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Intensive Archeological Survey of the Highway US 69 and Farm-to-Market 779 Interchange, Wood County, Texas

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Intensive Archeological Survey of the Highway US 69 and Farm-to-Market 779 Interchange, Wood County, Texas

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Report for Archeological Survey

Intensive Archeological Survey of the
Highway US 69 and Farm-to-Market 779
Interchange, Wood County, Texas

Tyler District

Kevin Hanselka, Principal Investigator, Antiquities Permit No. 8162

CSJ: 0203-05-039

November 6, 2017

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated 12-16-14, and executed by FHWA and TxDOT.

Abstract

On behalf of the Texas Department of Transportation, SWCA Environmental Consultants (SWCA) conducted an intensive cultural resources survey with mechanical trenching on September 20-22, 2017, of 57.69 acres of new and existing right-of-way (ROW) along United States Highway (US) 69 and the intersection of Farm-to-Market (FM) 779 in Wood County, Texas. Because the project will receive funding from the Federal Highways Administration, it qualifies as an undertaking as defined in Title 36 Code of Federal Regulations Part 800.16(y) and, therefore, survey was conducted in compliance with Section 106 of the National Historic Preservation Act (54 U.S. Code 306108). Furthermore, the project must also comply with the Antiquities Code of Texas (9 Natural Resources Code 191). Kevin Hanselka served as Principal Investigator under Texas Antiquities Permit No. 8162.

The area of potential effects (APE) is defined as a two-mile long stretch of US 69 and a 0.17-mile long stretch along FM 779. The area includes the existing 120-foot-wide ROW and an additional 25.19 acres (from 19 parcels) of new ROW along the southwest side of the existing ROW. The total project area is therefore about 57.69 acres, of which about 32.5 acres is existing ROW and 25.19 acres is new ROW. Typical depths of impact are anticipated to be approximately two feet, with maximum depths of impacts of up to six feet at culvert locations.

A background literature review determined that the APE has previously been surveyed for cultural resources by Hicks & Company in 2004, but that no deep testing was conducted to assess the potential for deeply buried deposits during that effort. One other cultural resource survey was conducted within 0.6 miles (1 kilometer) of the survey area; a 2010 survey of Golden Community Cemetery by AR Consultants, Inc. on behalf of the Texas Water Development Board. One archeological site (41WD257) is located approximately 350 meters north of the APE, but minimal information is available on this site. Two historic markers are located in the town of Golden near the APE, for Reuben Leon and Fairness Simmons, and for the Reneau Building (marker numbers 15501 and 17729). Finally one cemetery, Golden Cemetery, is located within 0.6 miles of the project area.

The survey identified substantial disturbances within the APE, including prior infrastructure development, such as utilities and road construction, and a variety of other land use practices. SWCA assessed the entire 57.69-acre survey area, but focused on the 25.19 acres of proposed new ROW. SWCA excavated eight backhoe trenches (BHTs) to assess the potential for deeply buried cultural deposits along the prominent drainages and 26 shovel tests in upland areas. The survey identified a negligible potential for intact cultural resources within the existing ROW, and the investigations revealed no cultural material within the new ROW. At the time of the survey access was denied for six parcels, comprising 1.85 acres of new ROW; these parcels are predominantly commercial or residential developments. No further archeological investigations are recommended within the APE and within a 50-foot buffer beyond the horizontal project limits on the southwestern side of the roadway.

Project Identification

- **Date:** 11/06/2017
- **Date(s) of Survey:** 9/20-22/2017
- **Archeological Survey Type:** Reconnaissance Intensive
- **Report Version:** Draft Final
- **Jurisdiction:** Federal State
- **Texas Antiquities Permit Number:** 8162
- **District:** Tyler
- **County or Counties:** Wood
- **USGS Quadrangle(s):** Golden (3295-314)
- **Highway:** United State Highway (US) 69 and Farm-to-Market (FM) 779
- **CSJ:** 0203-05-039
- **Report Author(s):** Dan Rodriguez and Steve Carpenter
- **Principal Investigator:** Kevin Hanselka

Texas Historical Commission Approval

Signature

Date

Project Description

- **Project Type:** Highway expansion
- **Total Project Impact Acreage:** 57.69 acre
- **Area of Pedestrian Survey:** 55.84 acres
- **Project Description and Impacts:** The proposed project would construct a grade-separation interchange along US 69 at the existing intersection with FM 779, and widen US 69 to four, 12-foot travel lanes, with 10-foot shoulders adjacent to outside lanes and 4-foot shoulders adjacent to interior lanes, with a depressed median. The project also proposes minor widening along FM 779 at US 69, for a length of approximately 0.17 mile (Figure 1). Most of the work is limited to the new ROW with minimal testing of the existing ROW.
- **Area of Potential Effects (APE):** The APE is defined as a two-mile long stretch of US 69 between the limits outlined above, and a 0.17-mile long stretch along FM 779, and includes the existing 120-foot-wide ROW and an additional 25.19 acres (from 19 parcels) of new ROW along the southwest side of existing ROW. Total project area is about 57.69 acres, of which about 32.5 acres is existing ROW and 25.19 acres is new ROW. Typical depths of impact are anticipated to be approximately two feet, while maximum depths of impacts up to six feet at culvert locations (Figure 2).
- **Parcel Number(s):** 18980, 19007, 19042, 19043, 19045, 19048, 19050, 19073, 19076, 19081, 19109, 19111, 19805, 54817, 60162, 68693, 85310, 120970, 120971. No access was granted for parcels 18980, 19043, 19045, 19048, 19111, and 68693.
- **Project Area Ownership:** The existing US 69 and FM779 ROW is owned and managed by Texas Department of Transportation (TxDOT). The 25.19 acres of new ROW is privately owned.

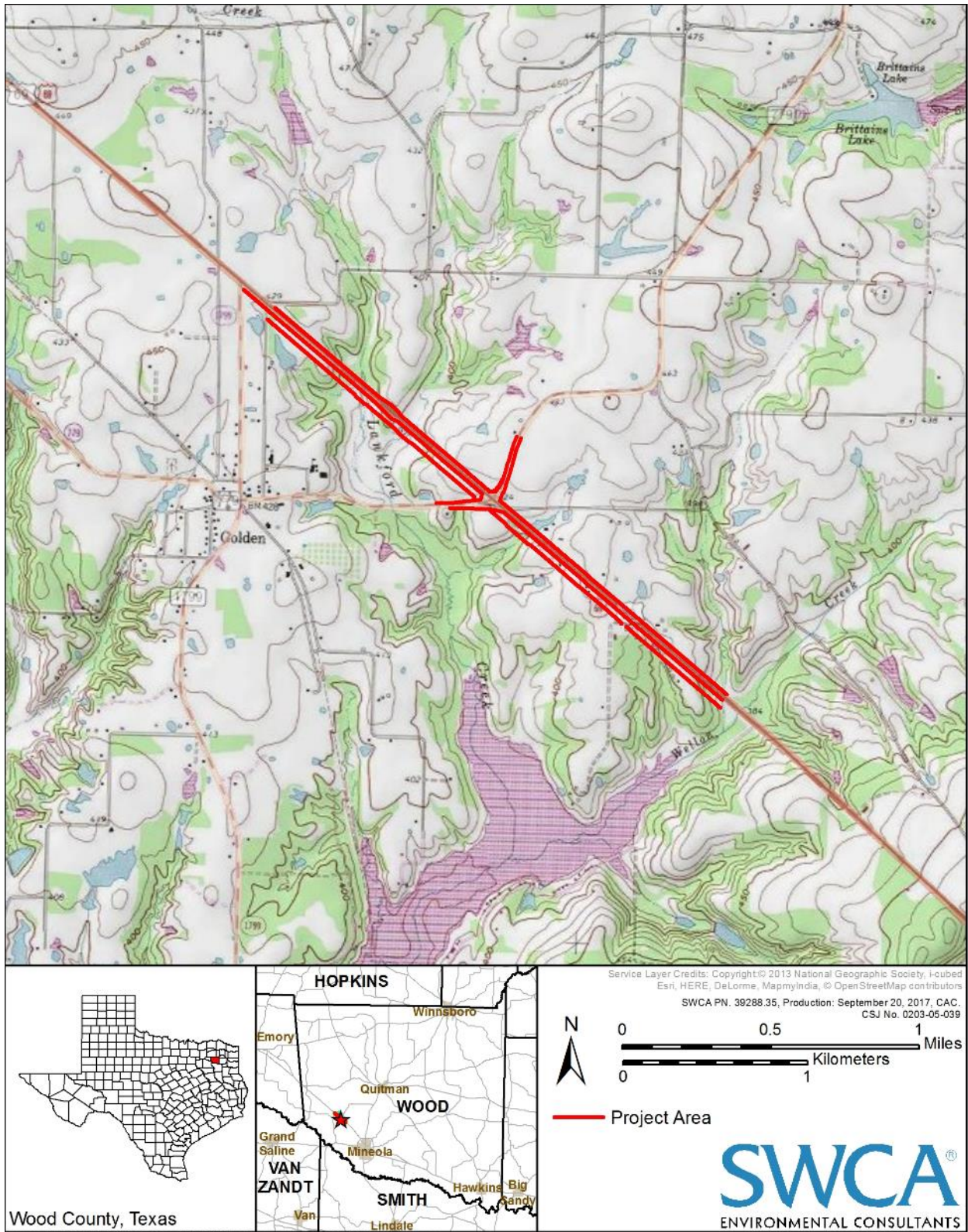


Figure 1. Project location.

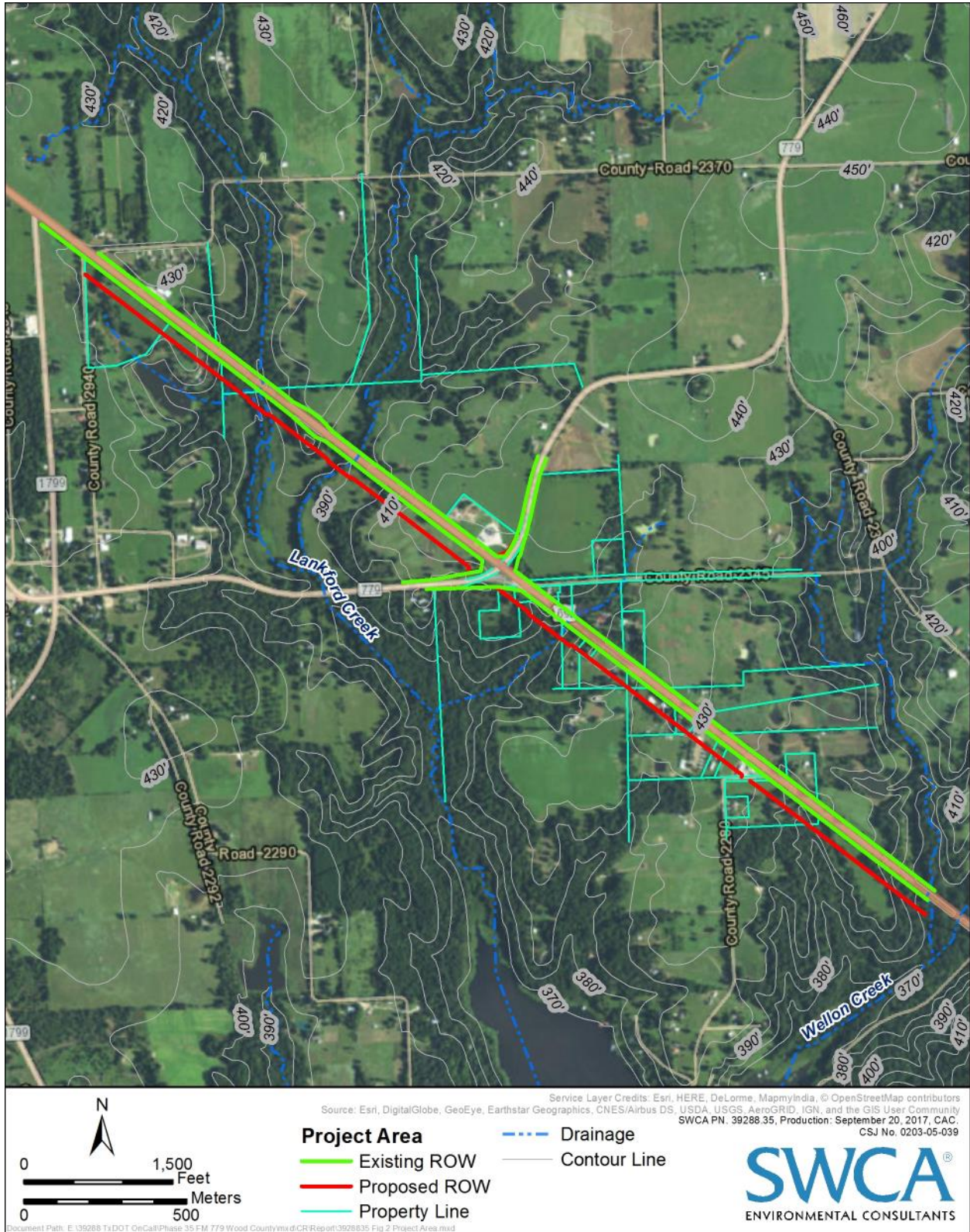


Figure 2. Project Area.

Project Setting

- **Topography:** The APE runs roughly southeast to northwest across the dissected rolling plains of the northern Post Oak Savanna ecoregion (Wermund 2017). Elevation ranges from a maximum of 420 feet above mean sea level (amsl) on the northwest terminus of the APE, to a low of 380 feet amsl at the southeast terminus.
- **Geology:** According to the Geologic Atlas of Texas, Palestine sheet, the APE is underlain by two Eocene formations, the Reklaw formation and Queen City Sands. The Reklaw formation consists of sandstone and clay with hematite, muscovite, and glauconite (Barnes 1967) (Figure 3). The Queen City Sand formation consists of quartz sand and clay that ranges in color from light gray to brownish-gray and weathers to red and white mottled sandstone substrate with ironstone concretions.
- **Soils:** The APE is underlain by four soil series; Freestone, Woodtell, Manco, and Wolfpen (Figure 4). The Freestone fine sandy loam consists of very deep, moderately well-drained soils formed in loamy and clayey alluvium derived from shale and siltstone of Eocene age. Freestone soils are located on nearly level to gently sloping stream terraces on inland dissected coastal plains with slopes from 0 to 5 percent. The Woodtell fine sandy loam consists of deep, stratified loamy and clayey residuum derived from sandstone and shale. Woodtell soils occur on gently sloping to moderately steep interfluvies and side slopes of ridges on inland dissected coastal plains with slopes ranging from 1 to 20 percent. The Manco silt loam consists of very deep soils formed in loamy alluvial sediments. The Manco soils are located on nearly level flood plains with slopes ranging from 0 to 1 percent. Finally, Wolfpen loamy fine sand consists of very deep, well drained soils formed in lentil sands on uplands of coastal plains. Wolfpen soils are located on slopes ranging from 1 to 15 percent (Natural Resources Conservation Service 2017).
- **Land Use:** The proposed project is a mix of agricultural and rural commercial properties. The existing ROW consists of roadway, drainage ditches, and a series of intersecting and parallel utilities, including, but not limited to, communications and petrochemical lines. The APE crosses wooded drainages flanked by agricultural and pastoral fields.
- **Vegetation:** Vegetation within the project area is primarily short, mixed grasses within the existing ROW. The area surrounding the APE consists of manicured grasses, dense trees, and secondary growth along drainages (Figure 5).
- **Estimated Ground Surface Visibility:** Zero (0) percent within new and existing ROW.

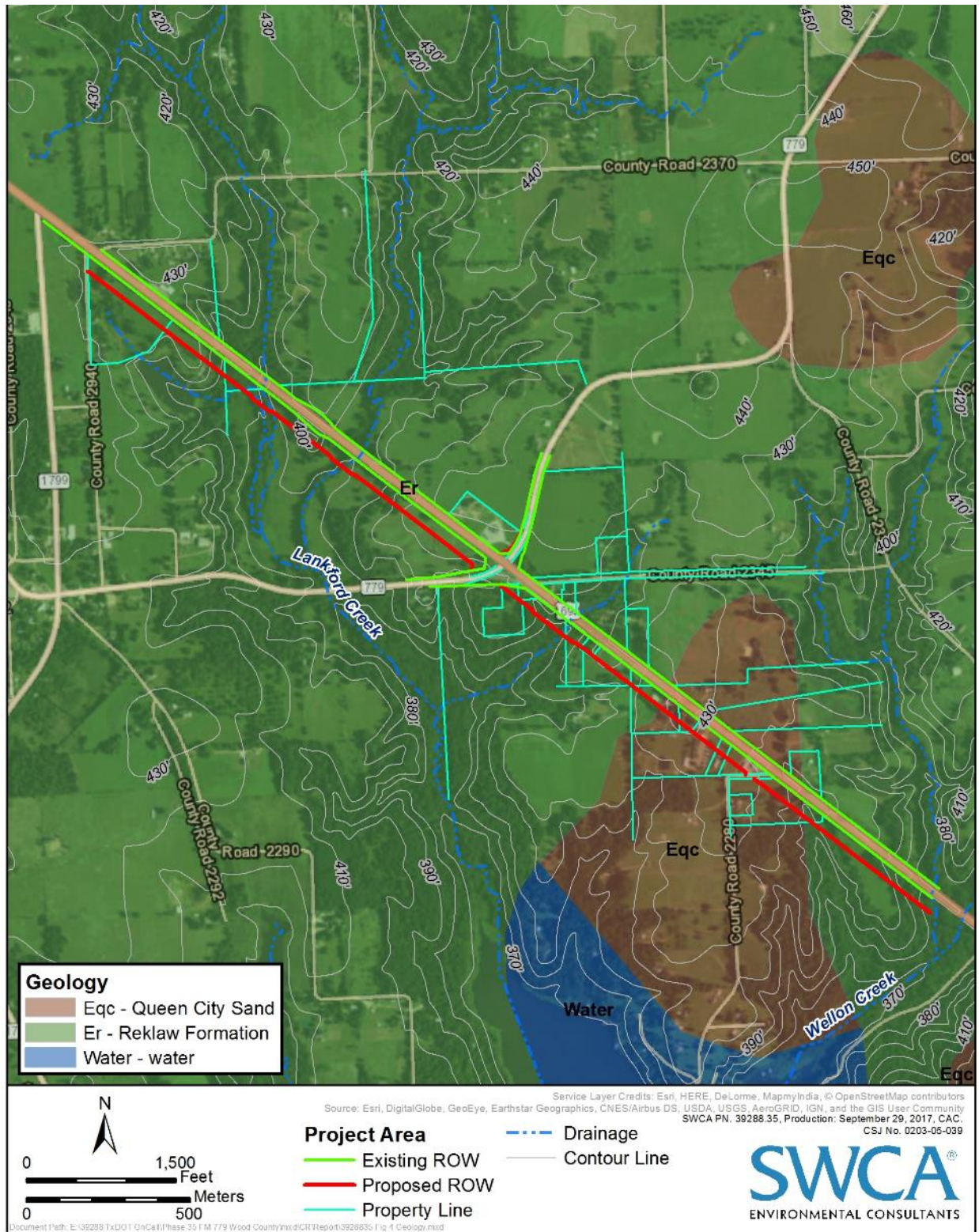


Figure 3. Project area geology.

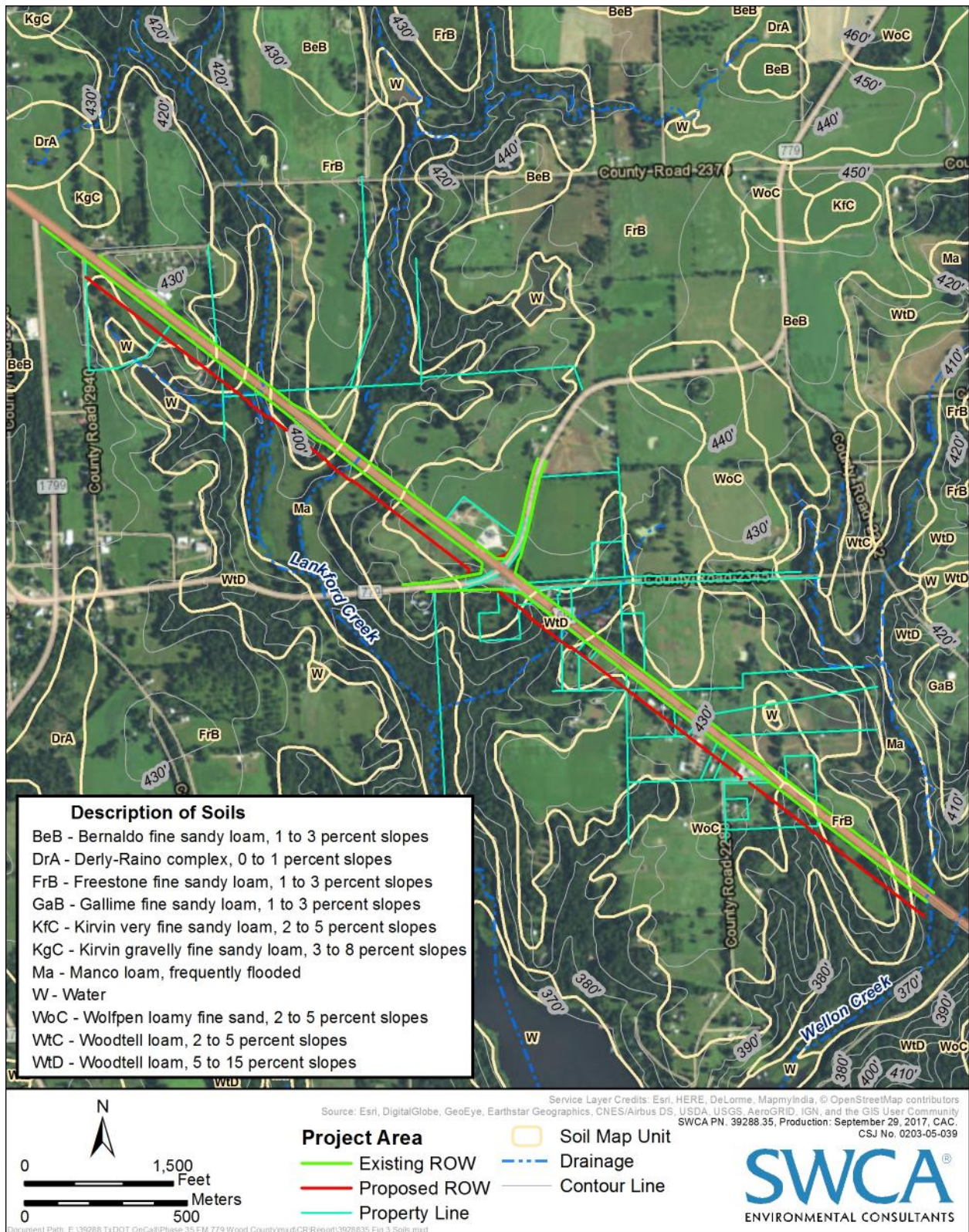


Figure 4. Project area soils.



Figure 5. Lankford Creek and dense riparian vegetation, facing southwest.

- **Previous Investigations and Known Archeological Sites:** A background literature review determined that Hicks & Company previously surveyed the APE for cultural resources in 2004. This survey, conducted on behalf of TxDOT as part of the US 69 Alba to Mineola archeological survey, consisted of shovel testing; however, no backhoe trenching was conducted. Hicks & Company identified no cultural resources within the APE. One other cultural resource survey was conducted within 0.6 mile (1 kilometer [km]) of the survey area. In 2010, AR Consultants, Inc. surveyed Golden Community Cemetery on behalf of the Texas Water Development Board (Texas Historical Commission [THC] 2017a).

One archeological site (41WD257) and two historical markers are located within 0.6 miles (1 km) of the APE. The Atlas does not contain any information on 41WD257, but the site is plotted 350 m north of the APE on an upland projection on the western side of Wellan Creek, near the southeastern terminus of the project area. Two historic markers are located in the town of Golden near the APE, one for Reuben Leon and Fairness (Clark) Simmons (marker number 15501), and one for the Reneau Building (17729). Reuben Leon and Fairness (Clark) Simmons were educators in Texas public schools and community leaders teaching in various schools across the state from 1914 to 1973. The Reneau building was originally constructed for the Golden Masonic Lodge in 1913. Afterward, it became home to a general merchandise store in

1916 and eventually the Golden post office and home to the postmaster (THC 2017a).

Finally one cemetery, the Golden Cemetery, is located 0.6 miles from the south western end of the project area (THC 2017a). Golden Cemetery is still in use with interments dating from 1888 to 2014 (findagrave.com 2017).

Survey Methods

- **Surveyors:** Ken Lawrence, Ashley Eyeington, and Jared Wiersema
- **Methodological Description:** SWCA conducted mechanical trenching and shovel test probes across accessible portions of the proposed APE. SWCA archeologists excavated eight mechanical trenches and 26 shovel tests within the APE (Appendices A and B) (Table 1).

Table 1. Excavations in Project APE.

Method	Quantity in Existing ROW	Quantity in Proposed New ROW	Quantity in Temporary Easements	Total Number per Acre
Shovel Tests	4	22	0	0.45
Auger Test Units	0	0	0	0
Mechanical Trenching	0	8	0	0.14

BHTs were excavated entirely within the new ROW. The trench locations were chosen at the discretion of the project archeologist and focused on accessible areas with the least disturbance within the APE. Archeologists thoroughly documented and photographed the entire excavation process. Upon completion of each trench, the BHTs were backfilled, levelled, and returned as much as possible to their original state. SWCA performed all work in accordance with Occupational Safety and Health Administration regulations (29 Code of Federal Regulations [CFR] 1926).

SWCA excavated shovel tests in locations not practical for accessible for backhoe excavation. A shovel test consists of a roughly 30-centimeter (cm) (12-inch) round pit excavated to a maximum depth of one meter (3.3 feet). The shovel tests were excavated in arbitrary 20-cm (8-inch) levels until impenetrable soils or pre-Holocene strata were reached. All excavated soils were sifted through ¼-inch mesh. Archeologists recorded shovel tests on data forms, and included information on texture, consistency, color, and cultural materials collected.

- **Other Methods:** None
- **Collection and Curation:** NO YES If yes, specify facility.

Comments on Methods: Due to the presence of numerous buried utilities, existing roadway and driveways, and other heavy subsurface disturbance within the existing ROW, investigations focused on the new ROW. THC archeological survey standards require one shovel test per two acres in project areas between 11 and 100 acres (THC 2017b). The 26 shovel tests and eight BHTs exceeds the minimum survey standards, particularly since the investigations were primarily limited to the 25.19 acres of new ROW.

Survey Results

- **Project Area Description:** SWCA archeologists systematically surveyed the entire APE for which access had been granted (55.84 acres of the 57.69-acre APE), conducting shovel testing and backhoe trenching in areas with a potential for buried cultural materials (Figures 6a and 6b). Additionally, to the extent feasible SWCA visually assessed a 50-foot buffer beyond the horizontal project limits from within the APE. The investigations revealed that the existing project APE has been significantly disturbed from the construction of the current SH 69 and FM 779 roads, associated shoulders, and other infrastructure (Figures 7 and 8). In addition, at least three buried utilities are present within the existing ROW, including two fiber optic lines and phone lines paralleling SH 69 with oil and gas lines intersecting the APE. Due to evident disturbances throughout most the APE, subsurface investigations were restricted to the new ROW.
- **Backhoe Trenching:** SWCA excavated eight BHTs within the new ROW of the proposed project APE (Appendix A). All eight trenches (i.e., BHTs 1 through 8) were placed south of the roadway along and between Lankford Creek and its unnamed tributary to the east (see Figure 6a). Despite access limitations, no deep deposits that warranted trenching were identified on Wellan Creek at the eastern project terminus, based on the shovel testing results. The BHTs were excavated to varying depths, ranging from a minimum of 47 cm below surface (cmbs) (BHT 3) to a maximum of 308 cmbs (BHT 2) to assess the potential for deeply buried cultural deposits. Trench dimensions were typically 90 cm wide, 7 m long, and excavated to pre-Holocene deposits or the water table (Figure 7).

The stratigraphy in the trenches varied somewhat; however, the identified stratigraphy typically consisted of three to five standard strata in profile. The upper strata consisted of a brown (7.5YR 4/3) to yellowish brown (10YR 5/4) sandy loam over sandy clay loams ranging in color from dark gray (10YR 4/1) to dark yellowish brown (10YR 4/4). The substrate, representing pre-Holocene deposits, consisted of red (2.5YR 4/8) clays, brown to pale brown (10YR 5/3-6/3) clay loams, or gray (10YR 6/1) to dark grayish brown (10YR 4/2) sandy clay loams. The water table was encountered in BHT 4 (Figure 9). Bioturbation from roots, insects, crayfish, and mammals was common throughout the trench profiles (Figure 10).

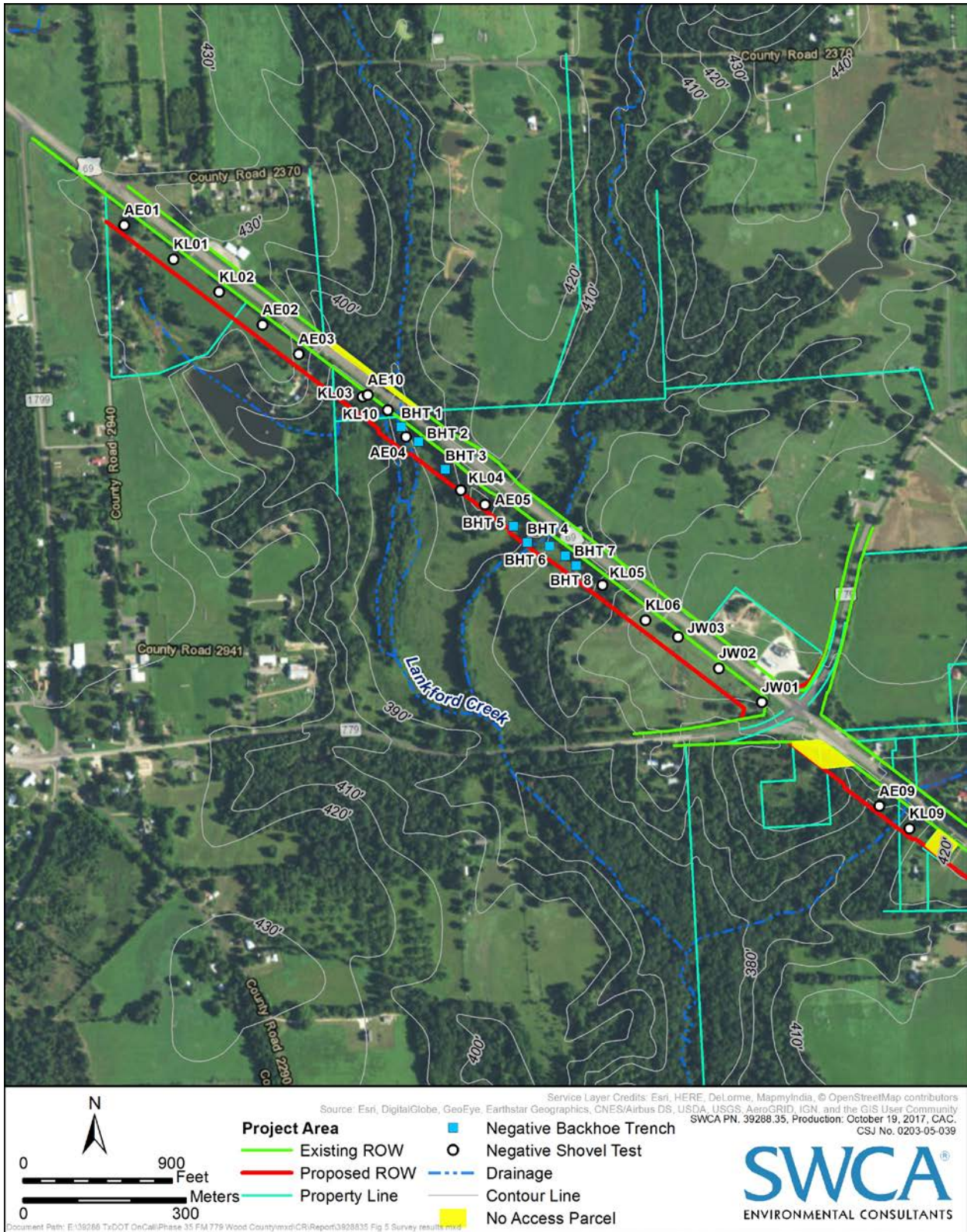


Figure 6a. Survey results.

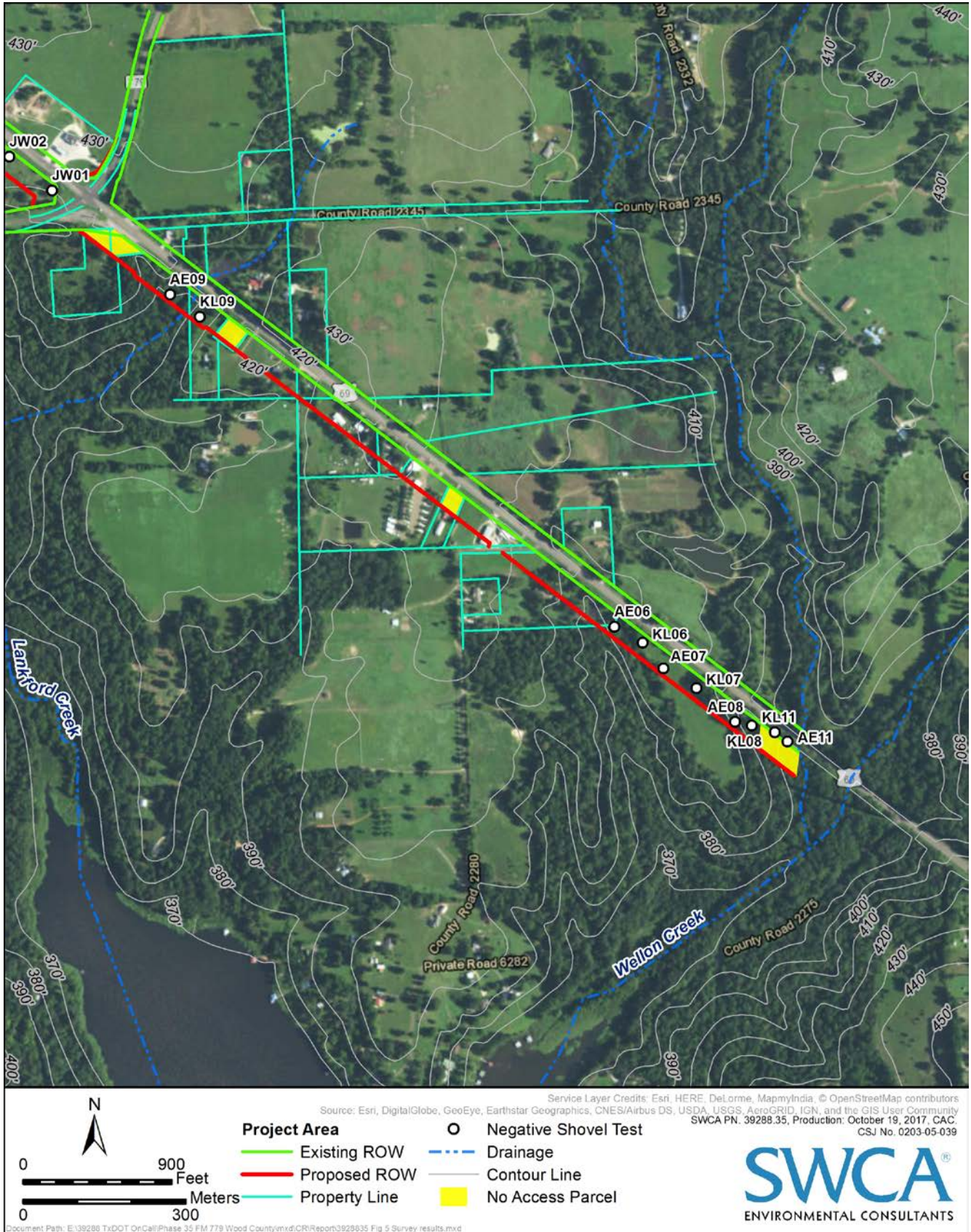


Figure 6b. Survey results.



Figure 7. Overview of existing FM 779 ROW at northern extent of Project limits, facing north.



Figure 8. Manicured lawn south of US 69 with pin flags marking multiple utilities, facing northwest.



Figure 9. Soil profile of BHT 4. Note water table and slumping at bottom of trench.



Figure 10. BHT 5 showing common bioturbation throughout upper loose sandy soil over rubified clay loam, facing west.

- **Shovel Testing:** In upland areas beyond the alluvial terraces, surveyors excavated 26 shovel tests to assess the potential for buried deposits (see Figures 6a and 6b; Appendix B). Depths of shovel tests ranged from 22 to 100 cmbs and typically encountered shallow sandy loam over a rubified argillic horizon. Due to the buried and surficial utilities (i.e., telephone line and buried fiber optic lines), most of the shovel tests were located in new ROW south of the roadway. Due to disturbances and utilities, no shovel tests were placed on the northeastern side of the road. Except for modern debris in one shovel test, no cultural materials were identified in any of the shovel tests.
- **Inaccessible Parcels:** At the time of the survey, access had not been obtained for six parcels, totaling approximately 1.85 acres (Table 2). With the exclusion of one parcel, all are small tracts with heavy commercial or residential development along US 69; these developed parcels have a low potential for intact archeological deposits. The one inaccessible undeveloped parcel (19111) is 0.47 acres in extent and located at the southern terminus near Wellan Creek. Working within the adjacent accessible ROW, SWCA did not encounter any cultural materials or deep alluvium that would warrant a recommendation for further work.

Table 2. Recommendations on inaccessible parcels

Parcel	Acreage in APE	Description	Recommendation
18980	not listed, negligible	Appears to be minor acreage associated with culvert installation	No further work
19043	0.27	heavily disturbed commercial development south side of US 69	No further work
19045	0.41	heavily disturbed commercial development south side of US 69	No further work
19048	0.4	residential development south side of US 69 - heavily disturbed	No further work
19111	0.47	relatively intact area at southern end of project area, assessed from accessible APE	No further work
68693	0.3	heavily disturbed commercial development south side of US 69	No further work
Total	1.85		

- **Archeological Materials Identified:** No archeological materials were identified within the APE.
- **APE Integrity:** The existing ROW has many cut sections that have removed all archeological potential; additionally, substantial modifications associated with roadway construction, buried utilities, and other developments have left a negligible potential for intact deposits in the existing ROW. Portions of the new ROW retain moderate integrity.

Recommendations

- **Further Work:** No further archeological investigations are recommended within the new and existing 57.69-acre ROW, nor within a 50-foot buffer beyond the horizontal project limits on the southwestern side of the APE. On the northeastern side of the roadway where no new ROW is proposed, SWCA was unable to assess the 50-foot buffer since no surface visibility was

available and the presence of buried utilities precluded subsurface investigations within existing ROW. Consequently, should new ROW be required on the northeastern side of the current APE, SWCA recommends additional work to assess the potential for and presence of archeological resources. Although access was not granted for six parcels totaling 1.85 acres, most of these areas are residential or commercial developments; therefore, no further work is recommended on the six inaccessible parcels.

- **Justification:** The available exposures, disturbances, and excavated BHTs and shovel tests afforded sufficient archeological data to adequately assess the survey areas. The previously noted modifications have substantially removed or minimized the potential for intact deposits in the existing ROW and portions of the new ROW. SWCA used backhoe trenching to evaluate the potential for deeply buried deposits in areas with mapped Holocene alluvium along Lankford Creek and its tributary. The project terminated just north of the more substantial terraces along Wellan Creek; therefore, shovel testing was adequate to assess the archaeological potential in this area, despite lack of access to one parcel. The soils in the uplands beyond the creek terraces formed in Eocene-aged surface geological formations and have negligible potential for deeply buried cultural deposits. No cultural materials were identified in the investigations. As per the federal and state implementing regulations at 36 CFR 800.4(b)(1) and 13 Texas Administrative Code 26, SWCA has made a reasonable and good faith effort to identify all cultural resources within the APE and recommends no further archeological investigation prior to construction.

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Appendix A. Backhoe Trench Results

Trench	Depth (cmbs)	Munsell	Soil Color	Soil Texture	Horizon Discussion	Lower Boundary	Comments
BHT 1	0-43	10YR 5/3-5/4	Brown to Yellowish Brown	Sandy Loam	Friable, crumb to sub angular, fine, weak, 15% roots, 30% rootlets, 3-5% worm burrows, 15% orange mottling	Clear, Slightly Wavy	Aluminum can 28 cmbs, partially decomposed vegetation upper 12 cm
	43-71	10YR 5/3-6/3	Brown to Pale Brown	Clay Loam	Friable, angular, fine, moderate, 15% rootlets, 5% roots, 5% insect burrows	Gradual, Smooth	Transitional horizon
	71-308	10YR 6/1-6/2	Gray to Light Brownish Gray	Clay Loam	Friable, sticky, angular to prismatic, medium to coarse, moderate to strong, 3% crayfish holes, vertical cracks 80-120 cm long	Unobserved	Water seeping in at 150 cmbs, walls slumped in and collapsed during excavation
BHT 2	0-31	10YR 5/3-5/4	Brown to Yellowish Brown	Sandy Loam	Friable, crumb to sub angular, fine, weak, 15% roots, 30% rootlets, 3-5% worm burrows, 15% orange mottling	Clear, Slightly Wavy	
	31-54	10YR 4/1	Dark Gray	Sandy Clay Loam	Friable, sub angular to angular, medium, weak to moderate, 25% Iron inclusions, 10-15% 10YR 5/3 mottles from strat 1, 5% rootlets, 2% pinhole burrows, 10% decomposing vegetation concentrated at top of strat	Clear, Irregular	Transitional horizon
	54-90	10YR 5/3-6/3	Brown to Pale Brown	Clay Loam	Friable, angular, fine, moderate, 15% rootlets, 5% roots, 5% insect burrows	Gradual, Smooth	Transitional horizon
	90-150	10YR 6/1-6/2	Gray to Light Brownish Gray	Clay Loam	Friable, sticky, angular to prismatic, medium to coarse, moderate to strong, 3% crawdad holes?, vertical cracks 80-120 cm long	Unobserved	Water table at 143 cmbs
BHT 3	0-52	7.5YR 3/4	Dark Brown	Sandy Loam	Friable, crumb to sub angular, fine to medium, weak, 5% roots, 15% rootlets, 3% pinhole burrows, ant gallery, 10% 10YR 6/1 mottles	Clear, Smooth	Root zone 0-10 cmbs
	52-80	2.5YR 4/8	Red	Clay	Friable to firm, angular, medium, moderate, 5% rootlets, 2% pinhole burrows, 1% sub angular sandstone cobbles sloping towards stream, 30% 10YR5/8 mottles	Gradual, Smooth	
	80-153	2.5YR 4/8	Red	Clay	Friable to firm, angular, medium, moderate to strong, 2% rootlets, 3% pinhole burrows, 30% 10YR5/8 mottles	Gradual, Smooth	

	153-361	10YR 6/1	Gray	Sandy Clay Loam	Friable to firm, sub angular to angular, medium, weak to moderate, <2% rootlets, <2% pinhole burrows, 15% 2.5YR4/8 mottles, 15% 10YR5/8 mottles	Unobserved	Moist, water table at 350 cmbs
BHT 4	0-40	7.5YR 4/4	Brown	Sandy Loam	Friable, crumb to sub angular, fine to medium, weak to moderate, 5% roots, 10% rootlets, 5% worm burrows, 3% pinhole burrows	Gradual, Smooth	Root zone 0-20 cmbs
	40-78	7.5YR 4/4	Brown	Sandy Loam	Friable, sub angular, medium, weak to moderate, 5% rootlets, 3% roots, 3-5% pinhole burrows, 2% worm burrows	Clear, Slightly Wavy	
	78-110	10YR 3/3	Dark Brown	Very fine Sandy Clay Loam	Friable, sub angular, medium, moderate, 5% rootlets, 2% roots concentrated at top and bottom of strat, 10% pinhole burrows, 3% worm burrows	Clear, Slightly Wavy	Buried Soil
	110-157	10YR 4/4	Dark Yellowish Brown	Fine Sandy Clay Loam	Friable, sub angular to angular, medium, weak to moderate, 5% rootlets, 15% pinhole burrows, 5% worm burrows, 20% 7.5YR3/3 mottles	Clear, Smooth	increase in Fe mottle 10% at base of strat
	157-218	10YR 4/2	Dark Grayish Brown	Sandy Loam	Friable, angular, medium, moderate, <2% rootlets, 10% pinhole burrows, 5% worm burrows, 15-20% 7.5YR5/4 mottles, 30% Iron mottling increases with depth	Gradual, Smooth	
	218-292	10YR 4/2	Dark Grayish Brown	Fine Sandy Loam	Loose, structure is saturated, 30% iron mottling	Unobserved	Moist
BHT 5	0-31	7.5YR 4/3	Brown	Sandy Loam	Friable, crumb to sub angular, fine to medium, weak to moderate, 5% roots, 25% rootlets, 5% worm burrows, 3% pinhole burrows, 20% 7.5YR4/6	Gradual, Wavy	Root zone 0-20 cmbs
	31-60	7.5YR 3/2-3/3	Dark Brown	Very fine Sandy Clay Loam	Friable, sub angular, medium, moderate, 10% rootlets, 3% roots, 3-5% pinhole burrows, 2% worm burrows, 10-15% 7.5YR4/2 mottles	Clear, Slightly Wavy	Discontinued pale sand lens range 1-3cm thick 45-55%
	60-71	7.5YR 2.5/2	Very Dark Brown	Very Fine Sandy Loam	Friable, sub angular, medium, moderate, 5% rootlets, 10% pinhole burrows, 3% worm burrows, <1% sandstone pebbles, 10% 7.5YR4/2 mottles faint	Clear to Abrupt, Irregular	Buried Soil? Lower boundary sloping at N end, smooth S end
	71-153	10YR 4/2	Dark Grayish Brown	Fine Sandy Clay Loam	Friable, sub angular to angular, medium, weak to moderate, 5% rootlets, 15% pinhole burrows, 5% worm burrows, 20% 7.5YR3/3 mottles	Unobserved	increase in Fe mottle 10% at base of strat

BHT 6	0-46	7.5YR 4/3	Brown	Sandy Loam	Friable, crumb to sub angular, fine to medium, weak to moderate, 5% roots, 25% rootlets, 5% worm burrows, 3% pinhole burrows, 20% 7.5YR4/6	Gradual, Wavy	Root zone 0-12 cmbs
	46-89	7.5YR 3/2-3/3	Dark Brown	Very fine Sandy Clay Loam	Friable, sub angular, medium, moderate, 10% rootlets, 3% roots, 3-5% pinhole burrows, 2% worm burrows, 10-15% 7.5YR4/2 mottles	Clear, Slightly Wavy	Discontinued pale sand lens range 1-3cm thick 45-55%, 67-76 cmbs, turbated
	89-100	10YR 4/2-4/3	Dark Grayish Brown to Brown	Very Fine Sandy Loam	Friable, sub angular, medium, moderate, 5% rootlets, 10% pinhole burrows, 3% worm burrows, <1% sandstone pebbles, 10% 7.5YR4/2 mottles faint	Clear, Irregular	Very turbated, heavily mottled with insect burrows
	100-302+	10YR 4/2	Dark Grayish Brown	Fine Sandy Clay Loam	Friable, sub angular to angular, medium, weak to moderate, 5% rootlets, 15% pinhole burrows, 5% worm burrows, 20% 7.5YR3/3 mottles	Unobserved	increase in Fe mottle 10% at base of strat
BHT 7	0-28	10YR 5/4	Yellowish Brown	Sandy Loam	Friable, crumb to sub angular, fine, weak, 3% roots, 15% rootlets, 5% worm burrows, 10% pinhole burrows, 1-2% SS sub angular pebbles, 5% insect burrows	Clear, Slightly Wavy	Root zone 0-12 cmbs
	28-121	10YR 5/6	Yellowish Brown	Sandy Loam	Friable, sub angular, fine to medium, weak, 20% SS sub angular sporadic pebbles, 10% red/orange mottling, 10% rootlets, 1% roots, 20% 10YR6/4 mottles	Clear, Irregular	Bioturbation
	121-175+	10YR 6/3-6/4	Pale Brown to Light Yellowish Brown	Sandy Loam	Friable, angular to prismatic, fine to medium, moderate to strong, 3-4% rootlets, 10% SS pebbles, 10-15% red/orange mottling, 1% roots, 20-25% 10YR5/8 mottles	Unobserved	
BHT 8	0-47	10YR 5/4	Yellowish Brown	Sandy Loam	Friable, crumb to sub angular, fine, weak, 3% roots, 15% rootlets, 5% worm burrows, 10% pinhole burrows, 1-2% SS sub angular pebbles, 5% insect burrows	Unobserved	Undulating sandstone bedrock base

Appendix B. Shovel Test Results

ST ID	Depth (cmbs)	Munsell	Soil Color	Soil Texture	Inclusion %	Inclusion	P=Positive N=Negative	Reason for Termination
AE01	0-15	10YR 5/3	Brown	Silt		rootlets	N	
	15-30	10YR 6/4	Light Yellowish Brown	Silt Loam	10%	light rootlets, gravel and pebbles	N	
	30-60	7.5YR 5/6	Yellowish Brown	Silty Clay Loam	30%	Gravels and pebbles, light gray mottles	N	
	60-100	7.5YR 5/6	Yellowish Brown	Silty Clay	30%	Gravels and pebbles, light gray mottles, redox	N	Terminated at depth
AE02	0-15	10YR 5/3	Brown	Sandy Loam		rootlets	N	
	15-30	10YR 6/4	Light Yellowish Brown	Sandy Loam	10%	light rootlets, gravel and pebbles	N	
	30-40	7.5YR 5/6	Yellowish Brown	Sandy Clay Loam	30%	Gravels and pebbles, light gray mottles	N	
	40-60	7.5YR 5/6	Yellowish Brown	Sandy Clay	30%	Gravels and pebbles, light gray mottles, redox	N	Terminated at basal clay
AE03	0-10	10YR 5/3	Brown	Sandy Loam		root zone	N	
	10-25	10YR 6/4	Light Yellowish Brown	Sandy Clay Loam	10-15%	Pebbles	N	
	25-40	7.5YR 5/6	Yellowish Brown	Sandy Clay Loam	5%	Redox	N	
	40-50	7.5YR 5/6	Yellowish Brown	Sandy Clay	15%	Redox	N	Terminated at basal clay
AE04	0-40	10YR 4/6	Dark Yellowish Brown	Sandy Clay Loam		moist, dense redox and gray mottling	N	
	40-75	10YR 5/3	Brown	Sandy Clay Loam		increasing moisture, redox and gray mottling	N	Terminated at water table
AE05	0-20	10YR 6/4	Light Yellowish Brown	Sandy Loam			N	
	20-35	5YR 4/6	Yellowish Red	Clay		dense redox	N	Terminated at basal clay
AE06	0-20	10YR 6/4	Light Yellowish Brown	Sandy Loam	25%	Gravels and sandstone	N	Terminated at bedrock
AE07	0-15	10YR 6/4	Light Yellowish Brown	Sandy Loam			N	
	15-35	5YR 4/6	Yellowish Red	Sandy Clay		Blocky and firm with dense redox	N	Terminated at basal clay
AE08	0-10	10YR 5/3	Brown	Sandy Loam	10%	Gravels and pebbles	N	
	10-45	7.5YR 6/4	Light Brown	Sandy Loam	10%	Increasing gravels and pebbles	N	Terminated at impassable

								gravels
AE09	0-15	10YR 5/3	Brown	Sandy Loam	10%	Gravels and pebbles	N	
	15-60	7.5YR 6/4	Light Brown	Sandy Loam	10%	Increasing gravels and pebbles	N	Terminated at compact soil
AE10	0-10	10YR 5/3	Brown	Sandy Loam	5%	Gravels	N	
	10-30	7.5YR 4/6	Strong Brown	Sandy Loam		Moderate redox	N	
	30-50	7.5YR 4/2	Brown	Silty Loam		Dense redox, moist	N	Terminated at compact soil
AE11	0-10	10YR 5/3	Brown	Sandy Loam	5%	Gravel, modern trash (plastic, gum wrapper)	N	
	10-25	10YR 5/2	Grayish Brown	Sandy Loam	5%	Gravels	N	
	25-45	7.5YR 4/6	Strong Brown	Sandy Clay		Redox and light gley	N	Terminated at compact soil
JW01	0-50	10YR 6/4	Light Yellowish Brown	Sandy Loam			N	Terminated at basal clay
JW02	0-40	10YR 6/4	Light Yellowish Brown	Sandy Loam			N	Terminated at basal clay
JW03	0-40	10YR 6/4	Light Yellowish Brown	Sandy Loam			N	Terminated at basal clay
KL01	0-14	10YR 6/3	Pale Brown	Sandy Loam	3%	Sub rounded pebbles	N	
	14-58	5YR 5/4	Reddish Brown	Sandy Clay Loam	3-5%	Sub rounded pebbles	N	
	58-63+	5YR 4/4	Reddish Brown	Sandy Clay			N	Terminated at basal clay
KL02	0-12	10YR 6/3	Pale Brown	Sandy Loam	3%	Sub rounded pebbles	N	
	Dec-56	7.5YR 5/4	Brown	Sandy Loam	14%	Pebbles, gravels, cobbles	N	Terminated at impassable boulder
KL03	0-18	10YR 4/3-5/3	Brown	Sandy Clay Loam			N	
	18-81	10YR 5/2	Grayish Brown	Sandy Clay Loam	5%	Pebbles, brown mottles	N	
	81-84+	10YR 2/1	Black	Clay Loam			N	Terminated at compact soil
KL04	0-22	10YR 5/4	Yellowish Brown	Sandy Loam	3-5%	Roots	N	Terminated at impassable boulder
KL05	0-4	10YR 4/3-5/3	Brown	Sandy Loam	5%	Roots	N	
	4-21	10YR 5/4	Yellowish Brown	Sandy Loam			N	
	21-26+	5YR 5/6	Yellowish Red	Clay	2%	Sandstone gravels	N	Terminated at basal clay
KL06	0-7	10YR 5/4	Yellowish Brown	Sand			N	
	7-24+	10YR 5/6	Yellowish Brown	Sandy Clay Loam			N	Terminated at compact soil
KL07	0-6	10YR 6/3	Pale Brown	Sandy Loam	5%	Rootlets	N	

	6-27	10YR 7/3	Very Pale Brown	Sandy Loam	3%	Rootlets, one sub angular gravel	N	
	27-31+	5YR 4/6	Yellowish Red	Clay Loam			N	Terminated at basal clay
KL08	0-8	10YR 6/3	Pale Brown	Sandy Loam	5%	Rootlets	N	
	8-38	10YR 7/3	Very Pale Brown	Sandy Loam	3%	Rootlets, one sub angular gravel	N	
	38-43+	5YR 4/6	Yellowish Red	Clay Loam			N	Terminated at basal clay
KL09	0-8	10YR 6/3	Pale Brown	Sandy Loam	5%	Rootlets	N	
	8-34	10YR 7/3	Very Pale Brown	Sandy Loam	5%	Rootlets	N	
	34-37+	5YR 4/6	Yellowish Red	Clay Loam			N	Terminated at basal clay
KL10	0-3	Humate		Humate			N	
	3-11	7.5YR 4/3	Brown	Sandy Loam			N	
	11-22	7.5YR 6/3	Light Brown	Sandy Loam			N	
	22-24+	5YR 4/6	Yellowish Red	Clay Loam			N	Terminated at basal clay
KL11	0-14	10YR 4/3-5/3	Brown	Sandy Clay Loam			N	
	14-73+	10YR 5/2	Grayish Brown	Sandy Clay Loam	5%	Pebbles, brown mottles	N	Terminated at compact soil
KL12	0-18	7.5YR 5/3	Brown	Sandy Loam			N	
	18-31+	7.5YR 6/6	Reddish Yellow	Sandy Clay Loam			N	Terminated at compact soil

This report was written on behalf of the Texas Department of Transportation by



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