05 April 2007

Mr. Mark Buthman
CSC/CEV
140 Channel Street
Vance Air Force Base, OK 73705

Subject: Contract No.: F41689-02-D-0001, Task Order No. 0078
Project: Environmental Impact Analysis for Installation Development, Vance Air Force Base, Oklahoma
Submittal: Final Environmental Assessment
Final Aircraft Operations Resource Book

Dear Mr. Buthman:

Science Applications International Corporation is pleased to submit five hard copies and two sets of CD-ROM disks (electronic copies in Word and .pdf format) of the Final Environmental Assessment for the subject project. Five hard copies and two sets of CD-ROM disks (electronic copies in Word and .pdf format) of the Final Aircraft Operations Resource Book are also included in this submittal. By copy of this letter, and per the SOW dated 16 June 2006, one hard copy and two sets of CD-ROM disks of each document have been sent via FedEx to Ms. Marion Erwin, HQ AETC/A7CPR. A comment response matrix is included in each submittal.

Thank you for the opportunity to assist the 71 CSC/CE and HQ AETC/A7CPR on this project. Please call if you have any questions regarding this submittal. You may reach me at (210) 731-2217.

Sincerely,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Kent R. Wells
Project Manager

Atch: Comment Response Matrix

cc: Ms. Marion Erwin, HQ AETC/A7CPR (as stated)
Ms. Juanita Cormier, AETC CONS/LGCU (transmittal letter only)
Mr. Thomas Patton, 71 CONF/LGC (transmittal letter only)

Report Documentation Page

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

The 71st Flying Training Wing at Vance Air Force Base (AFB), Oklahoma proposes to implement installation development projects based on the current Capital Improvements Program (CIP) and the requirements of the Base Realignment and Closure (BRAC) program as it relates to Vance AFB. The components of the current CIP include new building construction and alteration, replacement of old buildings, and demolition of some existing facilities. The proposed action is necessary at this time because there is a lack of available adequate facilities on Vance AFB. The proposed action would provide the necessary facilities to accomplish the mission of the 71st Flying Training Wing. New building and pavement construction, renovation, and building and pavement demolition would occur based on BRAC-related recommendations. An increase in personnel and aircraft would also occur based on the BRAC recommendations. One action alternative is presented, which establishes and evaluates a potential development capability of Vance AFB. Implementation of this alternative would include developing Vance AFB facilities to the maximum capability of the installation, increasing the number of assigned personnel to the base?s potential capability, and conducting flying operations at maximum sustainable levels. Resources considered in the impact analysis were noise, airspace management and air traffic control, land use, earth resources, water resources, hazardous materials and waste, biological resources, utilities and infrastructure socioeconomics and environmental justice, air quality, and cultural resources.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**325**	

SAIC Responses to Comments
Public Draft Environmental Assessment
Installation Development Program on
Vance Air Force Base, Oklahoma

3/26/2007

Reviewer Names: William Ray, Robert L. Brooks, Hayley Dikeman/Jerry J. Brabander
Reviewer Agency/Organization: Oklahoma Department of Wildlife Conservation; Oklahoma Archeological Society, University of Oklahoma; USFWS

#	Reviewer	Page Number	Line Number	Section	Comment	Comment Response
1.	Oklahoma Department of Wildlife Conservation, William Ray				Recommend coordination with USFWS relating to migratory birds.	N/A, Vance AFB responsibility (IICEP letter was submitted to USFWS).
2.	Oklahoma Archeological Society, University of Oklahoma, Robert L. Brooks	3-55			"...there are some errors on page 3-55 concerning the archaeological resources, especially if you include Kegelman AAF as part of the plan. While there are no previously recorded sites at Vance, there are four historic archaeological sites documented for Kegelman. These are 34AL17 – 34AL20. These were recorded during a survey at auxiliary field by Geomarine in 2002.	Text revised to read: At Kegelman AAF, Building 300 was the only building identified in the 1993 study as potentially eligible for nomination to the NRHP, and the study recommended that a more thorough cultural resources survey be conducted (USAF 2002). Subsequently, the SHPO determined that Building 300 was not eligible for inclusion in the NRHP. The follow-up survey at Kegelman AAF conducted from 16 to 24 September 2002 documented four historic sites that were designated 34AL17, 34AL18, 34AL19, and 34AL20. Because the sites did not contain artifacts or near-surface deposits, none of the four sites were recommended for consideration as eligible for inclusion in the NRHP (USAF 2003c).

#	Reviewer	Page Number	Line Number	Section	Comment	Comment Response
3.	Oklahoma Archeological Society, University of Oklahoma, Robert L. Brooks	3-55			"...the numbers of sites listed for Garfield County are misleading. While there may be 546 recorded sites in the surrounding counties (which would depend on which counties were counted), there are only 54 sites in Garfield County. The total number of sites is also roughly 20,000, not 8,000."	Text revised to read: Fifty-four of approximately 20,000 historic archeological sites in the state of Oklahoma are located in Garfield County (Oklahoma Archeological Society 2007). For the most part, the sites in Garfield and the surrounding counties are located near Cimarron and North Canadian Rivers (USAF 2002).
4.	Oklahoma Archeological Society, University of Oklahoma, Robert L. Brooks	4-61 – 4-62			"Vance resides in an upland, very level setting which has (in my opinion) little potential for prehistoric sites. Thus, I suspect that base expansion would be unlikely to significantly affect the prehistoric cultural heritage. However there is the potential for historic arechaeological resources..."	No revision necessary.
5.	Hayley Dikeman/ Jerry J. Brabander, USFWS				The Service recommends incorporating migratory birds into your environmental review process.	Text added to Section 3.3.7.1 that reads: Migratory birds (protected under the Migratory Bird Treaty Act [MBTA] and the Sikes Act) are present throughout both Vance AFB and Kegelman AAF, but are more prevalent at Kegelman AAF. Text added to Section 4.3.7.1.2 (Proposed Action) that reads: Development activities at Vance AFB and Kegelman AAF would continue to be performed in compliance with the MBTA and the Sikes Act.

FINDING OF NO SIGNIFICANT IMPACT
FOR
INSTALLATION DEVELOPMENT AT
VANCE AIR FORCE BASE, OKLAHOMA

AGENCY: Department of the Air Force, 71st Flying Training Wing, Vance Air Force Base (AFB), Oklahoma.

PROPOSED ACTION AND ALTERNATIVES: The proposed action includes completion of installation development projects and implementation of the Base Realignment and Closure Commission's final recommendations for Vance AFB, which includes installation development activities to support the relocation of missions to Vance AFB. Approximately 357,927 square feet of building construction, 71,084 square feet of building renovation, 525,863 square feet of construction or upgrade of pavements, and 144,781 square feet of building demolition would be accomplished. The base population would increase by 250 persons, to approximately 3,765. The proposed action includes the overall increase of annual aircraft operations from approximately 225,000 to 330,000, an increase of 47 percent. The alternative action includes development of Vance AFB facilities to the maximum capability of the installation as well as increasing the number of assigned personnel and conducting flying operations at maximum sustainable levels. Approximately 1.8 million square feet of buildings would be constructed, 55 acres of associated pavements would be added, and approximately 660 thousand square feet of buildings would be demolished. The base population would increase by 7,402, to 10,917. The alternative action includes the overall increase of annual aircraft operations to approximately 384,000. The no action alternative consists of the continuing use of existing facilities at Vance AFB to conduct training and aircraft operations at the same level as is currently occurring.

SUMMARY OF FINDINGS: An Environmental Assessment (EA) was completed and is attached and incorporated by reference. It analyzed the proposed action, an alternative action, and the no action alternative. Direct, indirect, and cumulative impacts regarding noise, aircraft operations and airspace, land use, earth resources, water resources, hazardous materials and waste, biological resources, utilities and infrastructure, socioeconomics and environmental justice, air quality, and cultural resources were all analyzed.

Implementation of the proposed action would result in increases in impervious surfaces, hazardous materials consumption, hazardous waste generation, and infrastructure demand; however, best management practices would be employed to minimize erosion and impacts to water resources by the increased impervious surfaces, and the projected increase in demand on base infrastructure is not expected to create adverse impacts. Because hazardous materials and waste would be managed in accordance with existing protocols, impacts are expected to be minor. Anticipated increases in emissions are not expected to result in any meaningful long-term impacts to Garfield County or Air Quality Control Region 185. Land and persons located under the noise contours in the vicinity of Vance AFB are expected to increase, however the effects are not expected to be noticeable. The proposed action is not expected to contribute appreciably to cumulative environmental impacts when considered in the context of other projects that have recently been

completed, are currently under construction, or are anticipated to be implemented in the near future.

Implementation of the alternative action would result in similar impacts as the proposed action in all respects except noise. Land and persons located under the noise contours in the vicinity of Vance AFB would increase. However, the increase is not expected to be significant. As with the proposed action, the alternative action is not expected to contribute appreciably to cumulative environmental impacts.

SUMMARY OF PUBLIC REVIEW AND INTERAGENCY COORDINATION: The appropriate federal, state, and local agencies were provided copies of the Draft EA and Draft Finding of No Significant Impact and asked to submit comments. The Draft EA and Draft Finding of No Significant Impact were made available to the public and public agencies for 30 days. Notification of this 30-day comment period was placed in the *Enid News and Eagle* on February 25, 2007.

FINDING OF NO SIGNIFICANT IMPACT: Based on my review of the facts and analysis in the EA, I conclude that neither the proposed action nor the alternative action will have a significant impact either by itself or by considering cumulative impacts. Accordingly, the requirements of the *National Environmental Policy Act*, the Council on Environmental Quality Regulations, and 32 *Code of Federal Regulations* 989 have been fulfilled, and an environmental impact statement is not required and will not be prepared.

5 Apr 07

RICHARD A. KLUMPP, **JR.**
Colonel, USAF **Date**
Commander

FINAL

ENVIRONMENTAL ASSESSMENT

INSTALLATION DEVELOPMENT AT VANCE AIR FORCE BASE, OKLAHOMA

United States Air Force
Air Education and Training Command
Vance Air Force Base, Oklahoma

April 2007

ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
µg/m^3	micrograms per cubic meter
71 FTW	71st Flying Training Wing
71 MDG	71st Medical Group
71 MSG	71st Mission Support Group
71 OG	71st Operations Group
71 OSS	71st Operations Support Squadron
ACAM	Air Conformity Applicability Model
ACM	asbestos-containing material
AETC	Air Education and Training Command
ADAL	Additions and Alterations
AFB	Air Force Base
AFI	Air Force Instruction
AFRC	Armed Forces Reserve Center
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
AMP	*Asbestos Management Plan*
AOC	Area of Concern
AOP	*Asbestos Operating Plan*
APZ I	Accident Potential Zone 1
APZ II	Accident Potential Zone 2
AQCR	Air Quality Control Region
ARTCC	Air Route Traffic Control Center
ASR	*Asbestos Survey Report*
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
ATFP	Anti-terrorism and Force Protection
AVGAS	aviation gasoline
BHPO	Base Historic Preservation Officer
BMP	best management practices
BOS	Base Operations Support
BRAC	Base Realignment and Closure
CAA	*Clean Air Act*
CE	Civil Engineering
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CIP	Capital Improvements Program
CO	carbon monoxide
COMBS	Contractor Operated and Managed Base Supply
CRMP	*Cultural Resources Management Plan*
CWA	*Clean Water Act*
dB	decibel
dBA	A-weighted decibel
DoD	Department of Defense
DOT	Department of Transportation
DP	Disposal Area
EA	Environmental Assessment
ECP	Entry Control Point
EIS	Environmental Impact Statement
EO	Executive Order
ERP	Environmental Restoration Program
ESA	*Endangered Species Act*
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIP	Federal Implementation Plan
FL	flight level
FT	Fire Training Area
FTS	Flying Training Squadron
FY	fiscal year
HAP	hazardous air pollutant
HAWC	Health and Wellness Center
HAZMAT	Hazardous Material
hr	hour
HWMP	*Hazardous Waste Management Plan*
Hz	Hertz
IFF	Introduction to Fighter Fundamentals
IFR	Instrument Flight Rule
IR	Instrument Route
JP	jet propulsion
JPATS	Joint Primary Air Training System
Kegelman AAF	Kegelman Auxiliary Airfield
Kts	knots
kW	kilowatt
lbs	pound
LBP	lead-based paint
LF	landfill
L_{dn}	Day-Night Average Sound Level
L_{eq}	equivalent noise level
L_{max}	maximum sound level
LOS	level of service
LTO	landing-takeoff
MBTA	Migratory Bird Treaty Act
M-F	Monday through Friday
MFH	Military Family Housing
mg/m^3	milligrams per cubic meter
mgd	million gallons per day

continued on back cover

FINAL

Environmental Assessment

Installation Development at
Vance Air Force Base, Oklahoma

Department of the Air Force
71st Flying Training Wing
Vance Air Force Base, Oklahoma

April 2007

This Report Printed on 20% Recycled Paper

FINAL

PRIVACY ADVISORY NOTICE

Public comments on this Environmental Assessment (EA) were requested pursuant to the *National Environmental Policy Act*, 42 *United States Code* 4321, et seq. All written comments received during the comment period were made available to the public and considered during final EA preparation. Any personal information provided has been kept confidential. Private addresses have been compiled to develop a mailing list for those requesting copies of the Final Environmental Assessment. However, if applicable, only names of individuals making comments and specific comments have been disclosed. Personal home addresses and phone numbers are not published in the Final Environmental Assessment.

FINAL

COVER SHEET
ENVIRONMENTAL ASSESSMENT
INSTALLATION DEVELOPMENT
VANCE AIR FORCE BASE, OKLAHOMA

Responsible Agency: 71st Flying Training Wing, Vance Air Force Base (AFB), Oklahoma

Proposed Action: Installation Development at Vance AFB, Garfield County, Oklahoma and Kegelman Auxiliary Airfield, Alfalfa County, Oklahoma.

Point of Contact: Mr. Mark Buthman, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB, Oklahoma 73705-5623, 580-213-7344.

Report Designation: Environmental Assessment

Abstract: The 71st Flying Training Wing at Vance Air Force Base (AFB), Oklahoma, proposes to implement installation development projects based on the current Capital Improvements Program (CIP) and the requirements of the Base Realignment and Closure (BRAC) program as it relates to Vance AFB. The components of the current CIP include new building construction and alteration, replacement of old buildings, and demolition of some existing facilities. The proposed action is necessary at this time because there is a lack of available adequate facilities on Vance AFB. The proposed action would provide the necessary facilities to accomplish the mission of the 71st Flying Training Wing. New building and pavement construction, renovation, and building and pavement demolition would occur based on BRAC-related recommendations. An increase in personnel and aircraft would also occur based on the BRAC recommendations.

One action alternative is presented, which establishes and evaluates a potential development capability of Vance AFB. Implementation of this alternative would include developing Vance AFB facilities to the maximum capability of the installation, increasing the number of assigned personnel to the base's potential capability, and conducting flying operations at maximum sustainable levels. Resources considered in the impact analysis were noise, airspace management and air traffic control, land use, earth resources, water resources, hazardous materials and waste, biological resources, utilities and infrastructure, socioeconomics and environmental justice, air quality, and cultural resources.

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CHAPTER 1

PURPOSE OF AND NEED FOR ACTION

The Commander of the 71st Flying Training Wing (71 FTW) proposes to initiate installation development activities based on the current Capital Improvements Program (CIP) and implement the requirements of the Base Realignment and Closure (BRAC) program related to Vance Air Force Base (AFB). This Environmental Assessment (EA) consists of seven chapters covering the purpose and need for the proposed action, a detailed description of the proposed action and alternatives, a discussion of baseline environmental conditions, the environmental analysis, a list of individuals who prepared the EA, a list of agencies and individuals contacted during preparation of the EA, and a list of source documents for the EA. This chapter presents the purpose of and need for the action, a description of the location, a description of the scope of the environmental review, an overview of environmental requirements, an introduction to the organization of this document, and a summary of public involvement activities.

1.1 PURPOSE OF AND NEED FOR ACTION

The Air Force must maintain its readiness with a highly educated and trained force structure. The Air Education and Training Command (AETC) is responsible for the quality training and education of Air Force personnel. The primary mission of Vance AFB and the 71 FTW is to train over 410 military pilots each year to perform combat and air support duties. In order to support this important mission and provide a high quality of life for the base community, it is essential that Vance AFB take a proactive role in the maintenance of its facilities and infrastructure.

The proposed action is necessary to upgrade, replace, or supplement existing facilities that no longer function as originally intended. The proposed action is needed due to shortfalls in available facilities at Vance AFB, and would provide the necessary facilities for the 71 FTW to execute its continuously evolving training mission.

1.2 LOCATION

Vance AFB is located on the southern edge of the city of Enid, Oklahoma, in Garfield County in north-central Oklahoma (Figure 1-1). The location is approximately 80 miles north-northwest of Oklahoma City, and 100 miles south-southwest of Wichita, Kansas. Kegelman Auxiliary Airfield (Kegelman AAF), a geographically separated unit of Vance AFB, is located approximately 40 miles northwest of Enid near the town of Jet, Oklahoma, in east-central Alfalfa County. The airfield at Kegelman AAF is active from dawn to dusk for flying training exercises. Vance AFB consists of 2,125 acres of land, the majority of which contains some form of development or restricted area for airfield clearances. Kegelman AAF consists of 1,066 acres of land that is primarily used for airfield-related activities. Both Vance AFB and Kegelman AAF are surrounded by farmland. The area immediately adjacent to their boundaries is sparsely developed.

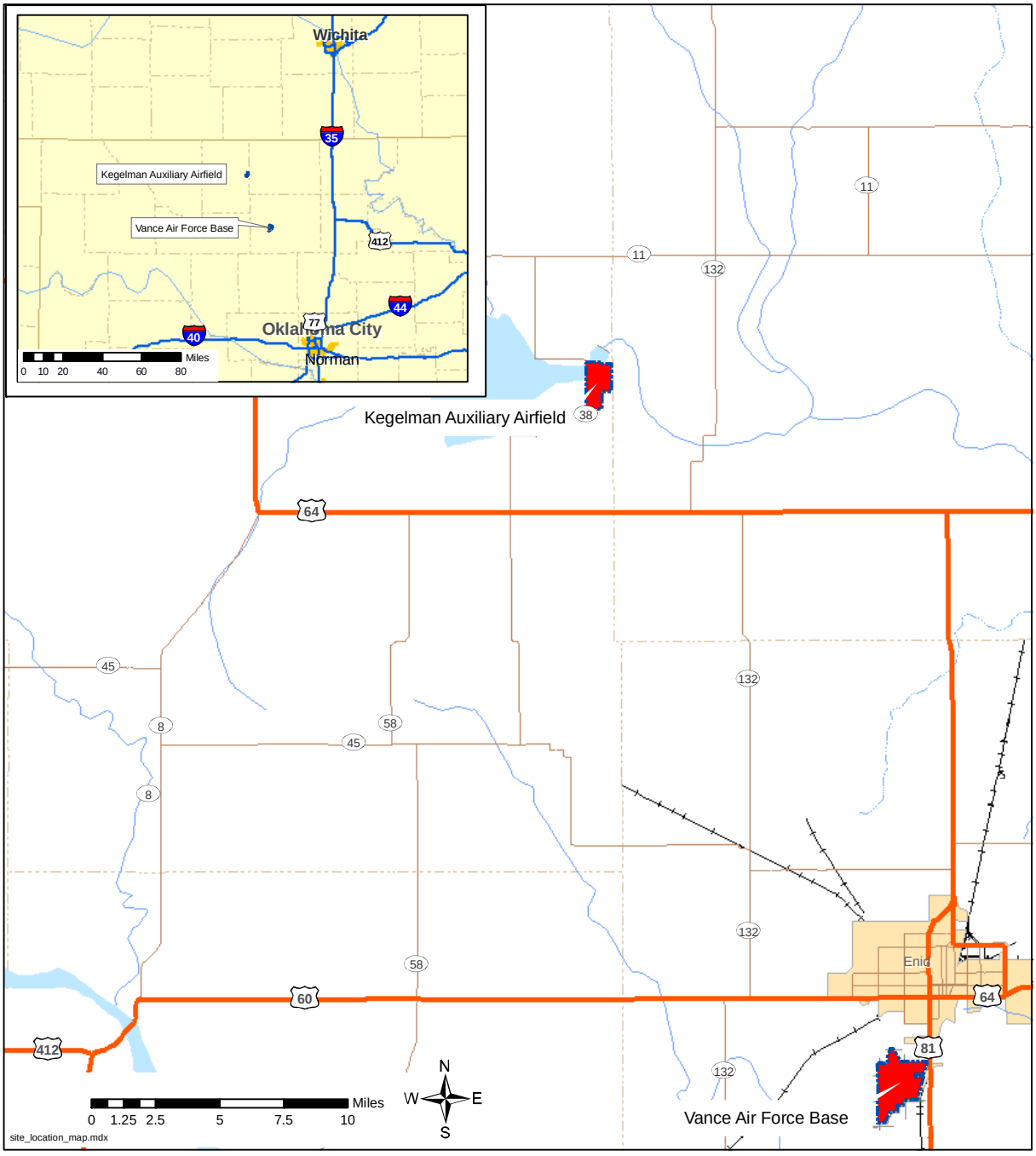

Figure 1-1 Site Location Map

1.3 SCOPE OF THE ENVIRONMENTAL REVIEW

The *National Environmental Policy Act* of 1969 (NEPA), as amended, requires federal agencies to consider environmental consequences in the decision-making process. The President's Council on Environmental Quality (CEQ) issued regulations to implement NEPA that include provisions for both the content and procedural aspects of the required environmental analysis. The Air Force Environmental Impact Analysis Process is accomplished through adherence to the procedures set forth in CEQ regulations (40 *Code of Federal Regulations* [CFR] §§1500-1508) and 32 CFR Part 989, *Environmental Impact Analysis Process*. These federal regulations establish the administrative process and substantive scope of the environmental impact evaluations that are designed to ensure that deciding authorities have a proper understanding of the potential environmental consequences of a contemplated course of action. The Air Force plans to prepare an EA for this proposal. The CEQ regulations require that an EA:

- Provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact.
- Facilitate the preparation of an EIS when required.

This EA identifies, describes, and evaluates the potential environmental impacts that may result from implementation of the CIP and BRAC projects (the proposed action), implementation of the potential development alternative (the alternative action), and the no action alternative. As appropriate, the affected environment and environmental consequences of the proposed action and alternatives may be described in terms of site-specific descriptions or in terms of a regional overview. Finally, if required, the EA identifies measures to reduce impacts or best management practices (BMP) to prevent or minimize environmental impacts.

The resources that could be impacted and will therefore be analyzed in the EA include noise, airspace management and air traffic control, land use, earth resources, water resources, hazardous materials and waste, biological resources, utilities and infrastructure, socioeconomics and environmental justice, air quality, and cultural resources. Assessment of safety and health impacts is not included in this document; all contractors would be responsible for compliance with applicable *Occupational Safety and Health Act* regulations concerning occupational hazards for their employees.

Other actions or potential actions that may be concurrent with the proposed action could contribute to cumulative impacts. The environmental impacts of these other actions are addressed in this EA only in the context of potential cumulative impacts. A cumulative impact, as defined by the 40 CFR §1508.7, is the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

1.4 ENVIRONMENTAL JUSTICE

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued by the President on February 11, 1994. In the EO, the President instructed each federal agency to make "…achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations..." Adverse is defined by the Federal Interagency Working Group on Environmental Justice as "…having a deleterious effect on human health or the environment that is significant, unacceptable, or above generally accepted norms."

The existing conditions associated with the environmental justice analysis and the environmental justice analysis are presented in Chapters 3 and 4 of this EA, as described in Section 1.6.

1.5 APPLICABLE REGULATORY REQUIREMENTS

Table 1-1 summarizes potentially applicable regulatory requirements for the proposed action and alternatives.

1.6 INTRODUCTION TO THE ORGANIZATION OF THE DOCUMENT

This EA is organized into seven chapters. Chapter 1 contains a statement of the purpose of and need for action, the location of the proposed action, a summary of the scope of the environmental review, identification of applicable regulatory requirements, an introduction to the organization of the EA, discussion of environmental justice analysis requirements, and a summary of public involvement activities.

Chapter 2 contains a brief introduction, describes the history of the formulation of alternatives, describes the alternatives eliminated from further consideration, provides a detailed description of the proposed action, identifies other action alternatives, summarizes other known or reasonably foreseeable actions in the proposed action's region of influence, identifies the preferred alternative, identifies measures to reduce impacts (if required), and provides a comparison matrix of environmental effects for all alternatives.

Chapter 3 contains a general description of the biophysical resources that could potentially be affected by the proposed action or alternatives. Chapter 4 is an analysis of the environmental consequences. Chapter 5 lists preparers of this document. Chapter 6 lists persons and agencies consulted in the preparation of this EA. Chapter 7 is a list of source documents relevant to the preparation of this EA.

Table 1-1 Potentially Required Federal Permit, License, or Entitlement

Federal Permit, License, or Entitlement	Typical Activity, Facility, or Category of Persons Required to Obtain the Federal Permit, License, or Entitlement	Resources Affected	Authority	Regulatory Agency
Title V permit under the *Clean Air Act* (CAA)	Sources subject to the Title V permit program include: Any major source: (1) A stationary source that emits or has the potential to emit 100 tons per year (tpy) of any pollutant (major source threshold can be lower in nonattainment areas), (2) A major source of air toxics regulated under Section 112 of Title III (sources that emit or have the potential to emit 10 tpy or more of a hazardous air pollutant or 25 tpy or more of any combination of hazardous air pollutants). Any "affected source" as defined in Title IV (acid rain) of the CAA. Any source subject to New Source Performance Standards under Section 111 of the CAA. Sources required to have new source or modification permits under Parts C [Prevention of Significant Deterioration (attainment areas)] or D [New Source Review (nonattainment areas)] of Title I of the CAA. Any source subject to standards, limitations, or other requirements under Section 112 of the CAA. Other sources designated by United States Environmental Protection Agency (USEPA) in the regulations.	Air emissions from increased air traffic.	Title V of CAA, as amended by the 1990 CAA Amendments	USEPA; Oklahoma Department of Environmental Quality (ODEQ)
National Pollutant Discharge Elimination System permit	Discharge of pollutant from any point source into navigable waters of the United States.	Potential of increases in wastewater discharge due to increased personnel.	§402 of Clean Water Act (CWA); 33 United States Code (USC), §1342	USEPA; ODEQ

Appendix A contains copies of all interagency correspondence regarding the proposed action. The *Capability Analysis* on which the alternative action (potential development alternative) was based is included in Appendix B. Appendix C contains the socioeconomics impact calculations. Appendix D contains the Notice of Availability.

1.7 PUBLIC INVOLVEMENT SUMMARY

On December 20, 2006, copies of the description of proposed action and alternatives were sent to 11 governmental agencies with accompanying letters requesting their review and comments (Appendix A). No comments were received from the regulatory agencies in response to that request for comments. The Draft EA and Draft Finding of No Significant Impact were made available at the following location to provide public access to the document during the 30-day public comment period, which began on February 25, 2007 and ended on March 27, 2007: the Public Library of Enid and Garfield County, 120 West Main, Enid, Oklahoma, 73701. Notification of this 30-day comment period detailing the availability of the document for public review was placed in the *Enid News and Eagle*. Copies of the Draft EA with letters requesting review and comment were provided to 11 governmental agencies (Appendix A). The review period afforded the public and appropriate federal, state, and local agencies the opportunity to review and comment on the EA. All comments received on the Draft EA were used in the preparation of this Final EA.

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CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter is composed of eight sections: an introduction, a brief history of the formulation of alternatives, identification of alternatives eliminated from further consideration, a description of the no action alternative, a detailed description of the proposed action, a detailed description of other action alternatives, a general description of other projects that may have the potential to impact the region when cumulative effects are considered, and a comparison matrix that summarizes the environmental effects of each alternative.

2.2 HISTORY OF THE FORMULATION OF ALTERNATIVES

The alternatives developed for the proposed action at Vance AFB are designed to capture the range of possible development and activity levels at Vance AFB from the no action alternative to the alternative action (potential development alternative). The *Capability Analysis* (Appendix B) identified expansion potential of the current mission activity at Vance AFB for the planning period ending in the year 2013. Vance AFB projects are planned based on the government fiscal year (FY) that begins on October 1 and ends on September 30 of the following calendar year. For the purposes of this EA, all projects performed or planned from the baseline (FY2005) to the end of the planning period (FY2013) were included. Three viable alternatives were identified:

- No Action Alternative: continue use of existing facilities at Vance AFB and continue technical training and aircraft operations at the current level.
- Proposed Action: (1) implement construction to accomplish the CIP (including demolition of facilities that are either dilapidated or in the footprint of proposed CIP construction) and (2) implement the BRAC program as it relates to Vance AFB.
- Alternative Action (Potential Development Alternative): develop facilities to the capability of the installation and conduct technical and flying operations at potential levels as quantified in the *Capability Analysis*.

2.3 IDENTIFICATION OF ALTERNATIVES ELIMINATED FROM CONSIDERATION

No additional alternatives were considered because the three alternatives provide the full range of potential impacts: from no development (the no action alternative) to implementing the development potential of Vance AFB through the planning period ending in 2013 (the alternative action).

2.4 NO ACTION ALTERNATIVE

Under the no action alternative, there would be no increase in personnel or mission activity at Vance AFB and no construction or demolition would be accomplished in support of the CIP or the BRAC program projects relating to Vance AFB. The no action alternative would limit the base's ability to conduct its mission successfully and to maintain wartime readiness and training.

2.5 DETAILED DESCRIPTION OF THE PROPOSED ACTION

Under the proposed action, the 71 FTW at Vance AFB would implement installation development activities based on the current CIP and BRAC-related projects. The components of the CIP that would be implemented include new building construction and alteration, replacement of old buildings, and demolition of selected existing facilities.

The Vance AFB CIP components of the proposed action would include the construction of 243,635 square feet of new building space, the construction or upgrade of 73,656 square feet of pavement, and the renovation of 73,656 square feet of existing space. Demolition would consist of approximately 144,781 square feet of facilities and 196,776 square feet of associated pavement. Major components of the CIP support the Flightline; Mission Expansion Area; Flying Training Campus; and the community, recreation, and fitness complex; as well as other development areas. The Vance AFB CIP would also include approximately 7,500 square feet of building construction at Kegelman AAF.

BRAC project support would include construction of approximately 106,792 square feet of building space and 452,207 square feet of pavement, and renovation of approximately 650 square feet of building space. Demolition of approximately 20,369 square feet of pavement would be required.

The implementation of the BRAC program would result in a change in population based on gaining missions at Vance AFB. The relocation of missions would result in an increase of approximately 250 personnel associated with the Armed Forces Reserve Center (AFRC). An increase in aircraft would also occur based on BRAC-related recommendations. Vance AFB would receive 14 T-6A and 15 T-38C aircraft.

All programmed projects with identified locations (including major construction, minor construction, fencing, and pavement projects) are summarized in Table 2-1. Unless otherwise noted, the square foot values apply to building construction, renovation, or demolition. Figures 2-1 and 2-2 show the project construction locations and Figure 2-3 shows the associated project demolition locations.

Table 2-1 Project List, Proposed Action

Project Number	Description/Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
1	Survival Equipment Shop (gaining mission)	BRAC	650 (renovation) 1,200 (building)	--	This project would provide adequate space necessary for the Egress Shop.
2	ADAL Aircraft Parking Apron (gaining mission)	BRAC	1,240 (building) 200,000 (pavement)	--	This project would provide construction of two rows on the north end of the existing aircraft apron and two rows on the south end of the existing aircraft apron to support the addition of 14 T-6As and 15 T-38Cs that require additional apron space.
3	Construct AFRC (gaining mission)	BRAC	93,504 (building)	--	Construction of this facility would provide organizational, maintenance shop, administrative, educational, assembly, library, learning center, vault, weapons simulator, barracks areas, and physical fitness areas to support one Army Reserve unit and three Oklahoma Army National Guard units.
4	Extend Utilities to AFRC (gaining mission)	BRAC	--	--	This project would provide all utility distribution system connections to the existing base systems to support the new AFRC.
5	Construct Base Streets to AFRC (gaining mission)	BRAC	223,893 (pavement)	20,369 (pavement)	This project would provide all roads and connections to the existing base roads to support the new AFRC.

Table 2-1, Continued

Project Number	Description/Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
6	IFF, UPT, and FTS Squadron Facilities (gaining mission)	BRAC	10,800 (building)	--	To support the IFF, UPT, and FTS, Building 171 and 179 would require renovation and a one-story facility would need to be constructed.
7	South Gate ECP (gaining mission)	BRAC	48 (building) 28,314 (pavement)	--	Construction of a single story facility consisting of site improvements, masonry walls, and standing seam metal roof would occur.
8	Fuel Systems Maintenance Hangar	CIP	22,692 (building) 6,752 (renovation)	9,026 (building)	Construction of a fuel maintenance dock with an administrative area and four adequately sized maintenance bays to accommodate aircraft assigned to Vance AFB would occur. Building 188 would be renovated to become an aircraft washrack. Existing Fuel System Maintenance Dock would be demolished.
9	ADAL Squadron Facilities	CIP	27,632 (building) 48,882 (renovation)	--	Construction of an addition to the 32nd FTS, Building 541 would include two classrooms and squadron space. Renovation of existing facilities in Buildings 179, 183, and 541 would be required.
10	Control Tower	CIP	6,230 (building)	2,292 (building)	Construction of a control tower and installation of a tower cab would occur. The tower would provide nine floors plus the control tower cab and provide space for administrative, Chief Controller's office, training room, ATC Tower Simulator room, ready room, mechanical rooms, and electronic rooms.

Table 2-1, Continued

Project Number	Description/Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
11	Community Support and Professional Development Center	CIP	29,747 (building)	11,900 (building)	Construction of a Community Support and Professional Development Center that would house the Education Center, Base Library, and Airman and Family Readiness Center would occur. The existing Education Center/Library/Family Support Center (Building 314) would be demolished with the construction of the new facility.
12	Unaccompanied Enlisted Quarters	CIP	38,865 (building) 721 (pavement)	51,121 (building)	Construction of a three-story 96 room UEQ dormitory facility would occur.
13	Lodging – 63-Room Visiting Quarters Facility	CIP	41,329 (building)	31,902 (building)	Construction of a 63-room Visiting Quarters Facility would occur.
14	Physical Fitness Center/ HAWC Addition	CIP	37,000 (building) 14,000 (renovation)	7,097 (building) 9,876 (pavement)	Renovate and construct new fitness center at existing Bradley Fitness and Sports Center. The renovation would be comprised of administration, group exercise, men's and women's locker rooms and fitness equipment spaces. The addition would be comprised of support, men's and women's locker rooms, gymnasium, racquetball courts, indoor running track, and fitness equipment spaces.
15	Repair Petroleum, Oil, and Lubricant (POL) Piping and Lighting	CIP	--	--	Replacement of the existing light poles, wiring, and fixtures would occur.

Table 2-1, Continued

Project Number	Description/Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
16	Fuel Storage Tank	CIP	20,000 (pavement)	--	Installation of a 12,000-gallon double wall fuel tank system, fuel dispenser, leak detection, and remote tank gauging systems would occur.
17	Military Working Dog Kennel Facility	CIP	2,991 (building)		Construction of a kennel that would provide space for six working dogs would occur. The facility would also provide space for tack storage, office space, and food preparation.
18	Airfield Systems Facility Addition	CIP	1,215 (building)	80,400 (pavement)	Construction of an addition to Building 751 would include space for an additional nine personnel, storage area, male and female latrine, and break room. Demolition of existing parking and drive to provide appropriate ATFP standoff would occur. Construction of new parking space would also occur.
19	Entomology	CIP	1,800 (building) 800 (renovation)		Construction of a building for the CE Environmental Controls (pest management) function that complies with Air Force regulations would occur. This would include storage, canopies, and covered drive-through hardstand.

Table 2-1, Continued

Project Number	Description/Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
20	Construct Road/Close Scott Road	CIP	10,935 (pavement)	9,026 (building) 31,500 (pavement)	Construction of a concrete roadway from Young Road to Scott Road would occur. Construction of a parking lot on the east side of the proposed roadway and west of the Consolidated Logistics Complex Building 200 would also occur. Demolition of MWR and housing supply Building 260 and associated pavements, existing pavements on Scott Road just east of Elam Road, and existing parking on north side of Young Road as required would also be part of this project.
21	Storm Drain	CIP	42,000 (pavement)	--	This construction would upgrade the existing earthen channel to include a 12-foot wide concrete bottom for a total of 3,500 linear feet northwest of Runway 17C. This project would result in the placement of dredged or fill material, permanently or temporarily, into the unnamed tributary of Boggy Creek, a jurisdictional stream. This proposal is subject to regulation pursuant to Section 404 of the *Clean Water Act*, and a Department of the Army permit would be required prior to construction.
22	Skills Center	CIP	12,234 (building)	7,900 (building)	This new facility would house the Automotive Skills Development Center, the Arts and Crafts Skills Development Center, a four-bay POV wash rack, as well as administrative space, secure storage areas, restrooms, service equipment space, and mechanical rooms. A state-of-the-art two-bay car wash separate from the building footprint would be provided to allow POV access at all times.

Table 2-1, Continued

Project Number	Description/Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
23	Transient Living Facility (TLF)	CIP	20,000 (building)	13,552 (building) 75,000 (pavement)	Construction of a new TLF complex to accommodate eight families would occur. The existing TLF would be demolished.
24	Rod and Gun Club Facility (Kegelman Auxiliary Airfield)	CIP	7,500 (building)	--	Construction of a facility to support the Vance AFB Rod and Gun Club would be completed.
25	Fuels Off-Load Station	CIP	1,900 (building)	965 (building)	Construction of a facility to unload JP-8 jet fuel from tanker trucks near the new north industrial gate would occur. Demolition of existing facilities to include Building 264, removal of concrete pavement, fencing, and piping would be completed. Pipeline demolition would only include the removal of pipe situated aboveground; all underground piping would be cleaned, plugged, and abandoned in place.
		Total	357,927 (building) 71,084 (renovation) 525,863 (pavement)	144,781 (building) 217,145 (pavement)	

Note: Construction and demolition areas obtained from the General Plan (USAF 2006a).

ADAL	Additions and Alterations	HAWC	Health and Wellness Center
AFB	Air Force Base	IFF	Introduction to Fighter Fundamentals
AFRC	Armed Forces Reserve Center	JP	jet propulsion
ATC	Air Traffic Control	MWR	Morale, Welfare, and Recreation
ATFP	Anti Terrorism and Force Protection	POL	petroleum, oil, and lubricant
BRAC	Base Realignment and Closure	POV	Privately Owned Vehicle
CE	Civil Engineering	TLF	Transient Living Facility
CIP	Capital Improvements Program	UEQ	Unaccompanied Enlisted Quarters
ECP	Entry Control Point	UPT	Undergraduate Pilot Training
FTS	Flying Training Squadron	USAF	United States Air Force

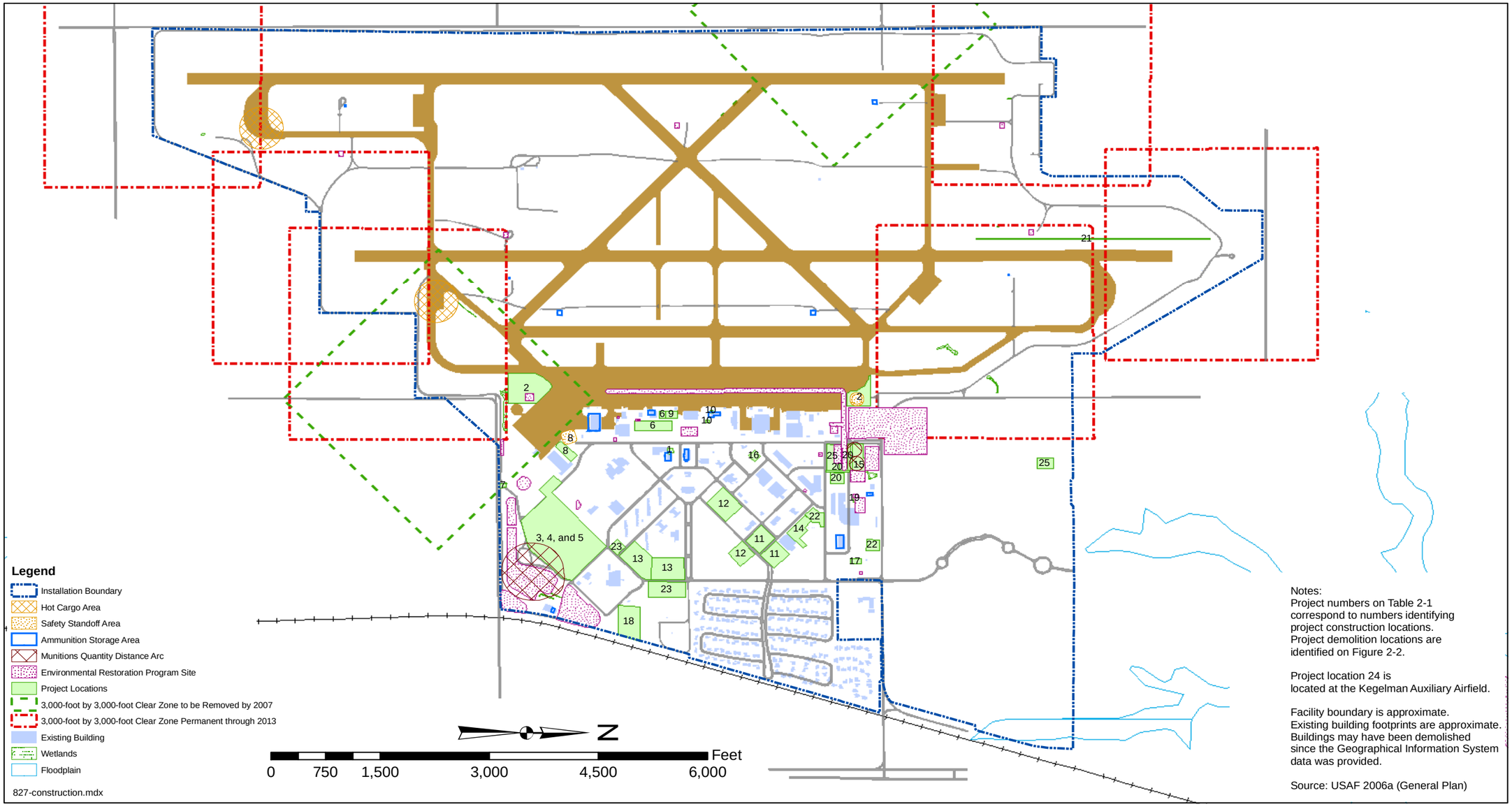

Figure 2-1 Locations of Proposed Action, Vance Air Force Base, Oklahoma

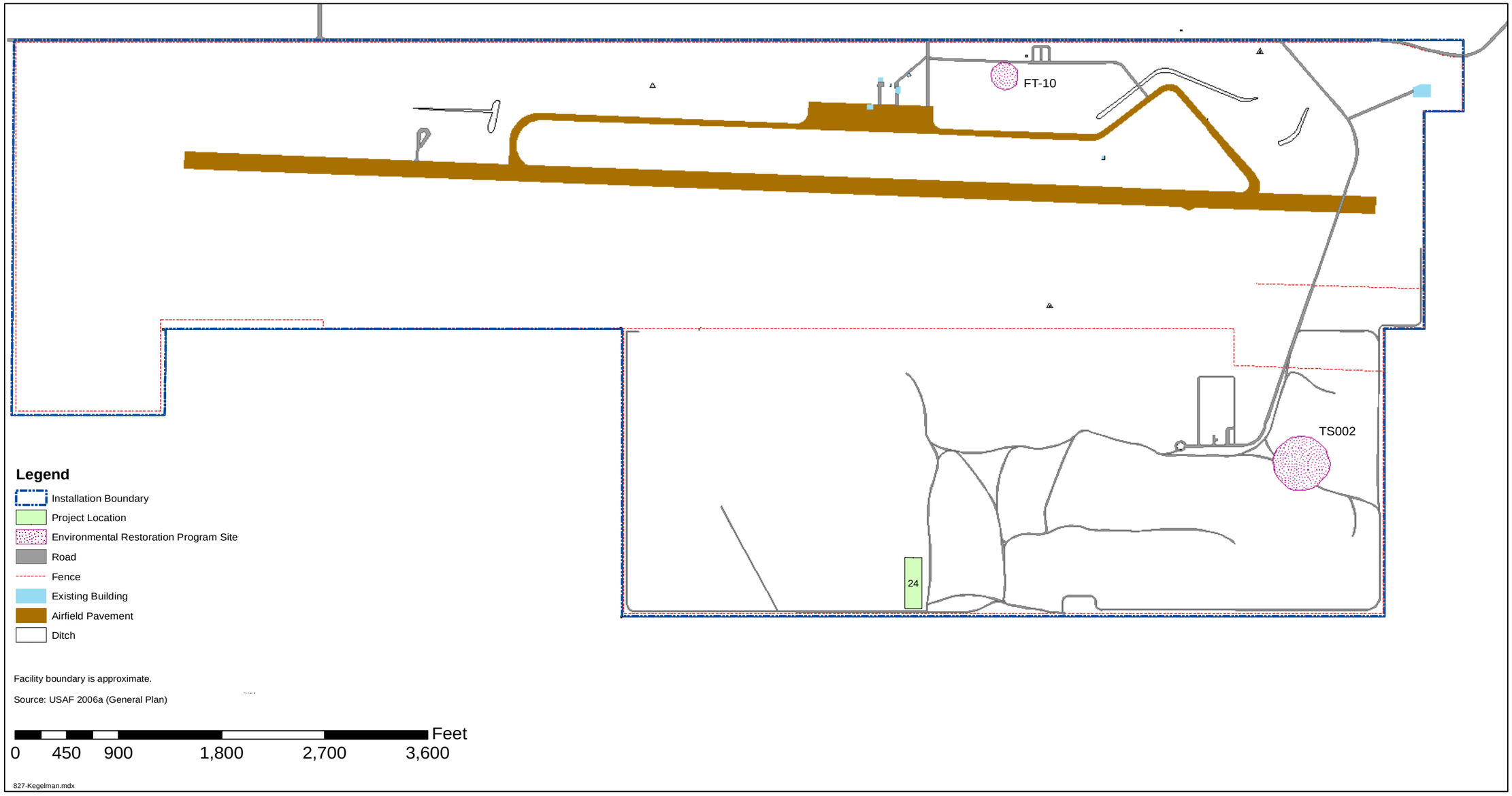

Figure 2-2 Locations of Proposed Action, Kegelman Auxiliary Airfield, Oklahoma

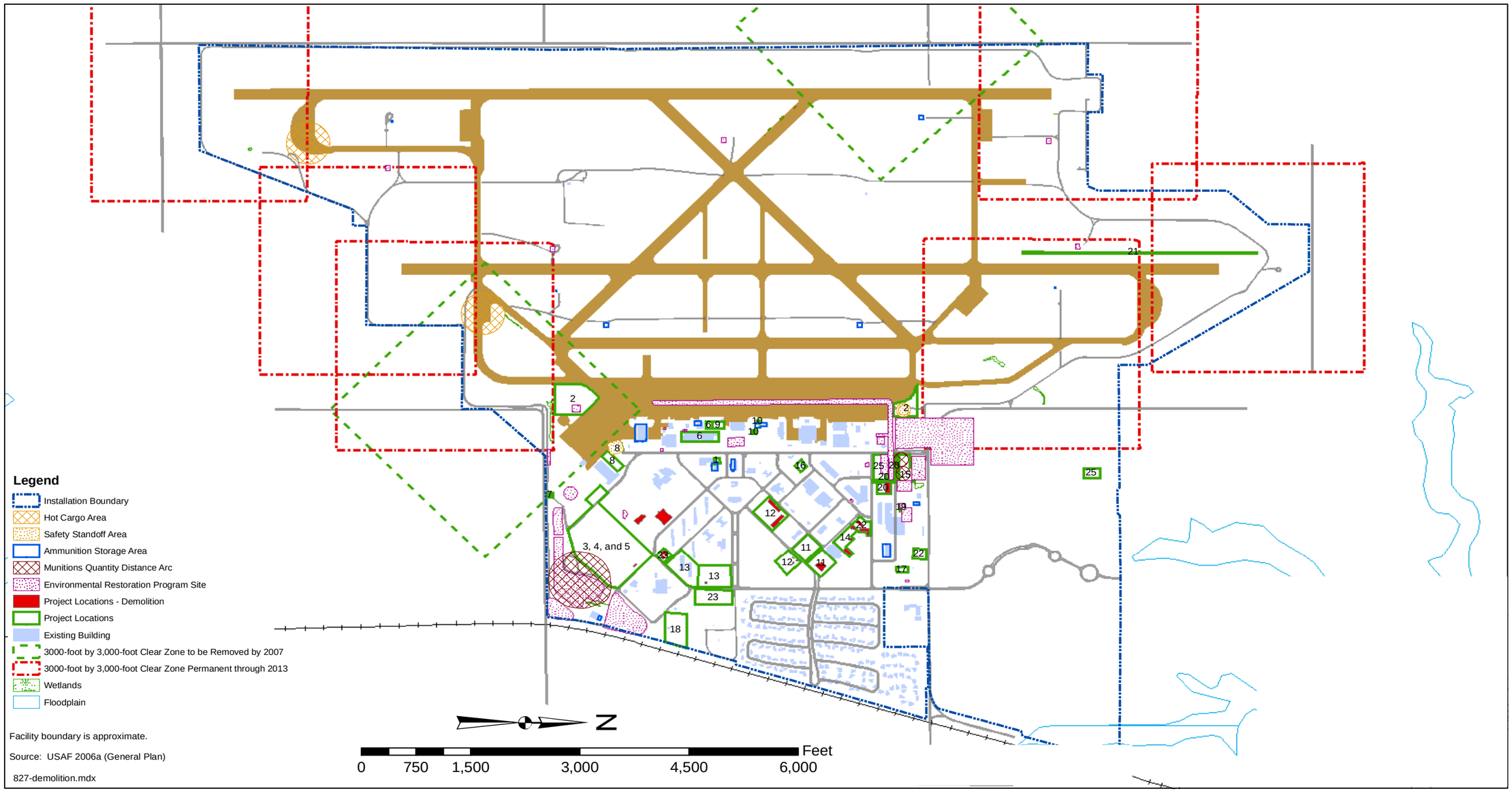

Figure 2-3 Locations of Demolition Associated with Proposed Action, Vance Air Force Base, Oklahoma

2.6 POTENTIAL DEVELOPMENT (ALTERNATIVE ACTION)

The alternative action consists of the development of Vance AFB to its potential for the planning period beginning in FY2005 and ending in the year FY2013. This alternative is based on the development potential quantified in the Vance AFB *Capability Analysis* (Appendix B).

The development potential was determined in the *Capability Analysis* for the planning period ending in the FY2013 as follows: (1) maximum available land was calculated, (2) basis for sustainable population growth through the end of the planning period was determined, (3) maximum developable land and sustainable populations with respect to potentially limiting factors such as potable water resources and other utility system resources was evaluated, and (4) noise environment surrounding the Vance AFB airfield and training airspace to determine the growth potential for the flying mission was evaluated.

2.6.1 Sustainable Population

Vance AFB currently supports a baseline population of approximately 3,515 military, military dependent, student, and civilian personnel. Based on an analysis of potential new facilities that include administrative, training, and housing structures (see Appendix B), it has been determined that the base has the potential to accommodate an additional population of 7,402: 6,736 working personnel (military and civilian), 595 resident military dependents, and 71 visitors.

2.6.2 Development Potential

Thirty-four individual parcels totaling 355 acres of land available for development were identified based on analysis of existing and future land use plans and the elimination of parcels associated with building constraints (Figure 2-4). Table 2-2 identifies developable acreage per Air Force land use category. Based on the current development ratios per land use category, the square footage of buildings and pavements that could be accommodated within these developable areas was estimated. The calculations in Appendix B demonstrate that Vance AFB can accommodate an additional 1,770,713 square feet of new building space construction, and therefore can accommodate the proposed action construction projects, which total 500,678 square feet. The demolition of existing building space necessary to implement this construction is 658,750 square feet. This figure includes both the 179,526 square feet of demolition associated with the proposed action as well as an additional 199,935 square feet of existing building space from structures that would reach the end of their useful life within the planning period ending in FY2013. The net gain in building space would be 1,111,963 square feet, and the net gain in pavements would be 55 acres (including roadways, sidewalks, and parking areas). Note that building space typically includes multiple floors and does not add directly to pavements for total impervious surfaces; impervious surfaces are calculated by finding the sum of the building footprints and the pavements surrounding them. The net increase in impervious surfaces would be 118 acres.

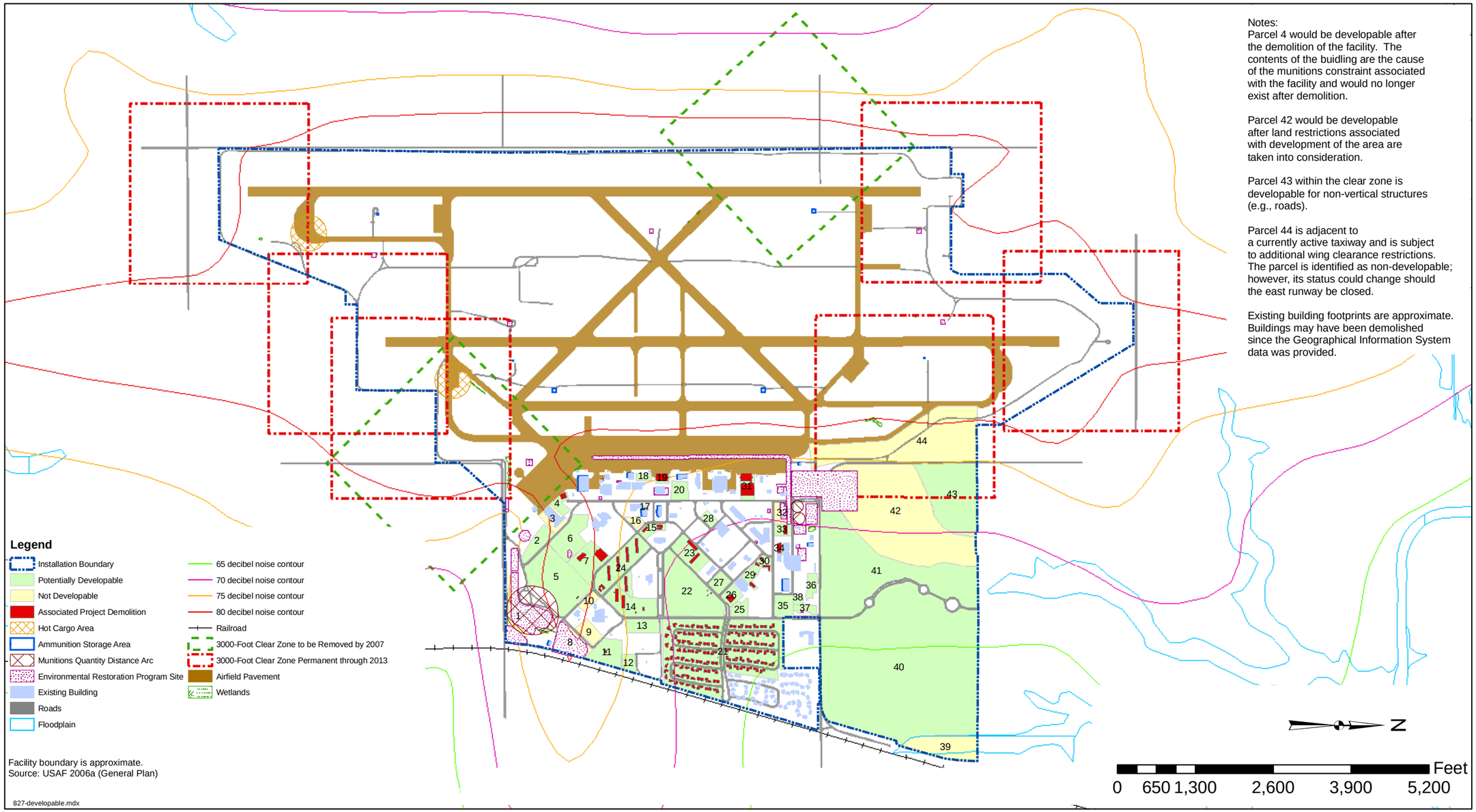

Figure 2-4 Potentially Developable Parcels, Vance Air Force Base, Oklahoma

Table 2-2 Developable Acreage, Alternative Action

Air Force Land Use Category	Developable Parcels (acres)
Aircraft Operations and Maintenance	14
Administrative	37
Airfield	0
Airfield Pavements	0
Community Commercial	11
Community Services	5
Housing Accompanied	131
Housing Unaccompanied	45
Industrial	15
Medical	0
Open Space	45
Outdoor Recreation	52
Total	**355**

Source: Appendix B (Tables B-1 and B-5)

2.6.3 Sustainable Flying Mission Levels

Vance AFB provides primary and advanced pilot training in T-1, T-6, and T-38 aircraft. Currently, Vance AFB conducts approximately 225,000 aviation operations[1] annually (United States Air Force [USAF] 2006b). Assuming 260 flying days per year, this equates to approximately 865 daily operations.

To assess the potential for the expansion of the basic and advanced flight training operations at Vance AFB, current T-1, T-6, and T-38 flight operations and related maintenance activities were incrementally increased and evaluated. The resulting analysis identified a potential for a total of 384,328 annual flight operations at the installation provided that noise impacts east of the base associated with current maintenance of T-38 aircraft and other related stationary noise sources were held to current levels.

The *Specialized Undergraduate Pilot Training* (SUPT) EA investigated changes to the SUPT program across several AETC installations in 1997. Volumes I and IV of this assessment dealt with the changes to the flying mission at Vance AFB (USAF 1997). The SUPT EA proposed a total of 384,328 annual operations for aircraft based at Vance AFB, and the March 2003 *Air Installation Compatible Use Zone (AICUZ) Study* (briefly described in Section 3.3.3.2) specified this figure as the current number of operations at Vance AFB; therefore, 384,328 operations is considered the maximum potential annual based-aircraft operations (USAF 2003a).

[1] Essentially, an operation is a takeoff or a landing. A touch-and-go is considered two operations.

2.7 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS IN THE REGION OF INFLUENCE

Cumulative impacts to environmental resources result from the incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the region of influence (ROI). Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, or local) or individuals. These impacts can be the result of both on- and off-base proposed activities in the ROI. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed, under construction, recently completed, or anticipated to be implemented in the near future is required. Specific projects that have the potential to result in cumulative impacts at Vance AFB are described below.

2.7.1 On-base Activities

The following list includes projects evaluated in other environmental assessments, but not completed prior to the end of the 2005 baseline year. Projects completed prior to the end of 2005 are included in the baseline and will not be regarded as ongoing activities in the cumulative effects analysis. The following are projects that will be considered when evaluating cumulative impacts (Figure 2-5).

- Renovation of Hangar 170: Renovation of approximately 270 square feet of space adjacent to the existing aircraft maintenance area would be completed.

- Renovation of Hangar 129: Renovation of approximately 500 square feet of the existing wheel and tire maintenance area would occur to make more efficient use of the space. Part of the hangar would be converted to a cage storage area to make room for the additional load imposed by the addition of new aircraft.

- Renovation of Building 672: Renovation of Building 672 (approximately 1,500 square feet) would occur to provide additional simulators and offices for instructors and support staff.

- Construction of Joint Primary Air Training System (JPATS) Contractor Operated and Managed Base Supply (COMBS) Warehouse: Construction of a 2,700-square foot addition on the north end of Building 187 to provide additional adequate space for the T-6A COMBS warehouse would occur.

- Construction of JPATS Munitions Storage Facility: A munitions storage facility would be constructed within the quantity-distance area around Building 907. This facility would consist of a 180-square foot facility made up of one maintenance and inspection area and three storage igloos.

- Construction of Replacement Flightline Maintenance Shelter Building 176: The existing flightline shelter would be replaced with a modern facility adequately sized for T-6A aircraft launch and recovery maintenance crews. The new 1,100-square foot shelter would be constructed adjacent to the old shelter. Once construction was completed, the old 459-square foot shelter would be demolished.

- Construction of Replacement Flight Line Maintenance Shelter Building 181: The existing flightline shelter would be replaced with a modern facility adequately sized for T-6A aircraft launch and recovery maintenance crews. The new 1,100-square foot shelter would be constructed adjacent to the old shelter. Once construction was completed, the old 448-square foot shelter would be demolished.

- Construction of Kegelman AAF Fire Station: The demolition of the existing Fire Station (3,670 square feet) would occur to make room for construction of the 4,811 square feet of the new Fire Station.

- Replace Family Housing Phase II: The demolition of approximately 120,400 square feet of housing would occur to make room for the construction of approximately 176,000 square feet of new military family housing construction.

- Replace Family Housing Phase III: The demolition of approximately 120,400 square feet of housing would occur to make room for the construction of approximately 174,000 square feet of new Military Family Housing (MFH) construction.

2.7.2 Off-base Activities

The following list includes off-base projects in the ROI that have not been completed. No other planned or reasonably foreseeable projects have been identified. Projects completed prior to the end of 2005 are included in the baseline and projects not completed prior to the end of 2005 are considered when evaluating cumulative impacts. In addition, there is a plan to add a No-Drop Range 20 to 50 miles from Vance AFB property in order to accommodate the additional flying activity associated with the BRAC activities; however, this project will be evaluated in another EA and is not evaluated as cumulative impact.

- New electrical feed from off base onto the south end of the base would be installed by the local electrical service provider in order to supply adequate power to the new AFRC facilities.

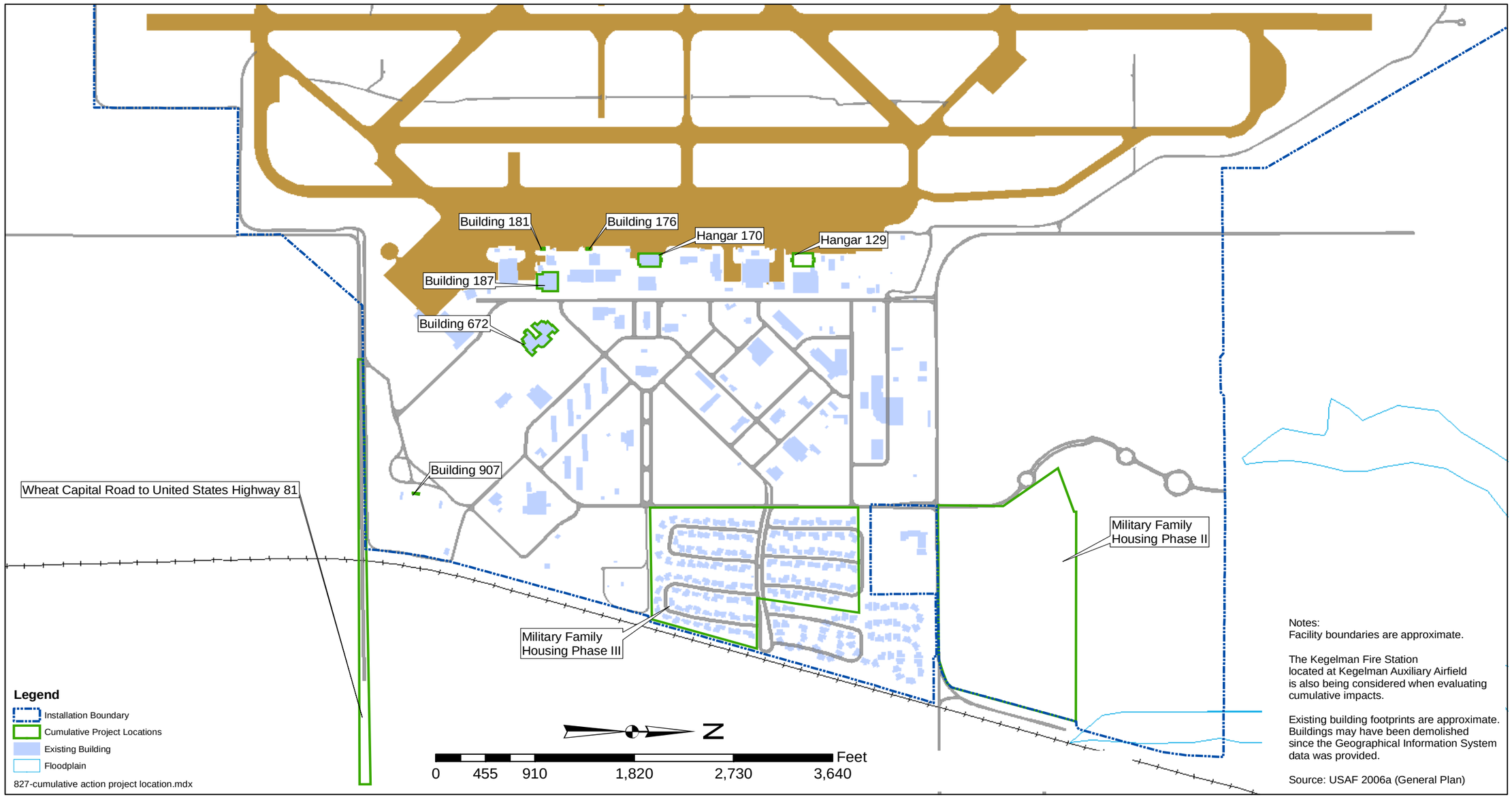

Figure 2-5 Project Locations of Other Ongoing Projects in the Region of Influence, Vance Air Force Base, Oklahoma

- Improvements to Wheat Capital Road, which runs parallel to the south fence line from the Main Apron (on the south side Vance AFB), would extend to United States (US) Highway 81 (266,299 square feet pavement construction by the city of Enid).

2.8 COMPARISON MATRIX OF ENVIRONMENTAL EFFECTS OF ALL ALTERNATIVES

Table 2-3 summarizes the impacts of the proposed and alternative actions. The impacts for the no action alternative are the same as baseline conditions.

Table 2-3 Summary of Environmental Effects

Resource	No Action Alternative	Proposed Action	Alternative Action
Noise	Same as baseline conditions presented in Section 3.3.1. No cumulative adverse impacts to sensitive receptors for the no action alternative and ongoing actions would occur.	Acreage in the vicinity of Vance Air Force Base (AFB) exposed to a day-night average sound level of 65 A-weighted decibels would increase by approximately 3,056 acres, which is less than the net increase under the Air Installation Compatible Use Zone noise contours that were established in 2003 (3,799 acres). No cumulative adverse impacts to sensitive receptors for the proposed and ongoing actions are expected.	Acreage in the vicinity of Vance AFB exposed to a day-night average sound level of 65 A-weighted decibels would not increase above the Air Installation Compatible Use Zone noise contours established in 2003 (3,799 acres) under the alternative action. No cumulative adverse impacts to sensitive receptors for the alternative and ongoing actions are expected.
Airspace Management and Air Traffic Control	Same as baseline conditions presented in Section 3.3.2. No cumulative adverse impacts to sensitive receptors for the no action alternative and ongoing actions would occur.	Flight activity conducted by Vance AFB-based aircraft would increase from approximately 225,000 annual operations to approximately 330,000 annual operations. No modifications or changes to the airspace structure around Vance AFB or to the existing air traffic control systems would occur. No cumulative adverse impacts to airspace management and air traffic control for the proposed and ongoing actions are expected.	Approximately 384,328 annual operations at Vance AFB would be added under the alternative action. No cumulative adverse impacts to airspace management and air traffic control for the alternative and ongoing actions are expected.
Land Use	Same as baseline conditions presented in Section 3.3.3. No cumulative adverse impacts to land use for the no action alternative and ongoing actions would occur.	The land on which the projects currently occur would be recategorized (as necessary) to accommodate the new facilities based on the future land use plan. No cumulative adverse impacts to land use are expected.	Impacts to land use would be the same as for the proposed action. No cumulative adverse impacts to land use are expected.

Table 2-3, Continued

Resource	No Action Alternative	Proposed Action	Alternative Action
Earth Resources	Same as baseline conditions presented in Section 3.3.4. No cumulative adverse impacts to earth resources from the no action alternative and ongoing actions are expected.	Soil disturbance impacts would be minimized through observance of Oklahoma Pollutant Discharge Elimination System requirements. Approximately 9.8 acres of impervious (impenetrable) cover would be added under the proposed action. No cumulative adverse impacts to earth resources from the proposed and ongoing actions are expected.	Soil disturbance impacts would be minimized through observance of Oklahoma Pollutant Discharge Elimination System requirements. Approximately 118 acres of impervious cover would be added under the alternative action No cumulative adverse impacts to earth resources from the alternative and ongoing actions are expected.
Water Resources	Same as baseline conditions presented in Section 3.3.5. No cumulative adverse impacts to water resources from the no action alternative and ongoing actions are expected.	The construction of the proposed facilities would add approximately 9.8 acres of impervious cover at Vance AFB and Kegelman Auxiliary Airfield (Kegelman AAF). This is expected to have a minimal impact on the total amount of impervious cover and on the total volume of storm water runoff. The construction associated with the proposed action at Vance AFB and Kegelman AAF and ongoing actions are expected to cumulatively increase surface cover.	The construction of the proposed facilities would add 118 acres of impervious cover at Vance AFB and Kegelman AAF. This is expected to have a minimal impact on the total amount of impervious cover and on the total volume of stormwater runoff. The construction associated with the proposed action at Vance AFB and Kegelman AAF and ongoing actions are expected to cumulatively increase surface cover.
Hazardous Materials and Waste	Same as baseline conditions presented in Section 3.3.6. No cumulative adverse impacts to hazardous materials and hazardous waste are expected from the no action alternative and ongoing actions.	Hazardous materials consumption and hazardous waste generation would increase under the proposed action. Increased regulation would not occur. Lead-based paint and asbestos, if encountered, would be managed and disposed according to existing plans and procedures. No cumulative adverse impacts to environmental resources from hazardous materials, hazardous waste, asbestos, and lead-based paint are expected from the proposed and ongoing actions.	Hazardous materials consumption and hazardous waste generation would increase under the alternative action. Increased regulation would not occur. Lead-based paint and asbestos, if encountered, would be managed and disposed according to existing plans and procedures. No cumulative adverse impacts to environmental resources from hazardous materials, hazardous waste, asbestos, and lead-based paint are expected from the alternative and ongoing actions.

Table 2-3, Continued

Resource	No Action Alternative	Proposed Action	Alternative Action
Biological Resources	Same as baseline conditions presented in Section 3.3.7. No cumulative adverse impacts to biological resources from the no action alternative and ongoing actions are expected.	No measurable impacts to vegetative or wildlife resources would occur. The proposed action would have no impact on federal listed threatened and endangered species because they are not known to occur on Vance AFB or Kegelman AAF. The proposed action and ongoing actions would not have incremental effects on the vegetation and wildlife of Vance AFB, Kegelman AAF, or the local area.	Same as for the proposed action. The alternative action and ongoing actions would not have incremental effects on the vegetation and wildlife of Vance AFB, Kegelman AAF, or the local area.
Utilities and Infrastructure	Same as baseline conditions presented in Section 3.3.8. No cumulative adverse impacts to infrastructure and utilities from the no action alternative and ongoing actions are expected.	The quantity of wastewater generated would increase by 13.5 percent, potable water consumption would increase by 13.5 percent, electricity and natural gas demand would increase by 18.4 percent, and negligible solid waste would be generated from the addition of personnel at Vance AFB. A one-time generation of approximately 13,749 tons of solid waste would result from construction and demolition activities. Additional vehicles would pass through the main gate each day; however, only slight impacts to transportation would be expected. No cumulative adverse impacts to infrastructure and utilities are expected from implementation of proposed and ongoing actions.	The quantity of wastewater generated would increase 210 percent, potable water consumption would increase by 210 percent, and electricity and natural gas demand would increase by 64.7 percent. A one-time generation of 61,739 tons of solid waste would result from construction activities. If the majority of the additional personnel commuted from off base, increased congestion would occur at the Hairston and Industrial gates during morning and evening workday rush hours. There would also be a subsequent increase in traffic using the on-base roadways. No cumulative adverse impacts to infrastructure and utilities are expected from implementation of alternative and ongoing actions.

Table 2-3, Continued

Resource	No Action Alternative	Proposed Action	Alternative Action
Socioeconomics and Environmental Justice	Same as baseline conditions presented in Section 3.3.9. No cumulative adverse impacts to socioeconomics resulting from the no action alternative and ongoing actions are expected.	The proposed construction activities would be in line with previous years' construction budgets and would generate an economic benefit for the local community. Slight benefits would result from the increased construction and demolition projects to the local economy. No cumulative adverse impacts to socioeconomics resulting from the implementation of the proposed action and ongoing actions are expected. Slight benefits would result from the increased construction and demolition projects.	The alternative action would generate slight economic benefits to the local community similar to the proposed action. The addition of military personnel associated with the alternative action could affect the housing market and public services, particularly in the area immediately surrounding the base. Based on military dependent ratios for Vance AFB, it is estimated that school enrollments could increase representing growth in enrollment of 29.9 percent in the Enid Public School District and 20.5 percent in Garfield County. No cumulative adverse impacts to socioeconomics resulting from the implementation of the alternative and ongoing actions are expected. Slight benefits would result from the increased construction and demolition projects.
Air Quality	Same as baseline conditions presented in Section 3.3.10. The cumulative emissions of all pollutants would be less than 250 tons per year for all Air Quality Control Regions; therefore, the no action alternative would not impact air quality.	The emissions of all pollutants would be well below the 10 percent criterion for each pollutant in comparison to Garfield County's year 2002 National Emissions Inventory, a more restrictive criterion than required by the General Conformity Rule; therefore, the proposed action and ongoing actions would not impact air quality. The proposed action and ongoing actions would have minor incremental effects on the air quality of Vance AFB and the local area and would be well below the 10 percent criterion for each pollutant in comparison to Garfield County's year 2002 National Emissions Inventory, a more restrictive criterion than required by the General Conformity Rule.	The emissions of all pollutants would be well below the 10 percent criterion for each pollutant in comparison to Garfield County's year 2002 National Emissions Inventory, a more restrictive criterion than required by the General Conformity Rule; therefore, the alternative action and ongoing actions would not impact air quality. The alternative action and ongoing actions would have minor incremental effects on the air quality of Vance AFB and the local area and would be well below the 10 percent criterion for each pollutant in comparison to Garfield County's year 2002 National Emissions Inventory, a more restrictive criterion than required by the General Conformity Rule.

Table 2-3, Continued

Resource	No Action Alternative	Proposed Action	Alternative Action
Cultural Resources	Same as for baseline conditions as presented in Section 3.3.11. No cumulative adverse impacts to cultural resources are expected from the no action alternative and ongoing actions.	No adverse impacts on cultural resources are expected because there are no cultural resources associated with the proposed action. No cumulative adverse impact to cultural resources resulting from the implementation of the proposed action and ongoing actions are expected.	Same as for the proposed action. No cumulative adverse impact to cultural resources resulting from the implementation of the alternative action and ongoing actions are expected.
AFB	Air Force Base	Kegelman AAF	Kegelman Auxiliary Airfield

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CHAPTER 3

AFFECTED ENVIRONMENT

The affected environment is the baseline against which potential impacts caused by the proposed action and alternative actions (including the no action alternative) are assessed. This chapter focuses on the human environment that has the potential to be affected by the proposed implementation of the construction to accomplish the CIP projects, BRAC program projects related to Vance AFB and Kegelman AAF, and demolition of facilities that are either dilapidated or in the footprint of the proposed construction projects. As stated in 40 CFR §1508.14, the potentially affected human environment is interpreted comprehensively to include natural and physical resources and the relationship of people with the resources. The environmental baseline was defined first by identifying potential issues and concerns related to the proposed action, as discussed in Section 1.3, then, from this information, selecting the relevant natural and physical resources for description in this chapter.

3.1 INTRODUCTION

This chapter provides baseline data describing the man-made and natural environmental elements with the potential to be affected by the implementation of the proposed action or alternative action at Vance AFB and Kegelman AAF. Information is presented in this section to the level of detail necessary to support the analysis of potential impacts in Chapter 4, Environmental Consequences. Due to the limited nature of current Vance AFB activities at Kegelman AAF and the fact that the only change at Kegelman AAF in the proposed and alternative actions is the construction of the Rod and Gun Club (7,500 square feet), many of the resource areas do not include Kegelman AAF in the ROI. Discussion of resources within the ROI of Kegelman AAF are included where applicable.

3.2 INSTALLATION HISTORY AND CURRENT MISSION

In July 1941, the federal government leased the land where Vance AFB is currently located from the city of Enid and began construction of what soon came to be known as Air Corps Basic Flying School. Created as a temporary installation for army pilot training activities in preparation for early conflicts of World War II (WWII), it was officially named Enid Army Flying School in 1942 and Enid Army Flying Field a year later. After WWII, the demand for pilots decreased and only the pilot training mission remained until 1947 when the field was inactivated. Vance AFB became a government owned installation in 1948 when it was reactivated and renamed Vance AFB after Lt. Col. Leon Robert Vance, Jr., a native of Enid and Medal of Honor winner.

Following the Korean War in 1953 demand for pilots again decreased, requiring the base to reduce the number of classes, extend the time required for graduation, and add B-26 transition pilot training. Throughout the early 1960s, the base implemented the Undergraduate Pilot Training program, which provided primary training in the T-37 aircraft (later replaced by the T-6, Texan II), and basic training in the T-33 (recently replaced by the T-38).

Today, Vance AFB is home to the 71 FTW, which was established and assigned to Vance AFB in April 1972. Vance AFB is home to five Flying Training Squadrons (FTS) – the 5th, 8th, 25th, 32nd, and 33rd – that provide Joint Specialized Undergraduate Pilot Training. These squadrons train student pilots at primary, intermediate, and advanced levels in various aircraft in preparation for global combat, transport, and reconnaissance missions. Missions at Vance AFB include:

- 71st Operations Group (71 OG). The 71 OG includes the 71st Operations Support Squadron (71 OSS) and the 5 FTS which uses over 200 training aircraft and fly over 60,000 sorties each year. The 71 OSS provides operational support to Vance AFB, including radar approach control and weather monitoring. The 5 FTS trains instructor pilots, providing a reserve of instructors in the event they are needed in times of war.

- 71st Mission Support Group (71 MSG). The 71 MSG provides training for professional airman in order to sustain combat capability.

- 71st Medical Group (71 MDG). This group is composed of the Medical Support and Medical Operations Squadrons that provide medical care to the Vance AFB community. The 71 MDG trains students and aircrews in aerospace physiology and supports mobility taskings for AETC.

- Tenant units on Vance AFB include the Air Force Office of Special Investigation, Army and Air Force Exchange Service, and the US Army Corps of Engineers (USACE).

In 1960, Vance AFB was chosen as one of the test bases in an Air Force-wide experiment in contract services. Today, civilian contractors continue to perform aircraft and base maintenance, transportation, fire protection, supply, security, and other services in addition to various aspects of the simulator maintenance and operations.

Kegelman AAF, a one-runway facility of 1,066 acres, is isolated 40 miles northwest of Vance AFB and four miles northeast of the small town of Jet, Oklahoma. Prior to being placed under the administrative purview of Vance AFB in the late 1940s, Kegelman AAF had been utilized for various missions, including use as a bomb range under Will Rogers Field during WWII. This airfield is used for training of 71 FTW T-6 aircraft where they practice touch–and-go landings.

3.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.3.1 Noise

3.3.1.1 Definition of the Resource

Noise is considered unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive. It may be stationary or transient. Stationary sources are normally related to specific land uses, e.g., housing tracts or industrial plants. Transient noise sources move through the environment, either along relatively established paths (e.g., highways, railroads, and aircraft flight tracks around airports), or randomly. There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal).

The physical characteristics of noise or sound include its intensity, frequency, and duration. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the eardrum. This may be likened to the ripples in water that would be produced when a stone is dropped into it. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses louder noise. The unit used to measure the intensity of sound is the decibel (dB). Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale to accommodate this wide range. The logarithm, and its use, is nothing more than a mathematical tool that simplifies dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is -6 (minus 6). Obviously, as more zeros are added before or after the decimal point, converting these numbers to their logarithms greatly simplifies calculations that use these numbers.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, not all sounds throughout this range are heard equally well. Because the human ear is most sensitive to frequencies in the 1,000 to 4,000 Hz range, some sound meters are calibrated to emphasize frequencies in this range. Sounds measured with these instruments are termed "A-weighted," and are indicated in terms of A-weighted decibels (dBA).

The duration of a noise event and the number of times noise events occur are also important considerations in assessing noise impacts. As a basis for comparison when noise levels are considered, it is useful to note that at distances of about 3 feet, noise from

normal human speech ranges from 63 to 65 dB, operating kitchen appliances range from about 83 to 88 dB, and rock bands approach 110 dB.

The word "metric" is used to describe a standard of measurement. Many different types of noise metrics have been developed by researchers attempting to represent the effects of environmental noise. Each metric used in environmental noise analysis has a different physical meaning or interpretation.

The metrics supporting the assessment of noise from aircraft operations around Vance AFB and construction activities associated with the proposals assessed in this document are the maximum sound level (L_{max}), the Sound Exposure Level (SEL), and Time-Averaged Sound Levels. Each metric represents a "tier" for quantifying the noise environment, and is briefly discussed below.

Maximum Sound Level. The L_{max} metric defines peak noise levels. L_{max} is the highest sound level measured during a single noise event (e.g., an aircraft overflight), and is the sound actually heard by a person on the ground. For an observer, the noise level starts at the ambient noise level, rises up to the maximum level as the aircraft flies closest to the observer, and returns to the ambient level as the aircraft recedes into the distance. Maximum sound level is important in judging a noise event's interference with conversation, sleep, or other common activities.

This document considers noise from aircraft operating around airfields. Around airfields, the primary operational modes of aircraft are departures (take-offs) and arrivals (landings). Table 3-1 shows L_{max} values at various distances associated with typical military aircraft operating at Vance AFB.

Table 3-1 Representative Maximum Sound Levels

Aircraft/Type Power	L_{max} Values (in dBA) at Varying Distances (in feet) 500	1,000	2,000	5,000	10,000
Take-off/Departure Operations					
T-1	91.5	83.4	74.7	61.9	50.6
T-6	85.1	78.3	71.2	61.0	52.4
T-38	105.9	98.3	89.8	76.6	64.8
Landing/Arrival Operations					
T-1	84.7	75.5	65.8	53.2	42.8
T-6	82.8	75.8	68.6	58.0	48.8
T-38	91.4	84.3	76.5	64.4	53.6

L_{max} maximum sound level dBA A-weighted decibel

Source: OMEGA108

Sound Exposure Level. L_{max} alone may not represent how intrusive an aircraft noise event is because it does not consider the length of time that the noise persists. The SEL metric combines intensity and duration into a single measure. It is important to note, however, that SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the total exposure of the entire event. Its value represents all of the acoustic energy associated with the event, as though it was present for one second. Therefore, for sound events that last longer than one second, the SEL value will be higher than the L_{max} value. The SEL value is important because it is the value used to calculate other time-averaged noise metrics. Table 3-2 shows SEL values corresponding to the aircraft and power settings reflected in Table 3-1.

Table 3-2 Representative Sound Exposure Levels

Aircraft/Type Power	SEL Values (in dBA) at Varying Distances (in feet) 500	1,000	2,000	5,000	10,000
Take-off/Departure Operations					
T-1	102.7	96.4	89.5	79.1	69.6
T-6	97.9	92.9	87.6	79.8	73.0
T-38	111.3	105.5	98.8	88.0	78.0
Landing/Arrival Operations					
T-1	97.2	89.8	81.9	71.1	63.1
T-6	86.3	81.1	75.6	67.5	60.1
T-38	95.7	90.4	84.4	74.7	65.7

SEL sound exposure level dBA A-weighted decibel

Source: OMEGA108

Time-Averaged Cumulative Noise Metrics. The number of times noise events occur during given periods is also an important consideration in assessing noise impacts. The "cumulative" noise metrics supporting the analysis of multiple time-varying noise events are the Day-Night Average Sound Level (L_{dn}), and the equivalent noise level (L_{eq}).

Day-Night Average Sound Level. This metric sums the individual noise events and averages the resulting level over a specified length of time. It is a composite metric that considers the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. This metric adds 10 dB to those events that occur between 10:00 p.m. and 7:00 a.m. to account for the increased intrusiveness of noise events that occur at night (when ambient noise levels are normally lower than during the daytime). This cumulative metric does not represent the variations in the sound level heard. Nevertheless, it does provide an excellent measure for comparing environmental noise exposures when there are multiple noise events to be considered.

Equivalent Noise Level. This metric also sums all individual noise events and averages them over a specified time period. Common averaging times are 8- and 24-hour periods [$L_{eq(8)}$ and $L_{eq(24)}$]. This metric assigns no penalty for the time at which the noise

event occurs. Therefore, if no noise events occur at night, calculations of L_{dn} and L_{eq} would be identical.

Finally, it should be noted that ambient background noise is not considered in the noise calculations presented in this document. There are two reasons for this. First, ambient background noise, even in wilderness areas, varies widely, depending on location and other conditions. For example, studies conducted in an open pine forest in the Sierra National Forest in California have measured up to a 10 dBA variance in sound levels simply due to an increase in wind velocity (Harrison 1973). Therefore, assigning a value to background noise would be arbitrary. Secondly, and probably most important, it is reasonable to assume that ambient background noise in the project's ROI would have little or no effect on the calculated L_{dn}. In calculating noise levels, louder sounds dominate the calculations, and overall, aircraft and other transportation-related noise would be expected to be the dominant noise sources characterizing the acoustic conditions in the region.

Using measured sound levels as a basis, the Air Force developed several computer programs to calculate noise levels resulting from aircraft operations. Sound levels calculated by these programs have been extensively validated against measured data, and have been proven highly accurate.

In this document, the sound levels calculated for aircraft operations in the airfield environment are all presented in terms of daily L_{dn}. L_{dn} metrics are the preferred noise metrics of the Department of Housing and Urban Development, the Department of Transportation, the Federal Aviation Administration (FAA), the United States Environmental Protection Agency (USEPA), and the Department of Veterans Affairs.

Ignoring the nighttime penalty for the moment, L_{dn} may be thought of as the continuous or cumulative A-weighted sound level that would be present if all variations in sound level that occur over the given period were smoothed out so as to contain the same total sound energy. While L_{dn} does provide a single measure of overall noise impact, it is fully recognized that it does not provide specific information about the number of noise events or the specific individual sound levels that occur. For example, an L_{dn} of 65 dB could result from very few noisy events, or a large number of quieter events. Although it does not represent the sound level heard at any one particular time, it does represent the total sound exposure. Scientific studies and social surveys have found the L_{dn} metric to be the best measure to assess levels of community annoyance associated with all types of environmental noise. Therefore, its use is endorsed by the scientific community and governmental agencies (American National Standards Institute 1980 and 1988, USEPA 1974, Federal Interagency Committee on Urban Noise 1980, Federal Interagency Committee on Noise 1992).

The ROI for the noise assessments is the area around Vance AFB exposed to elevated noise levels caused by aviation-related noise and other human activities in the region.

3.3.1.2 Existing Conditions

Public annoyance is the most common concern associated with exposure to elevated noise levels. When subjected to L_{dn} levels of 65 dBA, approximately 12 percent of the persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is significantly lower (less than three percent), and at levels above 70 dBA, it is significantly higher (greater than 25 percent) (Finegold et al. 1994). Table 3-3 shows the percentage of the population expected to be highly annoyed at a range of noise levels.

Table 3-3 Percentage of Population Highly Annoyed by Elevated Noise Levels

Noise Exposure (L_{dn} in dBA)	Percent Highly Annoyed
< 65	< 12
65 – 70	12 – 21
70 – 75	22 – 36
75 – 80	37 – 53
80 – 85	54 – 70
> 85	> 71

L_{dn} Day-Night Average Sound Level dBA A-weighted decibel

Source: Finegold, et al. 1994

3.3.1.3 Aircraft Activity at Vance AFB

The following terms are defined to provide a better understanding of how data are developed for input to the various noise models used to calculate noise.

Around an airfield, aircraft operations are categorized as take-offs, landings, or closed patterns (which could include activities referred to as touch-and-gos or low approaches). Each take-off or landing constitutes one operation. A closed pattern occurs when the pilot of the aircraft approaches the runway as though planning to land, but then applies power to the aircraft and continues to fly as though taking off again. The pilot then flies a circular or rectangular track around the airfield, and again approaches for landing. In some cases the pilot may actually land on the runway before applying power, or in other cases, the pilot simply approaches very close to the ground. Either of these events is considered two operations because practically it consists of a landing and a takeoff.

The airfield includes runways, taxiways, aircraft parking area, ramps, an Air Traffic Control (ATC) Tower, other ATC facilities, and the flightline, which includes surrounding grassed areas, and roads.

Class D Controlled airspace has been established in the region to manage air traffic. The Vance AFB Class D airspace approximates a 5-nautical mile (NM) circle around the base, except to the east where it abuts the Class D airspace supporting operations at Woodring Airport.

Under current conditions, Vance AFB supports approximately 225,000 annual aviation operations. This equates to approximately 867 daily operations. Considering all types of flight activities, a scenario representing an "average day's" operations was developed. The operations considered include arrivals (landings), departures (take-offs), and closed patterns. Noise calculations consider the frequency of flight operations, runway utilization, and the flight tracks and flight profiles flown by each aircraft. The numbers and types of representative operations considered are shown in Table 3-4.

Table 3-4 Vance Air Force Base Aircraft Operations Levels

Aircraft	Arrivals		Departures		Closed Patterns		Totals
	Day	Night	Day	Night	Day	Night	
T-1	47.005	1.340	46.950	1.394	40.628	1.204	138.521
T-6	113.198	1.809	113.198	1.809	280.810	2.798	513.622
T-38	48.530	2.024	48.557	1.998	106.452	5.530	213.091
Transients	0.860	0.000	0.860	0.000	0.000	0.000	1.720
Total	**209.593**	**5.173**	**209.565**	**5.201**	**427.890**	**9.532**	**866.954**

Note: Daily operations are based on averages of annual operations; therefore, numbers do not round.

Source: Personal Communication (USAF 2006b)

The data in Table 3-4 are then combined with information on climatology, maintenance activities, and aircraft flight parameters and processed through the Air Force's BASEOPS/NOISEMAP (Moulton 1990) computer models to calculate L_{dn}. Once noise levels are calculated, they are plotted on a background map in 5-dB increments from 65 dBA to 85 dBA, as applicable. Noise contours associated with current activities at Vance AFB are shown in Figure 3-1.

Vance AFB are shown in Figure 3-1 which also includes the 65 dBA contour from the most recently published AICUZ map for comparison purposes (USAF 2003a). Current operations vary from those presented in the 2003 AICUZ map in that T-37 aircraft operations and maintenance have been replaced by T-6 aircraft operations and maintenance. In addition, the current total annual aircraft operations of 225,000 is presently less than the 384,328 total annual aircraft operations from the 2003 *AICUZ Study*. With the exception of those areas east of the base (in which the noise levels are dominated by T-38 aircraft maintenance activities), the current 65 dBA contour line is located an average distance of 1,500 feet inside of the 65 dBA contour line published in the 2003 AICUZ (Figure 3-1). The land area (in acres) encompassed by each contour based on current aircraft operational levels is shown in Table 3-5.

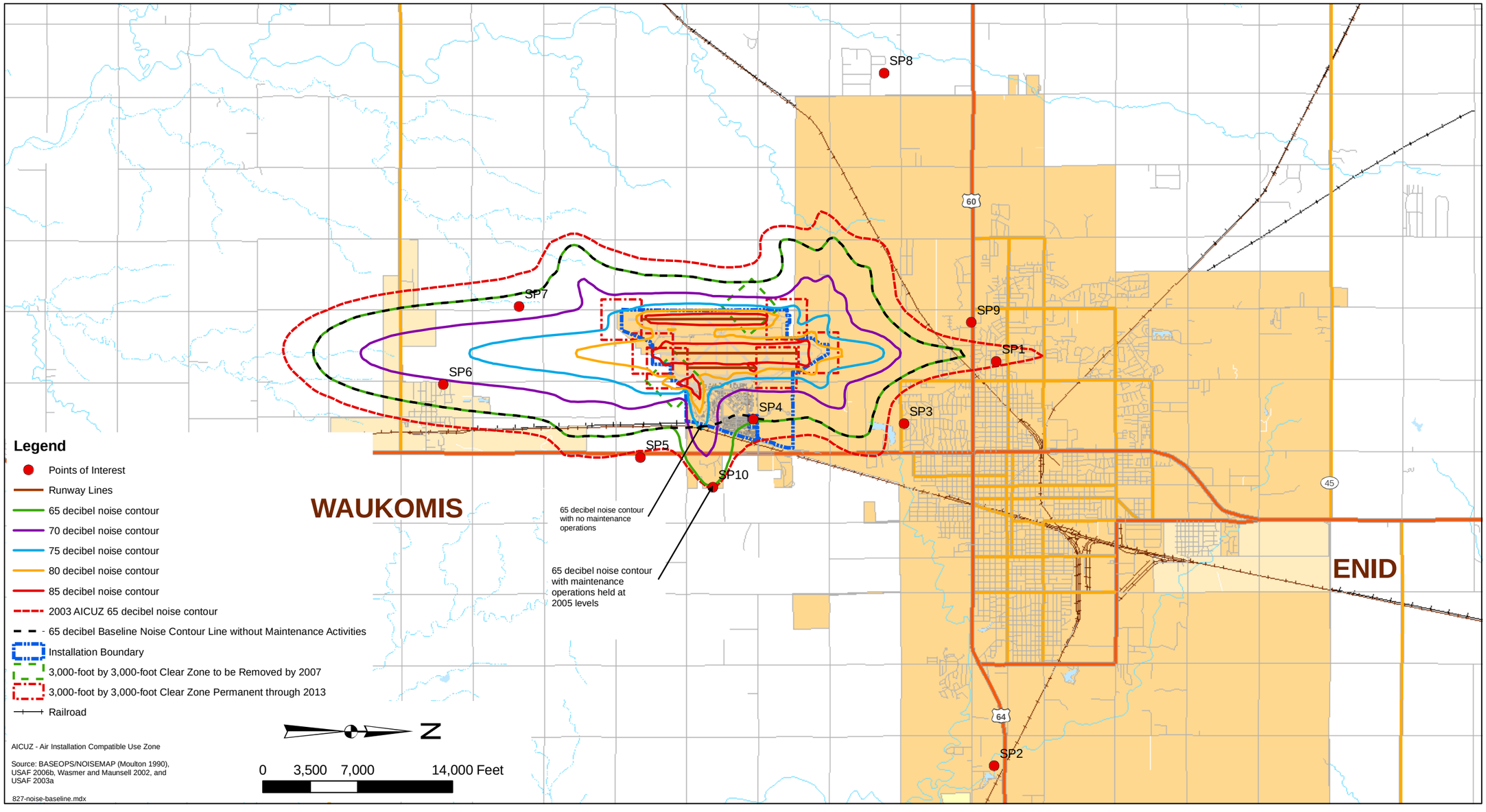

Figure 3-1 Existing Noise Contours, Vance Air Force Base, Oklahoma

Table 3-5 Land Areas Exposed to Indicated Sound Levels

Sound Level (in L_{dn})	Acres of Land		
	On-base	Off-base	Total
65 – 70	294.7	4,246.5	4,541.2
70 – 75	184.4	2,493.9	2,678.3
75 – 80	339.0	1,153.6	1,492.6
80 – 85	593.7	272.0	865.7
> 85	567.5	0.7	568.2
Total	**1,979.3**	**8,166.7**	**10,146.0**

L_{dn} Day-Night Average Sound Level

Source: Wasmer and Maunsell 2002

In order to further assess noise exposure from aviation activity, 10 locations around the base were selected for specific analysis. These points represent land uses that could be potentially sensitive to elevated noise levels. Noise exposure at these locations is shown in Table 3-6, and the locations of the points are depicted in Figure 3-1

Table 3-6 Noise Exposure at Specific Points of Interest

Point of Interest	Location	Noise Level in L_{dn}
SP1	Hoover School	63.0
SP2	Residential Area	37.1
SP3	Residential Area	59.5
SP4	Eisenhower School	65.3
SP5	Residential Area	61.3
SP6	Waukomis United Methodist Church	69.2
SP7	Residential Area	67.2
SP8	Residential Area	49.1
SP9	Church of Christ	59.3
SP10	Residential Area	65.1

L_{dn} Day-Night Average Sound Level

Source: BASEOPS/NOISEMAP model (Moulton 1990) output, USAF 2006b

3.3.1.4 Military Training Space Noise

Aircrew from Vance AFB use regional military training airspace (Military Operations Areas [MOA], Slow Routes [SR], and Instrument Routes [IR]). Use levels of any specific airspace element are relatively low. The altitude structure and size of the MOAs further minimize the noise exposure on the ground. Using the Air Force's MOA Range Noisemap Assessment Program (referred to as MR_NMAP), which is specifically designed to model noise in these airspace elements, representative noise levels for a MOA and an SR were calculated. Results show that noise levels are generally at or below what would be considered ambient noise. In MOAs, calculated uniformly distributed sound levels were 25.3 dBA; along the center line of an SR, noise levels ranged from 44.6 dBA to 45.8 dBA, depending on the width of the route (Lucas and Calamia 1996).

3.3.1.5 Other Ground-based Activity

Operations, maintenance, and industrial activities on Vance AFB generate non-aircraft related noise. Noise sources include transportation noise from the operation of ground-support equipment. However, this noise is generally localized in industrial areas on or near the airfield, or on established lines of communication supporting traffic to and from the airfield. Noise is also generated from other commercial activities located near the airfield. Noise resulting from aircraft operations remains the dominant noise source in the airfield region.

3.3.2 Airspace Management and Air Traffic Control

3.3.2.1 Definition of Resource

Airspace management involves the direction, control, and handling of flight operations in the volume of air that overlies the geopolitical borders of the US and its territories. Airspace is a resource managed by the FAA, with established policies, designations, and flight rules to protect aircraft in the airfield and en route; in Special Use Airspace (SUA) identified for military and other governmental activities; and in other military training airspace.

Management of this resource considers how airspace is designated, used, and administered to best accommodate the individual and common needs of military, commercial, and general aviation. Because of these multiple and sometimes competing demands, the FAA considers all aviation airspace requirements in relation to airport operations, Federal Airways, Jet Routes, military flight training activities, and other special needs to determine how the National Airspace System can best be structured to satisfy all user requirements.

The FAA has designated four types of airspace above the US. They are Controlled, Special Use, Other, and Uncontrolled airspace and are defined as follows:

Controlled Airspace

Controlled airspace is categorized into five separate classes: Class A, B, C, D, and E airspace. These classes identify airspace that is controlled, airspace that supports airport operations, and designated airways affording en route transit from place to place. These classes also dictate pilot qualification requirements, rules of flight that must be followed, and the type of equipment necessary to operate within that airspace.

Controlled Airspace is defined by FAA Order 7400.2 (Department of Transportation [DOT] 2001). It is airspace of defined dimensions within which ATC service is provided to Instrument Flight Rule (IFR) flights and to Visual Flight Rule (VFR) flights in accordance with the airspace classification. For IFR operations in controlled airspace, a pilot must file an IFR flight plan and receive an appropriate ATC clearance.

Each Class B, C, and D airspace designated for an airport contains at least one primary airport around which the airspace is designated.

Class A Airspace

Class A airspace, generally, is that airspace from 18,000 feet above mean sea level (msl) up to and including flight level (FL) 600. Flight level is described in terms of hundreds of feet above msl, using a standard altimeter setting. Thus, FL 600 is approximately 60,000 feet above msl. Class A airspace includes the airspace overlying the waters within 12 NM of the coast of the 48 contiguous states and Alaska (DOT 2001). It extends from 18,000 feet above msl up to and including 60,000 feet above msl (P/CG 2004).

Class B Airspace

Class B airspace, generally, is that airspace from the surface to 10,000 feet above msl around the nation's busiest airports. The actual configuration of Class B airspace is individually tailored and consists of a surface area and two or more layers, and is designed to contain all published instrument procedures (DOT 2001).

Class C Airspace

Class C airspace, generally, is that airspace from the surface to 4,000 feet above the airport elevation (charted in feet above msl) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the actual configuration of Class C airspace is individually tailored, it usually consists of a surface area with a 5-NM radius, and an outer circle with a 10-NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation (DOT 2001).

Class D Airspace

Class D airspace, generally, is that airspace from the surface to 2,500 feet above the airport elevation (charted in feet above msl) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be designated as Class D or Class E airspace (DOT 2001).

Class E Airspace

Class E airspace is controlled airspace that is not Class A, B, C, or D. There are seven types of Class E airspace, as described below.

- **Surface Area Designated for an Airport**. When so designated, the airspace will be configured to contain all instrument procedures.

- **Extension to a Surface Area.** There are Class E airspace areas that serve as extensions to Class B, C, and D surface areas designated for an airport. This

airspace provides controlled airspace to contain standard instrument approach procedures without imposing a communications requirement on pilots operating under VFR.

- **Airspace used for Transition.** There are Class E airspace areas beginning at either 700 or 1,200 feet above ground level used to transition to/from the terminal or en route environment.

- **En Route Domestic Airspace Areas.** These areas are Class E airspace areas that extend upward from a specified altitude to provide controlled airspace where there is a requirement for IFR en route ATC services, but where the Federal Airway system is inadequate.

- **Federal Airways.** Federal Airways (Victor Routes) are Class E airspace areas, and, unless otherwise specified, extend upward from 1,200 feet to, but not including, 18,000 feet above msl.

- **Other.** Unless designated at a lower altitude, Class E airspace begins at 14,500 feet above msl to, but not including 18,000 feet above msl overlying (a) the 48 contiguous states, including the waters within 12 miles from the coast of the 48 contiguous states; (b) the District of Columbia; (c) Alaska, including the waters within 12 miles from the coast of Alaska, and that airspace above FL 600, excluding the Alaska peninsula west of 160°00'00" west longitude; and (d) the airspace below 1,500 feet above the surface of the earth unless specifically designated otherwise.

- **Offshore/Control Airspace Areas.** This includes airspace areas beyond 12 NM from the coast of the United States, wherein ATC services are provided (DOT-2001).

Uncontrolled Airspace

Airspace that has not been designated as Class A, B, C, D, or E airspace is Uncontrolled Airspace (Class G) (DOT 2001).

Special Use Airspace

An SUA includes MOAs, Air Traffic Control Assigned Airspace (ATCAA), Warning Areas, and Restricted Areas.

Military Operations Area

An MOA is airspace of defined vertical and lateral limits established outside Class A airspace to separate and segregate certain non-hazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted. Class A airspace covers the continental US and limited parts of Alaska, including the airspace

overlying the water within 12 NM of the US coast. It extends from 18,000 feet above msl up to and including 60,000 feet above msl. MOAs are considered "joint use" airspace. Non-participating aircraft operating under VFR are permitted to enter an MOA, even when the MOA is active for military use. Aircraft operating under IFR must remain clear of an active MOA unless approved by the responsible Air Route Traffic Control Center (ARTCC). Flight by both participating and VFR non-participating aircraft is conducted under the "see-and-avoid" concept, which stipulates that "when weather conditions permit, pilots operating IFR or VFR are required to observe and maneuver to avoid other aircraft. Right-of-way rules are contained in CFR Part 91 (P/CG 2004). The responsible ARTCC provides separation service for aircraft operating under IFR and MOA participants. The "see-and-avoid" procedures mean that if an MOA were active during inclement weather, the general aviation pilot could not safely access the MOA airspace.

Air Traffic Control Assigned Airspace

An ATCAA is airspace of defined vertical and lateral limits, assigned by ATC, for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic. This airspace, if not required for other purposes, may be made available for military use. ATCAAs are normally structured and used to extend the horizontal and/or vertical boundaries of SUA such as MOAs and Restricted Areas.

Restricted Areas

A Restricted Area is designated airspace that supports ground or flight activities that could be hazardous to non-participating aircraft. A Restricted Area is airspace designated under 14 CFR Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated "joint-use" and IFR/VFR operations in the area may be authorized by the controlling ATC facility when it is not being utilized by the using agency (P/CG 2004).

Other Airspace

Other Airspace consists of advisory areas, areas that have specific flight limitations or designated prohibitions regarding use.

3.3.2.2 Existing Conditions

Class D Controlled airspace has been established in the region to manage air traffic. The Vance AFB Class D airspace approximates a 5-NM circle around the base, except to the east where it abuts the Class D airspace supporting operations at Woodring Airport.

ATC at Vance AFB is supported by:

- The Vance Radar Approach Control.
- The Vance AFB ATC Tower.
- Additional ATC remote facilities.

There are five runways at Vance AFB. Three are parallel, oriented generally north to south (35R/17L, 35C/17C, and 35L/17R). Runway 35R/17L is 5,024 feet long and 150 feet wide. Runway 35C/17C is 9,202 feet long and 150 feet wide. Runway 35L/17R is 9,202 feet long and 150 feet wide. Additionally, there is a cross-wind runway oriented northwest to southeast (31/13). Runway 31/13 is 4,971 feet long and 150 feet wide.

Military Training Airspace. Pilot training is supported by regional SUA and other military training airspace. There are four MOAs available for use. These are the Eureka, Bison, Vance, and Ada MOAs. Most of these MOAs are subdivided into smaller areas, which facilitates scheduling. There are two types of military training routes available for training. SR must be flown at airspeeds less than 250 nautical miles per hour (knots). IRs are flown under instrument flight rules regardless of the actual meteorological conditions. Vance AFB aircrews use nine SRs and nine IRs. There are also three refueling tracks that support training in aerial refueling.

The MOAs and military training routes are described in Tables 3-7 and 3-8, respectively.

Table 3-7 Military Operations Area Identification and Description

MOA	Altitude (in feet)		Hours of Use[1]		Controlling
	Minimum	Maximum	from	to	ARTCC
Ada East/West	7,000 msl	UTBNI FL 180 [2]	Sunrise (M-F) 5	Sunset (M-F)	Kansas City
Bison	1,000 msl	UTBNI FL 180	8:30 a.m. (M-F) 1:30 p.m. (M-F)	11:30 a.m. (M-F) 4:00 p.m.(M-F)	Kansas City
Eureka High	6,000 msl	UTBNI FL 180	Sunrise (M-F)	Sunset (M-F)	Kansas City
Eureka Low	2,500 msl	UTBNI 6,000 msl	Sunrise (M-F)	Sunset (M-F)	Kansas City
Vance 1A	10,000 msl	UTBNI FL 180	1 Hour before Sunrise (M-F)	1 Hour after Sunset (M-F)	Kansas City
Vance 1B	7,000 msl	UTBNI FL 180	1 Hour before Sunrise (M-F)	1 Hour after Sunset (M-F)	Kansas City

Notes:
[1]Hours of use shown are published times. Other times may be scheduled by Notices to Airmen.
[2]Described in terms of hundreds of feet above msl, using a standard altimeter setting. Thus, FL 500 is approximately 50,000 feet above msl.

ARTCC	Air Route Traffic Control Center	FL	flight level
msl	feet above mean sea level	M-F	Monday through Friday
MOA	Military Operations Area	DOT	United States Department of Transportation
UTBNI	Up to, but not including		

Source: DOT 2006

Table 3-8 Training Routes Identification and Description

Route	Altitude (in feet)		Route Width (in Nautical Miles)	
	Minimum	Maximum	Minimum	Maximum
IR-145	Surface	6,000 msl	6	9
IR-171	500 AGL	6,000 msl	4	8
IR-172	500 AGL	6,000 msl	6	8
IR-173	500 AGL	6,000 msl	4	8
IR-175	500 AGL	6,000 msl	5	8
IR-181	500 AGL	6,000 msl	4	8
IR-182	500 AGL	6,000 msl	6	8
IR-183	500 AGL	6,000 msl	4	8
IR-185	500 AGL	6,000 msl	5	8
SR-235	500 AGL	1,500 AGL	5	8
SR-241	500 AGL	1,500 AGL	5	6
SR-247	500 AGL	1,500 AGL	5	6
SR-253	500 AGL	1,500 AGL	5	8
SR-274	500 AGL	1,500 AGL	5	8
SR-275	500 AGL	1,500 AGL	5	8
SR-294	500 AGL	1,500 AGL	10	10
SR-295	500 AGL	1,500 AGL	10	10
SR-296	500 AGL	1,500 AGL	10	10

AGL feet above ground level
DoD Department of Defense
IR Instrument Route
msl mean sea level
SR Slow Route

Source: DoD 2006b

3.3.3 Land Use

3.3.3.1 Definition of the Resource

Land use comprises natural conditions or human-modified activities occurring at a particular location. Human-modified land use categories include residential, commercial, industrial, transportation, communications and utilities, agricultural, institutional, recreational, and other developed use areas. The attributes of land use considered in this analysis include general land use patterns, land ownership, land management plans, and special use areas. General land use patterns characterize the types of uses within a particular area including agricultural, residential, military, and recreational. Land ownership is a categorization of land according to type of owner. The major land ownership categories include private, federal, and state. Management plans and zoning regulations determine the type and extent of land use allowable in specific areas and are often intended to protect specially designated or environmentally sensitive areas.

Certain land use designations are particular to military installations and incompatible with residential areas. These include clear zones and accident potential zones. Areas at the end of each runway typically delineate geographic areas around the airfield where historic aircraft mishap data have shown most aircraft accidents occur. Three zones were established based on these accident patterns: the clear zone, Accident Potential Zone 1 (APZ I), and Accident Potential Zone 2 (APZ II). The clear zone, the area closest to the runway end, is the most hazardous and must be clear of any development. Some development is allowed in APZ I and APZ II, although this development is usually limited

to light industrial, manufacturing, transportation, and similar land use categories, while uses that concentrate people in small areas are not considered acceptable.

Noise is another factor in determining appropriate land uses since elevated sound levels are incompatible with residential areas. As described in Sections 3.3.1.1 and 3.3.1.2, sound levels are typically measured in decibels using L_{dn} as the standard of measurement. Numerous studies have shown a relationship between L_{dn} and the percentage of the population likely to be highly annoyed. Residential areas are typically inconsistent with noise levels above L_{dn} 65 dB.

Visual resources are the natural and man-made features that give a particular environment its aesthetic qualities. In undeveloped areas, landforms, water surfaces, and vegetation are the primary components that characterize the landscape. Man-made elements such as buildings, fences, and streets may also be visible. These may dominate the landscape or be relatively unnoticeable. In developed areas, the natural landscape is more likely to provide a background for more obvious man-made features. The size, forms, materials, and functions of buildings, structures, roadways, and infrastructure will generally define the visual character of the built environment. These features form the overall impression that an observer receives of an area or its landscape character. Attributes used to describe the visual resource value of an area include landscape character, perceived aesthetic value, and uniqueness.

The ROI for land use and visual resources includes Kegelman AAF, Vance AFB, and the area surrounding Vance AFB that may be affected by aircraft noise.

3.3.3.2 On-base Land Use

Vance AFB encompasses 2,125 acres and includes a variety of land use categories such as airfield and aircraft operations and maintenance, industrial, medical, and housing. There is limited open and undeveloped space on Vance AFB (USAF 2006a). The installation's goal has been to consolidate compatible functions within the same land use areas to provide the highest quality training campus while implementing the latest security development strategies and providing aesthetic areas that enhance the quality of life for personnel. Table 3-9 presents the 12 land use categories that have been established for land management at the base (USAF 2006a). Not including airfield and associated airfield pavement, which make up over 70 percent of the base's overall area, Open Space is the base's largest current land use category in terms of acreage, accounting for 217 acres. The base's next two largest land use categories are Industrial and Accompanied Housing, which account for 86 and 79 acres, respectively. Vance AFB recently acquired a 125-acre parcel of land in the northeast corner of the installation (USAF 2006a). When this area is developed as planned and the intended land uses are employed, the top three land uses will be Open Space, Industrial, and Accompanied Housing (in that order).

Table 3-9 Air Force Land Use Categories

Air Force Land Use Categories	Description
Aircraft Operations and Maintenance	Base operations, control tower, fire station, maintenance hangars, shops, and docks.
Administrative	Headquarters, civilian personnel, education center, law center, and security operations.
Airfield	Aircraft operating areas.
Airfield Pavement	Runways, taxiways, and aprons.
Community Commercial	Commissary, exchange, club, dining hall, recreation center, gym, and theater.
Community Service	Post office, library, chapel, childcare center, and education center.
Housing Accompanied	Family housing.
Housing Unaccompanied	Dormitories and visitors' housing.
Industrial	Base engineering, maintenance shops, storage, warehousing, and utilities.
Medical	Hospital, clinic, and medical storage.
Open Space	Conservation area, buffer space, and undeveloped land.
Outdoor Recreation	Swimming pool, outdoor courts and field, golf course, and marina.

Vance AFB is a federally managed installation. Several plans and programs guide land use planning on Vance AFB. The "Land Use Plan" section of the Vance AFB *General Plan* presents planning strategies to support military missions assigned to the installation. The *General Plan* provides information regarding the installation and describes existing land uses, a planning analysis of constraints and opportunities, future land use, and implementation guidelines. The *General Plan* presents factors affecting both on- and off-base land use and includes recommendations to on-base officials and local community leaders to ensure compatible development (USAF 2006a).

The AICUZ program, which delineates noise contours, also promotes compatible development around Air Force installations. An AICUZ study provides installation commanders and local governments with recommendations for land use restrictions. The most recent AICUZ study was published in March 2003 (USAF 2003a).

Figure 3-1 depicts noise contours for the installation. The total area within the L_{dn} contour of 65 dB or greater is 10,146 acres. The designated clear zones at Vance AFB are located at either end of the runways as identified in figure 2-4; the APZs extend beyond the clear zones from the ends of the runways as detailed in section 3.3.3.1.

3.3.3.3 Off-base Land Use

Land usage surrounding Vance AFB consists almost entirely of undeveloped farmland. A residential development exists to the east of the base approximately 1,500 feet from the fenceline, a small industrial complex of about 12 acres is situated just northeast of base property, and a school is located north of the base housing complex.

3.3.4 Earth Resources

Earth resources include geology, topography, and soils. Geologic resources of an area typically consist of surface and subsurface materials and their inherent properties. Topography refers to the configuration of the land surface, including its relief and the position of its natural and man-made features. The term "soils" refers to unconsolidated materials formed from the underlying bedrock and other parent material. Soils have a critical role in both the natural and human environment. Soil drainage, texture, strength, shrink-swell potential, and erodibility all determine the sustainability of the ground to support man-made structures and facilities. These resources may be of scientific, historical, economical, and recreational value.

The ROI for earth resources includes the areas immediately underlying Vance AFB and Kegelman AAF.

3.3.4.1 Geology

Vance AFB is located within the north-central portion of the Red Bed Plains in the Osage Section of the Central Lowlands Physiographic Province. The Red Bed Plains is a large area of moderately rolling plains developed on thick masses of Permian sedimentary bedrock. These Permian age rocks generally dip to the west or southwest at approximately 40 feet per mile towards the Anadarko Basin. The general stratigraphic sequence in the region is comprised of marine deposited shale, siltstone, sandstone, limestone, and dolomite ranging in age from Cambrian-Ordovician through Permian. These sedimentary units rest upon the Pre-Cambrian basement rocks (granite, etc.) which lie approximately 6,000 feet below the current ground surface. The uppermost bedrock units beneath Vance AFB and in the vicinity of the installation are those of the Hennessey Group of the lower Permian. The Bison Formation immediately underlies Vance AFB and is the uppermost member of the Hennessey Group. The Bison Formation beneath Vance AFB is essentially flat-lying and approximately 120 feet thick. Other more recent stratigraphic units of importance in the general vicinity of Vance AFB are the Quaternary age terrace and the alluvial materials from the Arkansas River tributaries that have been deposited on the older units in more recent times. These river type deposits are mainly comprised of unconsolidated sands with some layers of clay, silt, and gravel. Though typically discontinuous throughout the region, these deposits usually form good to excellent sources for groundwater. This region is not considered to be tectonically active, and there are no known surficial faults or folds in the vicinity of Vance AFB (Oklahoma Geological Survey 1980).

Kegelman AAF is located on 50 feet of unconsolidated Quaternary Terrace deposits. These deposits overlie the Salt Plains and Kingman Formations of the Permian Age (USAF 1992).

3.3.4.2 Topography

Vance AFB, formed on a thick mass of Permian age shales, is generally located on a broad, low ridgetop at an average elevation of approximately 1,285 feet above msl. Topographic relief across Vance AFB is approximately 40 feet and the installation is above the limits of the 500-year flood plain. The crest of the topographic high near the southern boundary of Vance AFB is a drainage divide separating tributaries of Boggy Creek to the north from intermittent streams feeding Hackberry Creek to the south; both of these creeks contribute to Skeleton Creek, which flows into the Cimarron River. Because Vance AFB is located on an upland, there is no surface water run-on from off-base areas (*Resource Conservation and Recovery Act* [RCRA] Permit Application 2006).

3.3.4.3 Soils

In general, the soil at Vance AFB is a well-drained fine sandy loam. The terrain has a medium to high susceptibility to wind and water erosion (USAF 2003b). The dominant soil type for Vance AFB is the Grant Pond Creek association. The association is characterized as having gently rolling, sandy loams with medium fertility. In addition to the Grant Pond Creek association, tributaries of the Arkansas River deposit alluvial material in localized areas. Unlike Vance AFB, Kegelman AAF contains soils from the Attica-Pratt-Shellabarger association, which are characterized as loamy, sandy soils with rapid permeability (USAF 1992).

3.3.5 Water Resources

3.3.5.1 Definition of the Resource

Water resources analyzed in this EA include descriptions of the qualitative and quantitative characteristics of water resources, including surface waters, groundwater, and floodplains. Surface waters include streams, rivers, bays, ponds, and lakes and are important for a variety of reasons including economic, ecological, recreational, and human health. Groundwater consists of the subsurface hydrologic resources of the physical environment and is an essential resource. Groundwater properties are often described in terms of depth to the aquifer or water table, water quality, and surrounding geologic composition. Groundwater is important as a water source for potable water, irrigation, and industrial purposes.

Other issues relevant to water resources include the downstream water and watershed areas affected by existing and potential runoff and hazards associated with the 100-year floodplain. Stormwater flows, which usually increase in volume and velocity with increases in impervious surfaces such as rooftops and paved areas, have the potential to impact surface water hydrology.

Floodplains are defined by EO 11988, *Floodplain Management*, as "the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." Floodplain vegetation promotes bank stability, filters excess

nutrients, pollutants, and sediments from the water, and moderates flooding by absorbing surface water runoff.

3.3.5.2 Surface Water

Vance AFB is located within the Arkansas River basin and the Cimarron River sub-basin. The region contains no known natural lakes; however, Canton Lake (a 7,900-acre impoundment) and the Great Salt Plains Reservoir (9,300 acres) are found in the region. The four rivers in the region include the Canadian River, the Cimarron River, the Chikaskia River, and the Salt Fork River. All of these waters discharge into the Arkansas River, which flows into the Mississippi River and finally into the Gulf of Mexico.

Surface water drainage at the installation is controlled by a series of man-made ditches that direct stormwater off the base. Nearly all runoff from Vance AFB drains to the north toward Boggy Creek Tributary or into storm sewers that discharge into the Stormwater Outfall Area that flows to the Vance AFB stormwater drainage drain at an outfall just west of the Central Groundwater Treatment Facility. The Stormwater Outfall Area in turn flows into the Vance AFB stormwater drain that discharges into Boggy Creek at the northern boundary of the base. Runoff from most of the paved areas in the southern part of the base drains to the Flightline Drainage Creek that eventually drains into the base outfall at the point where it leaves Vance AFB property and enters Hackberry Creek. Both creeks join Skeleton Creek before draining into the Cimarron River (USAF 2006a).

Surface water quality of the streams in the vicinity of Vance AFB is characterized as being of good quality, with low sulfate and chloride concentrations.

3.3.5.3 Groundwater

Usable groundwater in this region of north-central Oklahoma does not occur in a single uniform aquifer. It is found in recent alluvial and terrace sediments at shallow deposits and at deeper depths in the more permeable sandstones and siltstones interbedded within the older Permian age bedrock. The groundwater in the more recent and shallower sediments is generally of good quality and plentiful. However, neither alluvium nor terrace deposits occur beneath Vance AFB. Quantity and quality of groundwater in deeper Permian rocks is dependent upon site geology. Groundwater occurrence in the deeper rock is contained in poorly cemented sandstones and siltstones or in fracture or joint systems located within the same. The groundwater is often hard with high chlorides, sulfates, and total dissolved solids (RCRA Permit Application 2006).

The Bison Formation below Vance AFB is regarded as a single water-bearing unit. Within the formation, zones with a higher proportion of coarse-grained material are expected to transmit water more readily than the other strata. These zones of higher transmissivity would be expected to be the primary pathways of groundwater transport of contaminants. They are separated by intervals that have a higher proportion of fine-grained material, especially clays. These intervals would be expected to prevent or retard

the vertical migration of groundwater and contaminants from one zone to another (RCRA Permit Application 2006).

To the depths that it has been investigated at Vance AFB, the Bison Formation has not exhibited any layers that could serve as a drinking water or industrial use aquifer. The installation purchases all of its potable water from the city of Enid, Oklahoma, and does not use base groundwater resources for either drinking water or industrial applications. The Enid public water supply is obtained from three separate well fields located in the Quaternary West Cimarron Terrace aquifer (USAF 2006a). The public water supply well field nearest to Vance AFB is approximately 7 miles to the northeast. The groundwater in these fields yields an adequate supply of good quality water (USAF 1992). According to the city of Enid water production plant personnel, approximately 160 water wells covering a 50 to 60 square mile area are capable of producing 25 million gallons per day (mgd), although typical consumption averages 9 to 10 mgd (USAF 1997).

Regional groundwater flows are generally southward in the vicinity of Vance AFB. The more localized movement of groundwater is usually due to changes in topography and flows are directed towards discharge areas along local creeks. Primary discharge for the soils and upper bedrock aquifers is provided through vertical infiltration of precipitation.

Groundwater contamination is located on Vance AFB property and the groundwater contamination plumes have been delineated. Groundwater contamination at Vance AFB is actively addressed under the Environmental Restoration Program (ERP). Shallow affected groundwater is not used for drinking water or irrigation.

3.3.5.4 Floodplains

EO 11988, *Floodplain Management*, directs federal agencies to provide leadership and take action to reduce risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore, preserve, and enhance the natural and beneficial values served by floodplains. The EO requires that an agency shall avoid undertaking or providing assistance for new construction located in floodplains and that if the head of the agency finds that there is no practicable alternative to such construction, the proposed action must include all practicable measures to minimize harm to floodplains that may result from such use.

The National Flood Insurance Program (NFIP), administered by the Federal Emergency Management Agency (FEMA), was created in 1968 to provide flood insurance to people who live in areas with the greatest risk of flooding, called Special Flood Hazard Areas (SFHA). Generally, the SFHAs are those portions of participating communities within the 100-year floodplain. The NFIP is effective only for participating communities. Both Garfield County and the city of Enid are participants. In participating communities, the extent of SFHAs are determined and published in Flood Insurance Rate Maps by FEMA.

Several flood events have occurred within 1.5 miles of the installation, including three during the October 1973 flood (USAF 2006a). A designated 100-year floodplain area is located immediately adjacent to the extended northern boundary that encompasses the Baker Tract, future home of the base's new main gate. There is also a 100-year floodplain area that runs roughly parallel to the railroad tracks very near Highway 81 and Southgate Road. Figure 3-2 shows the floodplain associated with Vance AFB.

Kegelman AAF has no known floodplains within its boundary. The only active water source that could potentially produce flooding is the Salt Fork River, which lies to the north of the airfield. However, it is considerably lower in elevation, eliminating the possibility of flooding (USAF 2006a).

3.3.6 Hazardous Materials and Waste

A hazardous material may be defined as any substance that due to quantity, concentration, physical, chemical, or infectious characteristics, may present a danger to public health, welfare, or the environment. Hazardous waste is defined as any solid, liquid, contained gaseous or semisolid waste, or any combination of wastes that pose a substantive present or potential hazard to human health or the environment. In addition, hazardous waste must meet either a hazardous characteristic of ignitability, corrosivity, toxicity, or reactivity under 40 CFR Part 261, or be listed as a waste under 40 CFR Part 261. Solid waste is waste that does not meet the requirement for hazardous waste. Based on an evaluation of existing conditions at Vance AFB, the following items are relevant to this assessment and are addressed in this section: hazardous materials, hazardous waste, ERP sites, polychlorinated biphenyls (PCB), lead-based paint (LBP), and asbestos.

3.3.6.1 Hazardous Materials

The management of hazardous materials at Vance AFB is accomplished in accordance with Air Force Instruction (AFI) 32-7086, *Hazardous Materials Management,* which incorporates the requirements of all federal regulations, other AFIs, and Department of Defense (DoD) Directives for the reduction of hazardous material uses and purchases. AFI 32-7086 calls for installations to implement an Air Force-approved tracking system in order to monitor and help control the usage of hazardous material across the installation. Vance AFB utilizes the Air Force Environmental Management Information System

3.3.6.2 Hazardous Waste

The Air Force goal is to recycle resources for reuse when possible and economically feasible. Waste minimization and recycling are emphasized with hazardous waste disposal as the last resort. Vance AFB is currently regulated as a large quantity generator of hazardous waste. All hazardous wastes are regulated under RCRA by USEPA, unless otherwise exempted by *Comprehensive Environmental Response, Compensation, and Liability Act* regulations.

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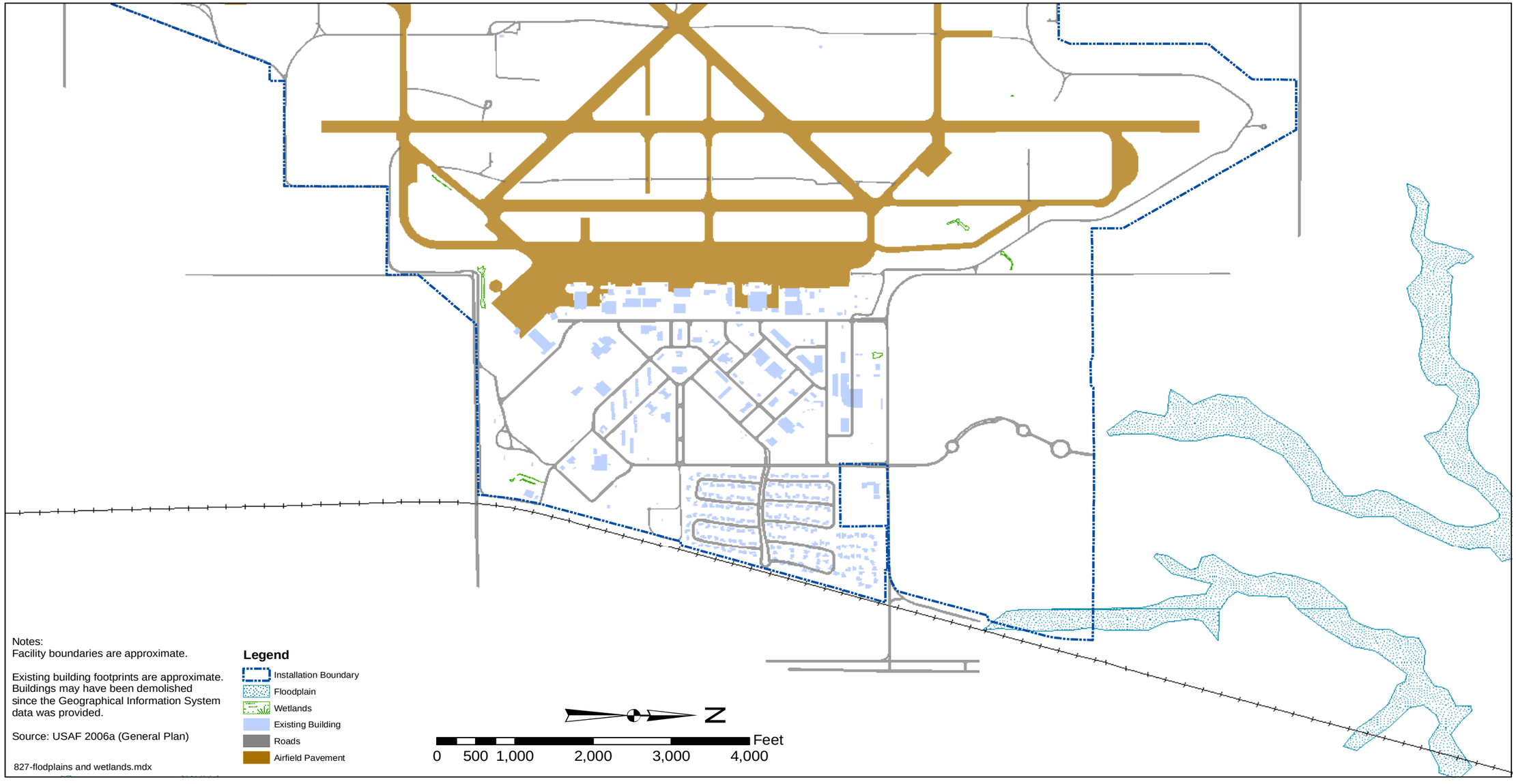

Figure 3-2 Floodplains and Non-jurisdictional Wetlands Associated with Vance Air Force Base, Oklahoma

Vance AFB manages hazardous wastes through the implementation of the installation's *Hazardous Waste Management Plan* (HWMP), which details the waste generation, accumulation, and disposal procedures, policies, and responsibilities (USAF 2006a). Additionally, waste identification, characterization, sampling, and analysis guidelines and methods are detailed in this plan. The HWMP states that there is a 90-day storage area in Building 250, 52 satellite accumulation points, and 53 hazardous waste streams generated across the base (USAF 2005a). The environmental branch ensures that a waste stream inventory for the base is updated annually. Vance AFB does not collect, handle, dispose of, or otherwise manage non-DoD owned hazardous waste.

3.3.6.3 Environmental Restoration Program

The overall program goal of the Air Force ERP is to "reduce risks to human heath and the environment due to contamination from past Air Force activities…" (USAF 2001a). The ERP (initially called the Installation Restoration Program) is used to identify, characterize, clean up, and restore sites contaminated with toxic and hazardous substances, low-level radioactive materials, petroleum, oils, lubricants, and other pollutants and contaminants.

Vance AFB initiated the Installation Restoration Program in 1984. According to the *General Plan*, there are 26 ERP sites on Vance AFB and two sites at Kegelman AAF. These locations, other than the Kegelman AAF sites, are mapped in Figure 3-3. Table 3-10 lists the 13 open ERP sites (including one Area of Concern not listed in the *General Plan*) and the 16 closed sites.

3.3.6.4 PCBs

PCBs are chemicals that persist in the environment, accumulate in organisms, and concentrate in the food chain. Exposure to PCBs and their by-products have been linked to chloracne (a skin disorder), bleeding and neurological disorders, liver damage, human embryo deformation, cancer, and death. PCB items consist of any containers or equipment components that contain PCBs in a concentration equal to or greater than 50 parts per million (ppm). The USEPA, under the *Toxic Substances Control Act*, regulates the removal and disposal of all PCB items. Commercial PCBs are used in electrical systems such as transformers, capacitors, and voltage regulators because they are electrically non-conductive and stable at high temperatures. The PCB management program is managed by a contractor under the direction of the Environmental Flight. The *General Plan* documents some older PCB-containing transformers in the process of being removed in the spirit of the installation's dedication to the aggressive removal of any PCBs discovered on the installation (USAF 2006a). There are no known PCBs located at Vance AFB.

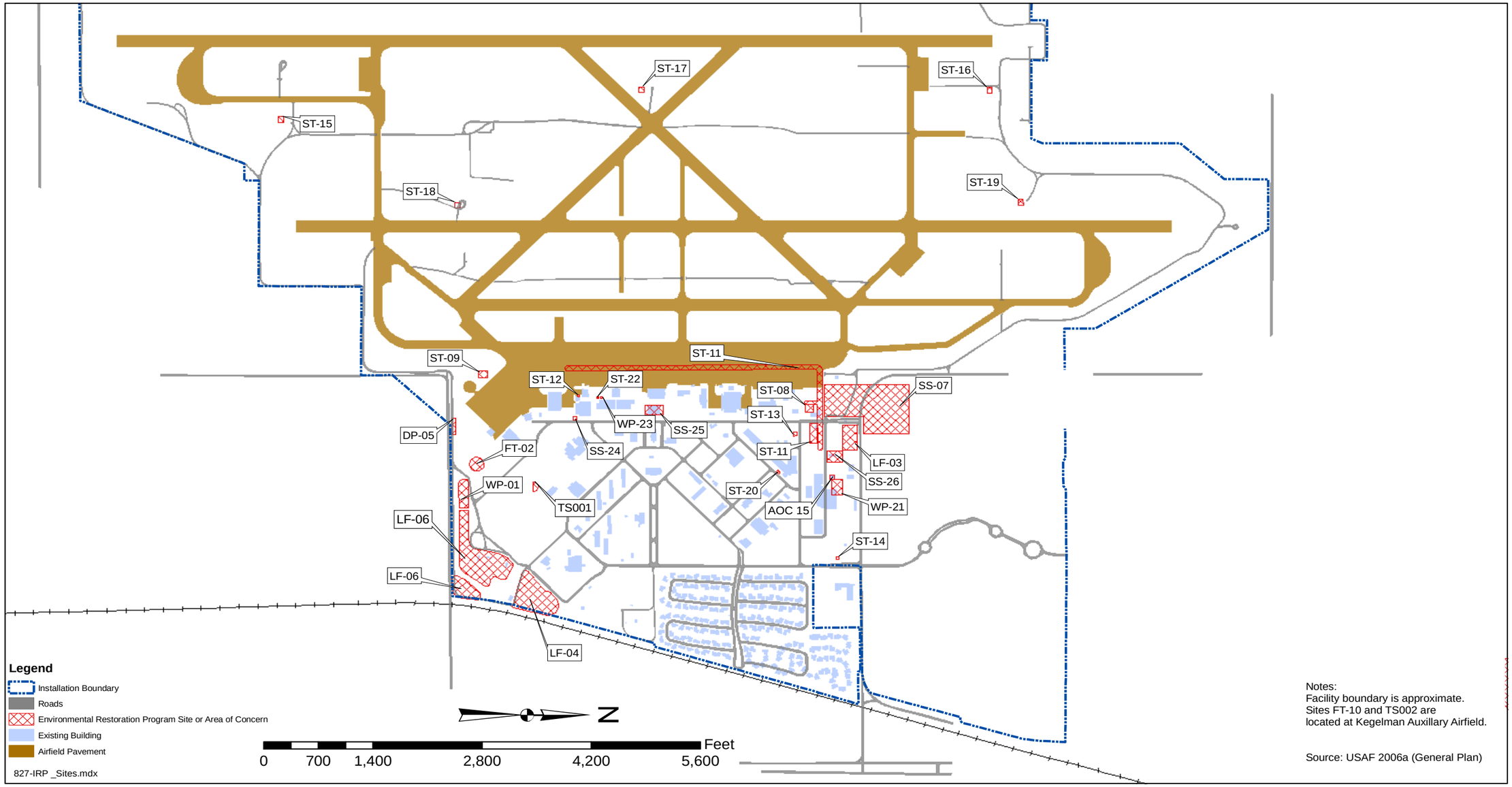

Figure 3-3 Environmental Restoration Program Sites, Vance Air Force Base, Oklahoma

Table 3-10 Environmental Restoration Program Sites and Area of Concern at Vance Air Force Base and Kegelman Auxiliary Airfield

Site Identifier	Site Description	Site Status
Open Sites		
FT-02	Fire Training Area	Response complete; 2 wells being monitored
LF-03	Tank Farm Landfill	RIP
DP-05	Tank Sludge Disposal Area	Undergoing final RA
SS-07	Hazardous Waste Accumulation Point	RIP
ST-08	UST No. 106 at Building 110	RIP
ST-12	Paint Stripping Equalization Tank	RIP
WP-23	Industrial Waste Pit	RIP
SS-24	Jet Engine Shop	RIP
SS-25	COMBS Warehouse	RIP
SS-26	JP-4 Fuel Storage Area	Awaiting final RD/RA
TS001	Old Skeet Range (MMRP site)	Comprehensive Site Evaluation
TS002	Old Skeet Range at Kegelman AAF (MMRP site)	Comprehensive Site Evaluation
AOC 15	Entomology Shop	PA in the next few months
Closed Sites		
WP-01	Chemical Disposal Pit	Closed
LF-04	East Boundary Landfill	Closed
LF-06	Southeast Boundary Landfill	Closed
ST-09	Jet Engine Test Area	Closed
FT-10	Fire Training Area at Kegelman AAF	Closed
ST-11	Aqua/AVGAS Fuel Distribution System	Closed
ST-13	Quartermaster Service Station	Closed
ST-14	Abandoned UST at Building 202	Closed
ST-15	Abandoned UST at Building 1023	Closed
ST-16	Abandoned UST at Building 1024	Closed
ST-17	Abandoned UST at Building 1030	Closed
ST-18	Abandoned UST at Building T-1	Closed
ST-19	Abandoned UST at Building T-2	Closed
ST-20	Civil Engineering Paint Shed	Closed
WP-21	Former Waste Treatment Facility	Closed
ST-22	Lift Station	Closed

AAF	Auxiliary Airfield	LF	landfill	RIP	Remedy In Place
AOC	Area of Concern	MMRP	Military Munitions Response Program	SS	Spill Site
AVGAS	aviation gasoline	No.	number	ST	Storage Tank
COMBS	Contractor Operated and Managed Base Supply	PA	Preliminary Assessment	TS	Trap and Skeet Range
DP	Disposal Area	RA	Remedial Action	UST	Underground Storage Tank
FT	Fire Training Area	RD	Remedial Design	WP	Waste Pit

Source: USAF 2006a

3.3.6.5 Lead-based Paint and Asbestos

LBP was commonly used in and on buildings and other structures until 1978. When in good condition, LBP does not pose a health hazard; however, when deteriorated (e.g., cracking, peeling, chipping) or damaged by renovation or maintenance activities, LBP can release lead-containing particles that pose a threat of lead contamination to the environment and a health hazard to workers and building occupants who may inhale or ingest the particles.

The LBP Management Program at Vance AFB is conducted in accordance with Air Force Policy. The *LBP Management Plan*, updated in November 2005, provides guidance in preventing heath and environmental hazards associated with LBP exposure and outlines the policy and procedures to be followed in conducting the surveying, sampling, analysis, and abatement of LBP-contaminated materials.

Asbestos was widely used in construction/manufacturing in the past because of its insulating properties, its ability to withstand heat and chemical corrosion, and its soft, pliant nature. Friable (brittle) asbestos becomes hazardous when fibers become airborne and can be inhaled. Asbestos fibers (less than 5 microns in size) may become trapped in the lungs and may lead to diseases including asbestosis, lung cancer, and mesothelioma.

Asbestos-containing material (ACM) is managed in accordance with the installation's *Asbestos Management Plan* (AMP) and *Asbestos Operating Plan* (AOP) (USAF 2001b). The AMP is a comprehensive policy document that specifies work to be accomplished and assigns various base offices responsibility for the work. Other components of the AMP include a record retention system and a regulatory review covering applicable federal, state, and Air Force regulations. The AOP, updated in September 2001, sets forth specific procedures for accomplishing asbestos abatement and related tasks such as work control procedures, operations and maintenance work practices, worker protection, training, and record keeping. Another portion of the installation's overall asbestos management program is the *Asbestos Survey Report* (ASR) and Database System, based on an asbestos survey that was completed in August 1991. The ASR contains the location, condition assessment, Air Force's Guidance for Rating and Assessing Damage and Exposure priority, recommended response, and estimated cost of response for all cells of ACM or suspect material identified during the survey (USAF 2001b).

3.3.7 Biological Resources

Biological resources include native plants and animals, and their habitats. Sensitive and protected biological resources include plant and animal species listed as threatened or endangered species by the United States Fish and Wildlife Service (USFWS) or a state. Under the *Endangered Species Act* (ESA) (16 *United States Code* [USC] 1536), an "endangered species" is defined as any species in danger of extinction throughout all or a significant portion of its range. A "threatened species" is defined as any species likely to become an endangered species in the foreseeable future. The USFWS also maintains a list

of species considered to be candidates for possible listing under the ESA. Although candidate species receive no statutory protection under the ESA, the USFWS has attempted to advise government agencies, industry, and the public that these species are at risk and may warrant protection under the Act.

Although Oklahoma does not have an endangered species act, the state has several provisions under which threatened and endangered wildlife can be classified based on scientific criteria. The Oklahoma Permanent Statutes define endangered wildlife species as "any wildlife species or subspecies in the wild or in captivity whose prospects of survival and reproduction are in immediate jeopardy and includes those species listed as endangered by the federal government, as well as any species or subspecies identified as threatened by Oklahoma statute or Commission resolution" (Oklahoma Permanent Statutes §29-2-109). The Oklahoma Permanent Statutes define threatened wildlife species as "any wildlife species or subspecies in the wild or in captivity that, although not presently threatened with extinction, are in such small numbers throughout their range that they may become an endangered species within the foreseeable future or that they may be endangered if their environment deteriorates. Threatened species and subspecies include those species and subspecies listed as 'threatened' by the federal government as well as any species or subspecies identified as threatened by Oklahoma statutes or Commission resolution" (Oklahoma Permanent Statutes §29-2-135).

Biological resources also include wetlands. Wetlands are an important natural system and habitat because of the diverse biologic and hydrologic functions they perform. These functions include water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, wildlife habitat provision, unique flora and fauna niche provision, stormwater attenuation and storage, sediment detention, and erosion protection. Wetlands are protected as a subset of the "waters of the US" under Section 404 of the *Clean Water Act* (CWA). The term "waters of the US" has a broad meaning under the CWA and incorporates deep-water aquatic habitats and special aquatic habitats (including wetlands). The USACE defines wetlands as "those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR Part 328).

Biological resources are defined as vegetation, wildlife, and the habitats (including wetlands) in which they occur. The ROI for biological resources at Vance AFB is the installation itself and Kegelman AAF. Vance AFB is an urbanized installation, the majority of which is developed and occupied by roads, buildings, and runways. Open areas consist primarily of mowed lawns lots between buildings. Most of the wildlife is found on Kegelman AAF and not on Vance AFB, because portions of Kegelman AAF have remained a suitable habitat for their preservation. Wildlife is discouraged from taking up residency on Vance AFB in order to reduce the potential conflicts between operational

activities and the preservation of those species, whereas Kegelman AAF has ample open space.

3.3.7.1 Vegetation and Wildlife

Vance AFB is located in the Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow Province (Bailey 1995). Located along the eastern edge of the Great Plains in the Red Bed Plains, this biotic province is also known as the Enid Prairies Subdivision, characterized by flat to gently rolling prairies that are typically only broken by drainage basin (USAF 2006a).

A variety of plant species common to the area are present on Vance AFB. Vegetation communities include large areas of native short and tall grasses and forbs. Species of grasses and forbs found on Vance AFB include buffalo grass, sideoats grama, and sand dropseed (USAF 2002). Agricultural areas present within Vance AFB are planted with wheat, alfalfa, sorghum, and other small grains (USAF 2002).

The majority of land at Vance AFB is improved and/or semi-improved. In 1993, an urban forest study was conducted to inventory and evaluate the condition of trees on Vance AFB to establish a long-range management plan for this resource. The study revealed that approximately 4,000 trees consisting of over 75 different species existed on Vance AFB (USAF 2002).

A biological survey of Vance AFB and Kegelman AAF was completed in July 1996 by the Oklahoma Biological Survey (USAF 1996). The survey found that very few species reside at Vance AFB compared with the wide variety that exists at Kegelman AAF. Migratory birds (protected under the Migratory Bird Treaty Act [MBTA] and the Sikes Act) are present throughout both Vance AFB and Kegelman AAF, but are more prevalent at Kegelman AAF. Table 3-11 lists principal mammal and bird species at Kegelman AAF.

3.3.7.2 Threatened and Endangered Species

The ESA of 1973, along with subsequent amendments, requires that actions of federal agencies avoid jeopardizing the continued existence of federally listed or proposed threatened or endangered species, or destroying or adversely modifying designated or proposed critical habitats.

No threatened or endangered plant or animal species are known to exist on either Vance AFB or Kegelman AAF (USAF 2006a). However, there are considerable habitats or historical habitats known to exist within the ROI, which includes Garfield, Alfalfa, and Grant counties. Specifically, Kegelman AAF is subject to a high likelihood that threatened or endangered species may establish themselves on installation property because of their proximity to the Great Salt Plains Lake and the Salt Plains National Wildlife Refuge. Table 3-12 identifies the known threatened or endangered species within the ROI.

Table 3-11 Wildlife Species in or near Kegelman Auxiliary Airfield

Common Name	Scientific Name
Mammals	
Virginia opossum	*Didelphis virginiana*
Black-tailed jackrabbit	*Lepus californicus*
Eastern cottontail	*Sylvilagus floridanus*
Fox squirrel	*Sciurus niger*
Coyote	*Canis latrans*
Raccoon	*Procyon lotor*
Striped skunk	*Mephitis mephitis*
Badger	*Taxidea taxus*
Bobcat	*Lynx rufus*
White-tailed deer	*Odocoileus virginianus*
Birds	
Chinese ringneck pheasant	*Phasianus colchicus*
Wild turkey	*Meleagris gallopavo*
Northern bobwhite	*Colinus virginianus*
Mourning dove	*Zenaida macroura*
Red-tailed Hawk	*Buteo jamaicensis*
Common Nighthawk	*Chordeiles minor*
Scissor-tailed Flycatcher	*Tyrannus forficatus*
Barn Swallow	*Hirundo rustica*
Carolina Chickadee	*Parus carolinensis*
Eastern Bluebird	*Sialia sialis*
Northern Mockingbird	*Mimus polyglottos*
Northern Cardinal	*Cardinalis cardinalis*
Lark Sparrow	*Chondestes grammacus*
Harris's Sparrow	*Zonotrichia querula*
Eastern Meadowlark	*Sturnella magna*
White-crowned Sparrow	*Zonotrichia leucophrys*
Field Sparrow	*Spizella pusilla*
American crow	*Corvus brachyrhynchos*

Source: American Ornithologist's Union 1983, Owen and Schnell 1989, and USAF 2002

Table 3-12 Regional Threatened and Endangered Species

Common Name	Scientific Name
Mammals	
Prairie Dog	*Cynomys ludovicianus*
Black Tailed Prairie Dog	*Cynomys ludovicianus*
Birds	
Bald Eagle	*Haliaeetus leucocephalus*
Interior Least Tern	*Sterna antillarum*
Whooping Crane	*Grus americana*
Piping Plover	*Charadrius melodus*
Mountain Plover	*Charadrius montanus*
Lesser Prairie Chicken	*Tympanuchus pallidinctus*
Arkansas River Shiner	*Notropis girardi*

Source: USAF 2006a

3.3.7.3 Wetlands

Wetlands are those areas inundated or saturated by surface or groundwater at a frequency and for a duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The characteristics of hydrophytic vegetation, hydric soils, and wetland hydrology were the criteria for determining the presence of wetland area. The overall management objective for this resource, as required by Section 404 of the CWA and the EO on Wetlands (EO 11990), is that there be "no net loss of wetlands." AFI 32-7064, *Integrated Natural Resources Management*, is a source of requirements for managing wetlands.

There are no jurisdictional wetlands on Vance AFB as determined by the USACE in a wetland determination letter dated November 2001. Any wetlands appearing on Figure 3-2 have not been identified as jurisdictional and are therefore not subject to CWA jurisdiction. There are three clustered sites on Kegelman AAF that contain identified jurisdictional wetland areas registered with the USACE totaling 3.4 acres in area (USAF 2006a). These wetland areas are located approximately 500 feet east of the overrun for runway 35 within the primary surface of the airfield.

3.3.8 Utilities and Infrastructure

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly human-made with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "urban" or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to economic growth of an area.

3.3.8.1 Electricity and Natural Gas

Electrical service for Vance AFB is purchased jointly through Oklahoma Gas and Electric and Southwestern Power Administration and delivered via an overhead transmission line to a single source main distribution switching substation located on base adjacent to the corner of Fox Drive and Gott Road. Power enters base switchgear through an underground feed to five switches (and one bypass switch), then out through five underground feeders to four electric zones on the installation. Each circuit can carry approximately 6,600 kilowatts (kW) from a primary power supply of 12,500 volts. The substation transformer is rated to 7,500 kW with an overload maximum of 9,000 kW. The four electrical zones are fed primarily through underground feeds with only 3.5 miles of aboveground utility lines remaining on the installation (USAF 2006c). Consumption data collected by Vance AFB between 2004 and 2005 indicate an annual electrical energy consumption of approximately 27 million kilowatt-hours. The corresponding peak load information estimated from the same time period indicates a peak load condition of approximately 4,427 kW for the main base (Appendix B).

Natural gas is supplied to the main base by Tiger Natural Gas located in Tulsa, Oklahoma. The delivery system is owned and maintained by the Oklahoma Natural Gas Company. The supply line is a 4-inch, high-pressure insulated black iron pipe, which runs parallel to Cleveland Road and then diagonally traverses the Baker Tract to a point along the northern boundary near the electric substation. The base distribution system is comprised of approximately 13 miles of mains and feeders arranged in a dual looped main configuration with dead-end feeders to large areas of multiple facilities. Pressure at the point of entry is approximately 200 pounds per square inch (psi) and is considered an uninterruptible supply. From the master entry meter, the pressure is reduced to approximately 15 psi for the loop mains. Pressure is again reduced to 12 psi from the main to the facility feeds and to 3.5 psi as it enters each facility. The majority of the original black steel pipe gas distribution system is still in use throughout the base. All steel pipes are cathodically protected. The installation initiative is to systematically replace all old steel pipe with new polyethylene pipe (USAF 2006c). Consumption data collected by Vance AFB between 2004 and 2005 indicate an annual natural gas energy consumption of approximately 79,460,000 cubic feet. The corresponding peak load information estimated from the same time period indicates a peak load condition of approximately 45 cubic feet per hour. Additional information on gas energy consumption at Vance AFB can be found in Appendix B.

3.3.8.2 Potable Water

The installation purchases all of its potable water from the city of Enid. The public water supply well field nearest to Vance AFB is approximately 7 miles to the northeast. The Enid public water supply is obtained from three separate well fields located in the Quaternary West Cimarron Terrace aquifer. Water is distributed throughout the installation via approximately 20 miles of water mains and feeds of various sizes. Approximately 90 percent of the system is constructed of cast iron pipe. The remainder consists of asbestos, concrete, or polyvinyl chloride. The system configuration consists of a main loop with dead-end feeders to areas of buildings or large facilities. The system has valves throughout to allow isolation of an area for service or in case of line interruption (USAF 2006a). Potable water consumption at Vance AFB in FY2005 averaged approximately 0.148 mgd; the maximum daily consumption is estimated as 0.273 mgd. Historical data dating back to 1996 indicate historical annual potable water consumption has not exceeded 0.196 mgd. Additional information on the potable water supply for Vance AFB can be found in Appendix B.

3.3.8.3 Solid Waste Management

Vance AFB solid waste is managed in accordance to the guidelines specified in AFI 32-7042, *Solid and Hazardous Waste Compliance.* AFI 32-7042 incorporates by reference the requirements of Subtitle D, 40 CFR Parts 240 through 244, 257, and 258, and other applicable federal regulations, AFIs, and DoD Directives. In general, AFI 32-7042 establishes the requirement for installations to have a solid waste management program to incorporate the following: a solid waste management plan; procedures for handling,

storage, collection, and disposal of solid waste; record keeping and reporting; and pollution prevention (USAF 1994).

Base Operation Support (BOS) contractors collect non-hazardous solid waste from across the base and deliver it to the city of Enid Landfill, which is located approximately 2 miles northeast of the base (USAF 2006a). Some non-regulated industrial waste, such as corings and other soil samples, are sent to the Red Carpet Landfill in Meno, Oklahoma, which is approximately 20 miles west of Vance AFB. Waste generated at Kegelman AAF suitable for landfill disposal is taken to the Northern Oklahoma Disposal, Inc., landfill approximately 50 miles east of Kegelman AAF in Tonkawa, Oklahoma.

The Vance AFB Recycling Program is managed by BOS contractor personnel. All work centers throughout the installation have recycling collection bins, according to the *General Plan*. Most recycled materials are sent to Northern Oklahoma Recycling Center of Enid, which is approximately 40 miles northeast of Vance AFB in Tonkawa, Oklahoma (USAF 2006a).

Table 3-13 summarizes selected solid waste metrics from Vance AFB and Kegelman AAF for calendar year 2005.

Table 3-13 Solid Waste Generated/Recycled at Vance Air Force Base during Calendar Year 2005

Waste Type	Waste Generated/Recycled (tons)		
	2004	**2005**	**2006**
Solid Waste Landfilled	1,040	1,031	740
Solid Waste Composted/Mulched	1,475	1,783	1,628
Solid Waste Reused	1,330	847	1,132
Construction and Demolition Waste Landfilled	217	15	4
Total Solid Waste Generated	**5,546**	**4,118**	**3,808**

Note: Table does not include all categories of waste types and ultimate disposal method; therefore, total solid waste generated is not a column total.

Source: USAF 2005b

3.3.8.4 Wastewater

Wastewater treatment is provided by the city of Enid's wastewater treatment facility. The city of Enid manages an 8.5 mgd tertiary treatment wastewater plant (City of Enid 2006a). The Vance AFB wastewater collection system consists of approximately 13.5 miles of gravity feed and force main pipes. The majority of the installation is gravity fed and distributed through cast iron pipes; however, several areas remain that employ the use of old clay tile pipes. In these cases, the majority of the collection lines have been retrofitted with Insituform liners. Insituform is an internal fiberglass insert for sewer piping that forms a seal to prevent water and plant intrusion. There are a total of eight lift stations and associated force mains to remove effluent from low-lying areas of the installation and those facilities with basement fixtures. Two groundwater treatment units

(Building 258 and ERP site DP-05) treat volatile contaminants in extracted groundwater prior to discharge of the treated groundwater into the wastewater collection system. While treated groundwater is not considered industrial wastewater by Vance AFB or the city of Enid, these units contribute a total of approximately 35,521 gallons per day into the system, which is approximately 25 percent of the total system flow (USAF 2006c and USAF 2007). Based on data collected between 2004 and 2005, wastewater generation at Vance AFB averaged approximately 0.135 mgd and the maximum daily generation was approximately 0.171 mgd. Historical data dating back to 1996 indicate historical annual wastewater generation has not exceeded 0.203 mgd. The city of Enid wastewater collection system can accommodate up to 0.500 mgd of flow coming from Vance AFB (USAF 2006c). Additional details can be found in Appendix B.

3.3.8.5 Transportation

Vance AFB is located just south of the city of Enid. Enid is reached from the east and west by State Highway 412, a four-lane thoroughfare connecting to Tulsa. The nearest interstate is Interstate 35, which connects to Wichita, Kansas to the north and Oklahoma City to the south. Vance AFB is primarily accessed from State Highway 81 (Van Buren Road), a four-lane, major north-south route through the city of Enid. Most non-regional, ground-based deliveries and visitors follow Interstate 35 to State Highway 412 west to State Highway 81 then south to the installation. Other roadways that connect the installation to Enid include Cleveland Street and Oakwood Road. Cleveland Street is a paved, two-lane city street and Oakwood Road is a paved, two-lane road (Figure 3-4). Other roadways near the installation include:

- Longhorn Trail – an east-west, two-lane gravel county road on the south side of the base.
- Wheat Capital Road – an east-west, two-lane, gravel county road located south of the Vance AFB cantonment that was bisected by previous base expansions.
- Fox Drive – (a paved road on the east side of the base and gravel on the west side) is a two-lane, east-west roadway located north of the cantonment that was also bisected in the past by base expansions.
- Southgate Road – a two-lane, east-west roadway that is partially paved and located directly north of the runway clear zones.

All off-base roadways are well maintained and provide unrestricted access to the installation (USAF 2006a).

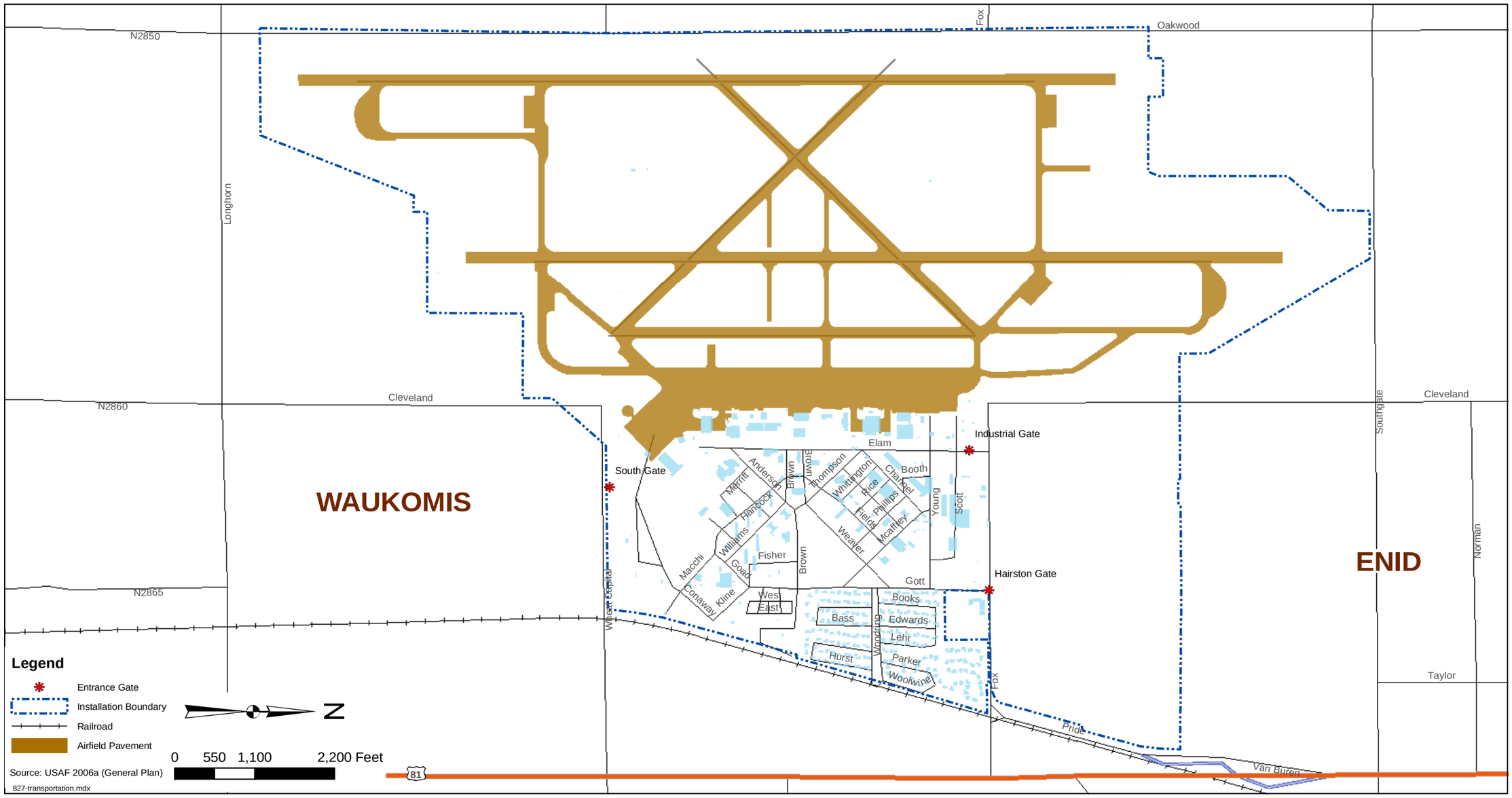

Figure 3-4 Transportation System, Vance Air Force Base, Oklahoma

Access to Vance AFB is controlled by three entrance gates. The main gate (Hairston Gate) and the Industrial Gate are located on Fox Drive on the north side of the cantonment area. The South Gate is located along Wheat Capital Road on the south side of the installation. Hairston Gate provides access to the main portion of the cantonment along Gott Road. The Industrial Gate provides access to the aircraft operations and maintenance areas and industrial portions of the base via Elam Road. The South Gate is not used for regular traffic and only provides limited access to the industrial areas located on the south side of the installation.

The existing road network within Vance AFB consists of approximately 21 miles of roads and streets, primarily constructed of asphalt pavement with concrete curbs and gutters (Figure 3-4). Elam Road and Young Road, which carry substantial industrial traffic, are constructed of concrete. The streets of the family housing area are also concrete but are planned to be reconstructed of asphalt with concrete curb and gutter. The perimeter security road at the south end of the base and encircling the airfield is surfaced with milled asphalt and gravel. The base road network is essentially the same as it was originally established and consists of a series of diagonal connector roads between two rectilinear primary delivery roadways. The roadways reflect the pattern established by the airfield primary and crosswind runways. The pattern can be confusing and makes traversing the installation difficult (USAF 2006a).

Parking at Vance AFB is considered to be adequate for the current mission but is affected by recently implemented anti-terrorism/force protection criteria. Most parking areas are large surface lots but many on-street parking areas also exist on the installation. The base does not presently have a good network for pedestrian circulation. Off-street sidewalks, crosswalks, and recreational pathways are limited.

3.3.8.6 Stormwater Drainage

Stormwater systems convey precipitation away from developed sites to appropriate receiving surface waters through a series of underground stormwater lines, culverts, and drainage ditches. Stormwater systems employ a variety of devices to slow the movement of water, thus reducing sediments and other contaminants that could otherwise flow directly into surface waters.

The base is roughly divided into 10 stormwater drainage areas, based upon topography, that gather and direct stormwater through surface sheeting, open drainage ditches, and underground stormwater lines to 3 permitted outfalls and 6 non-permitted outfalls located around the perimeter of the installation (Figure 3-5). The system is comprised of approximately 23 miles of underground pipes being supplied by collection basins, curb collector inlets, and manholes. Nearly 80 percent of the underground system components consist of vitrified clay pipe. Other sections have recently been replaced with concrete pipes that have been enlarged to sustain the runoff from a calculated 100-year storm (USAF 2006a). Table 3-14 provides a breakdown of the impervious surfaces at Vance AFB by drainage basin. Kegelman AAF has approximately 94 acres of impervious surface.

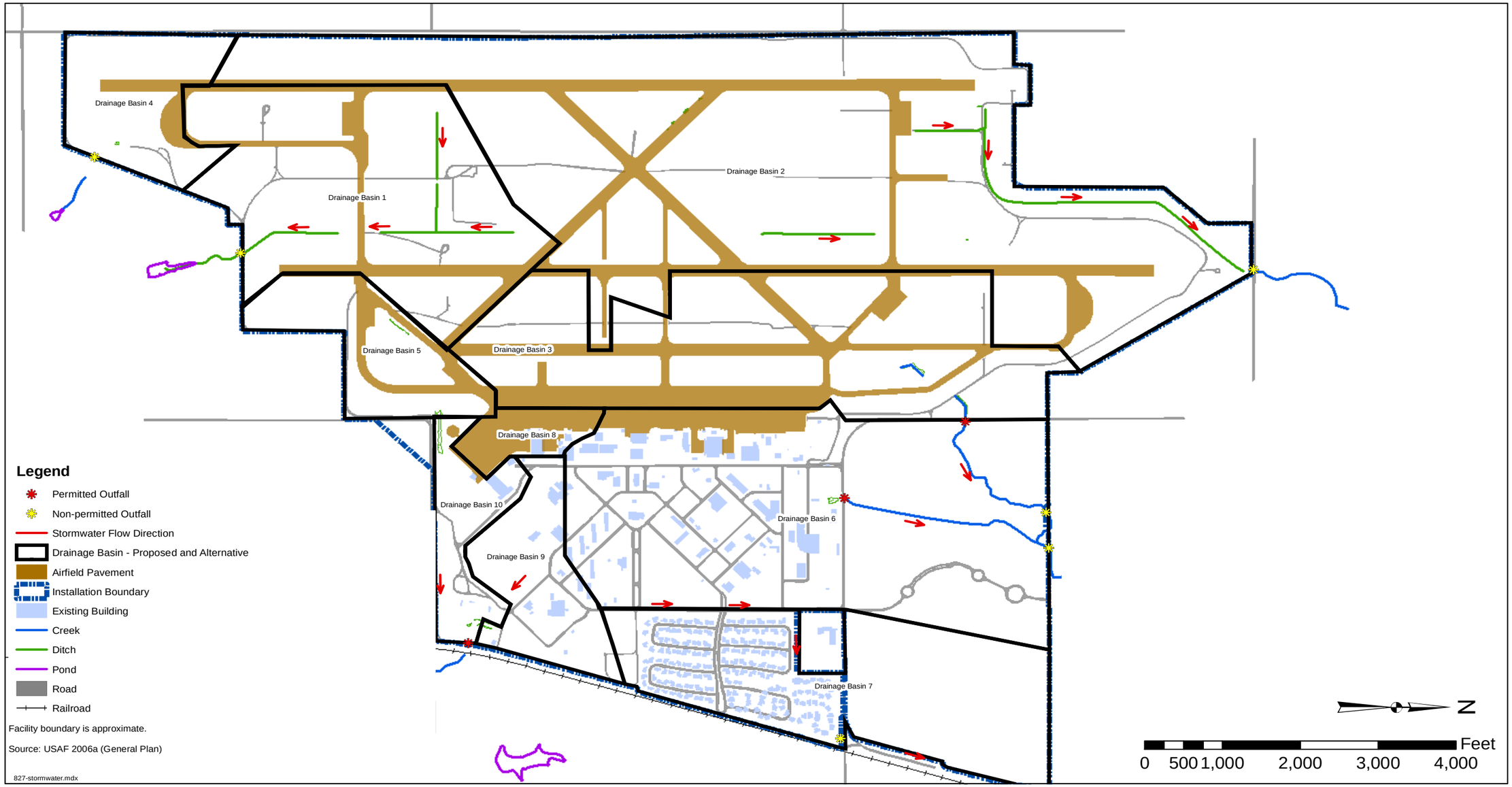

Figure 3-5 Stormwater Drainage Basins, Vance Air Force Base, Oklahoma

Table 3-14 Baseline Drainage Area Conditions

Drainage Area	Total Drained Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Percent Impervious
1	247	34	213	14%
2	689	89	600	13%
3	288	75	213	26%
4	76	9	67	11%
5	77	15	62	20%
6	386	106	280	27%
7	197	26	171	13%
8	25	22	3	87%
9	72	15	57	21%
10	47	13	34	27%
Totals	**2,104**	**403**	**1,701**	**19%**

Note:
Basin drainage area calculated from information provided in the Stormwater Pollution Prevention Plan (USAF 2001c). Drainage area only includes on-base area. Impervious cover determined from most current Geographical Information System layer provided by the base in June 2006.

In general, water flows to the north, south, or east into unnamed tributaries by way of seven permitted outfalls leaving the installation. The seven outfalls are grouped by their relative locations and direction of egress from the installation. With the addition of the Baker Tract, outfalls 3-North and 2-North are in the process of being replaced by the two non-permitted outfalls leaving the base through the Baker Tract addition. Figure 3-5 shows the incorporation of the Baker Tract into the stormwater drainage basin system used in the environmental analysis. At present, there are no detention or retention ponds on the installation and there is rarely any standing water within the open ditches.

Vance AFB has an active stormwater discharge permit issued by the Oklahoma Department of Environmental Quality (ODEQ) under the Oklahoma Pollutant Discharge Elimination System (OPDES). The base has been issued a General Permit for Storm Water Discharges. All currently permitted industrial facilities under the USEPA Multi-Sector General Industrial Permit must reapply to ODEQ for coverage under the General Permit (USAF 2001c).

Stormwater runoff being discharged off base is monitored and sampled from outfall discharge points on a regular basis. Several measures such as prescribed storage and materials handling, containment dikes around storage areas, a spill retention sluice gate with back-up inflatable bladder, appropriate pesticide applications, oil/grease/sediment interceptors, and paved surface sweeping have been implemented as part of the *Stormwater Pollution Prevention Plan* used to minimize runoff contamination (USAF 2001c).

3.3.9 Socioeconomics and Environmental Justice

Socioeconomic resources are defined as the basic attributes associated with the human environment, generally including factors associated with population, housing, education, and the economy. Direct impacts to any of these factors may generate secondary effects on other factors, resulting in a series of potential socioeconomic ramifications within the affected area. Vance AFB is situated on the southern edge of the city of Enid, in Garfield County, Oklahoma, which constitutes the socioeconomic region of analysis. Due to the limited amount of activity at Kegelman AAF and the fact that only one project is scheduled for construction at Kegelman AAF, Kegelman AAF will not be considered part of the ROI for the analysis of socioeconomics and environmental justice.

Concern that certain disadvantaged communities may bear a disproportionate share of adverse health and environmental effects compared to the general population led to the enactment in 1994 of EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This executive order directs federal agencies to address disproportionate environmental and human health effects in minority and low-income communities. EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, was enacted in 1997, directing federal agencies to identify and assess environmental health and safety risks to children, coordinate research priorities on children's health, and ensure that their standards take into account special risks to children.

Environmental justice analysis applies to adverse environmental impacts. Potential disproportionate impacts to minority or low-income populations are assessed only when adverse environmental consequences to the human population are anticipated, otherwise no analysis is required. The same is true for analysis of special risks to children, which would be driven by adverse environmental impacts. If adverse impacts are not anticipated, no special risk to children analysis is required.

3.3.9.1 Population

The baseline population associated with Vance AFB is 4,340 persons, including 1,288 military personnel, 423 average student population, 1,250 military dependents, 1,332 civilian personnel, and 47 transient personnel (see Table 3-15). The baseline population in this section differs from the baseline data presented in Appendix B in that the socioeconomic analysis includes off-base resident military dependents. An estimated 23 percent of the Vance AFB population resides on base, including 582 personnel and 425 dependents. The remaining 77 percent reside off base, comprised of 2,508 personnel and 825 dependents. The base population constitutes 9.3 percent and 7.6 percent of the city of Enid and Garfield County populations, respectively.

Table 3-15 Vance Air Force Base Baseline Population (FY2005)

	Living On Base	Living Off Base	Total
Military Personnel	339	949	1,288
Student Personnel	196	227	423
Military Dependents	425	825	1,250
Civilian Personnel	0	1,332	1,332
Transient Personnel	47	0	47
Total Baseline Population	1,007	3,333	4,340

Source: Appendix B

Garfield County population has declined by 1.5 percent since 2000, after experiencing minor population growth of 1.9 percent between 1990 and 2000. By comparison, the Oklahoma population increased by 9.7 percent during the previous decade, with continued growth of 2.8 percent since 2000 (US Bureau of the Census [USBC] 2006). The 2005-estimated population of Garfield County was 56,958, down from 57,813 persons in 2000. The city of Enid, which accounts for 82 percent of the county population, has experienced similar population trends, decreasing 1.3 percent from 47,045 persons in 2000 to an estimated 2003 population of 46,436 persons.

Table 3-16 identifies total population and percentage disadvantaged and youth populations in the city of Enid, Garfield County, the state of Oklahoma, and the US. The proportion of minority residents in the region associated with the proposed action and alternatives is moderately lower than for the state overall. Minority persons as a percentage of the total population represent 14.6 percent in Garfield County and comprise 14.7 percent of the city of Enid population. In the state of Oklahoma, minorities comprise 27.1 percent of the population. Persons of Hispanic or Latino origin represent the predominant minority group in Garfield County, followed closely by Black persons and American Indians.

Table 3-16 Total Population and Populations of Concern

	Total Population	Percent Minority	Percent Low-Income	Percent Youth
City of Enid	46,436	14.7%	14.8%	24.8%
Garfield County	56,958	14.6%	14.1%	24.1%
State of Oklahoma	3,547,884	27.1%	14.6%	24.4%
United States	281,421,906	30.9%	12.4%	25.7%

Note:

City of Enid population is for calendar year 2003. Garfield County, State of Oklahoma, and US populations are for calendar year 2005. Ratios for all populations of concern for city of Enid are calendar year 1999 data from Census 2000. Ratios for minority and youth populations for the county, state, and nation are calendar year 2004 estimates. Ratios for low-income population for the county, state, and nation are 2003 estimates.

% percent

USBC US Bureau of the Census

Source: USBC 2000, 2006

The incidence of poverty in the affected region is consistent with the state average, which is 14.6 percent. Individuals living below the poverty level account for 14.8 and 14.1 percent of the population in the city of Enid and Garfield County, respectively. The demographic data indicate that minority and low-income groups do not represent a disproportionate number of the ROI population.

The youth population, comprised of children under the age of 18 years, is relatively consistent throughout the region, with no known concentrated areas of concern where youth might experience special health or safety risks. Children constitute 24.1 percent of the population in Garfield County, comparable to the state youth population of 24.4 percent.

3.3.9.2 Housing

The MFH inventory at Vance AFB includes 229 units (Appendix B). Unaccompanied permanent party housing at Vance AFB consists of 109 total units; in addition, there are presently 196 bed spaces for student use in non-prior service dormitories. Housing for transient use includes six Visiting Officers' Quarters, 57 Visiting Quarters, and 10 temporary lodging facility spaces. The utilization rate in non-MFH housing units is 93 percent, with virtually all of the vacancies occurring in transient housing. MFH units are generally fully occupied.

According to the Census, there were a total of 26,499 housing units in Garfield County in 2005 (USBC 2006). The vacancy rate was 11.0 percent, and the homeownership rate was 70.3 percent. The city of Enid had 21,255 housing units, of which 10.8 percent were vacant and 67.2 percent were owner-occupied. The median value of owner-occupied homes in the county was $58,800. The average household size is 2.42 persons.

3.3.9.3 Education

There are eight Public School Districts serving the Garfield population surrounding Vance AFB, with an estimated total enrollment of 9,308 students in the 2005-2006 school year (see Table 3-17). Student-teacher ratios in the county Public School Districts range from 8.97 in Covington-Douglas Public School District to 12.52 in Enid Public School District. The majority of military dependents associated with Vance AFB presumably attend Enid Public School District schools. The Enid Public School District is the largest of the eight districts, with over 6,385 students enrolled in the district's 14 schools.

3.3.9.4 Economy

The civilian labor force in Garfield County included 27,399 persons in 2000, of which 26,012 were employed (USBC 2000). The unemployment rate in 2000 was 5.1 percent. Median household income was $34,356 and persons below the poverty level represent 14.1 percent of the population. In the city of Enid, 20,680 persons were employed, and the unemployment rate in 2000 was 5.5 percent

Table 3-17 Garfield County Public School Enrollment (2005-2006)

	Enrollment	Schools	Student-Teacher Ratio
Chisholm Public Schools	896	3	12.44
Covington-Douglas Public Schools	287	2	8.97
Drummond Public Schools	262	2	9.70
Enid Public Schools	6,385	14	12.52
Garber Public Schools	319	2	9.38
Kremlin-Hillsdale Public Schools	262	2	11.39
Pioneer-Pleasant Vale Schools	537	3	12.49
Waukomis Public Schools	360	2	10.59
Total	**9,308**	**30**	**12.01**

Source: Oklahoma Department of Education 2006

The city of Enid serves as the commercial and social hub of northwest Oklahoma, providing economic, medical, political, and educational services to the region (City of Enid 2006b). In addition to the traditional northern Oklahoma industries of agriculture and oil production, the city of Enid has diversified to include food processing, metal fabricating, machine shop industries, and equipment manufacturing. Local farming and ranch operations, by incorporating new technology and contemporary methods, continue to represent an important part of the economy. As the home of Farmland and Johnston Grain Company, Enid has the third largest grain storage capacity in the world.

Vance AFB is the area's largest single employer, and considered a primary economic driver in the Enid region. The base enjoys a supportive relationship with the Enid community. Other large employers in the greater Enid area, representing a range of products and services, are presented in Table 3-18.

Table 3-18 Greater Enid Top Ten Employers

	Product	Employees
Vance Air Force Base[1]	Military	2,620
Advance Food Company	Breaded Meat Products	1,300
CSC, Vance Infrastructure Support	Aircraft/Base Maintenance	1,000
Enid Public Schools	Public Education	903
St. Mary's Medical Center	Health Care	643
INTEGRIS Bass Health Center	Health Care	600
StarTek, Inc.	Call Center	500
Northern Oklahoma Recycling Center of Enid	Institutional Care	500
City of Enid	Government	428
Wal-Mart Stores, Inc.	Retail	360

[1.] Employment includes Activity Duty Military and Civilian Employees only.

Source: Greater Enid Chamber of Commerce 2006, Appendix B

3.3.10 Air Quality

This section discusses air quality considerations and conditions in the area around Vance AFB, Oklahoma. It addresses air quality standards and describes current air quality conditions in the region.

3.3.10.1 Definition of the Resource

3.3.10.1.1 Federal Air Quality Standards

Air quality in a given location is described by the concentration of various pollutants in the atmosphere, generally expressed in units of ppm or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of a pollutant concentration is determined by comparing it to federal and state ambient air quality standards. These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare, with a reasonable margin of safety. The national ambient air quality standards (NAAQS) are established by the USEPA.

In order to protect public health and welfare, the USEPA has developed numerical concentration-based standards or NAAQS for six "criteria" pollutants (based on health related criteria) under the provisions of the Clean Air Act (CAA). There are two kinds of NAAQS: primary and secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

National ambient air quality standards have been established for: (1) ozone (O_3), (2) nitrogen dioxide, (3) carbon monoxide (CO), (4) sulfur oxides (SO_X): measured in terms of sulfur dioxide [SO_2]), (5) lead, and (6) particulate matter. Particulate matter standards incorporate two particulate size classes: (1) particulate matter with an aerodynamic diameter (diameter of a spherical particle having a density of 1 grams per cubic centimeter that has the same inertial properties (terminal settling velocity) in the gas as the particle of interest) less than or equal to 10 microns (PM_{10}), and (2) particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$). The NAAQS are the cornerstone of the CAA. Although not directly enforceable, they are the benchmark for the establishment of emission limitations by the states for the pollutants that USEPA determines may endanger public health or welfare. The federal ambient air quality standards are presented in Table 3-19.

Table 3-19 National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide (CO)	9 ppm (10 mg/m^3)	8-hour [1]	None
	35 ppm (40 mg/m^3)	1-hr [1]	None
Lead	1.5 µg/m^3	Quarterly Average	Same as Primary
Nitrogen Dioxide (NO_2)	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM_{10})	Revoked [2]	-	-
	150 µg/m^3	24-hr [3]	-
Particulate Matter ($PM_{2.5}$)	15.0 µg/ m^3	Annual [4] (Arithmetic Mean)	Same as Primary
	35 µg/m^3	24-hr [5]	-
Ozone (O_3)	0.08 ppm	8-hr [6]	Same as Primary
	0.12 ppm	1-hr [7] (Applies in limited areas)	Same as Primary
Sulfur Oxides (SO_X)	0.03	Annual (Arithmetic Mean)	-
	0.14	24-hr [1]	-
	-	3-hr [1]	0.5 ppm (1,300 µg/m^3)

[1]Not to be exceeded more than once per year.

[2]Due to lack of evidence linking health problems to long-term exposure to coarse particulate pollution, USEPA revoked the annual PM_{10} standard in 2006. Effective on 18 December 2006.

[3]Not to be exceeded more than once per year on average over 3 years

[4]To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.

[5]To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 ug/m^3 (the previous standard was 65 µg/ m^3). Effective on 18 December 2006.

[6]To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[7](a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1. (b) As of June 15, 2005 USEPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact Areas.

mg/m^3	milligrams per cubic meter	hr	hour
µg/m^3	micrograms per cubic meter	NO_2	nitrogen dioxide
CO	carbon monoxide	ppm	parts per million
CFR	*Code of Federal Regulations*	USEPA	United States Environmental Protection Agency
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns		
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns		

Source: 40 CFR Part 50

Ozone (ground-level ozone), a major component of "smog," is not directly emitted into the atmosphere but is formed in the atmosphere through the reactions of previously emitted pollutants or precursors (volatile organic compounds [VOC] and nitrogen oxides [NO_x]) in the presence of sunlight. Large spatial and temporal separation can exist between the emission sources of VOCs and NO_x and the formation of O_3. Since VOCs and NO_x participate in atmospheric photochemical reactions that produce O_3, the attempt is made to control O_3 through the control of VOCs and NO_x. For this reason, VOCs and NO_x emissions are calculated and reported in emissions inventories.

The fundamental method by which the USEPA tracks compliance with the NAAQS is the designation of a particular region as "attainment," "nonattainment," or "unclassifiable." Areas meeting or having better air quality than the NAAQS are said to be in attainment. Areas that exceed the NAAQS are said to be in nonattainment. Areas that cannot be classified on the basis of available information as attainment or nonattainment are defined as unclassifiable and are treated as attainment areas. Attainment areas can be further

classified as maintenance areas. Maintenance areas are areas that were previously nonattainment but have reduced pollutant concentrations below the standard and must maintain some of the nonattainment area plans (maintenance plans) to stay in compliance

State Air Quality Standards The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the federal program. The ODEQ has adopted the primary and secondary NAAQS as duly promulgated by the USEPA.

State Implementation Plan The states have primary responsibility to implement the CAA; the primary vehicle for this implementation is the State Implementation Plan (SIP). An SIP is an enforceable plan developed by the state that explains how the state will comply with air quality standards according to the federal CAA. It is essentially a collection of regulations that explain how a state will clean up polluted areas under the CAA.

Each state is required to develop a SIP that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

ODEQ has a federally-approved SIP, codified in Regulation 1.4 (Air Resources Management Permits Required), Regulation 3.8 (Control of Emission of Hazardous Air Contaminants), and Oklahoma Administrative Code, Title 252, Subchapters 1 to 45.

Prevention of Significant Deterioration Section 160 of the CAA establishes the prevention of significant deterioration (PSD) program. PSD applies to new major sources or major modifications at existing sources for pollutants where the area the source is located in is in attainment or unclassifiable with the NAAQS. Major sources are defined as any stationary pollutant source with potential to emit more than 100 tons per year (tpy). In PSD areas, the cutoff level may be either 100 or 250 tons, depending upon the type of source. A major modification is a modification of a major stationary source of emissions with respect to PSD.

The goal of the program is to: (1) protect public health and welfare from any adverse effects which might occur even at pollutant levels better than the NAAQS; (2) insure economic growth while preserving existing air quality; (3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas; and (4) assure that emissions from any source in a state will not interfere with any portion of the applicable SIP to prevent significant

deterioration of air quality. Sources subject to PSD review are required by the CAA to obtain a permit before commencing construction. The permit process requires an extensive review of all other major sources within a 50-mile radius and of all Class I areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using Best Available Control Technology (an emissions limitation that is based on the maximum degree of control that can be achieved).

Section 162 of the CAA further established the goal of PSD of air quality in all international parks; national parks which exceeded 6,000 acres; and national wilderness areas and memorial parks which exceeded 5,000 acres if these areas were in existence on August 7, 1977. These areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development. Currently there are no designated Class III areas in the US. There is one Class I area within the state: Wichita Mountains National Wildlife Refuge. This refuge is located in the southwestern part of the state approximately 25 mile northwest of Lawton, Oklahoma. There is no Class I area within 62 miles of Vance AFB.

Visibility The national visibility goal was established in section 169A of the 1977 CAA as "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I areas which impairment results from manmade air pollution." There are 156 mandatory Federal Class I areas identified for visibility protection under this provision. The term visibility refers to the clarity with which scenic vistas and landscape features are perceived at great distances. Visibility impairment, quantified as light extinction, is caused by the scattering and absorption of light by particles and gases in the atmosphere. Without the effects of human-caused air pollution, a natural visual range is estimated to be about 140 miles in the western US and 90 miles in the eastern US (USEPA 2001).

Under the 1990 CAA, the USEPA promulgated the Regional Haze Rule to protect visibility in the 156 mandatory Federal Class I areas (Regional Haze Regulations, Final Rule, 1999). The rule requires the states, in coordination with the USEPA, National Park Service, USFWS, US Forest Service, and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment. Emission levels are used to qualitatively assess potential impairment to visibility in PSD Class I areas. Decreased visibility may potentially result from elevated concentrations of PM_{10} and SO_2 in the lower atmosphere.

3.3.10.1.2 General Conformity

The DoD, like all federal agencies, is subject to the general conformity determination as specified in Section 176(c) of the CAA, codified at 42 USC §7506(c). The conformity determination is made in accordance with USEPA's final rule, *Determining Conformity of General Federal Actions to State or Federal Implementation Plan*, as published in the Federal Register on November 30, 1993 and codified at 40 CFR Part 51 Subpart W. The specific purpose of Section 176(c) is to make emissions from federal activities consistent with the air quality planning goals of the CAA. The conformity rule applies only in those air basins or parts of air basins designated as nonattainment for one or more of the NAAQS or attainment areas subject to maintenance plans (maintenance area). A maintenance plan establishes measures and procedures to control emissions to ensure that the air quality standard is maintained in areas that have been redesignated from a previous nonattainment status to attainment. Federal actions occurring in areas that are in attainment with the NAAQS are not subject to the conformity rule.

Conformity, as determined under the general conformity rule, prohibits a federal agency from implementing, approving, or supporting any activity that fails to conform to an approved SIP or USEPA-promulgated Federal Implementation Plan (FIP). The statute provides that conforming to a SIP or FIP means that the activity will not:

- Cause or contribute to any new violation of the NAAQS for any criteria air pollutant.
- Increase the frequency or severity of any existing violation of any standard in the area.
- Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The intent of the conformity rule is to encourage long range planning by evaluating the air quality impacts from federal actions before the project are undertaken. If the emissions from a federal action proposed in a nonattainment area exceed annual thresholds identified in the rule, a conformity determination is required for that action. The thresholds become more restrictive as the severity of the nonattainment status of the region increases.

Vance AFB is not subject to the General Conformity Rule since it is located in an attainment area.

3.3.10.1.3 Stationary Source Operating Permits

Permits are legal documents that the emissions source must follow. They specify what construction is allowed, what emission limits must be met, how the source must be operated, and the reporting requirements that must be followed. They may contain conditions to make sure that the source is built to match parameters in the application that the permit agency relied on in their analysis. For example, the permit may specify stack heights that the permit agency used in their analysis of the source. Some limits in the

permit may be there at the request of the source to exempt them from other requirements. To assure that sources follow the permit requirements, permits also contain monitoring, recordkeeping, and reporting requirements.

The federal operating permit program (Title V permit, often called Part 70 permits because the regulations that establish minimum standards for state permit programs are found in 40 CFR Part 70 requires that major industrial sources and certain other sources obtain a permit that consolidates all of the applicable requirements for the facility into one document. The purpose of Title V permits is to reduce violations of air pollution laws and improve enforcement of those laws. Operating permits are legally enforceable documents that permitting authorities (USEPA, state, and local) issue to air pollution sources after the source has begun to operate. Major is a term used to determine the applicability of permitting regulations to specific sources. What constitutes a major source varies according to what type of permit is involved, the pollutants being emitted, and the attainment designation of the area where the source is located. In general, a source is major if its emissions exceed certain thresholds that are defined in terms of tpy. For example, under Title V of the CAA, any source that emits or has the potential to emit 100 tpy or more of any criteria air pollutant, 25 tpy total hazardous air pollutants (HAP), or 10 tpy of any individual HAP is a major source and must obtain a Title V operating permit.

The Air Quality Division within ODEQ implements the state and federal CAAs.

Vance AFB is not classified as a major source and therefore does not operate under a Title V operating permit.

3.3.10.2 Existing Conditions

3.3.10.2.1 Climate

Several large features affect the weather at Vance AFB: (1) the Gulf of Mexico, (2) the Rocky Mountains, and 3) the high plains and plateau regions. The Gulf of Mexico serves as a moisture source for the central plains. Migratory high-pressure systems located to the northeast of Vance AFB bring south-southeast winds and advect moisture into the region. The Gulf of Mexico also makes available large amounts of moisture for severe thunderstorm development from mid-spring to early summer. Strong moisture advection occurs most often in spring when southerly winds transport large amounts of moisture northward.

The Rocky Mountains are located 300 miles west of Vance AFB and are most instrumental in the formation of leeside troughs, dry lines, and dynamic lows. The greatest effect caused by the Rockies is the extraction of moisture at low- and mid-levels from maritime polar air masses that move across the central and northern Rockies of the US. The upper level moisture continues onward while the mid-levels dry out, creating several parameters necessary for the development of severe thunderstorms.

The high plains and plateau regions of southeast New Mexico, southwest Texas, western Kansas, eastern Colorado and the Texas/Oklahoma Panhandles are generally a semi-arid high plains or plateau region. This area acts as a source of dry, warm air. From spring to early summer, hot dry air overrides cooler, moist air from the Gulf of Mexico and serves as a "lid" or cap on the moisture. A surface dry line separating maritime tropical from continental tropical air usually exists from the Texas Panhandle to the Big Bend area of southern Texas. The lid allows high dew points to continually advect northward and further enhances the potential for severe thunderstorms when the lid is broken. By midsummer, the dry air attempts to prevail (and does to a degree).

As noted above, Vance AFB is located near an area of frequent cyclonic storms. This is particularly true from November through May when many strong cyclonic storms initially develop along the lee side of the Rocky Mountains. Lines of severe thunderstorms frequently develop in the months of March through June and again in September (USAF 1987). In this regard, Vance AFB is located on the southwestern end of "Tornado Alley" (a favored development area for tornadoes) and is subject to extremely severe thunderstorms. Thunderstorms occur on about 51 days each year, and during the period 1950 from 2003, Garfield County recorded 59 tornadoes (Oklahoma Climatological Survey 2006).

Average temperatures range from 35 degrees Fahrenheit (ºF) in January to 83ºF during July. Average annual precipitation is 28.3 inches: May is the wettest month with 4.2 inches and January the driest with 0.9 inches. Average annual snowfall is 10.5 inches; January has the greatest amount with 3.0 inches and April the least with 0.1 inches. Winds are predominantly from the south during March through December, and from the north during January and February. Wind velocity averages 11 knots (11.5 miles per hour) (Oklahoma Climatological Survey 2006).

Wind direction helps to locate a single source or multi-source area affecting a specific location. From an air pollution perspective, low wind speeds are conducive to poor pollutant dilution and are therefore associated with higher ambient pollutant concentrations. During stable atmospheric conditions, the wind is often light or calm. When stable conditions persist, the natural ambient conditions that effectively disperse pollutants are suppressed and ambient pollutant concentrations are higher near sources or source areas.

The characteristic patterns of local air movement in the Vance AFB area are illustrated by the annual wind rose shown in Figure 3-6. Wind roses show the prevailing direction from which the wind is blowing. Figure 3-6 provides a graphical description of the prevailing winds, depicting the frequency of occurrence of the wind speed and direction. The wind rose is a quantitative graphical summary of the wind direction and speed over a given time period. It shows the number of wind speed and direction observations, expressed as a percentage, that had a particular direction and speed during the summary period.

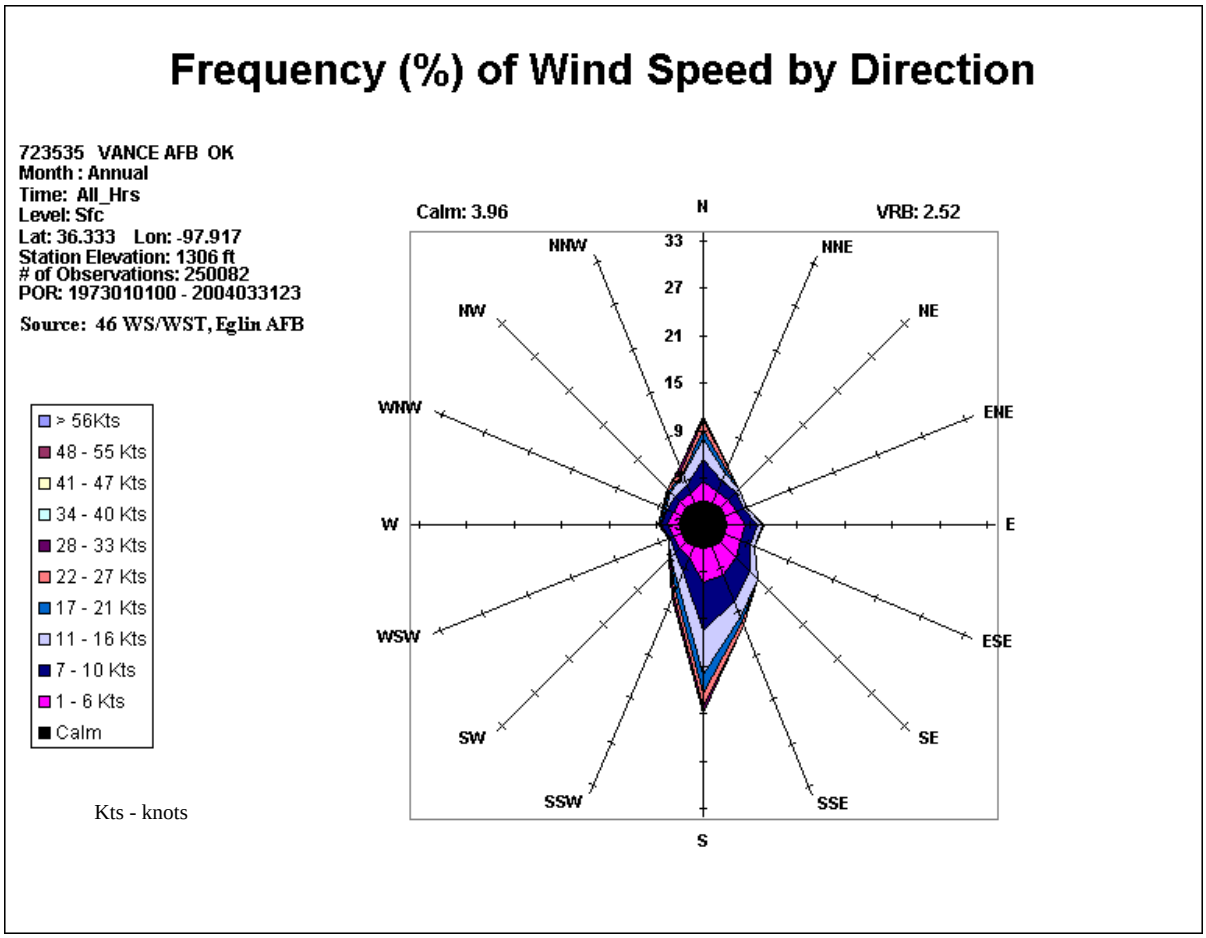

Figure 3-6 Annual Wind Rose for Vance Air Force Base, Oklahoma

The "spokes" on the wind rose graph represent 16 points of the compass. The percentage of time the wind blew from a given direction (without regard to speed) can be determined from the percent scale located on the spokes of the wind rose. For a particular wind direction, the length of each segment of a spoke represents the percentage of time the wind was within a particular wind speed interval. If a specific wind speed interval were summed for all wind directions, the result would be the percentage of all hours the wind speed was measured within that particular interval. The percentage of time during which the wind was light and/or calm is provided separately on the rose.

3.3.10.2.2 Regional Air Quality

Vance AFB is located in the North Central Oklahoma Intrastate Air Quality Control Region (AQCR) 185. AQCR 185 consists of the territorial area encompassed by the boundaries of the following jurisdiction as described in 40 CFR Part 81.124: Garfield County, Grant County, Kay County, Noble County, and Payne County.

Collection and analysis of air quality data is a basic need of any effective air pollution control program. During 2005, ODEQ operated an air quality monitoring network consisting of 66 monitors located at 35 sites throughout the state for the purpose of measuring ambient air levels of criteria pollutants to include O_3, PM, SO_2, CO, and NO_x.

This monitoring network serves many purposes including:

- Determines attainment and non-attainment areas for ground-level O_3 and PM.
- Generates data to assist in determining methods to reduce visibility obscuration.
- Supports O_3 reduction programs and HAP programs.
- Determines general air quality trends.

Under the statewide air monitoring site network, ODEQ maintains monitoring sites in Garfield County (Enid) and Kay County (Ponca City) in AQCR 185. In Enid, ODEQ maintained one $PM_{2.5}$ monitor. In Ponca City, ODEQ maintained one $PM_{2.5}$ monitor, one PM_{10} monitor, and one SO_2 monitor.

USEPA has designated the counties in AQCR 185 as unclassifiable/attainment for all criteria pollutants.

3.3.10.2.3 Current Air Emissions

An air emission inventory is an effort to qualitatively and quantitatively describe the amount of emissions from a facility or within an area. Inventories are designed to locate pollution sources, define the type and size of emission sources, define and characterize emissions from each source, determine relative contributions to air pollution problems by classes of sources and by individual sources, and determine the adequacy of regulations. The air emissions inventory is an estimate of total mass emissions of pollutants generated from a source or sources over a period of time, normally a year. Accurate inventories are needed for estimating the interrelationship between emission sources and air quality and for determining whether an emission source requires an operating permit based on actual emissions or the potential to emit.

Every three years, USEPA prepares a national database of air emissions referred to as the National Emissions Inventory (NEI). The NEI is compiled using information from numerous state and local air agencies, from tribes, and from industry. This database contains information on stationary and mobile sources that emit criteria air pollutants and their precursors. There are three classes of sources in the inventory: (1) point sources (stationary sources of emissions, such as an electric power plant, that can be identified by name and location); (2) area sources (small point sources such as a home or office building, or a diffuse stationary source, such as wildfires or agricultural tilling); and (3)°mobile sources (any kind of vehicle or equipment with a gasoline or diesel engine,

airplane, or ship). The latest finalized version of the NEI is for calendar year 2002. The calendar year 2002 NEI emissions inventory data for Garfield County are presented in Table 3-20.

The latest air emissions inventory for Vance AFB was accomplished in order to: (1) comply with applicable federal, state, and local pollution control standards, including the CAA; and (2) meet Title V permitting requirements of the CAA. The inventory quantifies emissions from stationary sources based on 2005 calendar year activity (USAF 2005c). The inventory does not indicate that Vance AFB is a major source under Title V. The Vance AFB emission inventory is presented in Table 3-20 along with the Garfield County inventory, also for comparison purposes.

Table 3-20 Baseline Emissions for Garfield County and Vance Air Force Base

Source Category	Pollutants (tons per year)				
	CO	NO_X	SO_2	PM_{10}	VOC[1]
Vance AFB (2005)					
Stationary Sources	17.48	10.51	1.10	1.25	11.93
Mobile Sources (Aircraft)	947.74	131.91	28.67	49.08	154.33
Mobile Sources (Vehicles)	965.22	142.42	29.770	50.33	166.26
Total	1930.44	284.84	59.54	100.66	332.52
Garfield County (2002 NEI)	**18,560.00**	**7,085.00**	**7,190.00**	**17,182.00**	**4,882.00**
Percent of Garfield County	7.49	2.28	0.42	0.29	3.97

CO carbon monoxide
NEI National Emissions Inventory
NO_x nitrogen oxide
O_3 ozone
SO_2 sulfur dioxide
PM_{10} particulate matter with an aerodynamic diameter less than or equal to 10 microns
VOC volatile organic compound

[1]VOC is not a criteria pollutant; however, VOC is reported because, as an O_3 precursor, it is a controlled pollutant.

Source: USAF 2005c

3.3.11 Cultural Resources

3.3.11.1 Definition of the Resource

Cultural resources may include prehistoric and historical archaeological sites, buildings, structures, districts, artifacts, objects, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, or religious purposes. Under 36 CFR Part 800, federal agencies must take into consideration the potential effect of an undertaking on "historic properties," which refers to cultural resources listed in, or eligible for inclusion in, the National Register of Historic Places (NRHP). In order to be determined a "historic property," the resource must meet one or more of the criteria established by the National Park Service and outlined in 36 CFR Part 60.4 that make the resource eligible for inclusion in the NRHP.

Cultural resources management at Air Force installations is established in AFI 32-7065, *Cultural Resources Management.* The AFI details the compliance requirements for protecting cultural resources including the preparation of a *Cultural Resources Management Plan* (CRMP). The CRMP must include: an inventory and evaluation of all known cultural resources; identification of the likely presence of other

significant cultural resources; description of installation strategies for maintaining cultural resources and complying with related resource statutes, regulations, policies, and procedures; standard operating procedures and action plans; clear identification and resolution of the mission impact on cultural resources; and conformance with local, state, and federal preservation programs. Vance AFB completed an *Integrated Resources Management Plan* in April 2002 that includes their CRMP.

3.3.11.2 Existing Conditions

Cultural resources at Vance AFB are managed in accordance with environmental laws: Air Force Regulation 126-7, *Historic Preservation*; AFI 32-7061; the *National Historic Preservation Act* (NHPA) of 1966, as amended, and its implementing regulations, 36 CFR Part 800; EO 11593 of 1971; the *Archaeological and Historic Preservation Act* of 1974 (Public Law 93-291); the *Native American Religious Freedom Act* of 1978 (Public Law 95-341); and the *Native American Graves Protection and Repatriation Act* of 1990 (Public Law 101-601).

Vance AFB is required to consider the effects of its undertakings on historic properties listed, or eligible for listing, in the National Register. NHPA obligations to a federal agency are independent from NEPA and must be complied with even when an environmental document is not required. As per AFI 32-7065 Sections 3.3.1 and 3.3.2, and 36 CFR Part 800.8, Vance AFB incorporates NHPA Section 106 review into the NEPA process or substitutes the NEPA process for a separate NHPA Section 106 review of alternatives.

A cultural resources survey was conducted at Vance AFB in July 1993 by National Park Service representative Steven L. De Vore. This survey evaluation included an archaeological reconnaissance survey of Vance AFB and Kegelman AAF as a part of the Archaeological Baseline Survey (USAF 2002).

Archaeological Resources

The majority of the state of Oklahoma has not been extensively surveyed for archaeological sites. The potential for archaeological sites in the Oklahoma region is highest along the rivers and tributaries that exist in the plains areas and on terraces associated with the mountainous regions in the southeastern portion of the state. Fifty-four of approximately 20,000 historic archeological sites in the state of Oklahoma are located in Garfield County (Oklahoma Archeological Society 2007). For the most part, the sites in Garfield and the surrounding counties are located near Cimarron and North Canadian Rivers (USAF 2002).

The cultural resources assessment conducted by the National Park Service in 1993 included an archaeological reconnaissance survey, and the identification of buildings and structures built between 1942 and 1950 that could be potentially eligible for nomination to the NRHP. There are no known archeological resources on Vance AFB. No further work

was recommended at Vance AFB due to extensive land disturbance and a low potential for archaeological resources (USAF 2002).

In 1988, the city of Enid enlisted the services of Stanley D. Bussey, PhD., to conduct an archaeological survey on the portion of the Baker Tract property that contains the sewer line from Vance AFB to the city. No evidence of historic or prehistoric cultural resources was found on the ground surface, in stream banks, or in back dirt from animal burrows (USAF 2003b).

Historic Resources

Historical structures in the vicinity of Vance AFB are primarily commercial buildings, with only a few private homes and ranches that date from the 1890s and early 1900s. The largest concentrations of historical structures in Oklahoma are located in Cherokee, Alfalfa, Okeene, Blaine, Taloga, Dewey, Arnett, Shattuck, and Ellis counties (USAF 2002).

The cultural resources survey that was conducted at Vance AFB in July 1993 identified 41 buildings that warranted further investigation as to their potential for historic significance. The State Historic Preservation Officer (SHPO) determined that only 37 were potentially eligible for the NRHP. Only two buildings (Building 129 and 170) were deemed eligible for inclusion in the NRHP for their association with WWII-related activities, as outstanding examples of airplane hangars at Vance AFB, and as contributing resources within an apparent historic district of airplane hangars (USAF 2002). Due to renovations to these two structures, they are no longer eligible for inclusion on the NRHP (USAF 2002, SHPO 2006).

At Kegelman AAF, Building 300 was the only building identified in the 1993 study as potentially eligible for nomination to the NRHP, and the study recommended that a more thorough cultural resources survey be conducted (USAF 2002). Subsequently, the SHPO determined that Building 300 was not eligible for inclusion in the NRHP. The follow-up survey at Kegelman AAF conducted from 16 to 24 September 2002 documented four historic sites that were designated 34AL17, 34AL18, 34AL19, and 34AL20. Because the sites did not contain artifacts or near-surface deposits, none of the four sites were recommended for consideration as eligible for inclusion in the NRHP (USAF 2003c).

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes potential impacts and cumulative impacts that could occur if the proposed action or the alternative action is implemented at Vance AFB. Additionally, potential impacts are addressed for the no action alternative. Criteria used to evaluate potential impacts are discussed at the beginning of each resource area.

4.2 CHANGE IN CURRENT MISSION

In all cases, the primary missions of Vance AFB would continue; however, implementation of the proposed action would allow Vance AFB to meet mission and security requirements more effectively.

4.3 DESCRIPTION OF THE EFFECTS OF ALL ALTERNATIVES ON THE AFFECTED ENVIRONMENT

4.3.1 Noise

In this section, noise associated with proposed construction activities and aircraft operations at Vance AFB are evaluated, and compared with current conditions to assess potential impacts. Data developed during this process also supports analyses in other resource areas. The proposed and alternative actions do not include increases in aircraft operations at Kegelman AAF.

Based on numerous sociological surveys and recommendations of federal interagency councils, the most common benchmark referred to is an L_{dn} of 65 dBA. This threshold is often used to determine residential land use compatibility around airports and airfields, highways, or other transportation corridors. Two other average noise levels are also useful:

- An L_{dn} of 55 dBA has been identified by the USEPA as a level "...requisite to protect the public health and welfare with an adequate margin of safety" (USEPA 1974). Noise may be heard, but there is no risk to public health or welfare.
- An L_{dn} of 75 dBA is a threshold above which effects other than annoyance may occur. It is 10 to 15 dBA below levels at which hearing damage is a known risk (Occupational Safety and Health Administration 1983); however, it is also a level above which some adverse health effects cannot be categorically discounted.

Public annoyance is the most common impact associated with exposure to elevated noise levels. As stated in Chapter 3, when subjected to L_{dn} of 65 dBA, approximately 12 percent of persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is correspondingly lower (less than three percent). The percentage of people annoyed by noise never drops to zero (some people are always annoyed), but at levels below 55 dBA it is reduced enough to be essentially negligible.

4.3.1.1 No Action Alternative

Under the no action alternative, no proposed construction activities would occur, and no additional aircraft operations would occur at Vance AFB. Since no construction would occur, the noise associated with such activities would not result. Since no changes to aircraft operations or other transportation activities would result from this alternative, noise levels at Vance AFB would remain as described in Section 3.3.1. In previous years, noise complaints concerning operations at Vance AFB have been minimal. Noise issues associated with ongoing aircraft operations would be considered minimal.

4.3.1.2 Proposed Action

Under the proposed action, Vance AFB would accomplish those construction activities proposed in the *General Plan*, and increase aviation operations by approximately 47 percent over the operational levels reported for 2005 (USAF 2006b). With the exception of those areas east of the base, in which the noise levels are dominated by T-38 aircraft maintenance activities, the 2005 operational levels and resulting noise exposure contours are below the levels and exposures reported in the 2003 *AICUZ Study* (USAF 2003a). The proposed action has the potential to create noise impacts in the ROI based on increases over the reported 2005 values. However, these noise impacts are generally within the footprint of the 65 dB noise contour published in the 2003 *AICUZ Study*.

Construction Noise

Construction would most likely occur over an extended timeframe (i.e., five years), and only a relatively small number of projects would be expected to be ongoing simultaneously. Therefore, noise associated with active construction sites would be expected to be intermittent and of relatively limited duration. A hypothetical scenario was developed to assess potential noise associated with construction activities on a construction site. Primary noise sources during such activity would be expected to be heavy vehicles and earth moving equipment. Table 4-1 shows sound levels associated with typical heavy construction equipment under varying modes of operation.

For the assessment of construction noise, a hypothetical "construction area" was designated that approximated the estimated area that would be involved in supporting a major project under the proposal.

Table 4-1 Typical Sound Levels of Construction Equipment

Equipment	Sound Level (in dBA) under Indicated Operational Model[1]		
	Idle Power	Full Power	Moving under Load
Forklift	63	69	91
Backhoe	62	71	77
Dozer	63	74	81
Front-end Loader	60	62	68
Dump Truck	70	71	74

dBA A-weighted decibel
[1]Measured at 125 feet from source.

The first step in the analysis was to estimate equipment usage and calculate the total acoustic energy that would be expected to be generated on the site. These data also provided information on each piece of equipment's relative contribution to the total amount of acoustic energy generated on the site. Next, the equipment was spatially distributed throughout the construction zone considering "most likely" areas of operation. This yielded an equipment-weighted contribution to total site acoustic energy at different points throughout the site. With this spatial distribution, it was then possible to calculate a mean and standard deviation for the distribution along an axis running through the site.

These data were then used to normally distribute the total site energy throughout the site. Finally, the normally distributed energy from multiple source points throughout the site was aggregated at a range of points at varying distances from the site edge. This allowed a determination at those points of the total acoustic energy that had emanated off-site.

Calculations based on this conservative scenario indicate an equivalent noise level over an $L_{eq(8)}$ of 67 dBA at a distance of 500 feet from the edge of the site. This is then normalized to an equivalent noise level over an $L_{eq(24)}$ of 62 dBA. Since no construction activity would be expected to occur at night, this would be equivalent to L_{dn} 62 dBA. At a distance of 1,000 feet from the site, noise levels are $L_{eq(8)}$ 62 dBA and $L_{eq(24)}$ 58 dBA. Due to the conservative nature of the scenario, and the fact that sound attenuation only due to spherical spreading was considered, actual levels emanating off-site would be expected to be lower.

It should be noted that the areas involving construction are situated within areas already exposed to elevated noise from airfield operations. Many of these areas are well within the L_{dn} 65 contour created by aircraft noise. Construction noise emanating off-site would probably be noticeable in the immediate site vicinity, but would not be expected to create adverse impacts, or alter noise contours associated with aircraft operations. Furthermore, construction-related noise is intermittent and transitory, ceasing at the completion of construction. The long-term acoustic environment on Vance AFB would not be expected to be impacted by construction activities.

Aircraft Noise

Under the proposed action, aviation operations conducted at Vance AFB would increase from approximately 225,000 annual operations to approximately 330,000 annual operations.

Airfield Noise

Daily operations at Vance AFB would increase from approximately 867 operations to approximately 1,270 operations. Table 4-2 summarizes these operations.

Table 4-2 Average Daily Operations at Vance Air Force Base, Proposed Action

Aircraft	Arrivals		Departures		Closed Patterns		Totals
	Day	Night	Day	Night	Day	Night	
T-1	58.051	1.655	57.983	1.722	50.176	1.486	171.073
T-6	161.307	2.578	161.307	2.578	400.154	3.988	731.912
T-38	83.326	3.475	83.372	3.431	182.778	9.496	365.878
TRANSIENT	0.860	0.000	0.830	0.000	0.000	0.000	1.690
TOTAL	**303.544**	**7.708**	**303.492**	**7.731**	**633.108**	**14.970**	**1,270.553**

Note: Numbers of daily operations are based on averages of annual operations; therefore, numbers do not round.

Source: USAF 2006b

Noise contours associated with the proposed action increased operations are shown in Figure 4-1, which also includes the 65 dBA noise contour from the 2003 *AICUZ Study* for comparison purposes (USAF 2003a). Land areas exposed to the elevated noise levels associated with the proposed action are compared with current conditions in Table 4-3, and changes in noise levels at sensitive land use areas are summarized in Table 4-4.

Although Vance AFB's airfield and supporting infrastructure are physically capable of handling this increased operational level (Appendix B), overall noise exposure increases and noise levels at specific points increase in all cases. In accordance with 14 CFR Part 150, Subpart B, §150.21, a change in airport operations "…creates a substantial new noncompatible use if that change results in an increase in the yearly day-night average sound level of 1.5 dB or greater in either a land area which was formerly compatible but is thereby made noncompatible...or in a land area which was previously determined to be noncompatible...whose noncompatibility is now significantly increased."

As shown, previously compatible land uses determined from 2005 operational data become noncompatible (SP1), and the noncompatibility of other land uses (SP4, SP6, SP7, and SP10) is exacerbated. The potentially affected area east of SP10 is rural farmland upon which is located a single dwelling and a barn.

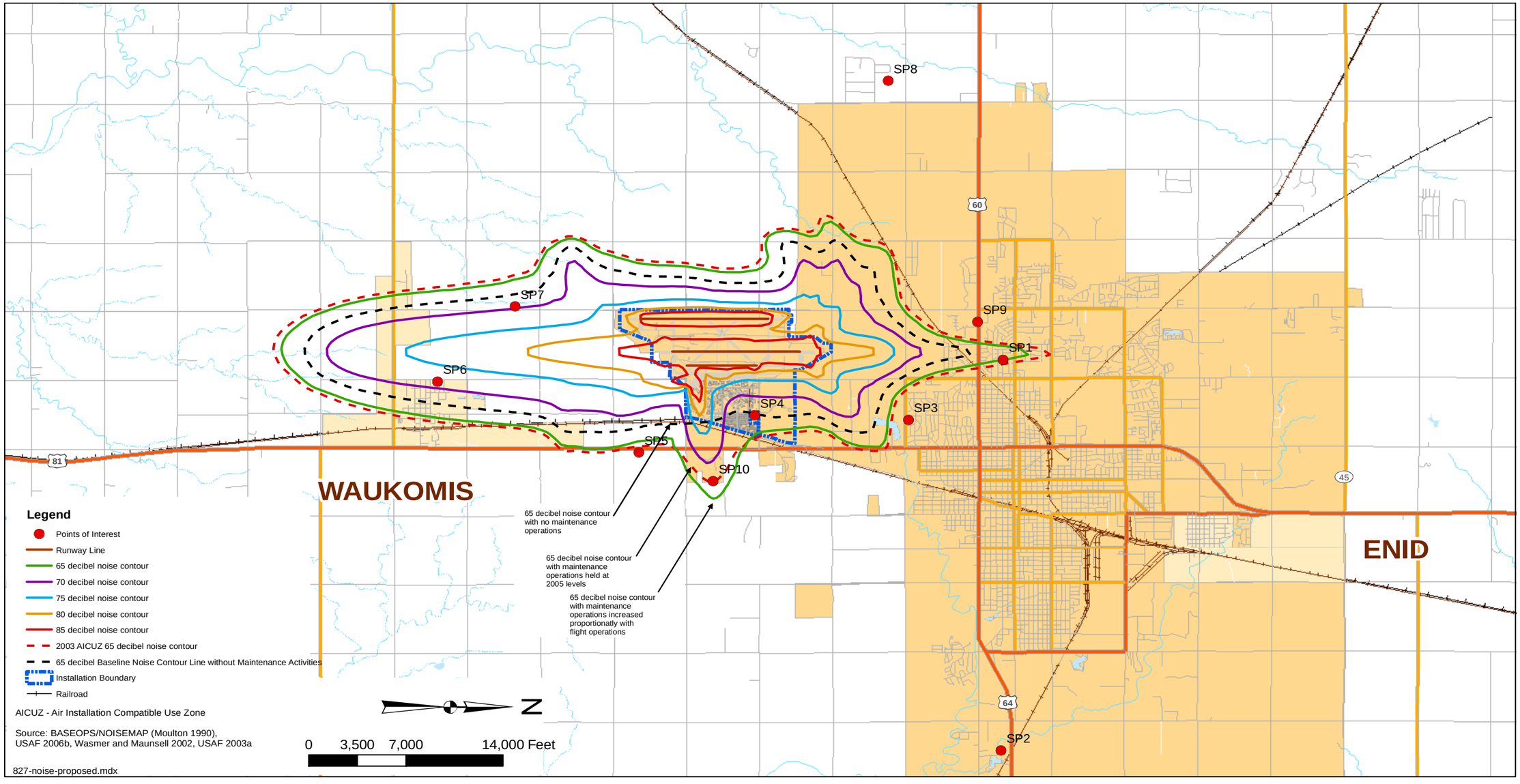

Figure 4-1 Proposed Action Noise Contours, Vance Air Force Base, Oklahoma

Table 4-3 Land Area Exposed to Elevated Noise, Proposed Action

Sound Level (in L_{dn})	Acres of Land		Net Change	Percent Change
	Baseline	Proposed		
On Base				
65 – 70	294.7	565	270.3	91.7
70 – 75	184.4	209	24.6	13.3
75 – 80	339.0	220	-119	-35.1
80 – 85	593.7	525	-68.7	-11.6
> 85	567.5	828	260.5	45.9
Total > 65	**1,979.3**	**2,347**	**367.7**	**18.6**
Off Base				
65 – 70	4,246.5	5,270	1,023.5	24.1
70 – 75	2,493.9	3,208	714.1	28.6
75 – 80	1,153.6	1,711	557.4	48.3
80 – 85	272.0	607	335	123.2
> 85	0.7	59	58.3	greater than 100
Total > 65	**8,166.7**	**10,855**	**2,688.3**	**32.9**
Total Land Area				
65 – 70	4,541.2	5,835	1,293.8	28.5
70 – 75	2,678.3	3,417	738.7	27.6
75 – 80	1,492.6	1,931	438.4	29.4
80 – 85	865.7	1,132	266.3	30.8
> 85	568.2	887	318.8	56.1
Total >65	**10,146**	**13,202**	**3,056.0**	**30.1**

Note: The total acreage greater than 65 decibels under the *2003 Air Installation Compatible Use Zone Study* is approximately 13,945 acres (USAF 2003a)

L_{dn} Day-Night Average Sound Level % percent USAF United States Air Force

Source: Determined from noise contours using Geographic Information System

Table 4-4 Specific Point Noise Exposure, Proposed Action

Point Identification	Description	Exposure (in L_{dn})			Change (Current to Proposed, L_{dn})
		Current	Proposed	2003 AICUZ	
SP1	Hoover School	63.0	65.1	65.7	+ 2.1
SP2	Residential Area	37.1	38.7	39.3	+ 1.6
SP3	Residential Area	59.5	61.7	62.4	+ 2.2
SP4	Eisenhower School	65.3	67.2	67.7	+ 1.9
SP5	Residential Area	61.3	63.3	63.9	+ 2.0
SP6	Waukomis United Methodist Church	69.2	71.5	72.1	+ 2.3
SP7	Residential Area	67.2	69.5	70.2	+ 2.3
SP8	Residential Area	49.1	51.0	51.6	+ 1.9
SP9	Church of Christ	59.3	61.4	62.1	+ 2.1
SP10	Residential Area	65.1	67.4	65.1	+ 2.3

L_{dn} Day-Night Average Sound Level AICUZ Air Installation Compatible Use Zone
USAF United States Air Force

Source: Moulton 1990, USAF 2003a

The proposed increase in aircraft operations would result in potential noise impacts that although increased, are generally less than the impacts presented in the 2003 *AICUZ Study* (USAF 2003a). A sensitivity analysis was performed to demonstrate the relative impacts associated with the proposed aircraft flight and maintenance operational increases at selected sensitive locations. Figure 4-1 presents the current baseline conditions depicting the 65 dBA noise contour both with and without static pad noise sources from maintenance operations. Table 4-5 summarizes the relative contribution of flight operation noise and maintenance (static pad) noise at location SP10 for baseline conditions and the proposed action.

Table 4-5 Relative Impact of Static Operations (Maintenance Runs) and Increased Flight Operations at SP10, Proposed Action

Condition	Flight Noise (dBA)	Static (Maintenance) Noise (dBA)	Total Noise (dBA)	Total Noise (no increase to static) (dBA)
Baseline	54.1	64.8	65.1	65.1
Proposed	56.1	67.1	67.4	65.3
Increase			2.3	0.2

dBA A-weighted decibel

Note: Noise values converted to energy prior to summing and then converted back to dBA using log base 10 rules.

Table 4-5 shows that maintaining maintenance operational noise levels to currently modeled levels during implementation of the proposed action would result in a change in predicted noise impacts at SP10 of less than 1.5 dBA (less than the significance criterion). The noise model used to model the proposed action conservatively increases the quantity of maintenance operations for all aircraft by the same ratio used to increase flight operations, but does not take into account possible new static pad locations, alterations to the orientation of existing noise abatement structures, the addition of new noise abatement structures, or noise dispersion caused by existing facilities located between the static pads and SP10. Due to the conservative nature of the scenario and the fact that only sound attenuation due to spherical spreading was considered, actual levels emanating off-site from static pad locations is expected to be lower than predicted.

Based on guidelines in the CFR, the impacts listed in Table 4-4 could be considered significant, and could indicate preparation of an EIS and/or implementation of mitigation measures. However, when the information recently published in the 2003 *AICUZ Study* is evaluated and the conservative modeling assumptions of static noise sources is considered, it is clear that the 2005 noise exposure levels and the estimated noise exposure levels that would result from the proposed increase in aircraft operations would likely remain at or below the noise exposure levels published in the 2003 *AICUZ Study* noise exposure map (USAF 2003a). Therefore, based on the documented 2003 *AICUZ Study* information, the levels of significance established at 14 CFR Part 150.21 (d and g) would not be met by implementing the proposed action.

Airspace Noise

The increase in overall operations would also result in increased operations in the regional military training airspace. If a linear expansion of all operations is assumed, operations in the military training airspace would also increase by approximately 47 percent. This may be assessed by considering any given noise level, and calculating the impact of a 47 percent increase in operations.

Since noise levels are expressed in logarithmic terms, they cannot be directly calculated arithmetically. They must first be converted to units of energy. This is done by raising 10 to the power of the noise level divided by 10. For example, if a noise level of 50 L_{dn} is considered, the conversion would be solved by $10^{50/10}$ (or 10^5), resulting in 100,000. Therefore, a 47 percent increase is calculated by 100,000 x 1.47, or 147,000. Finally, the process is reversed by taking 10 times the logarithm of the energy (in this case 147,000).

This yields a noise level of 51.7 L_{dn}, or an increase of 1.7 dB. This change would hardly be noticeable. Noise levels in the military training airspace as a result of the proposed action increased aircraft operations are not expected to change significantly from current conditions. The increased aircraft operations would not be expected to increase the noise level above 55 dBA.

4.3.1.3 Alternative Action

The alternative action includes the same general activities described under the proposed action. However, additional facilities would be developed to the maximum extent supportable by the geographic area available on the installation. Aviation operations conducted by Vance AFB-based prime mission aircraft would be increased. Annual operations would increase from approximately 225,000 to approximately 384,328, an increase of approximately 71 percent.

Construction Noise

Under the alternative action, the scope of facility construction, renovation, and demolition would be greater than the proposed action. However, the accomplishment of these activities would be as described above for the proposed action. The only difference that would be expected would be that construction activities would occur over an extended timeframe. During any one period, noise associated with these activities would be expected to be similar, as described for the proposed action.

Aircraft Noise

Under the alternative action, aviation operations around the airfield and in the military training airspace would increase by approximately 71 percent.

Airfield Noise

Average daily operations at Vance AFB would increase from approximately 867 operations to approximately 1,480 operations, as summarized in Table 4-6.

Table 4-6 Average Daily Operations at Vance Air Force Base, Alternative Action

Aircraft	Arrivals		Departures		Closed Patterns		Totals
	Day	Night	Day	Night	Day	Night	
T-1	67.687	1.93	67.608	2.007	58.504	1.734	199.470
T-6	187.909	3.003	187.909	3.003	466.144	4.644	852.612
T-38	97.060	4.048	97.114	3.996	212.904	11.060	426.182
TRANSIENT	0.860	0.000	0.830	0.000	0.000	0.000	1.690
TOTAL	**353.516**	**8.981**	**353.461**	**9.006**	**737.552**	**17.438**	**1,479.954**

Source: USAF 2006b
[1]Numbers of daily operations are based on averages of annual operations; therefore, numbers do not round.

Noise contours associated with the alternative action increased operations are shown in Figure 4-2, which also includes the 65 dBA contour from the 2003 *AICUZ Study* for comparison purposes (USAF 2003). Land areas exposed to the elevated noise levels associated with the alternative action are compared with current conditions in Table 4-7, and changes in noise levels at sensitive land use areas are summarized in Table 4-8.

Although Vance AFB's airfield and supporting infrastructure are physically capable of handling this increased operational level (Appendix B), overall noise exposure increases, and noise levels at specific points increase in all cases. In accordance with 14 CFR Part 150, Subpart B, §150.21, a change in airport operations "...creates a substantial new noncompatible use if that change results in an increase in the yearly day-night average sound level of 1.5 dB or greater in either a land area which was formerly compatible but is thereby made noncompatible...or in a land area which was previously determined to be noncompatible...whose noncompatibility is now significantly increased."

As shown, previously compatible land uses determined from 2005 operational data become noncompatible (SP1), and the noncompatibility of other land uses (SP4, SP6, SP7, and SP10) is exacerbated. The potentially affected area east of SP10 is rural farmland upon which is located a single dwelling and a barn.

With the exception of the potential noise impacts modeled at SP10 and nearby areas east of the base, where projected increases in aircraft maintenance activities dominate the noise profiles, the alternative action operational increases would result in potential noise impacts that are equivalent to the impacts presented in the 2003 *AICUZ Study* (USAF 2003a).

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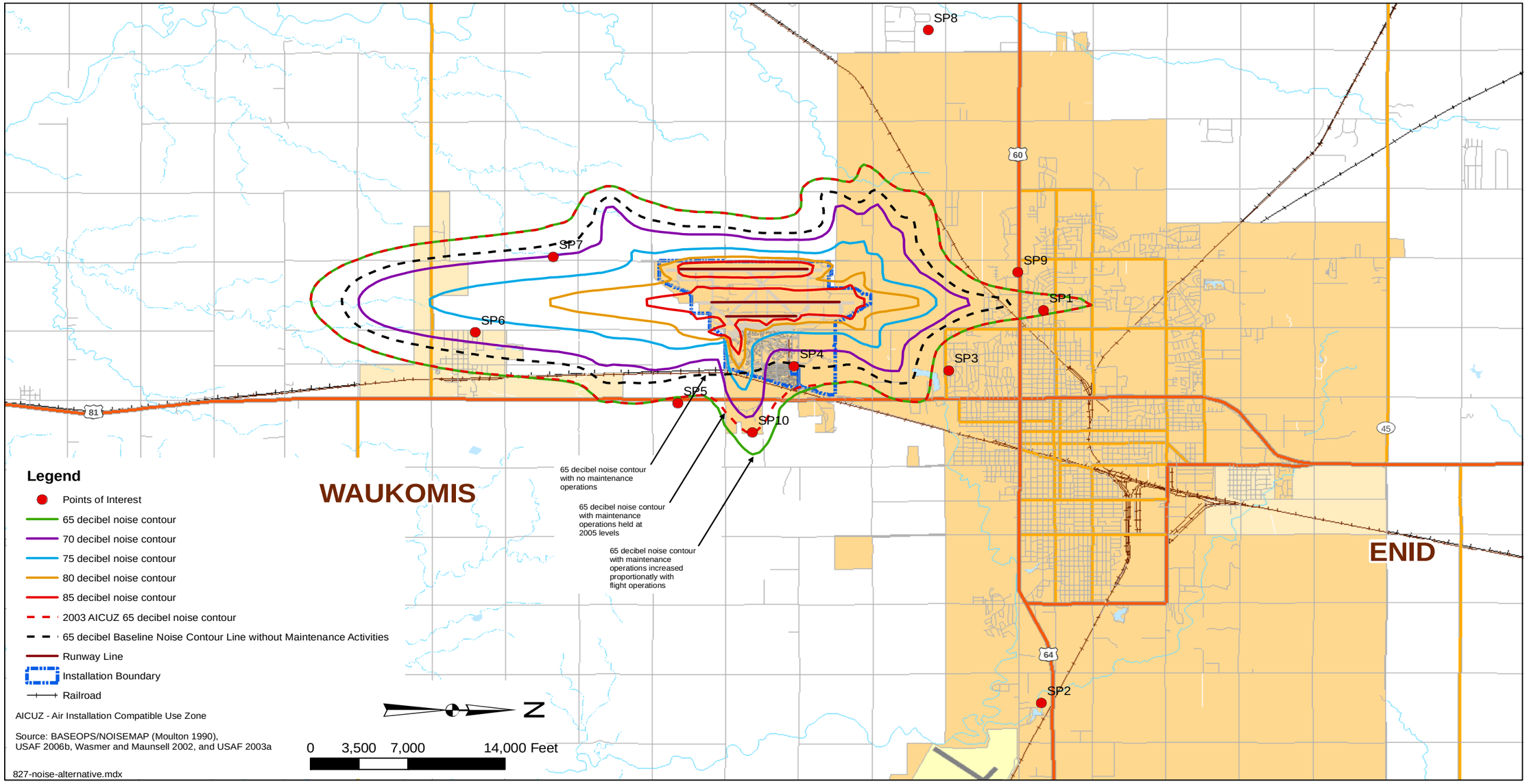

Figure 4-2 Alternative Action Noise Contours, Vance Air Force Base, Oklahoma

Table 4-7 Land Area Exposed to Elevated Noise, Alternative Action

Sound Level (in L_{dn})	Acres of Land Baseline	Acres of Land Alternative[1]	Net Change	Percent Change
On Base				
65 – 70	294.7	570	+275.3	+93.4
70 – 75	184.4	223.8	+ 39.4	+ 21.4
75 – 80	339.0	199.8	- 139.2	- 41.1
80 – 85	593.7	493.8	- 99.9	- 16.8
> 85	567.5	878.5	+ 311	+ 54.8
Total > 65	**1,979.3**	**2,365.9**	**+386.6**	**+19.5**
Off Base				
65 – 70	4,246.5	5,539.3	+ 1,292.8	+ 30.4
70 – 75	2,493.9	3,383.9	+ 890.0	+ 35.7
75 – 80	1,153.6	1,863.9	+ 710.3	+ 61.6
80 – 85	272.0	704.5	+ 432.5	+ 159.0
> 85	0.7	86.1	+ 85.4	greater than 100
Total > 65	**8,166.7**	**11,578.8**	**+ 3,412.1**	**+ 41.8**
Total Land Area				
65 – 70	4,541.2	6,109.8	+ 1,568.6	+ 34.5
70 – 75	2,678.3	3,607.7	+ 930.4	+ 34.7
75 – 80	1,492.6	2,063.7	+ 570.3	+ 38.2
80 – 85	865.7	1,198.3	+ 333.4	+ 38.5
> 85	568.2	964.6	+ 396.5	+ 69.8
Total > 65	**10,146.0**	**13,944.1**	**+ 3,799.2**	**+ 37.4**

[1]The alterative action noise contours are the *2003 Air Installation Compatible Use Zone Study* established 2003 noise contours (USAF 2003a).

L_{dn} Day-Night Average Sound Level % percent USAF United States Air Force

Source: Determined from noise contours using Geographic Information System

Table 4-8 Specific Point Noise Exposure, Alternative Action

Point Identification	Description	Exposure (in L_{dn}) Current	Exposure (in L_{dn}) Alternative	Change (in L_{dn})
SP1	Hoover School	63.0	65.7	+ 2.7
SP2	Residential Area	37.1	39.3	+ 2.2
SP3	Residential Area	59.5	62.4	+ 2.9
SP4	Eisenhower School	65.3	67.7	+ 2.4
SP5	Residential Area	61.3	63.9	+ 2.6
SP6	Waukomis United Methodist Church	69.2	72.1	+ 2.9
SP7	Residential Area	67.2	70.2	+ 3.0
SP8	Residential Area	49.1	51.6	+ 2.5
SP9	Church of Christ	59.3	62.1	+ 2.8
SP10	Residential Area	65.1	68.1	+ 3.0

L_{dn} Day-Night Average Sound Level

Source: Moulton 1990

A sensitivity analysis was performed to demonstrate the relative impacts associated with the alternative action aircraft flight and maintenance operational increases. Figure 4-3 presents the current baseline condition depicting the 65 dBA noise contour both with and without static pad noise sources from maintenance operations. Table 4-9 summarizes the relative contribution of flight operation noise and maintenance (static pad) noise at SP10 for baseline conditions and the alternative action.

Table 4-9 Relative Impact of Static Operations (Maintenance Runs) and Increased Flight Operations at SP10, Alternative Action

Condition	Flight Noise (dBA)	Static (Maintenance) Noise (dBA)	Total Noise (dBA)	Total Noise (no increase to static) (dBA)
Baseline	54.1	64.8	65.1	65.1
Proposed	56.7	67.8	68.1	65.4
Increase			3.0	0.3

dBA A-weighted decibel

Note: Noise values converted to energy prior to summing and then converted back to dBA using log base 10 rules.

Table 4-9 shows that maintaining maintenance operations noise levels to currently modeled levels during implementation of the alternative action would result in a change in predicted noise impacts at SP10 of less than 1.5 dBA (less than the significance criterion). The noise model used to model the alternative action conservatively increases the quantity of maintenance operations for all aircraft by the same ratio used to increase flight operations, but does not take into account possible new static pad locations, alterations to the orientation of existing noise abatement structures, the addition of new noise abatement structures, or noise dispersion caused by from existing facilities located between the static pads and SP10. Due to the conservative nature of the scenario and the fact that sound only attenuation due to spherical spreading was considered, actual levels emanating off-site from static pad locations is expected to be lower than predicted.

Based on guidelines in the CFR, the impacts listed in Table 4-9 could be considered significant, and could require preparation of an EIS and/or implementation of mitigation measures. However, when the information recently published in the 2003 *AICUZ Study* is evaluated and the conservative modeling assumptions of static noise sources is considered, it is clear that the 2005 noise exposure levels and the estimated noise exposure levels that would result from the proposed increase in aircraft operations would likely remain at or below the noise exposure levels published in the 2003 *AICUZ Study* noise exposure map (USAF 2003a). Therefore, based on the documented 2003 *AICUZ Study* information, the levels of significance established at 14 CFR Part 150.21 (d and g) would not be met by implementing the alternative action.

Airspace Noise

The increase in overall operations would also result in increased operations in the regional military training airspace. If a linear expansion of all operations is assumed, operations in the military training airspace would also increase by approximately 71 percent. This may be assessed by considering any given noise level, and calculating the impact of a 71 percent increase in operations.

This yields a noise level of 52.3 L_{dn}, or an increase of 2.3 dB. This change would hardly be noticeable. Noise levels in the military training airspace as a result of the alternative action increased aircraft operations are not expected to change significantly from current conditions. The increased aircraft operations would not be expected to increase the noise level above 55 dBA.

4.3.1.4 Cumulative Impacts

Other past proposed and/or ongoing activities within the ROI would be expected to generate construction and traffic noise over the duration of each project. These projects are dispersed throughout the region and are not atypical sources of noise in the community. Construction noise emanating offsite as a result of the proposed and/or alternative actions, and the activities in the region would probably be noticeable only in the immediate construction site vicinity, and would not be expected to create adverse impacts. Cumulative impacts from other noise sources would be expected to be minimal.

4.3.1.5 Measures to Reduce Impacts

Since major construction activities are planned to be conducted during the daytime, potential nighttime impacts, when community ambient noise levels are normally lower, would be minimized.

For aircraft operations at Vance AFB, mitigation measures in the ROI may be required at the discretion of local authorities. However, when compared to the information recently published in the 2003 *AICUZ Study*, it is clear that the 2005 noise exposure levels and the estimated noise exposure levels that would result from the proposed increases in aircraft operations would remain below the noise exposure levels already experienced by the surrounding land area as documented in the 2003 *AICUZ Study* noise exposure map (USAF 2003a). Still, consideration to the potential incompatible land use associated with the 2003 AICUZ Study exposure map and Hoover School (SP1) may be required in order to maintain good public relations with the communities served by the school. Further consideration to static pad operations and the potential need for additional noise abatement structures may also be required in order to maintain good public relations with the residents located east of the base.

4.3.2 Airspace Management and Air Traffic Control

The potential effects of the proposed and alternative actions on the existing airspace environment were assessed by considering the changes in airspace utilization that could result from the proposals.

The type, size, shape, and configuration of individual airspace elements in a region are based upon, and are intended to satisfy, competing aviation requirements. Potential impacts could occur if air traffic in the region and/or the ATC systems were encumbered by changed flight activities associated with the proposed action or alternative action. Impacts could result if such changes adversely affected (1) ATC systems and/or facilities; (2) movement of other air traffic in the area; or (3) airspace already designated and used for other purposes supporting military, commercial, or general aviation.

4.3.2.1 No Action Alternative

Under the no action alternative, no additional aircraft activity would occur at Vance AFB. Operations at the airfield and in the military training airspace would continue at the same levels as under current conditions. No impacts would be anticipated under this alternative.

4.3.2.2 Proposed Action

Under the proposed action, which would implement the proposals of the *General Plan* and recommendations of the BRAC [now Public Law 101.510], new construction and facility renovation activities would occur. Additionally, overall flight activity conducted by Vance AFB-based aircraft would increase from approximately 225,000 annual operations to approximately 330,000 annual operations. Although this represents a 47 percent increase in based aircraft operations, these proposals do not involve any modifications or changes to the airspace structure around Vance AFB, or to the existing ATC systems. The airfield and its infrastructure are physically capable of handling this increase in traffic volume (Appendix B). Aviation operations would continue to be controlled and managed as under current conditions. No adverse impacts to the airspace around Vance AFB or the existing ATC systems would be anticipated.

The increased level of sorties being flown from Vance AFB would also increase the use levels of applicable regional military training airspace; however, the proper control, use, and management of these airspace elements would continue and the current scheduling and coordination processes and procedures would remain. No major adverse impacts would be anticipated.

4.3.2.3 Alternative Action

Under the alternative action, which could result in expanding Vance AFB operations to their maximum potential, up to approximately 71 percent additional based aircraft operations could be conducted at Vance AFB (384,328 annual operations). If a linear

expansion in aviation operations is assumed, daily operations at the airfield would increase from approximately 865 operations to 1,478 operations. Based on throughput capacity models developed by the FAA, an airfield such as that at Vance AFB is capable of handling approximately 2,064 daily operations, even under adverse weather conditions, (Appendix B). No adverse impacts to the airspace around Vance AFB or the existing ATC systems would be anticipated.

The airfield (overall) and airspace assets (in general) are physically able to accommodate the increased number of operations associated with the alternative action.

The increased level of sorties being flown from Vance AFB would also increase the use levels of applicable regional military training airspace; however, the proper control, use, and management of these airspace elements would continue and the current scheduling and coordination processes and procedures would remain. No major adverse impacts would be anticipated.

No modifications to controlled airspace, SUA, or ATC systems are associated with, or would be required by implementation of the alternative action.

4.3.2.4 Cumulative Impacts

There are no known aviation-related projects in the ROI that would have the potential to impact airspace availability or ATC.

4.3.2.5 Measures to Reduce Impacts

Since impacts that would result from the implementation of the alternative action are essentially non-existent, no specific measures for minimization of impacts would be recommended.

4.3.3 Land Use

Land use impacts can result if an action displaces an existing use or reduces the suitability of an area for its current, designated, or formally planned use. In addition, a proposed activity may be incompatible with local plans and regulations that provide for orderly development to protect the general welfare of the public, or may conflict with management objectives of a federal or state agency for an affected area. The methodology to assess impacts on individual land uses requires identifying those uses, as well as affected land use planning and control policies and regulations and determining the degree to which they would be affected by the proposal.

To assess impacts to visual resources, areas that have high visual value or low tolerance for visible modification or have prescribed guidelines are identified. Visual impacts are assessed by determining how, and to what extent, a proposed action would alter the overall visual character of the area.

4.3.3.1 No Action Alternative

Under the no action alternative, there would be no change from the baseline conditions described in Section 3.3.3. All of the existing facilities would remain, and no new facilities would be constructed. No impacts to land use or visual resources are expected. Vance AFB would continue to manage on-base development activity according to the *General Plan* and established planning, architectural, landscaping, and civil guidelines. Coordination with local communities affected by overflight activity would continue with the AICUZ program.

4.3.3.2 Proposed Action

Vance AFB has identified the need for construction, demolition, and renovation of facilities for 25 projects (including the construction of one building at Kegelman AAF). The future land use categories identified in the *General Plan* that surround each of the proposed action locations have been evaluated, and the proposed action would be consistent with land use concepts defined for the installation by base planners. No additional land would be needed to accommodate the activities associated with the proposed action.

The extent of new construction, renovation, and demolition would somewhat alter the overall visual character of the area. Any development activity undertaken on Vance AFB and Kegelman AAF would be consistent with established planning, architectural, landscaping, and civil guidelines to ensure that the base character and aesthetic qualities are retained.

Under the proposed action, aviation operations conducted at Vance AFB would increase from approximately 225,000 annual operations to approximately 330,000 annual operations. Land use patterns, ownership, and management plans would not be expected to change from those published in the 2003 *AICUZ Study* since the proposed modification of aircraft operations would result in annual operations and noise exposure levels below the levels documented in 2003 (USAF 2003a).

4.3.3.3 Alternative Action

Under the alternative action, no direct effect on land use resources is anticipated. This alternative would reduce the amount of open space on the installation, although acreage constrained by environmental factors (e.g., wetlands, floodplain, safety easements, etc.) would remain open. Development that would occur as a result of the alternative action would be consistent with land use concepts as defined in the *General Plan* and established planning, architectural, landscaping, and civil engineering guidelines. No additional land would be needed to accommodate the activities associated with the alternative action.

The extent of development associated with the alternative action would somewhat alter the overall visual character of the area. Any development activity undertaken on Vance AFB would be consistent with established planning, architectural, landscaping, and

civil engineering guidelines to ensure that the base's character and aesthetic qualities are retained.

Under the alternative action, aviation operations conducted at Vance AFB would increase from approximately 225,000 annual operations to approximately 384,329 annual operations. Land use patterns, ownership, and management plans would not be expected to change from those published in the 2003 *AICUZ Study* since the proposed modification of aircraft operations would result in annual operations and noise exposure levels equivalent to the levels documented in 2003 (USAF 2003a).

4.3.3.4 Cumulative Impacts

Other past, proposed, and/or ongoing activities within the ROI, as described in Section 2.7, are not expected to substantially modify or render existing land uses incompatible either at Vance AFB or in the general ROI. The long-term objective at Vance AFB is to combine like activities spatially, and the projects described in this analysis would work toward that end. There would be a general overall positive result from implementation of these projects. As a result, there would not be any cumulative adverse impacts to land use as a result of the proposed action or alternative.

4.3.3.5 Measures to Reduce Impacts

Land use impacts would not be anticipated at Vance AFB for the proposed action or the alternative actions. Therefore, no measures to reduce impacts would be required as a result of the implementation of the proposed action or alternative actions.

4.3.4 Earth Resources

Protection of unique geologic features, minimization of soil erosion, and relation of existing facilities to potential geologic hazards, soil limitations, and sharp topological features are considered when evaluating impacts to earth resources. Generally, impacts can be avoided or minimized if proper construction techniques, erosion control measures, and structural engineering designs are incorporated into project development

Analysis of potential impacts to geologic resources typically includes identification and description of resources that could potentially be affected, examination of the potential effects that an action may have on the resource, and provision of measures to reduce impacts, if necessary. Analysis of impacts to soil resources resulting from proposed activities examines the suitability of locations for proposed operations and activities. Impacts to soil resources can result from earth disturbance that would expose soil to wind or water erosion.

4.3.4.1 No Action Alternative

Under the no action alternative, Vance AFB would maintain their existing facilities, and would not construct any new facilities. Similarly, there would be no demolition activity. No impacts to earth resources would occur as a result of the no action alternative. Conditions would remain as described in Section 3.3.4.

4.3.4.2 Proposed Action

Under the proposed action, the physiography, underlying geology, and topography of the area would not change; however, the soil would be disturbed by construction activities. Under this alternative, approximately 17 acres of land would be disturbed at Vance AFB and Kegelman AAF (14.3 and 0.17 acres of impervious surfaces, respectively) as a result of new building footprints, associated pavements, and demolition activities. Well-maintained silt fences, wetting of the construction site, daily site inspections, and other BMPs would be used to limit or eliminate soil movement, stabilize runoff, and control sedimentation. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and managed to prevent future erosion. Given the relatively small area disturbed at any one given time, and the employment of BMPs to minimize potential erosion, impacts to earth resources as a result of the proposed action are expected to be minimal.

4.3.4.3 Alternative Action

Under the alternative action, the physiography, underlying geology, and topography of the area would not change. It is estimated that a total of approximately 142 acres would be disturbed and 118 acres rendered impervious as a result of construction and paving activities. Although the alternative action would result in more impervious cover and about eight times more land disturbed than the proposed action, it is clear that construction activities would not all occur at the same time. Construction would occur only as the need arose and as funds became available. It is unlikely that more than 10 percent (11.8 acres) of construction activity would occur at any given time. Well-maintained silt fences, wetting of the construction site, daily site inspections, and other BMPs would be used to limit or eliminate soil movement, stabilize runoff, and control sedimentation. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and managed to prevent erosion. Given the relatively small potentially disturbed area at one given time and the employment of BMPs to minimize potential erosion, impacts to earth resources are not expected to be significant.

Under the alternative action, impacts to soils would be similar as those described under the proposed action.

4.3.4.4 Cumulative Impacts

Ground-disturbing activities within the ROI currently underway or planned in the short-term (Section 2.7) have the potential to result in soil disturbance. It is likely that the Air Force would maintain silt fences, wetting of the construction site, perform daily site inspections, and implement other BMPs to limit or eliminate soil movement, stabilize runoff, and control sedimentation as part of the *Stormwater Pollution Prevention Plan* (SWPPP) and project-specific OPDES permitting requirements. These activities, along with the reestablishment of appropriate vegetation on the sites to ensure rapid soil stabilization, would minimize potential erosion during construction activities for future projects. Cumulative impacts to earth resources are expected to be minor.

4.3.4.5 Measures to Reduce Impacts

The potential for impacts to earth resources from construction and demolition activities is expected to be minimal. The control of on-site erosion, off-site water runoff, and measures to contain sediment are essential components of OPDES permitting and SWPPP requirements. Although specific requirements would not be determined until the permitted process is completed, the list of BMPs for controlling erosion during or after construction activities is extensive. A few typical BMPs for soil erosion that are likely to be required include: recondition damaged soils, stabilize slope soils, transport runoff within non-erosive water conveyance systems, intercept and diffuse the erosive energy of runoff at predetermined intervals, and transition water flows to non-erosive discharge points.

4.3.5 Water Resources

Criteria for evaluating impacts related to water resources are water availability, water quality, and adherence to applicable regulations. Impacts are measured by the potential to reduce water availability to existing users, endanger public health or safety by creating or worsening health hazards or safety conditions, or violate laws or regulations adopted to protect or manage water resources.

Water availability impacts are assessed by determining the potential increases in use that may affect availability of water resources. Floodplain and surface water impact analyses were conducted by first identifying floodplain areas associated with water bodies at Vance AFB and Kegelman AAF and their proximity to potential development sites. Relevant literature sources were then used to calculate the potential and the extent of all impacts in the affected areas.

4.3.5.1 Surface Water

4.3.5.1.1 No Action Alternative

Under the no action alternative, surface water resources would remain comparable to baseline conditions as described in Section 3.3.5.2.

4.3.5.1.2 Proposed Action

Under the proposed action, several facilities would be constructed and demolished at Vance AFB. Table 2-1 provides the total drained area, increase in impervious area, and resulting increase in runoff for each of the 10 drainage areas on base. (Note that building space typically includes multiple floors and does not add directly to pavements for total impervious surfaces; impervious surfaces are calculated by finding the sum of the building footprints and the pavements surrounding them.) Based on analysis of the project list, approximately 16.8 acres of impervious surfaces would be created as a result of new construction and 7.0 acres of existing impervious surfaces would be demolished. The proposed construction and demolition would result in a net increase of 9.8 acres of

impervious cover to the installation. Table 2-1 describes details of the individual projects comprising the proposed action.

The proposed action construction and demolition projects would cause a net increase in the current impervious cover for the base outfall drainage areas. The distribution of facilities in the 10 drainage areas would change (thus changing the amount of impervious cover), causing flow increases and decreases in drainage areas on base. Analysis of a 25-year rainfall event with a 1-hour duration indicated a 0.76 percent increase in runoff. The small increase was a result of the fact that the demolished facility footprints were approximately the same as the new facility footprints. Table 4-10 shows the changes that would occur for each drainage area.

Table 4-10 Runoff Effects Associated with the Proposed Action
Vance Air Force Base

Drainage Area[1]	Total Drained Area (acres)	Net Change in Impervious Area (acres)	Percent Increase in Impervious Area[2]	Percent Increase in Runoff	Increase in Runoff (acre-feet)
1	247	0.0	0.00%	0.00%	0.00
2	689	0.96	0.14%	0.25%	0.47
3	288	0.0	0.00%	0.00%	0.00
4	76	0.0	0.00%	0.00%	0.00
5	77	2.31	3.00%	4.66%	1.13
6	386	3.35	0.87%	1.26%	1.64
7	197	0.0	0.00%	0.00%	0.00
8	25	0.0	0.00%	0.00%	0.00
9	72	2.21	3.07%	4.66%	1.08
10	47	0.96	2.04%	2.91%	0.47
Overall	**2,104**	**9.79**	**0.47%**	**0.76%**	**4.81**

Note:

[1]Basin drainage area calculated from information provided in the *Stormwater Pollution Prevention Plan* (USAF 2001c). Drainage area only includes on-base area. Impervious cover determined from Geographical Information System layer data provided by the base in June 2006.

[2][(0.95)*(403+9.79 impervious acres)+(0.30)*(2,104-403-9.79 vegetated acres)] divided by 2,104 total acres is equivalent to 0.4279, which indicates a 0.76 percent increase in runoff, or 4.81 acre-feet of water in a 24-hour period for a 25-year storm (6.2 inches per day with an intensity of 1.4 inches per hour, assuming a 20-minute time of concentration [National Oceanic and Atmospheric Association 2006]).

% percent

The proposed projects on Kegelman AAF would cause a net increase in the current impervious cover by approximately 0.17 acres. The proposed actions at Kegelman AAF would increase impervious cover by 0.01 percent. Total runoff would increase by 0.03 percent (0.08 acre-feet of additional runoff in 24 hours).

The proposed action would add to the impervious surfaces associated with Vance AFB and Kegelman AAF. In general, increases in impervious surfaces act to increase peak discharge volume and speed delivery of water to nearby streams and waterways, which ultimately increases the likelihood of flooding. In undeveloped land, rainfall collects and is stored in vegetation, in the soil column, or in topographic depressions. Water is then utilized by plants and is respired, or it moves slowly into groundwater and/or eventually to surface water bodies where it slowly moves through the hydrologic cycle. Removal of vegetation decreases infiltration into the soil column and thereby increases the quantity and timing of runoff. Replacement of vegetation with an impervious surface eliminates any potential for infiltration and speeds up delivery of the water to nearby drainage and stream channels. With less storage capacity in the soil column and vegetation, urban streams rise more quickly during storm events and have higher peak discharge rates, which both increase the potential for flooding.

Prior to project construction, Vance AFB would obtain all appropriate permits pursuant to Section 404 of the CWA as well as any other applicable regulations.

Stormwater drainage systems would be incorporated into base construction projects. The drainage systems would be designed in accordance with applicable local area criteria to minimize impacts from localized flooding and assure that downstream areas are not adversely affected by increased flows. Curbs and gutters installed during any street and off-street parking construction would be connected to the existing stormwater system. An additional 4.81 acre-feet of site wide stormwater detention capacity would be a consideration for mitigating any perceived off-site impacts, which would be minimal.

The potential for stormwater to carry contaminants that could flow directly into surface waters is a concern when impervious areas increase. In accordance with the installation's SWPPP, BMPs (including techniques such as berms, sediment traps, and silt fences) would be implemented to minimize any runoff and subsequent degradation of surface water quality. In addition, the OPDES program requires that since the individual sites are part of a larger area (i.e., part of a military installation) a Notice of Intent (NOI) under the ODEQ General Permit is required to be filed for any site disturbance, even for sites less than one acre in size. Additionally, the contractor would be required to develop a SWPPP for the project. Erosion control techniques would be incorporated through contractual requirements to minimize erosion during construction. Therefore, water quality would not be adversely impacted by the proposed action.

4.3.5.1.3 Alternative Action

Approximately 142 acres of land at Vance AFB would be temporarily disturbed for the alternative action, resulting in a net increase of approximately 118 acres of impervious surfaces. The alternative action would cause a net increase in the current impervious cover for the base outfall drainage areas. Analysis showed an 8.5 percent increase in runoff (for a 25-year rainfall event with a 1-hour duration). Table 4-11 shows the changes that would occur for each drainage area.

Table 4-11 Runoff Effects Associated with the Alternative Action Vance Air Force Base

Drainage Area[1]	Total Drained Area (acres)	Net Change in Impervious Area (acres)	Percent Increase in Impervious Area[2]	Percent Increase in Runoff	Increase in Runoff (acre-feet)
1	247	0	0.00%	0.00%	0.00
2	689	0	0.00%	0.00%	0.00
3	288	0	0.00%	0.00%	0.00
4	76	0	0.00%	0.00%	0.00
5	77	0	0.00%	0.00%	0.00
6	386	54.64	14.16%	17.17%	26.82
7	197	46.11	23.41%	29.80%	22.63
8	25	0	0.00%	0.00%	0.00
9	72	13	18.06%	22.33%	6.38
10	47	4.22	8.98%	11.64%	2.07
Overall	**2,104**	**117.97**	**5.61%**	**8.46%**	**57.90**

Note:

[1]Basin drainage area calculated from information provided in the *Stormwater Pollution Prevention Plan* (USAF 2001c). Drainage area only includes on-base area. Impervious cover determined from Geographical Information System layer data provided by the base in June 2006.

[2][(0.95)*(403+117.97 impervious acres)+(0.30)*(2,104-403-117.97 vegetated acres)] divided by 2,104 total acres is equivalent to 0.4639, which indicates an approximately 8.5 percent increase in runoff, or 57.9 acre-feet of water in a 24-hour period for a 25-year storm (6.2 inches per day with an intensity of 1.4 inches per hour, assuming a 20-minute time of concentration [National Oceanic and Atmospheric Association 2006]).

% percent

Stormwater drainage systems would be incorporated into base construction projects. The drainage system would be designed in accordance with applicable local area criteria to minimize impacts from localized flooding and assure that downstream areas are not adversely affected by increased flows. Curbs and gutters installed during any street and off-street parking construction would be connected to the existing stormwater system. An additional 57.9 acre-feet of site wide stormwater detention capacity would be a consideration to reduce any perceived off-site impacts, which would be minimal.

The alternative action would not increase impervious cover at Kegelman AAF.

The construction and demolition activities would be conducted consistent with the requirements of the OPDES stormwater program, as described in Section 4.3.5.1.2. Additionally, the contractor would be required to develop a SWPPP for each construction project. Erosion control techniques would be incorporated through contractual

requirements to minimize erosion during construction. Therefore, water quality would not be adversely impacted by the alternative action.

4.3.5.1.4 Cumulative Impacts

The proposed and alternative actions, when considered with respect to other ongoing and future actions, would have a minimal net cumulative impact on surface water at Vance AFB when compared to the whole installation. There would be minor adverse impacts on surface water quality due to construction and demolition. Approximately 2.6 acres of new impervious surfaces would be associated with ongoing projects. The proposed and ongoing actions would result in an increase of 12.4 acres, resulting in a total of 416 acres of impervious surfaces, while the alternative and ongoing actions would result in an increase of 121 acres, resulting in a total of 524 acres of impervious surfaces. When considering the proposed action along with ongoing projects, on-base impervious cover would increase by 0.6 percent; the alternative action in combination with ongoing and future projects would increase the impervious cover by 5.7 percent. Total runoff under the proposed action in combination with ongoing and future projects would increase by 0.96 percent (6.1 acre-feet of additional runoff in 24 hours) and under the alternative action in combination with ongoing and future projects, it would increase by 8.6 percent (59.2 acre-feet of additional runoff in 24 hours).

The proposed and other potential actions on Kegelman AAF would cause a net increase in the current impervious cover by approximately 0.26 acres (0.17 acres associated with the proposed action and 0.09 acres associated with other actions). These actions at Kegelman AAF would increase impervious cover by 0.02 percent. Total runoff would increase by 0.04 percent (0.13 acre-feet of additional runoff in 24 hours).

Similar impacts might be expected from other construction activities as loose soil is exposed to runoff during rain events. The net cumulative effect on Vance AFB, Kegelman AAF, and areas within the ROI due to the proposed or alternative activities in combination with ongoing and future activities in the ROI would be minimal when compared to the ROI. Sediment erosion would be controlled using BMPs during construction and demolition, negating large-scale adverse effects on surface waters. Therefore, minor cumulative impacts would be expected on surface water.

4.3.5.1.5 Measures to Reduce Impacts

The proposed action and alternative action construction and demolition activities have the potential to affect the quality of stormwater runoff through a potential increase in soil erosion at each site. Impacts on surface water resources from the proposed action and alternative actions would be minimal when compared to the whole installation and BMPs would be used to reduce or eliminate runoff or contamination into surface water bodies or the groundwater. Site-specific sediment and erosion control plans with detailed BMPs to prevent soil disturbance, capture and contain loose soil, and slow the movement of

stormwater during heavy rains would be included in the project development. No other measures to reduce impacts would be required to ensure surface water quality.

4.3.5.2 Groundwater

4.3.5.2.1 No Action Alternative

Under the no action alternative, there would be no change from the baseline conditions described in Section 3.3.5.3.

4.3.5.2.2 Proposed Action

There would be negligible effect on groundwater from implementation of the proposed action. The proposed action would not result in increased use of the aquifer located under Vance AFB because the installation purchases all of its potable water from the city of Enid, Oklahoma, and does not use base groundwater resources for either drinking water or industrial applications. The proposed action would not reduce water availability to existing users or degrade or worsen groundwater quality of the aquifer located under Vance AFB.

None of the activities associated with the proposed action would involve installation of materials or equipment that would degrade groundwater quality. Although groundwater contamination is located on Vance AFB property, the groundwater contamination plumes have been delineated and groundwater contamination is actively addressed under the ERP. Prior to initiation of construction activities over the active groundwater plume, consultation with representatives from the ERP program would be required to determine appropriate actions that would need to be taken prior to construction. Shallow affected groundwater is not used for drinking water or irrigation.

Standard BMPs to reduce runoff (such as revegetation of disturbed areas or sediment fencing) would minimize adverse impacts to shallow groundwater quality. Though construction would create more impervious surfaces, the increase would not likely affect the quality of the aquifer located under Vance AFB. The proposed action is not expected to appreciably contribute to impacts associated with groundwater.

4.3.5.2.3 Alternative Action

There would be a negligible effect on groundwater from implementation of the alternative action. Impacts would be similar to those identified under the proposed action. Therefore, the alternative action is not expected to appreciably contribute to impacts associated with groundwater.

4.3.5.2.4 Cumulative Impacts

The installation purchases all of its potable water from the city of Enid, Oklahoma, and does not use base groundwater resources for either drinking water or industrial applications. The proposed action or alternative action, when combined with the other

ongoing action and actions proposed in the area, would result in a negligible effect on use of groundwater under Vance AFB.

4.3.5.2.5 Measures to Reduce Impacts

Should the proposed or alternative actions be implemented, measures to protect human health and welfare would not be required; however, BMPs would be used to reduce or eliminate runoff or contamination into the groundwater. Site-specific sediment and erosion control plans with detailed BMPs to prevent soil disturbance, capture and contain loose soil, and slow the movement of stormwater during heavy rains would be included in the project development. Prior to initiation of construction activities over the active groundwater plume, consultation with representatives from the ERP program would be required to determine appropriate actions that would need to be taken prior to construction.

4.3.5.3 Floodplains

As defined in 44 CFR Part 9.4, natural values of floodplains include natural moderation of floods, water quality maintenance, groundwater recharge, habitats, open space, and recreation, among others. These natural benefits are not as pronounced in tidal floodplains when compared to riverine floodplains. By incorporating stormwater BMPs and other engineering controls, adverse impacts to floodplains would be minimized. Any project constructed in the floodplain would conform to city of Enid, Oklahoma, building code requirements regarding construction in a floodplain or flood hazard area.

4.3.5.3.1 No Action Alternative

Under the no action alternative, there would be no change from the baseline conditions described in Section 3.3.5.4.

4.3.5.3.2 Proposed Action

No additional construction within the floodplain would occur under the proposed action. Therefore, no impacts to the floodplain would be expected by the implementation of the proposed action.

4.3.5.3.3 Alternative Action

No additional construction within the floodplain would occur under the alternative action. Therefore, no impacts to the floodplain would be expected by the implementation of the alternative action.

4.3.5.3.4 Cumulative Impacts

When considered in the context of other ongoing and proposed actions in the ROI, the proposed action or alternatives (to include the no action alternative) would not have cumulative effects on the floodplain associated with Vance AFB or Kegelman AAF.

4.3.5.3.5 Measures to Reduce Impacts

No adverse impacts to the floodplains are expected; however, Vance AFB would continue the implementation of BMPs to structurally moderate the volume and slow the discharge of stormwater runoff into the floodplain area. Landscaping should be installed strategically in the proposed action project areas to increase infiltration capability. Possible modifications or additions to the current volume of stormwater retention structures incorporated into the active and passive recreational areas should be evaluated as part of the final designs for each project. Using gravel where possible would also minimize the impact of impervious surfaces to the floodplain by slowing the rate of discharge of stormwater and allowing more time for infiltration into the soil.

An OPDES General Permit and SWPPP would be required for each project grouping and include structural and programmatic controls to eliminate pollution from construction and operational-related runoff. During clearing, grading, and construction of facilities, erosion control BMPs would be employed to minimize erosion into nearby waterways on the site. These measures would include installation of silt fences or berms between waterways and the ongoing construction processes and would help to reduce any potential to impact floodplain areas during construction of the facilities.

4.3.6 Hazardous Materials and Waste

CIP and BRAC construction and demolition projects would be performed utilizing normal construction methods, which would limit the use, to the extent possible, of hazardous materials. Petroleum, oil, and lubricant (POL) products and other hazardous materials (e.g., paints) would be used during construction/renovation/demolition activities. These materials would be stored in the proper containers, employing secondary containment as necessary to prevent/limit accidental spills. All spills and accidental discharges of POLs, hazardous materials, or hazardous waste would be reported.

Vance AFB has developed emergency response procedures and site-specific contingency plans for all hazardous materials and waste storage/generation locations. This information is incorporated into the installation's *Spill Prevention, Control, and Countermeasures* (SPCC) plan (also known as the 705 Plan). Applicable spill response procedures are also detailed in the Vance AFB *Lead Based Paint Management Plan* and *Hazardous Waste Management Plan* (USAF 2005d and 2005b).

The USEPA and ODEQ administer RCRA Subtitle C (40 CFR Parts 260 through 270) regulations applicable to the management of hazardous waste. Hazardous waste must be handled, stored, transported, disposed, or recycled in accordance with these regulations. There would be impacts to hazardous waste management if the federal action resulted in noncompliance with applicable federal and Oklahoma regulations or caused waste generation that could not be accommodated by current Vance AFB waste management capacities.

No impacts from hazardous materials and hazardous wastes are expected; the Air Force and developers would adhere to hazardous materials and hazardous waste management requirements and any increases in the quantity of hazardous waste generated at Vance AFB as a result of the actions would be handled by base plans and standard operating procedures.

4.3.6.1 No Action Alternative

No construction, renovation, or demolition activities would occur under the no action alternative. Therefore, no adverse impacts are expected under this alternative.

4.3.6.2 Proposed Action

No adverse impacts associated with hazardous materials/waste, ERP sites, ACM, LBP, or PCBs are anticipated under the proposed action, as standard operating procedures would be implemented as described in Section 4.3.6. Beneficial impacts would result from the removal of ACM and LBP materials in the older housing units.

4.3.6.3 Alternative Action

No adverse impacts associated with hazardous materials/waste, ERP sites, ACM, LBP, or PCBs are anticipated under the alternative action, as standard operating procedures would be implemented as described in Section 4.3.6. Beneficial impacts would result from the removal of ACM and LBP materials in the older housing units.

4.3.6.4 Cumulative Impacts

No adverse impacts associated with hazardous materials or waste have been identified with respect to the implementation of the proposed action or alternative action. When considered with the other ongoing and proposed activities in the ROI, these activities would not contribute to any cumulative impacts to the environment associated with hazardous materials and/or waste.

4.3.6.5 Measures to Reduce Impacts

No measures to reduce impacts would be required as part of the proposed action or alternative action.

4.3.7 Biological Resources

Potential impacts to biological resources were determined by analyzing the proposed and alternative actions within the context of the importance of the existing resources and the sensitivity of those resources. In addition, impacts were evaluated based on whether the actions would:

- Affect threatened or endangered species.
- Substantially diminish natural habitats for a plant or animal species.
- Substantially interfere with wildlife movement or reproductive behavior.
- Infuse exotic plant or animal species.

4.3.7.1 Vegetation and Wildlife

4.3.7.1.1 No Action Alternative

No construction, renovation, or demolition activities would occur under the no action alternative. Therefore, no adverse impacts to vegetation and wildlife are expected under this alternative.

4.3.7.1.2 Proposed Action

Activities under the proposed action would occur within largely developed, maintained urban and suburban areas with a disturbed landscape; therefore, impacts to vegetation and wildlife occurring on Vance AFB would be minimal. Because the proposed action activities would occur on previously disturbed areas, the proposed action would have no potential to impact the existence of listed species occurring near Kegelman AAF. Use of BMPs during construction would minimize the potential for adverse effects to vegetation at and near construction sites, and there would be minimal impacts to native vegetation outside the developed regions of Vance AFB and Kegelman AAF. There would be no or minimal impacts to wildlife, with the exception of birds that associate with and nest on or in man-made structures. Development activities at Vance AFB and Kegelman AAF would continue to be performed in compliance with the MBTA and the Sikes Act.

4.3.7.1.3 Alternative Action

Potential impacts associated with the alternative action would be the same as those described in Section 4.3.7.1.2. The Air Force expects only negligible impacts to vegetation given the disturbed nature of the project landscape and the use of BMPs during construction Since projects would occur in essentially urban or suburban areas, there would be no or minimal impacts to wildlife, with the exception of birds that associate with and nest on or in man-made structures.

4.3.7.1.4 Cumulative Impacts

Localized loss of habitat or direct impacts to species can have a cumulative impact when viewed on a regional scale if that loss or impact is compounded by other events with the same end result. However, there would be no net loss of critical habitats at or around Vance AFB or Kegelman AAF, because projects for the proposed and alternative action would occur within developed areas of the installations. The proposed or alternative actions would not have incremental effects on the vegetation and wildlife of Vance AFB, Kegelman AAF, or the local area when considered with the other ongoing and future projects within the ROI.

4.3.7.1.5 Measures to Reduce Impacts

No impacts to vegetation and wildlife are expected under the proposed or alternative actions. Therefore, no specific measures to reduce impacts on vegetation and wildlife

would be required. However, for the proposed and alternative actions, trees and shrubs would be retained to the greatest extent possible. Use of BMPs during construction would minimize the potential for adverse effects to vegetation at and near the construction sites.

4.3.7.2 Threatened and Endangered Species

No threatened or endangered plant or animal species are known to exist on either Vance AFB or Kegelman AAF (USAF 2006a). Implementation of the proposed action would not require the dredging or filling of wetlands. Wetlands will continue to be inspected annually, and any decision-making involving wetlands will follow the procedures outlined in AFIs 32-7062 and 32-9003 and EOs 11988 and 11990.

4.3.7.2.1 No Action Alternative

No construction, renovation, or demolition activities would occur under the no action alternative. Therefore, no adverse impacts to threatened and endangered species are expected under this alternative.

4.3.7.2.2 Proposed Action

As described in section 3.3.7.2, Kegelman AAF is in close proximity to some sensitive habitats and there are a number of listed species in the area; however, due to the scope of activities occurring at Kegelman AAF and the fact that there are no listed species on or near Vance AFB, no adverse impacts are anticipated as a result of the proposed action.

4.3.7.2.3 Alternative Action

Potential impacts associated with the alternative action would be the same as those described in Section 4.3.7.2.2.

4.3.7.2.4 Cumulative Impacts

When considered in the context of other ongoing and proposed future actions in the ROI, the proposed action or alternatives (to include the no action alternative) would not have cumulative effects on threatened or endangered species.

4.3.7.2.5 Measures to Reduce Impacts

No adverse impacts to threatened or endangered species are expected. Construction activities would not impact habitat available to the wildlife species that occur at Vance AFB or Kegelman AAF. Vance AFB and Kegelman AAF would continue good stewardship of wildlife habitat by including all practicable measures to avoid and minimize impacts to threatened and endangered species caused by the proposed construction projects and continuing to implement and enforce strict control of wildlife habitat. In the case that listed species are introduced to installation property, base personnel should follow guidance provided in the *Integrated Resources Management Plan* to ensure that the proper steps are taken to protect the sensitive wildlife (USAF 2002).

4.3.7.3 Wetlands

Vance AFB does not have any jurisdictional wetlands, but Kegelman AAF has approximately 3.4 acres of identified jurisdictional wetland areas registered with the USACE. Implementation of the proposed action would not require dredge or fill of wetlands. Wetlands will continue to be inspected annually, and any decision-making involving wetlands will follow the procedures outlined in AFIs 32-7062 and 32-9003 and EOs 11988 and 11990.

4.3.7.3.1 No Action Alternative

No construction, renovation, or demolition activities would occur under the no action alternative. Therefore, no adverse impacts to wetlands are expected under this alternative.

4.3.7.3.2 Proposed Action

Vance AFB and Kegelman AAF would continue with the existing policy to conserve and protect the wetland habitats on and near the installation by (1) including all practicable measures to avoid and minimize impacts to wetlands caused by fill required by the proposed construction projects (pipelines and electrical cable trenching, building construction, and similar activities); (2) continuing to implement and enforce strict control of spills of hazardous materials; and (3) effectively managing stormwater runoff that might affect wetlands by updating and implementing various plans such as the SPCC plan, SWPPP, and *Hazardous Material* (HAZMAT) *Management Plan*.

4.3.7.3.3 Alternative Action

Potential impacts associated with the alternative action would be the same as those described in Section 4.3.7.2.2.

4.3.7.3.4 Cumulative Impacts

When considered in the context of other ongoing and proposed future actions in the ROI, the proposed action or alternatives (to include the no action alternative) would not have cumulative effects on the wetlands at Kegelman AAF.

4.3.7.3.5 Measures to Reduce Impacts

No adverse impacts to wetlands are expected; however, Vance AFB and Kegelman AAF would continue good stewardship of wetland habitat by (1) including all practicable measures to avoid and minimize impacts to wetlands caused by fill required by the proposed construction projects (pipelines and electrical cable trenching, building construction, and similar activities); (2) continuing to implement and enforce strict control of spills of hazardous materials; (3) effectively managing stormwater runoff that might affect wetlands by updating and implementing various plans such as the SPCC plan, SWPPP, and *HAZMAT Management Plan*; and (4) continuing to control encroachment of invasive species.

4.3.8 Utilities and Infrastructure

In evaluating impacts on infrastructure and utilities, several items were examined, including (1) the degree to which a utility service would have to alter operating practices and personnel requirements; (2) the degree to which the change in demands from implementation of the proposed action and alternatives would impact a system's capacity; (3) the degree to which a transportation system would have to alter operating practices and personnel requirements to support the action; (4) the capacity required from new or revised transportation systems; and (5) the degree to which the increased demands from the proposed program would reduce the reliability of transportation systems, or aggravate already existing adverse conditions on base. For the evaluation of potential impacts, the ROI for the infrastructure and utilities resource area encompasses Vance AFB and Kegelman AAF.

4.3.8.1 Electricity and Natural Gas

4.3.8.1.1 No Action Alternative

Under the no action alternative, there would be no demolition, construction, or mission related changes in activities; therefore, there would be no effect on electricity and natural gas as described in Section 3.3.8.1.

4.3.8.1.2 Proposed Action

The proposed action includes new construction and associated demolition, which would increase the interior building space by 313,652 square feet at Vance AFB and 7,500 square feet at Kegelman AAF due to the combined CIP and BRAC actions. Population changes at Vance AFB are associated with the proposed action, which include the addition of 250 personnel due to BRAC actions. The increase in building space at Vance AFB represents an increase of approximately 18.4 percent over baseline conditions (approximately 1,706,782 square feet) (Appendix B). The increase in building space at Kegelman AAF represents an 89.8 percent increase over baseline conditions (approximately 9,619 square feet) (DoD 2006a). The additional energy demand associated with the population increase would be accommodated by the new facilities proposed at Vance AFB. As further described in Appendix B, a 18.3 percent increase in habitable building space at Vance AFB is directly related to a similar increase in the demand for electrical and natural gas utilities serving those buildings. Energy consumption due to the proposed building additions at Kegelman AAF is not anticipated to increase substantially due to the lower frequency of occupancy at these remote support facilities.

The utility systems supporting electrical and natural gas services at Vance AFB are capable of supporting an 18.3 percent increase in demand (Appendix B). The utility systems supporting the energy services at Kegelman AAF would be modified to support the new facilities as part of the proposed action. Localized temporary service disruptions may occur during construction of new facilities, but would not constitute a permanent decrease in level of service (LOS).

4.3.8.1.3 Alternative Action

The alternative action would increase the interior building space at Vance AFB by approximately 1.1 million square feet and would increase the base population by approximately 7,402 people (6,736 military and civilian personnel, 595 resident military dependents, and 71 overnight visitors). The associated increase in effective population would be 3,881 24-hour equivalents (Appendix B, Table 2-3). The increase in building space represents an increase of approximately 64.7 percent over the current value of 1,706,782 square feet (Appendix B). The 24-hour equivalent effective population increase of 3,881 is approximately 2.1 times the baseline effective population of 1,843 described in Appendix B. The alternative action would not affect Kegelman AAF.

As further described in Appendix B, a 64.7 percent increase in habitable building space is directly related to a similar increase in the demand for electrical and natural gas utilities serving those buildings. The additional energy demand associated with the population increase would be accommodated by the new facilities proposed at Vance AFB. The utility systems supporting electrical and natural gas services are capable of supporting a 64.7 percent increase in demand (Appendix B). Localized temporary service disruptions may occur during construction of new facilities, but would not constitute a permanent decrease in LOS.

4.3.8.1.4 Cumulative Impacts

The off-base installation of new electrical feed to support the AFRC will have a net positive impact, as it will provide additional power to the base. No other impacts of this project are foreseen. Otherwise, with the exception of the family housing replacement projects, the efforts described in Section 2.7 are negligible in comparison to either the proposed action or the alternative action with respect to net changes in building space and population; therefore, the cumulative impacts to the existing electricity supply and natural gas distribution systems would be similar to those already described for the proposed action and alternative action. The family housing projects listed in section 2.7.1 could ultimately result in a net positive effect on these base resources because in association with these construction efforts the utilities demand from approximately 350,000 square feet of residential facilities would potentially be removed from the base systems (Appendix B). As further described in Appendix B, the existing utility supplies can accommodate anticipated demands associated with the proposed consumption increases; however, upgrades to individual electrical subsystems would be anticipated to coincide with implementation of the projects associated with the alternative action.

4.3.8.1.5 Measures to Reduce Impacts

Measures to reduce impacts for increased energy requirements would not be required for the proposed action and electrical subsystem replacements would be incorporated into the alternative action as required.

4.3.8.2 Potable Water

4.3.8.2.1 No Action Alternative

Under the no action alternative, no demolition, construction, or mission related change in activity would occur; therefore, there would be no effect on the potable water system as described in Section 3.3.8.2.

4.3.8.2.2 Proposed Action

Population changes at Vance AFB are associated with the proposed action, which would add 250 personnel due to BRAC actions. Assuming the worst-case potential effect of all 250 additional personnel being housed on base, the 24-hour equivalent effective service population would increase by 13.5 percent over the current effective population of 1,843. The anticipated demand for potable water would increase by up to 13.5 percent over the levels described in Section 3.3.8.2. As described in Appendix B, the potable water supplies are capable of supporting a 13.5 percent increase in demand. Localized temporary service disruptions may occur during construction of new facilities, but would not constitute a permanent decrease in LOS.

4.3.8.2.3 Alternative Action

The alternative action would increase the base population by approximately 7,402 people (6,736 military and civilian personnel, 595 resident military dependents, and 71 overnight visitors). The associated increase in effective population would be 3,881 24-hour equivalents (Appendix B, Table 2-3). The 24-hour equivalent effective population increase of 3,881 is approximately 2.1 times the baseline effective population of 1,843 described in Appendix B. The increase in demand for potable water associated with these increases would be approximately 210 percent over the amount described in Section 3.3.8.2.

Localized temporary service disruptions may occur during construction of new facilities, but would not constitute a permanent decrease in LOS. As further described in Appendix B, the existing potable water system facilities and suppliers could accommodate anticipated demands associated with consumption increases of at least 210 percent based on current usage. The alternative action would not affect Kegelman AAF.

4.3.8.2.4 Cumulative Impacts

With the exception of the MFH projects, the efforts described in Section 2.7 are negligible in comparison to either the proposed or the alternative action with respect to net changes in building space and population; therefore, the cumulative impacts to the existing potable water distribution system would be similar to those already described for the proposed action and alternative action. The family housing projects listed in Section 2.7.1 could ultimately result in a net positive effect on these base resources because in association with these construction efforts, the utilities demand from approximately 350,000 square feet of residential facilities would potentially be removed from the base

systems (Appendix B). As further described in Appendix B, the existing potable water distribution facilities and supply could accommodate anticipated demands associated with the described consumption increases based on current usage.

4.3.8.2.5 Measures to Reduce Impacts

Measures to protect health and welfare would not be required for the proposed action or alternative action. The available potable water supplies are capable of meeting the projected demand associated with the proposed action or alternative action, provided the potable water purveyor contracts are managed to keep pace with population and facility growth.

4.3.8.3 Solid Waste Management

Impacts on solid waste were evaluated with respect to the degree to which the proposed construction projects and demolition projects could affect the existing solid waste management program and capacities of the area landfills. Solid waste generated from the proposed construction activities would consist of building materials such as solid pieces of concrete, metals (e.g., conduit, piping, and wiring), and lumber. Analysis of the impacts on solid waste is based on the following assumptions:

- Non-residential construction waste generation is 4.02 pounds (lb) per square foot.
- Non-residential renovation waste generation is 6.85 lbs per square foot.
- Non-residential demolition waste generation is 173 lbs per square foot (USEPA 1998).
- Approximately 1 lb of construction debris is generated for each square foot of paving.
- The approximate rate of solid waste generation per person is 3.0 lb per day (Murphy and Chaterjee 1976).

It is important to note that any cut vegetation would not be added to the solid waste stream (i.e., dumpsters or roll-offs), but instead would be composted at Vance AFB. (Note that in 2005, Vance AFB composted approximately 1,782 tons of cut vegetation and reused 847 tons of solid waste.) To the greatest extent possible, waste would be recycled (especially wood, scrap metal, and wiring [USAF 2005b]). Where feasible, Vance AFB would reuse concrete material as riprap in spillways to prevent erosion.

Coordination between Vance AFB, disposal contractors, developers, and local landfill operators prior to demolition or construction would minimize any potential impacts associated with disposal of construction and demolition debris.

4.3.8.3.1 No Action Alternative

Under the no action alternative, there would be no demolition, construction or mission related changes in activities. Therefore, there would be no effect on solid waste disposal resources as described in Section 3.3.8.3.

4.3.8.3.2 Proposed Action

The proposed action involves the construction of approximately 357,927 square feet of building space and the construction of 525,863 square feet of pavements. This action also involves the demolition of approximately 144,781 square feet of building space. The estimated quantity of construction and demolition debris that would be generated as a result of these activities is shown in Table 4-12; these calculations assume that construction and demolition debris generation is distributed evenly over the next 5 years.

Table 4-12 Estimated Construction and Demolition Debris, Proposed Action

Project Year	Construction			Renovation		Demolition		Total Debris (tons)
	Buildings (square feet)	Pavements (square feet)	Debris (tons)	Buildings (square feet)	Debris (tons)	Buildings & Pavement (square feet)	Debris (tons)	
1	71,585	105,173	196	14,217	49	28,956	2,505	2,750
2	71,585	105,173	196	14,217	49	28,956	2,505	2,750
3	71,585	105,173	196	14,217	49	28,956	2,505	2,750
4	71,585	105,173	196	14,217	49	28,956	2,505	2,750
5	71,585	105,173	196	14,217	49	28,956	2,505	2,750
Total	**357,927**	**525,863**	**982**	**71,084**	**243**	**144,781**	**12,524**	**13,749**

Notes:
Figures are rounded and may not appear to the nearest whole number.
Non-residential construction debris is generated at the rate of approximately 4.02 pounds per square foot.
Approximately 1 pound of construction debris is generated per square foot of paving.
Non-residential demolition activities generate approximately 173 pounds of debris per square foot of activity.

Over the five-year period of the proposed action, it is estimated that the total quantity of the debris generated from construction and demolition activities would be 13,749 tons. The annual quantity of debris generated during construction, renovation, and demolition under the proposed action was compared to the average annual amount of waste received at regional landfills that accepted construction and demolition waste in 2005, as shown in Table 4-13 (note that recycling by Vance AFB would reduce the projected total amount of construction and demolition debris shown in Table 4-13).

Table 4-13 Estimated Increase in Construction and Demolition Debris at Local Landfills, Proposed Action

Landfill Sites	2005 Waste Received (tons/year)	2005 Landfill Life[1] (years)	2005 Total Capacity (tons)	Total Construction & Demolition Debris for Proposed Action (tons)	Total Landfill Capacity Remaining (tons)	Landfill Life Remaining after Proposed Action (years)
City of Enid Landfill	82,910	20	1,658,200	13,749	1,644,451	19.8
Ponca City Vashi Four Eyes, Phase II Landfill	46,484	25.5	1,185,342	13,749	1,171,593	25.1
Red Carpet Landfill	451,240	1.4	631,736	13,749	617,987	1.4
Northern Oklahoma Disposal, Inc.	29,258	1.29	37,743	13,749	23,994	0.7
Combined Landfills	**609,892**	**48.19**	**3,513,020**	**13,749**	**3,495,896**	**48.00**

Notes:

This table illustrates what would happen if one site received all the construction and demolition debris over the course of 5 years and displays, in the last row, a broad view of approximately what would happen the same waste were to be spread out over the four area landfills. Not all columns are summed in the final row.

[1]Landfill life expectancy is determined by personal conversation with Mr. Alex Dee of the Oklahoma Department of Environmental Quality (ODEQ) on December 5, 2006; a personal conversation with Mr. Toby Pritchett, the city of Enid Landfill Manager, on December 13, 2006; and the ODEQ website. Combined Landfill Life Remaining is the Combined 2005 Landfill Life multiplied by the ratio of capacity remaining to 2005 capacity.

Source: City of Enid 2006c, ODEQ 2006

The 13,749 tons of construction debris includes 15 tons estimated to be generated by the Rod and Gun Club construction at Kegelman AAF. The waste from the Kegelman AAF project will most likely be sent to the landfill in Tonkawa City (Northern Oklahoma Disposal, Inc.), which has a reported capacity of 20,619 tons. This one-time construction and demolition debris contribution from the project at Kegelman AAF would constitute less than one-tenth of one percent of the capacity of the landfill, which would accommodate such a load without difficulty.

The average annual amount of solid waste landfilled by Vance AFB over the last three years was 937 tons; although the proposed action would be estimated to generate an additional 2,750 tons of construction and demolition debris each year, this amount would represent just 3.3 percent of the total amount of waste accepted by the city of Enid Landfill in calendar year 2005. If all construction and demolition debris were sent to the city of Enid Landfill (Vance AFB's existing construction and demolition debris recipient), the life of the landfill (as reported in 2005) would be reduced by just a few months. Population changes at Vance AFB associated with the proposed action would add 250 personnel due

to BRAC actions. Assuming the worst-case potential effect that all 250 additional personnel were housed on base, approximately 137 tons of additional solid waste would be generated per year. This additional, recurring annual generation of solid waste would equate to less than one-quarter of a percent of the total amount of waste received at the city of Enid Landfill in 2005. The city of Enid Landfill has ample capacity to accommodate both the one-time generation of construction/demolition debris and the recurring generation of solid waste by additional base personnel that would result from implementation of the proposed action.

4.3.8.3.3 Alternative Action

The alternative action involves the construction of approximately 1,770,713 square feet of building space and approximately 55 acres of accompanying pavements (including roadways, sidewalks, and parking areas). This action also involves the demolition of approximately 658,750 square feet of building space. The quantity of construction and demolition debris that would be generated as a result of these activities is estimated in Table 4-14.

Table 4-14 Estimated Construction and Demolition Debris, Alternative Action

Project Year	Construction			Renovation		Demolition		Total Debris (tons)
	Buildings (square feet)	Pavements (square feet)	Debris (tons)	Buildings (square feet)	Debris (tons)	Buildings & Pavement (square feet)	Debris (tons)	
1	354,143	479,160	951	0	0	131,750	11,396	12,348
2	354,143	479,160	951	0	0	131,750	11,396	12,348
3	354,143	479,160	951	0	0	131,750	11,396	12,348
4	354,143	479,160	951	0	0	131,750	11,396	12,348
5	354,143	479,160	951	0	0	131,750	11,396	12,348
Total	**1,770,713**	**2,395,800**	**4,757**	**0**	**0**	**658,750**	**56,982**	**61,739**

Notes:
Figures are rounded and may not appear to the nearest whole number.
Non-residential construction debris is generated at the rate of approximately 4.02 pounds per square foot.
Approximately 1 pound of construction debris is generated per square foot of paving.
Non-residential demolition activities generate approximately 173 pounds of debris per square foot of activity.

Over the five-year period of the alternative action, it is estimated that the total quantity of the debris generated from construction and demolition activities would be 61,739 tons. The annual quantity of debris generated during construction, renovation, and demolition under the alternative action was compared to the average annual amount of waste received at regional landfills that accept construction and demolition waste, as shown in Table 4-15 (note that recycling by Vance AFB would reduce the projected total amount of construction and demolition debris shown in Table 4-15).

Table 4-15 Estimated Increase in Construction and Demolition Debris at Local Landfills, Alternative Action

Landfill Sites	2005 Waste Received (tons/year)	2005 Landfill Life (years)	2005 Total Capacity (tons)	Total Construction & Demolition Debris for Alternative Action	Total Landfill Capacity Remaining (tons)	Landfill Life Remaining after Alternative Action (years)
City of Enid Landfill	82,910	20	1,658,200	61,739	1,596,461	19.3
Ponca City Vashi Four Eyes, Phase II Landfill	46,484	25.5	1,185,342	61,739	1,123,603	24.2
Red Carpet Landfill	451,240	1.4	631,736	61,739	569,997	1.3
Northern Oklahoma Disposal, Inc.	29,258	1.29	37,743	61,739	-	-
Combined Landfills	**609,892**	**48.19**	**3,513,021**	**61,739**	**3,451,282**	**47.34**

Notes:

This table illustrates what would happen if one site received all the construction and demolition debris over the course of 5 years and displays, in the last row, a broad view of approximately what would happen the same waste were to be spread out over the four area landfills. Not all columns are summed in the final row.

Landfill life expectancy is determined by personal conversation with Mr. Alex Dee of the Oklahoma Department of Environmental Quality (ODEQ) on December 5, 2006; a personal conversation with Mr. Toby Pritchett, the city of Enid Landfill Manager, on December 13, 2006; and the ODEQ website.

Source: City of Enid 2006c, ODEQ 2006

If all construction and demolition debris were landfilled at the city of Enid Landfill (Vance AFB's existing construction and demolition debris recipient), the life of the landfill reported in 2005 would be reduced by less than one year. The annual amount of debris generated by the alternative action (12,348 tons) represents 15 percent of the amount received by the city of Enid Landfill. Distribution of construction and demolition debris to the Ponca City Landfill would minimize the potential for adverse impacts on any one individual landfill.

The alternative action would increase the base population by approximately 7,402 people (6,736 military and civilian personnel, 595 resident military dependents, and 71 overnight visitors). The associated increase in effective population would be 3,881 24-hour equivalents (Appendix B, Table 2-3). Approximately 2,125 tons of additional solid waste would be generated per year. This additional, recurring annual generation of solid waste equates to 2.5 percent of the total amount of waste received at the city of Enid Landfill in 2005. The city of Enid Landfill has the capacity to accommodate the one-time generation of construction/demolition debris and the recurring generation of solid waste by additional base personnel from implementation of the alternative action.

Distribution of solid waste to the Ponca City Landfill would minimize the potential for adverse impacts on any one individual landfill.

4.3.8.3.4 Cumulative Impacts

The ongoing actions on Vance AFB and Kegelman AAF property involve the construction of approximately 361,891 square feet of new building space, approximately 2,270 square feet of building renovation, and approximately 245,377 square feet of building space demolition. Additionally, the off-base Wheat Road improvements involve the construction of approximately 266,299 square feet of pavements. It is estimated that the total quantity of debris generated from construction and demolition activities associated with the ongoing actions would be approximately 22,093 tons, an average of 4,419 tons of debris per year over a 5-year period. This annual average is equivalent to 5 percent of the total amount of waste accepted by the city of Enid Landfill in calendar year 2005.

If all construction and demolition debris generated from the ongoing activities and the proposed action were to be sent to the city of Enid Landfill, it would reduce the landfill's 20-year life expectancy by six months. When the ongoing activities are combined with the alternative action and all debris sent to the city of Enid Landfill, the landfill's life expectancy would drop by approximately one year. If the debris were distributed among all four available area landfills, the burden would be lessened considerably.

4.3.8.3.5 Measures to Reduce Impacts

The following BMPs would be followed to reduce impacts caused by solid waste generated by the proposed action and alternative action (1) recycling and reuse of construction and demolition debris (to the extent practicable), and (2) distribution of construction and demolition debris among the four local landfills. Recycling and reuse of construction and demolition debris would limit adverse and/or cumulative impacts to local landfills to the extent practicable, thus helping to increase the life of the area landfills.

4.3.8.4 Wastewater

4.3.8.4.1 No Action Alternative

Under the no action alternative, there would be no demolition, construction, or mission related changes in activities. Therefore, there would be no effect on wastewater as described in Section 3.3.8.4

4.3.8.4.2 Proposed Action

Population changes at Vance AFB re associated with the proposed action, which would add 250 personnel due to BRAC actions. Assuming the worst-case potential effect of all 250 additional personnel being housed on base, the 24-hour equivalent effective service population would increase by 13.5 percent over the current effective population of 1,843. Generation of wastewater would increase by up to 13.5 percent over the levels described in Section 3.3.8.4. As described in Appendix B, the existing wastewater

collection system facilities could accommodate anticipated demands associated with increased wastewater generation of at least 13.5 percent based on current rates. Localized temporary service disruptions may occur during construction of new facilities, but would not constitute a permanent decrease in LOS.

4.3.8.4.3 Alternative Action

The alternative action would increase the base population by approximately 7,402 people (6,736 military and civilian personnel, 595 resident military dependents, and 71 overnight visitors). The associated increase in effective population would be 3,881 24-hour equivalents (Appendix B, Table 2-3). The 24-hour equivalent effective population increase of 3,881 is approximately 2.1 times the baseline effective population of 1,843 described in Appendix B. The amount of wastewater generation would increase by approximately 210 percent over the amount described in Section 3.3.8.4.

Localized temporary service disruptions may occur during construction of new facilities, but would not constitute a permanent decrease in LOS. As further described in Appendix B, the existing wastewater collection system facilities could accommodate anticipated demands associated with increased wastewater generation of at least 210 percent based on current rates. The alternative action would not affect Kegelman AAF.

4.3.8.4.4 Cumulative Impacts

With the exception of the MFH projects, the efforts described in Section 2.7 are negligible in comparison to either the proposed or the alternative action with respect to net changes in building space and population; therefore, the cumulative impacts to the existing wastewater collection system would be similar to those already described for the proposed and alternative actions. The family housing projects listed in section 2.7.1 could ultimately result in a net positive effect on these base resources because in association with these construction efforts the utilities demand from approximately 350,000 square feet of residential facilities would potentially be removed from the base systems (Appendix B). As described in Appendix B, the existing wastewater collection system could accommodate anticipated increased generation associated with the proposed action and alternative actions.

4.3.8.4.5 Measures to Reduce Impacts

Measures to protect health and welfare would not be required for the proposed action or alternative action. The city of Enid infrastructure limits the wastewater collection system to a maximum flow of 0.5 mgd; however, there is sufficient headroom in the current system to accommodate future demand. Additional information on wastewater collection system capabilities and city of Enid expansion plans are presented in Appendix B.

4.3.8.5 Transportation

4.3.8.5.1 No Action Alternative

Under the no action alternative, there would be no increase in personnel or mission activity at Vance AFB and there would be no construction or demolition accomplished in support of the CIP or the BRAC program for the base. Consequently, baseline transportation conditions as described in Section 3.3.8.5 would remain unchanged and no transportation impacts would occur beyond those associated with ongoing activities and approved actions.

4.3.8.5.2 Proposed Action

Under the proposed action, BRAC-related projects would result in a net increase of 250 military personnel at Vance AFB. The increase in the base population would result in a minor increase in base traffic. However, the volume of traffic should remain close to the current baseline. If the additional personnel live off base, the slight increase in traffic would be most noticeable during the weekday peak morning hour since entering traffic would be slowed by base access security requirements. This could impact both the affected public road and the base access gate.

Implementation of the various projects under the proposed action would require delivery of materials to and removal of construction-related debris from construction and demolition sites. Minor delays and traffic congestion would be likely around construction areas because of temporary road closures and detours. The additional construction related traffic could also cause some minor congestion on affected off-base roads. However, construction traffic would make up only a small portion of the total existing traffic volume in the area and at the base. Increased traffic during construction could contribute to increased congestion at gates and in the processing of access passes. The potential for short-term increases in traffic are not likely to substantially affect commute times. Any congestion would be short-term, and would cease upon completion of the projects. No long-term impacts to on- or off-base transportation systems would result.

Projects under the proposed action would impact exiting on-base roadways and access to the base. Construction of the AFRC would require construction of new base streets to connect the new center with the existing base roadways. It is assumed that the new streets would connect to Elam Road, Macchi Avenue, and the road from the South Gate. Another project would be the construction of a new concrete roadway connecting Young Road to Scott Road. This project would also involve the construction of a new parking area and the removal of the existing pavement on Scott Road east of Elam Road. The existing parking lot on the north side of Young Road would be removed to accommodate the new connector. Construction of the South Gate Entry Control Point (ECP) would provide additional access to the base for government personnel located at the proposed AFRC. This new ECP could also provide secondary access for such things as special events, construction traffic, or as an

emergency exit/entrance. These projects would have a negligible affect on the existing system of on-base roadways and should help to improve safety and traffic flow.

4.3.8.5.3 Alternative Action

The alternative action would increase the base population by approximately 7,402 people (6,736 military and civilian personnel, 595 resident military dependents, and 71 overnight visitors), which would greatly increase traffic over baseline conditions. If the majority of the additional personnel commuted from off base, there would be increased congestion at Hairston Gate and the Industrial Gate during the morning and evening workday rush hours. There would also be a subsequent increase in traffic using the on-base roadways and circulation and safety problems could occur. The two main base entrance gates and the South Gate ECP could be improved and expanded to handle the increase in privately owned vehicle (POV) or commercial traffic and help reduce congestion.

In addition to the increase in base population, the alternative action would include construction and demolition projects similar to those described for the proposed action. Therefore, potential construction related transportation impacts would be similar to those described in Section 4.3.8.5.2.

4.3.8.5.4 Cumulative Impacts

Transportation within the ROI may experience slight, localized short-term negative impacts during the proposed construction and demolition activities from the increase in heavy equipment and contractor vehicles. However, impacts would be minimized by the short operating period associated with each project.

Cumulative impacts to transportation as a result of the proposed or alternative action in combination with other projects in the area (e.g., Wheat Capital Road improvement) would be expected to be positive over the long-term because they would enhance the flow of traffic on, to, and off the base. In addition, with the improvement to Wheat Capital Road, the proposed South Gate ECP could be expanded to provide additional POV and commercial access to the base as the population grows.

4.3.8.5.5 Measures to Reduce Impacts

Interim measures to minimize any short-term impacts (e.g., temporary road closures and detours) have been defined as part of the proposed action and alternative action. Improvements to the main base entrance gates and the South Gate could help off set traffic congestion that might result with any future increase in military and civilian personnel accessing Vance AFB.

4.3.8.6 Stormwater Drainage

4.3.8.6.1 No Action Alternative

Under the no action alternative, there would be no demolition or construction projects; therefore, there would be no effect on stormwater drainage as described in Section 3.3.8.6.

4.3.8.6.2 Proposed Action

Under the proposed action, several facilities would be constructed and demolished at Vance AFB. Based on analysis of the project list, approximately 16.8 acres of new construction and 7.0 acres of associated demolition would occur. A total of 9.8 acres of impervious cover would be added to the installation. As detailed in Section 4.3.5.1.2, this is expected to have a minimal impact on the total amount of impervious cover (0.47 percent increase) and on the total volume of stormwater runoff (0.76 percent or 4.81 acre-feet additional runoff in 24 hours) and would not impact existing capacity of the stormwater drainage systems. Additionally, new site-specific stormwater drainage would be designed, engineered, and implemented at each project location to move stormwater efficiently into the overall drainage system.

In accordance with the installation's SWPPP, BMPs (including techniques such as berms, sediment traps, and silt fences) would be implemented to minimize any runoff and subsequent degradation of surface water quality. The SWPPP would address all the elements of the proposed action before initiating activities. The plan would include erosion and sediment control techniques that would be used during demolition and construction to minimize erosion. In addition, the OPDES program requires that an NOI be filed under the ODEQ General Permit. Adequate control of runoff and erosion must also be demonstrated at each site. Therefore, water quality would not be adversely impacted by the proposed action.

4.3.8.6.3 Alternative Action

Under the alternative action, a total of 118 acres of new impervious cover would be added to the installation. As detailed in Section 4.3.5.1.3, this is expected to have a minimal impact on the total amount of impervious cover (5.6 percent increase) and on the total volume of stormwater runoff (8.5 percent or 57.9 acre-feet of additional runoff in 24 hours) and would not impact the existing capacity of the stormwater drainage systems. The kind and duration of construction activities associated with the alternative action would be similar to those identified under the proposed action. The construction and demolition activities would be conducted consistent with the requirements of the OPDES stormwater program, as described in Section 4.3.8.6.2. Therefore, no significant adverse water quality impacts are anticipated as a result of implementation of the alternative action.

4.3.8.6.4 Cumulative Impacts

The proposed and alternative actions, when considered with respect to other ongoing actions, would have a marginal net cumulative impact on stormwater at Vance AFB when

compared to the total current runoff across the base. The proposed action and ongoing activities would increase impervious cover by 0.6 percent (12.4 acres) and the alternative action and ongoing activities would increase impervious cover by 5.7 percent (121 acres). Total runoff for the proposed action and ongoing activities would increase by 0.96 percent (6.1 acre-feet of additional runoff in 24 hours) and for the alternative action and ongoing activities, it would increase by 8.6 percent (59.2 acre-feet of additional runoff in 24 hours). Sediment erosion would be controlled using BMPs during construction and demolition, negating large-scale adverse effects on surface waters. Therefore, minor cumulative impacts would be expected on stormwater resources.

4.3.8.6.5 Measures to Reduce Impacts

Impacts on stormwater resources from the proposed action and alternative actions are minimal when compared to the whole installation. Implementation of the SWPPP and BMPs should be used to reduce or eliminate runoff or contamination into stormwater conveyances (USAF 2001c). Site-specific sediment and erosion control plans with detailed BMPs to prevent soil disturbance, capture and contain loose soil, and slow the movement of stormwater during heavy rains should be included in the project development. The cumulative addition of approximately 59.2 acre-feet of stormwater detention facilities across Vance AFB may be considered as a stormwater management BMP for good stewardship of the common watersheds shared with neighboring facilities and residences.

4.3.9 Socioeconomics and Environmental Justice

In order to assess the potential socioeconomic impacts of the proposed action, demographic and economics characteristics at Vance AFB, the city of Enid, and Garfield County were analyzed, as presented in Section 3.3.9. Potential socioeconomic consequences were assessed in terms of effects of the proposed alternatives on the local economy, typically driven by changes in project personnel or expenditure levels. Economic multipliers, migration ratios, and other factors are utilized to determine the total economic effect of project-related changes on regional socioeconomic attributes.

For this EA, potential socioeconomic impacts are evaluated for factors associated with the action alternatives at Vance AFB. Facility changes associated with the action alternatives can often generate population changes in the region, causing change in housing and service demand, induced employment, and income. Construction activity associated with facility modifications on base often generates temporary economic benefits to the region in terms of employment and income; however, these benefits last only for the duration of the construction period.

4.3.9.1 No Action Alternative

Under the no action alternative, there would be no change in personnel or mission activity at Vance AFB, and no facility modifications. Population on base and in the affected ROI would not be affected. In addition, construction-related employment and

earnings impacts associated with the action alternatives would not occur. No impacts to socioeconomic resources would occur under implementation of the no action alternative.

4.3.9.2 Proposed Action

Construction-Related Consequences

Under the proposed action, Vance AFB would implement CIP and BRAC projects involving construction of new building space, alteration or replacement of existing buildings, and demolition of selected facilities (see Section 2.5). As stated in the methodology section above, construction activities associated with facility development under the proposed action would generate a number of jobs during the construction period, and contribute to local earnings and induced spending. These effects would be temporary, however, only occurring for the duration of the construction period.

Operations-Related Consequences

Under the proposed action, employment at Vance AFB would experience a net increase of 250 personnel, representing an increase of 8.1 percent to the existing base-related employment of 3,090 personnel, and 1.2 percent to the existing city of Enid employment of 20,680. Base-related employment plus the 425 dependents living on base would increase to 3,765. Based on existing family size ratios at Vance AFB, it is anticipated that 217 military dependents would accompany the incoming military personnel, yielding a direct population increase of 467 persons (see Table 4-16). An increase of this size would raise the Vance AFB population to 4,807 persons, representing an increase of 10.8 percent in the base population. A population increase of this magnitude would represent growth of 1.0 percent in the city of Enid population and 0.8 percent for Garfield County. The potential population increase associated with the proposed action would offset the population declines experienced in the region since 2000 (see Section 3.3.9.1).

For the purposes of this analysis, it is assumed that on-base MFH and unaccompanied permanent party housing is already occupied at capacity. Consequently, the anticipated increase in personnel under the proposed action, and the resulting in-migration of their households, would result in a greater demand for housing in the greater Enid area. Assuming a stable stock of available housing, the vacancy rate could decrease from 10.8 percent to 9.6 percent of all housing units. Similarly, the in-migration of military families would increase school enrollments in Garfield County school districts, presumably in the Enid Public School District. Based on military dependent ratios for Vance AFB, it is estimated that school enrollments may increase by approximately 113 students, representing an increase in enrollment of 1.8 percent.

Table 4-16 Vance Air Force Base Population, Baseline and Proposed Action

	Living On Base	Living Off Base	Total
BASELINE VANCE AFB POPULATION			
Military Personnel	339	949	1,288
Student Personnel	196	227	423
Military Dependents	425	825	1,250
Civilian Personnel	0	1,332	1,332
Transient Personnel	47	0	47
Total Baseline Population	**1,007**	**3,333**	**4,340**
PROPOSED ACTION			
Military Personnel	0	250	250
Student Personnel	0	0	0
Military Dependents	0	217	217
Civilian Personnel	0	0	0
Transient Personnel	0	0	0
Total Population Change	**0**	**467**	**467**
PROPOSED VANCE AFB POPULATION			
Military Personnel	339	1,199	1,538
Student Personnel	196	227	423
Military Dependents	425	1,042	1,467
Civilian Personnel	0	1,332	1,332
Transient Personnel	47	0	47
Total Projected Population	**1,007**	**3,800**	**4,807**

Note: Population impacts in this socioeconomic analysis differ from those presented in Appendix B in that the number of military dependents living off base are estimated and included. This number is estimated by applying current military-to-civilian personnel ratios and military dependent ratios.

Source: Appendix B

Environmental Justice Concerns

The potential for environmental justice concerns exists only if adverse environmental impacts are anticipated and disadvantaged groups represent a disproportionate segment of the affected population. As presented in Section 3.3.9.1, minority and low-income populations do not represent a disproportionate share of the total population when compared with regional and state levels. In addition, there are no known concentrated areas of concern where children might be subject to special health or safety risks. In order to address the possibility of environmental justice concerns, potential health and safety factors were analyzed to determine whether any disproportionately high or adverse human health or environmental impacts could affect the human population. In addition, potential environmental health or safety hazards were examined to assess potential special risks to children. These environmental analyses indicate that no adverse environmental impacts to the human population are anticipated under the proposed action. As a result, no

disproportionate environmental justice impacts would occur, nor would there be any special health or safety risks to children.

4.3.9.3 Alternative Action

Construction-Related Consequences

Under the alternative action, Vance AFB would be developed to the maximum potential identified in the Vance AFB *Capability Analysis* (see Appendix B). It is estimated that the base could accommodate an additional 1.8 million square feet of new building construction, including the CIP and BRAC projects described under the proposed action. Under the alternative action, the net gain in building space would be 1.1 million square feet and the net increase in impervious surfaces of 55 acres. Construction activities associated with facility development would be similar to those described under the proposed action, although somewhat greater in magnitude due to the increased development capacity proposed. As stated in the methodology section, construction activities associated with facility development under the alternative action would generate a number of jobs during the construction period, and contribute to local earnings and induced spending. These effects would be temporary, however, only occurring for the duration of the construction period.

Operations-Related Consequences

Under the alternative action, if Vance AFB were developed to maximum capacity the base could accommodate an additional 4,687 military and civilian personnel, 2,521 students, 2,799 military dependents, and 24 transient personnel, resulting in a total increase in direct population of 10,031 persons. This level of growth represents an increase of 231 percent over the baseline Vance AFB population of 4,340 persons to the projected maximum sustainable population of 14,371 persons (see note in Table 4-17). A population increase of this magnitude would represent growth of 21.6 percent in the city of Enid population and 17.6 percent for Garfield County.

Movement of additional military personnel to Vance AFB to the maximum sustainable capacity could affect the housing market and public services, particularly in the area immediately surrounding the base. While growth of this magnitude is not inconsequential, the greater Enid region has a certain amount of under-utilized housing and service capacity already existing due to population decline in recent years. In addition, the region has a supportive relationship with Vance AFB and promotes economic growth (Greater Enid Chamber of Commerce 2006).

Table 4-17 Vance Air Force Base Population, Baseline and Alternative Action

	Living On Base	Living Off Base	Total
BASELINE VANCE AFB POPULATION			
Military Personnel	339	949	1,288
Student Personnel	196	227	423
Military Dependents	425	825	1,250
Civilian Personnel	0	1,332	1,332
Transient Personnel	47	0	47
Total Baseline Population	**1,007**	**3,333**	**4,340**
ALTERNATIVE ACTION			
Military Personnel	759	2,125	2,884
Student Personnel	1,168	1,353	2,521
Military Dependents	170	2,629	2,799
Civilian Personnel	0	1,803	1,803
Transient Personnel	24	0	24
Total Population Change	**2,121**	**7,910**	**10,031**
ALTERNATIVE VANCE AFB POPULATION			
Military Personnel	1,098	3,074	4,172
Student Personnel	1,364	1,580	2,944
Military Dependents	595	3,454	4,049
Civilian Personnel	0	3,135	3,135
Transient Personnel	71	0	71
Total Projected Population	**3,128**	**11,243**	**14,371**

Note: Population impacts in this socioeconomic analysis differ from those presented in Appendix B in that the number of military dependents living off base are estimated and included. This number is estimated by applying current military-to-civilian personnel ratios and military dependent ratios.

Source: Appendix B

For the purposes of this analysis, it is assumed that on-base MFH and unaccompanied permanent party housing would be occupied at capacity at all times. Under the alternative action, on-base housing capability will increase moderately, providing accommodation for the increase in on base population presented in Table 4-17. The anticipated increase in off-base personnel would be substantial. Consequently, the influx of these personnel under the alternative action, and the resulting in-migration of their households, could result in an increase in demand for 3,929 housing units in the greater Enid region. Based on current vacancy rates, there are an estimated 2,914 housing units available in the region, which is insufficient to accommodate anticipated growth under the alternative action. Similarly, the in-migration of military and civilian families would increase school enrollments in the Garfield County schools, particularly the Enid Public School District. Based on military dependent ratios for Vance AFB, it is estimated that school enrollments could increase by approximately 1,906 students, representing growth in enrollment of 29.9 percent in the Enid Public School District and 20.5 percent in Garfield County.

Environmental Justice Concerns

The potential for environmental justice concerns exists only if adverse environmental impacts are anticipated and disadvantaged groups represent a disproportionate segment of the affected population. As presented in Section 3.3.9.1, minority and low-income populations do not represent a disproportionate share of the total population when compared with regional and state levels. In addition, there are no known concentrated areas of concern where children might be subject to special health or safety risks. In order to address the possibility of environmental justice concerns, potential health and safety factors were analyzed to determine whether any disproportionately high or adverse human health or environmental impacts could affect the human population. In addition, potential environmental health or safety hazards were examined to assess potential special risks to children. These environmental analyses indicate that no adverse environmental impacts to the human population are anticipated under the alternative action. As a result, no disproportionate environmental justice impacts would occur, nor would there be any special health or safety risks to children.

4.3.9.4 Cumulative Impacts

Although there are beneficial economic effects from planned construction projects under both action alternatives, in the short-term demand for skilled laborers and building supplies in the region could exceed available capacity. With regard to the cumulative effect of operational activities, under the proposed action population increases would offset minor population losses experienced in the region in recent years. Under the alternative action, population increases would more than offset recent losses, tap under-utilized housing and service capacity, and prompt economic growth in the region. The current regional housing stock and school capacity are not sufficient to accommodate the increase in demand that would occur. It is likely there would be challenges in meeting the housing, school, and service needs of the incoming base population.

4.3.9.5 Measures to Reduce Impacts

Potential socioeconomic impacts associated with implementation of the proposed action are related to added pressure on the construction industry. While these impacts are not insignificant, they would not change the nature of the economic conditions communities generally face during periods of growth. As a result, no specific mitigations are identified under the proposed action.

Under implementation of both the proposed action and the alternative action, the anticipated change in the number of personnel and dependents in the region would affect local housing markets and community services. Coordination with the city of Enid and area school districts would help ensure housing and school capacity is available to accommodate projected incoming population.

4.3.10 Air Quality

4.3.10.1 Methodology

Project generated air emissions were analyzed to determine if:

- There would be a violation of a NAAQS.
- Emissions would contribute to an existing or projected air quality violation.
- Sensitive receptors would be exposed to substantial pollutant concentrations.
- There would be an increase of 10 percent or more in Garfield County criteria pollutants.
- Any significance criteria established by the Oklahoma SIP would be exceeded.
- A permit to operate would be required.
- A change to the Title V permit would be required.

Under existing conditions, the ambient air quality in Garfield County is classified as unclassifiable/attainment for all national ambient air quality standards as defined in 40 CFR Part 50.

Oklahoma has developed a SIP as required by Section 110 of the CAA to provide for the implementation, maintenance, and enforcement of the NAAQS for each air quality region within the state. The SIP is the primary vehicle used by USEPA for enforcement of federal air pollution legislation.

Section 176(c) of the CAA provides the basis for the relationship between the SIP and federal projects. It states that no federal agency shall support or approve any activity or action that does not conform to an implementation plan after the plan has been approved or promulgated under Section 110. This means that federally supported or funded activities would not (1) cause or contribute to any new violation of any air quality standard, (2) increase the frequency or severity of any existing violation of any standard, or (3) delay the timely attainment of any standard or any required interim emission reductions or other milestones in any area. In accordance with Section 176(c), USEPA promulgated the *General Conformity Rule* that is codified at 40 CFR Part 51, Subpart W. The provisions of this rule apply to state review of all federal general conformity determinations submitted to the state pursuant to 40 CFR Part 51, Subpart W. The *General Conformity Rule* only affects federal actions occurring in nonattainment and maintenance areas. Since Vance AFB is located in an attainment area, the Air Force does not plan to prepare a conformity determination for the proposed action at Vance AFB.

Even though a conformity determination is not required, the federal action must still comply with the conformity requirements of Section 176(c); that is, the federal action may not exceed the threshold and criteria outlined above. For impacts screening in this analysis, a more restrictive criteria than found in the *General Conformity Rule* was used.

Rather than comparing project emissions to 10 percent of a region's inventory (as required by the *General Conformity Rule*), emissions were compared to 10 percent of Garfield County's year 2002 NEI for each pollutant, a more restrictive comparison. Therefore, the 10 percent criterion for each pollutant has been selected to determine if the proposed project causes adverse impacts to air quality.

Air quality effects would occur during construction and demolition activities, realignment of personnel, and aircraft operations associated with the proposed action and alternative action. Intermittent construction and demolition related effects would result from fugitive dust (particulate matter) and combustive emissions generated by facility construction and demolition sources to include: (1) grading equipment; (2) stationary equipment (generators, saws, etc.); (3) mobile equipment (forklifts, dump trucks, backhoes, graders, etc.); (4) architectural coating; (5) asphalt paving; and (6) construction worker commuting. Operational effects would occur from stationary sources such as boilers/space heaters used for heating; personnel realignment (commuter trips, government vehicle usage, space heating, facility heating, and a variety of common sources that occur from similar support activities found at other representative bases); and aircraft operations (landing/takeoffs, closed pattern operations, ground support equipment, jet engine test cells, etc.).

The methods selected to analyze air quality effects depend on the type of emission source being examined. The primary emission source categories associated with the proposed action and alternative action, as noted above, include construction and demolition activities and associated heating systems, realignment of personnel, and aircraft operations. Because the construction and demolition phase emissions are generally considered temporary, analysis is limited to estimating the amount of uncontrolled fugitive dust that may be emitted from disturbed areas, the amount of combustive emissions that may be emitted from worker commutes and construction equipment, and fugitive emissions from architectural coatings and paving. Analysis of personnel realignment includes estimating emissions from vehicle-related trips, residential and facility heating requirements, government vehicle usage, and other miscellaneous sources associated with base activities. Analysis of aircraft operations includes estimating emissions, not only from flying activities, but also from operation of ground support equipment, engine trim tests, and jet engine test cells.

Fundamental steps in the evaluation of environmental effects on air quality are to identify the sources of the effect, identify the quantitative measures for evaluating the extent of the effect, and develop formulas for computing and assessing those measures. These formulations are based on the types of data that are generally available or can easily be collected for the proposed actions. For the proposed action and alternative action, the following emission sources anticipated to contribute to ambient air quality effects have been targeted for analysis:

- Construction and demolition activities.
- Boiler/space heater operation associated with buildings constructed and/or demolished.
- Personnel realignment.
- Aircraft operations.

The algorithms embodied in the Air Force Air Conformity Applicability Model (ACAM) were used to calculate emissions from the various sources previously discussed. The purpose of ACAM is to estimate air quality impacts from Air Force actions, force structure consolidations, and other unit/mission changes. The algorithms were used to calculate pollutant emission rates for the following criteria pollutants and criteria pollutant precursors: CO, NO_X, SO_2, PM_{10}, and VOC. Emission factors used in the model were obtained from established sources/computer models or were derived from available, representative Air Force installation emissions factors data. For a more detailed discussion of these algorithms and emission calculation methods, see the ACAM version 4.3 *User's Guide and Technical Documentation* (USAF 2005e and 2005f).

4.3.10.2 No Action Alternative

Under the no action alternative, there would be no increase in personnel or mission activity and no construction or demolition accomplished in support of the CIP or the BRAC program as it relates to Vance AFB. Therefore, the base's operational and indirect emissions would be identical to current baseline emissions presented in Chapter 3.

4.3.10.3 Proposed Action

The primary emissions source categories associated with the proposed action include construction and demolition activities, heating requirements due to any net increase/decrease in building space, personnel realignment, and aircraft operations. Because construction phase emissions are generally considered temporary, analysis is limited to estimating the amount of uncontrolled fugitive dust emissions that may be emitted from disturbed areas, fugitive VOC emissions from application of architectural coatings and paving activities, and the amount of combustive emissions that may be emitted from worker commutes and construction equipment. Analysis of boiler operation and mobile sources (vehicles, aircraft) during the operational phase consists of quantifying the emissions and evaluating how those emissions would affect progress toward maintenance of the national and state ambient air quality standards.

4.3.10.3.1 Construction Emissions

Fugitive and combustive emissions would be generated during the proposed construction and demolition activities under this alternative. Table 4-18 summarizes the conservative construction and demolition assumptions associated with the proposed action.

Table 4-18 Proposed Action Construction Emissions Calculation Inputs

	Square Feet	Acres
Construction		
One-story buildings	357,927	8.2
New pavement	525,863	12.1
Demolition		
One-story buildings	144,781	3.3
Pavement	217,145	5.0

Fugitive dust emissions from new construction activities would primarily be generated from site clearing, grading, cut and fill operations, and from vehicular traffic moving over the disturbed sites. Fugitive emissions would be greatest during the initial site preparation activities and would vary from day to day depending on the amount of land being worked, the level of construction activity, the specific operations, and the prevailing meteorological conditions. Fugitive dust emissions from demolition/renovation activities would be generated primarily from building dismemberment, debris loading, and debris hauling. Additional fugitive VOC emissions sources would result from the application of architectural coatings and from paving activities.

Combustion emissions would be generated by construction equipment needed to construct and/or demolish facilities to support the proposed action. Additionally there would be exhaust emissions from the POVs of the construction workers who commute to and from the base.

Fugitive and combustive emissions would produce slightly elevated short-term pollutant concentrations. In other words, effects from construction and demolition activities would be temporary and would fall off rapidly with distance from construction sites Table 4-19 summarizes the estimated fugitive and combustive emissions for the construction and demolition activities.

4.3.10.3.2 Operational Emissions

As noted previously, operational emissions (increase/decrease) would be associated with the heating requirements (boiler operation/space heating) due to any building space constructed or demolished as part of the proposed action. Based on construction and demolition details presented in Table 2-1, there will be a net increase of 321,152 square feet in building space under the proposed action. Additional emissions from boiler operations due to changes in building space heating requirements are provided in Table 4-19.

Table 4-19 Total Emissions, Proposed Action

Pollutant Emission Source	CO (tons per year)	NO_X (tons per year)	SO_2 (tons per year)	PM_{10} (tons per year)	VOC[1] (tons per year)
Construction					
Buildings	8.916	3.122	0.358	12.144	0.718
Facility Heating	0.280	0.344	0.002	0.024	0.018
Grading/Paving	0.384	0.660	0.068	17.266	0.094
Demolition					
Buildings	0.000	0.00	0.000	0.076	0.000
Facility Heating	-0.102	-0.126	0.000	-0.008	-0.006
Grading/Paving	0.050	0.188	0.020	5.152	0.020
Personnel Realignment	9.600	0.000	0.000	0.000	0.610
Aircraft Operations	75.338	9.664	1.616	3.130	11.574
Vance AFB Total	94.466	13.852	2.064	37.784	13.028
Garfield County (2002 NEI)	18,560.000	7,085.000	7,190.000	17,182.000	4,882.000
Percent of Garfield County Emissions[2]	0.51	0.20	0.03	0.22	0.27

[1]VOC is not a criteria pollutant. However, VOC is reported because, as an O_3 precursor, it is a controlled pollutant.

[2]Emission values reported are for one year out of the five total planning years.

AFB	Air Force Base	CO	carbon dioxide
NO_X	nitrogen oxide	NEI	National Emissions Inventory
VOC	volatile organic compound	O_3	ozone
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns	SO_2	sulfur dioxide

Calculations of pollutant emissions from aircraft operations were based on the annual number of landing-takeoff (LTO) and touch-and-go (TGO) cycles flown in conjunction with projected aircraft operations at Vance AFB. The rates of emissions from aircraft engines vary according to these types of aircraft operations. A LTO cycle includes an approach from 3,000 feet above ground level (AGL) to the airfield, landing, taxi-in to a parking position, taxi-out to the runway, take-off, and climb-out to 3,000 AGL. A TGO cycle is identical to a LTO cycle except that all taxi time has been excluded (in this analysis, TGOs were assumed to approximate closed pattern operations). Only those portions of the flying operation that take place below the atmospheric mixing height are considered (these are the only emissions presumed to affect ground level concentrations). The 3,000 feet AGL ceiling was assumed as the atmospheric mixing height above which any pollutant generated would not contribute to increased pollutant concentrations at ground level. Therefore, all pollutant emissions from aircraft generated above 3,000 feet AGL were excluded from the analysis.

Under the proposed action, Vance AFB would experience an increase in T-1, T-6, and T-38 flight operations as shown in Table 4-20 (refer to Section 4.3.1, Noise, for aircraft flight data).

Table 4-20 Increase in Flight Operations over Baseline, Proposed Action

Aircraft Type	LTOs/day	Closed Patterns/ Day	LTOs/year	Closed Patterns/ Year
T-1	19	16	4,940	4,160
T-6	47	114	12,220	29,640
T-38	20	45	5,200	11,700

LTO landing-takeoff

For the various flight profiles, Air Force-published fuel flow rates, emission factors, and times-in-mode were used by the ACAM model algorithms for estimating pollutant emissions. The calculated aircraft emissions rates also include emissions from engine testing, auxiliary power unit operation, and associated aircraft ground support equipment. An aircraft-related emissions summary for the proposed action is included in Table 4-19.

4.3.10.3.3 Indirect Emissions

Implementation of the proposed action would result in an increase in 250 personnel associated with the AFRC. This realignment action would increase emissions from commuting and the associated heating and other miscellaneous personnel-related emissions related to miscellaneous sources on base. Indirect emissions (e.g., emissions resulting from the growth-inducing impacts) are, therefore, expected to increase relative to the baseline. This increase in indirect emissions is captured in Table 4-19.

4.3.10.3.4 Proposed Action Total Emissions

Table 4-19 summarizes total emissions for the proposed action. As can be seen from the information presented in the table, increased emissions are minor when compared to the Garfield County emissions inventory and are well below the 10 percent criterion. It should be noted that emissions for one year are well below the 10 percent criteria limit. Due to the short-term effect of construction-related fugitive and combustive emission and the small area affected, there would be no potential adverse cumulative decrease in air quality associated with the proposed action activities.

4.3.10.4 Alternative Action

The primary emission source categories associated with the alternative action include construction and demolition activities, heating requirements due to any net increase or decrease in building space, personnel realignment, and aircraft operations. Because construction phase emissions are generally considered temporary, analysis is limited to estimating the amount of uncontrolled fugitive dust that may be emitted from disturbed areas and the amount of combustive emissions that may be emitted from worker commutes and construction equipment. Analysis of boiler operation and mobile sources (vehicles, aircraft) during the operational phase consists of quantifying the emissions and evaluating

how those emissions would affect progress toward maintenance of the national and state ambient air quality standards.

4.3.10.4.1 Construction Emissions

Fugitive dust from ground disturbing activities and combustive emissions from construction equipment would be generated during the construction and demolition activities under this alternative. Table 4-21 summarizes the construction and demolition assumptions associated with the alternative action.

Table 4-21 Alternative Action Construction Emissions Calculation Inputs

	Square Feet	Acres
Construction		
One-story buildings	1,770,713	40.6
New pavement	2,395,800	55.0
Demolition		
One-story buildings	658,750	15.1

Fugitive dust emissions from new construction activities would primarily be generated from site clearing, grading, cut and fill operations, and from vehicular traffic moving over the disturbed sites. Fugitive emissions would be greatest during the initial site preparation activities and would vary from day to day depending on the amount of land being worked, the level of construction activity, the specific operations, and the prevailing meteorological conditions. Fugitive dust emissions from demolition/renovation activities would be generated primarily from building dismemberment, debris loading, and debris hauling. Additional fugitive emissions sources would be the VOC emissions from the application of paints and from paving activities.

Combustion emissions would be generated by construction equipment needed to construct and/or demolish facilities to support the alternative action. Additionally, there would be exhaust emissions from the POVs of the construction workers who commute to and from the base.

Fugitive emissions would produce slightly elevated short-term pollutant concentrations. In other words, effects from construction and demolition activities would be temporary and would fall off rapidly with distance from construction sites. Table 4-22 summarizes the estimated total fugitive and combustive emissions for the construction and demolition activities.

Table 4-22 Total Emissions, Alternative Action

Pollutant Emission Source	CO (tons per year)	NO_X (tons per year)	SO_2 (tons per year)	PM_{10} (tons per year)	VOC[1] (tons per year)
Construction					
Buildings	16.662	6.146	0.684	42.258	1.470
Facility Heating	1.000	1.226	0.008	0.088	0.064
Grading/Paving	0.778	2.144	0.218	57.868	0.262
Demolition					
Buildings	0.000	0.000	0.000	0.160	0.000
Facility Heating	-0.216	-0.266	0.000	-0.018	-0.014
Personnel Realignment	188.162	9.14	0.13	0.184	12.124
Aircraft Operations	166.814	16.484	3.056	5.608	19.482
Vance AFB Total	373.200	34.870	4.100	106.150	33.390
Garfield County (2002 NEI)	18,560.000	7,085.000	7,190.000	17,182.000	4,882.000
Percent of Garfield County Emissions[2]	2.01%	0.49%	0.06%	0.62%	0.68%

[1]VOC is not a criteria pollutant. However, VOC is reported because, as an O_3 precursor, it is a controlled pollutant.

[2]Emission values reported are for one year out of the five total planning years.

AFB	Air Force Base	CO	carbon dioxide
NO_X	nitrogen oxide	NEI	National Emissions Inventory
VOC	volatile organic compound	O_3	ozone
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns	SO_2	sulfur dioxide

4.3.10.4.2 Operational Emissions

As noted above, operational emissions (increase/decrease) would be associated with the heating requirements (boiler operation/space heating) due to any building space constructed or demolished as part of the alternative action. Based on construction and demolition details presented in Table 2-1, there will be an additional 1,266,035 square feet in building space under the alternative action. Additional emissions from boiler operations due to changes in building space heating requirements are provided in Table 4-22.

Under the alternative action, Vance AFB would experience an increase in T-1, T-6, and T-38 flight operations as shown in Table 4-23 (refer to Section 4.3.1, Noise, for aircraft flight data).

For the various flight profiles, Air Force published fuel flow rates, emission factors, and times-in-mode were used by the ACAM model algorithms for estimating pollutant emissions. The calculated aircraft emissions rates also include emissions from engine testing, auxiliary power unit operation, and associated aircraft ground support equipment. An aircraft-related emission summary for the alternative action is included in Table 4-22.

Table 4-23 Increase in Flight Operations over Baseline, Alternative Action

Aircraft Type	LTOs/day	Closed Patterns/ Day	LTOs/year	Closed Patterns/ Year
T-1	21	18	5,460	4,680
T-6	76	187	19,760	48,620
T-38	51	112	13,260	29,120

LTO landing/takeoff

4.3.10.4.3 Indirect Emissions

Based on an analysis of potential new facilities (including administrative, training, and housing structures), it has been determined that the base has the potential to accommodate an additional 7,232 working personnel (military and civilian). The breakout of this working population is shown below:

- Military on base: 1,953.
- Military off base: 3,478.
- Civilian employees: 1,803.

This realignment action would increase emissions from personnel-related indirect emissions such as emissions from vehicle-related trips, residential and facility heating requirements, government vehicle usage, and other miscellaneous sources associated with base activities. Indirect emissions (e.g., emission resulting from the growth-inducing impacts) are therefore expected to increase relative to the baseline. This increase in indirect emissions is captured in Table 4-22.

4.3.10.4.4 Alternative Action Total Emissions

Table 4-22 summarizes total emission for the alternative action. Total emissions were reported for one year of the five-year planning period. As can be seen from the information presented in the table, increased annual emissions over the planning phase of the action are well below the established significance level – 10 percent of the Garfield County emissions inventory. It should be noted that at the end of the construction phase of the action, annual operational-related emissions would be below the 10 percent criterion for all pollutants. Due to the short-term effect of construction-related fugitive and combustive emission and the small area affected, there would be no potential adverse cumulative decrease in air quality associated with these construction activities.

4.3.10.5 Cumulative Impacts

The other ongoing actions would contribute to air pollution emissions during construction and demolition, and during the operation phase that occurs in the outyears after base construction and demolition activities are completed. The contribution from the

different phases would impact regional air quality goals and attainment standards, but the contribution from the proposed, alternatives, and other ongoing actions would be negligible. Even when construction and demolition and operational emissions are added together, total emissions are less than 10 percent of Garfield County's annual emissions. Project emissions would not contribute to other county emissions in any appreciable manner.

4.3.10.6 Measures to Reduce Impacts

It should be noted that the fugitive dust emissions were calculated assuming no dust control methods were utilized; however, fugitive dust emissions would be reduced with implementation of BMPs and use of control measures. The USEPA estimates that the effects of fugitive dust from construction activities would be reduced significantly with an effective watering program. In addition, the state requires that no person shall permit or allow the emissions of unconfined particulate matter from any activity, including vehicular movement; transportation of materials; and activities such as construction, alteration, demolition, or wrecking without taking reasonable precautions to prevent such emissions. BMPs will be employed to control fugitive dust from any construction activity and help prevent any dust related problems that may occur in the vicinity of construction projects. These management practices may include the following controls:

- Application of water or chemical dust suppressants to control fugitive particulate emissions from such activities as demolition of buildings, grading roads, construction, and land clearing.

- Application of asphalt, water, oil, chemicals, or other dust suppressants to unpaved roads, yards, open stockpiles, and similar sources.

- Removal of particulate matter from roads and other paved areas to prevent reentrainment, and from buildings or work areas to prevent particulate matter from becoming airborne.

- Sweeping vehicle/aircraft traffic areas where dust may accumulate either from carryover by construction equipment or from airborne settling.

- Reducing construction vehicle speed.

- Landscaping or planting of vegetation as soon as practical.

Combustive emissions from construction vehicles/equipment could be mitigated by efficient scheduling of equipment use, implementing a phased construction schedule to reduce the number of units operating simultaneously, and performing regular vehicle engine maintenance. The amount of emission reduction provided by these measures is not known with certainty because of the potential variables involved; however, it is assumed

that implementation of these measures would substantially reduce combustive emissions and air quality effects from construction activities.

4.3.11 Cultural Resources

Potential impacts of the proposed action were assessed by (1) identifying the nature and potential significance of cultural resources in potentially affected areas and (2) identifying activities that could directly affect cultural resources classified as historic properties. Historic properties (as defined by 36 CFR Part 800) are cultural resources included in or eligible for inclusion in the NRHP. The term "eligible for inclusion" includes both listed and eligible properties that meet NRHP listing criteria as outlined by 36 CFR Part 60.4. Therefore, cultural resources not yet evaluated are considered potentially eligible for the NRHP and are afforded the same regulatory consideration as nominated historic properties. Under Section 106 of the NHPA, when a federal action meets the definition of an undertaking, the federal agency must consult with the SHPO, Tribal Historic Preservation Officer (THPO) (as appropriate), and any other identified consulting parties. The federal agency is responsible for determining whether any historic properties are located in the area, assessing whether the proposed undertaking would adversely impact the resources, and notifying the SHPO and THPO (if necessary) of any adverse impacts.

Direct adverse impacts to archaeological sites eligible for listing on the NRHP may result from construction or demolition activities including clearing, grading, paving, utility installation, and earth moving. Indirect effects can occur from increased use of areas near or adjacent to archaeological sites resulting in vandalism, erosion, and other adverse effects.

4.3.11.1 No Action Alternative

Under the no action alternative, there would be no change from the baseline condition. Therefore, no archaeological or historic resources would be affected by the no action alternative.

4.3.11.2 Proposed Action

No archaeological sites have been identified on Vance AFB and there is an extremely low potential for intact archaeological resources due to the extensive land disturbance that has occurred previously with the development of Vance AFB. If archaeological materials were uncovered during the course of construction of the proposed action, the Base Historic Preservation Officer (BHPO) would be contacted and would inform appropriate federal, state, and local government officials and other public groups.

Based on the locations of cultural resources on Vance AFB, the proposed action would have no adverse impacts on archeological or historical resources (USAF 2002b).

4.3.11.3 Alternative Action

Impacts for the alternative action are the same as those for the proposed action since no additional archaeological or historical resources would be affected.

4.3.11.4 Cumulative Impacts

When considered with respect to other ongoing actions, neither the proposed nor the alternative actions are expected to contribute to cumulative impacts on cultural resources in or around Vance AFB.

4.3.11.5 Measures to Reduce Impacts

None of the structures identified as part of the proposed or alternative action has been identified as being historically significant (as of January 2007). As specified in the Vance AFB *Integrated Resources Management Plan*, if archaeological materials are uncovered during the course of construction, the BHPO would be contacted and would inform the appropriate federal, state, and local government officials and other public groups. These would include the SHPO and the seven tribal groups identified as occupying the Vance AFB vicinity: the Cherokee, Comanche, Wichita, Kiowa, Kiowa Apache, Cheyenne, and Arapaho Cherokee (USAF 2002b).

CHAPTER 5

LIST OF PREPARERS

Name/Organization	Degree	Professional Discipline	Years of Experience
Kent R. Wells, P.G. Science Applications International Corporation (SAIC)	B.S., Geology M.S., Industrial Hygiene	Environmental Scientist	20
Benjamin P. Elliott, P.E. SAIC	B.A., Physical Sciences, B.S., Civil Engineering, M.S.E., Petroleum and Geosystems Engineering,	Civil Engineer Geographical Information Specialist	10
Fred Fisher, SAIC	B.S. Environmental Engineering	Environmental Engineer	7
James A. Garrison, P.E., SAIC	M.E., Environmental Engineering, B.S. Agricultural Engineering	Environmental Engineer	30
Joshua B. Heiss, SAIC	B.S., Natural Resources and Environmental Science	Environmental Scientist	8
Irene M. Johnson, SAIC	B.S., Economics M.A., Economics	Economist	17
Brandi J. Mulkey, E.I.T SAIC	B.S., Environmental Engineering	Environmental Engineer Geographical Information Specialist	7
Victoria J. Wark SAIC	B.S., Biology	Biologist	18
William A. Wuest SAIC	M.P.A., Political Science B.S., Political Science	Noise Specialist	33

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CHAPTER 6

PERSONS AND AGENCIES CONSULTED

The following individuals were consulted during the preparation of this EA:

6.1 FEDERAL AGENCIES

United States Air Force

Vance Air Force Base

Captain Derek Marvel (71 OSS/OSOP)
Marilyn Wells (71 LRS/CE)
Mark Buthman (CSC/CE)
Shannon Elledge (CSC/CEV)

Eglin Air Force Base

Richard Henning (46 WS/WTS)

Headquarters Air Education and Training Command

Marion Erwin (HQ AETC/A7CVI)

United States Army Corps of Engineers, Tulsa District

United States Environmental Protection Agency, Region VI

Michael Jansky (Regional NEPA Environmental Review Coordinator)

United States Bureau of Indian Affairs, Southern Plains Regional Office

United States Fish and Wildlife Service

6.2 STATE AGENCIES

State of Oklahoma

The Honorable Brad Henry (Governor)

Oklahoma Department of Environmental Quality

Alex Dee (Land Protection Division)

Oklahoma Department of Wildlife Conservation, Natural Resources Section

State Historic Preservation Office, Oklahoma Historical Society

Oklahoma Archaeological Survey

Robert Brooks (State Archaeologist)

6.3 LOCAL AGENCIES

City of Enid

Chris Bauer (Planning Administrator)
Toby Pritchett (Solid Waste Supervisor)

Garfield County, Garfield County Commissioners

CHAPTER 7

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Appendix A

Interagency and Intergovernmental Coordination for Environmental Planning

APPENDIX A

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION FOR ENVIRONMENTAL PLANNING

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OKLAHOMA

BRAD HENRY, GOVERNOR

GREG D. DUFFY, DIRECTOR

DEPARTMENT OF WILDLIFE CONSERVATION

P.O. Box 53465 Oklahoma City, OK 73152 PH. (405) 521-3851

March 21, 2007

MAR 2 3 2007

Mr. Mark Buthman
CSC/CEV
140 Channel St., Ste 231
Vance AFB, OK 73705-5621

RE: Draft EA for Installation Development at Vance Air Force Base (VAFB)

Dear Mr. Buthman,

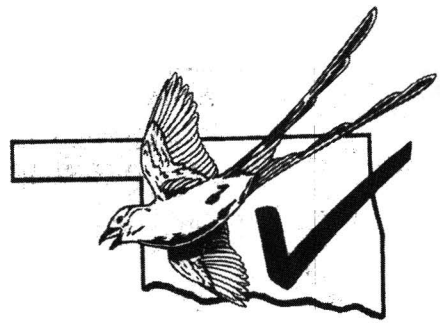
This is in response your letter dated February 22, 2007 requesting comments on the draft Environmental Assessment (EA) for implementation of the Base Realignment and Closure activities for VAFB. Vance Air Force Base is located in Enid, Garfield County, Oklahoma.

The Oklahoma Department of Wildlife Conservation has reviewed the EA document and has concluded that the actions described would cause no significant impacts to the fish ands wildlife of the state with the exception of any ongoing activities relating to bird strike avoidance. For this issue we recommend you coordinate with the United States Fish and Wildlife Service since they have jurisdiction over issues relating to migratory birds. For additional information, we recommend that you contact the Oklahoma Natural Heritage Inventory, 111 E. Chesapeake Street, Norman, Ok. 73019.

We appreciate the opportunity to review and provide comments on this project. If we can be of further assistance, please contact our Environmental Section at 405-424-6062.

Sincerely,

William Ray
Natural Resources biologist



Search for the Scissortail on Your State Tax Form

MAR 15 2007

Oklahoma Historical Society

Founded May 27, 1893

State Historic Preservation Office

Oklahoma History Center • 2401 North Laird Ave. • Oklahoma City, OK 73105-7914
(405) 521-6249 • Fax (405) 522-0816 • www.okhistory.org/shpo/shpom.htm

March 12, 2007

Mr. Mark Buthman
Vance AFB
140 Channel Street, Ste. #231
Vance AFB, OK 73705

RE: File 0541-07; Vance AFB Installation Development Draft Environmental Assessment Report

Dear Mr. Buthman:

We have received and reviewed the documentation concerning the referenced project in Garfield County. Additionally, we have examined the information contained in the Oklahoma Landmarks Inventory (OLI) files and other materials on historic resources available in our office. We find that there are no historic properties affected by the referenced project.

Thank you for the opportunity to comment on this project. We look forward to working with you in the future.

If you have any questions, please contact Charles Wallis, RPA, Historical Archaeologist, at 405/521-6381.

Should further correspondence pertaining to this project be necessary, the above underlined file number must be referenced. Thank you.

Sincerely,

Melvena Heisch
Deputy State Historic
Preservation Officer

MH:pm

Oklahoma Archeological Survey

THE UNVERSITY OF OKLAHOMA

February 27, 2007

Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB , OK 73705-5036

Re: Draft Environmental Assessment, Installation Development at Vance Air Force Base, Oklahoma. Legal Description: Sections 26, 35, and 36 T26N R7W; Sections 2 and 11 T21N R7W, Garfield County and Sections 12 and 13 T26N R9W, Alfalfa County, Oklahoma.

Dear Colonel Thelen:

I have reviewed the above referenced draft document and have some comment on its content. First, there are some errors on page 3-55 concerning the archaeological resources, especially if you include Kegelman AAF as part of the plan. While there are no previously recorded sites at Vance, there are four historic archaeological sites documented for Kegelman. These are 34AL17 – 34AL20. These were recorded during a survey at auxiliary field by Geomarine in 2002. Second, the numbers of sites listed for Garfield County are misleading. While there may be 546 recorded sites in the surrounding counties (which would depend on which counties were counted), there are only 54 sites in Garfield County. The total number of sites is also roughly 20,000, not 8,000.

Pertaining to the potential impacts to cultural resources discussed on pp. 4-61 – 4-62, there are a few points to consider. Vance AFB resides in an upland, very level setting which has (in my opinion) little potential for prehistoric sites. Thus, I suspect that base expansion would be unlikely to significantly affect the prehistoric cultural heritage. However, there is the potential for historic archaeological resources as well as the noted historic buildings. **I defer comment on the historic sites and buildings and potential effect to the State Historic Preservation Office.**

This review has been conducted in cooperation with the State Historic Preservation Office, Oklahoma Historical Society.

Sincerely,

Robert L. Brooks
State Archaeologist

Cc: SHPO

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129
918/581-7458 / (FAX) 918/581-7467

In Reply Refer To:
FWS/R2/OKES/
2007-B-0005

February 22, 2007

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB, Oklahoma 73705-5036

Dear Lieutenant Colonel Williamsen:

We have reviewed you letter notifying the U.S. Fish and Wildlife Service (Service) of the preparation of an Environmental Assessment (EA) for a proposed installation development based on the current Capital Improvements Program (CIP) and Base Realignment and Closure (BRAC) activities. Pursuant to the Council on Environmental Quality we would be pleased to serve as a cooperating agency for your EA. The Service's comments are submitted in accordance with section 7 of the Endangered Species Act (ESA), National Environmental Policy Act (NEPA), Migratory Bird Treaty Act (MBTA), and the Sikes Act.

Based on Vance's past wildlife surveys and our records, the Service believes that there are no federally-listed species present on either Vance Air Force Base or Kegelman Auxiliary Airfield (Kegelman). However, migratory birds, protected under the MBTA, are present throughout both installations, but more prevalent on Kegelman. The Service recommends incorporating migratory birds into your environmental review process.

We appreciate the opportunity to participate in the development of this EA. Please refer to the consultation number in the top, left corner. If you have any questions, please contact me or Hayley Dikeman at 918-382-4519.

Sincerely,

Jerry J. Brabander
Field Supervisor

cc: Refuge Manager, US Fish and Wildlife Service, Jet, OK
Oklahoma Department of Wildlife Conservation, Oklahoma City, OK
Attention: Natural Resources
Natalie Stennis, Vance Air Force Base, Enid, OK

HMD:plh:2007-B-0005 Vance Kegleman AFB BRAC CIP 12-29-07

FEB 26 2007

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705

US Fish and Wildlife Service
9014 E 21st Street
Tulsa OK 74129-1428

Dear Sir/Madam

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

The environmental impact analysis process for this proposal is being conducted in accordance with the Council on Environmental Quality guidelines pursuant to the requirements of the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your participation by reviewing the attached Draft EA and solicit your comments concerning the proposal and any potential environmental consequences.

Please provide written comments or information regarding the action within 30 days of this letter. Please address questions concerning this proposal to Mr. Mark Buthman, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB OK 73705-5621 or by telephone at (580) 213-7344. Thank you for your assistance.

Sincerely

CHRISTOPHER J. THELEN, Colonel, USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Mr. Robert Brooks
State Archaeologist
Oklahoma Archaeological Survey
111 E Chesapeake Street
Norman OK 73019-5111

Dear Mr. Brooks

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

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Please provide written comments or information regarding the action within 30 days of this letter. Please address questions concerning the proposal to Mr. Mark Buthman, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB, OK 73705-5621 or by telephone at (580) 213-7344. Thank you for your assistance.

Sincerely

CHRISTOPHER J. THELEN, Colonel USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

State Historic Preservation Office
Oklahoma Historical Society
2401 N Laird Ave
Oklahoma City OK 73105-5015

Dear Sir/Madam

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

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Sincerely

CHRISTOPHER J. THELEN, Colonel USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Oklahoma Department of Environmental Quality
Customer Assistance Program
1000 Northeast Tenth Street
Oklahoma City OK 73152

Dear Sir/Madam

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

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Please provide written comments or information regarding the action within 30 days of this letter. Please address questions concerning the proposal to Mr. Mark Buthman, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB, OK 73705-5621 or by telephone at (580) 213-7344. Thank you for your assistance.

Sincerely

CHRISTOPHER J. THELEN, Colonel USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Oklahoma Department of Wildlife Conservation
Natural Resources Section
1801 North Lincoln
Oklahoma City OK 73107

Dear Sir/Madam

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

The environmental impact analysis process for this proposal is being conducted in accordance with the Council on Environmental Quality guidelines pursuant to the requirements of the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your participation by reviewing the attached Draft EA and solicit your comments concerning the proposal and any potential environmental consequences.

Please provide written comments or information regarding the action within 30 days of this letter. Please address questions concerning the proposal to Mr. Mark Buthman, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB, OK 73705-5621 or by telephone at (580) 213-7344. Thank you for your assistance.

Sincerely

CHRISTOPHER J. THELEN, Colonel USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Southern Plains Regional Office
U.S. Bureau of Indian Affairs
P.O. Box 638
Anadarko OK 73005-0368

Dear Sir/Madam

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

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CHRISTOPHER J. THELEN, Colonel USAF

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Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Department of the Army
Corps of Engineers, Tulsa District
Planning, Environmental, and Regulatory Division
Regulatory Branch
1645 South 101st East Avenue
Tulsa OK 74126-4909

Dear Sir/Madam

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AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Mr. Chris Bauer
Planning Administrator
City of Enid
P.O. Box 1768
Enid OK 73701

Dear Mr. Bauer

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

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CHRISTOPHER J. THELEN, Colonel USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Mr. Michael Jansky
USEPA Region 6
Federal Assistance Section (6E-FF)
1445 Ross Avenue, Suite 1200
Dallas TX 75202-2733

Dear Mr. Jansky

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

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CHRISTOPHER J. THELEN, Colonel USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Christopher J. Thelen
Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

Garfield County Commissioners
Garfield County Courthouse
114 W Broadway
Enid OK 73701

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CHRISTOPHER J. THELEN, Colonel USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

22 February 2007

Colonel Richard A. Klumpp, Jr.
Commander, 71st Flying Training Wing
246 Brown Parkway, Suite 224
Vance AFB OK 73705-5015

The Honorable Brad Henry
Governor of Oklahoma
State Capitol Building
2300 N. Lincoln Blvd., Rm 212
Oklahoma City OK 73105

Dear Governor Henry

The United States Air Force is preparing an Environmental Assessment (EA) in which the Air Force proposes to develop the base and implement the Base Realignment and Closure Commission's final recommendations for Vance AFB. The Draft EA is included with this correspondence as an attachment.

The environmental impact analysis process for this proposal is being conducted in accordance with the Council on Environmental Quality guidelines pursuant to the requirements of the National Environmental Policy Act of 1969.

The following federal and state offices have been contacted in regards to this assessment:

US Fish and Wildlife Service
US Bureau of Indian Affairs
Oklahoma Department of Environmental Quality
Oklahoma Department of Wildlife Conservation
Oklahoma State Archaeologist
Oklahoma Historical Society
Department of the Army, Corps of Engineers, Tulsa District

In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we want to offer you the opportunity to participate by reviewing the attached Draft EA and provide your comments concerning the proposal and any potential environmental consequences. If you would like to make comments, we will need to receive your response by March 27, 2007, to enable us to comply with the terms of the executive order.

If you have any questions concerning the proposal, you may address them to Mr. Mark Buthman, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB OK 73705-5621 or by telephone at (580) 213-7344. Thank you for your assistance.

Sincerely

RICHARD A. KLUMPP, JR., Colonel, USAF

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, TULSA DISTRICT
1645 SOUTH 101ST EAST AVENUE
TULSA, OKLAHOMA 74128-4609

January 22, 2007

Regulatory Office

Mr. Mark Buthman
CSC/CEV,
140 Channel Street, Suite 231
Vance AFB, OK 73705-5623

Dear Mr. Buthman:

This is in reference to a letter signed from Mr. David L Williamsen, Deputy Commander, 71st Mission Support Group, concerning the implementation of installation development at Vance AFB. The proposed project is located in Section 26, Township 22 North, Range 7 West, in Enid, Garfield County, Oklahoma. We have reviewed the submitted data relative to Section 404 of the Clean Water Act (CWA).

Based on the provided information the Project Number 23, Storm Drain Project, would result in the placement of dredged or fill material, permanently or temporarily, into the unnamed tributary of Boggy Creek, a jurisdictional stream. This proposal is subject to regulation pursuant to Section 404 of the CWA, and a Department of the Army (DA) permit would be required prior to construction.

Enclosed please find a DA permit application and a Regulatory Program applicant information packet. Please complete the application and return it to our office.

Your project has been assigned Identification Number 2006-68 Please refer to this number during future correspondence. If further assistance is required, contact Mr. Marcus Ware at 918-669-7403.

Sincerely,

David A. Manning
Chief, Regulatory Office

Enclosures

JAN 31 2007

JAN 2 4 2007

Oklahoma Archeological Survey

THE UNVERSITY OF OKLAHOMA

January 19, 2007

Mark Buthman
CSC/CEV
140 Cannel Street, Ste. 231
Vance AFB OK 73705-5623

Re: US Air Force EA for Vance Air Force Base demolition and construction of facilities. Legal Description: Section 36 T22N R7W; E ½ Section 26 T22N R7W; E ½ E ½ Section 35 T22N R7W; NW ¼ SW ¼ Section 25 T22N R7W; all in Garfield County, Oklahoma.

Dear Mr. Buthman:

The Community Assistance Program staff of the Oklahoma Archeological Survey has reviewed the above referenced project in order to identify potential areas that may contain prehistoric or historic archaeological materials (historic properties). The location of your project has been crosschecked with the state site files containing approximately 18,000 archaeological sites that are currently recorded for the state of Oklahoma. No sites are listed as occurring within your project area, and based on the topographic and hydrologic setting; no archaeological materials are likely to be encountered. Thus an archaeological field inspection is not considered necessary. However, should construction activities expose buried archaeological materials such as chipped stone tools, pottery, bone, historic crockery, glass, metal items or building materials, this agency should be contacted immediately at (405) 325-7211. A member of our staff will be sent to evaluate the significance of these remains.

This environmental review and evaluation is performed in order to locate, record, and preserve Oklahoma's prehistoric and historic cultural heritage in cooperation with the State Historic Preservation Office, Oklahoma. Historical Society. In addition to our review comments, under 36CFR Part 800.3 you are reminded of your responsibility to consult with the appropriate Native American tribe/groups to identify any concerns they may have pertaining to this undertaking and potential impacts to properties of traditional and/or ceremonial value. Thank you.

Sincerely,

Elizabeth Thompson
Staff Archaeologist

Robert L. Brooks
State Archaeologist

ls

Cc: SHPO

111 E. Chesapeake, Room 102, Norman, Oklahoma 73019-5111 PHONE: (405) 325-7211 FAX: (405) 325-7604
A UNIT OF ARTS AND SCIENCES SERVING THE PEOPLE OF OKLAHOMA

Oklahoma Historical Society *Founded May 27, 1893*

State Historic Preservation Office
Oklahoma History Center • 2401 North Laird Ave. • Oklahoma City, OK 73105-7914
(405) 521-6249 • Fax (405) 522-0816 • www.okhistory.org/shpo/shpom.htm

January 10, 2007

Mr. Mark Buthman
Vance AFB
140 Channel Street, Ste. #231
Vance AFB, OK 73705-5623

RE: File #0541-07; Vance AFB & Kegelman Auxiliary Airfield CIP & BRAC Project, Garfield and Alfalfa Counties, Oklahoma

Dear Mr. Buthman:

We have reviewed the documentation relating to the referenced project. We have no objection to your continued program planning on this undertaking. Once the draft EA is received and reviewed, we will issue an opinion on the effect of the program on Oklahoma's cultural and historic resources. We appreciate your cooperation in the effort to identify and preserve the cultural heritage of Oklahoma.

If you have any questions, please contact Charles Wallis, RPA, Historical Archaeologist, at 405/521-6381.

Please reference the above underlined file number when responding Thank you.

Sincerely,

Melvena Heisch

Melvena Heisch
Deputy State Historic
Preservation Officer

MH:pm

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
Eastern Oklahoma Regional Office
P.O. Box 8002
Muskogee, OK 74402-8002

IN REPLY REFER TO:

Division of Environmental
Safety and Cultural Resources

JAN 0 9 2007

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance ABF OK 73705-5036

Dear Lieutenant Colonel Williamsen:

On December 22, 2006, the Bureau of Indian Affairs (BIA), Eastern Oklahoma Regional Office (EORO), received a request for comments from Vance Air Force Base (Vance AFB) for a proposed installation development project at Vance AFB in Garfield County, Oklahoma. The project includes demolition of facilities, alteration or replacement of old buildings, and new construction. The EORO has no comments regarding the project.

The project is within the jurisdictional area of the Southern Plains Regional Office (SPRO) which has been provided the notice by copy of this letter. As SPRO may have environmental and/or cultural resources concerns relating to the project, it is recommended that the Vance AFB coordinate directly with the SPRO on any of its concerns. The contact address is:

Dan Deerinwater, Regional Director
Southern Plains Regional Office
P.O. Box 368
Anadarko, Oklahoma 73005-0368

If any additional information is required, please contact Mr. Bob Coleman, Division Chief, Division of Environmental, Safety and Cultural Resources, EORO, at (918) 781-4660.

Respectfully,

Regional Director

United States Department of the Interior
BUREAU OF INDIAN AFFAIRS
Eastern Oklahoma Regional Office
P.O. Box 8002
Muskogee, OK 74402-8002

IN REPLY REFER TO:

Division of Environmental
Safety and Cultural Resources

JAN 0 9 2007

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance ABF OK 73705-5036

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Southern Plains Regional Office
P.O. Box 368
Anadarko, Oklahoma 73005-0368

If any additional information is required, please contact Mr. Bob Coleman, Division Chief, Division of Environmental, Safety and Cultural Resources, EORO, at (918) 781-4660.

Respectfully,

(Sgd) Jeanette Hanna

Regional Director

cc: Southern Plains Regional Office, Eastern Oklahoma Region

Oklahoma Archeological Survey

THE UNVERSITY OF OKLAHOMA

January 3, 2007

Mark Buthman
CSC/CEV
140 Channel Street, Ste. 231
Vance AFB OK 73705-5623

RE: US Air Force EA for Vance Air Force Base demolition and construction of facilities. Garfield County, Oklahoma.

Dear Mr. Buthman:

We have received the referenced project for review, but find that additional information is necessary. We would prefer to receive the project location plotted on a USGS 7.5 topographic quadrangle map (or xerox copy). Alternatively, we could use a legal description given in quarters (1/4, ¼,1/4), Section, Township, and Range. Street addresses or lot and block descriptions are usually **not** helpful.

NOTE: Please plot project locations on the enclosed map and return.

Please contact this office at (405)325-7211 if you require additional information.

Sincerely,

Marjy Duncan
Staff Archaeologist

Robert L. Brooks
State Archaeologist

111 E. Chesapeake, Room 102, Norman, Oklahoma 73019-5111 PHONE: (405) 325-7211 FAX: (405) 325-7604
A UNIT OF ARTS AND SCIENCES SERVING THE PEOPLE OF OKLAHOMA

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Garfield County Commissioners
Garfield County Courthouse
114 W. Broadway
Enid OK 73701

Dear Sir/Madame

The U.S. Air Force is preparing an Environmental Assessment (EA) for a proposal related to installation development based on the current Capital Improvements Program (CIP) and Base Realignment and Closure (BRAC) activities. The environmental analysis for the proposed action is being conducted by Vance Air Force Base (AFB) in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your participation by reviewing this memo describing the proposed action and alternatives, and solicit your comments concerning the proposal and any potential environmental consequences of the action. Two action alternatives and the no action alternative will be analyzed in the EA.

The proposed action includes implementation of installation development at Vance AFB. Under the proposed action, Vance AFB would implement the CIP (including demolition of facilities that are either dilapidated or in the footprint of proposed CIP construction) and implement the Vance AFB-related components of the BRAC program. The proposed action would include new building construction, alteration or replacement of old buildings, and demolition of some existing facilities. The proposed action would include construction of 631,238 square feet of new space, the renovation of 63,176 square feet of existing space, and the construction or upgrade of 73,656 square feet of pavement. Demolition would consist of approximately 421,790 square feet of facilities and 217,145 square feet of associated pavement. Major components of the CIP support the flight line; mission expansion area; flying training campus; and the community, recreation and fitness complex; as well as other development areas. There would also be approximately 51,766 square feet of building construction and 38,489 square feet of building demolition occurring at Kegelman Auxiliary Airfield.

BRAC project support would include construction of approximately 271,206 square feet of building space and 604,926 square feet of pavement and renovation of approximately 9,630 square feet of building space. In addition, demolition of approximately 37,025 square feet of building space and 20,369 square feet of pavement would be required.

Implementation of the BRAC-related projects would result in the addition of about 250 personnel associated with the Armed Forces Reserve Center.

Maximum Capability Alternative: An alternative to the proposed action is to maximize development potential at Vance AFB. Under this alternative, a maximum capability of Vance AFB would be identified. The maximum capability of the base would evaluate: the maximum supportable population; the base's ability to provide infrastructure support to this population; the maximum acreage available for development; and the maximum number of aircraft that could be supported at the base and in the training airspace. Under this alternative, Vance AFB could support an increase of on-base population by up to 7,402 personnel, increase habitable space on-base by 1,111,963 square feet, development of 34 parcels comprising 355 acres, and increase airfield operations to 384,328 annual operations.

No Action Alternative: Under the no action alternative, there would be no construction or demolition accomplished in support of the CIP or BRAC-related activities at Vance AFB. The no action alternative would limit the base's ability to successfully conduct its mission and to maintain wartime readiness and training.

The draft EA will be forwarded in its entirety for your review within the next couple of months; however, we are soliciting any initial comments or concerns regarding the proposal that you may have at this time so that we might incorporate them into our analysis in a proactive manner. A listing of Federal and state agencies that have been contacted is attached (Attachment 1) as is a projects list for the proposed action (Attachment 2). If there are any additional agencies that you feel should review and comment on the proposal or the draft EA, please let us know.

To facilitate cumulative impact analysis, we would also appreciate identification of major projects in the vicinity that may contribute to cumulative impacts associated with this proposal. Please return your comments to our consultant within 30 days of receipt.

The technical point of contact at SAIC is Mr. Kent R. Wells who can be reached at (210) 731-2217. Please forward any questions concerning the proposal or written comments to Mr. Mark Buthman, at (580) 213-3744, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB OK, 73705-5623. Thank you for your assistance.

Sincerely,

DAVID L. WILLIAMSEN, Lt Col, USAF

2 Attachments:
1. List of Agencies Contacted
2. Projects List

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Oklahoma Department of Wildlife Conservation
Natural Resources Section
1801 North Lincoln
Oklahoma City OK 73107

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The draft EA will be forwarded in its entirety for your review within the next couple of months; however, we are soliciting any initial comments or concerns regarding the proposal that you may have at this time so that we might incorporate them into our analysis in a proactive manner. A listing of Federal and state agencies that have been contacted is attached (Attachment 1) as is a projects list for the proposed action (Attachment 2). If there are any additional agencies that you feel should review and comment on the proposal or the draft EA, please let us know.

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AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Oklahoma Department of Environmental Quality
Customer Assistance Program
1000 Northeast Tenth Street
Oklahoma City OK 73152

Dear Sir/Madame

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Sincerely

DAVID L. WILLIAMSEN, Lt Col, USAF

2 Attachments:
1. List of Agencies Contacted
2. Projects List

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

U.S. Fish and Wildlife Service
Director, Ecological Services Office
222 Sam Houston Avenue, Suite A
Tulsa OK 74127

Dear Sir/Madame

The U.S. Air Force is preparing an Environmental Assessment (EA) for a proposal related to installation development based on the current Capital Improvements Program (CIP) and Base Realignment and Closure (BRAC) activities. The environmental analysis for the proposed action is being conducted by Vance Air Force Base (AFB) in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your participation by reviewing this memo describing the proposed action and alternatives, and solicit your comments concerning the proposal and any potential environmental consequences of the action. Two action alternatives and the no action alternative will be analyzed in the EA.

The proposed action includes implementation of installation development at Vance AFB. Under the proposed action, Vance AFB would implement the CIP (including demolition of facilities that are either dilapidated or in the footprint of proposed CIP construction) and implement the Vance AFB-related components of the BRAC program. The proposed action would include new building construction, alteration or replacement of old buildings, and demolition of some existing facilities. The proposed action would include construction of 631,238 square feet of new space, the renovation of 63,176 square feet of existing space, and the construction or upgrade of 73,656 square feet of pavement. Demolition would consist of approximately 421,790 square feet of facilities and 217,145 square feet of associated pavement. Major components of the CIP support the flight line; mission expansion area; flying training campus; and the community, recreation and fitness complex; as well as other development areas. There would also be approximately 51,766 square feet of building construction and 38,489 square feet of building demolition occurring at Kegelman Auxiliary Airfield.

BRAC project support would include construction of approximately 271,206 square feet of building space and 604,926 square feet of pavement and renovation of approximately 9,630 square feet of building space. In addition, demolition of approximately 37,025 square feet of building space and 20,369 square feet of pavement would be required.

Implementation of the BRAC-related projects would result in the addition of about 250 personnel associated with the Armed Forces Reserve Center.

Maximum Capability Alternative: An alternative to the proposed action is to maximize development potential at Vance AFB. Under this alternative, a maximum capability of Vance AFB would be identified. The maximum capability of the base would evaluate: the maximum supportable population; the base's ability to provide infrastructure support to this population; the maximum acreage available for development; and the maximum number of aircraft that could be supported at the base and in the training airspace. Under this alternative, Vance AFB could support an increase of on-base population by up to 7,402 personnel, increase habitable space on-base by 1,111,963 square feet, development of 34 parcels comprising 355 acres, and increase airfield operations to 384,328 annual operations.

No Action Alternative: Under the no action alternative, there would be no construction or demolition accomplished in support of the CIP or BRAC-related activities at Vance AFB. The no action alternative would limit the base's ability to successfully conduct its mission and to maintain wartime readiness and training.

The draft EA will be forwarded in its entirety for your review within the next couple of months; however, we are soliciting any initial comments or concerns regarding the proposal that you may have at this time so that we might incorporate them into our analysis in a proactive manner. A listing of Federal and state agencies that have been contacted is attached (Attachment 1) as is a projects list for the proposed action (Attachment 2). If there are any additional agencies that you feel should review and comment on the proposal or the draft EA, please let us know.

To facilitate cumulative impact analysis, we would also appreciate identification of major projects in the vicinity that may contribute to cumulative impacts associated with this proposal. Please return your comments to our consultant within 30 days of receipt.

The technical point of contact at SAIC is Mr. Kent R. Wells who can be reached at (210) 731-2217. Please forward any questions concerning the proposal or written comments to Mr. Mark Buthman, at (580) 213-3744, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB OK, 73705-5623. Thank you for your assistance.

Sincerely

DAVID L. WILLIAMSEN, Lt Col, USAF

2 Attachments:
1. List of Agencies Contacted
2. Projects List

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Department of the Army
Corps of Engineers, Tulsa District
Planning, Environmental, and Regulatory Division
Regulatory Branch
1645 South 101st East Avenue
Tulsa, OK 74126-4909

Dear Sir/Madame

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BRAC project support would include construction of approximately 271,206 square feet of building space and 604,926 square feet of pavement and renovation of approximately 9,630 square feet of building space. In addition, demolition of approximately 37,025 square feet of building space and 20,369 square feet of pavement would be required.

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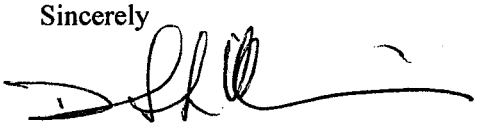

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AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Mr. Robert Brooks
State Archaeologist
Oklahoma Archaeological Survey
111 E. Chesapeake Street
Norman OK 73019-5111

Dear Sir/Madame

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DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Mr. Chris Bauer
Planning Administrator
City of Enid
P.O. Box 1768
Enid OK 73701

Dear Sir/Madame

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DAVID L. WILLIAMSEN, Lt Col, USAF

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AIR EDUCATION AND TRAINING COMMAND

Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Ms. Melvena Heisch
Deputy, State Historic Preservation Officer
Oklahoma Historical Society
2704 Villa Prom, Shepherd Mall
Oklahoma City OK 73107

Dear Sir/Madame

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Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

The Honorable Brad Henry
State Capital, Room 212
Oklahoma City OK 73505-5015

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Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

U.S. Bureau of Indian Affairs
Mr. Merritt E. Youndeer
Muskogee Area Director
Federal Building and U.S. Courthouse
Muskogee Area Office
Muskogee OK 74401

Dear Sir/Madame

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Lieutenant Colonel David L. Williamsen
Deputy Commander, 71st Mission Support Group
246 Brown Parkway, Suite 230
Vance AFB OK 73705-5036

December 20, 2006

Mr. Michael Jansky
USEPA Region 6
Federal Assistance Section (6E-FF)
1445 Ross Avenue, Suite 1200
Dallas TX 75202-2733

Dear Sir/Madame

The U.S. Air Force is preparing an Environmental Assessment (EA) for a proposal related to installation development based on the current Capital Improvements Program (CIP) and Base Realignment and Closure (BRAC) activities. The environmental analysis for the proposed action is being conducted by Vance Air Force Base (AFB) in accordance with the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, we request your participation by reviewing this memo describing the proposed action and alternatives, and solicit your comments concerning the proposal and any potential environmental consequences of the action. Two action alternatives and the no action alternative will be analyzed in the EA.

The proposed action includes implementation of installation development at Vance AFB. Under the proposed action, Vance AFB would implement the CIP (including demolition of facilities that are either dilapidated or in the footprint of proposed CIP construction) and implement the Vance AFB-related components of the BRAC program. The proposed action would include new building construction, alteration or replacement of old buildings, and demolition of some existing facilities. The proposed action would include construction of 631,238 square feet of new space, the renovation of 63,176 square feet of existing space, and the construction or upgrade of 73,656 square feet of pavement. Demolition would consist of approximately 421,790 square feet of facilities and 217,145 square feet of associated pavement. Major components of the CIP support the flight line; mission expansion area; flying training campus; and the community, recreation and fitness complex; as well as other development areas. There would also be approximately 51,766 square feet of building construction and 38,489 square feet of building demolition occurring at Kegelman Auxiliary Airfield.

BRAC project support would include construction of approximately 271,206 square feet of building space and 604,926 square feet of pavement and renovation of approximately 9,630 square feet of building space. In addition, demolition of approximately 37,025 square feet of building space and 20,369 square feet of pavement would be required.

Implementation of the BRAC-related projects would result in the addition of about 250 personnel associated with the Armed Forces Reserve Center.

Maximum Capability Alternative: An alternative to the proposed action is to maximize development potential at Vance AFB. Under this alternative, a maximum capability of Vance AFB would be identified. The maximum capability of the base would evaluate: the maximum supportable population; the base's ability to provide infrastructure support to this population; the maximum acreage available for development; and the maximum number of aircraft that could be supported at the base and in the training airspace. Under this alternative, Vance AFB could support an increase of on-base population by up to 7,402 personnel, increase habitable space on-base by 1,111,963 square feet, development of 34 parcels comprising 355 acres, and increase airfield operations to 384,328 annual operations.

No Action Alternative: Under the no action alternative, there would be no construction or demolition accomplished in support of the CIP or BRAC-related activities at Vance AFB. The no action alternative would limit the base's ability to successfully conduct its mission and to maintain wartime readiness and training.

The draft EA will be forwarded in its entirety for your review within the next couple of months; however, we are soliciting any initial comments or concerns regarding the proposal that you may have at this time so that we might incorporate them into our analysis in a proactive manner. A listing of Federal and state agencies that have been contacted is attached (Attachment 1) as is a projects list for the proposed action (Attachment 2). If there are any additional agencies that you feel should review and comment on the proposal or the draft EA, please let us know.

To facilitate cumulative impact analysis, we would also appreciate identification of major projects in the vicinity that may contribute to cumulative impacts associated with this proposal. Please return your comments to our consultant within 30 days of receipt.

The technical point of contact at SAIC is Mr. Kent R. Wells who can be reached at (210) 731-2217. Please forward any questions concerning the proposal or written comments to Mr. Mark Buthman, at (580) 213-3744, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB OK, 73705-5623. Thank you for your assistance.

Sincerely

DAVID L. WILLIAMSEN, Lt Col, USAF

2 Attachments:
1. List of Agencies Contacted
2. Projects List

List of Agencies Contacted

Department of the Army
Corps of Engineers, Tulsa District
Planning, Environmental, and Regulatory Division
Regulatory Branch
1645 South 101st East Avenue
Tulsa OK 74126-4909

U.S. Fish and Wildlife Service
Director, Ecological Services Office
222 Sam Houston Avenue, Suite A
Tulsa OK 74127

Oklahoma Department of Environmental Quality
Customer Assistance Program
1000 Northeast Tenth Street
Oklahoma City OK 73152

Oklahoma Department of Wildlife Conservation
Natural Resources Section
1801 North Lincoln
Oklahoma City OK 73107

Garfield County Commissioners
Garfield County Courthouse
114 W. Broadway
Enid OK 73701

Mr. Michael Jansky
USEPA Region 6
Federal Assistance Section (6E-FF)
1445 Ross Avenue, Suite 1200
Dallas TX 75202-2733

U.S. Bureau of Indian Affairs
Mr. Merritt E. Youndeer
Muskogee Area Director
Federal Building and U.S. Courthouse
Muskogee Area Office
Muskogee OK 74401

The Honorable Brad Henry
State Capital, Rm 212
Oklahoma City OK 73505-5015

Ms. Melvena Heisch
Deputy, State Historic Preservation Officer
Oklahoma Historical Society
2704 Villa Prom, Shepherd Mall
Oklahoma City OK 73107

Mr. Chris Bauer
Planning Administrator
City of Enid
P.O. Box 1768
Enid OK 73701

Mr. Robert Brooks
State Archaeologist
Oklahoma Archaeological Survey
111 E. Chesapeake Street
Norman OK 73019-5111

Project List, Proposed Action

Project Number	Description/ Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
1	Survival Equipment Shop (gaining mission)	BRAC	9,630 (renovate) 1,850 (building)	--	This project would require an addition to the building to provide adequate space necessary for the Egress Shop.
2	Construct Officers' Quarters (gaining mission)	BRAC	144,205 (building)	37,025 (building)	IFF students would require additional housing (48-room dormitory). No extra Officers 'Quarters space currently exists to support new missions.
3	ADAL Aircraft Parking Apron (gaining mission)	BRAC	442,989 (pavement) 1,119 (building)		This project would require construction of two rows of apron space on the north end of the existing aircraft apron and two rows of apron space on the south end of the existing aircraft apron.
4	Construct AFRC (gaining mission)	BRAC	89,904 (building)		This facility would provide organizational, maintenance shop, administrative, educational, assembly, library, learning center, vault, weapons simulator, barracks areas, and physical fitness areas for one Army Reserve unit and three Oklahoma Army National Guard units.
5	Extend Utilities to AFRC (gaining mission)	BRAC	--	--	This project would provide all utility distribution system connections to the existing base systems to support the new AFRC.
6	Construct Base Streets to AFRC (gaining mission)	BRAC	89,964 (pavement)	20,369 (pavement)	This project would provide all roads and connections to the existing base roads to support the new AFRC.
7	IFF, UPT, and FTS Squadron Facilities (gaining mission)	BRAC	27,081 (building)	--	To support the IFF, UPT, and FTS, Building 171 and 179 would require renovation and a one story facility would need to be constructed.
8	South Gate ECP (gaining mission)	BRAC	7,047 (building) 71,973 (pavement)	--	Construction of a single story facility consisting of site improvements, masonry walls, and standing seam metal roof would occur.

Project Number	Description/ Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
9	Fuel Systems Maintenance Hangar	CIP	22,692 (building) 5,500 (renovation)	6,746 (building)	Construction of a fuel maintenance dock with an administrative area and four adequately sized maintenance bays to accommodate aircraft assigned to Vance AFB would occur. Existing Fuel System Maintenance Dock and Building 188 would be demolished.
10	ADAL Squadron Facilities	CIP	27,632 (building) 48,882 (renovation)	--	Construction of an addition to the 32nd FTS, Building 541 would include two classrooms and squadron space. Renovation of existing facilities in Buildings 179, 183, and 541 would be required.
11	Control Tower	CIP	5,627 (building)	2,292 (building)	Construction of a control tower and installation of a tower cab would occur. The tower would provide nine floors plus the control tower cab and provide space for administrative, Chief Controller's office, training room, ATC Tower Simulator room, ready room, mechanical rooms, and electronic rooms.
12	Community Support and Professional Development Center	CIP	22,553 (building)	11,900 (building)	Construction of a Community Support and Professional Development Center that would house the Education Center, Base Library, and Airman and Family Readiness Center would occur. The existing Education Center/Library/Family Support Center (Building 314) would be demolished with the construction of the new facility.
13	Unaccompanied Enlisted Quarter	CIP	38,865 (building) 721 (pavement)	51,121 (building)	Construction of a three-story 96 room UEQ dormitory facility would occur.
14	Lodging – 63-Room Visiting Quarters Facility	CIP	41,329 (building)	31,902 (building)	Construction of a 63-room Visiting Quarters Facility would occur.

Project Number	Description/ Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
15	Physical Fitness Center/ HAWC Addition	CIP	23,134 (building) 7,994 (renovation)	7,097 (building) 9,876 (pavement)	Construction of areas for support storage, group fitness, cardiovascular area, stretching areas, the HAWC, indoor swimming pool, elevated running track, and circulation access to the existing fitness facility would occur. Renovation includes the lobby, administration areas, free weight training area, men and women locker rooms, and HAWC. Demolition would include the existing swimming facility and supporting facilities and an auxiliary facility to the Fitness Center Building 312.
16	Kegelman Fire Station	CIP	51,766 (building)	38,489 (building)	Construction of a Fire Station at Kegelman Auxiliary Airfield would occur.
17	Repair Petroleum, Oil, and Lubricant (POL) Piping and Lighting	CIP	--	--	Replacement of the existing light poles, wiring, and fixtures would occur.
18	Fuel Storage Tank	CIP	20,000 (pavement)	--	Installation of a 12,000-gallon double wall fuel tank system, fuel dispenser, leak detection, and remote tank gauging systems would occur.
19	Military Working Dog Kennel Facility	CIP	2,991 (building)		Construction of a kennel that would provide space for six working dogs would occur. The facility would also provide space for tack storage, office space, and food preparation.
20	Airfield Systems Facility Addition	CIP	1,215 (building)	80,400 (pavement)	Construction of an addition to Building 751 would include space for an additional nine personnel, storage area, male and female latrine, and break room. Demolition of existing parking and drive to provide appropriate ATFP standoff would occur. Construction of new parking space would also occur.
21	Entomology	CIP	1,800 (building) 800 (renovation)		Construction of a building for the CE Environmental Controls (pest management) function that complies with Air Force regulations would occur. This would include storage, canopies, and covered drive-through hardstand.

Project Number	Description/ Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
22	Construct Road/Close Scott Road	CIP	10,935 (pavement)	9,026 (building) 31,500 (pavement)	Construction of a concrete roadway from Young Road to Scott Road would occur. Construction of a parking lot on the east side of the proposed roadway and west of the Consolidated Logistics Complex Building 200 would also occur. Demolition of MWR and housing supply Building 260 and associated pavements, existing pavements on Scott Road just east of Elam Road, and existing parking on north side of Young Road as required would also be part of this project.
23	Storm Drain	CIP	42,000 (pavement)	--	This construction would upgrade the existing earthen channel to include a 12-foot wide concrete bottom for a total of 3,500 linear feet northwest of Runway 17C.
24	Perimeter Barrier East Boundary	CIP	11,088 (fencing)		Construction of a barrier fence to mitigate the possibility of a train derailment causing extensive damage to the Military Family Housing area would occur. The fence would be located on the east perimeter from the base park north to Woodring Parkway.
25	Replace Family Housing Phase II	CIP	176,000 (building)	120,400 (building)	Demolition and replacement of 88 housing units with replacement housing commensurate with local standards would occur.
26	Skills Center	CIP	12,234 (building)	7,900 (building)	This new facility would house the Automotive Skills Development Center, the Arts and Crafts Skills Development Center, a four-bay POV wash rack, as well as administrative space, secure storage areas, restrooms, service equipment space, and mechanical rooms. A state-of-the-art two-bay car wash separate from the building footprint would be provided to allow POV access at all times.
27	Transient Living Facility (TLF)	CIP	20,000 (building)	13,552 (building) 75,000 (pavement)	Construction of a new TLF complex to accommodate eight families would occur. The existing TLF would be demolished with this project.

Project Number	Description/ Location	Type of Project (CIP/BRAC)	Construction (square feet)	Demolition (square feet)	Summary
28	Replace Family Housing Phase III	CIP	174,000 (building)	120,400 (building)	Demolition and replacement of 87 housing units with replacement housing commensurate with local standards would occur.
29	Rod and Gun Club Facility (Kegelman)	CIP	7,500 (building)		Construction of a facility to support the Vance AFB Rod and Gun Club would be completed.
30	Fuels Off-Load Station	CIP	1,900 (building)	965 (building)	Construction of a facility to unload JP-8 jet fuel from tanker trucks near the new north industrial gate would occur. Demolition of existing facilities to include Building 264, removal of concrete pavement, fencing, and piping would be completed. Pipeline demolition would only include the removal of pipe situated aboveground; all underground piping would be cleaned, plugged, and abandoned in place.
Total			902,444 (building) 72,806 (renovation) 678,582 (pavement) 11,088 (fencing)	458,815 (building) 217,145 (pavement)	

Note: Construction and demolition areas obtained from the Implementation Plan.

ADAL Additions and Alterations
AFB Air Force Base
AFRC Armed Forces Reserve Center
ATC Air Traffic Control
ATFP Anti Terrorism and Force Protection
BRAC Base Realignment and Closure
CE Civil Engineering
CIP Capital Improvements Program
ECP Entry Control Point
FTS Flying Training Squadron
HAWC Health and Wellness Center
JP jet propulsion
MWR Morale, Welfare, and Recreation
POV Private Owned Vehicle
TLF Transient Living Facility
UEQ Unaccompanied Enlisted Quarters
UPT Undergraduate Pilot Training
IFF Introduction to Fighter Fundamentals

Appendix B

Capability Analysis

APPENDIX B

CAPABILITY ANALYSIS

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FINAL

CAPABILITY ANALYSIS

FOR THE
INSTALLATION DEVELOPMENT ON
VANCE AIR FORCE BASE, OKLAHOMA

United States Air Force
Air Education and Training Command
Vance Air Force Base, Oklahoma

February 2007

ACRONYMS AND ABBREVIATIONS

%	percent
AAFES	Army and Air Force Exchange Service
AC	Advisory Circular
ACES	Automated Civil Engineering System
AICUZ	Air Installation Compatible Use Zone
AETC	Air Education and Training Command
AFB	Air Force Base
ANSI	American National Standards Institute
ATC	Air Traffic Control
CFR	*Code of Federal Regulations*
CNG	compressed natural gas
dB	decibel
dBA	A-weighted decibel
DeCA	Defense Commissary Agency
DMP	Dormitory Master Plan
DSS	Defense Security Service
EA	Environmental Assessment
EP	effective population
ERP	Environmental Restoration Program
FAA	Federal Aviation Administration
FTW	Flying Training Wing
FY	fiscal year
Hz	hertz
IMC	Instrument Meteorological Conditions
IR	Instrument Route
kVA	kilovolt-ampere
kW	kilowatt
KWh	kilowatt-hour
L_{dn}	Day-Night Average Sound Level
LU	living unit
Mcf	thousand cubic feet
Mcf/d	thousand cubic feet per day
Mcf/hr	thousand cubic feet per hour
MFH	military family housing
mg	million gallons
mgd	million gallons per day
MOA	Military Operations Area
MWh	megawatt-hour
NA	not applicable
N/A	not available
NAF	Non-Appropriated Funds
OSI	Office of Special Investigations
PF	power factor
POTW	publicly owned treatment works
psi	pounds per square inch
SAIC	Science Applications International Corporation
SR	Slow Route
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
VMC	Visual Meteorological Conditions

FINAL

Capability Analysis

Installation Development Program on
Vance Air Force Base, Oklahoma

Department of the Air Force
71st Flying Training Wing
Vance Air Force Base, Oklahoma

February 2007

This Report Printed on 20% Recycled Paper

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Executive Summary

EXECUTIVE SUMMARY

The objective of this Capability Analysis is to quantify sustainable non-flying and flying mission growth through the year 2013 to define the maximum development potential for Vance Air Force Base considering limiting factors. The parameters evaluated in this Capability Analysis are analyzed only to that level of detail required to determine a general capacity for growth. The growth potential identified in this Capability Analysis will be used to define a potential development alternative to be assessed in the Installation Development Environmental Assessment.

The results of the on-base housing (bed space) analysis presented in Section 2.1 suggest that an additional 7,402 persons could be supported by future planned changes to the dormitories, lodging facilities, and military family housing areas when double occupancy is a consideration for all military personnel dormitories. The results of the land use analysis presented in Section 2.2 suggest that an additional 2,819 persons could be supported by planned additions to base facilities (associated with scheduled construction and demolition) and future developable areas; however, the factors used in estimating new population from the potential development on base do not account for double occupancy.

Primary differences between the supportable population estimates derived from the housing and land use analyses result from the use of generalized ratios between current on-base and off-base population (in the case of the housing analysis) and the use of site-wide averaging of construction and demolition parameters (in the case of the land use analysis). Although the two analytical methods appear to converge on a similar conclusion, the population estimate based on the housing analysis will be brought forward for further analysis in the Installation Development Environmental Assessment because it is considered a more accurate representation of the potential for population growth.

Table ES-1 summarizes the findings in this Capability Analysis. Based on the available information, Vance Air Force Base could have the capability to construct 1,770,713 square feet of facilities and associated pavements, provided the required demolition of 658,750 square feet of existing outdated facilities is implemented and that crosswind runways 04-22 and 13-31 are closed by the end of 2007 as currently planned. These actions would provide a net increase of 1,111,963 square feet of building space and an associated increase of 55 acres of pavements. Noise analysis indicates that based-aircraft operations have the capability to increase by 71 percent over the base recorded 2005 levels prior to exceeding the most recently published levels from the 2003 *Air Installation Compatible Use Zone Study*. Subsequent assessments of Vance Air Force Base's physical capability indicate the airfield and runways are generally sufficient to support the 71 percent increase in based-aircraft operations. The net increase in building space and operations would support up to 7,402 additional personnel (inclusive of students, military and civilian personnel, and on-base resident dependents), as demonstrated by the on-base housing analysis and currently available utility resources.

Table ES-1 Summary of Resource Constraints on Potential Development

Resource Usage Category	Allocation or Capability	Percent Utilized Basewide	Remaining Capability	Additional Population Supported
Base Land (acres)	2,125	83 percent	355	Not applicable
Current and Future Building Space (square feet)	2,903,274	62 percent	1,111,963	7,402[1]
Potable Water (million gallons per day)	0.80	25 percent	0.60	5,940[2]
Electrical System (megawatt-hours)	65,700	42 percent	38,200	Not applicable
Sewer System (million gallons per day)	0.50	28 percent	0.36	Not applicable
Gas System (thousand cubic feet per hour)	730,000	11 percent	650,540	Not applicable

Notes: Calculation details are provided in Appendix A.

[1]Housing analysis estimated an additional total population of 7,402 people (3,881 effective population) could be supported based on future dormitory additions, assuming waivers for double occupancy on all military personnel dormitories and that base year 2005 ratios between on- and off-base housing populations remain constant. Based on the land use analysis, approximately 2,819 additional people could be supported. The two population analyses present similar findings.

[2]600,000 gallon per day surplus is based on an average between the peak and average daily flows from 2005. The 5,940 effective 24-hour population (approximately 11,329 total population) can be supported based on a 101 gallon per day per person factor.

Chapter 1

Introduction

CHAPTER 1

INTRODUCTION

1.1 PURPOSE

The purpose of this Capability Analysis is to define the maximum development potential for Vance Air Force Base (AFB), Oklahoma (Figure 1-1) considering limiting factors. The primary objective is to quantify sustainable non-flying and flying mission growth through the year 2013.

The 71st Flying Training Wing (FTW) at Vance AFB is planning future installation development based on the current Capital Improvements Plan and Base Realignment and Closure activities. These activities would provide operational support for current missions, improve the effectiveness of training, replace inadequate facilities, correct current deficiencies, and accommodate new mission activities.

The information provided in this document will be used in an Installation Development Environmental Assessment (EA). The growth potential quantified in this Capability Analysis will be used to drive the environmental impact analysis process and, more specifically, to define a potential development alternative to be assessed in the Installation Development EA. The goal of this Capability Analysis is to provide sufficient development potential to allow Civil Engineering Environmental Management the flexibility to prepare in-house tiered environmental documentation for specific project requirements as they occur based on findings outlined in the Installation Development EA.

1.2 GENERAL METHODOLOGY AND APPROACH

This Capability Analysis will provide information on development potential for Vance AFB. The Capability Analysis is presented in two major sections: the Non-flying Mission and the Flying Mission. As part of the Non-flying Mission evaluation (Figure 1-2), the Capability Analysis determines the supportable population at Vance AFB (Section 2.1). The Capability Analysis also considers the net acreage available for development in each land use category (Section 2.2) that is free of any physical and/or operational constraints (e.g., floodplains, height constraints, safety easements, Environmental Restoration Program [ERP] sites, wetlands). The analysis also examines the base's ability to provide basic infrastructure support to the expanded population and facilities (Section 2.3). Flying Mission capability is assessed by considering increased flight operations, the effect these increases would have on noise around the airfield, the physical throughput capacity of the airfield and air traffic control, and possible availability constraints on military training airspace supporting unit operations (Section 3.0).

Figure 1-1 Location of Vance Air Force Base, Oklahoma

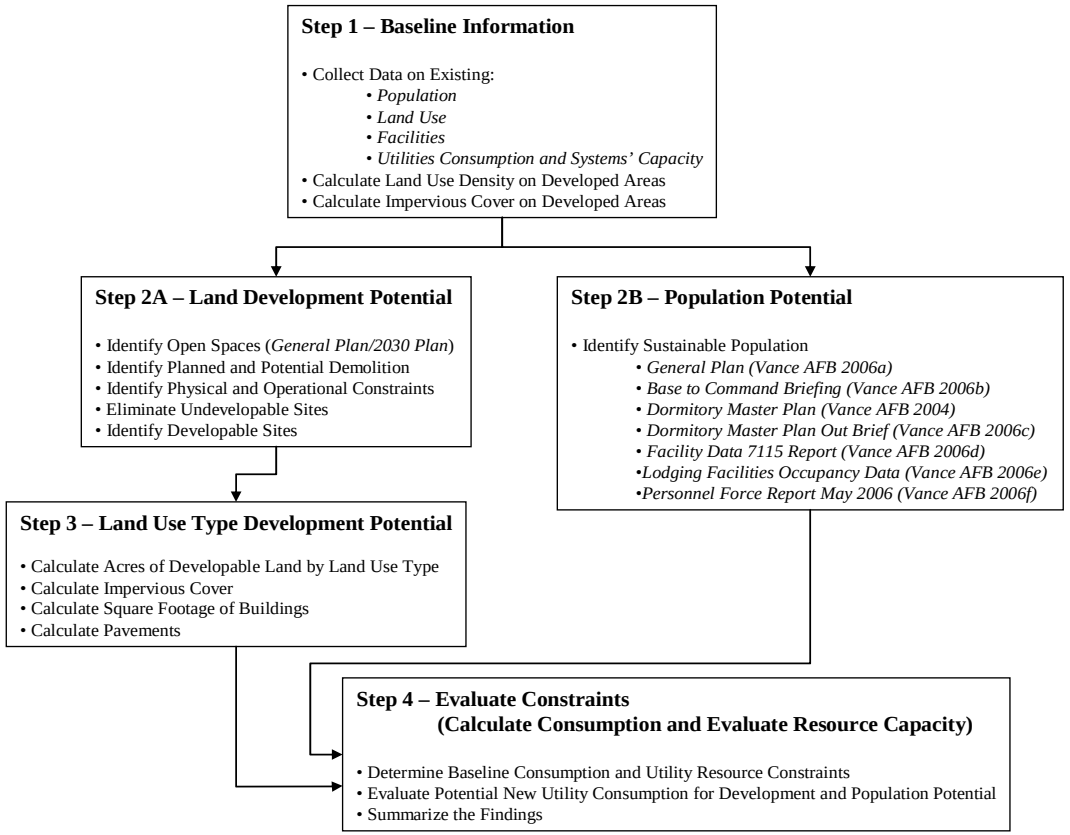

Figure 1-2 Process Flow Diagram for Non-flying Mission

After determining current baseline conditions, the first step in the Capability Analysis is to determine the sustainable population. The next step is to determine the maximum installation development potential based on available acreage per land use category from the future land use map. For Vance AFB, the evaluation of available acreage includes a review of all vacant and underutilized parcels; these include land associated with scheduled demolition projects during the planning period (before 2013) as well as facilities and buildings that exceed a recommended life expectancy of 67 years within the planning period (before 2013) that would potentially be available for reassignment (Air Education and Training Command [AETC] 2006). Local guidance identifies 50 years as the useful life of housing and lodging facilities. The resulting maximum developable land area and corresponding sustainable population are then evaluated with respect to potentially limiting factors such as utility systems. Finally, the flying capacity at the airfield and the associated training airspace, as well as the noise environment surrounding Vance AFB and the utilized training airspace are evaluated to determine the maximum growth potential for the flying mission.

Chapter 2

Non-Flying Mission Capability

CHAPTER 2

NON-FLYING MISSION CAPABILITY

2.1 SUSTAINABLE POPULATION EVALUATION

This Capability Study references current population, housing assets, and occupancy data collected at a site visit and interviews conducted during June 2006 in order to assess current and future population capability.

2.1.1 Baseline Population

The official population number referenced for Vance AFB by the 71 FTW staff in a recent 2006 *Base to Command Brief* was 6,850 people (Vance AFB 2006b). This population includes military personnel and their dependents, contractors, civilians, students, and extended population members including reserve and retired members and their families.

Additional population information was obtained in order to further limit this population to those individuals who would regularly utilize base facilities (Vance AFB 2006f). The estimate of base population for this Capability Study is restricted to those population members (e.g., all personnel, students, on-base dependents, and transient personnel) who would have a higher cumulative effect upon the potentially limiting base resources. In total, the 2005 baseline population of Vance AFB was 3,515 persons. Table 2-1 summarizes the baseline population at Vance AFB used for this Capability Study.

As referenced in Table 2-1, the total 2005 baseline population of 3,515 persons comprised military and dependents residing on base, military and civilian employees residing off base, and students residing on base. The effective population (EP) of 1,843 is defined as the estimate of the equivalent 24-hour population served by Vance AFB's utility systems. On-base residents use the Vance AFB utility systems at home and at work (i.e., 24 hours), but off-base residents use the utilities at the base only during work hours (i.e., 8 hours). Therefore, on-base residents have an EP factor of one, but off-base residents (present only one-third of the 24-hour period), have an EP factor of approximately one-third. EP is used to measure the capacity of those utility systems (e.g., water, sanitary sewer, and electrical) that have population-dependent usage rates (Section 2.3). Table 2-2 summarizes the baseline EP at Vance AFB used for this Capability Study.

Table 2-1 2005 Baseline Total Population, Vance AFB

Classification	Living on Base	Living off Base	Total
Military Personnel[1]	339	949	1,288
Civilian Personnel[2]	0	1,332	1,332
Average Daily Student Load[3]	196	227	423
Military Dependents[4]	425	NA[6]	425
Transient Personnel[5]	47	0	47
Total Population[6]	1,007	2,508	3,515

Source: Vance AFB 2006b; Vance AFB 2006f, Vance AFB 2006e

Notes:

[1]Military personnel (1,288) includes officers, enlisted military, DeCA/DSS/OSI/NAF/AAFES staff, and Navy/Marine Reserves. On-base (339) and off-base (949) breakdowns for military personnel were estimated from data provided for active duty USAF members (66 percent off base and 34 percent on base). These numbers were verified against available housing (339); only 230 MFH units plus 109 enlisted dorms available (filled to single occupancy).

[2]Civilian personnel (1,332) include all civil service, non-tax funded, contract, and other employees that are non-military. It was assumed that civilian personnel do not live on base.

[3]Average Daily Student Load (423) was obtained from May 2006 personnel data. Off-base students (227) were estimated from the total student population provided breakdown between on- and off-base personnel and the utilization of available unaccompanied housing (196) as depicted in the ACES report on base facilities (Real Property Inventory 7115 Data) queried on 20 June 2006 (Vance AFB 2006d).

[4]Number of dependents was obtained from the 2006 *Base to Command Brief* (Vance 2006b). On-base dependents estimated from the same ratios provided for active duty Air Force members. Off-base dependents estimated as 66 percent of 1,250 family members (or 825), but are excluded from the base population for this Capability Analysis since they do not significantly impact base consumption of resources.

[5]Transient personnel (47) were estimated from the number of available lodging rooms (73) and the average annual occupancy as reported in the FY2005 Lodging Facility Occupancy Report obtained from Billie J. Lunday, 71 FTW CSC/CS. Visiting Officers' Quarters (2 out of 6), Visiting Airman's Quarters (0 out of 0), Visiting Quarters (37 out of 57), and Temporary Lodging Facility (8 out of 10). [47 = 2+ 0 + 37 +8]

[6]Total population for this Capability Analysis excluded off-base dependents, retirees, guard reserve, and other members of the base extended population that have no significant cumulative effect on the availability of on-base resources. The official population reported in the 2006 *Base to Command Brief* was 6,850, which includes these extended populations.

AFB	Air Force Base	FY	fiscal year
EA	Environmental Assessment	OSI	Office of Special Investigations
MFH	military family housing	NAF	Non-Appropriated Funds
NA	not applicable	AAFES	Army and Air Force Exchange Service
DeCA	Defense Commissary Agency	ACES	Automated Civil Engineering System
DSS	Defense Security Service	USAF	United States Air Force

2.1.2 Limiting Factors

Limiting factors on population growth at Vance AFB include available undeveloped land outside the 3,000-foot by 3,000-foot clear zones, ERP sites, 100-year floodplains, and other operational or environmental constraints. Additional potential for growth is available in clear zones associated with underutilized runways and buildings (e.g., dormitories) that have either exceeded their intended life cycle or fail to meet new force protection standards (Vance AFB 2006b). All available land, whether currently unconstrained or associated with underutilized runways and buildings, is evaluated in more detail in Section 2.2.

Table 2-2 2005 Baseline Effective Population, Vance AFB

Category	Population	Effective Population Factor	Effective Population
Military on Base	339	1.00	339
Dependents on Base	425	1.00	425
Military off Base	949	0.3333	316
Trainees/Cadets on Base	196	1.00	196
Trainees/Cadets off Base	227	0.3333	76
Civilian Employees	1,332	0.3333	444
Transient Personnel	47	1.00	47
Total	3,515	--	1,843
Source: Vance AFB 2006f and Table 2-1			

2.1.3 Maximum Population

Potential population at Vance AFB was derived from an analysis of the on-base housing potential and the current breakdown between on- and off-base resident personnel. This analysis included a review of all military family housing (MFH), unaccompanied enlisted personnel quarters, unaccompanied officer housing, and all other on-base lodging including the Visiting Officers' Quarters, Visiting Quarters, and Temporary Lodging Facilities. The analysis assumed the off-base housing market is capable of absorbing additional growth associated with new mission changes at the base.

The 2006 *Dormitory Master Plan* (DMP) for Vance AFB is presently being updated to include several officers' dormitory replacement facilities that are shown in the *General Plan* as outyear funding priorities to be completed in the mid- to long-term period ending in 2030 (Vance AFB 2006a). The 2006 DMP will also include one new 48-room officers' dormitory and one 96-room new enlisted dormitory, which are listed in the *General Plan* as funding priorities to be completed within the planning period ending in 2013 (short-term). The planned number of enlisted units is reduced by 14 rooms from the current 110 and the planned number of officers' dormitories would increase from 200 to 248 in the short term. The 2006 *General Plan* indicates plans to privatize and reduce the available MFH from 230 to 229 units (Vance AFB 2006a).

Based on information obtained from the 2006 *Base to Command Brief*, Vance AFB is to receive 229 living units (LU) under the Housing Revitalization and Modernization effort. Fifty-four of these already exist (2004 through 2005 Military Construction program); the remaining 175 allocated LUs will be used to replace the 176 remaining units built in the 1960s (Vance AFB 2006b). The plan results in a loss of one housing unit overall. The newer housing areas will be less dense than the current 1960s MFH areas and an additional 125 acres recently acquired from the City of Enid will be used to help accommodate the new layout.

Table 2-3 presents the current, short term planned, and maximum planned population capacity for Vance AFB based on current and future on- and off-base housing availability. Short-term plans would be those projected in the Future Years Defense Program/Plan with a start date prior to the end of 2013. Maximum projected housing capability is based on an analysis of available land resources, aged facilities (greater than 50 years old), the 2004 and 2006 DMP, and the Housing Privatization plans. The estimated population supported by future available dormitory space considers double occupancy waivers for all available military personnel rooms. The current and planned rooms are presently considered as single occupancy.

Table 2-3 On-base Housing Analysis

Category	Baseline (2005) Population[1]	Current (2006) Housing Capability[2]	Planned (2013) Future Housing Capability[3]	Maximum Future Housing Capability[4]
Accompanied Housing (MFH)	230 military 425 dependent	230 military 575 dependent	229 military 573 dependent	238 military 595 dependent
Unaccompanied Housing	196 officer 109 enlisted	200 officer 110 enlisted	248 officer 96 enlisted	1,364 officer 860 enlisted
Transient Housing	47	73	71	71
Total On-base Population[5]	535 military 425 dependent 47 transient	540 military 575 dependent 73 transient	573 military 573 dependent 71 transient	2,462 military 595 dependent 71 transient
Off-base Population[6]	2,508	2,958	3,030	7,789
Total Base Population[6]	3,515	4,146	4,247	10,917
Effective Population[6]	1,843	2,174	2,227	5,724

Source: *Dormitory Master Plan* (Vance AFB 2004), *Dormitory Master Plan Outbrief Presentation* (Vance AFB 2006c), *General Plan* (Vance AFB 2006a), 7115 data obtained from ACES in June 2006 (Vance AFB 2006d), *Base to Command Brief* (Vance AFB 2006b)

Notes:

[1]Baseline population data is obtained from Table 2-1 of this report. Note that students are housed in the officers' unaccompanied housing.

[2]Current housing capability is based on ACES data (Vance AFB 2006d). On-base dependents estimated as 1.85 per MFH unit.

[3]Planned housing capability is based on *General Plan*, 2004 DMP, 2006 DMP Outbrief, and 2006 *Base to Command Brief.*

[4]Maximum housing capability is based on 2.3 houses per acre established from recent MFH construction, 125 acres of additional land for MFH over current plan, and 2.5 dependents per unit for MFH areas. For unaccompanied housing, population capability is based on replacement of officers' quarters with 1.5 as intense development (3-4 stories), additional dormitory development in 21 acres of open spaces, and considers double occupancy waivers for all military personnel dormitory rooms (682 x 2 officer and 430 x 2 enlisted).

[5]Total on-base estimate for military population capability includes all transient housing, student housing (officers' and enlisted), unaccompanied housing (officers' and enlisted), and accompanied housing. Maximum future housing capability for dependents estimated at 2.5 per MFH unit.

[6]Off-base populations for current, planned, and maximum capability are estimated from the ratio of on- to off-base population established from the 2006 baseline population data, which is 1.96 for active duty USAF personnel (664/339 off-base/on-base) and 2.49 overall (i.e. 2,508/1,007 off-base/on-base) (Vance AFB 2006f). Total base population is the sum of on- and off-base population. Effective population is the sum of the on-base residents and one third of the off-base residents who work on the base; this number is used in evaluating population-based utilities such as potable water consumption.

ACES	Automated Civil Engineering System
AFB	Air Force Base
EA	Environmental Assessment
MFH	military family housing
USAF	United States Air Force

2.1.4 Summary of Population

The maximum on-base housing (bed space) analysis compared to the 2006 baseline population suggests that an approximate 211 percent increase in total and effective service population is possible at Vance AFB, provided other base resources could accommodate the higher demand and privatization proceeds as planned. The population potentially supported by the base maximum capability scenario described in Table 2-3 is 10,917 people (total population) and 5,724 people (EP), compared to the 2005 baseline population of 3,515 people (total population) and 1,843 people (EP). The net increase in the base population would be 7,402 people for the total population and 3,881 people for the EP.

As further described in Section 2.2, the available land is capable of supporting the new buildings and facilities required by this projected population increase, provided 1) the demolition required for restructuring the base is performed and 2) runways 04-22 and 13-31 are closed as planned by spring of 2007. As further described in Section 2.3, the available potable water supplies and other base utilities are fully capable of meeting the demand associated with this projected population increase.

2.2 LAND USE EVALUATION

The *General Plan* provided the foundation of the land use analysis (Vance AFB 2006a). The following section describes the evaluation of developable spaces by land use type. Additional details related to the developable parcels are included in Appendix A.

2.2.1 Current and Future Land Use

As identified in the *General Plan*, there is limited open and undeveloped space on Vance AFB (Vance AFB 2006a). The installation's goal has been to consolidate compatible functions within the same land use areas to provide the highest quality training campus while implementing the latest security development strategies and providing aesthetic areas that enhance the quality of life for personnel. The land use categories used by the United States Air Force (USAF) are defined in Table 2-4. Figure 2-1 presents the current distribution of land uses for Vance AFB. Open Space is the base's largest current land use category in terms of acreage, accounting for 217 acres (not including the airfield and associated airfield pavement). The base's next two largest land use categories are Industrial and Accompanied Housing , which account for 86 and 79 acres, respectively.

The future land use map (see Figure 2-2) shows logical land uses that would support reasonably foreseeable changes and expansion in the various missions on Vance AFB. Table 2-5 summarizes the distribution of land uses based on existing and future land use plans for Vance AFB and the change in area between existing and future land uses for each land use category. Approximately 125 acres of additional land was obtained by the USAF and has been accounted for in the future land use plan.

Table 2-4 Land Use Categories

Land Use Categories	Description
Aircraft Operation and Maintenance	Aircraft maintenance hangers, shops, base operations, control tower, fire station, and flight training. Technical, classroom instruction, and field training.
Administrative	Headquarters, civilian personnel areas, education center, law center, and security operations.
Airfield	Associated clearances and safety zones.
Airfield Pavements	Runways, taxiways, and aprons.
Community Commercial	Commissary, exchange, club, dining hall, recreation center, gym, and theater.
Community Service	Post office, library, chapel, childcare center, and education center.
Housing Accompanied	Family housing, temporary living facilities, and associated support.
Housing Unaccompanied	Dormitories and visitors housing.
Industrial	Base engineering, maintenance shops, storage, warehousing, and utilities.
Medical	Hospital, clinic, and medical storage.
Open Space	Conservation area, buffer space, and undeveloped land.
Outdoor Recreation	Swimming pool outdoor courts and field, and golf course.

2.2.2 Limiting Factors

During review of base aerial photographs and land use planning maps to identify potentially developable areas, discriminating factors are considered that would prevent development. The most common discriminating factors in the evaluation include sites within the 3,000-foot by 3,000-foot clear zone, active ERP sites, established outdoor recreation areas, areas within projected high noise zones, wetlands, and sites that are too small to develop (less than one acre) within established setback requirements.

Two other factors are also considered in the identification of developable parcels: 1) age of the building and 2) proposed project location. The USAF planning guidance identifies an average useful life of 67 years for facilities (AETC 2006). Local guidance identifies 50 years as the useful life of housing and lodging facilities (Vance AFB 2006i). Therefore, any area with buildings older than 67 years or housing/lodging facilities older than 50 years (through the planning period of 2013) are also considered developable. Proposed locations for future projects (within the planning period) are identified as potentially developable parcels with the assumption that demolition of the current facility will be completed. The 2006 DMP was still under development at the time of this analysis; however, the proposed replacement of the officers' quarters due to force protection violations has been taken into consideration when determining proposed demolition of facilities.

Figure 2-1 Existing Land Use, Vance Air Force Base, Oklahoma

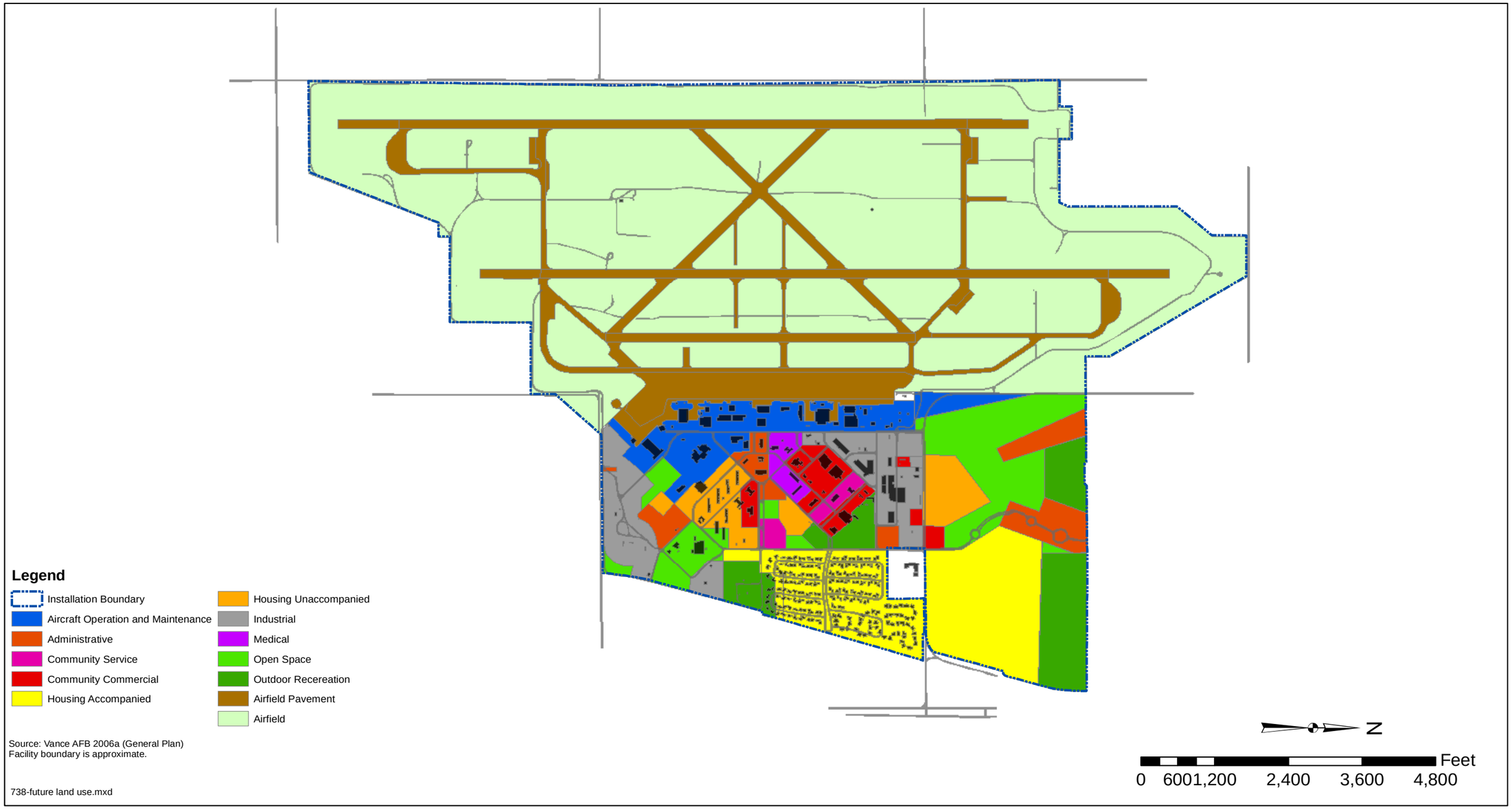

Figure 2-2 Future Land Use, Vance Air Force Base, Oklahoma

Table 2-5 Existing and Future Land Use Acreage by Land Use Category

Land Use Category	Existing Land Use		Future Land Use		Change in Land Use (acres)
	Acres	Percent Distribution	Acres	Percent Distribution	
Aircraft Operation and Maintenance	61	3.05	118	5.55	57
Administrative	17	0.85	53	2.50	36
Airfield	1,145	57.25	1,083	50.96	-62
Airfield Pavements	281	14.05	308	14.49	27
Community Commercial	20	1	33	1.55	13
Community Service	10	0.5	11	0.52	1
Housing Accompanied	79	3.95	161	7.58	82
Housing Unaccompanied	17	0.85	52	2.45	35
Industrial	86	4.3	85	4.00	-1
Medical	11	0.55	11	0.52	0
Open Space	217	10.85	123	5.79	-94
Outdoor Recreation	56	2.8	87	4.09	31
Total	2,000		2,125		125

Source: *General Plan* (Vance AFB 2006a)

Note:

Variations from *General Plan* future land use include reallocation of open space and outdoor recreation to aircraft operations, unaccompanied housing, and accompanied housing based on interviews held with the base planner in June and July 2006.

2.2.3 Maximum Developable Land

Base aerial photographs and land use planning maps have been reviewed, and 44 potentially developable parcels comprising 488 acres have been visually identified (Figure 2-3). Of the 44 sites, 10 have been eliminated due to physical and operational constraints[1] (Appendix A, Table A-1).

[1] Many of the potentially developable sites were included as parcels due to proposed activities in the *General Plan* (Vance AFB 2006a) and still have buildings or other facilities located upon them. Demolition would occur prior to construction of proposed projects.

The remaining 34 parcels (355 acres) are considered developable with the implementation of proposed demolition at project locations and the demolition of buildings older than 50 years. Available areas by land use category are summarized in Table 2-6. Additional details are presented in Appendix A, Table A-5.

Table 2-6 Developable Parcels by Land Use Category

Land Use Category	Developable Parcels (acres)	Non-developable Parcels (acres)
Aircraft Operation and Maintenance	14	44
Administrative	37	5
Airfield	0	0
Airfield Pavements	0	0
Community Commercial	11	0
Community Service	5	0
Housing Accompanied	131	0
Housing Unaccompanied	45	0
Industrial	15	8
Medical	0	5
Open Space	45	53
Outdoor Recreation	52	18
Total	**355**	**133**

Source: Appendix A (Tables A-1 and A-5)

Based on the current development ratios per land use area and the building density factors required to house the maximum population described in Section 2.1.3, the square footage of buildings and pavements that could be accommodated within these developable parcels are estimated. Vance AFB could accommodate an additional 1,111,963 square feet of building space with implementation of 1,770,713 square feet of construction and 658,750 square feet of associated demolition. The added pavements associated with these additional facilities would include approximately 55 acres (including roadways, sidewalks, and parking areas). The added impervious surfaces (inclusive of building footprints and pavements) would total approximately 118 acres (Appendix A). A summary of this potential development per land use area is provided in Table 2-7 and in Appendix A. Figure 2-3 depicts the potentially developable parcels on Vance AFB.

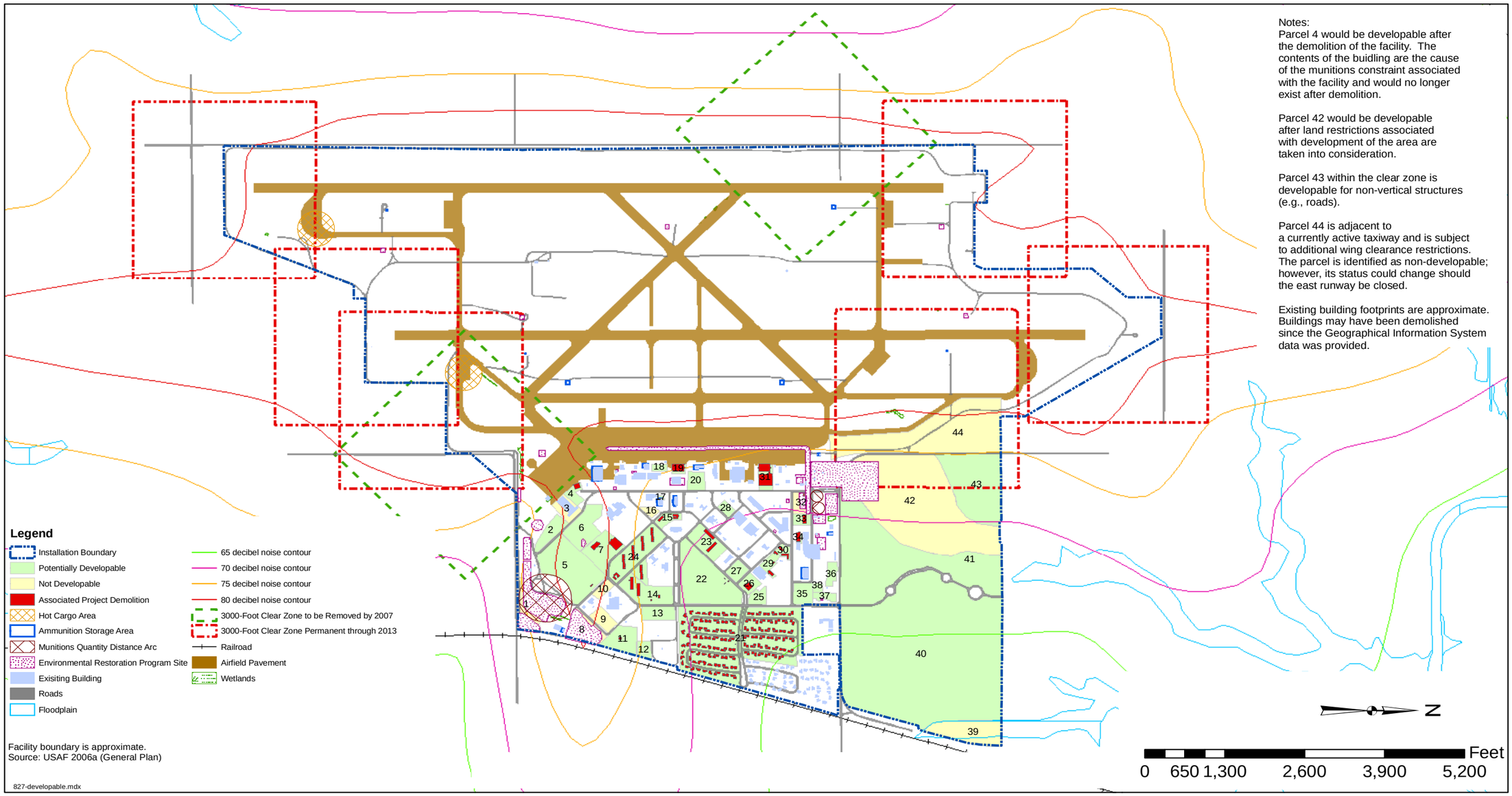

Figure 2-3 Potentially Developable Parcels, Vance Air Force Base, Oklahoma

Table 2-7 Potential Development per Land Use Category

Land Use Category	Developable Parcels (acres)	Future Building Capability (square feet)	Total Impervious Surface Capability (acres)	Required Building Demolition (square feet)
Aircraft Operation and Maintenance	14	133,185	7	138,019
Administrative	37	185,997	21	15,007
Airfield	0	0	0	0
Airfield Pavements	0	NA	NA	NA
Community Commercial	11	52,944	7	11,467
Community Service	5	40,997	2	22,157
Housing Accompanied	131	539,164	46	240,670
Housing Unaccompanied	45	768,809	21	155,145
Industrial	15	45,583	6	9,575
Medical	0	0	0	59,226
Open Space	45	116	3	560
Outdoor Recreation	52	3,918	5	6,924
Total	**355**	**1,770,713**	**118**	**658,750**

Source: Appendix A (Table A-5)

NA not applicable

Note: Demolition of existing facilities was not considered in the calculation of building and impervious surface square footage on this table. Demolition is presented in Table A-5.

2.3 INFRASTRUCTURE EVALUATION

2.3.1 Potable Water

The installation purchases all of its potable water from the City of Enid, Oklahoma. The public water supply well field nearest to Vance AFB is approximately 7 miles to the northeast. The Enid public water supply is obtained from three separate well fields located in the Quaternary West Cimarron Terrace aquifer (Vance AFB 2006a).

Water is delivered to the installation through a 10-inch main line at a line pressure of approximately 60 pounds per square inch (psi). This supply line runs parallel to Cleveland Road and enters the base along the northern boundary near the industrial gate. The base distribution system picks up the city main line directing the water first to a 300,000-gallon ground storage tank (facility 525) and then on to the elevated storage tank located behind the wing headquarters, Building 500. The water tower is 140 feet tall and can hold 500,000 gallons (Vance AFB 2006a). The Vance AFB potable water system is designed to supply a maximum of 0.8 million gallons per day (mgd), and the City of Enid has the capability of supplying 1.1 mgd (Vance AFB 2006b).

2.3.1.1 Baseline Potable Water Conditions

Water is distributed throughout the installation via approximately 20 miles of water mains and feeds of various sizes. Approximately 90 percent of the system is constructed of cast iron pipe. The remainder consists of asbestos, concrete, or polyvinyl chloride. The system configuration consists of a main loop with dead-end feeders to areas of buildings or large facilities. The system has valves throughout to allow isolation of an area for service or in case of line interruption (Vance AFB 2006a).

The street side fire hydrant system is connected directly to the potable water system and is therefore subject to the same 60-psi pressure as the potable water system. This is considered adequate for all anticipated firefighting needs. Two aboveground storage tanks are designated for fire suppression water for hangars 195 and 141. The tanks hold 250,000 gallons (hangar 195) and 360,000 gallons (hangar 141). These tanks are also connected to the potable water supply main. Facility fire protection systems include 32 wet pipe sprinklers, four dry pipe sprinklers, three action sprinklers, and three hangar deluge systems. The total present base water storage capacity is 1.41 million gallons. Fire fighting capabilities are restricted when the ground storage tank (facility 525) is less than half full (Vance AFB 2006a). Water tower gauging data and transfer pump data is continuously monitored and indicate that the typical variance in water levels in the ground storage tank are usually within 2 feet of the 20-foot target level in the tank (Vance AFB 2006g).

Potable water consumption at Vance AFB in fiscal year (FY) 2005 averaged approximately 0.148 mgd; the maximum daily consumption is estimated as 0.273 mgd based on consumption reported in the 5 November 2005 USAF Form 3552. Historical data reported in past USAF Form 3556 worksheets dating back to 1996 indicate historical annual potable water consumption has not exceeded 0.196 mgd. The present contractually guaranteed supplies are 0.33 mgd maximum and annualized average daily consumption of 0.233 mgd (Vance AFB 2006g).

2.3.1.2 Limiting Factors on Potable Water

Based on the above information, there does not appear to be supply related issues in the near term with the potable water resource. A recently completed water management plan indicates that historically, 14 percent of the water entering the potable water distribution system is accounted for by losses (Vance AFB 2006h and 2006g). Some water quality-related infrastructure enhancement projects are scheduled to eliminate existing long dead-end feeders, which become stagnated and lose chlorination. This condition is worse along the flightline section of the system. Stagnation prevention programs are implemented as necessary (when indicated by chlorination readings), and involve flushing sections of the system and circulating water between the ground storage tank and the water tower (Vance AFB 2006a).

2.3.1.3 Maximum Potable Water Capability

The base potable water system was designed to supply 0.8 mgd and the City of Enid is able to supply 1.1 mgd directly to Vance AFB (although the contractual supply limit is 0.33 mgd). Potable water consumption at Vance AFB in FY2005 averaged approximately 0.148 mgd; the maximum daily consumption is estimated as 0.273 mgd based on the consumption reported in the 5 November 2005 USAF Form 3552. Recent historical averages have not exceeded 0.2 mgd (Vance AFB 2006g). Table 2-8 summarizes the potable water system capability, current consumption, and surplus capability.

Table 2-8 Potable Water Capability Summary

Category	Value	Percent of Current Contract Supply[1]	Headroom from Designed
Potable Water Supply			
Enid City Supply Capacity (mgd)[2]	1.10	NA	NA
Vance System Design Capacity (mgd)[3]	0.80	72 percent[1]	NA
Contractual Supply Limit (daily max, mgd)	0.33	100	0.47
Potable Water Consumption			
FY2005 Average Daily (mgd)	0.148	45 percent	0.65
2005 Estimated Maximum Daily (mgd)	0.273	83 percent	0.52
2005 Average Daily with Fire Water Reserve[4]	0.91	275 percent	(-0.11)
2005 Maximum Daily with Fire Water Reserve[4]	1.03	313 percent	(-0.23)
Potable Water Storage			
Total Current Water Storage (mg)[5]	1.41	100 percent	NA
Estimated Storage Requirement (mg)[6]	0.83	59 percent	0.58

Source: Vance AFB 2006a, Vance AFB 2006b, and Vance AFB 2006g

Notes:

[1]Vance AFB system capacity is 72 percent of the current City of Enid supply capability of 1.1 mgd; percent of consumption to supply estimates are relative to the established Vance AFB contractual daily maximum limit of 0.33 mgd and headroom calculations are relative to the Vance AFB system limit of 0.8 mgd; percent of storage requirement is relative to currently available storage of 1.41 mg.

[2]Enid city supply based on the *Base to Command Brief* (Vance AFB 2006b).

[3]Vance AFB system design capacity obtained from *Base to Command Brief* (Vance AFB 2006b).

[4]Fire water reserve of 0.76 mg based upon an estimated worst-case fire requirement assuming both fire water tanks and half of the ground tank (0.36+0.25+0.30/2 = 0.76) need to be replenished on the same day. The reserve is added to the 2005 average and maximum daily average water consumption to establish potential worst-case consumption scenario under current conditions. This reserve is not a true limitation imposed on the potable water system. However, it is noteworthy for future planning efforts in fire protection.

[5]Water storage is based upon primary storage of one 500,000-gallon tank and one 300,000-gallon tank and secondary storage of one 360,000-gallon tank and one 250,000-gallon tank for a total of 1.41 mg.

[6]Estimated storage is calculated using 50 percent of 2005 average daily average and adding it to the estimated worst-case fire water requirement of 0.76 mg. Note that if the entire City of Enid supply of 1.10 mgd were consumed daily, the resulting storage requirement (1.31 mg) would still be met by current storage facilities assuming worst-case fire water requirement stays constant.

AFB	Air Force Base
FY	fiscal year
mgd	million gallons per day
mg	million gallons
NA	not applicable

Analysis of the 2005 average consumption data and the current design capability demonstrate a 0.6 mgd surplus in the current base capability and a 0.9 mgd surplus in the city's supply. Assuming non-population based demands on the potable water supply do not change significantly (e.g., industrial, commercial, irrigation, and fire protection), the surplus potable water based on local system design limitations would support an EP (equivalent 24-hour population) of at least 5,940 additional persons based on a typical average daily per capita consumption of 101 gallons (Vance AFB 2006h). Use of the value of 101 gallons per person is conservative in that it applies the highest consumption value presented in the recent water management plan to the entire effective population, but still indicates there is adequate water for a 322 percent increase in the current EP.

2.3.2 Wastewater Collection System

Wastewater treatment is provided by the City of Enid's wastewater treatment facility. The collection system leaves the main base area along the northern boundary at a point located behind the fuel storage tanks via a 12-inch gravity flow main line. From this point, the pipe runs alongside the stormwater channel through a utility easement located in the middle of the recently acquired Baker Tract and exits the base where the easement intersects the new base boundary approximately halfway between Fox Drive and Southgate Road (Vance AFB 2006a).

2.3.2.1 Baseline Wastewater Collection System Conditions

The Vance AFB wastewater collection system consists of approximately 13.5 miles of gravity feed and force main pipes. The majority of the installation is gravity fed and distributed through cast iron pipes. However, several areas remain that employ the use of the old clay tile pipes. In these cases, the majority have been retrofitted with Insituform liners. Insituform is an internal fiberglass insert for sewer piping that forms a seal to prevent water and plant intrusion. There are a total of eight lift stations and associated force mains to remove effluent from low-lying areas of the installation and those facilities with basement fixtures (Vance AFB 2006a).

Industrialized wastewater enters the domestic wastewater collection system at multiple locations. The majority of these sites are fitted with oil/water separators designed to filter out sludge pollutants before they enter the system. The primary source of industrialized wastewater is from two groundwater treatment units (Building 258 and ERP site DP-05). Both units treat volatile contaminants from extracted groundwater prior to release into the wastewater collection system. These units contribute a total of approximately 45,000 gallons per day into the system (Vance AFB 2006a).

Wastewater generation at Vance AFB in FY2005 averaged approximately 0.135 mgd; the maximum daily generation is estimated as 0.171 mgd based on data reported in the 4 November 2005 USAF Form 3552. Historical data reported in past USAF Form 3556 worksheets dating back to 1996 indicate historical annual wastewater generation has not exceeded 0.203 mgd. The present contract based effluent limitations are 0.27 mgd for maximum allowable flow and annualized average daily flow of 0.205 mgd

(Vance AFB 2006g). The city wastewater collection system can accommodate up to 0.500 mgd of flow coming from Vance AFB.

2.3.2.2 Limiting Factors on Wastewater Collection System

The city's wastewater treatment plant is presently operating at 80 to 85 percent of capacity, and Vance AFB is located at the far upstream end of the system (Vance AFB 2006a and 2006g). This is far more restrictive to future development than the constraints of the distribution system. The City of Enid has programmed an expansion of their wastewater treatment facility, which would expand that capacity beyond any anticipated needs of the installation (Vance AFB 2006a and 2006g).

There are no known or anticipated cross-connections between this system and the stormwater sewer system. There are also no known leaks or points of infiltration. All lines of these two systems were thoroughly inspected in 1990 and were found to be in good to excellent operating condition (Vance AFB 2006a and 2006g).

2.3.2.3 Maximum Wastewater Collection System Capability

Table 2-9 summarizes the wastewater collection system capability, current effluent rates, and surplus capability.

2.3.3 Electrical System

2.3.3.1 Baseline Electrical System Conditions

Electrical service is purchased jointly through Oklahoma Gas and Electric and Southwestern Power Administration and delivered via an overhead transmission line to a single source main distribution switching substation located on base adjacent to the corner of Fox Drive and Gott Road. Power enters base switchgear through an underground feed to five switches (and one bypass switch), then out through five underground feeders to four electric zones on the installation. The four electrical zones are fed primarily through underground feeds with only 3.5 miles of aboveground utility lines remaining on the installation (Vance AFB 2006a).

Each circuit can carry approximately 6,600 kilowatts (kW) from a primary power supply of 12,500 volts. The substation transformer is rated to 7,500 kW with an overload maximum of 9,000 kW. Power through circuits 1 and 2 has recently decreased dramatically due to the conversion of the simulator equipment from motion simulators to static simulators with newer processors that require far less energy consumption. The cooling load for that facility was dramatically reduced due to the equipment change creating further reduction in electrical demand. The bypass switch provides the ability to bypass the base switchgear and to interconnect the circuits in case of switchgear disruption. In this case, base electric load would be reduced to 3,500 kW, making mission critical items virtually failsafe (Vance AFB 2006a).

Table 2-9 Wastewater Collection System Capability Summary

Category	Value	Percent of Permitted Capacity	Percent of Current Design Capacity	Headroom from Designed
Wastewater Collection System Capacity				
Enid Collection System Capacity (mgd)	0.50	NA	NA	NA
Contractual Effluent Limit (daily max, mgd)	0.27	100%	NA	NA
Lift Station Capacity (mgd)	N/A	NA	NA	NA
Wastewater Collection System Effluent Flow Rates				
FY2005 Total Annual Flow (mgd)[1]	0.14	52%	28%	0.36
FY2004 Total Annual Flow (mgd)[1]	0.13	48%	26%	0.37
FY2000 Total Annual Flow (mgd)[1]	0.18	67%	36%	0.32
FY1999 Total Annual Flow (mgd)[1]	0.20	74%	40%	0.30
Estimated 2005 Peak Flow (mgd)[2]	0.17	63%	34%	0.33

Source: Vance AFB 2006a, Vance AFB 2006b, and Vance AFB 2006g

Notes:

[1]Annual contracted rates and annual effluent flows are restated in terms of a daily rate, which is not actually a daily limit. In addition, approximately 0.05 mgd of treated groundwater is included in all of the annual estimates. This is 10 percent of the city capacity and 19 percent of the current contracted maximum daily amount.

[2]Peak flow is estimated from USAF Form 3552 information (Vance AFB 2006g).

[3]Percent of design capacity and headroom from design capacity is expressed relative to the City of Enid POTW system capacity.

%	percent	POTW	publicly owned treatment works
mgd	million gallons per day	AFB	Air Force Base
N/A	not available	USAF	United States Air Force
NA	not applicable		

The substation has the physical capacity for additional circuits to support future development and it is assumed that the present electrical supply can handle significant load increases. A third party electrical study was completed in 2005 that verified this information. The study listed on-base projects so the utility company could plan to increase delivery capacity when necessary. However, for the purposes of this study, electrical supply is not considered a constraint to future development (Vance AFB 2006a).

A summary of electrical demands from USAF Forms 3556 and billing records for FY2005 is provided below (Vance AFB 2006g).

- Annual Usage: 27,547,680 kilowatt-hours (KWh[2])
- Monthly Average Usage: 2,295,640 KWh
- High Month Demand (August 2005): 4,427 kilowatts (kW[2])
- Low Month Demand (February 2005): 2,647 kW
- Contract Nominal Supply: 7,500 kW
- Instantaneous Peak (August 2005): 6,580 kW
- Contract Annual Supply (estimated[2]): 65,700,000 KWh
  $[7{,}500 kW \times 365 \times 24 = 65{,}700{,}000 KWh]$

[2] The relationship between kilowatts (kW), kilowatt-hours (KWh), kilovolt-amperes (kVA), and the power factor (PF) is the following: kVA*PF = kW and kW*(hours of service) = KWh.

2.3.3.2 Limiting Factors on Electrical System

Infrastructure is not a limiting factor for the electrical system. The electrical utility supply and distribution systems are currently serving the site adequately. The capacity of the supply system is considered more than adequate to meet present demands of the installation and it is thought that recent reductions in load demand due to changes in the simulator facility allow for substantial future development with little or no changes to the system. No part of the electrical supply or distribution system is considered a deterrent to ongoing operations or to future development.

The actual annual consumption is generally less than 42 percent of the annual contracted supply capacity. The peak loads are generally less than 73 percent of the overload supply capacity and 88 percent of the nominal supply capability.

2.3.3.3 Maximum Electrical System Capability

Table 2-10 summarizes the electrical system capability, current consumption, and surplus capability. The available interior building space could easily be doubled based on available electrical supply provided the general mix of added facilities is approximately the same in demand profile as the current facilities and appropriate distribution system upgrades are incorporated into individual project plans.

Table 2-10 Electrical System Capability Summary

Category	Value	Percent of Nominal Capacity	Percent of Actual Capacity	Headroom from Nominal
Electrical System Capacity				
Total Annual Capacity (MWh)	78,840	NA	100%	NA
Nominal Annual Capacity (MWh)	65,700	100%	83%	NA
Peak Overload Capacity (kW)	9,000	NA	100%	NA
Nominal Peak Capacity (kW)	7,500	100%	83%	NA
Electrical System Consumption				
FY2005 Consumption (MWh)	27,548	42%	35%	38,152
FY2005 Peak Demand (August) (kW)	6,580	88%	73%	920

Source: Vance AFB 2006a, Vance AFB 2006b, and Vance AFB 2006g

%	percent
AFB	Air Force Base
FY	fiscal year
kW	kilowatt
MWh	megawatt-hour, which is equivalent to 1,000 kilowatt-hour, and is the product of the power rating, ampere rating, and voltage rating in megawatts
NA	not applicable

2.3.4 Natural Gas Distribution System

2.3.4.1 Baseline Natural Gas Distribution System Conditions

Natural gas is supplied to the base by Tiger Natural Gas located in Tulsa, Oklahoma. The delivery system is owned and maintained by the Oklahoma Natural Gas Company. The supply line is a four-inch, high-pressure insulated black iron pipe, which runs parallel to Cleveland Road and then diagonally traverses the Baker Tract to a point along the northern boundary near the electric substation. This entry point is metered and is the sole source for natural gas on the installation. Pressure at the point of entry is approximately 200-psi and is considered an uninterruptible supply (Vance AFB 2006a). The contract based supply from the 4 November 2005 USAF Form 3551 indicates a supply of 100 thousand cubic feet (Mcf) per hour, 2,000 thousand cubic feet per day, and 730,000 thousand cubic feet per year (Vance AFB 2006g).

The base distribution system is comprised of approximately 13 miles of mains and feeders arranged in a dual looped main configuration with dead-end feeders to large areas of multiple facilities. The main cantonment loop and the family housing loop are interconnected providing continuous supply and allowing isolation if necessary. Each dead-end feed is fitted with an isolation valve in case of line interruption or needed service in that area. From the master entry meter, the pressure is reduced to approximately 15 psi for the loop mains. Pressure is again reduced to 12 psi from the main to the facility feeds and to 3.5 psi as it enters each facility. The majority of the original black steel pipe gas distribution system is still in use throughout the base. All steel pipes are cathodically protected. The installation initiative is to systematically replace all old steel pipe with new polyethylene pipe (Vance AFB 2006a).

In 1995, the installation installed a compressed natural gas (CNG) station to serve a 27 CNG vehicle fleet. The fleet was at one time as many as 54 vehicles and is now just 15 vehicles. This initiative is supplied from the main base loop and was conceived to promote better economic value and good environmental stewardship for the installation (Vance 2005a).

A summary of the FY2005 gas usage from USAF Form 3556 is provided below (Vance AFB 2006g):

- Annual Usage: 79,460 Mcf
- Monthly Average Usage: 6,621 Mcf
- Daily Average Usage: 218 Mcf
- High Month (January 2005): 18,443 Mcf
- Low Month (July 2005): 1,660 Mcf
- Estimated Peak Flow Rate (5 January 2005): 45 cubic feet per hour

2.3.4.2 Limiting Factors on Natural Gas Distribution

It is generally believed that there are no limiting factors to the implementation of the *General Plan* from the gas distribution system. The current peak consumption is less than 45 percent of the contracted supply. The natural gas supply and distribution system is considered in good condition and adequate to meet current demands of the installation. Although the supply is well beyond any anticipated future growth, the system should be analyzed on a case-by-case basis for the potential to expand. Additionally, dead-end feeders should be looped whenever the opportunity to economically do so presents itself (Vance AFB 2006a).

2.3.4.3 Maximum Infrastructure Capability Natural Gas Distribution System

Table 2-11 summarizes the natural gas distribution system capability, current consumption, and surplus capability.

Table 2-11 Natural Gas Distribution System Capability Summary

Category	Value	Percent of Supply	Headroom from Supply
Natural Gas System Supply			
Annual Supply (Mcf)	730,000	100%	NA
Daily Contract Rate Cap (Mcf/d)	2000	100%	NA
Pipeline Capacity (Mcf/hr)	100	NA	NA
Natural Gas System Consumption			
FY2005 Annual (Mcf)	79,460	11%	650,540
FY2005 Estimated Maximum Daily (Mcf/d)	218	11%	1,782
FY2005 Estimated Hourly Peak (Mcf/hr)	45	45%	55

Source: Vance AFB 2006a, Vance AFB 2006b, and Vance AFB 2006g

%	percent
FY	fiscal year
Mcf	thousand cubic feet
Mcf/d	thousand cubic feet per day
Mcf/hr	thousand cubic feet per hour
NA	not applicable

Chapter 3

Flying Mission Capability

CHAPTER 3

FLYING MISSION CAPABILITY

This section assesses Vance AFB's flying mission capacity. The assessment will consider three factors: 1) the airfield's and the airspace's capacity to support increased operations (which considers Air Traffic Control procedures and requirements); 2) noise levels in the immediate vicinity of the airfield; and 3) noise levels in the military training airspace which is used to support mission requirements.

The assessment addresses two conditions. First, existing operations in FY2005/FY2006 from the base and in the training airspace are described. Operational data were provided by operations staff at Vance AFB. These conditions are then compared with the potential increases in T-1, T-6, and T-38 operations to determine whether existing assets can support the increases.

Vance AFB provides primary and advanced pilot training. The base is the home of the 71st Flying Training Wing. The unit consists of five Flying Training Squadrons. Basic and advanced flying training is currently conducted in T-1, T-6, T-37, and T-38 aircraft. In the near future, the T-37 aircraft will be replaced by additional T-6 aircraft.

3.1 METHODOLOGY

3.1.1 Environmental Noise

Noise is considered to be an unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each has a different physical meaning or interpretation. The values depicted in these metrics incorporate a common factor. The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined with "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, not all sounds throughout this range are heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed A-weighted, and are shown in terms of A-weighted decibels (dBA). The metric associated with this assessment is described below.

3.1.2 Day-Night Average Sound Level

This metric, identified as Day-Night Average Sound Level (L_{dn}), is the most commonly used. Normally, it is used to assess aircraft operations around an airport. It sums the individual noise events and averages the resulting level over a specified length of time. Thus, it is a composite metric representing the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. This metric adds 10 decibels (dB) to those events that occur between 10:00 P.M. and 7:00 A.M. to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime. This cumulative metric does not represent the variations in the sound level heard. Nevertheless, it does provide an excellent measure for comparing environmental noise exposures when there are multiple noise events to be considered.

Public annoyance is the most common concern associated with exposure to elevated noise levels. When subjected to L_{dn} levels of 65 dBA, approximately 12 percent of the persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA, the percentage of annoyance is significantly lower (less than three percent), and at levels above 70 dBA, it is significantly higher (greater than 25 percent) (Finegold et al 1994).

L_{dn} metrics are the preferred noise metrics of the Department of Housing and Urban Development, the Department of Transportation, the Federal Aviation Administration (FAA), the United States Environmental Protection Agency (USEPA), and the United States Department of Veterans Affairs. While L_{dn} does provide a single measure of overall noise impact, it is fully recognized that it does not provide specific information on the number of noise events or the specific individual sound levels that do occur. For example, an L_{dn} of 65 dB could result from a very few noisy events, or a large number of quieter events. Although it does not represent the sound level heard at any one particular time, it does represent the total sound exposure. Scientific studies and social surveys have found the L_{dn} to be the best measure to assess levels of community annoyance associated with all types of environmental noise. Therefore, its use is endorsed by the scientific community and governmental agencies (American National Standards Institute [ANSI] 1980; ANSI 1988; USEPA 1974; Federal Interagency Committee on Urban Noise 1980; Federal Interagency Committee on Noise 1992).

It should be noted that ambient background noise is not considered in the aircraft noise calculations that are presented below. There are two reasons for this. First, ambient background noise, even in wilderness areas, varies widely, depending on location and other conditions. For example, studies conducted in an open pine forest in the Sierra National Forest in California have measured up to a 10 dBA variance in sound levels simply due to an increase in wind velocity (Harrison 1973). Therefore, assigning a value to background noise would be arbitrary. Secondly, and probably most important, it is reasonable to assume that ambient background noise in the project's radius of influence would have little or no effect on the calculated L_{dn}. In calculating noise levels, louder sounds dominate the calculations,

and overall, aircraft noise would be expected to be the dominant noise source characterizing the acoustic conditions in the region.

Using measured sound levels as a basis, the USAF developed several computer programs to calculate noise levels resulting from aircraft operations. Sound levels calculated by these programs have been extensively validated against measured data, and have been proven highly accurate.

3.1.3 Airfield Noise

The following terms are defined to provide a better understanding of how data are developed for input to the noise models used to calculate noise. Around an airfield, aircraft operations are categorized as takeoffs, landings, or closed patterns (which could include activities referred to as touch-and-gos or low approaches). Each takeoff or landing constitutes one operation. A closed pattern occurs when the pilot of the aircraft approaches the runway as though planning to land, but then applies power to the aircraft and continues to fly as though taking off again. The pilot then flies a circular or rectangular track around the airfield, and again approaches for landing. In some cases, the pilot may actually land on the runway before applying power, or in other cases, the pilot simply approaches very close to the ground. In either event, since a closed pattern operation essentially consists of a landing and a takeoff, it is considered two operations.

3.2 AVIATION RESOURCES

Airspace resources include the airfield at Vance AFB, the area in the vicinity of the airfield, and military training airspace used by the aircrew from Vance AFB to accomplish training requirements.

3.2.1 Current Aircraft Operations

Currently, Vance AFB maintains approximately 225,000 aviation operations annually (Marvel 2006). This equates to approximately 865 daily operations. Considering all types of flight activities, a scenario representing an "average busy day's" operations was developed. The operations considered include arrivals (landings), departures (takeoffs), and closed patterns. Noise calculations consider the frequency of flight operations, runway utilization, and the flight tracks and flight profiles flown by each aircraft.

These levels and types of activity are then combined with information on climatology, maintenance activities, and aircraft flight parameters, and processed through the USAF's BASEOPS/NOISEMAP (Moulton 1990) computer models to calculate L_{dn}. Once noise levels are calculated, they are plotted on a background map in 5-decibel increments from 65 dBA to 85 dBA, as applicable. Baseline contours resulting from the aircraft conversion (T-37 to T-6) are shown in Figure 3-1, which also includes the 65 dBA contour from the most recently published Air Installation Compatible Use Zone (AICUZ) map (USAF 2003).

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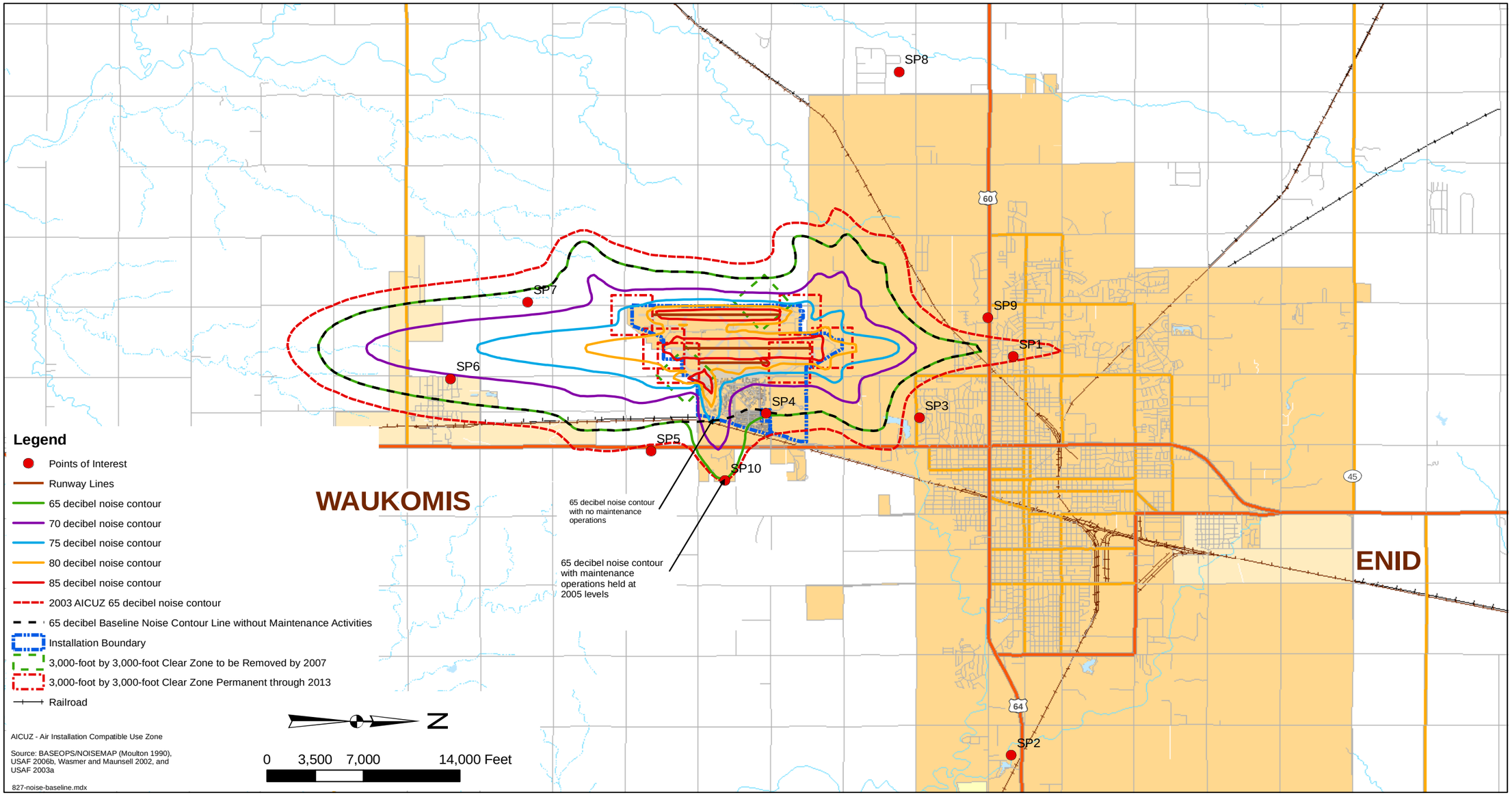

Figure 3-1 Existing Noise Contours

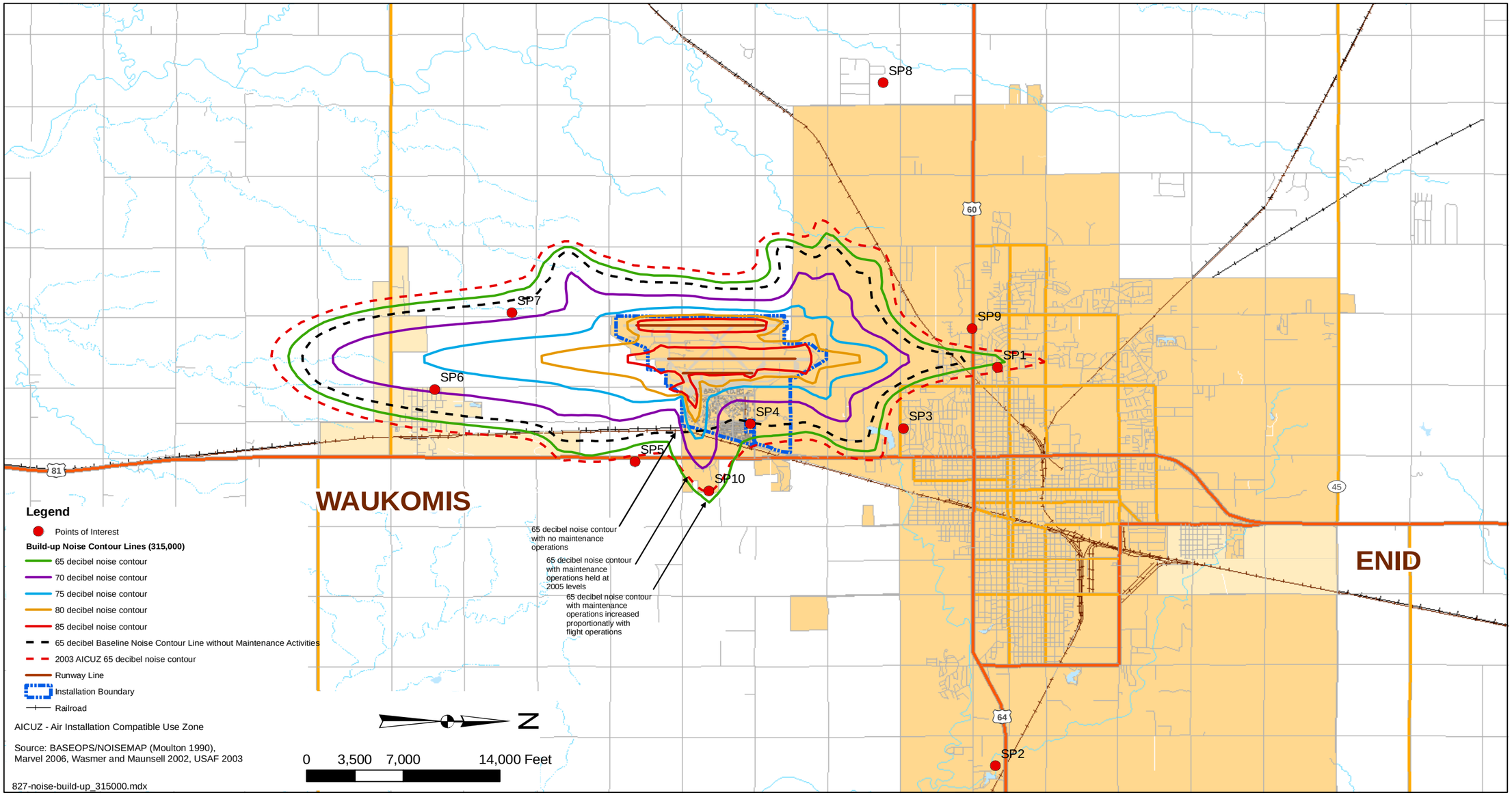

Figure 3-2 Noise Contours after Build-up from 2005 Baseline Aircraft Operations

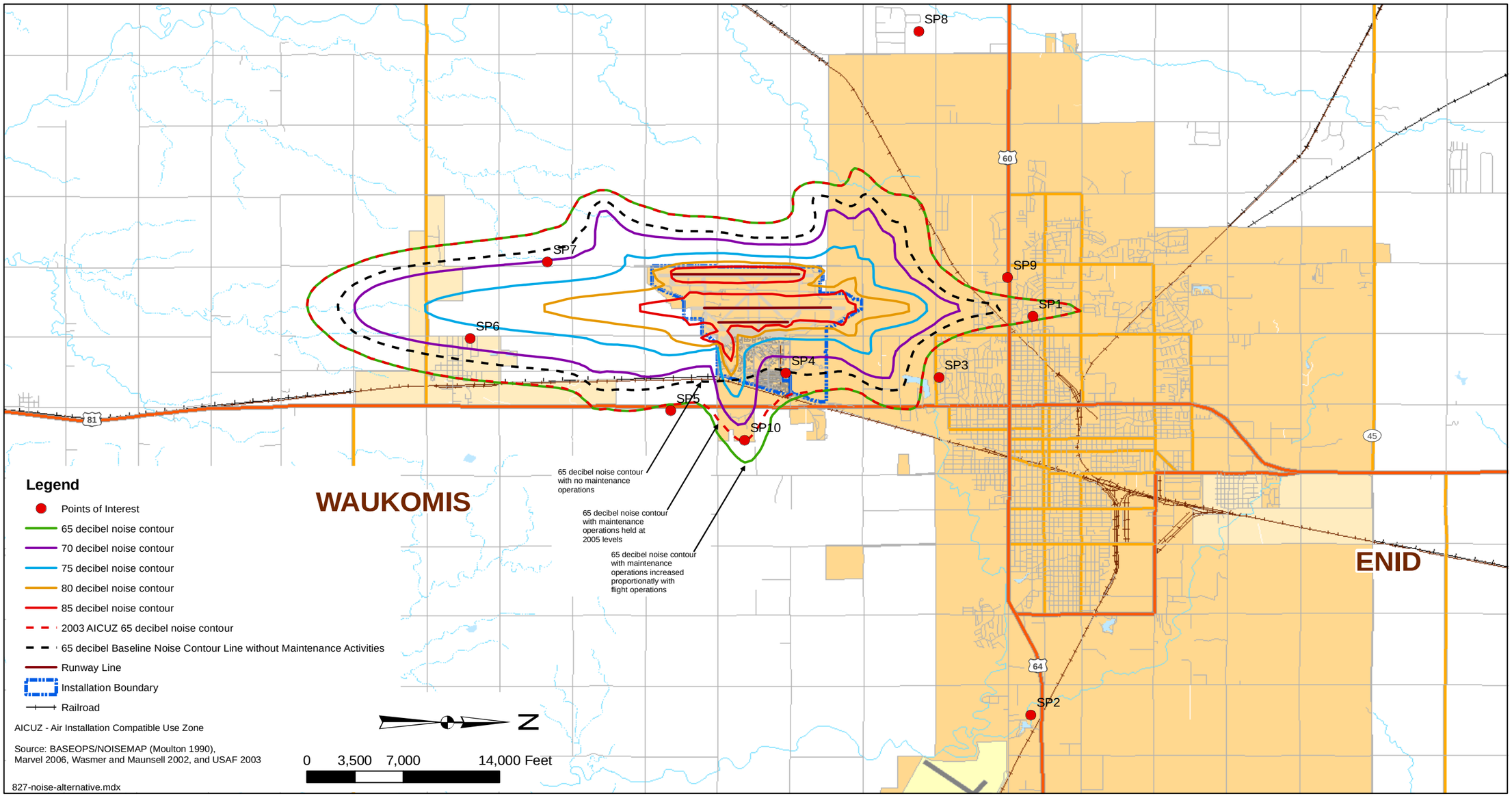

Figure 3-3 Noise Contours after Build-up to 2003 Air Installation Compatibility Use Zone Operational Levels and Current Static Conditions

Current operations vary from those presented in the 2003 *AICUZ Study* in that T-37 aircraft operations and maintenance (engine run-ups performed primarily in hush houses) have been replaced by T-6 aircraft operations and maintenance (engine run-ups performed outside). The current total annual number of aircraft operations (225,000) is less than the number reported in the *AICUZ Study* (384,328) (USAF 2003). Therefore, the current 65 dBA contour line is oriented an average distance of 1,500 feet inside the 65 dBA contour line published in the 2003 *AICUZ Study*, with the exception of those areas east of the base in which the modeled noise levels are dominated by T-38 and other aircraft maintenance activities (Figure 3-1).

In order to assess the potential for the expansion of operations at Vance AFB, T-1, T-38, and T-6 flight operations were incrementally increased and the resulting noise levels were evaluated at the 10 specific points listed below (Figures 3-1, 3-2, and 3-3).

- SP1 Hoover School
- SP2 Residential Area
- SP3 Residential Area
- SP4 Eisenhower School
- SP5 Residential Area
- SP6 Waukomis United Methodist Church
- SP7 Residential Area
- SP8 Residential Area
- SP9 Church of Christ
- SP10 Residential Area next to rural farmland

Two criteria were applied to determine capacity. These criteria reflect land use guidance provided in 14 *Code of Federal Regulations* (CFR) Part 150, Subpart B, § 150.21 (d and g):

- Capacity would be reached when a previously compatible land use became incompatible.
- Capacity would be reached when noise levels at any one currently incompatible point increased by more than 1.5 dB.

Without consideration to the 2003 *AICUZ Study*, the first criterion was met at SP1 after a 40 percent increase in the level of based-aircraft operations over the 2005 operational levels. This increase equates to performing approximately 315,000 annual operations at the installation. Contours associated with the build-up of annual aircraft operations from current levels to approximately 315,000 are shown in Figure 3-2. Noise contours associated with the build-up of annual aircraft operations from current levels to the 2003 *AICUZ Study* annual aircraft operational level of 384,423 are shown in Figure 3-3. Both Figures 3-2 and 3-3 include the original 65 dBA contour from the 2003 *AICUZ Study* for comparison purposes (USAF 2003). Due to changes in baseline maintenance activities from those that resulted in the 65 dB contour depicted in the 2003 *AICUZ Study*, there are some differences in the level of projected noise impacts east of Vance AFB near SP10 that needed to be further explored.

Noise exposure levels at the 10 specific points resulting from increases to 315,000 annual operations (a 40 percent increase) and 384,423 annual operations (2003 *AICUZ Study* levels) are shown in Table 3-1 and assessed relative to the criteria described at 14 CFR 150.21 (d and g). Noise exposure reported. The location of these points is depicted in Figures 3-1 through 3-3.

Table 3-1 Specific Point Noise Levels under Expanded Operations

Point	2005 Baseline 225,000 (L_{dn})	Build-up to 315,000 (L_{dn})	Build-up to 384,423, (L_{dn})	2003 *AICUZ Study* (L_{dn})	Remarks
SP1	63.0	64.5	65.7	65.7	Previously incompatible
SP2	37.1	38.5	39.3	39.3	
SP3	59.5	61.0	62.4	62.4	
SP4	65.3	66.7	67.7	67.7	Currently incompatible; 1.4 dB increase
SP5	61.3	62.8	63.9	63.9	
SP6	69.2	70.6	72.1	72.1	Currently incompatible; 1.4 dB increase
SP7	67.2	68.7	70.2	70.2	Currently incompatible; 1.5 dB increase
SP8	49.1	50.5	51.6	51.6	
SP9	59.3	60.8	62.1	62.1	
SP10	65.1	66.8	68.1	65 contour	Currently incompatible 1.7 to 3.0 dB increase

Source: BASEOPS/NOISEMAP (Moulton 1990), Marvel 2006, USAF 2003

L_{dn} Day-Night Average Sound Level
dB decibel
AICUZ Air Installation Compatible Use Zone
USAF United States Air Force

As shown in Table 3-1, the expanded level of operations depicted by the build-up from 225,000 to 315,000 would result in a currently compatible land use becoming incompatible at SP1, a location previously reported as incompatible in 2003. The same increase in operations would result in currently-incompatible land uses at SP4, SP6, and SP7 becoming exposed to a noise increase of 1.5 dB or less. The predicted noise increase at SP10 could exceed 1.5 dB; however, the modeled increase was determined to be overly conservative as explained by the following sensitivity analysis of the relative impacts from static and flight operations at SP10.

A sensitivity analysis was performed to demonstrate the relative impacts associated with the range of potential increases to static (maintenance) and flight operations. Figure 3-3 presents the current 2005 baseline location of the 65 dBA noise contour both with and without static pad noise sources from maintenance operations. Table 3-2 summarizes the results of the analysis of the relative impacts of potential increases to static and flight operations.

Table 3-2 Sensitivity Analysis of Modeled Noise Levels
Relative Impacts of Static and Flight Operations at SP10

Scenario One: Modeled Increases to Flight and Static Operations are Equivalent					
Condition	**Annual Operations**	**Flight Noise (L_{dn})**	**Static Noise (L_{dn})**	**Total Noise (L_{dn})**	**Total Increase (dB)**
Baseline	225,000	54.1	64.8	65.1	NA
Plus 34%	300,600	55.3	66.2	66.5	1.4
Plus 40%	315,000	55.6	66.5	66.8	1.7
Plus 47%	330,000	56.1	67.1	67.4	2.3
Plus 71%	384,423	56.7	67.8	68.1	3.0
Scenario Two: Static Operations Held Constant at Current Levels					
Condition	**Annual Operations**	**Flight Noise (L_{dn})**	**Static Noise (L_{dn})**	**Total Noise (L_{dn})**	**Total Increase (dB)**
Baseline	225,000	54.1	64.8	65.1	NA
Plus 34%	300,600	55.3	64.8	65.2	0.1
Plus 40%	315,000	55.6	64.8	65.2	0.1
Plus 47%	330,000	56.1	64.8	65.3	0.2
Plus 71%	384,423	56.7	64.8	65.4	0.3
Scenario Three: Static Operations Held Constant at Current Levels Plus 34 Percent					
Condition	**Annual Operations**	**Flight Noise (L_{dn})**	**Static Noise (L_{dn})**	**Total Noise (L_{dn})**	**Total Increase (dB)**
Baseline	225,000	54.1	64.8	65.1	NA
Plus 34%	300,600	55.3	66.2	66.5	1.4
Plus 40%	315,000	55.6	66.2	66.6	1.5
Plus 47%	330,000	56.1	66.2	66.6	1.5
Plus 71%	384,423	56.7	66.2	66.7	1.6

L_{dn} Day-Night Average Sound Level
dB decibel
% percent

Table 3-2 suggests that limiting static operations between currently modeled levels and a 34 percent increase would allow for an increase in flight operations by up to 71 percent without exceeding the significance criteria (1.5 dBA) for predicted noise impacts at SP10. The level of annual operations published in the 2003 *AICUZ Study* totals 384,423 operations for all aircraft types (USAF 2003). Provided the limiting factors associated with the impact of static noise sources at SP10 are taken into consideration, increases to

flight operations can be decoupled from maintenance activities in the noise analysis. Therefore, the 2003 *AICUZ Study* noise contours for annual flight operations can be considered the capability for Vance AFB aircraft operations.

The results of the noise model depicted in Figures 3-2 and 3-3 were based on conservative increases in the quantity of maintenance operations for all aircraft by the same ratio used to increase flight operations (Scenario one, Table 3-2). However, the modeled results do not consider the possibility of new static pad locations, alterations to the orientation of existing noise abatement structures, the addition of new noise abatement structures, or noise dispersion by existing facilities located between the static pads and SP10. Due to the conservative nature of the modeled scenarios, and the fact that sound attenuation due to spherical spreading only was considered in the model, actual levels emanating off site from static pad locations would be expected to be lower than predicted. The land areas associated with the noise contours depicted on these figures are used to quantify changes in affected areas associated with expanding current operations (225,000) to the anticipated capability (384,423).

The land areas (in acres) encompassed by each contour for the 2005 baseline and the expanded-operations conditions are compared in Table 3-3, which also includes the land areas encompassed by the 2003 contours as modeled from the 2003 *AICUZ Study* reported level of operations.

Table 3-3 Land Areas Exposed to Elevated Noise Levels (Baseline Conditions)

Noise Level (L_{dn})	2005 Current (Acres)	Build-up (Acres[1])	2003 AICUZ [2] (Acres)	Capability from the 2005 Baseline	
				Area Change (Acres)	Percent Change
65 – 70	4,541.2	6,109.8	5,831.7	+ 1,568.6	+ 34.5
70 – 75	2,678.3	3,607.7	3,607.7	+ 929.4	+ 34.7
75 – 80	1,492.6	2,063.7	2,063.7	+ 571.1	+ 38.2
80 – 85	865.7	1,198.3	1,198.3	+ 332.6	+ 38.5
> 85	568.2	964.6	964.6	+ 396.4	+ 69.8
Total >65	10,146.0	13,944.1	13,666.0	+ 3,798.1	+ 37.4

[1]Reflects a 40 percent increase in based-aircraft operations from 2005 baseline operations.
[2]Reflects data obtained from the 2003 AICUZ based aircraft operations.

Source: Wasmer and Maunsell 2002, Marvel 2006, USAF 2003

L_{dn} Day-Night Average Sound Level
AICUZ Air Installation Compatible Use Zone
USAF United States Air Force
% percent

Overall, total land area exposed to elevated noise levels would increase from 10,146 acres under the reported 2005 operational conditions up to 13,944 acres with expanded operations established under the previously described scenario. This is an increase of 3,798 acres; a 37.4 percent increase. The expanded area, with the exception of the predicted increase in the vicinity of SP10 (Figure 3-1) is almost identical to the area encompassed by the 65 dB contour from the 2003 *AICUZ Study* (USAF 2003). The increase in the described area over that of the 2003 *AICUZ Study* is approximately 278 acres, all of which can be located east of SP10. The potentially affected area east of SP10 is rural farmland upon which is located a single dwelling and a barn.

3.2.2 Airfield

The airfield includes runways, taxiways, aircraft parking area, ramps, an Air Traffic Control (ATC) Tower, other ATC facilities, and the flight line, which includes surrounding grassed areas, and roads.

Class D Controlled airspace has been established in the region to manage air traffic. The Vance AFB Class D airspace approximates a 5-nautical mile circle around the base, except to the east where it abuts the Class D airspace supporting operations at Woodring Airport.

Air traffic control at Vance AFB is supported by:

- Vance Radar Approach Control,
- Vance ATC Tower, and
- Additional ATC remote facilities.

There are five runways at Vance AFB. Three are parallel, oriented generally north to south (35R/17L, 35C/17C, and 35L/17R). Runway 35R/17L is 5,024 feet long and 150 feet wide. Runway 35C/17C is 9,202 feet long and 150 feet wide. Runway 35L/17R is 9,202 feet long and 150 feet wide. The additional two runways are crosswind runways northwest to southeast (31/13) and northeast to southwest (4/22). Runway 31/13 is 4,971 feet long; runway 4/22 is 5,013 feet long. Both are 150 feet wide.

The vast majority of the military traffic at Vance AFB confines activities to the three parallel runways. Therefore, the following capacity assessments are limited to those facilities, and based on their capabilities.

3.2.3 Military Training Airspace

Pilot training is supported by regional Special Use Airspace and military training airspace. There are four Military Operations Areas (MOA) available for use. These are the Eureka, Bison, Vance, and Ada MOAs. Most of these MOAs are subdivided into smaller areas, to facilitate scheduling. There are two types of military training routes available for training. Slow Routes (SR) must be flown at airspeeds less than 250 nautical

miles per hour (knots). Instrument Routes (IR) are flown under instrument flight rules regardless of the actual meteorological conditions. Vance AFB aircrews use nine SRs and nine IRs. There are also three refueling tracks that support training in aerial refueling.

Noise levels in the military training airspace are not expected to change significantly from current conditions. A further consideration for the training airspace involves the potential 40 percent expansion of operations conducted by Vance AFB-based military aircraft. This may be assessed by considering any given noise level and calculating the impact of a 40 percent increase in operations.

Since noise levels are expressed in logarithmic terms, they cannot be directly calculated arithmetically. They must first be converted to units of energy. This is done by raising 10 to the power of the noise level divided by 10. For example, if a noise level of 50 L_{dn} is considered, the conversion would be solved by $10^{50/10}$, or 10^5 resulting in 100,000. Then, a 40 percent increase may be calculated by 100,000 x 1.4, or 140,000. Finally, the process is reversed by taking 10 times the logarithm of the energy (in this case 140,000). This yields a noise level of 51.5 L_{dn}, or an increase of 1.5 dB. This change would hardly be noticeable. Noise levels in the military training airspace are not expected to change significantly from current conditions.

3.3 AVIATION RESOURCES CAPACITY

3.3.1 Airfield Capacity

The capacity of an airfield can be described by its throughput rate. Throughput rate is the maximum number of operations that can take place within a given time period. Operations considered include arrivals, departures, and closed patterns.

Many factors determine an airfield's capacity (e.g., the number and types of runways, availability of taxiways, the availability and capability of landside support facilities to cycle aircraft, and the numbers and types of aircraft operating at the facility). In order to assess these factors, the FAA has developed several models. These are used in the civilian sector for airport planning. However, they are also frequently used by the military to determine airfield capacity at their installations.

The USAF has also published long-term runway capacity assessment procedures in Air Force Handbook 32-1084, Civil Engineering: Facility Requirements. These procedures are based on data from FAA Advisory Circular (AC) 150/50601A, Airport Capacity Criteria Used in Preparing the National Airspace Plan. In these calculations, aircraft are placed into "types" based on the type aircraft and the number and kind of engines.

A prime consideration in determining throughput capacity is the amount of time separation required between operations to minimize the potentially adverse effects of wake vortices. Subsequent to the publication of FAA AC 150/50601A, the FAA published

FAA AC 150/5060-5 (and associated changes), which rescinded FAA AC 150/50601A. While the considerations in both publications are generally analogous, a prime difference is that aircraft are now placed into "types" based on their gross takeoff weight. The mass properties of the aircraft are now considered a better indicator of wake-vortex effects than simply the number and type of engines.

For this analysis, runway capacity is assessed using guidance in FAA AC 150/5060-5, Airport Capacity and Delay. Two different methods have been employed that evaluate capacity in general and then specific terms. The first is applicable to long-term planning, is somewhat generalized, and considers factors for all elements that can influence airfield capacity. The second is more detailed and specific, and focuses on individual elements that can determine the capacity of Vance AFB's runways.

As previously addressed, the following assessments focus on the three parallel runways that support military operations. Unique to Vance AFB, due to the runway configuration and mission requirements, operational staff have developed process and procedures essentially to run two airbases. T-6 aircraft use runways 35R/17L. T-1 and T-38 aircraft use runways 35C/17C and 35L/17R. Due to multiple ATC capabilities, which allow simultaneous operations, these groups of runways will be assessed separately.

Long Term Planning

The assessment for long-term planning considers the mix of aircraft classes, and the ratio of aircraft in each class operating from the airfield/runways. Aircraft are classified by their maximum takeoff weight and the number of engines. This calculated "mix-index" is then applied to standard nominal values developed for the applicable runway configuration. Output from this assessment provides annual service volume (capacity) per year, and the number of operations per hour that can be conducted under Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC). These factors can then be compared with expected demand to assess the "capacity consumed" by a given level of operations. Table 3-4 summarizes the assessment for annual conditions for T-6 operations, and Table 3-5 shows similar data for operations per hour that could be conducted under VMC or IMC conditions.

Table 3-4 Comparison of Current Annual Operations Demand and Annual Operations Capability (T-6 Aircraft using 35R/17L)

Vance AFB Operations	Annual Service Volume[1]	Annual Demand	Capacity Used/ Remaining
Current[2]	230,000	133,500	58%/42%
Capability Build-up[3]	230,000	186,900	81%/19%

[1]Source: FAA 1983

[2]Personal Communication (Marvel 2006)

[3]Reflects a 221,726 annual operations increase in Vance AFB-based military operations.

% percent
AFB Air Force Base
FAA Federal Aviation Administration

Table 3-5 Comparison of Current Annual Estimated Airfield Capacity and Expected Annual Estimated Airfield Capacity under Varying Weather Conditions (T-6 Aircraft using 35R/17L)

Vance AFB Operations	Operations per Hour Capacity[1]	Operations per Hour Expected	Capacity Used/ Remaining
VMC Conditions			
Current[2]	98	32	33%/67%
Capability Build-up[3]	98	53	54%/46%
IMC Conditions			
Current[2]	59	32	54%/46%
Capability Build-up[3]	59	53	90%/10%

[1]Source: FAA 1983

[2]Personal Communication (Marvel 2006)

[3]Reflects a 221,726 annual operations increase in Vance AFB-based military operations.

% percent
AFB Air Force Base
FAA Federal Aviation Administration
IMC Instrument Meteorological Conditions
VMC Visual Meteorological Conditions

The capacity used and remaining is the ratio between the annual service volume/hourly capacity (FAA standard levels) and the annual demand/operations per hour estimated to occur at the airfield. It should be noted that data in Table 3-5 reflect a range of values. VMC and IMC would be mixed; neither would exist all of the time. Therefore, capacity would fall between the two values. Similarly, Tables 3-6 and 3-7 show analogous data for T-1 and T-38 operations.

Table 3-6 Comparison of Current Annual Operations Demand and Annual Operations Capability (T-1 and T-38 Aircraft using 35L/17R and 35C/17C)

Vance AFB Operations	Annual Service Volume[1]	Annual Demand	Capacity Used/ Remaining
Current[2]	300,000	91,500	31%/69%
Capability Build-up[3]	300,000	163,000	54%/46%

[1]Source: FAA 1983

[2]Personal Communication (Marvel 2006)

[3]Reflects a 163,044 operations increased over the baseline military operations at Vance AFB.

% percent
AFB Air Force Base
FAA Federal Aviation Administration

Table 3-7 Comparison of Current Annual Estimated Airfield Capacity and Expected Annual Estimated Airfield Capacity under Varying Weather Conditions (T-1 and T-38 Aircraft using 35L/17R and 35C/17C)

Vance AFB Operations	Operations per Hour Capacity[1]	Operations per Hour Expected	Capacity Used/ Remaining
VMC Conditions			
Current[2]	111	10	9%/91%
Capability Build-up[3]	111	39	35%/65%
IMC Conditions			
Current[2]	70	10	14%/86%
Capability Build-up[3]	70	39	56%/44%

[1]Source: FAA 1983

[2]Personal Communication (Marvel 2006)

[3] Reflects a 163,044 operations increased over the baseline military operations at Vance AFB.

% percent
AFB Air Force Base
FAA Federal Aviation Administration
IMC Instrument Meteorological Conditions
VMC Visual Meteorological Conditions

As illustrated above, Vance's runways are able to accommodate the increase in Vance-based aircraft operations. Furthermore, as previously stated, these assessments use nominal values for the many factors that influence an airfield's capacity. Many of these factors involve land-side supporting facilities dealing with the handling and processing of aircraft and deplaning/emplaning of passengers at a civil facility. These considerations are not applicable for Vance AFB. However, the runway component is applicable.

3.3.2 Runway Capacity

The FAA guidance in AC 150/5060-5 provides methodology specifically to model the throughput capacity for the runway. However, more specific data pertaining to specific types of operations and availability of taxiways is used than for the long-range planning addressed above.

Tables 3-8 and 3-9 show the modeled hourly capacity of Vance AFB's runways under IMC and VMC. This capacity is then assessed in relation to the estimated demand that would exist after an expansion of operations.

Table 3-8 Estimated Runway Capacity after Capability Build-up (Runway 35R/17L)

Weather Condition	Hourly Capacity[1]	Hourly Demand[2]	Capacity Used/ Remaining
IMC	59	53	91%/9%
VMC	125	53	43%/57%

[1]Source: FAA 1983

[2]Reflects a capability increase based on Vance AFB military operations.

% percent
AFB Air Force Base
FAA Federal Aviation Administration
IMC Instrument Meteorological Conditions
VMC Visual Meteorological Conditions

Table 3-9 Estimated Runway Capacity after Capability Build-up (Runways 35C/17C and 35L/17R)

Weather Condition	Hourly Capacity[1]	Hourly Demand[2]	Capacity Used/ Remaining
IMC	85	39	46%/54%
VMC	145	39	27%/73%

[1]Source: FAA 1983

[2] Reflects a capability increase based on Vance AFB military operations.

% percent
AFB Air Force Base
FAA Federal Aviation Administration
IMC Instrument Meteorological Conditions
VMC Visual Meteorological Conditions

As shown, based on this more detailed assessment, the runways at Vance AFB are fully capable of supporting increased operations.

3.3.3 Military Training Airspace Capacity

Vance AFB staff provided data on typical monthly utilization of varied elements of military training airspace. As a basis for assessment, the most intensely used was SR 241, supporting an average of 71 monthly sorties. A potential 71 percent increase in operations over the 2005 levels would indicate a monthly increase of approximately 28 sorties per month, or approximately 1.3 sorties per day. All other elements of military training airspace are less utilized; therefore, increases would be less. Based on current operational activity, availability of military training airspace assets would not be expected to be stressed by either current or expanded operations as described in this analysis.

3.4 FLYING MISSION CAPABILITY CONCLUSIONS

This assessment considered the physical capability of the aviation facilities at Vance AFB to handle increased operations, and the increases in noise exposure that would result from those potential increases. The prime limiting factor was noise exposure, indicating a maximum desirable capacity increase of 71 percent in based-aircraft

operations based on published values in the 2003 AICUZ (USAF 2003), or 40 percent based on 2005 operational levels. Considering this increase, assessments showed that overall, the physical capability of Vance AFB is generally sufficient to handle any increase up to the levels reported in the 2003 AICUZ. The relatively minor increased use of the military training airspace associated with the operational expansion would not be expected to adversely impact its availability for training. Noise exposure increases under the military training airspace at this increased level of operations are minimal, and would not create an adverse impact.

Chapter 4

List of Preparers

CHAPTER 4

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Chapter 5

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CHAPTER 5

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Appendix A

Land Use Factors and Calculations

APPENDIX A

LAND USE FACTORS AND CALCULATIONS

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Land Use Density Formula, Tables, and Calculations

Information on the existing land use categories on Vance Air Force Base (AFB) is maintained by representatives from the Base Operations Support contractor environmental section. The additional information required to define the existing and future land use plans for Vance AFB is contained in the *General Plan* and incorporated into this effort (Vance AFB 2006a).

For non-flying missions where open space was available, potential development areas are identified and evaluated using a Geographic Information System overlay analysis. Table A-1 identifies potentially developable parcels for Vance AFB. Each parcel is evaluated to determine if the area was available or appropriate for development. Areas possessing physical or operational constraints are eliminated from further consideration in the evaluation. The *General Plan* is used to define future land use and development constraints along with input from representatives of the Civil Engineer contractor (Vance AFB 2006). Parcels are also identified as developable if a demolition project is scheduled to occur within the planning period and if any buildings will reach 67 years or older during the planning period or if any housing/lodging facilities will reach 50 years or older during the planning period (through 2013).

In order to determine utility consumption estimates for evaluating constraints, population and interior building space are calculated by applying previously developed land use density factors to the identified developable parcels. The parcel density factor for impervious cover (Table A-2) and the authorized number of floors established by local development practices are used and the authorized per capita space (Table A-3) established in Air Force Handbook 32-1084 (United States Air Force [USAF] 1994) is applied to determine the capability of the parcel to manage additional facilities and population. Based on the authorized number of floors established for the base, an increased building density factor is applied to increase the total height of the buildings, which increases the interior building capacity of the base. Table A-4 provides the current interior building space by land use for the base.

Table A-5 presents the data used in the calculations presented below. The following equations are used to calculate the estimated additional population, increased interior building space, and future pavements for developable parcels available:

Population Equation:

$$P_I = \frac{\frac{FB_I}{d}}{\sum FB_I} \times \left(\sum FB_I - D \right)$$

Where:

P_I = Net Increase in Population

FB_I = Future Building Interior Area (square feet)

d = Density of occupancy in square foot per person (square feet/person) - (factors obtained from Air Force Handbook 32-1084)

D = Sum of Total Associated Demolition (square feet)

Future Building Interior Area Equation:

$$FB_I = A \times if \times B_I \times 43560$$

Where:

FB_I = Future building interior area (square feet)

A = Parcel size (acres)

if = Future intensity factor (typically 1.0)

B_I = Interior building area factor

Interior Building Factor Equation:

$$B_I = \frac{B_{Is}}{T_A}$$

Where:

B_I = Interior building area factor

B_{Is} = Current building interior space (acres)

T_A = Total Current Area for Land Use Type (acres)

Future Building Area Footprint Equation:

$$F_{BF} = \frac{FB_I}{s}$$

Where:

F_{BF} = Future building footprint (square feet)

FB_I = Future building interior area (square feet)

s = Building floors

Future Impervious Capacity Equation:

$$F_{IP} = A \times I_c \times 43560$$

Where:

F_{IP} = Future impervious capacity (square feet)

A = Parcel size (acres)

I_c = Impervious cover factor (defined by local practices)

Future Pavements Equation:

$$F_P = \frac{\frac{(F_{IP} - F_{BF})}{43560}}{\sum FB_I} \times \left(\sum FB_I - D\right)$$

Where:

F_P = Future pavements (acres)

F_{IP} = Future impervious capacity (square feet)

F_{BF} = Future building footprint (square feet)

FB_I = Future building interior area (square feet)

D = Sum of Total Associated Demolition (square feet)

Table A-1 Potentially Developable Parcels

Parcel Number	Rationale for Development	Constraint	Developable	Acres
1	Open Area	Environmental Restoration Program, Military Quantity Distance	No	6.58
2	Project Location	--	Yes	3.20
3	Project Location	Building 199 constructed in 2004	No	2.77
4	Project Location	--	Yes	1.51
5	Project Location	--	Yes	15.40
6	Open Area	--	Yes	6.55
7	Project Location	--	Yes	6.15
8	Open Area	Environmental Restoration Program Site	No	5.11
9	Open Area	Current Construction Ongoing	No	2.33
10	Open Area	Current Construction Ongoing	No	1.23
11	Project Location	--	Yes	4.75
12	Open Area	--	Yes	1.55
13	Project Location	--	Yes	3.00
14	Project Location	--	Yes	6.48
15	Age of buildings	--	Yes	1.61
16	Open Area	Less than 1 acre	No	0.82
17	Project Location	--	Yes	0.17
18	Project Location	--	Yes	0.65
19	Age of buildings	--	Yes	0.82
20	Project location	--	Yes	2.04
21	Project Location	--	Yes	49.47
22	Project Location	--	Yes	16.51
23	Age of Buildings	--	Yes	4.79
24	2006 DMP	--	Yes	10.1
25	Open Area	--	Yes	1.67
26	Project Location	--	Yes	1.81
27	Project Location	--	Yes	1.82
28	Open Area	--	Yes	1.00
29	Project Location	--	Yes	1.55
30	Age of buildings	--	Yes	0.99
31	Age of buildings	--	Yes	2.32
32	Project Location	Environmental Restoration Program Site	No	2.46
33	Project Location	--	Yes	1.32

Note:
Each parcel number corresponds to a parcel identified on Figure 2-3.

Table A-1 continued

Parcel Number	Rationale for Development	Constraint	Developable	Acres
34	Age of buildings	--	Yes	0.33
35	Open area	--	Yes	2.73
36	Project Location	--	Yes	1.45
37	Open Area	--	Yes	1.08
38	Project Location	--	Yes	0.61
39	Open Area	Floodplain	No	9.83
40	Open Area	--	Yes	131.18
41	Open Area	--	Yes	51.21
42	Open Area	Clear Zone, Environmental Restoration Program Site	No	61.70
43	Open Area	3000 Foot Clear Zone from closed crosswind air strip	Yes	21.99
44	Open Area	3000 Foot Clear Zone from East Air Strip	No	36.37

Note:
Each parcel number corresponds to a parcel identified on Figure 2-3.
The portion of parcel 43 within the clear zone is developable for non-vertical structures (i.e., roads, recreational facilities). Parcel 44 is adjacent to a currently active taxiway and is subject to additional wing clearance restrictions. Parcel 44 is identified as presently non-developable; however, its status could change should the east runway be closed.

Table A-2 Land Use Capability Facility Density Factors

Land Use Type	Percent Impervious Cover[1] "I_c"
Airfield Operation and Maintenance	49%
Administrative	55%
Airfield	0%
Airfield Pavements	100%
Community Commercial	65%
Community Service	46%
Housing Accompanied	35%
Housing Unaccompanied	47%
Industrial	41%
Medical	31%
Open Space	6%
Outdoor Recreation	10%

[1]Land use density factors verified against the *General Plan* (Vance AFB 2006a).
I_c = density of parcel coverage by facility footprint and parking

% percent
AFB Air Force Base

Table A-3 Space Authorizations by Land Use

Land Use	Authorized Space[1] (square feet/person) "d"
Airfield Operation and Maintenance	300
Administrative	180
Airfield[2]	NA
Airfield Pavements[2]	NA
Community – Commercial	1000
Community – Services	500
Housing – Accompanied	450
Housing – Unaccompanied	475
Industrial	750
Medical	500
Open Space[2]	NA
Outdoor Recreation[2]	NA

[1]Data obtained from Air Force Handbook-1084 (USAF 1994).

[2]No personnel would be assigned to these land uses.

d = density of occupancy

NA not applicable

USAF United States Air Force

Table A-4 Current Interior Building Space by Land Use

Land Type	Building Interior (square feet)	Building Interior B_{Is} (acres)
Airfield Operation and Maintenance	580,308	13.3
Administrative	85,458	2.0
Airfield	7,082	0.2
Airfield Pavements	NA	NA
Community Commercial	96,262	2.2
Community Service	81,994	1.9
Housing Accompanied	349,618	8.0
Housing Unaccompanied	193,626	4.4
Industrial	261,343	6.0
Medical	46,312	1.1
Open Space	560	0.01
Outdoor Recreation	4,219	0.1
Total	**1,706,782**	**39**

NA not applicable

Table A-5 Design Factors and Calculations

Land Type	Developable (acres)	Impervious Cover (percent)	Available Land Use (acres)	Authorized Space (square feet/person)	Current Floors	Future Intensity Factor	Existing Building Interior (square feet)	Building Interior (acres)	Interior Building Space Factor	Building Demo (square feet)	Future Building Interior (acres)	Future Building Interior (square feet)	Net Building Space Added[1]	Future Building Footprint (square feet)	Future Impervious Capacity (square feet)	Future Impervious Capacity (acres)	Future Pavements (square feet)	Future Pavements (acres)	Net Increase of People Supported[1]
Variable	A	I_c		d	s	If	B_{Is}		B_I	D		FB_I		F_{BF}	F_{IP}		F_P		P
Airfield Operation and Maintenance	14	49%	6.89	300	1.1	1.0	580,308	13.3	0.2184	138,019	3.058	133,185	-4,834	121,078	299,921	6.89	112,309	2.58	279
Administrative	37	55%	20.46	180	1.1	1.0	85,458	2.0	0.1154	15,007	4.270	185,997	170,990	169,088	891,186	20.46	453,460	10.41	649
Airfield	0	0%	0.00	NA	1.0	1.0	7,082	0.2	0.0001	0	0.000	0	0	0	0	0.00	0	0.00	
Airfield Pavements	0	100%	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Community Commercial	11	65%	7.15	1000	1.0	1.0	96,262	2.2	0.1105	11,467	1.215	52,944	41,477	52,944	311,454	7.15	162,338	3.73	33
Community Service	5	46%	2.30	500	1.6	1.0	81,994	1.9	0.1882	22,157	0.941	40,997	18,840	25,623	100,188	2.30	46,825	1.07	51
Housing Accompanied	131	35%	45.64	450	1.0	0.93	349,618	8.0	0.1016	240,670	12.378	539,164	298,494	539,164	1,988,033.46	45.64	909,853	20.89	752
Housing Unaccompanied	45	47%	21.18	475	2.1	1.5	193,626	4.4	0.2615	155,145	17.649	768,809	613,664	366,100	922,447	21.18	349,372	8.02	1,016
Industrial	15	41%	6.10	750	1.0	1.0	261,343	6.0	0.0698	9,575	1.046	45,583	36,008	45,583	265,919	6.10	138,365	3.18	38
Medical	0	31%	0.00	500	1.0	1.0	46,312	1.1	0.0967	59,226	0.000	0	-59,226	0	0	0.00	0	0.00	0
Open Space	45	6%	2.70	NA	1.0	1.0	560	0.01	0.0001	560	0.003	116	-444	116	117,431	2.70	73,671	1.69	
Outdoor Recreation	52	10%	5.20	NA	1.0	1.0	4,219	0.1	0.0017	6,924	0.090	3,918	-3,006	3,918	226,512	5.20	139,784	3.21	
Total	**355**		**117.61**				**1,706,782**	**39**		**658,750**		**1,770,713**	**1,111,963**					**54.77**	**2,819**

NA not applicable

Developable includes project locations and buildings older than 50 years.

658,750 Associated Demo for construction to occur.

1,111,963 Net added Building Space

[1]Combinations of multiple calculations with different variables may lead to localized seemingly anomalous results (i.e., negative building space, but associated population increases). However, based on the density factors, total building space, total demolition, and total population, are representative of the completed analysis.

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Appendix C

Socioeconomics Impact Calculations

APPENDIX C

SOCIOECONOMICS IMPACT CALCULATIONS

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Socioeconomic Population Impacts Calculations

	Living On Base	Living Off Base	Total
BASELINE VANCE AFB POPULATION			
Military Personnel	339	949	1,288
Student Personnel	196	227	423
Military Dependents	425	825	1,250
Civilian Personnel	0	1,332	1,332
Transient Personnel	47	0	47
Total Baseline Population	**1,007**	**3,333**	**4,340**
PROPOSED ACTION			
Military Personnel	0	250	250
Student Personnel	0	0	0
Military Dependents	0	217	217
Civilian Personnel	0	0	0
Transient Personnel	0	0	0
Total Population Change	**0**	**467**	**467**
PROPOSED VANCE AFB POPULATION			
Military Personnel	339	1,199	1,538
Student Personnel	196	227	423
Military Dependents	425	1,042	1,467
Civilian Personnel	0	1,332	1,332
Transient Personnel	47	0	47
Total Projected Population	**1,007**	**3,800**	**4,807**

Socioeconomic Population Impacts Calculations (continued)

	Living On Base	Living Off Base	Total
BASELINE VANCE AFB POPULATION			
Military Personnel	339	949	1,288
Student Personnel	196	227	423
Military Dependents	425	825	1,250
Civilian Personnel	0	1,332	1,332
Transient Personnel	47	0	47
Total Baseline Population	**1,007**	**3,333**	**4,340**
ALTERNATIVE ACTION			
Military Personnel	759	2,125	2,884
Student Personnel	1,168	1,353	2,521
Military Dependents	170	2,629	2,799
Civilian Personnel	0	1,804	1,804
Transient Personnel	24	0	24
Total Population Change	**2,121**	**7,911**	**10,032**
ALTERNATIVE VANCE AFB POPULATION			
Military Personnel	1,098	3,074	4,172
Student Personnel	1,364	1,580	2,944
Military Dependents	595	3,454	4,049
Civilian Personnel	0	3,136	3,136
Transient Personnel	71	0	71
Total Projected Population	**3,128**	**11,244**	**14,372**

Appendix D

Notice of Availability

APPENDIX D

NOTICE OF AVAILABILITY

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PUBLISHED IN THE FEBRUARY 25, 2007 *ENID NEWS & EAGLE*

PUBLIC NOTICE

The United States Air Force Invites Public Comment

Environmental Assessment for Installation Development at Vance Air Force Base, Oklahoma

The US Air Force has prepared a draft environmental assessment (EA) and proposed Finding of No Significant Impact (FONSI) for installation development at Vance AFB, Oklahoma.

The EA, prepared in accordance with the National Environmental Policy Act and Air Force instructions, evaluates potential impacts of the proposed action, alternative action, and no-action alternative on the environment. The EA evaluated: noise, land use, air quality, earth resources, water resources, hazardous materials and wastes, biological resources, utilities and infrastructure, and socioeconomics.

A copy of the EA and proposed FONSI will be maintained at the Enid Public Library, 120 West Maine Avenue, Enid, Oklahoma, 73701.

Written comments may be submitted through March 26, 2007 and should be directed to Mr. Mark Buthman, CSC/CEV, 140 Channel Street, Suite 231, Vance AFB, Oklahoma, 73705-5623.

PRIVACY ADVISORY: Comments on this draft EA are requested. Letters or other public comment documents provided may be published in the final EA. Information provided will be used only to improve analysis of issues in the draft EA. Comments will be addressed in the final EA and made available to the public. However, only the name of the individual and specific comments will be disclosed.

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ACRONYMS AND ABBREVIATIONS (CONT.)

MMRP	Military Munitions Response Program
MOA	Military Operations Area
MR_NMAP	MOA Range Noisemap Assessment Program
msl	mean sea level
MWR	Morale, Welfare, and Recreation
NAAQS	national ambient air quality standards
NEI	National Emissions Inventory
NEPA	*National Environmental Policy Act*
NFIP	National Flood Insurance Program
NHPA	*National Historic Preservation Act*
NM	nautical miles
No.	number
NOI	Notice of Intent
NO_x	nitrogen oxide
NO_2	nitrogen dioxide
NRHP	National Register of Historic Places
O_3	ozone
ODEQ	Oklahoma Department of Environmental Quality
OPDES	Oklahoma Pollutant Discharge Elimination System
PA	Preliminary Assessment
PCB	polychlorinated biphenyl
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
POL	petroleum, oil, and lubricant
POV	privately owned vehicle
ppm	parts per million
PSD	prevention of significant deterioration
psi	pounds per square inch
RA	Remedial Action
RCRA	*Resource Conservation and Recovery Act*
RD	Remedial Design
RIP	Remedy in Place
ROI	region of influence
SAIC	Science Applications International Corporation
SEL	sound exposure level
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_x	sulfur oxide
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasures
SR	Slow Route
SS	Spill Site
ST	Storage Tank
SUA	Special Use Airspace
SUPT	Specialized Undergraduate Pilot Training
SWPPP	*Stormwater Pollution Prevention Plan*
TGO	touch-and-go
THPO	Tribal Historic Preservation Officer
TLF	Transient Living Facility
TS	Trap and Skeet Range
tpy	tons per year
UEQ	Unaccompanied Enlisted Quarters
UPT	Undergraduate Pilot Training
US	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USBC	United States Bureau of the Census
USC	*United States Code*
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
UTBNI	up to but not including
VFR	Visual Flight Rule
VOC	volatile organic compound
WP	Waste Pit
WWII	World War II