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Intensive Archeological Survey of US Highway 277

Chris Ringstaff

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Intensive Archeological Survey of US Highway 277

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Archeological Survey Report

Project Name: Intensive Archeological Survey of US Highway 277

From: 0.75 mile north of Farm-to-Market 2105 **To:** US Highway 67

District(s): San Angelo

County(s): Tom Green

CSJ Number(s): 0264-06-042

Principal Investigator and Firm/Organization: Chris Ringstaff, Texas Department of Transportation (TxDOT)

Antiquities Permit No. 9542

Report Completion Date: September 16, 2020

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 12-09-19, and executed by FHWA and TxDOT.

Abstract

On behalf of the Texas Department of Transportation (TxDOT), SWCA Environmental Consultants (SWCA) conducted an intensive archeological survey on August 24–27, 2020, of 43.51 acres of proposed new right-of-way (ROW) along U.S. Highway (US) 277 in Tom Green 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 (CFR) Part 800.16(y) and, therefore, 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). Chris Ringstaff served as Principal Investigator under Texas Antiquities Code Permit No. 9542.

The project widens US 277 from 1.2 kilometers (km) (0.75 mile) north of Farm-to-Market 2105 to US 67. The total length of the project is approximately 4.11 km (2.86 miles). The total project area and archeological area of potential effects (APE) for this project consists of the footprint of all proposed improvements and totals 176.20 acres (132.69 acres existing ROW and 43.51 acres proposed new ROW); however, the survey area was limited to the 43.51 acres of proposed new ROW. The maximum depth of ground disturbances is approximately 3.0 m (10 feet) and the typical ground disturbance are 0.6 m (2 feet) in depth below the existing ground surface.

Background research identified one previous cultural resources survey that intersects the northern terminus of the APE and two previous cultural resource surveys within 1 km (0.6 mile) of the APE. In addition, three previously recorded archeological sites (i.e., 41TG15, 41TG315, and 41TG558) are within 1 km (0.6 mile) of the newly proposed APE. No previously recorded archeological sites intersect the project APE, and no historical markers, National Register of Historic Places (NRHP) properties, NRHP districts, or State Antiquities Landmarks (SALs) are within 1 km (0.6 mile) of the proposed project APE.

During the historic maps review, SWCA identified one potential historical structure and one historical railroad (i.e., Colorado and Santa Fe) within 1 km (0.6 mile) of the APE. The potential historical structure is outside of the APE and will not be affected by the proposed construction and road improvements. The railroad parallels Old Ballinger Highway, which intersects the existing US 277 ROW, and is currently in use.

SWCA conducted an intensive pedestrian survey of the proposed new ROW and excavated 50 shovel tests, four backhoe trenches, and four column samples within the APE. The deep mechanical prospection (i.e., backhoe trenching) was conducted in proximity to playa deposits identified within the APE. No cultural materials were identified within the APE during the investigations.

SWCA has made a reasonable and good faith effort to locate and identify historic properties as per 36 CFR 800.4(b)(1), and cultural resources as per Subchapter A of Chapter 26 of the

Texas Administrative Code, throughout the proposed project APE. Based on the results of the survey, SWCA recommends a finding of “no historic properties affected,” and no further archeological investigations are recommended within the proposed APE.

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Management Summary and Introduction

Management Summary

On behalf of the Texas Department of Transportation (TxDOT), SWCA Environmental Consultants (SWCA) conducted an intensive archeological survey on August 24–27, 2020, of 43.51 acres of proposed new U.S. Highway (US) 277 right-of-way (ROW) north of US 67 in Tom Green 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 (CFR) Part 800.16(y) and, therefore, the 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). Chris Ringstaff served as Principal Investigator under Texas Antiquities Permit No. 9542.

Introduction

On August 24–27, 2020, SWCA performed an intensive archeological survey of proposed new US 277 ROW. The investigations included shovel testing of new ROW within the area of potential effects (APE) as well as backhoe trenching and column sampling in proximity to playa deposits identified within the APE. The current report details the findings of the intensive pedestrian survey within proposed new ROW. The APE is located directly east of US 277, approximately 6.65 kilometers (km) (4.13 miles) northeast of San Angelo, Texas, in Tom Green County.

Project Information

▪ This survey is:	<input checked="" type="checkbox"/> the initial survey for this project.
	<input type="checkbox"/> a continuation of previous survey(s) due to: <input type="checkbox"/> access issues and/or <input type="checkbox"/> design changes. Identify previous investigation(s):
▪ Report Completion Date:	09/16/2020
▪ Date(s) of Survey:	08/24/2020 to 08/27/2020
▪ Archeological Survey Type:	<input type="checkbox"/> Reconnaissance <input checked="" type="checkbox"/> Intensive
▪ Report Version:	<input checked="" type="checkbox"/> Draft <input type="checkbox"/> Final
▪ Report Author(s) and Affiliation:	Jessica Ulmer (SWCA Environmental Consultants)
▪ Estimated Percentage of Time that the Principal Investigator was in the Field:	0

Area of Potential Effects and Survey Area

Area of Potential Effects (APE)

The total project area and APE encompasses approximately 176.20 acres, consisting of approximately 43.51 acres proposed new ROW and 132.69 acres of existing ROW (Figure 1). However, the survey area was limited to the 43.51 acres of proposed new ROW. The maximum depth of vertical ground disturbances within the APE will be approximately 3.0 m (10 feet) and the typical vertical impacts will be 0.6 m (2 feet) in depth below the existing ground surface.

No Survey Area

The 132.7 acres of existing ROW have been heavily modified by construction of US 277, US 67, Old Ballinger Highway, the Colorado and Santa Fe railroad, a transmission line, buried utilities, and the landscaping and grading associated with the construction of roads (Figures 2 and 3). The background review revealed no previously recorded sites or other known cultural resources concerns within the existing ROW. Due to the available exposures, high amount of disturbance, and no known previous cultural resources concerns within the existing ROW, no survey was recommended for the existing ROW.

Access Denied Area:

Not applicable – access was granted to all parcels requiring survey.

Survey Area:

The current survey area corresponds with the proposed new ROW defined above, including 43.51 acres of the APE located directly east of US 277 (Figure 4).

Project Area Ownership:

The APE contains existing TxDOT ROW and proposed new ROW consisting of private property that will be acquired by TxDOT.

Project Setting

Natural Setting

Topography:

The APE is located on gently sloping to flat terrain, on an upland plain. A playa lake is located immediately west of the APE and south of Farm-to-Market 2105. Elevation ranges from a maximum of 1,873 feet above mean sea level (amsl) to a low of 1,860 feet amsl.

Geology:

According to the U.S. Geological Survey (USGS), the APE is underlain by Quaternary-age Caliche and Playa deposits (Figure 5) (USGS 2020a). These sand, silt, clay, and gravel deposits are locally indurated with calcium carbonate and caliche.

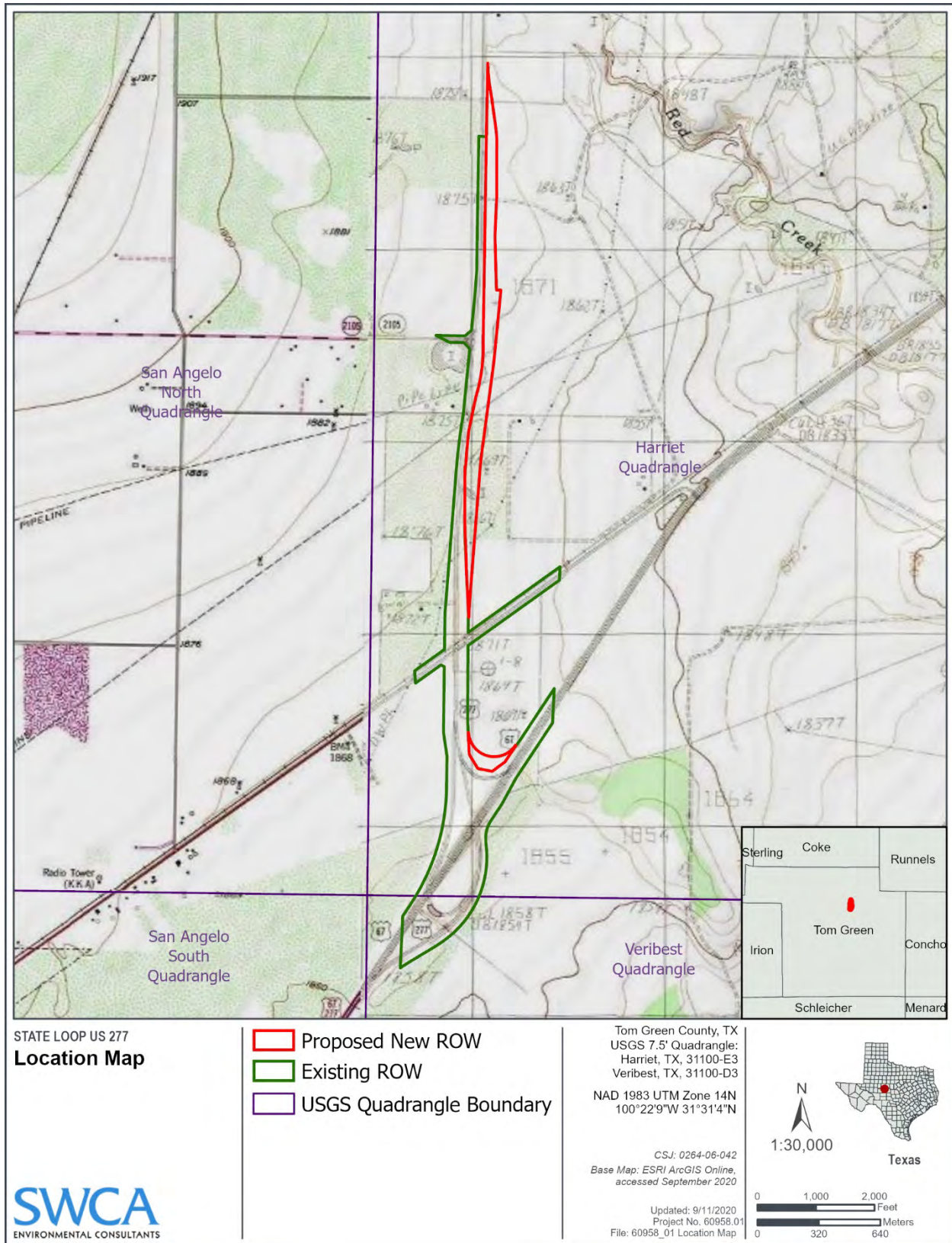


Figure 1. Project location map.



Figure 2. US 67 construction and landscaping disturbance, view facing southwest. Photo Point 01.



Figure 3. US 277 and transmission line disturbance, view facing south. Photo Point 06.

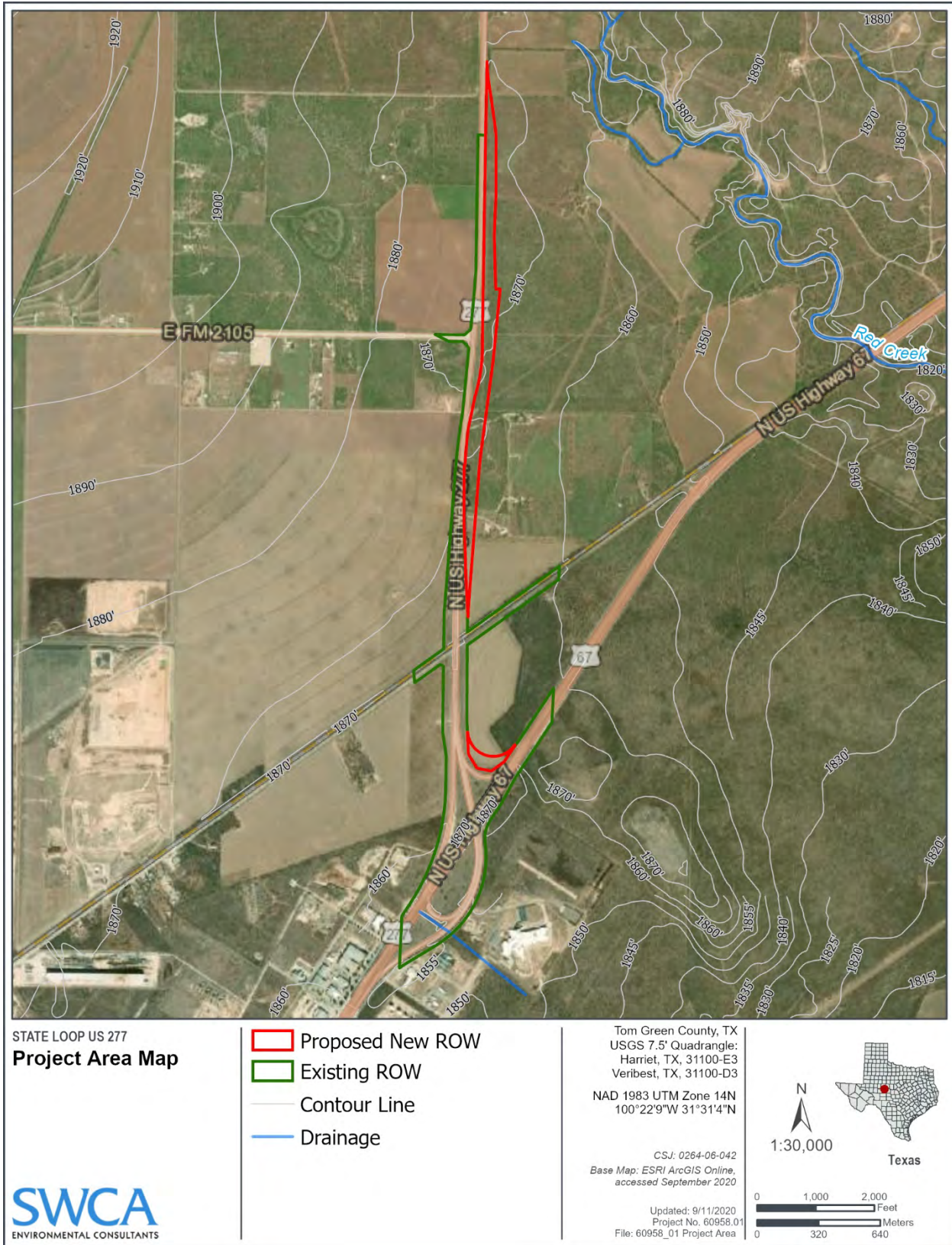


Figure 4. Project area map.

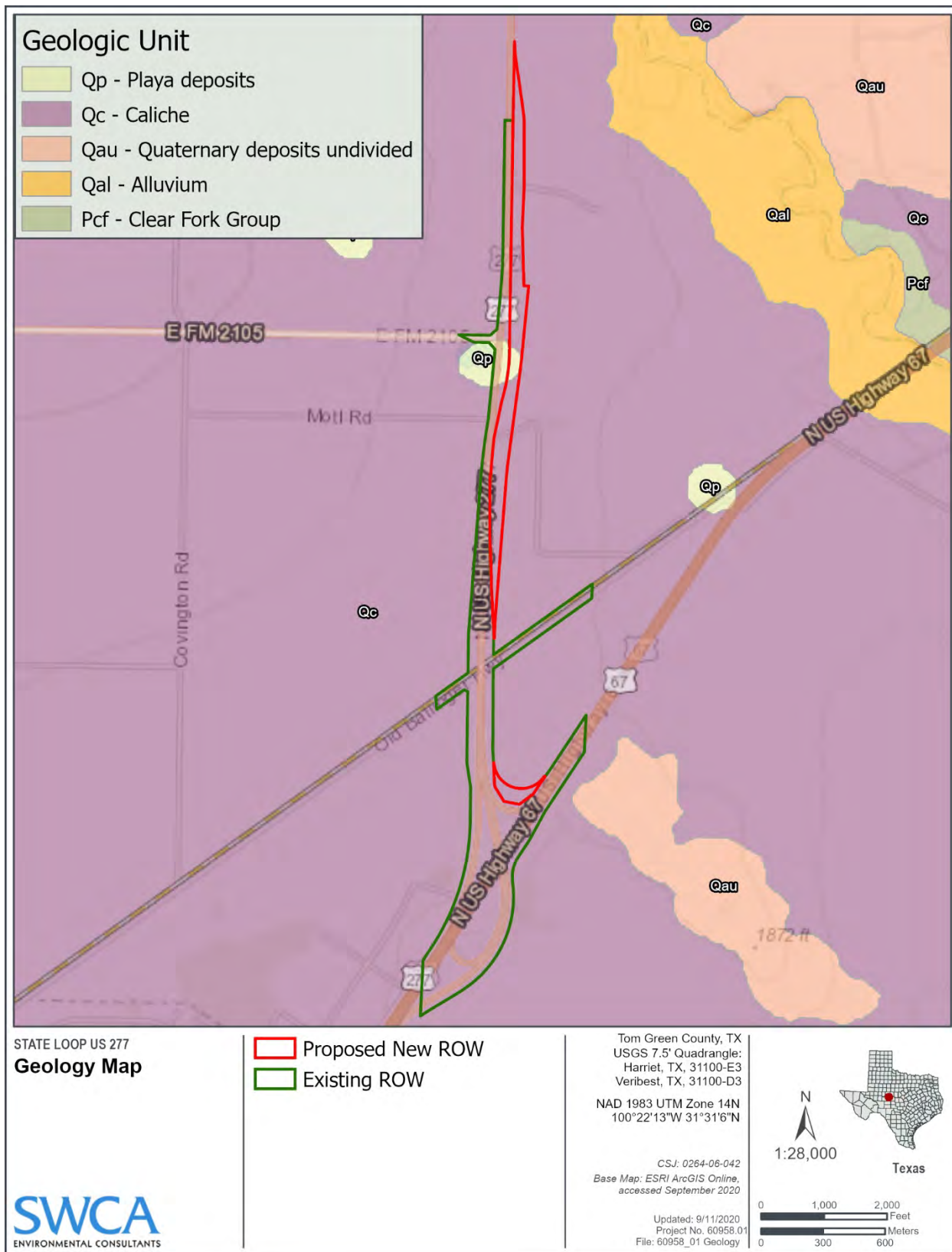


Figure 5. Geology within the project area.

Soils:

According to the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey, the APE is entirely underlain by the Angelo and the Lipan soil series (Figure 6). The Angelo series consists of deep to very deep, well-drained, moderately slowly permeable soils formed in calcareous loamy and clayey alluvium derived from limestone. The soils are typically found in nearly level to very gently sloping soils, with slopes ranging from 0 to 3 percent. The soils are characterized as dark grayish clay loam (NRCS 2020). The Lipan soils series consists of deep, moderately well-drained or somewhat poorly drained, very slowly permeable soils that formed in calcareous clayey alluvial materials derived from limestone. The soils are typically found in nearly level alluvial plains and slightly depressed playas, with slopes ranging from 0 to 1 percent. The soils are characterized as dark gray to light brownish gray clay (NRCS 2020).

Potential Archeological Liability Map:

No Potential Archaeological Liability Map is available for the San Angelo district.

Historic Land Use:

Historic aerial imagery reaching back to 1954 shows the APE has historically been used for crop production and ranching. No structures were observed within or immediately adjacent to (within 50 m [164 feet]) of the APE (Nationwide Environmental Title Research, LLC [NETR] 2020).

Land Use:

At the time of survey, the northern and southern terminus of the APE was utilized for crop production and the middle section of the APE was utilized for ranching (Figures 7 and 8). In addition, SWCA observed disturbances within the APE due to agricultural practices, ranching practices, stock pond construction, grading for a two-track road, vegetation clearing, construction of a waterline, and pipeline construction.

Vegetation:

The APE consists of plowed fields in the north and south, with desert scrub growth consisting of prickly pear, tall and short grasses, mesquite, and scrub shrub (Figure 9).

Estimated Ground Surface Visibility:

Ground surface visibility within the APE was approximately 30 percent.

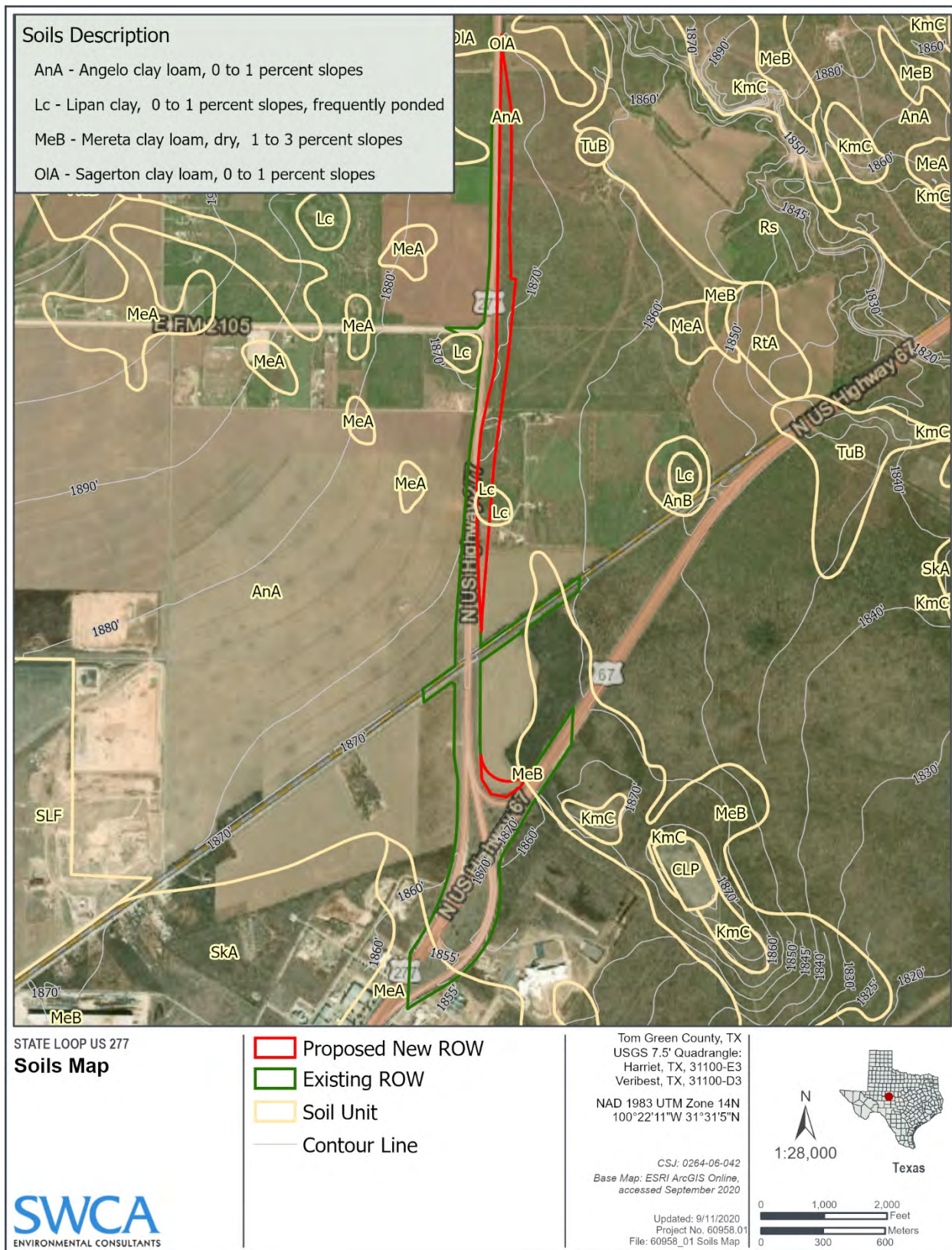


Figure 6. Soil units within the project area.



Figure 7. Plowed field in southern terminus of APE, view facing east. Photo Point 13.



Figure 8. Corral and arena in a ranching complex within the project area, view facing north. Photo Point 14.



**Figure 9. Typical vegetation within the project area, view facing north.
Photo Point 04.**

Previous Investigations and Known Archeological Sites:

SWCA conducted a cultural resources background and historic map review of the APE in September 2020. To conduct the background review, an SWCA archeologist reviewed the *Harriet* (3100-421), *San Angelo North* (3100-422), and *Veribest* (3100-134) USGS 7.5-minute topographic quadrangle maps and records pertaining to the APE on the Texas Historical Commission's (THC's) Archeological Sites Atlas online database (Atlas) (THC 2020a). Additionally, SWCA reviewed maps contained in the TxDOT Historic Overlay, a mapping/geographic information system (GIS) database with historic maps and resource information covering most portions of the state (Foster et al. 2006). SWCA also reviewed historical USGS topographic maps available on USGS TopoView (USGS 2020b). These sources contain information on the nature and location of previously conducted cultural resources investigations, previously recorded prehistoric and/or historic archeological sites, National Register of Historic Places (NRHP) districts and properties, State Antiquities Landmarks (SALs), Official Texas Historical Markers, Registered Texas Historic Landmarks, and local neighborhood surveys in, or within 1 km (0.6 mile) of, the proposed project APE.

The review identified one previously conducted survey that intersects the northern terminus of the APE and two previously conducted surveys within 1 km (0.6 mile) of the proposed project APE (Figure 10; THC 2020a). In addition, the review identified three previously recorded archeological sites (i.e., 41TG15, 41TG315, and 41TG558) within 1 km (0.6 mile) of the APE.

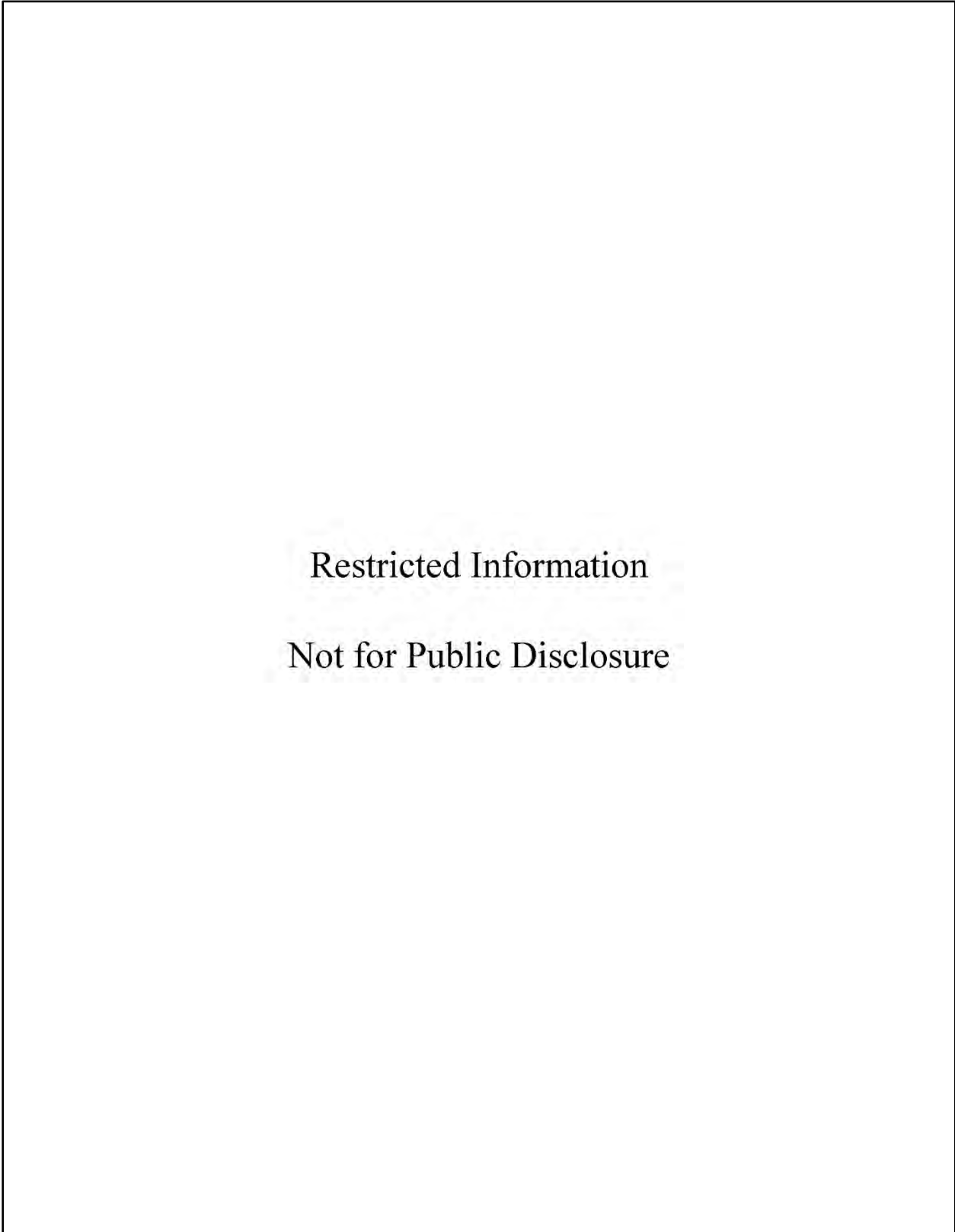


Figure 10. Background Review Map.

No previously recorded archeological sites intersect the project area, and no historical markers, NRHP properties, NRHP districts, or SALs are within 1 km (0.6 mile) of the proposed project APE.

The one previously conducted survey that intersects the northern terminus of the project APE consists of a linear survey conducted in 2002 by PBS&J for the Lower Colorado River Authority under Texas Antiquities Permit No. 2786 (THC 2020a). The two previously conducted surveys within 1 km (0.6 mile) of the APE were both conducted in 1992. The survey conducted for the Federal Communications Commission parallels the east side of U.S. 277. The other survey was conducted for the Army Corps of Engineers Fort Worth District. No additional information is available on Atlas for these two surveys.

Three previously recorded archeological sites (i.e., 41TG15, 41TG315, and 41TG558) are within 1 km (0.6 mile) of the APE. Site 41TG15 consists of a prehistoric lithic scatter recorded in 1970 by the Texas Highway Department. No recommendation for NRHP eligibility was made at the time and no additional information was available on the Atlas.

Site 41TG315 consists of a prehistoric campsite recorded in 1992 by Mariah Associates, Inc. for the Ivie Midland Pipeline project. No recommendation for NRHP eligibility was made at the time.

Finally, site 41TG558 consists of a prehistoric open campsite and lithic procurement site recorded in 2002 by PBS&J for the Morgan Creek, Segment B project under Texas Antiquities Permit No. 2786. The site was determined not eligible for the NRHP by the THC in 2004 .

The historic map review revealed one potential historical structure and one historical railroad (i.e., Colorado and Santa Fe) within 1 km (0.6 mile) of the APE. This structure is depicted on the *San Angelo North* 1957 USGS 7.5-minute topographic quadrangle map (USGS 2020b). Modern aerial imagery indicates that this structure is no longer extant. The railroad parallels Old Ballinger Highway, which intersects the existing US 277 ROW, and is currently in use.

Evaluation of Project Setting:

The APE was observed as being extensively modified by agricultural practices, ranching activities, modification of a playa into a stock pond, grading for a two-track road, vegetation clearing, construction of a waterline, and pipeline construction (Figures 11 and 12). The southern and northern terminus of the APE are active agricultural fields and a review of aerials indicates the APE has been an agricultural field for a least half of a century, probably longer (NETR 2020). The result of these activities would likely impact the integrity of any potential cultural resource within the APE.



Figure 11. Vegetation clearing and brush pile disturbance, view facing west-northwest. Photo Point 07.



Figure 12. Modified playa overview, view facing north. Photo Point 20.

Survey Methods

Surveyors:

Jessica Ulmer, B.A. and Sophia Salgado, B.A.

Description of Methods:

SWCA implemented field survey methods that comply with technical standards and requirements established by the THC, Council of Texas Archeologists (CTA), and the U.S. Army Corps of Engineers (THC 2020b). SWCA professional archeologists conducted a pedestrian survey across the entire 43.51-acre new ROW using systematic transects spaced no more than 30 m (98.4 feet) apart. Visual examination of the ground surface for evidence of cultural material was supplemented with hand-excavated shovel tests and backhoe trenches (BHTs) in accordance with THC standards. Area surveys between 25 and 200 acres require at least 50 shovel tests for the first 25 acres plus one shovel test per every 5 acres over 25 acres (THC 2020b), or a total of 54 shovel tests in the 43.51-acre area. Mechanical trenches are excavated at a 1:2 ratio relative to the shovel test standards. SWCA excavated 50 shovel tests and four BHTs with column samples, or the equivalent of 58 shovel tests, in the APE in order to meet these requirements (Table 1). SWCA excavated shovel tests in 20-centimeter (cm) (8-inch) arbitrary levels to 80 cm (31.5 inches) in depth, impervious surfaces, groundwater, or to culturally sterile deposits, whichever came first. All shovel tests were terminated at a calcareous substrate prior to reaching maximum depth. The matrix was screened through ¼-inch mesh. The SWCA archeologist plotted each shovel test using a global positioning system (GPS) receiver and recorded each test on appropriate project field forms.

The BHT locations were chosen at the discretion of the project archeologist and focused on accessible areas with the least disturbance within the APE, as well as areas with possible alluvial deposits and the potential for deeply buried cultural materials (i.e., in proximity to playa deposits). 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. In addition to the BHTs, SWCA excavated four column samples. Column samples were selectively placed along each of the trench edges to further test for potential cultural materials. Column samples were approximately 30 cm (11.8 inches) in diameter and excavated in arbitrary 20-cm (8-inch) levels to sterile strata. Archeologists screened the matrix from each column sample through ¼-inch mesh and plotted the location of each excavation using a hand-held GPS unit. The potential for deeply buried cultural deposits was deemed low for the majority of the project area based on the previously discussed soils and geology information, with the exception of the soils adjacent to the playa.

Subsurface Probes

Table 1. Subsurface Investigations

Method	Quantity in Existing ROW	Quantity in Proposed New ROW	Quantity in Proposed New Easements	Total Number per Acre
Shovel Test Pits	N/A	50	N/A	1.1
Power Auger Probes	N/A	N/A	N/A	N/A
Mechanical Trenches/Scrapes	N/A	4	N/A	0.1

Other Methods:

None.

Collection and Curation: NO YES

Comments on Methods:

As mentioned above, SWCA excavated 50 shovel tests and four BHTs (with column samples), or the equivalent of 58 tests, in the 43.51-acre survey APE, which exceeds THC survey standards requirements for projects of this size.

Survey Results

Survey Area Description:

The APE setting consists of a nearly level upland plain. Active cropland vegetation and desert scrub consisting of mesquite, prickly pear, and tall and short grasses were observed within the APE. The APE parallels US 277 on the eastern side of the road. Portions of a ranching complex are located within the APE north of Old Ballinger Highway. Additional development in the area includes the existing roadways, a railroad, a pipeline, a waterline and various above- and below-ground utilities.

SWCA archeologists conducted an intensive pedestrian survey with shovel testing and mechanical trenching within the project area (Figures 13a and 13b). A total of 50 shovel tests and four BHTs with column samples were excavated within the APE (see Attachment A, Tables A.1 and A.2). The BHTs were excavated adjacent to playa soils within the APE to determine the potential for intact buried soils and for deeply buried cultural deposits.

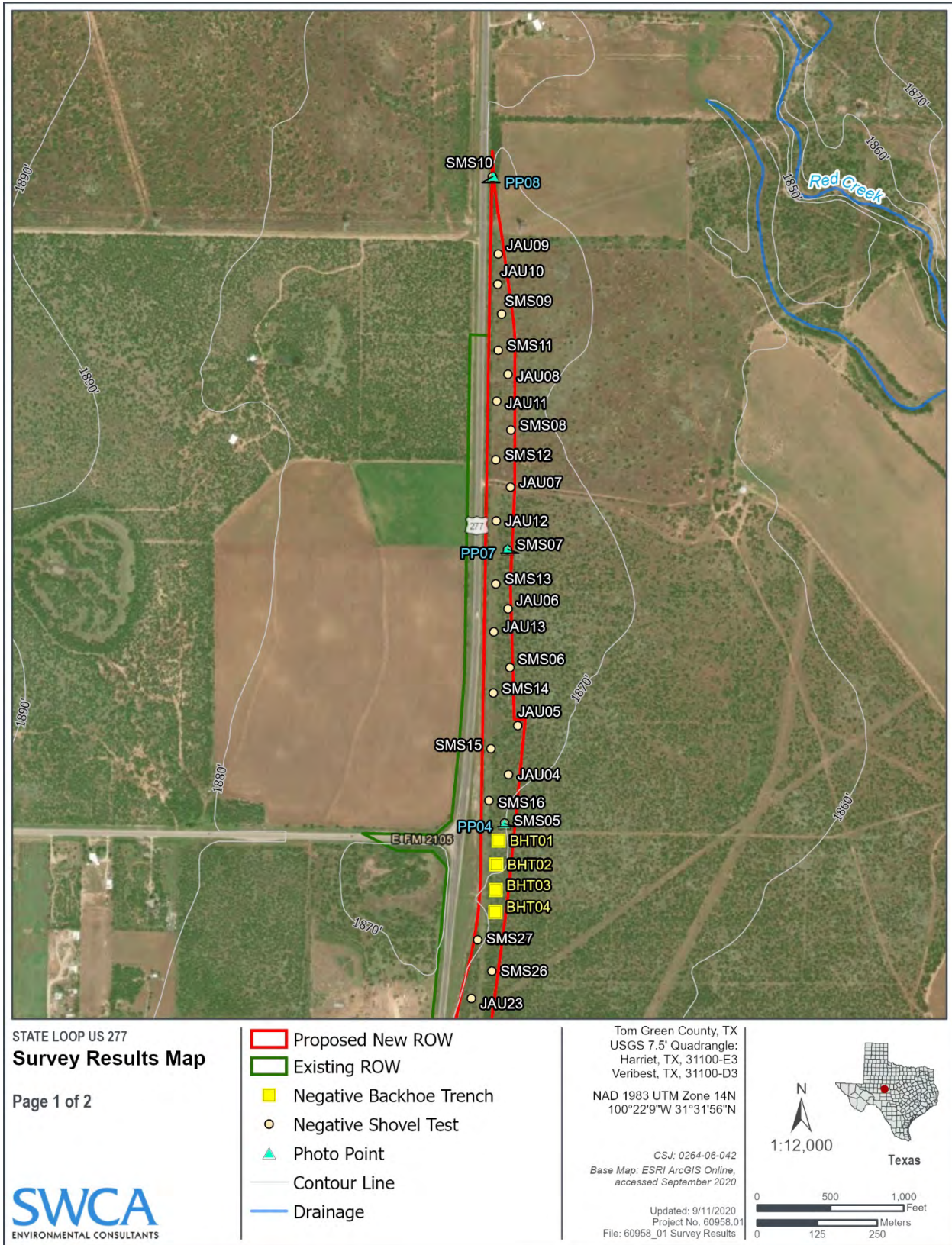


Figure 13a. Survey results map.

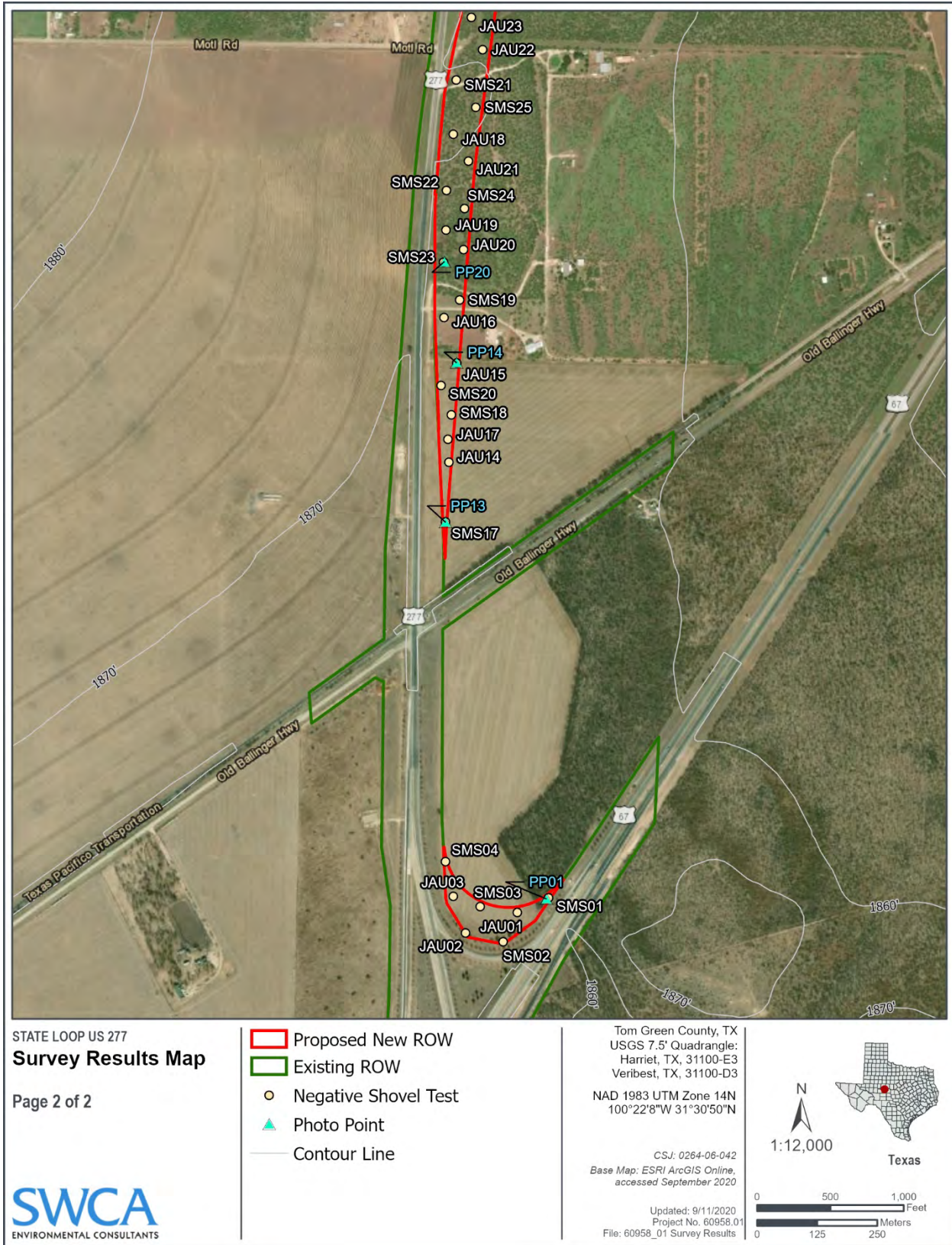


Figure 13b. Survey results map.

The intensive survey systematically assessed the entire APE but focused on two relict playa lakes, specifically the leeward sides where dunal formation is expected to have higher preservation potential for buried deposits. Soil data (see Figure 6) indicates two playas intersect the APE, one to the north in the central project area and one farther south. Both have been heavily modified within the APE by the previously mentioned modern disturbances. Trenching on the northern playa is discussed below. The southern playa appears in soil data, but not in the geological data (as does the northern playa - see Figure 5) and is a minor feature with little topographical expression in the APE. In addition, the playa has been modified in order to be utilized as a stock pond. Because of various disturbances and shallow soils, the southern playa was adequately assessed with shovel testing. No cultural materials were identified in either playa or adjacent dunes.

The typical shovel test excavated within the APE was excavated to approximately 40 cm (15.7 inches) and encountered a very compact dark brown (10YR 3/3) to very dark gray (10YR 3/2) clay loam with gravel or calcium carbonate inclusions (Figure 14; Attachment A, Table A-1). The tests terminated at a compact calcareous clay loam; based on the level of calcium carbonate development, the substrate is inferred to be ancient soils. All excavated shovel tests were negative for subsurface cultural materials.

The BHTs were excavated to varying depths, ranging from a minimum of 1.7 m (5.6 feet) to a maximum of 3.4 m (11.2 feet) to encounter strata that predated human occupation in the area. The BHT dimensions were typically 90 cm (2.95 feet) wide, 6 m (20 feet) long, and typically excavated to a minimum of 2.4 m (7.9 feet) deep.

Typically, the natural stratigraphy identified in the BHTs consisted of three strata in profile (Figure 15; Attachment A, Table A-2). Stratum I, 0 to 29 cm (0 to 11.4 inches) below surface, consisted of a dark brown (10YR 3/3) clay loam. Stratum II, 29 to 70 cm (11.4 to 27.6 inches) below surface, consisted of a brown (10YR 4/3) clay loam with 2 to 3 percent white nodules, possible calcium carbonate (CaCO_3). Finally, Stratum III extended from 70 cm (27.6 inches) below surface to the base of the BHT, which varied in depth from 170 to 340 cm (66.9 to 133.9 inches) below surface and consisted of yellowish brown (10YR 5/6) clay loam with 50 to 55 percent CaCO_3 nodules. A column sample was excavated in each of the four BHTs to determine if buried cultural materials were present (Figure 16). All BHTs and column samples were negative for cultural materials.



Figure 14. Shovel test SS05, view facing east.



Figure 15. BHT01 profile, view facing west.



Figure 16. BHT01 column sample overview, view facing west.

Potential Buffer Zone Description:

The setting within 15.2 m (50 feet) to the north, south, and east of the survey area is a nearly level upland plain with active cropland vegetation and desert scrub consisting of mesquite, prickly pear, and tall and short grasses. The existing US 277 ROW borders the western edge of the survey area and the US 67 ROW is adjacent to the southern terminus of the survey area. Due to the disturbance associated with US 277 and US 67 construction, pipeline construction, buried utilities, a railroad, and the presence of shallow calcareous soils, there is little to no potential for intact buried deposits within the 15.2-m (50-foot) buffer zone.

Archeological Materials Identified and Archeological Site Description:

No archeological sites were identified within or immediately adjacent to (within 50 m [164 feet]) of the APE.

Recommendations

Results Valid Within (check all that apply to define the buffer zone):

No Survey Area (NSA)		Survey Area		Either	
<input checked="" type="checkbox"/>	50 feet of NSA	<input checked="" type="checkbox"/>	50 feet of survey area	<input type="checkbox"/>	Variable, see map

The Definition and Evaluation of this Horizontal Buffer Zone Is Based on One or More of the Following Considerations (check all that apply):

<input checked="" type="checkbox"/>	The integrity of the areas has been affected by prior development, modern land use practices, or other disturbances.
<input checked="" type="checkbox"/>	The areas are unlikely locations for past human activity.
<input checked="" type="checkbox"/>	The survey shows that archeological materials are unlikely to exist in this area.
<input type="checkbox"/>	The survey shows that areas may contain intact archeological sites or the survey results cannot preclude the possibility of such sites.
<input type="checkbox"/>	Other (specify)

Archeological Site Evaluations:

No cultural materials were observed within the APE or within 50 m (164 feet) of the APE.

Comments on Evaluations:

None.

Further Work:

The proposed project would have no effect on archeological historic properties and/or SALs within the horizontal buffer zone, as specified in the previous subsections. Any design change within this area would not require additional review or investigation. Design changes that either extend beyond the buffer zone or result in potential impacts deeper than the impacts considered in this report would require additional review.

No further work or avoidance is recommended within the APE.

Justification:

The available exposures, disturbances, shovel tests, BHTs, and column sampling afforded sufficient data to adequately assess the APE. The background review revealed no previously recorded sites or other known cultural resources concerns within the APE. In addition, SWCA observed no cultural materials during the survey of the proposed new ROW.

Recommendations:

SWCA has made a reasonable and good faith effort to locate and identify historic properties as per 36 CFR 800.4(b)(1), and cultural resources as per Subchapter A of Chapter 26 of the Texas Administrative Code, throughout the proposed APE. Based on the results of the survey, SWCA recommends a finding of “no historic properties affected,” and no further archeological investigations are recommended within the surveyed APE.

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Attachment A. Tables

Shovel Test No.	Level	Depth (cmbs*)	Munsell	Color	Texture	Inclusions	Cultural Material	Comments/Termination
JAU01	1	0-20	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-35	10YR 4/3	Brown	Clay loam	3% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU02	1	0-35	10YR 4/3	Brown	Clay loam	1% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU03	1	0-15	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	15-35	10YR 4/3	Brown	Clay loam	5% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU04	1	0-25	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-40	10YR 4/3	Brown	Clay loam	3% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU05	1	0-25	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-40	10YR 4/3	Brown	Clay loam	3% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU06	1	0-20	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-40	10YR 4/3	Brown	Clay loam	3% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU07	1	0-40	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	40-50	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	Terminated due to compact soil.
JAU08	1	0-30	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	30-40	10YR 4/3	Brown	Clay loam	1% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU09	1	0-25	10YR 4/4	Dark yellowish brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-30	10YR 4/4	Dark yellowish brown	Clay loam	5% Gravels	No cultural material encountered.	Terminated due to compact soil.

Shovel Test No.	Level	Depth (cmts*)	Munsell	Color	Texture	Inclusions	Cultural Material	Comments/Termination
JAU10	1	0-25	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-30	10YR 4/3	Brown	Clay	5% Calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
JAU11	1	0-35	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	35-40	10YR 4/3	Brown	Clay loam	2% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU12	1	0-20	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-40	10YR 4/3	Brown	Clay loam	2% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU13	1	0-25	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-40	10YR 4/3	Brown	Clay loam	3% Gravels	No cultural material encountered.	Terminated due to compact soil.
JAU14	1	0-25	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-35	10YR 4/4	Dark yellowish brown	Clay loam	5% Calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
JAU15	1	0-15	10YR 4/4	Dark yellowish brown	Clay loam	None	No cultural material encountered.	N/A
	2	15-25	10YR 4/3	Brown	Clay loam	3% Calcium carbonate	No cultural material encountered.	Cement like compactness. Terminated due to compact soil.
JAU16	1	0-35	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	35-40	10YR 4/4	Dark yellowish brown	Clay loam	3% Calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
JAU17	1	0-25	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-30	10YR 4/4	Dark yellowish brown	Clay loam	1% Calcium carbonates	No cultural material encountered.	Terminated due to compact soil.

Shovel Test No.	Level	Depth (cmts*)	Munsell	Color	Texture	Inclusions	Cultural Material	Comments/Termination
JAU18	1	0-35	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	35-40	10YR 4/4	Dark yellowish brown	Clay loam	1% Calcium carbonates	No cultural material encountered.	Terminated due to compact soil.
JAU19	1	0-50	10YR 3/3	Dark brown	Clay loam	None	No cultural material encountered.	Terminated due to compact soil.
JAU20	1	0-40	10YR 3/3	Dark brown	Clay loam	None	No cultural material encountered.	Terminated due to compact soil.
JAU21	1	0-25	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-45	10YR 4/4	Dark yellowish brown	Clay loam	1% Calcium carbonates	No cultural material encountered.	Terminated due to compact soil.
JAU22	1	0-30	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	30-40	10YR 4/4	Dark yellowish brown	Clay loam	3% Calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
JAU23	1	0-20	10YR 4/4	Dark yellowish brown	Clay loam	10% Gravels	No cultural material encountered.	Terminated due to compact soil.
SMS01	1	0-40	10YR 4/3	Brown	Clay loam	None	No cultural material encountered.	N/A
	2	40-60	10YR 4/3	Brown	Clay loam	1-3% Gravels	No cultural material encountered.	Terminated due to compact soil.
SMS03	1	0-25	10YR 4/2	Dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	25-35	10YR 4/2	Dark grayish brown	Clay	1% Gravels, limestone cobbles	No cultural material encountered.	Terminated due to compact soil.
SMS04	1	0-30	10YR 4/2	Comments	Clay loam	3% Gravels, pebbles	No cultural material encountered.	Plowed field.
	2	30-50	10YR 4/2	Dark grayish brown	Clay	None	No cultural material encountered.	Terminated due to compact soil.
SMS05	1	0-30	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels	No cultural material encountered.	N/A
	2	30-60	10YR 3/2	Very dark grayish brown	Clay loam	2% Gravels	No cultural material encountered.	Terminated due to compact soil.

Shovel Test No.	Level	Depth (cmts*)	Munsell	Color	Texture	Inclusions	Cultural Material	Comments/Termination
SMS06	1	0-30	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels	No cultural material encountered.	N/A
	2	30-50	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
SMS07	1	0-15	10YR 3/3	Dark brown	Clay loam	1% Gravels	No cultural material encountered.	N/A
	2	15-40	10YR 3/3	Dark brown	Clay loam	5% Gravels	No cultural material encountered.	Terminated due to compact soil.
SMS08	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-50	10YR 3/2	Very dark grayish brown	Clay loam	2% Gravels, mottles	No cultural material encountered.	Terminated due to compact soil.
SMS09	1	0-15	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	15-40	10YR 3/2	Very dark grayish brown	Clay loam	2% Gravels	No cultural material encountered.	Terminated due to compact soil.
SMS10	1	0-30	7.5YR 2.5/3	Very dark brown	Clay loam	>30% Gravels, cobbles	No cultural material encountered.	Terminated due to compact soil.
SMS11	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels	No cultural material encountered.	N/A
	2	20-50	10YR 3/2	Very dark grayish brown	Clay loam	5% Gravels, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
SMS12	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-50	10YR 3/2	Very dark grayish brown	Clay loam	3% Gravels, calcium carbonate, mottles	No cultural material encountered.	Terminated due to compact soil.
SMS13	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-45	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels, rootlets	No cultural material encountered.	Terminated due to compact soil.
SMS14	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels	No cultural material encountered.	Immediately west of pushpile.
	2	20-55	10YR 3/2	Very dark grayish brown	Clay loam	3% Gravels, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.

Shovel Test No.	Level	Depth (cmbs*)	Munsell	Color	Texture	Inclusions	Cultural Material	Comments/Termination
SMS15	1	0-25	10YR 3/2	Very dark grayish brown	Clay loam	<1% Gravels	No cultural material encountered.	N/A
	2	25-50	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravel, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
SMS16	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	<1% Gravels	No cultural material encountered.	N/A
	2	20-50	10YR 3/2	Very dark grayish brown	Clay loam	<1% Gravels, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
SMS17	1	0-15	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	Plowed hay field.
	2	15-30	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	Terminated due to compact soil.
SMS18	1	0-15	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels	No cultural material encountered.	N/A
	2	15-40	10YR 3/2	Very dark grayish brown	Clay loam	3% Gravels, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
SMS19	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	3% Roots, rootlets	No cultural material encountered.	N/A
	2	20-45	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	Terminated due to compact soil.
SMS20	1	0-10	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	10-35	10YR 3/2	Very dark grayish brown	Clay loam	3% Gravels, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
SMS21	1	0-30	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	30-45	10YR 3/2	Very dark grayish brown	Clay loam	<1% Gravels	No cultural material encountered.	Terminated due to compact soil.
SMS22	1	0-15	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	15-45	10YR 3/2	Very dark grayish brown	Clay loam	<1% Gravels	No cultural material encountered.	Terminated due to compact soil.
SMS23	1	0-30	10YR 3/2	Very dark grayish brown	Clay loam	1% Calcium carbonate filaments	No cultural material encountered.	N/A
	2	30-50	10YR 3/2	Very dark grayish brown	Clay	None	No cultural material encountered.	Terminated due to compact soil.

Shovel Test No.	Level	Depth (cmbs*)	Munsell	Color	Texture	Inclusions	Cultural Material	Comments/Termination
SMS24	1	0-15	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	15-50	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels	No cultural material encountered.	Terminated due to compact soil.
SMS25	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-45	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels, calcium carbonate, root	No cultural material encountered.	Terminated due to compact soil.
SMS26	1	0-20	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	20-50	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels, calcium carbonate	No cultural material encountered.	Terminated due to compact soil.
SMS27	1	0-10	10YR 3/2	Very dark grayish brown	Clay loam	None	No cultural material encountered.	N/A
	2	10-40	10YR 3/2	Very dark grayish brown	Clay loam	1% Gravels, calcium carbonate filaments	No cultural material encountered.	Terminated due to compact soil.

* cmbs=centimeters below surface

Table A-1. Shovel Test Pit Results for Each Level in the Shovel Test Pit.

BHT	Strat	Depth (cmbs)	Munsell*	Soil Color	Soil Texture	Horizon Discussion	Lower boundary	Comments
BHT01	I	0-21	10YR 3/3	Dark brown	Clay loam	Friable; sub-angular blocky structure, fine to medium size, moderate grade; 8% roots, 20% rootlets, 2% insect burrows, <1% worm casts, 1% pin holes, 2% sub-angular pebbles, and 1% sub-rounded gravels.	Clear; Smooth	Column sampled to 60 cmbs. No cultural materials were observed.
	II	21-56	10YR 4/3	Brown	Clay loam	Friable; angular blocky structure, medium size, strong grade; 1% roots, 5% rootlets, 1% insect burrows, 2% worm casts, 2% pin holes, 2% sub-angular pebbles, <1% sub-rounded pebbles, 2% calcium carbonate nodule 1 to 3 mm.	Abrupt; Wavy	Increasing clay content from stratum I.
	III	56-249+	10YR 5/6	Yellowish brown	Clay loam	Friable; sub-angular blocky structure, medium size, moderate grade; 1% rootlets, 1% insect burrows, <1% pin holes, 55% calcium carbonate nodules ranging from 3 mm to 40 cm.	Unobserved	Large calcium carbonate nodule approximately 40 cm wide by 20 cm tall in the west wall from 60-80 cmbs. <1% chert and quartzite inclusions beginning at 235 cmbs.
BHT02	I	0-29	10YR 3/3	Dark brown	Clay loam	Friable; sub-angular blocky structure, fine to medium size, moderate grade; 5% roots, 15% rootlets, 2% insect burrows, <1% worm casts, 1% pin holes, 2% sub-angular pebbles, and 1% sub-rounded gravels.	Clear; Smooth	Column sampled to 71 cmbs. No cultural materials were observed.
	II	29-70	10YR 4/3	Brown	Clay loam	Friable; angular blocky structure, medium size, strong grade; 1% roots, 1% rootlets, 1% insect burrows, 1% worm casts, 2% pin holes, 2% sub-angular pebbles, <1% sub-rounded pebbles, 5% calcium carbonate nodule 1 to 3 mm.	Abrupt; Smooth	Increasing clay content from stratum I.
	III	70-340+	10YR 5/6	Yellowish brown	Clay loam	Friable; sub-angular blocky structure, medium size, moderate grade; 1% rootlets, 1% insect burrows, <1% pin holes, 55% calcium carbonate nodules ranging from 3 mm to 2 cm, 1% quartzite gravels and cobbles.	Unobserved	No cultural materials were observed.

BHT	Strat	Depth (cmbs)	Munsell*	Soil Color	Soil Texture	Horizon Discussion	Lower boundary	Comments
BHT03	I	0-27	10YR 3/3	Dark brown	Clay loam	Friable; sub-angular blocky structure, fine to medium size, moderate grade; 3% roots, 20% rootlets, 2% insect burrows, <1% worm casts, 1% pin holes, 2% sub-angular pebbles, and 1% sub-rounded gravels.	Clear; Smooth	Column sampled to 80 cmbs. No cultural materials were observed.
	II	27-80	10YR 4/3	Brown	Clay loam	Friable; angular blocky structure, medium size, strong grade; 2% roots, 5% rootlets, 1% insect burrows, 2% worm casts, 2% pin holes, 2% sub-angular pebbles, <1% sub-rounded pebbles, 2% calcium carbonate nodule 1 to 3 mm.	Abrupt; Smooth	Increasing clay content from stratum I.
	III	80-239+	10YR 5/6	Yellowish brown	Clay loam	Friable; sub-angular blocky structure, medium size, moderate grade; 1% rootlets, 1% insect burrows, <1% pin holes, 55% calcium carbonate nodules ranging from 2 mm to 2 cm.	Unobserved	No cultural materials were observed.
BHT04	I	0-21	10YR 3/3	Dark brown	Clay loam	Friable; sub-angular blocky structure, fine to medium size, moderate grade; 2% roots, 20% rootlets, 2% insect burrows, <1% worm casts, 1% pin holes, 2% sub-angular pebbles, and 1% sub-rounded gravels.	Clear; Smooth	Column sampled to 57 cmbs. No cultural materials were observed.
	II	21-51	10YR 4/3	Brown	Clay loam	Friable; angular blocky structure, medium size, strong grade; 5% roots, 5% rootlets, 1% insect burrows, 2% worm casts, 2% pin holes, 2% sub-angular pebbles, <1% sub-rounded pebbles, 2% calcium carbonate nodule 1 to 3 mm.	Abrupt; Wavy	Increasing clay content from stratum I.
	III	51-170+	10YR 5/6	Yellowish brown	Clay loam	Friable; sub-angular blocky structure, medium size, moderate grade; 1% rootlets, 1% insect burrows, <1% pin holes, 50% calcium carbonate nodules ranging from 3 mm to 4 cm.	Unobserved	Degraded bedrock slabs observed starting at 150 cmbs.

Table A-2. Backhoe Trench Results for Each Level, Zone, Strat, or Horizon in the Trench.

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



SWCA Environmental Consultants
4407 Monterey Oaks Blvd., Building 1, Suite 110
Austin, TX 78748
www.swca.com