Environmental Impacts of the US 90 / UPRR Grade Separation Bridge Project in Dayton, Texas

Internship Report

Presented to the Faculty of the Department of Geography, Planning, and Environment

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Master of Science in Geography

By

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Internship Overview

Per the requirements set forth by the East Carolina University's Masters of Geography degree, with a concentration in planning, I completed an internship totaling 14 weeks during the Spring of 2022 with HNTB Corporation in Plano, Texas. During this role, I averaged 40-hour work weeks which allowed me to accumulate almost 600 hours' worth of experience. This equates to 6 credit hours put towards my degree.

As an intern, I operated as an associate within HNTB's North Texas Office (NTX) as part of their environmental group. The environmental group handles all tasks and deliverables associated with Environmental Planning. My duties included, but were not limited to, writing technical reports, constructing maps with GIS software, undertaking noise studies, performing field surveys, demographic research, and attending departmental meetings. The interdisciplinary nature of my team, alongside the wide variety of projects, allowed me to gain incredible amounts of on-the-job experience.

HNTB is a national infrastructure planning and design firm headquartered in Kansas City, Missouri with a workforce of just over 5,000 employees. Infrastructure work is very diverse, and no two projects are the same; therefore, HTNB employs professionals from a wide variety of disciplines. HNTB's NTX office is the largest of all their offices, this is partly because it has multiple brick and mortar locations. NTX is made up of the brand new Plano office, as well as offices in Dallas, Fort Worth, and Little Rock, with additional satellite field offices. The majority of the NTX environmental group is located in the Plano, Texas office alongside a group of roadway and structural engineers. This setup facilitates an efficient workflow as the majority of environmental work is undertaken in reference to design schematics developed by the engineers. The environmental group in which I worked was made up of three project managers, three environmental planners, one urban planner, and one environmental scientist

Work performed by HNTB's environmental group is a direct result of the 1970 *National Environmental Policy Act* (NEPA) which requires federal agencies to assess any environmental impacts of proposed projects. In Texas, the vast majority of infrastructure projects are highway-related. This means that most clients are state transportation agencies like the Texas Department of Transportation (TxDOT), Arkansas Department of Transportation (ArDOT), or regional governmental authorities like the North-East Texas Regional Mobility Authority (NET RMA). Roadway projects are typically undertaken with funding provided by the Federal Highway Administration (FHWA), which is how NEPA factors into the process.

As an intern, the majority of work performed was on a desktop computer with less than 10% of work taking place in the field. I coordinated with other HNTB offices to travel within the state of Texas to perform site visits/studies in Tyler, Dayton, and El Paso Texas. Software used in the office included ESRI ArcMap, Microsoft Word, Excel, and Bentley Systems. Private consulting is a fast-paced environment, especially in a post-pandemic era. Projects that were put on hold during the pandemic have started back up and are being pursued alongside new projects originally scheduled to start this year. 2022 has proven to be HNTB NTX's busiest year in decades. Below is a list of projects I contributed to as an intern:

Figure 0-1: Internship Project & Clients

Project Name	Client	Deliverables
US90/UPRR Grade Separation	TxDOT	*Environmental Impacts Technical Report, Community Impacts Technical Report*
I-49 FEIS Re-evaluation	ArDOT	*Community Impact Assessment, Visual Impact Assessment, Floodplain Impacts, Induced Impacts Analysis*
RAISE and MPDG Grant Pursuits	ArDOT	*Constraint Mapping, APP& HDC Mapping*
Toll 49 Widening	NET-RMA	*Community Impacts Assessment*
FM 157 Redesign	TxDOT	*ROW Changes, Community Impacts Assessment*
Loop 12	TxDOT	*Community Impacts Assessment, Noise Technical Analysis*
US 380	TxDOT	*Hazmat Inventory, Noise Technical Analysis*
I-10/Artcraft Road	TxDOT	*Noise Technical Analysis*

To focus the scope of this internship report, one specific project was chosen for this report to study in detail. The US 90 / UPRR Grade Separation project in Dayton, Texas was the project I was the most involved with. The project started just before the beginning of my internship in December 2021. I was tasked with completing an Environmental Analysis Technical Report to be submitted to TxDOT. This report would outline all possible environmental impacts of the proposed project. The technical report can be thought of as a catalog of possible impacts and is to be used as a reference for TxDOT when continuing the project. The technical analysis was performed in reference to the 30% design schematic for the project, which means that the design was subject to future changes. However, the scope of the technical report was purposefully wide and included a 1000ft and 1-mile buffer to account for any future design expansions. The production of this report required the additional use of ESRI ArcGIS software and site visits. This internship research report is associated with the work done to file the Environmental Technical Analysis Report with TxDOT.

This study was reliant on HNTB guidance and resources and is framed in the context of NEPA documentation and TxDOT formatting. Had I not been an intern, an independent study like this would have looked very different. HNTB uses ArcMap instead of the more advanced ArcGIS Pro. Advanced functionality may have allowed for a more in-depth GIS study instead of one which was mostly representative. The report was focused by industry standards and regulations. Had the current project not been excluded from air quality standards, air quality presumptively would have been a focus since the project was roadway-based and would have impacted air quality and greenhouse gas emissions by altered automobile traffic. A site visit would still have been necessary to provide context to any desktop-based findings. This however may have proved difficult since the site visit performed was fully funded by HNTB.

Acknowledgments

I would like to thank the faculty of the ECU Department of Geography, Planning, and Environment for all their wisdom and experience and their dedication to teaching through a two-year pandemic. I specifically want to thank my committee for guiding me along the way. Thank you to Dr. Mukherji for helping through two years of largely remote advising. Thank you to Dr. Sung for being a great professor to work for and friend. Thank you to Dr. Montz for your work teaching *Advanced Environmental Impact Analysis*, I firmly believe that my experience in that class helped me land this internship.

I would also like to thank the great people at HNTB NTX. Specifically, Julie Morse, Scott Inglish, and Lupe Pettit for taking a chance on me from across the country with no real professional experience. I have been so blessed with these amazing colleagues during this opportunity. Even more thanks for offering me a full-time role post-graduation with the team.

And of course, thank you to my family and community group at Imago Dei Church in Raleigh, North Carolina who constantly supported me through this process from my first interview to graduation day.

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1.0 Introduction

Significant aspects of modern-day infrastructure were designed and implemented during a time when populations were smaller. As populations grow, the load experienced by these systems begins to weigh on the existing infrastructure. This is evident in the City of Dayton, Texas, a small municipality located in the southeastern region of the state. Traffic delays are common in this area due to the its aging transportation systems. Currently, US Highway 90 intersects with the Union Pacific Railroad (UPRR) and Waco Street all in the same at-grade crossing just west of Dayton's urban center. The high volume of rail-based freight transit means that there are often significant delays on US 90, a major arterial road that links the city with the larger metropolitan area of Houston. This intersection design may have been adequate a long time ago when population and traffic volumes were lower in the area. However, Houston is now the 4th largest city in the United States. Regional traffic congestion has increased the demand for more efficient transportation systems. Additionally, the speed limit of eastbound US 90 is 65 mph through the crossing. This means that in the event a train crosses, drivers must decelerate from 65 mph to 0 in a relatively short distance. This is a major safety issue.

TxDOT (Texas Department of Transportation) plans to construct a bridge on the current US 90 that will cross over the UPRR. The goal of this project is to update the current obsolete infrastructure. What once might have been a workable design, now creates delays and safety concerns as the local population has grown, and the roadways have become more congested. The project aims to eliminate congestion by keeping traffic moving at a constant rate while also improving safety. TxDOT is the state-level agency in Texas that organizes highway projects and their construction. According to the *Texas Statewide Long Range Transportation Plan 2035 (SLRTP)*, the mission of TxDOT is to:

> *"…provide safe and efficient movement of people and goods, enhance economic viability, and improve the quality of life for the people that travel in the state of Texas by maintaining existing roadways and collaborating with private and local entities to plan, design, build, and maintain expanded transportation infrastructure."*[1]

Published in 2010, the SLRTP serves as a blueprint for transportation planning in Texas and aids in coordination between TxDOT, local and regional decision-makers, and all transportation stakeholders with regard to transportation projects. The SLRTP forecasts the population of Texas to grow by about 43% by the year 2035. This is an increase from 39% between 1990 and 2008. This means that aging infrastructure will be servicing an ever-increasing load.[2]

It is important to note that TxDOT is a state-run organization that receives federal funding, a significant amount of which comes from the Federal Highway Administration (FHWA). This means that TxDOT and all its projects are subject to NEPA (National Environmental Policy Act). NEPA is the law that defines the purpose for environmental considerations of federally funded projects. Signed into law on January 1st, 1970; NEPA specifically requires federal agencies, or any organization using federal funds, to assess and understand the environmental impacts of any proposed project. Impacts analyzed range from

[1] Texas Department of Transportation, SLRTP Executive Summary (2010)
[2] Texas Department of Transportation, (2010)

environmental to social and economic.[3] The process forces decision-makers to compare environmental consequences to the purpose and need of the project. In short, NEPA requires project officials to make educated decisions about engineering projects while also considering social, economic, natural, and biological environmental factors. The consequences of any action taken must be understood and any impacts detected with the associated projects must be addressed.[4]

The NEPA process will ultimately categorize projects into specific document types. These are Categorical Exclusions, Environmental Assessments, or Environmental Impact Statements.[5] Categorical Exclusions, also referred to as CE or CATEX, are designations for actions that are known to not create significant impacts on the human environment. An agency must file specific forms that detail why a project classifies as a CE in order to gain the designation.[6] If a CE is not a possible classification, an Environmental Assessment of the project is conducted. This is a concise public document that ensures NEPA compliance of the project. An environmental assessment will result in one of two conclusions. First, a "Finding of No Significant Impact" (FONSI) is used when the assessment reveals no significant impacts. If significant impacts are determined to be associated with the project, the NEPA process moves towards the publication of an Environmental Impact Statement (EIS). This document is a detailed account of how the environment will be impacted by the proposed project.[7] All documents are public and are intended to involve the local populations and communities within

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[3] EPA, What is NEPA? (2021)
[4] Texas Department of Transportation, TxDOT Environmental Compliance ToolKit, NEPA and Project Development (2021)
[5] EPA, What is the NEPA Review Process? (2021)
[6] EPA, (2021)
[7] EPA, (2021)

the project area in the decision-making process. Public meetings are held to facilitate this process.

TxDOT is one of eight states that currently participates in the NEPA Assignment Program. This program leaves FHWA out of the environmental review process, meaning that TxDOT has complete responsibility for NEPA decision-making. With the decision-makers now no higher than the state, there is more effective communication and public involvement. Community, Visual, and Environmental Impacts Technical Reports are all pieces that contribute to larger public documents. Each technical report is submitted independently of each other for review instead of being placed directly into a larger, cumulative document.

The bridge at the US 90/UPRR junction currently proposed by TxDOT is the only solution currently being pursued. The only alternatives considered for this project were "build" or no "build". This Internship Report examines the environmental impact of the bridge project as per NEPA guidelines.

TxDOT has contracted HNTB as a consultant to help design the planned bridge over the UPRR. HNTB's work is a multi-step process with a multitude of design phases and schematics. Since TxDOT is subject to NEPA, and HNTB is a contractor of TxDOT, HNTB must also abide by the same guidelines. This means that with any design, the environmental impacts of its implementation must be studied and documented. Within HNTB, there is a group of environmental professionals that work closely with the engineers designing the bridge. Their role is to perform an environmental impact analysis on the proposed design and determine what kind of effects it will have if implemented. The focus of this Internship Report is associated with the work done to produce an Environmental Technical Analysis Report, one of many reports submitted for any project as part of the NEPA process. Additional reports required include

Community Impacts Technical Report and a Visual Impacts Technical Report. The Environmental Technical Analysis Report’s goal is to document the possible environmental factors that could be affected by the proposed project. It is effectively a catalog of everything in the area that is potentially environmentally sensitive. The term “Environmental” is broad in this sense. The report focuses not only on natural resources and hazmat-related issues but also on community cohesiveness and the socioeconomic factors of the project area.

1.1 Project Area Infrastructure

The City of Dayton and therefore the project area is located in TxDOT’s Beaumont District. This district is in southeastern Texas near the Louisiana border as seen in Figure 1-1. Situated in Liberty County, Dayton is located inland of several deep-water ports. Port Arthur and the Port of Beaumont are located to the east, while the ports of Galveston and Houston are located to the southwest.[8]

Connecting these ports to the rest of Texas is the largest freight rail system in the country, transporting 8% of all national freight via rail every year. A segment of the UPRR, one of three Class I Railroads in the state, passes right through downtown Dayton as it connects Beaumont and Port Arthur in

Figure 1-1: Beaumont District in Texas

(Source: TxDOT SLRTP 2035)

[8] Texas Department of Transportation, (2010)

the east, to Houston and Galveston in the west, as well as the Burlington Northern and Santa Fe (BNSF) rail yard just south of the city itself. This layout means that a railroad junction is present just west of downtown Dayton, where the UPRR splits off south towards the BSNF railyard. The tracks cross over both Waco Street and US Highway 90 in Dayton which creates a large and complicated at-grade railroad crossing in the urban area.[9]

The proposed project is included in the H-GAC 2040 Regional Transportation Plan as part of the US 90 Northeast Corridor. Improvements planned for this corridor include additional main lanes, grade separations, an extension of the US 90 freeway in Harris County; and additional lanes and grade separations along the US 90 highway in Liberty County.[10] The proposed project is not included in the 2021-2024 Transportation Improvements Program (TIP) or Draft 2023-2026 TIP.

1.2 Proposed Improvements

The proposed improvements would consist of the elimination of the UPRR at-grade crossing by providing a grade separation for US 90 over the UPRR tracks. This can commonly be referred to as an “overpass”. The at-grade portion of the proposed US 90 facility would consist of 2-12-foot eastbound lanes and 2-12-foot westbound lanes with a 12 to 20-foot variable median for an overall roadway width of 80 feet. The overpass itself would consist of 4-12-foot travel lanes separated by a 2-foot traffic concrete barrier, with 10-foot shoulders on the outside and 4-foot shoulders on the inside. All of this will occur with a right of way varying between 128 and 131 feet. An at-grade 14-foot discontinuous frontage road in each direction would be built along and under the overpass just east and west of County Road (CR) 605 (Waco Street). These discontinuous

[9]Texas Department of Transportation, (2010)
[10] Houston-Galveston Area Council. (2012).

frontage roads and U-turns would provide property access, not through traffic. The existing Waco Street crossing would be eliminated. No additional Right-of-Way (ROW), would be acquired in order to construct the project.

The proposed drainage would be a standard curb-and-gutter improvement along the roadway. To tie back into the existing drainage on the western limit of the project, the proposed drainage would be an open ditch.

The proposed overpass will be approximately 1,100 feet long consisting of standard TxDOT concrete beams for which length/depth are yet to be determined. The proposed project is not defined as an added capacity project as it is not intended to support higher traffic loads compared to the current design. A project schematic is provided on the next page for reference.

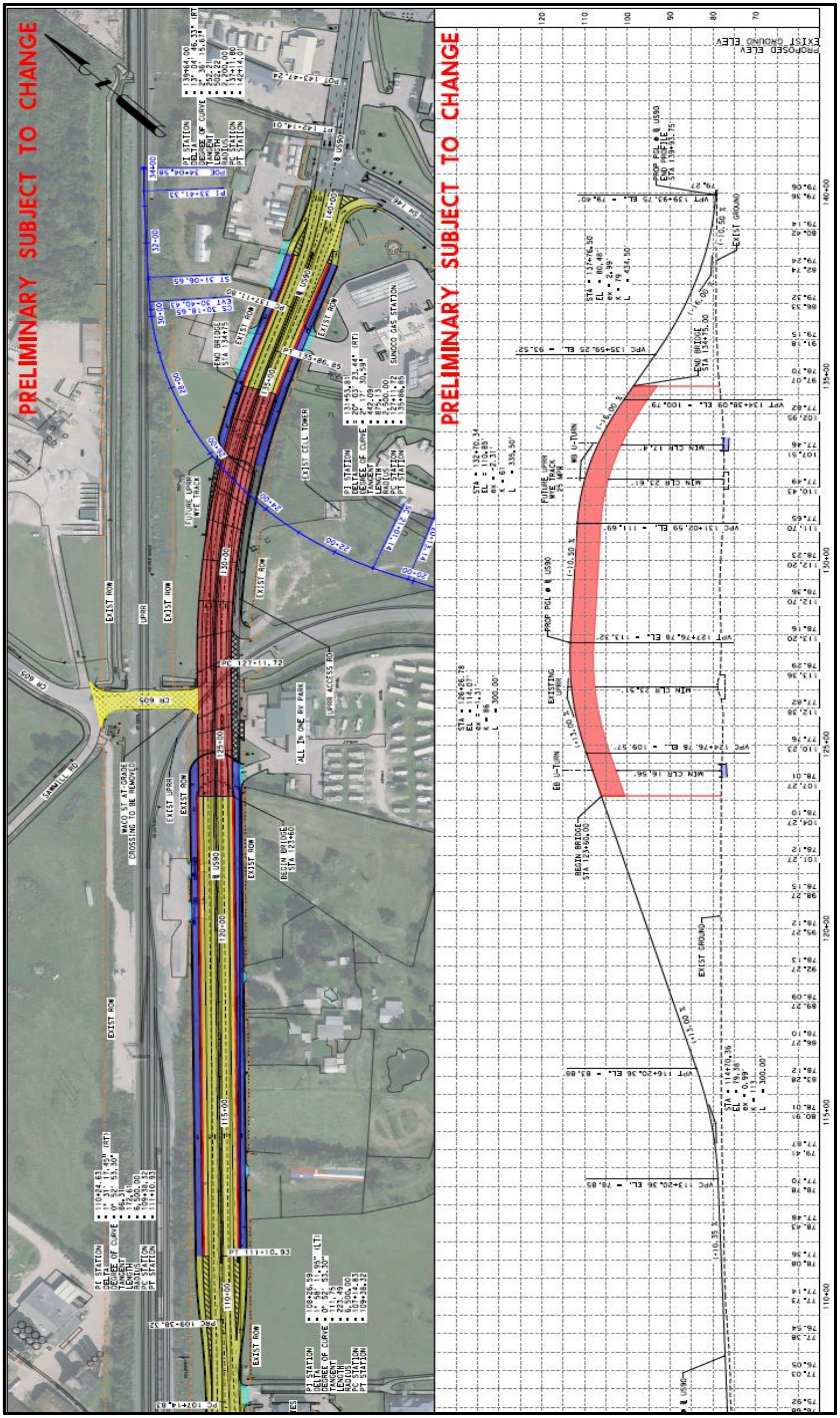

Figure 1-2: Project Schematic

(Source: HNTB Corp)

2.0 Literature Review

2.1 At-Grade Crossings

At-grade crossings are defined as junctions where roadways intersect railroads on the same plane. This usually involves railroad safety gates that lower and block passage if trains cross. At-grade railroad crossings have long been a known safety issue. Articles in the *Scientific American* have discussed the issue ever since the early 1900s. There was a general concern focused on the noticeable loss of life at railroad crossings. At the turn of the last century, the primary safety precaution used the flagman. The flagman's role would be to monitor the tracks and ensure traffic stopped in the event an oncoming train was present. However, it is suggested that this role became obsolete as trains became capable of higher speeds. Additionally, it was noted that the symbology used by flagmen was often confusing. Flagmen used white flags to denote an oncoming train, but generally, white flags are associated with safety (much like using a white flag to surrender on the battlefield). This confusion led to several accidents involving at-grade crossings where drivers thought passage was safe when seeing the white flag.[11] A publication in 1923 developed the narrative that drivers were the primary cause of these accidents. During a 12-month period, a total of 183 automobile-related accidents were reported along the Baltimore & Ohio Transportation System, injuring 95 people, and killing another 35. Aside from various excuses like incompetence, tiredness, or carelessness related to drivers, the article notes the habit of drivers attempting to "beat" trains over crossings. They are aware a train is coming, yet still, attempt to cross in a hurried manner. This act, however unsafe, may have

[11] Low, Flagging at Grade Crossings (1913)

proved more successful in the past, but as technology improved and trains began to move faster, the collision rate increased.[12] Over time, the primary response to these crashes was to install more advanced precautionary measures. Most crossings now have some sort of flashing lights or even an audible bell that is triggered when a train is approaching. Typically, these kinds of warnings are required by legislation in the United States.[13]

Legislation regarding at-grade crossings dates back to before the American Civil War. A good example of an early attempt to mitigate these dangers lies in the State of Connecticut. Legislation in the state existed in 1849 that prohibited the construction of a railroad across a highway unless special permission was granted. The state's Railroad commission stated that crossings of this nature were "*one great cause for anxiety*". Even though the aforementioned warning systems such as flagmen and signage were in place, the commission still moved to further restrict such crossings. In 1883, Connecticut's Railroad commission made the drastic move of banning at-grade crossings altogether. However, this action was repealed in 1931. Data taken from the time shows the effectiveness of banning the construction of future and the removal of existing at-grade railroad projects.[14] This is shown in Figure 2-1. Given the success of the measure, it is unclear

Year	Crossings Eliminated	Accidents per 10,000 Automobiles
1912...............	1	11.672
1913...............	20	10.674
1914...............	4	8.852
1915...............	2	7.957
1916...............	3	7.922
1917...............	6	4.199
1918...............	5	3.564
1919...............	1	2.554
1920...............	0	3.545
1921...............	0	2.969
1922...............	1	2.181
1923...............	11	2.745
1924...............	6	2.447
1925...............	6	2.014
1926...............	5	1.573
1927...............	3	1.630
1928...............	9	1.626
1929...............	5	1.002
1930...............	....	.830

*Data in the files of the Chief Engineer of the Commission.

Figure 2-1: Grade Crossing Eliminations and Accidents

(Source: Fisher, 1931)

[12] Winters, Why at Grade Crossings (1923)
[13] ABA, Railroad Crossings: Statute does not remove liability (1994)
[14] Fisher, Connecticut's Regulation of Grade Crossing Elimination (1931)

why it was eventually repealed. It appears that the legislation was linked to a lawsuit against the Connecticut Public Utilities Commission the year it was repealed.[15]

Fast-forwarding to 1997, it appeared that not much else had been done with regard to at-grade crossings. An editorial in the *Defense Transportation Journal* by Dr. Joseph G. Mattingly Jr. called for railroad crossing safety to be made a national priority. The country, along with its infrastructure, had grown exponentially since Connecticut's state-level attempts to mitigate the issue. It can be understood that the problem would have been far worse by this time. Dr. Mattingly wrote that he believes, *"both state and federal governments must play a joint role to achieve crossing safety of highways crossing over rail lines".*[16]

Texas' *SLRTP* 2035 aligns with Dr. Mattingly's request. Currently, Texas operates and maintains over 80,000 miles of centerline highway miles and 10,000 miles of railroad tracks, both of which are the largest among the 50 states. The vast interconnectivity of these systems means that, as of 2019, there was a total of 9,197 public at-grade crossings within the state. Texas' *SLRTP* and its *Rail Plan Update 2019* highlight grade crossings as critical issues to be resolved. Texas now has a Railroad Grade Separation Program that is funded through the Unified Transportation Program which sets aside 25 million dollars annually for grade separation projects.[17]

[15] Fisher, (1931)
[16] Mattingly, Railroad Grade Crossings (1998)
[17] Texas Department of Transportation, Rail Plan Update (2019)

2.2 Grade Separation Projects

A grade separation is a term used to describe a broad range of projects. The term describes a project that involves altering the vertical profile of several paths of transport. These paths can be roadways, railways, pedestrian traffic, or a combination of all three. Highway overpasses/interchanges are the most common form of grade separation. Grade separations serve as an alternative to standard intersections (at-grade) which are typically monitored by some type of traffic light or crossing warning. This intersection format is associated with delays as one path must stop for the other to cross. Additionally, grade separations reduce safety concerns since perpendicular paths do not cross at the same level; therefore, the risk of a collision is completely mitigated. Typically grade separation projects are targeted towards intersections of high volumes and speeds (much like interstate junctions) or railroad-roadway junctions.[18]

Focusing on railroad-roadway junctions, grade separation projects specific to these types of intersections can come in two primary forms. The more complex option is a trench grade separation. This option is used when the railroad runs parallel to a major road that has several arterial connections (See figure 2-2). The *San Gabriel Trench Project* is a good example of such separation. The railroad was lowered by 30 feet along areas of dense development in order to

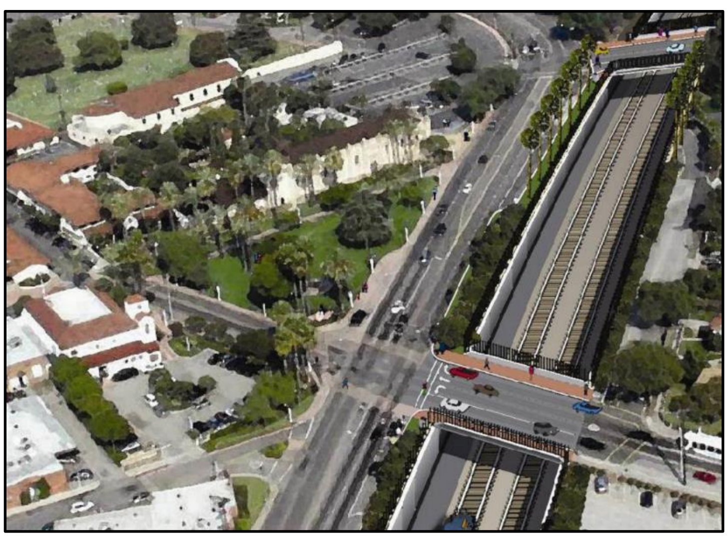

Figure 2-2: San Gabriel Trench Grade Separation

(Source: The ACE Project, 2018)

[18] Texas A&M, Grade Separation (2021)

prevent a train's passage from stopping traffic. This project cuts under four major roads in the City of San Gabriel California and saved an estimated 1,750 vehicle hours of delay per day.[19]

The second option is simpler. For less-dense areas, bridge construction is a suitable solution. US Highway 90 in Dayton, Texas only crosses one railroad at one intersection. Given the flat topography, the simplest solution is to bridge US 90 up and over the UPRR tracks. This project will be just under one mile in length and will cost close to $35 million. Waco Street, the additional street at the junction, will be eliminated altogether.[20] [21]

2.3 Environmental Impacts of Highways

Highways are complex projects with a seemingly endless and dynamic list of impacts. Several studies since the inception of NEPA have attempted to categorize impacts into concise standardized lists. A Journal article written in 1975 by Maurice Rollier and Marc-Auguste Erbetta summarized post-graduate work in this area.[22] The study was an early attempt to delineate specific sites prone to impacts into groups. These areas are: Natural Features, Cultural Features, Constructed Features, and Superimposed Features. Natural features denote a feature that can be maintained without the presence of human beings and would flourish otherwise without the presence of a nearby highway. Sites in this category are forests, lakes, or swamps. Cultural features can be described as features that are seemingly natural but are maintained by humans. This includes farms, ranches, and other agricultural-type features. Constructed features are buildings, housing, or local industry developed by humans. Lastly, superimposed features are

[19] The ACE Project, San Gabriel Trench Project (2018)
[20] HNTB Project Documentation (2022)
[21] Texas Department of Transportation, TxDOT Project Tracker (2022)
[22] Rollier et al. Environmental Impact of Highways. (1976)

described as animal or plant systems (ecosystems) that encompass an entire region.[23] This work has developed a substantial list from which to start, but there are noticeable holes in its coverage. The article generated a list of impacts that covers and defines the natural and biological resources affected by a project. There is an attempt to delineate the human impacts on land use and constructed features, but not to the degree required by modern standards. There is no mention of possible community impacts or environmental justice-related issues. As a whole, this list is generalized in nature but serves as decent a starting point for cataloging potential environmental impacts. Significantly more detail is required.

From an ecological perspective, roadways are inherently divisive. Accepting the fact that roadways will produce roadkill, all roadways also form a barrier to movement for most animals, with some being more significantly affected than others. *Roads and Their Ecological Effects* is a review published in 1998 that attempts to discuss the current knowledge base surrounding roadway impacts. Several experiments show that the willingness of animals to cross roads is largely dependent on species type. Amphibians or small insects are typically the least likely to cross.[24] However, amongst all species, two roadway variables were also discovered that influenced animal crossings. A combination of roadway width and traffic density were seen to be major contributors to the barrier effect.[25] Traffic density is also linked to noise, which was shown to push wildlife further away from roadways.[26] This is significant because it shows that a major highway like US 90 will likely have a greater impact on wildlife habits than a project on a local county road. The barrier effect is detrimental to local wildlife because as a roadway network increases in size, the local population is continually subdivided more and more. Studies have

[23] Rollier et al. (1976).
[24] Richard et al. Roads and Their Major Ecological Effects. (1998).
[25] Richard et al. (1998).
[26] Richard et al. (1998).

proved these local populations to be more fragile. Small populations are prone to greater size volatility and in turn, extinction.[27] The review notes that these impacts are directly correlated with at-grade roads. A discussion of the practices put in place by Australia and the Netherlands reveals ways to mitigate these impacts. Planning policy in the Netherlands identifies potential areas where the barrier effect of a roadway would be significant. In these areas, roadways are designed as overpasses or incorporate tunnels for wildlife. The use of tunnels for wildlife is also a common practice in Australia. Tunnels of different shapes and sizes are used for varying species types.[28]

Roadway impacts also have a significant geomorphological aspect. The position of a roadway on a slope plays a significant role in how the roadway impacts nearby ecosystems, specifically aquatic ones. The impermeable surface of a roadway significantly alters the way in which the local landscape would typically drain. Roadways serve as a focusing point to concentrate water flows.[29] These higher waterflows create channels with greater flow rates than normal, significantly increasing soil erosion downslope. Increased flow rates are associated with increased volatility of water levels within riparian habitats. Increased flow rates also enhance the possibility of chemical and sediment runoff into nearby habitats.[30]

[27] Richard et al. (1998).
[28] Richard et al. (1998).
[29] Richard et al. (1998).
[30] Richard et al. (1998).

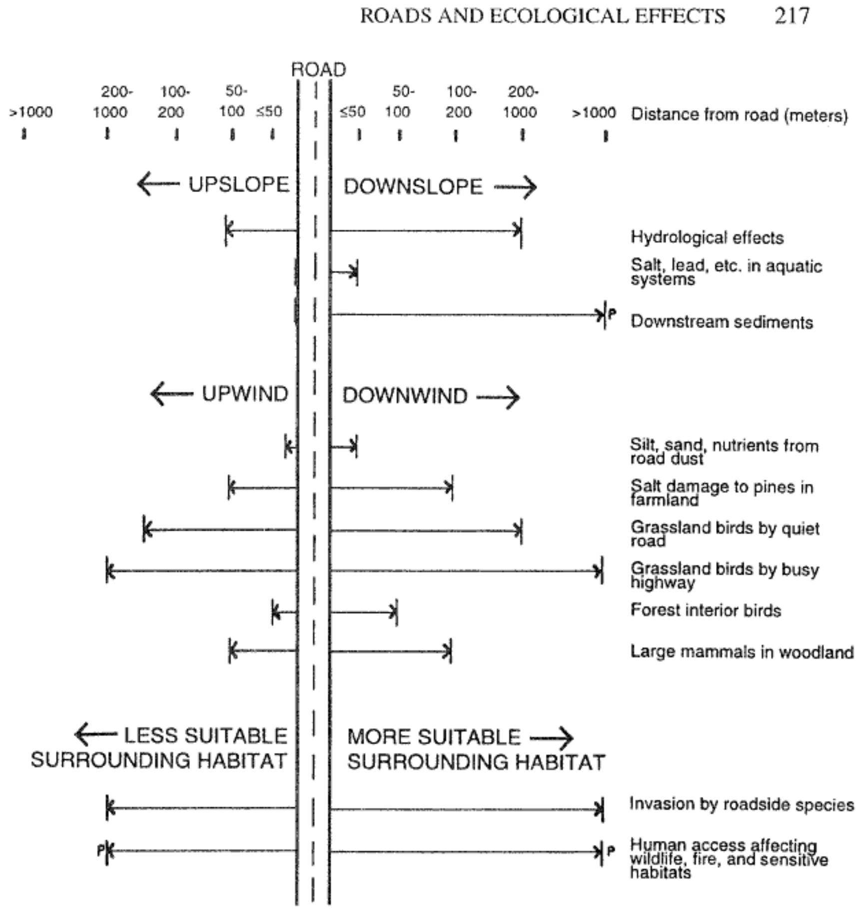

Figure 2-3: Impacts of Roadway Position

(Source: Richard et al. 1998)

The above chart from *Roads and Their Major Ecological Effects* demonstrates the effect of road location relative to habitats. The impacts of roadways are more detrimental and far-reaching to habitats downslope and downwind of their location.[31]

The study of a project area's slope is extremely important for hazardous material studies. The study of local topography informs decision-makers where runoff from the project will likely flow. This is important to know when cataloging local hazardous material sites. The study of hazardous material studies is largely focused on any site that contains or may contain an

[31] Richard et al. (1998).

underground storage tank (UST). These tanks typically contain fuels for combustion engines and thus are referred to as petroleum storage tanks (PSTs) by TxDOT. In May 1986, the EPA published a study on 433 tanks in the United States. It was discovered that 35% of these tanks were leaking their petroleum products into the surrounding soil. PSTs and Leaking Petroleum Storage Tanks (LPSTs) are identified as part of the environmental process.[32] Heavy construction associated with roadway projects could potentially disturb these hazardous sites. These tanks are documented in order to inform construction crews and to make sure the necessary precautions are taken for the environment's and their own safety.[33]

It is well understood that "Environmental Impacts" refers to ecological and natural resource-related impacts, however, impacts associated with the "human environment" are often overlooked. Impacts of this nature can be referred to as "Community Impacts". Community impacts can be the most severe and notorious impacts associated with roadway construction. Roads are typically constructed under the guise of connecting communities (City A to City B and so on). But what happens when there are people in the way of this new road? Right-of-way-based residential displacements are tied hand in hand with roadway projects and have become an essential part of community studies when attempting to environmentally clear a project. In modern times, environmental studies take into careful consideration the demographic make-up of project area residents and their location but this was not always the case. In the 25 years between the end of World War II and the conception of NEPA, there was a boom in roadway infrastructure projects. The vast majority of projects did not care who or what was in their way. There is a countless number of horror stories of evictions and community separation associated

[32] Gauthier, (1990).
[33] Texas Department of Transportation. Environmental handbook: Hazardous materials. (2014).

with projects of this era. As the Public Planning Commissioner of New York City, Robert Moses pushed the most expensive highway project conceived, the Cross Bronx Expressway.[34] The expressway was built through a minority neighborhood, effectively cutting it in half and displacing 1,400 families without providing relocation assistance. The project also demolished several community facilities like schools, parks, and churches that were in the way. No alternatives were considered during this process. This project was funded by the federal government in the name of progress without consideration of issues related to environmental justice.[35] This, however, was not a one-time occurrence. Robert Moses may have obtained a lot of notoriety, but he was not alone. In fact, his practices were commonplace pre-1970. Highway projects were completed without any consideration for community impacts.

Another such project was the East Los Angeles Freeway System. Despite having plenty of "Legitimate property owners and well-established communities" the incoming freeways spared nothing.[36] The Santa Ana freeway demolished an elementary school without accommodations, subsequently hampering the local school system by overcrowding it. Additionally, in a pre-NEPA area, no abatement actions were taken towards noise, pollution, or other environmental health issues.[37] A complete analysis of the Los Angeles Freeway System was published in the *Southern California Quarterly* in 2005 by Gilbert Estrada. Estrada advocated that a much better approach should have been taken. Public interest would have been better served if the freeway had been rerouted and/or buffer zones were used to limit air and noise pollution. Estrada also argued if there was even a need for so many freeways in Los

[34] Berkley, Recognizing Environmental Justice in History, (2011).
[35] Berkely, (2011)
[36] Estrada. If You Build It, They Will Move, (2005).
[37] Estrada, (2005)

Angeles.[38] Interestingly enough, all of Estrada's suggestions are linked in one way or another to current processes associated with NEPA.

It seems projects like the Santa Ana 5 Freeway were subject to lobbying by large corporations aiming to serve their own interests. Estrada highlights how the Sears Corporation promoted the project as contributing to the nation's economic stability. It was argued that "blighted communities like East Los Angeles" were holding the economy back and "could be redeemed with the symbols of progress: freeways".[39] This blatant act of gentrification became the norm, as cultural landmarks and vulnerable populations were often bulldozed and displaced instead of nearby industrial or commercial land uses. This process continued all over Los Angeles among the different freeway projects. It was commonplace for those with money or enough political representation to influence freeway construction away from their communities. This means that the freeways almost always demolished and displaced communities containing low-income and/or minority populations.[40]

NEPA regulations, specifically those referring to the study of community impacts force decision-makers to analyze the demographic makeup of affected communities. This entails utilizing United States Census Bureau data to understand the ethnic, economic, and linguistic characteristics of a project community. The goal of studying these statistics is to ensure that impacts to EJ (Environmental Justice) Communities are not disproportionately larger than impacts to non-EJ communities.[41]

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[38] Estrada, (2005)
[39] Estrada, (2005)
[40] Estrada, (2005)
[41] Texas Department of Transportation, Environmental Handbook: Community impacts, (2020)

As a whole, NEPA requires the study of all potential environmental impacts associated with any project. For roadway projects, this includes studying local wildlife and habitats, and how the design and location of the roadway will impact them. The same design aspects that impact wildlife could also influence the geological components of the project area. These impacts are important to understand when dealing with hazardous materials. Community studies are required to understand the human impact, and to see if any impacts are unfairly or unequally distributed amongst different demographics.

3.0 Methodology

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3.1 Objective

The objective of this Internship Report is to examine the environmental impact of the proposed project by cataloging and analyzing all environmental factors that, under NEPA guidelines, could be significantly impacted by the construction of the US 90 bridge over the UPRR tracks in Dayton, Texas. These factors can be collectively referred to as environmental constraints. This report focuses on the following environmental constraints as part of the study: Current Land Use, Hazardous Materials, Wildlife, Vegetation, Cultural and Historic Resources, Water Resources, Soils, Socio-economic Demographics, Air Quality, and Community Impacts.

3.2 Data Gathering

Databases from federal and state agencies were used to develop the documentation, tables, and Geographic Information System (GIS) based maps. Data were gathered from the following sources:

Table 3-1: Data Used and Sources

Source	Abbreviation	Data Retrieved
Liberty County	--	Shapefiles, Reports
City of Dayton	--	Shapefiles, Reports
Houston Galveston Area Council	H-GAC	Shapefiles, Reports

Texas Department of Transportation	TxDOT	Shapefiles, Regulations, Codes, Reports
Texas Commission on Environmental Quality	TCEQ	Shapefiles
Environmental Protection Agency	EPA	Reports, Regulations
Texas Natural Resources Information System	TNRIS	Reports, Regulations
Texas Historical Commission	THC	Shapefiles
United States Geological Survey	USGS	Topographic Maps
Federal Emergency Management Agency	FEMA	Shapefiles, FIRM Panels
Natural Resource Conservation Service	NRCS	Shapefiles, Soil Report
United States Fish and Wildlife Service	USFWS	Endangered Species Reports. Vegetation Reports
United States Census Bureau	USCB	Census Data, ACS 5 Year Estimate Data, Shapefiles.

Data and information collected were used to identify constraints related to engineerings such as utilities, existing/proposed roadways, rail lines, and environmental resources including natural resources, cultural resources, socioeconomics resources, land use, and other items of consideration such as hazardous materials, traffic noise, and air quality. A significant portion of data retrieved was in the form of GIS shapefiles (.shp). Specific facilities were point shapefiles, while roadways, project limits, and cartographic boundaries needed for the study were in polygon and polyline formats. Often datasets were out of date, or not fully complete; therefore, additional shapefiles were created via the "Create Feature Class" tool in ArcMap. The site was visited briefly by employees of HNTB in October of 2021 for a windshield survey where a video was recorded driving through the project corridor. A more detailed field reconnaissance trip occurred in early March 2022 to verify the accuracy of data collected during the production of the report, and to obtain project area photographs that will aid in the production of the report.

3.3 Data Analysis

The GIS data retrieved was processed using ESRI ArcMap GIS software. Liberty County and the City of Dayton itself are quite large. In order to narrow the scope, a project area was defined for the study. The buffer tool in ArcMap was used to create a 1000ft buffer that served as the project study area. Additionally, a 1-mile study area was developed primarily for the study of census data, as 1000ft was determined to be too small to be effective when studying community demographics. Data sets were clipped within the associated study areas. While initially developed for the Census data analysis, the 1-mile study area is referenced throughout the study among various constraints in order to give a sense of scale where applicable.

Other forms of data gathered for this study include customized reports and spreadsheets. An example of this was soil data gathered from the Natural Resource Conservation Service (NRCS). The NRCS offers a GIS-based tool to define a study area, from which a report on soil make-up and classification can be generated. This custom report formed the basis for a soil study. Data in spreadsheet form is taken from the United States Census Bureau. Tables breaking out the necessary socio-economic and demographic data are processed for the required statistics. This data will be used to summarize the project area population in terms of Limited English Proficiency (LEP), minority makeup, and income.

As a summary effort, and designed to display all constraints collectively for comparison, a Gradient Analysis was used as a summarizing tool. Extrapolating from study design aspects taken from TxDOT, a series of five study boundaries was used to display and categorize constraints. Keeping the inner and outermost boundaries of 1000ft and 1 mile, three additional boundaries were added to give a progressive scale. These boundaries were created using the Buffer Tool in ArcMap and were set at the following distance: 1000ft, 2000ft, 3000ft, 4000ft, and 1-mile. 1000ft was kept as the starting point for the gradient analysis because it was the primary area that TxDOT was concerned with, and the only boundary guideline specifically required by the agency. 1000ft foot intervals were chosen because, according to Richard et al. (1998), the maximum effective distance of roadway impacts is just over 1000 meters. This distance is equivalent to about 3280 feet, putting the maximum impact extent somewhere between the 3rd and 4th interval of the gradient. The 1-mile study area was retained because it serves as an analog for the 5000ft interval at 5280ft from the project. Additionally, the US Census data were clipped to this feature; using this 1-mile interval allowed the Census data to be displayed alongside all other constraints. The Gradient Summary Analysis is included after all of the findings are reported in this document.

A field visit to the site in early March 2022 allowed for verification of previous GIS-based findings. Any discrepancies will be noted in the report. Photos were also taken to document the project area for later reference and to help familiarize myself with key points of interest.

4.0 Results

4.1 Land Use

4.1.1 *Land Use Inventory and Planning Goals*

The US 90 project study area surrounds approximately 1 mile of roadway southwest of downtown Dayton in Liberty County. The project is located within a predominately industrial area in a rural town. The land uses adjacent to the proposed project include commercial, industrial, residential, and additional infrastructure like railways. The Houston to Dayton segment of the Lafayette Subdivision rail is within the project study area and parallels US 90, crossing the project at the intersection of US 90 and CR 605 (Waco Street), and continues south to the Burlington Northern and Santa Fe Railway (BNSF Dayton Yard).

Residential uses feature a mix of mobile and manufactured homes in a relatively rural community. Outlying residential areas are often accessed via Farm to Market Roads and additional unpaved streets. Close to Dayton, more up-scale, suburban homes constructed in more uniform subdivisions are present. These subdivisions often include pedestrian facilities.

Commercial uses are typical alongside large highways, and the same is true for US 90 in Dayton. Local uses include gas stations, hotels, motels, and fast-food restaurants, with some local sit-down food venues present as well. Significant portions of the surrounding areas consist of industrial, agricultural, or vacant (developable) land.

Land use data generated by the H-GAC reveals that 53.1% of the parcels immediately adjacent to the project are comprised of vacant/developable (including farming). The remaining

46.9% consists of industrial (13.7%), commercial (11.7%), residential (11.0%), and multiple (10.5%). The various land-use types identified within the project study area are shown in **Appendix A, Exhibit 2: Current Land Use Map**.

The City of Dayton employs the use of a comprehensive planning policy guide to direct the use of land as well as the character of development and redevelopment within its municipal boundary. In addition, Dayton also employs a Downtown Revitalization Plan, a Parks Master Plan, and a Unified Development Code.

Future land use plans, which are typically associated with comprehensive planning policy guides for local jurisdictions, indicate the type of land uses planned by municipalities within the project study area within their respective jurisdictions. The City of Dayton's Future Land Use Plan indicates a planned growth of predominantly suburban residential and rural/agricultural uses north of the project study area and industrial uses to the south.[42]

In addition to future land use designations and development strategies, The City of Dayton employs zoning and subdivision standards implementing the objectives of the aforementioned planning policy guides that direct future land uses and the character of development. Municipalities' land use planning policy guides generally do not direct the future of land use in unincorporated areas of the project study area; the remaining unincorporated land within the project study area is located within the extraterritorial jurisdictions (ETJs) of The City of Dayton. A municipality's ETJ is subject to future annexation, and therefore, land in unincorporated portions of the project study area is subject to future land use planning and will likely develop with similar uses as those currently suggested by future land use plans. No additional ROW is required for the

[42] City of Dayton, (2017)

proposed project; therefore, no direct impacts to current existing properties or land use plans are immediately anticipated.

4.1.2 *Section 4(f) Properties*

According to the U.S. Department of Transportation Act (U.S. DOT ACT), a Section 4(f) property is any significant publicly owned park, recreation area, wildlife and waterfowl refuge, or historic property protected by additional legislation and regulations. Examples of potential Section 4(f) properties located within the project area include city parks, parks, and cemeteries that may be designated as historic sites. The project study area does contain several parks and cemeteries, however; they are not considered Section 4(f) properties, as they are not protected by any federal regulation. Therefore, Section 4(f) evaluations are not anticipated.

4.1.3 *Section 6(f) Properties*

A Land and Water Conservation Fund Section 6(f) property is any public outdoor recreational land acquired or improved with funds authorized under the Land and Water Conservation Fund (LWCF) Act of 1965. Section 6(f) of the LWCF Act established restrictions on the use of these properties, and conversion of these properties to a use other than public recreation would require a Section 6(f) evaluation. There are no Section 6(f) properties along the proposed project; therefore, Section 6(f) impacts are not anticipated, and no further studies on necessary.

4.2 Hazardous Materials

A preliminary desktop review of the online Texas Commission on Environmental Quality (TCEQ) GIS data was performed. There is a total of twelve hazardous sites located within the project area, four of which are immediately adjacent to the proposed project and are related to automotive services. The leaking sites are: AutoZone (Old Miller Mart Tank) and Dayton Oil & Lube. Non-leaking tanks are located at the Mobil and Sunoco gas stations. These four sites are located on parcels of land which border the proposed project. This increases the likelihood of the tanks being disturbed during the construction process. All other hazardous sites non-adjacent to the project include oil wells, and more PSTs, both leaking and non-leaking. Moving out from the 1000 ft study area, more sites are present. Between 1000ft and 1 mile from the project, there are an additional 18 oil and natural gas wells. An additional 17 petroleum storage tanks are located within the 1-mile study area, 11 of which are leaking. Again, these sites are largely related to automotive services.

A Hazardous Materials Initial Site Assessment would be completed during the environmental process to fully evaluate potential hazardous materials locations and risks. For now, the locations of all sites mentioned above are shown in **Appendix A**, **Exhibit 3: Environmental Constraints Map, and Exhibit 4: Hazardous Material Sites Map.** Photos of the four at-risk sites are shown in **Appendix B.**

An online review of the Railroad Commission (RRC) public GIS viewer identified several gas pipelines within Liberty County, but none that directly cross or are adjacent to the project. The location of the pipelines is shown in **Appendix A**, **Exhibit 4: Hazardous Materials Sites Map.**

4.3 Threatened and Endangered Species/Habitat

The construction of the bridge on US 90 must comply with federal and state regulations for protecting and managing threatened and endangered fish, wildlife, and plant species. Per review of the Critical Habitat Portal from the United States Fish and Wildlife Service (USFWS), there are no specific critical habitats for any species located within or adjacent to the specific project area. Although no suitable habitat has been identified for federal or state-listed species or species of concern at this stage of analysis, a site visit by skilled biologists would be needed to completely assess the environment.

The Texas Parks and Wildlife Department (TPWD) Annotated County list of Threatened, Endangered, and Rare Species for Liberty County was reviewed for this project and a complete listing of these species is provided in **Appendix C: Federal and State Listed Threatened/Endangered Species in Liberty County.** This list provides both state and federal-listed threatened and endangered species indigenous to Liberty County, Texas, as well as the TPWD-determined rare species with no regulatory protection status found within Liberty County. These species have yet to be specifically identified as living within the project area, however, their habitat range is known to encompass parts of, if not all, of the entire project study area.

4.3.1 *Migratory Bird Treaty Act*

The proposed project must comply with stipulations laid out in the Migratory Bird Treaty Act (MBTA) and TWPD avian legislation. It is standard policy to make every attempt to avoid the removal and destruction of active bird nests except through federal or state-approved options. In addition, the following alternatives can be pursued where/when appropriate:

- Measures taken to prevent or discourage birds from building nests on engineered structures within portions of the study area planned for construction.
- Scheduling construction activities outside the typical nesting season.

Currently, the proposed project has no known impacts associated with any migratory bird population, thus no removal of nesting sites is expected, and a state or federal approval for such action is not required.

4.4 Vegetation

The project area is located within the TPWD-defined Coastal Sand Plain natural region of Texas, which stretches from the Mexico border along the Gulf Coast to the State of Louisiana. Typical annual rainfall in the region is approximately 30 to 50 inches which precipitates at a constant rate throughout the year.[43] The TPWD vegetation shapefiles indicate that the project area falls within the "Crops" and "Pine Hardwood" classification. The project area encompasses approximately 449 acres total. Of the total project area, the "Crops" classification comprises approximately 80%, and the "Pine Hardwood" classification comprises approximately 20%. [44]

The "crops" classification contains cultivated cover crops or row crops providing food and/or fiber for either humans or domesticated animals. This type may also portray grassland associated with crop rotations.[45]

Plant species commonly associated with the "Pine Hardwood" classification are listed in the following table.

[43] Texas Parks & Wildlife Department. Exploring Texas Ecoregions. (1996).
[44] Texas Parks & Wildlife Department, (1996).
[45] Texas Parks & Wildlife Department, (1996).

Table 4-1: Vegetation Species Native to Pine Hardwood Regions[46]

Common Name	*Scientific Name*
Shortleaf Pine	*Pinus Echinate*
Water Oak	*Quercus Laurifolia*
White Oak	*Quercus Alba*
Southern Red Oak	*Quercus Falcata*
Winged Elm	*Ulmus Alata*
American Hornbeam	*Carpinus Caroliniana*
Blackgum	*Nyssa Aquatica*
American Beautyberry	*Carlicarpa Americana*
Flowering Dogwood	*Cornus Florida*
Yaupon	*Ilex Vomitoria*
Supplejack	*Berchemia Scandens*
Virginia Creeper	*Parthenocissus Quiquefolia*
Wax Myrtle	*Morella Cerifera*
Red Bay	*Persea Borbonia*
Sassafras	*Sassafras Albidum*
Southern Arrowwood	*Viburnum Dentatum*
Poison Oak	*Toxidendron Pubescens*
Greenbirar	*Smilax Californica*
Blackberry	*Rubus Paracaulis*

[46] Texas Parks & Wildlife Department, (1996).

Several beech and hawthorn species are also present.[47] Locations of both Pine Hardwood and Crops vegetation classifications are shown in **Appendix A: Exhibit 7 Environmental Gradient Study.**

The following list shows additional criteria for identifying habitats in need of special consideration as developed by both the TPWD and TxDOT.[48]

1. Habitats for federal candidate species which are directly impacted by the project, if mitigation would assist in the prevention of the listing of the species;
2. Rare vegetation series that also locally provide habitat for a state-listed species;
3. All vegetation communities, regardless of whether or not the series in question provides habitat for state-listed species;
4. Bottomland hardwoods, native prairies, and riparian sites; and,
5. Any other habitat feature considered to be locally important.

The project area does not contain any major riparian areas. Waterways are further discussed in section **4.7 Water Resources**. Additional site investigations would be needed to determine the presence or absence of habitats to be considered for non-regulatory mitigation. Specific rare or unique vegetation species have not been identified within the project limits or in the adjacent areas.

4.5 Soils

A custom NRCS Soil Survey of the project area in February 2022 indicated it is within areas designated as having the *Labelle-Levac, Leage, Moncarey-Yeaton, Morey-Levac, and*

[47] Texas Parks & Wildlife Department, (1996).
[48] Texas Parks and Wildlife Department, Wildlife Habitat Assessment Program (2022).

Morey-Urban general soil types. The *Labelle-Levac* soil type is classified as somewhat poorly drained, nearly level, clay loam soils that have very slow permeability. The *Leage* soil type is classified as somewhat poorly drained, nearly level, silty clay soils that have very slow permeability. The *Moncarey-Yeaton* type is classified as moderately well-drained, nearly level, loamy soils that have high permeability. The *Morey-Levac* soil type is classified as somewhat poorly drained, gently sloping, clay loam soils that have high permeability. The *Morey-Urban* soil type is characterized as somewhat poorly drained, nearly level, clay loam soils that have slow permeability.[49]

Expanding from the 1000ft study area variations of the same soil types are located within 1 mile. Variations of the *Levac* complex as well as clay and loamy soils are present. Small pockets of Orcadia-Aris Complex and Beaumont Clay soils are present. The general makeup of all soils can be considered a mixture of clay-loam. The slope is level and unchanging across the entire region.

The *Labelle-Levac* and *Leage* soil types are classified as prime farmland soils. *Moncarey-Yeaton* is classified as prime farmland if properly drained. The *Morey-Levac* soil type is considered as farmland of statewide importance. Prime farmland soils are considered to not be easily erodible or saturated with water for extended periods of time. *Morey-Levac* is not classified as a significant soil type.

[49] Natural Resource Conservation Service, Soil Survey | NRCS Soils. (2022).

4.6 Cultural Resources

Cultural resources is a general term referring to buildings, structures, objects, sites, and districts more than 50 years of age with the potential to have significance in local, state, or national history. Archeological resources are those material remains of past human existence of archaeological interest. Historic resources refer to any site, district, object, building, or structure that is primarily non-archeological in nature.

Cultural resources, including archeological, historical, architectural sites, and traditional cultural properties located on land owned or controlled by the political authorities are protected by the State of Texas by law. Any historic or prehistoric property located on publicly owned land may be determined eligible as a State Archeological Landmark. All groundbreaking activities affecting public land must be authorized by the Texas Historical Commission (THC) Department of Antiquities Protection. Authorization includes a formal Antiquities Permit, which stipulates the conditions under which survey, discovery, excavation, demolition, restoration, or scientific investigations would occur. [50]

The proposed project entails the planning of a funded and permitted federal action. If any significant historic properties are present in the area of potential effect (APE) of the recommended alternative, these are considered under the National Historic Preservation Act (NHPA) of 1966 and the National Environmental Policy Act (NEPA) of 1969. NHPA and NEPA require federal agencies to consider the effects of proposed undertakings on traditional cultural properties. Traditional cultural properties can be districts, buildings, structures, objects, cemeteries (if

[50] Texas Department of Transportation, Environmental handbook: Historic properties. (2014)

associated with historic persons), or archeological sites eligible for inclusion in the National Register of Historic Places (NRHP).

In accordance with NHPA, federal agencies and their contractors must consider the effects of their undertakings on historic properties and also afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on the said undertakings. If an effect is determined to be adverse, steps must be taken to avoid, minimize, and/or mitigate the adverse effect. Projects that propose the use of a historic property may be approved if they will not adversely affect that property, or if there is no feasible or prudent alternative to the use of the property *and* the project includes all possible planning to minimize harm to the historic site.

NHPA also requires that the FHWA consult with federally-recognized American Indian tribes regarding the current undertaking. The Programmatic Agreement[51] between TxDOT, FHWA, and federally-recognized American Indian tribes specifies that consultation will only occur under certain circumstances. Per the Programmatic Agreement, FHWA grants TxDOT authority to fulfill FHWA's consultation requirements with federally-recognized American Indian tribes within the project area. The proposed project will not cross or disrupt native lands, therefore; a consultation will not be required.

4.6.1 *Archeological Resources*

A detailed review of the Texas Archeological Sites Atlas was conducted which revealed no archeological sites within 1000ft of the proposed project limits that were listed as State Archeological Landmarks or appear in the NRHP. Impact avoidance, minimization, and mitigation

[51] Texas Department of Transportation, Programmatic Agreement (2014).

efforts would be evaluated if the results of the investigations indicate a potential for impacts to archeological resources. No archeological sites are identified within 1000ft or otherwise near the project area.

4.6.2 *Historic Resources*

According to an online search of the THC's Texas Historic Sites Atlas, no historic resources (Historical Markers or historic-age cemeteries, or National Register sites) are present directly adjacent to the proposed project. However, there are four historic sites within the project study area: First United Methodist Church of Dayton, First Baptist Church of Dayton, Dayton's Old School Museum, and Dayton's Old School. A March 2022 site visit revealed the presence of a military veteran's memorial located southwest of the US 90/SH 146 intersection near the Sunoco gas station. This site is listed as property of Dayton's Historical Society which also owns the old school and its accompanying museum. Outside the 1000ft project study area, but within 1 mile, other historical markers are present. Linney Cemetery is located about 1 mile to the north of the project. According to the THC, two historical markers are present within the City of Dayton about 0.5 miles from the northeastern extent of the project, one of which being the Historic Judge Walter S. Neel House.

4.7 Water Resources

4.7.1 *Waters of the U.S., including Wetlands*

As required by the Clean Water Act (CWA), a preliminary investigation was conducted to identify potential jurisdictional waters of the U.S. (including wetlands) within the proposed project limits. According to the United States Army Corps of Engineers (USACE), the Federal agency having permitting authority over waters of the United States, wetlands are those areas that are inundated or saturated by surface or groundwater for ample time to support a significant amount of vegetation typically adapted for life in such soil conditions.

Potential water and wetland features were identified through the use of Google Maps, a review of National Wetland Inventory (NWI) maps, and a review of USGS topographic maps. Several unnamed waterways intersect the proposed project limits and flow into the Dayton Canal which is located just over three miles south of the project area. The locations of the streams and tributaries are shown in **Appendix A, Exhibit 5: USGS Topographical Map**. Additionally, waterways were documented during a field survey. Photos are presented in **Appendix B, Project Area Photographs.**

NWI GIS shapefiles were used to document any wetlands in and around the project area. Wetlands are not prominent within 1,000 feet of the US 90 centerline. However, a substantial number of wetlands are present starting at about 0.5 miles southeast and northwest of the project limits. In total, about 125 acres of wetlands reside within 1 mile of the project, primarily located between 0.5 and 1 mile away from the proposed project. These water features are shown in **Appendix A**, **Exhibit 3: Environmental Constraints Map, and Exhibit 5: USGS Topographical Map.**

4.7.2 *Floodplains*

The FEMA Flood Insurance Rate Maps were reviewed for the project area to determine potential floodplain impacts. Liberty County is a participant in the National Flood Insurance Program. The entire project area is encompassed by FEMA Map Panel 48291C0420D, which has an effective date of January 18, 2018.[52] This panel shows the 100-year floodplain is present within the project study area at its southwestern extent. This area contains approximately 15 acres of floodplain. Expanding from the project study area, **Appendix A**, **Exhibit 3: Environmental Constraints Map** shows more floodplains within a 1-mile radius. The 1-mile study area encompasses approximately 200 acres of the 100-year floodplain. Northeast of the project limits, the Trinity River floodplain extends into the 1-mile study area. The Trinity River main waterway is located approximately 3.5 miles due east of the project. The portions of the project area that are located within the 100-year floodplain are also shown in **Appendix A: Exhibit 5: USGS Topographical Map.**

4.8 Socio-economic Demographics

4.8.1 *Socio-economic Project Study Area*

The socio-economic project study area encompasses portions of four Census Tracts (CTs) as delineated by the United States Census Bureau (USCB) for Census 2010. Data gathered from the Census allows for a detailed study of project area demographics. The socio-economic project study area is defined by a 1-mile distance on each side of the existing roadway centerline of US 90. The enlarged study area was used to better understand the characteristics of the community which currently surrounds the project.

Population projections generated by the H-GAC's 2018 Regional Growth Forecast reveal robust expected growth in Liberty County. Between 2015 and 2045, the population of Liberty

[52] FEMA, National Flood Hazard Layer Viewer. (2022).

County is anticipated to double. Local jobs are expected to grow at the same rate. It should be noted that the majority of this growth is expected after 2035. From 2015 to 2035 Liberty County is expected to grow at a rate of approximately 856 persons per year. However, H-GAC predicts growth of approximately 5,771 persons per year from 2035 to 2045.[53]

4.8.2 *Environmental Justice Populations*

NEPA, and other federal legislation, mandate that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs on minority and low-income populations. The FHWA defines a minority as a person who is of African descent, Hispanic (ethnically or culturally), Asian American or American Indian, or Alaska Native. A low-income population is defined as one with a median income for a family of four equal to or below the Department of Health and Human Services National Poverty level of $27,750 in the year 2022.

Executive Order (EO) 12898, signed by President Clinton on February 11, 1994, requires that minority and low-income populations not receive disproportionately high and adverse human health effects from environmental impacts. Data analyses in this report involving minority populations utilize CTs from Census 2010. Studies were performed at the Block Group Level since the American Community Survey 2015-2019 population estimates were used instead of raw census data. The survey was the preferred choice over the 2010 census because it

[53] Houston-Galveston Area Council, Regional Growth Forecast (2018)

provides a more accurate representation of current demographics. The 2020 census data was not completely available at the time of this report.

Minority populations within the four Census 2010 CTs that are either wholly or partially contained by the socio-economic project study area account for approximately 40.9% of the total population. The socio-economic project study area has a comparable percentage of minority populations to Liberty County (43.2%). Racial and ethnic population data in all four Census 2010 CTs partially or wholly contained within the socio-economic project study area as well as comparison counties and municipalities are provided in **Table 4-2**.

Minority populations are dominated by people of Hispanic origin/descent at 31%. African-American populations follow at 8%. Asian American and American Native populations round out the rest at 1.3% and 0.6% respectively. No Pacific Islander minority populations were recorded in the project or socio-economic study areas.

Table 4-2: Racial and Ethnic Composition of the Population within the Project Area[54]

Area/ Census Tract BG	Total Population	Minority Population of One Race / Not Hispanic or Latino				Hispanic or Latino of Any Race	Total Minority Population
		Black or African American	American Indian and Alaska Native	Asian American	Pacific Islander		
Comparison Areas							
Liberty County	91,628	7,171 7.8%	1,100 1%	499 <0.1%	17 <0.1%	30,797 33.6%	39,584 43.2%
City of Dayton	8,777	1,328 15.1%	58 12.5%	135 1.5%	3 <0.1%	1,852 21.1%	3,376 38.5%
Project Area							
CT 7008.00 BG2	3,368	622 18.4%	0 0%	105 3%	0 0%	613 18.2%	1,340 39.7%
CT 7008.00 BG 3	605	16 2.6%	0 0%	0 0%	0 0%	168 27.7%	184 30.3%
CT 7009.00 BG 2	1,447	74 5.1%	0 0%	0 0%	0 0%	116 8.0%	190 13.1%
CT 7010.00 BG 1	3,052	201 6.5%	28 0.9%	81 2.6%	0 0%	1,902 62.3%	2,212 72.5%
CT7010.00 BG 2	1,109	117 10.5%	0 0%	0 0%	0 0%	106 9.5%	223 20.1%
CT 7010.00 BG 3	3,256	71 2.1%	0 0%	0 0%	0 0%	1,779 54.63%	1,850 56.8%
CT 7011.00 BG 3	1,494	22 1.4%	0 0%	16 1.1%	0 0%	37 2.5%	75 5.0%
CT 7011.00 BG 4	1,262	129 10.2%	65 5.1%	0 0%	0 0%	108 8.6%	302 23.9%
Total Project Area	**15,593**	**1,252** **8.0%**	**93** **0.6%**	**202** **1.3%**	**0** **0%**	**4,829** **31%**	**6,376** **40.9%**

Data analyses in this report involving low-income populations also use CTs from Census 2010 and data from the 2015-2019 American Community Survey, which is the most recent data

[54] Source: U. S. Census Bureau, 2019 ACS 5 Year Estimates.

set for which income data are available. According to the USCB 2015-2019, American Community Survey, the median household income of the project area ranged from $40,875 to $110,333. Percentages of project area CT populations below the poverty level ranged from 6.1 to 13.0%. None of these CTs have median household incomes below the 2022 established national poverty level of $27,750. Thus, no further evaluation is anticipated due to impacts to low-income populations in the project development process to assess if disproportionate impacts would occur. Median household income data for the project area are summarized in **Table 4-3** and poverty data is summarized in **Table 4-4**.

Table 4-3: Median Household Income within the Project Area[55]

Census Tract BG	Population	Median Household Income
CT 7008.00 BG2	3,368	$40,875
CT 7008.00 BG 3	605	$75,568
CT 7009.00 BG 2	1,447	$69,250
CT 7010.00 BG 1	3,052	$63,528
CT7010.00 BG 2	1,109	$51,403
CT 7010.00 BG 3	3,256	$51,363
CT 7011.00 BG 3	1,494	$110,333
CT 7011.00 BG 4	1,262	$53,028
Total	15,593	**N/A**

[55] U. S. Census Bureau, 2019 ACS 5 Year Estimates.

Table 4-4: Persons Below Poverty Level within the Project Area[56]

Census Tract	Persons Below Poverty	Percent
CT 7008	508	6.1%
CT 7009	173	6.6%
CT 7010	963	13%
CT 7011	638	9.9%
Total	2,282	8.9%

4.8.3 *Limited English Proficiency Populations*

EO 13166, "Improving Access to Services for Persons with Limited English Proficiency (LEP)" requires federal agencies to examine the services they provide and identify any need for services for those with LEP. The EO requires federal agencies to work to ensure that recipients of federal financial assistance provide meaningful access to their LEP applicants and beneficiaries. Identifying LEP populations facilitates the public involvement process and allows for equal access to public information for all people of varying linguistic abilities and characteristics. Data on LEP

[56] U. S. Census Bureau, 2019 ACS 5 Year Estimates.

directly impacts the presence of translators and non-English signage used during the public involvement process.

Census Tract data for "Ability to Speak English" from the 2015-2019 American Community Survey for the population five years and over indicate 11.0% of the total population within the CTs contained by the socio-economic project study area speak English "Well", "Not Well" or "Not at All." Data indicating the level of English language proficiency for the area are provided in **Table 4-5**.

Table 4-5: Percentage of LEP Population within the Project Area[57]

Census Tract	Block Group	Total Population 5 Years and Older	Total Number Who Speak English "Well", "Not Well", or "Not at All"	% LEP
CT 7008.00	2	3,288	205	6.2
CT 7008.00	3	605	26	4.2
CT 7009.00	2	1,325	201	15.2
CT 7010.00	1	2,780	544	19.5
CT 7010.00	2	974	16	1.6
CT 7010.00	3	2,988	575	19.2
CT 7011.00	3	1,320	33	2.5
CT 7011.00	4	1,214	0	0
Total Project Area		**14,494**	**1,600**	**11.0%**

[57] U.S. Census Bureau. 2015-2019 American Community Survey.

4.9 Air Quality

In compliance with the Clean Air Act (CAA) of 1970, the EPA adopted the National Ambient Air Quality Standards (NAAQS) to protect public health, safety, and welfare from the effects of six specific air pollutants. The air pollutants identified by the EPA as criteria pollutants of concern nationwide include ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and particulate matter (10 and 2.5 microns).[58] The EPA regulates air quality nationally while the TCEQ Office of Air Quality enforces air quality regulations in Texas.

When a pollutant level within an area exceeds the NAAQS, the EPA designates the area as "non-attainment" for the pollutant. For non-attainment areas, it is required that the Metropolitan Planning Organization (MPO) and the state transportation departments demonstrate that transportation plans, programs, and projects funded by the Federal Transit Act conform to state or federal implementation plans.[59] Thus, all transportation projects that are subject to FHWA approval must first be found to conform to an approved State Implementation Plan (SIP). A SIP is a collection of requirements that delineates how a state would reduce emissions to attain the NAAQS. The SIP must be approved by the EPA.

The proposed project is located in Liberty County, which is part of the EPA's designated eight-county serious non-attainment area for the 8-hour standard for ozone (Houston-Galveston-Brazoria ozone nonattainment area); therefore, the transportation conformity rule would normally apply.[60] However, because the project is a "Railroad/highway crossing" which is denoted as a type of "Safety" project per TxDOT regulations, it is exempt from transportation air quality conformity

[58] Environmental Protection Agency (2022)
[59] Texas Commission on Environmental Quality, (2021)
[60] Texas Commission on Environmental Quality, (2021)

rules. Thus, the potential impact on air quality was not studied. Additionally, this project is not classified as "adding capacity" so it is exempt from other air quality studies per TxDOT guidelines.

4.10 Community Impacts

4.10.1 *Traffic Noise*

Federal Highway Administration's, *Procedures for Abatement of Highway Traffic Noise and Construction Noise* was developed to provide procedures for traffic noise studies and noise abatement measures, to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways. These guidelines are applicable to all federal, federal-aid, and state-funded Type I highway projects. Per FHWA regulations, certain types of projects are considered to have "Substantial Vertical Alteration" to the existing roadways. These types of projects qualify as Type I highway projects. The proposed project is a grade separation that involves the construction of a bridge, thereby altering the existing line of sight between the roadway and the surrounding area. By this definition, the proposed project is considered a Type I Project and a traffic noise analysis is required.

In general, sound becomes unwanted when it either interferes with normal activities such as sleeping or conversation or when it disrupts or diminishes a person's quality of life. At this point, sound becomes an environmental constraint that must be predicted, studied, and mitigated if necessary.

This report describes the existing land uses that are most sensitive to traffic noise in accordance with noise abatement criteria (NAC) included in the 2019 *TxDOT Guidelines for*

Analysis and Abatement of Highway Traffic Noise and listed in **Figure 4-6**. The NAC are used as one of two means to determine when a traffic noise impact will occur. When a traffic noise impact occurs, traffic noise abatement measures must be considered and evaluated for feasibility and reasonableness. A traffic noise abatement measure is any positive action taken to reduce the impact of traffic noise. This may include the construction of noise abatement walls made with a sound deadening material alongside the highway if necessary.

Table 4-6: FHWA Noise Abatement Criteria[61]

Activity Category	FHWA dB(A) L_{eq}	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extra-ordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Residential.
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (interior)	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	------	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	------	Undeveloped lands that are not permitted.
NOTE: Primary consideration is given to exterior areas (Category A, B, C or E) frequently used by humans. However, interior areas (Category D) are used if exterior areas are physically shielded from the roadway, or if there is little or no human activity in exterior areas adjacent to the roadway.		

As described in section **4.1.1 Land Use Inventory and Planning goals,** the project area is largely comprised of industrial, commercial, and agricultural uses with a small portion of residential. Additionally, section **4.6.2 Historical Resources** denotes the presence of a school, two churches, and a museum within the project area.

[61] Texas Department of Transportation, Guidance - Traffic noise policy implementation., (2019, December).

Based on the described land uses of the project area and the application of the FHWA noise abatement criteria, the project area is determined to be comprised of land use activity areas represented by the following NACs: Sunset Heights residential neighborhood (NAC B); educational, cemeteries, museums, libraries, parks, places of worship, recreational areas, parks, and civic facilities, (NACs C and D); motels and restaurants (NAC E); agricultural lands, retail facilities, and warehouses (NAC F); and for the most part, undeveloped lands (NAC G). In summary, the project area can be categorized mostly under NACs B, C, D, and G.

Currently, the existing facility does not incorporate any kind of sound barrier. Since the roadway is being elevated, the line of sight from the noise generation points is changing. Changes to the current noise levels are expected.

4.10.2 *Waco Street*

Waco Street and its closure is the primary point of community impacts associated with the proposed project. The street is being closed because it is located at-grade at a point where the bridge will be near its highest vertical geometry. The project would prove too complex to incorporate a "T-shaped" intersection in the middle of a bridge.

Waco Street currently operates as an access point for those traveling to US 90 from Northwest Dayton and greater Liberty County. Access points to current infrastructure are key aspects of community cohesion. TxDOT does not immediately consider this a concern as the US 90 improvements will greatly improve overall access within the study area. However, local residents have raised concerns about Waco Street's closure. These comments are discussed in the following section.

4.11 Public Involvement

TxDOT held a stakeholder meeting with UPRR, the City of Dayton, and Liberty County Staff on January 14, 2022, at the Dayton Community Center to discuss the project overview, conceptual alternatives, proposed typical section, and project schedule. Initial stakeholder opinions were positive about the continuation of the project. However, representatives from the City of Dayton did express some mild concerns about the closure of Waco Street. As of right now, no mitigation has been proposed to address these concerns.

The first public meeting was held at the Dayton Community Center on March 31st. The first 15-day public comment period ended on April 15th. Due to the presence of LEP populations that speak primarily Spanish, legal notices were published in both English and Spanish while Spanish translators were also available. Additional meetings and comment periods may be held as needed.

A total of 32 comments were submitted by the citizens during the meeting at the Dayton Community Center. The comments can be summarized as follows:

There were numerous comments in support of the project. Citizens appeared excited about the project and are eager for construction to begin. Many recognized the problems associated with the current design and are thankful that TxDOT is addressing them.

Most negative comments were associated with the closure of Waco Street. The phrase *"non-negotiable"* was often used in this context. Many people stated that it is currently an alternative route to alleviate heavy traffic. Additional comments stated that Waco Street does not flood as often as other local streets, therefore it is often the only available route around down during heavy rains. TxDOT has replied stating that connecting Waco Street to the overpass is not feasible without significant right of way acquisitions, which will lead to even more impacts. TxDOT did state that a drainage pump station at N Cleveland Street was recently rebuilt for improved capacity which should aid in flood mitigation. No further mitigation efforts are planned.

5.0 Gradient Summary Analysis

A gradient analysis was performed in order to compare all constraints together and associate their spatial attributes with one another. Constraints were studied through a series of 1000ft intervals enclosed in the largest 1-mile study area. The analysis discussed here is visually represented in **Appendix A: Exhibit 7: US 90 Environmental Gradient Study**. Findings are additionally presented in the following **Table 5-1: Constraints Distances from Project Limits.**

Table 5-1: Constraint Distances from Project Limits

Gradient Intervals	Hazardous Sites	Places of Worship	Schools	Historic Resources	Parks	Cemetery	LEP Census Blocks	Minority Census Blocks
Within 1000ft	12	1	2	2	0	0	1	1
1000 – 2000ft	12	2	1	1	0	0	2	1
2000 – 3000ft	7	3	0	0	1	1	2	1
3000 – 4000ft	8	3	1	0	1	0	3	2
4000ft – 1 Mile	9	1	0	0	0	1	4	2

5.1 Constraints Within 1000ft of Project Limits

Constraints within immediate proximity to the project have largely already been discussed. Hazardous Material sites are prominent near the northern terminus of the project limits. In total there are twelve hazardous material sites which are broken out as follows: two oil wells, three intact PSTs, and seven leaking petroleum storage tanks.

Additionally, there are two historic sites, two schools, one place of worship, one memorial, and one large stadium. Like most of the project area, the immediate area is made up of vegetation identified as *"Crops"* and *"Pine Hardwood"*. Demographically, the project runs along an area identified as having both minority and LEP populations. Minor wetlands and about 15 acres of the 100-year floodplain are present.

5.2 Constraints Between 1000ft and 2000ft from the Project Limits

Moving further out, Hazardous Material sites are still prominent. There are twelve more hazardous material sites which consist of three oil wells, four intact PSTs, and five leaking petroleum storage tanks. The majority of these PSTs are located along US 90 near S Winfree St un downtown Dayton.

There are two places of worship, one school, and one historic site within these boundaries. Expanding out to 2000ft includes additional LEP communities, which are located just north of the project and west of N Cleveland St.

5.3 Constraints Between 2000ft and 3000ft from the Project Limits

Between 2000 and 3000 ft, the constraints begin to become less dense. Hazardous Material sites are reduced to seven and are made up of three oil wells, one intact PST, and three LPSTs. These sites appear to be evenly distributed around the project area.

Other constraints include three churches, one cemetery, and a park. LEP and minority populations as well as floodplains and wetlands are still present but with no significant change in amount or frequency as areas within closer proximity to the project. Particularly noteworthy is the presence of oil wells close to known wetlands northwest of the project.

5.4 Constraints Between 3000ft and 4000ft from the Project Limits

Between 3000 and 4000 ft, the following constraints are present. Eight hazardous material sites are made up of three PSTs and five oil and natural gas wells. No leaking sites are present in this area. Three churches, a school, and a park are located in this interval. In addition, minority and LEP populations are present due west of the project.

5.5 Constraints Between 4000ft and 1 mile from the Project Limits

Just under a mile from the project area, there are a total of nine hazardous material sites made up of seven oil wells and two intact PSTs. At this distance, a significant amount of additional floodplain is present northeast of the project. This can be attributed to the presence of the Trinity River. Additional LEP populations are incorporated in the north, and a total of four LEP Census Blocks are encircled within the one-mile interval. Additional minority Census

Blocks are located to the southwest. One church and one cemetery are present within these bounds.

6.0 Discussion & Conclusion

6.1 Discussion

Research using GIS, online federal and state agency databases, as well as in-person reconnaissance, has documented the following environmental constraints in the project study area.

Land use data from the Houston-Galveston Area Council revealed that the land immediately surrounding the proposed project was primarily occupied by industrial, agricultural, and commercial land uses. The only exception is the presence of the residential Sunset Heights neighborhood, located on Sunset Heights Ave just northeast of CR 493.

The UPRR operates one rail line which splits at the US 90 & Waco St intersection. This is the primary purpose for why the grade separation is being performed. This section of the UPRR connects the deep-water ports of Houston and Beaumont by transiting through the City of Dayton. Additionally, the UPRR provides access to the BNSF railyard located south of the project area.

Twelve hazardous material sites are located within the project. These locations are made up of oil and natural gas wells, PSTs, and LPSTs. No facilities related to the fertilizers or other agricultural products are located nearby. Of the twelve hazardous sites, four can be considered significant with regard to environmental concerns. These four sites are PSTs and are located adjacent to the proposed project, two of which are leaking. These four sites are significant due to their proximity to the proposed project, all of which are located on parcels that border the project area. Additional sites are located outside of the 1000ft study area but do not appear immediately significant given the scale of the proposed project.

Liberty County is home to a significant number of federally and state-listed endangered species; however, no habitats for such species were documented during a site visit. Further natural resources documentation will be required to assess the status of wildlife habitats in and around the proposed project.

According to the NRCS, the project study area contains three prime farmland soils. All present soils have a wide mix of runoff, with some high rates and others with low rates. However, the topography of the region is level, and the project is not expanding the right of way. This means that affected soils will not expand outside soils already affected by the presence of the current roadway.

Historic resources include two Churches, a museum, and a school located within 1,000 feet of the project limits but do not immediately appear to be at risk from the construction of the proposed project as none of the sites are adjacent to the proposed project.

Two unnamed streams cross the project and flow into the Dayton Canal, which is located south of the project area. Numerous small wetlands are present in the project study area. The 100-year floodplain as denoted by FEMA does cross US 90 at the far southwestern extent of the project area. The greater area is noticeably wet with various wetlands and just over 200 acres of floodplains located around the project. However, most of these wetlands and floodplains are not within 1000 ft of the proposed project.

The project area contains two 2010 US Census Block Groups that have a Minority Population Greater than 50% and four Block Groups where the LEP population is greater than >5%. No low-income populations were discovered within the project area.

Based on the current design schematic of the US 90 bridge, the project qualifies as a Type I Project per TxDOT and FHWA guidelines. Therefore, a noise study will be required to determine the detailed impacts.

Historic and archeological sites were studied, but no sites were discovered of interest that would potentially be disturbed by the project.

The closure of Waco Street eliminates a significant north-south route within the City of Dayton, and this has been highlighted as a primary concern in recent public involvement.

6.2 Limitations

The primary goal of this study was to identify environmental constraints associated with the proposed project and define their significance. Each set of constraints will require a more in-depth study covered by its technical analysis report. In its entirety, this study serves as a focusing point for additional studies. Constraints listed as significant will no doubt require more attention at a later phase of analysis. Identifying them now allows a firm like HNTB to properly allocate resources like time, money, and personnel towards these studies. With this understood, the major limitation of this report is that it is a step in the process and, on its own, is not sufficient to satisfy any NEPA requirement.

Specific to this study, the use of online databases is a limitation. Databases, while computer-based, are developed by human beings who make mistakes. Aside from the possibility of inaccurate data, databases have to be updated for them to be useful. Often data could be up to a decade old. This is part of the reason for a site visit. The data collected needed to be verified.

A drawback of the Census Data used in this study was its scale. Data was aggregated at the block group level, thus for the size of the project, it appears to be too large. With that being said, only race and ethnicity data are available at the small Census Block level. This became a prominent issue in the environmental gradient study. As the intervals expanded, no real meaningful demographic data was revealed. Specific details about the locations of these populations were unknown. Additionally, it seemed that all of the Census Block Groups converge on a point close to the northern project terminus; this is apparent in **Appendix A: Exhibit 6: Census Tracts Map.** This convergence, accompanied by the coarse-scale of the data, means that an expanding gradient study like the one performed was not particularly useful for the study of demographic and socio-economic data because the data would not necessarily change all that much which each interval expansion.

6.3 Effectiveness

This study was effective due to its comprehensiveness. It covers a broad spectrum of environmental constraints and allows them to be compared to each other. To someone unfamiliar with environmental impacts or the NEPA process, this study would allow them to understand the severity of a wide assortment of issues and to see how they stack up against each other. Ultimately, this research serves as a comparative tool, which will aid readers in the process of identifying constraints of concern and eliminating those which are insignificant.

GIS is the primary and undoubtedly the most efficient method of accomplishing this goal. Maps play a key role in representing information, and the severity of environmental impacts is often relative to spatial locations. Of course, field verification is necessary and is required per TxDOT guidelines. The field visit was effective because it provided further context to the data recorded. Additionally, the field visit allowed for minor corrections. For instance, one of the petroleum storage tanks was said to be located at a "*Racetrac"* gas station. The field visit revealed that this location had changed to a *"Mobil"*. The same was true for the AutoZone, GIS data had shown that location to be the "*Miller Mart"*. As a whole, this study lays an effective foundation for more detailed work centered on specific constraints identified in the conclusion.

As stated in the previous section, the scale of the Census Data may have been too coarse for this study, preventing the study from saying anything more than LEP and Minority populations exist in the project area. A study at the Census Block level would have been more effective.

6.4 Conclusion

The information presented in this study lays out the environmental constraints and provides the groundwork for further, more technical studies.

Environmental constraints have been identified that range widely in significance. To start, the most significant findings prove to be local hazardous material sites. Four PSTs are located immediately adjacent to the project limits. Two of these sites are leaking. All four sites need to be monitored, especially the leaking tanks, during the construction process. Heavy construction could result in a worsening of the current leaks. Pavement will be disturbed, and heavy vehicles will be frequenting the area. The risk is somewhat mitigated by the non-existent slope of the project area. Petroleum or any other automotive fluid is very detrimental to the environment and could have significant impacts on the numerous endangered or at-risk species which call Liberty County home. The exact locations of habitats for these species are not specifically known, but their documented presence in the region makes the potential impacts of a hazardous material spill that much more significant. The details of such a hazardous material spill are still not fully known but would be revealed with further study and documentation. Looking at the entire project area, it is evident that the majority of hazardous sites are clustered within 2000ft of the project limits, primarily towards the north near the urban center of Dayton. Sites between 1000ft and 2000ft away from the project are not an immediate concern but could come into play if the project limits/design change or expand, which is a possibility this early in the process.

Community impacts related to the closure of Waco Street are significant because of the weight placed on them by local stakeholders. Local government officials know their communities better than national contractors like HNTB or state entities like TxDOT. Closing Waco Street means the loss of a primary access point for US 90. Traffic patterns will inevitably change, especially for commuters from Northwest Dayton and Liberty County. With an access point being removed, traffic now has fewer options; therefore, additional congestion on nearby streets like N Cleveland Street can be expected. Roadway projects are supposed to have benefits for the greater public, but this is an example of how associated effects can be detrimental instead. Community facilities like churches and schools are present in the area. The project would greatly improve access and safety while traveling to and from these locations by eliminating the at-grade crossings. No significant impacts on these facilities or their patterns of access are anticipated. However, it is entirely possible that they could temporarily be impacted by construction traffic.

Community Impacts regarding environmental justice population are not greatly significant. Minority populations are present through the study area at all distances from the project, but at a rate that is equal to Liberty County and the United States as a whole. Additionally, no right of way is being acquired by the project, so no displacements are occurring in either EJ or non-EJ communities. The study area also does not contain any low-income populations. LEP populations are present throughout but are easily accommodated with Spanish signage and translators at public meetings and comment periods.

Noise can be considered a potentially significant impact. The proposed facility is considered a Type I project by TxDOT and the FHWA. Therefore, it is known by these agencies that projects of this type have noise impacts. The elevation of the roadway is increasing, which could potentially project noise further. However, the exact severity of such impacts will not be known until a noise reading is taken and impacts are projected using a noise model. It is known that the noise generated from the proposed project will require mitigation if it is louder than 52db based on surrounding land uses. If noise impacts are significant, and heavy mitigation is required, it could lead to future land-use changes in the area, specifically residential. Residents may not be happy with noise or the presence of a large noise abatement wall just behind their property. In this case, it is possible that surrounding residents may choose to move, allowing for a gradual change of residential land uses to possible commercial or industrial uses. At the very least, expansion of residential land uses would be slowed if noise impacts are significant.

Impacts on soils and local vegetation are not significant. Prime farmland soils are not at risk even though they are present in the study area. This is because the project is using existing right-of-way and is an improvement on an existing facility. Whatever soils are present inside the project limits have already been disturbed. Being prime farmland soils is insignificant since they have been paved over by a previously constructed roadway. Areas paved as a roadway are now useless as farmland. Additionally, shoulders of roadways tend to form their own unique ecosystems, as they are typically well maintained through landscaping by local governments and TxDOT. Heavy cutting and the frequent use of herbicides and pesticides effectively tame grass ecosystems within the existing right-of-way, making the area uniquely different from the surrounding vegetation.

Ordinarily, based on the project's location, air quality would be a significant concern. The project is located in an area that is designated as "serious non-attainment" by TxDOT. However, railway junctions like this project are excluded from air quality standards, so no air quality study was or will be performed. NEPA requirements will still be satisfied without any study on air quality impacts. The project, as designed, is not adding capacity to US 90, only making travel more efficient. Automobile traffic should not greatly increase as a result of the project, therefore it can be reasonably concluded that air quality measurements would not change in any significant manner for better or for worse. The project will not worsen the “serious non-attainment” zone, nor will it cause any noticeable improvement.

Public perception can generally be considered positive with some reservations. Most commenters want the project to move forward, while a select number do not want Waco Street closed. Community opposition does not appear strong, and thus the project is proceeding as planned with no mitigation planned aside from the already-completed drainage pump improvement at N Cleveland Street.

As a whole, this project has a limited number of significant impacts. This is likely why TxDOT is aiming to label the project as a Categorical Exclusion Open Ended (d). Based on TxDOT regulations, this project qualifies specifically as a Categorical Exclusion Open Ended (d) because it will add less than 30 acres of right of way and will not displace properties. Based on TxDOT’s understanding, projects within this footprint are generally limited in their environmental impacts; however, there is always the need for verification. This report and a series of additional technical studies serve as verification that the project is indeed a categorical exclusion. Environmental factors analyzed in this report are not deemed significant enough at this time to impede the Categorical Exclusion approval process. The project is still in the early stages and is slated for final Categorical Exclusion approval in June 2023 with an official letting date projected for July 2024.

6.5 Further Studies

The findings of this report are understood as a general starting point for further studies and are part of the preliminary planning phase of the proposed grade separation project in Dayton, Texas. Information contained in this report is not a comprehensive environmental analysis that would meet NEPA requirements, instead, it is a step in the process of NEPA approval. Additional, detailed environmental studies would be undertaken as part of the NEPA process during a later stage of project development.

The *Environmental Technical Analysis Report* that this research paper is associated with is the first step in the environmental process. It serves as a summary and prepares the way for further environmental studies. The following technical studies are planned/required for the proposed project as part of the environmental process:

Community Impacts Assessment Technical Report: Community Impact Assessments are studies undertaken to analyze the effects of transportation action on a community and assess its quality of life. The report studies demographics and community facilities in an effort to preserve community quality of life, inform responsible decision-making and ensure nondiscrimination.

Noise Analysis Technical Report: Noise analyses are studies undertaken to identify noise-sensitive areas and impacts associated with proposed projects and evaluate proper abatement measures.

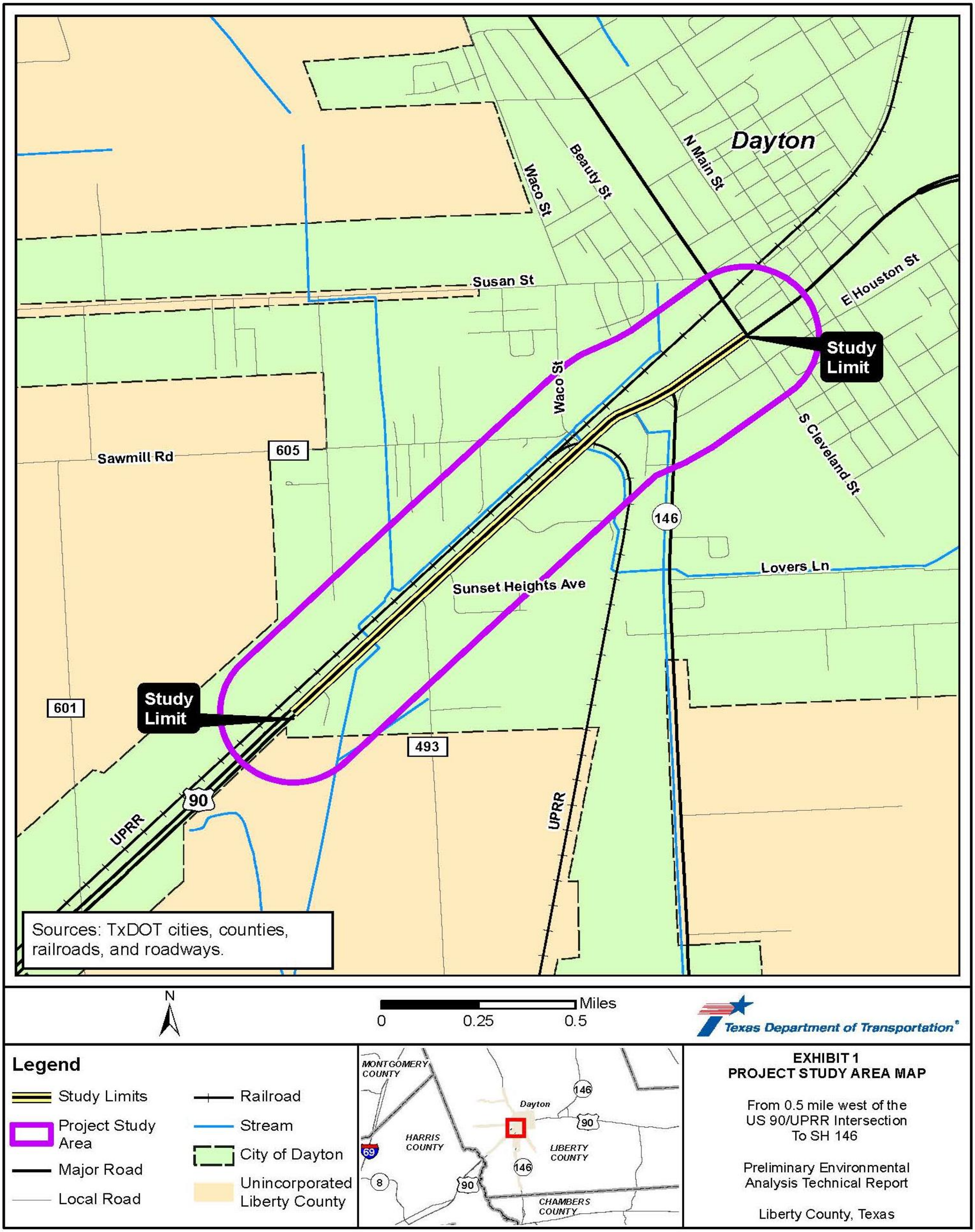
Water Resources Analysis and documentation, *Biological/Natural Resources Management Analysis and documentation:* All of these documents fall under TxDOT's natural resource studies which aim to delineate present resources and demonstrate the potential risk posed by the proposed project if any. Appropriate mitigation measures are also provided.

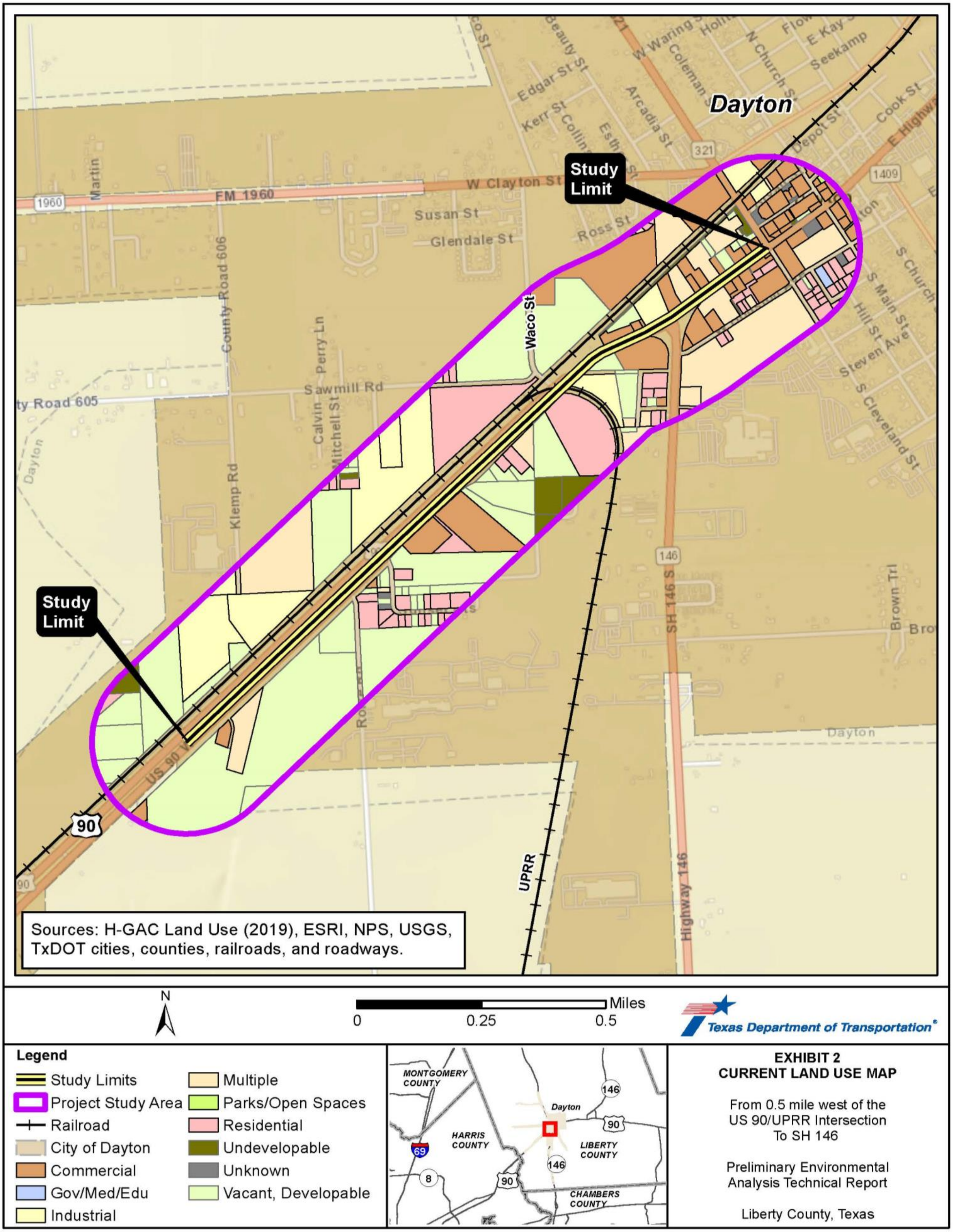
Hazardous Materials Initial Site Assessment with a Project Impacts Evaluation Report: A more specific study was performed to analyze the types of hazardous materials present and the potential threats they pose to the environment.

Archaeological Background Study, Historic Project Coordination Request: Actions undertaken to preserve the culture and history of an area in which a proposed project are planned.

All reports and studies are necessary to satisfy the requirements put forth by NEPA and are all individual parts of documentation such as categorical exclusions, environmental assessments, and environmental impact assessments.

Appendix A: Project Maps


Dayton
Waco St
Beauty St
N Main St
Susan St
E Houston St
Study Limit
Waco St
S Cleveland St
Sawmill Rd
605
146
Lovers Ln
Sunset Heights Ave
601
Study Limit
493
90
UPRR
UPRR
Sources: TxDOT cities, counties, railroads, and roadways.
N
Miles
0
0.25
0.5
Texas Department of Transportation
Legend
Study Limits
Project Study Area
Major Road
Local Road
Railroad
Stream
City of Dayton
Unincorporated Liberty County
MONTGOMERY COUNTY
HARRIS COUNTY
Dayton
146
90
LIBERTY COUNTY
69
8
90
146
CHAMBERS COUNTY
EXHIBIT 1
PROJECT STUDY AREA MAP
From 0.5 mile west of the US 90/UPRR Intersection To SH 146
Preliminary Environmental Analysis Technical Report
Liberty County, Texas



Dayton
Study Limit
Study Limit
W Clayton St
FM 1960
Susan St
Glendale St
Ross St
Waco St
Sawmill Rd
County Road 606
Klemp Rd
US 90
UPRR
SH 146 S
Highway 146
Brown Trl
Sources: H-GAC Land Use (2019), ESRI, NPS, USGS, TxDOT cities, counties, railroads, and roadways.
Miles
0
0.25
0.5
Texas Department of Transportation
Legend
Study Limits
Project Study Area
Railroad
City of Dayton
Commercial
Gov/Med/Edu
Industrial
Multiple
Parks/Open Spaces
Residential
Undevelopable
Unknown
Vacant, Developable
MONTGOMERY COUNTY
HARRIS COUNTY
LIBERTY COUNTY
CHAMBERS COUNTY
Dayton
EXHIBIT 2
CURRENT LAND USE MAP
From 0.5 mile west of the US 90/UPRR Intersection To SH 146
Preliminary Environmental Analysis Technical Report
Liberty County, Texas

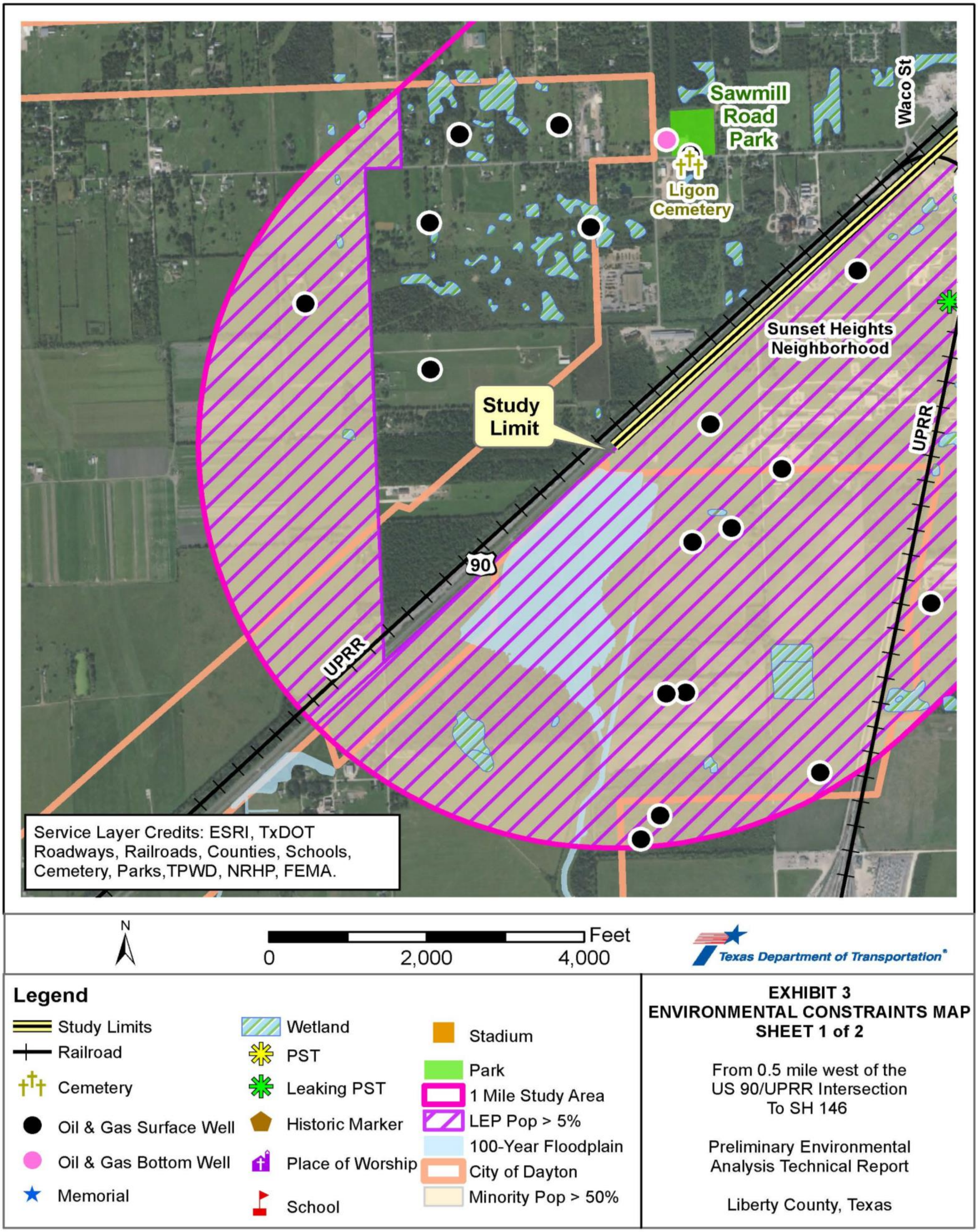


EXHIBIT 3
ENVIRONMENTAL CONSTRAINTS MAP
SHEET 1 of 2

From 0.5 mile west of the US 90/UPRR Intersection To SH 146

Preliminary Environmental Analysis Technical Report

Liberty County, Texas

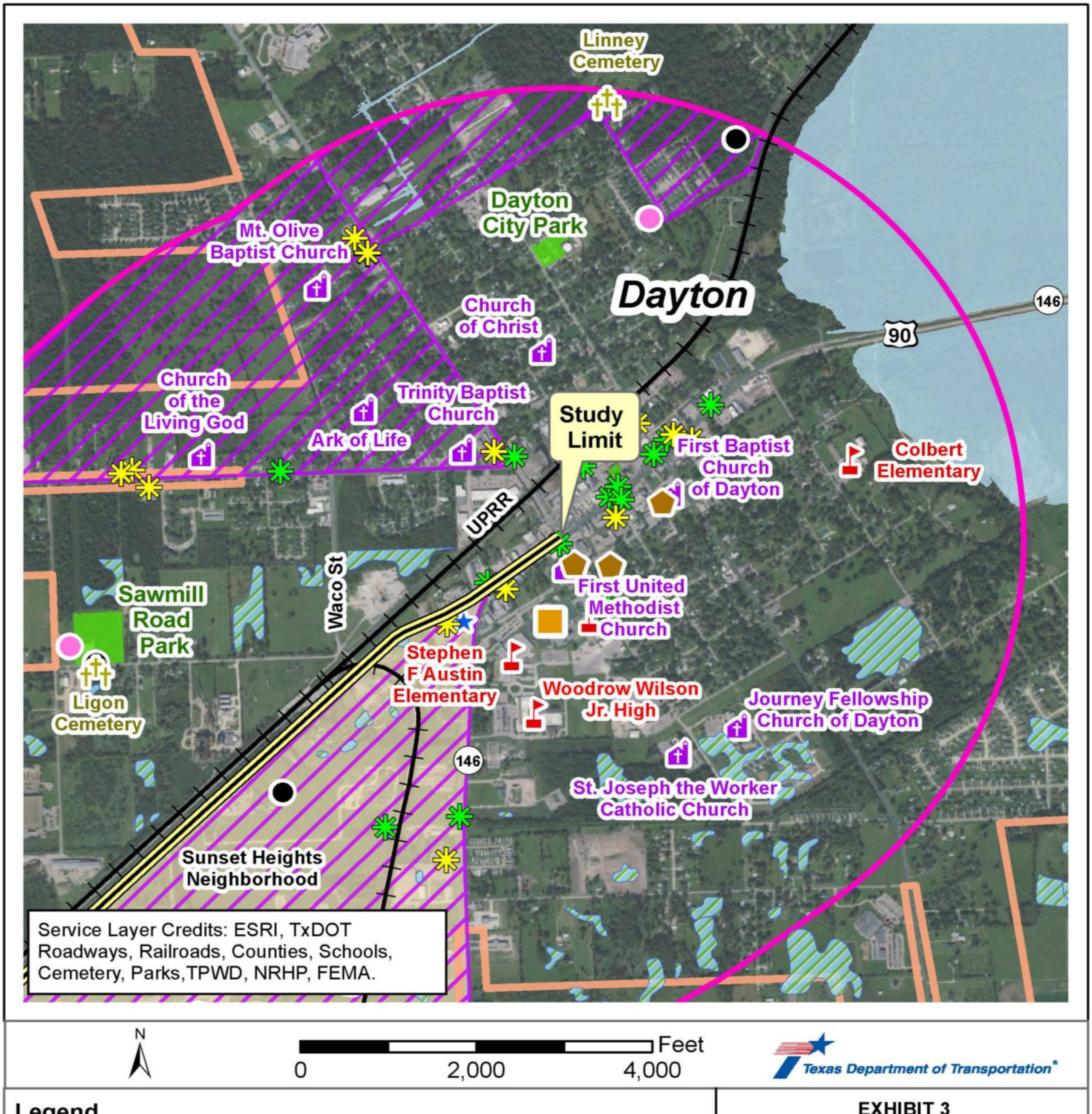
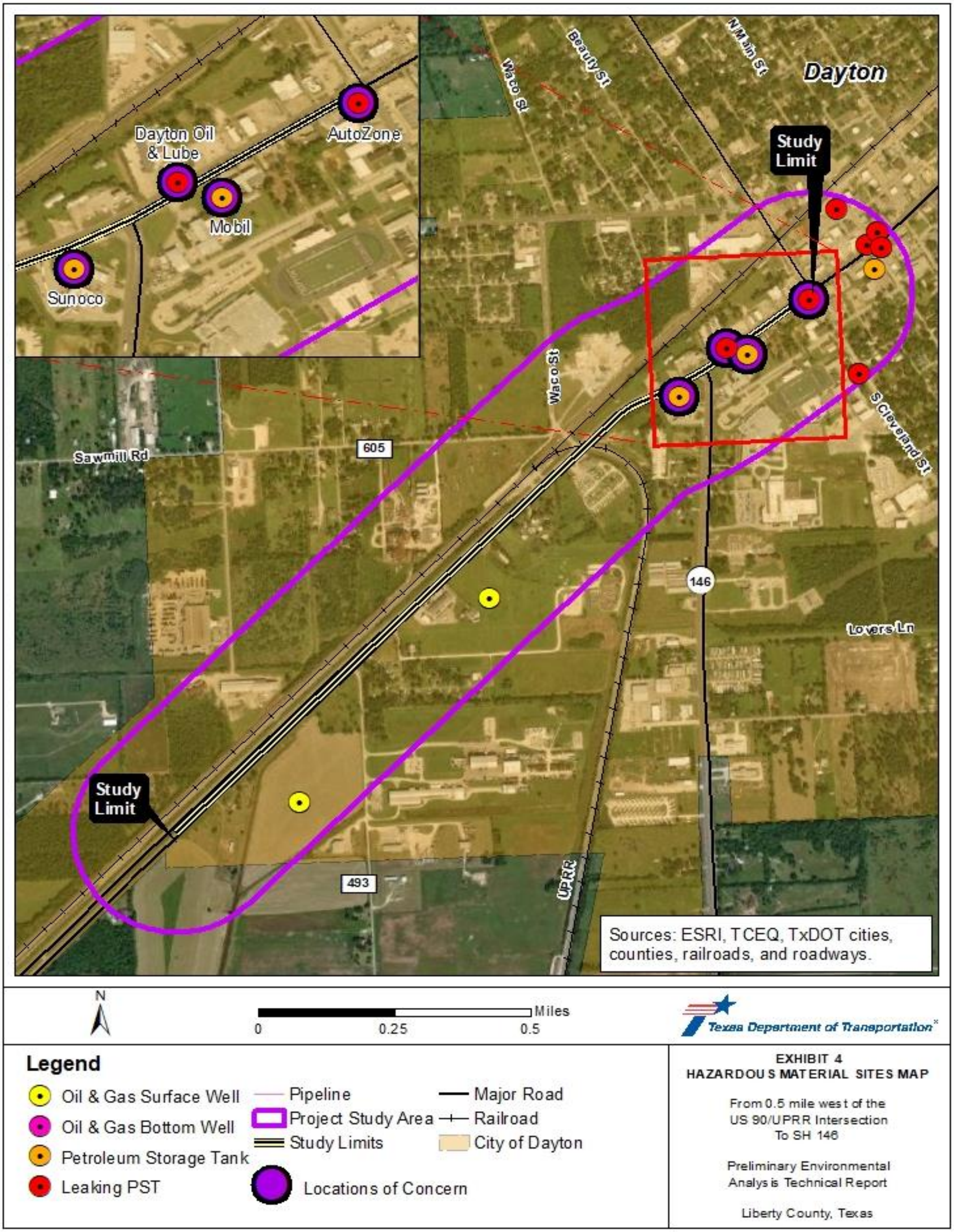


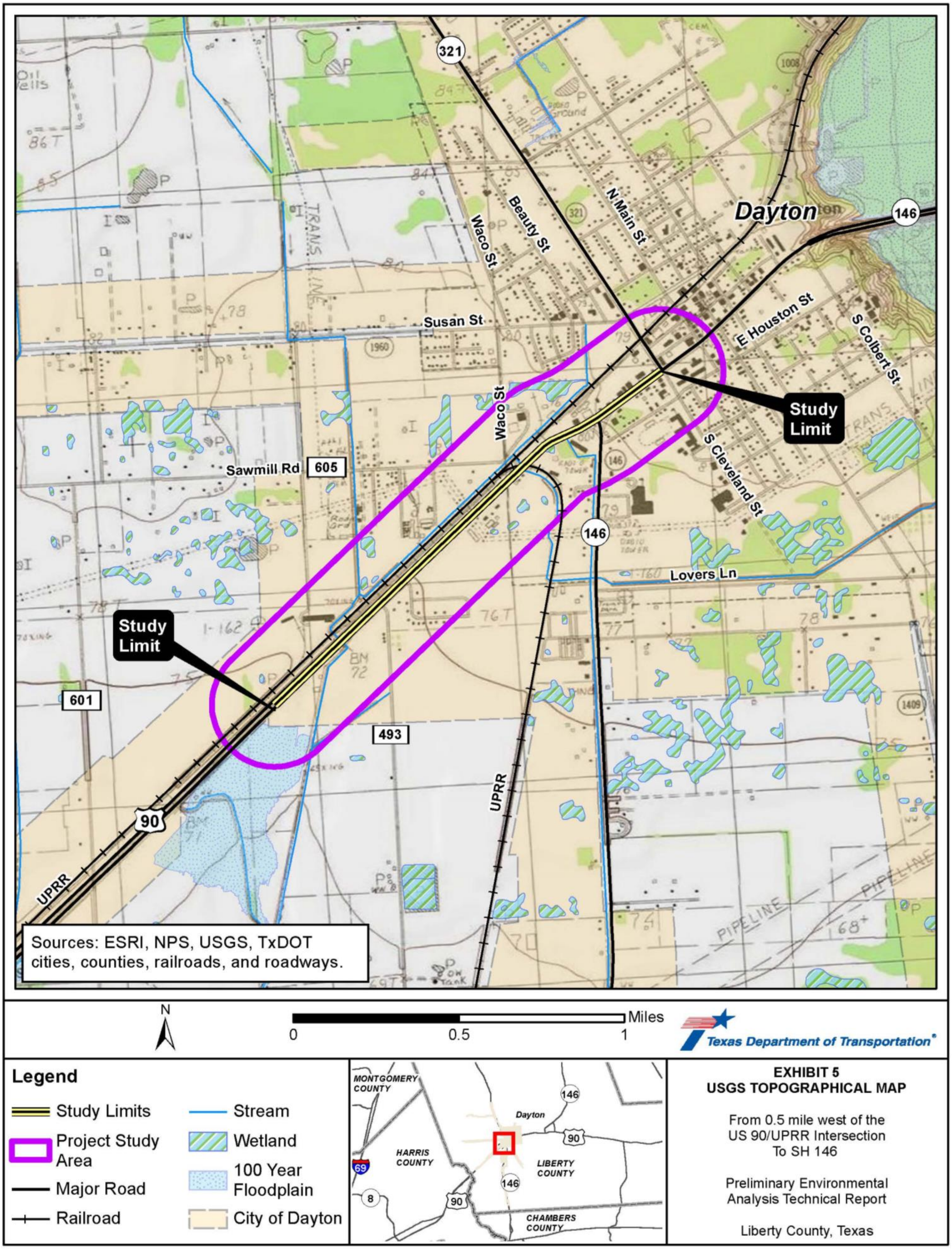
EXHIBIT 3
ENVIRONMENTAL CONSTRAINTS MAP
SHEET 2 of 2

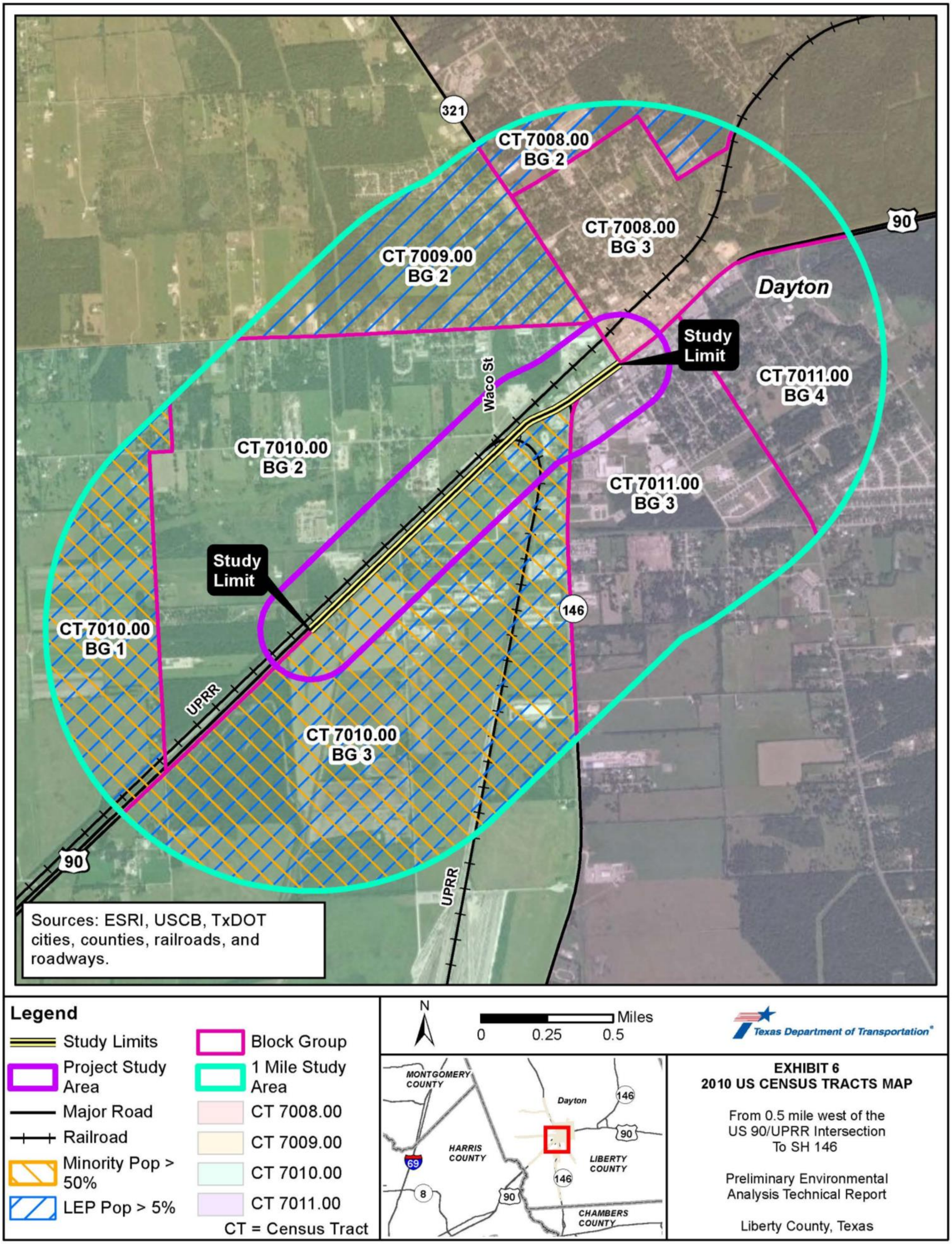
From 0.5 mile west of the US 90/UPRR Intersection To SH 146

Preliminary Environmental Analysis Technical Report

Liberty County, Texas


Dayton
N Main St
Beauty St
Waco St
Study Limit
Dayton Oil
& Lube
AutoZone
Mobil
Sunoco
Waco St
Sawmill Rd
605
S Cleveland St
146
Lovers Ln
Study Limit
493
UPRR
Sources: ESRI, TCEQ, TxDOT cities, counties, railroads, and roadways.
N
0
0.25
0.5
Miles
Texas Department of Transportation
Legend
Oil & Gas Surface Well
Oil & Gas Bottom Well
Petroleum Storage Tank
Leaking PST
Pipeline
Project Study Area
Study Limits
Locations of Concern
Major Road
Railroad
City of Dayton
EXHIBIT 4
HAZARDOUS MATERIAL SITES MAP
From 0.5 mile west of the
US 90/UPRR Intersection
To SH 146
Preliminary Environmental
Analysis Technical Report
Liberty County, Texas


321
Dayton
146
Beauty St
N Main St
Waco St
Susan St
E Houston St
S Colbert St
Study Limit
S Cleveland St
Waco St
Sawmill Rd
605
146
Lovers Ln
Study Limit
601
493
UPRR
90
UPRR
Sources: ESRI, NPS, USGS, TxDOT cities, counties, railroads, and roadways.
N
Miles
0
0.5
1
Texas Department of Transportation
Legend
Study Limits
Project Study Area
Major Road
Railroad
Stream
Wetland
100 Year Floodplain
City of Dayton
MONTGOMERY COUNTY
HARRIS COUNTY
LIBERTY COUNTY
CHAMBERS COUNTY
Dayton
146
90
69
8
EXHIBIT 5
USGS TOPOGRAPHICAL MAP
From 0.5 mile west of the US 90/UPRR Intersection To SH 146
Preliminary Environmental Analysis Technical Report
Liberty County, Texas


321
CT 7008.00
BG 2
CT 7008.00
BG 3
90
CT 7009.00
BG 2
Dayton
Study Limit
CT 7011.00
BG 4
Waco St
CT 7010.00
BG 2
CT 7011.00
BG 3
Study Limit
146
CT 7010.00
BG 1
UPRR
CT 7010.00
BG 3
90
UPRR
Sources: ESRI, USCB, TxDOT cities, counties, railroads, and roadways.
Legend
Study Limits
Project Study Area
Major Road
Railroad
Minority Pop > 50%
LEP Pop > 5%
Block Group
1 Mile Study Area
CT 7008.00
CT 7009.00
CT 7010.00
CT 7011.00
CT = Census Tract
N
Miles
0
0.25
0.5
Texas Department of Transportation
MONTGOMERY COUNTY
Dayton
146
90
HARRIS COUNTY
LIBERTY COUNTY
69
8
146
90
CHAMBERS COUNTY
EXHIBIT 6
2010 US CENSUS TRACTS MAP
From 0.5 mile west of the US 90/UPRR Intersection To SH 146
Preliminary Environmental Analysis Technical Report
Liberty County, Texas

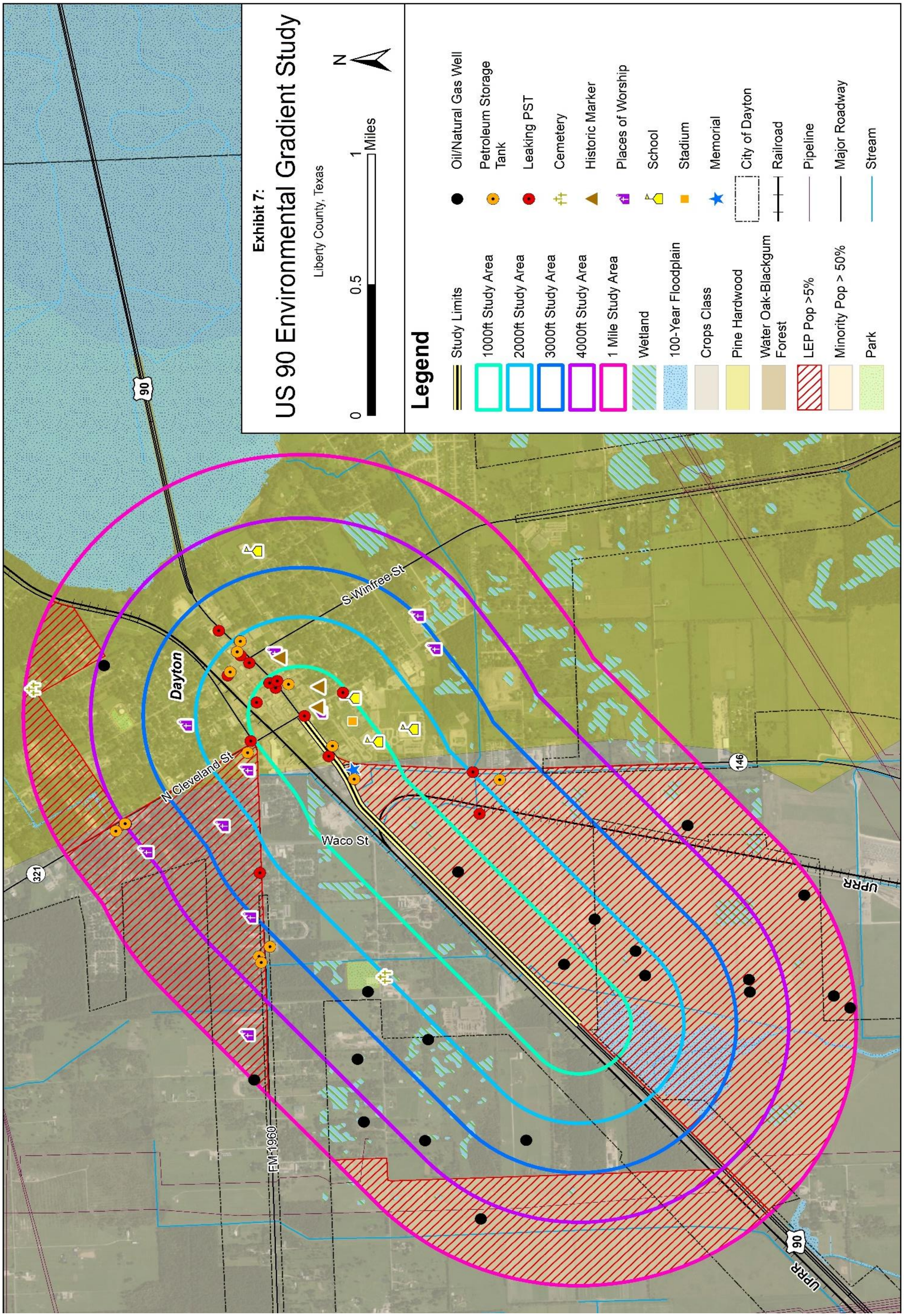


Exhibit 7:
US 90 Environmental Gradient Study
Liberty County, Texas
0
0.5
1
Miles
N
Legend
Study Limits
1000ft Study Area
2000ft Study Area
3000ft Study Area
4000ft Study Area
1 Mile Study Area
Wetland
100-Year Floodplain
Crops Class
Pine Hardwood
Water Oak-Blackgum Forest
LEP Pop >5%
Minority Pop > 50%
Park
Oil/Natural Gas Well
Petroleum Storage Tank
Leaking PST
Cemetery
Historic Marker
Places of Worship
School
Stadium
Memorial
City of Dayton
Railroad
Pipeline
Major Roadway
Stream
Dayton
S Winfree St
N Cleveland St
Waco St
FM 1960
UPRR
90
146
321

Appendix B: Project Photographs

PROJECT PHOTOGRAPHS

(Photos taken by Brandon Wrenn on March 8, 2022)

Photo 1 – Looking northeast along US 90 near the southwest project limit.

Photo 2 – Looking northeast along US 90 at the CR 493 intersection.

Photo 3 – Looking southeast at the US 90 and Sunset Heights Ave. intersection.

Photo 4 – Looking north at Waco St. near the US 90/UPRR intersection.

Photo 5 – Looking northwest at an unnamed stream crossing the US 90/UPRR intersection.

Photo 6 – Looking southeast at an unnamed stream crossing the US 90/UPRR intersection.

Photo 7 – Looking north at the US 90/UPRR at-grade crossing.

Photo 8 – Looking northeast at the Sunoco gas station located at the southwest corner of the US 90/SH 146 intersection.

Photo 9 – Looking northeast at a culvert near the Sunoco located at the southwest corner of the US 90/SH 146 intersection.

Photo 10 – Looking south along SH 146 from its intersection with US 90.

Photo 11 – US Military Veterans Memorial at Sunoco at the US 90/SH 146 intersection.

Photo 12 – View of Bronco Stadium from W. Houston St.

Photo 13 – Nottingham Elementary located at 302 S. Cleveland St.

Photo 14 – THC Historic Marker: Dayton Old School & Museum located at 111 W. Houston St.

Photo 15 – THC Historic Marker: First United Methodist Church located at 106 S. Cleveland St.

Photo 16 – THC Historic Marker: First Baptist Church of Dayton located at 202 E. Houston St.

Photo 17 – Looking west along US 90 towards the intersection with SH 146.

Photo 18 – Looking east along US 90 towards at Mobil Gas Station located at 607 US 90.

Photo 19 – AutoZone located at 303 US 90 near the northeastern project limit.

Photo 20 – Looking northeast at the US 90 and N. Cleveland St. intersection.

Photo 21 – Dayton Oil & Lube located at 708 W. US 90.

Photo 22 – Looking southwest along US 90.

Photo 23 – Looking northeast at culverts along the north shoulder of US 90.

Photo 24 – Looking north at culvert near the southeastern project limits, located on the north of US 90.

Appendix C: Threatened/Endangered Species in Liberty County

Species	Federal Status	State Status	Description
Amphibians			
Eastern Tiger Salamander *Ambystoma tigrinum*			Terrestrial adults generally occur under cover objects or in burrows surrounding a variety of lentic freshwater habitats, such as ponds, lakes, bottomland wetlands, or upland ephemeral pools. The specific terrestrial habitats are also varied and the occurrence of this species seems to be more closely associated with sandy, loamy or other soils which have easy burrowing properties, rather than any particular ecological system type. Requires fishless breeding pools for successful reproduction.
Spotted Dusky Salamander *Desmognathus conanti*			This species occurs in association with aquatic habitats in forested areas. Small, clear, spring fed streams with sandy substrate bordered with ferns and moss as well as murky, stagnant water bodies in cypress swamps, baygalls, and flood plains in bottomland forests support populations of this species.
Houston Toad *Anaxyrus houstonensis*	LE	E	Terrestrial and aquatic: Primary terrestrial habitat is forests with deep sandy soils. Juveniles and adults are presumed to move through areas of less suitable soils using riparian corridors. Aquatic habitats can include any water body from a tire rut to a large lake.
Woodhouse's toad *Anaxyrus woodhousii*			Terrestrial and aquatic: A wide variety of terrestrial habitats are used by this species, including forests, grasslands, and barrier island sand dunes. Aquatic habitats are equally varied.
Strecker's chorus frog Pseudacris streckeri			Terrestrial and aquatic: Wooded floodplains and flats, prairies, cultivated fields and marshes. Likes sandy substrates.
Southern crawfish frog *Lithobates areolatus areolatus*			Terrestrial and aquatic: The terrestrial habitat is primarily grassland and can vary from pasture to intact prairie; it can also include small prairies in the middle of large, forested areas. Aquatic habitat is any body of water but preferred habitat is ephemeral wetlands.
Birds			
Reddish egret *Egretta rufescens*		T	Resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear.
White-faced ibis *Plegadis chihi*		T	Prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; currently confined to near-coastal rookeries in so-called hog-wallow

Species	Federal Status	State Status	Description
			prairies. Nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats.
Wood stork *Mycteria americana*		T	Prefers to nest in large tracts of bald cypress (Taxodium distichum) or red mangrove (Rhizophora mangle); forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960.
Swallow-tailed kite *Elanoides forficatus*		T	Lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees.
Bald eagle *Haliaeetus leucocephalus*			Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds.
Black Rail *Laterallus jamaicensis*	LT	T	Salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous years dead grasses; nest usually hidden in marsh grass or at base of Salicornia.
Piping plover *Charadrius melodus*	LT	T	Beaches, sandflats, and dunes along Gulf Coast beaches and adjacent offshore islands. Also spoil islands in the Intracoastal Waterway. Based on the November 30, 1992, Section 6 Job No. 9.1, Piping Plover and Snowy Plover Winter Habitat Status Survey, algal flats appear to be the highest quality habitat. Some of the most important aspects of algal flats are their relative inaccessibility and their continuous availability throughout all tidal conditions. Sand flats often appear to be preferred over algal flats when both are available, but large portions of sand flats along the Texas coast are available only during low-very low tides and are often completely unavailable during extreme high tides or strong north winds. Beaches appear to serve as a secondary habitat to the flats associated with the primary bays, lagoons, and inter-island passes. Beaches are rarely used on the southern Texas coast, where bayside habitat is always available, and are abandoned as bayside habitats become available on the central and

Species	Federal Status	State Status	Description
			northern coast. However, beaches are probably a vital habitat along the central and northern coast (i.e. north of Padre Island) during periods of extreme high tides that cover the flats. Optimal site characteristics appear to be large in area, sparsely vegetated, continuously available or in close proximity to secondary habitat, and with limited human disturbance.
Rufa Red Knot *Calidris canutus rufa*	LT	T	Habitat: Primarily seacoasts on tidal flats and beaches, herbaceous wetland, and Tidal flat/shore. Bolivar Flats in Galveston County, sandy beaches Mustang Island, few on outer coastal and barrier beaches, tidal mudflats and salt marshes.
Franklin's gull *Leucophaeus pipixcan*			This species is only a spring and fall migrant throughout Texas. It does not breed in or near Texas. Winter records are unusual consisting of one or a few individuals at a given site (especially along the Gulf coastline). During migration, these gulls fly during daylight hours but often come down to wetlands, lake shore, or islands to roost for the night.
Interior least tern *Sternula antillarum athalassos*			Sand beaches, flats, bays, inlets, lagoons, islands. Subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc.); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony.
Red-cockaded woodpecker *Dryobates borealis*	LE	E	Cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly.
Bachman's sparrow *Peucaea aestivalis*		T	Open pine woods with scattered bushes and grassy understory in Pineywoods region, brushy or overgrown grassy hillsides, overgrown fields with thickets and brambles, grassy orchards; remnant grasslands in Post Oak Savannah region; nests on ground against grass tuft or under low shrub.
Fish			
Mississippi silvery minnow *Hybognathus nuchalis*			Found in eastern Texas streams, from the Brazos River eastward and northward to the Red River; found in moderate current; silty, muddy, or rocky substrate. In Texas, adults likely to inhabit smaller tributary streams.
Chub shiner Notropis potteri		T	Brazos, Colorado, San Jacinto, and Trinity River basins. Flowing water with silt or sand substrate.

Species	Federal Status	State Status	Description
Sabine shiner *Notropis sabinae*			Inhabits small streams and large rivers of eastern Texas from San Jacinto drainage northward along the Gulf Coast to the Sabine River Basin; Habitat generalist with affinities for shallow, moving water and rarely found in pools and backwater areas; closely restricted to substrate of fine, silt free sand in small creeks and rivers having slight to moderate current.
Slverband shiner *Notropis shumardi*			In Texas, found from Red River to Lavaca River; Main channel with moderate to swift current velocities and moderate to deep depths; associated with turbid water over silt, sand, and gravel.
Blackside darter *Percina maculata*		T	Restricted to the Red River Basin in the northeast part of the state although specimens have been taken in the lower Trinity and San Jacinto rivers; Often found in clear, gravelly streams.
Southern flounder *Paralichthys lethostigma*			This is an estuarine-dependent species that inhabits riverine, estuarine and coastal waters, and prefers muddy, sandy, or silty substrates (Reagan and Wingo 1985). Individuals can tolerate wide temperature (~5-35Â°C) and salinity ranges (0-60 ppt). Southern Flounder spawn in offshore waters of the Gulf of Mexico from October to February (Reagan and Wingo 1985). The oceanic larval stage is pelagic and lasts 30 to 60 days. Metamorphosing individuals enter estuaries and migrate towards low-salinity headwaters, where settlement occurs (Burke et al. 1991, Walsh et al. 1999). The young fish enter the bays during late winter and early spring, occupying seagrass; some may move further into coastal rivers and bayous. Juveniles remain in estuaries until the onset of sexual maturation (approximately two years), at which time they migrate out of estuaries to join adults on the inner continental shelf. Adult southern flounder leave the bays during the fall for spawning in the Gulf of Mexico. They spawn for the first time when two years old at depths of 50 to 100 feet. Although most of the adults leave the bays and enter the Gulf for spawning during the winter, some remain behind and spend winter in the bays. Those in the Gulf will reenter the bays in the spring. The spring influx is gradual and does not occur with large concentrations that characterize the fall emigration.
Mammals			
Southeastern myotis bat *Myotis austroriparius*			Caves are rare in Texas portion of range; buildings, hollow trees are probably important. Historically, lowland pine and hardwood forests with large hollow trees; associated with ecological communities near water. Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures.

Species	Federal Status	State Status	Description
Tricolored bat *Perimyotis subflavus*			Forest, woodland and riparian areas are important. Caves are very important to this species.
Bjg brown bat *Eptesicus fuscus*			Any wooded areas or woodlands except south Texas. Riparian areas in west Texas.
Eastern red bat *Lasiurus borealis*			Red bats are migratory bats that are common across Texas. They are most common in the eastern and central parts of the state, due to their requirement of forests for foliage roosting. West Texas specimens are associated with forested areas (cottonwoods). Also common along the coastline. These bats are highly mobile, seasonally migratory, and practice a type of wandering migration". Associations with specific habitat is difficult unless specific migratory stopover sites or wintering grounds are found. Likely associated with any forested area in East.
Hoary bat *Lasiurus cinereus*			Hoary bats are highly migratory, high-flying bats that have been noted throughout the state. Females are known to migrate to Mexico in the winter, males tend to remain further north and may stay in Texas year-round. Commonly associated with forests (foliage roosting species) but are found in unforested parts of the state and lowland deserts. Tend to be captured over water and large, open flyways.
Northern yellow bat *Lasiurus intermedius*			Occurs mainly along the Gulf Coast but inland specimens are not uncommon. Prefers roosting in Spanish moss and in the hanging fronds of palm trees. Common where this vegetation occurs. Found near water and forages over grassy, open areas. Males usually roost solitarily, whereas females roost in groups of several individuals.
Rafinesque's big-eared bat *Corynorhinus rafinesquii*		T	Historically, lowland pine and hardwood forests with large hollow trees. roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures.
Swamp rabbit *Sylvilagus aquaticus*			Primarily found in lowland areas near water including cypress bogs and marshes, floodplains, creeks and rivers.
Muskrat *Ondatra zibethicus*			Found in fresh or brackish marshes, lakes, ponds, swamps, and other bodies of slow-moving water. Most abundant in areas with cattail. Dens in bank burrow or conical house of vegetation in shallow vegetated water. It is primarily found in the Rio Grande near El Paso and in SE Texas in the Houston area.

Species	Federal Status	State Status	Description
Louisiana black bear *Ursus americanus luteolus*		T	Bottomland hardwoods, floodplain forests, upland hardwoods with mixed pine; marsh. Possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas.
Long-tailed weasel *Mustela frenata*			Includes brushlands, fence rows, upland woods and bottomland hardwoods, forest edges & rocky desert scrub. Usually live close to water.
Eastern spotted skunk *Spilogale putorius*			Generalist; open fields prairies, croplands, fence rows, farmyards, forest edges & woodlands. Prefer wooded, brushy areas &; tallgrass prairies. S.p. ssp. interrupta found in wooded areas and tallgrass prairies, preferring rocky canyons and outcrops when such sites are available.
Western hog-nosed skunk *Conepatus leuconotus*			Habitats include woodlands, grasslands & deserts, to 7200 feet, most common in rugged, rocky canyon country; little is known about the habitat of the ssp. telmalestes.
Mountain lion *Puma concolor*			Generalist; found in a wide range of habitats statewide. Found most frequently in rugged mountains & riparian zones.
Reptiles			
Alligator snapping turtle *Macrochelys temminckii*		T	Aquatic: Perennial water bodies; rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near running water; sometimes enters brackish coastal waters. Females emerge to lay eggs close to the water’s edge.
Western chicken turtle *Deirochelys reticularia miaria*			Aquatic and terrestrial: This species uses aquatic habitats in the late winter, spring and early summer and then terrestrial habitats the remainder of the year. Preferred aquatic habitats seem to be highly vegetated shallow wetlands with gentle slopes. Specific terrestrial habitats are not well known.
Texas diamondback terrapin *Malaclemys terrapin littoralis*			Coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive. Bay islands are important habitats. Nests on oyster shell beaches.
Eastern box turtle *Terrapene carolina*			Terrestrial: Eastern box turtles inhabit forests, fields, forest-brush, and forest-field ecotones. In some areas they move seasonally from fields in spring to forest in summer. They

Species	Federal Status	State Status	Description
			commonly enters pools of shallow water in summer. For shelter, they burrow into loose soil, debris, mud, old stump holes, or under leaf litter. They can successfully hibernate in sites that may experience subfreezing temperatures.
Western box turtle *Terrapene ornata*			Terrestrial: Ornate or western box trutles inhabit prairie grassland, pasture, fields, sandhills, and open woodland. They are essentially terrestrial but sometimes enter slow, shallow streams and creek pools. For shelter, they burrow into soil (e.g., under plants such as yucca) (Converse et al. 2002) or enter burrows made by other species.
Smooth softshell *Apalone mutica*			Aquatic: Large rivers and streams; in some areas also found in lakes and impoundments (Ernst and Barbour 1972). Usually in water with sandy or mud bottom and few aquatic plants. Often basks on sand bars and mudflats at edge of water. Eggs are laid in nests dug in high open sandbars and banks close to water, usually within 90 m of water (Fitch and Plummer 1975).
Slender glass lizard *Ophisaurus attenuatus*			Terrestrial: Habitats include open grassland, prairie, woodland edge, open woodland, oak savannas, longleaf pine flatwoods, scrubby areas, fallow fields, and areas near streams and ponds, often in habitats with sandy soil.
Texas horned lizard *Phrynosoma cornutum*		T	Terrestrial: Open habitats with sparse vegetation, including grass, prairie, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive. Occurs to 6000 feet, but largely limited below the pinyon-juniper zone on mountains in the Big Bend area.
Louisiana pine snake *Pituophis ruthveni*	LT	T	Terrestrial: Deep sandy soils with large stands of well-managed long leaf pine woodlands.
Common garter snake *Thamnophis sirtalis*			Terrestrial and aquatic: Habitats used include the grasslands and modified open areas in the vicinity of aquatic features, such as ponds, streams or marshes. Damp soils and debris for cover are thought to be critical.
Timber (canebrake) rattlesnake *Crotalus horridus*			Terrestrial: Swamps, floodplains, upland pine and deciduous woodland, riparian zones, abandoned farmland. Limestone bluffs, sandy soil or black clay. Prefers dense ground cover, i.e. grapevines, palmetto.

Species	Federal Status	State Status	Description
Pigmy Rattlesnake *Sistrurus miliarius*			The pygmy rattlesnake occurs in a variety of wooded habitats from bottomland coastal hardwood forests to upland savannas. The species is frequently found in association with standing water.
Crustaceans			
Houston burrowing crayfish *Fallicambarus houstonensis*			All species in the genus Fallicambarus primary burrowers (Guiasu, 2007). It is clearly a primary burrower with 100% of adult and subadult specimens known from excavated burrows. Large numbers of juveniles were collected from Temporary pools (October through February) (Johnson, 2008).
Insects			
American bumblebee *Bombus pensylvanicus*			Habitat description is not available.
Caddisfly *Neotrichia mobilensis*			Habitat description is not available.
Mollusks			
Sandbank Pocketbook *Lampsilis satura*		T	Occurs in small streams to large rivers in slow to moderate current in sandy mud to sand and gravel substrate. Can occur in a variety of habitats but most common in littoral habitats such as banks or backwaters or in protected areas along point bars (Randklev et al. 2013b; Randklev et al. 2014a; Troia et al. 2015). [Mussels of Texas 2019].
Louisiana Pigtoe *Pleurobema riddellii*		T	Occurs in small streams to large rivers in slow to moderate currents in substrates of clay, mud, sand, and gravel. Not known from impoundments (Howells 2010f; Randklev et al. 2013b; Troia et al. 2015). [Mussels of Texas 2019].
Texas Heelsplitter *Potamilus amphichaenus*		T	Occurs in small streams to large rivers in standing to slow-flowing water; most common in banks, backwaters and quiet pools; adapts to some reservoirs. Often found in soft substrates such as mud, silt or sand (Howells et al. 1996; Randklev et al. 2017a). [Mussels of Texas 2019].
Texas Fawnsfoot *Truncilla macrodon*	PT	T	Occurs in large rivers but may also be found in medium-sized streams. Is found in protected near shore areas such as banks and backwaters but also riffles and point bar habitats with low to moderate water velocities. Typically occurs in substrates of mud, sandy mud, gravel and

Species	Federal Status	State Status	Description
			cobble. Considered intolerant of reservoirs (Randklev et al. 2010; Howells 2010o; Randklev et al. 2014b,c; Randklev et al. 2017a,b). [Mussels of Texas 2019].
Plants			
Scarlet catchfly *Silene subciliata*			Deep well-drained sandy soils in and along margins of fire-maintained, dry, upland, longleaf pine savannas; in fire-suppressed forests with dense understory, it is often limited to sunnier roadsides or cleared utility easements; also sparingly in moister sands on openly forested creek banks; flowering early July-October, sometimes early November.
Marsh-elder dodder *Cuscuta attenuata*			Parasitizes a particular sump weed (Iva annua) almost exclusively as well as ragweed and heath aster. Host plants typically found in open, disturbed habitats like fallow fields and creek bottomlands; Annual; Flowering late summer through October.
Texas pinkroot *Spigelia texana*			Woodlands on loamy soils; Perennial; Flowering March-Nov; Fruiting April-Nov.
Cypress knee sedge *Carex decomposita*			Occurs in shallow water or on bald cypress stumps and logs in wooded ponds or swamps; Perennial; Flowering/Fruiting April-May.
LE or LT: Federally Listed Endangered or Threatened PE or PT: Federally Proposed Endangered or Threatened E or T: State Listed Endangered or Threatened			

Sources: USFWS (February 22, 2022), TPWD for Liberty County (February 22, 2022).

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