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Archeological Survey for the Lubbock Canyon Lakes Sanitary Sewer Interceptor Rehabilitation Project, City of Lubbock, Lubbock County, Texas

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Abstract

In December of 2014 and January of 2015, prior to rehabilitation of a sanitary sewer interceptor in Lubbock, Lubbock County, Texas, archeologists from aci consulting conducted a pedestrian survey with shovel testing and backhoe trenching of approximately 11 acres in accordance with Council of Texas Archeologists (CTA) and Texas Historical Commission (THC) guidelines. The survey was conducted under Permit 7105, in compliance with the Rules of Practice and Procedure for the Texas Antiquities Code, found in Texas Administrative Code, Title 13, Part 2, Chapter 26 (13 TAC 26). Jennifer Hatchett Kimbell served as Principal Investigator, and Julie Shipp served as the project geoarcheologist. Records from this investigation will be curated at the Museum of Texas Tech University.

Eleven proposed new segments or sets of segments and 13 proposed new manholes, not associated with the proposed new segments, were investigated. Proposed locations for new segments and manholes were investigated through pedestrian survey and through shovel testing or backhoe trenching if field conditions indicated a possibility for intact buried deposits. Areas that were clearly disturbed were not subjected to subsurface investigation. In all, 18 backhoe trenches, measuring a total of 90 m (295 ft) in length by 0.6 m (2 ft) in width, and four shovel tests were excavated. No intact prehistoric or historic deposits or features were observed, and no sites were recorded. Significant portions of the proposed alignment had been disturbed by the original installation of the sewer interceptor and by modern landscape alteration. Some backhoe trenches revealed modern debris to at least 3 m (10 ft) below the ground surface. Some, if not all, of this debris likely represents the remains of buildings destroyed by the tornado of 1970 that tore through northeast Lubbock that were subsequently bulldozed into Yellowhouse Draw. Based on the results of this cultural resources survey, no further archeological work is recommended.

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1 INTRODUCTION

The City of Lubbock is proposing to rehabilitate an aging sanitary sewer interceptor in the eastern part of the City. This interceptor runs through the Canyon Lakes area, located in part of Yellowhouse Draw (Appendix A, Figures 1-3). Depending on the current assessed condition of various portions of the interceptor, sections will be cleaned, repaired, replaced from inside the existing line, replaced in place using open trenching, or replaced via new segments installed using either open trenching or boring. In addition, new manholes will be added and some existing manholes will be replaced in place. Segments of the interceptor that run above ground are supported by piers that will also be replaced.

Eleven new segments of interceptor are proposed (see Appendix A, Figures 6-1 through 6-16). These segments will be placed some distance from the existing line and connected to the existing line via manholes. Once the new segments have been installed, the older lines will be abandoned in place; they will not be removed from their current positions. In addition, as many as 13 new manholes may be added along existing portions of the interceptor (see Appendix A, Figures 6-1 through 6-16).

Because most of the proposed impacts will occur on City of Lubbock property, the project falls under the Texas Administrative Code (13 TAC 26). The archeological investigation, conducted under TAC permit 7105, included pedestrian survey, photography, subsurface testing, data analysis, and report preparation in accordance with THC and Council of Texas Archeologists (CTA) standards. New segments totaling 861 m (2,825 ft) and new ranges of manhole locations totaling 1,309 m (4,295 ft) are proposed and were investigated with varying degrees of effort depending on the level of disturbance. The area of potential effects (APE) examined measured 20 m (66 ft) in width by a total of 2,170 m (7,120 ft) in length. The total area investigated was approximately 11 acres. Eighteen backhoe trenches totaling 90 m (295 ft) in length and each 0.6 m (2 ft) in width were excavated to various depths. Site recording and National Register of Historic Places (NRHP) and State Antiquities Landmark (SAL) eligibility assessments were not required, as no new sites were located, and no evidence of previously recorded sites was observed. Because the impact areas are relatively small and are, for the most part, already disturbed, no conclusions can be drawn from the current investigation about the status of previously recorded sites.

2 BACKGROUND

2.1 Environmental Setting

The proposed project area is located in the Llano Estacado subregion of the High Plains ecoregion just east of the Caprock Canyonlands, Badlands, and Breaks. The Llano Estacado is bounded by escarpments to the north, west, and east. The flat surface of the plain is broken by few streams, but there are several shallow draws as well as numerous playas that hold water after rains. Before widespread human settlement, the Llano Estacado was home to a vast shortgrass prairie ecosystem including bison, black-tailed prairie dog, swift fox, pronghorn, burrowing owl, mountain lion, coyote, gray wolf, and other species. At present, approximately 80 percent of the Llano Estacado is tilled for agriculture, and farmers grow corn, wheat, cotton, and grain sorghum either using irrigation or under dry land conditions. Cattle ranching and oil and gas production are also common on the Llano Estacado (Griffith et al. 2007).

The specific project area is located within Yellowhouse Draw, just north of its intersection with Blackwater Draw (Appendix A, Figures 1-3). The North Fork of the Double Mountain Fork of the Brazos River begins where the two draws converge. Because these shallow canyons would have provided water at least during rainy periods throughout prehistory and the historic period, draws on the Llano Estacado are highly likely to contain evidence of human occupation. For this reason, the vast majority of known archeological sites in Lubbock County are clustered along Yellowhouse Draw and Yellowhouse Canyon, where the draw widens and deepens to the south of the project area. Within the project area, Yellowhouse Draw averages approximately 11 m (35 ft) in depth and 400 m (1,300 ft) in width.

2.2 Geology and Soils

Geology

Geologically, the project area overlies the Pliocene Blanco Formation and the Pliocene and Miocene Ogallala Formation (Barnes 1993). The Blanco Formation is composed of sand, clay, and limestone, while the Ogallala Formation comprises sand, silt, clay, and gravel capped by caliche (Barnes 1993).

General Soils

Soils in this area consist almost exclusively of very deep, well drained, moderately permeable loams (NRCS 2013) (Appendix A, Figures 4-1 through 4-5). Most of these soils have the potential to contain intact buried cultural deposits. Eight soil units occur in the proposed alignment. For Lubbock County, soil units are coded by number rather than by abbreviation, so the code number for each unit follows the soil name and is set off by parentheses.

Acuff-Urban land complex, 0 to 2 percent slopes (3): The Acuff-Urban land complex consists of approximately 55 percent Acuff soils, 35 percent urban land, and 10 percent other components. Acuff soils are generally found on nearly level to gently sloping plains and on the slopes of playas. These soils are characterized as very deep and well drained with moderate permeability. Acuff series soils formed from Pleistocene-aged loamy eolian sediments of the Blackwater Draw formation. The upper layer of this soil series is a brown to dark brown loam to 20 cm (12 in). Below this is sandy clay loam up to 200 cm (80 in) below the surface.

Arents and Pits (9): Areas classified as “arents and pits” are associated with spoils from caliche mining and other earthy fill.

Berda loam, 1 to 3 percent slopes (10) and 3 to 5 percent slopes (11): Berda series soils are found on gently sloping valley flats or valley sides. These soils are very deep, well drained, and moderately permeable. This soil formed from calcareous loamy colluvium and slope alluvium derived from the Miocene-Pliocene age Ogallala formation.

Berda-Potter association, hilly (12): This soil association consists of approximately 60 percent Berda soils, 30 percent Potter soils, and 10 percent other soils. Found on side- and back-slopes of valley sides and scarps, this soil association formed from calcareous loamy colluvium and slope alluvium derived from the Miocene-Pliocene age Ogallala formation. These loamy soils are characterized as very deep and well drained with moderate permeability.

Bippus clay loam, frequently flooded (15): Bippus soils are found on nearly level to gently sloping floodplains or draws. These soils formed in Holocene-aged loamy alluvium and are very deep, well drained, and moderately permeable. The surface layer, up to 20 cm (8 in) deep, is a brown or dark brown clay loam overlaying sandy clay loam to 200 cm (80 in) below the surface.

Estacado-Urban land complex, 0 to 2 percent slopes (20): The Estacado-Urban land complex consists of approximately 60 percent Estacado soils, 30 percent urban land, and 10 percent other components. This complex is found on plains and is characterized as very deep, well drained, and moderately permeable. This complex formed from calcareous loamy eolian deposits from the Pleistocene-aged Blackwater Draw formation.

Potter loam, 2 to 12 percent slopes (38): Potter loam is found on the shoulders and crests of draws and scarps and formed from calcareous loamy alluvium in the Ogallala formation of Miocene-Pliocene age. This soil is very deep, well drained, and moderately permeable. Typically, this soil presents as up to 30 cm (12 in) of loam overlying very cobbly loam.

Potter-Kimbrough-Urban land complex, 1 to 5 percent slopes (40): This complex consists of approximately 50 percent Potter soils, 30 percent urban land, 15 percent Kimbrough soils, and 5 percent other components. This complex is found on shoulders and crests of draws and scarps and developed in calcareous loamy alluvium in the Ogallala formation of Miocene-Pliocene age. Like the other soils in the project area, this complex is characterized as very deep, well drained, and moderately permeable. Typically, this complex contains loam up to about 30 cm (12 in) below the surface with cobbly loam underneath.

Specific Soils

More specifically, the deposits of Yellowhouse Draw are well known, as is their likelihood for containing intact archeological material. Five basic late Quaternary geological units and five associated soils have been identified at the Lubbock Lake site and occur throughout Yellowhouse Draw.

Stratum 1, a sandy and gravelly alluvium and the earliest of the geological units, appears to have been deposited by approximately 11,000 BP (Holliday and Allen 1987; Holliday 1995).

Stratum 2 is characterized as interbedded diatomaceous mud and peaty muds of primarily lacustrine and marsh origins (Holliday and Allen 1987; Holliday 1995). Stratum 2 is subdivided based on internal stratification. Substratum 2A has been dated to between 11,000 BP and 10,000 BP, while the overlying Substratum 2B is dated to between 10,000 BP and approximately 8,500 BP (Holliday and Allen 1987). Stratum 3, which has been dated to between approximately 10,000 BP and 7,500 BP, is characterized as a highly calcareous, silty, friable lacustrine unit (Holliday and Allen 1987). The Yellowhouse Soil developed in Stratum 3 and is characterized by an organic-rich A horizon and minimal leaching of calcium carbonate in the C horizon (Holliday and Allen 1987).

Stratum 4 is a loamy to sandy, eolian unit subdivided into two substrata. Substratum 4A, found only along the valley axis, contains sandy alluvium interbedded with clayey marsh deposits, while Substratum 4B is a sandy eolian deposit. The Lubbock Lake Soil formed in Substratum 4B between about 4,500 BP and 1,000 BP in areas where the soil was buried; in areas where the soil was not buried, soil formation continues (Holliday and Allen 1987).

Stratum 5, where it occurs, is also divided into two substrata. Substratum 5A comprises slopewash sand and gravel and eolian sand, and in some places a weakly developed soil, called the Apache Soil, formed. Substratum 5A appears to have been deposited between approximately 750 and 600 BP, and the Apache Soil began forming sometime before about 300 BP. Substratum 5B is of lacustrine origin

and is characterized as an organic-rich clay deposited between about 300 and 250 BP (Holliday and Allen 1987). In some places, a very weakly developed soil, the Singer Soil, formed in Substratum 5A beginning around 100 BP (Holliday and Allen 1987).

2.3 Prehistoric Background

The property falls within the Southern High Plains or Llano Estacado archeological region, where prehistoric archeological sites represent continuous human occupation starting around 11,500 years ago (Johnson and Holliday 2004). Johnson and Holliday (2004) authored a synthesis of Southern High Plains archeology in which they divide the prehistory of this region into five periods: (1) the Paleoindian, (2) the Archaic, (3) the Ceramic, (4) the Protohistoric, and (5) the Historic. Some of these are further divided into subperiods such as early and late. Transitions between cultural periods are generally associated with technological changes, especially changes in projectile point types. Dates are presented as Before Present or BP in Table 1.

Table 1. Regional Prehistoric Chronology of the Southern High Plains

Period	Date Range
Paleoindian	11,500-8,500 BP
Clovis	11,500-11,000 BP
Folsom	10,800-10,300 BP
Late Paleoindian	10,000-8,500 BP
Archaic	8,500-2,000 BP
Early	8,500-6,500 BP
Middle	6,500-4,500 BP
Late	4,500-2,000 BP
Ceramic	2,000-500 BP
Protohistoric	500-300 BP
Historic	300-50 BP
Aboriginal Historic	300-150 BP
European Historic	150-50 BP

Paleoindian

The Paleoindian period dates between approximately 11,500 and 8,500 BP (Johnson and Holliday 2004). While Paleoindian artifacts, especially the distinctive diagnostic dart points, are known from locations on the Southern High Plains, in situ finds are rare, which limits the amount of information that can be recovered. The Early Paleoindian on the Southern High Plains is part of a larger, regional cultural horizon, the Clovis horizon. Clovis sites record a general hunter-gatherer lifeway based upon a wide variety of fauna including large herbivores as well as smaller animals during a relatively cool, moist period. Evidence of plant resources is less common, but it is presumed that local flora were also important to subsistence. Later

Folsom sites indicate a continued reliance on big game hunting, although some of the large species hunted by Clovis people had become extinct due to significant climatic change. Temperatures became more extreme, with greater seasonal fluctuations, and dryer conditions caused water sources to become more scarce (Johnson and Holliday 2004). A change in technology is marked by the appearance of the Folsom point. The Late Paleoindian was marked by a continuation of the climatic trends of Folsom times, with a continued reduction of moisture on the High Plains. Late Paleoindian archeological sites on the High Plains indicate a continued reliance on bison as a food source, and technological changes seem to indicate increased differentiation among groups. Point types from the Late Paleoindian on the Southern High Plains include Plainview, Firstview, and Milnesand (Johnson and Holliday 2004).

Archaic

Archaic sites on the Southern High Plains are most often associated with the presence of heated rock in hearths, ovens, middens, and scatters. The period as a whole is defined by the intensified use of local resources and diversity of material culture in comparison to the Paleoindian period. The climate ranged from mesic (relatively moist) in the Early Archaic and the later part of the Late Archaic to xeric (relatively dry) during the Middle Archaic and beginning of the Late Archaic. On the Southern High Plains, Archaic-period people relied on a combination of meat and desert plants for subsistence and in dryer locations were reliant on hand-dug wells for water. Several Middle Archaic sites in the region have yielded evidence of intentionally excavated wells (Johnson and Holliday 2004).

Ceramic

The Ceramic period is associated with the introduction of the bow and arrow and pottery onto the Southern High Plains. The transition between Archaic technologies and those of later times is marked by sites that have yielded assemblages containing both dart and arrow points from the same stratigraphic context (Johnson and Holliday 2004). The Ceramic period on the Southern High Plains is also associated with an increased diversity of game animals, which included by this time pronghorn, coyote, and wolf in addition to modern bison (Johnson and Holliday 2004).

Protohistoric

Protohistoric sites on the Southern High Plains, based on the system in use by Johnson and Holliday (2004), are associated with Garza type arrow points. Sites from this period on the Llano Estacado continue to reflect a nomadic hunting and gathering lifeway, although people were living in horticulture-based villages in other regions, some as close as the Canadian River area.

2.4 Historic Background

The Historic period is marked by the incorporation of European trade goods and the remains of modern horses (Johnson and Holliday 2004). Aboriginal historic sites reflect occupation by native people who were in contact with Europeans, either directly or indirectly. Several sites of this type are known from the Southern High Plains (Johnson and Holliday 2004). European historic sites are associated with actual European occupation of the region, beginning in the middle to late 1800s. These sites include buffalo hunter camps, U.S. military camps, and sites associated with traders, sheepherders, and ranchers. Later historic sites document the gradual settlement of the Southern High Plains and its conversion to irrigated agricultural land, oil and gas fields, and cities.

In the area of what is now Lubbock, Lubbock Lake and Yellowhouse Draw provided water for nomadic Indian groups, and some historians suggest that part of Coronado's expedition traveled through present-day Lubbock County, stopping at Lubbock Lake, in 1541 (Carlson et al. 2008). Certainly by the end of the 1540s the native peoples of the region had been exposed to Europeans and European goods, and the Spanish named Lubbock Lake *La Punta de Agua* (Point of Water) on their maps (Carlson et al. 2008). By the late seventeenth century, Apache groups dominated the High Plains; by the early eighteenth century they had been supplanted by the Comanche (Carlson et al. 2008). Both of these groups, as well as others, utilized Lubbock Lake and Yellowhouse Draw as year-long sources of water during their travels.

In the early nineteenth century, *comancheros* (traders from upper New Mexico) and *ciboleros* (New Mexican bison hunters) were using Yellowhouse Draw and *La Punta de Agua* as meeting places for trade and hunting (Carlson et al. 2008). After the Red River War of 1874-1875, most Southern Plains Indians had been shepherded to their reservations in Oklahoma, leaving the southern High Plains open for Anglo settlement (Carlson et al. 2008). Farmers and ranchers of cattle and sheep began to claim land in what is now Lubbock County, but Anglo settlement was slow to grow until about 1900, when the community of Lubbock was populated by speculators, shopkeepers, ranch managers, and others. Lubbock County was created in 1876 and was named for Tom S. Lubbock, a brother of the governor of Texas during the Civil War and a former Texas Ranger and officer in the Confederate military (Connor 1962). Bison hunters attacked a Comanche camp in Yellowhouse Draw, in a portion of the draw believed by some to be within the project area, in the spring of 1877 (Carlson 2003). City historical markers memorialize this battle, in which the bison hunters apparently accomplished little; the Indians withdrew after inflicting injuries on several of the Anglos (Carlson 2003).

In 1884 a postmaster was named to the Lubbock post office, and in 1889 a group of town promoters founded a village called Lubbock in what is now northeast of the

main part of the City of Lubbock. Almost immediately a hotel was built and attracted overnight guests and local people out for a meal (Carlson et al. 2008). Another set of town promoters founded their own town in 1890 and called it variously Ray Town, South Town, South Lubbock, and Monterey (Carlson et al. 2008). This town was just east of what is now Texas Tech University's Jones AT&T Stadium. At the end of 1890 the two groups of town founders agreed to combine their two communities into one on a jointly purchased tract of land where present-day downtown Lubbock is located (Carlson et al. 2008). The terms of the agreement required that virtually all buildings in each of the two original towns be moved to the new town site within 30 days (Connor 1962). By the end of 1891, Lubbock had a newspaper and a school, a liquor store, two livery stables, two lawyers, and a land office, and by the end of the following year there were at least three church congregations and two mercantile stores, although the population of the town remained small (Connor 1962; Carlson et al. 2008).

The City of Lubbock, with a population reported at 1,900, was incorporated in 1909, the same year a rail line reached the town from Amarillo and Plainview (Carlson et al. 2008). The 1909 railroad trestle bridge crossing Yellowhouse Draw still survives, although parts of it have undoubtedly been replaced in the ensuing century. The town at this time boasted twelve doctors, three banks, at least two schools, multiple churches, and an early version of a chamber of commerce (Carlson et al. 2008). Postcards from this early period advertise Lubbock as a town "where everybody lives easy, has a good time, and makes lots of money" and call Lubbock a "lately developed summer health resort" (Carlson et al. 2008:50). By 1920 the city had 4,051 inhabitants, and in 1923 the city of about 6,500 was chosen to be the home of Texas Technological College which opened in 1925 (Carlson et al. 2008). With the construction and opening of the college and an increase in rail access, the city began to grow more quickly and experienced a minor boom during the 1920s.

As in other parts of the country, the Great Depression slowed the city's growth, although city merchants and leaders developed programs to avoid some of the economic disasters that devastated some other communities, and the city took advantage of many of the New Deal programs available (Carlson et al. 2008). A large grant from the Works Progress Administration (WPA) in 1935 allowed the city to excavate into the bed of Lubbock Lake, which by this point rarely held water. A huge amount of fill was removed, allowing ground water to seep in to the lake, and the site became a swimming hole. In 1936 some children found arrow points in the area and took them to William Curry Holden at Texas Technological College. In 1939 Holden and others began professional archeological investigations that continue today (Carlson et al. 2008). It is impossible to estimate the amount of archeological knowledge that was destroyed by the city's efforts to renew the water source at Lubbock Lake. In 1935, city officials deeded land along Yellowhouse Draw for Mackenzie State Park to the state, and Civilian Conservation Corps (CCC) workers built a swimming pool, a golf course, tennis courts, and picnic areas, some

of which still exist (Carlson et al. 2008).

World War II brought renewed growth to the city, which gained two military training bases; one of these, South Plains Army Air Field “became the largest advance glider pilot training base in the world” (Carlson et al. 2008:86). By 1940 the city’s population had grown to 31,853, and it continued to grow during the war. In 1950 the population was listed as 71,747; it grew to 128,691 by 1960; and by 1970 it had reached 149,101 and was the largest city on the Texas High Plains (Carlson et al. 2008). The city became known as the “Hub of the Plains” and was a major cultural center, especially for music. Charles Hardin Holley, better known as Buddy Holly, went to school in Lubbock and began his short but incredibly influential musical career there. In the 1950s, Bob Wills, Fats Domino, and Elvis Presley performed in Lubbock (Carlson et al. 2008).

May 11, 1970 brought devastation to the Hub City in the form of an F-5 category tornado that killed 26 people and injured nearly 1,800 (Carlson et al. 2008). The tornado swirled through downtown and then northeast out of the city and left an estimated 1,800 people homeless; property loss is estimated at approximately $840 million (Carlson et al. 2008). This disaster remains prominent in the memories of Lubbockites who witnessed it, and at least one downtown building retains a slight twist in its walls that could never be completely removed. In the aftermath of the tornado, with disaster funds from the federal and state governments, the city undertook a massive rebuilding program, bulldozing much of the wreckage into Yellowhouse Draw and using it to create landscaping around the downtown area. A sign in Helen Hodges Park, near the project area, records this activity and explains some of the findings of the current archeological investigation (Photo 1).

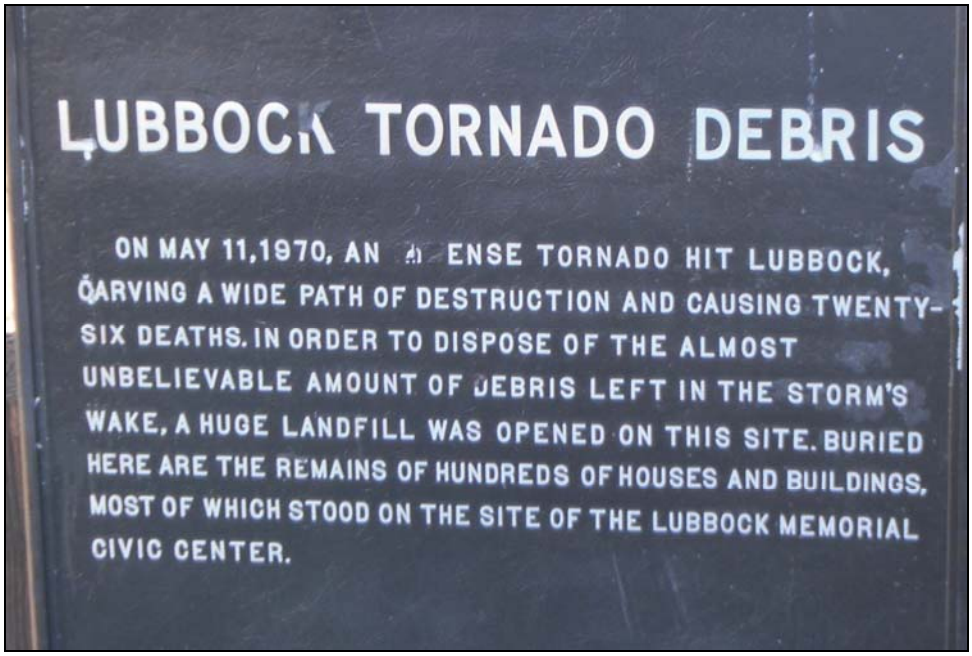

Photo 1. Sign from Helen Hodges Park.

Lubbock has continued its steady growth and now boasts a population of over 225,000. The city is known for its universities, medical facilities, and museums. It remains easily the largest city in the region and is complimented by a thriving agricultural community based on cotton and cattle

3 LITERATURE REVIEW

A literature review of the THC Archeological and Historic Sites databases, historic maps, records from the Texas Archeological Research Laboratory (TARL), and reports generated by the Lubbock Lake Landmark Quaternary Research Center (QRC) revealed that the project alignment is in an area that is relatively well known archeologically. Numerous archeological investigations have been conducted in Yellowhouse Draw, beginning in the 1930s.

The project alignment crosses portions of seven archeological sites, while 25 sites have been recorded within 250 m (820 ft) of the project area and 42 sites have been recorded within approximately 1 km (0.62 mi) of the project alignment (Appendix A, Figures 5-1 through 5-5). Of the 42 sites within 1 km of the alignment, 30 sites are prehistoric, two sites are historic, and 10 sites have both prehistoric and historic components. Site information is summarized below. Many of these sites were recorded when the City of Lubbock was creating the Canyon Lakes system in the 1970s. The creation of the lakes and other development in the area has destroyed several sites. Fortunately, numerous archeological surveys and more intensive investigations have been conducted in the area and have produced a large volume of information on the archeology of this portion of Yellowhouse Canyon.

The project alignment also passes through portions of two NRHP Districts. The Lubbock Lake Site was registered as a National Register District in 1971, as a National Historic Landmark in 1977, and as a SAL in 1981. The Canyon Lakes Archeological District was named to the National Register in 1976.

3.1 Previous Investigations

Numerous archeological investigations have been conducted within 1 km (0.62 mi) of the project area. The first archeological site identified in Lubbock County was 41LU1, the Lubbock Lake site, which is located just north of the project area. The name refers to a reservoir excavated in Yellowhouse Draw in 1936 in an effort by the City of Lubbock to establish a reliable water source for the city. During the dredging of the reservoir, Paleoindian occupation surfaces were exposed at the site, and in 1939 the first archeological investigations were conducted. The site is now part of an archeological preserve associated with the Museum of Texas Tech University and has been shown to retain an archeological record of virtually continuous human occupation dating back approximately 12,000 years (Johnson and Holliday 2013). Special studies at the Lubbock Lake site and other sites within the preserve are yielding important information on environmental and ecological changes through time and the interactions between humans and the environment of the Llano Estacado. Other sites along Yellowhouse Draw have been shown to contain similarly well-stratified archeological deposits.

In 1975, researchers conducted archeological survey of the Canyon Lakes project area after earthmoving activities had revealed several sites (Johnson and Stafford 1976). As is discussed above, sites 41LU28, 41LU35, 41LU38, 41LU45, and 41LU46 were recorded either prior to this survey (but as a result of exposure by excavation activities for the Canyon Lakes development) or as part of this survey. This 1975 survey was apparently conducted under considerable time constraints, as clearing and excavation for the City project had already begun (Johnson and Stafford 1976).

Most relevant for the current project, archeological investigations were undertaken between 1983 and 1985 in preparation for the construction of the Northwest Sanitary Relief Main, which makes up a section of the current interceptor alignment. The 1983 investigations included pedestrian survey and the excavation of five shovel tests, five backhoe trenches, and 31 auger tests (Judd et al. 1983). This 1983 project resulted in the recording of two isolated finds and sites 41LU77 and 41LU78 (Judd et al. 1983). As part of the same project, a survey was conducted of a proposed road extension within the Canyon Lakes area. The investigation of the proposed road alignment included pedestrian survey with concurrent shovel testing (Judd et al. 1983). Shovel tests were excavated to only 40 cm (16 in) below the surface. This investigation resulted in the recording of five isolated finds and sites 41LU79 and 41LU80 (Judd et al. 1983). At the time, the researchers recommended further investigation of site 41LU79 should other ground-disturbing activities be planned in the area, although the proposed road project was not expected to cause negative impacts to the site (Judd et al. 1983). Due to the archeologically sensitive nature of the area, Texas Parks and Wildlife Department (TPWD) recommended archeological monitoring of the excavation of the pipeline corridor; this monitoring was carried out in May through December 1985 (Campbell and Judd 1986). Only one new archeological site, 41LU82, was recorded as a result of the monitoring. Bison bones bearing cut marks were found in the backdirt from a particular section of the pipeline excavation, but no other cultural material was located (Campbell and Judd 1986). The lack of associated tools or other artifacts makes dating the site problematic; the site could be either prehistoric or historic, although the researchers noted that “the irregularity of the cuts suggest a pre-metal people processed the bison sometime between 4,000 B.C. and A.D. 1800” (Campbell and Judd 1986: 33).

Many other archeological investigations have since followed, ranging from small-scale surface investigations to data recovery projects. Table 2 presents a summary of archeological investigations that have been conducted within 1 km (0.62 mi) of the project alignment. Figures 5-1 through 5-5 in Appendix A present known archeological sites and areas that have been investigated archeologically. Unfortunately, precise geographic information is not available for some projects, especially those completed in the 1970s through 1980s, and these project areas are not represented in Appendix A, Figures 5-1 through 5-5. Additionally, site boundaries as represented in the sites atlas (and thus in Appendix A, Figures 5-1 through 5-5)

are often estimated if shown at all. In some cases, a site is marked by only a point, regardless of the actual extent of the site. It also should be noted that investigations conducted more than about 30 years ago are generally considered obsolete, since accepted methods of investigation and recording have changed considerably since that time.

Table 2. Previous Archeological Investigations within 1 km of the Project Alignment*

Citation (see Section 7.0 References Cited)	Project Date	Agency**	Sites Investigated/Discussed
Johnson and Johnson 1975	1975	City of Lubbock	41LU1, 41LU4, 41LU5, 41LU29
	1975	TDHPT	None
	1975	TDHPT	None
	1975	TDHPT	41LU46?
Johnson and Stafford 1976	1975		41LU26, 41LU28, 41LU35, 41LU38, 41LU45, 41LU46
Johnson 1976	1976		41LU27
Johnson 1978	1978		41LU46
	1978	TDHPT	41LU78?
	1978	TDHPT	None
	1978	Dept. of the Interior	None
	1978		None
	1978		41LU46
Barkes and Johnson 1978	1978		41LU31
Mayer-Oakes and Alvey 1978	1978		41LU46
	1979	Dept. of the Interior	41LU26, 41LU35, 41LU37, 41LU45, 41LU46
	1981	NPS	None
	1981	NPS	41LU26, 41LU35
Bandy et al. 1981	1981		41LU26, 41LU35
Judd et al. 1983	1983		41LU77, 41LU78, 41LU79, 41LU80
	1983		41LU135, 41LU136, 41LU118
Campbell and Judd 1986	1985		41LU82
Henderson 1986	1986	TDHPT	None
Bowman and Montgomery 1986	1986	NPS	None
Johnson 1995	1989-		41LU1, 41LU29

Citation (see Section 7.0 References Cited)	Project Date	Agency**	Sites Investigated/Discussed
	1990		
Jurgens 1991	1990		41LU40, 41LU43
Fox 1991	1990		None
Johnson 2002	1991-2000		41LU1, 41LU29, 41LU32, 41LU101
	1992	FHWA	None
Hall 1993	1993		None
Johnson et al. 2002	1993		41LU1
Hicks et al. 1997	1997	City of Lubbock	41LU46
Hall 1998	1998		None
	1999	City of Lubbock	None
Katz and Litwinionek 1999	1999		None
Feit and Griffith 2000	2000	City of Lubbock	None
	2000	TPWD	41LU1, 41LU35, 41LU37, 41LU45, 41LU46
	2000	TPWD	41LU26, 41LU28, 41LU35, 41LU37, 41LU38, 41LU41, 41LU42, 41LU44, 41LU46
Johnson 2009	2001-2002		41LU35
Johnson 2010	2001-2004		41LU26, 41LU35, 41LU128, 41LU136
Johnson 2006	2001-2005		41LU1
Johnson 2005	2002-2003		41LU26, 41LU28, 41LU35, 41LU36, 41LU37, 41LU38, 41LU40, 41LU41, 41LU42, 41LU43, 41LU44, 41LU45, 41LU46, 41LU77, 41LU78, 41LU79, 41LU80, 41LU82, 41LU119, 41LU128, 41LU130, 41LU131
	2003		None
Backhouse et al. 2005	2003		41LU36, 41LU40, 41LU43, 41LU79, 41LU80, 41LU130
	2003		None
	2003		None
Hurst et al. 2011	2003-2005		41LU77, 41LU134, 41LU135
Moe et al. 2011	2003-		41LU137, 41LU138, 41LU139

Citation (see Section 7.0 References Cited)	Project Date	Agency**	Sites Investigated/Discussed
	2005		
Johnson 2011	2003-2005, 2010		41LU77, 41LU134, 41LU135, 41LU137, 41LU138, 41LU139
	2005		41LU1
Bradle et al. 2006	2006		None
Johnson 2012	2006-2010		41LU1
Bradle et al. 2007	2007		None
Hatfield 2009	2009		41LU136
Bradle 2011	2009		41LU134
	unknown		41LU77, 41LU78, 41LU118, 41LU119, 41LU135, 41LU136

*Information presented is compiled from the Texas Archeological Sites Atlas and from archeological reports. In some cases, no report was available although a project area and associated sites are known; in other cases, information is incomplete. Additionally, some reports discuss investigations that are not shown on the sites atlas, as no project area map was submitted to the THC; these project areas are not shown in Appendix A, Figures 5-1 through 5-5 of this report.

**FHWA=Federal Highway Administration; NPS=National Parks Service; TDHPT=Texas Department of Highways and Public Transportation; TPWD=Texas Parks and Wildlife Department.

3.2 Previously Recorded Sites

Site information is summarized in Table 3. Sites located within 250 m (820 ft) of the project alignment are described in more detail below.

Table 3. Previously Recorded Archeological Sites

Trinomial	Year Recorded	Site Type	Time Period	Notes
Sites Located Within 250 m (820 ft) of Project Alignment (Described in more detail below)				
41LU001*	1939	multicomponent	Paleoindian to Historic	Lubbock Lake Landmark
41LU026*	unknown	bison kill/ butchering site	Late Historic (possibly late 1800s)	Within Canyon Lakes Archeological District
41LU028	1974	bison kill/ butchering site	Late Historic (possibly late 1800s)	Within Canyon Lakes Archeological District

Trinomial	Year Recorded	Site Type	Time Period	Notes
41LU035	1975	bison bone bed/ butchering site	Paleoindian to Late Historic (possibly late 1800s)	Within Canyon Lakes Archeological District
41LU036	1975	bone bed	prehistoric unknown	
41LU037	1975	campsite?	prehistoric unknown	Within Canyon Lakes Archeological District
41LU038	1975	bison bone bed	unknown	Within Canyon Lakes Archeological District
41LU040	1975	campsite	Late Prehistoric	
41LU041	1975	lithic scatter	prehistoric unknown	Within Canyon Lakes Archeological District
41LU043	1975	lithic scatter	prehistoric unknown	
41LU045	1975	lithic scatter	prehistoric unknown	Within Canyon Lakes Archeological District
41LU046	1975	lithic scatter	prehistoric unknown	Within Canyon Lakes Archeological District
41LU077*	1983	campsite, historic component	Archaic through Historic	
41LU078	1983	campsite, historic component	prehistoric unknown, historic post 1950	
41LU082	1986	possible bison kill site	prehistoric?	
41LU101	1994	campsite	prehistoric unknown	
41LU128*	2004	campsite	Archaic, Protohistoric	
41LU130	2004	campsite/lithic scatter	Protohistoric	
41LU131	2004	campsite	prehistoric unknown	
41LU134	2005	campsite	prehistoric unknown, historic	
41LU135*	2006	campsite	Archaic through Historic	

Trinomial	Year Recorded	Site Type	Time Period	Notes
41LU136*	2006	campsite, lithic scatter	prehistoric unknown, historic component	
41LU137*	2011	campsite	Ceramic to Historic	
41LU138	2011	campsite	Paleoindian through Protohistoric	
41LU139	2011	campsite	Middle Archaic through Protohistoric	
Sites Located 250-1000 m (820-3281 ft) from Project Alignment				
41LU003	1973	multicomponent	Folsom, Archaic, etc.	
41LU004	1973	campsite?	Paleoindian?	
41LU027	1974	campsite	prehistoric unknown	
41LU029	1974	campsite/ multicomponent	Late Paleoindian to Ceramic	
41LU030	1974	campsite?	Archaic?	
41LU031	1974	campsite	Archaic?	
41LU032	1974	campsite	Archaic?	Within Lubbock Lake Archeological District
41LU039	1975	campsite	prehistoric unknown	
41LU042	1975	lithic scatter	prehistoric unknown (possibly Paleoindian)	Within Canyon Lakes Archeological District
41LU044	1974	lithic scatter	prehistoric unknown	Within Canyon Lakes Archeological District
41LU062	1982	campsite	Late Prehistoric?	Within Lubbock Lake Archeological District
41LU063	1982	campsite	prehistoric unknown	
41LU064	1982	campsite	prehistoric unknown	Within Lubbock Lake Archeological District
41LU079	1983	bison bone, carriage bolt	prehistoric unknown, historic	

Trinomial	Year Recorded	Site Type	Time Period	Notes
41LU080	1983	campsite?	prehistoric unknown, historic	
41LU118	2000	campsite	prehistoric	
41LU119	2001	campsite	Late Archaic, Late Ceramic	

*Sites crossed by the proposed project alignment.

Site 41LU1, the Lubbock Lake site (Appendix A, Figure 5-5), was discussed above. The site is the subject of ongoing archeological investigations and continues to yield important information. Because it is an archeological preserve that is under continuous study, a vast amount of literature describing various investigations and interpretations is available (see, for example, Johnson 1987; Johnson 2002; Johnson 2006; Johnson 2012).

Site 41LU26 (see Appendix A, Figure 5-5) was discovered during the construction of the Canyon Lakes system. The recorder noted the site as a shallowly buried bison kill and butchering location, possibly dating to as late as the late 1800s (Johnson and Stafford 1976). Much of the site had been destroyed by the removal of fill for the creation of Canyon Lake #1; the recorder noted that only the extreme eastern portion of the site was preserved. In the portions of the site that were tested, however, deeply stratified archeological deposits were identified (Bandy et al. 1981). In 2002 and 2003, the QRC conducted additional investigations at site 41LU26 (Johnson 2005). At the time, researchers had limited access to the site and were unable to determine the extent of intact deposits (Johnson 2005).

In 1974, archeologists investigated a bulldozer backdirt pile created during the excavation of Canyon Lake #2 and recorded site 41LU28 (Appendix A, Figure 5-4). The site was noted to represent a bison kill and butchering site, possibly dating to the late 1800s (Johnson and Stafford 1976). Researchers from the QRC returned to this site in 2002 and 2003 but had limited access and were unable to determine the extent of intact deposits at the site (Johnson 2005).

Site 41LU35 (see Appendix A, Figure 5-5) was recorded in 1975. Like sites 41LU26 and 41LU28, this site was discovered during excavation of fill for the creation of one of the Canyon Lakes. At that time, ground clearing work had exposed a living surface including hearths, lithic chipping stations, and large numbers of artifacts of bone, ceramic, and stone. Numerous stone tools, including many projectile points, were also recovered, and others are known from private collections. The site yielded diagnostic materials from the Paleoindian,

Archaic, and Protohistoric periods (Johnson and Stafford 1976). In 2001 and 2002, researchers from the QRC conducted intensive investigations of the site driven by carefully designed research questions (Johnson 2009). The researchers determined that, despite the damage the site had sustained, intact deposits were preserved and could yield important information about prehistory.

Site 41LU36 (Appendix A, Figure 5-2) was originally recorded in 1975. The site was revisited in 2002 by the QRC and was found to retain evidence of human occupation from Paleoindian through the Archaic periods (Johnson 2005). The stratigraphic sequence at site 41LU36 yielded valuable information about Archaic adaptations, and the researchers indicated that the site likely had more information to offer (Johnson 2005).

Like several other sites, site 41LU37 (see Appendix A, Figure 5-4) was recorded in 1975 during the excavation of fill for the Canyon Lakes project. The recording archeologist noted bison bone and lithic debitage but considered the site to have been virtually destroyed. Additional investigations in 2002 and 2003 revealed artifact scatters on the surface and led to the conclusion that site 41LU37 is actually a part of site 41LU35, but the extent of this portion of the site was not determined (Johnson 2005).

Site 41LU38 (see Appendix A, Figure 5-4) was also recorded in 1975. Bison bone was recovered from the excavation for the foundation of a dam. The bison bone represented an extinct species (*Bison antiquus*) and appeared to have originated at least 5 m (16 ft) below the surface (Johnson and Stafford 1976). At the time, the site was thought to have been completely destroyed. A revisit to the site in 2002 revealed that, although no cultural material was visible on the surface, the site retained significant archeological deposits below the surface (Johnson 2005). Backhoe trenching yielded evidence of intact stratigraphic sequences and a long record of human occupation at the site (Johnson 2005).

Site 41LU40 (Appendix A, Figure 5-1) was originally recorded in 1975 as a scatter of lithic material and burned rock; two projectile points were identified as Late Prehistoric Fresno points by the recording archeologist. Additional investigation was recommended. In 1990, archeologists from the Texas Water Development Board (TWDB) revisited the site during archeological reconnaissance for proposed wastewater facilities in Yellowhouse Canyon (Jurgens 1991). The site was characterized by a scatter of burned caliche nodules and lithic debitage in a plowed field and on the surrounding dirt roads. The 1990 researchers recommended the site be tested for NRHP eligibility based on the potential for intact buried cultural resources below the agricultural plow zone or in surrounding areas (Jurgens 1991). A 2002 revisit by the QRC confirmed the presence of lithic material and burned rock in the plowed field; the QRC researchers recommended additional subsurface investigation to determine

the extent of intact deposits (Johnson 2005).

Site 41LU41 (see Appendix A, Figure 5-5) was initially recorded in 1975 by the Museum of Texas Tech University. At the time, the site was noted to consist of two hearthstones and two lithic unifaces. The site recorder recommended further investigation. In 2002, the QRC revisited the site but found no cultural material on the surface; subsurface investigation was recommended (Johnson 2005).

A scatter of lithic material found in association with burned caliche was recorded in 1975 as site 41LU43 (see Appendix A, Figure 5-1). No subsurface investigation was conducted at the time, and only non-diagnostic lithic artifacts were recovered. A 1990 surface investigation found no evidence of the site on the surface, and the researcher recommended subsurface testing (Jurgens 1991). No surface manifestations of the site were noted in 2002, either, although investigators noted that subsurface exploration would be necessary to determine the remaining extent of the site (Johnson 2005).

Site 41LU45 (see Appendix A, Figure 5-5) was recorded in 1975 as a lithic scatter on the surface in a construction area (Johnson and Stafford 1976). No subsurface investigation was conducted, but numerous artifacts were collected at the time, ranging in date from Late Archaic to early Historic (Johnson and Stafford 1976). A 2002 visual inspection of the site suggested the possibility that intact subsurface deposits may exist (Johnson 2005).

Another lithic scatter found in 1975 was recorded as site 41LU46 (see Appendix A, Figure 5-5). Again, no subsurface investigation was conducted, but lithic artifacts collected from the surface have been tentatively dated to the Late Archaic and Protohistoric to early Historic periods (Johnson 2005). Work in 1978, in advance of proposed construction, recovered additional lithic material and two hearths (Mayer-Oakes and Alvey 1978). A mitigation project later in 1978 determined that the site consisted of only a lithic scatter, two projectile points, a pottery sherd, burned caliche, and one hearth (Johnson 1978). Backhoe trenching and shovel testing in 1997 revealed no subsurface cultural deposits (Hicks et al. 1997). In 2002 the westernmost portion of the site appeared to be the only portion of the site that was relatively undisturbed (Johnson 2005).

Site 41LU77 (Appendix A, Figure 5-3) was originally recorded in 1983 as part of the first survey conducted for the Northwest Sanitary Relief Main in the Canyon Lakes area (Judd et al. 1983). At the time, the site was noted to consist of a sparse scatter of historic debris and a small amount of chert debitage. At the time, no further work was recommended (Judd et al. 1983). A 2002 revisit found no surface manifestations of the site but noted that subsurface deposits might remain (Johnson 2005). QRC researchers returned to the site in 2005 and conducted extensive backhoe trenching. Their investigations revealed the

presence of intact prehistoric cultural features including bison bone beds, hearths, and occupational surfaces; the earliest materials appear to date to the Middle Archaic period (Johnson 2011).

Site 41LU78 (see Appendix A, Figure 5-3) was also originally recorded in 1983 during the survey of the proposed sanitary relief main (Judd et al. 1983). This site also included both historic and prehistoric artifacts in small quantities; no further work was recommended at the time (Judd et al. 1983). Researchers revisiting the site in 2002 noted no surface artifacts but recommended subsurface investigation to determine the remaining extent, if any, of the site (Johnson 2005).

During monitoring of the installation of the Northwest Sanitary Relief Main in 1985, archeologists first noted site 41LU82 (see Appendix A, Figure 5-3) (Campbell and Judd 1986). The site was recorded based on bison bones bearing cut marks and found in backdirt piles (Campbell and Judd 1986). No other cultural material was identified at the site, and the remains could not be tied to a particular stratigraphic location.

Site 41LU101 (see Appendix A, Figure 5-5) was recorded in 1994 during archeological survey at the Lubbock Lake Landmark preserve and was revisited in 1997 (Johnson 2002). Hearthstones constituted the vast majority of artifacts recovered from the site, but one lithic biface, several pieces of lithic debitage, one bone fragment, and one ceramic sherd were also recorded (Johnson 2002).

Site 41LU128, the Herrera Site (see Appendix A, Figure 5-4), was recorded during a 2003 QRC survey of a portion of Yellowhouse Canyon (Johnson 2005). Based on backhoe trenching, the site seems to retain evidence of at least four cultural occupation zones beginning in the Middle Archaic. The researchers noted that “the site represents an excellent opportunity to examine an under-researched dynamic period of cultural stress and transition on the Southern High Plains” (Johnson 2005:784).

Site 41LU130, also known as the Nicola-Jane Site (see Appendix A, Figure 5-1), was identified during a 2002 QRC survey of a portion of Yellowhouse Canyon (Johnson 2005). The site yielded lithic debitage, hearthstones, and one Harrell point, a projectile point associated with the Protohistoric period. The recorders of the site noted that it was primarily a surface manifestation but that some buried deposits were present (Johnson 2005).

The Alex Site, 41LU131 (see Appendix A, Figure 5-4), was recorded in 2003 during a QRC survey of a portion of Yellowhouse Canyon (Johnson 2005). Although no diagnostic artifacts were recovered, the site appears to represent a Late Holocene campsite that has been partially destroyed by historic caliche quarrying (Johnson 2005).

Archeologists from the QRC recorded site 41LU134, the Nutmeg Site (Appendix A, Figures 5-2 and 5-3), in 2005 (Johnson 2011). The site was recorded as a canyon-rim site with the potential for intact subsurface archeological deposits; historic-period remains were also recovered (Johnson 2011). A 2009 revisit to the site, which included backhoe trenching, did not recover any prehistoric cultural material, although post-1950 historic trash was present (Bradle 2011).

The Mackenzie Park North Site, 41LU135 (see Appendix A, Figure 5-3), was also first recorded by QRC researchers in 2005 (Johnson 2011). The site appears to retain stratigraphically separated occupation surfaces dating to between the Early or Middle Archaic and Historic times. The QRC archeologists noted that the site had a "high potential to further the understanding of how climate change impacted hunter-gatherer groups from the latter part of the Early to Late Holocene periods" (Johnson 2011:653).

Site 41LU136 (see Appendix A, Figure 5-3) was first identified through subsurface trenching prior to proposed construction activities (some of which were later cancelled or postponed) (Johnson 2010). Between 2001 and 2004, extensive trenching at the site and numerous special studies revealed that the site had been occupied during every major cultural period since the terminal Pleistocene (Johnson 2010). Despite a relatively low density of cultural material, the site provided important insight into the prehistory and history of Yellowhouse Draw. A 2009 survey south of the site boundary as it was originally recorded yielded a surface scatter of lithic materials and resulted in the extension of the site boundary to the south (Hatfield 2009). The newly recorded southernmost portion of the site was found to not contribute to the eligibility of the site for inclusion on the NRHP or for listing as a SAL, and no further investigation was recommended for that portion of the site (Hatfield 2009).

During a large-scale survey conducted by the QRC in 2003 through 2005, site 41LU137 (Appendix A, Figure 5-2) was recorded. While no diagnostic artifacts were recovered, the large quantities of hearthstones, lithic debitage, and bone were dated based on association with stratigraphy of known ages (Johnson 2011). Materials from the site were dated to occupation levels between Paleoindian and Historic periods (Johnson 2011).

Site 41LU138 (see Appendix A, Figure 5-2) was also recorded by QRC researchers during the 2003 through 2005 survey (Johnson 2011). Like site 41LU137, 41LU138 yielded no diagnostic artifacts. However, like the cultural deposits from site 41LU138, the large quantities of hearthstones, lithic material, and bone were dated based on stratigraphy. The site appears to have been occupied repeatedly throughout the Holocene (Johnson 2011).

Site 41LU139 (see Appendix A, Figure 5-2), recorded during the 2003 through 2005 QRC survey, appears to have been occupied throughout the Holocene but especially frequently during the Late Archaic period (Johnson 2011). The types of cultural material found were similar to those recovered from sites 41LU137 and 41LU138 but were found in smaller quantities at site 41LU139 (Johnson 2011).

4 METHODS

The tasks for this archeological investigation were developed in coordination with the THC and are specific to each of the segments of line involved. General methods are discussed in section 4.1, and the specific impacts and approach at each individual proposed impact area are discussed in section 4.2. In all cases, investigation occurred as close to the proposed impact location as possible. If existing utility easements indicated heavy disturbance in the exact location of a proposed impact and to a comparable depth, no subsurface investigation was conducted. This was evaluated on a case-by-case basis in the field and was fully documented.

4.1 Pedestrian Survey

Survey methods complied with THC/CTA survey standards for the overall project area. A pedestrian survey of each proposed impact area was conducted to locate any archeological or historical sites that might have been adversely affected by construction and included a surface manifestation. The subject area was walked in parallel transects spaced sufficiently to adequately cover the unsurveyed portions of the proposed pipeline easement (the width of the easement varied depending on depth of impacts).

Had any sites been discovered, they would have been investigated and recorded on TexSite Archeological Data Collection forms (digital) for submittal to TARL. If surface visibility had been less than 30 percent at sites with surface manifestations, then a minimum of six shovel tests would have been excavated to delimit site boundaries.

4.2 Subsurface Examination

Shovel Tests

Shovel tests were excavated in settings that had potential for shallowly buried cultural horizons. Preliminary research indicated that deposits in the upland portions of the project area are less than 1 m (39 in) deep and are thus suitable for shovel testing. Shovel tests were at least 30 cm (12 in) in diameter and were excavated to the bottom of Holocene deposits. The shovel tests were dug in levels no thicker than 20 cm (8 in), and the excavated sediments were screened through 1/4-in hardware cloth. Had artifacts been recovered, they would have been collected for later analysis. The results of each shovel test were recorded on a purpose-designed form.

Deep Soil Testing

Backhoe trenching is a suitable means for testing for archeological deposits in areas that may contain deeply buried sites. The results of previous archeological investigation and the soils illustrated in the USDA Soil Survey of Lubbock County that are found within the subject area indicated that deep soil testing was necessary in portions of the project area. When necessary, backhoe trenches were excavated

in order to adequately examine these deposits. This testing was monitored by at least two archeologists, one who supervised the progress in the trench, examining the walls for cultural material, and one who examined the sediments being removed. Trench data was recorded and described, and photographs of trench walls were taken. In each trench, at least two 5-gallon buckets of backdirt from each stratigraphic unit were collected and screened through 1/4-in hardware cloth in the field unless high clay or water content required that the material be troweled through. In some cases (discussed in section 5.2, below), the samples were screened through 1/8-in hardware cloth. Although the investigation recovered little cultural material, samples of modern debris of potential use as time-diagnostic markers were collected.

Preliminary research indicated a possibility that, in some places, cultural material could be present to the full depth of proposed impacts. While every effort was made to excavate trenches to the proposed depth of impacts or to the bottom of Holocene deposits (whichever was reached first), trenches were terminated before safety was compromised.

4.3 Data Collection

Shovel test locations were recorded using a handheld Trimble GeoXH GPS unit, and shovel test data were recorded using a task-specific form. Backhoe trench profiles were recorded on graph paper as were notes about each backhoe trench. General project photographs were taken as were photographs of trench profiles. Records, including field notes, were prepared to meet the curation standards of the Texas Archeological Research Laboratory.

5 RESULTS OF INVESTIGATION

The intensive survey for the Lubbock Canyon Lakes Sanitary Sewer Interceptor Rehabilitation Project resulted in the recording of no new archeological sites. Eleven segments or sets of segments and 13 proposed new manhole locations were investigated, for a total of approximately 11 acres of surface area surveyed. Eighteen backhoe trenches and four shovel tests supplemented pedestrian survey in areas that had potential for buried deposits. A few pieces of debitage were found in one trench (see NWL-059A, below), but these were underlain by a layer of asphalt chunks and modern debris. Several trenches contained modern debris to varying depths; most of this is believed to be debris pushed into the draw following the 1970 tornado. In no case did the debris appear to represent the intact remains of any structure or feature. See Appendix B for an inventory of collected artifacts and photographs of the more distinctive of those items.

5.1 Impact Areas: New Segments

The proposed project impacts at each of the following locations will consist of either open-cut trenching or a combination of open-cut trenching and boring for purposes of sewer line replacement (Appendix A, Figures 6-1 through 6-16). Other segments, not investigated, will be rehabilitated from inside the existing pipe, creating no new impacts to the ground. Open-cut trenches for proposed impacts less than 6 m (20 ft) deep will be approximately 1.4 m (4.5 ft) wide. Trenches for impacts greater than 6 m (20 ft) deep will vary in width depending on depth, so the deeper the proposed impact, the wider the trench.

Segment 1

Segment 1 currently consists of a combination of metal and non-metal pipe running between an existing manhole southeast of the southernmost dam on the Canyon Lakes system, west of the BNSF railroad tracks, and east of the City of Lubbock Cemetery (Appendix A, Figure 6-1). A large portion of the segment is above ground (aerial). The proposed replacement segment is to be offset from the original alignment by approximately 3 m (10 ft) and will also be largely above ground. The pipe will be approximately 9.1 m (30 ft) below the ground surface at the point at which the ground surface is highest, although the ground surface along much of the line is no more than about 1.5 m (5 ft) above the level of the proposed pipe. The proposed new sections of 30-in sewer line total 230 m (755 ft) in length. The installation of three new manholes is proposed for the point at which the proposed new segment would connect to the original line and for two additional locations on the proposed new segment (see Appendix A, Figure 6-1). The City also proposes to replace the existing manhole at the southern end of the alignment.

Two backhoe trenches were excavated along the proposed alignment (Table 4; Photo 2). Trench 1 reached 120 cm (about 4 ft) below the surface, and screening of

approximately 10 gallons of fill from each stratigraphic unit yielded no artifacts. Trench 3 reached 250 cm (just over 8 ft) below the surface and also yielded no artifacts. The southern portion of the proposed alignment was not investigated due to evidence of massive landscape alteration and other disturbance. Raised railroad tracks, a flattened area where numerous sewer and water lines converge and where manholes provide access, and an area of bike and walking paths all indicate significant disturbance to the ground (Photos 3 and 4).

Table 4. Segment 1 Trench Results.

Trench	Zone	Depth (cmbs)	Description
1	I	0-50	10YR 4/4 dark yellowish brown gravelly fine sandy loam; thick bed; smooth, clear boundary; weak, fine, subangular structure; many very fine and fine roots; common, coarse carbonate nodules increasing with depth; friable; A.
	II	50-100	10YR 5/4 yellowish brown very gravelly sandy loam; thick bed; smooth, clear boundary; weak, fine, subangular, blocky structure; few fine roots; common, coarse calcium carbonate nodules; friable; Bk.
	III	100-120+	10YR 7/4 very pale brown fine sandy loam; boundary unknown; few, fine calcium carbonate nodules, friable, BCk.
3	I	0-75	10YR 5/4 yellowish brown fine sandy loam; thick bed; clear, wavy boundary; weak, fine, subangular, blocky structure; friable; many medium calcium carbonate nodules; many very fine and fine roots. A.
	II	75-95	10YR 4/4 dark yellowish brown fine sandy loam; medium bed; smooth, clear boundary; common, fine calcium carbonate nodules; this zone is basin-shaped and discontinuous across the trench and may be an old stream channel. Buried A.
	III	95-105+	10YR 6/4 light yellowish brown fine sandy loam; thick bed; smooth, gradual boundary; about five percent calcium carbonate calcium carbonate nodules. Bk.
	IV	220-240	7.5YR 7/6 reddish yellow sandy silt; medium bed; smooth clear boundary; granular structure; loose; about ten percent calcium carbonate calcium carbonate nodules and cobbles. BCk.
	V	240-250	bedrock

Photo 2. Setting for Trench 1 and Trench 3, at proposed location of Segment 1 (parallel to existing line), facing north.

Photo 3. Proposed location of Segment 1 (parallel to existing line), facing south toward railroad tracks from Trench 3.

Photo 4. Proposed location of Segment 1, facing south from railroad tracks.

Segment 3

Segment 3 currently consists of a metal pipe that runs under SH114 with non-metal sections of pipe at both ends (Appendix A, Figure 6-4). The proposed new segment comprises two sections of 30-in sewer line; one section will be 88.4 m (290 ft) and the other will be 33.2 m (109 ft) in length, and the two sections will be connected by a proposed new manhole. The proposed new segment will connect to the existing line with two new manholes, one at each end. Approximately 66.5 m (218 ft) of the longer section of line will be bored beneath SH114. The portion of the segment that is deepest underground will be approximately 4.3 m (14 ft) deep.

Due to the evidence that the area north of SH114 is heavily disturbed, no investigation was conducted in that area. The portion of the segment south of SH114 was investigated through backhoe trenching (Photo 5). Trench 2 reached 270 cm (almost 9 ft) below the surface (Table 5). Approximately 12 gallons of matrix (2 gallons from each of 6 stratigraphic units) were screened through 1/4-in hardware cloth, but no cultural material was recovered.

Photo 5. Proposed location of Segment 3, facing north.

Table 5. Segment 3 Trench Results.

Trench	Zone	Depth (cmbs)	Description
2	I	0-20	10YR 4/3 brown sandy loam; fill.
	II	20-30	10YR 6/6 brownish yellow sand; fill.
	III	30-50	10YR 6/3 pale brown fine sandy loam; thick bed; smooth, gradual boundary; weak, fine, subangular, blocky structure; friable; few, medium calcium carbonate nodules; few fine roots. Bw.
	IV	50-150	10YR 6/3 pale brown fine sandy loam; thick bed; smooth, clear boundary; weak, fine subangular, blocky structure; very friable; few, fine calcium carbonate nodules; few, fine roots. Bk1.
	V	150-190	10YR 6/2 light brownish gray fine sandy loam; thick bed; smooth, clear boundary; weak, fine, subangular, blocky structure; firm; slickensides; many, coarse, faint mottles of 10YR 8/1 white. Bk2.
	VI	190-270	10YR 8/1 white sandy silt; about thirty percent calcium carbonate calcium carbonate nodules and cobbles. BCk.

Segment 4

This segment currently crosses below East Broadway from the south to the north and then angles to the northwest (Appendix A, Figure 6-5). The proposed new segment of 30-in sewer line will measure 116 m (380 ft) long and will connect to the existing line via two new manholes. Forty-two meters (138 ft) of the new line will be bored to cross below East Broadway. At its deepest point below the ground surface, the proposed segment will be 6.7 m (22 ft) below the ground.

Backhoe trenches were excavated at both the south and north ends of proposed Segment 4. The portion of the proposed alignment south of East Broadway runs across the edge of site 41LU137, and along that portion of the proposed alignment, samples of deposits from each stratigraphic unit were collected and screened through 1/8-in hardware cloth. This proposed impact area is within the boundaries of the American Wind Power Center. Trench 17, excavated in this area, reached 310 cm (10 ft) below the surface (Photo 6). Up to 125 cm (4 ft) below the surface, fill was mixed with modern debris. Below that depth, sediments appeared to be relatively intact, although no evidence of soil development was encountered (Table 6). No artifacts were recovered from the approximately 10 gallons of matrix that were screened through 1/8-in hardware cloth. North of East Broadway, the alignment crosses into the property of the Bayer Museum of Agriculture, the grounds of which have undergone considerable landscape modification. Trench 18 (Photo 7), excavated in this area, yielded fill and modern debris to about 60 cm (2 ft) below the surface (see Table 6).

Photo 6. Setting for Trench 17 at south end of proposed location of Segment 4, facing northwest.

Table 6. Segment 4 Trench Results.

Trench	Zone	Depth (cmbs)	Description
17	I	0-80	10YR 3/3 dark brown silty loam; subangular, blocky structure; friable; 10% small calcium carbonate nodules; common, fine roots; wavy, gradual boundary; fill
	II	80-125	Modern debris (cinder block fragments, stainless steel wire, glass, brick fragments); clear, wavy boundary; fill
	III	125-210	10YR 3/3 dark brown silty loam; subangular, blocky structure; friable; 10% small calcium carbonate nodules; gradual, wavy boundary; fill
	IV	210-295	7.5YR 4/6 strong brown sandy loam; granular structure; 10% small calcium carbonate nodules; gradual, wavy boundary; fill
	V	295-310	7.5YR 5/4 brown sand; granular structure; small calcium carbonate nodules; boundary unknown; fill
18	I	0-60	7.5YR 4/6 strong brown fine, compact sandy loam; granular structure; 20% small calcium carbonate nodules; modern trash near 60 cmbs (concrete, glass, metal); clear, wavy boundary; fill
	II	60-150	degraded bedrock, increasingly consolidated with depth

Photo 7. Setting for Trench 18 at north end of proposed location of Segment 4, facing southeast.

Segment 5

Segment 5, a 152-m- (500-ft-) long section of 24-in sewer line will be replaced in place, within the existing easement (Appendix A, Figure 6-7). A portion of the segment crosses the North Fork of the Double Mountain Fork of the Brazos River and is supported on concrete piers. Since the segment lies within the boundary of site 41LU77, backhoe scraping of the surface above the existing pipe was proposed in order to determine the width of the existing trench. However, the line is only very shallowly buried where it is buried at all, and conditions in the field indicated that the entire area surrounding the alignment was heavily disturbed; therefore no subsurface investigations were conducted (Photos 8-10).

Photo 8. Segment 5, facing south from north end.

Photo 9. Segment 5, aerial portion, facing south from north side of tributary.

Photo 10. Segment 5, facing north from south end.

Segments 6 and 7

These segments will create a new angle of 24-in sewer line crossing below SH62 near Canyon Lake Drive (Appendix A, Figure 6-8). The total length of the proposed new segments is 127.4 m (418 ft), and the maximum depth is 4 m (13 ft). The new impacts would also include the installation of three new manholes along these segments and the replacement of two existing manholes. The western portion of the proposed alignment crosses onto the property of Joyland Amusement Park and runs immediately adjacent to the berm that was created to support SH62. Since the area is already heavily disturbed due to road impacts, no subsurface investigation was conducted (Photos 11-13).

Photo 11. Proposed location of Segments 6 and 7, facing west from intersection of two segments.

Photo 12. Proposed location of Segments 6 and 7, facing south from intersection of two segments.

Photo 13. Proposed location of Segments 6 and 7, facing north from south end.

Segments 12, 13, and 14

Segments 12, 13, and 14 run north of East Cornell Street between approximately Avenue S and just east of Avenue Q (Appendix A, Figure 6-11). These segments total 562 m (1,844 ft) in length and will be placed at a maximum depth of 5.2 m (17 ft) below the surface. The proposed line will be bored under the streets and under an existing storm drain and will require three new manholes. The individual sections, connected to one another via manholes, will measure approximately 105 m (344 ft); 235 m (770 ft), of which 48 m (157 ft) will be bored; 190 m (621 ft), of which 84 m (275 ft) will be bored; and 33 m (109 ft) of 24-in sewer line. Shovel tests were sufficient to reach bedrock, and all four shovel tests excavated along the proposed line were negative for cultural material (Table 7; Photos 14 and 15).

Table 7. Segments 12, 13, and 14 Shovel Test Results.

Shovel Test	Depth (cmbs)	Description
db01	0-23	7.5YR 6/6 reddish yellow to brown, fine-grained sand; 35% small calcium carbonate nodules; terminated at bedrock
db02	0-48	7.5YR 5/3 brown, fine-grained sand; 30% small to medium calcium carbonate nodules; several fragments of glass; terminated at bedrock
jk01	0-40	7.5YR 6/4 light brown, fine-grained sand; 60-80% small to medium calcium carbonate nodules; terminated at bedrock
js01	0-35	7.5YR 6/4 light brown; large calcium carbonate nodules and cobbles; terminated at bedrock

Photo 14. Proposed location of Segments 12, 13, & 14, facing east from western end of alignment.

Photo 15. Proposed location of Segments 12, 13, & 14, facing west from eastern end of alignment.

Segment 15

Proposed Segment 15 will cross the intersection of Erskine and Avenue U (Appendix A, Figure 6-12). This segment will consist of 87.5 m (287 ft) of 24-in sewer line and will be 3 m (10 ft) deep at its deepest point. It will connect to the existing line via two new manholes, one at each end of the proposed new section. A proposed 36.6-m-(120-ft-) long section of 4-in sewer line will extend north from the southern manhole. At the time the fieldwork was conducted, the proposed approach to installation of this segment was open-cut trenching. Since that time the City of Lubbock has requested both the 24-in and the 4-in sections be bored underneath the road intersection, and the engineering plans have been revised accordingly. Most of this segment is within the boundary of the Canyon Lakes Archeological District. Investigations included trenching at the north end, outside the roadway. Trenching of the southern portion of the alignment had also been proposed, but the presence of a heavily disturbed utility easement across the entire southern portion of the alignment precluded this effort (Photo 16).

Photo 16. Proposed location for southern portion of Segment 15, facing northwest. Note utility easement in foreground.

Backhoe Trench 4 (Photo 17), at the northern end of the proposed alignment and on the northwest corner of the intersection, yielded modern structural debris, almost certainly related to the 1970 tornado, to 3 m (almost 10 ft) below the surface, which was the maximum depth of the excavation (Table 8; Photo 18). The original proposal for archeological investigation had included monitoring of the excavation of the construction trench to be cut through the road, but the presence of deep deposits of

modern debris on one end and a heavily used utility easement on the other indicate a low likelihood that the road overlies intact archeological deposits. In addition, the revised proposal, which includes boring under the road intersection, makes monitoring unnecessary.

Photo 17. Setting for Trench 4, at proposed location of Segment 15. View is from northwest end of alignment facing southeast.

Table 8. Segment 15 Trench Results.

Trench	Zone	Depth (cmbs)	Description
4	I	0-300	Historic and modern debris; clay bricks, including an Acme Ferris brick, concrete, coke bottles, various pieces of glass, metal, etc.; fill

Photo 18. Trench 4. Note bricks and other building debris at bottom of trench.

Segment 16

This segment is also within the Canyon Lakes Archeological District. It crosses North University Avenue south of two of the lakes (Appendix A, Figure 6-13). This proposed segment comprises two sections of 24-in sewer line, one of 76.2 m (250 ft) and one of 86 m (282 ft), connected to one another by a new manhole. The proposed new segment will connect to the existing line via an existing manhole on the west end and a proposed new manhole on the east end. The deepest impacts will be 7.6 m (21 ft) below the surface. A portion of the longer section will be bored under North University Avenue.

Two backhoe trenches, Trench 5 and Trench 6, were excavated along the proposed alignment. Trench 5 (Photo 19) revealed modern debris overlying multiple layers of asphalt between 100 and 140 cm (39 and 54 in) below the surface (Photo 20). Underlying this debris was unconsolidated bedrock (Table 9). Trench 6 reached 200 cm (79 in) below the surface, and modern debris was recovered from all depths (see Table 9; Photo 21).

Photo 19. Setting for Trench 5, at proposed location of Segment 16, west of University Avenue facing east.

Photo 20. Trench 5, south wall profile.

Table 9. Segment 16 Trench Results

Trench	Zone	Depth (cmbs)	Description
5	I	0-30	10YR 6/2 light brownish gray sand and gravels; fill.
	II	30-50	7.5YR 4/6 strong brown clay; fill.
	III	50-120	10YR 7/2 light gray gravelly loam; clay brick fragments; broken pvc pipe at top of zone; fill.
	IV	120-140	7.4YR 4/6 strong brown clay; four layers of asphalt interbedded with clay; fill.
	V	140-180	7.5YR 8/3 pink gravelly silt; thick bed; smooth, clear boundary; granular structure; loose; some fill debris still present; BCk.
	VI	150-250	7.5YR 8/2 pinkish white gravelly silt; thick bed; boundary unknown; granular structure, loose; BCk2.
6	I	0-50	10YR 5/3 brown sandy loam; fill.
	II	50-90	7.5YR 7/6 reddish yellow loam; brick and metal fragments; fill.
	III	90-120	10YR 4/3 brown loam; asphalt and brick fragments, large concrete blocks; fill.
	IV	120-200	7.5YR 7/6 reddish yellow loam; structural debris; fill.

Photo 21. Setting for Trench 6 at proposed location of Segment 16, eastern portion of alignment, facing east.

Segment 17

This proposed segment will cross Loop 289 just west of Landmark Lane (Appendix A, Figure 6-15). The northern end of the proposed segment crosses into the boundary of the Lubbock Lake Site Archeological District, and one new manhole is proposed for that end of the alignment. The proposed segment is composed of two sections of 24-in sewer line, one of 105.8 m (347 ft) and one of 6.1 m (20 ft). Almost the entire length of the longer section (96.3 m or 316 ft) will be bored under Loop 289. This segment will connect to the existing line via a proposed new manhole at the northern end of the line and an existing manhole at the southern end of the line. The maximum depth of impacts is 6.1 m (20 ft) at the southern end of the proposed segment; at the northern end of the proposed alignment the ground level is lower and the pipe is approximately 3 m (10 ft) below the surface. Due to the fact that almost the entire proposed segment will be bored under Loop 289, no investigations were conducted (Photo 22).

Photo 22. Proposed location for Segment 17, facing south from north end.

Segment 18

Proposed Segment 18 begins south of US 84 and north of the Loop 289 access road and crosses the edge of a field, the Loop 289 access road, another small field, US 84, and the edge of another field before terminating just west of Landmark Lane (Appendix A, Figure 6-16). The proposed segment comprises four sections that will be connected to the existing lines via existing manholes and will be connected to one another via two proposed new manholes. The southernmost section of Segment 18 consists of approximately 129 m (423 ft) of proposed 8-in sewer line. The other sections, all of 30-in sewer line, measure 83.2 m (273 ft), 75.3 m (247 ft) of which 69.5 m (228 ft) will be bored under US 84, and 41.8 m (137 ft). The maximum depth of impacts is 7.6 m (23 ft). One backhoe trench was placed within the southeastern-most portion of the proposed location of Segment 18 (Photo 23). The proposed locations of the other portions of the segment are in areas that have clearly been heavily disturbed in modern times (Photo 24). Backhoe Trench 7 revealed very shallow, very disturbed deposits (Table 10).

Photo 23. Proposed location for eastern portion of Segment 18. View is from railroad tracks, facing east. Eastern end of alignment coincides with manhole visible in middle distance.

Photo 24. Proposed location for western portion of Segment 18, facing east.

Table 10. Segment 18 Trench Results.

Trench	Zone	Depth (cmbs)	Description
7	I	0-30	7.5YR 7/6 reddish yellow silty loam; subangular blocky structure; 5% large calcium carbonate nodules; gradual, wavy boundary
	II	30-40	7.5YR 6/6 reddish yellow loam; blocky structure; 40% large calcium carbonate nodules; clear, wavy boundary
	III	40-65	unconsolidated bedrock

Segment 28

Proposed Segment 28 is located just southeast of Segment 5 and is also inside the boundary of site 41LU77 (see Appendix A, Figure 6-7). The proposed new segment comprises one section, measuring less than 6 m (20 ft) long, of 30-in sewer line. It will connect to the existing alignment via two proposed new manholes. The maximum depth of this segment is 2.7 m (9 ft).

Because proposed Segment 28 is within the boundary of site 41LU77, which has been demonstrated to retain intact archeological deposits, the proposed location of the segment was investigated through backhoe trenching and screening of samples through 1/8-in hardware cloth. To avoid impacts to potentially undisturbed portions of the site, LAN proposed to place the new segment as near to the existing sewer line as was possible. Trench 8 (Photo 25), placed immediately adjacent to the proposed alignment, revealed heavily disturbed deposits as deep as 220 cm (7 ft) below the surface (Photo 26). Modern trash, including snack wrappers, elastic bands from clothing, and plastic bags were recovered (Table 11). Had the deposits appeared to be undisturbed, hand excavation of a 1-x-1-m (39-x-39-in) test unit was planned. However, the disturbed nature of the sediments indicated that the proposed alignment in this area will not impact an intact portion of site 41LU77, and no hand excavation was conducted.

Photo 25. Setting for Trench 8 at proposed location of Segment 28, facing north.

Photo 26. Trench 8, west wall profile.

Table 11. Segment 28 Trench Results.

Trench	Zone	Depth (cmbs)	Description
8	I	0-220	10YR 5/3 brown sandy loam; fill; large amounts of modern trash (plastic, elastic, cellophane, etc).

5.2 Impact Areas: New Manholes

Nine new manholes (referred to as NWLs) are also planned for segments of the existing line that are not being replaced (see Appendix A, Figures 6-1 through 6-16). The installation of an additional 4 manholes is possible in order to maintain a distance of no more than 244 m (800 ft) between manholes along the entire alignment. The total ground disturbance at each new manhole location is not expected to exceed a 3-m- (10-ft-) square area, and the maximum depth of disturbance will be equal to the depth of the existing pipe at each location. The exact locations of the proposed new manholes have not been determined, although a range of locations was provided for each proposed manhole. The placement of the manholes within the ranges will depend on conditions at each location. Near the range for each proposed approximate new manhole location, backhoe trenching with sampling was utilized to investigate the area for archeological material. Backhoe trenches were offset from the actual alignment to avoid damage to the existing sewer lines. In cases in which existing utility easements indicate heavy disturbance in a proposed manhole location, no investigation was conducted.

NWL-003A and NWL-004A

These proposed locations for new manholes are located on a steep slope immediately adjacent to Canyon Lake Drive (Appendix A, Figure 6-2). No investigation was conducted in these locations due to the low likelihood of encountering intact archeological deposits in this particular setting (Photos 27 and 28).

Photo 27. Proposed location of NWL-003A, facing south from north end.

Photo 28. Setting for proposed location of NWL-004A, facing south.

NWL-008A

This proposed new manhole location is just north of Canyon Lake Drive in an area covered with mountain bike trails (Appendix A, Figure 6-3). One backhoe trench, Trench 16, was excavated near the existing alignment (Photo 29). The trench reached 130 cm (51 in) in depth and yielded no cultural material (Table 12).

Photo 29. Setting of Trench 16 at proposed location of NWL-008A, facing north.

Table 12. NWL-008A Trench Results.

Trench	Zone	Depth (cmbs)	Description
16	I	0-20	7.5YR 4/3 brown silty loam; subangular blocky structure; 10% small calcium carbonate nodules; clear, smooth boundary. Ap.
	II	20-27	7.5YR 5/3 brown sandy loam; granular structure; very gravelly; abrupt, wavy boundary. A.
	III	27-30	7.5YR 2.5/2 very dark brown silty loam; blocky structure; abrupt, wavy boundary. Ab.
	IV	30-55	10YR 5/3 brown fine sandy loam; granular structure 60% calcium carbonate nodules (large and small); gradual, broken boundary. Bk.
	V	55-130	10YR 6/2 light brownish gray, 75% large rocks; boundary unknown. BCk.

NWL-021A

The proposed location for this new manhole is along a 120-m (394-ft) section of sewer line on the property of the Bayer Museum of Agriculture (Appendix A, Figure 6-6). While pedestrian survey was conducted, no subsurface investigation of this section was completed due to the presence of a metal building and numerous pieces of agricultural equipment directly above the proposed impact area (Photo 30). In addition, the areas to both the north and the south of the metal building have clearly undergone extensive landscape modification in recent years. Due to the extent of obvious disturbance, no further investigation is recommended.

Photo 30. Proposed location of NWL-021A, facing north from near south end.

NWL-023A

The proposed location for manhole NWL-023A is on land currently in use as a disk golf course (see Appendix A, Figure 6-7). The backhoe trench, Trench 15 (Photo 31), reached 100 cm (39 in) below the surface and yielded one possible lithic flake from the upper 70 cm, but there was no evidence of intact archeological deposits (Table 13).

Photo 31. Proposed location for NWL-023A, facing east from west end.

Table 13. NWL-023A Trench Results.

Trench	Zone	Depth (cmbs)	Description
15	I	0-70	10YR 3/2 very dark grayish brown silty loam; subangular, blocky structure; few calcium carbonate nodules, 1 possible lithic flake; gradual, wavy boundary. A.
	II	70-100	10YR 5/4 yellowish brown compact sandy loam; streaks of 10YR 5/3 brown sandy loam; granular structure; 30% medium calcium carbonate nodules, increasing with depth; boundary unknown. Bk.

NWL-026A and NWL-027A

These proposed manhole locations are within the boundaries of Joyland Amusement Park and immediately adjacent to the base of the berm on which SH 82 is located (see Appendix A, Figure 6-8). The overall area reflects the removal of fill to create the road berm, and numerous other changes to the landscape are apparent (Photos 32 and 33). Due to the high degree of disturbance evident from the settings of the proposed manholes, no subsurface investigation was completed at these locations.

Photo 32. Proposed location of NWL-026A, facing west.

Photo 33. Proposed location of NWL-027A, facing southwest.

NWL-031A

The proposed location of this manhole is within a 160-m (525-ft) range just east of I 27 (Appendix A, Figure 6-9). Approximately half of the range of potential locations is underneath a parking lot. Two backhoe trenches were placed northwest of the parking lot along the northern half of the proposed range (Photo 34). Trench 13 was placed at the bottom of the slight slope that rises to the south. This trench reached 300 cm (almost 10 ft) below the surface and yielded no cultural material (Table 14). Trench 14 was placed on the slope and reached only 30 cm (12 in) below the ground surface before hitting unconsolidated bedrock. Excavation continued to 80 cm (32 in) in increasingly dense bedrock before being terminated (see Table 14).

Photo 34. Locations of Trench 13 (foreground, see cleared area in shade of tree) and Trench 14 (background, where backhoe is stationed), facing southwest.

Table 14. NWL-031A Trench Results.

Trench	Zone	Depth (cmbs)	Description
13	I	0-120	10YR 4/3 brown loose silty loam; subangular, blocky structure; 10% small calcium carbonate nodules, few larger calcium carbonate nodules; clear, wavy boundary. A.
	II	120-200	7.5YR 5/4 brown, increase in clay content, pockets of 10YR 4/3 loose silty loam; gradual, wavy boundary. Bw.
	III	200-300	2.5Y 7/3 pale brown sand; granular structure; some calcium carbonate nodules, increase in size of calcium carbonate nodules with depth; boundary unknown. Bk.
14	I	0-30	10YR 3/3 dark brown silty loam; blocky structure; many small calcium carbonate nodules; pockets of 5YR 4/6 yellowish red silty clay loam; clear, wavy boundary. A.
	II	30-80	unconsolidated bedrock BCk.

NWL-034

The proposed location for this manhole is within Aztlan Park, within a 156-m (512-ft) range (Appendix A, Figure 6-10). Backhoe Trench 12 was placed near the eastern end of this alignment, outside the main portion of the park and east of the walking path (Photo 35). This location was chosen with the aim of not disturbing the irrigation system that underlies most of the park but does not extend as far east as the backhoe trench location. The trench reached 65 cm (26 in) before hitting unconsolidated bedrock. Excavation was continued, through increasingly consolidated stone, to 170 cm (approximately 5.5 ft) below the surface. Although there was modern debris in the trench, no intact cultural features were observed (Table 15; Photo 36).

Photo 35. Setting of Backhoe Trench 12 at proposed location of NWL-034, facing west.

Table 15. NWL-034 Trench Results.

Trench	Zone	Depth (cmbs)	Description
12	I	0-22	10YR 3/2 very dark grayish brown silty loam; blocky structure; 10% small calcium carbonate nodules; clear, smooth boundary. Ap.
	II	22-50	10YR 7/3 very pale brown silty loam; 80% calcium carbonate nodules; gradual, wavy boundary. A.
	III	50-62	10YR 5/3 brown silty loam, 20% calcium carbonate nodules, some modern debris (glass, animal bone, charcoal); clear, wavy boundary, Bk.
	IV	62-170	10YR 8/1 white unconsolidated bedrock. BCk.

Photo 36. Trench 12, south wall profile.

NWL-057A

Backhoe Trench 9 was excavated adjacent to the proposed location for NWL-057A, within Helen Hodges Park, west of University Avenue (see Appendix A, Figure 6-13). The proposed location for the new manhole is within a 155-m (509-ft) range. Backhoe Trench 9 was placed near the middle of the location range (Photo 37). The trench was excavated to 190 cm (about 6.25 ft) below the ground surface. It yielded chunks of asphalt from around 55 cm (22 in) below the surface along with a section of chain, fragments of painted stucco, brick fragments, and other modern debris (Table 16; Photo 38). The modern materials found in this trench are consistent with debris from the 1970 tornado.

Photo 37. Setting for Trench 9 at proposed location of NWL-057A, facing west.

Table 16. NWL-057A Trench Results.

Trench	Zone	Depth (cmbs)	Description
9	I	0-20	10YR 4/3 brown silty loam, 5% large calcium carbonate nodules; blocky structure; abrupt, wavy boundary
	II	20-55	7.5YR 3/4 dark brown clay loam, 5% large calcium carbonate nodules, chunks of asphalt around 55 cmbs; clear, smooth boundary
	III	55-130	7.5YR 6/4 light brown sandy loam, 75% large calcium carbonate nodules; modern debris; clear, wavy boundary
	IV	130-190	7.5YR 4/4 brown loose clay loam, few calcium carbonate nodules; modern debris; boundary unknown

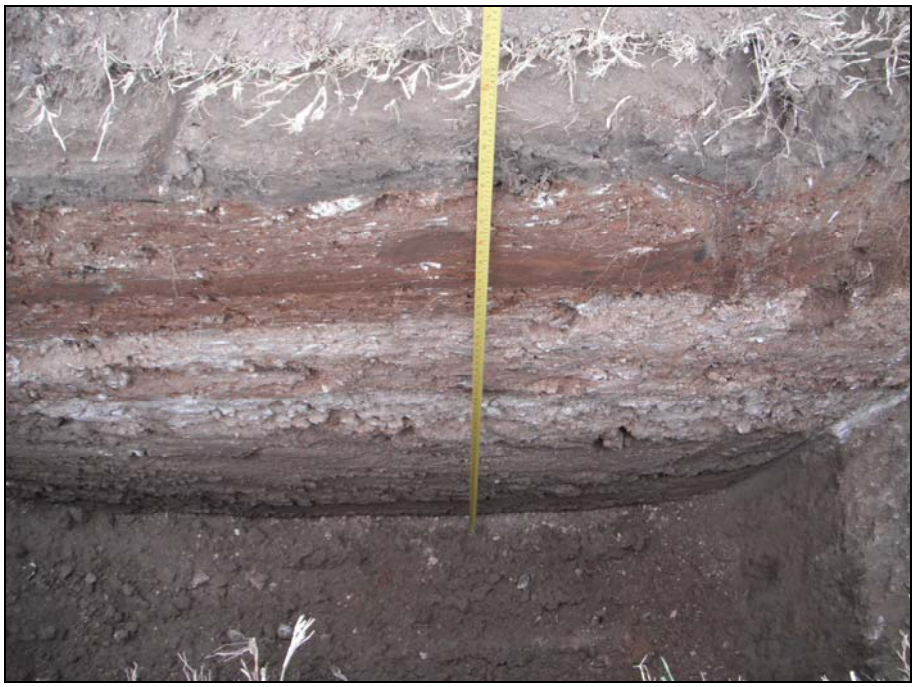

Photo 38. Trench 9, south wall profile.

NWL-059A

The range of proposed locations for NWL-059A stretches across 210 m (689 ft) along the west side of one of the Canyon Lakes on the west side of Helen Hodges Park (Appendix A, Figure 6-14). The alignment runs east of a small bluff that appears to be at least partially artificial. The bluff rises to the west and is topped by an industrial complex with warehouses and spoil piles of dirt, gravels, and asphalt. Backhoe Trenches 10 and 11 were excavated along this range of locations, adjacent to the existing sewer line (Photo 39). Trench 10 reached unconsolidated bedrock at about 55 cm (22 in) but was continued to 80 cm (32 in) below the surface through increasingly dense limestone (Table 17; Photo 40). Trench 11 reached unconsolidated bedrock at 85 cm (33 in) below the surface but was continued to 120 cm (4 ft) (see Table 17; Photo 41).

Photo 39. Setting for Trench 10 and Trench 11, at proposed location of NWL-059A, facing northwest.

Table 17. NWL-059A Trench Results.

Trench	Zone	Depth (cmbs)	Description
10	I	0-12	10YR 4/2 dark grayish brown silty loam; blocky structure; wavy, gradual boundary; fill.
	II	12-18	7.5YR 5/3 brown silty loam; blocky structure; wavy, gradual boundary; fill.
	III	18-27	10YR 4/3 brown mottled with 10YR 5/2 grayish brown silty loam; wavy, abrupt boundary; fill.
	IV	27-35	7.5YR 3/1 very dark gray silty clay loam; smooth, abrupt boundary; fill.
	V	35-50	7.5YR 4/6 strong brown silty loam, few calcium carbonate nodules; wavy, abrupt boundary; fill.
	VI	50-55	10YR 3/3 dark brown silty clay loam, fine, very few calcium carbonate nodules; smooth, very abrupt boundary; fill
	VII	55-80	10YR 8.5/1 white unconsolidated bedrock
11	I	0-20	10YR 7/2 light gray gravelly loam; fill; wavy, gradual boundary; fill.
	II	20-30	7.5YR 7/6 reddish yellow silty loam, 5% small calcium carbonate nodules; wavy, gradual boundary; fill.
	III	30-45	7.5YR 5/8 strong brown clay loam, 20% small calcium carbonate nodules; wavy, gradual boundary; fill.
	IV	45-105	modern debris (plastic, metal, asphalt, etc.); wavy, clear boundary; fill.
	V	105-120	10YR 8/1 white unconsolidated bedrock

Photo 40. Trench 10, west wall profile.

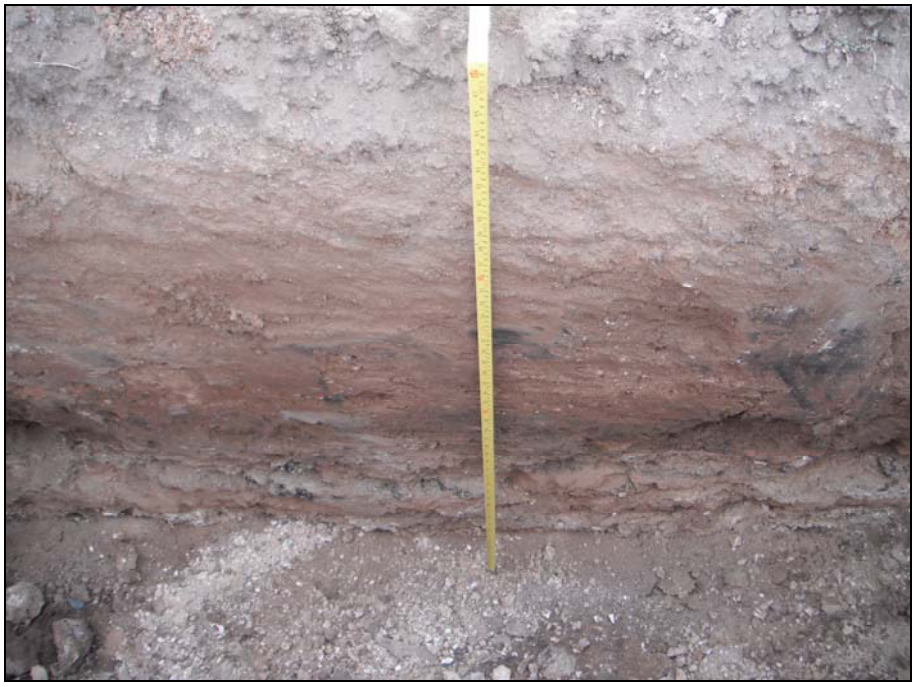

Photo 41. Trench 11, west wall profile.

NWL-064A

This proposed manhole location is sited south of Loop 289 and east of Gary Avenue, north of NWL-059A and on the slope leading to the industrial complex that covers the slight bluff to the west (see Appendix A, Figure 6-15). Due to obvious landscape modification, no subsurface investigation of this area was undertaken (Photo 42).

Photo 42. Proposed location of NWL-064A, facing northwest.

NWL-065A

The location range for this proposed new manhole is south of and immediately adjacent to Loop 289, within a heavily used utility easement (see Appendix A, Figure 6-15). Due to the evidence of heavy disturbance, no archeological investigations were conducted at this location (Photo 43).

Photo 43. Proposed location of NWL-065A, facing east.

6 CONCLUSIONS AND RECOMMENDATIONS

In advance of the rehabilitation of a sanitary sewer interceptor in the City of Lubbock, Lubbock County, Texas, archeologists from aci consulting conducted a pedestrian survey, shovel testing, and backhoe trenching in accordance with CTA and THC guidelines. This work was conducted in compliance with the Texas Administrative Code (13 TAC 26) under Permit 7105. Eighteen backhoe trenches, totaling 90 m (295 ft) in length by 0.6 m (2 ft) in width, and four shovel tests were excavated, and a total of approximately 11 acres of surface area was investigated through pedestrian survey. Due to clear disturbance in some areas, field conditions precluded the excavation of additional trenches that had been proposed. No intact prehistoric or historic features were observed and no sites were recorded. Significant portions of the APE had been previously disturbed by the installation of the existing sanitary sewer system and by landscape modification. In some areas, the ground surface had been raised artificially by the bulldozing of tornado debris in the aftermath of the 1970 tornado. Destroyed buildings and other materials were pushed into Yellowhouse Draw and now form the basis for much of the rolling topography of the parks along the waterway. Other trenches indicated subsurface disturbance due to the proximity of the proposed segments to existing alignments. In many cases, the proposed alignments will be placed within existing easements, the widths of which were not known prior to beginning fieldwork. Based on the results of this archeological survey, no further archeological work, including monitoring, is recommended. It must be noted that no level of survey intensity can be guaranteed to locate all cultural features within a project area. Therefore, should previously unrecorded cultural resources, including human remains, be discovered during the course of construction for this project, the City of Lubbock or Lockwood, Andrews and Newnam, Inc. will notify the Texas Historical Commission of the discoveries.

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Appendix A: Figures

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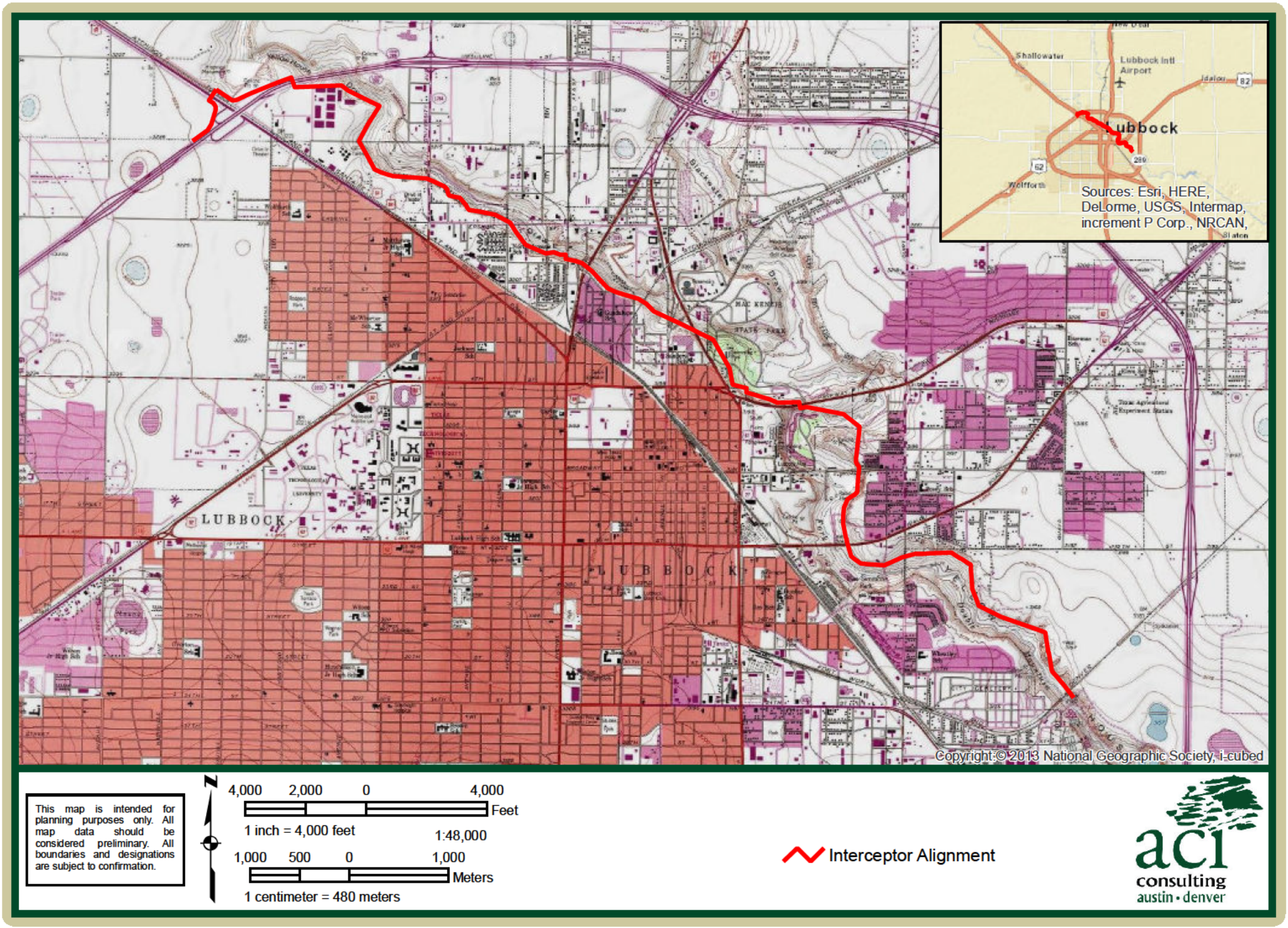
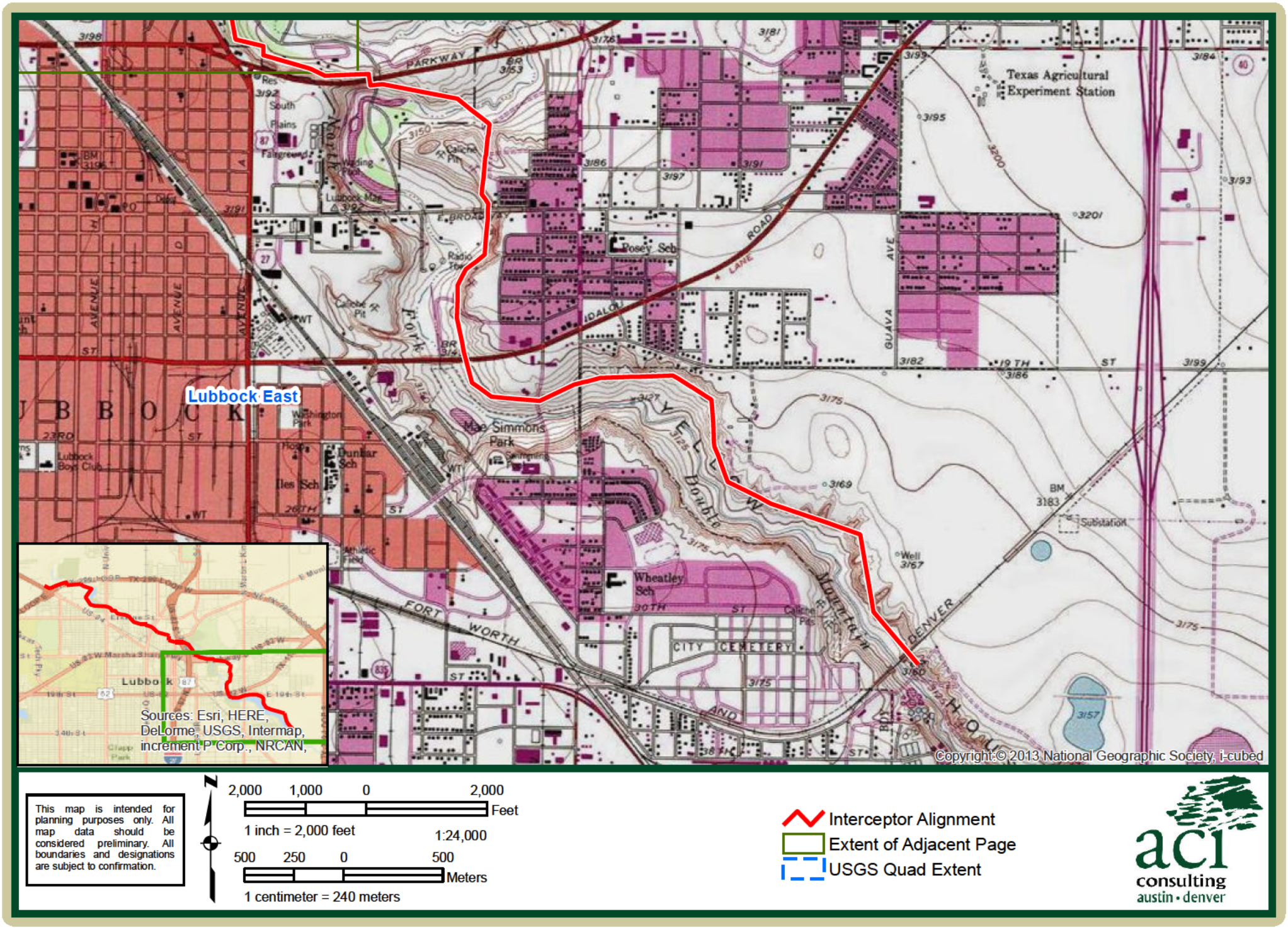
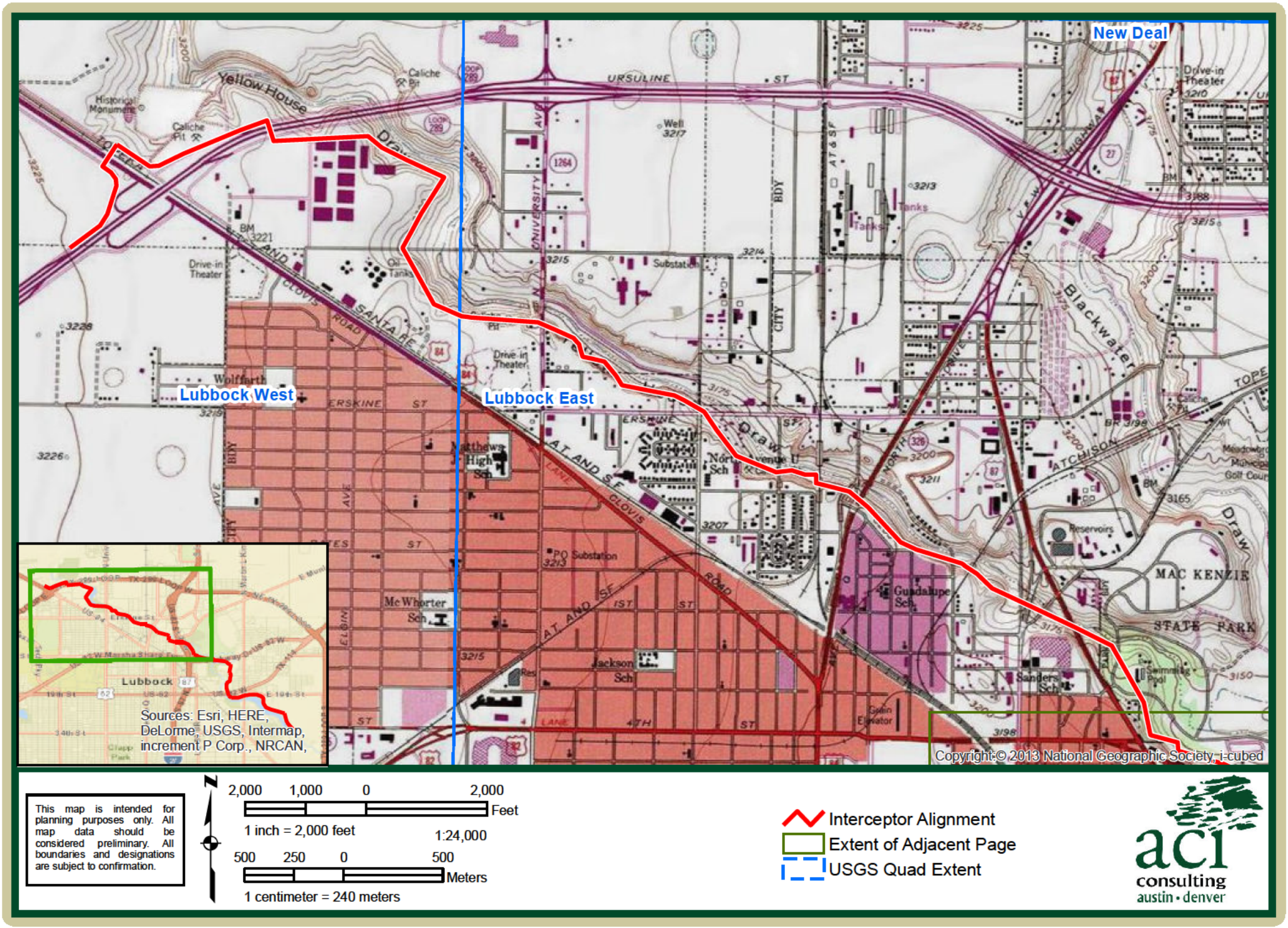


Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 1. Project area overview.



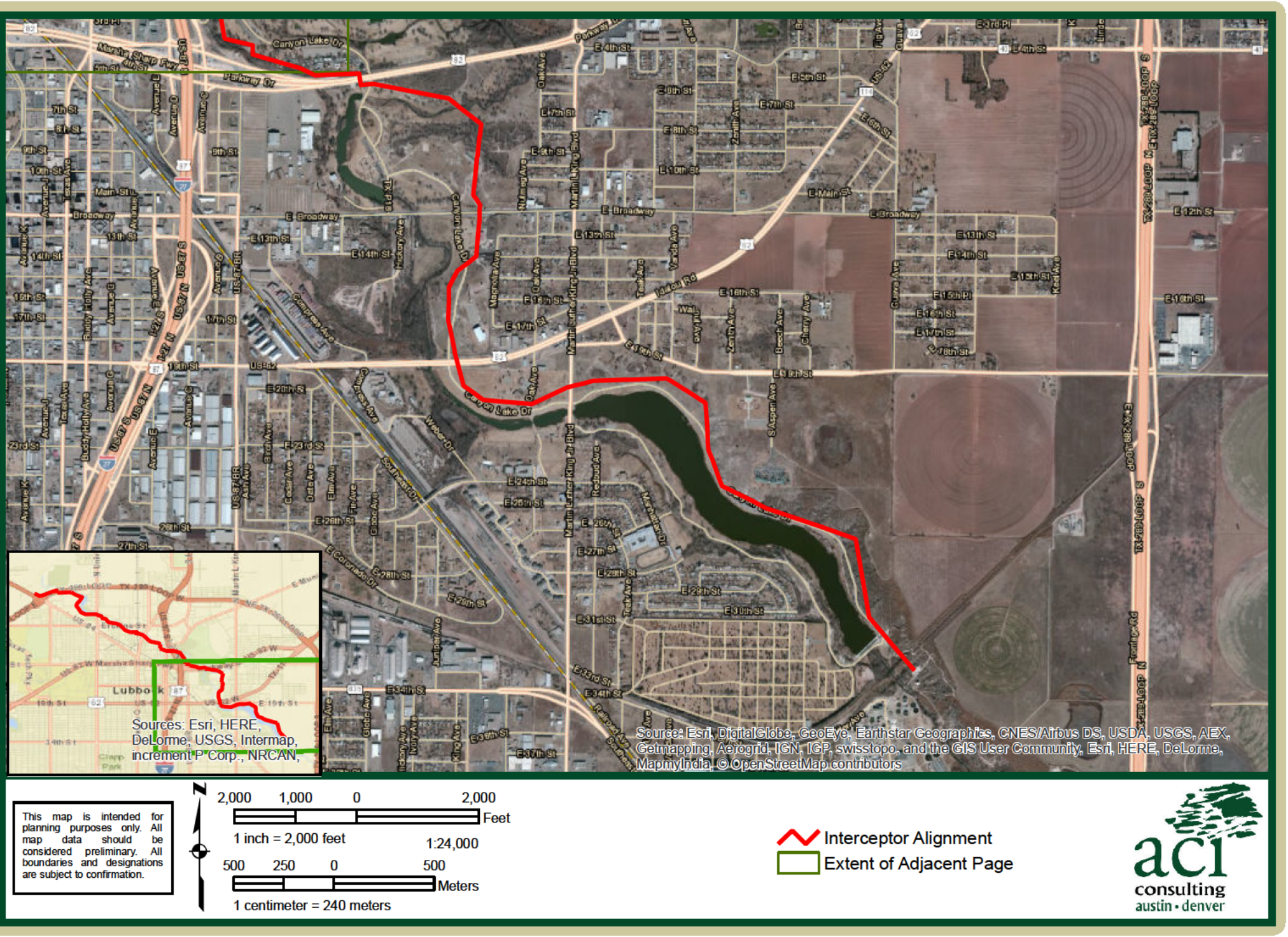
Lubbock Canyon Lakes Sanitary Sewer Interceptor

Figure 2- 1. Project area on Lubbock West and Lubbock East USGS 7.5" topographic quads.

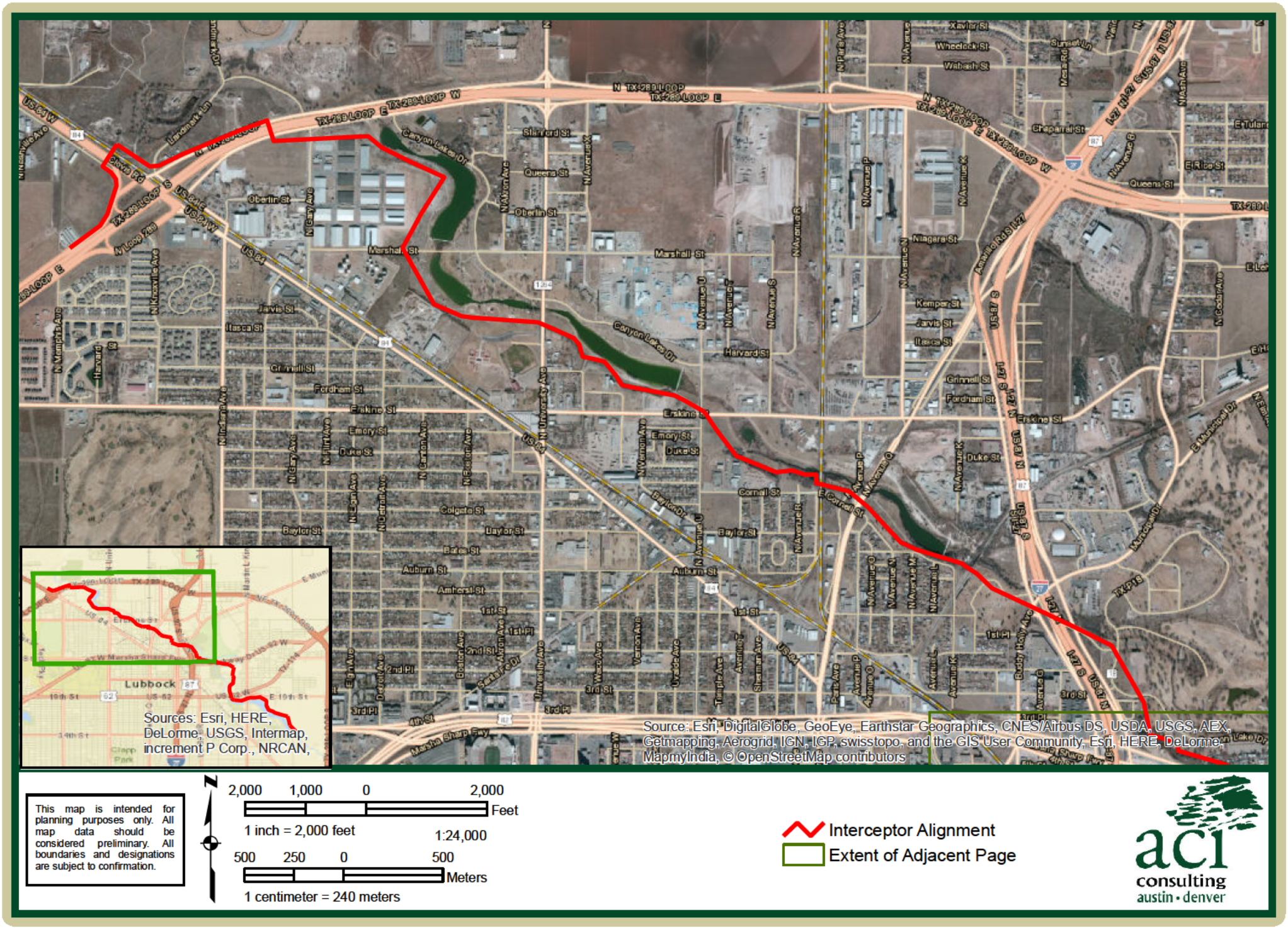


Lubbock Canyon Lakes Sanitary Sewer Interceptor

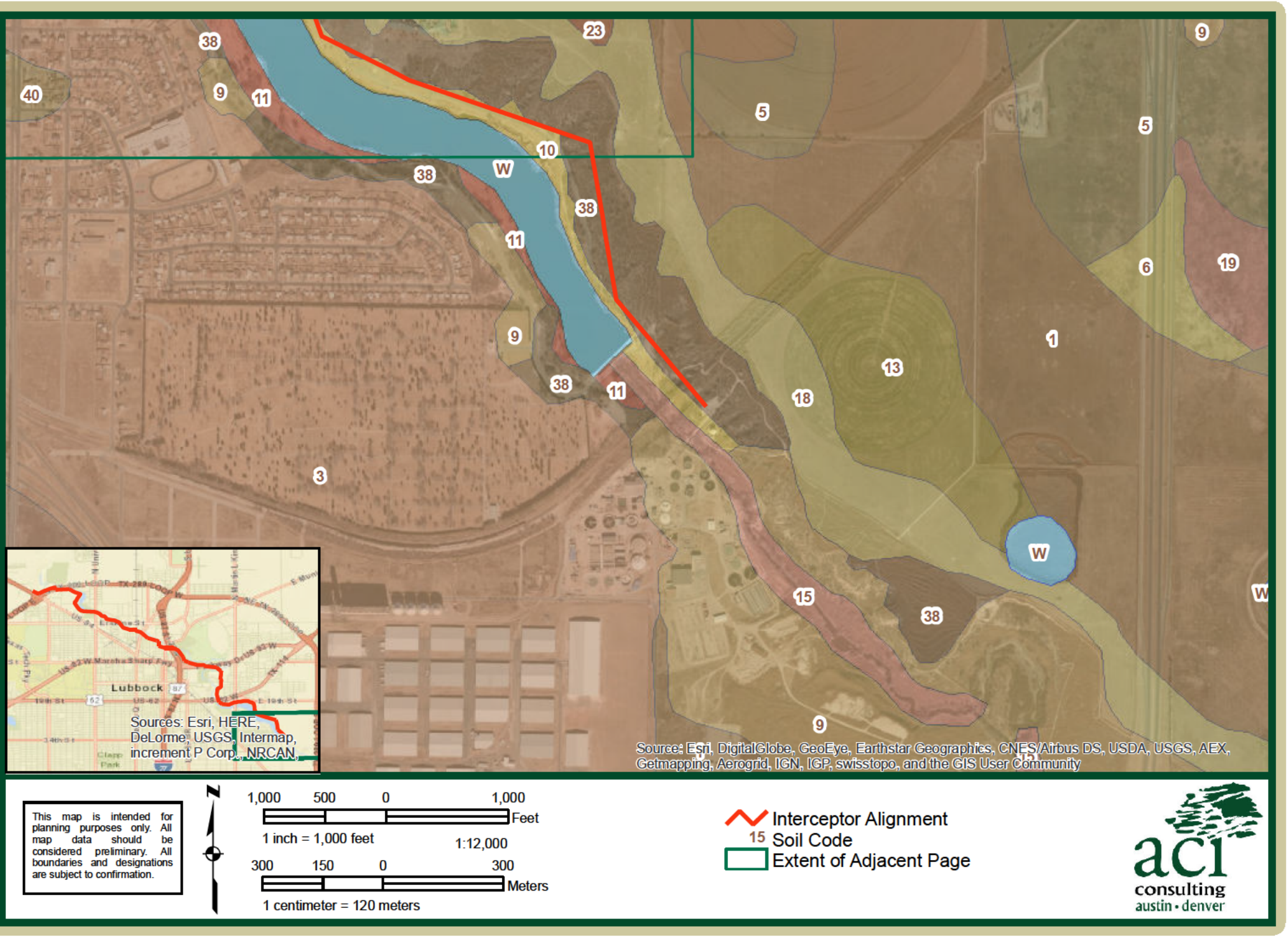
Figure 2- 2. Project area on Lubbock West and Lubbock East USGS 7.5" topographic quads.



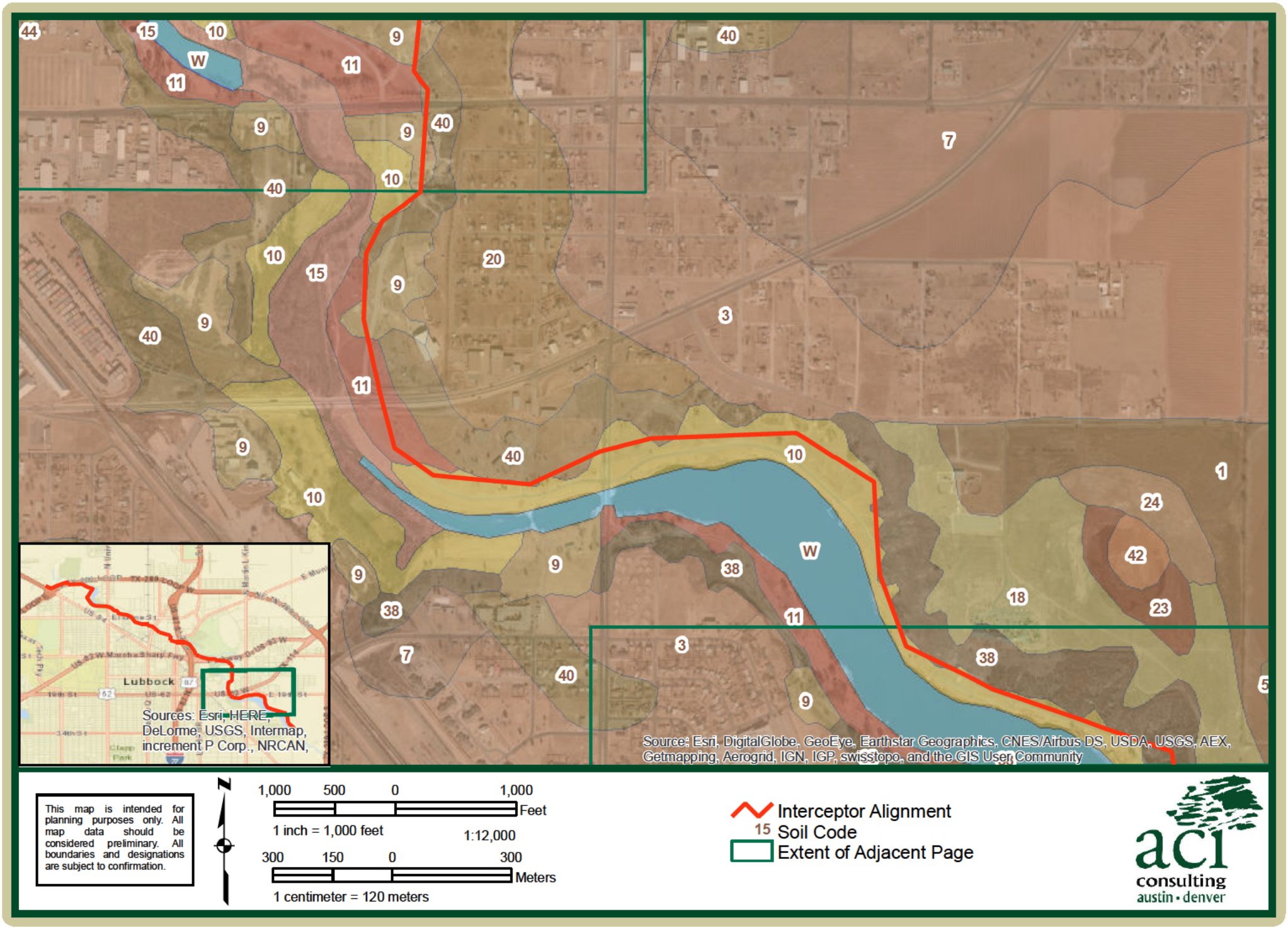
Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 3-1. Project area on aerial photograph.



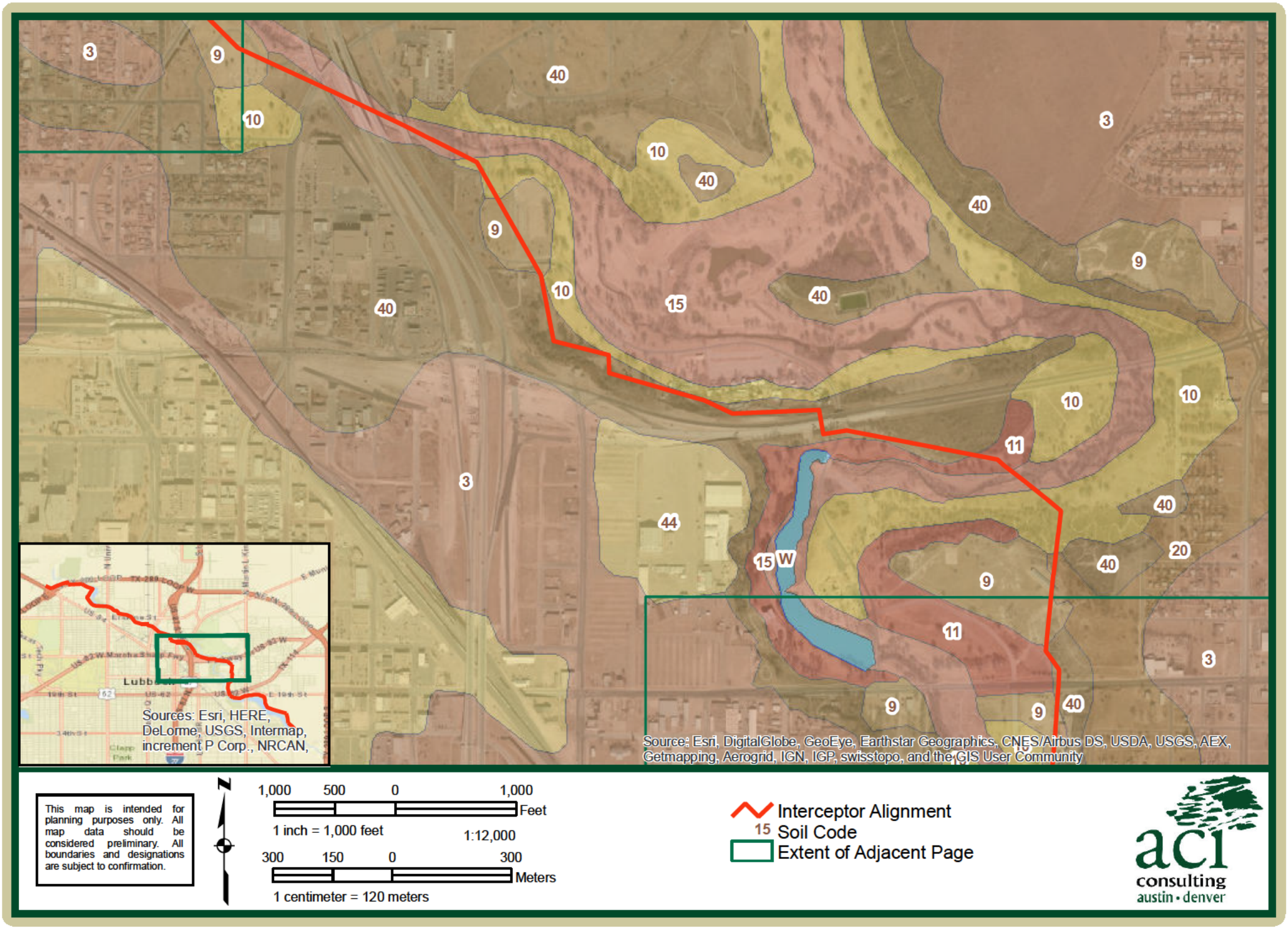
Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 3-2. Project area on aerial photograph.



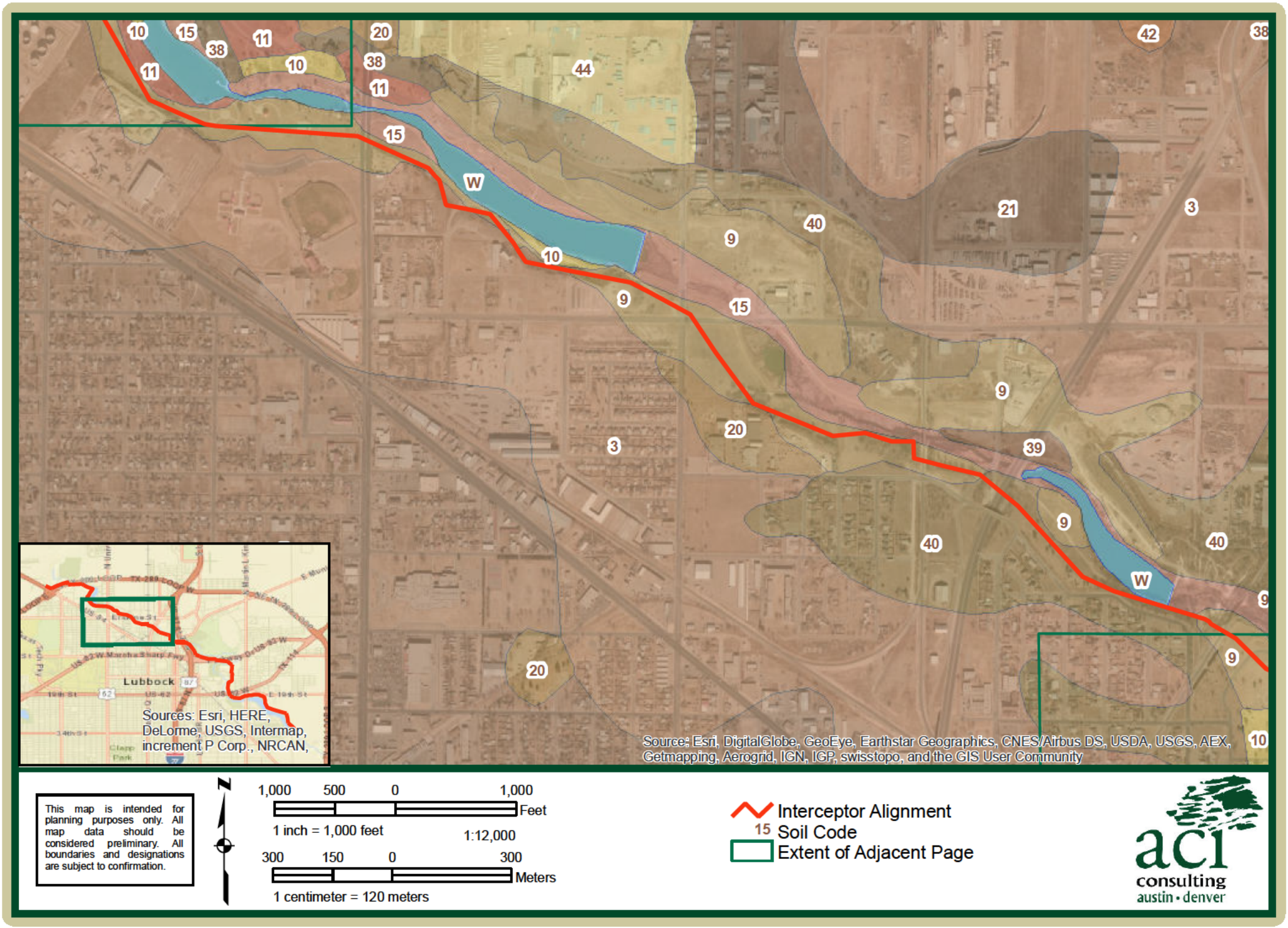
Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 4- 1. Project area soils.



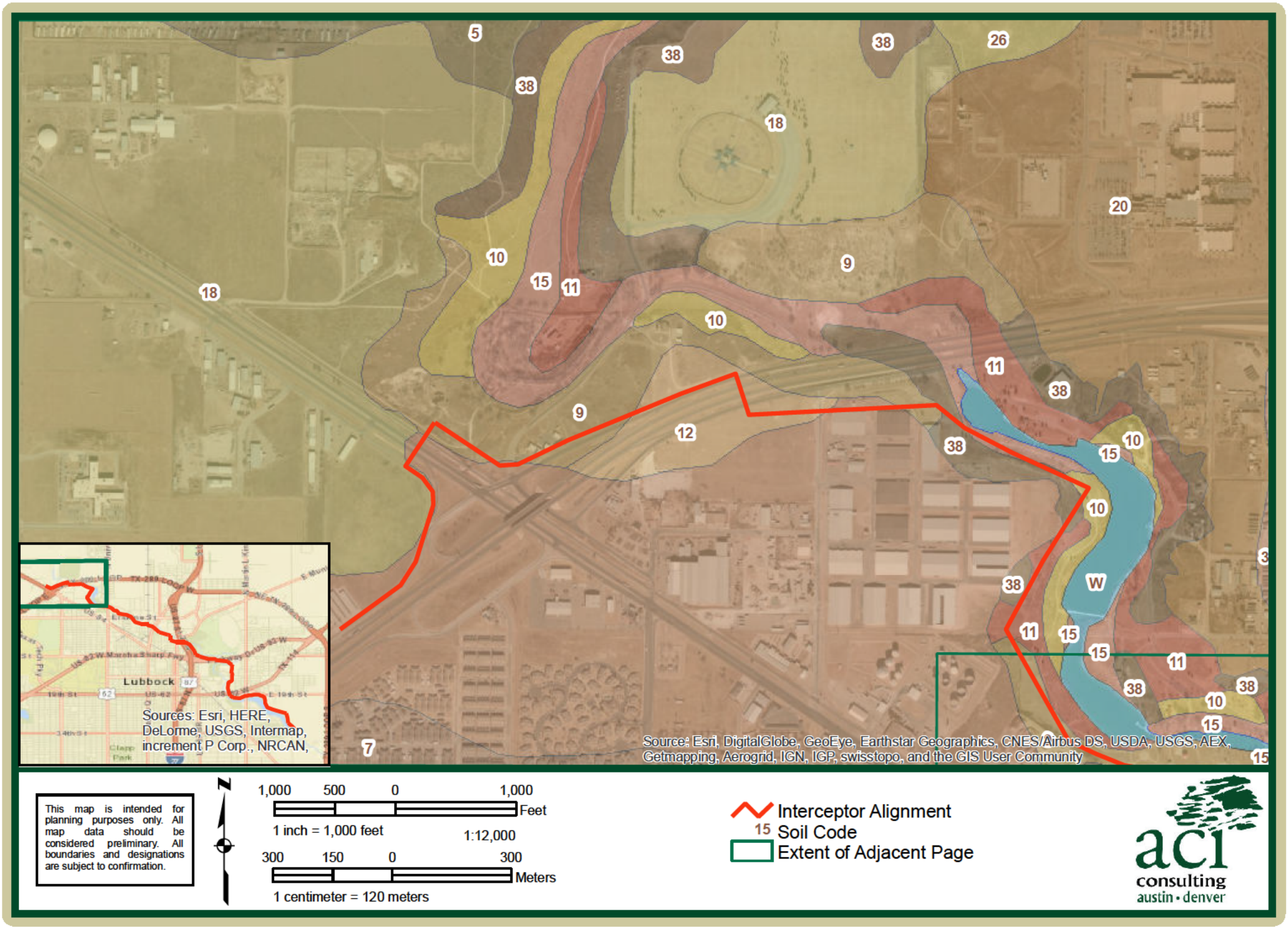
Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 4- 2. Project area soils.



Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 4- 3. Project area soils.



Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 4- 4. Project area soils.



Lubbock Canyon Lakes Sanitary Sewer Interceptor
Figure 4- 5. Project area soils.

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Figures 5-1 to 5-5 and

Figures 6-1 to 6-16

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Appendix B: Inventory and Photographs of Collected Artifacts

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APPENDIX B. Inventory and Photographs of Collected Artifacts

Table 1. Inventory of Collected Artifacts.

Lot #	Trench	Depth	Description
1	2	0-10 cmbs	1 white stoneware edge sherd with brown pattern
2	4	0-300 cmbs	6 fragments brick (apparently from wall), three painted yellow along narrow edge, none stamped , 2 3/8" wide, 1 1/8" tall (painted on edge measuring 1 1/8")
3	6	90-120 cmbs	1 ceramic horse head (broken off body)
4	9	20-55 cmbs	1 fragment bubbly green glass with wire reinforcement; 1 fragment clear rounded glass (bottle glass); 1 fragment green bottle glass
5	11	30-45 cmbs	3 small tertiary flakes (less than 1.5 cm in any dimension); 5 small fragments possible fire-cracked rock (less than 1.5 cm in any dimension)
6	11	45-105 cmbs	1 Falstaff beer bottle cap (screw on); 1 small fragment amber bottle glass
7	12	0-20 cmbs	1 fragment red terra cotta (floor tile?); 1 fragment thick glazed brick
8	12	50-70 cmbs	1 small fragment brick (no stamp visible); 2 fragments flat clear glass; 2 fragments translucent clear glass; 1 fragment ferrous metal unidentified artifact
9	18	0-60 cmbs	1 fragment clear glass (from1 pint liquor bottle); base has Owens-Illinois stamp design; D1 and 56 52 (Manufactured 1952)

Figure 1. Lot 1 ceramic sherd.

Figure 2. Lot 2 bricks (sample).

Figure 3. Lot 3 ceramic horse head.

Figure 4. Lot 4 glass fragment.

Figure 5. Lot 5 debitage.

Figure 6. Lot 9 glass fragment.