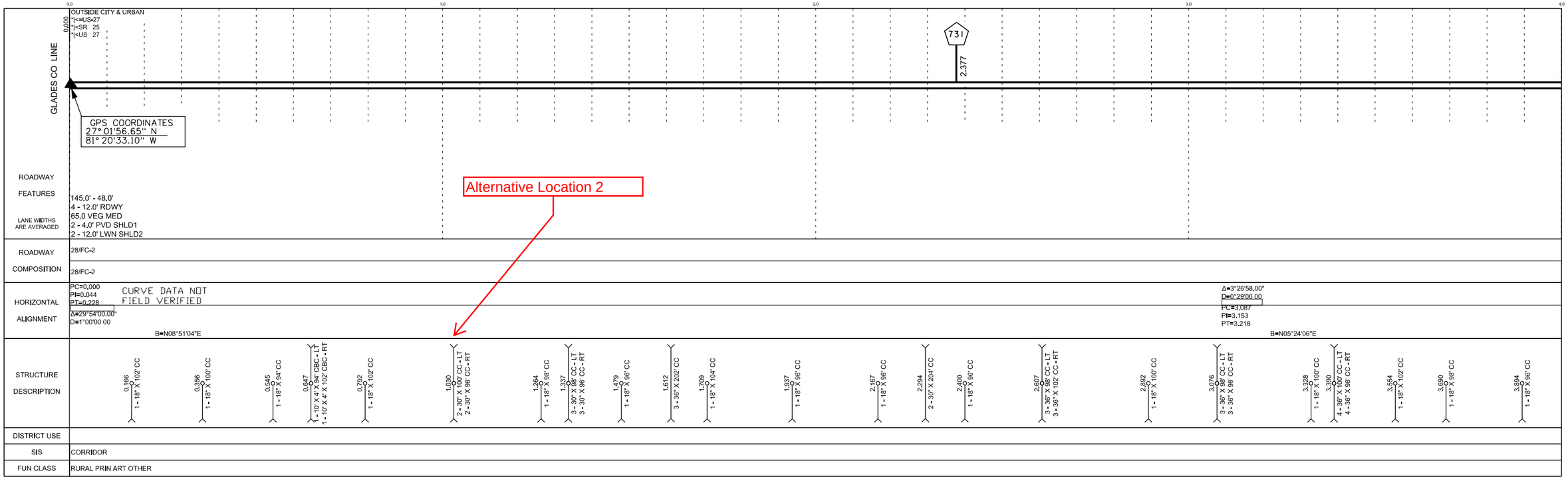
THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

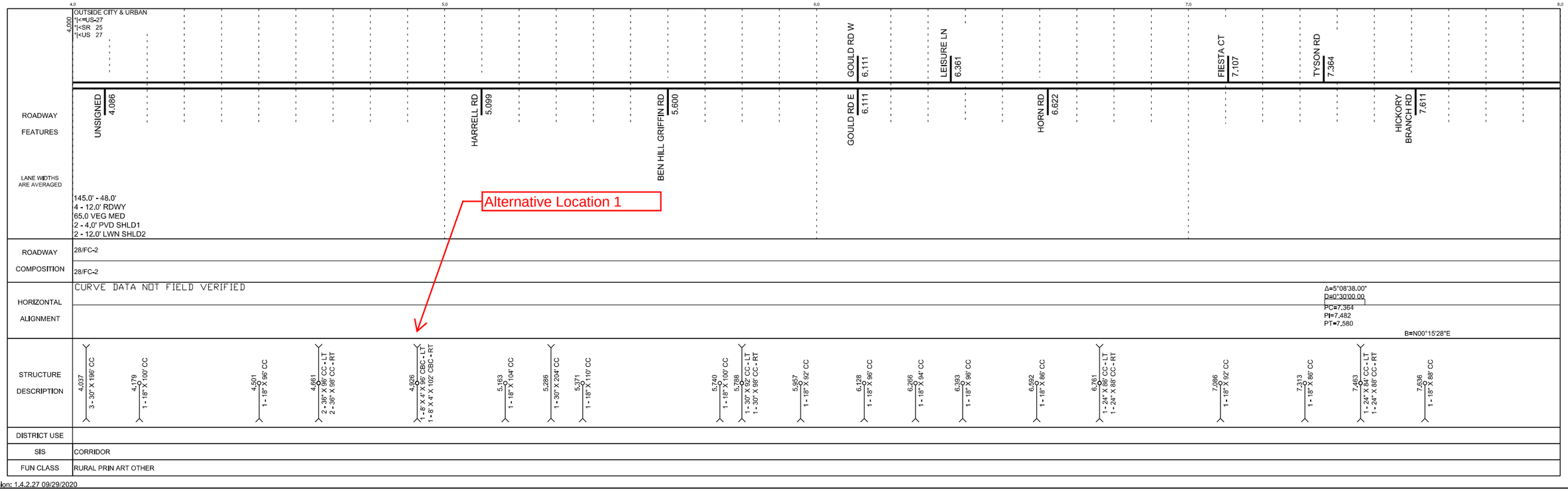
	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	09/22/2020	09/29/2020				
BY	FTE	FTE				

FLORIDA DEPARTMENT OF TRANSPORTATION

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO.
02	US 27	SR 25	HIGHLANDS	01	09010000	1 OF 5





Version: 1.4.2.27 09/29/2020

APPENDIX B

PHOTO PAGES

Photo 1: Alternative Location 1

Canal approaching box culvert from the northwest on the west side of US 27. Photo taken facing northwest.

Photo 2: Alternative Location 1

Existing box culvert on the west side of US 27 facing east.

Photo 3: Alternative Location 1

North facing view on west side of US 27.

Photo 4: Alternative Location 1

South facing view on west side of US 27. The adjacent cattle gate and unpaved driveway/road can be observed to the south of the canal.

Photo 5: Alternative Location 1

Canal approaching box culvert from southeast on the east side of US 27. Photo taken facing southeast.

Photo 6: Alternative Location 1

Existing box culvert on east side of US 27. Photo taken facing north.

Photo 7: Alternative Location 1

North facing view from east side of US 27 at box culvert. Vine-covered right-of-way fencing extends to north.

Photo 8: Alternative Location 1

Photo screenshot from Google Maps on November 19, 2021. Photo is facing southeast on the east side of US 27. Imagery is from April 2018; field reviews verified the landscape is the same as of October 2021.

Photo 9: Alternative Location 2

Double barrel culvert on the west side of US 27. Photo taken facing southeast.

Photo 10: Alternative Location 2

Photo taken standing at the southern edge of head wall facing southwest. A cattle gate to the Peeples Woodrow property is observed.

Photo 11: Alternative Location 2

View from on top of headwall on the west side of US 27 facing south. Overhead utilities are observed.

Photo 12: Alternative Location 2

View of box culvert in relation to adjacent cattle gate on the west side of US 27 facing north.

Photo 13: Alternative Location 2

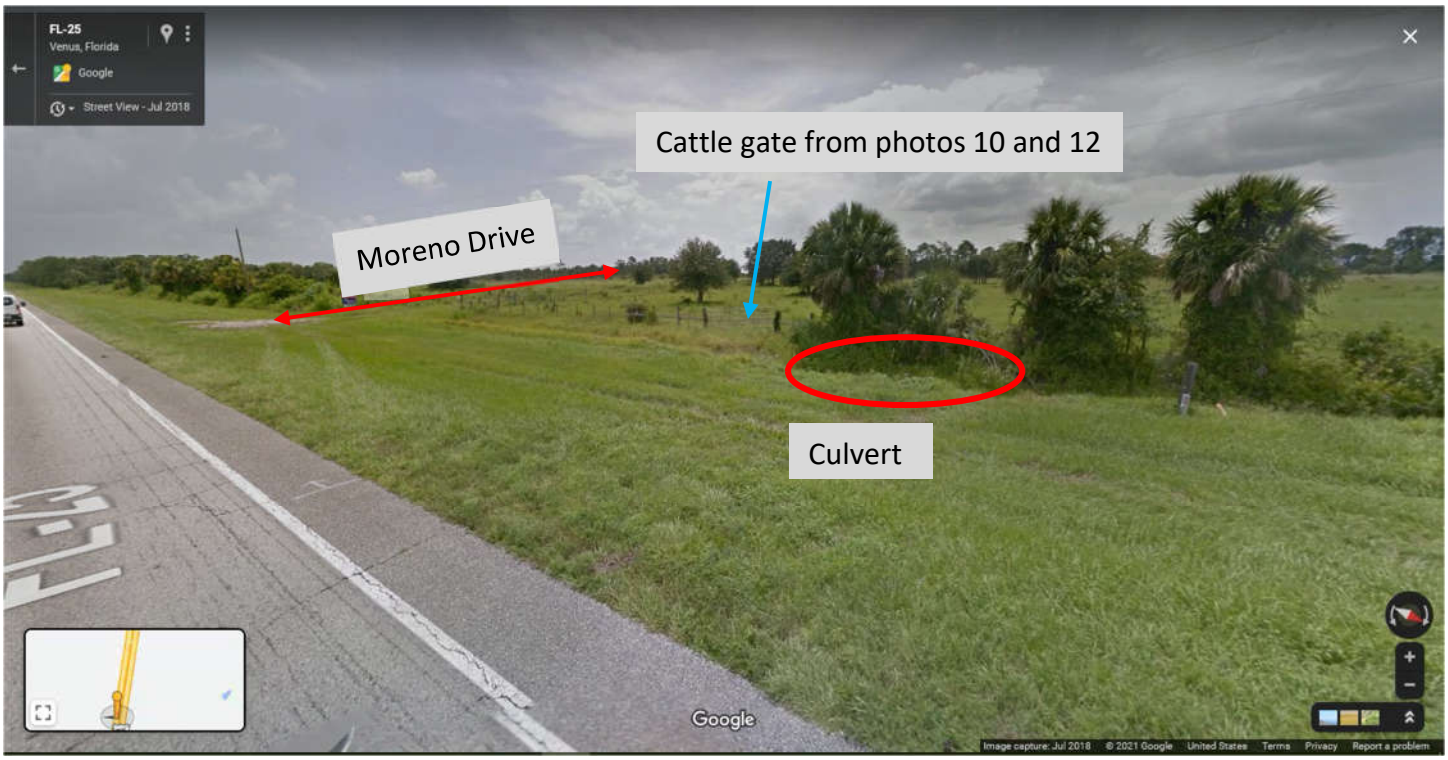


Photo screenshot from Google Maps on November 19, 2021. Photo is facing southwest on the west side of US 27. Imagery is from July 2018; field reviews verified the landscape is mostly the same as of October 2021. The main difference is the presence of mailboxes where Moreno Drive is.

Photo 14: Alternative Location 2

Photo screenshot from Google Maps on November 19, 2021. Photo is facing west on the west side of US 27 showing what is currently Moreno Drive. Imagery is from July 2018; field reviews verified the landscape is mostly the same as of October 2021 including the presence of the cattle gate. The road, however, is a dirt road with no vegetation coverage on it. Additionally, there is a mailbox located on the side of US 27 for 131 Moreno Drive.

Photo 15: Alternative Location 2

View from top of headwall at culvert facing east on the east side of US 27.

Photo 16: Alternative Location 2

View from top of headwall on the east side of US 27 facing northeast.

Photo 17: Alternative Location 2

View from top of headwall facing southeast on east side of US 27.

Photo 18: Alternative Location 2

View of culvert from east side of US 27 on the east side of the right-of-way fencing northwest.

Photo 19: Alternative Location 2

View of canal from east of right-of-way fencing on east side of US 27 facing east in active cattle pasture.

Photo 20: Alternative Location 2

View from east side of US 27 on the east side of right-of-way fencing facing north.

APPENDIX C

Florida Forever Projects

Abstract

The 2021 Florida Forever Five-Year Plan includes a description of each of the 125 land acquisition projects approved by the Acquisition and Restoration Council (ARC). In 2020, ARC approved the following changes to the 2021 list:

- added four new projects
- amended boundaries of 18 project boundaries
- removed four projects from the list

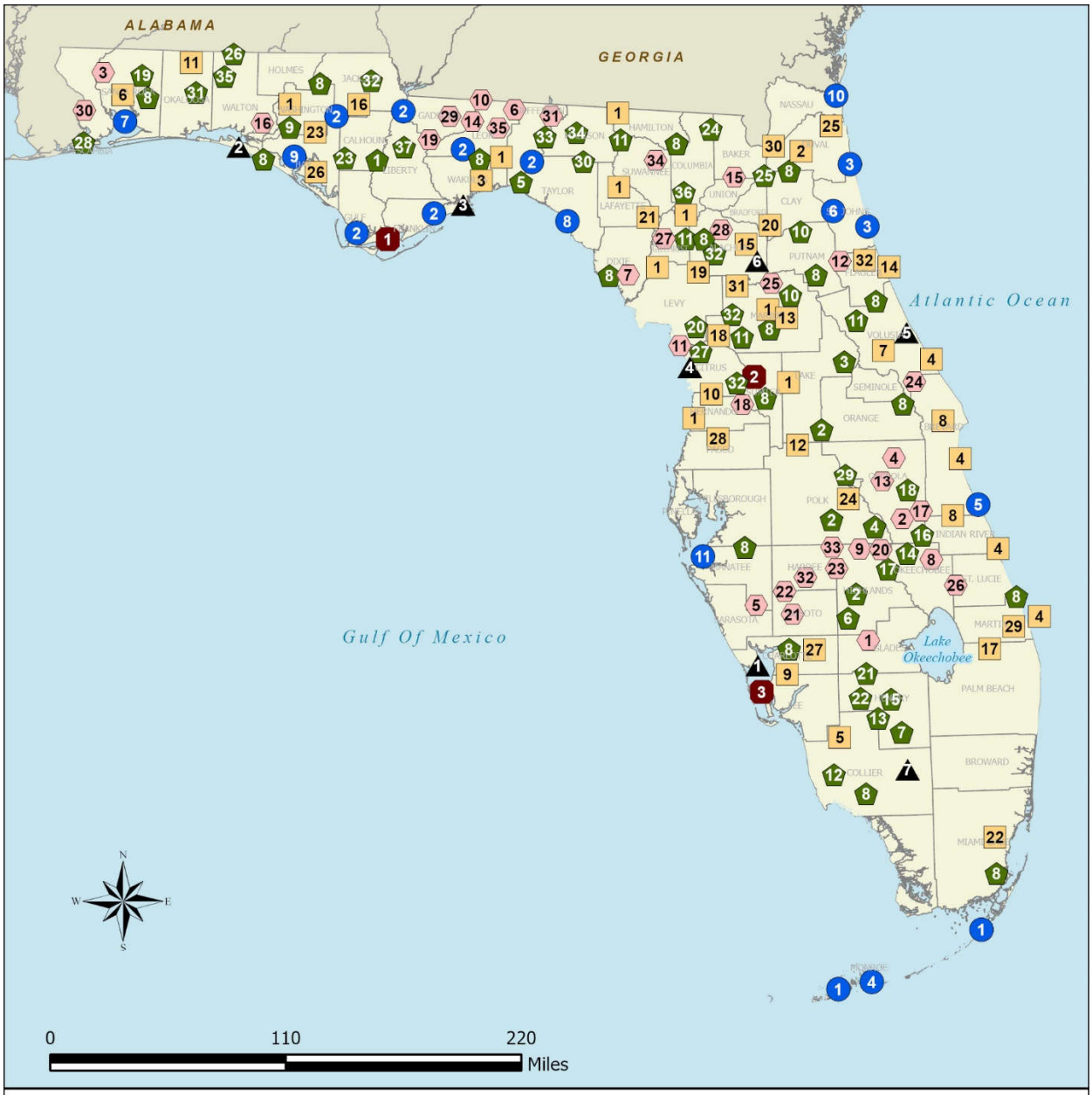
New Projects Added to the List	Acres +/-	County
Bluefield to Cow Creek	10,942	St. Lucie, Okeechobee
Crayfish Habitat Restoration	2,348	Bay
Welannee Watershed Forest	8,370	Okaloosa
Withlacoochee River Corridor	1,714	Citrus

Projects with Boundary Amendments	Acres +/-	County
Annutteliga Hammock	48.30	Hernando
Apalachicola River	347	Gulf
Bombing Range Ridge	-3.47	Polk
Fisheating Creek Ecosystem	6,560	Highlands
Florida Keys Ecosystem	-1.07	Monroe
Florida Springs Coastal Greenway	149	Citrus
Florida's First Magnitude Springs	37.60	Hernando
Hardee Flatwoods	160	Hardee
Kissimmee-St. Johns River Connector	3,656	Okeechobee
Lake Wales Ridge Ecosystem	7,883.63	Highlands, Polk
Middle Chipola River	49.41	Jackson
Natural Bridge Creek	170	Walton
Pinhook Swamp	147.50	Hamilton
St. Johns River Blueway	112	Clay
Strategic Managed Area Lands List	290.50	Hernando, Lake, Palm Beach
Wekiva-Ocala Greenway	179	Seminole, Volusia
Withlacoochee River Corridor	1,645	Citrus, Hernando

The following four projects were removed from the list because they are considered 90% or more complete:

- Caber Coastal Connector (Levy),
- Estero Bay (Lee),
- Tippen Bay Ranch (DeSoto), and
- Upper St. Marks River Corridor (Jefferson, Leon, Wakulla).

Consistent with section 259.032(8), F.S. and rule 18-24.002(2)(b), F.A.C, removing projects from the list does not prevent Florida Forever funds from being used to purchase the remaining acres.



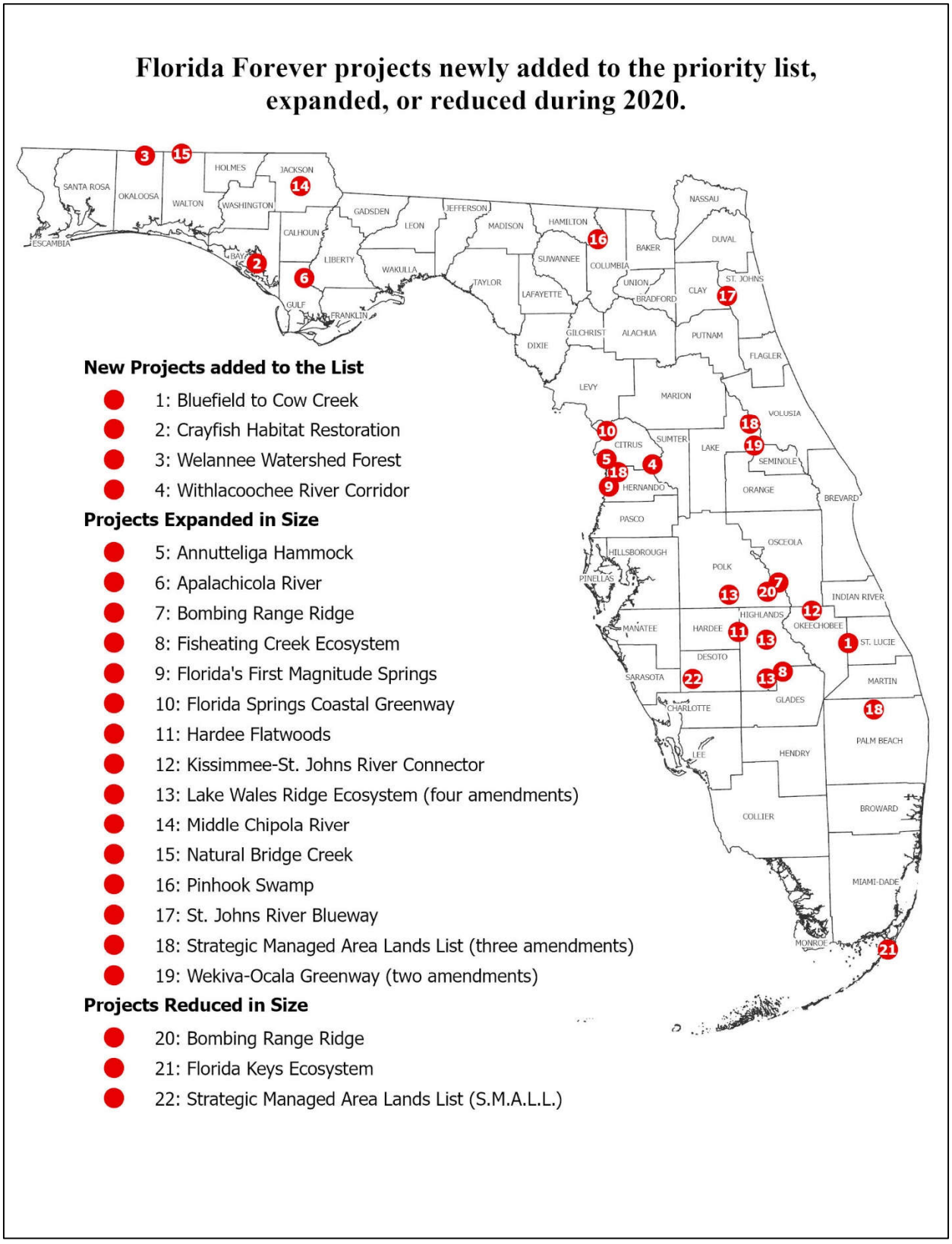
STATEWIDE DISTRIBUTION OF FLORIDA FOREVER LAND ACQUISITION PROJECTS JANUARY 2021

Florida Forever Project Categories

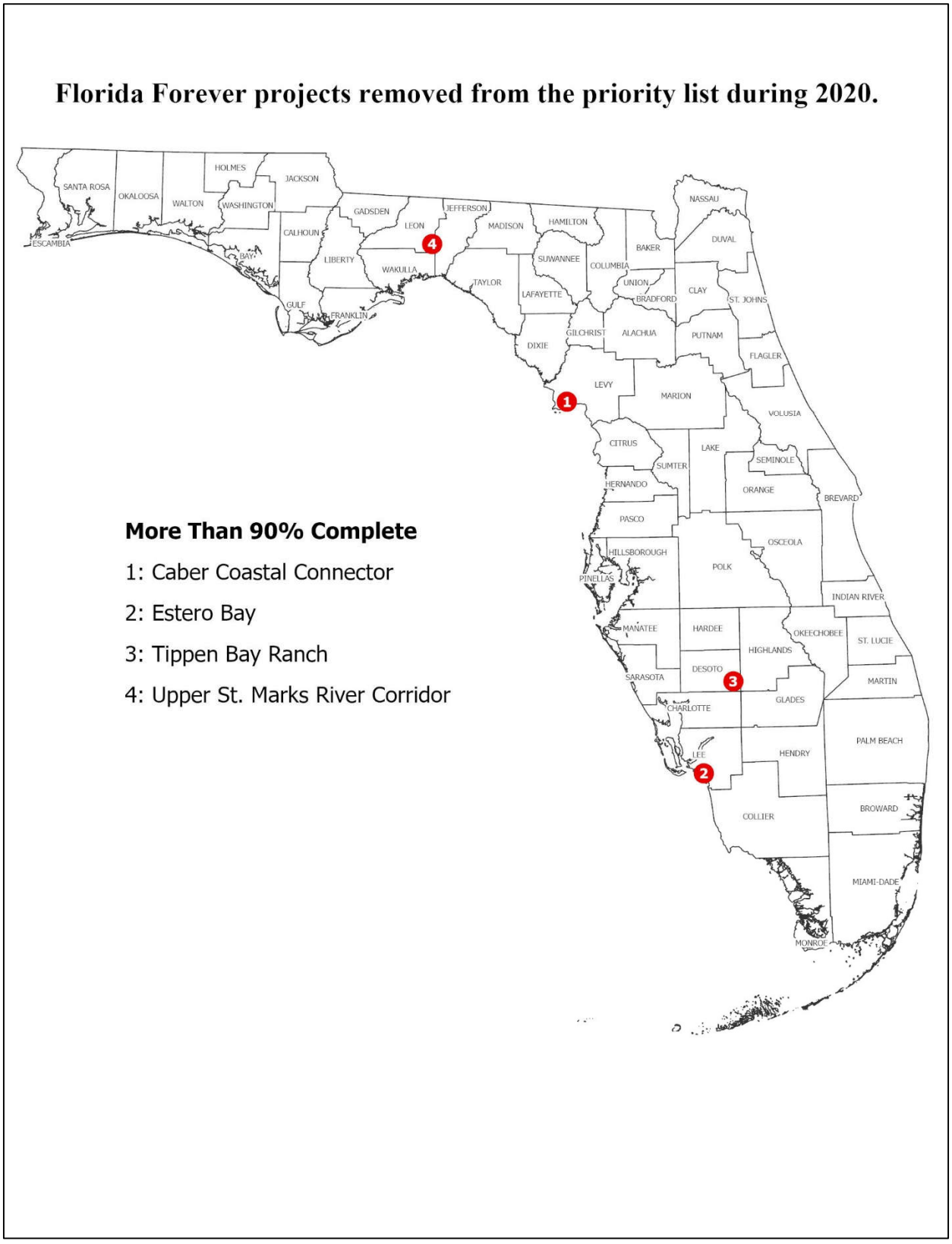
- Climate Change Lands Category
- Critical Historical Resources Category
- Critical Natural Lands Category
- Less-Than-Fee Category
- Partnerships and Regional Incentives Category
- Substantially Complete Category

NOTE: Numerals within the symbols represent the project rank within each category. See priority list for project name and details.

Map 1 Statewide Distribution of Florida Forever Land Acquisition Projects January 2021



Map 2 Florida Forever projects newly added to priority list, expanded, or reduced during 2020



Map 3 Florida Forever projects removed from priority list during 2020

ARC's Recommended 2021 Florida Forever Priority List for Land Acquisition Projects

The 2021 Florida Forever Priority List was adopted by ARC on December 11, 2020 and includes 125 projects. Each project was ranked within one of following six categories: Critical Natural Lands, Partnerships & Regional Incentives, Less-Than-Fee, Climate Change Lands, Substantially Complete and Critical Historical Resources.

Pursuant to section 259.04(1)(c), F.S., "…the board shall approve, in whole or in part, the list of projects in the order of priority in which such projects are presented" [see also s. 259.105(14), F.S.]

Substantially Complete

Rank	Project	County	Remaining Acres	Cumulative Acres	Work Plan Priority
1	Charlotte Harbor Estuary	Charlotte, Lee, Sarasota	5,902	5,902	High
2	South Walton County Ecosystem	Walton	2,657	8,559	High/Medium
3	Dickerson Bay/Bald Point	Franklin, Wakulla	3,077	11,636	Medium
4	Florida Springs Coastal Greenway	Citrus	8,855	20,491	Medium/Low
5	Spruce Creek	Volusia	367	20,858	Low
6	Lochloosa Wildlife	Alachua	4,446	25,304	Low
7	Save Our Everglades	Collier	24	25,328	Low

Critical Historical Resources

Rank	Project	County	Remaining Acres	Cumulative Acres	Work Plan Priority
1	Pierce Mound Complex	Franklin	562	562	High/Medium
2	Battle of Wahoo Swamp	Sumter	853	1,415	Medium/Low
3	Pineland Site Complex	Lee	148	1,563	Low

Climate Change Lands

Rank	Project	County	Remaining Acres	Cumulative Acres	Work Plan Priority
1	Florida Keys Ecosystem	Monroe	5,849	5,849	High
2	St. Joe Timberland	Bay, Franklin, Gadsden, Gulf, Jefferson, Leon, Liberty, Taylor, Wakulla, Walton, Washington	56,276	62,126	High/Medium
3	Northeast Florida Blueway	Duval, Flagler, St. Johns	11,920	74,046	Medium/Low
4	Coupon Bight/Key Deer	Monroe	1,157	75,203	Low
5	Archie Carr Sea Turtle Refuge	Brevard, Indian River	179	75,382	Low
6	St. Johns River Blueway	Clay, St. Johns	17,182	92,565	Low
7	Garcon Ecosystem	Santa Rosa	3,393	95,846	Low
8	Taylor Sweetwater Creek	Taylor	3,742	99,587	Low
9	West Bay Preservation Area	Bay	4,511	104,098	Low
10	Tiger Island/Little Tiger Island	Nassau	1,142	105,240	Low
11	Terra Ceia	Manatee	2,292	107,532	Low

Less-than-Fee

Rank	Project	County	Remaining Acres	Cumulative Acres	Work Plan Priority
1	Fisheating Creek Ecosystem	Glades, Highlands	122,213	122,213	High
2	Adams Ranch	Osceola	5,598	127,811	High
3	Coastal Headwaters Longleaf Forest	Escambia, Santa Rosa	99,544	227,355	High
4	Conlin Lake X	Osceola	3,522	230,878	High
5	Myakka Ranchlands	DeSoto, Manatee, Sarasota	30,573	261,451	High/Medium
6	Red Hills Conservation	Jefferson, Leon	16,951	278,401	Medium
7	Lower Suwannee River and Gulf Watershed	Dixie	30,705	309,106	Medium
8	Kissimmee-St. Johns River Connector	Indian River, Okeechobee	37,930	347,036	Medium
9	Arbuckle Creek Watershed	Highlands	4,172	351,209	Medium
10	Ochlockonee River Conservation Area	Gadsden, Leon	3,881	355,089	Medium
11	Gulf Hammock	Levy	25,611	380,701	Medium
12	Matanzas to Ocala Conservation Corridor	Flagler, Putnam, St. Johns	99,032	479,733	Medium/Low
13	Big Bend Swamp/Holopaw Ranch	Osceola	41,892	521,625	Low
14	Ayavalla Plantation	Leon	6,018	527,643	Low
15	Raiford to Osceola Greenway	Baker, Union	67,702	595,345	Low
16	Seven Runs Creek Final Phase	Walton, Washington	2,826	598,171	Low
17	Ranch Reserve	Brevard, Indian River, Osceola	12,515	610,687	Low
18	Withlacoochee River Corridor	Citrus, Hernando	3,286	613,973	Low
19	Hosford Chapman's Rhododendron Protection Zone	Gadsden, Liberty	6,923	620,896	Low
20	Eastern Scarp Ranchlands	Highlands	2,214	623,111	Low
21	Peace River Refuge	DeSoto	3,804	626,915	Low
22	Horse Creek Ranch	DeSoto, Hardee	16,316	643,231	Low
23	Hardee Flatwoods	Hardee	1,836	645,067	Low
24	Maytown Flatwoods	Brevard	5,021	649,928	Low
25	Mill Creek	Marion	12,293	662,221	Low
26	Bluefield to Cow Creek	Okeechobee, St. Lucie	10,996	673,216	Low
27	North Waccasassa Flats	Gilchrist	14,153	687,369	Low
28	San Felasco Conservation Corridor	Alachua	376	687,745	Low
29	Little River Conservation Area	Gadsden	2,085	689,829	Low
30	Lower Perdido River Buffer	Escambia	2,338	692,168	Low
31	West Aucilla River Buffer	Jefferson	710	692,877	Low
32	Limestone Ranch	Hardee	6,382	699,260	Low
33	Old Town Creek Watershed	Hardee, Polk	1,264	700,524	Low
34	Suwannee County Preservation	Suwannee	1,254	701,778	Low
35	Millstone Plantation	Leon	83	701,861	Low

Partnerships & Regional Incentives

Rank	Project	County	Remaining Acres	Cumulative Acres	Work Plan Priority
1	Florida's First Magnitude Springs	Bay, Citrus, Gilchrist, Hamilton, Hernando, Jackson, Lafayette, Leon, Levy, Madison, Marion, Suwannee, Wakulla, Walton, Washington	6,040	6,040	High
2	Northeast Florida Timberlands and Watershed Reserve	Clay, Duval, Nassau	76,427	82,468	High
3	Wakulla Springs Protection Zone	Leon, Wakulla	3,970	86,438	High
4	Indian River Lagoon Blueway	Brevard, Indian River, Martin, St. Lucie, Volusia	18,257	104,695	High
5	Corkscrew Regional Ecosystem Watershed	Collier, Lee	34,048	138,743	High
6	Clear Creek/Whiting Field	Santa Rosa	2,867	141,609	High
7	Volusia Conservation Corridor	Flagler, Volusia	17,832	159,441	High
8	Brevard Coastal Scrub Ecosystem	Brevard	21,104	180,545	High/Medium
9	Charlotte Harbor Flatwoods	Charlotte, Lee	6,990	187,535	Medium
10	Annutteliga Hammock	Citrus, Hernando	8,789	196,324	Medium
11	Welannee Watershed Forest	Okaloosa	8,321	204,597	Medium
12	Green Swamp	Lake, Pasco, Polk	160,797	365,394	Medium/Low
13	Heather Island/Ocklawaha River	Marion	13,663	379,057	Low
14	Flagler County Blueway	Flagler	3,912	382,969	Low
15	Lochloosa Forest	Alachua	4,693	387,662	Low
16	Middle Chipola River	Calhoun, Jackson	12,353	400,015	Low
17	Pal-Mar	Palm Beach, Martin	9,564	409,531	Low
18	Rainbow River Corridor	Citrus, Marion	1,129	410,660	Low
19	Watermelon Pond	Alachua, Levy	5,862	416,522	Low
20	Lake Santa Fe	Alachua, Bradford	9,619	426,141	Low
21	Lafayette Forest	Lafayette	10,253	436,394	Low
22	Dade County Archipelago	Miami-Dade	304	436,698	Low
23	Sand Mountain	Bay, Washington	14,534	451,232	Low
24	Catfish Creek	Polk	3,231	454,463	Low
25	Pumpkin Hill Creek	Duval	12,344	466,807	Low
26	Crayfish Habitat Restoration	Bay	2,348	469,155	Low
27	Hall Ranch	Charlotte	7,503	476,658	Low
28	Crossbar/Al Bar Ranch	Pasco	12,440	489,098	Low
29	Atlantic Ridge Ecosystem	Martin	8,193	497,291	Low
30	Baldwin Bay/St. Marys River	Duval, Nassau	8,394	505,685	Low
31	Carr Farm/Price's Scrub	Alachua, Marion	305	505,989	Low
32	Pringle Creek Forest	Flagler	8,446	514,435	Low

Critical Natural Lands

Rank	Project	County	Remaining Acres	Cumulative Acres	Work Plan Priority
1	Apalachicola River	Calhoun, Gadsden, Gulf,	48,846	48,846	High
		Jackson, Liberty			
2	Lake Wales Ridge Ecosystem	Highlands, Lake, Osceola, Polk	29,567	78,413	High
3	Wekiva-Ocala Greenway	Lake, Orange, Seminole, Volusia	22,447	100,860	High
4	Bombing Range Ridge	Highlands, Osceola, Polk	29,263	129,944	High
5	Wacissa/Aucilla River Sinks	Jefferson, Taylor	14,908	144,852	High
6	Blue Head Ranch	Highlands	43,051	187,903	High
7	Panther Glades	Hendry	39,382	227,285	High
8	Strategic Managed Area Lands List	Alachua, Bay, Broward, Clay, Collier, Columbia, Dixie, Gadsden, Gilchrist, Hamilton, Hernando, Lafayette, Lake, Levy, Manatee, Miami-Dade, Orange, Palm Beach, Putnam, Santa Rosa, St. Johns, St.Lucie, Taylor, Union, Volusia, Wakulla, Washington	11,099	238,384	High
9	Forest and Lakes Ecosystem	Bay, Washington	54,862	293,246	High/Medium
10	Etoniah/Cross Florida Greenway	Citrus, Clay, Levy, Marion, Putnam	54,367	347,613	Medium
11	Longleaf Pine Ecosystem	Gilchrist, Hamilton, Marion, Volusia	9,687	357,299	Medium
12	Belle Meade	Collier	6,300	363,599	Medium
13	Half Circle L Ranch	Collier, Hendry	11,182	374,780	Medium
14	Triple Diamond	Okeechobee	5,336	380,116	Medium
15	Devil's Garden	Collier, Hendry	55,694	435,810	Medium
16	Pine Island Slough Ecosystem	Osceola	48,973	484,784	Medium
17	Corrigan Ranch	Okeechobee	6,211	490,994	Medium
18	Osceola Pine Savannas	Osceola	27,503	518,497	Medium
19	Wolfe Creek Forest	Santa Rosa	8,687	527,184	Medium
20	South Goethe	Levy, Marion	11,706	538,890	Medium
21	Caloosahatchee Ecoscape	Glades, Hendry	10,643	549,533	Medium
22	Twelvemile Slough	Hendry	8,128	559,873	Medium
23	Bear Creek Forest	Bay, Calhoun, Gulf	97,434	657,307	Medium/Low
24	Pinhook Swamp	Baker, Columbia	53,749	711,056	Low
25	Camp Blanding to Raiford Greenway	Baker, Bradford, Clay, Union	32,283	743,191	Low
26	Natural Bridge Creek	Walton	1,967	745,158	Low
27	Bear Hammock	Marion	4,689	749,847	Low
28	Perdido Pitcher Plant Prairie	Escambia	2,389	752,236	Low
29	Lake Hatchineha Watershed	Osceola, Polk	3,592	755,828	Low
30	San Pedro Bay	Madison, Taylor	44,999	800,827	Low
31	Shoal River Buffer	Okaloosa	2,188	803,015	Low
32	Southeastern Bat Maternity Caves	Alachua, Citrus, Jackson, Marion, Sumter	598	803,612	Low
33	Econfina Timberlands	Jefferson	1,665	805,278	Low
34	Hixtown Swamp	Madison	22,399	827,677	Low
35	Upper Shoal River	Walton	12,035	839,711	Low
36	Ichetucknee Trace	Columbia	1,717	841,428	Low
37	Telogia Creek	Liberty	12,428	853,856	Low

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Introduction

Florida Forever is the state's current blueprint for conserving our natural resources. It replaced the highly successful Preservation 2000, the largest program of its kind in the United States. Preservation 2000 acquired more than 1.78 million acres of land for protection. The Florida Forever Act, implemented in 2000, reinforced Florida's commitment to conserve its natural and cultural heritage, provide urban open space, and better manage the land acquired by the state.

Florida Forever is more than an environmental land acquisition mechanism. It encompasses a wide range of goals including environmental restoration; water resource development and supply; increased public access; public lands management and maintenance; and increased protection of land by acquisition of conservation easements.

The $3 billion investment over the past decade demonstrates Florida's continued commitment to protecting and restoring our vital natural resources. Florida has been at the forefront of the nation's land protection efforts and continues to be the model for other land acquisition programs.

Legislation and Policy

In 1998, Florida voters amended the state constitution by ratifying a constitutional amendment that re-authorized bonds for land acquisition. The 1999 legislature responded with the ten-year $3 billion Florida Forever program to acquire and manage land for conservation. This was extended another 10 years in 2008 for a total of $6 billion.

In 2014 Florida voters amended the state constitution again, ratifying a constitutional amendment that dedicated 33 percent of documentary stamp taxes to finance or refinance acquisition and improvement of land, water areas, and related property interests, including conservation easements, and resources for conservation lands including wetlands, forests, and fish and wildlife habitat; wildlife management areas; lands that protect water resources and drinking water sources, including lands protecting the water quality and quantity of rivers, lakes, streams, springsheds, and lands providing recharge for groundwater and aquifer systems; lands in the Everglades Agricultural Area and the Everglades Protection Area, as defined in Article II, Section 7(b); beaches and shores; outdoor recreation lands, including recreational trails, parks, and urban open space; rural landscapes; working farms and ranches; historic or geologic sites; together with management, restoration of natural systems, and the enhancement of public access or recreational enjoyment of conservation lands.

The ten-member *Acquisition and Restoration Council* makes recommendations about acquisition, management and disposal of state-owned lands. This important advisory group includes private citizen members with backgrounds in scientific disciplines of land, water, or environmental sciences as well as wildlife management, forestry management, and outdoor recreation, in addition to four state agency representatives.

The Governor and Cabinet, as the Board of Trustees of the Internal Improvement Trust Fund, are responsible for acting on ARC's recommendations. The Board also approves the acquisition of each parcel and has ultimate oversight on state lands leases and management plans.

The Department of Environmental Protection's Division of State Lands (DSL) provides primary staff support for the Acquisition and Restoration Council. DSL coordinates Council meetings; prepares agendas and reports; prepares or obtains appraisal maps, title work, appraisals and closing documents for acquisitions; and negotiates land purchases on behalf of the Board of Trustees. The Division also provides staff support for managing all leases, reviewing and approving management plans, and coordinating management review team functions for state-owned lands titled to the Board.

Partnerships

The state's land acquisition programs have a long history of cooperative partnerships with local and national land trusts, water management districts, counties, cities and other local governments, as well as the federal government. The successful acquisition of many state projects is the direct result of these partnerships. Many of the projects on the Florida Forever list have partners.

Results

For decades, Florida has been one of the most successful states in acquiring and conserving critical natural resources and providing lands for public recreation. Since 1963, Florida has invested approximately $8.3 billion to conserve more than 4 million acres of land for environmental, recreational and preservation purposes. This has been accomplished with a number of programs including Environmentally Endangered Lands, Outdoor Recreation, Save Our Coasts, Save Our Rivers, Conservation and Recreation Lands, Preservation 2000 and Florida Forever. Because of Florida Forever and its predecessor programs, residents and visitors have benefited from the protection of land and natural resources, including Florida's abundant flora and fauna.

Accomplishments of Florida Forever

Since its inception in July 2001, the state's Florida Forever land acquisition program provided protection for the following:

- 679,490 acres of strategic habitat conservation areas
- 670,880 acres of rare species habitat conservation areas, including 1,132 sites that are habitats for 507 different rare species, 215 of which are federal- or state-listed as endangered, and 108 federal- or state-listed threatened
- 838,500 acres of ecological greenways
- 164,910 acres of under-represented natural communities
- 619,450 acres landscape-size protection areas
- 486,840 acres of natural floodplains
- 849,550 acres important to significant water bodies
- 492,270 acres minimize damage from flooding
- 10,400 acres of fragile coastline
- 341,250 acres of functional wetlands
- 818,860 acres of significant groundwater recharge areas
- 480 miles of priority recreational trails
- 444,400 acres of sustainable forest land
- 1,170 archaeological/historic sites
- 12,270 acres in urban service areas

These acreages were derived from the updates of the Florida Forever data layers, which are continuously updated by Florida Natural Areas Inventory to reflect the most current scientific analyses of Florida's natural resources. The acreages include properties acquired under the Florida Forever program, as well as donations and acquisitions by other entities with funding from other sources that were within Florida Forever project boundaries. Additionally, the acreages recorded for each measure often overlap, and thus should not be added together. Collectively, under the Florida Forever program more than 869,477 acres of land with a little over $3.2 billion in Florida Forever funds has been protected. Accounting for donations and lands acquired with non-

Florida Forever program funding, the total acreage protected within Florida Forever projects is more than 947,019 acres.

All property within the boundaries of the Florida Forever acquisition projects, unless specifically noted, is proposed to be purchased in fee simple or a lesser interest, for conservation purposes.

The 2021 Florida Forever Priority List of land acquisition projects is consistent with section 187.201(9), F.S., the Natural Systems and Recreational Lands section of the State Comprehensive Plan.

Explanation of Project Information

A comprehensive project evaluation report is approved by ARC for each project as part of the process and vote to be included on the Florida Forever Priority List. These evaluation reports contain extensive resource and planning information compiled from various partner agencies. Also included in the ARC-approved evaluation report is a management prospectus from the recommended land manager (for proposed fee simple projects) that includes a management cost summary. To summarize the pertinent information from the project evaluation reports and track acquisition progress/changes over time, each project description in this plan includes:

- a general overview of significant natural and cultural resources
- the recommended land manager
- the purpose for state acquisition
- whether the project would allow public use
- FNAI element occurrences
- project/parcel acres, acquisition history and boundary modifications
- a management policy statement and summary of anticipated management costs (fee simple) and
- a project map showing project boundaries and essential parcels.

The project acres, acres acquired and acres remaining included with each summary (in at-a-glance or referred to in the text), are based on the initial project proposal and are an approximation. Acres within a project may be refined over time as improved data (ArcGIS) are available and once parcels are acquired. Therefore, acres presented at the beginning of a project summary, may fluctuate slightly throughout the life of a project. Therefore, acreage from this report should be cited as an approximation until such time actual parcels are fully acquired and final acres are determined as part of the official closing process.

Acquisition and Restoration Council

Agency Council Members

Florida Department of Environmental Protection (Chair)

Shawn Hamilton, Deputy Secretary for Land and Recreation
Designee for Secretary, Noah Valenstein

Florida Fish and Wildlife Conservation Commission

Thomas Eason, Ph.D., Assistant Executive Director
Designee for Executive Director, Eric Sutton

Florida Forest Service

Erin Albury, Director

Florida Division of Historical Resources

Tim Parsons, Ph.D., RPA, Director
B. Calvin Jones Center for Archeology

Agency Appointee Council Members

Lynetta Usher Griner, ARC Vice Chair (Florida Forest Service)
Griner Usher Land and Timber, Inc., Chiefland, Florida

Bill Palmer, Ph. D., President (Fish and Wildlife Conservation Commission)
Tall Timbers Research Station and Land Conservancy, Tallahassee, Florida

Gubernatorial Appointee Council Members

Elva Peppers, President
Florida Environmental and Land Services, Inc., Tallahassee, Florida

Gubernational Appointee - Vacant (2)
Scientific Disciplines related to Land, Water, Environmental Sciences

Gubernatorial Appointee - Vacant (1)
Experience in Managing Lands for Active and Passive Types of Recreation

ARC Staff Director

Shauna Allen

2021 Florida Forever Five-Year Plan

Fisheating Creek Ecosystem

Summary of Recommendations and Status
as of
December 2020

Division of State Lands
Florida Department of Environmental Protection

Fisheating Creek Ecosystem

Less-Than-Fee Project
Glades, Highlands

Project-at-a-Glance

Year Added to Priority List	2000
Project Acres	190,739
Acquired Acres	68,526
Cost of Acquired Acres	$55,628,563
Remaining Project Acres	122,213
2019 Assessed Value of Remaining Acres	$552,944,200

Purpose for State Acquisition

Fisheating Creek, the only undammed tributary to Lake Okeechobee, flows through vast prairies and flatwoods primarily owned by Lykes Brothers, Inc. The Fisheating Creek Ecosystem project will acquire both less-than-fee and fee-simple property to help preserve this natural land, which links the Okaloacoochee Slough, Big Cypress Swamp, Babcock-Webb Wildlife Management Area, and Lake Okeechobee. This project will also help to ensure the survival of the Florida panther, swallow-tailed kite, other plants and animals that require such natural lands. It may also help complete the Florida National Scenic Trail, a statewide non-motorized trail that crosses a number of Florida Forever project sites.

Manager(s)

Florida Wildlife Conservation Commission (FWC) will monitor conservation easements and manage the fee-simple acquisitions unless otherwise noted.

General Description

Natural communities in the project area include dry prairies and flatwoods interrupted by numerous freshwater marshes of various kinds, including seepage slopes, wet prairies, and depression marshes. Diverse prairie hammocks occur east of U.S. 27. Hydric hammocks,

bottomland forests, and floodplain swamp along Fisheating Creek make up most of the remainder of the natural communities. Large areas of the project are improved pasture, former and current eucalyptus plantations, or current pine plantations. Invasive exotic plants are largely confined to the Hoover Dike system around Lake Okeechobee.

As one of the largest fairly natural areas in the Florida peninsula, with a strategic position between several other natural areas, the project is important for the protection of rare plants and animals. The area includes large populations of three plants endemic to central Florida: Edison's ascyrum, cutthroat grass, and nodding pinweed. The proposal is extremely important as a Strategic Habitat Conservation Area for the Florida panther and the American swallow-tailed kite, as well for such animals as Audubon's crested caracara, snail kite, Florida grasshopper sparrow, Florida sandhill crane, mottled duck, red-cockaded woodpecker, and short-tailed hawk. At least six bald eagle nests are known to be in this project.

The water quality of Fisheating Creek and Gator Slough is good, but agricultural runoff has impaired the water quality of canals in the project.

The project area includes at least 31 archaeological sites, many associated with the important Fort Center Site Complex of the Belle Glades culture (500 B.C. to A.D. 1700). More recent sites are also known, and there could be many more in the project. The Fort Center Complex offers an opportunity for an interpretive center.

FNAI Element Occurrence Summary

FNAI Elements	Score
Florida panther	G5T1/S1
Swallow-tailed kite	G5/S2
Florida scrub-jay	G2?/S2
Red-cockaded woodpecker	G3/S2
Eastern indigo snake	G3/S2?
Gopher tortoise	G3/S3
Florida black bear	G5T4/S4
perforate reindeer lichen	G1/S1
wedge-leaved button-snakeroot	G1/S1
Carter's warea	G1/S1
Edison's ascyrum	G2/S2
Florida blazing star	G2/S2

37 rare species are associated with the project

Public Use

This project is designated as a wildlife management area, with uses such as hunting, hiking, and wildlife observation. Public use in easement areas will depend on agreements with the

landowner, but the project could support such activities as hiking, horseback riding, hunting, fishing, and canoeing.

Acquisition Planning

1999

On May 6, 1999, the LAMAC added the Fisheating Creek Ecosystem project, in Glades and Highlands counties, to the CARL Priority list. This less-than-fee acquisition, sponsored by The Nature Conservancy (TNC), consisted of approximately 168,360 acres, a single owner, Lykes Bros. Inc., and a 1999 taxable value of $22,297,408.

On May 25, 1999, the BOT approved a settlement agreement with Lykes Bros. Inc. on the case of Board of Trustees of the Internal Improvement Trust Fund v. Lykes Bros. Inc. The settlement agreement was contingent upon, among other things, a multiple-phase, and combined less-than-fee acquisition.

2000

On December 12, 2000, the Acquisition and Restoration Council (ARC) approved a less-than-fee addition, in Glades County, to the project boundary. This addition, also known as the Venus Ranch, sponsored by TNC, consisted of approximately 8,400 acres with a single owner at a 1999 taxable value of $667,863. The Fisheating Creek project was also moved to Group A of the Florida Forever (FF) Priority list. This easement was acquired by the BOT in 2003.

2002

On August 15, 2002, ARC approved an addition, seized by law enforcement in Glades County, to the project boundary. The .46-acre Lucky Whidden parcel was sponsored by the Division of State Lands (DSL) and FWC. It had a 2001 taxable value of $4,000.

2004

On June 16, 2004, ARC approved a fee-simple addition to the project boundary in Glades County. The addition, sponsored by the two owners and known as Journigan Place, consisted of 115.4 acres and a 2003 taxable value of $207,692.

2011

On December 9, 2011, ARC placed this project in the Less-than-Fee list of Florida Forever projects.

2015

On June 19, 2015, ARC voted to add a new project proposal, Chaparral Slough, a 6,859-acre corridor, about 11 miles long and one mile wide. It runs along Chaparral Slough, a tributary to Cypress Branch, to the Florida Forever list. The ARC then immediately added this new project boundary into the boundary of the existing Fisheating Creek Florida Forever project. Chaparral Slough was originally proposed by Lykes Brothers as a standalone less-than-fee project to provide habitat, an ecological greenway, and aquifer recharge. The land has been used for cattle ranching, silviculture and hunting. It includes 1,919 acres of pine plantation and a 669-acre eucalyptus plantation that is harvested and replanted several times a year.

2020

On June 12, 2020, the ARC approved the Buck Island Ranch addition of 6,560-acres in Highlands County to the project boundary.

Coordination

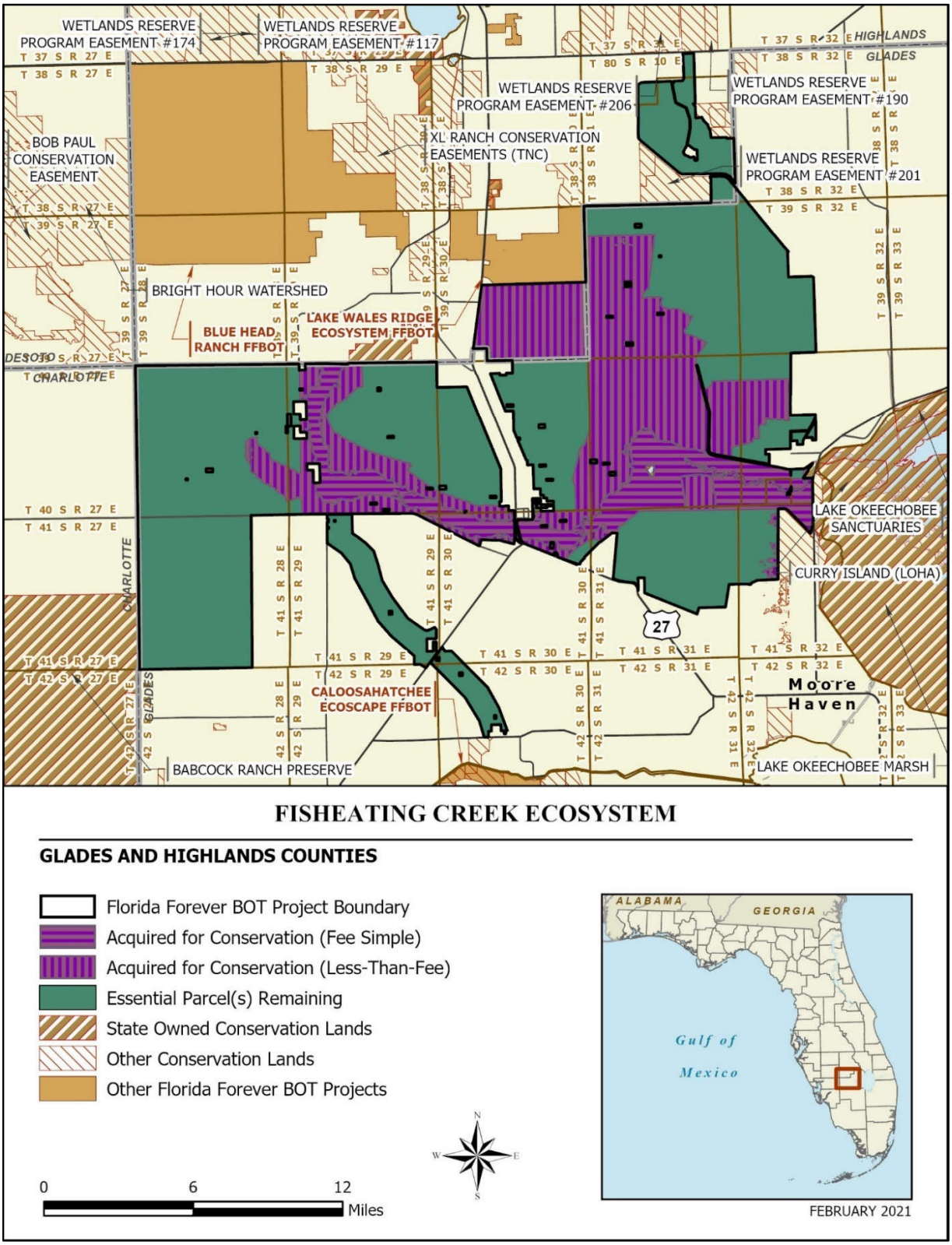
TNC is considered an acquisition partner and there may be some potential for joint acquisition with the South Florida Water Management District.

Management Policy Statement

The primary objectives of the acquisition of the Fisheating Creek project are to conserve and protect natural communities along the shores of Fisheating Creek, and thereby assist in maintaining and possibly improving the status of several rare plant and animal communities. Achieving this objective will help to secure the survival of the Florida panther in this state, as well as protect many other rare and endangered animals and a number of migratory bird species and provide for traditional public uses and recreational activities within sovereignty submerged lands and fee lands as specified in the Settlement Agreement.

Management Prospectus

Pursuant to the Settlement Agreement the BOT will lease the sovereignty submerged lands and the fee lands to the FWC, which was designated as the managing agency for sovereignty submerged lands and fee lands, and as the Easement Monitor over the conservation easements at this site. The sovereignty submerged lands and the fee lands will be managed as the Fisheating Creek Wildlife Management Area. The Settlement Agreement outlining specific management guidelines is on file with the Office of Environmental Services.



Map 1 : FNAI, January 2021

Hendrie Ranch

Less-than-Fee

Florida Forever Project Evaluation Report

Highlands County

prepared by

Division of State Lands Staff

Acquisition and Restoration Council Liaison Staff

and

Florida Natural Areas Inventory

DRAFT for June 12, 2020 ARC meeting

Proposed Land Manager	Landowner (DSL monitors)
Acres	7,229
Just Value	$2,438,653
Application Date	October 31, 2019
Sponsor	J&J Hendrie and J&D Hendrie LC

Executive Summary

The Hendrie Ranch less-than-fee proposal is in Highlands County located on both sides of U.S. Hwy 27, 3.5 miles north of the Glades County line. Calculated in GIS, the acreage total is 7,229 (7,242 acres according to the county property cards) and has a just value of $2.4 million. This proposal was sponsored by Derek Hendrie, manager of Hendrie Ranch.

The addition of Hendrie Ranch would create linkage for 125,000-acre contiguous expanse of conservations lands. It would increase the amount of protected area and connectivity between established conservation lands in the greater landscape. Several of the environmental analyses note that this area has long been viewed as a vital link to regional conservation efforts.

The land would be managed by the landowner and the conservation easement would be periodically monitored by the Division of State Lands.

Hendrie Ranch is bordered by Archbold Biological Station to the northwest, and from there to the 53,000-acre contiguous conservation landscape that includes Archbold, the McJunkin Tract of the state's Lake Wales Ridge (LWR) Wildlife and Environmental Area, the XL Ranch easement, and a series of Wetland Reserve Program (WRP) easements along Fisheating Creek including the Bluehead, Westby and Carlton ranches. The Stokes USDA WRP easement of 1,532 acres lies to the west. The Lott WRP easement for 1,161 acres lies to the northeast. And a nearly four-mile common boundary with lands owned and managed by the Smoak family to the south, a Florida Forever conservation easement of 8,434 acres. There are nearly two miles of common boundary with protected easement property owned by Lykes, combined with the state lands along Fisheating Creek, representing a conservation area of 59,976 acres.

The entire Hendrie Ranch proposal is 100 percent rare species habitat. Almost 90 percent of the proposal lies within a designated FWC Strategic Habitat Conservation Area. This property provides good quality habitat for Florida panthers and Florida black bears, both documented on site. Panther movement north of the Caloosahatchee would benefit from Hendrie Ranch being placed in perpetual conservation as proposed. The area supports a small population of scrubjays. Burrowing owls and gopher tortoises have been observed on the property. Resource analyses included in this report record many more species of note onsite.

Hendrie Ranch is near the southern terminus of the LWR. Almost 70 percent of the site is still in natural communities. Mesic flatwoods (1,840 acres) are the most prevalent. Baygall covers 1,401 acres. The Hendrie Ranch's almost 1,300 acres of scrub and scrubby flatwoods harbor "a rich complement of rare and endangered plants and animals characteristic of the southern Lake Wales Ridge". On this site, and the Smoak property to the south, are the only remaining intact scrubs on south LWR. Depression marsh communities (276 acres) are spread through Hendrie Ranch. The hydric hammock on the property (153 acres) appears to have a well-developed canopy of cabbage palm, sweetbay, and red bay. There are a few

dome swamps and also three seepage streams on the property, two emanating from the ridge portion of the property and a third from a contiguous holding pond.

Hendrie Ranch is 30 percent improved pasture, with less than four percent of the proposal improved for roads, woodland pasture, artificial ponds, cattle ponds, and ranching structures. A total of 600 head of beef cattle use the eastern half of the property. Old world climbing fern was seen in many places here, and, smutgrass is problematic in much of the pasture. Feral hogs are present on the property.

A habitat management program that incorporates routine prescribed fire, particularly within the native habitat on Hendrie Ranch, will improve and maintain conditions in native habitat and benefit many imperiled wildlife species. Hendrie Ranch lies within a landscape that is increasingly under pressure from expansion of nearby cities and developments, and protection of intact private lands such as Hendrie Ranch is important to the long-term persistence of wildlife in this region.

If ARC approves this land for inclusion in the 2021Florida Forever priority list, it is ideal for adding to the boundary of the LWR Florida Forever project. It should be designated essential for the Florida Forever program.

Purpose for Acquisition

Hendrie Ranch is proposed for the following public purposes:

(a) Enhance the coordination and completion of land acquisition projects;
(b) Increase the protection of Florida's biodiversity at the species, natural community, and landscape levels;
(c) Protect, restore, and maintain the quality and natural functions of land, water, and wetland systems of the state;
(d) Ensure that sufficient quantities of water are available to meet the current and future needs of natural systems and the citizens of the state; and
(g) Increase the amount of forest land available for sustainable management of natural resources.

Location and Proximity to Other Managed Areas

Hendrie Ranch proposal in Highlands county comprises 7,242 acres (per application) and is calculated using GIS as 7,229 acres. The site is being offered for less-than-fee simple sale to the state. Approximately 22% of the property lies west of U.S. Highway 27. Hendrie Ranch is the best remaining link between a complex of conservation lands that extend generally northwest and south/southeast of the property. Adjacent conservation lands include Fisheating Creek/Smoak Groves Conservation Easement (CE), Fisheating Creek/Lykes Brothers CE, and Archbold Biological Station. Several Wetlands Reserve Program easements also border the property on the west and the eastern boundary. The ranch has long been viewed as a vital piece linking regional conservation efforts.

Resource Description (By FNAI and FWC)

Florida Natural Areas Inventory (FNAI)

A field survey was conducted on February 18, 2020, by FNAI staff Dan Hipes and Katy NeSmith, along with the Acquisition and Restoration Council (ARC) liaison staff. The western half of Hendrie Ranch is within the Carlton Ranch Ridge of the Southwestern Flatwoods District while the eastern half lies within the District's De Soto Slope, sloping from 100 feet in elevation at the ridge's edge to 40 feet on the eastern boundary (Brooks 1981). The proposal is situated near the southern end of the LWR and covers a broad area of scrub and scrubby flatwoods, and improved pasture on the ridge. Continuing east, the topography initially drops dramatically off the ridge through baygall and seepage stream communities and then more gradually through a mosaic of wet/mesic flatwoods and hydric hammock, culminating in a large baygall (over 900 acres) and improved pasture along the eastern boundary. Small depression marshes are scattered throughout the property.

The higher elevations are underlain by thick sandy soils, primarily of the Archbold, Basinger and Satellite soil series. Poorly drained Basinger, St. Johns, and Placid soils and Kaliga, Hicoria and Hontoon muck soils

are predominate off the ridge in the flatwoods and baygall areas of the site. The northeast portion of the property, currently in improved pasture, is underlain primarily by Basinger fine sand and Immokalee sand and was likely dry prairie historically.

While the ranch is a working cattle ranch with approximately 600 beef cows and 2,175 acres (30%) of improved pasture, approximately 69 percent is in varying degrees of natural condition. Dominant natural communities are mesic/wet flatwoods (25%), baygall (19%) and scrub/scrubby flatwoods (18%). Widely scattered depression marshes and small pockets of hydric hammock and dome swamp make up the remaining area (<7%). Improved pasture is more prevalent on the western ridge portion of the ranch and on the far eastern boundary. Unimproved roads, ranching structures, cattle ponds and artificial ponds, and areas of woodland pasture make up <4% of the non-natural acreage on the ranch. The structures are primarily located on the western half of the property.

Flatwoods on the property are mostly down slope from the ridge although small, more linear, stretches can be found bordering baygall and seepage streams on the ridge. Cutthroatgrass (Coleataenia abscissa) is State-listed Endangered and endemic to south-central Florida. On Hendrie Ranch there are several areas of cutthroatgrass-dominated wet flatwoods that appear park-like in that South Florida slash pine (Pinus elliottii var. densa) forms a canopy over a dense grassy understory with few shrubs or mid-story vegetation. These are generally areas that have been burned frequently. Less frequently burned flatwoods have a scattered subcanopy of loblolly bay (Gordonia lasianthus), laurel oak (Quercus laurifolia), and cabbage palm (Sabal palmetto) and a tall shrub layer of saw palmetto (Serenoa repens), southern bayberry (Morella cerifera), fetterbush (Lyonia lucida), gallberry (Ilex glabra), and winged sumac (Rhus copallinum). Herbaceous cover is generally sparse in less frequently burned areas. Noted epiphytes include common wild-pine (Tillandsia fasciculata) and spreading airplant (Tillandsia utriculata), both of which are State-listed as Endangered. Old World climbing fern (Lygodium microphyllum), Florida Exotic Pest Plant Council (FLEPPC) Category I, is common. Brazilian pepper (Schinus terebinthifolia), also FLEPPC Category I, is occasional.

The mesic flatwoods visited during the field assessment has an open canopy of South Florida slash pine, including some old flattop trees. The occasional cabbage palm can be found in the subcanopy. The recently burned site has a low, 2-3ft, diverse shrub layer that includes dwarf huckleberry (Gaylussacia dumosa), gallberry (Ilex glabra), coastalplain staggerbush (Lyonia fruticosa), fetterbush, few small sand pine (Pinus clausa), saw palmetto, shiny blueberry (Vaccinium myrsinites), and hog plum (Ximenia americana). The groundcover includes purple bluestem (Andropogon glomeratus var. glaucopsis), broomsedge bluestem (Andropogon virginicus), bottlebrush threeawn (Aristida spiciformes), wiregrass (Aristida stricta), netted pawpaw (Asimina reticulata), cutthroatgrass, witchgrass (Dichanthelium sp.), tall elephantsfoot (Elephantopus elatus), blackroot (Pterocaulon pycnostachyum), creeping little bluestem (Schizachyrium stoloniferum), whitetop aster (Sericocarpus tortifolius), knotroot foxtail (Setaria parviflora), sweet

goldenrod (Solidago odora), yellow hatpins (Syngonanthus flavidulus), and Adam's needle (Yucca filamentosa). Some bahiagrass (Paspalum notatum) is present. Cattle are allowed in the 'lower' eastern half of the property but are kept at low densities at 60/1000 acres according to Derek Hendrie.

Small, linear baygall occurs in association with seepage areas on the ridge and 'spill' over into larger areas down slope and eastward. Hendrie Ranch has a large, over 900-acre baygall in the eastern quarter of the property. The head or northern third is outside the Hendrie boundary to the north and west and has mostly been converted to pasture, severing the connection with the source seepage wetlands coming off the ridge (themselves compromised by citrus). This baygall was not accessible during the field assessment, however aerial photography indicates a very heavy infestation of Old World climbing fern. A dense baygall visited near the ridge was dominated by red bay (Acer rubrum), loblolly bay (Gordonia lasianthus), and sweetbay (Magnolia virginiana); coastalplain willow (Salix caroliniana), muscadine (Vitis rotundifolia) and Old-World climbing fern were also present.

The scrub and scrubby flatwoods communities (almost 1,300 acres) on Hendrie Ranch harbor a rich complement of rare and endangered plants and animal characteristic of the southern LWR. They range in size from an acre to over 300 acres. The smaller scrub/scrubby flatwoods are mostly islands in a matrix of improved pasture; the large blocks are more contiguous, divided by seepage areas, and form the high ridge edge. These, and those on the Smoak property to the south, are the only remaining intact scrubs on the southern end of the LWR. The scrubs vary in the density of scrub oaks and the amount of sand pine and open sandy patches and generally grade into scrubby flatwoods. Several large areas are dominated by Florida rosemary (Ceratiola ericoides), which retain openings long after fire. Several rare plants, endemic to the LWR, are present in the scrub on Hendrie Ranch. These include wedge-leaved button-snakeroot (Eryngium cuneifolium; only known from Highlands County), Highlands Scrub hypericum (Hypericum cumulicola), paper nailwort (Paronychia chartacea), Florida jointweed (Polygonella basiramia), and scrub plum (Prunus geniculata).

In the oak-dominated scrubby areas sand pine is present to varying degrees as young seedlings to 20-30' trees. The shrub layer includes rusty staggerbush (Lyonia ferruginea), coastalplain staggerbush (Lyonia fruticosa), Chapman's oak (Quercus chapmanii), sand live oak (Quercus geminata), scrub oak (Quercus inopina), scrub palmetto (Sabal etonia), saw palmetto (Serenoa repens), and hog plum (Ximenia americana). Herbaceous and ground cover species include the rare nodding pinweed (Lechea cernua), Feay's palafox (Palafoxia feayi), bracken fern (Pteridium aquilinum), and lichens Evans' reindeer lichen (Cladina evansii) and cup lichen (Cladonia leporina). Abundant oak leaf litter is present in dense portions of the infrequently burned scrub.

Scrubby flatwoods on the site have scattered South Florida slash pine, few sand pine, and generally more saw palmetto than scrub. A low to 4-6' shrub layer shares many, although not all, of the same species with

scrub. These include tarflower (Bejaria racemosa), rusty staggerbush, coastalplain staggerbush, fetterbush, Chapman's oak, sand live oak, scrub oak, dwarf live oak (Quercus minima), tough bully (Sideroxylon tenax), sparkleberry (Vaccinium arboreum), shiny blueberry, and hog plum. The groundcover includes wiregrass, witchgrass, sensitive briar (Mimosa quadrivalvis), and pricklypear (Opuntia humifusa). Open sandy patches have Evans' reindeer lichen and cup lichen. Particularly dense areas have little to no herbaceous component and abundant oak leaf litter.

Depression marsh communities are spread throughout the ranch and of those seen include natural marshes dominated by maidencane (Panicum hemitomon) in shallower portions and pickerelweed (Pontederia cordata) in deeper portions of the marsh. Marshes that are more impacted by improved pasture and cattle are dominated by soft rush (Juncus effusus ssp. solutus). The rare, endemic, St. John's-wort, Edison's ascyrum (Hypericum edisonianum) is found near the eastern boundary on a ruderal berm adjacent to a drainage ditch and is also suspected to occur in more natural settings on the ranch near baygall and depression marsh communities.

Hydric hammock was only viewed peripherally but appears to have a well-developed canopy of cabbage palm, red bay, and sweetbay. The toothed midsorus fern (Telmatoblechnum serrulatum) is common in the understory.

Only a few small dome swamps were identified on the ranch. Swamp tupelo (Nyssa biflora) seems to be a dominant canopy tree with red maple and sweetbay making up the subcanopy. Shrubby southern bayberry and sawgrass (Cladium jamaicense) was also noted.

Two seepage streams appear to originate on the ridge portion of Hendrie Ranch and a third, at the north boundary, from a dug out holding pond just off site. These clear running seepage areas are bordered mostly by narrow bands of baygall on the ridge. Going east down slope from the ridge the surrounding vegetation spreads out into wider baygalls and flatwoods dominated by cutthroatgrass. Extensive invasion of Old-World climbing fern is present in these drainages.

Improved pasture makes up 30% of the property and consists of pasture grasses. Bahiagrass is used most commonly but the ranch also uses limpograss (Hemarthria altissima), Jiggs grass (a variety of bermudagrass (Cynodon dactylon), and pangolagrass (Digitaria eriantha). Smutgrass (Sporobolus indicus), an invasive bunch grass, is problematic in many if not most of the pastures. Tropical soda apple (Solanum viarum; FLEPPC Category I) is scattered around and one large clump of elephant ear (Xanthosoma sagittifolium; FLEPPC Category II) was observed. Clumps of South Florida slash pine, live oaks, and saw palmetto, are scattered around large pasture areas. Larger loose clumps that have a pasture grass understory were delineated as woodland pasture.

Ruderal areas, including ditches and along roadsides are weedier and have additional invasive species including Peruvian primrosewillow (Ludwigia peruviana), Natal grass (Melinis repens), and Caesar's weed (Urena lobata), all FLEPPC Category I species.

The following table lists, in approximate order of estimated areal extent, natural communities and other land cover types within the site's boundaries.

Natural communities and landcover types within Florida Forever proposal

Community or Landcover	Acres	Percent of Proposal
mesic/wet flatwoods	1840	25
Baygall	1401	19
Scrub/scrubby flatwoods	1286	18
Depression marsh	276	4
Hydric hammock	153	2
Dome swamp	10	<1
Improved pasture	2,175	30
Roads	24	<1
Developed (ranching structures)	21	<1
Woodland pasture	21	<1
Artificial ponds and cattle ponds	22	<1
Total	7,229	100

Source: Florida Natural Areas Inventory

Florida Fish and Wildlife Conservation Commission (FWC)

Hendrie Ranch is a working cattle ranch with a herd of approximately 600 beef cows. Approximately 2,164 acres (30%) is improved pasture, with the remainder primarily in native conditions. Mesic and wet flatwoods (1,919 acres) and baygall (1,320 acres) comprise approximately 17% and 18% of the landcover, respectively. Scrub and scrubby flatwoods (1,276 acres) accounts for 15% of the landcover. Depression marsh (270 acres) and hydric hammock (153 acres) comprise 4% and 2%, respectively, with wet prairie, dome swamp, roads, structures, woodland pasture, and artificial ponds comprising less than 1% each. The western portion (west of U.S. Highway 27) of Hendrie Ranch is primarily pasture, with scrub and scrubby flatwoods in the northeastern portion, and pockets of scrub, depression marsh, and flatwoods scattered through the pasture. The eastern portion has a unique landscape, starting with a small pasture area that moves uphill into a large complex of scrub and scrubby flatwoods. These communities have a clear eastern border, which is also the eastern edge of the Lake Wales Ridge. The highest point in the scrub is 150 feet above mean sea level. Moving east, the landscape changes to pockets of baygall and flatwoods, with cutthroat grass (Panicum abscissum) seeps on the downslope portion. The eastern edge of the property is pasture, with an elevation of 40 feet above sea level.

Prescribed fire has been a management tool on Hendrie Ranch, primarily in pastures and mesic/wet flatwoods. Scrub and scrubby flatwoods have not been managed with prescribed fire and are in a mix of

conditions as a result. Occasional wildfires have burned in scrub on Hendrie Ranch, and the area continues to support a small population of Florida scrub-jays (Aphelocoma coerulescens).

Timber harvest has been used occasionally as a management tool in flatwoods on Hendrie Ranch, and those communities are in good condition. Pastures on Hendrie Ranch are relatively open, with snags and trees to provide perching and roosting habitat for wildlife. Exotic invasive plant species do not appear to be a widespread issue on Hendrie Ranch, aside from the non-native pasture grasses. Tropical soda apple (Solanum viarum Dunal) was observed within the pastures. However, the area has an extensive climbing fern infestation in many of the ditches, baygall, and other wet communities. Currently, treatment is ongoing for this infestation, but the landowner expressed interest in working with the local Cooperative Invasive Species Management Area to pursue treatment. Overall, native communities on Hendrie Ranch will continue to benefit from the regular application of prescribed fire. The scrub and scrubby flatwoods would benefit from increased prescribed fire to improve and retain conditions suitable for Florida scrub-jays.

The cattle program on Hendrie Ranch consists of approximately 600 cows in a cow/calf operation, which have access to both native and non-native areas. The property has several cattle pens and other infrastructure for cows, as well as man-made cattle ponds.

Wildlife species observed during the tour included gopher tortoise (Gopherus polyphemus), eastern meadowlark (Sturnella magna), white-tailed deer (Odocoileus virginianus), great blue heron (Ardea herodias), red-shouldered hawk (Buteo lineatus), and many other species. Feral hog (Sus scrofa) sign was observed. The landowner also reports that Florida scrub-jays are present and that Florida burrowing owls (Athene cunicularia) have been observed on the property. Additionally, trail cameras have detected Florida panthers (Puma concolor coryi) and Florida black bears (Ursus americanus floridanus).

During the field tour, listed wildlife species observed included gopher tortoises. The gopher tortoises were observed around the perimeter of the scrub on the larger eastern portion of Hendrie Ranch. It is likely gopher tortoises occur in other areas besides the scrub, including the pastures. The landowner stated that the area gets very wet during the rainy season, so the higher elevation scrub provides suitable habitat for gopher tortoises even during the rainy season. The pastures on Hendrie Ranch are suitable for use by other listed wildlife such as the Florida sandhill crane (Grus canadensis), northern crested caracara (Caracara cheriway), and southeastern American kestrel (Falco sparverius paulus). These species were not observed during the field tour but are known to occur in the surrounding landscape. The FNAI Element Occurrence database lists several occurrences of rare plants and animals on Hendrie Ranch that were not observed during the field tour including the Florida scrub lizard (Sceloporus woodi), sand skink (Plestiodon reynoldsi), as well as 13 listed rare plants.

The Hendrie Ranch is a well-kept property that is located within a larger landscape of lands critical to the long-range conservation of wildlife and natural communities on the Lake Wales Ridge. Its proximity to

existing conservation lands and those protected under easement provides a vital link connecting protected lands in the Fisheating Creek region to the south and north and northwest to the Lake Wales Ridge. Bear researchers with the University of Kentucky, Archbold Biological Station, and the FWC have conducted several studies of the Highlands-Glades bear subpopulation and identified extensive bear denning on Hendrie Ranch and surrounding areas. Florida panthers are known to occur in this area, and with their recent move north of the Caloosahatchee River, protection of the Hendrie Ranch in the long-term would be very beneficial to these wide-ranging imperiled species.

The FWC GIS analysis of the Cooperative Land Cover v3.3 indicates that Hendrie Ranch is a mix of many different community types including improved pasture (30%), scrub and scrubby flatwoods (18%), mesic flatwoods (17%), baygall (4%), and freshwater marsh and swamp (3%). Approximately 33% of the proposal is classified as wetland based on the National Wetlands Inventory.

The FWC Florida Landscape Assessment Model (FLAM) is a GIS model that determines the landscape value based on natural resources and fish and wildlife habitat. The FLAM ranks habitat from 0 to10; a rank of 10 being of greatest value. The mean FLAM score for this property is 8.7. All the project is identified as Priority 1 or 2 (of 5) for the Critical Lands and Waters Identification Project. Approximately 33% of the proposal is classified as wetland based on the National Wetlands Inventory.

Approximately 89% of Hendrie Ranch lies within a designated FWC Strategic Habitat Conservation Area (SHCA) for species including the Florida scrub-jay, Cooper's hawk (Accipiter cooperii), swallow-tailed kite (Elanoides forficatus), sand skink, Florida black bear and Florida burrowing owl. The FWC GIS Environmental Resources Analysis containing more detailed information has been provided under separate cover.

Goals, Measures and Criteria

The primary source for resource-related acreages is the Florida Forever Measures Evaluation (FFME) table prepared by FNAI. For additional relevant information, sources used will be specifically identified.

Goal A:

Enhance the coordination and completion of land acquisition projects

Measure A2:

The number of acres protected through the use of alternatives to fee simple acquisition.

If acquired 7,229 acres (GIS) will be protected through less-than-fee acquisition.

Goal B:

Increase the protection of florida's biodiversity at the species, natural community, and landscape levels

Measure B1:

The number of acres acquired of significant Strategic Habitat Conservation Areas.

Approximately 6,438 acres (89%) of the project will contribute to significant Strategic Habitat Conservation Areas, as noted in the FFME table prepared by FNAI. (See appendix for more detail.)

Measure B2:

The number of acres acquired of highest priority conservation areas for Florida's rarest species.

An analysis of priority conservation areas based on Florida Forever Conservation Needs Assessment data may be found in the Florida Forever Measures table. Habitat conservation priorities for 281 of Florida's rarest species were mapped and divided into six priority classes. The Florida Forever Measures table shows the acres for each priority class found on the Hendrie Ranch proposal. Overall, the site contains approximately 7,229 acres (100% of site) of rare species habitat. The habitat is mostly Priority 2 (52% of site) with substantial areas in Priority 1 (18%), Priority 3 (14%) and Priority 4 (13%) and the remainder split between Priority 5 (2%) and Priority 6 (<1%).

The following table lists the acres of habitat for each species that may be found on the site, based on the FNAI Habitat Conservation Priorities. Please note that habitats for these species overlap, so that the sum of habitat for all species is more than the total acreage of the priority conservation areas.

Rare species habitat based on FNAI Habitat Conservation Priorities for 281 species with the greatest conservation need

Scientific Name	Common Name	Global Rank	Acres
Chionanthus pygmaeus	Pygmy fringe tree	G2G3	807
Cladonia perforata	Perforate reindeer lichen	G1	803
Eryngium cuneifolium	Wedge-leaved button-snakeroot	G1	738
Hypericum cumulicola	Highlands scrub hypericum	G2	1146
Liatris ohlingerae	Florida blazing star	G2	880
Nolina brittoniana	Britton's beargrass	G3	887
Paronychia chartacea ssp. chartacea	Paper-like nailwort	G3T3	1064
Polygonella basiramia	Florida jointweed	G3	1129
Prunus geniculata	Scrub plum	G3	912
Schizachyrium niveum	Scrub bluestem	G1G2	41
Drymarchon couperi	Eastern indigo snake	G3	5609
Plestiodon egregius lividus	Blue-tailed mole skink	G5T2	975
Plestiodon reynoldsi	Sand skink	G2	1095
Aphelocoma coerulescens	Florida scrub-jay	G2	2283
Caracara cheriway	Crested caracara	G5	4998
Mycteria americana	Wood stork	G4	289
Picoides borealis	Red-cockaded woodpecker	G3	238
Puma concolor coryi	Florida panther	G5T1	5469
Ursus americanus floridanus	Florida black bear	G5T2	7227

Source: Florida Natural Areas Inventory

Measure B3:

The number of acres acquired of significant landscapes, landscape linkages, and conservation corridors, giving priority to completing linkages

Approximately 7,229 acres (100%) of the project will contribute to landscape linkages, conservation corridors, and giving priority to completing linkages, as noted in the FFME table prepared by FNAI. (See appendix for more detail.)

Measure B4:

The number of acres acquired of under-represented native ecosystems.

The Florida Forever natural community analysis includes only those communities that are under-represented on existing conservation lands. This analysis provides a conservative estimate of the extent of these communities, because it identifies only relatively undisturbed portions of these communities that occur within their historic range. The Florida Forever Measures table lists the acreages of under-represented natural communities found on the site. Based on this analysis, the Hendrie Ranch proposal contains 1,840 acres of mesic/wet flatwoods (25% of site) and 1,286 acres of scrub and scrubby flatwoods (18% of site).

Measure B5:

The number of landscape-sized protection areas of at least 50,000 acres that exhibit a mosaic of predominantly intact or restorable natural communities established through new acquisition projects, or augmentations to previous projects.

The Hendrie Ranch proposal contributes to a large, contiguous landscape-sized protection area of more than 140,000 acres, which includes Fisheating Creek/Smoak Groves Conservation Easement, Fisheating Creek/Lykes Brothers Conservation Easement, Fisheating Creek Wildlife Management Area, Archbold Biological Station, several NRCS WRP Easements, LWR Wildlife and Environmental Area and several other protected lands.

Measure B6:

The percentage increase in the number of occurrences of imperiled species on publicly managed conservation areas.

The FNAI database includes multiple records of many rare species of animals and plants on site because of Hendrie Ranch's long history of allowing scientists to carry out surveys on their property. The data is principally the result of field surveys by Ann Johnson (FNAI) and Steve Christman (for FWC) in the 1980s and later surveys mostly from the University of South Florida (for FWC) and Archbold Biological Station. Taxa documented that are endemic to the LWR alone number seven plants and one lizard (* in following table). Hendrie Ranch is also extremely important for the wide-ranging species, Florida black bear and the Florida panther, based on ongoing research by the FWC.

The Florida Forever Measures table lists the number of Element Occurrences by Global Rank (G-rank) that are found on the proposal. Note that the number of occurrences does not necessarily match the number of species in the following table because a) some species may have more than one occurrence on the proposal site, or b) some species observed on site lack sufficient data to justify addition to the FNAI database at this time. The following table contains species falling into any of these observational categories, as well as species gleaned from other sources (e.g., Florida Breeding Bird Atlas) with different degrees of locational precision.

Rare plants and animals documented or reported to occur within the Florida Forever proposal conservation need

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
Rare plants documented on site					
Calamintha ashei	Ashe's savory	G3	S3	N	T
Chionanthus pygmaeus	pygmy fringe tree	G2G3	S2S3	E	E
Cladonia perforata	perforate reindeer lichen	G1	S1	E	E
Eryngium cuneifolium*	wedge-leaved button-snakeroot	G1	S1	E	E
Euphorbia rosescens*	scrub spurge	G1	S1	N	E
Hypericum cumulicola*	Highlands Scrub hypericum	G2	S2	E	E
Lechea cernua	nodding pinweed	G3	S3	N	T
Lechea divaricate	pine pinweed	G2	S2	N	E
Liatris ohlingerae*	Florida blazing star	G2	S2	E	E
Nolina brittoniana	Britton's beargrass	G3	S3	E	E
Paronychia chartacea var. chartacea*	paper-like nailwort	G3T3	S3	T	E
Polygonella basiramia*	Florida jointweed	G3	S3	T	E
Prunus geniculata*	scrub plum	G3	S3	E	E
Rare animals documented on site					
Lithobates capito	gopher frog	G3	S3	N	N
Crotalus adamanteus	eastern diamondback rattlesnake	G4	S3	N	N

Source: Florida Natural Areas Inventory (FNAI)

Goal C:

Protect, restore and maintain the quality of natural functions of land, water, and wetland systems of the state

Measure C1:

The number of acres of publicly-owned land identified as needing restoration; enhancement, and management, acres undergoing restoration or enhancement; acres with restoration activities completed, and acres managed to maintain such restored or enhanced conditions; the number of acres which represent actual or potential imperiled species habitat; the number of acres which are available pursuant to a management plan to restore, enhance, repopulate, and manage imperiled species habitat; and the number of acres of imperiled species habitat managed, restored, and enhanced, repopulated, or acquired.

The property is offered for less-than-fee acquisition, intended to be utilized in a manner consistent with existing uses. Invasive exotic plant control needs of the property appear manageable. Targeting cogongrass, Brazilian pepper, and tropical soda apple while they are still at a relatively low level would be beneficial. A baseline assessment to determine the full extent of invasive plant species is warranted if acquisition of the easement occurs.

Measure C4:

The number of acres acquired that protect natural floodplain functions.

Approximately 2,770 acres (38%) provides for the protection of natural floodplain functions, as noted in the FFME table prepared by FNAI. (See appendix for more detail.)

Measure C5:
The number of acres acquired that protect surface waters of the State.

Approximately 7,210 acres (100%) provides for the protection of surface waters of the state, as noted in the FFME table prepared by FNAI. (See appendix for more detail.)

Measure C8:
The number of acres of functional wetland systems protected.

Approximately 2,224 acres (31%) provides for the protection of functional wetlands, as noted in the FFME table prepared by FNAI (See appendix for more detail.)

Goal D:
Ensure that sufficient quantities of water are available to meet the current and future needs of natural systems and the citizens of the state

Measure D3:
The number of acres acquired of groundwater recharge areas critical to springs, sinks, aquifers, other natural systems, or water supply.

Approximately 7,229 acres (100%) provides for the protection of groundwater recharge areas, as noted on the FFME table prepared by FNAI. (See appendix for more detail.)

Property is roughly 7,240 acres, north west of Lake Okeechobee and just south of Lake Placid. This property is in the Lake Okeechobee BMAP. The property would provide water protection and ground water protection for the region.

Hendrie Ranch is in Northern Everglades BMAPs, and while based on the scoring may not be considered high priority, these areas are of particular interest and focus for restoration efforts.

FINAL DEAR SCORE = 2 (Medium Low Water Quality Protection Benefits)

Goal E:
Increase natural resource-based public recreational and educational opportunities

Measure E1:
The number of acres acquired that are available for natural resource-based public recreation or education.

This is a less-than-fee proposal, so public use is not expected. However, Hendrie Ranch has an agreement with Archbold Biological Station to allow scientists to conduct research on the scrub habitat. The property is extremely important to regional biodiversity both for common species and for many imperiled and rare plants and animals. Acquisition of this property would link five large discrete conservation lands and would assemble an approximate 125,000-acre continuous expanse of conservation lands within a vital wildlife corridor.

Goal F:

Preserve significant archaeological or historic sites

Measure F1:

The increase in the number of and percentage of historic and archaeological properties listed in the Florida Master Site File or National Register of Historic Places which are protected or preserved for public use.

There are no archaeological sites known or recorded on the property. There is one unrecorded historic structure; however, it is unclear whether the owners plan on preserving the integrity of the structure or having it recorded. Were the structure to be recorded then it would meet Measure F1 for increasing the number and percentage of historic properties listed in the Florida Master Site File.

Measure F2:

The increase in the number and percentage of historic and archaeological properties that are in state ownership.

The project does not meet measure two because it is a less-than fee project.

Cultural Resources:

This tract holds no sites currently listed in the Florida Master Site File. The applicant stated that he is not aware of any archaeological sites on the property. The property has not been professionally surveyed for archaeological and historical sites. The site file shows 17 historic structures, 34 archaeological sites, and 3 resource groups as being located within a five-mile radius of this property. The tract's location, topography, and proximity to freshwater suggests low – medium probability of holding any potentially significant archaeological or historical sites.

Field Observations:

No substantial ground disturbance was observed during field review of the property. There is an unrecorded historic cabin on the property that was present when the property was acquired by the Dupuis family. The cabin was reported to have been used as temporary lodging by cowboys while working in the area.

Goal G:

Increase the amount of forestland available for sustainable management of natural resources

Measure G1:

The number of acres acquired that are available for sustainable forest management.

Approximately 294 acres (4%) are available for sustainable forest management, as noted in the FFME table prepared by FNAI. (See appendix for more detail.)

Criteria
Section 259.105(9), Florida Statutes

(a) The project meets multiple goals described in subsection (4).
(b) The project is part of an ongoing governmental effort to restore, protect, or develop land areas or water resources.
(c) The project enhances or facilitates management of properties already under public ownership.
(f) The project contributes to the solution of water resource problems on a regional basis.
(l) The project is a joint acquisition, either among public agencies, nonprofit organizations, or private entities, or by a public-private partnership.

Management
If acquired as a perpetual conservation easement, primary management responsibility would remain with the landowner. Periodic monitoring of the site's management to confirm continued compliance with the conditions of the easement would be coordinated by the Florida DEP, Division of State Lands, Office of Environmental Services. Transfer of ownership would not affect the conditions of the perpetual easements and rights acquired. Each time the land would transfer to another ownership, the perpetual easement and its conditions run with the title. The Board of Trustees is granted the opportunity to exercise its right of first refusal (to acquire the land in fee simple) each time the land under the acquired perpetual conservation easement is transferred from one landowner to another.

Funding Sources
Florida Forever Program Funds

Funding for Mapping, Appraisal, Negotiations and Closing
Florida Forever Program Funds

Ownership Pattern and Acquisition Planning
DEP Bureau of Surveying and Mapping (BSM) notes the ownership information is based on the Property Appraiser's website and the Florida Forever Application. Hendrie Ranch is currently owned by J&J Hendrie and J&D Hendrie LC. It is a combination of seventeen parcels encompassing 7,240.36 acres located in Highlands County.

Title and Legal Access Issues
Title issues that may be significant in the negotiation process would be determined during the preparation of the appraisal map and title information review. Access to the property is via US Highway 27, an improved public road.

Jurisdictional and Sovereignty Lands Issues
There do not appear to be any sovereignty lands associated with this project. The property appears to be pasture, scrub and wetlands. There are jurisdictional wetlands located on the property. The limits and area of the jurisdictional wetlands and uplands would be determined during the appraisal mapping.

Known Encumbrances (easement, long-term leases, restrictive covenants, etc.)
The potential easements and encumbrances are currently unknown. Easements and encumbrances of record associated with the project would be identified in the title information and reported in the appraisal map accordingly.

Description and location of hazardous waste sites, dumps, borrow pits
There are no apparent contamination sites within the project based on the application and research of the property appraiser's website information. There is an automobile salvage yard located adjacent to the NE part of the property West of US 27 and the West boundary is adjacent to a railroad corridor.

Legal Issues
BSM noted no legal issues at this time.

Acquisition Phases
The proposal is for acquisition of the easement in a single transaction.

Government Planning and Development

Contribution to Recreation and Open Space Needs
None. No public access is proposed. This project is proposed in the less-than-fee category for the purchase of a conservation easement which would not provide public access or public recreational use.

Potential for Losing Significant Natural Attributes or Recreational Open Spaces
The subject property contains an abundance of natural resource features (e.g., at least 2,200 acres of wetland habitat) that provide habitat for an array of rare plants and animals. The property provides significant watershed and water quality protection. Because the potential for urban development is low to moderate in this area, there is low to moderate potential for losing the natural attributes located on the subject property.

The proposal has a moderate to high potential for contributing to recreation and open space needs. The proposal is for less-than-fee simple acquisition, and thus, the opportunity for public access recreation would depend on the terms of the acquisition. The property could function as a wildlife corridor located between surrounding conservation areas. Potential recreational activities could include bicycling, camping, dog walking, environmental education and interpretation, fishing, hiking/jogging, horseback riding, wildlife observation and photography. These recreational uses would likely be compatible with the future land use designation of Agriculture.

Potential for Being Subdivided

There are two platted subdivisions on the subject. Both were platted in the 1920s. Moving forward, a developer would need to build the required infrastructure. That the approvals were in place, and to this day, this area has not been developed, suggests a low demand for additional housing in this area.

Venus Farms is a flag-shaped area with frontage along Highway 27. Per plat, there are 43 lots with sizes ranging from 4.11 to 4.56 acres. This area is under two parcel ID numbers (C-09-39-30-020-0010-0000 consisting of 220 +/- acres and C-09-39-30-020-0130-0000 with 7.49 acres. The northern boundary of the subdivision is on the south side of Harrell Road, the eastern boundary fronts Pollard Place, both are unpaved roads.

Zoning and Densities within the Project Boundaries

All of the subject property is within the Agriculture (AU) zoning category. This district applies to areas that are presently and primarily agricultural. Permitted structures and uses include but are not limited to: one-family dwellings, community residence homes (with no more than six residents), church and accessory residence, golf course, country club, grove, gardens: truck, botanical, hydroponic, wayside stands of AG products, farms (produce, horticultural, sod, floriculture, dairy, fish), nursery, crop raising, greenhouse, slat house, forestry, beekeeping, farms, cattle or stock raising and grazing, raising and keeping of <9 collectively, of sheep, goats, and hogs (<3 hogs), dock, noncommercial boat pier, slip or boathouse for docking private watercraft, railroad right-of-way and tracks, team tracks, farm labor housing, mobile home on lot, public parks/recreation, public and private schools, and central potable water facilities (less than 100,000 gpd). Additional specifications may apply.

The minimum lot size requirement is five acres, minimum width is 100 feet, and legal access is required. Wetland areas include a density of one dwelling unit for every ten acres.

Based on current zoning, the subject's estimated maximum potential single-family residential density is 1,211 units.

Estimated Cost of Appraisal Mapping

The project contains 7,200 acres +/- based on the parcel information included with the application and FNAI Evaluation. The property lies within parts of 13 land sections.

Estimated costs for appraisal mapping of project could be $8,000.00. If there were boundary surveys available or other survey information available this cost would be reduced significantly, or the appraisal mapping could be prepared in-house by BSM.

Existing Land Uses and Future Land Use Designations

The future land use is Agriculture. Rural areas in Highlands County are predominantly Agriculture. Uses include rural settlements, active agriculture including biofuel feedstock and other resource-based activities, and recreation and open space.

Development Potential

The housing needs in Highlands County are for multifamily rental housing that is affordable for the workforce. Given the zoning, location, and rural characteristics of the subject, it is not a prime location for the immediate needs of the County.

Existing Land Uses and Future Land Use Designations

Each of the 17 parcels that comprise the subject has an existing land use code of 63-grazing soil cap 4. Per NRCS Soils Classification, these soils have very severe limitations that restrict the choice of plants or require very careful management, or both. The appearance of lands on the subject is pasture, wetlands, brush, and sandy areas.

Transportation Issues

US Highway 27 is a major arterial four-lane roadway that runs north-south from Georgia to Miami. In Highlands County, it connects Avon Park, Sebring, and Lake Placid to Polk and Glades Counties. The subject has frontage along both sides of this highway.

State Road 70 intersects with US Highway 27 seven miles north of the subject. SR 70 is the east/west route connecting the east coast at Ft. Pierce to the west coast at Bradenton. The traffic count for US Highway 27 near the subject is 8,532. SR 70 to the north has a traffic count of 3,700 AADT (Annual Average Daily Traffic). There are no anticipated transportation changes.

Ongoing Governmental Efforts

Several of the analyses for this proposal note that this area has long been viewed as a vital piece linking regional conservation efforts. To assist in the mission of providing for better water supply, aquifer recharge, stormwater management, and other challenges in fresh and saltwater bodies in this area of the state, many strategic properties have been acquired in recent years by various governmental agencies through local, regional, state, and federal land acquisition programs. Connecting corridors for wildlife using conservation easements and conservation lands is a mission codified in Florida statute, and accomplished in concert with other missions to provide for Florida's quality of life, protecting lands, waters, and wildlife for future generations.

ACKNOWLEDGEMENTS

Consensus among the FNAI, ARC Liaison staff, and the staff of the Division of State Lands (DSL) determined the final project recommendations. Paula L. Allen and Zachariah Barton, Office of Environmental Services, were responsible for the overall coordination of this report, with participation and contributions from the following:

Archaeological and Historical: Division of Historical Resources, Josh Goodwin

Forestry: Florida Forest Service, Cat Ingram and Vitor Aguilar

Government Planning: Department of Economic Opportunity, Dan Evans

Government Planning: DEP Bureau of Survey and Mapping, Steve Kellogg

Government Planning: DEP Bureau of Appraisal, Frances Alford

Government Planning: DEP Division of Recreation and Parks, Justin Baldwin and Diane Martin

Government Planning: DEP Office of Greenways and Trails, Samantha Browne

Biodiversity: Fish and Wildlife Conservation Commission, Beth Morford

Biodiversity: Florida Natural Areas Inventory, Dan Hipes, Katy Nesmith, and Nathan Pasco

Water Resources: DEP Division of Evaluation, Assessment and Restoration, Kevin Koyne

Transportation: Florida Department of Transportation, Jennifer Carver

Appendix A:

Hendrie Ranch: Florida Forever Measures Evaluation 20200305

GIS ACRES = 7,229

MEASURES	Resource Acres[a]	% of project
B1: Strategic Habitat Conservation Areas		
Priority 1	1	< 1%
Priority 2	6,404	89%
Priority 3	33	< 1%
Priority 4	0	0%
Priority 5	0	0%
Total Acres	6,438	89%
B2: FNAI Habitat Conservation Priorities		
Priority 1	1,324	18%
Priority 2	3,740	52%
Priority 3	1,033	14%
Priority 4	940	13%
Priority 5	147	2%
Priority 6	44	< 1%
Total Acres	7,228	100%
B3: Ecological Greenways		
Priority 1	7,182	99%
Priority 2	39	< 1%
Priority 3	0	0%
Priority 4	0	0%
Priority 5	7	< 1%
Priority 6	0	0%
Total Acres	7,228	100%
B4: Under-represented Natural Communities		
Upland Glade (G1)	0	0%
Pine Rockland (G1)	0	0%
Scrub and Scrubby Flatwoods (G2)	1,286	18%
Rockland Hammock (G2)	0	0%
Dry Prairie (G2)	0	0%
Seepage Slope (G2)	0	0%
Sandhill (G3)	0	0%
Sandhill Upland Lake (G3)	0	0%
Upland Pine (G3)	0	0%
Mesic/Wet Flatwoods (G4)	1,840	25%
Upland Hardwood Forest (G5)	0	0%
Total Acres	3,126	43%
B6: Occurrences of FNAI Tracked Species		
G1	12	
G2	21	
G3	25	
G4	2	
G5	1	
Total	61	
C4: Natural Floodplain Function		
Priority 1	1,210	17%
Priority 2	866	12%
Priority 3	358	5%
Priority 4	208	3%
Priority 5	120	2%
Priority 6	8	< 1%
Total Acres	2,770	38%

MEASURES (continued)	Resource Acres[a]	% of project
C5: Surface Water Protection		
Priority 1	0	0%
Priority 2	2,612	36%
Priority 3	0	0%
Priority 4	4,598	64%
Priority 5	0	0%
Priority 6	0	0%
Priority 7	0	0%
Total Acres	7,210	100%
C7: Fragile Coastal Resources		
Fragile Coastal Uplands	0	0%
Imperiled Coastal Lakes	0	0%
Coastal Wetlands	0	0%
Total Acres	0	0%
C8: Functional Wetlands		
Priority 1	1,068	15%
Priority 2	749	10%
Priority 3	278	4%
Priority 4	86	1%
Priority 5	64	< 1%
Priority 6	0	< 1%
Total Acres	2,244	31%
D3: Aquifer Recharge		
Priority 1	0	0%
Priority 2	545	8%
Priority 3	2,013	28%
Priority 4	3,548	49%
Priority 5	1,122	16%
Priority 6	0	0%
Total Acres	7,228	100%
E2: Recreational Trails (miles)		
(prioritized trail opportunities from Office of Greenways and Trails & Univ. Florida)		
Land Trail Priorities	0.0	
Land Trail Opportunities	5.6	
Total Miles	5.6	
F2: Arch. & Historical Sites (number)	0 sites	
G1: Sustainable Forestry		
Priority 1	0	0%
Priority 2	0	0%
Priority 3	591	8%
Priority 4	0	0%
Priority 5 - Potential Pinelands	1,506	21%
Total Acres	2,097	29%
G3: Forestland for Recharge	294	4%

[a]Acres of each resource in the project and percentage of project represented by each resource are listed except where noted.
Acres and precentages are based on rasters of the resources and are rounded.

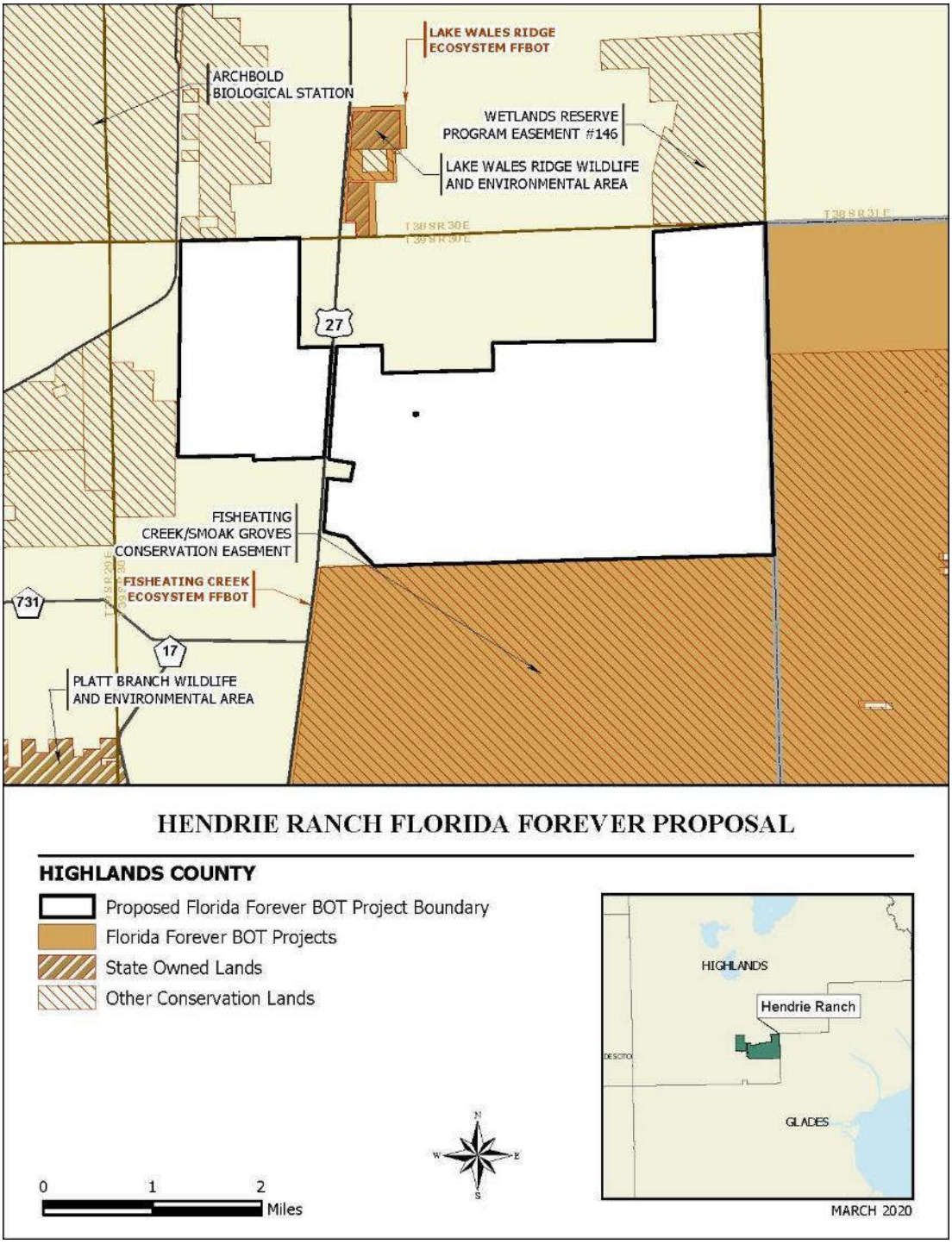
Table 1 Florida Forever Measures Evaluation

Source: Florida Natural Areas Inventory (FNAI)

Appendix B:

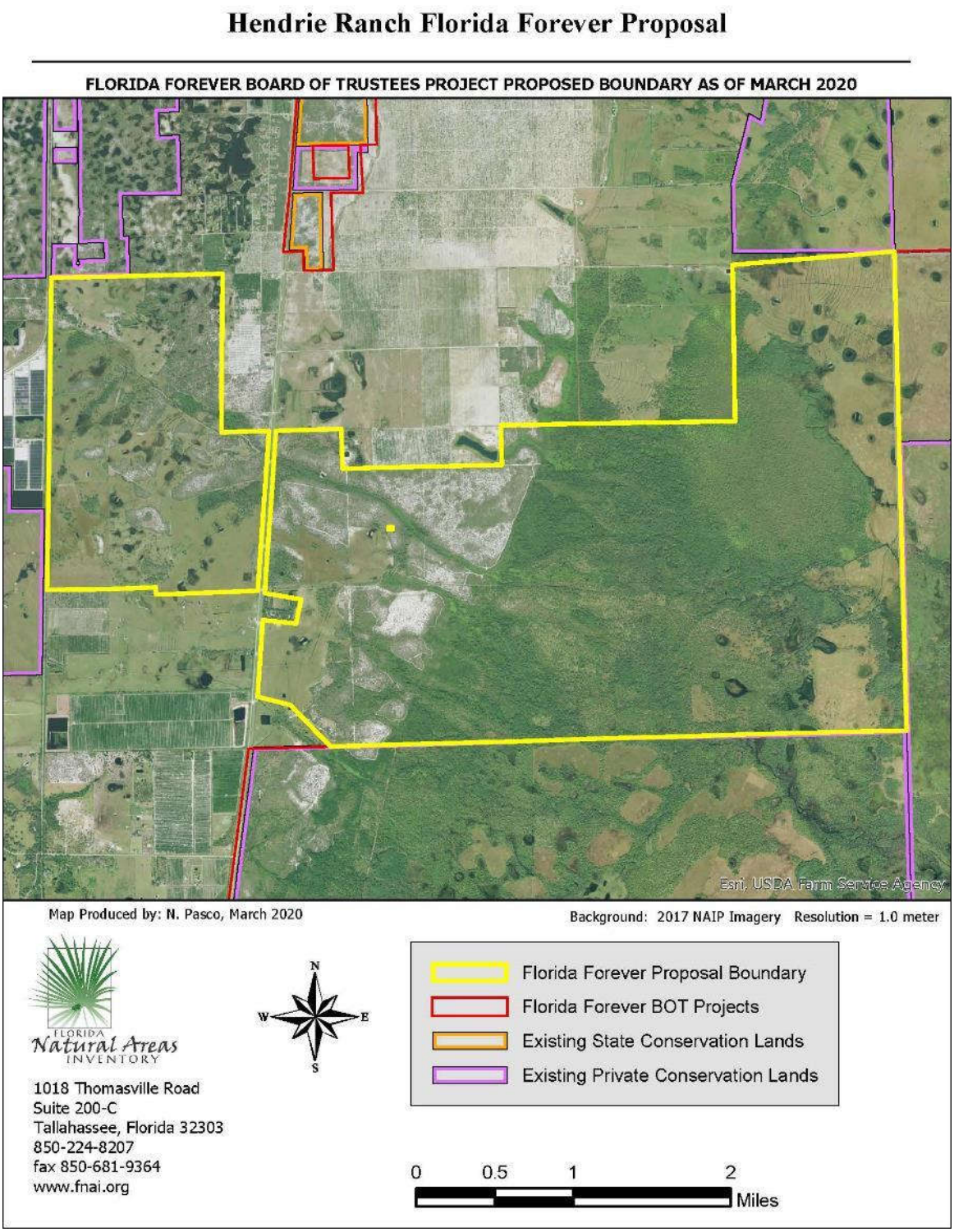
Florida Forever proposal boundary maps: Florida Natural Areas Inventory

B1:



Map 1 Proposal Boundaries

B2:



Map 2 Aerial map

Appendix C:

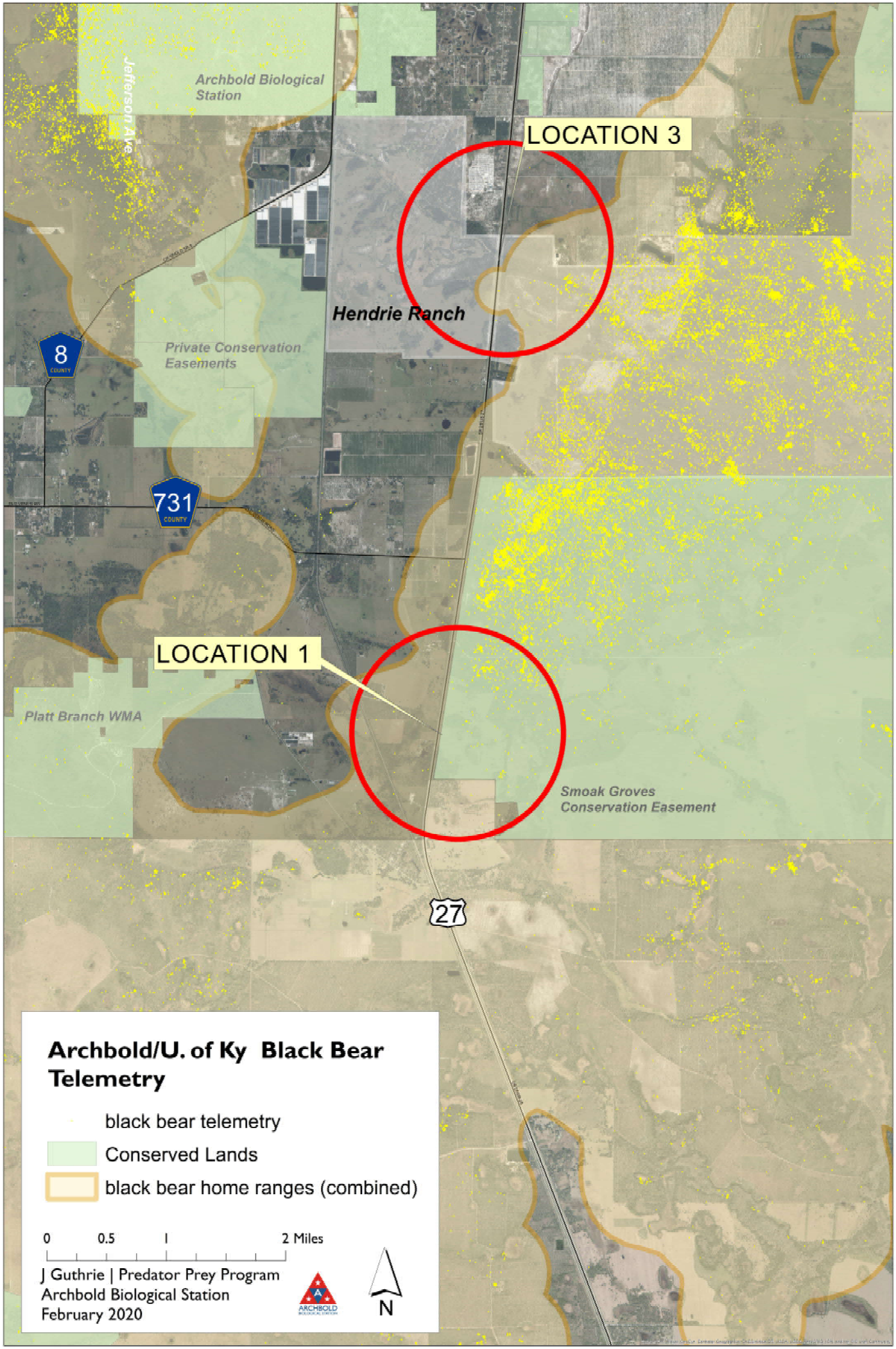
Property ID Numbers for Final Recommended Boundary

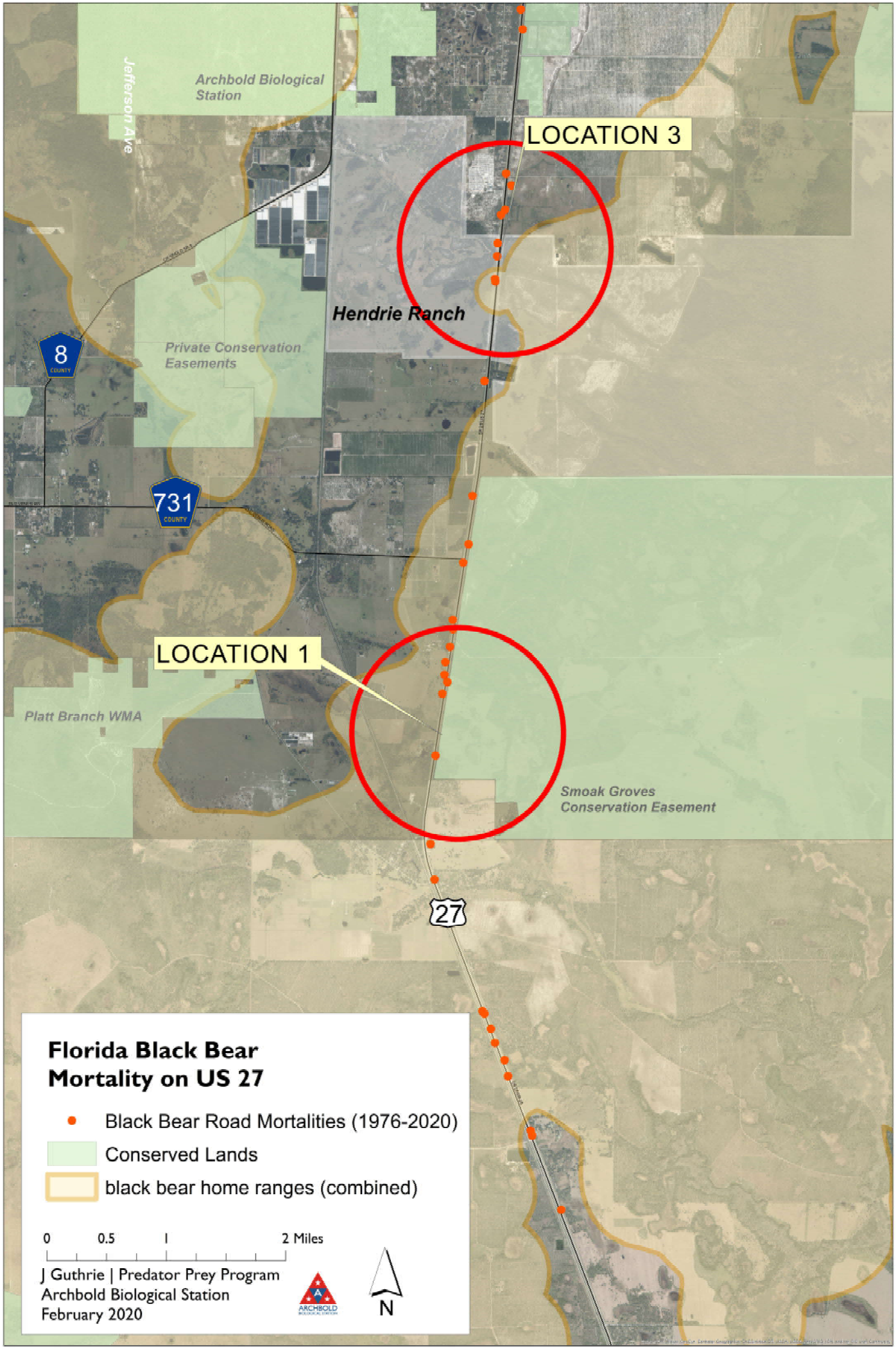
County	Parcel ID	Owner	Acres	Assessed Value	Just (Market) Value
Highlands	C013930A0000100000	J&J Hendrie LC	667.6	$168,793	$388,224
Highlands	C013930A0000100000	J&D Hendrie LC	483.2	$75,756	$286,806
Highlands	C063930A0000300000	J&D Hendrie LC	222.0	$64,612	$380,490
Highlands	C073930A0000200000	J&D Hendrie LC	233.0	$60,764	$139,756
Highlands	C083930A0000100000	J&D Hendrie LC	634.1	$139,316	$320,428
Highlands	C083930A0000200000	J&J Hendrie LC	0.6	$67	$154
Highlands	C09393001000100000	J&J Hendrie LC	20.0	$1,269	$2,920
Highlands	C09393001000700090	J&J Hendrie LC	0.8	$31	$72
Highlands	C09393002000100000	J&J Hendrie LC	220.4	$20,919	$48,114
Highlands	C09393002001300000	J&J Hendrie LC	8.0	$632	$1,454
Highlands	C093930A0000100000	J&J Hendrie LC	92.2	$8,420	$19,366
Highlands	C093930A0000300000	J&J Hendrie LC	10.2	$432	$994
Highlands	C093930A0000600000	J&J Hendrie LC	205.2	$28,279	$65,042
Highlands	C103930A0000400000	J&J Hendrie LC	529.0	$36,072	$82,966
Highlands	C103930A0000500000	J&J Hendrie LC	41.0	$1,884	$4,334
Highlands	C113930A0000100000	J&J Hendrie LC	3,858.0	$485,806	$1,166,257
Highlands	C173930A0000500000	J&J Hendrie LC	178.0	$5,623	$12,934
		Total	**7,240.3**	**$1,098,675**	**$2,920,311**

Source: Application

Appendix D

Archibold Bear Research


Archbold Biological Station
Jefferson Ave
LOCATION 3
Hendrie Ranch
Private Conservation Easements
8
COUNTY
731
COUNTY
LOCATION 1
Platt Branch WMA
Smoak Groves Conservation Easement
27
Archbold/U. of Ky Black Bear Telemetry
black bear telemetry
Conserved Lands
black bear home ranges (combined)
0
0.5
1
2 Miles
J Guthrie | Predator Prey Program
Archbold Biological Station
February 2020
ARCHBOLD BIOLOGICAL STATION
N


Archbold Biological Station
Jefferson Ave
LOCATION 3
Hendrie Ranch
Private Conservation Easements
8
731
LOCATION 1
Platt Branch WMA
Smoak Groves Conservation Easement
27
Florida Black Bear Mortality on US 27
Black Bear Road Mortalities (1976-2020)
Conserved Lands
black bear home ranges (combined)
0 0.5 1 2 Miles
J Guthrie | Predator Prey Program
Archbold Biological Station
February 2020
N

Appendix E

Agency Meeting Minutes

MEETING MINUTES

Date/Time: November 5, 2021, 1:00 PM

Location: Microsoft Teams Meeting

Attendees:

Nicole Monies, FDOT	Mark Cantrell, USFWS
Brent Setchell, PE, FDOT	Marc Criffield, FWC
Ryan Molloy, EI, FDOT	Brian Kelly, FWC
Lauren Peters, FDOT	Samantha Szatyari, FDA
Jonathon Bennet, FDOT	Nicole Cribbs, FDA

Subject: US 27 Wildlife Crossing Enhancement: Meeting with USFWS and FWC

1) Purpose of Meeting

a) To present and discuss five alternative locations for wildlife crossing enhancements within a segment of US 27 in southern Highlands County.

b) To move forward with an FDOT-funded wildlife crossing feasibility study based on two locations agreed upon during the meeting.

2) **Introductions and Project Background:**

a) Introductions were given by all.

b) Brent Setchell shared his screen with Google images to explain the study segment initially was in Glades County just north of FishEating Creek however after meeting with the adjacent property owner (Lykes Bros.), it was learned that the future land use plan for the lands adjacent to US 27 did not include either conservation or preservation. This prompted shifting the study to the current segment of US 27 in southern Highlands County which has existing conservation lands adjacent to the east side of US 27, Florida Forever proposed land acquisitions in the northern part of the corridor, and conservation lands approximately 1.7 miles to the west of US 27. This area also has a record of vehicle collisions with both Florida panthers and Florida black bears. Five potential crossing locations were identified in a 4-mile segment of US 27 near the community of Venus (Figure 1).

c) Design funding for crossing enhancements has been acquired.

d) Construction funding is not currently in-hand; the infrastructure bill is a potential funding source.

3) General Discussion of Potential Locations:

a) Location 1: This is currently a small drainage culvert and is the southern-most alternative. FishEating Creek/Smoak Groves Conservation Easement is adjacent to US 27 to the east and

Platt Branch Wildlife and Environmental Area is situated about 1.5 miles to west. Private lands and a railroad track are between US 27 and the Platt Branch area. Land use is improved pasture, scrub, the rail corridor, and freshwater marsh between US 27 and Platt Branch. An agricultural use driveway is present near this proposed crossing and wildlife fencing would need to take the driveway into account. Putting the small parcels between US 27 and Platt Branch under a conservation easement would be beneficial for this crossing location and would ensure a future corridor for wildlife if it is selected for final design.

b) Location 2: This is also at a drainage culvert about 0.3 miles north of CR 731. Two panther-vehicle collisions and 3 bear-vehicle collisions have occurred in this vicinity (Figure 2). FishEating Creek is adjacent to US 27 to the east and private lands are adjacent to the west. The land use is generally citrus grove with a small area of mesic flatwoods immediately adjacent to US 27 at the west end of the culvert. A crossing at this location would necessitate that wildlife ultimately cross CR 731 east of US 27 to access Platt Branch lands. The FDOT is unable to spend state money to provide crossing enhancements on county roads. The county would need to use local money or acquire federal money to construct a crossing. The AADT (annual average daily traffic) is 600 cars per day on CR 731 based on FDOT sources while US 27 has an AADT of 7866 cars per day. The existing citrus groves between US 27 and Platt Branch could potentially be developed in the future.

c) Location 3: This location is the northern-most location in the segment and at an existing cross drain for a stream. Seven bear-vehicle collisions have occurred in this vicinity. There are mapped Florida Forever BOT lands on both the east and west sides of US 27 at this location. The lands are known as Hendrie Ranch and are proposed to be part of the Lake Wale Ridge Ecosystem. Five Florida black bear and one Florida panther vehicle-collisions have been recorded in the general area of Location 3. Telemetry data for collared panther "FP130" indicates the panther crossed US 27 in this vicinity.

d) Location 4: This is currently a cross drain culvert at the very northwestern corner of the FishEating Creek/Smoak Groves Conservation Easement. Private lands with citrus grove land use are present to the west. An east-west drainage ditch is present at this location that could be a wildlife corridor if the citrus groves were ultimately developed. This is south of the Florida Forever Hendrie Ranch proposed acquisition boundaries. This site was reviewed as an alternative to Location 2 because of the east-west drainage ditch that could serve as a corridor if the groves were developed.

e) Location 5: This is currently a cross drain culvert. Eight bear-vehicle collisions have occurred in this vicinity. FishEating Creek/Smoak Groves Conservation Easement is immediately adjacent to the east side of US 27. Private land with improved pasture is present to the west. This site was reviewed as an alternative to Location 1 to avoid the agricultural driveway as a potential conflict for wildlife fencing.

4) Structure Types Under Consideration for each Location

a) Box Culvert – this option would provide a 10-foot by 8-foot dry box culvert for wildlife to cross under US 27.

b) Bridges with dry wildlife shelves – this option will allow wildlife to cross under US 27 on dry shelves. The bridge option would incorporate the east-west drainage pattern with the shelves on both sides of the ditch channel. Shelves will be a minimum of 3 feet wide and provide 6 feet of vertical clearance.

c) Wildlife overpass – this option would provide an overpass route for wildlife and will require right of way acquisition for the touchdown points and related access slope.

5) Group Recommendations on Location

FWC noted that their preference to prevent panther vehicle collisions was in priority from north tosouth with location #3 being the preferred location. FWS noted their priority preference was location #3 followed by #1 followed by #5. The consensus of the group was that alternatives on the north provided the highest value to wildlife. Therefore Location #3 was a recommended location alternative. This alternative is valuable given historic data including FP130 telemetry and recorded wildlife-vehicle mortalities indicating that wildlife presently use the general corridor. The Florida Forever mapped lands at this location also contributed to the recommendation. Development at this location would need to avoid the existing stream which would provide a long-term corridor for wildlife movement.

Location #1 was also recommended for further analysis because of the short distance between conservation lands. With a future conservation easement over this short distance, a corridor could be established between FishEating Creek/Smoak Groves and the Platt Branch Conservation Area.

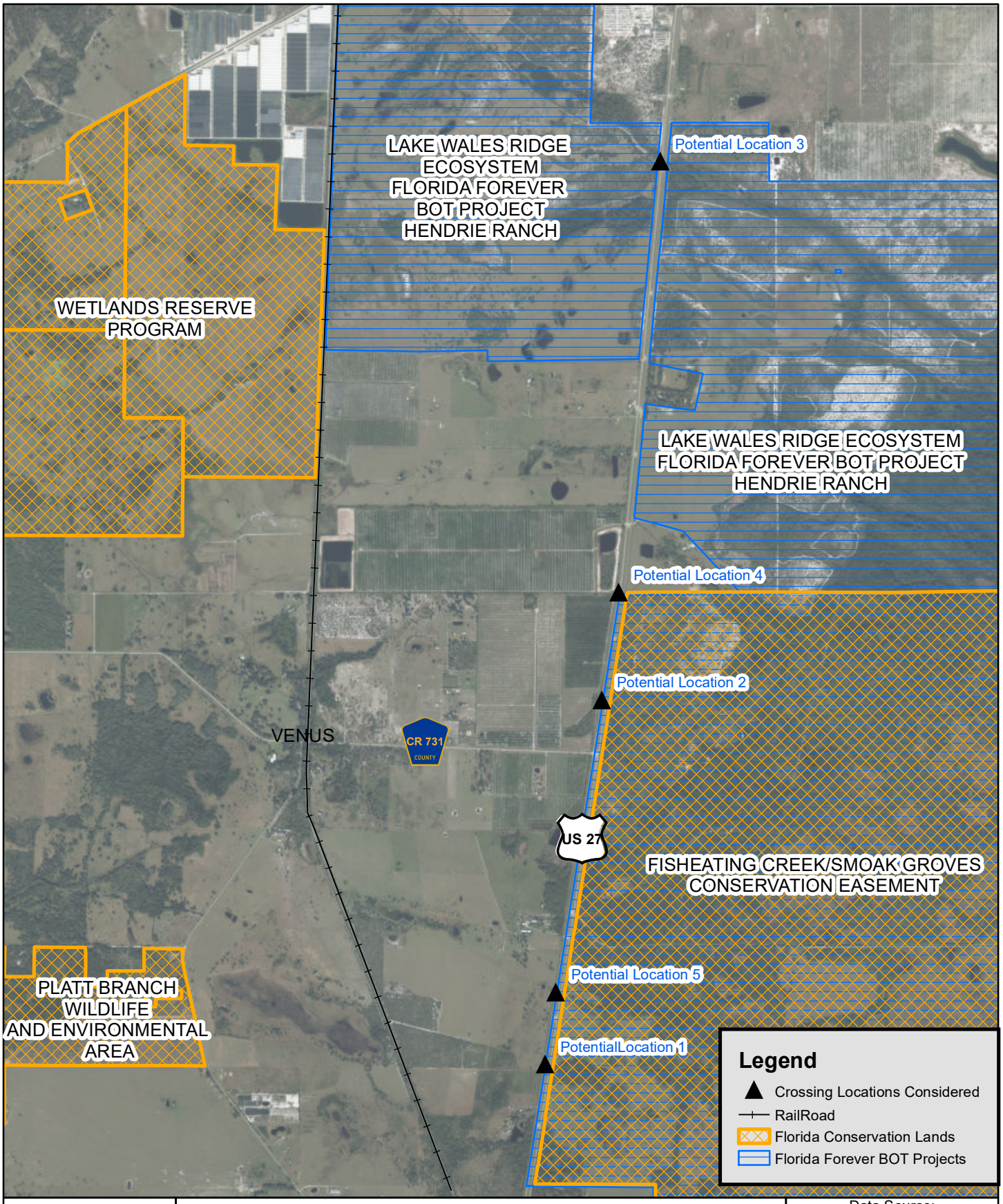


Figure 1 - LOCATIONS CONSIDERED

FPID 449144-1

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA, FNAI
- ESRI

1 inch = 3,000 feet

0 1,500 3,000 Feet

Coordinate System: NAD 1983 Florida State Plane East

N

Path: H:\55210\449144-1_US 27\Data - GIS\Figures\Figure 1 - For Agency Meeting Project Location.mxd

Figure 2 - Wildlife-Vehicle Collisions

FPID 449144-1

US 27 Wildlife Crossing Feasibility Study

Highlands County, FL

Data Source:
- FDA, FWC
- ESRI

1 inch = 3,000 feet

0 1,500 3,000 Feet

N

Coordinate System: NAD 1983 Florida State Plane East

Path: H:\55210\449144-1_US 27\Data - GIS\Figures\Figure 2 - For Agency Meeting Wildlife Vehicle Collisions.mxd

Appendix F

Cost Estimates

Roadway Cost Analysis

			Location 1	Location 2	Location 1	Location 2	Location 1	Location 2
			Box Culvert	Box Culvert	Bridge with Shelves	Bridge with Shelves	Wildlife Overpass	Wildlife Overpass
Structures*			$621,518	$460,802	$1,506,994	$1,406,736	$1,995,541	$1,978,084
Roadway	**UNIT**	**UNIT COST**						
Clearing & Grubbing	AC	$19,052.45	$121,935.68	$156,611.14	$74,685.60	$74,114.03	$25,911.33	$24,577.66
Embankment	CY	$8.37	$188,484.03	$213,209.01	$27,955.80	$37,053.99	$48,688.29	$54,873.72
Type B Stabilization	SY	$5.40	$71,400.00	$77,520.00	$48,960.00	$48,960.00	----	----
Optional Base, Base Group 01	SY	$14.97	$31,029.48	$33,689.15	$21,277.36	$21,277.36	----	----
Optional Base, Base Group 10	SY	$22.92	$219,802.80	$238,643.04	$150,721.92	$150,721.92	----	----
Superpave Asph Conc, Traffic C	TN	$97.90	$211,577.28	$226,154.98	$145,566.97	$145,548.42	----	----
Asph Conc FC, FC-5, PG 76-22	TN	$117.23	$62,130.53	$67,444.96	$42,644.30	$42,644.30	$15,109.64	$15,109.64
Milling Exist Asph Pavt , 3/4" Avg Depth	SY	$3.24	$10,440.00	$10,440.00	$10,440.00	$10,440.00	$10,440.00	$10,440.00
Miscellaneous Asphalt Pavement	TN	$197.94	$4,681.28	$4,136.95	$4,354.68	$4,354.68	----	----
Concrete Shoulder Gutter	LF	$30.85	$38,562.50	$33,935.00	$37,020.00	$37,020.00	----	----
Guardrail- Roadway, Gen TL-3	LF	$18.37	$22,962.50	$20,207.00	$22,044.00	$22,044.00	----	----
Guardrail- Bridge Anchorage Assem, F&I	EA	$2,651.68	----	----	$21,213.44	$21,213.44	----	----
Guardrail End Anch Assy/End Trea- Flared/Parallel	EA	$1,416.12	$5,664.48	$5,664.48	$11,328.96	$11,328.96	----	----
Pipe Culvert Optional Material, Round, 18"	LF	$121.59	$29,181.60	$29,181.60	$29,181.60	$29,181.60	----	----
Inlets, Gutter, Type S, <10	EA	$4,782.58	$38,260.64	$38,260.64	$38,260.64	$38,260.64	----	----
Turnout Construction /Driveway Base	SY	$24.08	$31,183.60	$29,136.80	$22,153.60	$21,166.32	----	----
Performance Turf, Sod	SY	$2.69	$58,542.77	$59,204.21	$23,943.09	$25,009.83	$13,374.68	$12,443.94
Temporary Pavement	SY	$16.78	$156,613.33	$156,613.33	$156,613.33	$156,613.33	$156,613.33	$156,613.33
Temporary Base/ Embankment	CY	$11.67	$72,613.33	$72,613.33	$72,613.33	$72,613.33	$72,613.33	$72,613.33
Temporary Barrier, F&I	LF	$20.81	$29,134.00	$29,134.00	$29,134.00	$29,134.00	$29,134.00	$29,134.00
Temporary Barrier, Relocate	LF	$8.58	$12,012.00	$12,012.00	$12,012.00	$12,012.00	$12,012.00	$12,012.00
Temporary Crash Cushion	LO	$827.36	$1,654.72	$1,654.72	$1,654.72	$1,654.72	$1,654.72	$1,654.72
Roadway Subtotal			**$1,375,066**	**$1,472,666**	**$960,979**	**$969,566**	**$342,751**	**$346,672**
Maintenance of Traffic		5%	$68,753.29	$73,633.28	$48,048.93	$48,478.31	$17,137.53	$17,333.58
Mobilization		5%	$68,753.29	$73,633.28	$48,048.93	$48,478.31	$17,137.53	$17,333.58
Project Unknowns		10%	$137,506.58	$147,266.56	$96,097.86	$96,956.62	$34,275.06	$34,667.16
ROADWAY TOTAL			**$1,650,079.01**	**$1,767,198.75**	**$1,153,174.36**	**$1,163,479.39**	**$411,300.74**	**$416,005.96**
STRUCTURE + ROADWAY TOTAL**			**$2,271,597.01**	**$2,228,000.75**	**$2,660,168.36**	**$2,570,215.39**	**$2,406,841.74**	**$2,394,089.96**

*see structures construction cost estimate in Appendix

** Wildlife fencing is additional. See Fencing and Gates Cost Estimate Table; right-of-way costs or easements is not included

Fencing and Gates	**UNIT**	**UNIT COST**	**Location 1 Fence Alternative 1**	**Location 2 Fence Alternative 1**	**Location 1 Fence Alternative 2**	**Location 2 Fence Alternative 2**	**Location 1 Fence Alternative 3**	**Location 2 Fence Alternative 3**
Fencing, Type B, 10.0', w/ barbed wire	LF	$60.00*	$240,000.00	$240,000.00	$360,000	$418,800	$643,920	$1,462,500
Fence Gate, Type B, Single, 6.1 - 12.0' Opening	EA	$1,258.71	$1,259	$2,517	$1,259	$2,517	$1,259	$5,035
TOTAL			**$241,258.71**	**$242,517.42**	**$361,258.71**	**$421,317.42**	**$645,178.71**	**$1,467,534.84**

*Engineer's Cost Estimate

Recommended	
Structure + Roadway Location 1, Box Culvert	$2,271,597.01
Fence Alternative 3	$645,178.71
RECOMMENDED TOTAL	**$2,916,775.72**

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Description: Alternative Estimates Summary

	Alternative No.	Alternative Description	Cost Estimate
Structure Cost Location 1	1	Station 360+50 (approx.) replace existing single barrel 8’ x 4’ box culvert and construct an adjacent 10' x 8' dry box culvert wildlife crossing	$621,518
	2	Station 360+50 (approx.) replace existing single barrel 8’ x 4’ box culvert with at-grade bridges with wildlife shelves (flat slab)	$1,506,994
	3	Station 362+50 (approx.) construct wildlife overpass bridge above US 27	$1,995,541

	Alternative No.	Alternative Description	Cost Estimate
Structure Cost Location 2	1	Station 154+60 (approx.) replace existing double 24" CPP pipes with double 24" RCP pipes and construct an adjacent 10' x 8' dry box culvert wildlife crossing	$460,802
	2	Station 154+60 (approx.) replace existing double 24" CPP pipes with at-grade bridges with wildlife shelves (flat slab)	$1,406,736
	3	Station 156+50 (approx.) construct wildlife overpass bridge above US 27	$1,978,084

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Description: Alternative Cost Estimates

US 27 - Location 1

The cost estimates developed herein utilize a combination of the FDOT BDR Cost Estimate Spreadsheet and the FDOT Historic Cost Information, 12 Month Statewide Moving Averages from November 2021, adjusted per engineering judgement. The culvert is quantified in accordance with FDOT standard Pay Item Nos. 400-4-1 Concrete Class IV, Culvert and 415-1-1 Reinforcing Steel-Roadway (per specifications). Slope protection quantities are quantified in accordance with FDOT standard Pay Item Nos. 530-1 Riprap Sand-Cement, 530-3-3 Riprap Rubble Bank and Shore, and 530-74 Bedding Stone. Multipliers have been included in accordance with SDG Section 9.2.3 (Step 2). While alternative 3 will not need to be phased constructed, a 20% multiplier is still applied due to the anticipated level of MOT that would be required for construction over US 27. Demolition costs of the existing box culvert are not included in the wildlife crossing estimate.

Alternative 1 - Wildlife Crossing Culvert

Pay Item Description	Quantity	Unit	Unit Cost ($/Unit)	Total Cost
400-4-1 Conc Class IV, Culvert(1)	311.6	CY	990.00	$308,464.20
400-4-1 Conc Class IV, Culvert(2)	127.3	CY	990.00	$126,027.00
415-1-1 Reinforcing Steel - Roadway(1)	65,379	LB	1.00	$65,379.16
415-1-1 Reinforcing Steel - Roadway(2)	18,061	LB	1.00	$18,061.00
			Sub-total	**$517,931.36**
			Sub-total(3)	**$373,843.36**
			Multiplier	20%
			Total	**$621,517.63**
			Total(3)	**$448,612.03**

(1) 10' x 8' Wildlife culvert and wingwalls
(2) 8' x 4' Existing culvert replacement (box only)
(3) If existing culvert does not require replacement

Alternative 2 - Flat Slab Bridge

Pay Item Description	Quantity	Unit	Unit Cost ($/Unit)	Total Cost
Bridge (See BDR Cost Estimating Sheet)	2	EA	581894.70	$1,163,789.40
530-1 Riprap, Sand-Cement	49.8	CY	850.00	$42,330.00
530-3-3 Riprap- Rubble, Bank and Shore	1,511.8	TN	113.00	$170,833.40
530-74 Bedding Stone	592.2	TN	123.00	$72,840.60
			Sub-total	**$1,449,793.40**
			Multiplier*	20%
			Total	**$1,506,994.20**

*Multiplier not applied to Bridge Cost, due to these multipliers previously being applied within the BDR Cost Estimating Spreadsheet.

Alternative 3 - Wildlife Overpass Bridge

Pay Item Description	Quantity	Unit	Unit Cost ($/Unit)	Total Cost
Bridge (See BDR Cost Estimating Sheet)	1	EA	1762681.65	$1,762,681.65
120-6 Embankment(1)	18660	CY	10.00	$186,595.46
142-70 Fill Sand(2)	420.1	CY	15.00	$6,302.18
459-71 Piles, Polyethylene Sheeting	144.0	SY	8.00	$1,152.00
			Sub-total	**$1,956,731.29**
			Multiplier*	20%
			Total	**$1,995,541.22**

*Multiplier not applied to Bridge Cost, due to these multipliers previously being applied within the BDR Cost Estimating Spreadsheet.

(1) Embankment quantities reflect the approach embankment leading to the bridge.

(2) Fill Sand quantities reflect the fill on top of the bridge shown in the typical section.

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Description: Alternative Cost Estimates

US 27 - Location 2

The cost estimates developed herein utilize a combination of the FDOT BDR Cost Estimate Spreadsheet and the FDOT Historic Cost Information, 12 Month Statewide Moving Averages from November 2021, adjusted per engineering judgement. The culvert is quantified in accordance with FDOT standard Pay Item Nos. 400-4-1 Concrete Class IV, Culvert and 415-1-1 Reinforcing Steel-Roadway (per specifications). Slope protection quantities are quantified in accordance with FDOT standard Pay Item Nos. 530-1 Riprap Sand-Cement, 530-3-3 Riprap Rubble Bank and Shore, and 530-74 Bedding Stone. Multipliers have been included in accordance with SDG Section 9.2.3 (Step 2). While alternative 3 will not need to be phased constructed, a 20% multiplier is still applied due to the anticipated level of MOT that would be required for construction over US 27. Demolition costs of the existing drainage structure are not included in the wildlife crossing estimate.

Alternative 1 - Wildlife Crossing Culvert

Pay Item Description	Quantity	Unit	Unit Cost ($/Unit)	Total Cost
400-4-1 Conc Class IV, Culvert	295.0	CY	990.00	$292,050.00
415-1-1 Reinforcing Steel - Roadway	61,964	LB	1.00	$61,964.00
430-175-124 Pipe Culvert, Optional Material, Round, 24"S/CD	294	LF	102.00	$29,988.00
			Sub-total	**$384,002.00**
			Multiplier	20%
			Total	**$460,802.40**

Alternative 2 - Flat Slab Bridge

Pay Item Description	Quantity	Unit	Unit Cost ($/Unit)	Total Cost
Bridge (See BDR Cost Estimating Sheet)	2	EA	539816.70	$1,079,633.40
530-1 Riprap, Sand-Cement	50.2	CY	850.00	$42,670.00
530-3-3 Riprap- Rubble, Bank and Shore	1,433.8	TN	113.00	$162,019.40
530-74 Bedding Stone	552.0	TN	123.00	$67,896.00
			Sub-total	**$1,352,218.80**
			Multiplier*	20%
			Total	**$1,406,735.88**

*Multiplier not applied to Bridge Cost, due to these multipliers previously being applied within the BDR Cost Estimating Spreadsheet.

Alternative 3 - Wildlife Overpass Bridge

Pay Item Description	Quantity	Unit	Unit Cost ($/Unit)	Total Cost
Bridge (See BDR Cost Estimating Sheet)	1	EA	1766561.40	$1,766,561.40
120-6 Embankment[(1)]	16881	CY	10.00	$168,814.79
142-70 Fill Sand[(2)]	420.1	CY	15.00	$6,302.18
459-71 Piles, Polyethylene Sheeting	144.0	SY	8.00	$1,152.00
			Sub-total	**$1,942,830.36**
			Multiplier*	20%
			Total	**$1,978,084.16**

*Multiplier not applied to Bridge Cost, due to these multipliers previously being applied within the BDR Cost Estimating Spreadsheet.

(1) Embankment quantities reflect the approach embankment leading to the bridge.

(2) Fill Sand quantities reflect the fill on top of the bridge shown in the typical section.

US 27 Alternative 1 at Location 1

WILDLIFE UNDERPASS - CONCRETE BOX CULVERT

US 27 WILDLIFE CROSSING ANALYSIS

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Substructure Quantities

US 27 - Location 1 - Alternative 1

0400 4 1 CONCRETE CLASS IV, CULVERT

Replace 8'-4' Existing Culvert Replacement					
Location	Volume *(CY)*			Quantity	Volume *(CY)*
Box	127.30			1	127.30
Wing Wall	35.04			2	70.08
				TOTAL	197.4 CY

10'-8' Wildlife Crossing					
Location	Volume *(CY)*			Quantity	Volume *(CY)*
Box	182.36			1	182.36
Wing Wall	17.79			2	35.58
				TOTAL	218.0 CY

Additional Wall				
Location	Cross Sectional area *(sf)*	Length *(ft.)*	Quantity	Volume *(CY)*
Wall Section 1	9.13	9.67	2	6.53
Wall Section 2	16.63	7.00	2	8.62
Footing	16.00	7.00	2	8.30
			TOTAL	23.5 CY

SUMMARY	
Location	Volume *(CY)*
8'x4' Culvert	197.4
10'x8' Wildlife Culvert	218.0
Additional Wingwall	23.5

PAY ITEM TOTAL 438.9 CY

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Substructure Quantities

US 27 - Location 1 - Alternative 1

0415 1 1 REINFORCING STEEL - ROADWAY

8'x4' Existing Culvert Replacement					
Location	Weight *(LB)*			Units	Weight *(LB)*
Main Box	18061.00			1	18061.00
Left Begin Wingwall	5756.00			1	5756.00
Right Begin Wingwall	5756.00			1	5756.00
Left Headwall	125.00			1	125.00
Right Headwall	125.00			1	125.00
Left Cutoff wall	58.00			1	58.00
Right Cutoff Wall	58.00			1	58.00
				TOTAL	29939 LB

10'x8' Wildlife Crossing					
Location	Weight *(LB)*			Units	Weight *(LB)*
Main Box	44198.00			1	44198.00
Left End Wingwall	2578.00			1	2578.00
Right End Wingwall	2578.00			1	2578.00
Left Headwall	151.00			1	151.00
Right Headwall	151.00			1	151.00
Left Cutoff wall	69.00			1	69.00
Right Cutoff Wall	69.00			1	69.00
				TOTAL	49794 LB

Additional Wingwall				
Location	Volume *(CY)*	Reinforcing ratio* *(LB/CY)*		Weight *(lb.)*
Box	23.50	158		3707
*Average between the being and end wingwalls			TOTAL	3707 LB

SUMMARY	
Location	Volume *(CY)*
8'x4' Culvert	29939.0
10'x8' Wildlife Culvert	49794.0
Additional Wingwall	3707.2

PAY ITEM TOTAL 83440 LB

M:\1201750 FDA D1 DW Environmental\WO 10 - SR29 US27 WLC Feasibility\Structures\US27\Cost Estimate\Loc_1_Alternative_1\Loc_1_Alt_1_Summary_of_Structures_Quantities.xlsx

Box Culvert Analysis:
Estimate of Quantities

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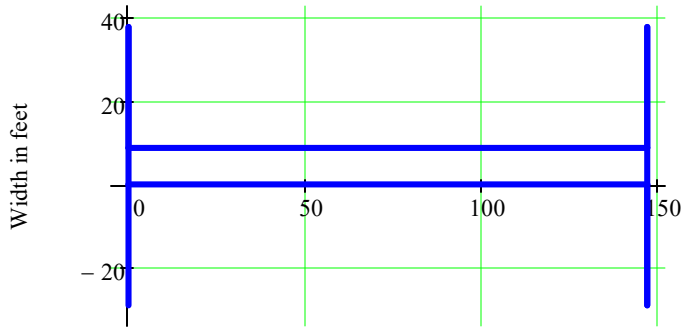
Project = "US27 Wildlife Crossing Analysis"

DesignedBy = "SKB"

CheckedBy = "____"

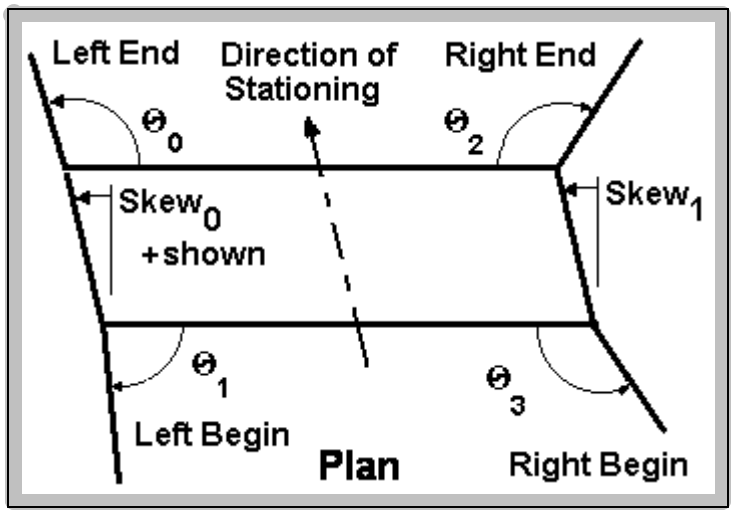
CurrentDataFile = "\Data Files CIP\8'x4' Existing Culvert.dat"

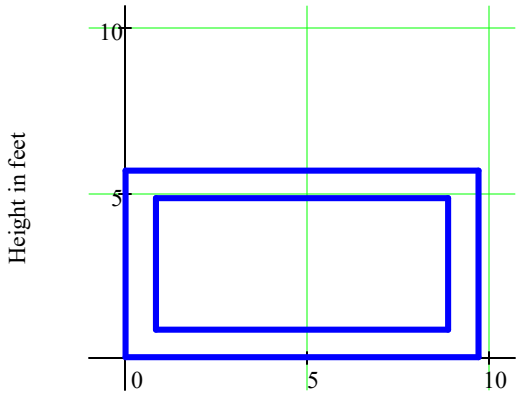
Comment = "Location 1 - 8'x4' Existing Box Culvert Replacement"



Length in feet

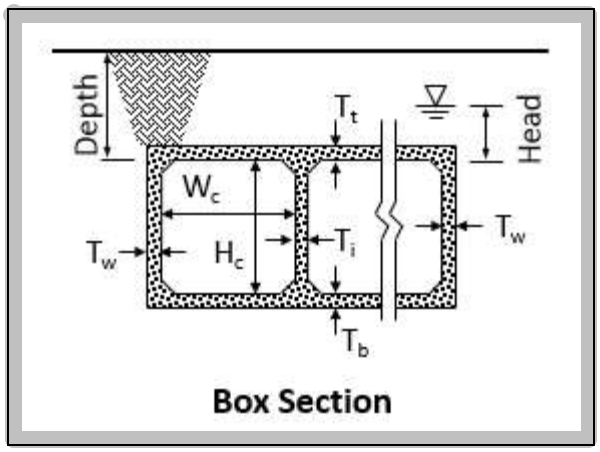
Plan - Box Culvert





Width in feet

Cross Section - Box Culvert



Box Dimensions

HydraulicOpening := $W_c \cdot H_c \cdot NoOfCells$

HydraulicOpening = $32\ ft^2$

SoilHeight = 9.3 ft

NoOfCells = 1 | W_c = 8 ft | H_c = 4 ft | L_c = 147 ft | θ^T = (90 90 90 90)·deg | Head = 0 ft

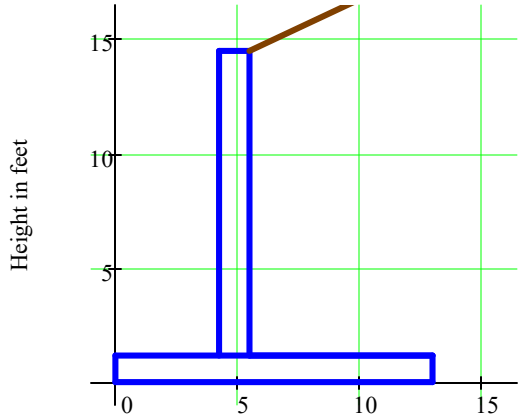
T_t = 10·in | T_b = 10·in | T_w = 10·in | T_i = 10·in | Cover = 2·in | Depth = 10.13 ft

Cutoff wall and Headwall Dimensions

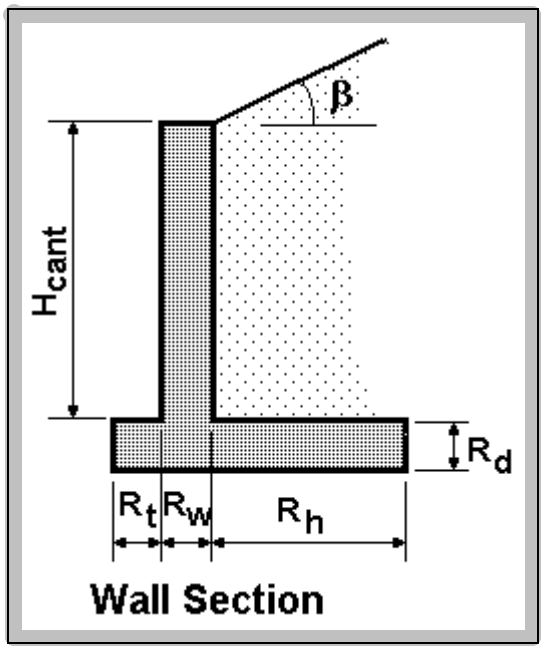
$Skew_{left}$ = 0·deg | B_{lhw} = 18·in | H_{lhw} = 24·in | B_{lcw} = 12·in | H_{lcw} = 24·in

$Skew_{right}$ = 0·deg | B_{rhw} = 18·in | H_{rhw} = 24·in | B_{rcw} = 12·in | H_{rcw} = 24·in

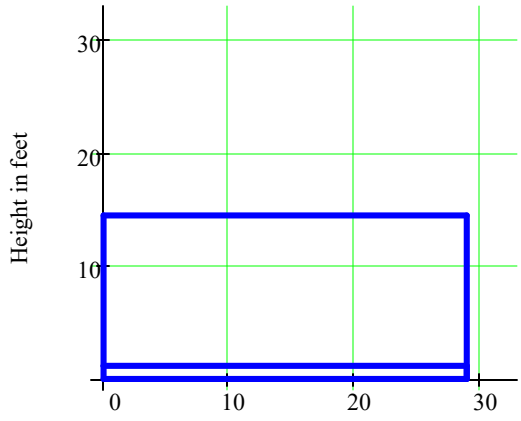
Wingwall Dimensions



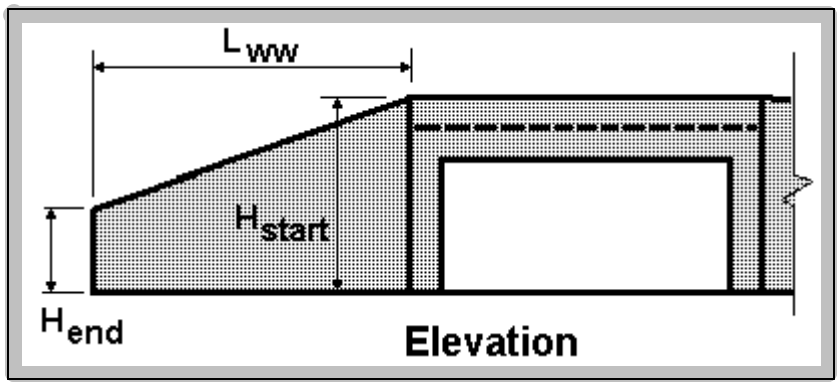
Cross Section - First Wingwall



$$R_t = \begin{pmatrix} 51 \\ 51 \\ 51 \\ 51 \end{pmatrix} \cdot in \qquad R_w = \begin{pmatrix} 15 \\ 15 \\ 15 \\ 15 \end{pmatrix} \cdot in \qquad R_h = \begin{pmatrix} 90 \\ 90 \\ 90 \\ 90 \end{pmatrix} \cdot in \qquad R_d = \begin{pmatrix} 14 \\ 14 \\ 14 \\ 14 \end{pmatrix} \cdot in \qquad \beta = \begin{pmatrix} 26.57 \\ 26.57 \\ 26.57 \\ 26.57 \end{pmatrix} \cdot deg$$



Elevation - First Wingwall



$$H_{end} = \begin{pmatrix} 13.3 \\ 13.3 \\ 13.3 \\ 13.3 \end{pmatrix} ft \qquad H_{start} = \begin{pmatrix} 13.3 \\ 13.3 \\ 13.3 \\ 13.3 \end{pmatrix} ft \qquad L_{ww} = \begin{pmatrix} 29 \\ 29 \\ 29 \\ 29 \end{pmatrix} ft \qquad \theta = \begin{pmatrix} 90 \\ 90 \\ 90 \\ 90 \end{pmatrix} \cdot deg$$

Summary of Concrete Quantities

$Vol_{cw.left} = 0.42 \cdot yd^3$ $Vol_{cw.right} = 0.42 \cdot yd^3$

$Vol_{bot.slab} = 44.75 \cdot yd^3$ $Vol_{walls} = 36.3 \cdot yd^3$ $Vol_{top.slab} = 43.86 \cdot yd^3$

$Vol_{hw.left} = 0.63 \cdot yd^3$ $Vol_{hw.right} = 0.63 \cdot yd^3$

$$Vol_{wall} = \begin{pmatrix} 17.86 \\ 17.86 \\ 17.86 \\ 17.86 \end{pmatrix} \cdot yd^3 \quad Vol_{ww.cowall} = \begin{pmatrix} 0.8951 \\ 0.8951 \\ 0.8951 \\ 0.8951 \end{pmatrix} \cdot yd^3 \quad Vol_{footing} = \begin{pmatrix} 16.29 \\ 16.29 \\ 16.29 \\ 16.29 \end{pmatrix} \cdot yd^3 \quad TotalVol_{wingwall} = \begin{pmatrix} 35.04 \\ 35.04 \\ 35.04 \\ 35.04 \end{pmatrix} \cdot yd^3$$

$Vol_{box} = 127.3 \cdot yd^3$ $\sum Vol_{wall} = 71.43 \cdot yd^3$ $\sum TotalVol_{footing} = 68.74 \cdot yd^3$ $TotalVolume = 267.47 \cdot yd^3$

Summary of Soil and Miscellaneous Values

$E = 4388 \cdot ksi$ $f_c = 5.5 \cdot ksi$

Extension = 0
0 - *new box (no extension)*
1 - *left extension*
2 - *right extension*

Env = 2
Environmental Class
1 - slightly aggressive
2 - moderately aggressive
3 - extremely aggressive

$F_y = 60 \cdot ksi$ $n_{mod} = 6.609$

$ConsiderLLSurcharge_{ww} = 1$ *0 - No* *1 - Yes*

$ConsiderLL_{hw} = 1$ *0 - No* *1 - Yes*

$BarrierDL_{hw} = 0 \cdot \frac{kip}{ft}$

$\gamma_{soil} = 120 \cdot \frac{lbf}{ft^3}$ $k_s = 100000 \cdot \frac{lbf}{ft^3}$ $\phi = 30 \cdot deg$ $q_{nom} = 5000 \cdot \frac{lbf}{ft^2}$

Summary of Reinforcement Check Values

$Check_{box}$ = "OK" $Check_{cw}$ = "OK" $Check_{hw}$ = "OK" $Check_{ww}$ = "OK" TotalCheck = "OK"

$$BarSize_{slabs} = \begin{pmatrix} 5 \\ 5 \\ 5 \\ 5 \end{pmatrix} \quad S_{slabs} = \begin{pmatrix} 10 \\ 10 \\ 10 \\ 10 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
bot slab, top mat
bot slab, bot mat

$$BarSize_{long} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad S_{long} = \begin{pmatrix} 12 \\ 12 \\ 12 \\ 12 \\ 12 \\ 12 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
interior wall(s)
exterior walls
bot slab, both m.

$$BarSize_{walls} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{walls} = \begin{pmatrix} 16 \\ 16 \end{pmatrix} \cdot in$$

interior wall(s)
exterior walls

$$BarSize_{corners} = \begin{pmatrix} 5 \\ 5 \end{pmatrix} \quad S_{corners} = \begin{pmatrix} 10 \\ 10 \end{pmatrix} \cdot in$$

top corner
bot corner

$$BarSize_{cw} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad Num_{cw} = \begin{pmatrix} 2 \\ 2 \\ 2 \\ 2 \end{pmatrix}$$

top bar, left cw
bot bar, left cw
top bar, right cw
bot bar, right cw

$$StirSize_{cw} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{stirrup.cw} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$$

$$BarSize_{hw} = \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \end{pmatrix} \quad Num_{hw} = \begin{pmatrix} 3 \\ 3 \\ 3 \\ 3 \end{pmatrix}$$

top bar, left hw
bot bar, left hw
top bar, right hw
bot bar, right hw

$$StirSize_{hw} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{stirrup.hw} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$$

Reinforcement List - Main Box

click table below to reveal scroll bar...

$Reinf_{box}$ =

	0	1	2	3	4
0	"Bar Location"	"Size"	"Desig"	"Len"	"Num"
1	"top face, top slab"	5	101	9.33	177
2	"bot face, top slab"	5	102	9.33	177
3	"top face, bot slab"	5	103	9.33	181
4	"bot face, bot slab"	5	104	9.33	181
5	"top ext corner"	5	105	5.28	352
6	"bot ext corner"	5	106	5.28	352
7	"inside face, ext wall"	4	108	5.33	220
8	long top face, bot slab"	4	109	152.49	11
9	long top face, top slab"	4	110	149.49	11
10	long bot face, top slab"	4	111	148.84	11
11	long bot face, bot slab"	4	112	152.49	11
12	ng each face, ext wall"	4	113	149.49	10
13	ng each face, ext wall"	4	114	149.49	...
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					

Reinforcement Lists - Left Begin and Left End Wingwalls

$Rw_0 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	7	401	13.05	59	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	402	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall horiz, soil side"	6	404	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall vert, front side"	4	406	13.05	30	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall vert, soil side"	7	407	8.55	59	10	0	0	5.17	3.38	0	0	0	0	0	0	0
"top footing heel"	6	409	12.67	59	1	0	0	12.67	0	0	0	0	0	0	0	0
"bot footing toe"	4	410	12.67	30	1	0	0	12.67	0	0	0	0	0	0	0	0
"temp footing"	4	411	28.67	28	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall to box ties"	5	412	2	21	1	0	0	2	0	0	0	0	0	0	0	0

$Rw_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	7	501	13.05	59	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	502	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall horiz, soil side"	6	504	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall vert, front side"	4	506	13.05	30	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall vert, soil side"	7	507	8.55	59	10	0	0	5.17	3.38	0	0	0	0	0	0	0
"top footing heel"	6	509	12.67	59	1	0	0	12.67	0	0	0	0	0	0	0	0
"bot footing toe"	4	510	12.67	30	1	0	0	12.67	0	0	0	0	0	0	0	0
"temp footing"	4	511	28.67	28	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall to box ties"	5	512	2	21	1	0	0	2	0	0	0	0	0	0	0	0

Reinforcement Lists - Right Begin and Right End Wingwalls

$Rw_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	7	601	13.05	59	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	602	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall horiz, soil side"	6	604	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall vert, front side"	4	606	13.05	30	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall vert, soil side"	7	607	8.55	59	10	0	0	5.17	3.38	0	0	0	0	0	0	0
"top footing heel"	6	609	12.67	59	1	0	0	12.67	0	0	0	0	0	0	0	0
"bot footing toe"	4	610	12.67	30	1	0	0	12.67	0	0	0	0	0	0	0	0
"temp footing"	4	611	28.67	28	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall to box ties"	5	612	2	21	1	0	0	2	0	0	0	0	0	0	0	0

$Rw_3 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	7	701	13.05	59	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	702	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall horiz, soil side"	6	704	28.67	15	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall vert, front side"	4	706	13.05	30	1	0	0	13.05	0	0	0	0	0	0	0	0
"wall vert, soil side"	7	707	8.55	59	10	0	0	5.17	3.38	0	0	0	0	0	0	0
"top footing heel"	6	709	12.67	59	1	0	0	12.67	0	0	0	0	0	0	0	0
"bot footing toe"	4	710	12.67	30	1	0	0	12.67	0	0	0	0	0	0	0	0
"temp footing"	4	711	28.67	28	1	0	0	28.67	0	0	0	0	0	0	0	0
"wall to box ties"	5	712	2	21	1	0	0	2	0	0	0	0	0	0	0	0

Reinforcement Lists - Headwalls and Cutoff Walls

$Rh_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	6	801	9.33	3	1	0	0	9.33	0	0	0	0	0	0	0	0
"bottom"	6	802	9.33	3	1	0	0	9.33	0	0	0	0	0	0	0	0
"stirrups"	4	803	6.13	10	27	0	0	1.61	0.5	0.67	0.42	1.2	1	1	0	0

$Rh_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	6	804	9.33	3	1	0	0	9.33	0	0	0	0	0	0	0	0
"bottom"	6	805	9.33	3	1	0	0	9.33	0	0	0	0	0	0	0	0
"stirrups"	4	806	6.13	10	27	0	0	1.61	0.5	0.67	0.42	1.2	1	1	0	0

$Rc_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	807	9.33	2	1	0	0	9.33	0	0	0	0	0	0	0	0
"bottom"	4	808	9.33	2	1	0	0	9.33	0	0	0	0	0	0	0	0
"stirrups"	4	809	4.9	10	7	0	0	1.61	0.67	0.5	0.5	0	0	0	0	0

$Rc_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	810	9.33	2	1	0	0	9.33	0	0	0	0	0	0	0	0
"bottom"	4	811	9.33	2	1	0	0	9.33	0	0	0	0	0	0	0	0
"stirrups"	4	812	4.9	10	7	0	0	1.61	0.67	0.5	0.5	0	0	0	0	0

No variables are modified in this file:

CurrentDataFile = "\Data Files CIP\8'x4' Existing Culvert.dat"

REINFORCING STEEL QUANTITIES

DATE RAN: MON NOV 29 16:08:28 2021

NAME OF UNIT	QUANTITY/UNIT	NO. UNITS	TOTAL-QUANTITY	COST/LB	TOTAL-COST
MAIN BOX	18061 LBS	X 1 =	18061 LBS AT	0.000 =	$ 0.00
LEFT END WINGWALL	5756 LBS	X 1 =	5756 LBS AT	0.000 =	$ 0.00
LEFT BEGIN WINGWALL	5756 LBS	X 1 =	5756 LBS AT	0.000 =	$ 0.00
RIGHT END WINGWALL	5756 LBS	X 1 =	5756 LBS AT	0.000 =	$ 0.00
RIGHT BEGIN WINGWALL	5756 LBS	X 1 =	5756 LBS AT	0.000 =	$ 0.00
LEFT HEADWALL	125 LBS	X 1 =	125 LBS AT	0.000 =	$ 0.00
RIGHT HEADWALL	125 LBS	X 1 =	125 LBS AT	0.000 =	$ 0.00
LEFT CUTOFF WALL	58 LBS	X 1 =	58 LBS AT	0.000 =	$ 0.00
RIGHT CUTOFF WALL	58 LBS	X 1 =	58 LBS AT	0.000 =	$ 0.00
		GRAND TOTAL =	41451 LBS		$ 0.00

LOCATION MAIN BOX NO. REQUIRED = 1

									LBS/MARK
5	101	9- 4	177	1	9- 4				1722.97
5	102	9- 4	177	1	9- 4				1722.97
5	103	9- 4	181	1	9- 4				1761.91
5	104	9- 4	181	1	9- 4				1761.91
5	105	5- 4	352	10	1- 9	3- 6 1/2			1938.48
5	106	5- 4	352	10	1- 9	3- 6 1/2			1938.48
4	108	5- 4	220	1	5- 4				783.30
4	109	152- 7	11	2	1- 5	149- 8 1/2		2	1120.72
4	110	149- 7	11	2	1- 5	146- 8 1/2		2	1098.67
4	111	148-10	11	2	1- 5	146- 0		2	1093.53
4	112	152- 7	11	2	1- 5	149- 8 1/2		2	1120.72
4	113	149- 7	10	2	1- 5	146- 8 1/2		2	998.79
4	114	149- 7	10	2	1- 5	146- 8 1/2		2	998.79

LOCATION LEFT END WINGWALL NO. REQUIRED = 1

									LBS/MARK
7	401	13- 1	59	1	13- 0 1/2				1573.78
4	402	28- 8	15	1	28- 8				287.27
6	404	28- 8	15	1	28- 8				645.94
4	406	13- 1	30	1	13- 0 1/2				261.52
7	407	8- 7	59	10	5- 2	3- 4 1/2			1031.10
6	409	12- 8	59	1	12- 8				1122.79
4	410	12- 8	30	1	12- 8				253.91
4	411	28- 8	28	1	28- 8				536.24
5	412	2- 0	21	1	2- 0				43.81

LOCATION LEFT BEGIN WINGWALL NO. REQUIRED = 1

									LBS/MARK
7	501	13- 1	59	1	13- 0 1/2				1573.78
4	502	28- 8	15	1	28- 8				287.27
6	504	28- 8	15	1	28- 8				645.94
4	506	13- 1	30	1	13- 0 1/2				261.52
7	507	8- 7	59	10	5- 2	3- 4 1/2			1031.10
6	509	12- 8	59	1	12- 8				1122.79
4	510	12- 8	30	1	12- 8				253.91
4	511	28- 8	28	1	28- 8				536.24
5	512	2- 0	21	1	2- 0				43.81

LOCATION RIGHT END WINGWALL NO. REQUIRED = 1

									LBS/MARK
7	601	13- 1	59	1	13- 0 1/2				1573.78
4	602	28- 8	15	1	28- 8				287.27
6	604	28- 8	15	1	28- 8				645.94
4	606	13- 1	30	1	13- 0 1/2				261.52
7	607	8- 7	59	10	5- 2	3- 4 1/2			1031.10
6	609	12- 8	59	1	12- 8				1122.79

4	610	12- 8	30	1	12- 8							253.91
4	611	28- 8	28	1	28- 8							536.24
5	612	2- 0	21	1	2- 0							43.81

LOCATION RIGHT BEGIN WINGWALL NO. REQUIRED = 1 LBS/MARK

7	701	13- 1	59	1	13- 0 1/2							1573.78
4	702	28- 8	15	1	28- 8							287.27
6	704	28- 8	15	1	28- 8							645.94
4	706	13- 1	30	1	13- 0 1/2							261.52
7	707	8- 7	59	10	5- 2	3- 4 1/2						1031.10
6	709	12- 8	59	1	12- 8							1122.79
4	710	12- 8	30	1	12- 8							253.91
4	711	28- 8	28	1	28- 8							536.24
5	712	2- 0	21	1	2- 0							43.81

LOCATION LEFT HEADWALL NO. REQUIRED = 1 LBS/MARK

6	801	9- 4	3	1	9- 4							42.05
6	802	9- 4	3	1	9- 4							42.05
4	803	6- 2	10	27	1- 7 1/2	0- 6	0- 8	0- 5	1- 2 1/2	1- 0	1- 0	40.96
10	0	0- 0	0	0								

LOCATION RIGHT HEADWALL NO. REQUIRED = 1 LBS/MARK

6	804	9- 4	3	1	9- 4							42.05
6	805	9- 4	3	1	9- 4							42.05
4	806	6- 2	10	27	1- 7 1/2	0- 6	0- 8	0- 5	1- 2 1/2	1- 0	1- 0	40.96
10	0	0- 0	0	0								

LOCATION LEFT CUTOFF WALL NO. REQUIRED = 1 LBS/MARK

4	807	9- 4	2	1	9- 4							12.47
4	808	9- 4	2	1	9- 4							12.47
4	809	4-11	10	7	1- 7 1/2	0- 8	0- 6	0- 6				32.73
10	0	0- 0	0	0								

LOCATION RIGHT CUTOFF WALL NO. REQUIRED = 1 LBS/MARK

4	810	9- 4	2	1	9- 4							12.47
4	811	9- 4	2	1	9- 4							12.47
4	812	4-11	10	7	1- 7 1/2	0- 8	0- 6	0- 6				32.73
10	0	0- 0	0	0								

Box Culvert Analysis:
Estimate of Quantities

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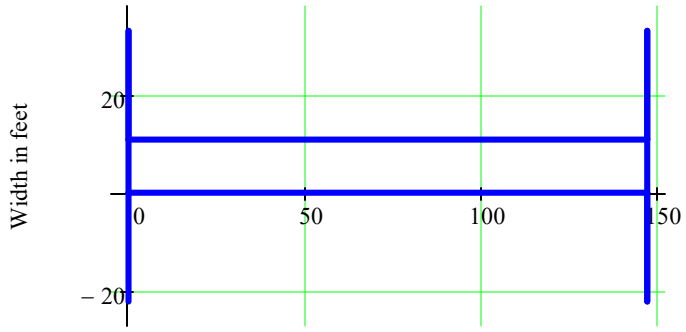
Project = "US27 Wildlife Crossing Analysis"

DesignedBy = "SKB"

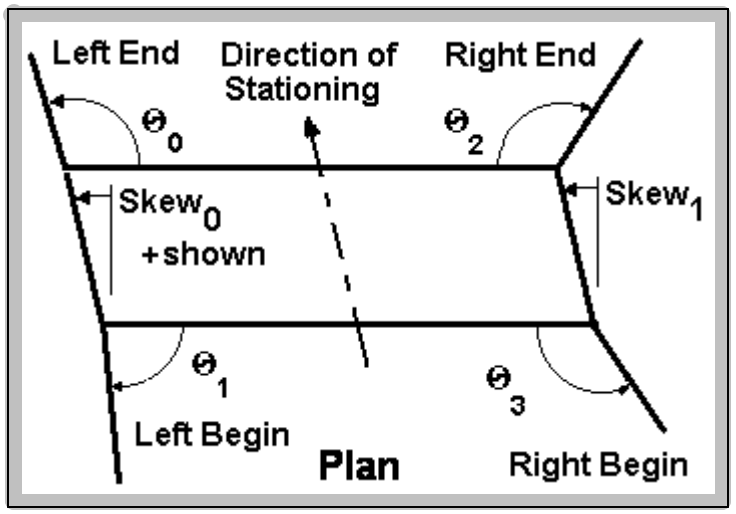
CheckedBy = "____"

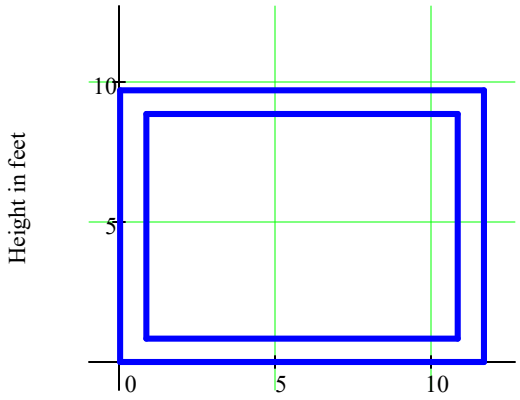
CurrentDataFile = "\Data Files CIP\Loc_1_10'x8' Wildlife Culvert.dat"

Comment = "Location 1 - 10' x 8' Wildlife Crossing Box Culvert"

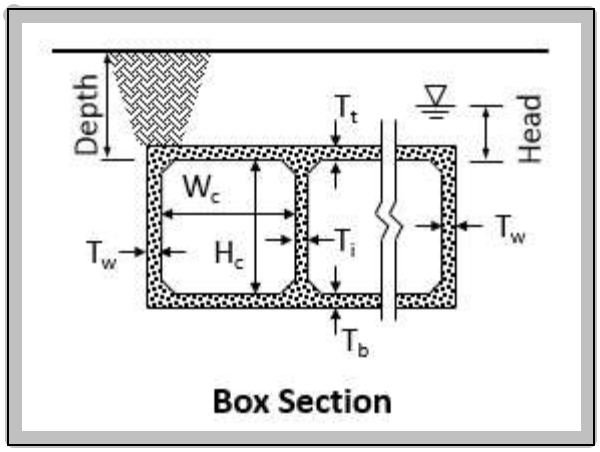


Plan - Box Culvert





Cross Section - Box Culvert



Box Dimensions

HydraulicOpening := $W_c \cdot H_c \cdot NoOfCells$ HydraulicOpening = 80 ft^2 SoilHeight = 2 ft

NoOfCells = 1 W_c = 10 ft H_c = 8 ft L_c = 147 ft θ^T = (90 90 90 90)·deg Head = 0 ft

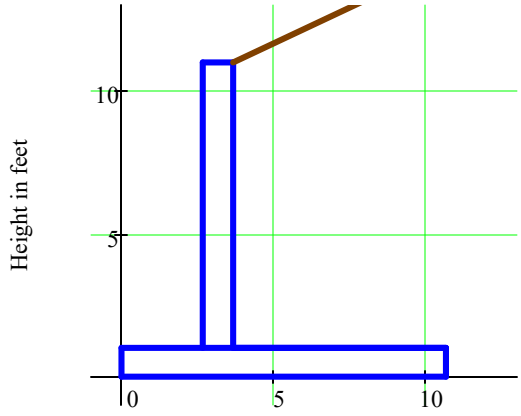
T_t = 10·in T_b = 10·in T_w = 10·in T_i = 10·in Cover = 2·in Depth = 2.833 ft

Cutoff wall and Headwall Dimensions

$Skew_{left}$ = 0·deg B_{lhw} = 18·in H_{lhw} = 24·in B_{lcw} = 12·in H_{lcw} = 24·in

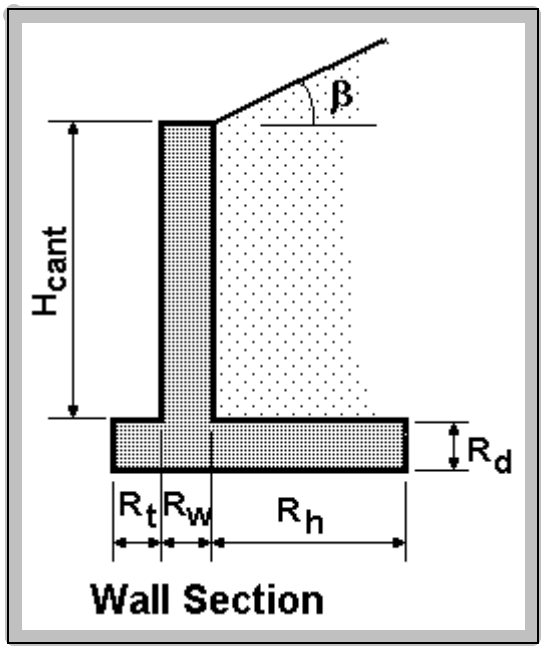
$Skew_{right}$ = 0·deg B_{rhw} = 18·in H_{rhw} = 24·in B_{rcw} = 12·in H_{rcw} = 24·in

Wingwall Dimensions

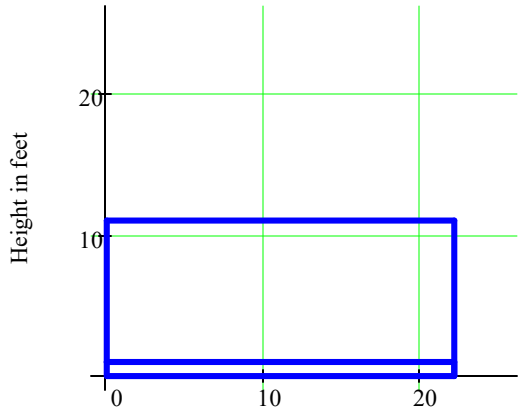


Width in feet

Cross Section - First Wingwall

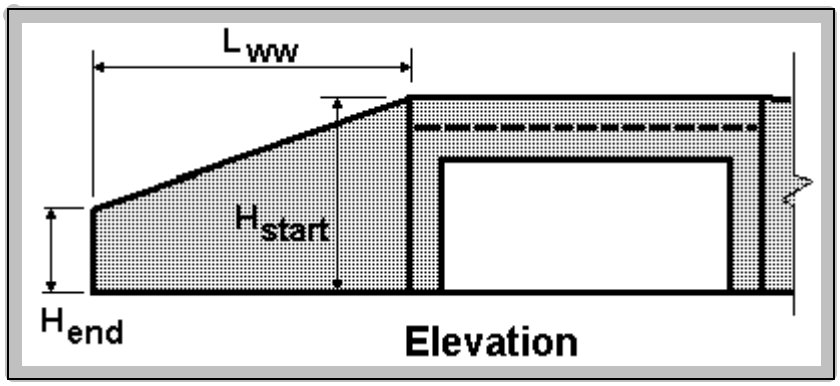


$$R_t = \begin{pmatrix} 32 \\ 32 \\ 32 \\ 32 \end{pmatrix} \cdot in \qquad R_w = \begin{pmatrix} 12 \\ 12 \\ 12 \\ 12 \end{pmatrix} \cdot in \qquad R_h = \begin{pmatrix} 84 \\ 84 \\ 84 \\ 84 \end{pmatrix} \cdot in \qquad R_d = \begin{pmatrix} 12 \\ 12 \\ 12 \\ 12 \end{pmatrix} \cdot in \qquad \beta = \begin{pmatrix} 26.57 \\ 26.57 \\ 26.57 \\ 26.57 \end{pmatrix} \cdot deg$$



Width in feet

Elevation - First Wingwall



$$H_{end} = \begin{pmatrix} 10 \\ 10 \\ 10 \\ 10 \end{pmatrix} ft \qquad H_{start} = \begin{pmatrix} 10 \\ 10 \\ 10 \\ 10 \end{pmatrix} ft \qquad L_{ww} = \begin{pmatrix} 22.17 \\ 22.17 \\ 22.17 \\ 22.17 \end{pmatrix} ft \qquad \theta = \begin{pmatrix} 90 \\ 90 \\ 90 \\ 90 \end{pmatrix} \cdot deg$$

Summary of Concrete Quantities

$Vol_{cw.left} = 0.5 \cdot yd^3$ $Vol_{cw.right} = 0.5 \cdot yd^3$

$Vol_{bot.slab} = 54.01 \cdot yd^3$ $Vol_{walls} = 72.59 \cdot yd^3$ $Vol_{top.slab} = 52.93 \cdot yd^3$

$Vol_{hw.left} = 0.76 \cdot yd^3$ $Vol_{hw.right} = 0.76 \cdot yd^3$

$$Vol_{wall} = \begin{pmatrix} 8.21 \\ 8.21 \\ 8.21 \\ 8.21 \end{pmatrix} \cdot yd^3 \quad Vol_{ww.cowall} = \begin{pmatrix} 0.8211 \\ 0.8211 \\ 0.8211 \\ 0.8211 \end{pmatrix} \cdot yd^3 \quad Vol_{footing} = \begin{pmatrix} 8.76 \\ 8.76 \\ 8.76 \\ 8.76 \end{pmatrix} \cdot yd^3 \quad TotalVol_{wingwall} = \begin{pmatrix} 17.79 \\ 17.79 \\ 17.79 \\ 17.79 \end{pmatrix} \cdot yd^3$$

$Vol_{box} = 182.36 \cdot yd^3$ $\sum Vol_{wall} = 32.84 \cdot yd^3$ $\sum TotalVol_{footing} = 38.32 \cdot yd^3$ $TotalVolume = 253.52 \cdot yd^3$

Summary of Soil and Miscellaneous Values

$E = 4388 \cdot ksi$ $f_c = 5.5 \cdot ksi$

Extension = 0
0 - *new box (no extension)*
1 - *left extension*
2 - *right extension*

Env = 2
Environmental Class
1 - slightly aggressive
2 - moderately aggressive
3 - extremely aggressive

$F_y = 60 \cdot ksi$ $n_{mod} = 6.609$

$ConsiderLLSurcharge_{ww} = 1$ *0 - No* *1 - Yes*

$ConsiderLL_{hw} = 1$ *0 - No* *1 - Yes*

$BarrierDL_{hw} = 0 \cdot \frac{kip}{ft}$

$\gamma_{soil} = 120 \cdot \frac{lbf}{ft^3}$ $k_s = 100000 \cdot \frac{lbf}{ft^3}$ $\phi = 30 \cdot deg$ $q_{nom} = 5000 \cdot \frac{lbf}{ft^2}$

Summary of Reinforcement Check Values

$Check_{box}$ = "OK" $Check_{cw}$ = "OK" $Check_{hw}$ = "OK" $Check_{ww}$ = "OK" TotalCheck = "OK"

$$BarSize_{slabs} = \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \end{pmatrix} \quad S_{slabs} = \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
bot slab, top mat
bot slab, bot mat

$$BarSize_{long} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad S_{long} = \begin{pmatrix} 12 \\ 12 \\ 12 \\ 12 \\ 12 \\ 12 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
interior wall(s)
exterior walls
bot slab, both m.

$$BarSize_{walls} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{walls} = \begin{pmatrix} 16 \\ 16 \end{pmatrix} \cdot in$$

interior wall(s)
exterior walls

$$BarSize_{corners} = \begin{pmatrix} 6 \\ 6 \end{pmatrix} \quad S_{corners} = \begin{pmatrix} 6 \\ 6 \end{pmatrix} \cdot in$$

top corner
bot corner

$$BarSize_{cw} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad Num_{cw} = \begin{pmatrix} 2 \\ 2 \\ 2 \\ 2 \end{pmatrix}$$

top bar, left cw
bot bar, left cw
top bar, right cw
bot bar, right cw

$$StirSize_{cw} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{stirrup.cw} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$$

$$BarSize_{hw} = \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \end{pmatrix} \quad Num_{hw} = \begin{pmatrix} 3 \\ 3 \\ 3 \\ 3 \end{pmatrix}$$

top bar, left hw
bot bar, left hw
top bar, right hw
bot bar, right hw

$$StirSize_{hw} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{stirrup.hw} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$$

Reinforcement List - Main Box

click table below to reveal scroll bar...

$Reinf_{box}$ =

	0	1	2	3	4
0	"Bar Location"	"Size"	"Desig"	"Len"	"Num"
1	"top face, top slab"	6	101	11.33	295
2	"bot face, top slab"	6	102	11.33	295
3	"top face, bot slab"	6	103	11.33	301
4	"bot face, bot slab"	6	104	11.33	301
5	"top ext corner"	6	105	7.76	588
6	"bot ext corner"	6	106	7.76	588
7	"inside face, ext wall"	4	108	9.33	220
8	long top face, bot slab"	4	109	152.49	13
9	long top face, top slab"	4	110	149.49	13
10	long bot face, top slab"	4	111	148.84	13
11	long bot face, bot slab"	4	112	152.49	13
12	ng each face, ext wall"	4	113	149.49	18
13	ng each face, ext wall"	4	114	149.49	...
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					

Reinforcement Lists - Left Begin and Left End Wingwalls

$Rw_0 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	6	401	9.75	45	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	402	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	404	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall vert, front side"	4	406	9.75	23	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	6	407	6.22	45	10	0	0	3.33	2.89	0	0	0	0	0	0	0
"top footing heel"	5	409	10.33	45	1	0	0	10.33	0	0	0	0	0	0	0	0
"bot footing toe"	4	410	10.33	23	1	0	0	10.33	0	0	0	0	0	0	0	0
"temp footing"	4	411	21.84	24	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall to box ties"	5	412	2	16	1	0	0	2	0	0	0	0	0	0	0	0

$Rw_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	6	501	9.75	45	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	502	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	504	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall vert, front side"	4	506	9.75	23	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	6	507	6.22	45	10	0	0	3.33	2.89	0	0	0	0	0	0	0
"top footing heel"	5	509	10.33	45	1	0	0	10.33	0	0	0	0	0	0	0	0
"bot footing toe"	4	510	10.33	23	1	0	0	10.33	0	0	0	0	0	0	0	0
"temp footing"	4	511	21.84	24	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall to box ties"	5	512	2	16	1	0	0	2	0	0	0	0	0	0	0	0

Reinforcement Lists - Right Begin and Right End Wingwalls

$Rw_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	6	601	9.75	45	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	602	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	604	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall vert, front side"	4	606	9.75	23	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	6	607	6.22	45	10	0	0	3.33	2.89	0	0	0	0	0	0	0
"top footing heel"	5	609	10.33	45	1	0	0	10.33	0	0	0	0	0	0	0	0
"bot footing toe"	4	610	10.33	23	1	0	0	10.33	0	0	0	0	0	0	0	0
"temp footing"	4	611	21.84	24	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall to box ties"	5	612	2	16	1	0	0	2	0	0	0	0	0	0	0	0

$Rw_3 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	6	701	9.75	45	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	702	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	704	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall vert, front side"	4	706	9.75	23	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	6	707	6.22	45	10	0	0	3.33	2.89	0	0	0	0	0	0	0
"top footing heel"	5	709	10.33	45	1	0	0	10.33	0	0	0	0	0	0	0	0
"bot footing toe"	4	710	10.33	23	1	0	0	10.33	0	0	0	0	0	0	0	0
"temp footing"	4	711	21.84	24	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall to box ties"	5	712	2	16	1	0	0	2	0	0	0	0	0	0	0	0

Reinforcement Lists - Headwalls and Cutoff Walls

$Rh_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	6	801	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	6	802	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	803	6.11	12	27	0	0	1.6	0.5	0.67	0.42	1.19	1	1	0	0

$Rh_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	6	804	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	6	805	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	806	6.11	12	27	0	0	1.6	0.5	0.67	0.42	1.19	1	1	0	0

$Rc_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	807	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	4	808	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	809	4.88	12	7	0	0	1.6	0.67	0.5	0.5	0	0	0	0	0

$Rc_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	810	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	4	811	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	812	4.88	12	7	0	0	1.6	0.67	0.5	0.5	0	0	0	0	0

No variables are modified in this file:

CurrentDataFile = "\Data Files CIP\Loc_1_10'x8' Wildlife Culvert.dat"

REINFORCING STEEL QUANTITIES

DATE RAN: MON NOV 29 16:17:13 2021

NAME OF UNIT	QUANTITY/UNIT	NO. UNITS	TOTAL-QUANTITY	COST/LB	TOTAL-COST
MAIN BOX	44198 LBS	X 1 =	44198 LBS AT	0.000 = $	0.00
LEFT END WINGWALL	2578 LBS	X 1 =	2578 LBS AT	0.000 = $	0.00
LEFT BEGIN WINGWALL	2578 LBS	X 1 =	2578 LBS AT	0.000 = $	0.00
RIGHT END WINGWALL	2578 LBS	X 1 =	2578 LBS AT	0.000 = $	0.00
RIGHT BEGIN WINGWALL	2578 LBS	X 1 =	2578 LBS AT	0.000 = $	0.00
LEFT HEADWALL	151 LBS	X 1 =	151 LBS AT	0.000 = $	0.00
RIGHT HEADWALL	151 LBS	X 1 =	151 LBS AT	0.000 = $	0.00
LEFT CUTOFF WALL	69 LBS	X 1 =	69 LBS AT	0.000 = $	0.00
RIGHT CUTOFF WALL	69 LBS	X 1 =	69 LBS AT	0.000 = $	0.00
		GRAND TOTAL =	54950 LBS	$	0.00

LOCATION MAIN BOX NO. REQUIRED = 1

										LBS/MARK
6	101	11- 4	295	1	11- 4					5020.21
6	102	11- 4	295	1	11- 4					5020.21
6	103	11- 4	301	1	11- 4					5122.32
6	104	11- 4	301	1	11- 4					5122.32
6	105	7- 9	588	10	2- 0	3/4	5- 8	1/2		6853.45
6	106	7- 9	588	10	2- 0	3/4	5- 8	1/2		6853.45
4	108	9- 4	220	1	9- 4					1371.14
4	109	152- 7	13	2	1- 5		149- 8	1/2	2	1324.48
4	110	149- 7	13	2	1- 5		146- 8	1/2	2	1298.43
4	111	148-10	13	2	1- 5		146- 0		2	1292.35
4	112	152- 7	13	2	1- 5		149- 8	1/2	2	1324.48
4	113	149- 7	18	2	1- 5		146- 8	1/2	2	1797.83
4	114	149- 7	18	2	1- 5		146- 8	1/2	2	1797.83

LOCATION LEFT END WINGWALL NO. REQUIRED = 1

										LBS/MARK
6	401	9- 9	45	1	9- 9					659.00
4	402	21-10	11	1	21-10					160.48
4	404	21-10	11	1	21-10					160.48
4	406	9- 9	23	1	9- 9					149.80
6	407	6- 3	45	10	3- 4		2-10	3/4		420.75
5	409	10- 4	45	1	10- 4					484.84
4	410	10- 4	23	1	10- 4					158.71
4	411	21-10	24	1	21-10					350.14
5	412	2- 0	16	1	2- 0					33.38

LOCATION LEFT BEGIN WINGWALL NO. REQUIRED = 1

										LBS/MARK
6	501	9- 9	45	1	9- 9					659.00
4	502	21-10	11	1	21-10					160.48
4	504	21-10	11	1	21-10					160.48
4	506	9- 9	23	1	9- 9					149.80
6	507	6- 3	45	10	3- 4		2-10	3/4		420.75
5	509	10- 4	45	1	10- 4					484.84
4	510	10- 4	23	1	10- 4					158.71
4	511	21-10	24	1	21-10					350.14
5	512	2- 0	16	1	2- 0					33.38

LOCATION RIGHT END WINGWALL NO. REQUIRED = 1

										LBS/MARK
6	601	9- 9	45	1	9- 9					659.00
4	602	21-10	11	1	21-10					160.48
4	604	21-10	11	1	21-10					160.48
4	606	9- 9	23	1	9- 9					149.80
6	607	6- 3	45	10	3- 4		2-10	3/4		420.75
5	609	10- 4	45	1	10- 4					484.84

4	610	10- 4	23	1	10- 4								158.71
4	611	21-10	24	1	21-10								350.14
5	612	2- 0	16	1	2- 0								33.38

LOCATION RIGHT BEGIN WINGWALL NO. REQUIRED = 1 LBS/MARK

6	701	9- 9	45	1	9- 9								659.00
4	702	21-10	11	1	21-10								160.48
4	704	21-10	11	1	21-10								160.48
4	706	9- 9	23	1	9- 9								149.80
6	707	6- 3	45	10	3- 4	2-10 3/4							420.75
5	709	10- 4	45	1	10- 4								484.84
4	710	10- 4	23	1	10- 4								158.71
4	711	21-10	24	1	21-10								350.14
5	712	2- 0	16	1	2- 0								33.38

LOCATION LEFT HEADWALL NO. REQUIRED = 1 LBS/MARK

6	801	11- 4	3	1	11- 4								51.05
6	802	11- 4	3	1	11- 4								51.05
4	803	6- 2	12	27	1- 7 1/4	0- 6	0- 8	0- 5	1- 2 1/4	1- 0	1- 0		48.97
10	0	0- 0	0	0									

LOCATION RIGHT HEADWALL NO. REQUIRED = 1 LBS/MARK

6	804	11- 4	3	1	11- 4								51.05
6	805	11- 4	3	1	11- 4								51.05
4	806	6- 2	12	27	1- 7 1/4	0- 6	0- 8	0- 5	1- 2 1/4	1- 0	1- 0		48.97
10	0	0- 0	0	0									

LOCATION LEFT CUTOFF WALL NO. REQUIRED = 1 LBS/MARK

4	807	11- 4	2	1	11- 4								15.14
4	808	11- 4	2	1	11- 4								15.14
4	809	4-11	12	7	1- 7 1/4	0- 8	0- 6	0- 6					39.09
10	0	0- 0	0	0									

LOCATION RIGHT CUTOFF WALL NO. REQUIRED = 1 LBS/MARK

4	810	11- 4	2	1	11- 4								15.14
4	811	11- 4	2	1	11- 4								15.14
4	812	4-11	12	7	1- 7 1/4	0- 8	0- 6	0- 6					39.09
10	0	0- 0	0	0									

US 27 Alternative 2 at Location 1

WILDLIFE UNDERPASS – AT GRADE FLAT SLAB BRIDGES

US 27 WILDLIFE CROSSING ANALYSIS

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Foundation Quantities

US 27 - Location 1 - Alternative 2

0455 34 3 PRESTRESSED CONCRETE PILING, 18" SQ

Location	No. Piles	Pile Length *(ft.)*		Total Length *(ft.)*
END BENT 1	5	80.00		400.00
END BENT 2	5	80.00		400.00

PAY ITEM TOTAL 800 LF

0455143 3 TEST PILES-PRESTRESSED CONCRETE, 18" SQ

Location	No. Piles	Pile Length *(ft.)*	Additional Length *(ft.)*	Total Length *(ft.)*
END BENT 1	1	80.00	15.00	95.00
END BENT 2	1	80.00	15.00	95.00

PAY ITEM TOTAL 190 LF

0530 1 RIPRAP, SAND-CEMENT

Location	Riprap-Rubble Height	Bedding Stone Height	Trench	Sand Cement Width	Total Length	Volume
	(ft.)	*(ft.)*	*(ft.)*	*(ft.)*	*(ft.)*	*(CY)*
END BENT 1	2.50	1.00	1.00	1	84.17	12.47
END BENT 2	2.50	1.00	1.00	1	84.17	12.47

PAY ITEM TOTAL 24.9 CY

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Foundation Quantities

US 27 - Location 1 - Alternative 2

0530 3 3 RIPRAP- RUBBLE, BANK AND SHORE

Rip-Rap Properties				
Specific Gravity	Water Weight *(PCF)*	Void Factor	'T' *(ft.)*	Rip-Rap Weight *(PSF)*
2.30	62.40	0.90	2.50	322.92

Location	Uniform Depth Plan Area	Triangular Plan Area	Weight	Weight
	(SF)	*(SF)*	*(PSF)*	*(Ton)*
END BENT 1	2138.27	520.40	322.92	377.94
END BENT 2	2138.27	520.40	322.92	377.94

PAY ITEM TOTAL 755.9 TN

0530 74 BEDDING STONE

Location	Plan Area of Bedding Stone	Unit Weight of bedding stone	Thickness	Weight
	(SF)	*(PCF)*	*(ft.)*	*(Ton)*
END BENT 1	2574.50	115.00	1	148.03
END BENT 2	2574.50	115.00	1	148.03

PAY ITEM TOTAL 296.1 TN

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Substructure Quantities

US 27 - Location 1 - Alternative 2

0400 4 5 CONCRETE CLASS IV, BRIDGE SUBSTRUCTURE

END BENTS 1 & 2					
Location	Length *(ft.)*	Width *(ft.)*	Height *(ft.)*	Quantity	Volume *(CY)*
Cap	46.75	3.00	3.00	1	15.58
Backwall	46.67	0.00	0.00	1	0.00
Cheekwall	5.67	1.00	4.83	2	2.03
				TOTAL	17.7

Applicable Equation: Volume = Quantity x (Length x Width x Height) / (27 ft^3/CY)
Reduction for pile embedment conservatively excluded.

SUMMARY	
Location	Volume *(CY)*
END BENT 1	17.7
END BENT 2	17.7

PAY ITEM TOTAL 35.4 CY

0415 1 5 REINFORCING STEEL - BRIDGE SUBSTRUCTURE

Location	Volume Concrete *(CY)*	BDR Estimate Value *(lb./CY)*	Weight *(lb.)*
END BENT 1	17.70	135	2390
END BENT 2	17.70	135	2390

PAY ITEM TOTAL 4779 LB

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Superstructure Quantities

US 27 - Location 1 - Alternative 2

0400 2 47 CONCRETE CLASS II, CIP TOPPING WITH SHRINKAGE REDUCING ADMIXTURE

Location	Number	Length *(ft.)*	Width *(ft.)*	Depth *(ft.)*	Volume *(CY)*
CIP Topping	1	54.00	46.67	0.50	46.67
Beam Pockets	20	54.00	0.500	0.917	18.3

PAY ITEM TOTAL 65.0 CY

0400 7 1 BRIDGE DECK GROOVING

Location	Length *(ft.)*	Width *(ft.)*	Area *(SY)*
BRIDGE	54.00	44.00	264.00

PAY ITEM TOTAL 264 SY

Applicable Equation: Area = Length x Width / (9 ft^2/SY)

0400 148 PLAIN NEOPRENE BEARING PADS

Location	Number	Length *(ft)*	Width *(in.)*	Thickness *(in.)*	Total *(CF)*
Bent 1	10	3.67	8	1	2.0
Bent 2	10	3.67	8	1	2.0

PAY ITEM TOTAL 4.1 CF

Applicable Equation: Volume = No. Pads x L x (W/ 12 in/ft) x (Thickness / 12 in/ft)

KISINGER CAMPO & ASSOCIATES

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US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Superstructure Quantities

US 27 - Location 1 - Alternative 2

0450 8 23 PRESTRESSED BEAM FLORIDA SLAB BEAM, BEAM DEPTH 15", WIDTH 55-57"

Location	Number	Length *(ft.)*	Total Length *(ft.)*
Span 1	10	53.0	530

PAY ITEM TOTAL 530 LF

0415 1 4 REINFORCING STEEL - BRIDGE SUPERSTRUCTURE

Location	Volume Concrete *(CY)*	BDR Estimate Value *(lb./CY)*	Weight *(lb.)*
CIP Topping	65.0	205	13325

PAY ITEM TOTAL 13325 LB

0458 1 11 POURED JOINT WITH BACKER ROD

Location	Width* *(ft.)*	Bridge Skew *(deg.)*	Length *(ft.)*
END BENT 1	44.00	0.00	46.00
END BENT 2	44.00	0.00	46.00

* Between inside face of rails/parapets.

PAY ITEM TOTAL 92 LF

Applicable Equation: Length = (Width / cos(skew)) + 2in. + $2\sqrt{[(6in.)^2 + (5in.)^2]}$

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Approach Slab Quantities

US 27 - Location 1 - Alternative 2

0400 2 10 CLASS II CONCRETE, APPROACH SLABS

Location	Length *(ft.)*	Width *(ft.)*	Depth - Slab *(ft.)*	Depth - Topping* *(ft.)*	Depth - To Backwall *(ft.)*	Volume *(CY)*
APPROACH SLAB 1	30.00	46.67	1.00	0.17	0.67	54.00
APPROACH SLAB 2	30.00	46.67	1.00	0.17	0.67	54.00

* Asphalt overlay + 1/4" when deck planing is required.

PAY ITEM TOTAL 108.0 CY

Applicable Equation: Volume = (Length x Width x Depth Slab + 2-ft x Width x Depth Topping
+ Width x Depth To Backwall x (1-ft + 0.5 x Depth To Backwall)) / (27 ft^3/CY)

0415 1 9 REINFORCING STEEL - APPROACH SLABS

Location	Volume Concrete *(CY)*	BDR Estimate Value *(lb./CY)*	Weight *(lb.)*
APPROACH SLAB 1	54.0	200	10800
APPROACH SLAB 2	54.0	200	10800

PAY ITEM TOTAL 21600 LB

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Barrier Quantities

US 27 - Location 1 - Alternative 2

0521 5 13 CONCRETE TRAFFIC RAILING - BRIDGE, 36" SINGLE-SLOPE

Location	Length *(ft.)*	No. Railings	Length *(ft.)*
APP SLAB 1	30.00	2	60.00
Bridge	54.00	2	108.00
APP SLAB 2	30.00	2	60.00

PAY ITEM TOTAL 228 LF

Bridge Development Report Cost Estimating - US 27 - Location 1 - Alternative 2

Effective 01/01/2021

Step One: Estimate Component Items

Utilizing the cost provided herein, develop the cost estimate for each bridge type under consideration.

A. Bridge Substructure

1. Prestressed Concrete Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot [1]	Quantity	Cost
18" (Driven Plumb or 1" Batter) [2]	$100	990	$99,000
18" (Driven Battered) [2]	$140		
24" (Driven Plumb or 1" Batter) [2]	$140		
24" (Driven Battered) [2]	$200		
30" (Driven Plumb or 1" Batter) [2]	$170		
30" (Driven Battered) [2]	$240		
18" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$135		
18" w/CFRP or Stainless Steel Strand (Driven Battered)	$160		
24" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$150		
24" w/CFRP or Stainless Steel Strand (Driven Battered)	$210		
30" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$225		
30" w/CFRP or Stainless Steel Strand (Driven Battered)	$280		
Heavy mild steel reinforcing in pile head (each)[2]	$250		
		Subtotal	$99,000

[1] When silica fume, metakaolin or ultrafine fly ash is used add $6/LF to the piling cost.

[2] When heavy mild steel reinforcing is used in the pile head, add $250.

2. Steel Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot	Quantity	Cost
14 x 73 H Section	$90		
14 x 89 H Section	$100		
18" Pipe Pile	$100		
20" Pipe Pile	$125		
24" Pipe Pile	$145		
30" Pipe Pile	$200		
		Subtotal	

3. Drilled Shaft (not including Excavation)

Dia. (On land with casing salvaged)	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$500		
4 ft	$550		
5 ft	$600		
6 ft	$680		
7 ft	$825		
8 ft	$1,550		
9 ft	$1,800		
Dia. (In water with casing salvaged)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$550		
4 ft	$625		
5 ft	$700		
6 ft	$825		
7 ft	$950		
8 ft	$1,650		
9 ft	$1,900		
Dia. (In water with permanent casing)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$700		
4 ft	$750		
5 ft	$850		
6 ft	$990		
7 ft	$1,250		
8 ft	$2,200		
9 ft	$2,400		
		Subtotal	

A. Bridge Substructure (continued)

4. Drilled Shaft Excavation

Dia.	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$250		
4 ft	$280		
5 ft	$300		
6 ft	$340		
7 ft	$420		
8 ft	$780		
9 ft	$900		
		Subtotal	

5. Cofferdam Footing (Cofferdam and Seal Concrete[1])

Prorate the cost provided herein based on area and depth of water. A cofferdam footing having the following attributes cost $600,000: Area 63 ft x 37.25 ft; Depth of seal 5 ft; Depth of water over footing 16 ft

Type	Cost per Footing	Quantity	Cost
Cofferdam Footing			
[1] Cost of seal concrete included in pay item 400-3-20 or 400-4-200.		Subtotal	

6. Substructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Concrete [1]	$950	35.4	$33,630
Mass Concrete [1]	$625		
Seal Concrete [1]	$650		
Bulkhead Concrete [1]	$1,000		
Shell Fill [1]	$30		
[1] Admixtures: For Calcium Nitrite add $40/cy (@4.5 gal/cy) and for highly reactive pozzolans add $40/cy (@ 60 lb./cy)		Subtotal	$33,630

7. Substructure Reinforcing and Post-tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.00	4779	$4,779
Low-Carbon Chromium Reinforcing Steel	$1.25		
Stainless Reinforcing Steel	$4.00		
Post-tensioning Steel, Strand - Grout Filler	$8.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand - Flexible Filler	$24.00		
Post-tensioning Steel, Bar - Flexible Filler	$30.00		
		Subtotal	$4,779

Substructure Subtotal **$137,409**

B. Walls

1. Retaining Walls			
MSE Walls	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent	**$30**		
Temporary	**$15**		
Sheet Pile Walls, Prestressed Concrete	**Cost per Lin. Foot**	**Quantity**	**Cost**
10" x 30"	**$150**		
12" x 30"	**$185**		
12" x 30" with FRP	**$265**		
Sheet Pile Walls, Steel	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent Cantilever Wall	**$30**		
Permanent Anchored Wall [1]	**$55**		
Temporary Cantilever Wall	**$16**		
Temporary Anchored Wall [1]	**$35**		
Soil Nail Wall with Permanent Facing	**Cost per Sq. Foot**	**Quantity**	**Cost**
Soil Nail Wall with Permanent Facing	**$110**		
Traffic Railings with Junction Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
32" Vertical Face	**$260**		
42" Vertical Face	**$280**		
36" Single-Slope	**$255**		
42" Single-Slope	**$275**		
		Subtotal	

[1] Includes the cost of anchors, waler steel, miscellaneous steel for permanent/temporary walls and concrete face for permanent walls.

2. Noise Wall			
Type	**Cost per Sq. Foot**	**Quantity**	**Cost**
Noise Wall	**$30**		
		Subtotal	

Walls Subtotal

C. Box Culverts

1. Box Culverts			
Concrete	**Cost per Cubic Yard**	**Quantity**	**Cost**
Class II Concrete	**$950**		
Class IV Concrete	**$990**		
Reinforcing Steel	**Cost per Pound**	**Quantity**	**Cost**
Carbon Reinforcing Steel	**$1.00**		
		Subtotal	

Box Culvert Subtotal

D. Bridge Superstructure

1. Bearing Type			
Neoprene Bearing Pads	**Cost per Cubic Foot**	**Quantity**	**Cost**
Neoprene Bearing Pads	**$1,000**	**4.1**	**$4,100**
Multirotational Bearings (Capacity in kips)	**Cost per Each**	**Quantity**	**Cost**
1- 250	**$6,000**		
251- 500	**$8,000**		
501- 750	**$8,750**		
751-1000	**$9,500**		
1001-1250	**$10,000**		
1251-1500	**$11,000**		
1501-1750	**$13,000**		
1751-2000	**$15,000**		
>2000	**$17,000**		
		Subtotal	$4,100

2. Bridge Girders			
Structural Steel (includes coating costs)	**Cost per Pound**	**Quantity**	**Cost**
Plate Girders, Straight [1]	**$1.65**		
Plate Girders, Curved [1]	**$1.95**		
Box Girders, Straight [1]	**$1.95**		
Box Girders, Curved [1]	**$2.15**		

[1] When weathering steel (uncoated) is used, reduce the price by $0.04 per pound.
Inorganic zinc coating systems have an expected life cycle of 20 years.

Prestressed Concrete Girders and Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
Florida U-Beam; 48" [1]	**$750**		
Florida U-Beam; 54"	**$800**		
Florida U-Beam; 63"	**$850**		
Florida U-Beam; 72"	**$900**		
Florida Slab Beam 12" x 48" [2]	**$230**		
Florida Slab Beam 12" x 60" [2]	**$280**		
Florida Slab Beam 15" x 48" [2]	**$280**		
Florida Slab Beam 15" x 56"	**$340**	**530**	**$180,200**
Florida Slab Beam 15" x 60" [2]	**$370**		
Florida Slab Beam 18" x 48" [2]	**$340**		
Florida Slab Beam 18" x 60" [2]	**$440**		
AASHTO Type II Beam	**$190**		
Florida-I Beam; 36	**$240**		
Florida-I Beam; 45	**$260**		
Florida-I Beam; 54	**$280**		
Florida-I Beam; 63	**$300**		
Florida-I Beam; 72	**$320**		
Florida-I Beam; 78	**$330**		
Florida-I Beam; 84	**$340**		
Florida-I Beam; 96	**$370**		
		Subtotal	**$180,200**

[1] Price is based on ability to furnish products without any conversions of casting beds and without purchasing of forms. If these conditions do not exist, add the following cost: $450,000

[2] Interpolate between given prices for intermediate width FSBs.

D. Bridge Superstructure (continued)

3. Cast-in-Place Superstructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Box Girder Concrete, Straight	$950		
Box Girder Concrete, Curved	$1,200		
Deck Concrete Class II	$750		
Deck Concrete Class IV	$1,200		
Precast Deck Overlay Concrete Class IV	$1,000		
Topping Concrete for slab beams and units[1]	$800	65	$52,000
[1] Including cost of shrinkage reducing admixture.		Subtotal	$52,000

4. Concrete for Precast Segmental Box Girders, Cantilever Construction

Concrete Cost by Deck Area	Cost per Cubic Yard	Quantity	Cost
≤ 300,000 SF	$1,250		
> 300,000 SF AND ≤ 500,000 SF	$1,200		
> 500,000 SF	$1,150		
		Subtotal	

5. Reinforcing and Post-Tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.05	13325	$13,991
Low-Carbon Chromium Reinforcing Steel	$1.30		
Stainless Reinforcing Steel	$4.05		
Post-tensioning Steel, Strand; longitudinal - Grout Filler	$8.00		
Post-tensioning Steel, Strand; transverse - Grout Filler	$10.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand; longitudinal - Flexible Filler	$24.00		
Post-tensioning Steel, Bars - Flexible Filler	$30.00		
		Subtotal	$13,991

6. Railings and Barriers

Traffic Railings [1]	Cost per Lin. Foot	Quantity	Cost
32" Vertical Face	$90		
42" Vertical Face	$100		
36" Single-Slope Median	$100		
36" Single-Slope	$110	108.00	$11,880
42" Single-Slope	$140		
Thrie Beam Retrofit	$180		
Thrie Beam Panel Retrofit	$110		
Vertical Face Retrofit	$125		
Rectangular Tube Retrofit	$100		
Pedestrian/Bicycle Railings:	**Cost per Lin. Foot**	**Quantity**	**Cost**
Concrete Parapet (27") [1]	$65		
Single Bullet Railing [1]	$40		
Double Bullet Railing [1]	$50		
Panel/Picket Railing (42") steel (Type 1 & 2)	$95		
Panel/Picket Railing (42") steel (Type 3-5)	$130		
Panel/Picket Railing (42") aluminum (Type 1 & 2)	$70		
Panel/Picket Railing (42") aluminum (Type 3-5)	$105		
Panel/Picket Railing (48") steel (Type 1 & 2)	$115		
Panel/Picket Railing (48") steel (Type 3-5)	$145		
Panel/Picket Railing (48") aluminum (Type 1 & 2)	$85		
Panel/Picket Railing (48") aluminum (Type 3-5)	$120		
[1] Combine cost of Bullet Railings with Concrete Parapet or Traffic Railing, as appropriate.		Subtotal	$11,880

7. Expansion Joints

Type	Cost per Lin. Foot	Quantity	Cost
Poured Joint With Backer Rod	$45	92	$4,140
Strip Seal	$250		
Finger Joint <6"	$850		
Finger Joint >6"	$1,500		
Modular 6"	$500		
Modular 8"	$700		
Modular 12"	$900		
		Subtotal	$4,140

Superstructure Subtotal	**$266,311**

E. Miscellaneous Items

1. Bridge Deck Grooving and Planing

Type	Cost per Sq. Yard	Quantity	Cost
Bridge Deck Planing	$6.00		
Bridge Deck Grooving for Short Bridge	$8.00	264	$2,112
Bridge Deck Grooving for Long Bridge	$5.00		
	Grooving and Planing Subtotal		$2,112

2. Detour Bridges

Type	Cost per Sq. Foot	Quantity	Cost
Acrow Detour Bridge [1]	$55		
[1] Using FDOT supplied components. The cost is for the bridge proper (measured out-to-out) and does not include approach work, surfacing, or guardrail.	Detour Bridge Subtotal		

3. Approach Slab

Approach Slab Material	Cost per Unit	Quantity	Cost
Cast-in-Place Concrete (per Sq. Yard)	$400	108	$43,200
Reinforcing Steel (per Pound)	$1.05	21600	$22,680
36" Single-Slope	$110.00	120.00	$13,200
	Approach Slab Subtotal		$79,080

Unadjusted Total	$484,912

Step Two: Estimate Conditional Variables and Cost per Square Foot

After developing the total cost estimate utilizing the unit cost, modify the cost to account for site condition variables. If appropriate, the cost will be modified by the following variables:

** Phased construction is defined as construction over traffic or construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the effected units of the superstructure and/or substructure.

Conditional Variables	% Increase/ Decrease	Cost (+/-)
For construction over open water, floodplains that flood frequently or other similar areas, increase cost by 3 %.		
For construction over traffic and/or phased construction, increase by 20 %. [1]	20%	$96,982
[1] Phased construction is defined as construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the affected units of the superstructure and/or substructure.	20%	$96,982

Substructure Subtotal	$137,409
Superstructure Subtotal	$266,311
Walls Subtotal	
Box Culverts Subtotal	
Grooving and Planing Subtotal	$2,112
Detour Bridge Subtotal	
Approach Slab Subtotal	$79,080
Conditional Variables	$96,982
Total Cost	$581,895
Total Square Feet of Deck	2520.0
Cost per Square Foot (not including Approach Slab)	$200

Design Aid for Determination of Reinforcing Steel

In the absence of better information, use the following quantities of reinforcing steel pounds per cubic yard of concrete.

Location	Pounds of Steel per Cubic Yard	Cubic Yds.	Tot. Pounds
Pile Abutments	135		
Pile Bents	145		
Single Column Piers >25'	210		
Single Column Piers <25'	150		
Multiple Column Piers >25'	215		
Multiple Column Piers <25'	195		
Bascule Piers	110		
Standard Deck Slabs	205		
Isotropic Deck Slabs	125		
Concrete Box Girders, Pier Seg	225		
Concrete Box Girders, Typ. Seg	165		
C.I.P. Flat Slabs @ 30ft & 15" Deep	220		
Approach Slab	200		

Step Three: Cost Estimate Comparison to Historical Bridge Cost

The final step is a comparison of the cost estimate by comparison with historic bridge cost based on a cost per square foot. These total cost numbers are calculated exclusively for the bridge cost as defined in the General Section of this chapter. Price computed by Steps 1 and 2 should be generally within the range of cost as supplied herein. If the cost falls outside the provided range, good justification must be provided.

Bridge Superstructure Type	Total Cost per Square Foot Low	High
Short Span Bridges:		
Reinforced Concrete Flat Slab- Simple Span [1]	$115	$160
Pre-cast Concrete Slab - Simple Span [1]	$110	$200
Medium Span Bridges:		
Concrete Deck / Steel Girder - Simple Span [1]	$125	$142
Concrete Deck / Steel Girder - Continuous Span [1]	$135	$170
Concrete Deck / Prestressed Girder - Simple Span [1]	$90	$145
Concrete Deck / Prestressed Girder - Continuous Span [1]	$95	$211
Concrete Deck / Steel Box Girder [1] -	$140	$180
Span range from 150' to 280' (for curvature, add 15% premium)		
Segmental Concrete Box Girders - Cantilever Construction	$140	$160
Span range from 150' to 280'		
Movable Bridge - Bascule Spans & Piers	$1,800	$2,000
Demolition Costs:		
Typical	$35	$60
Bascule	$60	$70
Project Type		
Widening (Construction Only)	$85	$160

[1] Increase the cost by twenty percent for phased construction

Estimated Cost per Square Foot **$200**

US 27 Alternative 3 at Location 1

WILDLIFE CROSSING – WILDLIFE OVERPASS BRIDGE

US 27 WILDLIFE CROSSING ANALYSIS

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Barrier Quantities

Alternative 3

0142 70 FILL SAND

Location	Length *(ft.)*	Width *(ft.)*	Depth *(ft.)*	Volume *(CY)*
SPAN 1	98.50	23.33	1.00	85.12
	98.50	10.00	1.63	59.28
	98.50	8.00	2.25	65.67
SPAN 2	98.50	23.33	1.00	85.12
	98.50	10.00	1.63	59.28
	98.50	8.00	2.25	65.67

PAY ITEM TOTAL 420 CY

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Foundation Quantities

Alternative 3

0455 34 5 PRESTRESSED CONCRETE PILING, 24" SQ

Location	No. Piles	Pile Length *(ft.)*		Total Length *(ft.)*
END BENT 1	4	80.00		320.00
PIER 2	11	80.00		880.00
END BENT 3	4	80.00		320.00

PAY ITEM TOTAL 1520 LF

0455143 5 TEST PILES-PRESTRESSED CONCRETE, 24" SQ

Location	No. Piles	Pile Length *(ft.)*	Additional Length *(ft.)*	Total Length *(ft.)*
END BENT 1	1	80.00	15.00	95.00
PIER 2	1	80.00	15.00	95.00
END BENT 3	1	80.00	15.00	95.00

PAY ITEM TOTAL 285 LF

0459 71 PILES, POLYETHYLENE SHEETING

Location	No. Piles	Avg. Fill Height *(ft.)*	Pile Perimeter *(ft.)*	Surface Area *(SY)*
END BENT 1	5	16.00	8.00	72.00
END BENT 3	5	16.00	8.00	72.00

PAY ITEM TOTAL 144 SY

Applicable Equation: Surface Area = No. Piles x (Avg. Fill Height x Pile Perimeter) / (9 ft^2/SY)

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Substructure Quantities

Alternative 3

0400 4 5 CONCRETE CLASS IV, BRIDGE SUBSTRUCTURE

END BENTS 1 & 3					
Location	Length *(ft.)*	Width *(ft.)*	Height *(ft.)*	Quantity	Volume *(CY)*
Cap	44.00	3.50	3.00	1	17.11
Backwall	44.00	1.00	5.13	1	8.35
Cheekwall	4.50	0.83	4.25	2	1.18
Pedestals	2.50	3.50	0.50	5	0.81
				TOTAL	27.5

Applicable Equation: Volume = Quantity x (Length x Width x Height) / (27 ft^3/CY)
Reduction for pile embedment conservatively excluded.

SUMMARY	
Location	Volume *(CY)*
END BENT 1	27.5
END BENT 3	27.5

PAY ITEM TOTAL 55.0 CY

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Substructure Quantities

Alternative 3

0400 4 25 CONCRETE CLASS IV, MASS, SUBSTRUCTURE

FOOTINGS							
Location	Length (ft.)	Width (ft.)	Depth (ft.)	No. Piles	Pile Area ($ft.^2$)	Pile Embed (ft.)	Volume (CY)
FOOTING 1	16.00	22.00	5.00	12	4.00	1.00	63.4
						TOTAL	63.4

Applicable Equation: Volume = (Length x Width x Depth - No. Piles x Area x Embed) / (27 ft^3/CY)

COLUMN				
Location	Width (ft.)	Depth (ft.)	Height (ft.)	Volume (CY)
COLUMN 1	10.00	5.00	12.50	23.1
			TOTAL	23.1

Applicable Equation: Volume = Width x Depth x Height / (27 ft3/CY)

CAP						
Location	Width (ft.)	Col. Width (ft.)	Height 1 (ft.)	Height 2 (ft.)	Depth (ft.)	Volume (CY)
PIER	44.00	10.00	5.00	5.00	5.00	65.7
					TOTAL	65.7

SUMMARY	
Location	Volume (CY)
FOOTING	63.4
COLUMN	23.1
CAP	65.7

PAY ITEM TOTAL 152.3 CY

0415 1 5 REINFORCING STEEL - BRIDGE SUBSTRUCTURE

Location	Volume Concrete (CY)	BDR Estimate Value (lb./CY)	Weight (lb.)
END BENT 1	27.50	135	3713
PIER 2	152.30	150	22845
END BENT 3	27.50	135	3713

PAY ITEM TOTAL 30270 LB

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Superstructure Quantities

Alternative 3

0400 4 4 CONCRETE CLASS IV, BRIDGE SUPERSTRUCTURE

BRIDGE DECK				
Location	Length *(ft.)*	Width *(ft.)*	Deck Depth *(ft.)*	Volume *(CY)*
SPAN 1	98.50	44.00	0.71	113.70
SPAN 2	98.50	44.00	0.71	113.70

BUILD-UP						
Location	No. Beams	Beam Length *(ft.)*	Flange Width *(ft.)*	'B' & 'D' * *(in.)*	'C' * *(in.)*	Volume *(CY)*
SPAN 1	5	98.50	4.00	3.00	2.00	14.19
SPAN 2	5	98.50	4.00	3.00	2.00	14.19

* See SPI Index 450-199, Case 1.

THICKENED DECK END								
Location	No.	Flange Depth *(in.)*	Buildup *(in.)*	Added Depth *(ft.)*	Flange Widths * *(ft.)*	Length *(ft.)*	Width *(ft.)*	Volume *(CY)*
BEGIN BRIDGE	5	3.50	3.00	0.54	16.00	36.00	2.50	1.11
END BRIDGE	5	3.50	3.00	0.54	16.00	36.00	2.50	1.11

* Total sum of flanges subtracted from length

Location	Deck *(CY)*	Build-Up *(CY)*	Deck End *(CY)*	Volume *(CY)*
SPAN 1	113.70	14.19	1.11	129.00
SPAN 2	113.70	14.19	1.11	129.00

PAY ITEM TOTAL 258.0 CY

Applicable Equations:

Bridge Deck — Volume = (Length x Width x Depth) / (27 ft^3/CY)

Build-Up — Volume = (Beam Length x Flange Width x (C + ((B + D - 2C)/6))) / (27 ft^3/CY)

Thickened Slab End — Volume = (Length - Flange Width) * (Width x Added Depth + 0.5 x (Added Depth)2) / (27 ft3/CY)

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Superstructure Quantities

Alternative 3

0400147 COMPOSITE NEOPRENE PADS

Location	No. Pads per Location	Pad Type*	L *(in.)*	W *(ft.)*	Thickness *(in.)*	Volume *(CF)*
END BENT 1	5	E	10	2.67	1.91	1.80
PIER 2	10	E	10	2.67	1.91	3.60
END BENT 3	5	E	10	2.67	1.91	1.80

* See Index 400-510 for dimensions.

PAY ITEM TOTAL 7.2 CF

Applicable Equation: Volume = No. Pads x (L / 12 in/ft) x W x (Thickness / 12 in/ft)

0415 1 4 REINFORCING STEEL - BRIDGE SUPERSTRUCTURE

Location	Volume Concrete *(CY)*	BDR Estimate Value *(lb./CY)*	Weight *(lb.)*
BRIDGE	258.00	205	52890

52890 LB

0450 2 45 PRESTRESSED BEAMS, FLORIDA-I BEAM 45"

Location	No. Spans	Beam Length *(ft.)*	Quantity	Length *(ft.)*
SPAN 1	1	98.50	5	493
SPAN 2	1	98.50	5	493

PAY ITEM TOTAL 986 LF

0458 1 11 BRIDGE DECK EXPANSION JOINT, NEW CONSTRUCTION,
F&I POURED JOINT WITH BACKER ROD

Location	Width* *(ft.)*	Bridge Skew *(deg.)*	Length *(ft.)*
END BENT 1	41.33	0.00	43.00
END BENT 2	41.33	0.00	43.00

* Between inside face of rails/parapets.

PAY ITEM TOTAL 86 LF

Applicable Equation: Length = Width + 2in. + $\sqrt{[(6in.)^2 + (5in.)^2]}$

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Barrier Quantities

Alternative 3

0521 5 22 CONCRETE TRAFFIC RAILING- BRIDGE, 8'-0" NOISE WALL

Location	Length *(ft.)*	No. Railings	Length *(ft.)*
Bridge	197.00	2	394.00

PAY ITEM TOTAL 394 LF

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Wall Quantities

Location 1 - Alternative 3

0120 6 EMBANKMENT

Location		Height *(ft.)*	Width *(ft.)*	Radius *(ft.)*	Volume *(CY)*
Wall 1	Front	24.00	52.60	149.00	3483.29
	Left	24.00		124.00	2385.44
	Right	24.00		119.50	2215.44
Wall 2	Front	27.00	52.60	162.00	4260.60
	Left	27.00		134.00	3133.91
	Right	27.00		135.00	3180.86

PAY ITEM TOTAL 18660 CY

0548 12 RETAINING WALL SYSTEM, PERMANENT, EXCLUDING BARRIER

Location		Height 1 *(ft.)*	Height 2 *(ft.)*	Length *(ft.)*	Area *(SF)*
Wall 1	Front	19.50	19.50	42.33	825.50
	Left	25.75	2.50	103.50	1520.06
	Right	25.75	2.50	95.00	1400.00
Wall 2	Front	23.00	23.00	42.33	973.67
	Left	29.25	2.50	113.00	1860.75
	Right	29.25	2.50	111.00	1829.00

PAY ITEM TOTAL 8409 SF

Bridge Development Report Cost Estimating - US 27 Alternative 3 - Location 1

Effective 01/01/2021

Step One: Estimate Component Items

Utilizing the cost provided herein, develop the cost estimate for each bridge type under consideration.

A. Bridge Substructure

1. Prestressed Concrete Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot [1]	Quantity	Cost
18" (Driven Plumb or 1" Batter) [2]	$100		
18" (Driven Battered) [2]	$140		
24" (Driven Plumb or 1" Batter) [2]	$140	1805	$252,700
24" (Driven Battered) [2]	$200		
30" (Driven Plumb or 1" Batter) [2]	$170		
30" (Driven Battered) [2]	$240		
18" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$135		
18" w/CFRP or Stainless Steel Strand (Driven Battered)	$160		
24" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$150		
24" w/CFRP or Stainless Steel Strand (Driven Battered)	$210		
30" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$225		
30" w/CFRP or Stainless Steel Strand (Driven Battered)	$280		
Heavy mild steel reinforcing in pile head (each)[2]	$250		
		Subtotal	$252,700

[1] When silica fume, metakaolin or ultrafine fly ash is used add $6/LF to the piling cost.

[2] When heavy mild steel reinforcing is used in the pile head, add $250.

2. Steel Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot	Quantity	Cost
14 x 73 H Section	$90		
14 x 89 H Section	$100		
18" Pipe Pile	$100		
20" Pipe Pile	$125		
24" Pipe Pile	$145		
30" Pipe Pile	$200		
		Subtotal	

3. Drilled Shaft (not including Excavation)

Dia. (On land with casing salvaged)	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$500		
4 ft	$550		
5 ft	$600		
6 ft	$680		
7 ft	$825		
8 ft	$1,550		
9 ft	$1,800		
Dia. (In water with casing salvaged)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$550		
4 ft	$625		
5 ft	$700		
6 ft	$825		
7 ft	$950		
8 ft	$1,650		
9 ft	$1,900		
Dia. (In water with permanent casing)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$700		
4 ft	$750		
5 ft	$850		
6 ft	$990		
7 ft	$1,250		
8 ft	$2,200		
9 ft	$2,400		
		Subtotal	

A. Bridge Substructure (continued)

4. Drilled Shaft Excavation

Dia.	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$250		
4 ft	$280		
5 ft	$300		
6 ft	$340		
7 ft	$420		
8 ft	$780		
9 ft	$900		
		Subtotal	

5. Cofferdam Footing (Cofferdam and Seal Concrete[1])

Prorate the cost provided herein based on area and depth of water. A cofferdam footing having the following attributes cost $600,000: Area 63 ft x 37.25 ft; Depth of seal 5 ft; Depth of water over footing 16 ft

Type	Cost per Footing	Quantity	Cost
Cofferdam Footing			
[1] Cost of seal concrete included in pay item 400-3-20 or 400-4-200.		Subtotal	

6. Substructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Concrete [1]	$950	55	$52,250
Mass Concrete [1]	$625	152.3	$95,188
Seal Concrete [1]	$650		
Bulkhead Concrete [1]	$1,000		
Shell Fill [1]	$30		
[1] Admixtures: For Calcium Nitrite add $40/cy (@4.5 gal/cy) and for highly reactive pozzolans add $40/cy (@ 60 lb./cy)		Subtotal	$147,438

7. Substructure Reinforcing and Post-tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.00	30270	$30,270
Low-Carbon Chromium Reinforcing Steel	$1.25		
Stainless Reinforcing Steel	$4.00		
Post-tensioning Steel, Strand - Grout Filler	$8.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand - Flexible Filler	$24.00		
Post-tensioning Steel, Bar - Flexible Filler	$30.00		
		Subtotal	$30,270

Substructure Subtotal **$430,408**

B. Walls

1. Retaining Walls			
MSE Walls	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent	**$30**	**8409**	**$252,269**
Temporary	**$15**		
Sheet Pile Walls, Prestressed Concrete	**Cost per Lin. Foot**	**Quantity**	**Cost**
10" x 30"	**$150**		
12" x 30"	**$185**		
12" x 30" with FRP	**$265**		
Sheet Pile Walls, Steel	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent Cantilever Wall	**$30**		
Permanent Anchored Wall [1]	**$55**		
Temporary Cantilever Wall	**$16**		
Temporary Anchored Wall [1]	**$35**		
Soil Nail Wall with Permanent Facing	**Cost per Sq. Foot**	**Quantity**	**Cost**
Soil Nail Wall with Permanent Facing	**$110**		
Traffic Railings with Junction Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
32" Vertical Face	**$260**		
42" Vertical Face	**$280**		
36" Single-Slope	**$255**		
42" Single-Slope	**$275**		
		Subtotal	$252,269

[1] Includes the cost of anchors, waler steel, miscellaneous steel for permanent/temporary walls and concrete face for permanent walls.

2. Noise Wall			
Type	**Cost per Sq. Foot**	**Quantity**	**Cost**
Noise Wall	**$30**		
		Subtotal	

Walls Subtotal	**$252,269**

C. Box Culverts

1. Box Culverts			
Concrete	**Cost per Cubic Yard**	**Quantity**	**Cost**
Class II Concrete	**$950**		
Class IV Concrete	**$990**		
Reinforcing Steel	**Cost per Pound**	**Quantity**	**Cost**
Carbon Reinforcing Steel	**$1.00**		
		Subtotal	

Box Culvert Subtotal

D. Bridge Superstructure

1. Bearing Type			
Neoprene Bearing Pads	**Cost per Cubic Foot**	**Quantity**	**Cost**
Neoprene Bearing Pads	**$1,000**	**7.2**	**$7,200**
Multirotational Bearings (Capacity in kips)	**Cost per Each**	**Quantity**	**Cost**
1- 250	**$6,000**		
251- 500	**$8,000**		
501- 750	**$8,750**		
751-1000	**$9,500**		
1001-1250	**$10,000**		
1251-1500	**$11,000**		
1501-1750	**$13,000**		
1751-2000	**$15,000**		
>2000	**$17,000**		
		Subtotal	$7,200

2. Bridge Girders			
Structural Steel (includes coating costs)	**Cost per Pound**	**Quantity**	**Cost**
Plate Girders, Straight [1]	**$1.65**		
Plate Girders, Curved [1]	**$1.95**		
Box Girders, Straight [1]	**$1.95**		
Box Girders, Curved [1]	**$2.15**		

[1] When weathering steel (uncoated) is used, reduce the price by $0.04 per pound.
Inorganic zinc coating systems have an expected life cycle of 20 years.

Prestressed Concrete Girders and Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
Florida U-Beam; 48" [1]	**$750**		
Florida U-Beam; 54"	**$800**		
Florida U-Beam; 63"	**$850**		
Florida U-Beam; 72"	**$900**		
Florida Slab Beam 12" x 48" [2]	**$230**		
Florida Slab Beam 12" x 60" [2]	**$280**		
Florida Slab Beam 15" x 48" [2]	**$280**		
Florida Slab Beam 15" x 60" [2]	**$370**		
Florida Slab Beam 18" x 48" [2]	**$340**		
Florida Slab Beam 18" x 60" [2]	**$440**		
AASHTO Type II Beam	**$190**		
Florida-I Beam; 36	**$240**		
Florida-I Beam; 45	**$260**	**986**	**$256,360**
Florida-I Beam; 54	**$280**		
Florida-I Beam; 63	**$300**		
Florida-I Beam; 72	**$320**		
Florida-I Beam; 78	**$330**		
Florida-I Beam; 84	**$340**		
Florida-I Beam; 96	**$370**		
		Subtotal	**$256,360**

[1] Price is based on ability to furnish products without any conversions of casting beds and without purchasing of forms. If these conditions do not exist, add the following cost: $450,000

[2] Interpolate between given prices for intermediate width FSBs.

D. Bridge Superstructure (continued)

3. Cast-in-Place Superstructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Box Girder Concrete, Straight	$950		
Box Girder Concrete, Curved	$1,200		
Deck Concrete Class II	$750		
Deck Concrete Class IV	$1,200	258	$309,600
Precast Deck Overlay Concrete Class IV	$1,000		
Topping Concrete for slab beams and units[1]	$800		
[1] Including cost of shrinkage reducing admixture.		Subtotal	$309,600

4. Concrete for Precast Segmental Box Girders, Cantilever Construction

Concrete Cost by Deck Area	Cost per Cubic Yard	Quantity	Cost
≤ 300,000 SF	$1,250		
> 300,000 SF AND ≤ 500,000 SF	$1,200		
> 500,000 SF	$1,150		
		Subtotal	

5. Reinforcing and Post-Tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.05	52890	$55,535
Low-Carbon Chromium Reinforcing Steel	$1.30		
Stainless Reinforcing Steel	$4.05		
Post-tensioning Steel, Strand; longitudinal - Grout Filler	$8.00		
Post-tensioning Steel, Strand; transverse - Grout Filler	$10.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand; longitudinal - Flexible Filler	$24.00		
Post-tensioning Steel, Bars - Flexible Filler	$30.00		
		Subtotal	$55,535

6. Railings and Barriers

Traffic Railings [1]	Cost per Lin. Foot	Quantity	Cost
32" Vertical Face	$90		
42" Vertical Face	$100		
36" Single-Slope Median	$100		
36" Single-Slope	$110		
8'-0" Noise Wall	$390	394.00	$153,660
42" Single-Slope	$140		
Thrie Beam Retrofit	$180		
Thrie Beam Panel Retrofit	$110		
Vertical Face Retrofit	$125		
Rectangular Tube Retrofit	$100		
Pedestrian/Bicycle Railings:	**Cost per Lin. Foot**	**Quantity**	**Cost**
Concrete Parapet (27") [1]	$65		
Single Bullet Railing [1]	$40		
Double Bullet Railing [1]	$50		
Panel/Picket Railing (42") steel (Type 1 & 2)	$95		
Panel/Picket Railing (42") steel (Type 3-5)	$130		
Panel/Picket Railing (42") aluminum (Type 1 & 2)	$70		
Panel/Picket Railing (42") aluminum (Type 3-5)	$105		
Panel/Picket Railing (48") steel (Type 1 & 2)	$115		
Panel/Picket Railing (48") steel (Type 3-5)	$145		
Panel/Picket Railing (48") aluminum (Type 1 & 2)	$85		
Panel/Picket Railing (48") aluminum (Type 3-5)	$120		
[1] Combine cost of Bullet Railings with Concrete Parapet or Traffic Railing, as appropriate.		Subtotal	$153,660

7. Expansion Joints

Type	Cost per Lin. Foot	Quantity	Cost
Poured Joint With Backer Rod	$45	86	$3,870
Strip Seal	$250		
Finger Joint <6"	$850		
Finger Joint >6"	$1,500		
Modular 6"	$500		
Modular 8"	$700		
Modular 12"	$900		
		Subtotal	$3,870

Superstructure Subtotal **$786,225**

E. Miscellaneous Items

1. Bridge Deck Grooving and Planing

Type	Cost per Sq. Yard	Quantity	Cost
Bridge Deck Planing	$6.00		
Bridge Deck Grooving for Short Bridge	$8.00		
Bridge Deck Grooving for Long Bridge	$5.00		
	Grooving and Planing Subtotal		

2. Detour Bridges

Type	Cost per Sq. Foot	Quantity	Cost
Acrow Detour Bridge [1]	$55		
	Detour Bridge Subtotal		

[1] Using FDOT supplied components. The cost is for the bridge proper (measured out-to-out) and does not include approach work, surfacing, or guardrail.

3. Approach Slab

Approach Slab Material	Cost per Unit	Quantity	Cost
Cast-in-Place Concrete (per Sq. Yard)	$400		
Reinforcing Steel (per Pound)	$1.05		
	Approach Slab Subtotal		

Unadjusted Total	$1,468,901

Step Two: Estimate Conditional Variables and Cost per Square Foot

After developing the total cost estimate utilizing the unit cost, modify the cost to account for site condition variables. If appropriate, the cost will be modified by the following variables:

** Phased construction is defined as construction over traffic or construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the effected units of the superstructure and/or substructure.

Conditional Variables	% Increase/ Decrease	Cost (+/-)
For construction over open water, floodplains that flood frequently or other similar areas, increase cost by 3 %.		
For construction over traffic and/or phased construction, increase by 20 %. [1]	20%	$293,780
[1] Phased construction is defined as construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the affected units of the superstructure and/or substructure.	20%	$293,780

Substructure Subtotal	$430,408
Superstructure Subtotal	$786,225
Walls Subtotal	$252,269
Box Culverts Subtotal	
Grooving and Planing Subtotal	
Detour Bridge Subtotal	
Approach Slab Subtotal	
Conditional Variables	$293,780
Total Cost	$1,762,682
Total Square Feet of Deck	8668.0
Cost per Square Foot (not including Approach Slab)	$203

Design Aid for Determination of Reinforcing Steel

In the absence of better information, use the following quantities of reinforcing steel pounds per cubic yard of concrete.

Location	Pounds of Steel per Cubic Yard	Cubic Yds.	Tot. Pounds
Pile Abutments	**135**		
Pile Bents	**145**		
Single Column Piers >25'	**210**		
Single Column Piers <25'	**150**		
Multiple Column Piers >25'	**215**		
Multiple Column Piers <25'	**195**		
Bascule Piers	**110**		
Standard Deck Slabs	**205**		
Isotropic Deck Slabs	**125**		
Concrete Box Girders, Pier Seg	**225**		
Concrete Box Girders, Typ. Seg	**165**		
C.I.P. Flat Slabs @ 30ft & 15" Deep	**220**		
Approach Slab	**200**		

Step Three: Cost Estimate Comparison to Historical Bridge Cost

The final step is a comparison of the cost estimate by comparison with historic bridge cost based on a cost per square foot. These total cost numbers are calculated exclusively for the bridge cost as defined in the General Section of this chapter. Price computed by Steps 1 and 2 should be generally within the range of cost as supplied herein. If the cost falls outside the provided range, good justification must be provided.

Bridge Superstructure Type	Total Cost per Square Foot Low	High
Short Span Bridges:		
Reinforced Concrete Flat Slab- Simple Span [1]	$115	$160
Pre-cast Concrete Slab - Simple Span [1]	$110	$200
Medium Span Bridges:		
Concrete Deck / Steel Girder - Simple Span [1]	$125	$142
Concrete Deck / Steel Girder - Continuous Span [1]	$135	$170
Concrete Deck / Prestressed Girder - Simple Span [1]	$90	$145
Concrete Deck / Prestressed Girder - Continuous Span [1]	$95	$211
Concrete Deck / Steel Box Girder [1] -	$140	$180
Span range from 150' to 280' (for curvature, add 15% premium)		
Segmental Concrete Box Girders - Cantilever Construction	$140	$160
Span range from 150' to 280'		
Movable Bridge - Bascule Spans & Piers	$1,800	$2,000
Demolition Costs:		
Typical	$35	$60
Bascule	$60	$70
Project Type		
Widening (Construction Only)	$85	$160

[1] Increase the cost by twenty percent for phased construction

Estimated Cost per Square Foot **$203**

US 27 Alternative 1 at Location 2

WILDLIFE UNDERPASS - CONCRETE BOX CULVERT

US 27 WILDLIFE CROSSING ANALYSIS

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support — DESIGNED BY: SKB 11/21
Task Work Order No. 10 — CHECKED BY:
US 27 Wildlife Crossing Analysis

Substructure Quantities

US 27 - Location 2 - Alternative 1

0400 4 1 CONCRETE CLASS IV, CULVERT

10'x8' Wildlife Crossing				
Location	Volume *(CY)*	Pipe Volume *(CY)*	Quantity	Volume *(CY)*
Box	182.36	N/A	1	182.36
Begin Wing Wall	38.93	-0.42	2	77.01
End Wing Wall	17.79	N/A	2	35.58
			PAY ITEM TOTAL	295.0 CY

0415 1 1 REINFORCING STEEL - ROADWAY

10'x8' Wildlife Crossing					
Location	Weight *(LB)*			Units	Weight *(LB)*
Main Box	44198.00			1	44198.00
Left End Wingwall	2578.00			1	2578.00
Left Begin Wingwall	6085.00			1	6085.00
Right End Wingwall	2578.00			1	2578.00
Right Begin Wingwall	6085.00			1	6085.00
Left Headwall	151.00			1	151.00
Right Headwall	151.00			1	151.00
Left Cutoff wall	69.00			1	69.00
Right Cutoff Wall	69.00			1	69.00
				PAY ITEM TOTAL	61964 LB

430175124 PIPE CULVERT,OPTIONAL MATERIAL,ROUND, 24"S/CD

Replace Existing Drainage Structure				
Location	Length *(ft.)*		Quantity	Volume *(LF)*
Pipe Culvert	147.00		2	294.00
			PAY ITEM TOTAL	294.0 LF

Box Culvert Analysis:
Estimate of Quantities

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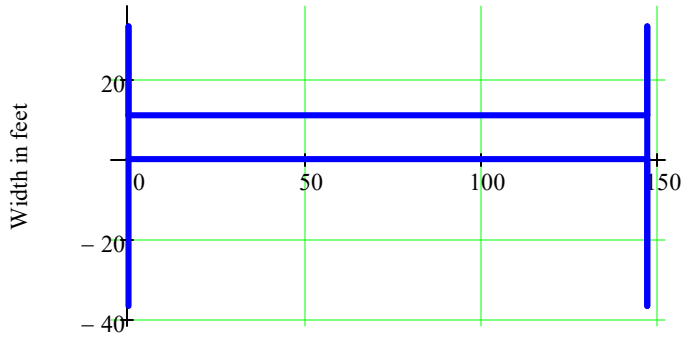
Project = "US27 Wildlife Crossing Analysis"

DesignedBy = "SKB"

CheckedBy = "____"

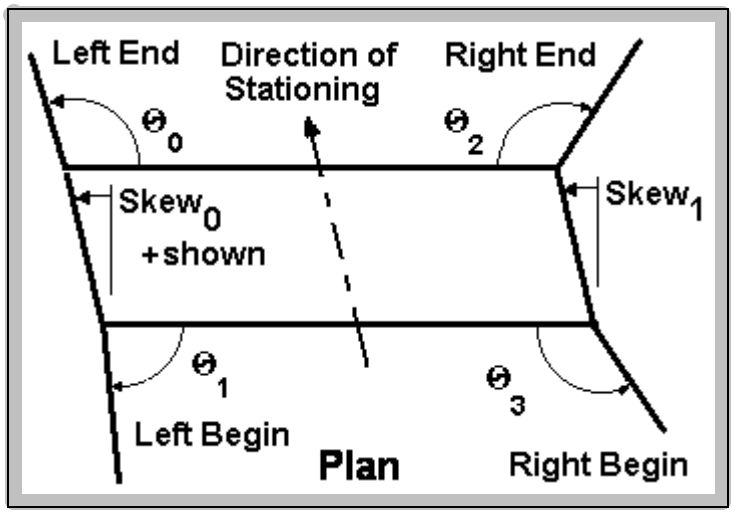
CurrentDataFile = "\Data Files CIP\Loc_2_10'x8' Wildlife Culvert.dat"

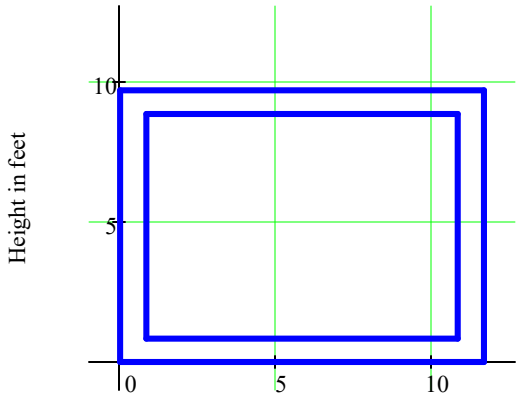
Comment = "Location 2 - 10' x 8' Wildlife Crossing Box Culvert"



Length in feet

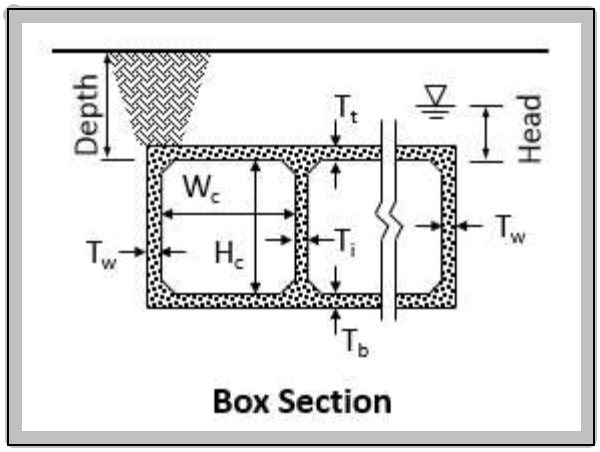
Plan - Box Culvert





Width in feet

Cross Section - Box Culvert



Box Dimensions

HydraulicOpening := $W_c \cdot H_c \cdot NoOfCells$

HydraulicOpening = $80\ ft^2$

SoilHeight = 2 ft

NoOfCells = 1 | W_c = 10 ft | H_c = 8 ft | L_c = 147 ft | θ^T = (90 90 90 90)·deg | Head = 0 ft

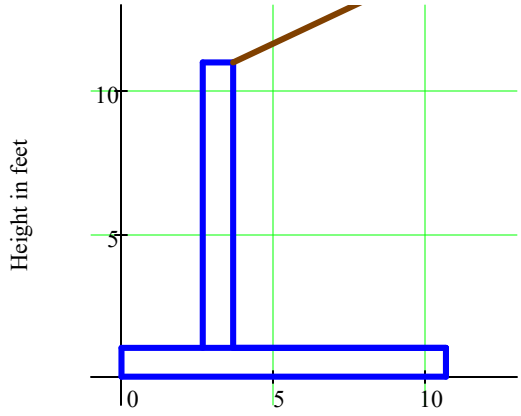
T_t = 10·in | T_b = 10·in | T_w = 10·in | T_i = 10·in | Cover = 2·in | Depth = 2.833 ft

Cutoff wall and Headwall Dimensions

$Skew_{left}$ = 0·deg | B_{lhw} = 18·in | H_{lhw} = 24·in | B_{lcw} = 12·in | H_{lcw} = 24·in

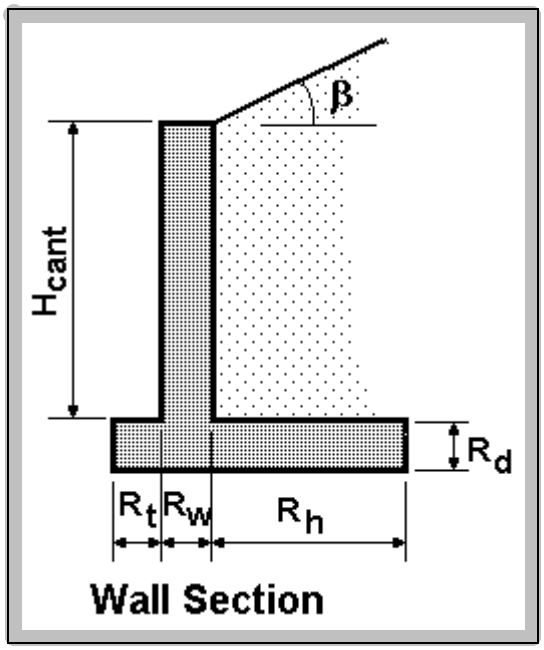
$Skew_{right}$ = 0·deg | B_{rhw} = 18·in | H_{rhw} = 24·in | B_{rcw} = 12·in | H_{rcw} = 24·in

Wingwall Dimensions

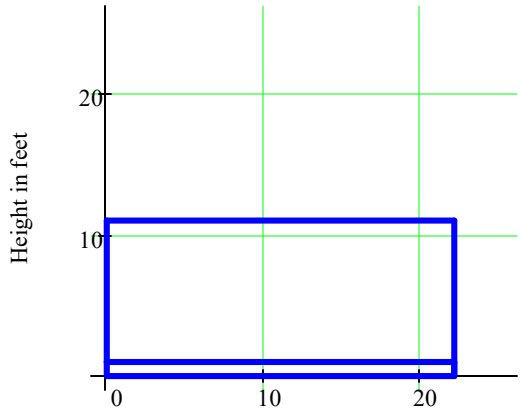


Width in feet

Cross Section - First Wingwall

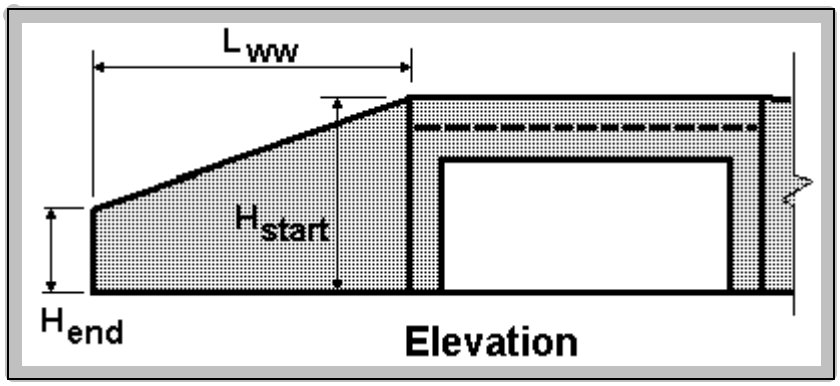


$$R_t = \begin{pmatrix} 32 \\ 39 \\ 32 \\ 39 \end{pmatrix} \cdot in \qquad R_w = \begin{pmatrix} 12 \\ 14 \\ 12 \\ 14 \end{pmatrix} \cdot in \qquad R_h = \begin{pmatrix} 84 \\ 90 \\ 84 \\ 90 \end{pmatrix} \cdot in \qquad R_d = \begin{pmatrix} 12 \\ 14 \\ 12 \\ 14 \end{pmatrix} \cdot in \qquad \beta = \begin{pmatrix} 26.57 \\ 26.57 \\ 26.57 \\ 26.57 \end{pmatrix} \cdot deg$$



Width in feet

Elevation - First Wingwall



$$H_{end} = \begin{pmatrix} 10 \\ 12 \\ 10 \\ 12 \end{pmatrix} ft \qquad H_{start} = \begin{pmatrix} 10 \\ 12 \\ 10 \\ 12 \end{pmatrix} ft \qquad L_{ww} = \begin{pmatrix} 22.17 \\ 36.58 \\ 22.17 \\ 36.58 \end{pmatrix} ft \qquad \theta = \begin{pmatrix} 90 \\ 90 \\ 90 \\ 90 \end{pmatrix} \cdot deg$$

Summary of Concrete Quantities

$Vol_{cw.left} = 0.5 \cdot yd^3$ $Vol_{cw.right} = 0.5 \cdot yd^3$

$Vol_{bot.slab} = 54.01 \cdot yd^3$ $Vol_{walls} = 72.59 \cdot yd^3$ $Vol_{top.slab} = 52.93 \cdot yd^3$

$Vol_{hw.left} = 0.76 \cdot yd^3$ $Vol_{hw.right} = 0.76 \cdot yd^3$

$$Vol_{wall} = \begin{pmatrix} 8.21 \\ 18.97 \\ 8.21 \\ 18.97 \end{pmatrix} \cdot yd^3 \quad Vol_{ww.cowall} = \begin{pmatrix} 0.8211 \\ 1.129 \\ 0.8211 \\ 1.129 \end{pmatrix} \cdot yd^3 \quad Vol_{footing} = \begin{pmatrix} 8.76 \\ 18.84 \\ 8.76 \\ 18.84 \end{pmatrix} \cdot yd^3 \quad TotalVol_{wingwall} = \begin{pmatrix} 17.79 \\ 38.93 \\ 17.79 \\ 38.93 \end{pmatrix} \cdot yd^3$$

$Vol_{box} = 182.36 \cdot yd^3$ $\sum Vol_{wall} = 54.36 \cdot yd^3$ $\sum TotalVol_{footing} = 59.09 \cdot yd^3$ $TotalVolume = 295.81 \cdot yd^3$

Summary of Soil and Miscellaneous Values

$E = 4388 \cdot ksi$ $f_c = 5.5 \cdot ksi$

Extension = 0
0 - *new box (no extension)*
1 - *left extension*
2 - *right extension*

Env = 2
Environmental Class
1 - slightly aggressive
2 - moderately aggressive
3 - extremely aggressive

$F_y = 60 \cdot ksi$ $n_{mod} = 6.609$

$ConsiderLLSurcharge_{ww} = 1$ *0 - No* *1 - Yes*

$ConsiderLL_{hw} = 1$ *0 - No* *1 - Yes*

$BarrierDL_{hw} = 0 \cdot \frac{kip}{ft}$

$\gamma_{soil} = 120 \cdot \frac{lbf}{ft^3}$ $k_s = 100000 \cdot \frac{lbf}{ft^3}$ $\phi = 30 \cdot deg$ $q_{nom} = 5000 \cdot \frac{lbf}{ft^2}$

Summary of Reinforcement Check Values

$Check_{box}$ = "OK" $Check_{cw}$ = "OK" $Check_{hw}$ = "OK" $Check_{ww}$ = "OK" TotalCheck = "OK"

$$BarSize_{slabs} = \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \end{pmatrix} \quad S_{slabs} = \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
bot slab, top mat
bot slab, bot mat

$$BarSize_{long} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad S_{long} = \begin{pmatrix} 12 \\ 12 \\ 12 \\ 12 \\ 12 \\ 12 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
interior wall(s)
exterior walls
bot slab, both m.

$$BarSize_{walls} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{walls} = \begin{pmatrix} 16 \\ 16 \end{pmatrix} \cdot in$$

interior wall(s)
exterior walls

$$BarSize_{corners} = \begin{pmatrix} 6 \\ 6 \end{pmatrix} \quad S_{corners} = \begin{pmatrix} 6 \\ 6 \end{pmatrix} \cdot in$$

top corner
bot corner

$$BarSize_{cw} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad Num_{cw} = \begin{pmatrix} 2 \\ 2 \\ 2 \\ 2 \end{pmatrix}$$

top bar, left cw
bot bar, left cw
top bar, right cw
bot bar, right cw

$$StirSize_{cw} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{stirrup.cw} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$$

$$BarSize_{hw} = \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \end{pmatrix} \quad Num_{hw} = \begin{pmatrix} 3 \\ 3 \\ 3 \\ 3 \end{pmatrix}$$

top bar, left hw
bot bar, left hw
top bar, right hw
bot bar, right hw

$$StirSize_{hw} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{stirrup.hw} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$$

Reinforcement List - Main Box

click table below to reveal scroll bar...

$Reinf_{box}$ =

	0	1	2	3	4
0	"Bar Location"	"Size"	"Desig"	"Len"	"Num"
1	"top face, top slab"	6	101	11.33	295
2	"bot face, top slab"	6	102	11.33	295
3	"top face, bot slab"	6	103	11.33	301
4	"bot face, bot slab"	6	104	11.33	301
5	"top ext corner"	6	105	7.76	588
6	"bot ext corner"	6	106	7.76	588
7	"inside face, ext wall"	4	108	9.33	220
8	long top face, bot slab"	4	109	152.49	13
9	long top face, top slab"	4	110	149.49	13
10	long bot face, top slab"	4	111	148.84	13
11	long bot face, bot slab"	4	112	152.49	13
12	ng each face, ext wall"	4	113	149.49	18
13	ng each face, ext wall"	4	114	149.49	...
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					

Reinforcement Lists - Left Begin and Left End Wingwalls

$Rw_0 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	6	401	9.75	45	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	402	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	404	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall vert, front side"	4	406	9.75	23	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	6	407	6.22	45	10	0	0	3.33	2.89	0	0	0	0	0	0	0
"top footing heel"	5	409	10.33	45	1	0	0	10.33	0	0	0	0	0	0	0	0
"bot footing toe"	4	410	10.33	23	1	0	0	10.33	0	0	0	0	0	0	0	0
"temp footing"	4	411	21.84	24	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall to box ties"	5	412	2	16	1	0	0	2	0	0	0	0	0	0	0	0

$Rw_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	7	501	11.75	74	1	0	0	11.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	502	36.25	13	1	0	0	36.25	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	504	36.25	13	1	0	0	36.25	0	0	0	0	0	0	0	0
"wall vert, front side"	4	506	11.75	38	1	0	0	11.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	7	507	7.47	74	10	0	0	4.08	3.38	0	0	0	0	0	0	0
"top footing heel"	6	509	11.58	74	1	0	0	11.58	0	0	0	0	0	0	0	0
"bot footing toe"	4	510	11.58	38	1	0	0	11.58	0	0	0	0	0	0	0	0
"temp footing"	4	511	36.25	26	1	0	0	36.25	0	0	0	0	0	0	0	0
"wall to box ties"	5	512	2	19	1	0	0	2	0	0	0	0	0	0	0	0

Reinforcement Lists - Right Begin and Right End Wingwalls

$Rw_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	6	601	9.75	45	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	602	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	604	21.84	11	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall vert, front side"	4	606	9.75	23	1	0	0	9.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	6	607	6.22	45	10	0	0	3.33	2.89	0	0	0	0	0	0	0
"top footing heel"	5	609	10.33	45	1	0	0	10.33	0	0	0	0	0	0	0	0
"bot footing toe"	4	610	10.33	23	1	0	0	10.33	0	0	0	0	0	0	0	0
"temp footing"	4	611	21.84	24	1	0	0	21.84	0	0	0	0	0	0	0	0
"wall to box ties"	5	612	2	16	1	0	0	2	0	0	0	0	0	0	0	0

$Rw_3 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N
"wall vert, soil side"	7	701	11.75	74	1	0	0	11.75	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	702	36.25	13	1	0	0	36.25	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	704	36.25	13	1	0	0	36.25	0	0	0	0	0	0	0	0
"wall vert, front side"	4	706	11.75	38	1	0	0	11.75	0	0	0	0	0	0	0	0
"wall vert, soil side"	7	707	7.47	74	10	0	0	4.08	3.38	0	0	0	0	0	0	0
"top footing heel"	6	709	11.58	74	1	0	0	11.58	0	0	0	0	0	0	0	0
"bot footing toe"	4	710	11.58	38	1	0	0	11.58	0	0	0	0	0	0	0	0
"temp footing"	4	711	36.25	26	1	0	0	36.25	0	0	0	0	0	0	0	0
"wall to box ties"	5	712	2	19	1	0	0	2	0	0	0	0	0	0	0	0

Reinforcement Lists - Headwalls and Cutoff Walls

$Rh_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	6	801	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	6	802	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	803	6.11	12	27	0	0	1.6	0.5	0.67	0.42	1.19	1	1	0	0

$Rh_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	6	804	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	6	805	11.33	3	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	806	6.11	12	27	0	0	1.6	0.5	0.67	0.42	1.19	1	1	0	0

$Rc_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	807	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	4	808	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	809	4.88	12	7	0	0	1.6	0.67	0.5	0.5	0	0	0	0	0

$Rc_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	810	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"bottom"	4	811	11.33	2	1	0	0	11.33	0	0	0	0	0	0	0	0
"stirrups"	4	812	4.88	12	7	0	0	1.6	0.67	0.5	0.5	0	0	0	0	0

No variables are modified in this file:

CurrentDataFile = "\Data Files CIP\Loc_2_10'x8' Wildlife Culvert.dat"

REINFORCING STEEL QUANTITIES

DATE RAN: TUE NOV 30 10:22:15 2021

NAME OF UNIT	QUANTITY/UNIT	NO. UNITS	TOTAL-QUANTITY	COST/LB	TOTAL-COST
MAIN BOX	44198 LBS	X 1 =	44198 LBS AT	0.000 = $	0.00
LEFT END WINGWALL	2578 LBS	X 1 =	2578 LBS AT	0.000 = $	0.00
LEFT BEGIN WINGWALL	6085 LBS	X 1 =	6085 LBS AT	0.000 = $	0.00
RIGHT END WINGWALL	2578 LBS	X 1 =	2578 LBS AT	0.000 = $	0.00
RIGHT BEGIN WINGWALL	6085 LBS	X 1 =	6085 LBS AT	0.000 = $	0.00
LEFT HEADWALL	151 LBS	X 1 =	151 LBS AT	0.000 = $	0.00
RIGHT HEADWALL	151 LBS	X 1 =	151 LBS AT	0.000 = $	0.00
LEFT CUTOFF WALL	69 LBS	X 1 =	69 LBS AT	0.000 = $	0.00
RIGHT CUTOFF WALL	69 LBS	X 1 =	69 LBS AT	0.000 = $	0.00
		GRAND TOTAL =	61964 LBS		$ 0.00

LOCATION MAIN BOX — NO. REQUIRED = 1

										LBS/MARK
6	101	11- 4	295	1	11- 4					5020.21
6	102	11- 4	295	1	11- 4					5020.21
6	103	11- 4	301	1	11- 4					5122.32
6	104	11- 4	301	1	11- 4					5122.32
6	105	7- 9	588	10	2- 0	3/4	5- 8	1/2		6853.45
6	106	7- 9	588	10	2- 0	3/4	5- 8	1/2		6853.45
4	108	9- 4	220	1	9- 4					1371.14
4	109	152- 7	13	2	1- 5		149- 8	1/2	2	1324.48
4	110	149- 7	13	2	1- 5		146- 8	1/2	2	1298.43
4	111	148-10	13	2	1- 5		146- 0		2	1292.35
4	112	152- 7	13	2	1- 5		149- 8	1/2	2	1324.48
4	113	149- 7	18	2	1- 5		146- 8	1/2	2	1797.83
4	114	149- 7	18	2	1- 5		146- 8	1/2	2	1797.83

LOCATION LEFT END WINGWALL — NO. REQUIRED = 1

										LBS/MARK
6	401	9- 9	45	1	9- 9					659.00
4	402	21-10	11	1	21-10					160.48
4	404	21-10	11	1	21-10					160.48
4	406	9- 9	23	1	9- 9					149.80
6	407	6- 3	45	10	3- 4		2-10	3/4		420.75
5	409	10- 4	45	1	10- 4					484.84
4	410	10- 4	23	1	10- 4					158.71
4	411	21-10	24	1	21-10					350.14
5	412	2- 0	16	1	2- 0					33.38

LOCATION LEFT BEGIN WINGWALL — NO. REQUIRED = 1

										LBS/MARK
7	501	11- 9	74	1	11- 9					1777.26
4	502	36- 3	13	1	36- 3					314.80
4	504	36- 3	13	1	36- 3					314.80
4	506	11- 9	38	1	11- 9					298.26
7	507	7- 6	74	10	4- 1		3- 4	1/2		1129.28
6	509	11- 7	74	1	11- 7					1287.09
4	510	11- 7	38	1	11- 7					293.95
4	511	36- 3	26	1	36- 3					629.59
5	512	2- 0	19	1	2- 0					39.63

LOCATION RIGHT END WINGWALL — NO. REQUIRED = 1

										LBS/MARK
6	601	9- 9	45	1	9- 9					659.00
4	602	21-10	11	1	21-10					160.48
4	604	21-10	11	1	21-10					160.48
4	606	9- 9	23	1	9- 9					149.80
6	607	6- 3	45	10	3- 4		2-10	3/4		420.75
5	609	10- 4	45	1	10- 4					484.84

4	610	10- 4	23	1	10- 4								158.71
4	611	21-10	24	1	21-10								350.14
5	612	2- 0	16	1	2- 0								33.38

LOCATION RIGHT BEGIN WINGWALL NO. REQUIRED = 1 LBS/MARK

7	701	11- 9	74	1	11- 9								1777.26
4	702	36- 3	13	1	36- 3								314.80
4	704	36- 3	13	1	36- 3								314.80
4	706	11- 9	38	1	11- 9								298.26
7	707	7- 6	74	10	4- 1	3- 4 1/2							1129.28
6	709	11- 7	74	1	11- 7								1287.09
4	710	11- 7	38	1	11- 7								293.95
4	711	36- 3	26	1	36- 3								629.59
5	712	2- 0	19	1	2- 0								39.63

LOCATION LEFT HEADWALL NO. REQUIRED = 1 LBS/MARK

6	801	11- 4	3	1	11- 4								51.05
6	802	11- 4	3	1	11- 4								51.05
4	803	6- 2	12	27	1- 7 1/4	0- 6	0- 8	0- 5	1- 2 1/4	1- 0	1- 0		48.97
10	0	0- 0	0	0									

LOCATION RIGHT HEADWALL NO. REQUIRED = 1 LBS/MARK

6	804	11- 4	3	1	11- 4								51.05
6	805	11- 4	3	1	11- 4								51.05
4	806	6- 2	12	27	1- 7 1/4	0- 6	0- 8	0- 5	1- 2 1/4	1- 0	1- 0		48.97
10	0	0- 0	0	0									

LOCATION LEFT CUTOFF WALL NO. REQUIRED = 1 LBS/MARK

4	807	11- 4	2	1	11- 4								15.14
4	808	11- 4	2	1	11- 4								15.14
4	809	4-11	12	7	1- 7 1/4	0- 8	0- 6	0- 6					39.09
10	0	0- 0	0	0									

LOCATION RIGHT CUTOFF WALL NO. REQUIRED = 1 LBS/MARK

4	810	11- 4	2	1	11- 4								15.14
4	811	11- 4	2	1	11- 4								15.14
4	812	4-11	12	7	1- 7 1/4	0- 8	0- 6	0- 6					39.09
10	0	0- 0	0	0									

US 27 Alternative 2 at Location 2

WILDLIFE UNDERPASS – AT GRADE FLAT SLAB BRIDGES

US 27 WILDLIFE CROSSING ANALYSIS

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Foundation Quantities

US 27 - Location 2 - Alternative 2

0455 34 3 PRESTRESSED CONCRETE PILING, 18" SQ

Location	No. Piles	Pile Length *(ft.)*		Total Length *(ft.)*
END BENT 1	5	75.00		375.00
END BENT 2	5	75.00		375.00

PAY ITEM TOTAL 750 LF

0455143 3 TEST PILES-PRESTRESSED CONCRETE, 18" SQ

Location	No. Piles	Pile Length *(ft.)*	Additional Length *(ft.)*	Total Length *(ft.)*
END BENT 1	1	75.00	15.00	90.00
END BENT 2	1	75.00	15.00	90.00

PAY ITEM TOTAL 180 LF

0530 1 RIPRAP, SAND-CEMENT

Location	Riprap-Rubble Height	Bedding Stone Height	Trench	Sand Cement Width	Total Length	Volume
	(ft.)	*(ft.)*	*(ft.)*	*(ft.)*	*(ft.)*	*(CY)*
END BENT 1	2.50	1.00	1.00	1	84.67	12.54
END BENT 2	2.50	1.00	1.00	1	84.67	12.54

PAY ITEM TOTAL 25.1 CY

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Foundation Quantities

US 27 - Location 2 - Alternative 2

0530 3 3 RIPRAP- RUBBLE, BANK AND SHORE

Rip-Rap Properties				
Specific Gravity	Water Weight *(PCF)*	Void Factor	'T' *(ft.)*	Rip-Rap Weight *(PSF)*
2.30	62.40	0.90	2.50	322.92

Location	Uniform Depth Plan Area	Triangular Plan Area	Weight	Weight
	(SF)	*(SF)*	*(PSF)*	*(Ton)*
END BENT 1	2072.09	412.44	322.92	358.47
END BENT 2	2072.09	412.44	322.92	358.47

PAY ITEM TOTAL 716.9 TN

0530 74 BEDDING STONE

Location	Plan Area of Bedding Stone	Unit Weight of bedding stone	Thickness	Weight
	(SF)	*(PCF)*	*(ft.)*	*(Ton)*
END BENT 1	2399.86	115.00	1	137.99
END BENT 2	2399.86	115.00	1	137.99

PAY ITEM TOTAL 276.0 TN

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Substructure Quantities

US 27 - Location 2 - Alternative 2

0400 4 5 CONCRETE CLASS IV, BRIDGE SUBSTRUCTURE

END BENTS 1 & 2					
Location	Length *(ft.)*	Width *(ft.)*	Height *(ft.)*	Quantity	Volume *(CY)*
Cap	46.75	3.00	3.00	1	15.58
Backwall	46.67	0.00	0.00	1	0.00
Cheekwall	6.17	1.00	4.83	2	2.21
				TOTAL	17.8

Applicable Equation: Volume = Quantity x (Length x Width x Height) / (27 ft^3/CY)
Reduction for pile embedment conservatively excluded.

SUMMARY	
Location	Volume *(CY)*
END BENT 1	17.8
END BENT 2	17.8

PAY ITEM TOTAL 35.6 CY

0415 1 5 REINFORCING STEEL - BRIDGE SUBSTRUCTURE

Location	Volume Concrete *(CY)*	BDR Estimate Value *(lb./CY)*	Weight *(lb.)*
END BENT 1	17.80	135	2403
END BENT 2	17.80	135	2403

PAY ITEM TOTAL 4806 LB

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Superstructure Quantities

US 27 - Location 2 - Alternative 2

0400 2 47 CONCRETE CLASS II, CIP TOPPING WITH SHRINKAGE REDUCING ADMIXTURE

Location	Number	Length *(ft.)*	Width *(ft.)*	Depth *(ft.)*	Volume *(CY)*
CIP Topping	1	48.00	46.67	0.50	41.48
Beam Pockets	20	48.00	0.500	0.917	16.3

PAY ITEM TOTAL 57.8 CY

0400 7 1 BRIDGE DECK GROOVING

Location	Length *(ft.)*	Width *(ft.)*	Area *(SY)*
BRIDGE	48.00	44.00	235.00

PAY ITEM TOTAL 235 SY

Applicable Equation: Area = Length x Width / (9 ft^2/SY)

0400 148 PLAIN NEOPRENE BEARING PADS

Location	Number	Length *(ft)*	Width *(in.)*	Thickness *(in.)*	Total *(CF)*
Bent 1	10	3.67	8	1	2.0
Bent 2	10	3.67	8	1	2.0

PAY ITEM TOTAL 4.1 CF

Applicable Equation: Volume = No. Pads x L x (W/ 12 in/ft) x (Thickness / 12 in/ft)

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Superstructure Quantities

US 27 - Location 2 - Alternative 2

0450 8 23 PRESTRESSED BEAM FLORIDA SLAB BEAM, BEAM DEPTH 15", WIDTH 55-57"

Location	Number	Length *(ft.)*	Total Length *(ft.)*
Span 1	10	47.0	470

PAY ITEM TOTAL 470 LF

0415 1 4 REINFORCING STEEL - BRIDGE SUPERSTRUCTURE

Location	Volume Concrete *(CY)*	BDR Estimate Value *(lb./CY)*	Weight *(lb.)*
CIP Topping	57.8	205	11845

PAY ITEM TOTAL 11845 LB

0458 1 11 POURED JOINT WITH BACKER ROD

Location	Width* *(ft.)*	Bridge Skew *(deg.)*	Length *(ft.)*
END BENT 1	44.00	0.00	46.00
END BENT 2	44.00	0.00	46.00

* Between inside face of rails/parapets.

PAY ITEM TOTAL 92 LF

Applicable Equation: $\text{Length} = (\text{Width} / \cos(\text{skew})) + 2\text{in.} + 2\sqrt{[(6\text{in.})^2 + (5\text{in.})^2]}$

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Approach Slab Quantities

US 27 - Location 2 - Alternative 2

0400 2 10 CLASS II CONCRETE, APPROACH SLABS

Location	Length *(ft.)*	Width *(ft.)*	Depth - Slab *(ft.)*	Depth - Topping* *(ft.)*	Depth - To Backwall *(ft.)*	Volume *(CY)*
APPROACH SLAB 1	30.00	46.67	1.00	0.17	0.67	54.00
APPROACH SLAB 2	30.00	46.67	1.00	0.17	0.67	54.00

* Asphalt overlay + 1/4" when deck planing is required.

PAY ITEM TOTAL 108.0 CY

Applicable Equation: Volume = (Length x Width x Depth Slab + 2-ft x Width x Depth Topping
+ Width x Depth To Backwall x (1-ft + 0.5 x Depth To Backwall)) / (27 ft^3/CY)

0415 1 9 REINFORCING STEEL - APPROACH SLABS

Location	Volume Concrete *(CY)*	BDR Estimate Value *(lb./CY)*	Weight *(lb.)*
APPROACH SLAB 1	54.0	200	10800
APPROACH SLAB 2	54.0	200	10800

PAY ITEM TOTAL 21600 LB

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Barrier Quantities

US 27 - Location 2 - Alternative 2

0521 5 13 CONCRETE TRAFFIC RAILING - BRIDGE, 36" SINGLE-SLOPE

Location	Length *(ft.)*	No. Railings	Length *(ft.)*
APP SLAB 1	30.00	2	60.00
Bridge	48.00	2	96.00
APP SLAB 2	30.00	2	60.00

PAY ITEM TOTAL 216 LF

Bridge Development Report Cost Estimating - US 27 - Location 2 - Alternative 2

Effective 01/01/2021

Step One: Estimate Component Items

Utilizing the cost provided herein, develop the cost estimate for each bridge type under consideration.

A. Bridge Substructure

1. Prestressed Concrete Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot [1]	Quantity	Cost
18" (Driven Plumb or 1" Batter) [2]	$100	930	$93,000
18" (Driven Battered) [2]	$140		
24" (Driven Plumb or 1" Batter) [2]	$140		
24" (Driven Battered) [2]	$200		
30" (Driven Plumb or 1" Batter) [2]	$170		
30" (Driven Battered) [2]	$240		
18" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$135		
18" w/CFRP or Stainless Steel Strand (Driven Battered)	$160		
24" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$150		
24" w/CFRP or Stainless Steel Strand (Driven Battered)	$210		
30" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$225		
30" w/CFRP or Stainless Steel Strand (Driven Battered)	$280		
Heavy mild steel reinforcing in pile head (each)[2]	$250		
		Subtotal	$93,000

[1] When silica fume, metakaolin or ultrafine fly ash is used add $6/LF to the piling cost.

[2] When heavy mild steel reinforcing is used in the pile head, add $250.

2. Steel Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot	Quantity	Cost
14 x 73 H Section	$90		
14 x 89 H Section	$100		
18" Pipe Pile	$100		
20" Pipe Pile	$125		
24" Pipe Pile	$145		
30" Pipe Pile	$200		
		Subtotal	

3. Drilled Shaft (not including Excavation)

Dia. (On land with casing salvaged)	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$500		
4 ft	$550		
5 ft	$600		
6 ft	$680		
7 ft	$825		
8 ft	$1,550		
9 ft	$1,800		
Dia. (In water with casing salvaged)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$550		
4 ft	$625		
5 ft	$700		
6 ft	$825		
7 ft	$950		
8 ft	$1,650		
9 ft	$1,900		
Dia. (In water with permanent casing)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$700		
4 ft	$750		
5 ft	$850		
6 ft	$990		
7 ft	$1,250		
8 ft	$2,200		
9 ft	$2,400		
		Subtotal	

A. Bridge Substructure (continued)

4. Drilled Shaft Excavation

Dia.	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$250		
4 ft	$280		
5 ft	$300		
6 ft	$340		
7 ft	$420		
8 ft	$780		
9 ft	$900		
		Subtotal	

5. Cofferdam Footing (Cofferdam and Seal Concrete[1])

Prorate the cost provided herein based on area and depth of water. A cofferdam footing having the following attributes cost $600,000: Area 63 ft x 37.25 ft; Depth of seal 5 ft; Depth of water over footing 16 ft

Type	Cost per Footing	Quantity	Cost
Cofferdam Footing			
[1] Cost of seal concrete included in pay item 400-3-20 or 400-4-200.		Subtotal	

6. Substructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Concrete [1]	$950	35.6	$33,820
Mass Concrete [1]	$625		
Seal Concrete [1]	$650		
Bulkhead Concrete [1]	$1,000		
Shell Fill [1]	$30		
[1] Admixtures: For Calcium Nitrite add $40/cy (@4.5 gal/cy) and for highly reactive pozzolans add $40/cy (@ 60 lb./cy)		Subtotal	$33,820

7. Substructure Reinforcing and Post-tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.00	4806	$4,806
Low-Carbon Chromium Reinforcing Steel	$1.25		
Stainless Reinforcing Steel	$4.00		
Post-tensioning Steel, Strand - Grout Filler	$8.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand - Flexible Filler	$24.00		
Post-tensioning Steel, Bar - Flexible Filler	$30.00		
		Subtotal	$4,806

Substructure Subtotal **$131,626**

B. Walls

1. Retaining Walls			
MSE Walls	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent	**$30**		
Temporary	**$15**		
Sheet Pile Walls, Prestressed Concrete	**Cost per Lin. Foot**	**Quantity**	**Cost**
10" x 30"	**$150**		
12" x 30"	**$185**		
12" x 30" with FRP	**$265**		
Sheet Pile Walls, Steel	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent Cantilever Wall	**$30**		
Permanent Anchored Wall [1]	**$55**		
Temporary Cantilever Wall	**$16**		
Temporary Anchored Wall [1]	**$35**		
Soil Nail Wall with Permanent Facing	**Cost per Sq. Foot**	**Quantity**	**Cost**
Soil Nail Wall with Permanent Facing	**$110**		
Traffic Railings with Junction Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
32" Vertical Face	**$260**		
42" Vertical Face	**$280**		
36" Single-Slope	**$255**		
42" Single-Slope	**$275**		
		Subtotal	

[1] Includes the cost of anchors, waler steel, miscellaneous steel for permanent/temporary walls and concrete face for permanent walls.

2. Noise Wall			
Type	**Cost per Sq. Foot**	**Quantity**	**Cost**
Noise Wall	**$30**		
		Subtotal	

Walls Subtotal

C. Box Culverts

1. Box Culverts			
Concrete	**Cost per Cubic Yard**	**Quantity**	**Cost**
Class II Concrete	**$950**		
Class IV Concrete	**$990**		
Reinforcing Steel	**Cost per Pound**	**Quantity**	**Cost**
Carbon Reinforcing Steel	**$1.00**		
		Subtotal	

Box Culvert Subtotal

D. Bridge Superstructure

1. Bearing Type			
Neoprene Bearing Pads	**Cost per Cubic Foot**	**Quantity**	**Cost**
Neoprene Bearing Pads	**$1,000**	**4.1**	**$4,100**
Multirotational Bearings (Capacity in kips)	**Cost per Each**	**Quantity**	**Cost**
1- 250	**$6,000**		
251- 500	**$8,000**		
501- 750	**$8,750**		
751-1000	**$9,500**		
1001-1250	**$10,000**		
1251-1500	**$11,000**		
1501-1750	**$13,000**		
1751-2000	**$15,000**		
>2000	**$17,000**		
		Subtotal	$4,100

2. Bridge Girders			
Structural Steel (includes coating costs)	**Cost per Pound**	**Quantity**	**Cost**
Plate Girders, Straight [1]	**$1.65**		
Plate Girders, Curved [1]	**$1.95**		
Box Girders, Straight [1]	**$1.95**		
Box Girders, Curved [1]	**$2.15**		

[1] When weathering steel (uncoated) is used, reduce the price by $0.04 per pound.
Inorganic zinc coating systems have an expected life cycle of 20 years.

Prestressed Concrete Girders and Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
Florida U-Beam; 48" [1]	**$750**		
Florida U-Beam; 54"	**$800**		
Florida U-Beam; 63"	**$850**		
Florida U-Beam; 72"	**$900**		
Florida Slab Beam 12" x 48" [2]	**$230**		
Florida Slab Beam 12" x 60" [2]	**$280**		
Florida Slab Beam 15" x 48" [2]	**$280**		
Florida Slab Beam 15" x 56"	**$340**	**470**	**$159,800**
Florida Slab Beam 15" x 60" [2]	**$370**		
Florida Slab Beam 18" x 48" [2]	**$340**		
Florida Slab Beam 18" x 60" [2]	**$440**		
AASHTO Type II Beam	**$190**		
Florida-I Beam; 36	**$240**		
Florida-I Beam; 45	**$260**		
Florida-I Beam; 54	**$280**		
Florida-I Beam; 63	**$300**		
Florida-I Beam; 72	**$320**		
Florida-I Beam; 78	**$330**		
Florida-I Beam; 84	**$340**		
Florida-I Beam; 96	**$370**		
		Subtotal	**$159,800**

[1] Price is based on ability to furnish products without any conversions of casting beds and without purchasing of forms. If these conditions do not exist, add the following cost: $450,000

[2] Interpolate between given prices for intermediate width FSBs.

D. Bridge Superstructure (continued)

3. Cast-in-Place Superstructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Box Girder Concrete, Straight	$950		
Box Girder Concrete, Curved	$1,200		
Deck Concrete Class II	$750		
Deck Concrete Class IV	$1,200		
Precast Deck Overlay Concrete Class IV	$1,000		
Topping Concrete for slab beams and units[1]	$800	57.78	$46,224
[1] Including cost of shrinkage reducing admixture.		Subtotal	$46,224

4. Concrete for Precast Segmental Box Girders, Cantilever Construction

Concrete Cost by Deck Area	Cost per Cubic Yard	Quantity	Cost
≤ 300,000 SF	$1,250		
> 300,000 SF AND ≤ 500,000 SF	$1,200		
> 500,000 SF	$1,150		
		Subtotal	

5. Reinforcing and Post-Tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.05	11845	$12,437
Low-Carbon Chromium Reinforcing Steel	$1.30		
Stainless Reinforcing Steel	$4.05		
Post-tensioning Steel, Strand; longitudinal - Grout Filler	$8.00		
Post-tensioning Steel, Strand; transverse - Grout Filler	$10.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand; longitudinal - Flexible Filler	$24.00		
Post-tensioning Steel, Bars - Flexible Filler	$30.00		
		Subtotal	$12,437

6. Railings and Barriers

Traffic Railings [1]	Cost per Lin. Foot	Quantity	Cost
32" Vertical Face	$90		
42" Vertical Face	$100		
36" Single-Slope Median	$100		
36" Single-Slope	$110	96.00	$10,560
42" Single-Slope	$140		
Thrie Beam Retrofit	$180		
Thrie Beam Panel Retrofit	$110		
Vertical Face Retrofit	$125		
Rectangular Tube Retrofit	$100		
Pedestrian/Bicycle Railings:	**Cost per Lin. Foot**	**Quantity**	**Cost**
Concrete Parapet (27") [1]	$65		
Single Bullet Railing [1]	$40		
Double Bullet Railing [1]	$50		
Panel/Picket Railing (42") steel (Type 1 & 2)	$95		
Panel/Picket Railing (42") steel (Type 3-5)	$130		
Panel/Picket Railing (42") aluminum (Type 1 & 2)	$70		
Panel/Picket Railing (42") aluminum (Type 3-5)	$105		
Panel/Picket Railing (48") steel (Type 1 & 2)	$115		
Panel/Picket Railing (48") steel (Type 3-5)	$145		
Panel/Picket Railing (48") aluminum (Type 1 & 2)	$85		
Panel/Picket Railing (48") aluminum (Type 3-5)	$120		
[1] Combine cost of Bullet Railings with Concrete Parapet or Traffic Railing, as appropriate.		Subtotal	$10,560

7. Expansion Joints

Type	Cost per Lin. Foot	Quantity	Cost
Poured Joint With Backer Rod	$45	92	$4,140
Strip Seal	$250		
Finger Joint <6"	$850		
Finger Joint >6"	$1,500		
Modular 6"	$500		
Modular 8"	$700		
Modular 12"	$900		
		Subtotal	$4,140

Superstructure Subtotal	**$237,261**

E. Miscellaneous Items

1. Bridge Deck Grooving and Planing

Type	Cost per Sq. Yard	Quantity	Cost
Bridge Deck Planing	$6.00		
Bridge Deck Grooving for Short Bridge	$8.00	235	$1,880
Bridge Deck Grooving for Long Bridge	$5.00		
	Grooving and Planing Subtotal		$1,880

2. Detour Bridges

Type	Cost per Sq. Foot	Quantity	Cost
Acrow Detour Bridge [1]	$55		
[1] Using FDOT supplied components. The cost is for the bridge proper (measured out-to-out) and does not include approach work, surfacing, or guardrail.	Detour Bridge Subtotal		

3. Approach Slab

Approach Slab Material	Cost per Unit	Quantity	Cost
Cast-in-Place Concrete (per Sq. Yard)	$400	108	$43,200
Reinforcing Steel (per Pound)	$1.05	21600	$22,680
36" Single-Slope	$110.00	120.00	$13,200
	Approach Slab Subtotal		$79,080

Unadjusted Total	$449,847

Step Two: Estimate Conditional Variables and Cost per Square Foot

After developing the total cost estimate utilizing the unit cost, modify the cost to account for site condition variables. If appropriate, the cost will be modified by the following variables:

** Phased construction is defined as construction over traffic or construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the effected units of the superstructure and/or substructure.

Conditional Variables	% Increase/ Decrease	Cost (+/-)
For construction over open water, floodplains that flood frequently or other similar areas, increase cost by 3 %.		
For construction over traffic and/or phased construction, increase by 20 %. [1]	20%	$89,969
[1] Phased construction is defined as construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the affected units of the superstructure and/or substructure.	20%	$89,969

Substructure Subtotal	$131,626
Superstructure Subtotal	$237,261
Walls Subtotal	
Box Culverts Subtotal	
Grooving and Planing Subtotal	$1,880
Detour Bridge Subtotal	
Approach Slab Subtotal	$79,080
Conditional Variables	$89,969
Total Cost	$539,817
Total Square Feet of Deck	2240.0
Cost per Square Foot (not including Approach Slab)	$206

Design Aid for Determination of Reinforcing Steel

In the absence of better information, use the following quantities of reinforcing steel pounds per cubic yard of concrete.

Location	Pounds of Steel per Cubic Yard	Cubic Yds.	Tot. Pounds
Pile Abutments	135		
Pile Bents	145		
Single Column Piers >25'	210		
Single Column Piers <25'	150		
Multiple Column Piers >25'	215		
Multiple Column Piers <25'	195		
Bascule Piers	110		
Standard Deck Slabs	205		
Isotropic Deck Slabs	125		
Concrete Box Girders, Pier Seg	225		
Concrete Box Girders, Typ. Seg	165		
C.I.P. Flat Slabs @ 30ft & 15" Deep	220		
Approach Slab	200		

Step Three: Cost Estimate Comparison to Historical Bridge Cost

The final step is a comparison of the cost estimate by comparison with historic bridge cost based on a cost per square foot. These total cost numbers are calculated exclusively for the bridge cost as defined in the General Section of this chapter. Price computed by Steps 1 and 2 should be generally within the range of cost as supplied herein. If the cost falls outside the provided range, good justification must be provided.

Bridge Superstructure Type	Total Cost per Square Foot Low	High
Short Span Bridges:		
Reinforced Concrete Flat Slab- Simple Span [1]	$115	$160
Pre-cast Concrete Slab - Simple Span [1]	$110	$200
Medium Span Bridges:		
Concrete Deck / Steel Girder - Simple Span [1]	$125	$142
Concrete Deck / Steel Girder - Continuous Span [1]	$135	$170
Concrete Deck / Prestressed Girder - Simple Span [1]	$90	$145
Concrete Deck / Prestressed Girder - Continuous Span [1]	$95	$211
Concrete Deck / Steel Box Girder [1] -	$140	$180
Span range from 150' to 280' (for curvature, add 15% premium)		
Segmental Concrete Box Girders - Cantilever Construction	$140	$160
Span range from 150' to 280'		
Movable Bridge - Bascule Spans & Piers	$1,800	$2,000
Demolition Costs:		
Typical	$35	$60
Bascule	$60	$70
Project Type		
Widening (Construction Only)	$85	$160

[1] Increase the cost by twenty percent for phased construction

Estimated Cost per Square Foot **$206**

US 27 Alternative 3 at Location 2

WILDLIFE CROSSING – WILDLIFE OVERPASS BRIDGE

US 27 WILDLIFE CROSSING ANALYSIS

See location 1 alternative 3 for all other quantities.

KISINGER CAMPO & ASSOCIATES

Districtwide Environmental Permits Design Support
Task Work Order No. 10
US 27 Wildlife Crossing Analysis

DESIGNED BY: SKB 11/21
CHECKED BY:

Wall Quantities

Location 2 - Alternative 3

0120 6 EMBANKMENT

Location		Height *(ft.)*	Width *(ft.)*	Radius *(ft.)*	Volume *(CY)*
Wall 1	Front	24.00	52.60	136.00	3179.38
	Left	24.00		116.50	2105.60
	Right	24.00		112.00	1946.08
Wall 2	Front	27.00	52.60	152.00	3997.60
	Left	27.00		126.00	2770.88
	Right	27.00		128.50	2881.93

PAY ITEM TOTAL 16881 CY

0548 12 RETAINING WALL SYSTEM, PERMANENT, EXCLUDING BARRIER

Location		Height 1 *(ft.)*	Height 2 *(ft.)*	Length *(ft.)*	Area *(SF)*
Wall 1	Front	20.25	20.25	42.33	857.25
	Left	26.50	5.00	102.00	1660.25
	Right	26.50	5.00	93.00	1518.50
Wall 2	Front	21.75	21.75	42.33	920.75
	Left	28.00	4.00	105.00	1740.00
	Right	28.00	4.00	110.00	1820.00

PAY ITEM TOTAL 8517 SF

Bridge Development Report Cost Estimating - US 27 Alternative 3 - Location 2

Effective 01/01/2021

Step One: Estimate Component Items

Utilizing the cost provided herein, develop the cost estimate for each bridge type under consideration.

A. Bridge Substructure

1. Prestressed Concrete Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot [1]	Quantity	Cost
18" (Driven Plumb or 1" Batter) [2]	$100		
18" (Driven Battered) [2]	$140		
24" (Driven Plumb or 1" Batter) [2]	$140	1805	$252,700
24" (Driven Battered) [2]	$200		
30" (Driven Plumb or 1" Batter) [2]	$170		
30" (Driven Battered) [2]	$240		
18" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$135		
18" w/CFRP or Stainless Steel Strand (Driven Battered)	$160		
24" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$150		
24" w/CFRP or Stainless Steel Strand (Driven Battered)	$210		
30" w/CFRP or Stainless Steel Strand (Driven Plumb or 1" Batter)	$225		
30" w/CFRP or Stainless Steel Strand (Driven Battered)	$280		
Heavy mild steel reinforcing in pile head (each)[2]	$250		
		Subtotal	$252,700

[1] When silica fume, metakaolin or ultrafine fly ash is used add $6/LF to the piling cost.

[2] When heavy mild steel reinforcing is used in the pile head, add $250.

2. Steel Piling, (furnished and installed)

Size of Piling	Cost per Lin. Foot	Quantity	Cost
14 x 73 H Section	$90		
14 x 89 H Section	$100		
18" Pipe Pile	$100		
20" Pipe Pile	$125		
24" Pipe Pile	$145		
30" Pipe Pile	$200		
		Subtotal	

3. Drilled Shaft (not including Excavation)

Dia. (On land with casing salvaged)	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$500		
4 ft	$550		
5 ft	$600		
6 ft	$680		
7 ft	$825		
8 ft	$1,550		
9 ft	$1,800		
Dia. (In water with casing salvaged)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$550		
4 ft	$625		
5 ft	$700		
6 ft	$825		
7 ft	$950		
8 ft	$1,650		
9 ft	$1,900		
Dia. (In water with permanent casing)	**Cost per Lin. Foot**	**Quantity**	**Cost**
3.5 ft	$700		
4 ft	$750		
5 ft	$850		
6 ft	$990		
7 ft	$1,250		
8 ft	$2,200		
9 ft	$2,400		
		Subtotal	

A. Bridge Substructure (continued)

4. Drilled Shaft Excavation

Dia.	Cost per Lin. Foot	Quantity	Cost
3.5 ft	$250		
4 ft	$280		
5 ft	$300		
6 ft	$340		
7 ft	$420		
8 ft	$780		
9 ft	$900		
		Subtotal	

5. Cofferdam Footing (Cofferdam and Seal Concrete[1])

Prorate the cost provided herein based on area and depth of water. A cofferdam footing having the following attributes cost $600,000: Area 63 ft x 37.25 ft; Depth of seal 5 ft; Depth of water over footing 16 ft

Type	Cost per Footing	Quantity	Cost
Cofferdam Footing			
[1] Cost of seal concrete included in pay item 400-3-20 or 400-4-200.		Subtotal	

6. Substructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Concrete [1]	$950	55	$52,250
Mass Concrete [1]	$625	152.3	$95,188
Seal Concrete [1]	$650		
Bulkhead Concrete [1]	$1,000		
Shell Fill [1]	$30		
[1] Admixtures: For Calcium Nitrite add $40/cy (@4.5 gal/cy) and for highly reactive pozzolans add $40/cy (@ 60 lb./cy)		Subtotal	$147,438

7. Substructure Reinforcing and Post-tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.00	30270	$30,270
Low-Carbon Chromium Reinforcing Steel	$1.25		
Stainless Reinforcing Steel	$4.00		
Post-tensioning Steel, Strand - Grout Filler	$8.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand - Flexible Filler	$24.00		
Post-tensioning Steel, Bar - Flexible Filler	$30.00		
		Subtotal	$30,270

Substructure Subtotal **$430,408**

B. Walls

1. Retaining Walls			
MSE Walls	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent	**$30**	**8517**	**$255,503**
Temporary	**$15**		
Sheet Pile Walls, Prestressed Concrete	**Cost per Lin. Foot**	**Quantity**	**Cost**
10" x 30"	**$150**		
12" x 30"	**$185**		
12" x 30" with FRP	**$265**		
Sheet Pile Walls, Steel	**Cost per Sq. Foot**	**Quantity**	**Cost**
Permanent Cantilever Wall	**$30**		
Permanent Anchored Wall [1]	**$55**		
Temporary Cantilever Wall	**$16**		
Temporary Anchored Wall [1]	**$35**		
Soil Nail Wall with Permanent Facing	**Cost per Sq. Foot**	**Quantity**	**Cost**
Soil Nail Wall with Permanent Facing	**$110**		
Traffic Railings with Junction Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
32" Vertical Face	**$260**		
42" Vertical Face	**$280**		
36" Single-Slope	**$255**		
42" Single-Slope	**$275**		
		Subtotal	$255,503

[1] Includes the cost of anchors, waler steel, miscellaneous steel for permanent/temporary walls and concrete face for permanent walls.

2. Noise Wall			
Type	**Cost per Sq. Foot**	**Quantity**	**Cost**
Noise Wall	**$30**		
		Subtotal	

Walls Subtotal	**$255,503**

C. Box Culverts

1. Box Culverts			
Concrete	**Cost per Cubic Yard**	**Quantity**	**Cost**
Class II Concrete	**$950**		
Class IV Concrete	**$990**		
Reinforcing Steel	**Cost per Pound**	**Quantity**	**Cost**
Carbon Reinforcing Steel	**$1.00**		
		Subtotal	

Box Culvert Subtotal

D. Bridge Superstructure

1. Bearing Type			
Neoprene Bearing Pads	**Cost per Cubic Foot**	**Quantity**	**Cost**
Neoprene Bearing Pads	**$1,000**	**7.2**	**$7,200**
Multirotational Bearings (Capacity in kips)	**Cost per Each**	**Quantity**	**Cost**
1- 250	**$6,000**		
251- 500	**$8,000**		
501- 750	**$8,750**		
751-1000	**$9,500**		
1001-1250	**$10,000**		
1251-1500	**$11,000**		
1501-1750	**$13,000**		
1751-2000	**$15,000**		
>2000	**$17,000**		
		Subtotal	$7,200

2. Bridge Girders			
Structural Steel (includes coating costs)	**Cost per Pound**	**Quantity**	**Cost**
Plate Girders, Straight [1]	**$1.65**		
Plate Girders, Curved [1]	**$1.95**		
Box Girders, Straight [1]	**$1.95**		
Box Girders, Curved [1]	**$2.15**		

[1] When weathering steel (uncoated) is used, reduce the price by $0.04 per pound.
Inorganic zinc coating systems have an expected life cycle of 20 years.

Prestressed Concrete Girders and Slabs	**Cost per Lin. Foot**	**Quantity**	**Cost**
Florida U-Beam; 48" [1]	**$750**		
Florida U-Beam; 54"	**$800**		
Florida U-Beam; 63"	**$850**		
Florida U-Beam; 72"	**$900**		
Florida Slab Beam 12" x 48" [2]	**$230**		
Florida Slab Beam 12" x 60" [2]	**$280**		
Florida Slab Beam 15" x 48" [2]	**$280**		
Florida Slab Beam 15" x 60" [2]	**$370**		
Florida Slab Beam 18" x 48" [2]	**$340**		
Florida Slab Beam 18" x 60" [2]	**$440**		
AASHTO Type II Beam	**$190**		
Florida-I Beam; 36	**$240**		
Florida-I Beam; 45	**$260**	**986**	**$256,360**
Florida-I Beam; 54	**$280**		
Florida-I Beam; 63	**$300**		
Florida-I Beam; 72	**$320**		
Florida-I Beam; 78	**$330**		
Florida-I Beam; 84	**$340**		
Florida-I Beam; 96	**$370**		
		Subtotal	**$256,360**

[1] Price is based on ability to furnish products without any conversions of casting beds and without purchasing of forms. If these conditions do not exist, add the following cost: $450,000

[2] Interpolate between given prices for intermediate width FSBs.

D. Bridge Superstructure (continued)

3. Cast-in-Place Superstructure Concrete

Type	Cost per Cubic Yard	Quantity	Cost
Box Girder Concrete, Straight	$950		
Box Girder Concrete, Curved	$1,200		
Deck Concrete Class II	$750		
Deck Concrete Class IV	$1,200	258	$309,600
Precast Deck Overlay Concrete Class IV	$1,000		
Topping Concrete for slab beams and units[1]	$800		
[1] Including cost of shrinkage reducing admixture.		Subtotal	$309,600

4. Concrete for Precast Segmental Box Girders, Cantilever Construction

Concrete Cost by Deck Area	Cost per Cubic Yard	Quantity	Cost
≤ 300,000 SF	$1,250		
> 300,000 SF AND ≤ 500,000 SF	$1,200		
> 500,000 SF	$1,150		
		Subtotal	

5. Reinforcing and Post-Tensioning Steel

Type	Cost per Pound	Quantity	Cost
Carbon Reinforcing Steel	$1.05	52890	$55,535
Low-Carbon Chromium Reinforcing Steel	$1.30		
Stainless Reinforcing Steel	$4.05		
Post-tensioning Steel, Strand; longitudinal - Grout Filler	$8.00		
Post-tensioning Steel, Strand; transverse - Grout Filler	$10.00		
Post-tensioning Steel, Bar - Grout Filler	$10.00		
Post-tensioning Steel, Strand; longitudinal - Flexible Filler	$24.00		
Post-tensioning Steel, Bars - Flexible Filler	$30.00		
		Subtotal	$55,535

6. Railings and Barriers

Traffic Railings [1]	Cost per Lin. Foot	Quantity	Cost
32" Vertical Face	$90		
42" Vertical Face	$100		
36" Single-Slope Median	$100		
36" Single-Slope	$110		
8'-0" Noise Wall	$390	394.00	$153,660
42" Single-Slope	$140		
Thrie Beam Retrofit	$180		
Thrie Beam Panel Retrofit	$110		
Vertical Face Retrofit	$125		
Rectangular Tube Retrofit	$100		
Pedestrian/Bicycle Railings:	**Cost per Lin. Foot**	**Quantity**	**Cost**
Concrete Parapet (27") [1]	$65		
Single Bullet Railing [1]	$40		
Double Bullet Railing [1]	$50		
Panel/Picket Railing (42") steel (Type 1 & 2)	$95		
Panel/Picket Railing (42") steel (Type 3-5)	$130		
Panel/Picket Railing (42") aluminum (Type 1 & 2)	$70		
Panel/Picket Railing (42") aluminum (Type 3-5)	$105		
Panel/Picket Railing (48") steel (Type 1 & 2)	$115		
Panel/Picket Railing (48") steel (Type 3-5)	$145		
Panel/Picket Railing (48") aluminum (Type 1 & 2)	$85		
Panel/Picket Railing (48") aluminum (Type 3-5)	$120		
[1] Combine cost of Bullet Railings with Concrete Parapet or Traffic Railing, as appropriate.		Subtotal	$153,660

7. Expansion Joints

Type	Cost per Lin. Foot	Quantity	Cost
Poured Joint With Backer Rod	$45	86	$3,870
Strip Seal	$250		
Finger Joint <6"	$850		
Finger Joint >6"	$1,500		
Modular 6"	$500		
Modular 8"	$700		
Modular 12"	$900		
		Subtotal	$3,870

Superstructure Subtotal **$786,225**

E. Miscellaneous Items

1. Bridge Deck Grooving and Planing

Type	Cost per Sq. Yard	Quantity	Cost
Bridge Deck Planing	$6.00		
Bridge Deck Grooving for Short Bridge	$8.00		
Bridge Deck Grooving for Long Bridge	$5.00		
	Grooving and Planing Subtotal		

2. Detour Bridges

Type	Cost per Sq. Foot	Quantity	Cost
Acrow Detour Bridge [1]	$55		
[1] Using FDOT supplied components. The cost is for the bridge proper (measured out-to-out) and does not include approach work, surfacing, or guardrail.	Detour Bridge Subtotal		

3. Approach Slab

Approach Slab Material	Cost per Unit	Quantity	Cost
Cast-in-Place Concrete (per Sq. Yard)	$400		
Reinforcing Steel (per Pound)	$1.05		
	Approach Slab Subtotal		

Unadjusted Total	$1,472,135

Step Two: Estimate Conditional Variables and Cost per Square Foot

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** Phased construction is defined as construction over traffic or construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the effected units of the superstructure and/or substructure.

Conditional Variables	% Increase/ Decrease	Cost (+/-)
For construction over open water, floodplains that flood frequently or other similar areas, increase cost by 3 %.		
For construction over traffic and/or phased construction, increase by 20 %. [1]	20%	$294,427
[1] Phased construction is defined as construction requiring multiple phases to complete the construction of the entire cross section of the bridge. The 20 percent premium is applied to the affected units of the superstructure and/or substructure.	20%	$294,427

Substructure Subtotal	$430,408
Superstructure Subtotal	$786,225
Walls Subtotal	$255,503
Box Culverts Subtotal	
Grooving and Planing Subtotal	
Detour Bridge Subtotal	
Approach Slab Subtotal	
Conditional Variables	$294,427
Total Cost	$1,766,561

Total Square Feet of Deck	8668.0

Cost per Square Foot (not including Approach Slab)	$204

Design Aid for Determination of Reinforcing Steel

In the absence of better information, use the following quantities of reinforcing steel pounds per cubic yard of concrete.

Location	Pounds of Steel per Cubic Yard	Cubic Yds.	Tot. Pounds
Pile Abutments	135		
Pile Bents	145		
Single Column Piers >25'	210		
Single Column Piers <25'	150		
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Approach Slab	200		

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Medium Span Bridges:		
Concrete Deck / Steel Girder - Simple Span [1]	$125	$142
Concrete Deck / Steel Girder - Continuous Span [1]	$135	$170
Concrete Deck / Prestressed Girder - Simple Span [1]	$90	$145
Concrete Deck / Prestressed Girder - Continuous Span [1]	$95	$211
Concrete Deck / Steel Box Girder [1] - Span range from 150' to 280' (for curvature, add 15% premium)	$140	$180
Segmental Concrete Box Girders - Cantilever Construction Span range from 150' to 280'	$140	$160
Movable Bridge - Bascule Spans & Piers	$1,800	$2,000
Demolition Costs:		
Typical	$35	$60
Bascule	$60	$70
Project Type		
Widening (Construction Only)	$85	$160

[1] Increase the cost by twenty percent for phased construction

Estimated Cost per Square Foot **$204**