FINDING OF NO SIGNIFICANT IMPACT (FONSI)
AND
FINDING OF NO PRACTICABLE ALTERNATIVE (FONPA)

PROPOSED SANITARY AND STORM SEWER REHABILITATION PROJECTS FOR SHEPPARD AIR FORCE BASE, WICHITA COUNTY, TEXAS

Pursuant to provisions of the *National Environmental Policy Act* (NEPA), Title 42 *United States Code* (USC) §§ 4321–4347; Council on Environmental Quality (CEQ) Regulations at 40 *Code of Federal Regulations* (CFR) Parts 1500–1508; and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP),* the United States (US) Air Force (AF) prepared the attached Environmental Assessment (EA) to address the potential environmental consequences associated with proposed sanitary and storm sewer rehabilitation projects at Sheppard Air Force Base (SAFB) in Texas.

Purpose and Need

The **purpose** of the Proposed Action is to address critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The AF prioritized the projects under the Proposed Action by conducting systemic, risk-based infrastructure assessments accounting for factors such as service life, physical condition, operational capacity, and cost. As a result, the Proposed Action would address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability. The Proposed Action is **needed** to address operational concerns associated with SAFB's aging sanitary and storm sewer infrastructure. Individual segments and components of these infrastructure systems are in a state of disrepair and require immediate action to ensure their continued operability. Without management action, the sanitary and storm sewer systems could become inoperable or result in SAFB's non-compliance with associated permit conditions (TCEQ, 2018, 2019, 2021a).

The AF developed the following selection standards in order to identify reasonable alternatives that would address the purpose of and need for the Proposed Action. The supporting alternatives must:

- minimize risk to the military mission from service disruption or failure;
- prioritize reinvestment action to address the most critical infrastructure deficiencies;
- provide sufficient capacity for near-term (i.e., 3–5 years) sanitary and storm sewer operations;
- satisfy current and anticipated environmental compliance requirements for discharges to publicly owned treatment works and/or waters of the US;
- avoid adverse effects on sensitive environmental or cultural resources, to the extent practicable; and
- comply with federal and AF mandates for sustainable design and development.

Description of the Proposed Action and Alternatives

The Proposed Action would repair or replace approximately 14,680 linear feet (lf) of selected 6–15-inch-diameter sanitary sewer line segments on SAFB (**Table 1**). Other sanitary sewer projects under the Proposed Action involve rehabilitation work at seven sewage lift stations and repair/replacement of 15 manholes. The Proposed Action also would improve or replace approximately 5,500 lf of storm sewer conveyance on SAFB. Approximately 1,943 lf of conveyance would be replaced with reinforced concrete pipe to include 864 lf of open ditch that would be converted to subsurface piping.

Table 1
Sanitary Sewer Line Segments under the Proposed Action

Map ID[a]	Project Description[b]
SS-1	1,600 lf of 10-inch concrete interceptor pipe.
SS-2	500 lf of 8-inch vitrified clay lateral pipe.
SS-3	5,000 lf of 15-inch concrete trunk pipe.
SS-4	450 lf of 8-inch concrete main pipe.
SS-5	3,240 lf of 6-inch vitrified clay lateral pipe.
SS-6	140 lf of 6-inch vitrified clay lateral pipe.
SS-7	560 lf of 8-inch vitrified clay main pipe.
SS-8	1,680 lf of pipe (line segment size/material under evaluation).
SS-9	1,510 lf of pipe (line segment size/material under evaluation).

Source: AECOM, 2015
a Alphabetical Map IDs correspond with **Figure 2-1** in the EA.
b Project-specific methods and materials are subject to change during design; however, cured-in-place pipe liner (rehabilitation method) and polyvinyl chloride pipes (material) are most common.
lf = linear feet; SS = sanitary sewer

No Action Alternative

Under the No Action Alternative, the AF would not implement the Proposed Action, and SAFB's sanitary and storm sewer systems would continue to operate in accordance with the status quo. Under the No Action Alternative, the sanitary and storm sewer systems could become inoperable or result in SAFB's non-compliance with associated permit conditions. While the No Action Alternative would not satisfy the purpose of and need for the Proposed Action, this alternative is retained to provide a comparative baseline against which to analyze the effects of the Proposed Action, as required under the CEQ regulations (40 CFR § 1502.14(d)).

Summary of Findings

Potentially affected environmental resources were identified through communications with state and federal agencies and review of past environmental documentation. Specific environmental resources with the potential for environmental consequences include air quality, earth resources, water resources, biological resources, cultural resources, environmental justice and protection of children, infrastructure (transportation), hazardous materials and wastes, and utilities.

The effects of the Proposed Action on regional air quality would be expected to be minor and temporary. The estimated project emissions for these alternatives would not be anticipated to result in significant emissions of criteria pollutant air emissions, and thus, no adverse impacts would be expected to occur.

The Proposed Action would involve earthwork to include trenching, backfilling, and compacting of soils or fill materials on and immediately adjacent to the project sites. Dependent on the scope and design of the individual projects, excavated soils and fill materials would require temporary storage on site and/or transport to/from SAFB for use or disposal. These activities would expose soils and increase their susceptibility to water and wind erosion. Where excavation and backfill are required, soil structure, composition, and function could be altered. Further, operating heavy vehicles and equipment to remove, place, or stabilize infrastructure could result in soil compaction, potentially altering the normal function of the soils on a temporary basis.

Several projects under the Proposed Action would have the potential to cause indirect impacts to surface water resources and preliminary jurisdictional wetlands as a result of surface water runoff. Project SS-7 is located 0.04 mile upgradient of Wetland 3, while Project SS-3 would drain to a stream segment located 0.02 mile to the northwest. Project SS-2 would drain underground to a separate stream segment. Indirect impacts to surface waters and wetlands would not impact waterbodies listed as Section 303(d) "impaired" waterbodies or any waterbodies that support human uses. Under the Proposed Action, Projects SS-6 and SW-4 are located within the identified 100-year floodplain, while Project SS-1 lies to the south directly adjacent to Zone A. Although two projects are located within the Zone A floodplain, these projects are

occurring in previously disturbed land with existing sewer lines, and additional floodplain effects would not be expected. Under the Proposed Action, risks of contamination of shallow groundwater would be expected to be reduced. As the Proposed Action seeks to repair and replace existing sewer and stormwater lines, the updated system would reduce the potential of further degradation of existing sewer lines. Leaks or breaks that have the potential to contaminate groundwaters would be mitigated through the Proposed Action.

Due to the lack of intact native vegetation in the areas designated for repair and replacement of sewer lines, no significant impacts to vegetation would be anticipated to occur under the implementation of the Proposed Action. The noise and movement temporarily caused by repair and replacement activities is anticipated to have negligible, short-term impacts on wildlife. Implementation of the Proposed Action would result in no significant impacts to special-status species, as ground disturbance related to the proposed projects would occur primarily in areas with existing development and outside of suitable habitat for special-status species. None of the repair and replacement activities associated with the Proposed Action have the potential to directly impact invasive species.

No archaeological resources on SAFB have been identified as eligible or potentially eligible for listing on the National Register of Historic Places (NRHP). No direct or indirect impacts to architectural resources identified as eligible or potentially eligible for listing on the NRHP would be anticipated under the Proposed Action. During construction, the AF would ensure standard operating procedures (SOPs) and any other applicable measures or provisions of the SAFB Integrated Cultural Resources Management Plan are incorporated into the Proposed Action. For example, should any excavations unearth undetected or unknown archaeological deposits, the procedures outlined in SOP-6, *Dealing with Discoveries*, would be invoked. In the event of a discovery, SOP-6 requires construction crews to immediately halt work in the area and notify the SAFB Cultural Resources program of the situation. Further, under SOP-5, *Archaeological Resource Protection Act Compliance*, any Native American communities that may consider a site to be of cultural or religious importance would receive a 30-day notice for making such a determination.

Sanitary and storm sewer system replacement and repair occurring under the Proposed Action would not be anticipated to result in disproportionately high and adverse impacts to minority, low-income, or youth populations. The Proposed Action would not impact the availability of housing, community resources, and community services in the Region of Influence. Construction noise associated with the Proposed Action would be temporary and confined to the Installation.

Temporary, minor, adverse impacts to transportation infrastructure would be anticipated under the Proposed Action, as local and regional roadways would be able to readily absorb construction-related traffic. Minor delays on or in the immediate vicinity of SAFB would be anticipated, but impacts on roadway capacity or condition would not be discernable. Potential impacts on transportation or traffic would be lessened by the phasing of the Proposed Action over approximately 5 years. No permanent adverse impacts to transportation infrastructure would result from the Proposed Action.

Temporary, minor, adverse impacts to hazardous materials and wastes (HMW) would be anticipated under the Proposed Action as a result of the increased potential for the accidental discharge or spill of HMW associated with construction equipment that could contaminate the environment or result in exposure of persons to such contaminants. Although the AF has not identified evidence of HMW in areas where the Proposed Action would occur, construction could also unearth contaminants in environmental media not yet known or identified for management action. Under the Proposed Action, HMW used or generated during construction would be handled, stored, and disposed of in accordance with federal and state laws and regulations. All applicable permits for handling and disposal of HMW would be obtained prior to commencement of construction activities.

Long-term, minor, beneficial impacts to utilities would be anticipated to occur under the Proposed Action. The Proposed Action would address the most deficient components of the sanitary and storm sewer systems on SAFB and prevent further degradation and future inoperability of the systems. This would result in minor, long-term, beneficial effects on the functional integrity of these infrastructure systems. The

Proposed Action would repair or replace approximately 14,680 lf of selected 6–15-inch-diameter sanitary sewer line segments on SAFB. Other sanitary sewer projects under the Proposed Action involve rehabilitation work at seven sewage lift stations and repair or replacement of 15 manholes. The Proposed Action also would improve or replace approximately 5,500 lf of storm sewer conveyance on the Base. Approximately 1,943 lf of conveyance would be replaced with reinforced concrete pipe to include 864 lf of open ditch that would be converted to subsurface piping. Implementation of the Proposed Action would ensure these systems continue to operate in support of the military mission and in compliance with applicable permit conditions.

Cumulative Impacts

The EA considered cumulative impacts that could result from the incremental impact of implementation of the Proposed Action when added to other past, present, or reasonably foreseeable environmental trends or planned actions at SAFB. No potentially significant cumulative impacts were identified.

Mitigation

The EA analysis concluded that the Proposed Action would not result in significant environmental impacts; therefore, no mitigation measures are recommended. Best management practices are described and recommended in the EA where applicable.

Conclusion

Finding of No Practicable Alternative. Pursuant to Executive Order 11988, *Floodplain Management* (amended by Executive Order 13690), and Executive Order 11990, *Protection of Wetlands*, and considering all supporting information, the AF finds that there is no practicable alternative to the Proposed Action being located in floodplains or near wetlands, as discussed in the attached EA. Although two projects are located within the Zone A floodplain, these projects would occur in previously disturbed land with existing sewer lines. In accordance with EO 11988, the AF considered alternatives for the repair/rehabilitation projects within and adjacent to the 100-year floodplain. However, because the Proposed Action would not replace a larger portion of the Base-wide sanitary and storm sewer systems, relocation of this infrastructure outside the floodplain boundary was not feasible, and the associated floodplain impacts are unavoidable. The existing sanitary and storm sewer infrastructure is located in proximity to several wetland areas that could experience temporary impacts from sedimentation and erosion during construction. Wetland impacts have been avoided and minimized to the extent possible at each of the Proposed Action sites.

Finding of No Significant Impact*.* After review of the EA prepared in accordance with the requirements of NEPA, CEQ regulations, and 32 CFR Part 989*,* and which is hereby incorporated by reference, I have determined that the proposed activities would not have a significant impact on the quality of the human or natural environment. Accordingly, an Environmental Impact Statement will not be prepared. This decision was made after considering all submitted information, including a review of agency comments submitted during the 30-day public comment period, and considering a full range of practical alternatives that meet project requirements and are within the legal authority of the US Air Force.

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CYNTHIA OLIVA, GS-15, USAF
Division Chief, AETC/A4P

DATE

Final
Environmental Assessment
Proposed Sanitary and Storm Sewer Rehabilitation Projects for Sheppard Air Force Base, Wichita County, Texas

September 2022

Prepared for:
United States Air Force
82d Mission Support Group

PRIVACY ADVISORY

This Environmental Assessment (EA) is provided for public comment in accordance with the *National Environmental Policy Act* (NEPA), the President's Council on Environmental Quality NEPA regulations (40 CFR Parts 1500–1508), and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP)*.

The EIAP provides an opportunity for public input on Air Force decision-making, allows the public to offer inputs on alternative ways for the Air Force to accomplish what it is proposing, and solicits comments on the Air Force's analysis of environmental effects.

Public commenting allows the Air Force to make better, informed decisions. Letters or other written or oral comments provided may be published in the EA. As required by law, comments provided will be addressed in the EA and made available to the public. Providing personal information is voluntary. Any personal information provided will be used only to identify your desire to make a statement during the public comment portion of any public meetings or hearings or to fulfill requests for copies of the EA or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of the EA; however, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the EA.

COMPLIANCE

This document has been certified that it does not exceed 75 pages, not including appendices as defined in 40 CFR § 1501.5(f). As defined in 40 CFR § 1508.1(v), a "page" means 500 words and does not include maps, diagrams, graphs, tables, and other means of graphically displaying quantitative or geospatial information

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COVER SHEET
Final Environmental Assessment for
Proposed Sanitary and Storm Sewer Rehabilitation Projects

a. *Lead Agency: United States Air Force (AF)*

b. *Location: Sheppard Air Force Base, Wichita County, Texas*

c. *Designation: Final Environmental Assessment*

d. *Point of Contact:* Mr. Thomas M. L'Esperance, 82d Civil Engineering Squadron, Environmental Compliance, 940.676.0944, thomas.lesperance.ctr@us.af.mil

Please send written comments or questions regarding this document to the email address noted above (preferred) or via postal mail to:

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Abstract:

This Environmental Assessment (EA) has been prepared pursuant to provisions of the National Environmental Policy Act, Title 42 *United States Code*, §§ 4321–4370, implemented by Council on Environmental Quality Regulations at Title 40, *Code of Federal Regulations* (CFR) Parts 1500–1508, and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP)*. Potentially affected environmental resources were identified in coordination with local, state, and federal agencies. Specific environmental resources with the potential for environmental consequences include air quality; earth, water, biological, and cultural resources; environmental justice and protection of children; infrastructure (transportation); hazardous materials and waste; and utilities.

The United States Air Force AF 82d Mission Support Group at Sheppard Air Force Base (SAFB) proposes to implement multiple rehabilitation projects to address deficient sanitary and storm sewer infrastructure on the Base. The purpose of the proposed projects is to address individual segments and components of these systems throughout the Base as identified by recent risk-based infrastructure assessments. The Proposed Action is needed to address operational concerns associated with SAFB's aging sanitary and storm sewer infrastructure. Individual segments and components of these infrastructure systems are in a state of disrepair and require immediate action to ensure their continued operability. Without management action, the sanitary and storm sewer systems could become inoperable or result in SAFB's non-compliance with associated permit conditions.

The analysis of the affected environmental and environmental consequences of implementing the Proposed Action and Alternatives concluded that by implementing standard environmental protection measures and best management practices, there would be no significant impacts from the actions at SAFB on the potentially affected resources: air quality; earth, water, biological, and cultural resources; environmental justice and protection of children; infrastructure (transportation); hazardous materials and waste; and utilities. Impacts associated with construction, demolition, and renovation would be minor; therefore, significant cumulative impacts are not anticipated from activities associated with the Proposed Action and Alternatives when considered with past, present, or reasonably foreseeable environmental trends and planned actions at SAFB.

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TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

ACAM	Air Conformity Applicability Model
AETC	Air Education and Training Command
AF	United States Air Force
AFCAMP	Air Force Comprehensive Asset Management Plan
AFFF	aqueous film forming foam
APE	Area of Potential Effect
AQCR	Air Quality Control Region
BMP	best management practice
CAA	*Clean Air Act*
CCD	Census County Division
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFR	Code of Federal Regulations
CGP	Construction General Permit
CH_4	methane
CIPP	cured-in-place pipe
CO_2	carbon dioxide
CO_2e	carbon dioxide-equivalent
CWA	*Clean Water Act*
DAFI	Department of Air Force Instruction
DOD	Department of Defense
DODI	Department of Defense Instruction
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EISA	Energy and Independence Security Act
EO	Executive Order
ESA	*Endangered Species Act*
°F	degree Fahrenheit
FFRMS	Federal Flood Risk Management Standard
FY	fiscal year
FONPA	Finding of No Practical Alternative
FONSI	Finding of No Significant Impact
GWP	Global warming potential
HMW	hazardous materials and waste
HUC	Hydrologic Unit Code
I/I	inflow and infiltration
ICRMP	Integrated Cultural Resources Management Plan
IICEP	Interagency/Intergovernmental Coordination for Environmental Planning
IPaC	Information for Planning and Consultation
IRP	Installation Restoration Program
lf	linear feet
MS4	Municipal Separate Storm Sewer System
MSGP	Multi-Sector General Permit
NAAQS	National Ambient Air Quality Standards
NAGPRA	*Native American Graves Protection and Repatriation Act*
NEPA	*National Environmental Policy Act*
NHPA	*National Historic Preservation Act*
NOA	Notice of Availability
NOI	Notice of Intent
NSR	New Source Review
O&M	Operation/Maintenance
PBR	permit-by-rule
PEM	palustrine emergent

PFAS	Per- and Polyfluoroalkyl substances
PFO	palustrine forested
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration
PSS	palustrine shrub scrub
PTE	potential to emit
PVC	polyvinyl chloride
R/R	Repair/Replacement
RCRA	*Resource Conservation and Recovery Act*
ROI	Region of Influence
RWPA	regional water planning areas
SAFB	Sheppard Air Force Base
SHPO	State Historic Preservation Office
SIU	Significant Industrial User
SOP	standard operating procedure
SPCC	Spill Prevention, Control and Countermeasure
SSO	Sanitary Sewer Overflow
SWMP	stormwater management plan
SWP3	Stormwater Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
TMDL	total maximum daily load
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
tpy	ton(s) per year
TSCA	*Toxic Substances Control Act*
TWDB	Texas Water District Board
UFC	Unified Facilities Criteria
US	United States
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WEF	Water Environment Federation

CHAPTER 1 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The United States (US) Air Force (AF), 82d Mission Support Group at Sheppard Air Force Base (SAFB) proposes to implement multiple rehabilitation projects to address deficient sanitary and storm sewer infrastructure on the Base. The proposed projects would address individual segments and components of these systems throughout the Base as identified by recent risk-based infrastructure assessments. This Environmental Assessment (EA) evaluates the potential environmental, cultural, and socioeconomic effects of the proposed projects to be implemented at SAFB from approximately fiscal year (FY) 2023 to FY 2027. This EA collectively refers to these projects as the "Proposed Action."

SAFB is an Air Education and Training Command (AETC) Base located in north-central Texas, approximately 6 miles south of the border with Oklahoma (**Figure 1-1**). Activated in 1941 during World War II, SAFB is home to the largest technical training wing in the AF and host to the only internationally manned and managed flying program. Situated on approximately 5,720 acres of land in Wichita County, Texas, north of the city of Wichita Falls, the Base supports diverse aircraft training missions for pilots and operational support specialists (e.g., engineering, maintenance, equipment, fuels, munitions, and telecommunications) (**Figure 1-2**). As a joint training base for the AF, Army, Navy, and Marine Corps, SAFB graduates more than 60,000 students annually, including nearly 200 pilots. Approximately 20,000 personnel are permanently stationed at the Base to administer training programs and provide support services (Air Force, 2015).

This EA is prepared in accordance with the *National Environmental Policy Act of 1969*, as amended (42 United States Code [USC] § 4321 et seq.) (NEPA); the Council on Environmental Quality (CEQ) NEPA regulations (40 *Code of Federal Regulations* [CFR] Parts 1500–1508); and the AF Environmental Impact Analysis Process (EIAP) at 32 CFR Part 989. EIAP informs decision-makers, regulatory agencies, and the public about an AF proposed action before any decision is made on whether to implement the action.

The CEQ NEPA regulations at 40 CFR § 1500.1(b), 40 CFR § 1506.6(b) and (c), and 40 CFR § 1507.4 provide purpose and direction for streamlining the NEPA process. CEQ memoranda (e.g., March 6, 2012) and guidance on modernizing the NEPA process (CEQ, 2003) identify opportunities to streamline the NEPA process, including the use of technology for communications and information dissemination. This EA satisfies the requirements of NEPA in accordance with the CEQ regulations and promotes NEPA streamlining through the implementation of the AF EIAP. To render this document more concise, links are provided to online data sources to which the reader can refer for more information. Should the reader not have internet access, please contact the AF point of contact listed on the **Cover Sheet** of this EA and accommodations will be made to provide hardcopies of relevant information requested.

1.2 BACKGROUND

Sanitary sewer systems collect wastewater from buildings for transport to a centralized treatment facility. These systems generally include a network of pipes and associated components such as pump stations, force mains, and manholes. Wastewater treatment plants (WWTPs) ensure water quality standards are met before discharging the treated water back into the environment. Conversely, storm sewer systems collect surface water runoff generated by snowmelt or rainwater for conveyance to nearby surface waters.

As infrastructure ages, it becomes more susceptible to deterioration. In sanitary sewer systems, there are two primary concerns associated with aging infrastructure: (1) sanitary sewer overflows (SSOs) and (2) inflow and infiltration (I/I), a causal factor of SSOs. SSO is the unintentional discharge from a sanitary sewer system; I/I occurs when extraneous water enters the system from stormwater or groundwater. During wet weather, I/I can cause SSOs when flow exceeds the maximum capacity of the system. During dry weather, SSOs can be caused by broken pipes or when pipes become obstructed by debris, such as grease, roots, paper products, and sand or grit.

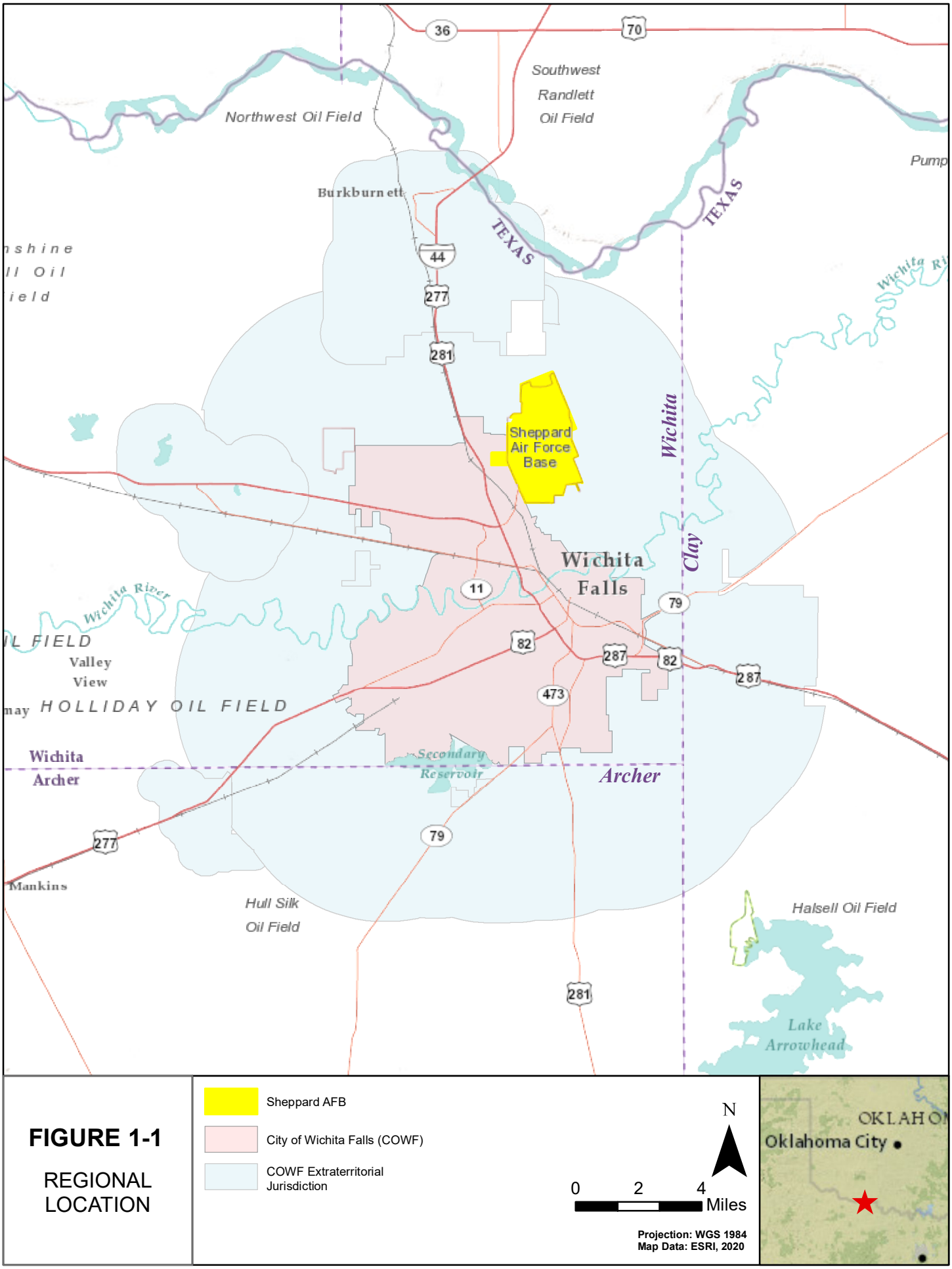

FIGURE 1-1

REGIONAL LOCATION

FIGURE 1-2

SHEPPARD AIR FORCE BASE

In storm sewer systems, infrastructure degradation can affect the rate, quantity, and quality of surface water runoff being conveyed to surface waters. Downstream flooding and decreased water and/or habitat quality (e.g., sedimentation and turbidity) are the primary management concerns. Stormwater is also a potential source of I/I in relation to degraded sanitary sewer infrastructure (Water Environment Federation [WEF], 2011a).

1.2.1 AIR FORCE COMPREHENSIVE ASSET MANAGEMENT PLAN

The AF Comprehensive Asset Management Plan (AFCAMP) institutes a management approach for strategic, prioritized infrastructure investments across AF installations. The AFCAMP process focuses on more efficient project delivery and generally uses an asset inventory, risk assessment, and geodatabase to target critical infrastructure investments. Overall, AFCAMP supports management decisions with respect to infrastructure restoration, modernization, and replacement. The results of the AFCAMP process for SAFB are documented in updates to the *Sheppard Air Force Base Infrastructure Plan* (Air Force, 2021a).

1.2.2 SANITARY SEWER SYSTEM EVALUATION AND INVENTORY

In 2015, the AF conducted a *Sanitary Sewer System Evaluation and Inventory* for SAFB (**Appendix A**). A risk-based model was used to recommend capital improvements and forecast individual repair/replacement (R/R) and operation/maintenance (O&M) actions for the Base-wide sanitary sewer system. The assessment focused on the collection and conveyance of wastewater from SAFB to nearby wastewater treatment plants and accomplished two primary objectives: 1) to update and verify the mapping of the system using a standardized geodatabase, and 2) to conduct a risk-based assessment of SAFB's sanitary sewer infrastructure assets.

Data collected during the inventory (e.g., location, estimated remaining service life, and structural and mechanical conditions) were used to develop a risk scoring system specific to each type of infrastructure reinvestment (i.e., R/R and O&M). The individual risk scores were then used to prioritize sanitary sewer R/R and O&M activities. Where critical infrastructure or compliance issues were identified, mitigating actions were also recommended (AECOM, 2015). Additional information is provided in **Appendix A** to this EA.

1.3 PURPOSE OF THE ACTION

The **purpose** of the Proposed Action is to address critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The AF prioritized the projects under the Proposed Action by conducting systemic, risk-based infrastructure assessments accounting for factors such as service life, physical condition, operational capacity, and cost. As a result, the Proposed Action would address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability.

1.4 NEED FOR THE ACTION

The Proposed Action is **needed** to address operational concerns associated with SAFB's aging sanitary and storm sewer infrastructure. Individual segments and components of these infrastructure systems are in a state of disrepair and require immediate action to ensure their continued operability. Without management action, the sanitary and storm sewer systems could become inoperable or result in SAFB's non-compliance with associated permit conditions (TCEQ, 2018, 2019, 2021a). The Proposed Action would target the most deficient, high-risk elements for each of these Base-wide infrastructure assets. In the short term, the Proposed Action would ensure these systems continue to operate in support of the military mission and in compliance with applicable permit conditions. In the long term, the AF would continue to systematically maintain and modernize these critical infrastructure assets in a logical, stepwise manner.

1.5 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

An EA is a concise public document that briefly discusses the purpose and need, alternatives, and environmental impacts of a proposed federal action. It aids in agency planning and decision-making or facilitates the preparation of an EIS, as necessary (40 CFR § 1501.5). This EA evaluates the potential environmental consequences of implementing the Proposed Action and Alternatives for the sanitary and storm sewer infrastructure projects at SAFB. The EA serves as a basis for the AF to determine whether these projects would result in a significant impact on the human environment.

If the EA determines that potential impacts would be less than significant, the AF would select an Alternative to implement and codify its decision by issuance of a Finding of No Significant Impact (FONSI). If the EA determines that potential impacts would or likely would be significant, the AF would announce its intent to prepare an EIS or choose to take no action. In lieu of preparing an EIS, the AF may also "mitigate" potentially significant environmental impacts found during preparation of an EA to less-than-significant levels. Any required, agreed-upon mitigation for this purpose would be codified in the FONSI. Should the Proposed Action and Alternatives affect floodplains or wetlands subject to Executive Order (EO) 11988, *Floodplain Management*; EO 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, as reinstated by EO 14030; or EO 11990, *Protection of Wetlands* (see **Section 1.8.1**), the AF would also prepare a Finding of No Practical Alternative (FONPA).

This EA addresses the potential effects of the Proposed Action and Alternatives on resource areas subject to potential impacts. **Chapter 3** presents information on the existing condition of each resource area, includes the environmental impact analysis, and, when appropriate, recommends mitigation measures. In accordance with 40 CFR 1502.15, the existing conditions presented in Chapter 3 also describe other relevant trends and planned actions, if any, in area(s) that could be affected by the Proposed Action and Alternatives, now or in the future.

Section 3.1 briefly describes the methodology used for the impact analyses in this EA. **Section 3.2** lists the resources eliminated from further, more detailed analysis, including a brief justification for their elimination. The resources carried forward for analysis in this EA include the following: air quality; earth resources; water resources; biological resources; cultural resources; infrastructure (transportation); environmental justice and protection of children; and hazardous materials and waste (HMW).

1.6 DECISION TO BE MADE

The decision to be made is whether to implement the Proposed Action. Should the AF choose to implement the Proposed Action, this EA will assist in determining an appropriate scope of action to minimize potential adverse environmental impacts. This EA will also identify and recommend additional, project-specific environmental review in compliance with NEPA, if appropriate. The decision-making framework for this EA (see also **Section 3.2**) is described as follows:

- Do not implement the Proposed Action.
- Implement the Proposed Action as documented in a FONSI for this EA and, when appropriate, via categorical exclusion (CATEX) [1] as defined in 32 CFR Part 989, Appendix B.
- Implement a reduced scope of the Proposed Action as documented in a FONSI for this EA and, when appropriate, via CATEX as defined in 32 CFR Part 989, Appendix B.
- Publish a NOI in the *Federal Register* to prepare an EIS for the Proposed Action.

Should the AF decide to implement the Proposed Action as described in **Section 2.2**, this EA will identify any actions the AF will commit to undertake to minimize environmental effects and comply with NEPA.

[1] A CATEX refers to a category of actions that do not individually or cumulatively have potential for significant effects on the environment and, therefore, do not require further environmental analysis (32 CFR § 989.13).

1.7 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

NEPA requires federal agencies to consider the potential environmental impacts of their proposed actions on the human and natural environment. The EIAP implements AF compliance with NEPA in accordance with the CEQ NEPA regulations and guidance.

1.7.1 INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATION

Interagency and intergovernmental coordination for environmental planning (IICEP) is a federally mandated process for informing and coordinating with other governmental agencies regarding a federal proposed action. The AF complies with the IICEP mandate through the scoping[2] process (40 CFR § 1501.9) and public involvement (see 40 CFR § 1506.6 and **Section 1.7.2** of this EA).

The AF sent scoping letters dated 7 October 2021 concerning the Proposed Action and Alternatives to six government agencies. Copies of relevant correspondence, including agency responses received during the scoping period, are provided in **Appendix B**.

1.7.2 PUBLIC AND AGENCY REVIEW

The intent of this EA is to inform decision-makers and the public of the potential environmental effects of the Proposed Action and Alternatives prior to making a federal decision to move forward with any Alternative. This allows the AF to make a fully informed decision, aware of any potential environmental effects. Overall, this EA:

- documents the NEPA process or EIAP;
- provides an opportunity for the public, regulatory agencies, and Native American Tribes to participate in the AF's decision-making process; and
- considers input on the possible environmental effects of the Proposed Action and Alternatives, including methods to reduce such effects.

The AF invited the public and other interested stakeholders to review and comment on this EA. Accordingly, a Notice of Availability (NOA) of the Draft EA and Draft FONSI/FONPA was published in the *Times Record News* on **10 June** and **12 June 2022** (**Appendix D**)**.** The 30-day public comment period ended on **13 July 2022**. During the public comment period, the Draft EA and Draft FONSI/FONPA were available to view and download at https://www.sheppard.af.mil/Library/Key-Documents/. Agency points of contact were informed of the document's availability via mailed letter (**Appendix B**). Printed copies of the Draft EA and Draft FONSI/FONPA were available by request (see the **Cover Sheet** for the designated AF point of contact). A printed copy was also available for review at the following local library:

Wichita Falls Public Library, 600 11th Street, Wichita Falls, TX 76301-4604

The AF received no public or agency comments on the Draft EA or Draft FONSI/FONPA during the public comment period.

1.8 INTEGRATION OF OTHER ENVIRONMENTAL STATUTES AND REGULATIONS

This EA organizes separate, but related, environmental compliance requirements associated with the Proposed Action and Alternatives in a single compliance document. In accordance with NEPA and the CEQ regulations, the AF addressed these requirements concurrently with the EIAP to the extent possible.

[2] Scoping is a process for determining the scope of issues to be addressed and analyzed in a NEPA document (40 CFR § 1501.9).

The AF works closely with relevant federal, state, and local agencies, as well as Native American Tribes, with purview over the Proposed Action. **Sections 1.8.1–1.8.4** summarize relevant environmental compliance requirements and their concurrency with this EA. Copies of relevant correspondence concerning these requirements are provided in **Appendix B**. These and other environmental statutes and regulations are further described in **Chapter 3**, as appropriate.

1.8.1 FLOODPLAIN MANAGEMENT AND PROTECTION OF WETLANDS

EO 11988, *Floodplain Management*, directs federal agencies to determine whether a proposed action would occur within a floodplain and to avoid or minimize adverse impacts on floodplains. If an agency considers avoiding adverse impacts on a floodplain and determines that no practicable alternative to undertaking the action is feasible, EO 11988 requires minimizing impacts by design or modification. In such cases, agencies must also prepare and circulate a notice to explain how avoidance was not practicable and describe minimization measures. The planning and evaluation steps required by EO 11988 also apply to EO 11990, *Protection of Wetlands*, a similar directive requiring federal agencies to avoid or minimize adverse impacts on wetlands. As applicable, this EA documents AF compliance with EOs 11988 and 11990.

To implement EO 11988, processes for evaluating the impacts of federal actions in or affecting floodplains (and wetlands) are in place. EO 13690 creates a new flood risk reduction standard for federally funded projects, the Federal Flood Risk Management Standard (FFRMS). The FFRMS is a flexible framework for increasing resilience against flooding and preserving the natural function benefits of floodplains. The incorporation of the FFRMS will expand federal management of actions that affect floodplains from the current base flood level to a higher vertical elevation and corresponding horizontal extent. EO 13690 also sets forth a process for further solicitation and consideration of public input.

An early public notice was published in the *Wichita Times Record News* on 25 March and 27 March 2022 to disclose that the Proposed Action may affect floodplains and wetlands and solicited early public comment on the Proposed Action. No public comments have been received.

As applicable, this EA documents Air Force compliance with EOs 11988, 11990, and 13690

1.8.2 STATE HISTORIC PRESERVATION OFFICE

Section 106 of the *National Historic Preservation Act* (54 USC § 300101 et seq.) (NHPA) requires that federal agencies consider the potential effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. This EA assists the AF in identifying relevant or interested consulting parties and initiates the Section 106 process for the proposed undertaking concurrent with the NEPA process.

The AF uses scoping to determine an appropriate level of analysis for potential effects on cultural resources, including historic properties.

1.8.3 FEDERALLY RECOGNIZED TRIBAL GOVERNMENTS

Numerous federal laws, regulations, policies, and directives protect the rights of indigenous communities and resources that preserve their heritage, culture, or religious beliefs. These include the NHPA, NEPA, and *Native American Graves and Protection and Repatriation Act* (NAGPRA; 25 USC § 3001 et seq.). Department of Defense Instruction (DoDI) 4710.02, *DOD Interactions with Federally Recognized Tribes*, describes and implements the U.S. Department of Defense (DOD) policy for engaging with Native American Tribal governments.

In accordance with Department of AF Instruction (DAFI) 90-2002, *Interactions with Federally Recognized Tribes*, the AF engages with federally recognized Native American Tribes that have potential historic or cultural affiliations to installation lands or lands under managed airspace. As part of the scoping process for this EA, the AF identified federally recognized Native American Tribes with a potential interest in the

Proposed Action and Alternatives. Those Tribes that expressed an interest in the Proposed Action were invited to participate in this EIAP and as consulting parties under Section 106 of the NHPA.

The AF sent letters concerning the Proposed Action and Alternatives to six federally recognized Native American Tribes on 7 October 2021. Copies of relevant Tribal correspondence are included in **Appendix B**.

1.8.4 ENDANGERED SPECIES ACT

Section 7 of the *Endangered Species Act* (16 USC § 1531 et seq.) (ESA) requires federal agencies to consider the potential impacts of their proposed actions on ESA-listed threatened and endangered species or habitat considered essential to their recovery, defined and designated as "critical habitat" under ESA.

As all formal consultations under ESA, Section 7, must be completed prior to the issuance of a NEPA decision document, federal agencies must consult with the US Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration–National Marine Fisheries Service, as applicable, for actions that may affect federally listed threatened and endangered species or their critical habitat. This EA constitutes an informal consultation under ESA, Section 7, for the potential for the Proposed Action and Alternatives to affect threatened or endangered species known or with potential to occur on the SAFB. No ESA-designated critical habitat is present on the Base.

Copies of relevant correspondence from the AF's consultation with the USFWS under Section 7 of ESA are provided in **Appendix B**.

1.9 APPLICABLE LAWS AND ENVIRONMENTAL REGULATIONS

Other laws and regulations applicable to the Proposed Action include, but are not limited to, the following:

- *Clean Water Act* (CWA; 33 USC § 1251 et seq.)
- *Resource Conservation and Recovery Act* (RCRA; 42 USC § 6901 et seq.)
- Section 438 of the *Energy Independence and Security Act* (Public Law 110-140)
- *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA; 42 USC § 9601 et seq.)
- *Federal Clean Air Act* (CAA; 42 USC § 7401 et seq., as amended)
- *Migratory Bird Treaty Act* (16 USC § 703 et seq.)
- *Toxic Substances Control Act* (15 USC § 2601 et seq.)
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994)
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (1997), as amended by EO 13296 (2003)

CHAPTER 2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

The following sections describe the Proposed Action, alternatives screening process, and alternatives dismissed and retained for analysis in this EA.

2.1 INTRODUCTION

Infrastructure systems such as sanitary and storm sewers are typically broken down into linear and point features for management purposes. Linear features may be further classified into segments based upon their physical properties that affect the capacity or delivery of a service or commodity. For example, sanitary sewer lines may be segmented based upon differences in pipe material, thickness, diameter, or date of construction. Linear features are also commonly segmented where a non-linear component of the system (e.g., manholes and lift stations) connects with a linear structure. When problems arise that require management action to repair, rehabilitate, or replace one or more components of a networked infrastructure system (or to conduct routine maintenance work), these classifications assist in locating the asset and prescribing an appropriate management action (WEF, 2011a). This management framework is applicable to the Proposed Action under analysis in this EA, as described in **Section 2.2** below.

SAFB's sanitary sewer system includes approximately 30 miles of in-service sewer lines, excluding abandoned or out-of-service (legacy) sewer lines. There are two primary interceptor pipes located off Base that transfer wastewater to one of two publicly owned treatment works (POTWs) operated by the City of Wichita Falls. These include a 15-inch pipe along the western side of the Base that carries wastewater to the Northside POTW and a 24-inch pipe near the Base's eastern boundary that carries flow to the River Road POTW. Domestic and commercial wastewater are collected on SAFB and conveyed for discharge into one of these two POTWs.[3] **Table 2-1** provides a quantitative summary of the Base-wide sanitary sewer system.

Table 2-1
Sanitary Sewer System Summary for Sheppard Air Force Base, Texas

Piping (lengths in miles)					
Force Mains (pressure)	**Service (lateral) Pipes**	**Gravity (mains)**	**Abandoned-in-Place Pipes[a]**	**Total Sheppard-AFB Owned/Operated Pipes**	
2.5	10	17.5	12	42	
Lift Stations	**Manholes (in service)**	**Pretreatment Devices**			**Septic Tanks**
		Grit Traps (Active)	**Grease Traps (Active)**	**OWSs**	
26 (6 assessed)	476	10	13	-	2

Source: AECOM, 2015; Air Force, 2021b
Note:
a. Length is approximate. Not all abandoned-in-place pipes may be mapped or known to exist.

The Proposed Action would address deficient components of sanitary and storm sewer infrastructure at SAFB. The operation and maintenance of each respective system is briefly described below in relation to the Proposed Action.

In accordance with City Ordinance 15-2002, the Wichita Falls pretreatment program authorizes SAFB to discharge industrial wastewater into one of two POTWs, the Northside POTW and the River Road POTW. Effluent wastewater generated at SAFB discharging to the Northside POTW is from residential areas on the Base; wastewater discharging to the River Road POTW also generates effluent from residences but primarily consists of effluent from industrial and food industry operations. Effluent discharges to the Northside POTW and to the River Road POTW are subject to conditions set forth by an Industrial User Wastewater Discharge Permit issued to SAFB by the City of Wichita Falls, Texas. Therefore, wastewater generated at SAFB is subject to effluent limitations and controls as required by the permitting authority. The

[3] Two septic tanks in the northern and southwestern portions of SAFB are exceptions to off-Base treatment.

Proposed Action would target the most deficient segments and components of SAFB's sanitary sewer infrastructure for replacement, rehabilitation, repair, or improvement, to support the proper operation and maintenance of the system as specified by permit.

The Base-wide storm sewer system on SAFB generally functions well; however, some areas are subject to "ponding" following high-intensity rain events. Because standing water attracts insects and birds, standing water (particularly near the airfield) is routinely managed via filling, leveling, and reseeding these areas with grass. To address these same concerns, the Base continues to replace open-surface drains with underground conveyances. Covered storm drains, catch basins, and outfalls are also routinely managed to address known or potential stoppages, breaks, and washouts. The stormwater projects under the Proposed Action would address some of these concerns for the selected stormwater conveyances.

2.2 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action would repair or replace approximately 14,680 linear feet (lf) of selected 6–15-inch-diameter sanitary sewer line segments on SAFB (**Table 2-2** and **Figure 2-1**). The AF reviewed repair/replacement options for conducting this work; however, more detailed designs for each project will aide in the selection of an appropriate technique for management action. These techniques are further described in the *Sanitary Sewer System Evaluation and Inventory Technical Report* (see **Appendix A**) and correlate to the sewer line projects associated with the Proposed Action (AECOM, 2015). Other sanitary sewer projects under the Proposed Action involve rehabilitation work at seven sewage lift stations and repair/replacement of 15 manholes.

Table 2-2
Sanitary Sewer Line Segments under the Proposed Action

Map ID[a]	Project Description[b]
SS-1	1,600 lf of 10-inch concrete interceptor pipe.
SS-2	500 lf of 8-inch vitrified clay lateral pipe.
SS-3	5,000 lf of 15-inch concrete trunk pipe.
SS-4	450 lf of 8-inch concrete main pipe.
SS-5	3,240 lf of 6-inch vitrified clay lateral pipe.
SS-6	140 lf of 6-inch vitrified clay lateral pipe.
SS-7	560 lf of 8-inch vitrified clay main pipe.
SS-8	1,680 lf of pipe (line segment size/material under evaluation).
SS-9	1,510 lf of pipe (line segment size/material under evaluation).

Source: AECOM, 2015
Notes:
a Alphabetical Map IDs correspond with **Figure 2-1**.
b Project-specific methods and materials are subject to change during design; however, cured-in-place pipe liner (rehabilitation method) and polyvinyl chloride pipes (material) are most common.
lf = linear feet; SS = sanitary sewer

The Proposed Action would also improve or replace approximately 5,500 lf of storm sewer conveyance on the Base (see **Figure 2-1**, Map IDs, **SW-2**–**SW-4**). Approximately 1,943 lf of conveyance would be replaced with reinforced concrete pipe to include 864 lf of open ditch that would be converted to subsurface piping (see **Figure 2-1**, Map ID, **SW-1**).

Standards, requirements, and guidance applicable to the Proposed Action include, but are not limited to, the following:

- Unified Facilities Criteria (UFC) 1-200-01, *DoD Building Code* (2020)
- UFC 3-240-01, *Wastewater Collection and Treatment* (2021)

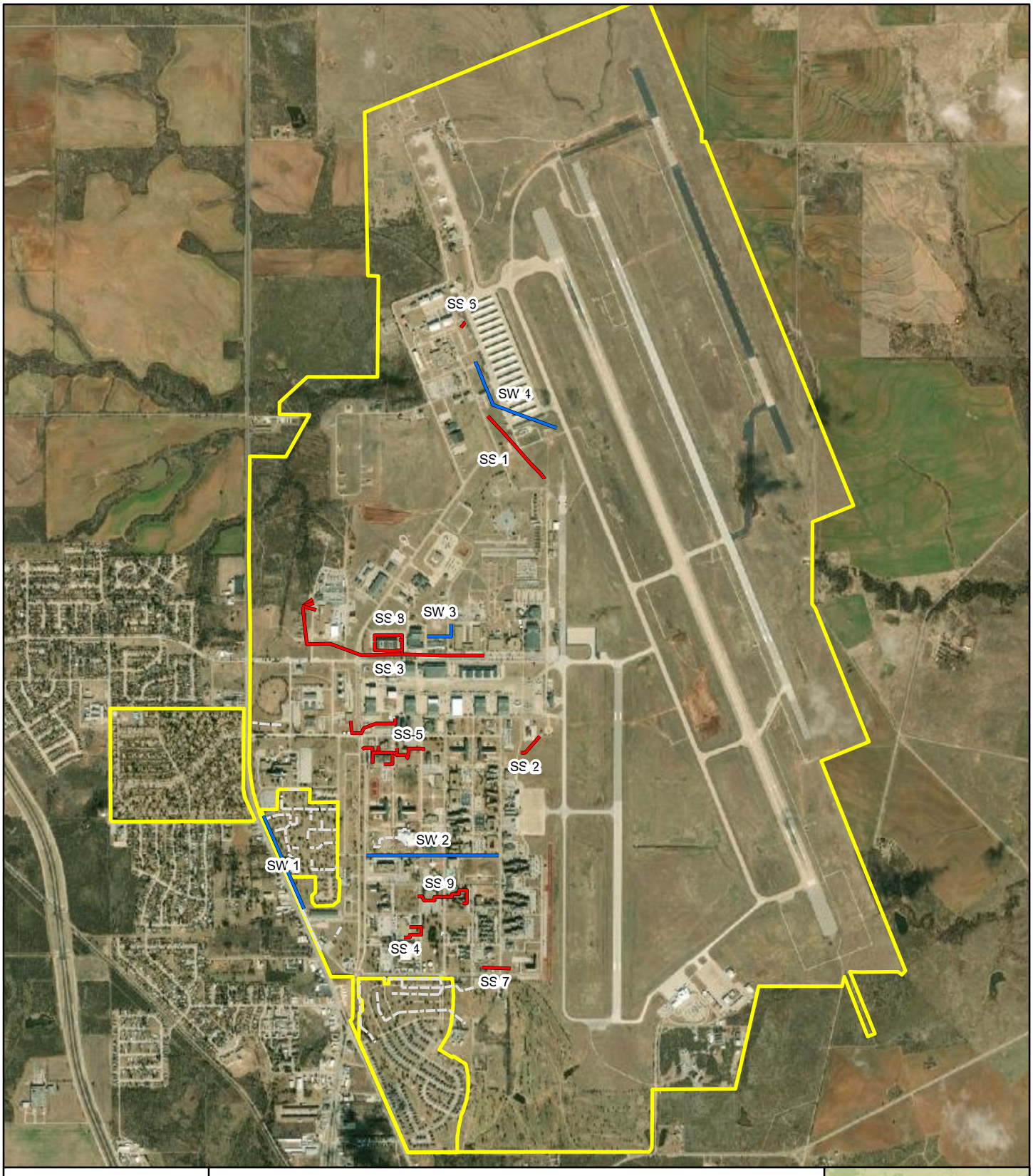

FIGURE 2-1

PROPOSED ACTION PROJECTS

- UFC 3-210-10, *Low Impact Development* (2020) (National Institute of Building Sciences, 2021), in accordance with *Guiding Principles for Sustainable Federal Buildings and Associated Instructions* (CEQ, 2016)
- WEF Manuals of Practice (WEF, 2006, 2008, 2009, 2011b)

2.3 ALTERNATIVES SCREENING PROCESS

NEPA requires all reasonable alternatives to be explored and evaluated objectively. Alternatives not found to be reasonable can be eliminated from evaluation, provided the EA or EIS includes a brief rationale for their elimination (40 CFR § 1502.14[a]).

2.3.1 SELECTION STANDARDS FOR ALTERNATIVE SCREENING

Consistent with 32 CFR § 989.8(c), the following selection standards meet the purpose of and need for the Proposed Action (see **Sections 1.2** and **1.3**) and were used to identify reasonable alternatives for analysis in the EA. The supporting alternatives must:

- minimize risk to the military mission from service disruption or failure;
- prioritize reinvestment action to address the most critical infrastructure deficiencies;
- provide sufficient capacity for near-term (i.e., 3–5 years) sanitary and storm sewer operations;
- satisfy current and anticipated environmental compliance requirements for discharges to POTWs and/or waters of the US;
- avoid adverse effects on sensitive environmental or cultural resources, to the extent practicable; and
- comply with federal and AF mandates for sustainable design and development.

The AF inventoried and evaluated the sanitary and storm sewer systems currently in operation at SAFB. Through comprehensive, risk-based assessments, the AF identified the most vulnerable segments and components within each system for restoration, rehabilitation, or replacement. The screening criteria above were considered as risk factors and evaluated in the process. Therefore, the AF determined that only the Proposed Action would meet the purpose and need.

Section 2.3.2 describes the alternatives considered but eliminated from detailed analysis, including a brief rationale for their dismissal. **Section 2.3.3** describes the alternatives retained for more detailed analysis, including the No Action Alternative.

2.3.2 ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

The AF used a risk-based scoring system to evaluate the individual components of storm and sanitary sewer infrastructure at SAFB. Through this evaluation, numerous alternatives or infrastructure rehabilitation projects were considered in lieu of the Proposed Action (see **Appendix A**). However, these alternatives were ultimately dismissed from more detailed analysis in this EA as being inconsistent with the purpose and need (see **Sections 1.3** and **1.4**).

The Proposed Action was the only alternative considered reasonable for addressing SAFB's critical sanitary and storm sewer infrastructure needs or those required to sustain operations in support of the military mission.

2.3.3 ALTERNATIVES RETAINED FOR DETAILED ANALYSIS

2.3.3.1 Proposed Action

As described in **Sections 2.3.1** and **2.3.2**, the Proposed Action is the only reasonable alternative that would meet the AF's purpose and need for action. Therefore, the Proposed Action is retained as an alternative for more detailed analysis in this EA, along with the No Action Alternative, described below.

2.3.3.2 No Action Alternative

Under the No Action Alternative, the AF would not implement the Proposed Action, and SAFB's sanitary and storm sewer systems would continue to operate in accordance with the status quo.

While the No Action Alternative would not satisfy the purpose of and need for the Proposed Action, this alternative is retained to provide a comparative baseline against which to analyze the effects of the Proposed Action, as required under the CEQ regulations (40 CFR § 1502.14[d]). The No Action Alternative reflects the status quo and serves as a benchmark against which the effects of the Proposed Action can be evaluated.

2.4 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Table 2-3 summarizes the potential impacts associated with Proposed Action and No Action Alternative. The summary is based on information discussed in detail in **Chapter 3** of this EA and includes a concise definition of the issues addressed and the potential environmental impacts associated with each alternative.

Table 2-3
Summary of Environmental Consequences

Resource Area	Proposed Action	No Action Alternative
Air Quality	No significant impacts to regional air quality.	No impacts would occur to regional air quality under the No Action Alternative.
Earth Resources	No significant impacts to earth resources.	No impacts to earth resources would be anticipated.
Water Resources	No significant impacts to water resources.	Water resources would not change from current condition, and no impacts to water resources would occur.
Biological Resources (flora, fauna, threatened and endangered species)	No significant impacts to biological resources.	No significant impacts to biological resources.
Cultural Resources (archaeological, architectural, traditional)	No significant impacts to historic buildings or archaeological deposits. No known traditional cultural resources or sacred sites are present.	Cultural resources would not change from current condition, and no impacts to cultural resources would be anticipated to occur.
Environmental Justice and Protection of Children	No disproportionate impact to minority or low-income populations. No disproportionate impacts to children or elderly.	There would be no change to minority, low-income, or youth populations.
Infrastructure (transportation)	No impacts to local traffic or infrastructure.	No impacts to local traffic or utilities would be expected to occur.
Hazardous Materials and Wastes, Toxic Substances, and Contaminated Sites	No impacts to hazardous waste management. No impacts to asbestos-containing materials and lead-based paint management. No impacts from radon. Construction occurs above Environmental Restoration Program sites but no impact.	No change to HMW, contaminated sites, and toxic substances would occur.
Utilities	Beneficial impacts to storm sewer and sanitary sewer facilities would be anticipated to occur under the Proposed Action because deficient elements of these systems would be repaired or replaced.	The current sanitary and storm sewer systems would continue to degrade under the No Action Alternative. Individual segments and components of these infrastructure systems would remain in disrepair and could become inoperable or cause SAFB to become non-compliant with associated permit conditions.

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the baseline resource conditions and environmental consequences of the Proposed Action and No Action Alternative.

The methodology used to determine the nature of effects that could result from the Proposed Action and No Action Alternative is briefly described in **Section 3.1** below. Resources considered but dismissed from detailed analysis in this EA, including a brief justification for their dismissal, are discussed in **Section 3.2**. Resources carried forward for more detailed analysis are identified in **Section 3.3**. These resources are further described and analyzed in **Sections 3.4** through **3.12**.

3.1 FRAMEWORK FOR ANALYSIS

This EA evaluates the potential adverse effects that could result from the Proposed Action and No Action Alternative. To determine the nature and level of possible effects, the AF defined a resource-specific study area, or Region of Influence (ROI), to analyze the potential effects under the Proposed Action. Beyond these ROIs, no potential adverse effects from the Proposed Action would be anticipated. For the purposes of analysis, potential effects are described as follows:

- **Beneficial –** positive effects that improve or enhance resource conditions.
- **Negligible –** adverse effects likely to occur but at levels not readily observable by evaluation.
- **Minor –** observable, measurable, tangible adverse effects qualified as below one or more significance threshold(s).
- **Significant –** obvious, observable, verifiable adverse effects qualified as above one or more significance threshold(s); not mitigable to below significance.

When relevant to the analyses in this EA, potential effects are further defined as direct and indirect, short- or long-term, and temporary, intermittent, or permanent.

3.2 RESOURCES ELIMINATED FROM DETAILED ANALYSIS

The CEQ regulations state that federal agencies should "identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review" (40 CFR § 1506.3). Accordingly, the AF considered but eliminated from further analysis the following resources:

- **Airspace Management –** The Proposed Action would not alter the current airspace configuration; the frequency, tempo, and volume of current aircraft training and operations would not change.
- **Socioeconomics –** The Proposed Action would produce short-term, minor, beneficial effects in the form of local expenditures (e.g., procurement of construction materials and temporary jobs) and incidental spending during construction. No adverse socioeconomic effects would occur in the short or long term.
- **Land Use, including Aesthetics –** Current and future land use on SAFB would not change under the Proposed Action. The aesthetics of the Base would change during construction of the Proposed Action; however, any such effects would be temporary and not likely to overlap in time or space due to the sequencing of projects. No long-term, adverse effects on the aesthetics of SAFB would occur. No or negligible impacts would occur on land use and aesthetics in areas adjacent to or proximate to SAFB under the Proposed Action.
- **Noise –** Construction noise associated with the Proposed Action would be negligible or barely perceptible in the context of the existing noise environment of SAFB (City of Wichita Falls, 2014).

- **Operational Safety –** The Proposed Action would not create an operational safety risk relative to the military mission; any delays or deviations from normal operations would be manageable.

3.3 RESOURCES CARRIED FORWARD FOR DETAILED ANALYSIS

Based on the results of internal and external scoping (see **Section 1.7**), the following resources are carried forward for analysis in **Sections 3.5 through 3.12** of this EA: air quality; earth resources; water resources; biological resources; cultural resources; infrastructure (transportation); environmental justice and protection of children; and HMW. To provide context for the resource analysis sections, **Section 3.4** briefly describes the environmental setting on and around SAFB.

3.4 ENVIRONMENTAL SETTING

SAFB is situated north-northeast of the city of Wichita Falls, Texas. The Base consists of approximately 5,720 acres of land generally bordered to the north and east by agriculture and to the south and west by residential and commercial development. Land use on SAFB includes a military airfield, oriented north to south along its eastern boundary. Various mission support facilities are concentrated adjacent to and west of the airfield in the central portion of the Base. The southern extent of SAFB primarily consists of housing; a small area in the northwest portion of the Base remains undeveloped due to natural resources constraints.

The topography of SAFB is mostly flat with elevations ranging from 950 to 1,075 feet above mean sea level from west to east. The climate in the region of SAFB is seasonally variable with an average high of 97 degrees Fahrenheit (°F) in the summer and an average low of 28°F in the winter. This area of north-central Texas receives an average of 29 inches of rainfall each year.

3.5 AIR QUALITY

Air pollution is harmful to human health and the environment. Air pollutants are emitted from both stationary (e.g., chemical and power plants) and mobile sources such as vehicles and aircraft. To protect against these harms, the US Environmental Protection Agency (USEPA) implements various programs under the CAA to control and minimize different types of air pollution.

The most common and widespread air pollutants are regulated by the National Ambient Air Quality Standards (NAAQS), science-based criteria for setting permissible levels for six such pollutants within a defined "airshed." Also known as "criteria pollutants," these include particle matter (PM), ground-level ozone,[4] carbon monoxide, sulfur oxides, nitrogen oxides, and lead. The limits set based on human health are called primary standards; the limits intended to prevent environmental damage are called secondary standards. States must adopt the federal standards but have authority to adopt stricter criteria pollutant standards. A geographic area with air quality that is below the primary standard threshold is called an "attainment" area; areas that do not meet the primary standard are called "nonattainment" areas. The most recently established NAAQS are available online.

The CAA also contains specific provisions to address hazardous and toxic air pollutants that pose health or environmental risks; acid rain that causes damage to aquatic life, forests, and property; chemical emissions that deplete the stratospheric ozone layer; and regional haze that impairs visibility in national parks and other recreational areas. In addition to these programs, the CAA provides the authority to regulate new or emerging pollutants such as greenhouse gases that cause global climate change.

This section describes regional air quality conditions and analyzes potential effects on air quality for the Proposed Action and No Action Alternative. The ROI for air quality is defined as the Abilene-Wichita Falls

[4] Ozone is formed by the mixing of two types of chemicals in the atmosphere, volatile organic compounds and nitrogen oxides. Volatile organic compounds are released by cars burning gasoline, petroleum refineries, chemical manufacturing plants, and other industrial facilities. The solvents used in paints and other consumer and business products also contain volatile organic compounds. Nitrogen oxides are produced when cars and other sources (e.g., power plants and industrial boilers) burn fuels such as gasoline, coal, or oil.

Intrastate Air Quality Control Region (AQCR), a designation the USEPA uses to determine an area's NAAQS compliance. Greenhouse gas emissions, although not limited to the ROI, are also analyzed.

3.5.1 EXISTING CONDITIONS

Wichita County, Texas, is part of the Abilene-Wichita Falls AQCR, a group of 30 contiguous counties in north-central Texas. The counties in this AQCR are currently unclassified or in attainment for all criteria pollutants. Therefore, the Proposed Action does not require a General Conformity applicability or determination analysis pursuant to Section 176(c) of the CAA. Regardless of a control region's air quality attainment status, Air Force Manual (AFMAN) 32-7002, *Environmental Compliance and Pollution Prevention* (4 February 2020) requires an air quality impacts analysis for any regulated pollutants under the CAA. AFMAN 32-7002 further requires AF action proponents to evaluate the net change in emissions using an approved emissions estimate technique or methodology. Accordingly, an AF screening tool known as the Air Conformity Applicability Model (ACAM) was employed to estimate emissions associated with the Proposed Action for comparison with the baseline air quality conditions within the ROI (i.e., the No Action Alternative).

3.5.1.1 Operating Permits

The State of Texas has adopted the federal NAAQS. Pursuant to Title 30 of the *Texas Administrative Code*, Chapter 122 (30 TAC 122), the Texas Commission on Environmental Quality (TCEQ) administers a permit program for stationary source emissions generated at federal facilities. Permitting requirements for federal owners and operators are largely based on "potential to emit" (PTE), defined as the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design or configuration. PTE calculations determine whether a federal facility is defined as a "major source" under the CAA requiring a Title V operating permit; however, some "non-major" or "minor source" federal owners or operators are subject to permit-by-rule (PBR) requirements (30 TAC 106). PBRs authorize stationary source emissions for individual or specific operations.

TCEQ's delegated authority under the CAA extends to mobile emissions generated in Texas. Pursuant to 30 TAC 111.145, fugitive dust generated by construction or demolition involving one or more acres of land require two dust control measures, at a minimum. These include the use of water (or other suitable oil or chemical application) for dust suppression and measures to prevent airborne particulate matter during sandblasting or similar operations.

3.5.1.2 New Source Review

Per the CAA, the Prevention of Significant Deterioration (PSD) New Source Review (NSR) permit program regulates criteria, and certain non-criteria, air pollutants for AQCRs designated as unclassified or in attainment status with respect to the federal standards. In such areas, a PSD review is required for new "major source" or "major modification of existing source" emissions that exceeds 100 or 250 tons per year (tpy) of a regulated CAA pollutant, dependent on the type of major stationary source.[5] For "minor source" emissions, a PSD review is required if a project increases a "major source" threshold by itself.

3.5.1.3 Greenhouse Gases

Greenhouse gases (GHGs) include carbon dioxide (CO_2), nitrous oxide, methane (CH_4), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. GHGs are both a natural phenomenon and the result of man-made activity. Natural concentrations of CO_2 are part of the global carbon cycle, an exchange between the atmosphere and land and water on the earth through processes such as plant photosynthesis. GHG emissions from human activity have risen over time through industrialization,

[5] There are two types of "major stationary source" emissions: named and un-named. A named stationary source is listed in 40 CFR § 51.166(b)(1) and has a PTE of 100 tpy (includes fugitive emissions). An un-named stationary source is one that is not listed in 40 CFR § 551.166(b)(1) and has a PTE of 250 tpy.

including the burning of fossil fuels. Although natural processes can absorb some anthropogenic GHG emissions, those that are not absorbed accumulate in the atmosphere and contribute to climate change.

There is no NAAQS for GHGs. As such, aggregate GHG emissions are included in the statewide PSD program administered by the TCEQ, regardless of attainment status. GHGs are defined as a non-criteria pollutant under 30 TAC 101.1 and are subject to regulation when their PTE exceeds 75,000 tpy or more of carbon dioxide-equivalent (CO_2e) (30 TAC 116.164i). However, there is no minor source program applicable to GHGs in Texas.

Global warming potential (GWP) is a metric used to determine how much a particular GHG contributes to climate change. The calculation is premised on a GWP of 1 for CO_2, which is then used to calculate a CO_2e for other GHGs. These data can then be totaled as an aggregate in metric tons CO_2e. According to the USEPA's Greenhouse Gas Reporting Program, in 2020, GHG emissions for the Wichita Falls, Texas, area were predominately from the following industrial activities:

- IESI Buffalo Creek Landfill, Iowa Park, Texas: 117,824 metric tons CO_{2e} (primarily CH_4)
- City of Wichita Falls Landfill, Wichita Falls, Texas: 141,085 metric tons CO_{2e} (primarily CH_4)
- Vitro Flat Glass LLC: 210,284 metric tons CO_{2e} (primarily CO_2)

Collectively, these activities generated 469,193 metric tons CO_{2e} in 2020

3.5.1.4 Federal Class I Areas

National parks larger than 6,000 acres and national wilderness areas larger than 5,000 acres in existence when the CAA was amended in 1977 are provided air quality and visibility protection under the CAA. Referred to as "Class I" areas, there are no such designations in north-central Texas.

3.5.1.5 Sheppard Air Force Base

SAFB is defined as a "minor source" for criteria and hazardous air pollutants and operates under PBR as specified in 30 TAC 106. Military operations at SAFB that generate stationary source emissions primarily include jet engine testing, fuel dispensing, woodworking, and painting. Other stationary source emissions include those generated from boiler, degreaser, and fuel storage tank operations.

3.5.2 ENVIRONMENTAL CONSEQUENCES

Potential adverse impact(s) on air quality would include:

- particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, and nitrogen oxides emissions above the applicable PSD (indicator) threshold of 250 tpy;
- lead emissions above the General Conformity Rule *de minimis* values of 25 tpy; and
- GHG emissions with a PTE above 75,000 tpy or more of CO_2e.

As required by AFMAN 32-7002, the ACAM was used to model and estimate air emissions that could result from the Proposed Action. ACAM requires various data inputs regarding the location, size, and nature of a proposed activity to model and estimate air emissions; however, assumptions may be established in lieu of certain data. Available data for the individual sanitary and storm sewer infrastructure projects (e.g., length of replacement line segments and areas subject to excavation or grading) was used to populate ACAM. Where data gaps existed, specific assumptions were established for the analysis. For example, it was assumed that excavation would occur for all linear projects under the Proposed Action; trench widths were assumed to be 10 feet wide and excavated to a depth of 15 feet below ground surface. **Appendix C** provides additional details and summarizes the results of the ACAM analysis conducted for the Proposed Action. The ACAM emissions estimates for the Proposed Action are also incorporated into the air quality impact analysis below (**Section 3.5.2.2**).

3.5.2.1 No Action Alternative

Under the No Action Alternative, air quality conditions in the ROI would remain consistent with the status quo in the short term. In the longer term, air quality conditions would be determined by changes in population, land use, energy usage, and similar inputs for the Wichita Falls area of Texas.

3.5.2.2 Proposed Action

The Proposed Action would involve small-scale infrastructure replacement, rehabilitation, repair, and improvement projects. Construction activities associated with the projects (e.g., hardscape demolition, trench excavation, pipe placement, backfilling and site restoration, and similar activities) would occur in phases from approximately FY 2023 through FY 2028. That is, not more than two to three projects would be implemented in any one year over this period. Under the Proposed Action, temporary construction workers would support the individual construction projects but no permanent, long-term increase to the population of SAFB would occur. The operation of the Proposed Action would increase air emissions from the current status quo; however, minor, beneficial effects on air quality could result from the infrastructure improvements.

Table 3-1 summarizes the results of the ACAM analysis for the duration of the Proposed Action. It compares the cumulative emissions of regulated NSR pollutants under the Proposed Action (FY 2023–2028) with their applicable (annual) PSD thresholds. Because the cumulative emissions of these pollutants would not exceed the applicable PSD thresholds for any one year under the Proposed Action, local and regional air quality impacts would be short term and negligible. In FY 2029, upon completion of the Proposed Action, the analysis indicates air quality would return to steady-state conditions. Therefore, no long-term air quality impacts would be anticipated from the Proposed Action.

Table 3-1
Comparison of Cumulative Air Emissions and Annual PSD Thresholds for the Proposed Action (FY 2023–2028)

Regulated NSR Pollutant	Emissions Estimate (tons/year)	Applicable PSD Threshold (tons/year)[a]
Volatile organic compound	2.56	250
Nitrogen oxides	12.72	
Carbon dioxide	20.12	
Sulfur oxides	0.05	
PM_{10}	247.87	
$PM_{2.5}$	0.48	
Lead	0.00	25
Ammonia	0.01	250
CO_2e	4,925	N/A

Notes:

a. Because SAFB is in an AQCR in attainment with the NAAQS, not listed as a stationary source in 40 CFR 51.166(b)(1)c, and defined as a "minor source" for criteria and hazardous air pollutants, applicable PSD thresholds are identified above for the regulated NSR pollutants.

CO_2e = carbon dioxide-equivalent; N/A = not applicable; $PM_{2.5}$ = particulate matter with a diameter less than 2.5 micrometers; PM_{10} = particulate matter with a diameter less than 10 micrometers.

3.5.2.3 Best Management Practices and Mitigation Measures

No specific best management practices (BMPs) for air quality are recommended.

No project-specific mitigation measures are recommended.

3.6 EARTH RESOURCES

This section describes the earth resources associated with SAFB and the potential impacts of the Proposed Action and No Action Alternative. Earth resources include geology, topography, and soils, the characteristics of which help determine whether land is suitable for development. Geology refers to the structure and configuration of surface and subsurface features. Characteristics of geology include geomorphology, subsurface rock types, and structural elements. Over long periods of time, geological processes determine topography: the shape, height, and position of the land surface. Soil refers to the unconsolidated materials overlying bedrock or other parent material. Soils are defined by their composition, slope, and physical characteristics. Attributes of soil, such as elasticity, load-bearing capacity, shrink-swell potential, and erodibility, determine its suitability to support a particular land use, including development.

The ROI for earth resources is SAFB. No potential adverse impacts from or on earth resources would be anticipated beyond the ROI.

As defined by the *Farmland Protection Policy Act* (7 USC §§ 4201–4209), and as depicted in the US Department of Agriculture Web Soil Survey tool, there are no "prime farmland" soils within the ROI. No impacts to "prime farmland" soils would result from the Proposed Action.

Sections 3.6.1 and **3.6.2** describe and analyze potential effects for earth resources in the ROI.

3.6.1 EXISTING CONDITIONS

3.6.1.1 Geology and Topography

The geologic strata associated with SAFB are products of ancient fluvial (river and stream) deposition and erosion. The exposed strata associated with the Wichita Falls area of Texas are dominated by the Petrolia Formation, the uppermost bedrock surface. The Petrolia Formation ranges from 10 to 30 feet below ground surface across SAFB. This stratum or layer of sedimentary rock and soil defines the fundamental characteristics of the strata underlying SAFB. These unconsolidated materials consist primarily of mudstone with shale, siltstone, and sandstone. SAFB lies within the outcrop area of a sandstone unit ranging in thickness from 3 to 25 feet and characterized by interbedded sands, silts, and clays.

SAFB is in the central portion of the Rolling Red Plains of Texas, part of the Central Lowlands physiographic province. Topography in this province generally consists of rounded hills with broad, shallow valleys. On and in the vicinity of SAFB, the topography is predominately flat (Air Force, 2017a, 2020a).

3.6.1.2 Soils

SAFB is situated within a broad east to west band of soils classified as the Kamay-Bluegrove-Deandale Association. These soils are generally characterized as reddish-brown sandy loam underlain by red clay and clay loam. On SAFB, soils are generally described as having a thin layer of sandy loam topsoil underlain by red clay (Air Force 2017a). **Figure 3-1** depicts the types of soils associated with SAFB. **Table 3-2** characterizes the soils associated with the Proposed Action.

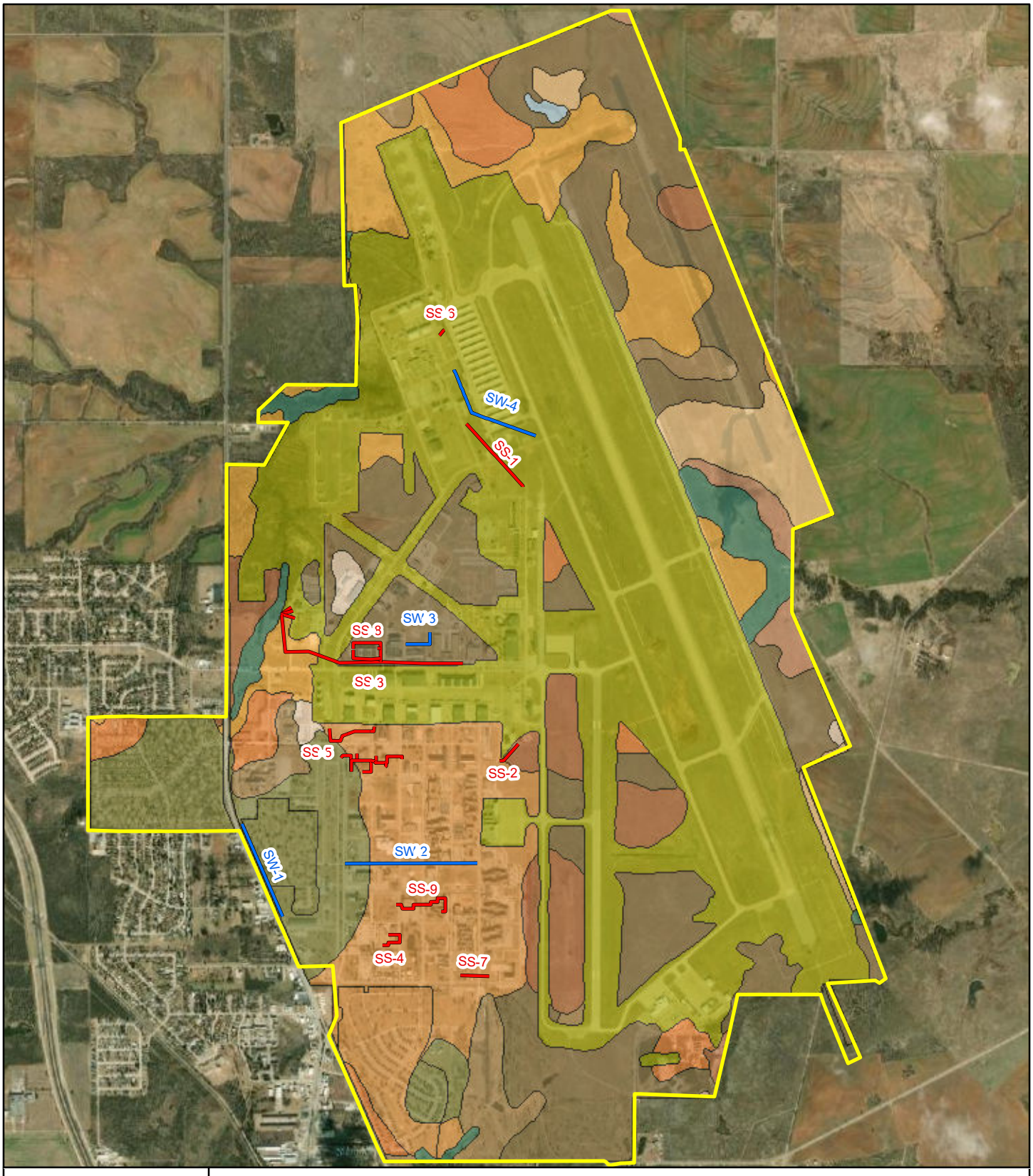

FIGURE 3-1
SOIL TYPES

Imagery: ESRI 2021
Projection: WGS 1984, Zone 14N

N

0 0.25 0.5 Miles

Sheppard AFB

Replace or Rehabilitate Sanitary Sewer Line

Improve or Replace Stormwater Conveyance

Aw	Wheatwood and Port	KaB	KaB - Kamay Silt Loam
BeB	Bluegrove Loam	KcB	Kamay-Urban Land Complex
BuB	Bluegrove-Urban Land Complex	ObC	Jolly Fine Sandy Loam
DaA	Deandale Silt Loam (0-1%)	Ua	Urban Land
DaB	Deandale Silt Loam (1-3%)	VcB	Vernon Clay Loam (1-3%)
DbA	Deandale Silt Loam, Loamy Substratum	VcC	Vernon Clay Loam (3-5%)
FrB	Frankirk Loam	W	Water

Table 3-2
Soil Types Associated with the Proposed Action

Symbol	Name	Percent of ROI	Hydric (Y/N)	Drainage Class	Runoff Class	Depth to Water Table (inches)
Ua	Urban land	42%	N	not specified	not specified	variable
KcB	Kamay-Urban land complex, 0–3 percent slopes	10.8%	N	well-drained	very high	> 80
KaB	Kamay silt loam, 1–3 percent slopes	18.2%	N	well-drained	very high	> 80
DaA	Deandale silt loam, 0–1 percent slopes	3.8%	N	moderately well-drained	high	> 80
BuB	Bluegrove-Urban land complex, 1–3 percent slopes	6.9%	N	well-drained	medium	> 80
DbA	Deandale silt loam, 0–1 percent slopes	1.0%	N	moderately well-drained	high	> 80
Aw	Wheatwood and Port soils, frequently flooded	2.1%	N	well-drained	negligible	> 80

Source: United States Department of Agriculture Web Soil Survey tool
ROI = Region of Influence

3.6.2 ENVIRONMENTAL CONSEQUENCES

Potential adverse impact(s) on earth resources would include:

- substantial alteration of unique, valued, or beneficial geologic or topographic conditions;
- substantial soil loss or erosion offsite;
- measurable loss or degradation of a valued or beneficial soil function; and
- disturbance of soils with contaminant(s) above regulatory threshold(s).

3.6.2.1 No Action Alternative

Under the No Action Alternative, the AF would not implement the Proposed Action. The storm and sanitary sewer infrastructure at SAFB would continue to operate in accordance with the status quo. Resource conditions would generally remain the same; however, in time, continued operations would be more likely to result in an unintentional discharge, contaminant deposition or transport via stormwater, and/or non-compliance with related permits at SAFB.

3.6.2.2 Proposed Action

The Proposed Action would involve earthwork to include trenching, backfilling, and compacting of soils or fill materials on and immediately adjacent to the project sites. Dependent on the scope and design of the individual projects, excavated soils and fill materials would require temporary storage on site and/or transport to/from SAFB for use or disposal. These activities would expose soils and increase their susceptibility to water and wind erosion. Inclement weather (i.e., rain or wind) could increase the probability and severity of any potential impacts on soils. Where excavation and backfill are required, soil structure, composition, and function could be altered. Further, operating heavy vehicles and equipment to remove, place, or stabilize infrastructure could result in soil compaction. In a compacted state, normal soil function may be altered (e.g., water storage, infiltration, or filtration).

The Proposed Action could also result in the accidental release of contaminants or unintentional disturbance and movement of contaminated soils that already persist in the environment. For example, construction vehicle and equipment usage could result in accidental spills of petroleum-based constituents into soil media.

Under the Proposed Action, potential adverse effects on soils, including soil loss, contamination, and structural alteration, would be managed at an individual project level. When applicable, the construction contractor would obtain and comply with a Construction General Permit (CGP) under the TCEQ-administered Texas Pollutant Discharge Elimination System (TPDES) program (see **Section 3.7.1.2**) when projects would disturb 1 acre or more of land. The CGP would require the preparation, approval, and implementation of a site-specific Stormwater Pollution Prevention Plan (SWP3) prior to construction, including appropriate structural and non-structural erosion, sediment, and waste control (BMPs). Additional measures may include planning and operational considerations such as staging construction equipment and materials on existing gravel or paved surfaces or minimizing or restricting vehicle movements to select areas on SAFB.

Once reuse or fill soils are placed and compacted, the construction contractor would grade surficial soils to conform to local topography and achieve positive surface drainage. Construction activities would conclude with revegetation of the landscape using native plants and trees, as appropriate. The AF would also conduct post-construction site inspections to ensure any agreed upon management measures remain effective and pre-construction conditions remain the same or improve.

All soils associated with the Proposed Action are previously disturbed and range in drainage class from moderately well drained to well drained. None of the soils are classified as “hydric” despite one soil type’s association with floodplains (i.e., Wheatwood and Port soils). All project sites under the Proposed Action are generally suitable for development; however, the AF would validate soil conditions at each site prior to construction to address any limiting factors by management or design. During construction, adherence to management plans such as the SAFB Hazardous Waste Management Plan and SPCC Plan would ensure the proper use, handling, storage, disposal, or cleanup of any contaminants or materials of concern. Additionally, construction phasing under the Proposed Action would minimize the severity of potential adverse effects on soils.

With these project-specific measures required and in place during implementation of the Proposed Action, potential effects on soils in the ROI would be negligible and temporary in duration; no permanent, long-term effects on soils would occur under the Proposed Action.

3.6.2.3 Best Management Practices and Mitigation Measures

BMPs recommended to reduce potential impacts on earth resources include:

- Revegetate temporarily disturbed areas as soon as possible to minimize erosion and sedimentation.
- Maintain stormwater management features throughout the life of the project to ensure long-term functionality to original design standards.

No project-specific mitigation measures are recommended.

3.7 WATER RESOURCES

This section describes the types and conditions of water resources associated with the Proposed Action and No Action Alternative. These include surface waters, stormwater management, floodplains, and groundwater.

The ROI for water resources includes the surface and subsurface environments at, adjacent to, and downstream of the Proposed Action. This area includes the portions of SAFB down gradient of the Proposed Action and approximately 0.5 mile from its boundary thereafter. Beyond this ROI, potential adverse impacts on water resources would not be anticipated to occur under the Proposed Action.

3.7.1 EXISTING CONDITIONS

3.7.1.1 Watershed Management

The city of Wichita Falls is situated along the Wichita River, approximately 25 miles southwest of its confluence with the Red River. Wichita Falls and SAFB lie within the Wichita River Basin (Hydrologic Unit Code [HUC] # 11130206), part of the larger Red River watershed that spans seven states. Two sub-basins of the Wichita River Basin divide the Base. To the north, the 37,155-acre Bear Creek-Wichita River sub-basin (HUC # 111302060501) includes Bear Creek and its tributaries. This area of SAFB directs surface flow to the south-southeast and discharges through an underground drainage system along the eastern boundary of the Base. To the south, the 37,478-acre Pond Creek-Wichita River sub-basin (HUC # 111302060407) includes Plum Creek and its tributaries. This area of SAFB directs surface flow to the south-southwest and discharges to Plum Creek, approximately 10 miles south of the Base (US Geological Survey [USGS], 2021). As depicted in the USGS National Map Viewer, both Bear Creek and Plum Creek are tributaries of the Wichita River.

The Texas Water Development Board (TWDB) administers a program for the long-term planning and development of State water resources. The TWDB divides Texas into 16 distinct regional water planning areas (RWPAs) for this purpose. Each RWPA is tasked with developing a regional water plan that feeds into a State water plan prepared by the TWDB. Wichita County, Texas, is part of the Region B RWPA.

3.7.1.2 Surface Waters and Water Quality

Pursuant to the CWA, the TCEQ sets and enforces water quality standards for surface waters in Texas. Discharges to State waters are permitted under the TPDES permit program. TPDES permits are required for different types of pollutant-generating activities such as construction, industrial operations, and public-owned and -operated storm sewers (TCEQ, 2020, 2021b).

Under Section 303(d) of the CWA, the State of Texas is required to identify and develop a list of waterbodies (or waterbody segments) that are impaired based on their intended use (e.g., swimming or fishing). Impaired waterbodies are those that are not in attainment with water quality standards promulgated by the TCEQ. To achieve attainment status, a total maximum daily load (TMDL) is developed for the impairment. TMDLs use science-based criteria to establish a regulatory ceiling for the impaired waterbody to achieve attainment of water quality standards. That is, the maximum pollutant loads a waterbody may receive from all or portions of a basin or sub-basin in attainment of water quality standards. TMDLs target specific pollutants and set enforceable limits to improve or maintain the current conditions of 303(d)-listed waterbodies. The TCEQ also implements a statewide water quality sampling program for this purpose and requires sampling through the issuance of TPDES permits (USEPA, 2021a).

The surface waters associated with SAFB include intermittent and perennial streams and, to a lesser extent, wetland communities and ponds. Bear Creek, a perennial stream that bisects SAFB from north to southeast, is the primary surface water feature. However, due to past development activities on SAFB, streams on the Base have been substantially altered from their natural state. Most streams on the Base were diverted below ground to support development (e.g., Bear Creek in the southern portion of the airfield). As a result, the drainage network on the Base is characterized by a network of canals and ditches that collect water and discharge to a series of underground conduits and pipes (**Figure 3-2**).

In 2014, the AF assessed and delineated Waters of the US on SAFB. The stream segments shown on **Figure 3-2** and listed in **Table 3-3** were identified as Waters of the US in accordance with a preliminary jurisdictional determination (Air Force, 2017a).

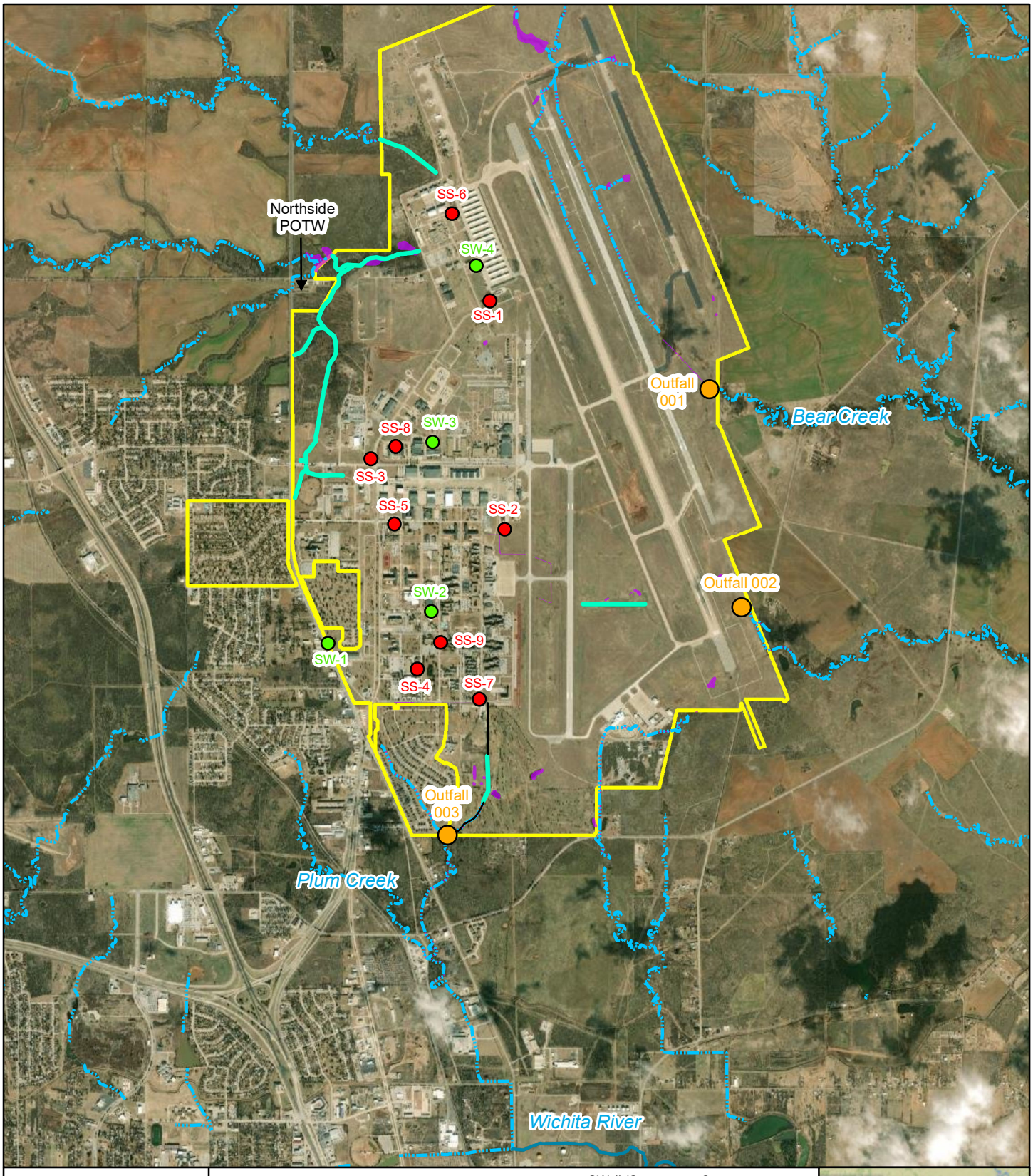

FIGURE 3-2
SURFACE WATER

SAFB
National Wetland Inventory Wetlands
Perennial Stream
Intermittent Stream
Pre-Jurisdictional Stream
SW-# (Stormwater Conveyance Project)
SS-# (Sanitary Sewer Project)
Stormwater Outfall

N

0 0.25 0.5 Miles

Projection: WGS 1984
Map Data: ESRI, 2020

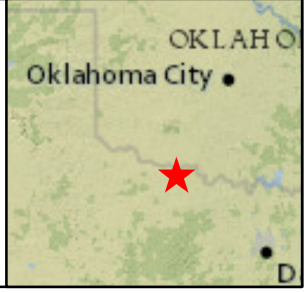

Table 3-3
Streams on SAFB with a Preliminary Jurisdictional Determination as Waters of the US

Stream ID	Stream Length (linear feet)	Stream Classification
SSG-01	3,500	Intermittent
SSG-02	190	Perennial
SSG-03	1,700	Perennial
SSG-04	9,950	Perennial
SSG-05	1,050	Intermittent
SSG-06	1,650	Intermittent

Source: Air Force, 2017a
SSG = stream segment

The nearest 303(d)-impaired waterbody to SAFB is more than 3 miles to the southeast of the Base; as depicted on the USEPA's WATERS GeoViewer tool, no waterbodies on or around SAFB are listed as impaired. **Section 3.7.1.2** describes stormwater permits maintained by SAFB to comply with the CWA.

3.7.1.3 Wetlands

The US Army Corps of Engineers (33 CFR § 328.3) and USEPA (40 CFR § 230.3) define wetlands as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands are a subset of Waters of the US, and those deemed "jurisdictional" are regulated under Section 404 of the CWA.

In 2014, the AF preliminarily determined that 10.1 acres of wetlands on SAFB were jurisdictional. The identified wetlands are hydrologically associated with several of the stream segments identified in **Table 3-3** (above), including Stream Segments (SSGs) -01, -04, and -05 (**Figure 3-2**). These wetlands were classified as palustrine emergent (PEM), palustrine shrub scrub (PSS), and palustrine forested (PFO) wetland communities (Cowardin, et al. 1979) and are further described below as delineated in 2014:

- **Wetland 3 –** two PFO wetland areas totaling 0.05 acre in size. Located in proximity to one another in the southernmost portion of SAFB, these wetlands are considered a singular community due to their hierological link via **SSG-01**.
- **Wetland 5 –** a 0.04-acre PEM wetland area immediately north of Missile Road near the western boundary of SAFB. This wetland is linked to **SSG-004**, and its hydrologic regime is influenced by a culver that drains underneath the road.
- **Wetland 6 –** an 8.4-acre PFO wetland in the far northwest portion of SAFB formed in an area where **SSG-05** drains southeast of the main channel.
- **Wetland 7 –** a 1.6-acre PSS wetland located adjacent to an unnamed tributary of Bear Creek in the northwest portion of SAFB, west of the airfield. This wetland area formed immediately upstream from a series of culverts that allow water to flow underneath the airfield.

Wetlands 3, **5**, and **6** were preliminarily determined jurisdictional as being within the ordinary highwater mark of **SSG-01**, **SSG-04**, and **SSG-05**, respectively. **Wetland 7** was preliminarily determined jurisdictional due to its association with a tributary of Bear Creek.

3.7.1.4 Stormwater Management

Stormwater originating on SAFB is conveyed by an extensive network of inverts and stormwater channels. Underground pipes and catch basins serve to route surface runoff into various drainage ditches across the Base. There are a total of nine outfalls on the Base that discharge stormwater, three of which drain most areas on the Base (**Figure 3-2**). Outfall 001 flows toward and discharges to Bear Creek in the northern portion of SAFB. Outfall 002 discharges along the eastern boundary of the Base into an unnamed

intermittent stream. Outfall 003 discharges just south of the boundary of SAFB. All stormwater originating on SAFB ultimately discharges to Plum Creek, Bear Creek, or the Wichita River. Plum and Bear creeks are tributaries of the Wichita River, which empties to the Red River farther east (Air Force, 2020a).

SAFB maintains a Base-wide Stormwater Management Plan (SWMP) to meet its obligations under the TCEQ General Permit for Phase II Municipal Separate Storm Sewer System (MS4) *Discharges for Small Cities within the State of Texas* (MS4 #TXR040087). The SWMP describes procedures for the management of stormwater that originates on SAFB and discharges via three main outfalls along the periphery of the Base. Outfall 003 also discharges into the city of Wichita Falls MS4 (Air Force, 2014). The SAFB SWMP also captures stormwater management BMPs established under the Base's MS4 permit. For example, one BMP is intended to prevent and minimize illicit discharge occurrences from sanitary sewer line blockages. This BMP involves water jetting lines with the most potential to develop blockages that can lead to SSOs. The BMP is currently practiced at SAFB and would remain in effect until deficient lines are rehabilitated (e.g., projects under the Proposed Action) so that SAFB maintains compliance with its Multi-Sector General Permit for Industrial Facilities.[6]

Multi-Sector General Permits (MSGPs) are issued under the TPDES permit program to regulate stormwater discharges from industrial areas.[7] Among other conditions, MSGPs require the preparation and implementation of SWP3 specific to the involved industrial activities. SAFB maintains a SWP3 for this purpose.

Stormwater discharges from construction activities that disturb 1 acre or more of soil on SAFB are also permitted under the TPDES. Construction sites of this size require a TCEQ-approved CGP prior to the start of construction activity. CGPs establish standard measures to prevent or minimize potential soil erosion and sedimentation from construction sites. For example, as conditions of the CGP construction activities, SAFB must adhere to a project-specific SWP3 and post-construction inspections are required to confirm establishment of a 70-percent vegetative cover (TCEQ, 2021a).

3.7.1.5 Floodplains

The Federal Emergency Management Agency (FEMA) defines the 100-year floodplain as an area that has a 1-percent chance of inundation in any given year. EO 11988 requires federal agencies to determine whether proposed development would occur within a floodplain and to avoid floodplains, to the maximum extent possible, when there is a practicable alternative. Where construction within the floodplain is unavoidable, development of a FONPA is required detailing no other alternatives.

As defined in **Figure 3-2**, SAFB is surrounded by several named and unnamed streams and tributaries containing identified 100-year floodplains classified as Zone A. Detailed analyses are not performed for floodplains that are classified as Zone A, meaning no base flood elevations are established in these areas. An unnamed river to the northwest of SAFB connects with Bear Creek to the east of SAFB via Zone A located in the northern third of SAFB. The floodplain bisects the Base in a northwest-southeast direction roughly 0.5 mile wide (see **Figure 3-3**) (FEMA, 2021).

3.7.1.6 Groundwater and Water Quality

The Seymour Aquifer extends across and underlies parts of north-central Texas. In Wichita County, Texas, this major aquifer system primarily occurs adjacent to the Wichita and Red rivers. It is possible that the Seymour Aquifer extends south from the Red River and north from the Wichita River to the northern and southern boundaries of SAFB. No minor aquifers occur in Wichita County. On average, depth to groundwater across the Seymour Aquifer is 23 feet below ground surface.

[6] SAFB's MS4 permit covers all other stormwater discharge originating on the Base.
[7] On 14 August 2021, the TCEQ renewed the *Multi-Sector General Permit for Industrial Facilities*.

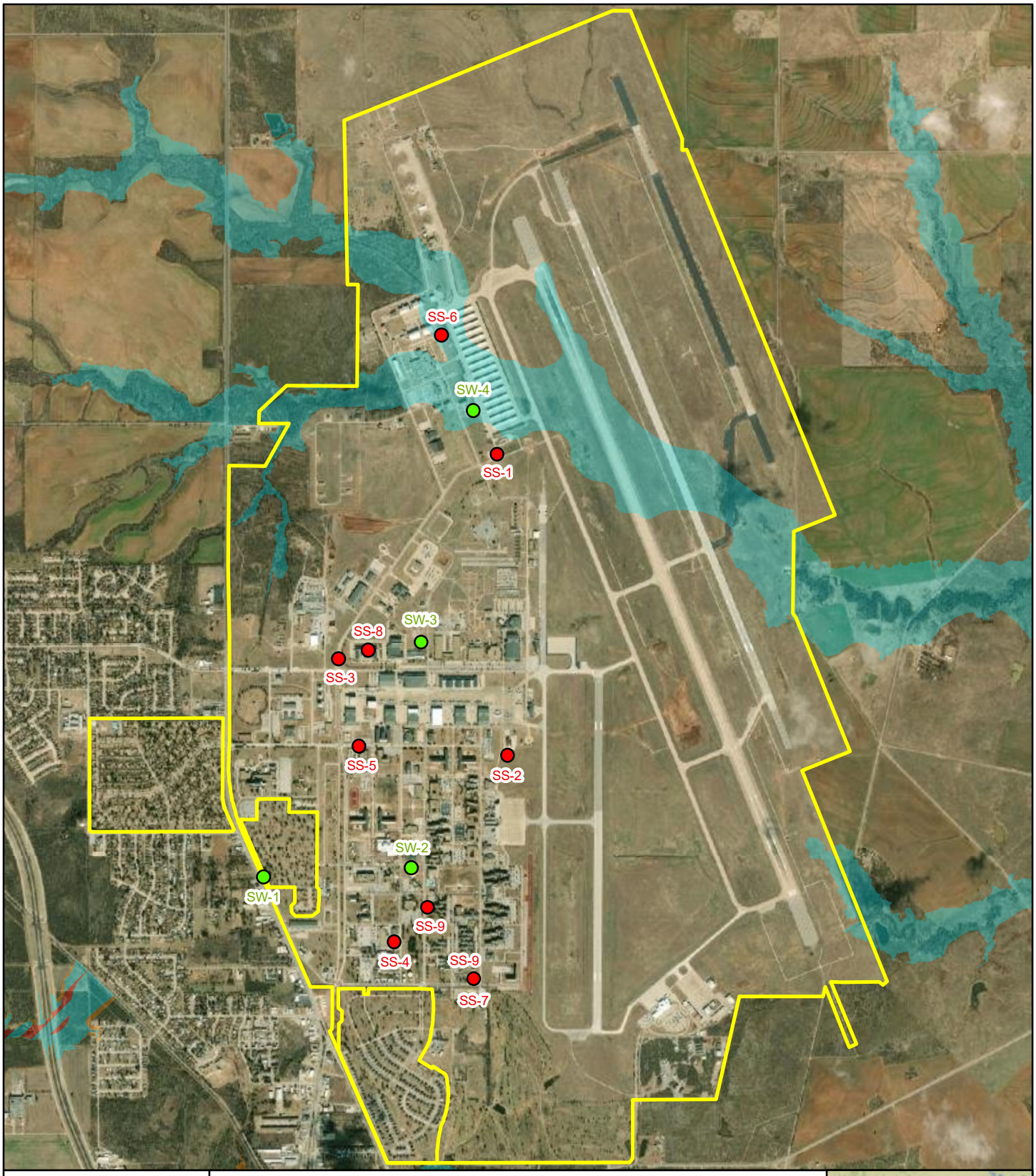

FIGURE 3-3

FLOODPLAINS

SAFB

100-Year Floodplain (FEMA, 2021)

SW-# (Stormwater Conveyance Project)

SS-# (Sanitary Sewer Project)

N

0 0.25 0.5 Miles

Projection: WGS 1984
Map Data: ESRI, 2020

Groundwater in the Wichita River Basin is characterized by high concentrations of chloride and other salinity-related constituents from salt springs and seeps in the upper reaches of the basin. The salt springs originated from a geologic period when the Texas Panhandle and western Oklahoma areas were covered by a broad shallow sea. Over geologic time, evaporation of the shallow seas resulted in the formation of salt deposits, an underlying characteristic of the area's present-day geology.

Groundwater quantity and quality in north-central Texas is characterized by the Seymour Aquifer. Most groundwater is contained in isolated patches of alluvium in poorly sorted gravel, conglomerate, sand, and silty clay beds. Groundwater yields are highly variable, ranging from 100 to 1,300 gallons per minute or, on average, 300 gallons per minute. Ranging from fresh to slightly saline, groundwater quality is affected by excess nitrates caused by natural processes and anthropogenic inputs (e.g., chloride). Approximately 90 percent of groundwater pumped from the Seymour Aquifer is used for irrigation; the remaining 10 percent is used as a potable water supply (TWDB, 2011).

Shallow groundwater occurs at or near the ground surface at SAFB under perched aquifer conditions. Groundwater depth varies, and a gradient of shallow groundwater to deeper groundwater is observed traveling from south to west within the boundaries of the Base. Depth to groundwater from the surface ranges from 2.5 feet in the southern end of the Base down to 35 feet in the western portion of the Base (TWDB, 2020). Within the northern extent of SAFB, groundwater generally flows in a northeasterly direction; within the southern half of the Base, groundwater generally flows in a southerly and easterly direction (Air Force, 2017a).

3.7.2 ENVIRONMENTAL CONSEQUENCES

Potential adverse impact(s) on water resources would include:

- fill or dredge of jurisdictional Waters of the US subject to Sections 401 and 404 of the CWA;
- the unauthorized release of contaminants into an "impaired" waterbody subject to a TMDL;
- non-compliance with applicable stormwater management requirements for the prevention, control, and minimization of erosion and sedimentation;
- development within a 100-year floodplain without full consideration of alternatives and methods that would avoid, prevent, or minimize adversely affecting its functional value; and
- the unmitigated release of a regulated contaminant into the environment with potential to enter groundwater.

3.7.2.1 No Action Alternative

Under the No Action Alternative, the water resources on, around, and underlying SAFB would continue to be managed in compliance with applicable federal, state, and local laws and regulations. Various components of the sanitary and storm sewer systems on the Base would continue to degrade, increasing the probability of a system malfunction such as leaks or breaks that contaminate local surface water or groundwater resources. The No Action Alternative would eventually result in SAFB's non-compliance with permit conditions currently in place to protect such resources.

3.7.2.2 Proposed Action

Surface Waters and Water Quality
Analysis to determine affected surface waters at SAFB was conducted within a 0.5-mile radius of the project sites. Several projects within this radius would drain to portions of streams or wetlands preliminarily determined to be jurisdictional Waters of the US under Sections 401 and 404 of the CWA. Project sites within 0.5 mile of these surface water features include:

- **Wetland 3** – approximately 0.04 mile downgradient of **Project SS-7**, which drains directly to **SSG01. Project SS-4** would also drain southeast-east to **SSG-01** at an approximate distance of 0.5 mile.
- **Wetland 5** – **Project SS-3** would drain to **SSG-04**, approximately 0.02 mile to the northwest, which flows into **Wetland 5** in a northerly direction, approximately 0.3 mile downstream.
- **Project SS-2** would drain underground into **SSG-03**.

Surface runoff from the Proposed Action could affect surface waters or wetlands preliminarily determined as jurisdictional pursuant to the CWA. However, none of these surface water features is designated as 303(d)-listed "impaired" waterbodies or subject to a TMDL. Additionally, these surface water features generally do not support human uses such as recreation, fishing, or swimming. All other project sites associated with the Proposed Action would either drain away from, or be located greater than 0.5 mile from, these surface water features. At this distance, potential effects from erosion and sedimentation or contaminants transported via runoff would not be anticipated under the Proposed Action.

Under the Proposed Action, the construction contractor would be required to obtain applicable TPDES permit(s), including a CGP for sites that individually or collectively disturb 1 or more acres of land. The CGP would identify measures to prevent and minimize stormwater discharges during construction. These measures would be detailed and implemented through preparation of a TCEQ-approved SWP3.

Floodplains
Under the Proposed Action, **Projects SS-6** and **SW-4** are located within the identified 100-year floodplain, **Project SS-1** lies to the south directly adjacent to Zone A (see **Figure 3-3**). Although two projects are located within the Zone A floodplain, these projects would occur in previously disturbed land with existing sewer lines. In accordance with EO 11988, the AF considered alternatives for the repair/rehabilitation projects within and adjacent to the 100-year floodplain. However, because the Proposed Action would not replace a larger portion of the Base-wide sanitary and storm sewer systems, relocation of this infrastructure outside the floodplain boundary was not feasible.

None of the soils associated with these floodplains are classified as hydric and, upon completion, the Proposed Action would improve the structural integrity of the involved infrastructure, minimizing the risk of malfunction or overflow. The Proposed Action also would result in minor, beneficial effects on the natural function of the floodplains in this area of the Base. Potential impacts during construction would be minor and temporary.

Groundwater and Water Quality
Based on the water table depth of the involved soils, excavation from the Proposed Action likely would not encounter groundwater. Should groundwater be encountered, the construction contractor would be required to halt work and remove groundwater from the excavated area before proceeding. Post-construction, the Proposed Action would result in minor, beneficial impacts on local groundwater resources by improving the structural integrity and function in portions of the sanitary and storm sewer systems.

When considered in conjunction with other past, present, and reasonably foreseeable environmental trends and planned actions at SAFB, no significant cumulative effects to water resources would be anticipated under the Proposed Action.

3.7.2.1 Best Management Practices and Mitigation Measures

BMPs recommended to reduce potential impacts on water resources include:

- Follow recommended procedures for soil erosion and sedimentation prevention surrounding stormwater and sewer lines.
- Implement yearly sewer line flushing to reduce degradation and blockage of existing lines to ensure stormwater is flowing freely through lines.

- Conduct regular inspections of stormwater outfalls.

No project-specific mitigation measures are recommended.

3.8 BIOLOGICAL RESOURCES

Biological resources include plants, animals, and habitats/vegetation communities, some of which receive protection under federal and state laws and regulations. This section describes the types and conditions of biological resources associated with the Proposed Action and No Action Alternative.

The ROI for biological resources includes SAFB and its immediately adjacent areas that contain natural resources. Beyond this ROI, potential adverse impacts on biological resources are not anticipated. The AF used the USFWS Information for Planning and Consultation (IPaC) database to obtain a listing of potential species occurring in the ROI (**Appendix B**).

3.8.1 EXISTING CONDITIONS

3.8.1.1 Vegetation

SAFB is located along the northernmost edge of the Central Texas Plateau within the Rolling Red Plains ecoregion. The prairies in the rolling plains of this ecoregion were once dominated by side-oats grama (*Bouteloua curtipendula*), little false bluestem (*Schizachyrium scoparium*), and blue grama (*Bouteloua gracilis*). However, most areas have since been converted to grain fields, used to pasture livestock, or cleared for oil extraction. These land use changes combined with a lack of natural fire on the landscape led to the establishment of annual and perennial forbs, legumes, and woody species. A mix of native and nonnative vegetation characterizes this part of the ecoregion today.

The area that is now SAFB consisted of mixed grass plains, short grass high plains, shinnery oak grasslands, and mesquite grasslands. Most of these native vegetation communities were removed during development of SAFB. Most natural vegetation that remains on the Base is concentrated to the northwest where a riparian corridor is surrounded and interspersed with woodland and brushland vegetative communities. Vegetation associated with the Proposed Action is predominately managed or landscaped grasses, including Bermuda grass (*Cynodon dactylon*), king ranch bluestem (*Bothriochloa ischaemum*), Texas grama (*Bouteloua rigidiseta*), Texas wintergrass (*Nassella leucotricha*), threeawn (*Aristida purpurea*), tumble windmill grass (*Chloris verticillate*), tumblegrass (*Schedonnardus paniculatus*), and western ragweed (*Ambrosia psilostachya*) (**Appendix B**).

With respect to the military mission of SAFB, vegetation is generally described as one of the following three categories:

- **Improved grounds –** vegetation associated with the built environment to include lawns, landscape plantings, fields, cemeteries, and other areas subject to routine maintenance;
- **Semi-improved grounds –** partially maintained vegetation adjacent to the airfield, on and around range areas, or other operational support facilities or areas; and
- **Unimproved grounds –** vegetation that requires limited or no maintenance in support of military operations or continual military operations.

3.8.1.2 Wildlife

A variety of mammal, avian, and reptile species occurs or has the potential to occur on SAFB. These include fox, rabbit, quail, dove, meadowlark, turkey, ducks, geese, heron, mink, muskrat, snakes, badger, pronghorn antelope, and field sparrow (**Appendix B**). Small mammals documented to occur on the Base include the eastern woodrat (*Neotoma floridana*), hispid cotton rat (*Sigmodon hispidus*), and the deer mouse (*Peromyscus maniculatus*). Two species of snake were observed on SAFB near water sources: the Texas ratsnake (*Elaphe obsolete*) and black racer (*Coluber constrictor*). Reptiles documented near water

sources on the Base include the red-eared slider turtle (*Trachemys scripta elegans*), pond slider (*Trachemys scripta*), yellow mud turtle (*Kinosternon flavescens*), and spiny softshell turtle (*Apalone spinifera*). Additionally, a total of 46 avian species have been identified during point counts and incidental monitoring at SAFB.

3.8.1.3 Special Status Species

Special status species include plants and animals or natural areas that receive protection under federal or state laws and regulations. There are three avian species that receive protection under the federal ESA with the potential to occur on SAFB. These include the Atlantic Coast and Northern Great Plains populations of the piping plover (*Charadrius melodus*) and the red knot (*Calidris canutus rufa*), both listed as **threatened** under the ESA, and the whooping crane (*Grus americana*), listed as **endangered** under the ESA. However, none of these species is documented to occur on SAFB, and no ESA-designated **critical habitat** for these species occurs on or adjacent to the Base.

There are no ESA-listed plant species known to occur on or adjacent to SAFB. Additionally, no unique ecological or natural areas are designated on or in the vicinity of SAFB.

There are two wildlife species listed as **threatened** by the State of Texas Parks and Wildlife Department (TPWD) documented to occur on SAFB. These include the Texas kangaroo rat (*Dipodomys elator*) and the Texas horned lizard (*Phrynosoma cornutum*).

A 2012 habitat assessment for the Texas kangaroo rat concluded that no suitable habitat exists for this species on SAFB. Further, none of the characteristic burrow systems for this rodent was identified in the southeastern part of the Base (Midwestern State University, 2012). The Texas horned lizard has been observed numerous times in the vicinity of the old landfill in the northwest corner of the Installation. Although development is restricted in areas where the Texas horned lizard has been observed, assessments have similarly concluded that habitat conditions for this reptile species are sub-optimal on SAFB. There are no other State-listed plant or animal species known to occur on or adjacent to SAFB (Air Force, 2017a).

3.8.1.4 Migratory Birds

SAFB lies within the Central Flyway, a major north-south bird migration corridor that encompasses much of the central US. As such, the Base is a potential stopover or breeding season location for various migratory birds. In accordance with the *Migratory Bird Treaty Act of 1918* (16 USC §§ 703–712) and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, SAFB enforces a do-not-disturb for any newly established migratory bird nests on the Base. In such cases, removal or relocation of active nests of migratory birds left undisturbed to hatch their young or deemed a safety hazard requires a permit.

Two migratory birds with potential to occur on or around SAFB are notable as birds of conservation concern species (**Appendix B**): Harris's sparrow (*Zonotrichia querula*) and the red-headed woodpecker (*Melanerpes erythrocephalus*). Harris's sparrow breeds elsewhere in the US but may be present regionally from mid to late March, April, and November each year. The red-headed woodpecker has the most potential to occur in late April each year and breeds regionally from approximately May through September.

3.8.2 ENVIRONMENTAL CONSEQUENCES

The level of impact on biological resources is based on the following:

- Importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource;
- Proportion of the resource that would be affected relative to its occurrence in the region;
- Sensitivity of the resource to the proposed activities; and
- Duration of potential ecological ramifications.

The potential impacts on biological resources would be considered adverse if species or habitats of high concern would be negatively affected over relatively large areas. Impacts would also be considered adverse if estimated disturbances would cause reductions in population size or distribution of a species of high concern.

As a requirement under the ESA, federal agencies must provide documentation that ensures that the agency's proposed actions would not adversely affect the existence of any threatened or endangered species. The ESA requires that all federal agencies avoid "taking" federally threatened or endangered species (which includes jeopardizing threatened or endangered species habitat). Section 7 of the ESA establishes a consultation process with the USFWS that ends with USFWS concurrence or a determination of the risk of jeopardy from a federal agency's proposed project.

3.8.2.1 No Action Alternative

Under the No Action Alternative, biological resources associated with SAFB would continue to be managed in accordance with the Base's *Integrated Natural Resources Management Plan* (INRMP).

3.8.2.2 Proposed Action

Vegetation above the sewer line segments consists of lawns, landscaping, or maintained open fields. Vegetation above sewer lines would be disturbed during excavation for sewer replacement or repair. No areas of native, unimproved vegetation would be disturbed under the Proposed Action.

Impacts to wildlife would be expected to be negligible because the Proposed Action would occur in highly developed areas where little to no wildlife habitat exists. Noise created by project construction equipment would have negligible impacts on wildlife because very few species occur within the developed areas, noise would be localized and short term (i.e., during construction), and construction noise would be undiscernible from potential effects of other noise sources such as vehicle traffic on nearby roads and jet aircraft from SAFB flight operations.

The AF used the USFWS IPaC online review tool to obtain a potential species list for the Proposed Action at SAFB (**Appendix B**). The AF initiated informal consultation (letter dated 7 October 2021) with the USFWS under Section 7 of the ESA regarding the potential impacts of the Proposed Action. In response, the USFWS stated that impacts to federally listed species with potential to occur in Wichita County "would be highly unlikely" given the highly developed nature of SAFB. USFWS concluded the consultation with no further "comments, objections, or recommendations" with respect to the Proposed Action (see **Appendix B**). No federally listed threatened and endangered species is known to occur on SAFB. No adverse impacts to any federally listed species are expected.

Habitat for the Texas kangaroo rat and the Texas horned lizard, both listed as threatened by the State of TPWD, does not exist in the developed areas where sewer lines would be replaced or repaired. Similarly, habitat for migratory birds is limited in the vicinity of the Proposed Action because the vegetation consists of lawns, landscaping, and maintained grass fields near roads or interspersed among buildings and parking areas. No impacts to migratory birds would be expected. Bald and golden eagles protected under the *Bald and Golden Eagle Protection Act* do not occur on SAFB and would not be affected by the Proposed Action.

When considered in conjunction with other past, present, and reasonably foreseeable environmental trends and planned actions at SAFB, no significant cumulative effects to biological resources would be anticipated under the Proposed Action.

3.8.2.3 Best Management Practices and Mitigation Measures

The AF received a comment from the TPWD during the EA scoping period (see **Appendix B**). The TPWD offered the following recommendations to minimize risks to wildlife during construction of the Proposed Action:

- Cover open trenches or excavation areas overnight and regularly inspect such areas for trapped wildlife prior to construction activities.
- Stabilize and/or revegetate disturbed areas using materials and methods that minimize risks to wildlife species. For example, materials that do not create an entanglement hazard (e.g., erosion control blankets or mats made of net or fiber mesh as opposed to plastic mesh) and methods such as no-till drilling, hydro-mulching, and hydro-seeding.

These BMPs, along with those outlined below, are recommended to reduce potential effects on biological resources.

- Enforce a do-not-disturb policy with respect to any newly established migratory bird nests on the Base.
- Do not remove or relocate active nests of migratory birds left undisturbed to hatch their young or deemed a safety hazard without a permit.

No project-specific mitigation measures are recommended.

3.9 CULTURAL RESOURCES

Cultural resources include a broad range of resources consisting of physical evidence of past human activity. These resources include any prehistoric or historic structures, buildings, objects, sites, districts (i.e., a collection of related structures, buildings, objects, and/or sites), landscapes, natural features, traditional cultural properties, and cemeteries. These terms are specifically defined by the NHPA and related laws and regulations that provide for the preservation of or access to cultural resources.

The ROI for cultural resources includes the limits of disturbance or construction right-of-way associated with the Proposed Action. This ROI is consistent with the APE, defined as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist,” (36 CFR § 800.16[d]). No adverse impacts on cultural resources would be anticipated under the Proposed Action beyond the ROI.

3.9.1 EXISTING CONDITIONS

3.9.1.1 Archaeological Resources

In 1993, the AF conducted an archaeological survey of more than 5,000 acres within SAFB’s Main Base area. The survey area included erosional exposures, fence lines, and drainages where intact cultural deposits would be most likely to occur. No archaeological resources were identified during this survey. Because of historic development activities in this area that involved substantial ground disturbance, it was recommended that no further archaeological investigations were necessary. The Texas SHPO subsequently reviewed the survey results and concurred with this recommendation.

3.9.1.2 Architectural Resources

The establishment of SAFB as an Army Air Corps Training Center in 1941 links the Base to the emergence of the AF from the Department of the Army. In 1950, SAFB was selected as a permanent AFB. During the Cold War, SAFB served as the primary training center for the Atlas ballistic missile system from 1955 through the mid-1980s and also functioned as a Strategic Air Command Center between 1960 and 1965.

Three prior surveys and evaluations of historic buildings, structures, and landscapes at SAFB were conducted in 1993, 2002, and 2012, respectively:

- **1993 –** The Kell Field Air Terminal (Building 2130) was determined eligible for listing in the National Register of Historic Places (NRHP) and Texas Historic Register. In 1981, the terminal was listed as a Recorded Texas Historic Landmark by the Texas Historical Commission.
- **2002 –** Of the 256 buildings and structures constructed at SAFB during the Cold War period evaluated, two were recommended eligible for listing in the NRHP: i.e., Building 2560 and the Alert Apron.
- **2012 –** Of the 133 buildings and structures dated through 1976 selected for evaluation, none was recommended eligible for listing in the NRHP.

Table 3-4 identifies buildings with adjacency to project sites associated with the Proposed Action that are 50 years or older. These buildings are potentially eligible for listing in the NRHP but have not yet been subject to evaluation under the NHPA.

Table 3-4
Buildings Constructed from 1976 to 1983 Adjacent to the Proposed Action

Building No.	Adjacency To
340	Project SS-9
1950	Projects SS-3 and SW-3
61	Project SS-5
2125	Project SS-3

SS = sanitary sewer; SW = stormwater

3.9.1.3 Native American Sacred Sites and Properties of Traditional and Religious Cultural Importance

In prior consultation with six federally recognized Native American Tribes,[8] the AF determined that no sacred sites or traditional and religious cultural sites of importance to Native Americans are known to occur within the present-day boundary of SAFB (Air Force, 2016).

3.9.2 ENVIRONMENTAL CONSEQUENCES

Potential adverse impact(s) on cultural resources would include:

- An adverse impact on cultural resources eligible for listing or listed on the NRHP.

By letter dated 7 October 2021, the AF initiated Section 106 consultation regarding the Proposed Action with the Texas SHPO and the Texas Historical Commission (THC). In response, by email correspondence dated 10 November 2021, the THC offered following determinations based upon its review of the Proposed Action (see **Appendix B**).

- Above-ground historic properties or sites on SAFB are either eligible for listing or already listed in the NRHP. The THC indicated its concurrence with the information provided and a “no adverse effects” finding for historic properties on SAFB under the Proposed Action.
- As there are no archaeological sites on SAFB either eligible for listing or listed in the NRHP, the THC also concurred with the information provided with respect to the potential adverse effects of the Proposed Action on below-ground resources.

[8] Native American Tribes consulted with included the Comanche Nation, Fort Sill Apache Tribe of Oklahoma, Kickapoo Traditional Tribe of Texas, Kiowa Indian Tribe of Oklahoma, Tonkawa Tribe of Oklahoma, and Wichita and Affiliated Tribes.

3.9.2.1 No Action Alternative

Under the No Action Alternative, SAFB would continue to consult with the SHPO, Native American Tribes, and other interested stakeholders for proposed "undertakings." Cultural resources management on the Base would continue in accordance with the SAFB *Integrated Cultural Resources Management Plan* (ICRMP).

3.9.2.2 Proposed Action

Under the Proposed Action, construction would occur adjacent to buildings 50 years or older not yet evaluated for their potential eligibility for listing in the NRHP (**Table 3-3**). However, because the Proposed Action would not involve any interior work or connect any new or rehabilitated segments of the sanitary sewer system, no potential effects on these buildings would be anticipated. In such cases, areas in vicinity of the unevaluated buildings would be avoided. For example, construction parking and staging areas would be established elsewhere on the Base.

During construction, the AF would ensure standard operating procedures (SOPs) and any other applicable measures or provisions of the SAFB ICRMP are incorporated into the Proposed Action. For example, should any excavations unearth undetected or unknown archaeological deposits, the procedures outlined in SOP-6, *Dealing with Discoveries*, would be invoked. In the event of a discovery, SOP-6 requires construction crews to immediately halt work in the area and notify the SAFB Cultural Resources program of the situation. Further, under SOP-5, *Archaeological Resource Protection Act Compliance*, any Native American communities that may consider a site to be of cultural or religious importance would receive a 30-day notice for making such a determination (Air Force, 2016).

As enforceable measures are in place to protect cultural resources during construction of the Proposed Action and the THC concurred with a finding of "no adverse effects" upon review of this undertaking, potential effects on cultural resources would be non-existent or negligible and limited to construction.

When considered in conjunction with other past, present, and reasonably foreseeable environmental trends and planned actions at SAFB, no significant cumulative effects to cultural resources would be anticipated under the Proposed Action.

3.9.2.3 Best Management Practices and Mitigation Measures

No additional BMPs are recommended to reduce potential impacts on cultural resources beyond those specified by SAFB's ICRMP.

No project-specific mitigation measures are recommended.

3.10 Environmental Justice and Protection of Children

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994), as amended by EO 14008, *Tackling the Climate Crisis at Home and Abroad* (2021), directs federal agencies to address disproportionate adverse human health, environmental, and climate-related impacts on disadvantaged communities. As part of this directive, federal agencies are required to consider low-income and minority populations when implementing a federal action with the potential to affect the environment. Because children are more susceptible to environmental contaminants than adults, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, provides similar direction to federal agencies to address these risks when implementing a federal action.

For the purposes of this analysis, minority populations are defined as Alaska Natives and American Indians, Asians, Blacks or African Americans, Native Hawaiians, and Pacific Islanders or persons of Hispanic origin (of any race); low-income populations include persons living below the poverty threshold as determined by the US Census Bureau (USCB); and youth populations are children under the age of 18 years.

The environmental justice ROI is Wichita Falls Census County Division (CCD). This CCD includes the city of Wichita Falls and SAFB, as well areas in their vicinity, which are then compared with those populations in Wichita County, Texas, and the US. The communities in the CCD would be most likely to receive a disproportionate share of impacts associated with the Proposed Action (e.g., traffic congestion or reduced water or air quality).

3.10.1 EXISTING CONDITIONS

3.10.1.1 Environmental Justice

An evaluation of minority and low-income populations in the Wichita Falls CCD forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the Proposed Action. In 2020, Wichita Falls CCD and Wichita County had lower percentages of minorities in the population compared to the state of Texas and the US (USCB, 2020) (**Table 3-5**). However, 42.5 percent of the population in Wichita Falls CCD is Hispanic or Latino, which is a higher percentage than that of the county, state, and US. Approximately 17.9 percent of the population in Wichita Falls CCD is below the poverty line, compared to 12.9 percent of the population in Wichita County, 13.6 percent of the population in Texas, and 12.3 percent of the population in the US; therefore, an environmental justice population is said to be present in Wichita Falls CCD.

Table 3-5
Total Population and Populations of Concern

Geographical Unit	Total Population	Percent Minority	Percent Hispanic or Latino[a]	Percent below Poverty	Percent Youth[b]	Percent Elderly
Wichita Falls CCD	106,662	36.6	42.5	17.9	22.0	13.8
Wichita County	129,350	33.0	38.4	12.9	22.4	14.5
Texas	29,145,505	49.9	39.3	13.6	25.5	12.9
United States	331,449,281	38.4	18.7	12.3	22.2	16.5

Sources: USCB 2020
Notes:
a. Hispanic and Latino denote a place of origin.
b. Percent youth are all persons under the age of 18.

3.10.1.2 Protection of Children

The percentage of youth in Wichita Falls CCD was 22.0 percent, which is lower than the percentage of youth in the county, state, and US (22.4 percent, 25.5 percent, and 22.2 percent, respectively) (**Table 3-5**) (USCB, 2020).

3.10.2 ENVIRONMENTAL CONSEQUENCES

Potential adverse impact(s) on environmental justice communities would include:

- a determination by analysis that potential adverse impacts would be disproportionately felt by minority, low-income, or youth populations present in the ROI.

3.10.2.1 No Action Alternative

Under the No Action Alternative, impacts to minority, low-income, and youth populations on SAFB and the surrounding environs would remain unchanged from current conditions. No significant impacts to minority, low-income, and youth populations would be anticipated.

3.10.2.2 Proposed Action

Sanitary and storm sewer system replacement and repair occurring under the Proposed Action would not be anticipated to result in disproportionately high and adverse impacts to minority, low-income, or youth populations. The Proposed Action would not impact the availability of housing, community resources, and community services in the ROI. Construction noise associated with the Proposed Action would be temporary and confined to the Installation. The impact assessment for each of the resource topics considered in the preceding sections identified insignificant impacts on the physical, natural, and human environment (see **Table 2-3**). When considered in conjunction with other past, present, and reasonably foreseeable environmental trends and planned actions at SAFB, no significant cumulative effects would disproportionately affect minorities, low-income populations, children, or the elderly under the Proposed Action.

3.10.2.3 Best Management Practices and Mitigation Measures

No BMPs are recommended (beyond those for related resources) to reduce potential environmental justice impacts.

No project-specific mitigation measures are recommended.

3.11 INFRASTRUCTURE (TRANSPORTATION)

This section describes the roadway network in the vicinity of and on SAFB. The ROI for transportation and traffic is defined as the local roadway network on the Base and portions of the public roadway network that directly link SAFB to the broader Wichita Falls area. No potential adverse impacts to transportation and traffic beyond the ROI would be anticipated under the Proposed Action.

3.11.1 EXISTING CONDITIONS

SAFB is located adjacent to and north of the city of Wichita Falls, Wichita County, Texas. Access to the Base is provided by State Highway 240 (Burkburnett Road), a main north-south thoroughfare along the western boundary of SAFB. Interstate 44 runs in a north-south direction to the west of SAFB and connects the Base to the city of Wichita Falls southwest of the Base. Missile Road and the Highway 325 Spur connect Interstate 44 and Burkburnett Road in the vicinity of the Base.

The existing road network on SAFB consists of approximately 32 miles of asphalt-paved roads and streets. It is generally configured in a grid pattern, except for Bridwell Road (formerly Kell Field runway), which runs diagonally from Missile Road to the northern portion of the airfield. Several blocks south of Missile Road, Ninth Avenue runs in an east-west direction and divides SAFB into two distinct north and south sections. Primary roads in the northern half of the Base include Avenues D and E, Bridwell Road, and Missile Road (west of its intersection with Avenues D and E). Secondary roads that provide access to the north include Avenue H, Avenue J, Tenth Avenue, Missile Road (east of its intersection with Avenues D and E), and 21st Avenue. Primary roads in the southern half of the Base include Avenues D and E, Avenue J, First Avenue, and Ninth Avenue. Secondary roads that provide access to the south include Nehls Boulevard, Falcon Boulevard, and Avenue H.

Table 3-6 compares the baseline and forecast average annual daily traffic from 2015 to 2020 for portions of the public roadway network used to access SAFB.

Table 3-6
Roadway Counts and Congestion Forecast in Vicinity of Sheppard Air Force Base

Roadway (location relative to SAFB)	AADT (2020)	Congestion Forecast (2039)
Interstate 44 (southwest)	53,829	moderate
Interstate 44 (north-northwest)	19,460	moderate
State Highway 240 / Burkburnett Road (south)	1,971	none
Highway 325 Spur (southeast)	15,271	none

Source: Texas Department of Transportation, 2021
Note:
AADT = average annual daily traffic

3.11.2 ENVIRONMENTAL CONSEQUENCES

Potential adverse impact(s) on transportation and traffic would include:

- an increase in peak-hour traffic, causing substantial delays above baseline traffic conditions; and
- use of a public roadway that causes measurable damage or lost function.

3.11.2.1 No Action Alternative

Under the No Action Alternative, local and regional roadways in the vicinity of SAFB would continue to operate under current conditions. Peak-hour traffic volumes likely would remain consistent with the status quo.

3.11.2.2 Proposed Action

The Proposed Action would increase traffic on and around SAFB during the construction phase of the projects. Construction workers residing elsewhere in the Wichita Falls area would travel to/from the Base. Vehicles, equipment, infrastructure, and materials would require transport to or pickup from SAFB. The local roadway network on SAFB would also be affected during project construction. Project sites would not be accessible during construction and parking and staging areas for vehicles, equipment, or excavated soils would be required in proximity thereof. Construction of the Proposed Action may impede vehicle or pedestrian access to buildings or areas of the Base. Road closures or re-routing of traffic likely would be required and could slow or delay traffic movement on SAFB at various times.

Under the Proposed Action, local and regional roadways would be able to readily absorb construction-related traffic (see **Table 3-6**). Minor delays on or in the immediate vicinity of SAFB would be anticipated, but effects on roadway capacity or condition would not be discernable. Potential effects on transportation or traffic would be lessened by the phasing of the Proposed Action over approximately 5 years. Each project under the Proposed Action would require traffic management and safety measures that account for localized factors. As necessary, the transportation of construction-related vehicles, equipment, infrastructure, and materials could be planned to take place during non-peak hours. Overall, potential effects on local and regional roadways in the ROI would be minor and temporary in nature. No permanent adverse impacts to transportation infrastructure would result from the Proposed Action. When considered in conjunction with other past, present, and reasonably foreseeable environmental trends and planned actions at SAFB, no significant cumulative effects to transportation infrastructure would be anticipated under the Proposed Action.

3.11.2.3 Best Management Practices and Mitigation Measures

BMPs recommended to reduce potential effects on transportation and traffic include:

- Limit construction traffic to non-peak periods.

- Ensure debris and soil are not deposited or stored on public roadways.

No project-specific mitigation measures are recommended.

3.12 HAZARDOUS MATERIALS AND WASTES

The definition of "hazardous materials and waste" depends on regulatory context. That is, the criteria used to define HMW is often specific to an activity or location (e.g., commerce [49 CFR § 171.8], energy [49 CFR § 171.8], and federal facilities [40 CFR § 262]). Generally, HMW are substances determined to present risks to human health, safety, or the environment when they occur above certain concentrations. A release of, or exposure to, HMW may also harm ecosystems to include plants, animals, soil, water, and other natural resources. Localized environmental conditions may affect the extent of contamination from, or exposure to, HMW.

The ROI for potential HMW effects is SAFB.

3.12.1 EXISTING CONDITIONS

RCRA establishes the mandatory procedures and requirements for federal facilities that use, accumulate, transport, treat, store, or dispose of hazardous waste or substances. Under RCRA, USEPA can grant authority to the state to establish and enforce its own hazardous waste management program, provided the state's requirements are no less stringent than the USEPA's (USEPA, 2021b). In Texas, the TCEQ implements the RCRA program.

Under RCRA, SAFB is classified as a large-quantity generator of hazardous waste (RCRA #TX3571524161). Aircraft operations, maintenance, and related industrial activities are the primary source of HMW generated at the Base. Examples of hazardous substances in use at SAFB include flammable and combustible liquids, acids, corrosives, caustics, anti-icing chemicals, compressed gases, solvents, paints, paint thinners, and pesticides. SAFB maintains a Hazardous Waste Management Plan applicable to operations involving handling, storage, transportation, and disposal of hazardous waste. The Hazardous Waste Management Plan also serves to document the processes and procedures for HMW management at SAFB, as required to remain in compliance with RCRA (Air Force, 2019).

Section 311 of the CWA, as amended by the *Oil Pollution Act* (Public Law 101-380), establishes requirements to prevent, prepare for, and respond to oil discharges at specific types of facilities, including military bases. SAFB maintains a Spill Prevention, Control and Countermeasure (SPCC) Plan to minimize oil discharges to Waters of the US. Regulated oil discharges at SAFB include gasoline and diesel fuel, jet fuel, engine oil, hydraulic fluid, mineral oil, vegetable oil and grease, and waste oils and sludge. Should an accidental spill occur at the Base, the SPCC Plan also formalizes and guides response and cleanup activities. The goal of this regulation is to prevent oil from reaching navigable waters and adjoining shorelines, and to contain discharges of oil. The regulation requires these facilities to develop and implement SPCC Plans and establishes procedures, methods, and equipment requirements (Subparts A, B, and C) (Air Force, 2020b).

3.12.1.1 Environmental Restoration Program

There were initially 18 IRP sites at SAFB. However, only nine sites have waste oils and fuels contaminated with waste solvents from aircraft maintenance and industrial operations dating back to the late 1930s and early 1940s at SAFB. Historical records indicate these contaminants were handled and stored in drums, dumped on the ground for disposal by storm drain or burned during training exercises. Additionally, household waste, municipal waste, incinerator ash, sludge from wastewater treatment drying beds, and construction waste were placed in landfills on the Base. Although discontinued, these former practices resulted in widespread soil and groundwater contamination at SAFB (Air Force, 2020c).

SAFB's Installation Restoration Program (IRP) implements cleanup actions for contaminated (IRP) sites on the Base. Under RCRA, IRP sites are subject to a detailed site investigation and risk assessment the results of which are used to identify cleanup options. The process continues with selection of a remedy, cleanup of the site, monitoring, and the eventual closure of the site under RCRA. There are currently nine IRP sites on SAFB all of which are closed under RCRA (**Figure 3-4**). However, because the selected remedies left contaminants above levels permitting unlimited use/unrestricted exposure, the AF conducts an evaluation of these sites at least every five years.[9] A five-year review was last completed in 2017 and concluded that the selected remedies (i.e., land use controls) remain protective of human health and the environment (Air Force, 2017b).

3.12.1.2 Per- and Polyfluoroalkyl Substances

Per- and Polyfluoroalkyl substances (PFAS) are a group of manufactured chemicals used in industry and consumer products since the 1940s due to their useful properties. There are thousands of different chemicals in the PFAS group, some of which are more widely used and studied than others. Most PFAS share characteristics of concern in their ability to move, persist, and bioaccumulate in the environment over time. Although PFAS exposure in humans at relatively low concentrations is common, research suggests that exposure to concentrated sources of PFAS over long periods of time may be linked to adverse health outcomes (USEPA 2021c).

The DOD identifies PFAS as emerging contaminants of concern as components of legacy aqueous film forming foam (AFFF) used to extinguish petroleum fires. In 2016, the USEPA issued a lifetime drinking water health advisory for two PFAS precursors in AFFF and health-based regional screening levels for a third PFAS used as a firefighting agent in AFFF. Per DOD's relative risk evaluation site evaluation framework, the AF continues to evaluate potential AFFF releases on its current and former bases. On SAFB, there are 10 such sites under evaluation, all of which are concentrated in the northern portion of the Base. Several of these sites are present in the vicinity of the project sites under the Proposed Action; however, none overlaps directly with AFFF areas (Air Force, 2020c).

3.12.1.3 Other Hazardous Materials and Waste

Structures that store or contain HMW include above- and below-ground storage tanks, asbestos-containing materials, and lead-based paint. Although SAFB maintains management plans for these types of HMW in compliance with federal and state laws and regulations, no petroleum storage tanks are known to occur within project sites under the Proposed Action. Should any structural components of the sanitary and storm sewer systems contain hazardous materials such as asbestos or lead-based paint, the Proposed Action would address these concerns by plan or design.

3.12.2 ENVIRONMENTAL CONSEQUENCES

Potential HMW adverse impact(s) would include:

- a substantial increase in the generation of a hazardous substance;
- an increase in exposure of persons to a hazardous substance; and
- an increased presence in the environment of a hazardous substance.

[9] Since the IRP sites received closure under RCRA and the Defense Environmental Restoration Program is conducted in accordance with Comprehensive Environmental Response, Closure, Liability, and Assessment (CERCLA), five-year reviews are now carried out in accordance with CERCLA and the National Contingency Plan.

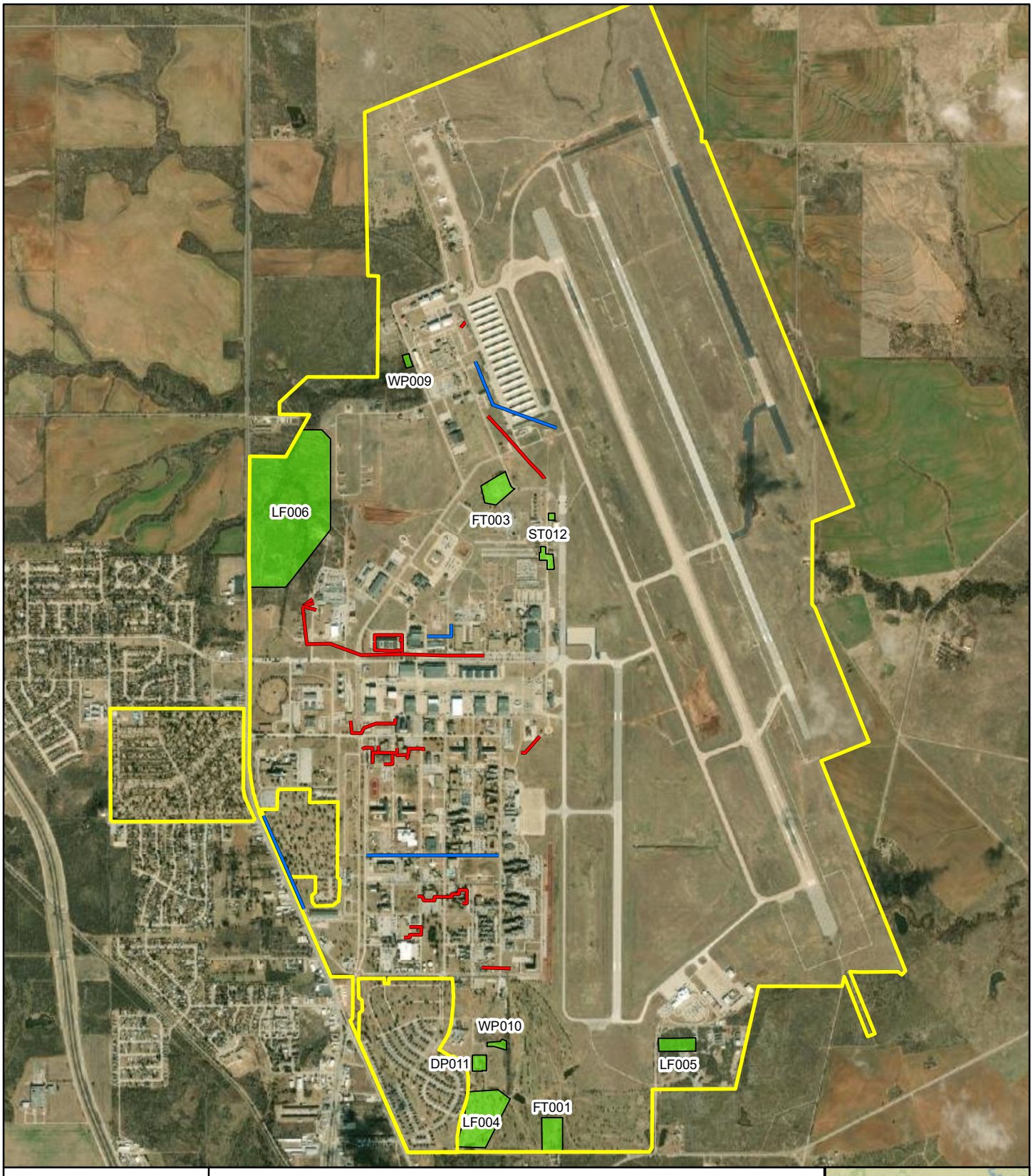

FIGURE 3-4

IRP SITES

SAFB

Installation Restoration Program (IRP) Site

Replace or Rehabilitate Sanitary Sewer Line

Improve or Replace Stormwater Conveyance

N

0 0.25 0.5 Miles

Imagery: ESRI 2021
Projection: WGS 1984, Zone 14N

3.12.2.1 No Action Alternative

Under the No Action Alternative, SAFB would continue to operate as a large-quantity generator of hazardous waste under RCRA. Management associated with the use, handling, storage, transport, treatment, or disposal of HMW at the Base would be in accordance with relevant plans. SAFB would maintain compliance with applicable HMW laws and regulations.

3.12.2.2 Proposed Action

The Proposed Action involves various construction operations that would require the use, handling, storage, transport, and disposal of regulated HMW, such as vehicle and equipment operating fuels (e.g., oil, diesel, gasoline, antifreeze, and lubricants). As such, the Proposed Action would create potential for the accidental discharge or spill of HMW that could contaminate the environment or result in exposure of persons to such contaminants. No construction activity would occur within the nine identified IRP sites and no ground-disturbing activity would occur within the footprint of any AFFF sites on SAFB; therefore, no potential impacts to these resources would be anticipated under the Proposed Action.

Although the AF has not identified evidence of HMW in areas where the Proposed Action would occur, construction could also unearth contaminants in environmental media not yet known or identified for management action. Even without a major release or discovery event, multiple minor releases of HMW under the Proposed Action could potentially affect the environment or persons in the vicinity thereof.

Under the Proposed Action, HMW used or generated during construction would be handled, stored, and disposed of in accordance with federal and state laws and regulations. All applicable permits for handling and disposal of HMW would be obtained prior to commencement of construction activities. Construction work under the Proposed Action would also be subject to the procedural requirements of SAFB's Hazardous Waste Management Plan, SPCC Plan, and other applicable management plans to prevent and minimize risks associated with contaminant release or transport in the environment. During construction, in the event an unexpected discovery of HMW occurs, all work in that location would stop until the potential contamination has been properly evaluated and addressed.

With the applicable requirements and management plans in place for construction of the Proposed Action and no contaminants at concentrations that would pose a risk to construction workers, potential HMW effects would be minor and short-term in duration. No potential impacts from operation of the Proposed Action would be anticipated to occur. When considered in conjunction with other past, present, and reasonably foreseeable environmental trends and planned actions at SAFB, no significant cumulative effects to HMW would be anticipated under the Proposed Action.

3.12.2.3 Best Management Practices and Mitigation Measures

No additional BMPs are recommended to reduce potential HMW effects beyond those required for the Proposed Action.

No project-specific mitigation measures are recommended.

3.13 UTILITIES

Utilities consist of the man-made systems and structures that enable a population in a specified area to function. The availability of infrastructure and its capacity to support growth generally define the degree to which an area is characterized as urban or developed. Utilities in operation at SAFB provide the Base with electricity, natural gas, water and wastewater, solid waste management, and stormwater management required to support the military mission. The Proposed Action would not affect electrical systems, natural gas, potable water, and solid waste utilities systems. Therefore, these utilities systems are eliminated from further evaluation.

This section describes the condition and capacity of utilities at SAFB and evaluates their operation under the Proposed Action and No Action Alternative.

The ROI for utilities effects is SAFB.

3.13.1 EXISTING CONDITIONS

3.13.1.1 Wastewater

As described in **Chapter 2**, SAFB's sanitary and storm sewer system consists of approximately 30 miles of in-service sewer lines and is composed of sewer mains, manholes, lift stations, and grease traps, and discharges to the city of Wichita Falls wastewater collection system. Wastewater is carried off the Base via one 15-inch pipe on the western side of the Base to the Northside POTW and a 24-inch pipe along the eastern boundary of the Base to the River Road POTW. Due to its age, many components of the collection system are structurally deficient and require repair or replacement. Approximately 80 percent of SAFB's wastewater flows to the River Road POTW south of the Base; the remaining 20 percent flows to the Northside POTW.

3.13.1.2 Stormwater Management

Stormwater infrastructure on SAFB drains to three primary outfalls via impervious and pervious conveyances throughout the Base (see **Section 3.7.1.4**). During high-intensity rainfall events, portions of the Base in the vicinity of the airfield are subject to ponding.

Because standing water attracts insects and birds, standing water (particularly near the airfield) is routinely managed via filling, leveling, and reseeding these areas with grass. To address these same concerns, the Base continues to replace open-surface drains with underground conveyances. Covered storm drains, catch basins, and outfalls are also routinely managed to address known or potential stoppages, breaks, and washouts. The stormwater projects under the Proposed Action would address some of these concerns for the selected stormwater conveyances (Air Force, 2021a).

3.13.2 ENVIRONMENTAL CONSEQUENCES

Impacts on infrastructure from the Proposed Action are evaluated for their potential to disrupt or improve existing levels of service in the ROI as well as impacts to resources such as sanitary and storm sewer systems.

3.13.2.1 No Action Alternative

Under the No Action Alternative, utility systems and infrastructure on SAFB would continue to operate in accordance with the status quo. Over time, the condition of the sanitary and storm sewer system would degrade further, increasing the risk of structural failures and potentially bringing the Installation out of compliance with applicable permit conditions. Stormwater management on SAFB would also remain consistent with the status quo; however, ponding after rain events would be more likely over time.

3.13.2.2 Proposed Action

The Proposed Action would address the most deficient components of the sanitary and storm sewer systems on SAFB and prevent further degradation and future inoperability of the systems. This would result in minor, permanent beneficial effects on the functional integrity of these infrastructure systems.

The Proposed Action would repair or replace approximately 14,680 lf of selected 6–15-inch-diameter sanitary sewer line segments on SAFB (see **Table 2-2**). Other sanitary sewer projects under the Proposed Action involve rehabilitation work at seven sewage lift stations and repair or replacement of 15 manholes.

Implementation of the Proposed Action would ensure these systems continue to operate in support of the military mission and in compliance with applicable permit conditions.

The Proposed Action would also improve or replace approximately 5,500 lf of storm sewer conveyance on the Base (see, Map IDs, **SW-2**–**SW-4**). Approximately 1,943 lf of conveyance would be replaced with reinforced concrete pipe to include 864 lf of open ditch that would be converted to subsurface piping (see Map ID, **SW-1**).

When considered in conjunction with other past, present, and reasonably foreseeable environmental trends and planned actions at SAFB, no significant cumulative effects on wastewater and stormwater utilities would occur under the Proposed Action.

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APPENDIX A
SANITARY SEWER SYSTEM EVALUATION AND INVENTORY TECHNICAL REPORT

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FINAL

Sanitary Sewer System Evaluation and Inventory Technical Report
Sheppard Air Force Base, Texas

Prepared for

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266 F Street West
Randolph AFB, TX 78150

And

82nd Training Wing
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Contract FA3002-07-D-0015
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QM

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Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

ACES	Automated Civil Engineer System
AECOM	AECOM Technical Services, Inc.
AETC	U.S. Air Force Air Education Training Command
AFB	Air Force Base
AMP	Asset Management Plan
AWWARF	American Water Works Research Foundation
AWWA	American Water Works Association
BCP	Base Contingency Plan
BE	Bioenvironmental Engineering
CCTV	Closed Circuit Television
CE	Civil Engineering
CES	Civil Engineering Squadron
DoD	Department of Defense
Etc.	Et Cetera
GIS	Geographical Information System
gpd	Gallons Per Day
gpm	Gallons Per Minute
GPS	Global Positioning System
GSU	Geographically Separated Unit
ID	Identification
I&I	Inflow and Infiltration
IWIMS	Interim Work Information Management System
KPI	Key Performance Indicator
MAS	Material Action Sheets
MG	Million Gallon
mi.	Miles
NDT	Non Destructive Testing
O&M	Operation and Maintenance
OWS	Oil Water Separator
POTW	Publicly Owned Treatment Works
PVC	Polyvinyl Chloride
R/R	Repair/Replace Requirements
RWP	Regular Work Plan
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and Environment
SOW	Statement of Work
SPCC	Spill Prevention, Counter measures, and Control Plan
SWP3	Storm Water Pollution Prevention Plan
UFC	Unified Facilities Criteria
U.S.	United States
USGS	U.S. Geologic Survey
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

Statement of Work

AECOM Technical Services, Inc. (AECOM) was contracted by the United States Department of the Air Force, Air Education Training Command (AETC) to evaluate the sanitary sewer system at Sheppard Air Force Base (AFB), TX, to conduct a base-wide sanitary sewer assessment, and recommend methods, processes, and tools for sanitary sewer system infrastructure management.

Methods

In 2014, AECOM updated existing Geographic Information System (GIS) sanitary sewer infrastructure maps and associated attribute data primarily with Global Positioning System (GPS) instruments and field observation. Further map updating was achieved with shop drawings, as-built plans, and information from 82nd Civil Engineering Squadron (CES) and from the on-base infrastructure team at Pacific Architects and Engineers (PAE). Sewer infrastructure compelling further clarity (such as domestic sewage and storm sewer cross-connections) was investigated with exploratory cameras and SSO data provided by PAE.

Procedural Recommendations

The chief recommendation is to center sanitary sewer infrastructure management around GeoBase. Continual map updating with field verification, tracking maintenance and repairs, and using numerical asset scoring (risk) to assist in prioritizing requirements will help increase asset management efficiency and substantiate capital funding requests. Appendix A includes risk scores and weighting tables which were assigned during this assessment and which should be used to assist in future updates. See Appendix F for maps with sanitary sewer system assets color-coded by R/R and O&M risk scores.

Also, the following procedural items are recommended:

- Track and report Sanitary Sewer Overflows (SSOs) with the use of the provided "SanitarySewerOverflowEPAReport" GeoBase feature class and the aid of input/output software tools, such as CartoPac(c).
- Track and record lift station, pretreatment device, and septic tank inspections, cleanings, and other Regular Work Plan (RWP) activities with the use of the provided GeoBase Business Tables, so as to closely monitor compliance, operation, and maintenance issues.
- Expand the inspection of sanitary sewer piping with the use of pole-mounted cameras, and incorporate observed condition data into the GeoBase and risk prioritization model.
- The accuracy of the GeoBase maps and risk prioritization model could possibly be improved with a "pot-holing" survey of the sewer system: underground pipes are carefully uncovered in areas designated for clarification to better understand size, material, and, when used in conjunction with Non Destructive Testing (NDT), to better understand condition.
    - In the course of GeoBase updating and preparation for prioritization scoring, many informed assumptions were necessary for pipe material, size, and age, as

available data (such as GeoBase, shop drawings, record drawings) was often missing basic pipe information.

Specific Asset Recommendations

Risk prioritization models are generally recommended for use as dynamic tools for capital improvements to the sanitary sewer system and to forecast individual asset repair/replacement (R/R) requirements. To develop R/R requirements, characterization items were generally based on physical and operating condition. These items include estimated remaining service life and structural, mechanical, and electrical condition(s) as applicable. Issues typically remediated through routine operation and maintenance (O&M) actions were considered separate from direct condition items. Thus, assets were assigned both a R/R risk score and an O&M risk score. Refer to Section 3.5.1 for details on the impact of data completeness on risk score development.

The overall sanitary sewer system is at low risk with respect to R/R and O&M criteria; however, several asset condition summaries and recommended maintenance actions are provided for consideration. Refer to Figure 2-1 for a general map of the base with asset identifications preceded by the corresponding asset type (i.e. Manhole – MH, OWS, etc.). (ID's are from GeoBase and are all preceded by VNVP_VNVP0001000):

Pipes

- Based upon length, approximately 4 percent of completely assessed pipes and 24 percent of incompletely assessed pipes require repair/replacement immediately or in the near future. Incompletely assessed pipes should be prioritized for further inspection.
- Seven recommended R/R projects (Table 7-2), along with capital cost estimates were selected for several pipes determined to require immediate rehabilitation (outlined in Section 7.1.1 and illustrated in Appendix E). At a minimum, CCTV analysis should precede each selected project in order to verify that the recommended solutions are technically appropriate. Additionally three projects are recommended (Table 7-3) for pole camera analysis due to inaccessibility during the field visit.
- Approximately one percent of total visually inspected and extrapolated pipe length was determined to require jetting and cleaning to remove buildup, as detailed in Section 7.2.1.

Manholes

- Manhole numbers 2272, 2254, 3078, 2448, 2532, 2993, and 2767 all have broken covers and should be repaired for safety reasons.
- Only five completely assessed manholes require repair/replacement immediately or in the near future (extreme risk). Refer to manhole R/R cost estimates specified in Section 7.1.2 and Appendix E.
- Of manholes assessed only on remaining service life, approximately 37% may require immediate repair (risk = High or Extreme). However, based on results of completely assessed manholes (75 percent are in good condition), they are likely to not require R/R once inspected.
- As indicated in Section 7.2.2, roughly 13% of all manholes require immediate O&M action to remove buildup.

Lift Stations

- Investigate maintenance practices and rehabilitate upstream assets causing surcharge during rainfall events, with particular attention to Lift Station #3034. (Refer to Section 7.2.3).

Pretreatment Devices and Septic Systems

- Conduct a comprehensive, need-based evaluation for each facility and consider removing unnecessary devices.
- Consider increasing cleanout frequency for grease traps serving food service establishments, specifically the dining facilities (Buildings 1368 and 1320) and the South Bowling Alley (Building 805). Poor maintenance and lack of efficient grease interception can precipitate downstream and cause O&M issues in lift stations, pipes, and manholes.
- The grease trap pumping contractor must fill with clear water when the pumping is completed instead of leaving the grease traps empty.
- All septic systems appear to be in good condition.

1 INTRODUCTION

The sanitary sewer infrastructure at Sheppard AFB is affected by age and degradation leading to increasing compliance issues including Sanitary Sewer Overflows (SSOs) and Inflow & Infiltration (I&I) which could potentially impact off-base treatment plant discharge. Other possible impacts could include the National Pollutant Discharge Elimination System (NPDES) permit compliance, and ex-filtration, potentially impacting ground water quality. Additionally, failure of pretreatment devices such as Oil-Water Separators (OWS) and Grease Traps may lead to compliance violations and costly rehabilitations.

An accurate assessment and inventory of sanitary sewer system assets is therefore necessary for environmental compliance, cost savings and other general asset management goals. These goals include:

- Strategically planning the management of the sanitary sewer system to evaluate the current physical and financial situation.
- Provide a full scale, fully integrated mapping system for future projects to build off of a strong foundation.
- Provide an assessment that triggers logical and effective rehabilitation processes.
- Provide financial savings by identifying system deficiencies to prevent or diminish the consequences of failures.

AECOM is committed under Task Order 2030 of Contract FA3002-07-D-0015 to support Sheppard AFB in its current efforts for sanitary sewer system asset management.

1.1 Overview and Scope

The purpose of this project is to provide Sheppard AFB with a sanitary system inventory and an observation based condition assessment which will support the overall asset management process. Two major objectives of this project are:

- Updating and verifying sanitary sewer system mapping (compatible with the GeoBase system)
- Conducting a risk based assessment of all sanitary assets including all fieldwork necessary to gather information.

The sanitary sewer assets assessed in this project were:

- Sewer pipes
- Manholes
- Lift Stations
- Oil-water separators (OWS)
- Grease Traps
- Septic Systems

This report describes the process and efforts needed to carry out the project scope for each objective. In particular, it details the related methodologies, analyses and results of sanitary

sewer system map updating (Sections 3, 4 and 5). An objective assessment of the sanitary system condition is provided in Section 6 as a culmination of reviewing all information and data collected as part of this project.

Where identified, critical infrastructure and compliance issues are discussed, along with recommendations for mitigating actions and improved data recording (Section 7).

Overall project deliverables are:

- Updated and enhanced GeoBase feature classes, business tables, and media files
- Prioritization model (Microsoft Excel spreadsheets) for prioritization of infrastructure replacement and operation/maintenance activities
- SSO, lift station, oil water separator, and grease trap regular inspection forms
- Infrastructure Assessment Report and Recommendations

In summary the appendices associated with the report are:

- Appendix A: Risk Scoring Criteria and Linear Segmentation Rules
- Appendix B: SSO, Lift Station, and Pretreatment Device Assessment Forms
- Appendix C: List of Unfound and Inaccessible Manholes
- Appendix D: System Inventory Maps
- Appendix E: Specific Issues Maps
- Appendix F: Repair and replace & Operation and Maintenance Risk Maps
- Appendix G: Updated GeoBase, GeoBase Technical Memorandum, Risk Score Spreadsheets (Electronic Deliverables)
- Appendix H: Cost Estimating (PACES)
- Appendix I: Field Work Summary Report

1.2 Area of Study

Sheppard AFB is located north of Wichita Falls, in Wichita County, Texas. As depicted on Figure 1-1, the base is primarily located in the U.S. Geologic Survey (USGS) at 33°59'20" north latitude, 98°29'31" west longitude at a mean sea level elevation of approximately 303 feet (ft.). The base has approximately 30 miles of in-service sewer lines installed over 5,297 acres of installation area. *(This excludes all abandoned lines and the recycled main from the wastewater treatment plant effluent to the golf course.)*

Two main interceptor pipes outside the base boundary transfer sewage from the base to two city operated wastewater treatment plants (WWTP). A 15-inch PVC pipe runs along the west side of the base and carries flow towards the Northside Wastewater Treatment Plant. A 24-inch PVC pipe runs near the east side of the base and carries flow south through the golf course and eventually off-base to the Wichita Falls WWTP located along River Road. There are two privatized housing areas within the base boundary. Private housing areas are excluded from the assessment.

The primary focus of the assessment was on the sanitary sewer conveyance and collection system and assets listed in Section 1.1. Assets within facilities were excluded except for pretreatment devices discussed during the kick-off meeting to be regularly assessed assets. Facility "sump" pumps and small lift station units were not included within the assessment.

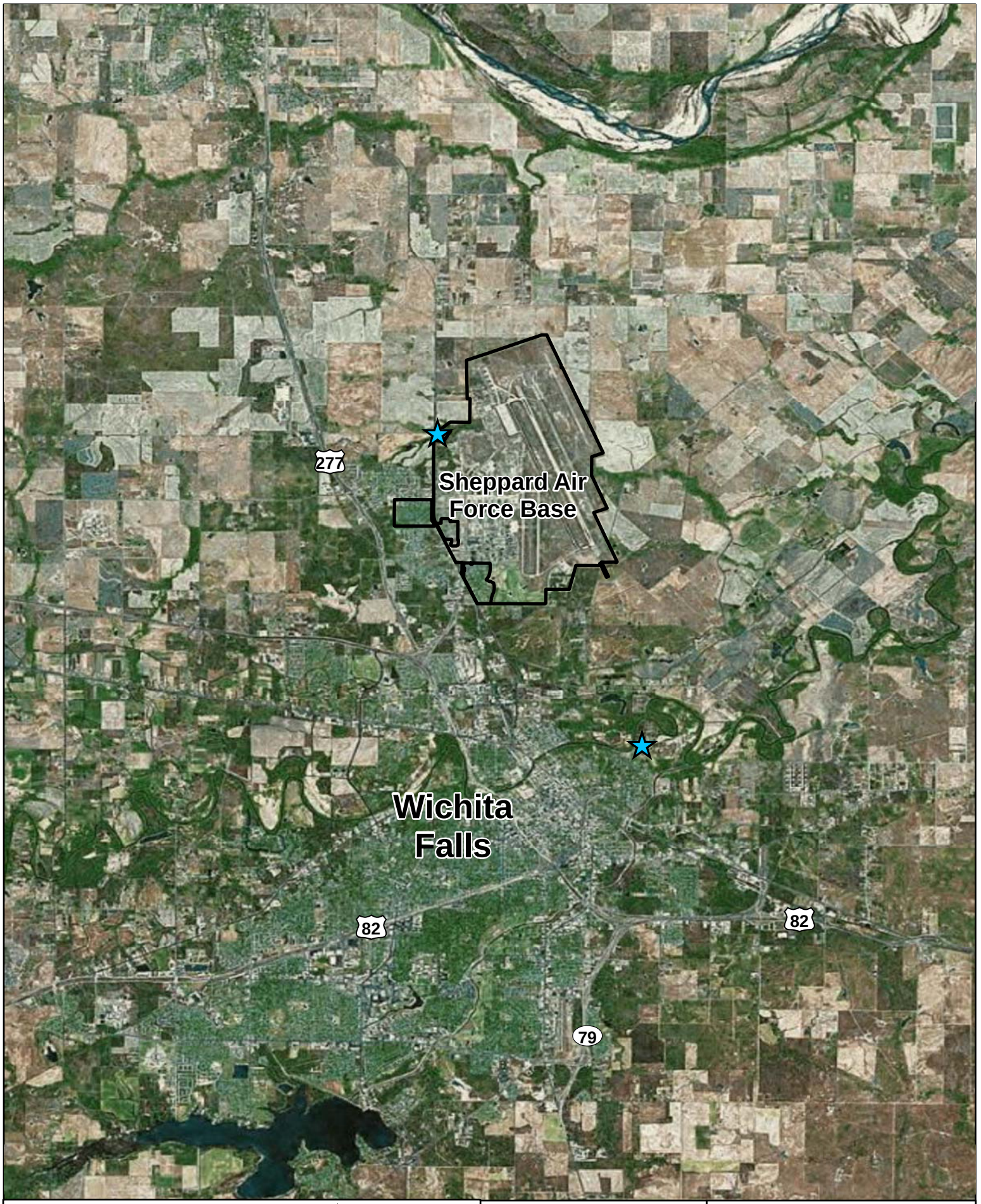


Figure 1-1
Site Location
Sheppard Air Force Base, TX

2 EXISTING SANITARY SEWER SYSTEM

2.1 System Description

The sanitary sewer system at Sheppard AFB conveys domestic and commercial wastes into a dedicated sanitary sewer conveyance system which collects through the sewage collection system and ultimately discharges into one of the off-site WWTPs.

Exceptions to off-site treatment include two septic tanks located at the far north end of the base in the Department of Defense (DoD) dedicated property and at the southernmost end of the base within the golf course. The majority of grease traps and OWS's discharge pre-treated wastewater to the sanitary sewer system. Section 2.2 describes existing practices on disposal of pre-treated waste that does not enter the collection system.

Sanitary sewer system statistics are presented in Table 2-1. The general location and layout of sanitary sewer system assets are illustrated in Figure 2-1. This section presents a summary of the facilities and operating characteristics of the existing sanitary sewer system at Sheppard AFB. More detailed sanitary sewer system inventory statistics are provided in Section 6.

Table 2-1: Existing Sanitary Sewer System Inventory

Piping (lengths in miles)					
Force Mains (Pressure)	**Service (Lateral) Pipes**	**Gravity (Mains)**	**Abandoned-In- Place Pipes[1]**	**Total Sheppard AFB Owned/ Operated Pipes**	
2.5	10	17.5	12	42	
Lift Stations	**Manholes (in service)**	**Pretreatment Devices**			**Septic Tanks**
		Sand Traps	**Grease Traps**	**OWSs**	
28 (6 assessed)	476	0[2]	12	3	2

1: Length is approximate. Not all abandoned-in-place may be mapped or known to exist.
2: Some sand traps may exist but were not located during the survey.

2.2 Existing Practices

2.2.1 General

The sanitary sewer system at Sheppard AFB is primarily maintained by the 82nd CES Utility Staff. Service calls and emergency repairs are handled on an as-needed basis.

Sewer service calls and emergency repairs are logged in the Air Force's Interim Work Information Management System (IWIMS). Information from these records, in conjunction with information obtained from plumbing personnel, and the recent Infrastructure Investment Plan performed by CH2MHill in 2006 were incorporated into the GeoBase. For further discussion on recommendations for tracking service calls and emergency repairs, refer to Section 3.5.3.3 and Section 7.3.

The base does not currently have an active Regular Work Plan (RWP) for the sanitary sewer system including the pretreatment devices. Maintenance is performed when required on the sewer system as well as the Lift Stations and OWS's. However, the base did indicate that they periodically check the lift stations to ensure they are pumping down the wet wells.

Septic tanks serving both the golf course and the far north section of the base are cleaned on an as-needed basis by the base utility staff.

Private contractors are typically employed for larger-scale capital projects and specialty services such as sewer pipe cleaning, pretreatment device pump-outs, and closed-circuit television (CCTV) inspections.

2.2.2 Grease Traps

Currently the base has their grease traps pumped out on varying frequencies, depending on the facility served, by a contracted licensed waste hauler (Table 2-2). Operations include only pumping and filling the grease trap with water. No additional or further treatment occurs.

Table 2-2: Grease Trap Locations and Cleaning Schedule

Grease Trap Identification	Building	Frequency of Clean Out
3017	61 – Kitchen Prep	Monthly
3134	120 – Commissary	6x's a year
3148	204 – Burger King	Monthly
2556	239 – Main Exchange	Monthly
3008	318 – South Bowling	Semiannually
3010	340 – Sheppard Club	3x's a year
3016	740 – Mini Mall	Quarterly
3133	776 – Dining Hall	Semiannually
3015	805 – Dining Hall	Quarterly
3132	1320 – Dining Hall	3x's a year
3011	1368 – Dining Hall	3x's a year
3038	2320 – Snack Bar	Monthly

Legend

Pretreatment Devices

- Septic Tank
- Grease Trap
- Lift Station
- Oil/Water Separator

Sanitary Pipe

- In Service Pipe
- Abandoned Pipe
- Privately Owned In Service Pipe
- Privately Owned Abandoned Pipe

Background

- Building
- Road
- Vehicle Parking
- Airfield Surface
- Watercourse
- Water Body

AECOM

Figure 2-1
Sanitary Sewer System
Map Overview
Sheppard Air Force Base, TX

January 2015

3 INFRASTRUCTURE MANAGEMENT METHODOLOGY

3.1 GeoBase Asset Management

The Air Force's geographic information system (GIS) system (GeoBase) has been a core component of DoD asset management modernization efforts dating back to the early 2000's. Critical to any comprehensive utility assessment and development of effective infrastructure management tools is a field-verified inventory of existing assets, accurate system mapping, and population of characteristic and condition data.

AECOM believes GeoBase is the most suitable means to maintain asset inventory and achieve the goals of asset management. Risk based prioritization models, asset management tracking, reporting and statistics can all be achieved through a GIS based system. This project is developed around leveraging GIS-based tools to assist the Base achieve optimized asset management.

Integral to the use of GeoBase is the ability to display and provide reports on the data contained. GeoBase provides a broad spectrum of data output variations and provides these reports in a concise and consistent way.

This section will describe the risk management approach taken to prioritize sanitary sewer asset requirements as well as how GeoBase data will be used. Further it will discuss how this data will be updated based on recent findings and how this data can be further incorporated into future standalone projects and/or RWPs.

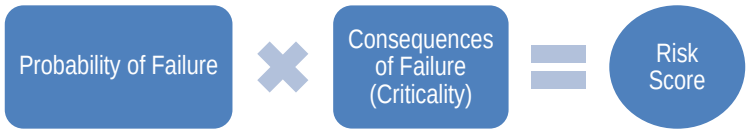
The following sub-sections describe the risk management approach taken through prioritization of sanitary sewer asset requirements as well as how GeoBase data will be used, updated, and incorporated. Recommendations on GeoBase management are provided in Section 7.4.

The Air Force is currently developing Utility Comprehensive Asset Management Plan (CAMP) Business Rules, which provide a risk based method to score assets which assists with ACES PM programming. At the time of writing, the CAMP rules are in development and, therefore, have not been used or presented in this report. However, there are similarities between this system and the one used by AECOM described in Section 3.2. Therefore, at the appropriate time, data will be translatable into the CAMP format.

It is also understood, at the time of writing, that a new GeoBase structure will be released. The new structure is partly designed to be compatible with CAMP rules for the sanitary sewer system. Where possible, AECOM has incorporated GIS attribute fields identified from draft versions of the new GeoBase structure into the updated GeoBase provided in this assessment (Section 3.5.3.1).

3.2 Risk Management

Risk management is a systematic and logical approach used to assist in the prioritization of infrastructure replacement. A risk-based approach was applied to assist in asset replacement and O&M prioritization in this project. The purpose is to provide a systematic, logical, and repeatable approach to proactively manage the reinvestment in existing infrastructure. Risk depends on both the probability and consequence of an event and is often represented using the following equation:



Probability of failure (PF) represents the likelihood that a specific asset will fail (not deliver the required level of service). Consequence of failure represents the overall impact of an asset failing. For the Air Force, criticality replaces the consequences of failure in the risk equation as consequences are related to the criticality of the asset with respect to the bases' mission.

3.2.1 Risk Matrix

Risk was defined in a qualitative matrix and quantitatively by means of a numerical score. There is a direct relationship between risk scores, and priority for further evaluation or replacement. The overall concept of risk and its relationship with PF and criticality can be summarized by the risk matrix. The risk levels used in this project are described further in Section 3.5.2.

Table 3-1: Risk Matrix

Probability of Failure	**Consequence of Failure**				
	Low	→	Medium	→	High
Low	Negligible	Negligible	Low	Low	Moderate
↓	Negligible	Low	Low	Moderate	Moderate
Medium	Low	Low	Moderate	Moderate	High
↓	Low	Moderate	Moderate	High	Extreme
High	Moderate	Moderate	High	Extreme	Extreme

3.2.2 Repair/Replace versus Operation and Maintenance Requirements

When undertaking an assessment of sanitary assets, certain condition and maintenance-type items can be readily obtained or observed. Items include:

- Physical condition such as breaks, cracks, and corrosion
- Build-up of grease, roots, sewage or sediment
- Evidence of inflow and/or infiltration
- Evidence of surcharge
- Corrosion of minor items like fasteners or chains

These items can typically be remedied through RWP or other Operation and Maintenance (O&M) procedures, and generally do not require asset replacement or repair.

To develop repair/replace requirements, characterization items were generally based on physical and operating condition. These items include estimated remaining service life, structural, mechanical, and electrical condition(s) as applicable. It was considered appropriate to designate issues typically remedied through routine O&M actions separate from direct condition items.

Thus, sanitary sewer assets were assigned both an O&M risk score and a Repair/Replace (R/R) requirement risk score.

3.2.3 Probability of Scoring Components

Sanitary sewer system assets were evaluated in the field for visual characteristics and/or with available information (for example: installation date, material, known SSOs or permit exceedances). This data is eventually judged against Key Performance Indicators (KPIs) and other criteria which can indicate potential for operational issues and component failure. Table 3-2 lists both R/R and O&M items for each asset type, potential sources to obtain the data, and justification for inclusion. For scoring, each component has standard descriptors ("domain values" in GeoBase), assigned a value between 1 and 10 to determine severity. For this project, a score of 1 represents lowest severity while 10 represents highest severity. For example, a good condition manhole barrel, with no noticeable defects, would be scored as 1 while a barrel with full break-through spalling, would be scored as a 10.

See Appendix A for a full breakdown of scoring components with regard to standardized values used in the assessment and associated score values.

Table 3-2: Probability of Failure Scoring Components

Scoring Component	Possible Data Source	Justification
Manholes		
R/R Items		
Chimney/ Grade Rings Condition	Visual inspection	A manhole is typically split into four substructures. Degradation of or damage to these substructures can lead to sediment intrusion, I&I, diminished hydraulic efficiency, partial or full manhole collapse.
Cone Condition		
Barrel Condition		
Bench Condition		
Percentage of Remaining Service Life	System mapping inventory Industry guidelines	Common industry indirect indicator for potential of structural problems. (Industry average of a 50-year service life is used[1]).
O&M Items		
Build-Up Level	Visual inspection	Build-up (sewage, fats, oils, grease, or debris) in a manhole can lead to hindered flow and blockages which could eventually lead to an SSO.
Degree of Inflow and Infiltration		Inflow and infiltration through structural joints or cover/frames introduces non-sanitary flows to the system. This reduces system capacity for sewage, which ultimately could lead to SSOs during storm events or peak flow periods. Generally I&I in manholes are relatively minor rehabilitation items.
Evidence of Surcharge		Incidences of surcharges tend to indicate potential blockage or insufficient capacity either in the same manhole of at a downstream location.

Scoring Component	Possible Data Source	Justification
Pipes		
R/R Items		
Breaks, Cracks, Corrosion	Visual inspection (pole camera/Closed Circuit Television)	Breaks, cracks, corrosion, and wall displacements can negatively impact system capacity and increase potential for infiltration and leakage which can contribute to eventual pipe failure.
Deformation/Deflection		Horizontal and vertical deflections impact hydraulics and can contribute to eventual pipe failure.
Percentage of Remaining Service Life	System mapping inventory Industry guidelines	Common industry indirect indicator for potential of failure. Remaining life is dependent on pipe material and installation date (Section 3.2.3.1).
O&M Items		
Level of Buildup	Field visual inspection	Build-up (sewage, fats, oils, grease, or debris) in a manhole can lead to hindered flow and blockages which could eventually lead to an SSO.
SSO History	Historical records	SSOs history attributable to a pipe segment can indicate a severe buildup or blockage. SSO's. As long as this is the cause, and not a collapsed or severely undersized pipe, jetting/cleaning services can mitigate recurrences of SSOs.
Lift Stations		
R/R Items		
Electrical Condition/ Reliability	Field visual inspection, Plumbing Shop records, or other knowledge	Failure of mechanical or electrical componentry – such as a failed pump, a shorted-out electrical panel, or a malfunctioning level float – can result in diminished or outright failure of lift station operation. Since major components may need to be replaced, this was not considered minor maintenance issue.
Mechanical Condition/ Reliability		
Structural Condition		Wet well structural integrity is key to lift station operation – a wall breakthrough or full collapse would result in sediment intrusion, I&I, to full lift station failure.
Percentage of Remaining Structural Service Life	Known or estimated date of original lift station installation	A common industry indicator for failure potential of mechanical/electrical components is remaining useful service life. Based on a series of industry studies[2], a standard structural service life of 50 years was used.
Percentage of Remaining Electrical/ Mechanical Service Life	Records of electrical & mechanical component replacement	A common industry indicator for failure potential of mechanical/electrical components is remaining useful service life. Based on a series of industry studies[3], a standard mechanical/electrical service life of 20 years was used.
O&M Items		
Fats, Oils, Grease (FOG)	Visual inspection	Observed floating greases are an indicator of future problems with level float interference and pump problems.
Solids/Debris Build-Up		Excessive solids build-up can lead to clogged and inoperable pumps and potential SSOs.
Corroded Fasteners/ Chains		Severe corrosion of fasteners and chains can break, and this can lead to pump vibrational issues and other operational problems. Replacement of these minor nut-and-bolt-type items is considered a maintenance activity.

Scoring Component	Possible Data Source	Justification
Pretreatment Devices		
R/R Items		
Visible Oil/ Solids Separation	Field visual inspection	Clear visual, field testing, or laboratory analytical data that the device is not separating solids and/or oils indicate that the device is not operating properly, or being used beyond design parameters. Permit criteria for discharge are often in contaminant concentrations and/or field parameters.
Number of permit criteria exceedances	Bioenvironmental records	
Mechanical/Electrical Condition	Field visual inspection and/or other knowledge	Deterioration to pumps, skimmers, level and oil sensors, alarms, and other componentry and lead to device operation failure.
Structure Material & Condition		Structural integrity is key to device operation. Leaks can result in environmental contamination. Major cracks/breaks can also result in sediment intrusion, I&I, diminished capacity, and structural collapse.
O&M Requirement Items		
Solids Build-Up	Field visual inspection	Sand traps, grease traps, and OWSs are designed to separate solids and/or oils from the effluent. Excessive buildup from solids and oil may lead to breakthrough of oils/grease into the collection system.
Oil Build-Up		
Septic Tanks		
R/R Items		
Leach Pipe/Field Washout	Field visual inspection	Distressed vegetation, vegetative overgrowth, and/or distorted soil grading are all indications of significant problems with the drainage mechanism of the septic tank. Since remedy may involve leach pipe replacement, re-bedding pipes, and/or more intrusive investigation of the septic tank, this is considered a major repair item.
Mechanical/Electrical Condition	Field visual inspection and/or other knowledge	Deterioration to pumps, grinders, skimmers, agitators, air diffusers, level, alarms, and other componentry may lead to device operation failure.
Structure Material & Condition		Structural integrity is key to device operation. Leaks can result in environmental contamination. Major cracks/breaks can also result in sediment intrusion, I&I, diminished capacity, and structural collapse.
O&M Items		
Noticeable Odor	Field inspection and/or facility staff comments	Noticeable odor and flushing problems (when facility toilets/piping is known to be fully functional and free of issues) can indicate the septic tank is overdue for maintenance actions.
Excessive Flush Time		

1: 50 years is an industry-accepted manhole service for planning purposes. Sources: *Asset Management: A Guide for Water and Wastewater Systems*, Environmental Finance Center, New Mexico Tech, 2006.

2: Industry research suggested the effective service life of lift station structures should be set at 50 years. Sources: *City Utilities Design Standards Manual, Sanitary, Chapter 8 Lift Station and Force Main Design*, City of Fort Wayne, Indiana, June 2013; *Asset Management: A Guide for Water and Wastewater Systems*, Environmental Finance Center, New Mexico Tech, 2006; and *Chapter 500, Lift Stations and Low Pressure Systems*, City of Indianapolis, Indiana, June 2006.

3: Industry research suggested estimating the service life of mechanical/electrical pump station equipment at 35 years (*Mechanical and Electrical Design of Pumping Stations*, Engineer Manual 1110-2-3105 Changes 1 and 2, U.S. Army Corps of Engineers, 30 November 1999.) to 15 years (*Asset Management: A Guide for Water and Wastewater Systems*, Environmental Finance Center, New Mexico Tech, 2006). Experience shows that mechanical/electrical components tend to follow more frequent repair/replace intervals; thus 20 years was chosen as the starting point for estimating service life. Even more frequent repair/replace intervals may be utilized if local criteria warrant (*City Utilities Design Standards Manual, Sanitary, Chapter 8 Lift Station and Force Main Design*, City of Fort Wayne, Indiana, June 2013.)

3.2.3.1 Remaining Service Life

Remaining service life is perhaps the most readily available indirect indicator of potential for failure. Remaining service life is defined as the difference between the expected service (design) life and the asset age. Expected service life can vary based on the material used, site specific conditions including soil corrosiveness, hydrogen sulfide concentration, and the quality of construction/installation.

For sewer pipes, expected service lives for different materials were based on previous studies including, but not limited to the Water Research Centre (UK) and the National Association of Sewer Service Companies (NASSCO – "Manual of Practices, Wastewater Collection Systems", 2004).

Table 3-3 provides a summary of expected service lives, for the most commonly used materials, from several sources and was used as a guide for establishing initial expected service lives. Furthermore, the table provides an expected life based on AECOM's experience in determining a value for pipe materials. This value can be used as a starting point or guideline from which it can be adjusted based on local conditions. Justification for AECOM's starting point value has been provided at the bottom of the table for each pipe material.

Table 3-3: Summary of Expected Pipe Service Lives, By Material

Source	Plastic (Includes HDPE and PVC)[1]	Asbestos Cement	Concrete	Reinforced Concrete with PVC Liner	Polymer Concrete	Vitrified Clay	Ductile Iron/ Cast Iron	Steel
Water Research Centre (WRc, 1994)	40	80-125				80-125		
City of Victoria (2005)		50-100						
US Army Corps of Engineers (USACE) (1984)	50		70-100					
NASSCO (2004)	50			75		75	75	25
National Clay Pipe Institute (2004)						100		
International Infrastructure Maintenance Manual (2000)	80-100	80-100		80-100		80-100		
2010 Pipe Material Guide (Trenchless Technologies)	50-100		100		100	200		
AECOM (starting point) service life for risk scoring	50[2]	60[3]	60[3]	70[4]	70[5]	70[6]	50[7]	40[8]
Sheppard AFB	50	45	45	55	40	45	40	30

1: HDPE = High density polyethylene, PVC = Polyvinyl chloride

2: Expected life for plastics is still a predicted life since they have only been used predominately since the 1980s. While highly resistant to hydrogen sulfide corrosion, there is discussion that plastic pipe materials may lose strength and elasticity over time. Presently, 50 years is considered an appropriate conservative estimate until a more detailed understanding of performance is established.

3: Concrete and asbestos cement has shown to be fairly robust as a material but is subject to hydrogen sulfide corrosion. 60 years is determined as a good starting point for both materials.

4: Some concrete pipes are installed with a built-in liner. This is different from rehabilitation of an existing concrete pipe with a liner. While the liner will provide resistance to hydrogen sulfide they do not improve structural performance to the pipe. Therefore, an additional 10 years is applied to account for the liner.

5: Concrete impregnated with a polymer additive is treated similarly in this context; a small amount of additional service life due to corrosion resistance is presumed to be added by the additive, and for lack of available industry data, 10 additional years on top of the original presumed 60 year service life was selected.

6: Care is required with expected service lives for clay pipes as the basis for the life depends on the failure mode. For example, clay is highly resistant to hydrogen sulfide which is generally why it is given a high expected life. However, it is brittle and vulnerable to soil movement that could cause early pipe failure. Also, sources tend to focus on clay pipe manufactured and joined with modern techniques, both which could make it significantly more robust than those employed at Air Force installations in the early to mid-20th century. Therefore, 70 years is chosen which is in the lower range of values from published sources accounting for pipe strength.

7: Hydrogen sulfide can cause significant corrosion to metallic pipes, which reduces the expected lives of cast iron and ductile iron pipes when used for sanitary system compared to potable water. They are not used as extensively in sanitary sewer due to corrosion issues and hence, a 50 year life is provided.

8: Steel pipe of varying grades tends to be used on smaller diameter service pipes. Experience has shown in potable water applications that galvanized steel often has a relatively short life. Given the more aggressive characteristics of a sanitary flow, a 40 year life is expected.

Consideration of expected service lives should pay regard to system operator experience and knowledge of local conditions. Discussions with utility personnel and observations during the field investigation indicated that multiple construction projects and heavy construction machinery may have likely impacted pipe and manhole conditions. See the last row of the table which provides adjusted numbers for Sheppard.

Many existing sewer pipes are lined as a means of rehabilitation to extend their service life. An allowance for the extension of the pipe service life has been included in the prioritization model.

The predicted life expectancies for different lining materials is generally 50 years assuming controlled manufacturing, handling, and installation (NASSCO and EPA "Rehabilitation of Wastewater Collection and Water Distribution Systems", 2009). Many of the typical sewer lining methods are non-structural (such as CIPP and some forms of slip lining) and require that the original pipe has structural integrity to support the liner. Therefore, adjustment of service life is based on the assumption that a proper engineering assessment of pipe condition was undertaken, prior to lining, to ensure that the existing pipe was suitable to be lined.

Manholes were given a general 50 year life expectancy. If they were observed to be lined (either with a concrete liner or a plastic liner), the assigned life expectancy increased to 60 years.

In order to calculate percentage of remaining service life, statistically-derived and generally-accepted service lives of mechanical/electrical and structural components of pipes, manholes, and lift stations from industry studies and government criteria were used in this report. The 20-year and 50-year service lives of mechanical/electrical and structural components (respectively) were sourced from industry studies, municipal criteria, and experience (see specific references in the footnotes to Table 3-2).

Pretreatment Devices and septic tanks do not require an age of structure to complete the scoring. Due to the frequency of cleaning and reporting, these units are scored on buildup level, structural, mechanical and electrical assessments.

3.3 Criticality Scoring Components

Table 3-4 presents the components chosen for assessing overall criticality for the sanitary sewer assets. See Appendix A for a full breakdown of criticality scoring components with regard to standardized values and related score values.

Table 3-4: Sanitary System Asset Criticality Basis

Scoring Component	Data Source	Justification
Pipes, Manholes, and Lift Stations		
Pipe Category	Analysis of base sanitary sewer system	Indicates the anticipated relative impact of failure reflecting the amount of flow and/or number of facilities served. Manholes are assigned the highest pipe criticality category of its connecting pipes. Lift stations are assigned the pipe criticality category of its intake, or upstream pipe. Section 3.3.1 describes infrastructure categorization in further detail).
Critical Facilities Served/Impacted		Some facilities and pavements have a higher importance than others based on the mission criticality. Failure of infrastructure serving these facilities therefore has greater consequence. Manholes are assigned the highest criticality facility served of its connecting pipes. Lift stations are assigned the criticality facility served of its intake, or upstream pipe.
Is Asset Within 100 Yards of a Water of the U.S.?	Map/distance measurement	Proximity to a regulated water body (within 100 yards) increases chance of a negative environmental impact / regulatory consequences in the event of a failure. Regulatory language and court precedents interpret "navigable waters" very broadly, so any natural or man-made surface water body, river, or canal is considered in this context.
Pretreatment Devices and Septic Tanks		
Capacity	Rating by manufacturer or estimated from shell dimensions	Pretreatment device and septic tank shell capacity is a readily-available indicator for the level of wastewater flow the device is designed to treat. The presumption is that the higher the shell capacity, the greater the number of facilities served.
Is Asset Within 100 Yards of a Water of the U.S.?	System mapping	Proximity to a regulated water body (within 100 yards) increases the chance of a negative environmental impact/regulatory consequences in the event of a failure. Waters of the U.S. as defined by the Clean Water Act. Regulatory language and court precedents interpret "navigable waters" very broadly, so any natural or man-made surface water body, river, or canal is considered in this context.

3.3.1 Infrastructure Categorization

For the purposes of this project, the sanitary system is categorized into five different levels. These five levels are identified in an infrastructure breakdown, which is based on the relative importance (criticality) of pipes in the collection system and in providing service to the base to maintain its mission. As this categorization system defines relative importance of pipe segments, engineering judgment and working knowledge of the system should be used in making category decisions.

Table 3-5 provides the general descriptions for understanding infrastructure categorization. The categorization of manholes and lift stations are based on the highest category of pipe they are connected to.

Table 3-5: Pipe Categories for Criticality Scoring

Category	Description	Criticality
Main Effluent Sewer Conveyance	Main effluent sewer conveyances are large sewers (typically greater than 24 inches) that are used to convey sewage effluent from an entire installation system to final treatment or other disposal facilities	Failure disrupts service to the entire base.
Intercepting Sewer Conveyance	Intercepting sewers are large diameter sewers (typically 21 inches or larger) that are used to intercept a number of main or trunk sewers representing a significant portion of a system (multiple sub-basins) and convey the sewage to ultimate discharge conveyance.	Failure disrupts service to significant portions of the base (multiple sub-basins).
Trunk Sewer Conveyance	Trunk sewers are large diameter sewers (typically up to 21 inches) that are used to convey sewage from main sewers to larger intercepting sewers.	Failure disrupts service to large portions of the base (a sub-basin).
Main Sewer Conveyance	Main sewers are used to convey sewage from one or more laterals to trunk or intercepting sewers.	Failure disrupts service several facilities.
Lateral Sewer Conveyance	Lateral sewers are generally small diameter sewers (typically 8 inches or less) forming the first part of the sanitary conveyance system taking flow directly from buildings. Multiple lateral sewers may serve a building and may connect together or separately downstream into either main or trunk sewer conveyance.	Failure disrupts service only to an individual facility

3.3.2 Critical Facilities Served and/or Impacted

For the purposes of assessing a sanitary sewer system, only runways, taxiways, aprons, and hospitals are included as mission critical areas, where condition is paramount and/or continuous service is always required. Poor condition or an SSO occurrence in assets underneath or situated in one of these areas could directly disrupt the mission and hence should have a high criticality.

The proximity to runways, taxiways and aprons needs to be taken into account when identifying whether or not an asset impacts these facilities. Consideration was given to Unified Facilities Criteria, 3-260-01 “Airfield and Heliport Planning and Design” to specify offset distances for sanitary sewer assets in order to evaluate whether or not an asset would impact the facility. An offset distance of 50 ft. was taken as a suitable offset distance to include assets that potentially affect runways, taxiways and aprons.

Only pipes, manholes, and lift stations directly serving (receiving flows from) the hospital were assigned the hospital critical facility criteria in this assessment. Sanitary sewer assets downstream of the hospital which convey flows from it, as well as flows from other facilities, will be evaluated for criticality, as appropriate, from the other criteria (e.g. pipe category) within this scoring component.

Primary roads and pipes under buildings are also included within this criticality component. A pipe collapse or loss of service to an asset under a primary road or building could severely affect

operations within the base. A buffer distance of 20 feet was applied to include assets that could impact primary roads.

Table 3-6: Specified Offset Distances for Class A and B Runway, Taxiway/Apron Facilities

Facility	Offset Distance (ft.)
Runway	200
Taxiway and Apron	50

In this project, for the hospital, only pipes, manholes, and lift stations, which are directly serving (receiving flows from) the hospital will be assigned the hospital critical facility criteria. Sanitary sewer assets downstream of the hospital which convey flows from it, as well as flows from other facilities, will be evaluated for criticality, as appropriate, from the other criteria within this scoring component. Primary roads and pipes under buildings are also included within this criticality component. A pipe collapse or loss of service to an asset under a primary road or building could severely affect operations within the base. A buffer distance of 20 ft. was applied to include assets that could impact primary roads.

3.4 Weighting Factors

The criteria used to establish the probability of failure and criticality components have varying levels of impact on risk. Thus, a "weighting" system was devised to distinguish factors of differing importance in determining overall risk. The following equations indicate this concept and summarize how the overall PF and criticality score is determined for assets.

3.4.1 Probability of Failure

Chosen PF weighting factors for a given asset sum to 100. Table 3-7 explains the PF weighting factors chosen for each asset type in this project.

Table 3-7: Probability of Failure R/R & O&M Weighting Factors

Scoring Component	Weighting Factor	Justification
Pipes		
R/R Items		
Breaks/Cracks/Corrosion	40	Directly observed, physical indicators of condition provide the greatest sign of potential for failure. Remaining service life is an indirect measurement of condition and thus it is ranked lower.
Deformation/Sag	40	
Percent Remaining Service Life	20	
O&M Items		
SSO History	70	An SSO is an empirical indicator of diminished downstream pipe performance, and it is thus ranked the highest. Level of buildup is ranked lower due to sanitary sewers, by nature, always having some level of debris in the flow; its observed presence may be temporary and not the clearest indication of diminished flow capacity.
Level of Buildup	30	
Manholes		
R/R Items		
Barrel Condition	30	Observed condition of manhole substructures were ranked in level of impact to overall manhole integrity and function. The barrel is the largest substructure of the manhole and generally provides most of the structural strength, so it is ranked the highest. Remaining service life is an indirect measurement of condition and thus it is ranked lowest.
Cone Condition	25	
Chimney/Grade Rings Condition	20	
Bench Condition	15	
Percent Remaining Service Lift	10	
O&M Items		
Build-Up Level	50	Observed build-up within the manhole is ranked highest as it directly relates to how well flow conveys through the manhole. Surcharge evidence indicates there has been an issue with flow capacity either in a downstream pipe or within the same manhole. However the issue causing surcharge conditions may no longer exist. Hence it is an indirect indicator and weighted lower than current build-up level.
Surcharge Evidence	30	
Inflow & Infiltration Level	20	I&I through the manhole structure can lead to manhole degradation and reduced flow capacity (potentially leading to surcharges and SSOs) but as only a precursor to major performance issues. Hence they are ranked lowest.

Table 3-7: Probability of Failure R/R and O&M Weighting Factors (continued)

Scoring Component	Weighting Factor	Justification
Lift Stations		
R/R Items		
Electrical Condition/ Reliability	25	Electrical and mechanical componentry directly impact the performance and are higher-stressed parts of lift stations compared to structures, and thus were ranked highest. Remaining service life is an indirect indicator of condition, hence weighted lowest.
Mechanical Condition/ Reliability	25	
Percent Remaining Electrical/ Mechanical Service Life	20	
Structural Condition	20	
Percent Remaining Structural Service Life	10	
O&M Items		
Fats, Oils, Greases (FOG)	34	FOG and solids/debris can hamper or ultimately stop pump operation, and failure of pump guide chains and related fasteners can also lead to pump operational issues; as such, all three maintenance issues are ranked equally.
Solids/Debris Buildup	33	
Corroded Fasteners/ Chains	33	
Pretreatment Devices		
R/R Items		
Number of Permit Exceedances	30	Mechanical/electrical and structural conditions of pretreatment devices are key indicators of operational performance and are ranked equally. A permit criteria exceedance may be the ultimate and empirical indicator of performance, but as it may also be due to upstream practices, not the device itself, it is not ranked highest. Visible oil/solids separation can be a direct, field-observed indicator of device performance, but as it is often not clear and ultimately a subjective judgment, it is ranked lowest.
Mechanical/Electrical Condition	30	
Structure Material & Condition	30	
Visible Oil/Grease/Solids Separation	10	
O&M Items		
Solids Build-Up	50	Sanitary sewer pretreatment devices are designed to reduce the concentration of solids and/or oils discharged from a given facility. This means that, solids and oils are retained- and excessive build up will hamper performance. Both are ranked equal in importance, as depending on the device type and design both or one may be applicable.
Excessive Oil/Grease Build-Up	50	

Table 3-7: Probability of Failure R/R & O&M Weighting Factors (continued)

Scoring Component	Weighting Factor	Justification
Septic Tanks		
R/R Items		
Electrical/Mechanical Condition	33	A septic tank, depending on its modernity and design, can be generally separated into electrical/mechanical, structural, and leach field components. All are key to proper septic system operation, and are ranked equally.
Structure Material and Condition	33	
Leach Pipe/Field Washout	34	
O&M Items		
Noticeable Odor	50	Odor and toilet drainage problems can both be indicators of a multitude of septic system issues, so each item is ranked equally.
Excessive Flush Time	50	

3.4.2 Criticality Scoring Component Weighting Factors

As with PF weighting factors, criticality weighting factors sum to 100. Table 3-8 explains criticality component relative importance through ranked weighting factors.

Table 3-8: Criticality Weighting Factors

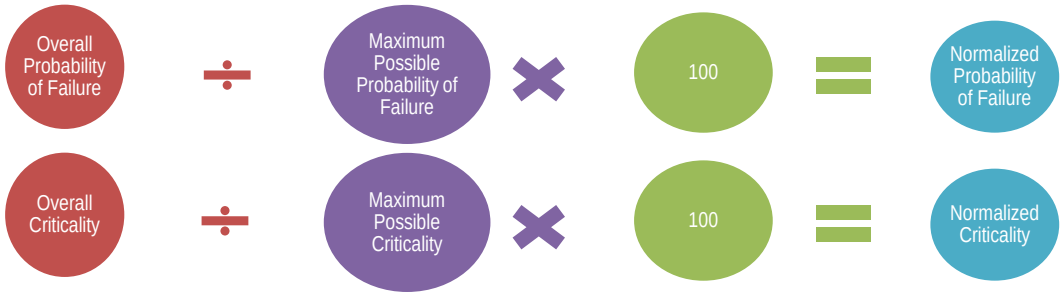
Criticality Component	Weighting Factor	Justification
Pipes, Manholes, and Lift Stations		
Pipe Category	50	The pipe category generally indicates how upstream facilities could be impacted by a failure or loss of service, and as such it is ranked highest in importance. If the asset serves a critical facility, while important, it typically has a lower impact from loss of service than pipe category. Finally, while considering impacts to navigable waters is important, failure of an asset and a resulting SSO which reaches a waterway, which, if the typical flow pathway would be over relatively flat and permeable ground, has a low probability, so it is ranked the lowest of the three criticality categories.
Critical Facilities Served/Impacted	30	
Is Asset Within 100 Yards of a Water of the U.S.?	20	
Pretreatment Devices and Septic Tanks		
Capacity	50	Device capacity (which is an indicator of flow level and facility size served) and proximity to water bodies are logically weighed evenly in terms of risk. Nearly all of the influent pipe categories for these assets will be laterals from one building, and device failure would have minimal impact to a critical facility's mission, so these categories are not considered.
Is Asset Within 100 Yards of a Water of the U.S.?	50	

3.5 Risk Score Calculation and Use

The prioritization model includes a method to normalize the data to provide a relative score from 1 through 100 in which to evaluate risk. In any given infrastructure assessment, there are instances where not all of the data can be collected or assessed for a scoring component. Normalizing the scores ensures that assets with incomplete or non-applicable data can be compared on the same scale.

Additionally, normalizing probability of failure and criticality separately provides a means to rank and evaluate both scores independently of each other. It may be necessary to identify assets with the highest PF score (worst condition) independently of its criticality and vise-versa.

The process of normalizing is demonstrated by the following equations for PF and criticality:



Since the maximum score that can be assigned to an evaluation component is 10 and weighting factors sum to 100 the maximum possible score, in most cases, for overall PF and criticality will be 1,000. Although certain assets may not have scores for every data record, the normalization process (dividing by the maximum possible score) ensures that the overall score will be between 0 and 100. The application of non-applicable and missing data is discussed further in Section 3.5.1. The normalized scores for probability of failure and criticality are then multiplied together to provide a risk score.

Finally, to ensure consistency in providing a score between 0 and 100, the risk score is also normalized by dividing the score by the maximum possible risk score (10,000) as demonstrated by the final equation.

Table 3-9 illustrates a sample calculation to summarize the prioritization model scoring methodology for a pipe segment, demonstrating the use of the above calculations. In the example, all of the data could be scored, thereby the maximum possible scores for probability of failure and criticality are 1000.

Table 3-9: Example Pipe R/R Risk Score Calculation

Scoring Components	Evaluation Score[1]	Weighting Factor	Overall Score (Score x weighting factor)
R/R Items			
Breaks, Cracks, Corrosion	7	40	280
Deformation/Sag	3	40	120
Percentage of Remaining Service Life	6	20	120
Probability of Failure score (Sum of overall scores)			520
Maximum Possible Score			1,000
Normalized Probability of Failure Score [(Sum score/maximum possible) x 100]			52
Criticality			
Critical Facilities Served/Impacted	1	30	30
Pipe Category	4	50	200
Is Pipe Within 100 Yards of a Water of the U.S.?	10	20	200
Criticality Score (Sum of overall scores)			430
Maximum Possible Score			1,000
Normalized Criticality Score [(Sum score/maximum possible) x 100]			43
Risk Score			
Risk Score (probability of failure x criticality)			2,236
Maximum Possible Score (100x100)			10,000
Normalized Risk Score [(Risk / Maximum possible) x 100]			**22**

1. Refer to Appendix A for full scoring details, i.e. condition descriptors and corresponding sub-scores.

3.5.1 Utilization of Incomplete Data

There may be instances where data required for a probability of failure or criticality scoring component is unavailable. This does not necessarily make the data set incomplete for the purposes of scoring, but such incomplete data elements fall into one of three categories:

1. Missing Data: The data element is required but not available because testing, survey, and/or study, for example, has not yet been completed, was out of contract scope, or the data exists but is considered to be in error and is therefore discarded. Where any individual required data element is missing, the risk score is designated as "Assessment Incomplete" in the calculations and represented as such in GeoBase.
2. Estimated Data: Data is required and may or may not be available, but estimated data which is judged to be representative is entered. Technically, the real data is missing but a representative data is entered based on a set of rational assumptions or data modeling techniques. Risk scores using estimated data are considered to be "Completely Assessed", though they may, as in all cases, be updated and made more accurate with future collection of real, observed data.

3. Data element not applicable: Empirical data is not entered because the data element does not apply to the component. This is not considered missing data and the risk score derived from it is considered "Completely Assessed", e.g., a non-applicable scoring component would be a manhole without a cone structure.

Therefore, one may have either a;

a) Completely Assessed Risk Score

b) Incompletely Assessed Risk Score

c) Not Assessed (no risk score)

The completed risk scores can be used to prioritize rehabilitation and replacement requirements, whereas incomplete risk scores may be used to prioritize which assets require additional investigation. It should be understood that the risk score resulting from an incompletely assessed asset should only be used for preliminary base-wide planning purposes and should not be compared to an asset assessed on a complete data set. Complete and incomplete data risk scores are distinguished in the sanitary sewer system prioritization spreadsheets (see "Assessed Status" column in the spreadsheets – Tab 'Risk Scores RR' and 'Risk Scores O&M'). Table 3-10 summarizes the different symbology used for linear and point based assets in risk score maps in Appendix F.

Table 3-10: Graphical Representation of Data Completeness

Risk Type		Linear Based Assets[1]	Point Based Assets[2]
Type 1	Completely Assessed	Solid color	Solid color
Type 2	Assessment Incomplete	Dashed color	Hollow color
Type 3	Not Assessed	Solid (grey)	Solid (grey)

1. Linear based assets in the sanitary sewer system are pipes. Only in-service pipes would follow this coloration scheme.
2. Point based assets in the sanitary wastewater system include manholes, lift stations, pretreatment devices, and septic tanks.

3.5.2 Risk Score Interpretation

The purpose of the risk scoring system is to provide a numerical and graphical system for asset repair/replacement prioritization and to be used as part of the process for larger-scale capital improvement planning. The risk matrix (Section 3.2 and Table 3-1) introduced the levels of risk. In this project, a total of five risk levels are used for categorizing repair/replace requirements, while three are used for categorizing O&M requirements.

As a result of determining the level of risk, from the risk score, it is necessary to define the appropriate course of action(s) pertaining to that risk level. Additionally, risk score ranges must be established to determine what scores satisfy each risk level. In developing the ranges, consideration was given to the threshold values which determined the point where PF and criticality scores met the descriptions and action levels tied to each risk category. The risk ranges developed are different for each asset because each asset has a different set of components and weighting factors for PF and criticality.

Tables 3-11 and 3-12 break down key elements and action categories relating to each risk level (and associated risk score range) for O&M and repair/replace requirements.

Table 3-11: R/R Risk Score and Graphical, Operational, and Prioritization

Risk Category	R/R Risk Score Range	Completely Assessed Risk Score	Assessment Incomplete Risk Score
		Recommended Actions	
Extreme	Pipes: >19 Manholes: >24 Lift Stations: > 26 Pretreatment Devices: >25 Septic Tanks: >33	Immediate need for repair/replacement.	Immediate need for inspections to determine actual condition.
High	Pipes: 16 to 19 Manholes: 18 to 24 Lift Stations: 19 to 26 Pretreatment Devices: 20 to 25 Septic Tanks: 23 to 33	Evaluate repair/ replacement alternatives. Repair/replace in the next 2 to 5 years.	Top priority for inspections to determine full condition.
		Recommend a minimum of annual inspection intervals until asset repaired or replaced.	
Moderate	Pipes: 10 to 15 Manholes: 10 to 17 Lift Stations: 10 to 18 Pretreatment Devices: 11 to 19 Septic Tanks: 10 to 22	Proactive monitoring.	Moderate priority for full characterization and assessment.
		Schedule inspection/evaluation on minimum 5 year intervals to monitor / assess deterioration and determine timing for replacement.	
Low	Pipes: 6 to 9 Manholes: 7 to 9 Lift Stations: 5 to 9 Pretreatment Devices: 5 to 10 Septic Tanks: 5 to 9	Immediate action not required	Low priority for full characterization and assessment.
		Normal O&M, RWP, and inspection intervals.	
Negligible	Pipes: 1 to 5 Manholes: 1 to 6 Lift Stations: 1 to 4 Pretreatment Devices: 1 to 4 Septic Tanks: 1 to 4	No repair/ replacement action planned. If criticality low, consider run to failure.	Plan for full characterization and assessment along normal inspection schedule(s).
		Normal O&M, RWP, and inspection intervals.	

Table 3-12: O&M Risk Score Ranges and Graphical, Operational, and Prioritization

Risk Category	O&M Risk Score Range	Completely Assessed Risk Score	Assessment Incomplete Risk Score
		Recommended Actions	
High	Pipes: >15 Manholes: >16 Lift Stations: > 16 Pretreatment Devices: >18 Septic Tanks: >17	Immediate need for maintenance.	Immediate need for inspections to determine missing data criteria.
Moderate	Pipes: 9 to 15 Manholes: 9 to 16 Lift Stations: 7 to16 Pretreatment Devices: 8 to 18 Septic Tanks: 10 to 17	Moderate priority for maintenance.	Moderate priority for full characterization and assessment.
		Schedule maintenance prior to the next scheduled round of maintenance of RWP (unless next round is imminent).	
Low	Pipes: 1 to 8 Manholes: 1 to 8 Lift Stations: 1 to 6 Pretreatment Devices: 1 to 7 Septic Tanks: 1 to 9	Low priority for maintenance, or no maintenance required.	Low priority for full characterization and assessment.
		Maintain normal O&M, RWP, and inspection intervals.	

Assets that have not been assessed should be prioritized for assessment based on criticality score, i.e. the most critical assets should be assessed first.

3.5.3 Geographic Information Systems (GeoBase)

Asset Management assessment tools such as this GeoBase model is useful because it derives information from a continually updated database with the latest asset characterization, assessment, and maintenance data. The following subsections discuss the mechanism to store the data for the prioritization model, the results of the analysis, and the development of the prioritization model.

3.5.3.1 GeoBase

The basic structure of the Air Force geodatabase ("GeoBase") follows DoD criteria (*Spatial Data Standards for Facilities, Infrastructure and Environment*, or SDSFIE). The geodatabase was provided in SDSFIE version 3.0 at the time of project commencement. For wastewater assets a node and segment layer provided all details relating to sanitary sewer assets. Data has been maintained in this format during the course of the project.

Data fields and tools have been added to the basic SDSFIE GIS structure primarily in the form of "business tables", which support the prioritization model. The data fields in the business tables are used for the prioritization model scoring system, and are linked to the core GeoBase with primary key identifiers. The business tables are simple database tables which can be read in GeoBase but do not contain geospatial data. Data in the original geodatabase business tables has also been maintained and updated during the course of the project. Refer to the separately submitted and updated original geodatabase (electronic files). Further information can be found in Appendix G.

A business table was created for each assessed sanitary sewer asset. Some of the existing SDSFIE attribute fields, and the fields created in the business tables, were used for the prioritization model and for storing additional useful information not related to the prioritization model. See the GeoBase Technical Memorandum for full attribute field and business table details (Appendix G).

3.5.3.2 Linear Segmentation

The GeoBase structure (SDSFIE 3.0) splits wastewater system assets into two basic classes (in GIS, they are "feature classes" or layers): nodes and segments. Nodes represent point-based assets, such as manholes and lift stations. Segments are the pipes which comprise the sanitary sewer network. In order to manage this linear infrastructure effectively, it is necessary to define and distinguish the pipes in discrete, geospatially located segments using a few basic rules known as linear segmentation.

Essentially pipe segments are split into separately identified, individual segments when one or more of the following occurs:

- A pipe intersects a manhole, lift station, pretreatment device, or septic tank (pipes are not split at cleanouts but are "snapped" to them)
- Pipe characteristics (e.g. material, size, installation date) change without a manhole

These rules are understood to follow the Air Forces current linear segmentation rules. See Appendix A for full linear segmentation rules used in this project.

3.5.3.3 SSO Tracking/Reporting

Sanitary sewer overflows attributable to pipe segments, and surcharge evidence in manholes, are both components of the O&M PAN risk scoring system (see Sections 3.2 and 3.4). However, tracking and trending details of SSO incidents is a useful sanitary sewer management tool. It allows for further investigation into recurring issues and complying with regulatory reporting requirements and recordkeeping guidelines.

Thus, an SSO point-based feature class ("SanitarySewerOverflowTCEQReport") was created for the GeoBase: it is modeled to gather all data necessary to report to the Texas Commission on Environmental Quality (TCEQ) according to the Texas Water Code Section 26.039. Full detail on this feature class is listed in the GeoBase Technical Memorandum (Appendix G). A copy of a generic SSP form is provided in Appendix B.

3.5.3.4 Lift Station, Pretreatment Inspection Forms

A lift station regular inspection form was developed to track data obtained during regular lift station inspections. The inspection form will help standardize and assist the data collection. The form has been developed to include the PF scoring components required for the prioritization model. A sample of the lift station form can be found in Appendix B.

Similarly, a regular inspection form was developed for pretreatment devices. The data collected will support the prioritization model and to provide a means to record additional maintenance related data. A sample of the regular inspection forms can be found in Appendix B.

4 DATA COLLECTION

4.1 Introduction

A key project objective is to update and verify the sanitary sewer system mapping, thus providing a complete and accurate layout of the base sanitary sewer system. Complete, accurate system mapping is essential for:

- Providing effective management and operation of the system
- Providing accurate and complete, current and present replacement value of inventory
- Isolating and repairing system defects, other malfunctions or emergencies
- Answering requests for system data, such as from higher command, regulators, or contractors
- Achieving asset management goals providing the base with a baseline assessment for future planning

As part of the map updating process, AECOM gathered documentation and photographs on system assets such as collection piping, sewer manholes, pretreatment devices, and lift stations. The photos are referenced in the geodatabase particularly for utility personnel to identify asset locations.

The following sections outline the initial data gathering efforts and methods used during the field surveys to update Sheppard AFB's sanitary sewer system data.

4.2 Kick-Off/Initial Site Visit

AECOM visited Sheppard AFB on December 11 and December 12, 2013 to collect and review information relating to sanitary sewer system assets, operation and existing mapping archives. Data from the initial visit was used to update the GIS mapping to serve as a base map for the survey field effort. Table 4-1 summarizes the principal sources of information gathered relating to the sanitary sewer system at Sheppard AFB.

Table 4-1: Summary of Wastewater System Data

Source	Description of data obtained
Utilities (CE and PAE)	• Partial Record Drawings provided by PAE at Kick-off Meeting. • Discussion of current GeoBase with respect to data gaps and out-of-date mapping • Base personnel information on existing sanitary system including problem areas (Provided at the Kick-off meeting walk through) • Base personnel added three lift stations and all grease trap locations to the existing maps • Grease trap inspection records and cleaning schedules • 2006 Infrastructure Investment Plan provided by CH2M Hill • CCTV inspections for a select portion of the pipes • An AutoCAD file of existing sanitary system
GeoBase	• All sanitary sewer utilities and background reference layers

4.2.1 Summary of System provided by Base Personnel

Base personnel were interviewed to gain their understanding of the sanitary system mapping and overall condition. Generally speaking, utility personnel did not indicate that there were any severe issues with the operation of the system. In recent decades, much of the system has been replaced with newer pipe materials either as part of major replacement projects or as part of new facility construction.

As discussed, AECOM understands the base doesn't currently undertake regular preventative maintenance activities on the system. Consequently there is a lack of overall understanding of the condition and performance of the system. With regards to mapping, the original GeoBase supplied information was understood to have originated from AutoCAD drawings. It was understood that this data had not been updated since and hence, considered out-of-date. This data was currently being used by utility shop personnel. The existing GIS did not include data such as pipe materials, sizes and installation dates. Missing information was populated prior to the initial field investigation by information from the AutoCAD drawing, CCTV results, and the 2006 Infrastructure Investment Plan report provided by Utility Base Personnel.

The main concern for Sheppard was the lack of updated information since numerous rehabilitation projects had taken place after 2006. Several buildings had been abandoned, some had been demolished, and multiple sanitary sewer lines had been installed since the GeoBase had been updated last. AECOM sought to use a variety of other data sources collected during the first visit to start mapping facility services. These sources would undergo verification during the field survey.

Other specific concerns noted by utility personnel included:

- Lift Station No. 3034 backed up through the sanitary line. Suspected stormwater infiltration.
- Pipes 5741, 5742, 5951, 2043, 2044, 4294, and 2051 have to be regularly jetted due to the build-up of grease.
- Surcharged manholes and significantly increased flows during heavy rainfall (as noted by PAE and CE).
- Possible root intrusions
- Mapping discrepancies

These areas and issues were prioritized for further investigation during subsequent field survey.

4.2.2 Record Drawings

AECOM was provided an electronic copy of as-built and other construction project files as available for a few select on-base facilities. These drawings were compared to the original GeoBase and updated to supplement the current mapping effort.

4.3 Primary Field Survey

Following the initial data gathering visit, AECOM conducted a field survey from April 21st – May 2nd in order to:

- Verify locations of existing sanitary system assets

- Locate assets not yet identified
- Collect sanitary sewer system characterization and assessment data (for the prioritization model) together with photographs.

Following the field survey, the sanitary sewer utility layers were updated in GeoBase in order to establish the most accurate and comprehensive data source on the sanitary system. The following sub sections outline the associated methodology.

4.3.1 Mapping and Locating Assets

AECOM field staff made good-faith efforts to locate and access all sanitary sewer system assets owned, operated and/or maintained by Sheppard AFB.

The existing GeoBase data, updated from the initial data gathering effort, was used to locate existing assets. In addition to new assets found, the location of existing assets was adjusted with global positioning system (GPS) equipment, as necessary, to improve their horizontal accuracy. Leica CS25 GNSS and Trimble Geo XH 2008 GPS (sub-meter accuracy capable devices) were used during the survey together with CartoPac software for collecting attribute data.

If a sanitary sewer system asset was indicated to exist from past data, but was not visible from the surface at the time of inspection, areas in the nearby vicinity were searched with digging tools and/or metal detectors.

Some manhole covers were located using these methods and were unearthed with hand tools and inspected. However, assets buried beyond 1-foot or otherwise inaccessible or still not able to be located were not unearthed and inspected. Such access issues were annotated in the geodatabase.

Other assets were located but the manhole covers could not be removed despite good faith attempts. Manhole covers that were unable to be removed as well as non-located assets are listed in the Field Work Summary Report which is included in Appendix I and graphically represented in Appendix E. See Section 4.3.5 for follow up efforts to locating and assessing these manholes.

In general, AECOM field staff followed the sanitary sewer system GeoBase map, and often extended asset location efforts beyond provided GPS positions. Although a considerable number of previously unmapped assets were located, it is possible additional unmapped assets may exist. This is particularly the case if assets were not present in government-furnished materials and their location was in significant variance from nearby mapped assets.

With respect to sanitary sewer system pipe geometry, above-ground component locations are helpful in locating buried pipe. However, accurate mapping of buried pipe is difficult in locations where pipes change direction between components, or where there are few above-ground features. Without excavations or exploratory equipment, it is necessary to rely on engineering judgment where existing mapping is insufficient. This is most likely to be the case with long sections of force mains before outfalling into a manhole. Often cleanouts are not visible or could be covered, so changes in pipe direction are difficult to confirm.

4.3.2 Pipe Inspection

As required, approximately 33 percent of the pipe network was assessed utilizing a relatively inexpensive alternative to CCTV for inspecting sewer pipes for basic condition characteristics,

pole-mounted camera imagery. AECOM utilized a camera mounted on a telescopic, pivoting rig (Envirosight(c) QuickView Haloptic) with a remote viewing interface.

Photographs (zoomed and un-zoomed) were taken from manholes looking into the upstream and downstream ends of pipes. Where the full length of pipe could not be illuminated by the pole camera, it was assumed that the condition that was observable was representative of the entire pipe segment.

The Haloptic camera used in this survey has a reported range of 400-feet but practically 50-100 feet. Viewing range is impacted by several factors including bends in the pipe, pipe diameter and manhole bench construction which can impact the angle in which the camera can be positioned.

Resources were focused on using the pole camera to assess a representative sample of the collection system (approximately 33 percent as required by the scope). Additionally, areas of concern as noted by the base (Section 4.2.1) were investigated.

The photographs taken were reviewed to evaluate condition and O&M items. The data was input into GPS devices which were subsequently uploaded to the GeoBase. Photograph references were recorded and input into the GeoBase to aid in referencing each pipe to the photograph.

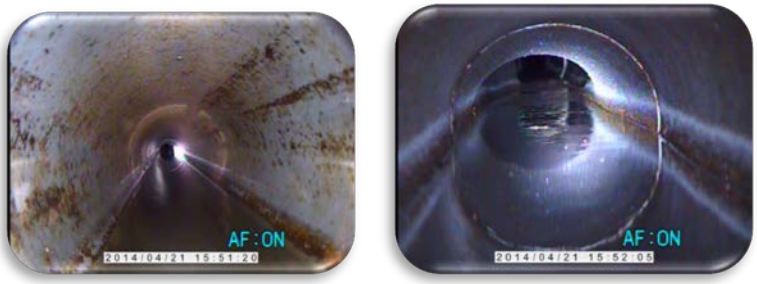


Figure 4-1: Example Pipeline Photographs

4.3.3 Manhole Inspection

The condition assessment was limited to visual inspection and was conducted from the ground surface to assess the condition of manhole covers and frames, chimney, cone, barrel, and benches (troughs). Photographs were taken of the chimney-cone interface and top down photos to capture the barrel, bench, and pipe entries and exits.

Data on surcharge evidence, depth from ground level and amount of build-up (e.g. sewage, debris) was recorded. Figure 4-2 provides example manhole photographs.

Figure 4-2: Example Manhole Photographs

4.3.4 Lift Station, Pretreatment Device, and Septic Tanks Inspection

Visual inspections were performed at lift stations. Pumps were operated and alarms were tested when applicable and accessible. AECOM was accompanied by utility personnel during the inspections. Descriptions provided in Appendix A on the probability of failure and criticality scoring sheets were used as a guide to evaluate structural, mechanical and electrical condition of lift stations. Photographs were taken of lift station structures, pumps, and electrical components.

Visual inspections were conducted for OWSs and grease traps from the surface (Figures 4-3 and 4-4). Observations were made on structural condition with specific attention paid to exposed concrete reinforcement or rust on metallic structural elements. Septic systems were assessed in a similar fashion.

Figure 4-3: Example Lift Station Photographs

Figure 4-4: Example Pretreatment Device Photographs

4.3.5 Follow Up

Following the primary field effort, AECOM requested that a work order be submitted to uncover and/or remove manhole lids on the remaining manholes that were unable to be accessed. The base confirmed that they were satisfied by AECOM's efforts and requested a list and map of the inaccessible manholes which can be found in Appendix C. AECOM recommends the additional manhole reconnaissance effort be conducted as soon as possible, followed by the manual update of the GeoBase data. Though there were a number of manholes that were unable to be assessed, the majority were evaluated and AECOM believes that an accurate representation of the base sanitary sewer system is portrayed herein.

5 MAP UPDATING AND DATA METHODOLOGY

5.1 Map Updating

Upon completion of field surveys, the sanitary sewer system geometry and attribute data were updated and examined with the aid of ESRI(c) ArcGIS 10.1 software. All mapping information collected as part of this project, together with site observations made during the field surveys, were used to verify and edit existing sanitary sewer system geometry and characterization data. Asset locations and associated attribute data within the sanitary sewer system was reviewed for accuracy and completeness. Although sub-meter capable devices were utilized in the field survey, the position of each asset was verified with imagery and photographs to ensure appropriate horizontal accuracy requirements are maintained. Linear segmentation rules were followed as described in Appendix A.

Each sanitary business table has an attribute field called "LOCATETYPE" for point-based assets which confirms whether the asset was an existing or new feature (added to the map during the field efforts), and whether it was field-verified by GPS, field-observed but not GPS-located, or if the feature was not verified, assessed, located, or is abandoned-in-place.

All point-based features had an existing Primary Key identifier in the furnished GeoBase. New features, when encountered, continued the end four-digit numbering scheme sequentially. Refer to Appendix G for the attribute data field names and definitions populated during this project.

5.1.1 Limitations and Areas of Mapping Uncertainty

During the course of survey, new assets were identified and mapped. To maintain GeoBase protocols new node features and any new pipe segments added to the map were given new unique primary key identifiers. New wastewater node and wastewater segment (WastewaternodeIDPK and wastewatersegmentIDPK) numbers were added to new features in sequential manner. More GeoBase information is provided in the separate GeoBase memo.

5.1.1.1 Unverified Assets

As described in Section 4.3.1, AECOM staff attempted to locate all previously mapped assets. However, in some cases not all assets could be located from the original mapping. In some instances there was strong evidence to suggest the previously mapped asset had been removed or was not correctly mapped. An example of this would be, recently demolished buildings where manholes and pretreatment devices had been removed. In those cases, the asset was removed from the map.

However, in other cases the asset could not be located but could still exist at a depth beyond the range of the assessment. In such cases the asset is shown on the updated mapping but is designated with a note. All items that could not be located but were believed to remain in service as well as those that were inaccessible due to a bolted/stuck manhole lid are listed in Appendix C. Therefore some uncertainly exists for certain asset locations.

5.1.1.2 Service Lines

One of the bases concerns was the lack of mapped service lines from buildings connecting to the main collection system. AECOM identified many service lines during the survey either from observations in manholes or locating cleanout points around buildings. However, there are still

instances where service lines have not been located around all buildings. Not all service lines connect to the main collection system at a manhole. Some connect via fittings outside of the manhole. This is likely the case in many instances. However, efforts were made with the pole camera to identify services connecting directly to pipes but this is often difficult if the service line has no flow or connects outside the viewing range of the pole camera.

Therefore, uncertainty remains as to the exact location of service lines at certain facilities. Table 5-1 lists the facilities which currently do not have service lines mapped or those mapped from record drawings but not verified from the field effort.

Table 5-1: Buildings with no Mapped Service Lines

Building Number	Building Name
2561	Fire Station
2252	Building Water Supply
2550	ACFT COR CON
2410	Maintenance Dock
2408	Maintenance Dock S/A
2536	SHP A/M ORGL
2521	SHP A/M ORGL
2326	Flight Simulator Training
1919	Technical Training Lab Shop
1918	Technical Training Lab Shop
TBD, East of Building 1900	OPC, BSE
790	Miscellaneous Recreation Building
690	Administration Office
196	Youth Center

5.1.1.3 Other Mapping Uncertainties

AECOM has made every effort to confirm the accuracy of the sanitary sewer system pipe routing and connectivity. Discussions were held with utility personnel during the field investigation to make a concerted effort to answer all uncertainties. However, there are certain areas where the routing and pipe connectivity are still uncertain. The following areas still require confirmation/verification:

Table 5-2: Routing Uncertainties

Location	Issue
Manhole 2469	There are two 4-inch PVC pipes going east out of the manhole. It is unclear which lines serve which buildings.
Building 632-634	It is unclear how building 634 service lines connect back to the main sewer discharge lines.
Building 471 and 472 Manholes 2541 and 2539	Swimming Pool area – Pipe routing unknown due to recent construction. As builts needed to confirm pipe configuration.

Refer to the GEOMINFOSRC attribute fields in the sanitary pipe business table for data sources and/or specific assumptions on geometry for each segment of pipe. Refer to Appendix D for an overall sanitary sewer system map.

5.1.2 Map Updating Summary

Overall, the sanitary system map has been updated and improved significantly using the best available data collected during this project.

A total of 30 miles of active pipelines (not including the 3.2 mile recycled water line from the wastewater treatment plant effluent to the golf course), 12 miles of abandoned pipelines, 476 active manholes, 6 lift stations, 15 pretreatment devices, and 2 septic tanks were characterized during the survey.

Prior to the incorporation of the 2006 Infrastructure Investment Plan and the information gathered from the base at the kick-off meeting, the GeoBase showed 36 miles of active pipelines and 8.5 miles of abandoned pipelines, 552 active manholes, 30 abandoned in place manholes, and 12 septic tanks.

After the incorporation of the 2006 Infrastructure Investment Plan and the information gathered from the base at the kick-off meeting, a total of 28 lift stations and 14 pretreatment devices were added to the GeoBase.

After the field investigation was complete, the total in service pipelines decreased by 17%, whereas the total abandoned pipelines increased by 41%. The total in service manholes decreased by 14%, whereas the total abandoned manholes almost doubled. This is mainly due to correcting asset operational status. Many assets originally thought to be in service were found to be abandoned because of either building demolition or system rehabilitation. Therefore, there were also multiple new assets found and assessed to complete the system. See Table 5-3 for a complete summary.

Table 5-3: Inventory Updates Post-Field Investigation

Asset Description	Original GeoBase (Prior to 2006 Infrastructure Investment Plan)	After 2006 Infrastructure Investment Plan	Total Assessed - 2014 Field Assessment	Net Change after 2014 Field Assessment
Active Pipeline (Miles)	36	36	30 (not including 3.2 mile recycled water line)	-17%
Abandoned Pipelines (Miles)	8.5	8.5	12	41%
Active Manholes	552	552	476	-13.80%
Abandoned Manholes	30	30	62	107%
Lift Stations	--	28	6 (22 not assessed)	0%
Pretreatment Devices	--	14	15	7%
Septic Tanks	12	12	2	-85%

5.2 Attribute Data Verification and Extrapolation

A significant amount of data has been updated and added during the course of the project to support providing an accurate inventory of the bases sanitary sewer asserts together with supporting the risk based assessment.

While much of the data was observed in the field or taken from other sources (e.g. as-built record drawings, utility personnel knowledge) a number of engineering assumptions were required. Additionally, data extrapolation has been utilized, where appropriate, to supplement observed conditions to non-observed assets. These are described in the following subsections.

5.2.1 Pipe Data Gaps and Engineering Assumptions

There is always a possibility that an incorrect pipe material, install date, and/or pipe size has been allocated to some pipes within the map.

It should be noted that none of the piping in the original furnished GeoBase had an install date (date acquired attribute field), material, or diameter allocated. These data gaps were first filled in according to the provided AutoCAD files and an Infrastructure Investment Plan performed by CH2MHill in 2006. Further methods of filling in data gaps and verifying data from this investment plan included direct field observation of material and/or size (from pole camera inspection and observations in manholes), available shop and record drawing files, and discussions with utility personnel.

Additionally, AECOM used several analysis methods to make reasoned assumptions on diameter, material, and/or install date to achieve 100% data completion. Of these, the most important and required by the prioritization model is the pipes install date and material, for determining an estimated remaining service life. The majority of data has been physically confirmed, but information sources should be noted. In some cases, assumptions had to be made and these are noted in the GeoBase.

It is important that any omissions regarding pipe material and size are corrected if data becomes available going forward. Occasions where pipes are exposed during construction should be used as an opportunity to confirm if the material and size are correctly mapped.

5.2.1.1 Installation Date

The first step taken was to assign all available assets' information from the Infrastructure Investment Plan performed by CH2MHill in 2006. When information was not available, the next step was to assign influent/effluent lines of lift stations and pretreatment devices the known age of the asset to which they were connected (such as indicated on the manufacturer's identification plate or other source, where available).

Subsequently, this data and all other furnished and incorporated data (from record drawings) was analyzed for trends of material and install date. In many instances, the install date did not correlate with the material type. For instance, a pipe listed as PVC was also listed as installed in the 1950's. Using engineering judgment, these discrepancies were analyzed and a new year or material type was assigned based on connecting pipes and surrounding rehabilitation jobs in the nearby areas or even connecting to the pipe with the discrepancy. Manhole ages assigned by giving the manhole a corresponding age to the connecting pipes unless survey photos showed a recent rehabilitation.

Using the aforementioned methods, all in-service, USAF-owned sanitary sewer mains and services were assigned an install date. From there, unless other supporting data was available, AECOM made assumptions on pipe material based on analysis of nearby buildings build dates and lift station install dates, and surrounding known materials in adjoining pipes. Typically, in lieu of any other supporting data, the following assumptions were made.

- PVC (or similar plastic-based material)-appearing pipes were assigned an install year of 1990, i.e., the median of typical historical use (1980 to current).
- Metallic (i.e., cast iron, ductile iron, galvanized steel, etc.)-appearing pipes were assigned an estimated install date of 1980, i.e., the median of typical historical use (1970 – 1990).
- Concrete-appearing pipes (e.g., asbestos cement) were assigned an estimated install year of 1970, i.e., the median of typical historical use (1960 – 1980).
- Clay-appearing pipes were assigned and estimated install year of 1950, i.e., the median of typical historical use (1940 – 1960).

Refer to the AGEINFOSRC attribute fields in the sanitary pipe business table for data sources and/or specific assumptions on installation dates for each segment of pipe. Appendix D includes sanitary sewer infrastructure maps broken down by pipe installation date.

5.2.1.2 Pipe Material

The vast majority of pipe materials were observed from manholes and pole camera observations. However, there were cases where not every pipe could be observed. Examples include, building services connecting to the main collection system outside of a manhole and where manholes could be not be located/unearthed. The 2006 Infrastructure Investment Plan material information was utilized for materials not observed. However, when material was not listed on this report, engineering assumptions were made to complete pipe materials. Depending on the specific pipe in question, the following assumptions were made:

- Pipes without a material were assumed to have the same material as those they are connected to, with the same installation date.
- Pipes without a material but known to be installed after 1980 were assumed to be PVC.

Refer to the MATLINFOSRC attribute field in the sanitary pipe business table for data sources and/or specific assumptions on materials for each segment of pipe. Appendix D includes sanitary sewer infrastructure maps broken down by pipe material.

5.2.1.3 Pipe Diameter

Similar to material, pipe sizes were observed from manholes and pole camera observations. However, where observations could not be made and/or other sources (record drawings, base knowledge) were not available, the following engineering assumptions were made:

- Services were assumed 6 inches in diameter;
- Connecting pipe segments without diameter data, were assumed the same diameter as in-line pipes directly upstream/downstream;

- Other pipe size gaps not determined through field observation or other supporting information were assigned a size based on reasoned assumptions and adjoining pipes of known size.

Refer to the DIAMINFOSRC attribute field in the sanitary pipe business table for data sources and/or specific assumptions on sizes for each segment of pipe. Appendix D includes sanitary sewer infrastructure maps broken down by pipe size.

5.2.1.4 Extrapolation of Pipe Condition

Linear segmentation aids in data extrapolation, particularly in the case of sanitary sewer pipes where data can be extrapolated to other segments with similar data attributes. Condition data obtained from CCTV footage or pole camera photographs of a pipe segment can be extrapolated to connecting pipe segments along the same contiguous stretch of pipe where material and age are the same.

Typically, data extrapolation of pipe condition should only occur within the same sub-basin. If a sufficient sample population of similar material and age is collected, condition could be extrapolated across the entire sanitary sewer system, provided that pipe segments have been inspected in each sub-basin, and flow characteristics and ground conditions are similar. Caution should be taken, however, where flow characteristics and ground conditions vary between sub-basins. Such variables can impact pipe condition differently even if the age and material are the same across sub-basins. In such cases, data extrapolation is not advisable. Some exceptions could be made where sub-basin size is considered small and in close proximity to sub-basins where pipes have been inspected.

The project scope called for assessing the condition of approximately one-third of the total pipe length via pole-camera inspection. Condition assessments from pole-camera inspections, reasonably extrapolated, extended the total percentage of pipes evaluated to approximately 41 percent (by length).

AECOM recommends that any future, large-scale surveys intended to inspect sanitary sewer system condition should be carefully planned and attempt to cover all ranges of pipe age and material across each sub-basin. The pipe business table field “CONDINFOSRC” indicates where condition information was obtained. If the pipe was inspected via pole camera, “Physical Confirmation or Tracer” would be selected. If the pipe has extrapolated condition data, “Surrounding/Connecting Facilities or Pipes” would populate the CONDINFOSRC field.

5.2.1.5 Extrapolation of Pipe Buildup

Extrapolation of buildup data is not scientifically based and is therefore much more difficult. Therefore, it is, for the most part, not considered for this report. However, there are certain instances when extrapolating buildup data to non-visually assessed pipelines makes sense and could save investigation and rehabilitation costs in the future. The process taken to extrapolate the buildup level in the pipelines included analyzing all manholes listed with severe buildup. If the photos showed the buildup extending into the pipeline, the pipeline was then rated to match the level of buildup. The only other extrapolation method was used near grease traps. If grease (FOG) was found downstream of a grease trap, the pipeline and any other asset between the grease trap and the reasonably close, visually assessed manhole was categorized with the same severity level.

5.3 Future Map Updating

The updated map provided to the base is only accurate at the time of the survey. Over time, changes will be made to the wastewater system due to upgrades, repairs, demolition, and construction.

It is important to update the map when changes occur and to correct any discrepancies. As discussed in more detail previously (Section 3.5.3), it is recommended that Sheppard AFB ensures that sanitary sewer system data and mapping remains accurate.

6 SYSTEM INVENTORY, CONDITION, AND PRIORITIZATION MODEL RESULTS

AECOM's inventory and assessment of the Sheppard AFB sanitary sewer system resulted in an updated map and asset inventory, along with a risk-based assessment. This data is captured in the updated GeoBase submitted in draft with this report. Figure 2-1 is a detailed, comprehensive map of the sanitary sewer system.

As detailed in Section 4.3, the field survey consisted of verifying and non-intrusively inspecting known sanitary sewer system assets. Section 3.5 and Appendix A specify the assessment criteria used to determine repair/replace and O&M requirements.

Complete sanitary sewer system maps with pipe, manhole, lift station, and other asset locations, based on updated mapping, can be found in Appendix D.

6.1 General Field Survey Observations, Inventory, Condition Data, and Prioritization Results

The field survey was conducted at the end of April 2014. The data collected during the field survey has been input into the updated GeoBase and into the prioritization model. Specific observations for each asset type are summarized in the following Sections 6.1.1 – 6.1.5, together with a selection of pertinent data and followed by the results from the prioritization model. Figure E-1 in Appendix E provides photos with locations of specific issues noted during the field survey.

Figures 6-1 through 6-4, along with Tables 6-6, 6-10, 6-13, and 6-17 present the results of the prioritization model for R/R and O&M requirements in graphical and tabular format. The tables provide the numbers and percentages of those assets that were assessed and inspected in this project. The figures and tables distinguish between assets assessed on a complete dataset and those incompletely assessed.

A summary report sheet for each assessed asset can be found in the separate reports in Appendix G. The summary sheets provide the photographs taken during the assessment and pertinent information obtained during the assessment.

6.1.1 Pipes

6.1.1.1 General Observations

Several deficiencies were noted during the field survey, with the most common being cracks and/or wall displacements. The most significant problems noted were on the pipes listed below. Each asset is referred to by an identification number assigned to it in the GeoBase. Refer to Figure E-1 in Appendix E.

- Pipe 3130 is a 6-inch pipe between Manhole 2466 and Building 2538 near the north end of the base and the tarmac.
- Pipe 4417 is a 4-inch PVC between Manholes 2323 and 2326 on the west side of the base near the privatized housing.
- Pipe 2407 is an 8-inch vitrified clay pipe between Manholes 2967 and 2968.
- Pipe 4312 is a 4-inch pipe between Manhole 2322 and Building 2135 near the main entrance of the base on the west side.

Severe buildup was noted in several pipe segments, either from sewage, sediment and/or roots. Examples of severe buildup were noted in the pipes listed below.

- Pipe 5669 is a 15-inch concrete pipe that crosses under Birdwell Road and serves as a trunk line for the buildings along Heritage Way.
- Pipe 5742 is an 8-inch vitrified clay pipe downstream of the grease trap servicing Building 239.
- Pipe 4933 is a 6-inch polyvinyl chloride lateral servicing Building 922.
- Pipe 5735 is an 8-inch polyvinyl chloride pipe downstream of the grease trap servicing Building 1320.
- Pipe 4940 is a 6-inch polyvinyl chloride pipe that is adjacent to Pipe 5735, servicing Building 1320.
- Pipe 4548 is a 15-inch polyvinyl chloride pipe servicing Building 791.
- Pipe 4081 is a 21-inch polyethylene interceptor line running south along Avenue J.

6.1.1.2 Inventory and Condition Data

Tables 6-1 summarizes the length of wastewater mains, those in-service and abandoned, located within the base and housing areas. Tables 6-2 through 6-5 only consider pipes that are in service and on base. Privatized housing lines, which were spot-investigated at connection points to the base sanitary sewer system for map clarity, were also excluded. These tables summarize the length of mains based on diameter, material, and approximate remaining service life. See Figures D-1, D-2, D-3, and D-4 (Appendix D) for identification of pipes by known/estimated decade of install, material, size, and category, respectively.

Table 6-1: Sanitary Sewer Pipe GeoBase Basic Inventory

Operational Status	Approximate total length (Miles)	
	Linear totals (miles)	Percentage of Total
USAF-Owned, In -Service Lines	30	45%
USAF-Owned, Abandoned Lines	12	18%
Off Base / Private Housing Lines	24.5	37%
Overall Total	**66.5**	**100%**

Footnotes (general):
The status of privatized housing sewer lines were not investigated. USAF lines reported as abandoned were typically only investigated and characterized up until their point of connection with in-service USAF lines.

Table 6-2: Sanitary Sewer Pipe Category Inventory (USAF Owned and In-Service)

Category	Approximate Total Length (miles)
Laterals	10.3
Mains	14.6
Trunks	4.0
Inter.	3.0
Main Effluent Lines	1.4
Total	**33.3**

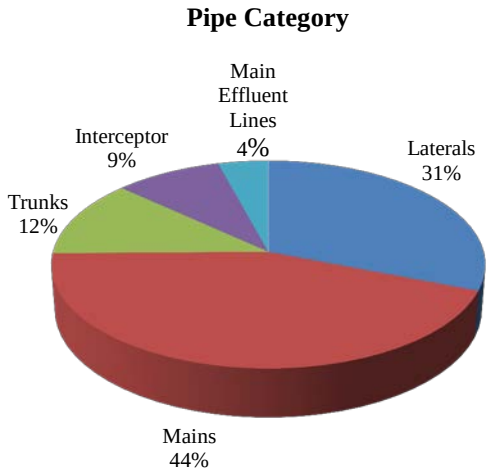


Table 6-3: Sanitary Sewer Pipe Size Data (USAF Owned and In-Service)

Diameter	Approx. Length (Miles)
4" and less	5.4
6"	10.8
8"	9.0
10"	2.8
12"	1.3
15"	2.3
18"	0.2
21"	0.5
24"	0.9
Total	**33.2**

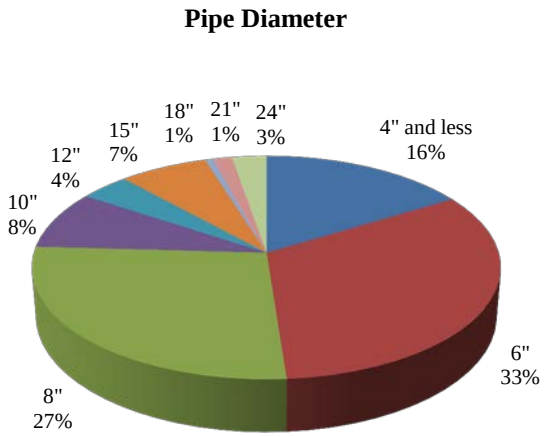


Table 6-4: Sanitary Sewer Pipe Material Data (USAF Owned and In-Service)

Material	Approx. Length (Miles)	Percentage of Total %
PVC	20.32	61%
HDPE	1.64	5%
Vitrified Clay	8.88	27%
Cast Iron & Ductile Iron	1.23	4%
Concrete	1.13	3%
Total	**33.20**	**100%**

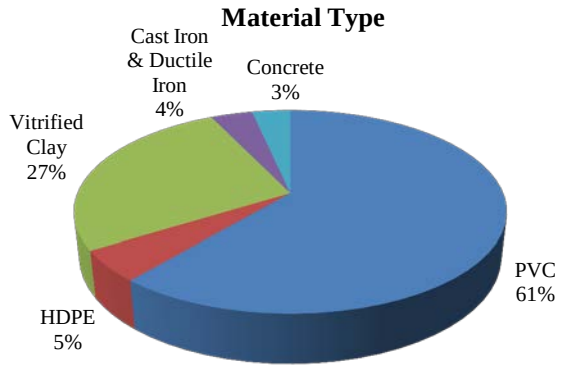
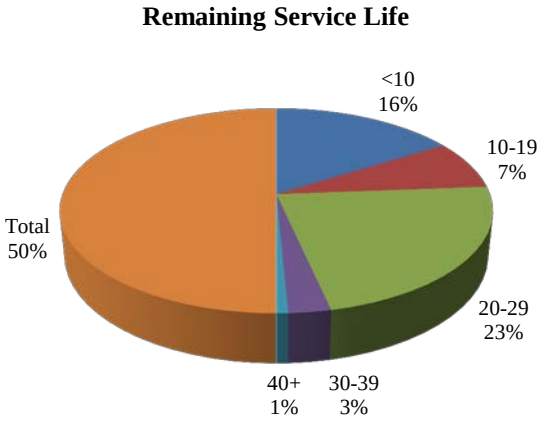


Table 6-5: Sanitary Sewer Pipe Percentage of Remaining Service Life Data

Remaining life (yrs.)	Approx. Length (Mi.)
<10	10.7
10-19	5.1
20-29	15.1
30-39	1.8
40+	0.5
Total	**33.2**

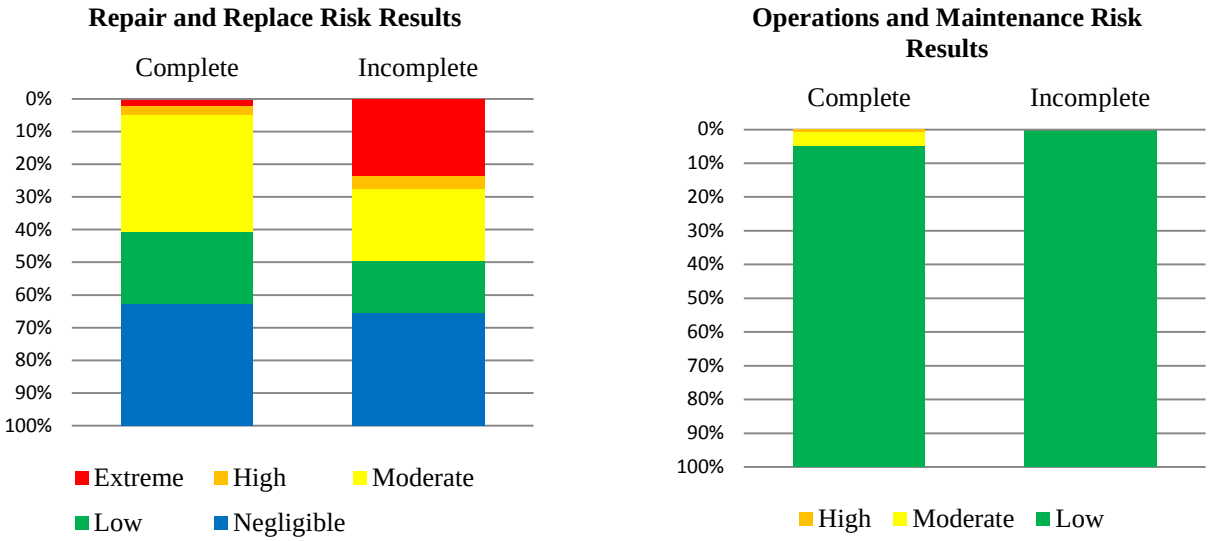
[1] See Sections 3.2.3.1 for a full description on service life estimates and assumptions.



During the field survey, pipes were assessed based on level of build-up of sewage, roots, and sediment. See Appendix F for a map showing O&M risk scores by color.

6.1.1.3 Prioritization Results

Figure 6-1: Repair/Replace and O&M Risk Results



1: Pipes that are incompletely assessed are those where pole camera was not available, or condition was not able to be extrapolated. Incompletely assessed pipes are only assessed on remaining service life.

Table 6-6: Repair/Replace and O&M Risk Results for Pipes

R/R Risk	Completely Assessed		R/R Risk	Incompletely Assessed	
	Length	Percentage		Length	Percentage
Extreme	1,796	2%	Extreme	21,995	24%
High	2,296	3%	High	3,709	4%
Moderate	29,545	36%	Moderate	20,228	22%
Low	18,133	22%	Low	14,811	16%
Negligible	30,872	37%	Negligible	31,883	34%
Total	82,642	100%	**Total**	92,626	100%
O&M Risk	**Completely Assessed**		**O&M Risk**	**Incompletely Assessed**	
	Length	**Percentage**		**Length**	**Percentage**
High	564	1%	High	0	0%
Moderate	2,880	4%	Moderate	0	0%
Low	68,981	95%	Low	102,897	100%
Total	72,425	100%	**Total**	102,897	100%

The prioritization model results indicate there is generally low risk from the piping system when pipes are completely assessed. Those incompletely assessed high and extreme R/R risk, and high O&M risk segments are recommended to be prioritized for full inspection to fill data gaps and thus generate more reflective completely assessed risk scores, as described in Tables 3-11 and 3-12.

6.1.2 Manholes

6.1.2.1 General Observations

During visual inspection of manholes various condition and O&M deficiencies were found, ranging from very minor to some significant structural defects as well as sewage buildup. Of the 399 visually inspected manholes, 12% had cracks and/or pieces of structural material falling into the manhole from the chimney, cone, or barrel. In Figure E-1, the pictures of Manhole 2967 (receives flow from Lift Station 2008, located just north of 17th Avenue) and Manhole 2757 (connected to the plant's effluent pipe) are examples of severe structural defects on chimney, cone, and barrel components.

Another deficiency found during the inspection were broken and damaged covers/frames. In some cases these present a health and safety issue. These were previously listed in the Executive Summary.

Active inflow/infiltration was observed through joints and structural components within manholes. An example of this is manhole 3079 near Building 602 however a total of 2% of manholes showed either moderate or significant I&I evidence.

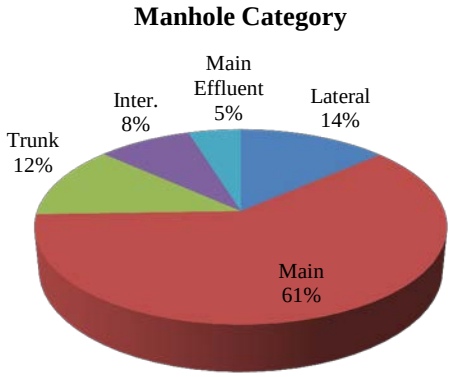
The following data summarizes asset inventory numbers and provides a sample of manhole condition information collected during the GPS survey.

6.1.2.2 Inventory and Condition Data

Table 6-7 summarizes manholes on pipe category determined for criticality scoring (Section 3.3.1).

Table 6-7: Manhole Category Data

Category	Total
Lateral	65
Main	291
Trunk	58
Inter.	41
Main Effluent	23
Total	**478**

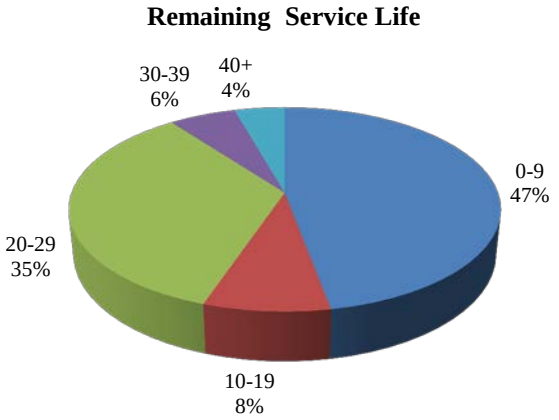


Tables 6-8 and 6-9 illustrate data on some major R/R and O&M elements. This data, along with several other criteria, was used to establish risk scores for each manhole. This is described further in Sections 3.2 through 3.5.

Table 6-8: Manhole Remaining Service Life Data

Remaining Life (yrs.)	Total
0-9	225
10-19	39
20-29	165
30-39	28
40+	21
Total	**478**

[1] See Sections 3.2.3.1 for a full description on service life estimates and assumptions.

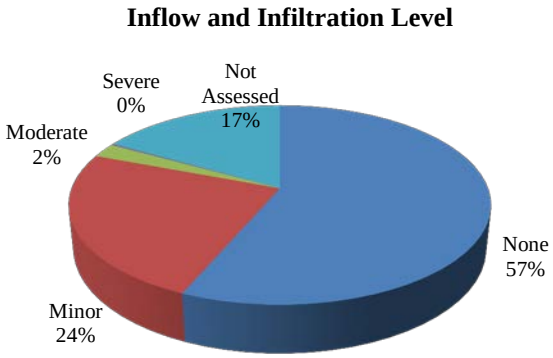


I&I evidence and level of severity in manholes is typically considered an item remedied through O&M practices, such as manhole sealing, frame realignment, or water-tight covers.

Table 6-9: Manhole Inflow and Infiltration Data

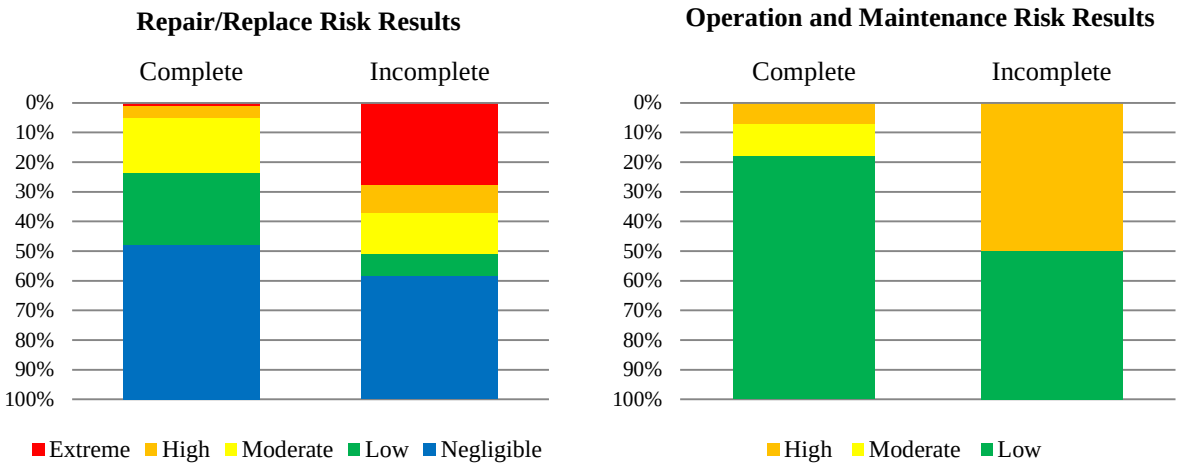
Inflow and Infiltration Level[1]	Total
None	270
Minor	116
Moderate	11
Severe	1
Not Assessed	80
Total	**478**

[1] See Sections 3.2.3.1 for a full description on service life estimates and assumptions.



6.1.2.3 Prioritization Results

Figure 6-2: Repair/Replace and O&M Risk Results for Manholes



1: Manholes that are incompletely assessed are the few where a substructure was not visible (e.g., a bench covered with debris and water) or was otherwise inaccessible or unable to be located. The base was notified of these shortly after the return of the field survey. Inaccessible manholes are assessed on remaining life alone. This list is included in Appendix C.

Table 6-10: Repair/Replace and O&M Risk Results for Manholes

R/R Risk	Completely Assessed		R/R Risk	Incompletely Assessed	
	Number	Percentage		Number	Percentage
Extreme	5	1%	Extreme	26	28%
High	16	4%	High	9	10%
Moderate	70	18%	Moderate	13	14%
Low	93	24%	Low	7	7%
Negligible	200	52%	Negligible	39	41%
Total	384	100%	**Total**	94	100%
O&M Risk	**Completely Assessed**		**O&M Risk**	**Incompletely Assessed**	
	Number	**Percentage**		**Number**	**Percentage**
High	29	7%	High	1	50%
Moderate	43	11%	Moderate	0	0%
Low	325	82%	Low	1	50%
Total	397	100%	**Total**	2	100%

1: Total number of manholes may differ from O&M to R/R assessments. This is due to the manholes that were unable to be assessed due to problems with locating, accessibility, or visibility. The total number of manholes assessed may also differ from the total number of USAF operated manholes due to these same factors.

The prioritization model results indicate there is a generally a low risk when manholes are completely assessed. Those incompletely assessed high and extreme R/R risk, and High O&M risk manholes are recommended to be prioritized for full inspection to fill data gaps and thus generate more reflective completely assessed risk scores, as prescribed in Tables 3-11 and 3-12.

6.1.3 Lift Stations

6.1.3.1 General Observations

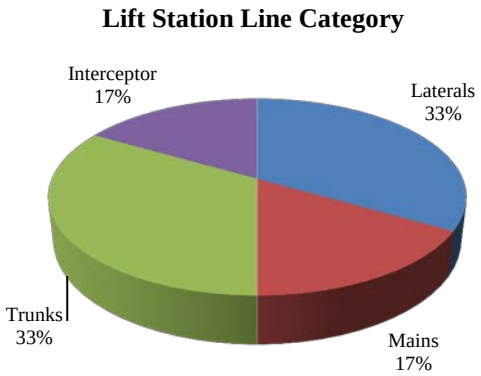
The visual inspections of lift stations highlighted various degrees of deterioration with the condition of the electrical, mechanical, and structural components of some lift stations. LS 3034, located in Building 2008, and LS 3070, located adjacent to Building 2414, were observed to be in poor condition.

6.1.3.2 Inventory and Condition Data

Tables 6-11 and 6-12 summarize inventory and provide a sample of the criteria used to field-assess lift stations.

Table 6-11: Lift Station Line Category

Lift Station Category	Total
Laterals	2
Mains	1
Trunks	2
Interceptors	1
Total	**6**

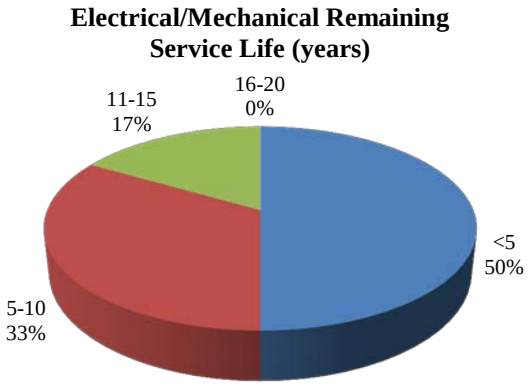


Electrical and mechanical components in lift stations are often the highest stressed components and the ones requiring the most frequent replacements. Table 6-12 displays known percentage of remaining service for base lift station electrical/mechanical components.

Table 6-12: Lift Station Electrical/Mechanical Remaining Service Lives

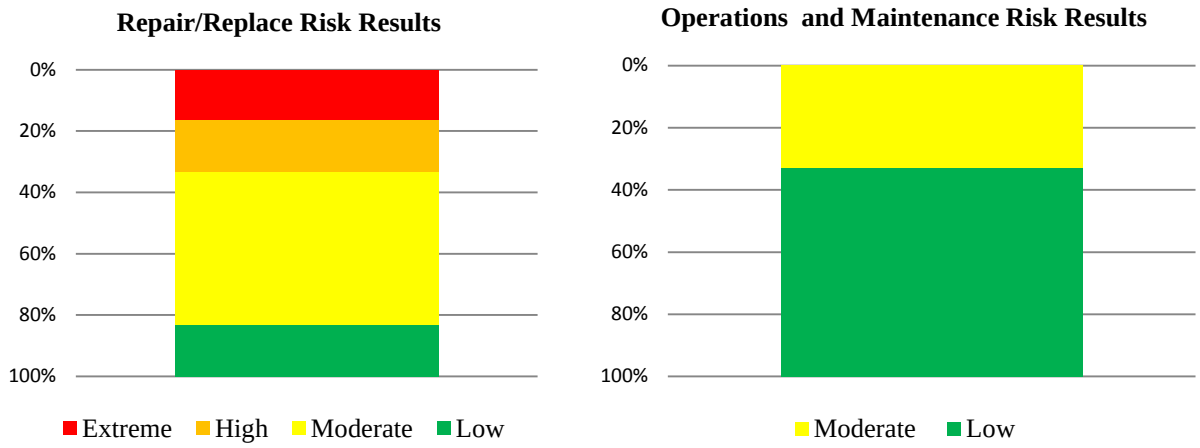
Remaining Service Life[1] (years)	Number of Lift Stations
<5	3
5-10	2
11-15	1
16-20	0
Total	**6**

[1] See Sections 3.2.3.1 for a full discussion on service life estimates and assumptions.



6.1.3.3 Prioritization Results

Figure 6-3: Repair/Replace and O&M Risk Results for Lift Stations



1: There are no incompletely assessed lift stations since the only lift stations that were assessed were those that the base requested (6 out of 28). The remaining 22 are considered not assessed rather than incompletely assessed.

Table 6-13: Repair/Replace and O&M Risk Results for Lift Stations

R/R Risk	Completely Assessed	
	Number	Percentage
Extreme	1	17%
High	1	17%
Moderate	3	50%
Low	1	17%
Negligible	0	0%
Total	6	100%
O&M Risk	**Completely Assessed**	
	Number	**Percentage**
High	0	0%
Moderate	2	33%
Low	4	67%
Total	6	100%

The prioritization model results indicate there is a low to moderate risk with the completely assessed lift stations. Those few high and extreme R/R risk, and high O&M risk lift stations are recommended to be prioritized for full inspection and repair or replacement to relevant parts of the lift station.

6.1.4 Pretreatment Devices

6.1.4.1 General Observations

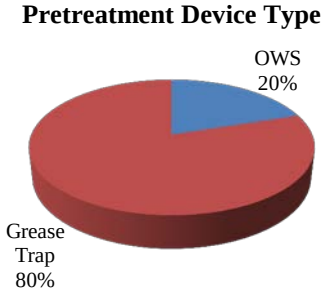
Typically, observations on condition of OWS's and grease traps are limited due to restricted access manholes and opportunities to visually observe all aspects of the devices. However, a number of deficiencies were noted including grease trap overflows, structural and mechanical deterioration of OWS' and grease traps, and numerous sewer pipes with FOG buildup downstream due to the grease trap overflows.

6.1.4.2 Inventory and Condition Data

Tables 6-14 through 6-16 summarize inventory data and provide a sample of criteria used in field-assessing pretreatment devices.

Table 6-14: Pretreatment Device Sub-Categories

Pretreatment Device Type	Count
OWS	3
Grease Trap	12
Total	**15**

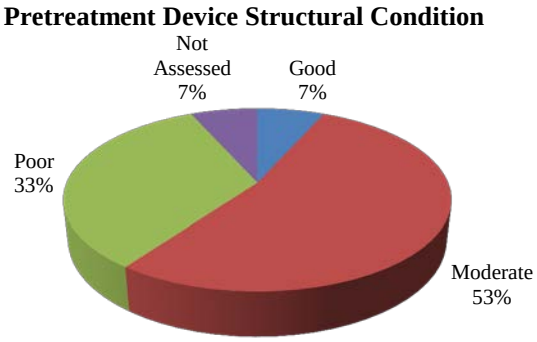


Structural type and observed integrity is an important indicator for the device providing leak-free performance. Table 6-15 summarizes observed pretreatment device structural condition.

Table 6-15: Pretreatment Device Structural Condition

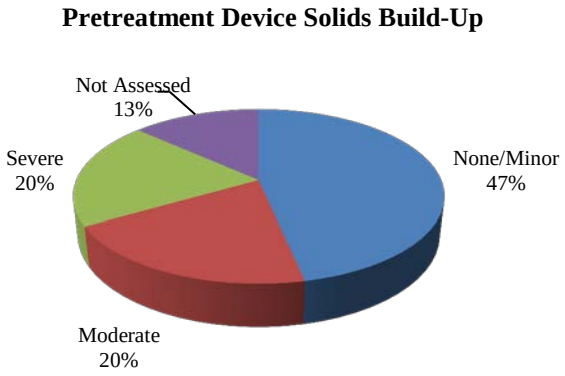
Structural Condition[1]	Number of Devices
Good	1
Moderate	8
Poor	5
Not Assessed[2]	1
Total	**15**

[1] Full descriptors for observed structural condition are listed in Appendices A and B.
[2] Some pretreatment devices were not accessible and/or visible.



Excessive solids build-up hinders capacity and performance, and is an indicator that the pretreatment device is overdue for the O&M practice of pump-outs and pressure cleaning. Table 6-16 summarizes observed solids build-up in base pretreatment devices.

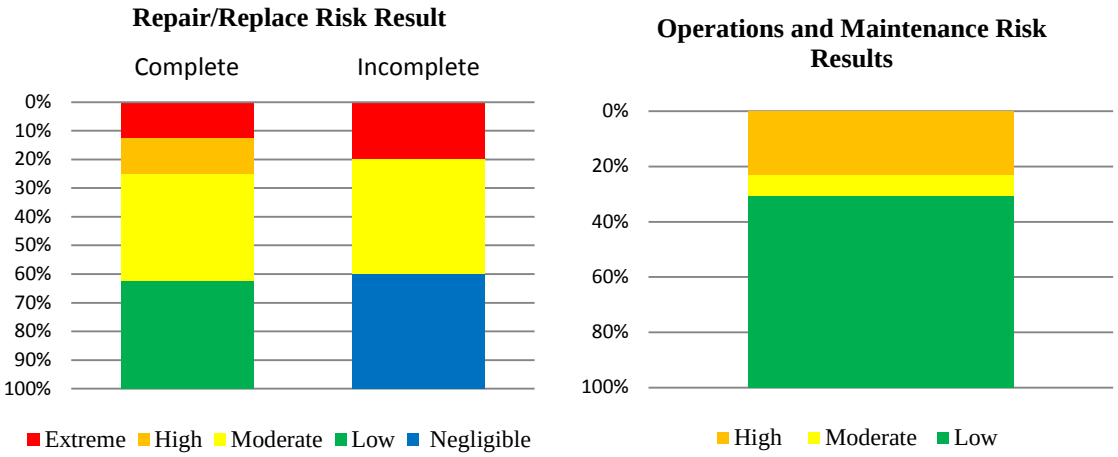
Table 6-16: Pretreatment Device Solids Build-Up



Complete sanitary sewer system maps with manhole, lift station, and other asset locations, based on updated mapping, can be found in Appendix D.

6.1.4.3 Prioritization Results

Figure 6-4: Repair/Replace and O&M Risk Results for Pretreatment Devices



1: Pretreatment devices that are non-assessed are the few where a substructure or control panel was not visible or otherwise inaccessible without escort, etc. and base personnel did not have knowledge of the component's condition.

Table 6-17: R/R and O&M Risk Results for Pretreatment Devices

R/R Risk	Completely Assessed		R/R Risk	Incompletely Assessed	
	Number	Percentage		Number	Percentage
Extreme	1	13%	Extreme	1	20%
High	1	13%	High	0	0%
Moderate	3	38%	Moderate	2	40%
Low	3	38%	Low	0	0%
Negligible	0	0%	Negligible	2	40%
Total	**8**	**100%**	**Total**	**5**	**100%**
O&M Risk	**Completely Assessed**		**O&M Risk**	**Incompletely Assessed**	
	Number	**Percentage**		**Number**	**Percentage**
High	3	23%	High	0	0%
Moderate	1	8%	Moderate	0	0%
Low	9	69%	Low	0	0%
Total	**13**	**100%**	**Total**	0	0%

[1] Total number of pretreatment devices may differ from O&M to R/R assessments. This is due to devices that were unable to be assessed due to problems with accessibility, or visibility.

The prioritization model results indicate there is generally a low risk with the exception of three grease traps rated in the high risk category when pretreatment devices are Completely Assessed. Some R/R risk numbers were returned as incomplete assessments and approximately one-half of the grease traps were rated as extreme or high risks. These high and extreme R/R risk pretreatment devices are recommended to be prioritized for full inspection to fill data gaps for the incompletely assessed devices as described in Tables 3-11 and 3-12.

6.1.5 Septic Tanks

Typically, observations on condition and performance of septic systems are limited due to restricted access manholes and opportunities to observe the entire device. The original GeoBase provided by the base showed 12 septic tanks. However, these septic tanks were inspected and all but two had been converted to standard sanitary sewer systems. The remaining two septic systems were not fully accessible, but appeared to be in working condition with no issues noted by base personnel.

The prioritization model results for septic tanks indicate there is no significant risk for the two remaining septic tanks. However, neither were able to be completely assessed due to proximity on base or lack of available and accessible information.

Sanitary sewer system maps with assets color-coded by their corresponding R/R and O&M risk ranges are located in Appendix F.

7 RECOMMENDATIONS AND CONCLUSIONS

AECOM advocates using the prioritization model as a tool for prioritizing repair/replace and O&M requirements. Continual updates to the GeoBase and the use of other recommended tools for tracking processes are essential for efficient sanitary sewer system management. The results of the prioritization model have led to a number of recommendations for repair/replacement and O&M actions.

Further recommendations are provided based on other observations and information collected during the assessment. Additionally, general recommendations are made to improve and optimize ongoing data collection and management to support effective decision making.

7.1 Repair and Replace Recommendations

Following the results of the prioritization model, presented in Section 6, a number of recommendations, including projects have been established. This section describes recommended projects for cleaning/televising followed by potential repair/replacement based on the prioritization model results with the identification of conceptual rehabilitation needed for sanitary sewer assets with the highest risk.

7.1.1 Sewer Pipes

Of the nearly 47 miles of active sewer lines at Sheppard AFB, approximately one third of the total length of pipe were visually inspected using photos taken with a pole camera. Data was extrapolated to connecting pipe segments with the same age and material. Data extrapolation is discussed in further detail in Section 5.2.

Table 7-1 shows the extreme and high risk sections of pipe to be considered for rehabilitation based on the prioritization risk score.

Table 7-1: Extreme and High Risk Pipes

Pipe Sewer GeoBase ID	Description and Location	Risk Score (Risk Category)	Issues/Criticality
Pipe 3130	6-inch vitrified clay lateral pipe located under tarmac to Building 2538	24 (Extreme)	• Severe damage including sediment buildup • Highly critical due to location next to runway apron
Pipe 5084	10-inch concrete pipe upstream of lift station and Building 2008	22 (Extreme)	• Moderate corrosion • Interceptor line that serves the northern area of the base • Runs beneath a primary road
Pipe 2596	15-inch concrete pipe running east, just south of Building 1956	21 (Extreme)	• Minor Corrosion and possible • Joint offset • Trunk line adjacent to primary road
Pipe 5669	15-inch concrete pipe, just upstream of Pipe 2596 .	21 (Extreme)	• Minor corrosion • Joint offset • Trunk line that runs beneath primary road
Pipe 5593	12-inch vitrified clay pipe that runs west just north of 1st Ave.	18 (High)	• Minor breaks/cracks • Moderate joint offsets • Trunk line that services dormitories east of Ave. J and runs beneath primary road.

Typically, a single segment of pipe would not get repaired or replaced in isolation. Rather, a project made up of multiple segments, would be programmed for replacement. Each of the highest risk pipes are either extreme or high risk which means that a repair/replacement is recommended.

A set of projects have been developed based on high and extreme risk pipes that are grouped in a common area and exhibiting common corrosion and/or crack patterns. It should be noted that these projects include but are not limited to the pipes listed in the table above. Costs have been developed and estimated for the base's consideration. Table 7-2 and Figure E-2 summarize the project locations, details of the inspection/repair/replacement, and cost.

Each project should be subject to a thorough engineering analysis, including a CCTV survey to confirm pipe condition, and to determine that the recommended solutions are technically appropriate. All pipes to be investigated, shown on Figure E-2, should be cleaned and televised; followed by a repair and replacement based on the results of the cleaning and televising project.

Additional projects were added to Figure E-2 and Table 7-3 to inspect by pole camera where there was a high concentration of inaccessible manholes. These areas have manholes that either were not located during the assessment or were not able to be opened. *This recommendation is a high priority because it represents the portion of the base that was not able to be accessed and assessed.*

There are no pipes recommended for replacement that are situated under runway and apron pavements. However, if this situation arises and this type of repair is ever added to the recommendations, micro-tunneling or pipe boring should be considered to prevent disturbance to the pavement and the base's flying mission. Such techniques can add significant costs to the project.

PACES, developed by AECOM, is an integrated cost estimating solution developed for facility and infrastructure construction and renovation projects, and is widely used for budgetary cost estimates by the Air Force, Navy, and Army Corps of Engineers. The PACES system uses a parametric methodology adjusting cost models for estimating requirements. Costs can be adjusted for the required locations. Markups and escalation are automatically applied. All costs listed in the tables shown in Appendix H were derived through the use of this program and its inherent assumptions. These costs are to be taken as budgetary costs only.

Unit costs were used to develop budgetary/estimated project costs. For pipes, the approach taken to develop a cost per linear foot was based upon the following parameters:

- Develop a cost on a pipe segment length of 1,000 linear feet (LF)
    - PVC sewer pipe
    - Pipe depth is 8 feet (common depth of pipes at Sheppard)
    - Four manholes (at 8 feet deep) included along the 1,000 LF length
    - Included replacing and disposing of an existing (non-asbestos) pipe (1,000 LF)
    - Dewatering of excavations and manhole bypass pumping included
- Divided total cost by 1,000 to obtain cost per unit length

Since costs to construct under pavement can be substantially higher than under green space, unit prices were formulated for both conditions. CIPP lining is commonly used to rehabilitate sewer pipes by extending original service life; therefore, unit costs were developed for different sizes of CIPP pipe and applied to recommended projects, as appropriate.

Appendix H outlines the unit costs developed for each pipe diameter, CIPP costs per unit length, as well the parameters used by PACES.

Table 7-2: Summary of Pipe Replacement/Repair Projects

Project Priority	Description	Justification	Estimated Cost
1	Approximately 1,600 LF of 10-inch concrete interceptor pipe connecting to the northern portion of the base just upstream of the lift station in Building 2008.	• Rehabilitate with CIPP Liner • Severe surcharging for the duration of the inspection. Cause is unknown but further investigation is required. • These select pipes have a high criticality as they are classified as an interceptor and are in very close proximity to airfield operations.[1]	CCTV: $5,600 Project: $158,000 Total: $164,000
2	Approximately 500 LF of 8-inch vitrified clay lateral line pipe segments serving Buildings 996 and 988.	• Replace all segments with PVC • Pipe is heavily deformed including joint offsets and cracks. • Pipe sections are located near airfield operations.	CCTV: $1,800 Project: $41,100 Total: $43,000
3	Approximately 5,000 LF of 15-inch concrete trunk line pipe segments and smaller diameter vitrified clay lateral lines. This portion runs east just north of Missile Road.	• Rehabilitate with CIPP Liner • Concrete pipe is reaching the end of its service life. • Minor deterioration throughout concrete pipe. Condition is unknown in VC lateral lines but they are reaching the end of their service life.	CCTV: $17,500 Project: $589,000 Total: $607,000
4	Approximately 450 LF of 8-inch concrete main line pipe segments near Base Exchange Building 239, downstream of the grease trap.	• Replace all segments with PVC. • Pipes were selected due to their close proximity to the grease trap and the buildup/corrosion noted in the pipes in this area. • Pipes are nearing the end of their service life.	CCTV: $1,600 Project: $43,000 Total: $45,000
5	Approximately 550 LF of 6-inch vitrified clay lateral line pipe segments servicing Building 61 and crossing under Bridwell Road.	• Rehabilitate with CIPP Liner • Pipes segments have moderate corrosion and structural damages. • Vitrified clay pipe is reaching the end of its service life.	CCTV: $2,000 Project: $50,000 Total: $52,000
6	Approximately 140 LF of 6-inch vitrified clay lateral line servicing Building 2538.	• Rehabilitate with CIPP Liner • Pipe is highly critical due to its location near the airfield operations. • Pipe is heavily corroded. • Vitrified clay pipe is nearing the end of its service life.	CCTV: $500.00 Project: $13,000 Total: $13,000
7	Approximately 560 LF of 8-inch vitrified clay pipe servicing Building 195 and the dormitories east of Ave. J.	• Replace all segments with PVC. • Pipe shows signs of severe deformation and is located under a primary road. • Pipe also runs under a portion of Building 195 and should be rerouted around building. • Vitrified clay pipe is nearing the end of its service life.	CCTV: $2,000 Project: $47,000 Total: $49,000

Project number 1 consists of several surcharged manholes upstream of Lift Station 3034. Base personnel informed AECOM during our field investigation that the lift station was experiencing

high level alarms during storm events. For the duration of the investigation (two weeks) these manholes remained surcharged during the several times the team attempted to assess them. However, it is inconclusive whether the lift station is not operating correctly or there are structural defects in the grade lines of the pipes/manholes upstream of the lift station. It is recommended to pump down all manholes and pipelines and inspect them to eliminate them as a cause. Furthermore, the lift station level controls should be checked along with the electrical components and pump components to ensure adequacy of operation.

The following table contains areas that were inaccessible and therefore not assessed. It is recommended that these areas be investigated with a pole camera to see if further rehabilitation is needed.

Table 7-3: Recommendations for Additional Pole Camera Inspections

Project Priority	Description	Justification
1	Approximately 1,680 LF of pipe surrounding Building 1956. Pole camera inspection and risk based assessment recommended.	• Based on a large number of inaccessible manholes in this area: 2692, 2691, 2690, 2639, 2634, 2635, 2641, 2640, and 2693.
2	Approximately 1,910 LF of pipe running east from Building 333 to Building 384. Pole camera inspection and risk based assessment recommended.	• Based on a large number of inaccessible manholes in this area: 2835, 2535, 2657, 2656, 2531, and 2596.
3	Approximately 2,880 LF of pipe serving as the base effluent piping located along the golf course. Pole camera inspection and risk based assessment recommended.	• Based on a large number of inaccessible manholes in this area: 2762, 2764, 2768, 2765, 2761, 2760, 2759, and 2758.

7.1.2 Manholes

The highest priority manholes presented in Table 7-4 are categorized as extreme risk which requires immediate attention. The unit costs listed used to develop the estimated costs of this repair were developed through the use of PACES, previously discussed in Section 7.1. Refer to Figure E-2 for a map showing the location of the manholes listed as well as additional high risk manholes.

Table 7-4: Recommended Manhole Rehabilitation Projects

Manhole Priority	Risk Score (Risk Category)	Description	Issues and Recommendations	Estimated Repair Cost	Estimated Replacement Cost
1	45 (Extreme)	Manhole 2967, near Taxiway. Main line leading into interceptor.	• Recommend immediate replacement. • Bricks detaching from the barrel and bench. • High criticality due to the proximity to airfield operations. • Exceeded expected service life.	$1,500	**$6,200**
2	28 (Extreme)	Manhole 2317, connected to the main effluent line to the north.	• Recommend immediate repairs to barrel and bench. • Cracks to the chimney and cone, loose aggregate or breakthrough(s) on barrel. • High criticality due to the location on the effluent line.	**$1,500**	$7,600
3	28 (Extreme)	Manhole 2466, north side of base near the hangers.	• Recommend immediate repairs to barrel and bench. • Severe deterioration on the barrel and the bench. • Nearing the end of expected service life.	**$1,500**	$6,200
4	25 (Extreme)	Manhole 2757, connected to the main effluent line to the south.	• Recommend immediate repairs to chimney, barrel and bench. • Severe deterioration with loose aggregate in the barrel. Minor cracks in the chimney and bench. • High criticality due to the location on the effluent line.	**$1,500**	$6,200
5	23 (Extreme)	Manhole 2766, within the golf course and along the main effluent line.	• Recommend immediate repairs to rim and cover, cone, barrel and bench. • Severe damage to the cover and severe corrosion within the cone and barrel. • High criticality due to the location on the effluent line.	**$1,500**	$7,600

7.1.3 Lift Stations

The visual inspections of lift stations highlighted various degrees of deterioration with the condition of the electrical, mechanical, and structural components of some lift stations. Approximately two-thirds of the visually inspected lift stations were noted to have poor electrical, mechanical, and/or structural conditions.

The highest risk lift stations based on R/R risk scores are presented in Table 7-5. As the table indicates, these three lift stations were either categorized as extreme, high or moderate risk. Most of the assessed lift stations were at least categorized as moderate risk.

Table 7-5: Top Lift Stations Based on Risk[1]

GeoBase Lift Station ID	Description	Risk Score (Risk Category)	Issues	Recommendations
3034	10-inch upstream sewer interceptor line serving multiple facilities	27 (Extreme)	• Fair structural condition. • Surcharged upstream manholes could possibly mean under designed or overworked lift station. • Mechanical condition is categorized as poor. • Alarm is weak and beacon is not clearly visible.	• Run tests on level settings to ensure accuracy. • Recommend replacement of select mechanical components with severe corrosion. • Replace electrical components (alarm/beacon)
3070	4-inch upstream sewer lateral line serving multiple facilities	21 (High)	• Poor electrical condition due to no backup power, unsealed conduits, and corrosion within the panel. • Fair Mechanical and Structural components.	• Replace electrical components such as unsealed conduits and corroded areas. • Add backup power. • Monitor mechanical and structural components.
3022	8-inch upstream sewer trunk line serving multiple facilities.	14 (Moderate)	• Fair mechanical and structural condition. • No major issue with electrical. Beacon and audible alarm in working condition.	• Monitor for future degradation and consider structural and mechanical repairs.
Note 1: Actual costs for rehabilitation recommendations will require further assessment.				

7.1.4 Pretreatment Devices

The pretreatment devices at Sheppard were considered to be at high risk from the prioritization model. Significant buildup and probable future overflows were found during the visual inspection. Five of the 13 inspected pretreatment devices were found to have a poor structural condition. Four of the five were grease traps and one was an OWS.

According to the prioritization model presented in Section 3.5, the highest priority pretreatment devices are listed in Table 7-6. All three of the critical pretreatment devices were grease traps. As the table indicates, all three of these are listed at high risk.

Table 7-6: High Risk Pretreatment Devices

GeoBase ID	Description	Risk Score (Risk Category)	Issues	Recommendations
GTP 3011	Grease Trap serving Building 1368 (Cafeteria).	35 (High)	Severe buildup in chambers and heavy signs of corrosion.	• Clean grease trap immediately. • Structurally repair/replace corroded areas.
GTP 3016	Grease trap serving Building 805 (Cafeteria).	26 (High)	Severe buildup in chamber 2 and heavy signs of corrosion.	• Clean grease trap immediately. • Structurally repair/replace corroded areas.
OWS 3132	Grease Trap serving Building 1320 (Cafeteria).	19 (High)	Severe buildup in chambers and heavy signs of structural decay.	• Clean grease trap immediately. • Structurally repair/replace corroded areas.

7.2 O&M Requirement Prioritization

In additional to repair and replace prioritization, the risk based model was used to determine requirements for O&M activities. Typically, O&M issues were evaluated by observing build-up levels of sewage or debris within the asset types. In the case of manholes, I&I and surcharge evidence is also considered. Table 3-12 and Appendix A details the specific criteria used to assess O&M items. The following subsections summarize the highest scoring assets for O&M.

7.2.1 Pipes

Table 7-7 lists the highest priority pipes based on their O&M risk score, together with the predominant O&M issues identified with recommendations. Refer to the risk summary figures in Appendix F for a complete representation of pipe segments ranked by risk score.

Table 7-7: High Priority Pipes Based on O&M Risk

Pipe Sewer GeoBase ID	Description	Risk Score (Risk Category)	Issues	Recommendations
Pipe: 5669	Located near Building 2112	22 (High)	Severe buildup of sewage / debris at select location.	Jet/clean pipe. Use mechanical methods if necessary.
Pipe: 4081	Located near Building 791	21 (High)	Severe buildup of sewage at select location.	Jet/clean pipe. Use mechanical methods if necessary.
Pipe: 5238, 5101	Located throughout plant	14 (Moderate)	Moderate buildup throughout pipe.	Jet/clean pipe. Use mechanical methods if necessary.

7.2.2 Manholes

Table 7-8 lists the highest priority manholes based on their O&M risk score, together with the predominant O&M issues identified with recommendations. Refer to the risk summary figures in Appendix F for a complete representation of manholes ranked by risk score.

Table 7-8: High Priority Manholes Based on O&M Risk

Manhole Sewer GeoBase ID	Description	Risk Score (Risk Category)	Issues	Recommendations
MH: 2967	Located near Building 996.	39	Severe structural degradation of the manhole walls and severe surcharge.	• Pump down surcharged manhole and inspect. • Repair/replace necessary components.
MH: 2454, 2479, 2598, 2599	Located near Building 2522 and near the intersection of Bridwell Road and Ave. J.	37	Severe surcharge during assessment	• Pump down surcharged manholes and inspect. • Repair/replace necessary components.
MH: 2794	Located near Building 1045	31	Severe surcharge during assessment.	• Pump down surcharged manholes and inspect. • Repair/replace necessary components.
MH: 3003, 2727	Near Building 793 and along the plant effluent line to the north (respectively)	30	Severe debris buildup, severe hindrance to flow or blockage	• Clean manhole bench especially in flow path.
MH: 2663	Located near Building 791.	27	Severe debris buildup	• Clean manhole bench especially in flow path.

7.2.3 Lift Stations

Table 7-9 lists the top lift stations based on their O&M risk score, together with the predominant O&M issues identified with recommendations. Refer to the risk summary figures in Appendix F for a complete representation of lift stations ranked by risk score.

Table 7-9: High Priority Lift Stations Based on O&M Risk

Manhole Sewer GeoBase ID	Description	Risk Score (Risk Category)	Issues	Recommendations
3034	10-inch upstream sewer interceptor line serving multiple facilities	10 (Moderate)	Fair structural condition. Surcharged upstream manholes could possibly mean under designed or overworked lift station. Mechanical condition is categorized as poor. Alarm is weak and beacon is not clearly visible.	No debris. Monitor for buildup or further degradation of mechanical and electrical components.
3070	4-inch upstream sewer lateral line serving multiple facilities	9 (Moderate)	Poor electrical condition due to no backup power, unsealed conduits, and corrosion within the panel. Fair Mechanical and Structural components.	No debris. Monitor for buildup or further degradation of mechanical and electrical components.
3022	8-inch upstream sewer trunk line serving multiple facilities.	8 (Moderate)	Fair mechanical and structural condition. No major issue with electrical. Beacon and audible alarm in working condition.	No debris. Monitor for buildup or further degradation of mechanical and electrical components.

7.2.4 Pretreatment devices

Table 7-10 lists the top pretreatment devices based on their O&M risk score, together with the predominant O&M issues identified with recommendations. Refer to the risk summary figures in Appendix F for a complete representation of pretreatment devices ranked by risk score.

Table 7-10: High Priority Treatment Devices Based on O&M Risk

Manhole Sewer GeoBase ID	Description	Risk Score (Risk Category)	Issues	Recommendations
GTP 3011	Grease Trap serving Building 1368 (Cafeteria).	35 (High)	Severe buildup in chambers.	Clean grease trap immediately.
GTP 3016	Grease trap serving Building 805 (Cafeteria).	26 (High)	Severe buildup in chamber 2.	Clean grease trap immediately.
OWS 3132	Grease Trap serving Building 1320 (Cafeteria).	19 (High)	Severe buildup in chambers.	Clean grease trap immediately.

7.2.5 Septic Systems

All septic systems shown on the original GeoBase had been replaced with sanitary sewer connections with the exception of two. These two septic systems were evaluated to the extent possible; however, a complete assessment could not be done. Therefore the O&M prioritization model returned a low risk with no maintenance actions for the remaining two septic systems.

7.3 Asset Management Procedural Recommendations

AECOM recommends that a Recurring Work Plan (RWP) be implemented based on the findings in this report to establish, at a minimum, weekly checks on the lift stations. Additional operational recommendations include the following:

- It is recommended to make accessible all manholes that could not be opened during the field investigation. This list and the locations can be found in Appendix C and Table 7-3. Since these manholes and connecting lines could not be assessed, it is recommended to inspect all manholes and connected lines once the manholes are made accessible.
- Consider increasing cleanout frequency for grease traps serving food service establishments, specifically the dining facilities (Buildings 1368 and 1320) and the South Bowling Alley (Building 805). Confirm that contractor fills grease traps with clear water after pumping. This prevents the first flush of grease from getting into the system. Poor maintenance and lack of efficient grease interception can precipitate downstream and cause O&M issues in lift stations, pipes, and manholes.
- Lift Station 3034 should be further evaluated due to the continual surcharging of the upstream manholes. From the site assessment, it does not appear that the storm sewer line upstream is leaking into the sanitary sewer pipeline. However, during rain events the high level alarm is being triggered at the lift station. Further evaluation on the alarm and electrical components of the lift station are necessary before proceeding with upstream rehabilitation techniques. Adjusting the level controls so that the pumps turn on more frequently could resolve the issue.

- Consider inspecting the approximately 17,000 LF recycle line (Pipe 2189). This pipe was not fully assessed due to the lack of manhole access points. However, if the base plans to use this line in the future, it is recommended for a full inspection and assessment.
- Jet lines and clean manholes with severe to moderate buildup, as identified in Section 7.2.2.

7.3.1 Continual GeoBase Updating

The accuracy and ultimate usefulness of the prioritization model is dependent on the accuracy and completeness of the underlying GeoBase infrastructure data. Going forward, it is important that facility (and related sanitary sewer system) changes, additions, alterations, and deconstructions, are simultaneously field GPS-verified and characterized in the GeoBase.

To provide the basis for risk scoring, some assumptions on pipe age, and occasionally size, material, and geometry were necessary. All of these assumptions were based on well-reasoned analyses and are expected to provide a sound basis for starting to use the risk prioritization model. However, it is recommended that the accuracy of the risk models be improved with direct verification, where selected pipes of uncertain characteristics are uncovered and analyzed with Non-Destructive Test (NDT) methods.

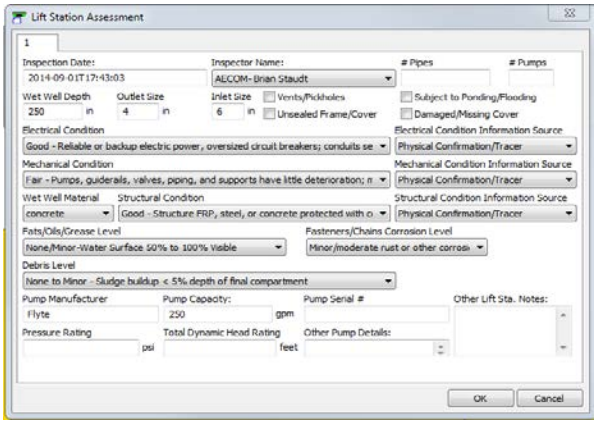
It is also recommended that the base uses every opportunity to update asset conditions and continually track problems in the GeoBase, as condition and SSO history are key components of the risk prioritization model.

7.3.2 Data Collection

7.3.2.1 Mobile Devices and Data Collection Forms

Ruggedized mobile computer devices with sub-meter GPS accuracy and easy-to-use data collection software (such as CartoPac) are recommended to be deployed to base engineering assistants so infrastructure condition changes and O&M practices are continually captured. This is vital for accurate and continual GeoBase updating. Ideally, mobile devices would be used in the field during RWP activities to collect relevant condition and maintenance information, which would subsequently be updated back to GeoBase.

Field GPS Instrument (Leica CS25 GNSS Shown)



Example Device Data Entry Form (CartoPac Tablet Software Shown)

During this assessment, AECOM used Leica CS25 GNSS device and Trimble GeoXH 2008 units together with CartoPac as the data collection software. CartoPac software offers basic and advance data form customization to aid efficient data collection workflows.

Additionally, an example procedure to assist with map and data updates has been summarized below.

- Sanitary sewer field books, based on updated map data, should be used by utility personnel. Field books will also act as a very useful tool for utilities personnel, as they can aid staff in locating sanitary system assets.
- Utilities staff should record changes as they occur and correct errors found in mapping on field books.
- On a regular basis, utilities staff should communicate changes recorded in field books to GeoBase or CE personnel to update mapping.
- GPS survey points should be taken along sections of pipe that are added or changed in the system. This data can be used when updating the GeoBase map. This will be particularly pertinent in areas of future construction. As-built drawings should not be relied on as the only source of information when documenting changes to the system.

7.3.2.2 Lift Station and Pretreatment Device Forms

As stated in Section 3.5.3.4, AECOM has provided customized paper/electronic forms (Appendix B) for utility shop personnel to record data during routine inspections of lift stations and pretreatment devices. Data from the forms could then be transferred into GeoBase in order to keep asset condition information current. AECOM recommends only using paper forms in the absence of data collection forms on GPS devices in the field.

7.3.2.3 Pole Camera Devices

Section 4.3.2 described the use of a pole-mounted camera such as the Haloptic QuickView camera manufactured by Envirosight, which was used during this assessment to observe pipe condition. AECOM recommends the base consider investment into a pole camera to aid relatively quick inspections of pipes during RWP activities, such as pipe jetting. Pole camera devices facilitate condition observations, which can provide forewarning of potential pipe failures. For budgetary considerations, the Haloptic QuickView camera is valued at approximately $15,000.

7.3.3 Reporting Services

It is understood that AETC bases previously used Esri ArcSDE server databases built on an Oracle server to maintain its GeoBase data on a daily basis. Utilizing reporting services is one of the many advantages of using server databases. Reporting services, such as Oracle Reports Services 11g or Microsoft SQL Server Report Builder, allow for customizable report Building to provide instant access to information residing in the GeoBase. Reports, viewable by webpage, can range from summary asset condition/risk reports to individual asset reports and can be available to stakeholders at all levels. Such reports provide valuable information for prioritization asset R/R and O&M activities and are recommended for continual use as an effective asset management tool.

AECOM has utilized reporting services to provide a range of reports which form part of the deliverable for this project. BIRT (Business Intelligence and Reporting Tools) is an open source platform used to create all the reports for this project. A field asset summary report from Sheppard AFB is provided in Appendix I.

APPENDIX B
INTERAGENCY/INTERGOVERNMENTAL COORDINATION FOR ENVIRONMENTAL PLANNING

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Debra Bills
Field Supervisor
USFWS Ecological Services
2005 NE Green Oaks Blvd
Arlington, TX 76006

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Regional Administrator
USEPA Region 6
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Dallas, TX 75270

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Office of the Governor, Budget and Policy Division
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P.O. Box 13087
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Vaughn Aldrege
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Texas Historical Commisssion
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Russell Schreiber
Director of Public Works
Department of Public Works
1300 7th Street
Wichita Falls, TX 76301

Brent Boydston
Attorney Advisor
Air Force
317 F Avenue
Sheppard AFB, TX 76311

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

OCT 07 2021

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg. 1402
Sheppard AFB TX 76311-3333

Debra Bills
Field Supervisor
USFWS Ecological Services
2005 NE Green Oaks Blvd
Suite 140
Arlington TX 76006

Dear Ms. Bills

The United States Air Force, 82d Mission Support Group (hereafter, the "Air Force") at Sheppard Air Force Base (SAFB) proposes to implement multiple rehabilitation projects to address deficient sanitary and storm sewer infrastructure on the base. The proposed infrastructure projects would target the most deficient components of each base-wide system for maintenance, repair, or replacement. The Air Force proposes to implement the projects from approximately 2023 to 2027.

SAFB is in north-central Texas, approximately six miles south of its border with Oklahoma. Situated on nearly 5,300 acres of land in Wichita County, Texas (see Attachment 1), SAFB supports diverse aircraft training missions for pilots and operational support specialists. Activated in 1941 during World War II, the sanitary and storm sewer systems on SAFB are generally outdated and, in some cases, in a state of disrepair. Management action is required for these systems to remain operational and continue to comply with applicable laws and regulations.

The Air Force proposes to repair or replace up to approximately 15,000 linear feet (lf) of selected 6–15-inch-diameter sanitary sewer line segments on SAFB; approximately 5,500 lf of storm sewer conveyance on SAFB would be replaced or converted to underground conveyance. Attachments 2 and 3 depict the type and location of the proposed infrastructure projects on SAFB.

As this is a federal proposed action, the Air Force is responsible for complying with the National Environmental Policy Act (NEPA), as amended (42 United States Code § 4331 et seq.). Accordingly, the Air Force is preparing an Environmental Assessment to evaluate the potential environmental, cultural, and socioeconomic impacts of its proposed action.

So that we remain on schedule to complete the environmental impact analysis process and implement the identified management actions in a timely manner, please provide your response to my point of contact for this matter as provided below not later than 30 days from receipt of this correspondence. Please send your response via postal mail or email (preferred) to:

ATTN: Ms. Lisa L. Black
82 CES/CEIE – Environmental Compliance
231 9th Avenue, Bldg. 1402
Sheppard AFB TX 76311
Email: lisa.black.2.ctr@us.af.mil

The Air Force appreciates your interest in and support of its military mission at SAFB. We thank you in advance for your assistance and look forward to your response.

Sincerely

MARK Mc BURNETT, GS-14, DAF
Deputy Base Civil Engineer

3 Attachments:
1. Map of Sheppard Air Force Base
2. Map Outlining Proposed Action (1 of 2)
3. Map Outlining Proposed Action (2 of 2)

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

OCT 07 2021

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg. 1402
Sheppard AFB TX 76311-3333

Vaughn Aldrege
Government Relations Specialist
Texas Historical Commission
P.O. Box 12276
Austin TX 78711

Dear Mr. Aldrege

The United States Air Force, 82d Mission Support Group (hereafter, the "Air Force") at Sheppard Air Force Base (SAFB) proposes to implement multiple rehabilitation projects to address deficient sanitary and storm sewer infrastructure on the base. The proposed infrastructure projects would target the most deficient components of each base-wide system for maintenance, repair, or replacement. The Air Force proposes to implement the projects from approximately 2023 to 2027.

SAFB is in north-central Texas, approximately six miles south of its border with Oklahoma. Situated on nearly 5,300 acres of land in Wichita County, Texas (see Attachment 1), SAFB supports diverse aircraft training missions for pilots and operational support specialists. Activated in 1941 during World War II, the sanitary and storm sewer systems on SAFB are generally outdated and, in some cases, in a state of disrepair. Management action is required for these systems to remain operational and continue to comply with applicable laws and regulations.

The Air Force proposes to repair or replace up to approximately 15,000 linear feet (lf) of selected 6–15-inch-diameter sanitary sewer line segments on SAFB; approximately 5,500 lf of storm sewer conveyance on SAFB would be replaced or converted to underground conveyance. Attachments 2 and 3 depict the type and location of the proposed infrastructure projects on SAFB.

As this is a federal proposed action, the Air Force is responsible for complying with the National Environmental Policy Act (NEPA), as amended (42 United States Code § 4331 et seq.). Accordingly, the Air Force is preparing an Environmental Assessment to evaluate the potential environmental, cultural, and socioeconomic impacts of its proposed action.

The proposed infrastructure projects also constitute a federal undertaking pursuant to Section 106 of the National Historic Preservation Act (NHPA) (36 Code of Federal Regulations (CFR) § 800.16(y)). The Air Force is using its Environmental Impact Analysis Process (EIAP) to initiate the NHPA, Section 106 consultation for the proposed undertaking.

Based on prior cultural resources investigations and the individual project locations, the Air Force determined the proposed action would result in "no adverse effects" on historic properties or sites listed or determined eligible for listing in the National Register of Historic Places (NRHP). There are no NRHP-listed or -eligible archaeological sites documented to occur on SAFB, and previous investigations

concluded there is a low probability for discovery of such resources. However, should there be an inadvertent discovery for projects involving excavation, the Air Force would comply with all agreed upon procedures in accordance with 36 CFR § 800.6(a)(1).

There are three NRHP-eligible buildings or structures on SAFB: the Kell Field Air Terminal Building (also a Texas Historical Landmark); Building 2560; and the Alert Apron. None of these resources would be physically affected by the proposed action. Temporary viewshed effects would be possible during construction; however, no permanent adverse effects on views to or from NRHP-eligible sites would result from the proposed action.

For the reasons described above, the Air Force determined the proposed action would result in "no adverse effects" on NRHP-listed or -eligible sites. We request your comment on our "no adverse effects" determination in accordance with 36 CFR Part 800. So that we remain on schedule to complete the EIAP and implement the identified management actions in a timely manner, please provide your response to my point of contact for this matter as provided below not later than 30 days from receipt of this correspondence. Please send your response via postal mail or email (preferred) to:

ATTN: Ms. Lisa L. Black
82 CES/CEIE – Environmental Compliance
231 9th Avenue, Bldg. 1402
Sheppard AFB, TX 76311
Email: lisa.black.2.ctr@us.af.mil

The Air Force appreciates your interest in and support of its military mission at SAFB. We thank you in advance for your assistance and look forward to your response.

Sincerely

MARK Mc BURNETT, GS-14, DAF
Deputy Base Civil Engineer

3 Attachments:
1. Map of Sheppard Air Force Base
2. Map Outlining Proposed Action (1 of 2)
3. Map Outlining Proposed Action (2 of 2)

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg.1402
Sheppard AFB TX 76311-3333

OCT 07 2021

Martina Callahan
Tribal Historic Preservation Officer
Comanche Nation
P.O. Box 908
Lawton OK 73502

Dear Ms. Callahan

The United States Air Force, 82d Mission Support Group (hereafter, the "Air Force") at Sheppard Air Force Base (SAFB) proposes to implement multiple rehabilitation projects to address deficient sanitary and storm sewer infrastructure on the base. The proposed infrastructure projects would target the most deficient components of each base-wide system for maintenance, repair, or replacement. The Air Force proposes to implement the projects from approximately 2023 to 2027.

SAFB is in north-central Texas, approximately six miles south of its border with Oklahoma. Situated on nearly 5,300 acres of land in Wichita County, Texas (see Attachment 1), SAFB supports diverse aircraft training missions for pilots and operational support specialists. Activated in 1941 during World War II, the sanitary and storm sewer systems on SAFB are generally outdated and, in some cases, in a state of disrepair. Management action is required for these systems to remain operational and continue to comply with applicable laws and regulations.

The Air Force proposes to repair or replace up to approximately 15,000 linear feet (lf) of selected 6-15-inch-diameter sanitary sewer line segments on SAFB; approximately 5,500 lf of storm sewer conveyance on SAFB would be replaced or converted to underground conveyance. Attachments 2 and 3 depict the type and location of the proposed infrastructure projects on SAFB.

As this is a federal proposed action, the Air Force is responsible for complying with the National Environmental Policy Act (NEPA), as amended (42 United States Code § 4331 et seq.). Accordingly, the Air Force is preparing an Environmental Assessment to evaluate the potential environmental, cultural, and socioeconomic impacts of its proposed action.

The proposed infrastructure projects also constitute a federal undertaking pursuant to Section 106 of the National Historic Preservation Act (NHPA) (36 Code of Federal Regulations (CFR) § 800.16(y)). The Air Force is using its Environmental Impact Analysis Process (EIAP) to conduct the NHPA, Section 106 consultation for the proposed undertaking.

Based on prior cultural resources investigations and the individual project locations, the Air Force determined the proposed action would result in "no adverse effects" on cultural resources of importance to Native Americans, including the Comanche Nation. There are no documented traditional cultural properties on SAFB, including archaeological, sacred, and religious sites, or landscapes. Previous investigations concluded there is a low probability for discovery of such resources on SAFB. However, in the event of an inadvertent discovery for projects involving excavation, the Air Force would comply with all agreed upon procedures in accordance with 36 CFR § 800.6(a)(1). Should any cultural resources be unearthed that may be of importance to the Comanche Nation, we will notify you and, if appropriate, reinitiate this consultation.

For the reasons described above, the Air Force determined the proposed action would result in "no adverse effects" on cultural resources of importance to Native Americans. We request your comment on our "no adverse effects" determination in accordance with 36 CFR Part 800.5(c). So that we remain on schedule to complete the EIAP and implement the identified management actions in a timely manner, please provide your response to my point of contact for this matter as provided below not later than 30 days from receipt of this correspondence. Please send your response via postal mail or email (preferred) to:

ATTN: Ms. Lisa L. Black
82 CES/CEIE – Environmental Compliance
231 9th Avenue, Bldg 1402
Sheppard AFB TX 76311
Email: lisa.black.2.ctr@us.af.mil

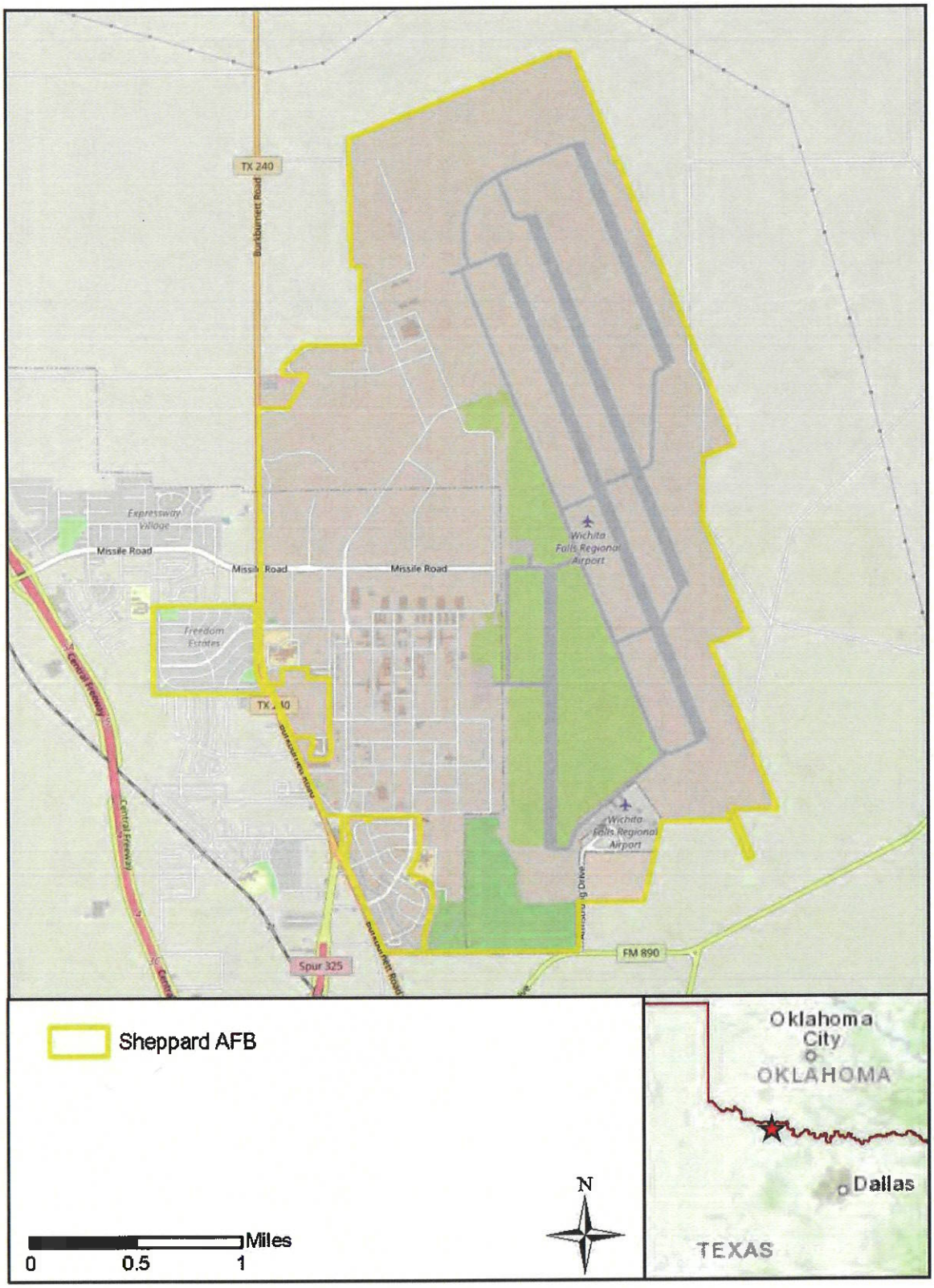
The Air Force appreciates your interest in and support of its military mission at SAFB. We thank you in advance for your assistance and look forward to your response.

Sincerely

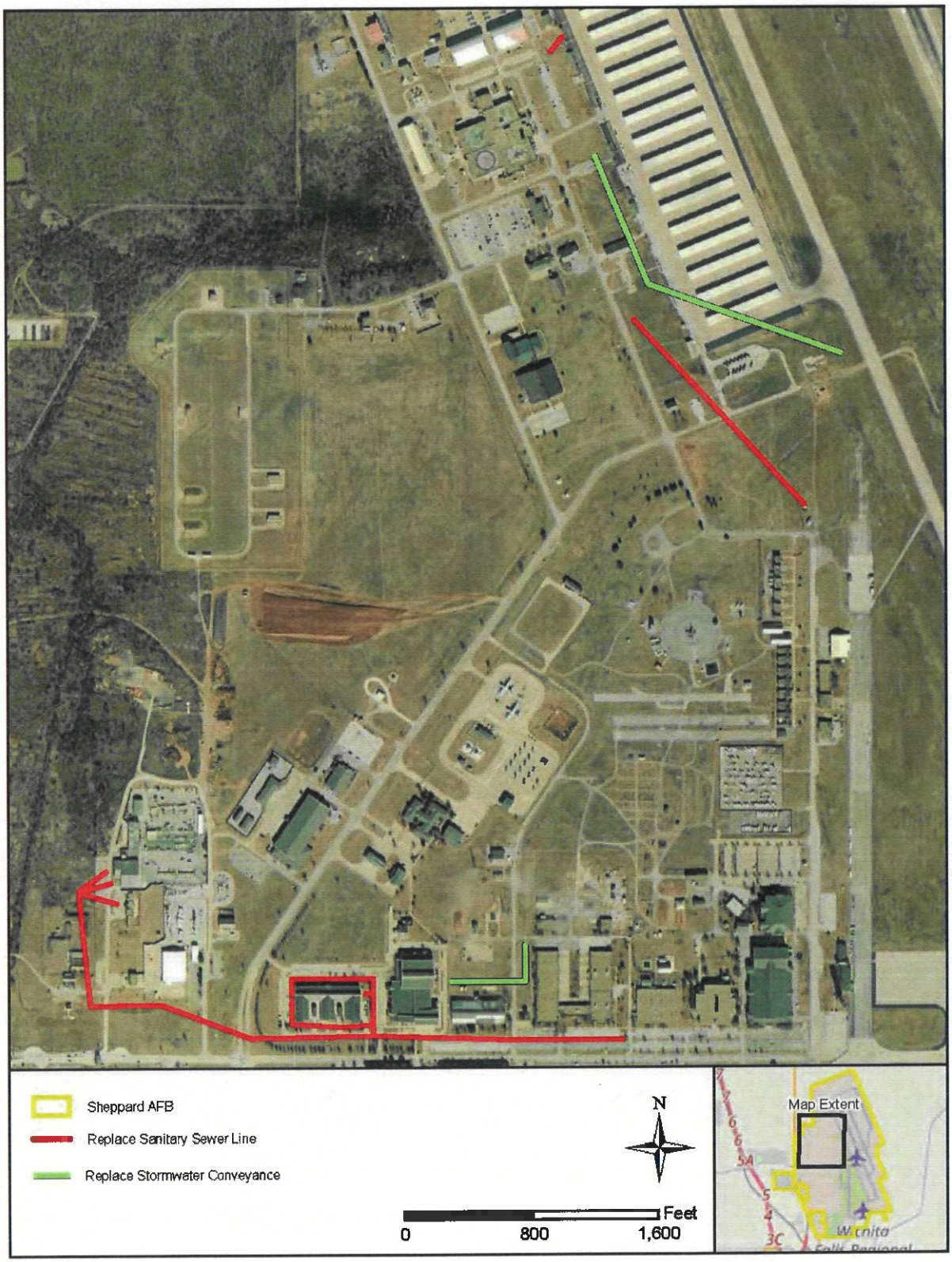
MARK Mc BURNETT, GS-14, DAF
Deputy Base Civil Engineer

3 Attachments:
1. Map of Sheppard Air Force Base
2. Map Outlining Proposed Action (1 of 2)
3. Map Outlining Proposed Action (2 of 2)

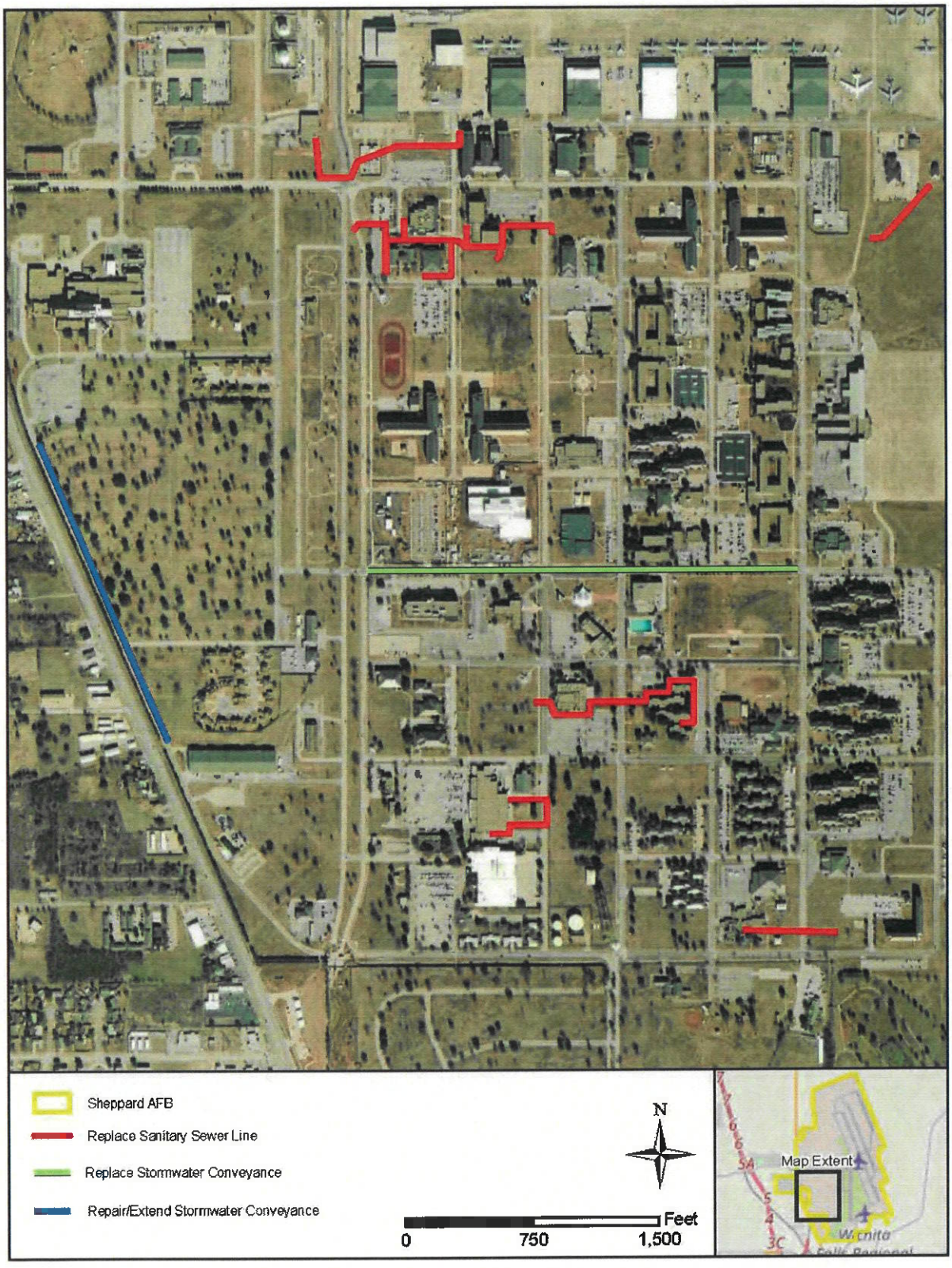
ATTACHMENT 1 – Sheppard Air Force Base



ATTACHMENT 2 – Proposed Action Map (1 of 2)



ATTACHMENT 3 – Proposed Action Map (2 of 2)



COMANCHE NATION

Department of the Air Force- Air Education and Training Command
Attn: Ms. Lisa L. Black
231 9th Avenue, Bldg. 1402
Texas 76311

November 29, 2021

Re: The Air Force proposes to repair or replace up to approximately, 15,000 linear feet (lf) Of selected 6-14-inch-diameter sanitary sewer line segments on SAFB

Dear Ms. Black:

In response to your request, the above reference project has been reviewed by staff of this office to identify areas that may potentially contain prehistoric or historic archeological materials. The location of your project has been cross referenced with the Comanche Nation site files, where an indication of ***"No Properties"*** have been identified. (IAW 36 CFR 800.4(d)(1)).

Please contact this office at (580) 595-9960/9618) if you require additional information on this project.

This review is performed in order to identify and preserve the Comanche Nation and State cultural heritage, in conjunction with the State Historic Preservation Office.

Regards

Comanche Nation Historic Preservation Office
Theodore E. Villicana , Technician
#6 SW "D" Avenue, Suite C
Lawton, OK. 73502

Consult Response delayed due to Covid-19 work conditions.

From: BLACK, LISA L CTR USAF AETC 82 CES/CEIE
To: L"ESPERANCE, THOMAS M CTR USAF AETC 82 CES/CEIE
Subject: FW: [Non-DoD Source] Sanitary Sewer and Storm Drain Rehab SAFB
Date: Friday, October 15, 2021 9:44:03 AM

From: Russell Schreiber <russell.schreiber@wichitafallstx.gov>
Sent: Friday, October 15, 2021 8:27 AM
To: BLACK, LISA L CTR USAF AETC 82 CES/CEIE <lisa.black.2.ctr@us.af.mil>
Cc: MCBURNETT, MARK D GS-14 USAF AETC 82 CES/CL <mark.mcburnett@us.af.mil>
Subject: [Non-DoD Source] Sanitary Sewer and Storm Drain Rehab SAFB

Lisa
The is in receipt of a letter dated 10/7/2021 from Mark Mc Burnett describing the above mentioned improvements. The information and maps attached to this letter appear to indicate all the proposed improvements will be within the boundaries of SAFB and outside the jurisdiction of the City of Wichita Falls. Therefore the City offers no comment and does not object to the proposed improvements.
If further action by the City is required, please let me know.

Respectfully;

Russell Schreiber P.E
Director of Public Works
City of Wichita Falls Texas
940 761 7477

From: noreply@thc.state.tx.us <noreply@thc.state.tx.us>
Sent: Wednesday, November 10, 2021 12:39 AM
To: BLACK, LISA L CTR USAF AETC 82 CES/CEIE <lisa.black.2.ctr@us.af.mil>; reviews@thc.state.tx.us
Subject: [Non-DoD Source] Section 106 Submission

Re: Project Review under Section 106 of the National Historic Preservation Act
THC Tracking #202201624
Date: 11/10/2021
Sheppard AFB

,TX

Description: implement multiple rehab projects to address defincient sanitary and storm sewer infrastructure

Dear Client:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Alex Toprac, Arlo McKee, Caitlin Brashear, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- Property/properties are eligible for listing or already listed in the National Register of Historic Places.
- No adverse effects on historic properties.
- THC/SHPO concurs with information provided.

Archeology Comments

- THC/SHPO concurs with information provided.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have

any questions concerning our review or if we can be of further assistance, please email the following reviewers: alex.toprac@thc.texas.gov, Arlo.McKee@thc.texas.gov, caitlin.brashear@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

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Lee M. Bass
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Fort Worth

T. Dan Friedkin
Chairman-Emeritus
Houston

Carter P. Smith
Executive Director

November 3, 2021

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg. 1402
Sheppard AFB TX 76311-3333

RE: Sheppard Air Force Base (SAFB) sanitary and storm sewer infrastructure rehabilitation projects

Dear Mr. Mc Burnett:

Texas Parks and Wildlife Department (TPWD) has received the request for review of the proposed project referenced above. TPWD staff has reviewed the information provided and offers the following comments and recommendations concerning this project. For tracking purposes, please refer to TPWD project number 47640 in any return correspondence regarding this project.

Project Description

SAFB proposes to repair or replace up to approximately 15,000 linear feet (lf) of selected 6-to-15-inch diameter sanitary sewer line segments. Approximately 5,500 lf of storm sewer conveyance on SAFB would be replaced or converted to underground conveyance.

Recommendation: TPWD recommends that any open trenches or excavation areas be covered overnight and/or inspected every morning to ensure no wildlife species have been trapped. Excavation areas should be inspected for trapped wildlife prior to refilling.

For soil stabilization and/or revegetation of disturbed areas, TPWD recommends erosion and seed/mulch stabilization materials that avoid entanglement hazards to snakes and other wildlife species. TPWD recommends the use of no-till drilling, hydromulching and/or hydroseeding due to a reduced risk to wildlife.

Because the mesh found in many erosion control blankets or mats pose an entanglement hazard to wildlife, TPWD recommends avoiding the use of plastic mesh matting. If erosion control blankets or mats containing netting must be used, the netting should be loosely woven, natural fiber

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AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.texas.gov

material where the mesh design allows the threads to move, therefore allowing expansion of the mesh openings.

TPWD appreciates the opportunity to provide comments on the proposed project.

Please contact me at (806) 761-4936 or Richard.Hanson@tpwd.texas.gov if you have any questions.

Sincerely,

Rick Hanson

Rick Hanson
Wildlife Habitat Assessment Program
Wildlife Division

RH: 47640

From: Edwards, Sean <sean_edwards@fws.gov>
Sent: Wednesday, October 20, 2021 4:14 PM
To: BLACK, LISA L CTR USAF AETC 82 CES/CEIE <lisa.black.2.ctr@us.af.mil>
Subject: [Non-DoD Source] Fw: Sheppard AFB Sewer Line Improvements Projects

Ms. Black,

Thank you for your October 7, 2021, letter and maps inviting our participation in preparation of an Environmental Assessment for the Sheppard AFB Sanitary and Storm Sewer Line Improvements Projects to be conducted approximately between 2023 and 2027. According to your letter, approximately 15,000 linear feet of sanitary sewer lines would be replaced along with 5,500 linear feet of storm sewer lines at Sheppard AFB. According to the map depicted in Attachment #3, these projects would occur within a heavily developed setting. Because the locations of the planned projects would occur in developed landscapes subjected to ongoing human disturbance, we believe that impacts to federally listed species potentially occurring in Wichita County would be highly unlikely. For these reasons, we have no comments, objections, or recommendations to offer regarding the proposed actions. Thank you again for the invitation to participate in this process and we look forward to further coordination.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

From: Bocanegra, Omar <omar_bocanegra@fws.gov>
Sent: Wednesday, October 20, 2021 3:39 PM
To: Edwards, Sean <sean_edwards@fws.gov>
Subject: Sheppard AFB

For your attention

Omar R. Bocanegra
Supervisory Fish & Wildlife Biologist
Branch of Environmental Review, Classification & Recovery
U.S. Fish & Wildlife Service

2005 NE Green Oaks Blvd, Suite 140
Arlington, Texas 76006
(817) 277-1100 ext. 22110
(817) 277-1129 fax
Website: https://www.fws.gov/southwest/es/arlingtontexas/

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
Phone: (817) 277-1100 Fax: (817) 277-1129
http://www.fws.gov/southwest/es/arlingtontexas/
http://www.fws.gov/southwest/es/EndangeredSpecies/lists/

In Reply Refer To: June 14, 2021
Consultation Code: 02ETAR00-2021-SLI-2176
Event Code: 02ETAR00-2021-E-04861
Project Name: Sheppard AFB Proposed Sanitary and Storm Sewer Rehabilitation Projects

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, which may occur within the boundary of your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under section 7(a)(1) of the Act, Federal agencies are directed to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Under and 7(a)(2) and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether their actions may affect threatened and endangered species and/or designated critical habitat. A Federal action is an activity or program authorized, funded, or carried out, in whole or in part, by a Federal agency (50 CFR 402.02).

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For Federal actions other than major construction activities, the Service suggests that a biological evaluation (similar to a Biological Assessment) be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

After evaluating the potential effects of a proposed action on federally listed species, one of the following determinations should be made by the Federal agency:

1. *No effect* - the appropriate determination when a project, as proposed, is anticipated to have no effects to listed species or critical habitat. A "no effect" determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, the action agency should maintain a complete record of their evaluation, including the steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information.
2. *May affect, but is not likely to adversely affect* - the appropriate determination when a proposed action's anticipated effects are insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where "take" of a listed species occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects, or expect discountable effects to occur. This determination requires written concurrence from the Service. A biological evaluation or other supporting information justifying this determination should be submitted with a request for written concurrence.
3. *May affect, is likely to adversely affect* - the appropriate determination if any adverse effect to listed species or critical habitat may occur as a direct or indirect result of the proposed action, and the effect is not discountable or insignificant. This determination requires formal section 7 consultation.

The Service recommends that candidate species, proposed species, and proposed critical habitat be addressed should consultation be necessary. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy

guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

For additional information concerning migratory birds and eagle conservation plans, please contact the Service's Migratory Bird Office at 505-248-7882.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

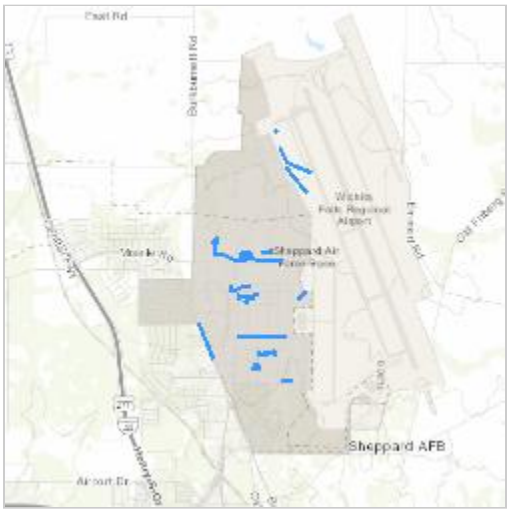
Arlington Ecological Services Field Office
2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247
(817) 277-1100

Project Summary

Consultation Code: 02ETAR00-2021-SLI-2176
Event Code: 02ETAR00-2021-E-04861
Project Name: Sheppard AFB Proposed Sanitary and Storm Sewer Rehabilitation Projects
Project Type: WASTEWATER PIPELINE
Project Description: SAFB is an Air Education and Training Command (AETC) base located in north-central Texas,
11 approximately six miles south of its border with Oklahoma. The Proposed Action would repair or replace approximately [14,680] linear feet (lf) of selected 6–15-inch diameter sanitary sewer line segments on SAFB. The Proposed Action would also replace or convert approximately [5,500] lf of storm sewer conveyance on the Base. Approximately 1,943 lf of conveyance would be replaced with reinforced concrete pipe to include 864 lf of open ditch that would be converted to subsurface piping.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@33.972148649999994,-98.50762845241579,14z



Counties: Wichita County, Texas

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. The location of the critical habitat is not available. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Wichita County, Texas

Local office

Arlington Ecological Services Field Office

(817) 277-1100
(817) 277-1129

2005 Ne Green Oaks Blvd
Suite 140
Arlington, TX 76006-6247

http://www.fws.gov/southwest/es/arlingtontexas/
http://www.fws.gov/southwest/es/EndangeredSpecies/lists/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
Least Tern Sterna antillarum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover Charadrius melodus This species only needs to be considered if the following condition applies: • Wind Energy Projects There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot Calidris canutus rufa This species only needs to be considered if the following condition applies: • Wind Energy Projects No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane Grus americana There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/758	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT

	THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Harris's Sparrow Zonotrichia querula This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

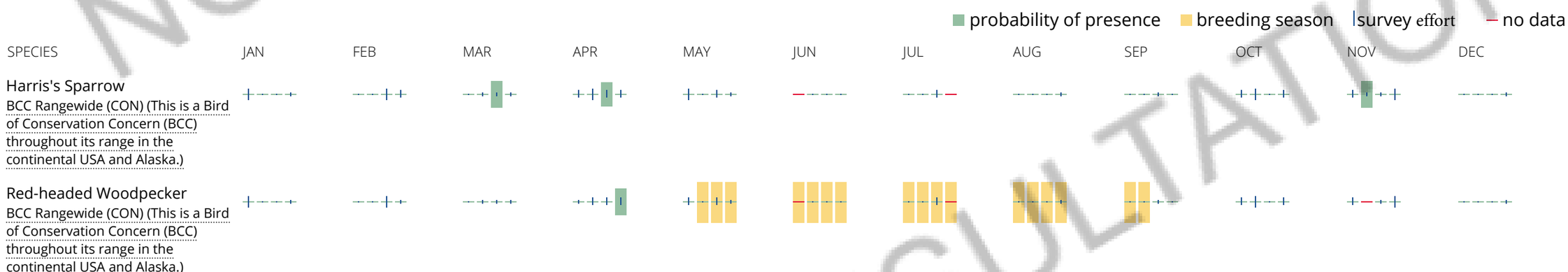
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ( )
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my speci ed location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affecte by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Wichita County, TX
Species Records

Taxon	SName	CName	USESA	SPROT	Endemic
Amphibians	Anaxyrus woodhousii	Woodhouse's toad			N
Birds	Plegadis chihi	white-faced ibis		T	N
Birds	Haliaeetus leucocephalus	bald eagle			N
Birds	Laterallus jamaicensis	Black Rail	LT	T	N
Birds	Grus americana	whooping crane	LE	E	N
Birds	Charadrius melodus	piping plover	LT	T	N
Birds	Charadrius montanus	mountain plover			N
Birds	Leucophaeus pipixcan	Franklin's gull			N
Birds	Sternula antillarum athalassos	interior least tern			N
Birds	Athene cunicularia hypugaea	western burrowing owl			N
Birds	Calamospiza melanocorys	Lark Bunting			N
Birds	Calcarius ornatus	Chestnut-collared Longspur			N
Fish	Hiodon alosoides	goldeye			N
Fish	Notropis bairdi	Red River shiner			N
Fish	Notropis potteri	chub shiner		T	N
Fish	Macrhybopsis storeriana	silver chub			N
Fish	Macrhybopsis australis	prairie chub		T	N
Fish	Cyprinodon rubrofluviatilis	Red River pupfish		T	N
Mammals	Myotis velifer	cave myotis bat			N
Mammals	Perimyotis subflavus	tricolored bat			N
Mammals	Eptesicus fuscus	big brown bat			N
Mammals	Lasiurus borealis	eastern red bat			N
Mammals	Lasiurus cinereus	hoary bat			N
Mammals	Corynorhinus townsendii	Townsend's big-eared bat			N
Mammals	Cynomys ludovicianus	black-tailed prairie dog			N
Mammals	Dipodomys elator	Texas kangaroo rat		T	N
Mammals	Ondatra zibethicus	Muskrat			N
Mammals	Mustela frenata	long-tailed weasel			N
Mammals	Spilogale putorius	eastern spotted skunk			N
Mammals	Puma concolor	mountain lion			N
Reptiles	Terrapene ornata	western box turtle			N
Reptiles	Apalone mutica	smooth softshell			N
Reptiles	Ophisaurus attenuatus	slender glass lizard			N
Reptiles	Phrynosoma cornutum	Texas horned lizard		T	N
Reptiles	Plestiodon septentrionalis	Prairie Skink			N
Reptiles	Heterodon nasicus	western hognose snake			N
Reptiles	Crotalus viridis	western rattlesnake			N
Reptiles	Sistrurus tergeminus	western massasauga			N
Insects	Cicindela celeripes	swift tiger beetle			N
Insects	Bombus pensylvanicus	American bumblebee			
Plants	Solidago mollis var. angustata	Rolling Plains goldenrod			N
Plants	Onosmodium helleri	Heller's marbleseed			Y
Plants	Gaura triangulata	prairie butterfly-weed			N

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

9 June 2022

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg. 1402
Sheppard AFB TX 76311-3304

David W. Gray
Regional Administrator
USEPA Region 6
1201 Elm St.
Suite 500
Dallas, TX 75270

Dear Mr. Gray

The United States Air Force (Air Force) and Sheppard Air Force Base (SAFB) announce the availability of a Draft Environmental Assessment (EA) addressing critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The Draft EA was prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality NEPA implementing regulations, and the Air Forces' environmental impact analysis process.

The Draft EA describes the Air Force's proposal to address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability. The Proposed Action would repair or replace sanitary sewer line segments and associated infrastructure such as sewage lift stations and manholes on SAFB. Portions of SAFB's storm sewer conveyance system also would be subject to repair or replacement. The Draft EA evaluates potential impacts on the environment from the Air Force's Proposed Action at SAFB. Bases on analysis in the Draft EA, no significant adverse impacts would be anticipated to result from the proposed infrastructure improvement projects. Accordingly, the Air Force has prepared a Draft Finding of No Significant Impact and Finding of No Practicable Alternative (FONSI/FONPA) to document the findings of the Draft EA.

SAFB is making available an electronic copy of the Draft EA and FONSI/FONPA for review and comment. The documents can be found at https://www.sheppard.af.mil/Library/Key-Documents/. The Air Force invites input and comment on these documents for a period 30 days from the date of this notice. Comments or inquiries may be sent via postal mail or email (preferred) to:

ATTN: Ms. Rhonda Lofgren
82 CES/CEIE – Environmental Compliance
231 9th Avenue, Bldg. 1402
Sheppard AFB, TX 76311-3304
Email: rhonda.lofgren.ctr@us.af.mil

Sincerely

MARK Mc BURNETT, GS-14, DAF
Deputy Base Civil Engineer

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

9 June 2022

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg. 1402
Sheppard AFB TX 76311-3304

Vaughn Aldrege
Government Relations
Texas Historical Commisssion
P.O. Box 12276
Austin, TX 78711

Dear Mr. Aldrege

The United States Air Force (Air Force) and Sheppard Air Force Base (SAFB) announce the availability of a Draft Environmental Assessment (EA) addressing critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The Draft EA was prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality NEPA implementing regulations, and the Air Forces' environmental impact analysis process.

The Draft EA describes the Air Force's proposal to address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability. The Proposed Action would repair or replace sanitary sewer line segments and associated infrastructure such as sewage lift stations and manholes on SAFB. Portions of SAFB's storm sewer conveyance system also would be subject to repair or replacement. The Draft EA evaluates potential impacts on the environment from the Air Force's Proposed Action at SAFB. Bases on analysis in the Draft EA, no significant adverse impacts would be anticipated to result from the proposed infrastructure improvement projects. Accordingly, the Air Force has prepared a Draft Finding of No Significant Impact and Finding of No Practicable Alternative (FONSI/FONPA) to document the findings of the Draft EA.

SAFB is making available an electronic copy of the Draft EA and FONSI/FONPA for review and comment. The documents can be found at https://www.sheppard.af.mil/Library/Key-Documents/. The Air Force invites input and comment on these documents for a period 30 days from the date of this notice. Comments or inquiries may be sent via postal mail or email (preferred) to:

ATTN: Ms. Rhonda Lofgren
82 CES/CEIE – Environmental Compliance
231 9th Avenue, Bldg. 1402
Sheppard AFB, TX 76311-3304
Email: rhonda.lofgren.ctr@us.af.mil

Sincerely

MARK Mc BURNETT, GS-14, DAF
Deputy Base Civil Engineer

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

9 June 2022

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg. 1402
Sheppard AFB TX 76311-3304

William Nelson, Sr.
Chairman
Comanche Nation
P.O.Box 908
Lawton, OK 73502

Dear Chairman Nelson, Sr.

The United States Air Force (Air Force) and Sheppard Air Force Base (SAFB) announce the availability of a Draft Environmental Assessment (EA) addressing critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The Draft EA was prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality NEPA implementing regulations, and the Air Forces' environmental impact analysis process.

The Draft EA describes the Air Force's proposal to address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability. The Proposed Action would repair or replace sanitary sewer line segments and associated infrastructure such as sewage lift stations and manholes on SAFB. Portions of SAFB's storm sewer conveyance system also would be subject to repair or replacement. The Draft EA evaluates potential impacts on the environment from the Air Force's Proposed Action at SAFB. Bases on analysis in the Draft EA, no significant adverse impacts would be anticipated to result from the proposed infrastructure improvement projects. Accordingly, the Air Force has prepared a Draft Finding of No Significant Impact and Finding of No Practicable Alternative (FONSI/FONPA) to document the findings of the Draft EA.

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Sincerely

MARK Mc BURNETT, GS-14, DAF
Deputy Base Civil Engineer

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

9 June 2022

Mr. Mark Mc Burnett
Deputy Base Civil Engineer
82 CES/CL
231 9th Ave, Bldg 1402
Sheppard AFB TX 76311-3304

Jana Hausburg
Library Administrator
Wichita Falls Public Library
600 11th St
Wichita Falls TX 76301

Dear Ms. Hausburg

The United States Air Force (Air Force) and Sheppard Air Force Base (SAFB) announce the availability of a Draft Environmental Assessment (EA) addressing critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The Draft EA describes the Air Force's proposal to address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability. The Proposed Action would repair or replace sanitary sewer line segments and associated infrastructure such as sewage lift stations and manholes on SAFB. Portions of SAFB's storm sewer conveyance system also would be subject to repair or replacement. The Draft EA evaluates potential impacts on the environment from the Air Force's Proposed Action at SAFB.

SAFB requests that the enclosed Draft EA be made available to the public for review. The availability of this document to the public will be announced in the *Wichita Times Record* on 10 June and 12 June 2022. The document is intended to be accessible to the public at the library, but it is not intended to be circulated. It is requested that the document remain available to the public from 10 June to 13 July 2022.

Comments or inquiries regarding the SAFB Draft EA may be sent via postal mail or email (preferred) to:

ATTN: Ms. Rhonda Lofgren
82 CES/CEIE – Environmental Compliance
231 9th Avenue, Bldg. 1402
Sheppard AFB, TX 76311-3304
Email: rhonda.lofgren.ctr@us.af.mil

Sincerely

MARK Mc BURNETT, GS-14, DAF
Deputy Base Civil Engineer

Attachment:
Draft EA

APPENDIX C
AIR CONFORMITY APPLICABILITY MODEL ANALYSIS

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AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:

Base: SHEPPARD AFB
State: Texas
County(s): Wichita
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Proposed Sanitary and Storm Sewer Rehabilitation Projects for Sheppard Air Force Base, Wichita County, Texas

c. Project Number/s (if applicable): NA

d. Projected Action Start Date: 7 / 2023

e. Action Description:

The Proposed Action would repair or replace approximately 14,680 linear feet (lf) of selected 6–15-inch-diameter sanitary sewer line segments on SAFB. The Air Force reviewed repair/replacement options for conducting this work and selected an appropriate technique for each individual line repair/replacement project under consideration.

The Proposed Action would also replace or convert approximately 5,500 lf of storm sewer conveyance on the Base (see Figure 2-1, Map IDs, SW-2 through SW-4). Approximately 1,943 lf of conveyance would be replaced with reinforced concrete pipe to include 864 lf of open ditch that would be converted to subsurface piping.

f. Point of Contact:

Name: Ryan Sauter
Title: Senior Scientist
Organization: Environmental Assessment Services, LLC
Email: ryan.sauter@easbio.com
Phone Number: 651.341.9955

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major

source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2023

VOC	0.262	250	No
NOx	1.333	250	No
CO	2.014	250	No
SOx	0.005	250	No
PM 10	28.076	250	No
PM 2.5	0.052	250	No
Pb	0.000	25	No
NH3	0.001	250	No
CO2e	493.5		

2024

Pollutant		**INSIGNIFICANCE INDICATOR**	
		Indicator (ton/yr)	**Exceedance (Yes or No)**
NOT IN A REGULATORY AREA			
VOC	0.523	250	No
NOx	2.665	250	No
CO	4.029	250	No
SOx	0.010	250	No
PM 10	56.152	250	No
PM 2.5	0.103	250	No
Pb	0.000	25	No
NH3	0.002	250	No
CO2e	987.0		

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

2025

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.523	250	No
NOx	2.665	250	No
CO	4.029	250	No
SOx	0.010	250	No
PM 10	56.152	250	No
PM 2.5	0.103	250	No
Pb	0.000	25	No
NH3	0.002	250	No
CO2e	987.0		

2026

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.499	250	No
NOx	2.421	250	No
CO	4.020	250	No
SOx	0.010	250	No
PM 10	42.995	250	No
PM 2.5	0.089	250	No
Pb	0.000	25	No
NH3	0.001	250	No
CO2e	982.9		

2027

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.499	250	No
NOx	2.421	250	No
CO	4.020	250	No
SOx	0.010	250	No
PM 10	42.995	250	No
PM 2.5	0.089	250	No
Pb	0.000	25	No
NH3	0.001	250	No
CO2e	982.9		

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

2028

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.250	250	No
NOx	1.211	250	No
CO	2.010	250	No
SOx	0.005	250	No
PM 10	21.498	250	No
PM 2.5	0.045	250	No
Pb	0.000	25	No
NH3	0.001	250	No
CO2e	491.5		

2029 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	250	No
NOx	0.000	250	No
CO	0.000	250	No
SOx	0.000	250	No
PM 10	0.000	250	No
PM 2.5	0.000	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	0.0		

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQS.

_____ _____

Ryan Sauter, Senior Scientist DATE

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location

Base: SHEPPARD AFB
State: Texas
County(s): Wichita
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Proposed Sanitary and Storm Sewer Rehabilitation Projects for Sheppard Air Force Base, Wichita County, Texas

- Project Number/s (if applicable): NA

- Projected Action Start Date: 7 / 2023

- Action Purpose and Need:

The purpose of the Proposed Action is to address critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The Air Force prioritized the projects under the Proposed Action by conducting systemic, risk-based infrastructure assessments accounting for factors such as service life, physical condition, operational capacity, and cost. As a result, the Proposed Action would address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability

The Proposed Action is needed to address operational concerns associated with SAFB's aging sanitary and storm sewer infrastructure. Individual segments and components of these infrastructure systems are in a state of disrepair and require immediate action to ensure their continued operability. Without management action, the sanitary and storm sewer systems could become inoperable or result in SAFB's non-compliance with associated permit conditions (TCEQ, 2018, 2019, 2021). The Proposed Action would target the most deficient, high-risk elements for each of these Base-wide infrastructure assets. In the short term, the Proposed Action would ensure these systems continue to operate in support of the military mission and in compliance with applicable permit conditions. In the long term, the Air Force would continue to systematically maintain and modernize these critical infrastructure assets in a logical, stepwise manner

- Action Description:

The Proposed Action would repair or replace approximately 14,680 linear feet (lf) of selected 6–15-inch-diameter sanitary sewer line segments on SAFB. The Air Force reviewed repair/replacement options for conducting this work and selected an appropriate technique for each individual line repair/replacement project under consideration.

The Proposed Action would also replace or convert approximately 5,500 lf of storm sewer conveyance on the Base (see Figure 2-1, Map IDs, SW-2 through SW-4). Approximately 1,943 lf of conveyance would be replaced with reinforced concrete pipe to include 864 lf of open ditch that would be converted to subsurface piping.

- Point of Contact

Name: Ryan Sauter
Title: Senior Scientist
Organization: Environmental Assessment Services, LLC
Email: ryan.sauter@easbio.com
Phone Number: 651.341.9955

- Activity List:

	Activity Type	Activity Title
2.	Construction / Demolition	Excavation for Sanitary Sewer Replacement
3.	Construction / Demolition	Storm Sewer Repair/Replacement
4.	Construction / Demolition	Extension of Storm Sewer

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Construction / Demolition

2.1 General Information & Timeline Assumptions

- Activity Location
County: Wichita
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Excavation for Sanitary Sewer Replacement

- Activity Description:
repair or replace approximately 15,690 linear feet (lf) of selected 6–15-inch-diameter sanitary sewer line segments on SAFB

- Activity Start Date
Start Month: 7
Start Month: 2023

- Activity End Date
Indefinite: False
End Month: 6
End Month: 2028

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	1.307815
SO_x	0.026094
NO_x	6.665903
CO	10.072741
PM 10	191.273851

Pollutant	Total Emissions (TONs)
PM 2.5	0.257611
Pb	0.000000
NH_3	0.003919
CO_2e	2468.6

2.1 Trenching/Excavating Phase

2.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 7
Start Quarter: 1
Start Year: 2023

- Phase Duration
Number of Month: 60
Number of Days: 0

2.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 320025

Amount of Material to be Hauled On-Site (yd^3): 17850
Amount of Material to be Hauled Off-Site (yd^3): 0

- Trenching Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8
Other General Industrial Equipmen Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.534	000.007	000.582	004.759	000.010	000.009		000.034	00373.409
LDGT	000.732	000.010	001.014	007.911	000.011	000.010		000.034	00500.251
HDGV	001.399	000.016	002.839	025.321	000.028	000.025		000.045	00783.622
LDDV	000.225	000.003	000.317	003.873	000.007	000.006		000.008	00382.861
LDDT	000.538	000.005	000.853	007.913	000.009	000.008		000.008	00597.264
HDDV	000.763	000.014	008.044	002.712	000.368	000.339		000.028	01587.983
MC	002.858	000.008	000.719	014.264	000.027	000.024		000.050	00395.027

2.1.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

3. Construction / Demolition

3.1 General Information & Timeline Assumptions

- Activity Location
County: Wichita
Regulatory Area(s): NOT IN A REGULATORY AREA

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Activity Title: Storm Sewer Repair/Replacement

- Activity Description:
The Proposed Action would also repair or replace approximately 5,460 lf of storm sewer conveyance on the Base

- Activity Start Date
Start Month: 7
Start Month: 2023

- Activity End Date
Indefinite: False
End Month: 0
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.653604
SO_x	0.013038
NO_x	3.329869
CO	5.035242
PM 10	44.743722

Pollutant	Total Emissions (TONs)
PM 2.5	0.128701
Pb	0.000000
NH_3	0.001940
CO_2e	1233.3

3.1 Trenching/Excavating Phase

3.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 7
Start Quarter: 1
Start Year: 2023

- Phase Duration
Number of Month: 30
Number of Days: 0

3.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 149494
Amount of Material to be Hauled On-Site (yd^3): 8300
Amount of Material to be Hauled Off-Site (yd^3): 0

- Trenching Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8
Other General Industrial Equipmen Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust

Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

3.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.534	000.007	000.582	004.759	000.010	000.009		000.034	00373.409
LDGT	000.732	000.010	001.014	007.911	000.011	000.010		000.034	00500.251
HDGV	001.399	000.016	002.839	025.321	000.028	000.025		000.045	00783.622
LDDV	000.225	000.003	000.317	003.873	000.007	000.006		000.008	00382.861
LDDT	000.538	000.005	000.853	007.913	000.009	000.008		000.008	00597.264
HDDV	000.763	000.014	008.044	002.712	000.368	000.339		000.028	01587.983
MC	002.858	000.008	000.719	014.264	000.027	000.024		000.050	00395.027

3.1.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)

HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

4. Construction / Demolition

4.1 General Information & Timeline Assumptions

- Activity Location
County: Wichita
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Extension of Storm Sewer

- Activity Description:
The proposed action will add approximatly 1,954 linear ft of storm sewer.

- Activity Start Date
Start Month: 1
Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 6
End Month: 2028

- Activity Emissions:

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Pollutant	Total Emissions (TONs)
VOC	0.594739
SO_x	0.012951
NO_x	2.719668
CO	5.013284
PM 10	11.851800

Pollutant	Total Emissions (TONs)
PM 2.5	0.094397
Pb	0.000000
NH_3	0.001752
CO_2e	1223.0

4.1 Trenching/Excavating Phase

4.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 30
Number of Days: 0

4.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 39396
Amount of Material to be Hauled On-Site (yd^3): 2188
Amount of Material to be Hauled Off-Site (yd^3): 0

- Trenching Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8
Other General Industrial Equipmen Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

4.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.534	000.007	000.582	004.759	000.010	000.009		000.034	00373.409
LDGT	000.732	000.010	001.014	007.911	000.011	000.010		000.034	00500.251
HDGV	001.399	000.016	002.839	025.321	000.028	000.025		000.045	00783.622
LDDV	000.225	000.003	000.317	003.873	000.007	000.006		000.008	00382.861
LDDT	000.538	000.005	000.853	007.913	000.009	000.008		000.008	00597.264
HDDV	000.763	000.014	008.044	002.712	000.368	000.339		000.028	01587.983
MC	002.858	000.008	000.719	014.264	000.027	000.024		000.050	00395.027

4.1.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

APPENDIX D
PUBLIC NOTICES

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ATTN

STATE OF WISCONSIN, COUNTY OF BROWN:

On this JUNE 12TH, 2022 AD, personally appeared before me the undersigned authority for the Times Publishing Company of Wichita Falls, publishers of the Wichita Falls in Wichita County, Texas, and of general circulation in said county, and upon being duly sworn by me, on oath states that the attached advertisement is a true and correct copy of advertising published in day (2) issues hereof on the following date:

June 10th, 2022; June 12th, 2022

Subscribed and sworn to before me on June 12th, 2022

Legal Clerk

Notary Public, State of Wisconsin, County of Brown

5.5.23
My commission expires

NANCY HEYRMAN
Notary Public
State of Wisconsin

Publication Cost: $1,140.00
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Notice of Availability

Draft Environmental Assessment and Draft Finding of No Significant Impact Addressing Sanitary and Storm Sewer Rehabilitation at Sheppard Air Force Base, Texas

The U.S. Air Force (Air Force) and Sheppard Air Force Base (SAFB) announce the availability of a Draft Environmental Assessment (EA) addressing critical infrastructure deficiencies for two SAFB infrastructure assets: the sanitary and storm sewer systems. The Draft EA was prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality NEPA implementing regulations, and the Air Forces's environmental impact analysis process (EIAP).

The Draft EA describes the Air Forces's proposal to address the most deficient segments and components of these critical infrastructure systems, including mitigating actions, to ensure their continued operability. The proposed action would repair or replace sanitary sewer line segments and associated infrastructure such as sewage lift stations and manholes on SAFB. Portions of SAFB's storm sewer conveyance system would also be subject to repair or replacement.

The Draft EA evaluates potential impacts on the environment from the Air Force's proposed action at SAFB. Based on analysis in the Draft EA, no significant adverse impacts would be anticipated to result from the proposed infrastructure improvement projects. Accordingly, the Air Force has prepared a Draft Finding of No Significant Impact and Finding of No Practicable Alternative (FONSI/FONPA) to document the findings of the Draft EA.

During the public review period, the Draft EA and Draft FONSI/FONPA are available for review online at https://www.sheppard.af.mil/Library/Key-Documents/. Hard copies of the Draft EA and Draft FONSI/FONPA are also available for review at the following local libraries:

Wichita Falls Public Library
600 11th Street
Wichita Falls, TX, 76301-4604.

The Air Force invites public input and comment on these documents for a period 30 days from the publication of this notice. Comments or inquiries may be sent via postal mail to: ATTN: Ms. Rhonda Lofgren, 1810 J Ave, Sheppard AFB, TX 76311 or via email (preferred) to rhonda.lofgren.ctr@us.af.mil.

WT-GCI0896003-01

White supremacists riling up thousands on social media

DHS, FBI working with state, local agencies to raise awareness about increased threat

Amanda Seitz
ASSOCIATED PRESS

A makeshift memorial stands outside the Tree of Life synagogue in the aftermath of a deadly shooting in Pittsburgh. MATT ROURKE/AP FILE

WASHINGTON – The social media posts are of a distinct type. They hint darkly that the CIA or the FBI are behind mass shootings. They traffic in racist, sexist and homophobic tropes. They revel in the prospect of a "white boy summer."

White nationalists and supremacists, on accounts often run by young men, are building thriving, macho communities across social media platforms like Instagram, Telegram and TikTok, evading detection with coded hashtags and innuendo.

Their snarky memes and trendy videos are riling up thousands of followers on divisive issues including abortion, guns, immigration and LGBTQ rights. The Department of Homeland Security warned last week that such skewed framing of the subjects could drive extremists to violently attack public places across the U.S. in the coming months.

These type of threats and racist ideology have become so commonplace on social media that it's nearly impossible for law enforcement to separate internet ramblings from dangerous, potentially violent people, Michael German, who infiltrated white supremacy groups as an FBI agent, told the Senate Judiciary Committee on Tuesday.

"It seems intuitive that effective social media monitoring might provide clues to help law enforcement prevent attacks," German said. "After all, the white supremacist attackers in Buffalo, Pittsburgh and El Paso all gained access to materials online and expressed their hateful, violent intentions on social media."

But, he continued, "so many false alarms drown out threats."

DHS and the FBI are also working with state and local agencies to raise awareness about the increased threat around the U.S. in the coming months.

The heightened concern comes just weeks after a white 18-year-old entered a supermarket in Buffalo, New York, with the goal of killing as many Black patrons as possible. He gunned down 10.

That shooter claims to have been introduced to neo-Nazi websites and a livestream of the 2019 Christchurch, New Zealand mosque shootings on the anonymous, online messaging board 4Chan. In 2018, the white man who gunned down 11 at a Pittsburgh synagogue shared his antisemitic rants on Gab, a site that attracts extremists. The year before, a 21-year-old white man who killed 23 people at a Walmart in the largely Hispanic city of El Paso, Texas, shared his anti-immigrant hate on the messaging board 8Chan.

References to hate-filled ideologies are more elusive across mainstream platforms like Twitter, Instagram, TikTok and Telegram. To avoid detection from artificial intelligence-powered moderation, users don't use obvious terms like "white genocide" or "white power" in conversation.

They signal their beliefs in other ways: a Christian cross emoji in their profile or words like "anglo" or "pilled," a term embraced by far-right chatrooms, in usernames. Most recently, some of these accounts have borrowed the pop song "White Boy Summer" to cheer on the leaked Supreme Court draft opinion on Roe v. Wade, according to an analysis by Zignal Labs, a social media intelligence firm.

Facebook and Instagram owner Meta banned praise and support for white nationalist and separatists movements in 2019 on company platforms, but the social media shift to subtlety makes it difficult to moderate the posts. Meta says it has more than 350 experts, with backgrounds from national security to radicalization research, dedicated to ridding the site of such hateful speech.

"We know these groups are determined to find new ways to try to evade our policies, and that's why we invest in people and technology and work with outside experts to constantly update and improve our enforcement efforts," David Tessler, the head of dangerous organizations and individuals policy for Meta, said in a statement.

A closer look reveals hundreds of posts steeped in sexist, antisemitic, racist and homophobic content.

In one Instagram post identified by The Associated Press, an account called White Primacy appeared to post a photo of a billboard that describes a common way Jewish people were exterminated during the Holocaust.

"We're just 75 years since the gas chambers. So no, a billboard calling out bigotry against Jews isn't an overreaction," the pictured billboard said.

The caption of the post, however, denied gas chambers were used at all. The post's comments were even worse: "If what they said really happened, we'd be in such a better place," one user commented. "We're going to finish what they started someday," another wrote.

The account, which had more than 4,000 followers, was immediately removed Tuesday, after the AP asked Meta about it. Meta has banned posts that deny the Holocaust on its platform since 2020.

U.S. extremists are mimicking the social media strategy used by the Islamic State group, which turned to subtle language and images across Telegram, Facebook and YouTube a decade ago to evade the industry-wide crackdown of the terrorist group's online presence, said Mia Bloom, a communications professor at Georgia State University.

"They're trying to recruit," said Bloom, who has researched social media use for both Islamic State terrorists and far-right extremists. "We're starting to see some of the same patterns with ISIS and the far-right. The coded speech, the ways to evade AI. The groups were appealing to a younger and younger crowd."

For example, on Instagram, one of the most popular apps for teens and young adults, white supremacists amplify each other's content daily and point their followers to new accounts.

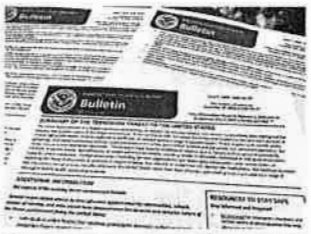
In recent weeks, a cluster of those accounts has turned its sights on Pride Month, with some calling for gay marriage to be "re-criminalized" and others using the #Pride or rainbow flag emoji to post homophobic memes.

Law enforcement agencies are already monitoring an active threat from a young Arizona man who says on his Telegram accounts that he is "leading the war" against retail giant Target for its Pride Month merchandise and children's clothing line and has promised to "hunt LGBT supporters" at the stores. In videos posted to his Telegram and YouTube accounts, sometimes filmed at Target stores, he encourages others to go the stores as well.

Target said in a statement that it is working with local and national law enforcement agencies who are investigating the videos.

As society becomes more accepting of LGBTQ rights, the issue may be especially triggering for young men who have held traditional beliefs around relationships and marriage, Bloom said.

"That might explain the vulnerability to radical belief systems: A lot of the beliefs that they grew up with, that they held rather firmly, are being shaken," she said. "That's where it becomes an opportunity for these groups: They're lashing out and they're picking on things that are very different."



The Department of Homeland Security warned June 7 that skewed framing of subjects like abortion, guns, immigration and LGBTQ rights could drive extremists to violently attack public places across the U.S. in the coming months. JON ELSWICK/AP

"It seems intuitive that effective social media monitoring might provide clues to help law enforcement prevent attacks. After all, the white supremacist attackers in Buffalo, Pittsburgh and El Paso all gained access to materials online and expressed their hateful, violent intentions on social media."

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FBI agent