DRAFT

KC-46A THIRD MAIN OPERATING BASE (MOB 3) BEDDOWN ENVIRONMENTAL IMPACT STATEMENT (EIS)

Prepared for:
Air Force Reserve Command
Air Force Civil Engineer Center
Air Mobility Command
United States Air Force

VOLUME II

November 2016

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
ACM	asbestos-containing material
ACS	American Community Survey
AFB	Air Force Base
AFI	Air Force Instruction
AFOSH	Air Force Occupational and Environmental Safety, Fire Protection, and Health
AGE	aerospace ground equipment
AGL	above ground level
AICUZ	Air Installations Compatible Use Zones
AMC	Air Mobility Command
AMSL	above mean sea level
APE	area of potential effect
APZ	accident potential zone
ARB	Air Reserve Base
ARW	Air Refueling Wing
AT/FP	Anti-Terrorism/Force Protection
BGEPA	Bald and Golden Eagle Protection Act
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CH_4	methane
CHABA	Committee on Hearing, Bioacoustics and Biomechanics
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COC	community of comparison
CONUS	continental United States
CWA	Clean Water Act
CZ	clear zone
dB	decibel(s)
dBA	A-weighted decibel
DNL	day-night average sound level
DoD	U.S. Department of Defense
DoDI	Department of Defense Instruction
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FICAN	Federal Interagency Committee on Aircraft Noise
FICON	Federal Interagency Committee on Noise
FICUN	Federal Interagency Committee on Urban Noise
FONPA	Finding of No Practicable Alternative
GHG	greenhouse gas
GIS	geographic information system

ACRONYMS AND ABBREVIATIONS (Continued)

GMV	government motor vehicle
GWP	global warming potential
HAP	hazardous air pollutant
Hz	hertz
ICRMP	Integrated Cultural Resources Management Plan
IDNR	Indiana Department of Natural Resources
IMPLAN	Impact Analysis for Planning
INRMP	Integrated Natural Resources Management Plan
L_{Adn}	A-weighted day-night average sound level
L_{Amax}	A-weighted maximum noise level
LAX	Los Angeles International Airport
LBP	lead-based paint
LEED	Leadership in Energy and Environmental Design
LID	Low Impact Design
MBTA	Migratory Bird Treaty Act
MOB 3	Third Main Operating Base
NAAQS	National Ambient Air Quality Standards
NAIP	National Agriculture Imagery Program
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIPTS	Noise-Induced Permanent Threshold Shift
NLR	noise level reduction
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	ozone
O&M	operations and maintenance
ODS	ozone depleting substance
OPTEMPO	operation tempo
PCB	polychlorinated biphenyl
PM_{10}	particulate matter less than or equal to 10 micrometers in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 micrometers in diameter
POV	privately owned vehicle
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTS	Permanent Threshold Shift
ROI	region of influence
SEL	sound exposure level
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
TCP	traditional cultural property
TTS	Temporary Threshold Shift
UCLA	University of California, Los Angeles
UFC	Unified Facilities Criteria
USACE	U.S. Army Corps of Engineers

ACRONYMS AND ABBREVIATIONS (Continued)

USAF	U.S. Air Force
USC	*United States Code*
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound

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APPENDIX A

CORRESPONDENCE

APPENDIX A CORRESPONDENCE

A.1 NOTICE OF INTENT AND NEWSPAPER ADVERTISEMENT

A.1.1 Notice of Intent

15510 Federal Register / Vol. 81, No. 56 / Wednesday, March 23, 2016 / Notices

~~*Estimated Total Annual Burden Hours:* 3,652.~~

~~*Abstract:* Regulation I applies to all depository institutions lacking Federal deposit insurance. It requires the disclosure of certain insurance related information in periodic statements, account records, locations where deposits are normally received, and advertising. This part also requires such depository institutions to obtain a written acknowledgment from depositors regarding the institution's lack of Federal deposit insurance. On December 16, 2011, the Bureau published an interim final rule (IFR) republishing Regulation I and making technical and conforming changes to reflect the transfer of authority and certain other changes made by the Dodd-Frank Act (76 FR 78126/RIN 3170–AA06). The IFR did not impose any new substantive obligations on persons subject to the existing regulations. As the Bureau added no new recordkeeping or reporting requirements, it adopted the PRA analysis from the original regulation. Upon further review, the Bureau has determined that the disclosures required by 12 CFR 1009.3 and 1009.4 and the signed acknowledgement required by § 1009.5 are subject to the PRA and require OMB approval thereunder. The Bureau has determined that it cannot reasonably comply with the standard approval timelines because the use of normal clearance procedures is reasonably likely to prevent the collection of information and result in public harm. *See* 5 CFR 1320.13(a)(2); 44 U.S.C. 3507(j).~~

~~Contemporaneously with this request for emergency processing, the Bureau is also initiating standard clearance procedures by allowing the public 60 days to comment on this collection of information. Accordingly, this request will also be resubmitted to OMB under standard clearance procedures.~~

~~Request for Comments: Comments are invited on: (a) Whether the collection of information is necessary for the proper performance of the functions of the Bureau, including whether the information will have practical utility; (b) The accuracy of the Bureau's estimate of the burden of the collection of information, including the validity of the methods and the assumptions used; (c) Ways to enhance the quality, utility, and clarity of the information to be collected; and (d) Ways to minimize the burden of the collection of information on respondents, including through the use of automated collection techniques or other forms of information technology. Comments submitted in response to this notice will be summarized and/or included in the request for OMB approval. All comments will become a matter of public record.~~

~~Dated: March 17, 2016.~~

~~**Darrin A. King,**~~

~~*Paperwork Reduction Act Officer, Bureau of Consumer Financial Protection.*~~

~~[FR Doc. 2016–06169 Filed 3–22–16; 8:45 am]~~

~~BILLING CODE 4810–AM–P~~

DEPARTMENT OF DEFENSE

Department of the Air Force

Notice of Intent To Prepare an Environmental Impact Statement for the KC–46A Third Main Operating Base (MOB 3) Beddown

AGENCY: Air Force Reserve Command, United States Air Force, DoD.

ACTION: Notice of intent.

SUMMARY: The United States Air Force (USAF) is issuing this notice to advise the public of the intent to prepare an Environmental Impact Statement (EIS) for the KC–46A Third Main Operating Base (MOB 3) Beddown. The EIS will assess the potential environmental consequences of various alternatives of the beddown of KC–46A tanker aircraft, associated infrastructure and personnel in support of the MOB 3 mission at existing installations where the Air Force Reserve Command (AFRC) leads a Mobility Air Force mission.

DATES: The USAF intends to hold scoping meetings from 5 p.m. to 8 p.m. in the following communities on the following dates:

1. Westover ARB—12 April 2016, at the Castle of Knights, 1599 Memorial Dr., Chicopee, MA 01020
2. Seymour Johnson AFB—14 April 2016, at the Herman Park Center, 701 East Ash St., Goldsboro, NC 27530
3. Grissom ARB—19 April 2016, at the Milestone Event Center, 1458 North Liberator Rd., Peru, IN 46970
4. Tinker AFB—21 April 2016, at the Sheraton Midwest City Hotel and Reed Conference Center, 57050 Will Rodgers Rd., Midwest City, OK 73110

ADDRESSES: The project Web site (*www.kc-46a-beddown.com*) provides more information on the EIS and can be used to submit scoping comments. Scoping comments may also be submitted to Mr. Hamid Kamalpour, U.S. Air Force, AFCEC/CZN, 2261 Hughes Ave., Ste 155, Lackland AFB, Texas 78236–9853.

As a convenience for comments submitted by mail, a comment form is available for download on the Web site. Comments will be accepted at any time during the environmental impact analysis process. However, to ensure the USAF has sufficient time to consider public input in the preparation of the Draft EIS, scoping comments should be submitted to the Web site or the address listed below by 25 April 2016.

SUPPLEMENTARY INFORMATION: The MOB 3 mission includes 12 KC–46A aircraft in one squadron. The KC–46A aircraft will replace the aging tanker fleet and would continue supporting the mission of providing worldwide refueling, cargo, and aeromedical evacuation support. The proposed basing alternatives for MOB 3 mission include: Seymour Johnson Air Force Base (AFB), Grissom Air Reserve Base (ARB), Tinker AFB, and Westover ARB. Along with the No Action Alternative, all four bases will be evaluated as alternatives in the EIS.

Scoping and Agency Coordination: To effectively define the full range of issues to be evaluated in the EIS, the USAF will determine the scope of the analysis by soliciting comments from interested local, state and federal elected officials and agencies, as well as interested members of the public and others. Implementation of the KC–46A MOB 3 mission at Tinker AFB in Oklahoma would have the potential to affect floodplains and/or wetlands. Consistent with the requirements and objectives of Executive Order (EO) 11990, "Protection of Wetlands," state and federal regulatory agencies with special expertise in wetlands and floodplains will be contacted to request comment. Consistent with EO 11988 and EO 11990, this NOI initiates early public review of the alternatives, including implementation of the KC–46A MOB 3 mission at Tinker AFB in Oklahoma which has the potential to affect wetlands and/or floodplains. Scoping meetings will be held in the local communities near the alternative basing locations. The scheduled dates, times, locations, and addresses for the scoping meetings will also be published in local media a minimum of 15 days prior to the scoping meetings.

Henry Williams,

Acting Air Force Federal Register Liaison Officer.

[FR Doc. 2016–06520 Filed 3–22–16; 8:45 am]

BILLING CODE 5001–10–P

A.1.2 General Newspaper Advertisement

The U.S. Air Force Invites You to Attend Public Scoping Meetings for the Proposed KC-46A Third Main Operating Base (MOB 3) EIS

Proposed Action and Alternatives

The U.S. Air Force (USAF) is proposing to establish the KC-46A Third Main Operating Base (MOB 3). The MOB 3 mission includes the basing of 12 KC-46A aircraft, facilities and infrastructure, and manpower at a USAF installation within the continental United States (CONUS) where the Air Force Reserve Command (AFRC) leads a Mobility Air Force mission. The purpose of the MOB 3 mission is to provide a fully capable, combat operational KC-46A aerial refueling squadron to accomplish aerial refueling and related missions.

The Strategic Basing Process resulted in the identification of Seymour Johnson Air Force Base (AFB) in North Carolina as the preferred alternative and Grissom Air Reserve Base (ARB) in Indiana, Tinker AFB in Oklahoma, and Westover ARB in Massachusetts as reasonable alternatives for the MOB 3 mission. The KC-46A MOB 3 mission could be an additive or replacement mission depending on where the aircraft is located. Along with the No Action Alternative, all four bases will be evaluated as alternatives in the EIS.

The KC-46A aircraft will replace the aging tanker fleet. With more refueling capacity and enhanced capabilities, improved efficiency and increased capabilities for cargo and aeromedical evacuation, the KC-46A will provide aerial refueling support to the USAF, Navy, and Marine Corps, as well as allied nation coalition force aircraft.

Environmental Impact Statement (EIS)

Pursuant to the National Environmental Policy Act, the USAF will prepare an EIS, which will assess the potential environmental consequences of the KC-46A MOB 3 beddown. In addition to aircraft, the MOB 3 mission will include personnel, facilities to support aircraft operations, and pilot and operator requirements.

Public Scoping Meetings – Please Attend

Public scoping meetings are being held to inform the public about the proposed action and alternatives under consideration, and to "scope" important issues to evaluate in the EIS. The meetings will be arranged in a "come and go" open house format with no formal USAF presentation or opportunity for public testimony. Written comments will be accepted. **Your input is valuable and assists the USAF in making more informed decisions.**

Open House: Drop in anytime between 5-8 P.M.

- April 12, 2016, Westover ARB, Castle of Knights, 1599 Memorial Dr., Chicopee, MA 01020
- April 14, 2016, Seymour Johnson AFB, Herman Park Center, 901 East Ash St., Goldsboro, NC 27530
- April 19, 2016, Grissom ARB, Milestone Event Center, 1458 North Liberator Rd., Peru, IN 46970
- April 21, 2016, Tinker AFB, Sheraton Midwest City Hotel and Reed Conference Center, 57050 Will Rodgers Rd., Midwest City, OK 73110

Public Comment

For more information or to submit written comments, please visit the project website at www.KC-46A-beddown.com or contact:

Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN, 2261 Hughes Ave, Ste 155, Lackland AFB, Texas 78236-9853.

The USAF will accept comments at any time during the environmental process. ***However, to ensure the USAF has sufficient time to consider public input in the preparation of the Draft EIS, please submit comments by April 25, 2016!***

A.1.3 Tinker AFB Newspaper Advertisement

The U.S. Air Force Invites You to Attend Public Scoping Meetings for the Proposed KC-46A Third Main Operating Base (MOB 3) EIS

Proposed Action and Alternatives

The U.S. Air Force (USAF) is proposing to establish the KC-46A Third Main Operating Base (MOB 3). The MOB 3 mission includes the basing of 12 KC-46A aircraft, facilities and infrastructure, and manpower at a USAF installation within the continental United States (CONUS) where the Air Force Reserve Command (AFRC) leads a Mobility Air Force mission. The purpose of the MOB 3 mission is to provide a fully capable, combat operational KC-46A aerial refueling squadron to accomplish aerial refueling and related missions.

The Strategic Basing Process resulted in the identification of Seymour Johnson Air Force Base (AFB) in North Carolina as the preferred alternative and Grissom Air Reserve Base (ARB) in Indiana, Tinker AFB in Oklahoma, and Westover ARB in Massachusetts as reasonable alternatives for the MOB 3 mission. The KC-46A MOB 3 mission could be an additive or replacement mission depending on where the aircraft is located. Along with the No Action Alternative, all four bases will be evaluated as alternatives in the EIS.

The KC-46A aircraft will replace the aging tanker fleet. With more refueling capacity and enhanced capabilities, improved efficiency and increased capabilities for cargo and aeromedical evacuation, the KC-46A will provide aerial refueling support to the USAF, Navy, and Marine Corps, as well as allied nation coalition force aircraft.

Environmental Impact Statement (EIS)

Pursuant to the National Environmental Policy Act, the USAF will prepare an EIS, which will assess the potential environmental consequences of the KC-46A MOB 3 beddown. In addition to aircraft, the MOB 3 mission will include personnel, facilities to support aircraft operations, and pilot and operator requirements. Implementation of the KC-46A MOB 3 mission at Tinker AFB in Oklahoma would potentially affect wetlands and/or floodplains and would therefore be subject to Executive Order (EO) 11988, "Floodplain Management", and EO 11990, "Protection of Wetlands." These public scoping meetings provide the opportunity for early public review of potential impacts to wetlands and floodplains.

Public Scoping Meetings – Please Attend

Public scoping meetings are being held to inform the public about the proposed action and alternatives under consideration, and to "scope" important issues to evaluate in the EIS. The meetings will be arranged in a "come and go" open house format with no formal USAF presentation or opportunity for public testimony. Written comments will be accepted. **Your input is valuable and assists the USAF in making more informed decisions.**

Open House: Drop in anytime between 5-8 P.M.

- April 12, 2016, Westover ARB, Castle of Knights, 1599 Memorial Dr., Chicopee, MA 01020
- April 14, 2016, Seymour Johnson AFB, Herman Park Center, 901 East Ash St., Goldsboro, NC 27530
- April 19, 2016, Grissom ARB, Milestone Event Center, 1458 North Liberator Rd., Peru, IN 46970
- April 21, 2016, Tinker AFB, Sheraton Midwest City Hotel and Reed Conference Center, 57050 Will Rodgers Rd., Midwest City, OK 73110

Public Comment

For more information or to submit written comments, please visit the project website at www.KC-46A-beddown.com or contact:

Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN, 2261 Hughes Ave, Ste 155, Lackland AFB, Texas 78236-9853.

The USAF will accept comments at any time during the environmental process. ***However, to ensure the USAF has sufficient time to consider public input in the preparation of the Draft EIS, please submit comments by April 25, 2016!***

A.1.4 List of Newspapers

Newspaper	Publication Date
The Republican (Westover ARB, MA)	Sunday, 27 March 2016
Goldsboro News-Argus (Seymour Johnson AFB, NC)	Sunday, 27 March 2016
The Free Press, Kinston, NC (Seymour Johnson AFB, NC)	Sunday, 27 March 2016
Kokomo Tribune (Grissom ARB, IN)	Sunday, 3 April 2016
Peru Tribune (Grissom ARB, IN)	Sunday, 3 April 2016
The Oklahoman (Tinker AFB, OK)	Sunday, 3 April 2016

A.2 AGENCY COORDINATION

A.2.1 Agency Coordination Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

28 March 2016

Mr. J. Dale Clark
Air Force NEPA Division (AFCEC/CZN)
2261 Hughes Ave, Suite 155
Lackland AFB TX 78235-9853

Name/Title
(address being mailed to)
(address being mailed to)
(City, State Zip)

Dear {*Merged Name from list*}

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. The Air Force has identified Seymour Johnson Air Force Base (AFB) as the preferred alternative with Grissom Air Reserve Base (ARB), Tinker AFB, and Westover ARB as reasonable alternatives. All four bases and the No Action Alternative will be evaluated as alternatives in the EIS. Additional information on the beddown and EIS process is included in the attached Notice of Intent from the March 23, 2016, Federal Register.

The Air Force will host a public come and go open house scoping meeting in the local area near each of the bases proposed for this action (see attached scoping brochure). The purpose of the meetings and the scoping period is to solicit comments on the scope of environmental issues to be analyzed in depth in the EIS. Public and agency comments provided to the Air Force during the scoping period will be considered in the preparation of the Draft EIS. Additional information can be found on the project website at www.kc-46A-beddown.com.

We request your participation and solicit scoping comments on this action. Please provide any comments by April 25, 2016, directly to Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN, 2261 Hughes Ave, Ste. 155, Lackland AFB, TX 78236-9853 or to the project website at www.kc-46A-beddown.com. Thank you for your assistance in this matter.

Sincerely,

J. DALE CLARK, PE, GS-14, DAF
Chief, Air Force NEPA Division
Environmental Management Directorate

Attachments:
1. Notice of Intent
2. KC-46A MOB 3 EIS Brochure

15510 Federal Register / Vol. 81, No. 56 / Wednesday, March 23, 2016 / Notices

~~*Estimated Total Annual Burden Hours:* 3,552.~~

~~*Abstract:* Regulation I applies to all depository institutions lacking Federal deposit insurance. It requires the disclosure of certain insurance-related information in periodic statements, account records, locations where deposits are normally received, and advertising. This part also requires such depository institutions to obtain a written acknowledgment from depositors regarding the institution's lack of Federal deposit insurance. On December 16, 2011, the Bureau published an interim final rule (IFR) republishing Regulation I and making technical and conforming changes to reflect the transfer of authority and certain other changes made by the Dodd-Frank Act (76 FR 78126/RIN 3170–AA06). The IFR did not impose any new substantive obligations on persons subject to the existing regulations. As the Bureau added no new recordkeeping or reporting requirements, it adopted the PRA analysis from the original regulation. Upon further review, the Bureau has determined that the disclosures required by 12 CFR 1009.3 and 1009.4 and the signed acknowledgment required by § 1009.5 are subject to the PRA and require OMB approval thereunder. The Bureau has determined that it cannot reasonably comply with the standard approval timelines because the use of normal clearance procedures is reasonably likely to prevent the collection of information and result in public harm. *See* 5 CFR 1320.13(a)(2); 44 U.S.C. 3507(j).~~

~~Contemporaneously with this request for emergency processing, the Bureau is also initiating standard clearance procedures by allowing the public 59 days to comment on this collection of information. Accordingly, this request will also be resubmitted to OMB under standard clearance procedures.~~

~~*Request for Comments:* Comments are invited on: (a) Whether the collection of information is necessary for the proper performance of the functions of the Bureau, including whether the information will have practical utility; (b) The accuracy of the Bureau's estimate of the burden of the collection of information, including the validity of the methods and the assumptions used; (c) Ways to enhance the quality, utility, and clarity of the information to be collected; and (d) Ways to minimize the burden of the collection of information on respondents, including through the use of automated collection techniques or other forms of information technology. Comments submitted in response to this notice will be summarized and/or included in the request for OMB approval. All comments will become a matter of public record.~~

~~Dated: March 17, 2016.~~

~~**Darrin A. King,**~~

~~*Paperwork Reduction Act Officer, Bureau of Consumer Financial Protection.*~~

~~[FR Doc. 2016–06160 Filed 3–22–16; 8:45 am]~~

~~BILLING CODE 4810–AM–P~~

DEPARTMENT OF DEFENSE

Department of the Air Force

Notice of Intent To Prepare an Environmental Impact Statement for the KC–46A Third Main Operating Base (MOB 3) Beddown

AGENCY: Air Force Reserve Command, United States Air Force, DoD.

ACTION: Notice of intent.

SUMMARY: The United States Air Force (USAF) is issuing this notice to advise the public of the intent to prepare an Environmental Impact Statement (EIS) for the KC–46A Third Main Operating Base (MOB 3) Beddown. The EIS will assess the potential environmental consequences of various alternatives of the beddown of KC–46A tanker aircraft, associated infrastructure and personnel in support of the MOB 3 mission at existing installations where the Air Force Reserve Command (AFRC) leads a Mobility Air Force mission.

DATES: The USAF intends to hold scoping meetings from 5 p.m. to 8 p.m. in the following communities on the following dates:

1. Westover ARB—12 April 2016, at the Castle of Knights, 1599 Memorial Dr., Chicopee, MA 01020
2. Seymour Johnson AFB—14 April 2016, at the Herman Park Center, 701 East Ash St., Goldsboro, NC 27530
3. Grissom ARB—19 April 2016, at the Milestone Event Center, 1458 North Liberator Rd., Peru, IN 46970
4. Tinker AFB—21 April 2016, at the Sheraton Midwest City Hotel and Reed Conference Center, 57060 Will Rodgers Rd., Midwest City, OK 73110

ADDRESSES: The project Web site (*www.kc-46a-beddown.com*) provides more information on the EIS and can be used to submit scoping comments. Scoping comments may also be submitted to Mr. Hamid Kamalpour, U.S. Air Force, AFCEC/CZN, 2261 Hughes Ave., Ste 155, Lackland AFB, Texas 78236–9853.

As a convenience for comments submitted by mail, a comment form is available for download on the Web site. Comments will be accepted at any time during the environmental impact analysis process. However, to ensure the USAF has sufficient time to consider public input in the preparation of the Draft EIS, scoping comments should be submitted to the Web site or the address listed below by 25 April 2016.

SUPPLEMENTARY INFORMATION: The MOB 3 mission includes 12 KC–46A aircraft in one squadron. The KC–46A aircraft will replace the aging tanker fleet and would continue supporting the mission of providing worldwide refueling, cargo, and aeromedical evacuation support. The proposed basing alternatives for MOB 3 mission include: Seymour Johnson Air Force Base (AFB), Grissom Air Reserve Base (ARB), Tinker AFB, and Westover ARB. Along with the No Action Alternative, all four bases will be evaluated as alternatives in the EIS.

Scoping and Agency Coordination: To effectively define the full range of issues to be evaluated in the EIS, the USAF will determine the scope of the analysis by soliciting comments from interested local, state and federal elected officials and agencies, as well as interested members of the public and others. Implementation of the KC–46A MOB 3 mission at Tinker AFB in Oklahoma would have the potential to affect floodplains and/or wetlands. Consistent with the requirements and objectives of Executive Order (EO) 11990, ''Protection of Wetlands,'' state and federal regulatory agencies with special expertise in wetlands and floodplains will be contacted to request comment. Consistent with EO 11988 and EO 11990, this NOI initiates early public review of the alternatives, including implementation of the KC–46A MOB 3 mission at Tinker AFB in Oklahoma which has the potential to affect wetlands and/or floodplains. Scoping meetings will be held in the local communities near the alternative basing locations. The scheduled dates, times, locations, and addresses for the scoping meetings will also be published in local media a minimum of 15 days prior to the scoping meetings.

Henry Williams,

Acting Air Force Federal Register Liaison Officer.

[FR Doc. 2016–06520 Filed 3–22–16; 8:45 am]

BILLING CODE 5001–10–P

A.2.1 Agency Coordination Letter (Continued)

The U.S. Air Force (USAF) is preparing a Draft Environmental Impact Statement (EIS) to assess the potential environmental consequences of basing and operating the KC-46A tanker aircraft, associated infrastructure, and manpower to establish the KC-46A Third Main Operating Base (MOB 3) mission. In order to effectively define the full range of issues to be evaluated in the EIS, the USAF is holding public scoping meetings to determine the EIS scope (i.e., what will be covered and in what detail) by soliciting comments from interested state and federal agencies and interested members of the public.

The National Environmental Policy Act (NEPA)

The NEPA is our national mandate for making informed decisions while considering environmental impacts. When federal agencies propose projects having the potential to significantly impact the environment, NEPA requires the following process be undertaken as part of planning before final decisions are made:

- Evaluation and consideration of potential environmental consequences for projects that may significantly impact the environment, and
- Consideration of public and government agency comments.

Where the potential for significant environmental impacts exists, this evaluation is presented in an EIS, which:

- Identifies and describes the affected environment;
- Evaluates the potential environmental consequences from a range of reasonable alternatives; and
- Identifies environmental permits and specific mitigation measures that could avoid, minimize, or reduce potential environmental consequences.

The EIS Timeline

Notice of Intent (NOI) and Scoping

The EIS begins with an NOI, which is published in the *Federal Register* to announce the USAF's intent to prepare an EIS on the KC-46A MOB 3 beddown proposed action and alternatives. The NOI is the beginning of the public scoping process, including community scoping meetings, to provide the public and government agencies and entities time to review the proposed action and alternatives.

1

Proposed Action: KC-46A MOB 3 Beddown

The KC-46A MOB 3 beddown EIS will evaluate the potential environmental consequences of the beddown of 12 KC-46A aircraft, associated facilities and infrastructure, and manpower at a single MOB 3 location.

The MOB 3 preferred alternative location is:

- Seymour Johnson Air Force Base (AFB), North Carolina

The MOB 3 reasonable alternative locations are:

- Grissom Air Reserve Base (ARB), Indiana
- Tinker AFB, Oklahoma
- Westover ARB, Massachusetts

Along with the No Action Alternative, all four alternatives are evaluated equally in the EIS.

The USAF is in the early stages of the EIS process, and no decision has been made as to the final MOB 3 beddown location.

U.S. Map of MOB 3 Alternative Bases

No Action Alternative

Under the No Action Alternative, beddown of the KC-46A MOB 3 mission would not occur at this time. A No Action Alternative will be evaluated at each proposed beddown location. Evaluation of the No Action Alternative provides a baseline for decision makers.

2

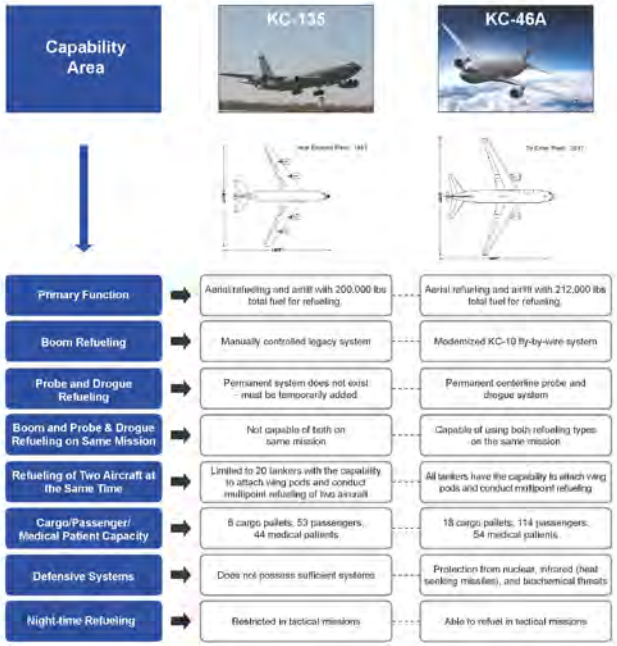
A.2.1 Agency Coordination Letter (Continued)

Purpose and Need: Tanker Modernization

The selected basing locations would need to accommodate training, flight operations, and maintenance support as necessary to support KC-46A pilots and operating personnel. Each KC-46A squadron requires personnel, facilities, and airspace to support aircraft operations and pilot and personnel training.

The purpose of the KC-46A MOB 3 beddown is to provide locations for training and flight operations. The KC-46A tankers are needed to support a high-threat, multi-role warfighting capability to Commanders worldwide. Trained pilots and personnel must be available to meet necessary KC-46A scheduled inventory replenishment dates as older tanker aircraft are withdrawn from the inventory.

Comparison of KC-135 and KC-46A Aircraft Performance Capabilities



Capability Area	KC-135	KC-46A
Primary Function	Aerial refueling and airlift with 200,000 lbs total fuel for refueling.	Aerial refueling and airlift with 212,000 lbs total fuel for refueling.
Boom Refueling	Manually controlled legacy system	Modernized KC-10 fly-by-wire system
Probe and Drogue Refueling	Permanent system does not exist - must be temporarily added	Permanent centerline probe and drogue system
Boom and Probe & Drogue Refueling on Same Mission	Not capable of both on same mission	Capable of using both refueling types on the same mission
Refueling of Two Aircraft at the Same Time	Limited to 20 tankers with the capability to attach wing pods and conduct multipoint refueling of two aircraft	All tankers have the capability to attach wing pods and conduct multipoint refueling
Cargo/Passenger/ Medical Patient Capacity	8 cargo pallets, 53 passengers, 44 medical patients	18 cargo pallets, 114 passengers, 54 medical patients
Defensive Systems	Does not possess sufficient systems	Protection from nuclear, infrared (heat seeking missiles), and biochemical threats
Night-time Refueling	Restricted in tactical missions	Able to refuel in tactical missions

Source: GAO presentation of USAF information; © Boeing Company (KC-46A photo).

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Environmental Resources

The USAF understands the potential for the KC-46A MOB 3 beddown to affect environmental resources. As part of the EIS, the USAF will analyze potential environmental consequences associated with changes made to support KC-46A operations, including changes in personnel, construction of facilities, and the inclusion of KC-46A flight operation activities. The environmental resource areas listed to the right are currently under consideration in the KC-46A MOB 3 beddown EIS.

Please take this opportunity to:

- ☑ Learn about the project,
- ☑ Identify community-specific issues, and
- ☑ Make sure you are included on our mailing list.

Public Scoping Meetings

5:00 p.m. - 8:00 p.m.

April 12, 2016
Westover Air Reserve Base
Castle of Knights
1599 Memorial Drive
Chicopee, MA

April 14, 2016
Seymour Johnson Air Force Base
Herman Park Center
901 E. Ash Street
Goldsboro, NC

April 19, 2016
Grissom Air Reserve Base
Milestone Event Center
1458 N. Liberator Road
Peru, IN

April 21, 2016
Tinker Air Force Base
Sheraton Midwest City Hotel and
Reed Conference Center
57050 Will Rodgers Road
Midwest City, OK

Environmental Resource Areas include:

Aircraft Operations
- Noise
- Air Quality
- Safety
  - Flight Safety
  - Ground Safety

Natural Resources
- Geology and Soils
- Surface Water and Groundwater
- Wetlands and Floodplains
- Biological Resources

Cultural Resources
- Archaeological Resources
- Architectural Resources
- Traditional Resources

Human Resources
- Land Use
- Recreation
- Socioeconomics
- Environmental Justice and Protection of Children

Community Infrastructure
- Infrastructure (utilities and public services)
- Hazardous Materials and Waste
- Transportation

How to Submit Comments

Scan with Your Phone to Learn More about the KC-46A MOB 3 Beddown EIS

Submit comments electronically at www.KC-46A-beddown.com

at a scoping meeting, or by mail before *April 25, 2016*, to:

Mr. Hamid Kamalpour
U.S. Air Force, AFCEC/CZN
2261 Hughes Ave, Ste. 155
Lackland AFB, TX 78236-9853

4

A.2.2 Agency Coordination Mailing List

A.2.2.1 Grissom ARB Agency Coordination Mailing List

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Mr.	Rune	Duke		AOPA	Washington	DC	20001
Mrs.	Susan	Hovermale	Conservation Specialist	Farm Service Agency	Indianapolis	IN	46278
Mr.	Barry	Cooper	Regional Administrator	Federal Aviation Administration, Great Lakes Regional Office	Des Plaines	IL	60018
Mr.	Robert	Kaplan	Regional Administrator	Ralph Metcalfe Federal building	Chicago	IL	60604
Mr.	Susan	Meadows	Asst. State Conservationist for Programs	Natural Resources Conservation Service	Indianapolis	IN	46278
Mr.	Scott	Pruitt	Field Supervisor	U.S. Fish and Wildlife Service	Bloomington	IN	47403-2121
Mr.	Jennifer	Boyle-Warner	Executive Director	Indiana Association of Soil and Water Conservation Districts	Indianapolis	IN	46202
Ms.	Brandye	Hendrickson	Commissioner	Indiana Department of Transportation	Indianapolis	IN	46204
Mr.	Duane	Embree	Executive Director	Indiana Office of Defense Development	Bloomington	IN	47404
Mr.	Jim	Schellinger	President	Indiana Economic Development Corporation	Indianapolis	IN	46204
Mr.	Bill	Konyha	Executive Director	Indiana Office of Community and Rural Affairs	Indianapolis	IN	46204
Ms.	Jennifer	Vandenberg	Community Liaison	Indiana Office of Community and Rural Affairs	Indianapolis	IN	46204
Mr.	Cameron F.	Clark	Director	Indiana Department of Natural Resources	Indianapolis	IN	46204
Mr.	Ted	McKinney	Director	Indiana State Department of Agriculture	Indianapolis	IN	46204
Mr.	Jason	Hill	Manager	Ducks Unlimited	Ann Arbor	MI	48108
Mr.	Andy	Kron	President	Indiana Farm Bureau	Indianapolis	IN	46202
Mr.	Robert	Suseland	Regional Biologist	Pheasants Forever	Lafayette	IN	47909
Ms.	Mary	McConnell	Director	The Nature Conservancy	Indianapolis	IN	46202
Mr.	Steven	Howell	Director	Indiana Department of Environmental Management (IDEM)	Indianapolis	IN	46204
Mr.	Kenneth	Westlake	NEPA Coordinator	US EPA Region V	Illinois	IL	60604
Mr.	Greg	Goodnight	Mayor of Kokomo	City of Kokomo	Kokomo	IN	46901
Ms.	Brenda	Brunnemer-Ott	City Clerk of Kokomo	City of Kokomo	Kokomo	IN	46901
Mr.	Gabriel	Greer	Mayor of Peru	City of Peru	Peru	IN	46970
Ms.	Trish	Soldi	Peru City Clerk/Treasurer	City of Peru	Peru	IN	46970
Mr.	Dennis	See	Zoning Administrator	City of Peru	Peru	IN	46970
Mr.	Dave	Kitchell	Mayor of City of Logansport	City of Logansport	Logansport	IN	46947
Ms.	Carol Sue	Hayworth	Logansport Clerk/Treasurer	City of Logansport	Logansport	IN	46947
Mr.	CJ	Crist	Town Council President	Town of Bunker Hill	Bunker Hill	IN	46914
Ms.	Rose	Jackson	Clerk Treasurer	Galveston Town Hall	Galveston	IN	46932
Ms.	Sandy	Chittum	President Chambers of Commerce	Miami County Chamber of Commerce	Peru	IN	46970
Mr.	Bill	Cuppy	Executive Director Chamber of Commerce	Logansport-Cass County Chamber of Commerce	Logansport	IN	46947
Mr.	Jim	Tidd	Director	Miami County Economic Development Authority	Peru	IN	46970
Ms.	Christy	Householder	Director	Cass County Economic Development Authority	Logansport	IN	46947
Mr.	Bill	Cuppy	Executive Director	Cass Logansport Economic Development Organization	Logansport	IN	46947

A.2.2.1 Grissom ARB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Mr.	John	Gilpin	President	Grissom Community Council	Wabash	IN	46992
Mr.	Timothy	Cox	Vice President	Grissom Community Council	Peru	IN	46970
Mr.	Jim	Price	Executive Director	Grissom Air Museum	Peru	IN	46970
Mr.	Patrick	Robinson	President	Walton Town Hall	Walton	IN	46994
Mr.	Josh	Francis	Commission Chairman	Miami County courthouse	Peru	IN	46970
Mr.	James L.	Sailors	Commission Chairman	Cass County	Logansport	IN	46947
Mr.	Arin	Shaver	AICP, Executive Director/Subdivision Administrator	Cass County Government Building	Logansport	IN	46947
Mr.	Steven	Ray	Executive Director	North Central Indiana Regional Planning Council	Peru	IN	46970
Mr.	Paul	Wyman	President	Howard County Administration Center	Kokomo	IN	46901
The Honorable	Mike	Pence	Governor	Indiana State House	Indianapolis	IN	46204
The Honorable	Sue	Ellspermann	Lt. Governor	Indiana State House	Indianapolis	IN	46204
The Honorable	James	Buck	Senate District 21	Indiana State House	Indianapolis	IN	46204
The Honorable	Randall	Head	Senate District 18	Indiana State House	Indianapolis	IN	46204
The Honorable	William	Friend	House District 23	Indiana State House	Indianapolis	IN	46204
The Honorable	Heath	VanNatter	House District 38	Indiana State House	Indianapolis	IN	46204
The Honorable	Dan	Coats	US Senator	U.S. Senate	Indianapolis	IN	46204
The Honorable	Joe	Donnelly	US Senator	U.S. Senate	Indianapolis	IN	46204
The Honorable	Jackie	Walorski	US Representative	U.S. House of Representatives	Mishawaka	IN	46544
The Honorable	Susan	Brooks	US Representative	U.S. House of Representatives	Carmel	IN	46032
The Honorable	Todd	Rokita	US Representative	U.S. House of Representatives	Danville	IN	46122
Ms.	Amy	Pate	Executive Vice President	REALTORS Association of Central Indiana	Kokomo	IN	46902
Mr.	Sean	White	General Manager	Montgomery Aviation, Inc.	Peru	IN	46970
Mr.	Chris	Renteria	General Manager	Dean Baldwin Painting	Peru	IN	46970
Mr.	Brandon	Smith	News Reporter	Indiana Public Broadcasting Stations	Indianapolis	IN	46805
Mr.	Jake	Robinson		Network Indiana	Indianapolis	IN	46204
				WEDJ-Radio	Indianapolis	IN	46202
Ms.	Michelle	Kiefer		WNDE-Radio	Indianapolis	IN	46220
Mr.	Jay	Michaels		WRWM-Radio	Indianapolis	IN	46220
Mr.	Bob	Richards		WLHK-Radio	Indianapolis	IN	46204

A.2.2.1 Grissom ARB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Ms.	Michelle	Johnson		WFYI-Radio	Indianapolis	IN	46202
Mr.	Chuck	Williams		WTLC-Radio	Indianapolis	IN	46202
Mr.	Jim	Ganley		WSQM-Radio	Indianapolis	IN	46250
Mr.	JR	Ammons		WZPL-Radio	Indianapolis	IN	46260
Mr.	Edward	Thurman		WBAT/WCJC/WMRI/WXXC-Radio	Marion	IN	46953
Mr.	Jack	Crummer		WIWU-Radio	Marion	IN	46953
Ms.	Camellia	Pflum		WZWZ-Radio	Kokomo	IN	46904
Mr.	Allan	James		WWKI-Radio	Kokomo	IN	46901
Mr.	Ken	Holtzinger		WSAL-Radio	Logansport	IN	46947
Mr.	Wade	Weaver		WJOT-Radio	Wabash	IN	46992
Ms.	Toni	Metzger		WKUZ-Radio	Wabash	IN	46992
Ms.	Shannon	Crouch		Kokomo Herald	Kokomo	IN	46901
Mr.	Pat	Munsey		Kokomo Perspective	Kokomo	IN	46901
Mr.	Jeff	Kovaleski		Kokomo Tribune	Kokomo	IN	46901
Ms.	Michelle	Dials		Cass County Info	Logansport	IN	46947
Ms.	Mitsy	Knisely		Pharos-Tribune	Logansport	IN	46947
Mr.	Tom	Davies	Editor	Associated Press	Indianapolis	IN	46204
Ms.	Linda	Kelsay		Chronicle-Tribune	Marion	IN	46952
Mr.	Greg	Andrews		Indianapolis Business Journal	Indianapolis	IN	46204
Ms.	Amanda	Heckert		Indianapolis Monthly	Indianapolis	IN	46204
Mr.	Willam	Mays		Indianapolis Recorder	Indianapolis	IN	46218
Ms.	Patricia	Miller		Indianapolis Star	Indianapolis	IN	46225
Ms.	Julie	Inskeep		Journal Gazette	Fort Wayne	IN	46802
Mr.	Ben	Quiggle		Peru Tribune	Peru	IN	46970
Mr.	Doug	Roorbach		News Herald	Marion	IN	46952
Mr.	Wayne	Rees		The Paper	Wabash	IN	46992
Mr.	Eric	Seaman		Wabash Plain Dealer	Wabash	IN	46992
Ms.	Tina	Cosby		WISH/WNDY-TV	Indianapolis	IN	46202
Mr.	Jimmy	Love		WRTV-TV	Indianapolis	IN	46202
Ms.	Julie	McQuoid		WTHR-TV	Indianapolis	IN	46204
Mr.	Brad	Norris		WXIN-TV	Indianapolis	IN	46278
Ms.	Maryann	Farnham		Peru Public Library	Peru	IN	46970
Ms.	Faith	Brautigam		Kokomo-Howard County Public Library Main	Kokomo	IN	46901
Ms.	Lori	Hugley		Kokomo Public Library-South	Kokomo	IN	46902
Mr.	Pat	Brubaker		Wabash Carnegie Public Library	Wabash	IN	46992
Mr.	David	Ivey		Logansport Public Library	Logansport	IN	46947

A.2.2.2 Seymour Johnson AFB Agency Coordination Mailing List

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
The Honorable	Louis	Pate	Deputy President Pro Tempore, Senator	North Carolina State Senate	Raleigh	NC	27601-2808
The Honorable	Jimmy	Dixon	Representative	North Carolina House of Representatives	Raleigh	NC	27603-5925
The Honorable	John	Bell, IV	Majority Whip, Representative	North Carolina House of Representatives	Raleigh	NC	27603-5925
The Honorable	Larry	Bell	Representative	North Carolina House of Representatives	Raleigh	NC	27603-5925
The Honorable	Pat	McCrory	Governor	North Carolina Governor	Raleigh	NC	27699-0301
The Honorable	Howard	Hunter	Senator	North Carolina House of Representatives	Raleigh	NC	27603-5925
Mr.	John	Hammond	Endangered Species Coordinator	U.S. Fish and Wildlife Service	Raleigh	NC	27636-3726
Mr.	Michael P.	Huerta	Administrator	U.S. Department of Transportation	Washington	DC	20591
Ms.	Heather	McTeer Toney	Regional Administrator	USEPA Region IV	Atlanta	GA	30303-3104
Mr.	Gordon	Myers	Executive Director	North Carolina Wildlife Resources Commission	Raleigh	NC	27699-1701
Ms.	Renee	Gledhill-Earley	DCR-Historic Preservation	North Carolina Department of Natural and Cultural Resources	Raleigh	NC	27699-4617
Mr.	Donald	van der Vaart	Secretary of Department of Environmental Quality	North Carolina Department of Environmental Quality	Raleigh	NC	27699-1601
Ms.	Crystal	Best		North Carolina State Environmental Review Clearinghouse	Raleigh	NC	27699-1301
Ms.	Sheila	Holman	Director	North Carolina Division of Air Quality	Raleigh	NC	27699-1641
Mr.	Braxton	Davis	Director	North Carolina Division of Coastal Management	Morehead City	NC	28557
Mr.	Bobby	Walston	Aviation Director	North Carolina Division of Aviation	Raleigh	NC	27699-1560
Secretary	Nick	Tennyson	Transportation Secretary	North Carolina Department of Transportation	Raleigh	NC	27699-1501
Mr.	Gregory	Richardson	Executive Director	North Carolina Commission of Indian Affairs	Raleigh	NC	27699-1317
The Honorable	Chuck	Allen	Mayor	City of Goldsboro	Goldsboro	NC	27533
Mr.	George	Wood	County Manager	Wayne County Manager	Goldsboro	NC	27533
Ms.	Ashley	Smith	Director	Wayne County Soil & Water Conservation	Goldsboro	NC	27530
Ms.	Kate	Daniels	President and Executive Director	Wayne County Chamber of Commerce	Goldsboro	NC	27533
Mr.	Davin	Madden	Director	Environmental Health Department	Goldsboro	NC	27530
Mr.	Chip	Crumpler	Planning Board	Wayne County Planning Department	Goldsboro	NC	27530

A.2.2.2 Seymour Johnson AFB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Mr.	James	Rowe	Planning Director	City of Goldsboro	Goldsboro	NC	27530
Mr.	Scott	Stevens	City Manager	City of Goldsboro	Goldsboro	NC	27530
Mr.	Joe	Daughtery	Chairman	Wayne County Board of Commissioners	Goldsboro	NC	27534
Ms.	Natasha	Francois	Reference Department Head	Wayne County Public Library	Goldsboro	NC	27530
Ms.	Kim	Webb	Librarian	Seymour Johnson AFB Library	Seymour Johnson AFB	NC	27531
Mr.	Dennis	Hill	Editor	Goldsboro News-Argus	Goldsboro	NC	27534
Mr.	Thomas	Vick	News Director	Goldsboro Daily News	Goldsboro	NC	27530
Mr.	Jared	Brumbaugh		Public Radio East - NPR	New Bern	NC	28562
Mr.	Bruce	Ferrell	Manager	WPTF - 680 AM	Raleigh	NC	27604
Mr.	Rick	Gall	News Director	WRAL-TV	Raleigh	NC	27605
Ms.	Andrea	Parquet-Taylor	News Director	WNCN-TV	Raleigh	NC	27609
Ms.	Michelle	Germano	News Director	WTVD-TV	Durham	NC	27701
Mr.	Gregory	Ruhl	Manager	Wayne Executive Jetport	Pikeville	NC	27863
The Honorable	Richard	Burr	Senator	U.S. Senate	Washington	DC	20510
The Honorable	Richard	Burr	Senator	U.S. Senate	Rocky Mount	NC	27804
The Honorable	Thom	Tillis	Senator	U.S. Senate	Washington	DC	20510
The Honorable	Thom	Tillis	Senator	U.S. Senate	Raleigh	NC	27601
The Honorable	G.K.	Butterfield	Congressman	U.S. House of Representatives	Washington	DC	20515
The Honorable	G.K.	Butterfield	Congressman	U.S. House of Representatives	Wilson	NC	27893
The Honorable	George	Holding	Congressman	U.S. House of Representatives	Washington	DC	20515
The Honorable	George	Holding	Congressman	U.S. House of Representatives	Fremont	NC	27830

A.2.2.3 Tinker AFB Agency Coordination Mailing List

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Ms.	Tamara	Francis-Fourkiller	THPO (Acting) Caddo Nation of Oklahoma	Caddo Nation of Oklahoma	Binger	OK	73009
Mr.	James	Floyd	Principal Chief Muscogee (Creek) Nation	Muscogee (Creek) Nation	Okmulgee	OK	74447
Dr.	Andrea	Hunter	THPO Osage Nation	Osage Nation	Pawhuska	OK	74056
Ms.	Natalie	Harjo	HPO Seminole Nation	Seminole Nation	Wewoka	OK	74884
Ms.	Terri	Parton	President Wichita & Affiliated Tribes	Wichita & Affiliated Tribes	Anadarko	OK	73005
Mr.	Ken	Collins	T&E Branch Chief	U.S. Fish and Wildlife Service	Tulsa	OK	74129-1428
Mr.	Kevin	Grant	State Director Oklahoma Wildlife Service	US Department of Agriculture	Oklahoma City	OK	73152
Mr.	Eddie	Streater	Regional Director	Bureau of Indian Affairs	Muskogee	OK	74401-6201
Mr.	Dan	Deerinwater	Regional Director	Bureau of Indian Affairs	Anadarko	OK	73005
Ms.	Rhonda	Smith	Chief Compliance Assurance and Enforcement Division	EPA Region VI	Dallas	TX	75202
Mr.	Ron	Curry	Regional Administrator	EPA Region VI	Dallas	TX	75202
Mr.	Gary	O'Neill	State Conservationist	US Department of Agriculture	Stillwater	Ok	74074-2655
Mr.	John	Hendrix	State Coordinator	US Fish and Wildlife Services	Tulsa	Ok	74129-1428
Mr.	Ross	Richardson		Federal Emergency Management Association (FEMA)	Denton	TX	76209
Ms.	Carolyn	Schultz		US Army Corps of Engineers, Tulsa District	Tulsa	OK	74128-4609
Ms.	Julie	Cunningham	Chief, Planning & Management Division	Oklahoma Water Resource Board	Oklahoma City	OK	73118
Ms.	Bob	Anthony	Chairman Oklahoma Corporation Commission	Oklahoma Corporation Commission	Oklahoma City	OK	73152-2000
Mr.	George	Geissler	State Forester	Oklahoma Department of Agriculture, Food and Forestry	Oklahoma City	OK	73105
Mr.	Richard	Hatcher	Director Oklahoma Department of Wildlife Conservation	Oklahoma Department of Wildlife Conservation	Oklahoma City	OK	73152
Dr.	Jeremy	Boak	Director Oklahoma Geological Survey	Oklahoma Geological Survey	Norman	OK	73019
Mr.	Jeff	Pearl	Environmental Programs Manager	Oklahoma Department of Transportation	Oklahoma City	OK	73105
Ms.	Jennifer	Wright		Oklahoma Department of Environmental Quality	Oklahoma City	OK	73101-1677
Ms.	Melvena	Heisch	Deputy SHPO	State Historic Preservation Office	Oklahoma City	OK	73105
Mr.	Eric	Pollard	Central Oklahoma Clean Cities Coordinator	Association of Central Oklahoma Governments	Oklahoma City	OK	73104-2405
Ms.	Kellie	Gilles	Planning Manager	Midwest City	Midwest City	OK	73110
Mr.	John	Johnson	Executive Director	Association of Central Oklahoma Governments (ACOG)	Oklahoma City	OK	73104-2405

A.2.2.3 Tinker AFB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Mr.	Eric	Wenger	Floodplain Administrator, Director, City Engineer	Oklahoma City	Oklahoma City	OK	73102
Ms.	Marsha	Slaughter	General Manager Oklahoma City Water Utilities Trust	City of Oklahoma City	Oklahoma City	OK	73102
Mr.	Mark	VanLandingham	Vice President Government Relations and Policy	Greater Oklahoma City Chamber of Commerce	Oklahoma City	OK	73102
Mr.	Pete	White	Councilman Ward Four	City of Oklahoma City	Oklahoma City	OK	73102
Mr.	Patrick	Menefee	Floodplain Administrator, City Engineer	City of Midwest City	Midwest City	OK	73110
Ms.	Monica	Cardin	Floodplain Administrator	City of Del City	Del City	OK	73115
Mr.	Erik	Brandt	Floodplain Administrator	Oklahoma County	Oklahoma City	OK	73102-3441
Mr.	William	Janacek	Co-Chair	Tinker Restoration Advisory Board	Midwest City	OK	73110
Mr.	Andy	McDaniels	Executive Director Oklahoma Wildlife Federation	Oklahoma Wildlife Federation	Oklahoma City	OK	73146
Mr.	Johnson	Bridgwater	Chapter Director Sierra Club	Sierra Club	Oklahoma City	OK	73103
Ms.	Susie	Beasley	Community Relations, Chair Executive Committee	Tinker Restoration Advisory Board	Choctaw	OK	73020
Mr.	Bill	Diffin	President	Audubon Society of Central Oklahoma	Oklahoma City	OK	73114
The Honorable	James	Inhofe	Senator	U.S. Senate	Washington	DC	20510-3603
The Honorable	James	Inhofe	Senator	U.S. Senate	Enid	OK	73701
The Honorable	James	Lankford	Senator	U.S. Senate	Washington	DC	20510
The Honorable	James	Lankford	Senator	U.S. Senate	Oklahoma City	OK	73102
The Honorable	Thomas	Cole	Congressman	U.S. House of Representatives	Washington	DC	20515
The Honorable	Thomas	Cole	Congressman	U.S. House of Representatives	Norman	OK	73069
The Honorable	Jack	Fry	Senator	Oklahoma State Senate	Oklahoma City	OK	73105
The Honorable	Charlie	Joyner	Representative	Oklahoma House of Representatives	Oklahoma City	OK	73105
The Honorable	Charlie	Joyner	Representative	Oklahoma House of Representatives	Midwest City	OK	73110
The Honorable	Mary	Fallin	Governor	Oklahoma Governor	Oklahoma City	OK	73105

A.2.2.3 Tinker AFB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
The Honorable	Brian	Linley Sr.	Mayor, City of Del City	City of Del City	Del City	OK	73115
Mr.	Brian	Maughanm	County Commissioner District Two	Oklahoma County	Oklahoma City	OK	73102-3441
The Honorable	Mick	Cornett	Mayor, City of Oklahoma City	City of Oklahoma City	Oklahoma City	OK	73102
The Honorable	Dee	Collins	Mayor, City of Midwest City	City of Midwest City	Midwest City	OK	73110
Ms.	Kelly	Dyer Fry	Editor of The Oklahoman & Vice President of News	The Oklahoman	Oklahoma City	OK	73125
Ms.	Natalie	Hughes	News Director	KFOR-TV	Oklahoma City	OK	73114
Ms.	Rebecca	Gaylord	News Director	KOCO-TV	Oklahoma City	OK	73131
Mr.	Rob	Krier	General Manager	KWTV-DT	Oklahoma City	OK	73111
Mr.	Adam	Pursch	News Director	KOKH-TV	Oklahoma City	OK	73111
Mr.	Tom	Travis	Director of Programming	KTOK	Oklahoma City	OK	73118
Mr.	Jack	Taylor	Program Director	KOKO	Oklahoma City	OK	73114
Mr.	Chris	Kennedy		Midwest City Public Library	Midwest City	OK	73110-7589
Mr.	David	Newyear		Del City Library	Del City	OK	73115
Mr.	Peter	Nardin	Reference Librarian	Tinker Library	Tinker AFB	OK	73145
Mr.	Mark	Kranenburg	Director	Will Rogers World Airport	Oklahoma City	OK	73159-0937

A.2.2.4 Westover ARB Agency Coordination Mailing List

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Mr.	Kevin	Walsh	Director	Massachusetts Department of Transportation	Boston	MA	02116
Ms.	Deirdre	Buckley	Director	Executive Office of Energy and Environmental Affairs (EEA)	Boston	MA	02114
Dr.	Jeffrey	DeCarlo	Administrator	Massachusetts Department of Transportation Aeronautics Division	East Boston	MA	02128-2909
Mr.	Matthew	Beaton	Secretary	Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs	Boston	MA	02114
Mr.	Leo	Roy	Commissioner	Department of Conservation and Recreation	Boston	MA	02114-2104
Mr.	Jack	Buckley	Administrator	Massachusetts Division of Fisheries and Wildlife	Westborough	MA	01581
Mr.	Steve	Hubbard		Chicopee Memorial State Park	Chicopee	MA	01020
Mr.	James	Reidy	Chairperson	City of Chicopee-Chicopee City Hall	Chicopee	MA	01013
Mr.	Lee	Pouliot	Administrator	City of Chicopee	Chicopee	MA	01013
Mr.	Jason	Martowski	Chairperson	Town of Ludlow	Ludlow	MA	01056

A.2.2.4 Westover ARB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Mr.	Douglas	Stefancik		Town of Ludlow	Ludlow	MA	01056
Mr.	Domenic	Sarno	Mayor	City of Springfield	Springfield	MA	01103
Mr.	Alex	Morse	Mayor	City of Holyoke	Holyoke	MA	01040
Mr.	Christopher	Martin	Town Administrator	Town of Granby	Granby	MA	01033
Mr.	Mike	Sullivan	Town Administrator	Town of South Hadley	South Hadley	MA	01075
The Honorable	Charlie	Baker	Governor	Massachusetts Governor Office	Springfield	MA	01103
The Honorable	Donald F.	Humason, Jr.		Massachusetts State Senate	Westfield	MA	01085
The Honorable	James T.	Welch		Massachusetts State Senate	Springfield	MA	01103
The Honorable	Eric P.	Lesser		Massachusetts State Senate	Boston	MA	02133
The Honorable	Stanley C.	Rosenberg		Massachusetts State Senate	Northampton	MA	01080
The Honorable	Michael J.	Finn		Massachusetts House of Representatives	West Springfield	MA	01089
The Honorable	John	Scibak		Massachusetts House of Representatives	Boston	MA	02133
The Honorable	Ellen	Story		Massachusetts House of Representatives	Boston	MA	02133
The Honorable	Thomas M.	Petrolati		Massachusetts House of Representatives	Ludlow	MA	01056
The Honorable	Joseph F.	Wagner		Massachusetts House of Representatives	Chicopee	MA	01013
The Honorable	Jose F.	Tosado		Massachusetts House of Representatives	Springfield	MA	01104-3000
The Honorable	Richard	Neal	Congressman	U.S. House of Representatives	Washington	DC	20515
The Honorable	James T.	McGovern	Congressman	U.S. House of Representatives	Washington	DC	20515
The Honorable	Elizabeth	Warren	Senator	U.S. Senate	Boston	MA	02203
The Honorable	Edward	Markey	Senator	U.S. Senate	Boston	MA	02203
Ms.	Wendi	Weber	Regional Director	United States Fish and Wildlife Service	Hadley	MA	01035-9589
Mr.	Maurice	Lourdes	Executive Director	Federal Aviation Administration	Washington	DC	20591
Mr.	Timothy W.	Brennan	Executive Director	Pioneer Valley Planning Commission	Springfield	MA	01104-3419

A.2.2.4 Westover ARB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Ms.	Gina	McCarthy	Regional Administrator	Environmental Protection Agency New England, Region 1	Boston	MA	02109-3912
Ms.	Mary T.	Walsh	Manager	Federal Aviation Administration New England Region	Burlington	MA	01803
Ms.	Eileen Drumm	Moore	President	Chicopee Chamber of Commerce	Chicopee	MA	01013
Mr.	Jeffrey	Ciuffreda	President	Affiliated Chambers of Commerce of Greater Springfield, Inc.	Springfield	MA	01103-1149
Mr.	Michael W.	Bolton	Director of Civil Aviation	Westover Metropolitan Airport	Chicopee	MA	01022
Mr.	Rick	Sullivan	President and CEO	Economic Development Council	Springfield	MA	01103
Mr.	Brian P.	Barnes	Airport Manager	Westfield-Barnes Airport	Westfield	MA	01085-5331
Ms.	Marie	Laflamme	Director	Westover Metropolitan Development Corporation	Chicopee	MA	01022
Ms.	Kathy	Brown	President	East Springfield Neighborhood Council	Springfield	MA	01104
Mr.	Gary	Clayton	President	Mass Audubon	Lincoln	MA	01773
Mr.	Eric	Stiles	President	New Jersey Audubon Society Headquarters	Bernardsville	NJ	07924
Mr.	Scott	Surner	President	Hampshire Bird Club	Amherst	MA	01004-0716
Ms.	Linda	Ferraresso	Director	Brookline Bird Club	Watertown	MA	02472
Ms.	Jaana	Cutson	President	Hitchcock Center for the Environment	Amherst	MA	01002
Mr.	Dave	Gallup	President	Springfield Naturalists' Club	Springfield	MA	01103
Ms.	Aimee	Henderson	Editor	The Sentinel	Palmer	MA	01069
Mr.	Larry	Parnass	Editor	The Daily Hampshire Gazette	Northampton	MA	01061
Mr.	George	Arwady	Publisher & CEO	The Republican	Springfield	MA	01103
Mr.	Michael	Gorski	Director	Massachusetts Department of Environmental Protection	Springfield	MA	01103
Mr.	William	Galvin	Secretary	Massachusetts Historical Commission (SHPO)	Boston	MA	02125
Mr.	Kevin	Kennedy	Chief Development Officer	City of Springfield	Springfield	MA	01104
Mr.	Marcos A	Marrero	Director	City of Holyoke	Holyoke	MA	01040
Ms.	Cathy	Leonard	Town Administrator's Secretary	Town of Granby	Granby	MA	01033
Mr.	Richard	Harris	Town Planner	Town of South Hadley	South Hadley	MA	01075
Mr.	William	Jebb	Chief	City of Chicopee	Chicopee	MA	01020
Mr.	Paul	Madera	Chief	Town of Ludlow	Ludlow	MA	01056
Mr.	John	Barbieri	Chief	City of Springfield	Springfield	MA	01105
Mr.	James M.	Neiswanger	Commissioner	City of Holyoke	Holyoke	MA	01040
Mr.	Alan	Wishart	Chief	Town of Granby	Granby	MA	01033
Mr.	David	LaBrie	Chief	Town of South Hadley	South Hadley	MA	01075
Ms.	Shannon	Bliven	Chief	East of the River 5	East Longmeadow	MA	01028

A.2.2.4 Westover ARB Agency Coordination Mailing List (Continued)

Salutation	First Name	Last Name	Title	Organization	City	State	Zip
Ms.	Kathleen	Anderson	Director	City of Holyoke	Holyoke	MA	01040-6504
Mr.	Dale	Johnson	President	Town of Granby and South Handley	South Hadley	MA	01075
Mr.	Glenn X.	Joslyn	Director	City of Chicopee	Chicopee	MA	01020
Mr.	Mark	Babineau	Chief	Town of Ludlow	Ludlow	MA	01056-0382
Mr.	Robert	Hassett	Director	City of Springfield	Springfield	MA	01104
Mr.	Stephen	Riffenburg	Chairman	City of Holyoke	Holyoke	MA	01040
Mr.	Russell	Anderson	Chief	Town of Granby	Granby	MA	01033
Ms.	Sharon	Hart	Director	Town of South Hadley	South Hadley	MA	01075
Mr.	Michael	Ashe Jr.	Sheriff	Hampden County	Ludlow	MA	01056
Ms.	Laura	Gentile		Hampden County	Springfield	MA	01102
Ms.	Emily L.	Partyka	Director	Chicopee Public Library	Chicopee	MA	01013
Ms.	Judy	Kelly	Director	Ludlow Public Library	Ludlow	MA	01056
Ms.	Molly	Fogarty	Director	Springfield City Library	Springfield	MA	01103
Mr.	Joseph	Rodio	Director	South Hadley Public Library	South Hadley	MA	01075
Ms.	Sharon	Sharry	Director	Amherst Public Library	Amherst	MA	01002
Ms.	Jennifer	Crosby	Director	Granby Public Library	Granby	MA	01033
Ms.	Sheila	McCormick	Director	Belchertown Public Library	Belchertown	MA	01007
Ms.	Maria G.	Pagan	Director	Holyoke Public Library	Holyoke	MA	01040
Mr.	Rune	Duke		AOPA	Washington	DC	20001

A.2.3 Grissom ARB Agency Coordination Responses

Office of COMMUNITY & RURAL AFFAIRS

OCRA

April 11, 2016

Mr. Hamid Kamalpour
United States Air Force
AFCEC/CZN
2261 Hughes Ave, Ste. 155
Lackland AFB, Texas 78236-9853

Re: EIS Third Main Operating Base (MOB 3) of the KC – 46A tanker aircraft Grissom Air Reserve Base (ARB)

Dear Mr. Kamalpour,

The Indiana Office of Community and Rural Affairs (OCRA) works with Indiana Communities to build relevant and economically thriving places where people want to live, work and grow. Therefore, on behalf of the State of Indiana we assist rural communities to develop and implement appropriate community and economic development plans.

OCRA has a substantial history of working with local elected officials, community and economic development officials, and the community at large to support development at and around Grissom Air Reserve Base. It is a substantial regional asset impacting no less than five counties. We believe that this project has great potential to impact the region in a very meaningful way. We established metrics by which we assist Indiana rural counties and regions to bench mark the relative success of community and economic development projects. The metrics include growing Assessed Value, Growing Population, Increasing Per Capita Income, Increasing Educational Attainment Rates, and Increased K-12 Public School Enrollment. We believe that this project has the potential to advance each of these metrics and the community as a whole.

OCRA will continue to support this project with grants when appropriate, with technical assistance, and to assist the community as it further aligns its vision with this and other assets. We encourage you to grant every consideration to Grissom Air Reserve Base for this project knowing that our office and operations will be on hand to support the community's efforts in every way possible.

Sincerely,

William S. Konyha
Executive Director

One North Capitol, Suite 600 - Indianapolis, IN 46204 - 800.824.2476 - 317.233.3597 (fax)
www.ocra.IN.gov

Subject: FW: KC-46A MOB 3 Environmental Impact Statement

-----Original Message-----
From: Kaiser, Jason [mailto:JASONKAISER@Indot.IN.gov]
Sent: Thursday, March 31, 2016 3:13 PM
To: KAMALPOUR, HAMID GS-13 USAF HAF AFCEC/CZN <hamid.kamalpour@us.af.mil>
Subject: KC-46A MOB 3 Environmental Impact Statement

Hamid Kamalpour,

The Indiana Department of Transportation Commissioner (Brandye Hendrickson) has received coordination associated with the beddown of the MOB 3 of the KC-46A tanker aircraft and its possible location at Grissom ARB. Please advise as to whether the US Air Force believes any impacts to or improvements to the Indiana Department of Transportation's facilities would be required by this potential project.

Respectfully,

Jason Kaiser P.E.

Technical Services Director

5333 Hatfield Road

Fort Wayne, IN 46808

Office: (260) 969-8229

Email: jasonkaiser@indot.in.gov <mailto:jasonkaiser@indot.in.gov>

<https://www.facebook.com/INDOTNortheast>
<https://twitter.com/indotnortheast>
<http://www.youtube.com/user/indianaDOT> <http://www.in.gov/indot/2341.htm>
<http://www.in.gov/>

<http://www.in.gov/indot/>

A.2.4 Seymour Johnson AFB Agency Coordination Responses

State Environmental Review Clearinghouse
ADMINISTRATION

Kathryn Johnston
Secretary

William W. Peaslee
General Counsel

April 22, 2016

Mr. Hamid Kamalpour
Department of the Air Force
AFCEC/CZN
2261 Hughes Avenue, Suite 155
Lackland AFB, TX 78236-9853

Re: SCH File # 16-E-0000-0296; SCOPING; US Air Force is preparing a Draft EIS to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base of the KC-46A tanker aircraft.

Dear Mr. Kamalpour:

The above referenced environmental impact information has been submitted to the State Clearinghouse under the provisions of the National Environmental Policy Act. According to G.S. 113A-10, when a state agency is required to prepare an environmental document under the provisions of federal law, the environmental document meets the provisions of the State Environmental Policy Act. Attached to this letter for your consideration are comments made by the agencies in the course of this review.

If any further environmental review documents are prepared for this project, they should be forwarded to this office for intergovernmental review.

Should you have any questions, please do not hesitate to call.

Sincerely,

Crystal Best
State Environmental Review Clearinghouse

Attachments
cc: Region P

Nothing Compares
State of North Carolina | Administration
116 West Jones St. | 1301 Mail Service Center | Raleigh, NC 27699-1301
state.clearinghouse@doa.nc.gov | 919 807 2419 T

Environmental Quality

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

MEMORANDUM

To: Crystal Best
State Clearinghouse Coordinator
Department of Administration

From: Lyn Hardison
Division of Environmental Assistance and Customer Service
Environmental Assistance and Project Review Coordinator

RE: 16-0296
Scoping – US Air Force is preparing a Draft EIS to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base of the KC-46A tanker aircraft
Wayne County

Date: April 21, 2016

The Department of Environmental Quality has reviewed the proposal for the referenced project. Based on the information provided, several of our agencies have identified permits that may be required and offered some guidance. The comments are attached for the applicant's review.

The Department's agencies will continue to be available to assist the applicant through the environmental review processes.

Thank you for the opportunity to respond.

Attachment

Nothing Compares
State of North Carolina | Environmental Quality
943 Washington Square Mall | Washington, North Carolina 27889
252-946-6481

A.2.4 Seymour Johnson AFB Agency Coordination Responses (Continued)

State of North Carolina
Department of Environment and Natural Resources
INTERGOVERNMENTAL REVIEW - PROJECT COMMENTS

Reviewing Office: Washington

Project Number 16-0296 Due Date: 4/18/2016
County Wayne

After review of this project it has been determined that the ENR permit(s) and/or approvals indicated may need to be obtained in order for this project to comply with North Carolina Law. Questions regarding these permits should be addressed to the Regional Office indicated on the reverse of the form. All applications, information and guidelines relative to these plans and permits are available from the same Regional Office.

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
☐	Permit to construct & operate wastewater treatment facilities, sewer system extensions & sewer systems not discharging into state surface waters	Application 90 days before begin construction or award of construction contracts. On-site inspection. Post-application technical conference usual	30 days (90 days)
☐	NPDES - permit to discharge into surface water and/or permit to operate and construct wastewater facilities discharging into state surface waters.	Application 180 days before begin activity. On-site inspection. Pre-application conference usual. Additionally, obtain permit to construct wastewater treatment facility-granted after NPDES. Reply time, 30 days after receipt of plans or issue of NPDES permit-whichever is later	90-120 days (N/A)
☐	Water Use Permit	Pre-application technical conference usually necessary	30 days (N/A)
☐	Well Construction Permit	Complete application must be received and permit issued prior to the installation of a well.	7 days (15 days)
☐	Dredge and Fill Permit	Application copy must be served on each adjacent riparian property owner. On-site inspection. Pre-application conference usual. Filling may require Easement to Fill from N.C. Department of Administration and Federal Dredge and Fill Permit.	55 days (90 days)
☐	Permit to construct & operate Air Pollution Abatement facilities and/or Emission Sources as per 15 A NCAC (2Q.0100 thru 2Q.0300)	Application must be submitted and permit received prior to construction and operation of the source. If a permit is required in an area without local zoning, then there are additional requirements and timelines (2Q.0113)	90 days
☐	Permit to construct & operate Transportation Facility as per 15A NCAC (2D.0800, 2Q.0601	Application must be submitted at least 90 days prior to construction or modification of the source.	90 days
☒	Any open burning associated with subject proposal must be in compliance with 15 A NCAC 2D.1900	N/A	60 days (90 days)
☒	Demolition or renovations of structures containing asbestos material must be in compliance with 15 A NCAC 2D.1110 (a) (1) which requires notification and removal prior to demolition. Contact Asbestos Control Group 919-707-5950		
☐	Complex Source Permit required under 15 A NCAC 2D.0800		
☒	The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres to be disturbed. Plan filed with proper Regional Office (Land Quality Section) At least 30 days before beginning activity. A fee of $65 for the first acre or any part of an acre. An express review option is available with additional fees		20 days (30 days)
☐	Sedimentation and erosion control must be addressed in accordance with NCDOT's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable stormwater conveyances and outlets.		(30 days)
☐	Mining Permit	On-site inspection usual. Surety bond filed with ENR Bond amount varies with type mine and number of acres of affected land. Any are mined greater than one acre must be permitted. The appropriate bond must be received before the permit can be issued.	30 days (60 days)
☐	North Carolina Burning permit	On-site inspection by N.C. Division Forest Resources if permit exceeds 4 days	1 day (N/A)
☐	Special Ground Clearance Burning Permit - 22 counties in coastal N.C. with organic soils	On-site inspection by N.C. Division Forest Resources required "if more than five acres of ground clearing activities are involved. Inspections should be requested at least ten days before actual burn is planned."	1 day (N/A)
☐	Oil Refining Facilities	N/A	90-120 days (N/A)
☐	Dam Safety Permit	If permit required, application 60 days before begin construction. Applicant must hire N.C. qualified engineer to prepare plans, inspect construction, certify construction is according to ENR approved plans. May also require permit under mosquito control program. And a 404 permit from Corps of Engineers. An inspection of site is necessary to verify Hazard Classification. A minimum fee of $200.00 must accompany the application. An additional processing fee based on a percentage of the total project cost will be required upon completion.	30 days (60 days)

February 11, 2015

County Wayne Project Number: 16-0296 Due Date: 4/18/2016

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
☐	Permit to drill exploratory oil or gas well	File surety bond of $5,000 with ENR running to State of NC conditional that any well opened by drill operator shall, upon abandonment, be plugged according to ENR rules and regulations.	10 days N/A
☐	Geophysical Exploration Permit	Application filed with ENR at least 10 days prior to issue of permit. Application by letter. No standard application form.	10 days N/A
☐	State Lakes Construction Permit	Application fee based on structure size is charged. Must include descriptions & drawings of structure & proof of ownership of riparian property.	15-20 days N/A
☐	401 Water Quality Certification	N/A	60 days (130 days)
☐	CAMA Permit for MAJOR development	$250.00 fee must accompany application	55 days (150 days)
☐	CAMA Permit for MINOR development	$50.00 fee must accompany application	22 days (25 days)
☐	Several geodetic monuments are located in or near the project area. If any monument needs to be moved or destroyed, please notify: N.C. Geodetic Survey, Box 27687 Raleigh, NC 27611		
☒	Abandonment of any wells. If required must be in accordance with Title 15A, Subchapter 2C.0100		
☐	Notification of the proper regional office is requested if "orphan" underground storage tanks (USTS) are discovered during any excavation operation.		
☒	Compliance with 15A NCAC 2H 1000 (Coastal Stormwater Rules) is required.		45 days (N/A)
☐	Catawba, Jordan Lake, Randleman, Tar Pamlico or Neuse Riparian Buffer Rules required.		
☐	Plans and specifications for the construction, expansion, or alteration of a public water system must be approved by the Division of Water Resources/Public Water Supply Section prior to the award of a contract or the initiation of construction as per 15A NCAC 18C .0300 et. seq. Plans and specifications should be submitted to 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. All public water supply systems must comply with state and federal drinking water monitoring requirements. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
☐	If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the Division of Water Resources/Public Water Supply Section at 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days

Other comments (attach additional pages as necessary, being certain to cite comment authority)

Division	Initials	No comment	Comments	Date Review
DAQ	RMB	☒	No comment	4/18/16
DWR-WQROS (Aquifer & Surface)	DRS	☒ ☐		4/19/16 / /
DWR-PWS	DEL	☒		4/15/16
DEMLR (LQ & SW)	SD	☐	Erosion & Sed. Control permit needed. Stormwater permit administered through the SJAFB woth DEMLR oversight.	4/18/16
DWM - UST	JSB	☐	Please see attached comments	4/14/16

REGIONAL OFFICES

Questions regarding these permits should be addressed to the Regional Office marked below.

☐ **Asheville Regional Office**
2090 US Highway 70
Swannanoa, NC 28778
(828) 296-4500

☐ **Mooresville Regional Office**
610 East Center Avenue, Suite 301
Mooresville, NC 28115
(704) 663-1699

☐ **Wilmington Regional Office**
127 Cardinal Drive Extension
Wilmington, NC 28405
(910) 796-7215

☐ **Fayetteville Regional Office**
225 North Green Street, Suite 714
Fayetteville, NC 28301-5043
(910) 433-3300

☐ **Raleigh Regional Office**
3800 Barrett Drive, Suite 101
Raleigh, NC 27609
(919) 791-4200

☐ **Winston-Salem Regional Office**
450 West Hanes Mill Road, Suite 300
Winston-Salem, NC 27105
(336) 771-9800

☒ **Washington Regional Office**
943 Washington Square Mall
Washington, NC 27889
(252) 946-6481

February 11, 2015

A.2.4 Seymour Johnson AFB Agency Coordination Responses (Continued)

Waste Management
ENVIRONMENTAL QUALITY

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

MICHAEL E. SCOTT
Acting Director

MEMORANDUM

TO: Michael Scott, Acting Division Director through Sharon Brinkley

FROM: Drew Hammonds, Eastern District Supervisor - Solid Waste Section

DATE: April 15, 2016

SUBJECT: Review: Project #16-0296 – Wayne County (Department of the Air Force)

The Division of Waste Management, Solid Waste Section (Section) has reviewed the assessment documents for the proposed establishment of the KC-46A Third Main Operating Base (MOB 3) Beddown, which includes the basing of 12 KC-46A aircraft, facilities and infrastructure, and manpower at a U.S. Air Force (USAF) installation within the continental United States (CONUS) where Air Force Reserve Command (AFRC) leads a Mobility Air Force Mission. The preferred alternative location is Seymour Johnson Air Force Base (AFB), North Carolina. The Section has seen no adverse impact on the surrounding community and likewise knows of no situations in the community, which would affect this project.

During construction, USAF and/or its contractors should make every feasible effort to minimize the generation of waste, to recycle materials for which viable markets exist, and to use recycled products and materials in the development of this project where suitable. Any waste generated by this project that cannot be beneficially reused or recycled must be disposed of at a solid waste management facility permitted by the Division. The Section strongly recommends that the owner require all contractors to provide proof of proper disposal for all waste generated.

Facilities are listed on the Division of Waste Management, Solid Waste Section portal site at: https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/solid-waste-management-annual-reports/solid-waste-permitted-facility-list

Questions regarding solid waste management should be directed to Mr. Wes Hare, Environmental Senior Specialist, Solid Waste Section, at (910) 7967405.

cc: Wes Hare, Environmental Senior Specialist
Jessica Montie, Compliance Officer

State of North Carolina Environmental Quality | Waste Management
Winston-Salem Regional Office | 450 W. Hanes Mill Road, Suite 300 | Winston-Salem, NC 27105
336 776 9800

Waste Management
ENVIRONMENTAL QUALITY

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

MICHAEL SCOTT
Acting Director

Date: April 12, 2016

To: Michael Scott, Acting Director
Division of Waste Management

Through: Dave Lown, Head
Federal Remediation Branch

From: Melanie Bartlett, Federal Remediation Branch

Subject: NEPA Project #16-0296, Draft EIS to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base of the KC 46A tanker aircraft, Wayne County, North Carolina

The above-mentioned project covers Seymour Johnson Air Force Base. No specific addresses were included in the project. For individual construction projects with specific addresses, nearby regulated sites may be viewed via maps found at https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/waste-management-gis-maps. Information included on these various maps are Site Name and/or Site ID.

If regulated sites are present in the area of a specific address or construction project, additional information for the sites can be accessed by following the "Access Online Files" link on the Superfund Section website: https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/e-documents. The sites may be searched by Site ID or Site Name. If you have any questions, please contact me at (919) 707-8373 or via email at melanie.bartlett@ncdenr.gov.

State of North Carolina | Environmental Quality | Waste Management
1646 Mail Service Center | 217 West Jones Street · Raleigh, NC 27699-1646
919 707 8200 Telephone

A.2.4 Seymour Johnson AFB Agency Coordination Responses (Continued)

Waste Management
ENVIRONMENTAL QUALITY

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

MICHAEL SCOTT
Acting Director

TO: Lyn Hardison, Environmental Coordinator

FROM: Scott Bullock, Regional UST Supervisor

COPY: Robert Davies, Corrective Action Branch Head

COPY: Sharon Brinkley, Administrative Secretary

DATE: April 14, 2016

RE: Environmental Review – Project Number 16-0296– Scoping – US Air Force at Seymour Johnson AFB in Goldsboro, NC is preparing a Draft EIS to assess the potential environmental consequences associated with the bed-down of the Third Main Operating Base for the KC46A tanker aircraft.

I searched the Petroleum Underground Storage Tank (UST) and Non-UST Databases and those databases indicated multiple petroleum releases at Seymour Johnson AFB. I reviewed the above proposal and determined that this project should not have any adverse impact upon groundwater. The following comments are pertinent to my review:

1. The Washington Regional Office (WaRO) UST Section recommends removal of any abandoned or out-of-use petroleum USTs or petroleum above ground storage tanks (ASTs) within the project area. The UST Section should be contacted regarding use of any proposed or on-site petroleum USTs or ASTs. We may be reached at (252) 946-6481.

2. Any petroleum USTs or ASTs must be installed and maintained in accordance with applicable local, state, and federal regulations. For additional information on petroleum ASTs it is advisable that the North Carolina Department of Insurance at (919) 661-5880 ext. 239, USEPA (404) 562-8761, local fire department, and Local Building Inspectors be contacted.

3. Any petroleum spills must be contained and the area of impact must be properly restored. Petroleum spills of significant quantity must be reported to the North Carolina Department of Environment & Natural Resources – Division of Waste Management Underground Storage Tank Section in the Washington Regional Office at (252) 946-6481.

4. Any soils excavated during demolition or construction that show evidence of petroleum contamination, such as stained soil, odors, or free product must be reported immediately to the local Fire Marshall to determine whether explosive or inhalation hazards exist. Also, notify the UST Section of the Washington Regional Office at (252) 946-6481. Petroleum contaminated soils must be handled in accordance with all applicable regulations.

5. Any questions or concerns regarding spills from petroleum USTs, ASTs, or vehicles should be directed to the UST Section at (252) 946-6481.

If you have any questions or need additional information, please contact me at 252-948-3906.

State of North Carolina | Environmental Quality | Waste Management
UST Section Central Office | 1646 Mail Service Center | Raleigh, NC 27699-1646 | (919) 707-8171

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

Natusha Earle

COUNTY: WAYNE

G07: MILITARY ACTIVITES (TRAINING, FLIGHT ROUTES, BASE EXPANSIONS

STATE NUMBER: 16-E-0000-0296
DATE RECEIVED: 04/01/2016
AGENCY RESPONSE: 04/18/2016
REVIEW CLOSED: 04/01/2016

MS CARRIE ATKINSON
CLEARINGHOUSE COORDINATOR
DEPT OF TRANSPORTATION
STATEWIDE PLANNING - MSC #1554
RALEIGH NC

REVIEW DISTRIBUTION

DEPT OF ENVIR. QUALITY - COASTAL MG
DEPT OF ENVIRONMENTAL QUALITY
DEPT OF NATURAL & CULTURAL RESOURCE
DEPT OF TRANSPORTATION
DNCR - DIV OF PARKS AND RECREATION
DPS - DIV OF EMERGENCY MANAGEMENT
EASTERN CAROLINA COUNCIL

PROJECT INFORMATION

APPLICANT: Department of the Air Force
TYPE: National Environmental Policy Act Scoping

DESC: US Air Force is preparing a Draft EIS to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base of the KC-46A tanker aircraft. - View documents at www.kc-46A-beddown.com

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: ☑ NO COMMENT ☐ COMMENTS ATTACHED

SIGNED BY: Natusha Earle-Fry DATE: 4/18/2016

APR 2016 RECEIVED

APR 2016 RECEIVED Secretary's Office DOA

A.2.4 Seymour Johnson AFB Agency Coordination Responses (Continued)

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

APR 26 2016

COUNTY: WAYNE

G07: MILITARY ACTIVITES (TRAINING, FLIGHT ROUTES, BASE EXPANSIONS

STATE NUMBER: 16-E-0000-0296
DATE RECEIVED: 04/01/2016
AGENCY RESPONSE: 04/18/2016
REVIEW CLOSED: 04/21/2016

MS PAULA CUTTS
CLEARINGHOUSE COORDINATOR
DPS - DIV OF EMERGENCY MANAGEMENT
FLOODPLAIN MANAGEMENT PROGRAM
MSC # 4218
RALEIGH NC

REVIEW DISTRIBUTION

DEPT OF ENVIR. QUALITY - COASTAL MG
DEPT OF ENVIRONMENTAL QUALITY
DEPT OF NATURAL & CULTURAL RESOURCE
DEPT OF TRANSPORTATION
DNCR - DIV OF PARKS AND RECREATION
DPS - DIV OF EMERGENCY MANAGEMENT
EASTERN CAROLINA COUNCIL

PROJECT INFORMATION

APPLICANT: Department of the Air Force
TYPE: National Environmental Policy Act Scoping
DESC: US Air Force is preparing a Draft EIS to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base of the KC-46A tanker aircraft. - View documents at www.kc-46A-beddown.com

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: ☑ NO COMMENT ☐ COMMENTS ATTACHED

SIGNED BY: [signature] DATE: 4/21/16

PAT MCCRORY
DONALD R. VAN DER VAART

April 25, 2016

Mr. Hamid Kamalpour
United States Air Force, AFCEC/CZN
2261 Hughes Ave, Ste 155
Lackland AFB, TX 78236-9853

Dear Mr. Kamalpour,

As the most military-friendly state in the nation, North Carolina is pleased to learn that the U.S. Air Force is considering Seymour Johnson Air Force Base (AFB) as the preferred location for the KC-46A tanker aircraft. The N.C. Department of Environmental Quality appreciates the opportunity to provide its comments on the Notice of Intent to prepare an Environmental Impact Statement (EIS) to assess the potential environmental consequences.

Seymour Johnson AFB has consistently demonstrated its commitment to conserving and protecting North Carolina's natural resources. In addition to its strong environmental stewardship, there are many advantages to basing and operating the KC-46A tanker aircraft in our state. North Carolina has laws in place to protect military aircraft from tall structures, including a permitting process for wind energy facilities that could conflict with military activities.

Applicants are required to conduct a preliminary evaluation to ensure that proposed wind turbines will not pose serious risk to military air navigation routes, air traffic control areas, military training routes, special-use air space, radar, or other potentially affected military operations. These safeguards protect military pilots, our environment, and the safety of our citizens.

I am available to answer any questions you may have, and I look forward to working with you throughout the selection process. Please do not hesitate to contact me at (919) 707-8622 or donald.vandervaart@ncdenr.gov.

Sincerely,

Donald R. van der Vaart
Secretary, N.C. Department of Environmental Quality

cc: Cornell Wilson, Secretary, N.C. Department of Military and Veterans Affairs
Nick Tennyson, Secretary, N.C. Department of Transportation

State of North Carolina | Environmental Quality
1601 Mail Service Center | Raleigh, NC 27699-1601
919-707-8600

A.2.4 Seymour Johnson AFB Agency Coordination Responses (Continued)

Bresnan, Sarah E.

To: Bresnan, Sarah E.
Subject: Scoping comments on behalf of NC Division of Coastal Management

-----Original Message-----
From: Spears, Courtney [mailto:courtney.spears@ncdenr.gov]
Sent: Tuesday, April 12, 2016 10:30 AM
To: KAMALPOUR, HAMID GS-13 USAF HAF AFCEC/CZN <hamid.kamalpour@us.af.mil>
Subject: Scoping comments on behalf of NC Division of Coastal Management

Good morning,

After review of the draft EIS scoping documents, it has been determined that a Federal Consistency Determination may be needed. Please submit any documents or questions for Consistency directly to our Federal Consistency Coordinator, Daniel Govoni. He can be reached by email at Daniel.govoni@ncdenr.gov <mailto:Daniel.govoni@ncdenr.gov> , or by phone at
252-808-2808 ext 233.

Thank you,

Courtney Spears

Assistant Major Permits Coordinator

Division of Coastal Management

Department of Environmental Quality

252 808 2808 office

courtney.spears@ncdenr.gov

400 Commerce Avenue

Morehead City, NC 28557

Email correspondence to and from this address is subject to the

North Carolina Public Records Law and may be disclosed to third parties.

NC Environmental Quality

PAT McCRORY
Governor

DONALD R. VAN DER VAART
Secretary

May 4, 2016

Mr. Dennis G. Goodson, P.E.
Deputy Base Civil Engineer
1095 Peterson Avenue
Seymour Johnson Air Force Base, NC 27531

SUBJECT: **CD16-020** Negative Determination concurrence for the project at Seymour Johnson Air Force Base, Wayne County, North Carolina (DCM#20160018)

Dear Mr. Goodson:

We received your negative determination on May 3, 2016, concerning the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft at Seymour Johnson Air Force Base, Wayne, North Carolina.

North Carolina's coastal zone management program consists of, but is not limited to, the Coastal Area Management Act, the State's Dredge and Fill Law, Chapter 7 of Title 15A of North Carolina's Administrative Code, and the land use plan of the County and/or local municipality in which the proposed project is located. It is the objective of the Division of Coastal Management (DCM) to manage the State's coastal resources to ensure that proposed Federal activities would be compatible with safeguarding and perpetuating the biological, social, economic, and aesthetic values of the State's coastal waters.

DCM concurs with the decision made by the United States Air Force that a Federal Consistency Determination is not necessary. Should the proposed action be modified, a revised consistency determination could be necessary. This might take the form of either a supplemental consistency determination pursuant to 15 CFR 930.46, or a new consistency determination pursuant to 15 CFR 930.36. Likewise, if further project assessments reveal environmental effects not previously considered by the proposed development, a supplemental consistency certification may be required. If you have any questions, please contact Courtney Spears at 252-808-2808 x215. Thank you for your consideration of the North Carolina Coastal Management Program.

Sincerely,

Daniel Govoni
Policy Analyst

Nothing Compares

State of North Carolina | Environmental Quality
217 West Jones Street | 1601 Mail Service Center | Raleigh, North Carolina 27699-1601
919 707 8600

A.2.4 Seymour Johnson AFB Agency Coordination Responses (Continued)

WAYNE COUNTY
COUNTY MANAGER
GEORGE A. WOOD

WAYNECOUNTY
NORTH CAROLINA
Phone: (919) 731-1435
Fax (919) 731-1446

March 31, 2016

Mr. Hamid Kamalpour
United States Air Force
AFCEC/CZN
2261 Hughes Avenue, Suite 155
Lackland AFB, TX 78236-9853

Comments for the Environmental Impact Statement for the Basing of KC-46A tanker aircraft at Seymour Johnson AFB, Goldsboro, NC

Dear Mr. Kamalpour:

I am in receipt of the Air Force's March 28th letter inviting my participation in your environmental scoping process for the above referenced project. Since Seymour Johnson AFB already is home to 16 KC-135 aircraft in the 916th Air Refueling Wing, and the intent is to replace them with the KC-46A aircraft, Wayne County does not believe there will be any negative environmental impact compared to the current situation. The base already has the basic infrastructure, and any additional construction necessary would not be detrimental to the environment. We already house comparable personnel and operations.

The people of Wayne County are used to the daily training exercises conducted both by the 916th Air Refueling Wing and the 4th Fighter Wing's 95 F-15E aircraft. I see no reason to believe that upgrading to the KC-46A aircraft will cause any concern about noise.

Wayne County is proud to host both the 916th and the 4th Fighter Wing, and we are totally supportive of this upgrade to the KC-46A aircraft. We are fully prepared to partner with the US Air Force to make this a seamless transition.

If you need anything further from my office, please do not hesitate to contact me.

Sincerely,

George A. Wood
County Manager

Cc: Board of Commissioners
Col. Mark Slocum, Base Commander
Mr. Stu Cox, SJAFB

THE GOOD LIFE. GROWN HERE.

PO BOX 227
GOLDSBORO, NC 27533

WAYNE COUNTY
BOARD OF COMMISSIONERS

WAYNECOUNTY
NORTH CAROLINA
Phone: (919) 731-1435
Fax (919) 731-1446

March 31, 2016

Mr. Hamid Kamalpour
United States Air Force
AFCEC/CZN
2261 Hughes Avenue, Suite 155
Lackland AFB, TX 78236-9853

RE: Comments for the Environmental Impact Statement for the Basing of KC-46A Tanker Aircraft at Seymour Johnson Air Force Base, Goldsboro, North Carolina

Dear Mr. Kamalpour:

Seymour Johnson Air Force Base is presently home to 16 KC-135 aircraft in the 916th Air Refueling Wing. Wayne County does not believe replacing them with the KC-46A aircraft will cause any negative environmental impact to our present situation. Seymour Johnson Air Force Base has the appropriate infrastructure, personnel and operations to handle this transition.

Wayne County citizens are accustomed to the training exercises conducted both by the 916th Air Refueling Wing and the 4th Fighter Wing's 95 F-15E aircraft. I do not believe upgrading to the KC-46A aircraft will create any concern regarding noise.

Wayne County is extremely proud to be the home of Seymour Johnson Air Force Base and will support the upgrade to the KC-46A aircraft. We will continue to partner with the United States Air Force to make this transition.

Please feel free to call me on my cell at 919-273-6064 with any additional questions.

Sincerely,

Joe C. Daughtery, Chairman
Wayne County Board of Commissioners

CC: Wayne County Board of Commissioners
Col. Mark Slocum, Base Commander
Mr. Stu Cox, SJAFB

THE GOOD LIFE. GROWN HERE.

PO BOX 227
GOLDSBORO, NC 27533

A.2.4 Seymour Johnson AFB Agency Coordination Responses (Continued)

GOLDSBORO
BE MORE DO MORE SEYMOUR

April 18, 2016

Mr. Hamid Kamalpour
United States Air Force
AFCEC/CZN
2261 Hughes Avenue, Suite 155
Lackland AFB, TX 78236-9853

Re: Comments for Environmental Impact Statement for the Basing of KC-46A Tanker Aircraft at Seymour Johnston AFB, Goldsboro, NC

Dear Mr. Kamalpour,

Many community members and City staff participated in the open house scoping meeting for the above referenced project held on April 14, 2016 in Goldsboro, North Carolina. Seymour Johnson AFB is currently home to 16 KC-135 aircraft in the 916th Air Refueling Wing. Since the intent is to replace the existing KC-135 aircraft with the KC-46A aircraft, the City of Goldsboro does not believe there would be any negative environmental impact compared to the current situation. Seymour Johnson AFB already has the basic infrastructure and if any additional construction is necessary, I do not feel it would be detrimental to the environment.

The citizens of Goldsboro are accustomed to the daily training exercises conducted by both the 916th Air Refueling Wing and the 4th Fighter Wing's 95 F-15E aircrafts. I see no reason to believe the upgrade to the KC-46A aircraft would cause any concern about noise.

The City of Goldsboro is proud to be home to both the 916th and the 4th Fighter Wing. We are totally supportive of the upgrade to the KC-46A aircraft and are fully prepared to partner with the United States Air Force to make this a seamless transition.

If you need anything further, please do not hesitate to contact me at 919-580-4330.

Sincerely,

Chuck Allen, Mayor

cc: Goldsboro City Council
Col. Mark Slocum, Commander, 4th Fighter Wing
Col. Craig Shenkenberg, Commander, 916th ARW

A.2.5 Tinker AFB Agency Coordination Responses

SCOTT A. THOMPSON
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

MARY FALLIN
Governor

April 8, 2016

Mr. J. Dale Clark
Department of the Air Force
2261 Hughes Ave, Suite 155
Lackland AFB, TX 78235-9853

Re: ENVIRONMENTAL REVIEW
Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft

Dear Mr. Clark,

In response to your request, we have completed an environmental review of air, land and water records for the above- referenced project. Attached is a list of environmental recommendations that you should consider as you complete your project.

If you have any questions or need clarification, please contact me at 405.702.7111. jon.roberts@deq.ok.gov

Sincerely,

Jon A. Roberts, Senior Manager
Office of External Affairs
Enclosure

707 NORTH ROBINSON, P.O. BOX 1677, OKLAHOMA CITY, OKLAHOMA 73101-1677

October 2010

AIR, LAND & WATER

Recommendations for General Construction/Improvement Projects

During the environmental review process for general construction/improvement projects, the following recommendations are offered to assist in ensuring environmental compliance throughout the project.

- Any project which includes the removal or installation of water and/or sewer lines shall conform to all relevant local and/or state plumbing codes.
- Any project which includes the removal of paint shall conform to all relevant lead-based paint regulations.
- Any project which includes the handling and/or removal of asbestos shall conform to all relevant asbestos regulations.
- During any construction, demolition, and/or rehabilitation reasonable precautions should be taken to protect air quality by minimizing fugitive dust emissions.
- If construction, demolition, and/or rehabilitation will disturb more than one acre of land, a determination should be made as to whether an Oklahoma Pollutant Discharge Elimination System (OPDES) permit for storm water is required during the construction phase.
- Any solid or hazardous waste from the site shall be recycled and/or disposed of in accordance with all relevant solid waste and/or RCRA regulations.

This publication is issued by the Oklahoma Department of Environmental Quality authorized by Steven A. Thompson, Executive Director. Copies have been prepared at a cost of $0.0535 each. Copies have been deposited with the publications clearinghouse of the Oklahoma Department of Libraries. (fact sheets\sols\GenConstructionImprovement) 3/2012.

A.2.5 Tinker AFB Agency Coordination Responses (Continued)

J. D. STRONG
EXECUTIVE DIRECTOR

MARY FALLIN
GOVERNOR

STATE OF OKLAHOMA
WATER RESOURCES BOARD
www.owrb.ok.gov

OKLAHOMA WATER RESOURCES BOARD
Planning & Management Division
Oklahoma City, OK

PUBLIC NOTICE REVIEW

___ We have no comments to offer. _X_ We offer the following comments.

WE RECOMMEND THAT YOU CONTACT THE LOCAL FLOODPLAIN ADMINISTRATOR FOR POSSIBLE PERMIT REQUIREMENTS FOR THIS PROJECT. THE OWRB WEB SITE, www.owrb.ok.gov, contains a directory of floodplain administrators and is located under forms/floodplain management/floodplain administrators, listed alphabetically by name of community. **If this development would fall on STATE OWNED or operated property, a floodplain development permit is required from OWRB.** The Chapter 55 Rules and permit application for this requirement can be found on the OWRB web site listed above. If this project is proposed in a non-participating community, try to ensure that this project is completed so that it is reasonably safe from flooding and so that it does not flood adjacent property if at all possible.

Reviewer: Cathy Poage, CFM **Date:** 05/31/2016

Project Name: Proposed Beddown of the Third Main Operating Base (MOB 3) of the KC-46A Tanker Aircraft, Possible Alternative Location at Tinker AFB, Oklahoma County, OK

FIRM Name: USAF, NEPA Division, Lackland AFB, J Dale Clark, PE
CC: Eric Wenger, FPA, Oklahoma City
Erik Brandt, CFM, FPA, Oklahoma County

* Oklahoma City and Oklahoma County both participate in the NFIP and have floodplain development permitting systems. Please see above paragraph.

OWRB
the water agency

3800 N. CLASSEN BOULEVARD • OKLAHOMA CITY, OKLAHOMA 73118
TELEPHONE (405) 530-8800 • FAX (405) 530-8900

Stephen B. Allen • Tom Buchanan • Bob Drake • F. Ford Drummond
Marilyn Feaver • Ed Fite • Jason W. Hatch • Linda P. Lambert • Richard G. Sevmour

WATER FOR 2060

A.2.6 Westover ARB Agency Coordination Responses

THE CITY OF SPRINGFIELD, MASSACHUSETTS

MAYOR DOMENIC J. SARNO

HOME OF THE BASKETBALL HALL OF FAME

April 12, 2016

Mr. J. Dale Clark
Chief, Air Force NEPA Division (AFCEC/CZN)
2261 Hughes Ave, Suite 155
Lackland AFB TX 78235-9853

Dear Chief Clark,

I hope this letter finds you well. The City of Springfield, MA is in receipt of your notification letter dated March 28th, 2016. We would like to offer our full support to Westover Air Reserve Base and the City of Chicopee in consideration of the relocation of the KC-46A Third Main Operating Base.

We understand that you are currently in the environmental assessment phase of this project and that Westover is currently one of several reasonable alternatives. The Westover facility is not only key to the security of the United States but provides immeasurable benefits to our region as a whole. The base provides essential employment opportunities to several thousand of our local residents and servicemen and women, and has long been part of the fabric of our region. The very same people live in our City, patronize our businesses and spur economic development all along the Pioneer Valley.

As we have long valued the importance of the C5 wing that currently operates from the base, we welcome the potential for a new wave of aircraft serving our military. The City would have no objections to the proposed beddown and any concerns about noise or safety have long been demonstrated by our service members at Westover to be minimal in nature. Should you have any questions or wish to discuss the future of the base and our region as a whole, please feel to reach out to my office at any time.

Thank you for your consideration and best wishes as you pursue this very important project.

Respectfully,

Mayor Domenic J. Sarno

City of Springfield • 36 Court Street • Springfield, MA 01103-1687 • (413) 787-6100

A.2.7 General Comments

+U. S. Department of Homeland Security
FEMA Region 6
800 North Loop 288
Denton, TX 76209-3698

FEMA

FEDERAL EMERGENCY MANAGEMENT AGENCY
REGION VI
MITIGATION DIVISION

NOTICE REVIEW/ENVIRONMENTAL CONSULTATION

☐ We have no comments to offer. ☒ We offer the following comments:

WE WOULD REQUEST THAT THE COMMUNITIES' FLOODPLAIN ADMINISTRATORS BE CONTACTED FOR THE REVIEW AND POSSIBLE PERMIT REQUIREMENTS FOR THIS PROJECT. IF FEDERALLY FUNDED, WE WOULD REQUEST PROJECT TO BE IN COMPLIANCE WITH EO11988 & EO 11990.

REVIEWER:

Mayra G. Diaz
Floodplain Management and Insurance Branch
Mitigation Division
(940) 898-5541

DATE: March 30, 2016

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

2016 MAR 29 A 2:44

28 March 2016

Mr. J. Dale Clark
Air Force NEPA Division (AFCEC/CZN)
2261 Hughes Ave, Suite 155
Lackland AFB TX 78235-9853

Mr. Ross Richardson
Federal Emergency Management Association (FEMA)
Mitigation Division
800 North Loop 288
Denton, TX 76209

Dear Mr. Richardson,

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. The Air Force has identified Seymour Johnson Air Force Base (AFB) as the preferred alternative with Grissom Air Reserve Base (ARB), Tinker AFB, and Westover ARB as reasonable alternatives. All four bases and the No Action Alternative will be evaluated as alternatives in the EIS. Additional information on the beddown and EIS process is included in the attached Notice of Intent from the March 23, 2016, Federal Register.

The Air Force will host a public come and go open house scoping meeting in the local area near each of the bases proposed for this action (see attached scoping brochure). The purpose of the meetings and the scoping period is to solicit comments on the scope of environmental issues to be analyzed in depth in the EIS. Public and agency comments provided to the Air Force during the scoping period will be considered in the preparation of the Draft EIS. Additional information can be found on the project website at www.kc-46A-beddown.com.

We request your participation and solicit scoping comments on this action. Please provide any comments by April 25, 2016, directly to Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN; 2261 Hughes Ave, Ste. 155, Lackland AFB, TX 78236-9853 or to the project website at www.kc-46A-beddown.com. Thank you for your assistance in this matter.

Sincerely,

J. DALE CLARK, PE, GS-14, DAF
Chief, Air Force NEPA Division
Environmental Management Directorate

Attachments:
1. Notice of Intent
2. KC-46A MOB 3 EIS Brochure

A.2.7 General Comments (Continued)

U.S. Department of Transportation
Federal Aviation Administration

Mission Support Services
800 Independence Avenue, SW.
Washington, DC 20591

APR 25 2016

Mr. Hamid Kamalpour
United States Air Force
AFCEC/CZN
2261 Hughes Avenue, Suite 155
Lackland AFB, TX 78236

Dear Mr. Kamalpour:

Thank you for the March 28, 2016, letter from Mr. J. Dale Clark concerning the Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB) of the KC-46A tanker aircraft.

The Federal Aviation Administration (FAA) has reviewed your letter and appreciates the opportunity to participate in the EIS scoping process. Currently, we do not have any comments involving the identified preferred and reasonable alternative beddown locations. The FAA can provide assistance if at any time the United States Air Force (USAF) identifies any special use airspace changes resulting from this action or the USAF needs the FAA's specific expertise regarding aviation.

Thank you for your consideration of the FAA in this matter.

Sincerely,

Jodi S. McCarthy
for Elizabeth L. Ray
Vice President, Mission Support Services
Air Traffic Operations

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

MAY 02 2016

REPLY TO THE ATTENTION OF:
E-19J

Hamid Kamalpour
United States Air Force
AFCEC/CZN
2261 Hughes Avenue, Suite 155
Lackland Air Force Base, Texas 78236-9853

Re: Project Scoping for KC-46A Aircraft Beddown at Seymour Johnson Air Force Base, Goldsboro, Wayne County, North Carolina

Dear Mr. Kamalpour:

EPA has reviewed the scoping document for the referenced project, dated March 28 2016, which was prepared by the United States Air Force (USAF), pursuant to our authorities under the National Environmental Policy Act (NEPA), Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act.

The proposed project involves the beddown of the Third Main Operating Base of the KC-46A aircraft at Seymour Johnson Air Force Base (AFB). Seymour Johnson AFB is the preferred location (the preferred alternative), however, USAF has proposed alternate beddown locations at Grissom Air Reserve Base (ARB), Indiana; Tinker AFB, Oklahoma; and Westover ARB, Massachusetts.

We have some general recommendations that we believe will assist the development of the draft environmental impact statement (DEIS), including comments on water quality, green infrastructure, climate change and greenhouse gas emissions, demolition of buildings, erosion control, and consultation records, as stated below.

Water Quality
The DEIS should describe how the proposed action may affect Clean Water Act (CWA) Section 303(d) listed water bodies and their listing status as impaired. We recommend that this section of the document discuss current impairments, and how the proposed action may affect, either positively or detrimentally, the impairment. A list of nearby impaired streams can be found at: https://iaspub.epa.gov/tmdl/attains_index.home.

Green Infrastructure
In compliance with Section 438 of the Energy Independence and Security Act, and also guidelines from Leadership in Energy and Environmental Design (LEED), we recommend USAF consider using energy-efficient design and building materials when constructing new

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A.2.7 General Comments (Continued)

infrastructure. As a measure to reduce or eliminate the need for traditional stormwater management infrastructure, we strongly encourage use of "green" stormwater management features, such as permeable pavement and bioretention, which are listed in the attachment *NEPA Stormwater Green Sheet*.

Climate Change and Greenhouse Gas Emissions
. EPA recommends the following be completed and information added to the DEIS:

- Include a summary discussion of climate change and reasonably foreseeable climate change impacts relevant to the project, based on U.S. Global Change Research Program[1] assessments, to assist with identification of potential project impacts that may be exacerbated by climate change and to inform consideration of measures to adapt to climate change impacts. This will assist in identifying resilience-related changes to the tentatively selected plan that should be evaluated and considered as part of the proposed project.
- Estimate the greenhouse gas (GHG) emissions associated with all project alternatives. Example tools for estimating and quantifying GHG emissions can be found on CEQ's NEPA.gov website[4]. For actions that are likely to have less than 25,000 metric tons of carbon dioxide (CO_2) emissions/year, providing a qualitative estimate is acceptable, unless quantification is easily accomplished. The estimated GHG emissions can serve as a reasonable proxy for climate change impacts when comparing the proposal and alternatives. In disclosing the potential impacts of the proposal and reasonable alternatives, consideration should be given to whether and to what extent the impacts may be exacerbated by expected climate change in the project area, as discussed in the "affected environment" sections.
- Describe measures to reduce GHG emissions associated with the proposed project, including reasonable alternatives or other practicable mitigation opportunities, and disclose the estimated GHG reductions associated with such measures. Any commitments to implement reasonable mitigation measures that will reduce or eliminate project-related GHG emissions should be committed to in the project Record of Decision (ROD).
- Include a discussion on adaptation and, as appropriate, consider practicable changes to the alternatives to make them more resilient to anticipated climate change. A list of practicable mitigation options is included in the attachment *Diesel Emission Reduction Checklist*.

Demolition of Buildings
For demolition projects, we recommend pavement (asphalt, concrete, or cement) and other structural materials be reclaimed for reuse, or recycled to the maximum extent possible.

Consultation Records
EPA recommends attaching consultation documents with the DEIS regarding historic resources, and Federal and state threatened and endangered species for each location.

[2] https://ceq.doe.gov/initiatives/nepa/ghg-guidance
[3] http://www.globalchange.gov/
[4] https://ceq.doe.gov/current_developments/GHG_accounting_methods_7Jan2015.html

2

Agency Coordination
Thank you for coordinating with EPA's Chicago Office (Region 5), which covers Indiana. We request USAF also coordinate with the following EPA offices for this project, since multiple bases in multiple states are under consideration by the Air Force:

Tim Timmermann
Office of Environmental Review
U.S. Environmental Protection Agency Region 1
5 Post Office Square, Suite 100
Mail Code ORA 17-1
Boston, Massachusetts 02109-3912
(This office covers Massachusetts)

Chris Militscher
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency Region 4
61 Forsyth Street SW
Atlanta, Georgia 30303-8960
(This office covers North Carolina)

Michael Jansky
Office of Planning and Coordination
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue
Dallas, Texas 75202-2750
(This office covers Oklahoma)

We are available to discuss these comments on the scoping document at your convenience. Please feel free to contact Mike Sedlacek of my staff at 312-886-1765, or by email at sedlacek.michael@epa.gov.

Sincerely,

Kenneth A. Westlake, Chief
NEPA Implementation Section
Office of Enforcement and Compliance Assurance

Encl: NEPA Stormwater Green Sheet
Diesel Emission Reduction Checklist

3

A.2.7 General Comments (Continued)

NEPA Stormwater Green Sheet

The Stormwater/Wastewater section of NEPA documents should (at a minimum) address the following:

- ✓ How will wastewater from the facility be managed? Is there a new or increased discharge of pollutants to a sensitive water body (e.g., a high quality water body, or a water body that is already impaired)?
- ✓ How will stormwater runoff from the building, parking lot, and other impervious surfaces be managed?
  - ✓ In most cases if more than one acre of land will be disturbed the project owner/operator will need to obtain NPDES permit coverage for stormwater runoff during the construction phase.
  - ✓ Most Region 5 States have general permits for stormwater runoff from construction sites, and most sites quality for coverage under the general permit.
  - ✓ The permit will require minimizing erosion and minimizing releases of sediment. If the site is immediately adjacent to a water body there should be a buffer area between the construction activity and the water body.
  - ✓ Post-construction requirements vary by jurisdiction. At this time there is no quantified Federal performance standard for runoff from the new impervious areas that will be created. Some States, e.g., WI, have a performance standard. Also, many municipalities have release rate requirements for stormwater. These rate restrictions are intended to keep the sewer systems from being overloaded from too much flow coming in all at once. Local release rate are the reason detention basins are put in place at new development sites.
  - ✓ If the project involves construction of a Federal building/structure, the provisions of the Energy Independence and Security Act of 2007 likely will be applicable. Title IV of the Act ("Energy Savings in Building and Industry"), Subtitle C "(High Performance Federal Buildings") establishes this requirement:

    SEC. 438. STORMWATER RUNOFF REQUIREMENTS FOR FEDERAL DEVELOPMENT PROJECTS The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.

    This provision for many projects can be quite significant. This language requires Federal sites to achieve/maintain the predevelopment hydrology to the "maximum extent technically feasible". For many sites what this will mean is practices must be put in place to store/soak in the first 1 to 1.5 inches of rain that falls in a large rain event (rather than having that water run off). Sites will need to include practices such as rain gardens and permeable pavement in order to do this.

4

U.S. Environmental Protection Agency

Diesel Emission Reduction Checklist

- Use low-sulfur diesel fuel (15 ppm sulfur maximum) in construction vehicles and equipment.
- Retrofit engines with an exhaust filtration device to capture diesel particulate matter before it enters the construction site.
- Position the exhaust pipe so that diesel fumes are directed away from the operator and nearby workers, reducing the fume concentration to which personnel are exposed.
- Use catalytic converters to reduce carbon monoxide, aldehydes, and hydrocarbons in diesel fumes. These devices must be used with low sulfur fuels.
- Use enclosed, climate-controlled cabs pressurized and equipped with high efficiency particulate air (HEPA) filters to reduce the operators' exposure to diesel fumes. Pressurization ensures that air moves from inside to outside. HEPA filters ensure that any incoming air is filtered first.
- Regularly maintain diesel engines, which is essential to keep exhaust emissions low. Follow the manufacturer's recommended maintenance schedule and procedures. Smoke color can signal the need for maintenance. For example, blue/black smoke indicates that an engine requires servicing or tuning.
- Reduce exposure through work practices and training, such as turning off engines when vehicles are stopped for more than a few minutes, training diesel-equipment operators to perform routine inspection, and maintaining filtration devices.
- Repower older vehicles and/or equipment with diesel- or alternatively-fueled engines certified to meet newer, more stringent emissions standards. Purchase new vehicles that are equipped with the most advanced emission control systems available.
- Use electric starting aids such as block heaters with older vehicles to warm the engine reduces diesel emissions.
- Use respirators, which are only an interim measure to control exposure to diesel emissions. In most cases, an N95 respirator is adequate. Workers must be trained and fit-tested before they wear respirators. Depending on work being conducted, and if oil is present, concentrations of particulates present will determine the efficiency and type of mask and respirator. Personnel familiar with the selection, care, and use of respirators must perform the fit testing. Respirators must bear a NIOSH approval number.
- Per Executive Order 13045 on Children's Health[2], EPA recommends operators and workers pay particular attention to worksite proximity to places where children live, learn, and play, such as homes, schools, daycare centers, and playgrounds. Diesel emission reduction measures should be strictly implemented near these locations in order to be protective of children's health.

[2] Children may be more highly exposed to contaminants because they generally eat more food, drink more water, and have higher inhalation rates relative to their size. Also, children's normal activities, such as putting their hands in their mouths or playing on the ground, can result in higher exposures to contaminants as compared with adults. Children may be more vulnerable to the toxic effects of contaminants because their bodies and systems are not fully developed and their growing organs are more easily harmed. EPA views childhood as a sequence of life stages, from conception through fetal development, infancy, and adolescence.

5

A.3 TRIBAL CORRESPONDENCE

To support this EIS, the USAF consulted on a government-to-government basis with potentially affected tribes in the Region of Influence (ROI) for each base associated with the proposed KC-46A MOB 3 beddown. The ROI includes each installation and the area surrounding the base. The table following provides a summarized list of USAF communication with tribes. All tribes listed in Table A-1, except those affiliated with Seymour Johnson AFB, received a letter notifying the tribe of the project, as well as requesting consultation under Section 106 of the NHPA. Several tribes responded to consultation requests or coordination letters, and a brief summary of the responses is included in Table A-1.

Follow-up correspondence was conducted for tribes that did not respond to initial consultation and coordination efforts. This additional outreach may have included additional telephone, e-mail, or letter correspondence.

Table A-1. Tribal Consultation

Tribe	Summary Response	Initial Notification and Section 106 Letter	Follow-Up Correspondence (email/phone calls)
Grissom ARB			
Citizen Potawatomi Nation	Received on 19 April 2016. No traditional religious or cultural properties or other interests that may be affected.	28 March 2016	Not applicable
Forest County Potawatomi		28 March 2016	Email to Harold Frank on 18 May 2016
Hannahville Indian Community		28 March 2016	Email to Chairperson Meshigaud on 18 May 2016
Kickapoo Tribe in Kansas		28 March 2016	Email to Chairman Randall on 18 May 2016
Kickapoo Tribe of Oklahoma		28 March 2016	Email to Kent Collier on 18 May 2016
Miami Tribe of Oklahoma	Received on 19 April 2016. No objections to the project. Requests archaeological surveys if performed and compliance with NAGPRA. Requests additional project information.	28 March 2016	Copies of the Draft and Final EIS will be provided.
Peoria Tribe of Indians of Oklahoma		28 March 2016	Email to Chief Froman on 18 May 2016
Pokagon Band of Potawatomi Indians	Email from Jason Wesaw on 18 May 2016 requesting additional information.	28 March 2016	Email to Marcus Winchester on 18 May 2016. Email also sent to Jason Wesaw on 18 May 2016
Peoria Band of Potawatomi Nation		28 March 2016	Email to Chairperson Onnen on 18 May 2016
Osage Nation	Same letter received for Tinker AFB, see below	28 March 2016	20 May 2016
Seymour Johnson AFB			
Eastern Band of Cherokee Indians (EBCI)	Previous correspondence indicates this Tribe has no interest in the area around Seymour Johnson AFB.	See email dated 17 April 2014	Not applicable

Table A-1. Tribal Consultation (Continued)

Tribe	Summary Response	Initial Notification and Section 106 Letter	Follow-Up Correspondence (email/phone calls)
Tinker AFB			
Muscogee (Creek) Nation	No Response	28 March 2016	3 May 2016, 20 May 2016
Osage Nation	Letter from the Osage Nation THPO stating no concerns; however, if something is discovered during construction, they want to be notified. Letter Dated 20 May 2016.	28 March 2016	3 May 2016, 20 May 2016
The Caddo Nation	No Response	28 March 2016	3 May 2016, 20 May 2016
Seminole Nation of Oklahoma	Assistant Chief Louis Johnson called to inform Tinker AFB that Chief Leonard M. Harjo wants to consult with the Base Commander on the KC-46A MOB 3 EIS.	28 March 2016	3 May 2016
Wichita and Affiliated Tribes	No Response	28 March 2016	3 May 2016, 20 May 2016
Westover ARB			
Narragansett Indian Tribe of Rhode Island	Expressed no interest in G2G consultation, and had no comments regarding proposed KC-46A MOB 3 beddown.	1 April 2016	Phone call on 2 May 2016
Mashpee Wampanoag Indian Tribal Council	Expressed no interest in G2G consultation, and had no comments regarding proposed KC-46A MOB 3 beddown.	1 April 2016	Phone call on 2 May 2016
Wampanoag Tribe of Gay Head (Aquinnah) of Massachusetts	Expressed no interest in G2G consultation, and had no comments regarding proposed KC-46A MOB 3 beddown.	1 April 2016	Phone call on 2 May 2016
Mashantucket Pequot Tribe	Expressed no interest in G2G consultation, and had no comments regarding proposed KC-46A MOB 3 beddown.	1 April 2016	Phone call on May 2, 2012
Stockbridge Munsee Band of Mohican Tribe	Expressed no interest in G2G consultation, and had no comments regarding proposed KC-46A MOB 3 beddown. THPO submitted Section 106 response form.	1 April 2016	Phone call on 2 May 2016, and email on 9 May 2016

Note: Unless specified, follow-up contacts were by phone.

A.3.1 Tribal Consultation and Notification Letters

A.3.1.1 Grissom ARB Tribal Consultation and Notification Letter (Example)

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESERVE COMMAND

28 March 2016

Colonel Douglas J. Schwartz, USAFR
Commander
434th Air Refueling Wing
7207 South Grissom Street
Grissom Air Reserve Base, Indiana 46971-1609

Chairman Lester Randall
Kickapoo Tribe in Kansas
1107 Goldfinch Road
Horton, Kansas 66439

Dear Chairman Randall

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Kickapoo Tribe in Kansas may have an interest; and to invite the Kickapoo Tribe in Kansas to participate in government-to-government consultation with Grissom ARB pursuant to Section 106 of the National Historic Preservation Act. [1]

The United States Air Force (USAF) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base (MOB 3). This EIS will, as required by law and regulations, [2] consider the potential impacts resulting from basing 12 KC-46A aircraft (and related construction, demolition, and renovation of facilities) at a USAF installation within the continental United States (CONUS) operated by the Air Force Reserve Command (AFRC). The USAF has identified Seymour Johnson Air Force Base (AFB) as the preferred alternative. Grissom Air Reserve Base (ARB), Tinker AFB, Westover ARB, and the No Action Alternative will be evaluated as alternatives.

If Grissom ARB is selected for the KC-46A MOB 3 mission, 12 KC-46A aircraft would replace the existing 16 KC-135 aircraft. The KC-46A would operate in existing airspace and the types of flight operations would be similar to existing KC-135 operations. The KC-46A would use existing KC-135 air refueling tracks and fuel jettison areas, if necessary. The elevation of the current air refueling tracks for the KC-135 vary but are generally at elevations of 14,000 to 24,000 feet above ground level. Preliminary analysis indicates that noise levels from these operations would be similar to noise levels associated with the current KC-135 mission. Therefore, the area of potential effect (APE) for this action will be limited to the areas of construction, demolition, and renovation on Grissom ARB. Additional information can be found on the project website at www.kc-46A-beddown.com.

Please let me know whether the Kickapoo Tribe in Kansas desires to participate in the development of this NEPA analysis, or to engage in government-to-government consultation. Grissom ARB does not know of any properties of religious and cultural significance within the APE. Nevertheless, we ask for your assistance in identifying such properties of which we may be unaware, particularly those that may be affected by this proposal.

My staff will be contacting your office by telephone to discuss the KC-46A MOB 3 project and any potential impacts. For staff questions, comments, or input on the NEPA process, please contact Mr. Jeff Woodring, Grissom ARB, Chief Environmental Flight, jeffrey.woodring@us.af.mil, (765) 688-4561. For matters related to government-to-government consultation, you may contact me directly at (765) 688-4340.

Please take this opportunity to complete attachment 4, which can be filled out to identify the Tribe's interest in consulting about the proposal and to facilitate further communication on the matter. Upon completion, please return attachment 4 to us in the stamped and self-addressed envelope. I look forward to receiving any input you may have regarding this endeavor.

Sincerely

DOUGLAS J. SCHWARTZ, Colonel, USAFR
Commander

5 Attachments
1. KC-46A MOB 3 EIS Scoping Brochure
2. Regional Location Map Grissom ARB
3. APE Grissom ARB
4. Response Endorsement and Preferences Form
5. Stamped, addressed return envelope

[1] 54 U.S.C. § 306108, as implemented by 36 CFR Part 800.
[2] National Environmental Policy Act (NEPA) of 1969 [42USC 4321 *et seq.*]; Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA 40 CFR Parts 1500-1508; and Air Force Instruction (AFI) 32-7061, *Environmental Impact Analysis Process* (32 CFR Part 989).

A.3.1.1 Grissom ARB Tribal Consultation and Notification Letter (Example) (Continued)

ATTACHMENT 1. KC-46A MOB 3 EIS SCOPING BROCHURE

The U.S. Air Force (USAF) is preparing a Draft Environmental Impact Statement (EIS) to assess the potential environmental consequences of basing and operating the KC-46A tanker aircraft, associated infrastructure, and manpower to establish the KC-46A Third Main Operating Base (MOB 3) mission. In order to effectively define the full range of issues to be evaluated in the EIS, the USAF is holding public scoping meetings to determine the EIS scope (i.e., what will be covered and in what detail) by soliciting comments from interested state and federal agencies and interested members of the public.

The National Environmental Policy Act (NEPA)

The NEPA is our national mandate for making informed decisions while considering environmental impacts. When federal agencies propose projects having the potential to significantly impact the environment, NEPA requires the following process be undertaken as part of planning before final decisions are made:

- Evaluation and consideration of potential environmental consequences for projects that may significantly impact the environment, and
- Consideration of public and government agency comments.

Where the potential for significant environmental impacts exists, this evaluation is presented in an EIS, which:

- Identifies and describes the affected environment;
- Evaluates the potential environmental consequences from a range of reasonable alternatives; and
- Identifies environmental permits and specific mitigation measures that could avoid, minimize, or reduce potential environmental consequences.

The EIS Timeline

Opportunities for Public Involvement

Where We Are Now

Notice of Intent to conduct environmental analysis on KC-46A Third Main Operating Base (MOB 3) beddown published in *Federal Register*
March 2016

↓

Minimum 30-day Scoping Period
Spring 2016

↓

Preparation of Draft EIS
Summer 2016

↓

Notice of Availability of Draft EIS for public review published in *Federal Register*
Minimum 45-day Comment Period
September 2016

↓

Preparation of Final EIS
Winter 2017

↓

Notice of Availability of Final EIS published in *Federal Register* and 30-day EIS Waiting Period
March 2017

↓

Record of Decision (ROD)

Notice of Intent (NOI) and Scoping

The EIS begins with an NOI, which is published in the *Federal Register* to announce the USAF's intent to prepare an EIS on the KC-46A MOB 3 beddown proposed action and alternatives. The NOI is the beginning of the public scoping process, including community scoping meetings, to provide the public and government agencies and entities time to review the proposed action and alternatives.

A.3.1.1 Grissom ARB Tribal Consultation and Notification Letter (Example) (Continued)

Proposed Action: KC-46A MOB 3 Beddown

The KC-46A MOB 3 beddown EIS will evaluate the potential environmental consequences of the beddown of 12 KC-46A aircraft, associated facilities and infrastructure, and manpower at a single MOB 3 location.

The MOB 3 preferred alternative location is:

- Seymour Johnson Air Force Base (AFB), North Carolina

The MOB 3 reasonable alternative locations are:

- Grissom Air Reserve Base (ARB), Indiana
- Tinker AFB, Oklahoma
- Westover ARB, Massachusetts

Along with the No Action Alternative, all four alternatives are evaluated equally in the EIS.

The USAF is in the early stages of the EIS process, and no decision has been made as to the final MOB 3 beddown location.

U.S. Map of MOB 3 Alternative Bases

No Action Alternative

Under the No Action Alternative, beddown of the KC-46A MOB 3 mission would not occur at this time. A No Action Alternative will be evaluated at each proposed beddown location. Evaluation of the No Action Alternative provides a baseline for decision makers.

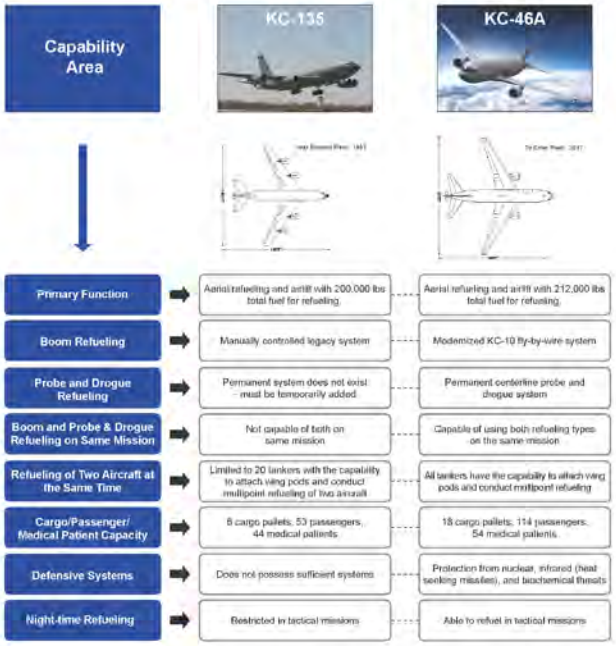
2

Purpose and Need: Tanker Modernization

The selected basing locations would need to accommodate training, flight operations, and maintenance support as necessary to support KC-46A pilots and operating personnel. Each KC-46A squadron requires personnel, facilities, and airspace to support aircraft operations and pilot and personnel training.

The purpose of the KC-46A MOB 3 beddown is to provide locations for training and flight operations. The KC-46A tankers are needed to support a high-threat, multi-role warfighting capability to Commanders worldwide. Trained pilots and personnel must be available to meet necessary KC-46A scheduled inventory replenishment dates as older tanker aircraft are withdrawn from the inventory.

Comparison of KC-135 and KC-46A Aircraft Performance Capabilities



Capability Area	KC-135	KC-46A
Primary Function	Aerial refueling and airlift with 200,000 lbs total fuel for refueling.	Aerial refueling and airlift with 212,000 lbs total fuel for refueling.
Boom Refueling	Manually controlled legacy system	Modernized KC-10 fly-by-wire system
Probe and Drogue Refueling	Permanent system does not exist - must be temporarily added	Permanent centerline probe and drogue system
Boom and Probe & Drogue Refueling on Same Mission	Not capable of both on same mission	Capable of using both refueling types on the same mission
Refueling of Two Aircraft at the Same Time	Limited to 20 tankers with the capability to attach wing pods and conduct multipoint refueling of two aircraft	All tankers have the capability to attach wing pods and conduct multipoint refueling
Cargo/Passenger/ Medical Patient Capacity	6 cargo pallets, 53 passengers, 44 medical patients	18 cargo pallets, 114 passengers, 54 medical patients.
Defensive Systems	Does not possess sufficient systems	Protection from nuclear, infrared (heat seeking missiles), and biochemical threats
Night-time Refueling	Restricted in tactical missions	Able to refuel in tactical missions

Source: GAO presentation of USAF information; © Boeing Company (KC-46A photo).

3

A.3.1.1 Grissom ARB Tribal Consultation and Notification Letter (Example) (Continued)

Environmental Resources

The USAF understands the potential for the KC-46A MOB 3 beddown to affect environmental resources. As part of the EIS, the USAF will analyze potential environmental consequences associated with changes made to support KC-46A operations, including changes in personnel, construction of facilities, and the inclusion of KC-46A flight operation activities. The environmental resource areas listed to the right are currently under consideration in the KC-46A MOB 3 beddown EIS.

Please take this opportunity to:

- ☑ Learn about the project,
- ☑ Identify community-specific issues, and
- ☑ Make sure you are included on our mailing list.

Public Scoping Meetings

5:00 p.m. - 8:00 p.m.

April 12, 2016
Westover Air Reserve Base
Castle of Knights
1599 Memorial Drive
Chicopee, MA

April 14, 2016
Seymour Johnson Air Force Base
Herman Park Center
901 E. Ash Street
Goldsboro, NC

April 19, 2016
Grissom Air Reserve Base
Milestone Event Center
1458 N. Liberator Road
Peru, IN

April 21, 2016
Tinker Air Force Base
Sheraton Midwest City Hotel and
Reed Conference Center
57050 Will Rodgers Road
Midwest City, OK

Environmental Resource Areas include:

Aircraft Operations
- Noise
- Air Quality
- Safety
  - Flight Safety
  - Ground Safety

Natural Resources
- Geology and Soils
- Surface Water and Groundwater
- Wetlands and Floodplains
- Biological Resources

Cultural Resources
- Archaeological Resources
- Architectural Resources
- Traditional Resources

Human Resources
- Land Use
- Recreation
- Socioeconomics
- Environmental Justice and Protection of Children

Community Infrastructure
- Infrastructure (utilities and public services)
- Hazardous Materials and Waste
- Transportation

How to Submit Comments

Scan with Your Phone to Learn More about the KC-46A MOB 3 Beddown EIS

Submit comments electronically at www.KC-46A-beddown.com

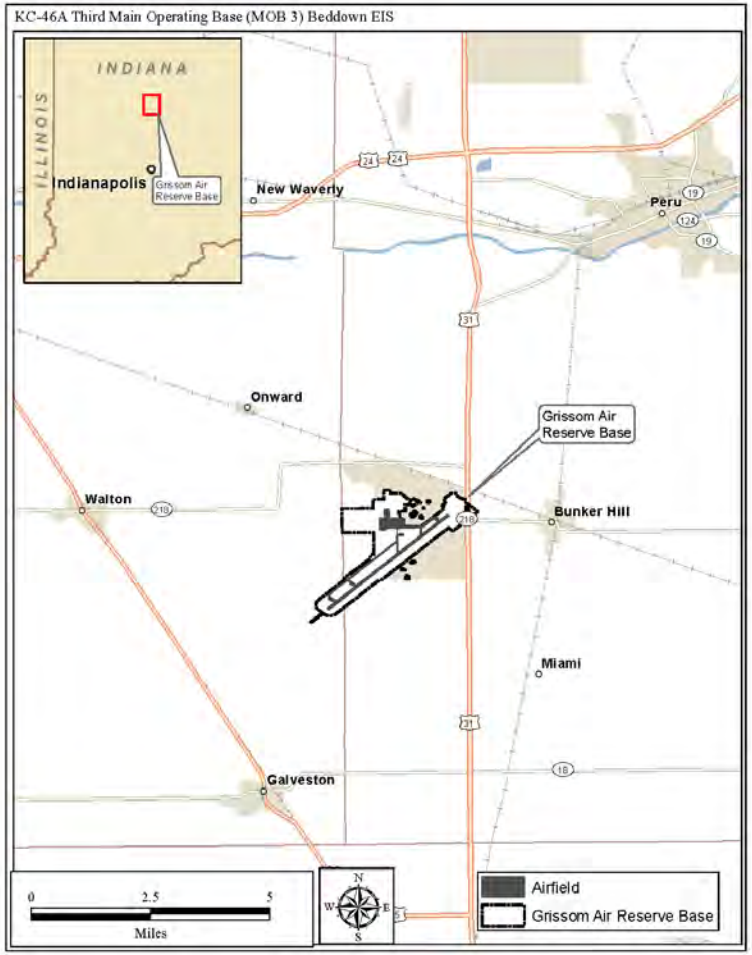
at a scoping meeting, or by mail before *April 25, 2016*, to:

Mr. Hamid Kamalpour
U.S. Air Force, AFCEC/CZN
2261 Hughes Ave, Ste. 155
Lackland AFB, TX 78236-9853

4

ATTACHMENT 2. REGIONAL LOCATION MAP GRISSOM ARB

A.3.1.1 Grissom ARB Tribal Consultation and Notification Letter (Example) (Continued)

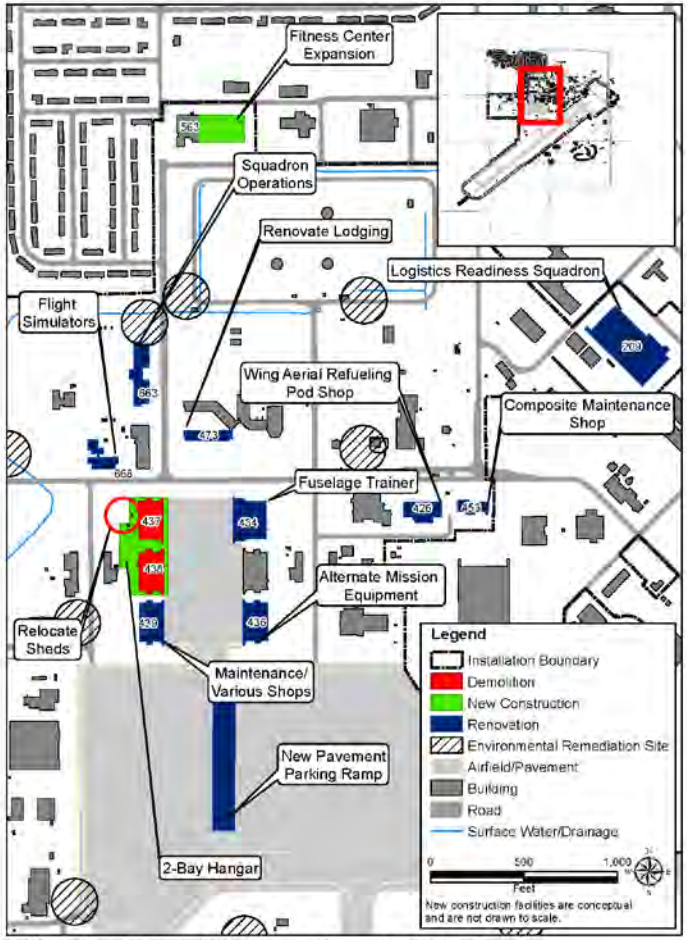


Regional Map of Grissom ARB March 2016

ATTACHMENT 3. AREA OF POTENTIAL EFFECT GRISSOM ARB

A.3.1.1 Grissom ARB Tribal Consultation and Notification Letter (Example) (Continued)

KC-46A Third Main Operating Base (MOB 3) Beddown EIS



The APE for this project is proposed as the construction footprints for the facilities shown above.

Facilities and Infrastructure Projects for the KC-46A MOB 3 at Grissom ARB *March 2016*

ATTACHMENT 4. RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR GRISSOM ARB

A.3.1.1 Grissom ARB Tribal Consultation and Notification Letter (Example) (Continued)

SECTION 106 CONSULTATION RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR GRISSOM ARB

Project Name: KC-46A Third Main Operating Base Beddown Environmental Impact Statement (KC-46A MOB 3 EIS)

Please check the appropriate response(s) from the list below and use the back of this form or additional sheets if you wish to make comments. You may also respond via e-mail to jeffrey.woodring@us.af.mil:

____ We have no traditional religious, cultural properties, or other interests that may be affected by the proposed project and further consultation is not required.

____ There are or may be issues of concern associated with this proposed project and we wish to be included as a Section 106 Consulting Party. We prefer:

_____ Meeting with the Air Force at a tribal facility.

_____ Communicating with the Air Force by scheduled teleconference.

____ We want to continue to receive project information by mail and participate in the public involvement process.

Name and Title of designated contact for this proposed project:

_____ Telephone: _____
Printed Name and Title

Please print email address: _____

Signed: _____ Date: _____

Please explain your reason for interest in the KC-46A MOB 3 EIS's Potential Effects on Cultural Resources:

_____

_____

_____

_____

_____

Please mail response in provided postpaid envelope to:

Colonel Douglas J. Schwartz
KC-46A MOB 3 EIS
Grissom Air Reserve Base
7207 South Grissom Street
Grissom ARB, IN 46971-1609
Or e-mail: jeffrey.woodring@us.af.mil

ATTACHMENT 5. STAMPED, ADDRESSED RETURN ENVELOPE

A.3.1.2 Seymour Johnson AFB Tribal Consultation and Notification Letter (Example)

The Eastern Band of the Cherokee Indians has indicated that they have no interests in projects in Wayne County, North Carolina (see letter below).

From: CHASTAIN, WILLIAM D GS-12 USAF ACC 4 CES/CEIE
To: PRSENTT, CATHRYN M GS-11 USAF ACC 4 CES/CEIEA
Subject: FW: EBCI North Carolina counties of interest
Date: Thursday, April 17, 2014 10:25:57 AM
Attachments: THPO Counties.docx

FYI

W. Dean Chastain, P.E.
Environmental Element Chief
4 CES/CEIE
DSN 722- 5168/COMM (919) 722-5168

----Original Message----
From: Yolanda Saunooke [mailto:yolasaun@nc-cherokee.com]
Sent: Thursday, April 10, 2014 8:14 AM
To: CHASTAIN, WILLIAM D GS-12 USAF ACC 4 CES/CEIE
Subject: RE: EBCI North Carolina counties of interest

Here you go. Have a good day.

----Original Message----
From: CHASTAIN, WILLIAM D GS-12 USAF ACC 4 CES/CEIE [mailto:william.chastain@us.af.mil]
Sent: Wednesday, April 09, 2014 11:39 AM
To: Yolanda Saunooke
Subject: EBCI North Carolina counties of interest

Ms. Saunooke,
Thank you for returning my call, and confirming that EBCI does not have interests in Dare County, NC. If you could provide a list of other North Carolina counties or areas that the EBCI does or does not have interests in, it would be greatly appreciated.

Again, thank you.
W. Dean Chastain, P.E.
Environmental Element Leader
4 CES/CEIE
DSN 722- 5168/COMM (919) 722-5168

State and County Summary
Of the Cherokee Indians Traditional Aboriginal Territory

Based on the Map of the Former Territorial Limits of the Cherokee Nation of Indians Exhibiting the Boundaries of the Various Cessions of Land Made by Them to the Colonies and the United States by Treaty Stipulations, From the Beginning of Their Relations with the White to the Date of Their Removal West of the Mississippi River (Royce 1884)

ALABAMA	GEORGIA	NORTH CAROLINA	SOUTH CAROLINA	VIRGINIA	WEST VIRGINIA
Blount	Banks	Alleghany	Abbeville	Bland	Boone
Cherokee	Barrow	Ashe	Aiken	Buchanan	Cabell
Colbert	Bartow	Avery	Anderson	Carroll	Fayette
Cullman	Catoosa	Buncombe	Calhoun	Dickenson	Kanawha
De Kalb	Chattooga	Burke	Cherokee	Floyd	Lincoln
Etowah	Cherokee	Caldwell	Chester	Giles	Logan
Franklin	Clarke	Catawba	Edgefield	Grayson	Mason
Jackson	Cobb	Cherokee	Fairfield	Lee	McDowell
Lauderdale	Dade	Clay	Greenwood	Montgomery	Mercer
Lawrence	Dawson	Cleveland	Greenville	Pulaski	Mingo
Limestone	Elbert	Gaston	Kershaw	Russell	Monroe
Madison	Fannin	Graham	Lancaster	Scott	Putnam
Marion	Floyd	Haywood	Laurens	Smyth	Raleigh
Marshall	Forsyth	Henderson	Lexington	Tazewell	Summers
Morgan	Franklin	Jackson	McCormick	Washington	Wayne
St. Clair	Gilmer	Lincoln	Newberry	Wise	Wyoming
Winston	Gordon	Macon	Oconee	Wythe	
	Gwinnett	Madison	Orangeburg		
	Habersham	McDowell	Pickens		
	Hall	Mitchell	Richland		
	Hart	Polk	Saluda		
	Jackson	Rutherford	Spartanburg		
	Lumpkin	Swain	Union		
	Madison	Transylvania	York		
	Murray	Watauga			
	Oconee	Wilkes			
	Oglethorpe	Yancey			
	Paulding				
	Pickens				
	Polk				
	Rabun				
	Stephens				
	Towns				
	Union				
	Walker				
	White				
	Whitfield				

A.3.1.2 Seymour Johnson AFB Tribal Consultation and Notification Letter (Example) (Continued)

State and County Summary
Of the Cherokee Indians Traditional Aboriginal Territory

Based on the Map of the Former Territorial Limits of the Cherokee Nation of Indians Exhibiting the Boundaries of the Various Cessions of Land Made by Them to the Colonies and the United States by Treaty Stipulations, From the Beginning of Their Relations with the White to the Date of Their Removal West of the Mississippi River (Royce 1884)

Kentucky	Kentucky cont'd	Kentucky cont'd	Tennessee	Tennessee cont'd
Adair	Grayson	Mercer	Anderson	Lewis
Allen	Green	Metcalfe	Bedford	Loudon
Anderson	Greenup	Monroe	Bledsoe	Macon
Barren	Hancock	Montgomery	Blount	Marion
Bath	Hardin	Morgan	Bradley	Marshall
Bell	Harlan	Muhlenburg	Campbell	Maury
Boone	Harrison	Nelson	Cannon	McMinn
Bourbon	Hart	Nicholas	Carter	Meigs
Boyd	Henderson	Ohio	Cheatham	Monroe
Boyle	Henry	Oldham	Claiborne	Moore
Bracken	Hopkins	Owen	Clay	Morgan
Breathitt	Jackson	Owsley	Cocke	Montgomery
Breckinridge	Jefferson	Pendleton	Coffee	Overton
Bullitt	Jessamine	Perry	Cumberland	Perry
Butler	Johnson	Pike	Davidson	Pickett
Caldwell	Kenton	Powell	DeKalb	Polk
Campbell	Knott	Pulaski	Dickson	Putnam
Carroll	Knox	Robertson	Fentress	Rhea
Carter	Larue	Rockcastle	Franklin	Roane
Casey	Laurel	Rowan	Giles	Robertson
Christian	Lawrence	Russell	Grainger	Rutherford
Clark	Lee	Scott	Greene	Scott
Clay	Leslie	Shelby	Grundy	Sequatchie
Clinton	Letcher	Simpson	Hamblen	Sevier
Crittenden	Lewis	Spencer	Hamilton	Smith
Cumberland	Lincoln	Taylor	Hancock	Stewart
Daviess	Livingston	Todd	Hardin	Sullivan
Edmonson	Logan	Trigg	Hawkins	Sumner
Elliot	Lyon	Trimble	Hickman	Trousdale
Estill	McCreary	Union	Houston	Unicoi
Fayette	McLean	Warren	Humphreys	Union
Fleming	Madison	Washington	Jackson	Van Buren
Floyd	Magoffin	Wayne	Jefferson	Warren
Franklin	Marion	Webster	Johnson	Washington
Gallatin	Martin	Whitley	Knox	Wayne
Garrard	Mason	Wolfe	Lawrence	White
Grant	Meade	Woodford	Lincoln	Williamson
	Menifee			Wilson

A.3.1.3 Tinker AFB Tribal Consultation and Notification Letter (Example)

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 72D AIR BASE WING (AFMC)
TINKER AIR FORCE BASE OKLAHOMA

MAR 2 8 2016

MEMORANDUM FOR PRESIDENT TERRY PARTON
WICHITA AND AFFILIATED TRIBES
1 ¼ MILES NORTH ON HIGHWAY 281
ANADARKO OKLAHOMA 73005

FROM: 72 ABW/CC
7460 Arnold Street, Suite 234
Tinker AFB OK 73145

SUBJECT: Introduction of the KC-46A MOB 3 Environmental Impact Statement and Section 106 Consultation Invitation for Tinker Air Force Base

1. The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Wichita and Affiliated Tribes of Oklahoma may have an interest; and to invite the Wichita and Affiliated Tribes of Oklahoma to participate in government-to-government consultation with Tinker AFB pursuant to Section 106 of the National Historic Preservation Act. [1]

2. The United States Air Force (USAF) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base (MOB 3). This EIS will, as required by law and regulations, [2] consider the potential impacts resulting from basing 12 KC-46A aircraft (and related construction, demolition, and renovation of facilities) at a USAF installation within the continental United States (CONUS) operated by the Air Force Reserve Command (AFRC). The USAF has identified Seymour Johnson Air Force Base (AFB) as the preferred alternative. Grissom Air Reserve Base (ARB), Tinker AFB, Westover ARB, and the No Action Alternative will be evaluated as alternatives.

3. If Tinker AFB is selected for the KC-46A MOB 3 mission, 12 KC-46A aircraft would replace the existing 8 KC-135 aircraft. The KC-46A would operate in existing airspace and the types of flight operations would be similar to existing KC-135 operations. The KC-46A would use existing KC-135 air refueling tracks and fuel jettison areas, if necessary. The elevation of the current air refueling tracks for the KC-135 vary but are generally at elevations of 14,000 to 24,000 feet above ground level. Preliminary analysis indicates that noise levels from these operations would be similar to noise levels associated with the current KC-135 mission. Therefore, the area of potential effect (APE) for this action will be limited to the areas of construction, demolition, and renovation on Tinker AFB. Additional information can be found on the project website at www.kc-46A-beddown.com.

4. Please let me know whether the Wichita and Affiliated Tribes of Oklahoma desire to participate in the development of this NEPA analysis, or to engage in government-to-government consultation. Tinker AFB does not know of any properties of religious and cultural significance within the APE. Nevertheless, we ask for your assistance in identifying such properties of which we may be unaware, particularly those that may be affected by this proposal.

5. My staff will be contacting your office by telephone to discuss the KC-46A MOB 3 project and any potential impacts. For staff questions, comments, or input on the NEPA process, please contact Mr. Tim Taylor, Tinker AFB, Cultural Resources Manager, timothy.taylor.5@us.af.mil, at (405) 734-4579. For matters related to government-to-government consultation, you may contact me directly at (405) 734-2101.

6. Please take this opportunity to complete attachment 4, which can be filled out to identify the Tribe's interest in consulting about the proposal and to facilitate further communication on the matter. Upon completion, please return attachment 4 to us in the stamped and self-addressed envelope. I look forward to receiving any input you may have regarding this endeavor.

Sincerely

STEPHANIE P. WILSON, Colonel, USAF
Commander

5 Attachments:
1. KC-46A MOB 3 EIS Scoping Brochure
2. Regional Location Map Tinker AFB
3. APE Tinker AFB
4. Response Endorsement and Preferences Form
5. Stamped, addressed return envelope

[1] 54 U.S.C. § 306108, as implemented by 36 CFR Part 800.
[2] National Environmental Policy Act (NEPA) of 1969 [42USC 4321 *et seq.*]; Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA 40 CFR Parts 1500-1508; and Air Force Instruction (AFI) 32-7061, *Environmental Impact Analysis Process* (32 CFR Part 989).

A.3.1.3 Tinker AFB Tribal Consultation and Notification Letter (Example) (Continued)

DEPARTMENT OF THE AIR FORCE
72D Air Base Wing (AFMC)
Tinker Air Force Base Oklahoma

ATTACHMENT 1. KC-46A MOB 3 EIS SCOPING BROCHURE

Third Main Operating Base (MOB 3)

KC-46A Beddown

The U.S. Air Force (USAF) is preparing a Draft Environmental Impact Statement (EIS) to assess the potential environmental consequences of basing and operating the KC-46A tanker aircraft, associated infrastructure, and manpower to establish the KC-46A Third Main Operating Base (MOB 3) mission. In order to effectively define the full range of issues to be evaluated in the EIS, the USAF is holding public scoping meetings to determine the EIS scope (i.e., what will be covered and in what detail) by soliciting comments from interested state and federal agencies and interested members of the public.

The National Environmental Policy Act (NEPA)

The NEPA is our national mandate for making informed decisions while considering environmental impacts. When federal agencies propose projects having the potential to significantly impact the environment, NEPA requires the following process be undertaken as part of planning before final decisions are made:

- Evaluation and consideration of potential environmental consequences for projects that may significantly impact the environment, and
- Consideration of public and government agency comments.

Where the potential for significant environmental impacts exists, this evaluation is presented in an EIS, which:

- Identifies and describes the affected environment;
- Evaluates the potential environmental consequences from a range of reasonable alternatives; and
- Identifies environmental permits and specific mitigation measures that could avoid, minimize, or reduce potential environmental consequences.

The EIS Timeline

Opportunities for Public Involvement
Where We Are Now

Notice of Intent to conduct environmental analysis on KC-46A Third Main Operating Base (MOB 3) beddown published in *Federal Register* *March 2016*

↓

Minimum 30-day Scoping Period *Spring 2016*

↓

Preparation of Draft EIS *Summer 2016*

↓

Notice of Availability of Draft EIS for public review published in *Federal Register* Minimum 45-day Comment Period *September 2016*

↓

Preparation of Final EIS *Winter 2017*

↓

Notice of Availability of Final EIS published in *Federal Register* and 30-day EIS Waiting Period *March 2017*

↓

Record of Decision (ROD)

Notice of Intent (NOI) and Scoping

The EIS begins with an NOI, which is published in the *Federal Register* to announce the USAF's intent to prepare an EIS on the KC-46A MOB 3 beddown proposed action and alternatives. The NOI is the beginning of the public scoping process, including community scoping meetings, to provide the public and government agencies and entities time to review the proposed action and alternatives.

1

A.3.1.3 Tinker AFB Tribal Consultation and Notification Letter (Example) (Continued)

Proposed Action: KC-46A MOB 3 Beddown

The KC-46A MOB 3 beddown EIS will evaluate the potential environmental consequences of the beddown of 12 KC-46A aircraft, associated facilities and infrastructure, and manpower at a single MOB 3 location.

The MOB 3 preferred alternative location is:

- Seymour Johnson Air Force Base (AFB), North Carolina

The MOB 3 reasonable alternative locations are:

- Grissom Air Reserve Base (ARB), Indiana
- Tinker AFB, Oklahoma
- Westover ARB, Massachusetts

Along with the No Action Alternative, all four alternatives are evaluated equally in the EIS.

The USAF is in the early stages of the EIS process, and no decision has been made as to the final MOB 3 beddown location.

U.S. Map of MOB 3 Alternative Bases

No Action Alternative

Under the No Action Alternative, beddown of the KC-46A MOB 3 mission would not occur at this time. A No Action Alternative will be evaluated at each proposed beddown location. Evaluation of the No Action Alternative provides a baseline for decision makers.

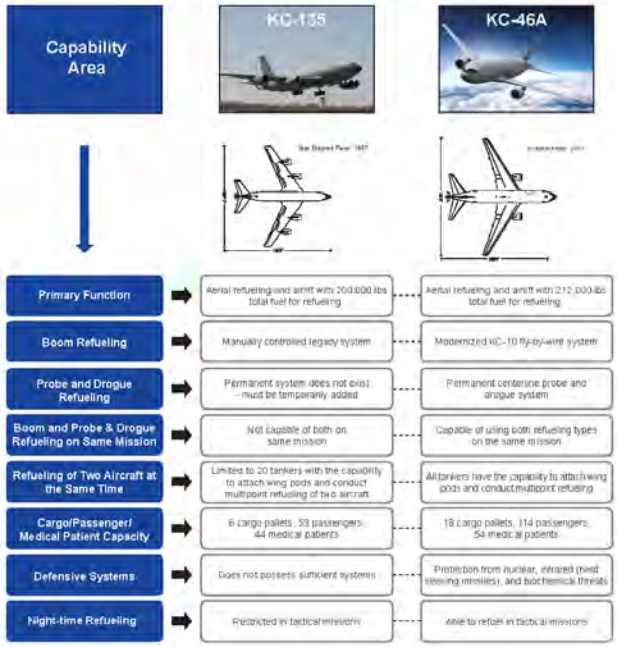
2

Purpose and Need: Tanker Modernization

The selected basing locations would need to accommodate training, flight operations, and maintenance support as necessary to support KC-46A pilots and operating personnel. Each KC-46A squadron requires personnel, facilities, and airspace to support aircraft operations and pilot and personnel training.

The purpose of the KC-46A MOB 3 beddown is to provide locations for training and flight operations. The KC-46A tankers are needed to support a high-threat, multi-role warfighting capability to Commanders worldwide. Trained pilots and personnel must be available to meet necessary KC-46A scheduled inventory replenishment dates as older tanker aircraft are withdrawn from the inventory.

Comparison of KC-135 and KC-46A Aircraft Performance Capabilities



Capability Area	KC-135	KC-46A
Primary Function	Aerial refueling and airlift with 200,000 lbs total fuel for refueling	Aerial refueling and airlift with 212,000 lbs total fuel for refueling
Boom Refueling	Manually controlled legacy system	Modernized KC-10 fly-by-wire system
Probe and Drogue Refueling	Permanent system does not exist - must be temporarily added	Permanent centerline probe and drogue system
Boom and Probe & Drogue Refueling on Same Mission	Not capable of both on same mission	Capable of using both refueling types on the same mission
Refueling of Two Aircraft at the Same Time	Limited to 20 tankers with the capability to attach wing pods and conduct multipoint refueling of two aircraft	All tankers have the capability to attach wing pods and conduct multipoint refueling
Cargo/Passenger/ Medical Patient Capacity	6 cargo pallets, 33 passengers; 44 medical patients	18 cargo pallets, 114 passengers; 54 medical patients
Defensive Systems	Does not possess sufficient systems	Protection from auxiliar, infrared (heat seeking missiles), and biochemical threats
Night-time Refueling	Restricted in tactical missions	Able to refuel in tactical missions

Source: GAO presentation of USAF information, © Boeing Company (KC-46A photo).

3

A.3.1.3 Tinker AFB Tribal Consultation and Notification Letter (Example) (Continued)

Environmental Resources

The USAF understands the potential for the KC-46A MOB 3 beddown to affect environmental resources. As part of the EIS, the USAF will analyze potential environmental consequences associated with changes made to support KC-46A operations, including changes in personnel, construction of facilities, and the inclusion of KC-46A flight operation activities. The environmental resource areas listed to the right are currently under consideration in the KC-46A MOB 3 beddown EIS.

Please take this opportunity to:

- ☑ Learn about the project,
- ☑ Identify community-specific issues, and
- ☑ Make sure you are included on our mailing list.

Public Scoping Meetings

5:00 p.m. - 8:00 p.m.

April 12, 2016
Westover Air Reserve Base
Castle of Knights
1599 Memorial Drive
Chicopee, MA

April 14, 2016
Seymour Johnson Air Force Base
Herman Park Center
701 E. Ash Street
Goldsboro, NC

April 19, 2016
Grissom Air Reserve Base
Milestone Event Center
1458 N. Liberator Road
Peru, IN

April 21, 2016
Tinker Air Force Base
Sheraton Midwest City Hotel and Reed Conference Center
57050 Will Rodgers Road
Midwest City, OK

Environmental Resource Areas include:

Aircraft Operations
- Noise
- Air Quality
- Safety
  - Flight Safety
  - Ground Safety

Natural Resources
- Geology and Soils
- Surface Water and Groundwater
- Wetlands and Floodplains
- Biological Resources

Cultural Resources
- Archaeological Resources
- Architectural Resources
- Traditional Resources

Human Resources
- Land Use
- Recreation
- Socioeconomics
- Environmental Justice and Protection of Children

Community Infrastructure
- Infrastructure (utilities and public services)
- Hazardous Materials and Waste
- Transportation

How to Submit Comments

Scan with Your Phone to Learn More about the KC-46A MOB 3 Beddown EIS

Submit comments electronically at www.KC-46A-beddown.com at a scoping meeting, or by mail before *April 25, 2016*, to:

Mr. Hamid Kamalpour
U.S. Air Force, AFCEC/CZN
2261 Hughes Ave, Ste. 155
Lackland AFB, TX 78236-9853

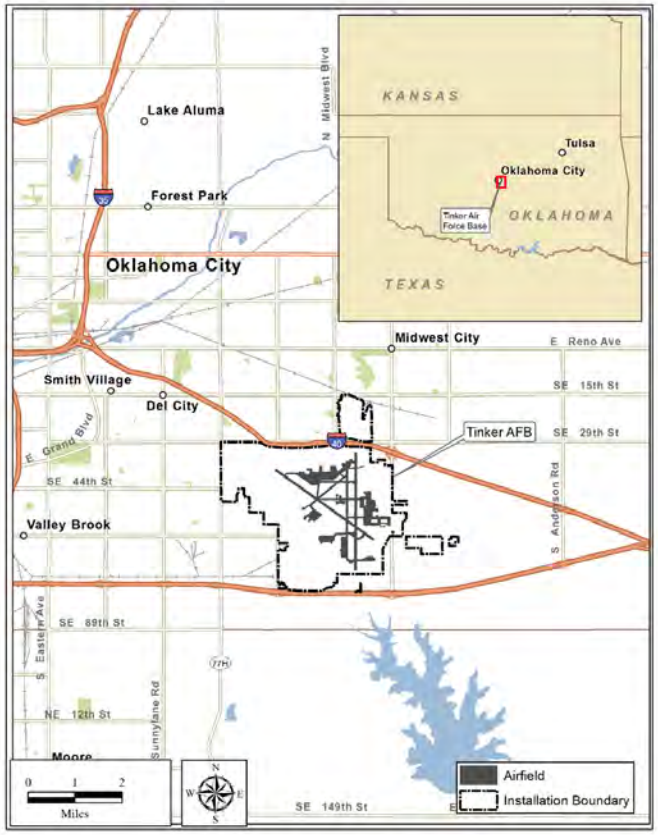
4

DEPARTMENT OF THE AIR FORCE
72D Air Base Wing (AFMC)
Tinker Air Force Base Oklahoma

ATTACHMENT 2. REGIONAL LOCATION MAP TINKER AFB

A.3.1.3 Tinker AFB Tribal Consultation and Notification Letter (Example) (Continued)

KC-46A Third Main Operating Base (MOB 3) Beddown EIS



Regional Location of Tinker AFB, Oklahoma

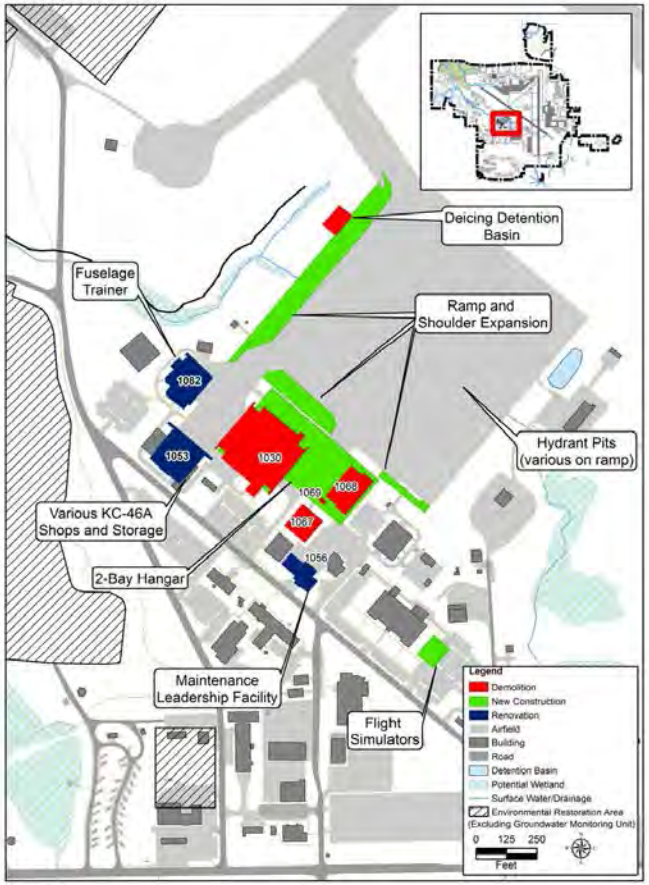
March 2016

DEPARTMENT OF THE AIR FORCE
72D Air Base Wing (AFMC)
Tinker Air Force Base Oklahoma

ATTACHMENT 3. AREA OF POTENTIAL EFFECT TINKER AFB

A.3.1.3 Tinker AFB Tribal Consultation and Notification Letter (Example) (Continued)

KC-46A Third Main Operating Base (MOB 3) Beddown EIS



The APE for this project is proposed as the construction footprints for the facilities shown above.

Facilities and Infrastructure Projects for the KC 46A MOB 3 at Tinker AFB *March 2016*

DEPARTMENT OF THE AIR FORCE
72D Air Base Wing (AFMC)
Tinker Air Force Base Oklahoma

ATTACHMENT 4. RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR TINKER AFB

A.3.1.3 Tinker AFB Tribal Consultation and Notification Letter (Example) (Continued)

SECTION 106 CONSULTATION RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR TINKER AFB

Project Name: KC-46A Third Main Operating Base Beddown Environmental Impact Statement (KC-46A MOB 3 EIS)

Please check the appropriate response(s) from the list below and use the back of this form or additional sheets if you wish to make comments. You may also respond via e-mail to timothy.taylor.5@us.af.mil:

____ We have no traditional religious, cultural properties, or other interests that may be affected by the proposed project and further consultation is not required.

____ There are or may be issues of concern associated with this proposed project and we wish to be included as a Section 106 Consulting Party. We prefer:

_____ Meeting with the Air Force at a tribal facility.

_____ Communicating with the Air Force by scheduled teleconference.

____ We want to continue to receive project information by mail and participate in the public involvement process.

Name and Title of designated contact for this proposed project:

_____ Telephone: _____
Printed Name and Title

Please print email address: _____

Signed: _____ Date: _____

Please explain your reason for interest in the KC-46A MOB 3 EIS's Potential Effects on Cultural Resources:

_____

_____

_____

_____

_____

Please mail response in provided postpaid envelope to:

Colonel Stephanie Wilson
KC-46A MOB 3 EIS
Tinker Air Force Base
7535 5th Street
Tinker AFB Oklahoma 73145-9100

Or, e-mail to: timothy.taylor.5@us.af.mil

DEPARTMENT OF THE AIR FORCE
72D Air Base Wing (AFMC)
Tinker Air Force Base Oklahoma

ATTACHMENT 5. STAMPED, ADDRESSED RETURN ENVELOPE

A.3.1.4 Westover ARB Tribal Consultation and Notification Letter (Example)

DEPARTMENT OF THE AIR FORCE
439TH AIRLIFT WING (AFRC)

April 1, 2016

Colonel Jay D. Jensen
Commander, 439th Airlift Wing
975 Patriot Avenue
Westover ARB, MA 01022

Mr. Rodney A. Butler, Tribal Council Chairman
Mashantucket Pequot Tribal Nation
2 Matts Path
PO Box 3060
Mashantucket, CT 06338-3060

Dear Mr. Butler,

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Mashantucket Pequot Tribal Nation may have an interest; and to invite the Mashantucket Pequot Tribal Nation to participate in government-to-government consultation with Westover ARB pursuant to Section 106 of the National Historic Preservation Act[1].

The United States Air Force (USAF) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base (MOB 3). This EIS will, as required by law and regulations[2], consider the potential impacts resulting from basing 12 KC-46A aircraft (and related construction, demolition, and renovation of facilities) at a USAF installation within the continental United States (CONUS) operated by the Air Force Reserve Command (AFRC). The USAF has identified Seymour Johnson Air Force Base (AFB) as the preferred alternative. Grissom Air Reserve Base (ARB), Tinker AFB, Westover ARB, and the No Action Alternative will be evaluated as alternatives.

If Westover ARB is selected for the KC-46A MOB 3 mission, 12 KC-46A aircraft would be based at Westover ARB. The KC-46A would operate in existing airspace and the types of flight operations would be similar to existing C-5 operations. The KC-46A would use existing KC-135 air refueling tracks and fuel jettison areas, if necessary. The elevation of the current air refueling tracks for the KC-135 vary but are generally at elevations of 14,000 to 24,000 feet above ground level. Preliminary analysis indicates that noise levels from these operations would be similar to noise levels associated with the current C-5 mission. Therefore, the area of potential effect (APE) for this action will be limited to the areas of construction, demolition, and renovation on Westover ARB. Additional information can be found on the project website at www.kc-46A-beddown.com.

Please let me know whether the Mashantucket Pequot Tribal Nation desires to participate in the development of this NEPA analysis, or to engage in government-to-government consultation. Westover ARB does not know of any properties of religious and cultural significance within the APE. Nevertheless, we ask for your assistance in identifying such properties of which we may be unaware, particularly those that may be affected by this proposal.

My staff will be contacting your office by telephone to discuss the KC-46A MOB 3 project and any potential impacts. For staff questions, comments, or input on the NEPA process, please contact Mr. Jack Moriarty, Westover ARB Environmental Manager, (413) 557-2434, john.moriarty.1@us.af.mil. For matters related to government-to-government consultation, you may contact me directly at (413) 557-3588.

Please take this opportunity to complete attachment 4, which can be filled out to identify the Tribe's interest in consulting about the proposal and to facilitate further communication on the matter. Upon completion, please return attachment 4 to us in the stamped and self-addressed envelope. I look forward to receiving any input you may have regarding this endeavor.

Sincerely,

JAY D. JENSEN, Colonel, USAFR
Commander

5 Attachments:
1. KC-46A MOB 3 EIS Scoping Brochure
2. Regional Location Map Westover ARB
3. APE Westover ARB
4. Response Endorsement and Preferences Form
5. Stamped, addressed return envelope

[1] 54 U.S.C. § 306108, as implemented by 36 CFR Part 800.
[2] National Environmental Policy Act (NEPA) of 1969 [42USC 4321 *et seq.*], Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA 40 CFR Parts 1500-1508; and Air Force Instruction (AFI) 32-7061, *Environmental Impact Analysis Process* (32 CFR Part 989)

A.3.1.4 Westover ARB Tribal Consultation and Notification Letter (Example) (Continued)

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 1. KC-46A MOB 3 EIS SCOPING BROCHURE

The U.S. Air Force (USAF) is preparing a Draft Environmental Impact Statement (EIS) to assess the potential environmental consequences of basing and operating the KC-46A tanker aircraft, associated infrastructure, and manpower to establish the KC-46A Third Main Operating Base (MOB 3) mission. In order to effectively define the full range of issues to be evaluated in the EIS, the USAF is holding public scoping meetings to determine the EIS scope (i.e., what will be covered and in what detail) by soliciting comments from interested state and federal agencies and interested members of the public.

The National Environmental Policy Act (NEPA)

The NEPA is our national mandate for making informed decisions while considering environmental impacts. When federal agencies propose projects having the potential to significantly impact the environment, NEPA requires the following process be undertaken as part of planning before final decisions are made:

- Evaluation and consideration of potential environmental consequences for projects that may significantly impact the environment, and
- Consideration of public and government agency comments.

Where the potential for significant environmental impacts exists, this evaluation is presented in an EIS, which:

- Identifies and describes the affected environment;
- Evaluates the potential environmental consequences from a range of reasonable alternatives; and
- Identifies environmental permits and specific mitigation measures that could avoid, minimize, or reduce potential environmental consequences.

The EIS Timeline

Opportunities for Public Involvement
Where We Are Now

Notice of Intent to conduct environmental analysis on KC-46A Third Main Operating Base (MOB 3) beddown published in *Federal Register* *March 2016*

↓

Minimum 30-day Scoping Period *Spring 2016*

↓

Preparation of Draft EIS *Summer 2016*

↓

Notice of Availability of Draft EIS for public review published in *Federal Register* Minimum 45-day Comment Period *September 2016*

↓

Preparation of Final EIS *Winter 2017*

↓

Notice of Availability of Final EIS published in *Federal Register* and 30-day EIS Waiting Period *March 2017*

↓

Record of Decision (ROD)

Notice of Intent (NOI) and Scoping

The EIS begins with an NOI, which is published in the *Federal Register* to announce the USAF's intent to prepare an EIS on the KC-46A MOB 3 beddown proposed action and alternatives. The NOI is the beginning of the public scoping process, including community scoping meetings, to provide the public and government agencies and entities time to review the proposed action and alternatives.

A.3.1.4 Westover ARB Tribal Consultation and Notification Letter (Example) (Continued)

Proposed Action: KC-46A MOB 3 Beddown

The KC-46A MOB 3 beddown EIS will evaluate the potential environmental consequences of the beddown of 12 KC-46A aircraft, associated facilities and infrastructure, and manpower at a single MOB 3 location.

The MOB 3 preferred alternative location is:

- Seymour Johnson Air Force Base (AFB), North Carolina

The MOB 3 reasonable alternative locations are:

- Grissom Air Reserve Base (ARB), Indiana
- Tinker AFB, Oklahoma
- Westover ARB, Massachusetts

Along with the No Action Alternative, all four alternatives are evaluated equally in the EIS.

The USAF is in the early stages of the EIS process, and no decision has been made as to the final MOB 3 beddown location.

U.S. Map of MOB 3 Alternative Bases

No Action Alternative

Under the No Action Alternative, beddown of the KC-46A MOB 3 mission would not occur at this time. A No Action Alternative will be evaluated at each proposed beddown location. Evaluation of the No Action Alternative provides a baseline for decision makers.

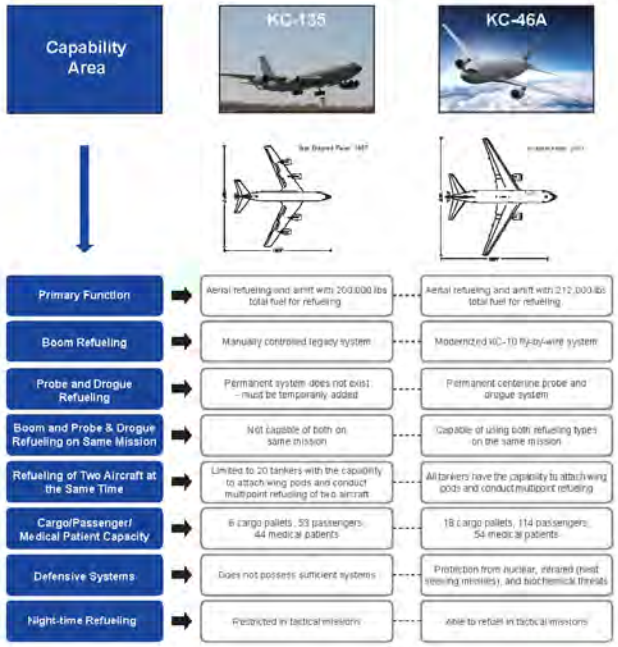
2

Purpose and Need: Tanker Modernization

The selected basing locations would need to accommodate training, flight operations, and maintenance support as necessary to support KC-46A pilots and operating personnel. Each KC-46A squadron requires personnel, facilities, and airspace to support aircraft operations and pilot and personnel training.

The purpose of the KC-46A MOB 3 beddown is to provide locations for training and flight operations. The KC-46A tankers are needed to support a high-threat, multi-role warfighting capability to Commanders worldwide. Trained pilots and personnel must be available to meet necessary KC-46A scheduled inventory replenishment dates as older tanker aircraft are withdrawn from the inventory.

Comparison of KC-135 and KC-46A Aircraft Performance Capabilities



Capability Area	KC-135	KC-46A
Primary Function	Aerial refueling and airlift with 200,000 lbs total fuel for refueling	Aerial refueling and airlift with 212,000 lbs total fuel for refueling
Boom Refueling	Manually controlled legacy system	Modernized KC-10 fly-by-wire system
Probe and Drogue Refueling	Permanent system does not exist – must be temporarily added	Permanent centerline probe and drogue system
Boom and Probe & Drogue Refueling on Same Mission	Not capable of both on same mission	Capable of using both refueling types on the same mission
Refueling of Two Aircraft at the Same Time	Limited to 20 tankers with the capability to attach wing pods and conduct multipoint refueling of two aircraft	All tankers have the capability to attach wing pods and conduct multipoint refueling
Cargo/Passenger/ Medical Patient Capacity	6 cargo pallets, 33 passengers; 44 medical patients	18 cargo pallets, 114 passengers; 54 medical patients
Defensive Systems	Does not possess sufficient systems	Protection from auxiliar, infrared (heat seeking missiles), and biochemical threats
Night-time Refueling	Restricted in tactical missions	Able to refuel in tactical missions

Source: GAO presentation of USAF information, © Boeing Company (KC-46A photo).

3

A.3.1.4 Westover ARB Tribal Consultation and Notification Letter (Example) (Continued)

Environmental Resources

The USAF understands the potential for the KC-46A MOB 3 beddown to affect environmental resources. As part of the EIS, the USAF will analyze potential environmental consequences associated with changes made to support KC-46A operations, including changes in personnel, construction of facilities, and the inclusion of KC-46A flight operation activities. The environmental resource areas listed to the right are currently under consideration in the KC-46A MOB 3 beddown EIS.

Please take this opportunity to:

- ☑ Learn about the project,
- ☑ Identify community-specific issues, and
- ☑ Make sure you are included on our mailing list.

Public Scoping Meetings

5:00 p.m. - 8:00 p.m.

April 12, 2016
Westover Air Reserve Base
Castle of Knights
1599 Memorial Drive
Chicopee, MA

April 14, 2016
Seymour Johnson Air Force Base
Herman Park Center
701 E. Ash Street
Goldsboro, NC

April 19, 2016
Grissom Air Reserve Base
Milestone Event Center
1458 N. Liberator Road
Peru, IN

April 21, 2016
Tinker Air Force Base
Sheraton Midwest City Hotel and Reed Conference Center
57050 Will Rodgers Road
Midwest City, OK

Environmental Resource Areas include:

Aircraft Operations
- Noise
- Air Quality
- Safety
  - Flight Safety
  - Ground Safety

Natural Resources
- Geology and Soils
- Surface Water and Groundwater
- Wetlands and Floodplains
- Biological Resources

Cultural Resources
- Archaeological Resources
- Architectural Resources
- Traditional Resources

Human Resources
- Land Use
- Recreation
- Socioeconomics
- Environmental Justice and Protection of Children

Community Infrastructure
- Infrastructure (utilities and public services)
- Hazardous Materials and Waste
- Transportation

How to Submit Comments

Scan with Your Phone to Learn More about the KC-46A MOB 3 Beddown EIS

Submit comments electronically at www.KC-46A-beddown.com at a scoping meeting, or by mail before *April 25, 2016*, to:

Mr. Hamid Kamalpour
U.S. Air Force, AFCEC/CZN
2261 Hughes Ave, Ste. 155
Lackland AFB, TX 78236-9853

4

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 2. REGIONAL LOCATION MAP WESTOVER ARB

A.3.1.4 Westover ARB Tribal Consultation and Notification Letter (Example) (Continued)

KC-46A Third Main Operating Base (MOB 3) Beddown EIS

Regional Map of Westover ARB, Massachusetts

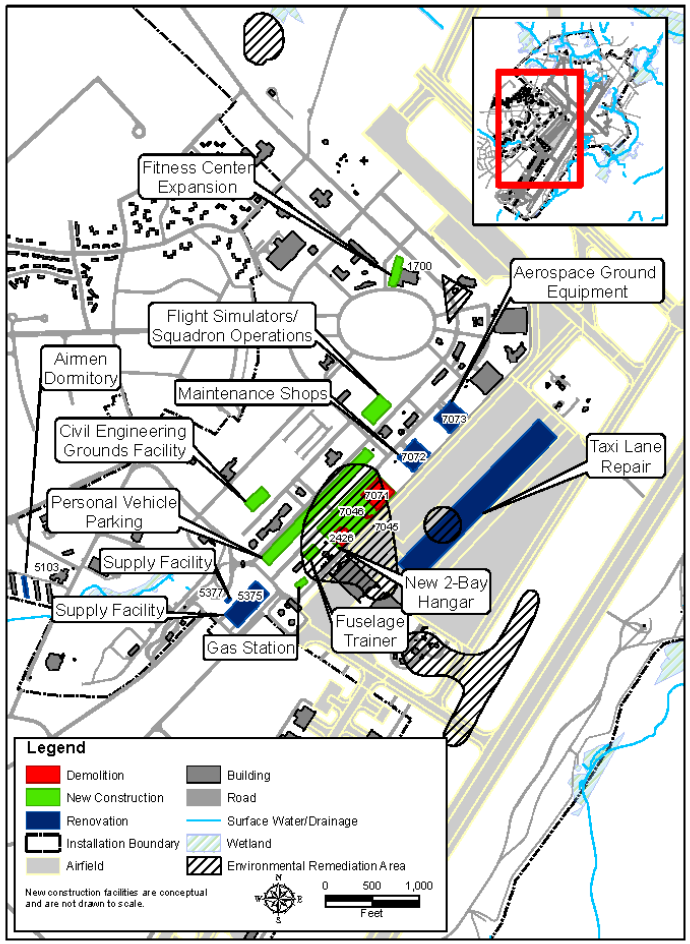
March 2016

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 3. AREA OF POTENTIAL EFFECT WESTOVER ARB

A.3.1.4 Westover ARB Tribal Consultation and Notification Letter (Example) (Continued)

KC-46A Third Main Operating Base (MOB 3) Beddown EIS



The APE for this project is proposed as the construction footprints for the facilities shown above.

Facilities and Infrastructure Projects for the KC 46A MOB 3 at Westover ARB *March 2016*

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 4. RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR WESTOVER ARB

A.3.1.4 Westover ARB Tribal Consultation and Notification Letter (Example) (Continued)

SECTION 106 CONSULTATION RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR WESTOVER ARB

Project Name: KC-46A Third Main Operating Base Beddown Environmental Impact Statement (KC-46A MOB 3 EIS)

Please check the appropriate response(s) from the list below and use the back of this form or additional sheets if you wish to make comments. You may also respond via e-mail to john.moriarty.1@us.af.mil:

____ We have no traditional religious, cultural properties, or other interests that may be affected by the proposed project and further consultation is not required.

____ There are or may be issues of concern associated with this proposed project and we wish to be included as a Section 106 Consulting Party. We prefer:

_____ Meeting with the Air Force at a tribal facility.

_____ Communicating with the Air Force by scheduled teleconference.

____ We want to continue to receive project information by mail and participate in the public involvement process.

Name and Title of designated contact for this proposed project:

_____ Telephone: _____
Printed Name and Title

Please print email address: _____

Signed: _____ Date: _____

Please explain your reason for interest in the KC-46A MOB 3 EIS's Potential Effects on Cultural Resources:

_____

_____

_____

_____

_____

Please mail response in provided postpaid envelope to:

Brig. General Al Lupenski
KC-46A MOB 3 EIS
Westover Air Reserve Base
250 Patriot Avenue
Westover ARB, MA 01022
Or, e-mail to: john.moriarty.1@us.af.mil

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 5. STAMPED, ADDRESSED RETURN ENVELOPE

A.3.2 Tribal Consultation and Notification Mailing Lists

A.3.2.1 Grissom ARB Tribal Consultation and Notification Mailing List

Salutation	First Name	Last Name	Tribe	City	State	Zip
Chairman	John "Rocky"	Barrett	Citizen Potawatomi Nation	Shawnee	Oklahoma	74801
Chairman	Harold "Gus"	Frank	Forest County Potawatomi	Crandon	Wisconsin	54520
Chairperson	Kenneth	Meshigaud	Hannahville Indian Community	Wilson	Michigan	49896
Chairman	Lester	Randall	Kickapoo Tribe in Kansas	Horton	Kansas	66439
Chairman	David	Pacheco, Jr.	Kickapoo Tribe of Oklahoma	McLoud	Oklahoma	74851
Chief	Douglas G.	Lankford	Miami Tribe of Oklahoma	Miami	Oklahoma	74354
Chief	John P.	Froman	Peoria Tribe of Indians of Oklahoma	Miami	Oklahoma	74354
Chairman	John	Warren	Pokagon Band of Potawatomi Indians	Dowagiac	Michigan	49047
Chairperson	Liana	Onnen	Prairie Band of Potawatomi Nation	Mayetta	Kansas	66509
Principal Chief	Geoffrey	Standing Bear	Osage Nation	Pawhuska	Oklahoma	74056

A.3.2.2 Seymour Johnson AFB Tribal Consultation and Notification Mailing List

The Eastern Band of the Cherokee Indians has indicated that they have no interests in projects in Wayne County, North Carolina (see section A.3.1.2).

A.3.2.3 Tinker AFB Tribal Consultation and Notification Mailing List

Salutation	First Name	Last Name	Tribe	City	State	Zip
President	Terry	Parton	Wichita and Affiliated Tribes	Anadarko	Oklahoma	73005
Attn	Emman	Spain	Muscogee (Creek) Nation	Okmulgee	Oklahoma	74447
Dr.	Andrea A.	Hunter	The Osage Nation	Pawhuska	Oklahoma	74056
Chief	Leonard M.	Harjo	Seminole Nation of Oklahoma	Wewoka	Oklahoma	74884
Chairman	Tamara	Francis-Fourkiller	The Caddo Nation	Binger	Oklahoma	73009

A.3.2.4 Westover ARB Tribal Consultation and Notification Mailing List

Salutation	First Name	Last Name	Tribe	City	State	Zip
Chairman	Rodney A.	Butler	Mashantucket Pequot Tribal Nation	Mashantucket	Connecticut	06338-3060
Chief		Silent Drum	Mashpee Wampanoag Tribe	Mashpee	Massachusetts	02649
Chief	Sachem Matthew	Thomas	Narragansett Indian Tribe of Rhode Island			
President	Shannon	Holsey	Stockbridge-Munsee Band of Mohican Tribe	Bowler	Wisconsin	54416
Chief	F. Ryan	Malonson	Wampanoag Tribe of Gay Head	Aquinnah	Massachusetts	02535-1546

A.3.3 Tribal Consultation and Notification Responses

A.3.3.1 Grissom ARB Tribal Consultation and Notification Responses

SECTION 106 CONSULTATION RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR GRISSOM ARB

Project Name: KC-46A Third Main Operating Base Beddown Environmental Impact Statement (KC-46A MOB 3 EIS)

Please check the appropriate response(s) from the list below and use the back of this form or additional sheets if you wish to make comments. You may also respond via e-mail to jeffrey.woodring@us.af.mil:

_X_ We have no traditional religious, cultural properties, or other interests that may be affected by the proposed project and further consultation is not required.

____ There are or may be issues of concern associated with this proposed project and we wish to be included as a Section 106 Consulting Party. We prefer:

____ Meeting with the Air Force at a tribal facility.

____ Communicating with the Air Force by scheduled teleconference.

____ We want to continue to receive project information by mail and participate in the public involvement process.

Name and Title of designated contact for this proposed project:

_____ Telephone: _____
Printed Name and Title

Please print email address: andrew-jourd@potawatomi.org

Signed: Andrew Jourd Date: 4-1-16

Please explain your reason for interest in the KC-46A MOB 3 EIS's Potential Effects on Cultural Resources:
CPN has historic ties to the geographic region described in your letter dated 3-28-16. At this time we know of no sites related to CPN history that will fall in the API However we invite Former Kickapoo, Delaware and Miami Villages in the general vicinity and defer opinions to those who are descendants of those Nations. Thank you for your time

Please mail response in provided postpaid envelope to:

Colonel Douglas J. Schwartz
KC-46A MOB 3 EIS
Grissom Air Reserve Base
7207 South Grissom Street
Grissom ARB, IN 46971-1609
Or e-mail: jeffrey.woodring@us.af.mil

WOODRING, JEFFREY A GS-12 USAF AFRC 434 MSG/CEV

From: Diane Hunter <dhunter@miamination.com>
Sent: Tuesday, April 19, 2016 10:38 AM
To: WOODRING, JEFFREY A GS-12 USAF AFRC 434 MSG/CEV
Subject: Grissom ARB consultation
Attachments: IN Grissom ARB consultation response.pdf

Dear Mr. Woodring:

Aya, kikwehsitoole. My name is Diane Hunter, and I am the Acting Tribal Historic Preservation Officer for the Federally Recognized Miami Tribe of Oklahoma. In this capacity, I am the Miami Tribe's point of contact for all Section 106 issues.

The Miami Tribe accepts the invitation to serve as a consulting party to the above-mentioned project. In my capacity as Tribal Historic Preservation Officer I am the point of contact for consultation. I have attached your consultation response form to this email.

The Miami Tribe offers no objection to the proposed project at this time, as we are not currently aware of existing documentation directly linking a specific Miami cultural or historic site to the project site. However, as this site is within the aboriginal homelands of the Miami Tribe and due to the site's location near an existing historically important site, we request a copy of all archaeological surveys performed as the project moves forward. Please mail all documentation to the address listed below or email to dhunter@miamination.com <mailto:dhunter@miamination.com> .

If any human remains or Native American cultural items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) or archaeological evidence is discovered during any phase of this project, the Miami Tribe requests immediate consultation with the entity of jurisdiction for the location of discovery. In such a case, please contact me at 918-541-8966, by email atdhunter@miamination.com <mailto:dhunter@miamination.com> , or by mail at the address listed below.

Sincerely,

Diane Hunter
Acting Tribal Historic Preservation Officer Miami Tribe of Oklahoma P.O. Box 1326 Miami, OK 74355
dhunter@miamination.com <mailto:dhunter@miamination.com>
918-541-8966

A.3.3.1 Grissom ARB Tribal Consultation and Notification Responses (Continued)

SECTION 106 CONSULTATION RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR GRISSOM ARB

Project Name: KC-46A Third Main Operating Base Beddown Environmental Impact Statement (KC-46A MOB 3 EIS)

Please check the appropriate response(s) from the list below and use the back of this form or additional sheets if you wish to make comments. You may also respond via e-mail to jeffrey.woodring@us.af.mil:

___ We have no traditional religious, cultural properties, or other interests that may be affected by the proposed project and further consultation is not required.

✓ There are or may be issues of concern associated with this proposed project and we wish to be included as a Section 106 Consulting Party. We prefer:

____ Meeting with the Air Force at a tribal facility.

____ Communicating with the Air Force by scheduled teleconference.

✓ We want to continue to receive project information by mail and participate in the public involvement process.

Name and Title of designated contact for this proposed project:

Diane Hunter, Tribal Historic Preservation Officer Telephone: 918-541-8966
Printed Name and Title

Please print email address: dhunter@miamination.com

Signed: Diane Hunter Date: 4-19-2016

Please explain your reason for interest in the KC-46A MOB 3 EIS's Potential Effects on Cultural Resources:
See email to which this is attached.

Please mail response in provided postpaid envelope to:

Colonel Douglas J. Schwartz
KC-46A MOB 3 EIS
Grissom Air Reserve Base
7207 South Grissom Street
Grissom ARB, IN 46971-1609
Or e-mail: jeffrey.woodring@us.af.mil

-----Original Message-----
From: Jason S. Wesaw - THPO [mailto:Jason.Wesaw@pokagonband-nsn.gov]
Sent: Wednesday, May 18, 2016 12:33 PM
To: WOODRING, JEFFREY A GS-12 USAF AFRC 434 MSG/CEV
<jeffrey.woodring@us.af.mil>
Subject: Pokagon THPO

Hi Jeffrey,

As of April 4, 2016 I assumed the position of Tribal Historic Preservation Officer from Marcus Winchester. I'm happy to assist in every way possible. I am not familiar with this consultation, but have a backlog of requests that I am working through since starting. So, I just may not have come across this paperwork or email thread yet. If there is anything you can provide me at your convenience to assist with this request, I would appreciate it. Feel free to contact me directly with any additional questions or concerns.

Thank you,

Jason S Wesaw
Tribal Historic Preservation Officer
(269) 462-4316 desk | (269) 783-9041 mobile
Pokegnek Bodewadmik
Pokagon Band of Potawatomi
www.PokagonBand-nsn.gov <http://www.pokagonband-nsn.gov/>

A.3.3.1 Grissom ARB Tribal Consultation and Notification Responses (Continued)

Tutterow, Brian W.

Subject: FW: Section 106 Consultation for KC-46A MOB3

-----Original Message-----
From: Andrea Hunter [mailto:ahunter@osagenation-nsn.gov]
Sent: Friday, May 20, 2016 9:40 AM
To: WOODRING, JEFFREY A GS-12 USAF AFRC 434 MSG/CEV <jeffrey.woodring@us.af.mil>
Subject: RE: Section 106 Consultation for KC-46A MOB3

Mr. Woodring,
Yes, the Osage Nation is going to participate in the consultation process for the beddown of the KC-46A tanker at a Third Main Operating Base (MOB3), Grissom Air Reserve Base. We will locate the notification documentation sent and provide a response.

Thank you,

Dr. Andrea A. Hunter
Director/THPO
Osage Nation Historic Preservation Office
627 Grandview Avenue
Pawhuska, OK 74056

Office Phone: (918) 287-5328
Office Fax: (918) 287-5376

-----Original Message-----
From: WOODRING, JEFFREY A GS-12 USAF AFRC 434 MSG/CEV [mailto:jeffrey.woodring@us.af.mil]
Sent: Wednesday, May 18, 2016 11:53 AM
To: Andrea Hunter
Subject: Section 106 Consultation for KC-46A MOB3

Dr. Hunter

I'm following up on the 28 Mar 2016 letter from my Commander concerning the government-to-government consultation process for Section 106 of the National Historic Preservation Act. His letter invited The Osage Nation to participate in the consultation process concerning the beddown of the KC-46A tanker at a Third Main Operating Base (MOB3). Grissom Air Reserve Base is one of the four potential locations.

As of this date, we have not received a response from The Osage Nation and I am wondering if you intend to participate in the government-to-government consultation process for this action.

Thank you
Jeffrey A. Woodring, GS-12, P.E.
Chief, Environmental Flight
434 MSG/CEV
7104 S. Warthog Street
Grissom ARB, IN 46971-1632

DSN 388-4561 Comm 765-688-4561
Fax DSN 388-4541 Comm 765-688-4541

Tutterow, Brian W.

Subject: FW: KC-46A Tanker Aircraft EIS
Attachments: 1516-1808OK 4 Grissom No Properties.pdf

-----Original Message-----
From: Jacqueline Rodgers [mailto:jrodgers@osagenation-nsn.gov]
Sent: Friday, May 20, 2016 5:41 PM
To: WOODRING, JEFFREY A GS-12 USAF AFRC 434 MSG/CEV <jeffrey.woodring@us.af.mil>
Subject: KC-46A Tanker Aircraft EIS

Dear Mr. Woodring,

Please find attached our office's response to the project titled EIS to assess beddown of KC-46A tanker aircraft at a third main operating base. I have also mailed a hard copy for your files.

Thank you for consulting with the Osage Nation on this project.

Sincerely,

Jackie Rodgers
Archaeologist, RPA

Osage Nation Historic Preservation Office

627 Grandview Avenue, Pawhuska, OK 74056

Office: 918-287-5494

jrodgers@osagenation-nsn.gov <mailto:jrodgers@osagenation-nsn.gov>

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Any unauthorized disclosure, dissemination, distribution, copying or the taking of any action in reliance on the information herein is prohibited.
Emails are not secure and cannot be guaranteed to be error-free. They can be intercepted, amended, or contain viruses. Anyone who communicates with us by email is deemed to have accepted these risks. Osage Nation is not responsible for errors or omissions in this message and denies any responsibility for any damage arising from the use of email. Any opinion and other statement contained in this message and any attachment are solely those of the author and do not necessarily represent those of the Osage Nation.

A.3.3.1 Grissom ARB Tribal Consultation and Notification Responses (Continued)

TRIBAL HISTORIC PRESERVATION OFFICE

Date: May 20, 2016 **File: 1516-1808OK-4**

RE: DoD, Department of the Air Force, Environmental Impact Statement to asses the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base, Tinker Air Force Base, Oklahoma

Department Of The Air Force
Douglas J Schwartz
7207 South Grissom
Grissom Air Reserve Base, Indiana 46971-1606

Dear Mr. Grissom,

The Osage Nation Historic Preservation Office has evaluated your submission regarding the proposed DoD, Department of the Air Force, Environmental Impact Statement to asses the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base, Tinker Air Force Base, Oklahoma and determined that the proposed project **most likely will not adversely affect any sacred properties and/or properties of cultural significance to the Osage Nation.** For direct effect, the finding of this NHPA Section 106 review is a determination of **"No Properties"** eligible or potentially eligible for the National Register of Historic Places.

In accordance with the National Historic Preservation Act, (NHPA) [54 U.S.C. § 300101 et seq.] 1966, undertakings subject to the review process are referred to in 54 U.S.C. § 302706 (a), which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires Federal agencies to consider the effects of their actions on historic properties (36 CFR Part 800) as does the National Environmental Policy Act (43 U.S.C. 4321 and 4331-35 and 40 CFR 1501.7(a) of 1969). **The Osage Nation concurs that the Department of Defense fulfilled NHPA compliance by consulting with the Osage Nation Historic Preservation Office in regard to the proposed project referenced as DoD, Department of the Air Force, Environmental Impact Statement to asses the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base, Tinker Air Force Base, Oklahoma .**

The Osage Nation has vital interests in protecting its historic and ancestral cultural resources. We do not anticipate that this project will adversely impact any cultural resources or human remains protected under the NHPA, NEPA, the Native American Graves Protection and Repatriation Act, or Osage law. **If, however, artifacts or human remains are discovered during project construction, we ask that work cease immediately and the Osage Nation Historic Preservation Office be contacted.**

Should you have any questions or need any additional information please feel free to contact me at the number listed below. Thank you for consulting with the Osage Nation on this matter.

for: Andrea A. Hunter

Andrea A. Hunter, Ph.D.
Director, Tribal Historic Preservation Officer

Jackie Rodgers
Archaeologist

627 Grandview, Pawhuska, OK 74056, (918) 287-5328, Fax (918) 287-5376

A.3.3.2 Seymour Johnson AFB Tribal Consultation and Notification Responses

The Eastern Band of the Cherokee Indians has indicated that they have no interests in projects in Wayne County, North Carolina (see Section A.3.1.2).

A.3.3.3 Tinker AFB Tribal Consultation and Notification Responses

TRIBAL HISTORIC PRESERVATION OFFICE

Date: **May 20, 2016** **File: 1516-1808OK-4**

RE: **DoD, Department of the Air Force, Environmental Impact Statement to asses the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base, Tinker Air Force Base, Oklahoma**

Department Of The Air Force
Tim Taylor
7460 Arnold Street, Suite 234
Tinker AFB, OK 73145

Dear Mr. Taylor,

The Osage Nation Historic Preservation Office has evaluated your submission regarding the proposed DoD, Department of the Air Force, Environmental Impact Statement to asses the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base, Tinker Air Force Base, Oklahoma and determined that the proposed project **most likely will not adversely affect any sacred properties and/or properties of cultural significance to the Osage Nation.** For direct effect, the finding of this NHPA Section 106 review is a determination of **"No Properties"** eligible or potentially eligible for the National Register of Historic Places.

In accordance with the National Historic Preservation Act, (NHPA) [54 U.S.C. § 300101 et seq.] 1966, undertakings subject to the review process are referred to in 54 U.S.C. § 302706 (a), which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires Federal agencies to consider the effects of their actions on historic properties (36 CFR Part 800) as does the National Environmental Policy Act (43 U.S.C. 4321 and 4331-35 and 40 CFR 1501.7(a) of 1969). **The Osage Nation concurs that the Department of Defense fulfilled NHPA compliance by consulting with the Osage Nation Historic Preservation Office in regard to the proposed project referenced as DoD, Department of the Air Force, Environmental Impact Statement to asses the potential environmental consequences associated with the beddown of KC-46A tanker aircraft at a Third Main Operating Base, Tinker Air Force Base, Oklahoma .**

The Osage Nation has vital interests in protecting its historic and ancestral cultural resources. We do not anticipate that this project will adversely impact any cultural resources or human remains protected under the NHPA, NEPA, the Native American Graves Protection and Repatriation Act, or Osage law. **If, however, artifacts or human remains are discovered during project construction, we ask that work cease immediately and the Osage Nation Historic Preservation Office be contacted.**

Should you have any questions or need any additional information please feel free to contact me at the number listed below. Thank you for consulting with the Osage Nation on this matter.

for Andrea A. Hunter

Andrea A. Hunter, Ph.D.
Director, Tribal Historic Preservation Officer

Jackie Rodgers
Archaeologist

627 Grandview, Pawhuska, OK 74056, (918) 287-5328, Fax (918) 287-5376

A.3.3.4 Westover ARB Tribal Consultation and Notification Responses

SECTION 106 CONSULTATION RESPONSE ENDORSEMENT AND PREFERENCES FORM FOR WESTOVER ARB

Project Name: KC-46A Third Main Operating Base Beddown Environmental Impact Statement (KC-46A MOB 3 EIS)

Please check the appropriate response(s) from the list below and use the back of this form or additional sheets if you wish to make comments. You may also respond via e-mail to john.moriarty.1@us.af.mil:

X We have no traditional religious, cultural properties, or other interests that may be affected by the proposed project and further consultation is not required.

___ There are or may be issues of concern associated with this proposed project and we wish to be included as a Section 106 Consulting Party. We prefer:

___ Meeting with the Air Force at a tribal facility.

___ Communicating with the Air Force by scheduled teleconference.

___ We want to continue to receive project information by mail and participate in the public involvement process.

Name and Title of designated contact for this proposed project:

Bonney Hartley, THPO, Stockbridge Munsee Mohican Tribe — Telephone: 518-244-3164

Printed Name and Title

Please print email address: bonney.hartley@mohican-nsn.gov

Signed: B Hartley — Date: 5/9/16

Please explain your reason for interest in the KC-46A MOB 3 EIS's Potential Effects on Cultural Resources:

Please mail response in provided postpaid envelope to:

Colonel Jay D. Jensen
KC-46A MOB 3 EIS
Westover Air Reserve Base
250 Patriot Avenue
Westover ARB, MA 01022
Or, e-mail to: john.moriarty.1@us.af.mil

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A.4 NATIONAL HISTORIC PRESERVATION ACT (NHPA) PREVIOUS CULTURAL RESOURCE CONSULTATION

A.4.1 Grissom ARB NHPA Previous Section 106 SHPO Consultation Letter

DNR Indiana Department of Natural Resources

Mitchell E. Daniels, Jr. Governor
Robert E. Carter, Jr. Director

Division of Historic Preservation & Archaeology • 402 W. Washington Street, W274 • Indianapolis, IN 46204-2739
Phone 317-232-1646 • Fax 317-232-0693 • dhpa@dnr.IN.gov

July 25, 2012

David A. Hughes, P.E.
Department of the Air Force
Air Force Reserve Command
434 MSG/CEV
7104 South Warthog Street
Grissom ARB, IN 46971-1632

Federal Agency: Department of the Air Force

Re: Request for SHPO concurrence regarding Grissom historic and cultural resources inventory (DHPA #13604)

Dear Mr. Hughes:

Pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) and 36 C.F.R. Part 800, the staff of the Indiana State Historic Preservation Officer ("Indiana SHPO") has conducted an analysis of the materials dated June 20, 2012 and received on June 25, 2012 for the above indicated project in Grissom Air Reserve Base, Miami County, Indiana.

Thank you for your recent submission. Based on the results of the previously conducted cultural resource surveys and the current information provided to our office, we see no reason to disagree with the Department of the Air Force's assessment that there are no sites listed in or eligible for inclusion in the National Register of Historic Places within Grissom ARB.

If any archaeological artifacts or human remains are uncovered during construction, demolition, or earthmoving activities, state law (Indiana Code 14-21-1-27 and 29) requires that the discovery must be reported to the Department of Natural Resources within two (2) business days. In that event, please call (317) 232-1646. Be advised that adherence to Indiana Code 14-21-1-27 and 29 does not obviate the need to adhere to applicable federal statutes and regulations.

A copy of the revised 36 C.F.R. Part 800 that went into effect on August 5, 2004 may be found on the Internet at www.achp.gov for your reference. If you have questions about archaeological issues please contact Cathy Draeger-Williams at (317) 234-3791 or cdraeger-williams@dnr.IN.gov. If you have questions about buildings or structures please contact Chad Slider at (317) 234-5366 or cslider@dnr.IN.gov. Additionally, in all future correspondence regarding the above indicated project, please refer to DHPA #13604.

Very truly yours,

James A. Glass, Ph.D.
Deputy State Historic Preservation Officer

JAG/CWS/CDW/cdw

www.DNR.IN.gov

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A.4.2 Seymour Johnson AFB Previous Section 106 Consultation Letter

NORTH CAROLINA DEPARTMENT OF CULTURAL RESOURCES

Raleigh
North Carolina
27611

Division of
Archives and History
Larry E. Tise, Director

October 9, 1978

Robert S. Dobbins, Lt. Col., USAF
Base Civil Engineer
Department of the Air Force
4th Civil Engineering Squadron (TAC)
Seymour Johnson Air Force Base, N.C. 27531

Re: Seymour Johnson Air Force Base, Wayne County

Dear Lt. Col. Dobbins:

We have reviewed the additional information forwarded by your office concerning an archeological investigation of Seymour Johnson Air Force Base in Wayne County, and would like to comment.

From information concerning the present and past use and ground disturbing activities that have taken place on the air base, it is likely that any archeological resources which may have been present on the property have been destroyed or sufficiently damaged to the extent that their potential significance has been destroyed. This conclusion was confirmed by an on-site inspection by a member of our staff on October 4, 1978.

The recorded archeological site (31 Wy 9) has also deteriorated to the point that it has lost any potential for inclusion in the National Register of Historic Places. This site was also visited on the 4th and found to have been eroded and disturbed so as to have become practically unrecognizable. We therefore recommend that no further archeological investigation be conducted on the air force base property.

We wish to thank you for your courtesy shown to our staff during the visit and for your cooperation and concern in this matter. If you have any questions concerning the above, please contact Ms. F. Langdon Edmunds, Environmental Review Coordinator, at 919/733-4763.

Sincerely,

Larry E. Tise
State Historic Preservation Officer

LET:slw

A.4.3 Tinker AFB NHPA Previous Section 106 Consultation Letter

No correspondence has been received at this time.

A.4.4 Westover ARB NHPA Previous Section 106 Consultation Letter

No correspondence has been received at this time.

A.5 NATIONAL HISTORIC PRESERVATION ACT (NHPA) SECTION 106 STATE HISTORIC PRESERVATION OFFICE (SHPO) CONSULTATION

A.5.1 Grissom ARB NHPA Section 106 SHPO Consultation Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESERVE COMMAND

11 Mar 2016

Mr. David A. Hughes, P.E.
Base Civil Engineer
7104 S. Warthog Street
Grissom ARB, IN 46971-1632

Dr. James A. Glass
Deputy State Historic Preservation Officer
Division of Historic Preservation and Archaeology
402 W. Washington Street, W274
Indianapolis, IN 46204-2739

Subject: Section 106 Consultation on Proposed Air Force Beddown of the Third Main Operating Base of the KC-46A Tanker aircraft at Grissom Air Reserve Base

Dear Dr. Glass

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. Grissom Air Reserve Base (ARB) is proposed as a reasonable alternative for the MOB 3 mission, along with Westover ARB, MA, and Tinker Air Force Base (AFB), OK. Seymour Johnson AFB, NC has been identified as the Preferred Alternative for this mission.

The proposed MOB 3 project would base 12 KC-46A aircraft at one of the four installations. Basing the aircraft at Grissom ARB would require the construction, demolition and renovation of facilities to accommodate the new personnel and aircraft associated with the mission. The attached Table 1 and project map identify specific facilities that are included as part of this project.

Pursuant to 54 U.S.C. § 306108 (commonly referred to as Section 106 of the National Historic Preservation Act) and 36 CFR 800, the Air Force, requests to enter into Section 106 consultation regarding the proposed undertaking. Grissom ARB has defined the Area of Potential Effects (APE) as the viewshed for historic facilities and areas of ground disturbance associated with construction, demolition and renovation on Grissom ARB (See attached Table 1). Based on the facts that the facilities identified in Table 1 are not eligible for the National Register of Historic Places and that all of the areas proposed for construction, demolition and renovation on Grissom ARB are heavily disturbed and in areas where the Integrated Cultural Resources Management Plan (ICRMP) indicates a lack of archaeological sites, Grissom ARB has determined that there are no historic properties affected within the APE.

Grissom ARB requests concurrence on both the APE for this project and this finding of no effect on historic properties.

In addition to the construction, demolition and renovation of facilities, aircraft operations would be conducted by the KC-46A aircraft. Aircraft activity near Grissom ARB would consist of aircraft operations similar to the existing KC-135 mission. The existing operations include take offs, landings, and flying patterns in the local airspace at Grissom ARB. Refueling operations would be conducted at altitudes above 14,000 feet above the ground surface. Preliminary analysis indicates that noise levels from these operations would be less than or similar to noise levels associated with the existing KC-135 mission at Grissom ARB.

In 2012 Grissom ARB submitted a determination package of its potentially historic and cultural resources to your office. Based on the information contained in the determination package, Grissom ARB determined and the Indiana SHPO confirmed that there were no sites listed in or eligible for inclusion in the National Register of Historic Places at Grissom ARB. The concurrence letter is included for reference. Based on the lack of historic and cultural resources, Grissom ARB has determined that this project has no potential to cause effects to cultural resources at Grissom ARB.

The following documentation, as detailed in Section 800.11(d), is included for your review:

- A description of the KC-46A project (see above)
- A summary of the efforts made to identify historic properties in the project's APE, including, as appropriate, efforts to seek information pursuant to Section 800.4(b), identification of historic properties (See Attached Table 1).
- 2012 Letter from the Indiana SHPO confirming that there are no sites listed in or eligible for inclusion in the National Register of Historic Places at Grissom ARB.

Please review the material enclosed and contact Mr. Jeff Woodring, Chief Environmental Engineer, at (765) 688-4541 if you have any questions. If we do not hear from you within 30 days after you receive this letter, we will assume that you concur with the finding of no historic properties affected determination. We then will proceed with the NEPA process, subject to the provisions of 36 CFR 800.13 for treating historic properties inadvertently discovered during an undertaking.

Sincerely

DAVID A. HUGHES, GS-13, P.E.
Base Civil Engineer

3 Attachments:
1. Table 1. Facilities and Infrastructure Development Table for Grissom ARB
2. Grissom ARB Project Map
3. 2012 Letter from the Indiana SHPO

A.5.1 Grissom ARB NHPA Section 106 SHPO Consultation Letter (Continued)

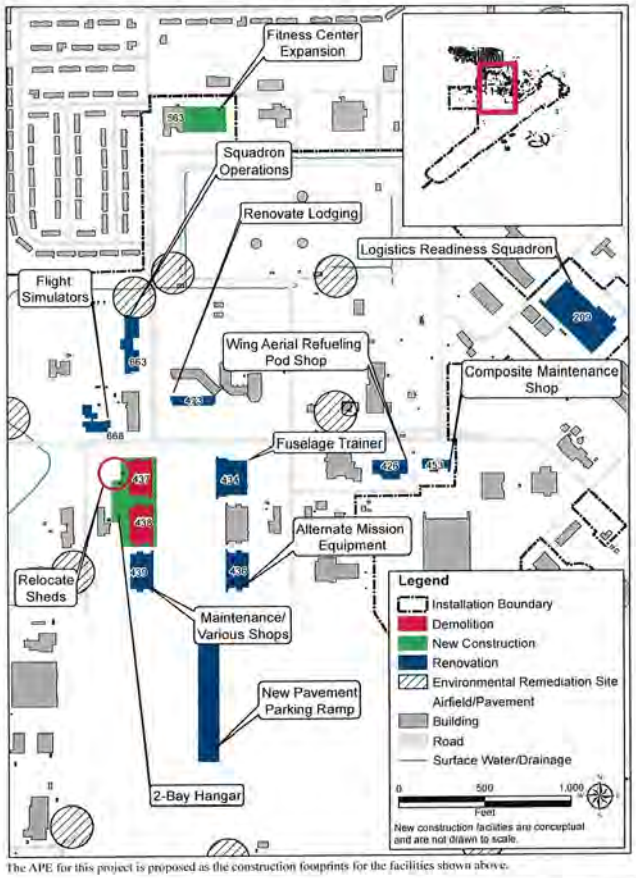
Table 1. Facilities and Infrastructure Projects for the KC-46A MOB 3 Beddown at Grissom ARB

Project	Status	Year Constructed
Demolition		
Building 437 (Hangar 5)	Not Eligible*	1959
Building 438 (Hangar 3)	Not Eligible*	1959
Renovation		
Building 209, Logistics Readiness Squadron (Internal fencing and vault)	Not Eligible*	1956
Building 426, Wing Air Refueling Pod (WARP) storage and maintenance	Not Eligible*	1960
Building 434, (Hangar 6) FuT	Not Eligible*	1959
Building 436, (Hangar 2) AME	Not Eligible*	2009
Building 439, (Hangar 1) Maintenance/Various Shops	Not Eligible*	1959
Building 453, Composite Maintenance Shop	Not Eligible*	1988
Building 473, Renovate Lodging (convert rooms into first-term Airmen/Single Airman Quarters)	Not Eligible*	2004
Building 663, Squadron Operations	Not Eligible*	1988
Building 668, Flight Simulators (WST/BOT)	Not Eligible*	1959
Relocation of two portable sheds (PB-56 and unnamed)	Not Eligible*	Unknown
New pavement parking ramp	Not Eligible*	Unknown
New Construction or Building Addition		
2-Bay Hangar	NA	NA
Building 563, Fitness Center	Not Eligible*	1977

Notes:
** Not Eligible based on addendum to the 2011 Determination of Eligibility*
*** Not Eligible based on the recent construction dates and the lack of significant related context*

ATCH 1

KC-46A Third Main Operating Base (MOB 3) Beddown EIS



The APE for this project is proposed as the construction footprints for the facilities shown above.

Facilities and Infrastructure Projects for the KC 46A MOB 3 at Grissom ARB *March 2016*

ATCH 2

A.5.1 Grissom ARB NHPA Section 106 SHPO Consultation Letter (Continued)

DNR Indiana Department of Natural Resources

Mitchell E. Daniels, Jr., Governor
Robert E. Carter, Jr., Director

Division of Historic Preservation & Archaeology • 402 W. Washington Street, W274 • Indianapolis, IN 46204-2739
Phone: 317-232-1646 • Fax: 317-232-0693 • dhpa@dnr.IN.gov

July 25, 2012

David A. Hughes, P.E.
Department of the Air Force
Air Force Reserve Command
434 MSG/CEV
7104 South Wanhug Street
Grissom ARB, IN 46971-1632

Federal Agency: Department of the Air Force

Re: Request for SHPO concurrence regarding Grissom historic and cultural resources inventory (DHPA #13604)

Dear Mr. Hughes:

Pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) and 36 C.F.R. Part 800, the staff of the Indiana State Historic Preservation Officer ("Indiana SHPO") has conducted an analysis of the materials dated June 20, 2012 and received on June 25, 2012 for the above indicated project in Grissom Air Reserve Base, Miami County, Indiana.

Thank you for your recent submission. Based on the results of the previously conducted cultural resource surveys and the current information provided to our office, we see no reason to disagree with the Department of the Air Force's assessment that there are no sites listed in or eligible for inclusion in the National Register of Historic Places within Grissom ARB.

If any archaeological artifacts or human remains are uncovered during construction, demolition, or earthmoving activities, state law (Indiana Code 14-21-1-27 and 29) requires that the discovery must be reported to the Department of Natural Resources within two (2) business days. In that event, please call (317) 232-1646. Be advised that adherence to Indiana Code 14-21-1-27 and 29 does not obviate the need to adhere to applicable federal statutes and regulations.

A copy of the revised 36 C.F.R. Part 800 that went into effect on August 5, 2004 may be found on the Internet at www.achp.gov for your reference. If you have questions about archaeological issues please contact Cathy Draeger-Williams at (317) 234-3701 or cdraeger-williams@dnr.IN.gov. If you have questions about buildings or structures please contact Chad Slider at (317) 234-5366 or cslider@dnr.IN.gov. Additionally, in all future correspondence regarding the above indicated project, please refer to DHPA #13604.

Very truly yours,

James A. Glass, Ph.D.
Deputy State Historic Preservation Officer

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ATCH 3

A.5.1.1 Grissom ARB NHPA Section 106 SHPO Consultation Response

DNR Indiana Department of Natural Resources

Michael R. Pence, Governor
Cameron F. Clark, Director

Division of Historic Preservation & Archaeology • 402 W. Washington Street, W274 • Indianapolis, IN 46204-2739
Phone 317-232-1646 • Fax 317-232-0693 • dhpa@dnr.IN.gov

April 18, 2016

David A. Hughes
Base Civil Engineer
7104 S. Warthog Street
Grissom ARB, IN 46971-1632

Federal Agency: U.S. Department of the Air Force

Re: Project information and the Department of the Air Force's finding of "no historic properties affected" regarding demolition, construction and renovation on Grissom Air Reserve Base for the proposed Air Force Beddown of the Third Main Operating Base of the KC-46A tanker aircraft (DHPA #18989)

Dear Mr. Hughes:

Pursuant to Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108) and 36 C.F.R. Part 800, the staff of the Indiana State Historic Preservation Officer ("Indiana SHPO") has conducted an analysis of the materials dated March 11, 2016 and received on March 17, 2016, for the above indicated project in Grissom Air Reserve Base, Miami County, Indiana.

We concur with the Department of the Air Force's March 11, 2016 finding that there are no historic buildings, structures, districts, objects, or archaeological resources within the area of potential effects that will be affected by the above indicated project.

If any prehistoric or historic archaeological artifacts or human remains are uncovered during construction, demolition, or earthmoving activities, state law (Indiana Code 14-21-1-27 and 29) requires that the discovery must be reported to the Department of Natural Resources within two (2) business days. In that event, please call (317) 232-1646. Be advised that adherence to Indiana Code 14-21-1-27 and 29 does not obviate the need to adhere to applicable federal statutes and regulations, including but not limited to 36 C.F.R. 800.

If you have questions about archaeological issues please contact Cathy Draeger-Williams at (317) 234-3791 or cdraeger-williams@dnr.IN.gov. If you have questions about buildings or structures please contact Ashley Thomas at (317) 234-7034 or asthomas@dnr.IN.gov.

Very truly yours,

Mitchell K. Zoll
Deputy State Historic Preservation Officer

MKZ:AH:CDW:cdw

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A.5.2 Seymour Johnson AFB NHPA Section 106 SHPO Consultation Letter

Subject: RE: SHPO emailFW: Determination of Eligibility for Listing Seven Bldgs at SJAFB

----Original Message-----
From: CHASTAIN, WILLIAM D GS-12 USAF ACC 4 CES/CEIE
Sent: Wednesday, March 09, 2016 2:04 PM
To: 'renee.gledhill-earley@ncdenr.gov'; 'renee.shearin@ncdcr.gov'
Cc: 'wchastain@nc.rr.com'
Subject: Determination of Eligibility for Listing Seven Bldgs at SJAFB

Dear Ms. Gledhill-Earley and Ms. Shearin,

We request your assistance regarding the determination of eligibility for

listing in the National Register of Historic Places (NRHP) for seven buildings at Seymour

Johnson Air Force Base (SJAFB). The eligibility determination is necessary because of a

proposed new mission at SJAFB that would impact the seven buildings and the required

completion of an Environmental Impact Statement (EIS) prior to that mission.

Attachment 1 of this email is our evaluation of the buildings based on guidance provided

in The National Register Bulletin - How to Apply the National Register Criteria for Evaluation.

Other attachments (18 total) are referred to within Attachment 1.

If you have any questions, or require any further information please let me know.

Respectfully,

W. Dean Chastain, P.E.

Environmental Element Chief

4 CES/CEIE

1095 Peterson Ave

SJAFB, NC 27531

DSN 722-5168, Comm (919) 722-5168

1

2

A.5.2.1 Seymour Johnson AFB NHPA Section 106 SHPO Consultation Response

North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

March 24, 2016

W. Dean Chastain
4 CES/CEIE
1095 Peterson Avenue
SJAFB, NC 27531

william.chastain@us.af.mil

Re: Determination of Eligibility for 7 Buildings, Seymour Johnson Air Force Base, Wayne County, ER 16-0461

Dear Mr. Chastain:

Thank you for your email of March 9, 2016, concerning the above-referenced undertaking. We have reviewed the materials submitted and offer the following comments.

The *NRHP Evaluation of Seven Buildings at Seymour Johnson AFB (SJAFB) Using the National Register Bulletin: "How to apply the National Register Criteria for Evaluation"* seemed to rely heavily upon the NRHP evaluation of Buildings 5015, 2130 and 4828 report our office reviewed in July 2015. While the 2015 report offered thorough documentation, including historic and current photographs of the properties in question, the 2016 report does not include photographs of the properties under evaluation. Without photographs demonstrating the current condition of the properties, it is difficult to properly evaluate their integrity.

It appears the properties were evaluated based on their associations with Cold War missions and activities, which are classified as "temporal." Does this mean the properties lack a direct relationship to significant Cold War events? Prior to offering further comments, we request the following information:

- Photographs demonstrating the current condition of the properties being evaluated for listing in the NRHP
- A clearer explanation of why the properties are considered "not eligible" for listing in the NRHP. What is meant by "temporal" and are the buildings only being evaluated for their association with the Cold War?

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address:** 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax:** (919) 807-6570/807-6599

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

A.5.2.1 Seymour Johnson AFB NHPA Section 106 SHPO Consultation Response (Continued)

DEPARTMENT OF THE AIR FORCE
4TH FIGHTER WING (ACC)
SEYMOUR JOHNSON AIR FORCE BASE NC

12 May 2016

Dennis G. Goodson, P.E.
Deputy Base Civil Engineer
1095 Peterson Ave
Seymour Johnson AFB NC 27531

Renee Gledhill-Earley
Environmental Review Coordinator
NC State Historic Preservation Office
4617 Mail Service Center
Raleigh NC 27699-4617

Dear Ms. Gledhill-Earley

Please find attached the information requested in your letter dated 24 March 2016 concerning Tracking Number **ER-16-0461**, Determination of Eligibility for 7 Buildings, Seymour Johnson Air Force Base, Wayne County.

Per your request, photographs of the buildings have been included. Also, the eligibility statements have been revised; the reference to "temporal" has been removed and replaced by more specific language.

To summarize, Seymour Johnson AFB has evaluated these 7 buildings and determined that none of these buildings are eligible for listing on the National Register of Historic Places. We request your concurrence on this determination.

Thank you very much for your time. If you have any questions or need additional information, please contact Mr. Dean Chastain at 722-5168 or william.chastain@us.af.mil.

Sincerely

DENNIS G. GOODSON, P.E.

Attachment:
Supplemental Information Package for NC SHPO Tracking Number ER 16-0461

cc: Hamid Kamalpour, AFCEC/CZN

North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

June 14, 2016

Dennis G. Goodson
Department of the Air Force
4th Fighter Wing (ACC)
Seymour Johnson Air Force Base NC

dennis.goodson@us.af.mil

Re: Determination of Eligibility for 7 Buildings, Seymour Johnson Air Force Base, Wayne County, ER 16-0461

Dear Mr. Goodson:

Thank you for your letter of May 12, 2016, regarding the above-referenced undertaking. We have reviewed the materials submitted and offer the following comments.

The *Supplemental Information Package for NC SHPO Tracking Number: ER 16-0461 Determination of Eligibility for 7 Buildings, Seymour Johnson Air Force Base, Wayne County* appears to be complete and we concur with the determination that none of the seven properties in question are eligible for listing in the National Register of Historic Places.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

cc: Dean Chastain, william.chastain@us.af.mil
Cathryn Penseti, cathryn.pesenti@us.af.mil

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address:** 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax:** (919) 807-6570/807-6599

A.5.3 Tinker AFB NHPA Section 106 SHPO Consultation Letter

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 72D AIR BASE WING (AFMC)
TINKER AIR FORCE BASE OKLAHOMA

Colonel Stephanie P. Wilson
Commander
7460 Arnold Street
Tinker AFB, OK 73145

17 March 2016

Melvena Heisch, Deputy State Historic Preservation Officer
Oklahoma State Historic Preservation Office
800 Nazih Zuhdi Drive
Oklahoma City, OK 73105-7917

Dear Ms. Heisch,

Attached for your review and comment is the Draft Description of Proposed Action and Alternatives (DOPAA) for the KC-46A Third Main Operating Base (MOB 3) Beddown Environmental Impact Statement (EIS), attachment 1, and the Draft Notice of Intent (NOI), attachment 2. The overall purpose of the project is to establish a KC-46A Third Main Operating Base (MOB 3). The MOB 3 mission includes the basing of 12 KC-46A aircraft, facilities and infrastructure, and manpower at a USAF installation within the continental United States (CONUS) where the Air Force Reserve Command (AFRC) leads a Mobility Air Force mission. The purpose of the MOB 3 mission is to provide a fully capable, combat operational KC-46A 14 aerial refueling squadron to accomplish aerial refueling and related missions.

The EIS is considering four alternatives; the Strategic Basing Process resulted in the identification of Seymour Johnson AFB in North Carolina as the preferred alternative and Grissom Air Reserve Base (ARB) in Indiana, Tinker AFB in Oklahoma, and Westover ARB in Massachusetts as reasonable alternatives for the MOB 3 mission.

In April 2006, the USAF completed an Analysis of Alternatives to determine the most appropriate strategy to recapitalize the existing KC-135 aircraft fleet. Based on this analysis, the USAF concluded that a commercial derivative replacement tanker would result in the best value.

At Tinker Air Force Base the beddown would occur at the 507th Air Refueling Wing Complex, attachment 4. Currently there have been no eligible historic buildings identified in this area. The closest eligible historic building is approximately a mile from the complex, Building 230. There are no eligible archeological sites in the area. The nearest eligible archeological site is approximately 1.3 miles away. Also a regional location map is attached, attachment 3.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation in the process, and solicit any comments or concerns you may have on the Draft DOPAA. Comments may be submitted no later than 30 days from receipt of this letter and should be provided to Mr. Tim Taylor, 72 ABW/CEIEC, by telephone at (405) 734-4579, or by email to timothy.taylor.5@us.af.mil

Sincerely

STEPHANIE P. WILSON, Colonel, USAF

Attachment:
1. Draft DOPAA
2. NOI
3. Regional Location Map
4. Area of Potential Effect

A.5.3.1 Tinker AFB NHPA Section 106 SHPO Consultation Response

Oklahoma Historical Society *Founded May 27, 1893*
State Historic Preservation Office
Oklahoma History Center • 800 Nazih Zuhdi Drive • Oklahoma City, OK 73105-7917
(405) 521-6249 • Fax (405) 522-0816 • www.okhistory.org/shpo/shpom.htm

April 6, 2016

Mr. Tim Taylor
72 ABW/CEIEC
7535 5th Street
Tinker AFB, OK 73145

RE: File #1167-16: Tinker AFB KC-46A Third Main Operating Base Beddown Project

Dear Mr. Taylor:

We have received and reviewed the documentation submitted on the referenced project in Oklahoma 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 known historic properties affected within the referenced project's area of potential effect.

In addition to our review, you must contact the Oklahoma Archeological Survey (OAS), 111 E. Chesapeake, #102, Norman OK 73019-5111 (#405/325-7211, FAX #405/325-7604), to obtain a determination about the presence of prehistoric resources that may be eligible for the National Register of Historic Places. Should the OAS conclude that there are no prehistoric archaeological sites or other types of "historic properties," as defined in 36 CFR Part 800.16(l), which are eligible for inclusion in the National Register of Historic Places within the project area and that such sites are unlikely to occur, we concur with that opinion.

The OAS may conclude that an on-site investigation of all or part of the project impact area is necessary to determine the presence of archaeological resources. In the event that such an investigation reveals the presence of prehistoric archaeological sites, we will defer to the judgment of the OAS concerning whether or not any of the resources should be considered "historic properties" under the Section 106 review process. If sites dating from the historic period are identified during the survey or are encountered during implementation of the project, additional assessments by the State Historic Preservation Office will be necessary.

Should further correspondence pertaining to this project be necessary, please reference the above underlined file number. If you have any questions, please contact Catharine M. Wood, Historical Archaeologist, at 405/521-6381. Thank you.

Sincerely,

Melvena Heisch
Deputy State Historic
Preservation Officer

MH:pm

Oklahoma Archeological Survey
THE UNIVERSITY OF OKLAHOMA

May 19, 2016

Trudi Logan
Department of the Air Force
Environmental Section
72 Air Base Wing
7535 5th Street
Tinker Air Force Base, Oklahoma 73145-9100

RE: Proposed ramp expansion of the 507th ARW as part of the KC 46A MOB 3 Project. Legal Description: NE ¼ SW ¼ NW ¼ SE ¼ Section 22 T11N R2W, Oklahoma County, Oklahoma.

Dear Ms. Logan:

The Community Assistance Program staff of the Oklahoma Archeological Survey has reviewed the above referenced project in order to identify areas that may potentially contain prehistoric or historic archeological materials (historic properties). The location of your project has been crosschecked with the state site files containing approximately 23,000 archaeological sites, which are currently recorded for the state of Oklahoma. **No sites are listed in your project area, but based on the topographic and hydrologic setting of your project, archeological materials are likely to be encountered. An archaeological field inspection is considered necessary prior to project construction in order to identify significant archaeological resources that may exist in the project area.** Please contact this office at (405) 325-7211 if you require additional information on this project.

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, and you must also have a letter from that office to document your consultation pursuant to Section 106 of the National Historic Preservation Act. 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 for your cooperation.

Sincerely,

J. Matthew Oliver
Staff Archaeologist

Kary Stackelbeck
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

A.5.4 Westover ARB NHPA Section 106 SHPO Consultation Letter

DEPARTMENT OF THE AIR FORCE
439TH MISSION SUPPORT GROUP (AFRC)

29 March 2016

Mr. Wayne M. Williams, CFM
Base Civil Egineer
250 Patriot Avenue
Westover ARB, MA 01022

Mr. Ryan T. Maciej
Preservation Planner
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

Dear Mr. Maciej,

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. Westover Air Reserve Base (ARB) is proposed as a reasonable alternative for the MOB 3 mission, along with Grissom ARB, IN; and Tinker Air Force Base (AFB), OK. Seymour Johnson AFB, NC has been identified as the Preferred Alternative for this mission.

The proposed MOB 3 project would base 12 KC-46A aircraft at one of the four installations. Basing the aircraft at Westover ARB would require the construction and renovation of facilities to accommodate the new personnel and aircraft associated with the mission. The attached table and project map identifies specific facilities that are included as part of this project.

In compliance with the National Historic Preservation Act (NHPA) and 36 CFR 800, Westover ARB, hereby enters into Section 106 consultation regarding the proposed undertaking. Westover ARB also requests concurrence with the Area of Potential Effect (APE) as defined below and in Attachment 1 and with a finding of no historic properties affected.

The APE for this effort includes the footprint of potential construction activities (see attached maps) and a five mile radius surrounding the installation. Aircraft activity in the five mile radius surrounding Westover ARB would consist of aircraft operations similar to the existing C-5 mission. The existing operations include takeoffs, landings, and flying patterns in the local airspace at Westover ARB. Refueling operations would be conducted at altitudes above 14,000 feet above the ground surface. Preliminary analysis indicates that noise levels from these operations would be less than or similar to noise levels associated with the existing C-5 mission at Westover ARB. Therefore the APE for potential historical building evaluations does not consider airspace outside of the five mile radius or the environment outside of the construction related footprints described above.

Westover ARB recently submitted a determination package of its potentially historic properties. Based on the information contained in the determination package, it is the finding of Westover ARB that no historic properties are present within the APE and therefore there are no potential effects to historic properties as part of the undertaking. The following documentation, as detailed in Section 800.11(d), is included for your review:

- A description of the KC-46A project (see above)
- A delineation of the APE (see attached map)
- A summary of the efforts made to identify historic properties in the project's APE, including, as appropriate, efforts to seek information pursuant to Section 800.4(b), identification of historic properties (See attached facilities list).
- The basis for determining that no historic properties are present or affected (attachment). The addendum to the June 2011 Determination of Eligibility transmitted on 11 February 2016 to your office was also used as a basis for determining that no historic properties are present or affected.

Please review the material enclosed and contact Mr. John B. Moriarty, Chief Environmental Engineer, at (413) 557-2434 if you have any questions. If we do not hear from you within 30 days after you receive this letter, we will assume that you do not object to our proposed determination of no historic properties affected. We then will proceed with the NEPA process, subject to the provisions of 36 CFR 800.13 for treating historic properties discovered during an undertaking.

Sincerely,

WAYNE M. WILLIAMS, CFM, GS-13, DAF
Base Civil Engineer

2 Attachments:
1. Table: Facilities and Infrastructure Development for Westover ARB
2. Westover ARB Project Map

A.5.4.1 Westover ARB NHPA Section 106 SHPO Consultation Response

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

April 28, 2016

Hamid Kamalpour
United States Air Force
AFCEC/CZN
2261 Hughes Ave, Ste. 155
Lackland AFB, TX 78236-9853

RE: KC-46A Third Main Operating Base (MOB 3) Beddown, Westover Air Reserve Base – One of Four Possible Locations Nationwide, Chicopee, MA; MHC# RC.60033

Dear Mr. Kamalpour:

The Massachusetts Historical Commission (MHC) has reviewed the information submitted, received March 29, 2016, concerning the proposed project referenced above. The Westover Air Reserve Base area (MHC# CHI.AA) is included in MHC's Inventory of Historic and Archaeological Assets of the Commonwealth. After a review of the information submitted, MHC staff have the following comments.

The MHC understands from the information you submitted, received March 29, 2016, that the Westover Air Reserve Base is being considered as one of three reasonable alternatives to the Seymour Johnson Air Force Base in North Carolina, which is the preferred alternative of the proposed beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. All four bases and the No Action Alternative will be evaluated as alternatives in the Environmental Impact Statement (EIS) that the United States Air Force is preparing.

The MHC looks forward to receiving and reviewing the EIS when it becomes available.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). Please do not hesitate to contact Ryan Maciej of my staff if you have any questions.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: Drew Milroy and John Moriarty, Westover ARB
Chicopee Historical Commission

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

06/17/2016 16:09 FAX 617 727 5128 MASS HIST COMM 001/003

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

Fax Transmittal Memorandum

To: John Moriarty / Westover Air Reserve Base — Fax #: (413) 557-2419
From: Ryan Maciej / TSD — Date: June 17, 2016
Re: CHI, Eligibility Opinion, Westover Air Reserve Base Management Plan, MHC# RC.12313 — Pages, including cover sheet: Three (3)
Comments:

If this communication has been received in error, please notify us immediately.

220 Morrissey Boulevard, Boston, Massachusetts 02125
Tel: (617) 727-8470 · Fax: (617) 727-5128 · Website: www.state.ma.us/sec/mhc

A.5.4.1 Westover ARB NHPA Section 106 SHPO Consultation Response (Continued)

06/17/2016 16:09 FAX 617 727 5128 MASS HIST COMM 002/003

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

June 17, 2016

Wayne M. Williams, CFM
Base Civil Engineer
Department of the Air Force
250 Patriot Avenue
Westover ARB, MA 01022

RE: Eligibility Opinion, Westover Air Reserve Base Management Plan, Westover Air Reserve Base, Chicopee, MA; MHC# RC.12313

Dear Mr. Williams:

The Massachusetts Historical Commission (MHC), office of the Massachusetts State Historic Preservation Officer (MA SHPO), has reviewed the additional information you submitted, received February 16, 2016, concerning the plan referenced above. The MHC appreciates receiving and reviewing the information that was submitted in response to an MHC letter dated July 15, 2011 requesting additional data in order for the MHC to concur with the Westover Air Reserve Base (WARB) National Register eligibility opinion of 2011. After a review of the information submitted, MHC staff have the following comments:

The Westover Air Reserve Base (WARB) had conducted a study in 2011 and made a new Determination of Eligibility (DOE) of facilities at WARB. The WARB 1995 evaluation indicated that a historic district consisting of thirty-nine contributing buildings and seven individually eligible buildings met the criteria of eligibility for listing in the National Register of Historic Places (NRHP) (36 CFR 60). On November 1, 1995, the MHC concurred with that 1995 DOE.

Information within the 2011 study indicated that it is WARB's opinion that the 1995 report incorrectly applied National Register Criteria for Evaluation because it based its eligibility determinations primarily on historic significance and downplayed the base's already substantially-diminished historic integrity. As of 2011, WARB had also demolished twenty of the buildings that were contributing resources identified in the 1995 report. The MHC understands that it is the opinion of the WARB that the WARB has undergone considerable alterations since the period of significance of 1973, which the WARB believes has resulted in a substantial loss of integrity. The 2011 WARB DOE indicated the following:

> WARB, while historically significant, does not contain an eligible National Register district due to its substantial loss of historic integrity needed to represent its Period of Significance. However, two of Westover's WWII-era buildings (Buildings 1502 and 1520) retain enough individual significance and integrity to be considered individually eligible for the NRHP.

In a letter dated July 15, 2011, the MHC noted that it was not able to concur with the 2011 WARB DOE and required that all of the buildings, structures, and other facilities including, but not limited to, fields, grounds, and tennis courts be included in the evaluation information. This should include both resources that are both currently and that have previously been functionally related to WARB. The MHC also requested additional information about Building 1800, Building 1850, and Buildings 5100-5105.

The MHC very much appreciates that information was submitted to assist in providing an eligibility concurrence from the MHC. WARB indicates in their submitted informational packet and the revised eligibility opinion that the current base and the former boundaries of the Westover base do not, in their entirety, meet the criteria of eligibility for listing in the National Register of Historic Places as a potential District. The MHC understands that since 2011, WARB has subsequently demolished other buildings that were contributing resources.

At this time, the MHC is not able to concur with WARB without additional information. The MHC notes that in portions of WARB's eligibility opinion, the fifty-year period is used as the cut-off point for eligibility and that in other portions of the submission, 1973 is utilized instead since that is the period, during the Cold War, when Westover started to sell off pieces of their property as part of their transitioning to a new role in the Armed Forces. It is the opinion of MHC that 1973 would be a good ending date for the period of

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significance since it denotes a major demarcation in the use of Westover and the commencement of selling off portions of its land in response to Westover's changing mission. The MHC requests that a line map diagram similar to the one that WARB provided of the current WARB boundaries proper be provided that illustrates what was once Westover's boundaries in 1973. Although some of this land has been sold, subdivided, and developed under various owners since it was once part of Westover, its 1973 boundaries are historically noteworthy. Color coding the outlines of the buildings based upon the line map diagram of the current WARB boundaries proper, the MHC and other viewers will be able to more readily identify what integrity remains and in what areas, much like the current WARB diagram of the current base. An 11" x 17" diagram may be a useful size to conveniently map the many dozens of resources and aerial view images that the contracted cultural resource team started to digitize.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), and M.G.L. Chapter 9, Section 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00). Please do not hesitate to contact me at this office if you have any questions.

Sincerely,

Ryan T. Maciej
Preservation Planner
Massachusetts Historical Commission

cc: Chicopee Historical Commission
John Moriarty and Andrew Milroy, Westover Air Reserve Base

A.5.4.1 Westover ARB NHPA Section 106 SHPO Consultation Response (Continued)

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESERVE COMMAND

Colonel Karen L. Magnus
439 MSG/CC
250 Patriot Avenue, Box 35
Westover ARB, MA 01022-1670

3 August 2016

Mr. Ryan T. Maciej
Preservation Planner
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

RE: Section 106 Consultation on Proposed Air Force Beddown of the Third Main Operating Base of the KC-46A Tanker aircraft at Westover Air Reserve Base; MHC# RC.60033

Dear Mr. Maciej,

We have reviewed the Massachusetts Historical Commission (MHC) letter dated 28 April 2016, in response to our letter dated 29 March 2016 for the proposed undertaking of the beddown of the Third Main Operating Base (MOB 3) of the KC-46A Tanker aircraft and in support of the KC-46A MOB 3 Environmental Impact Statement (EIS), in which Westover Air Reserve Base (ARB) is identified as one of the reasonable alternatives. In response to your letter, the United States Air Force (USAF) has identified historic properties within the area of potential effect (APE) for the undertaking, including the Westover ARB Historic District (MHC# CHI.AA), determined eligible for listing in the National Register of Historic Places (NRHP) in 1995 (MHC Opinion, 1 November 1995). The USAF has also determined that the proposed undertaking, which includes demolition of Hangar 7071 and Building 2426, contributing resources within the Westover ARB Historic District, will have an adverse effect on the historic property. Pursuant to 36 CFR 800.6, the USAF seeks consultation with the MHC in order to find ways to avoid, minimize or mitigate the potential adverse effects of the undertaking.

The USAF defines the Area of Potential Effect (APE) as the boundaries of the Westover ARB Historic District, including its viewshed, and areas of ground disturbance associated with construction, demolition, and renovation (see Attachment 1). The proposed beddown operation would demolish four buildings (Buildings 2426, 7071, 7045 and 7046), renovate five buildings (Buildings 7072, 7073, 5103, 5375 and 5377) and one parking ramp, relocate one gas station, and construct a new two-bay Hangar/Flight Simulator/Fuselage Trainer/Civil Engineering Grounds Facility, and expand the Building 1700 Fitness Center (see Attachment 2).

Although the proposed demolition, renovation and new construction for the beddown would occur in a limited area of the current Westover ARB boundaries, the undertaking has the potential to directly and indirectly affect the NRHP eligible Westover ARB Historic District, including portions of the district that may lie beyond the current installation boundary. The Westover ARB Historic District was determined eligible for listing in the NRHP under criteria A and C for its associations with military operations during World War II and the Cold War era and for the survival of historic building and structure types representative of air base design from those historic periods (MHC Inventory Form CHI.AA/LUD.G).

The period of significance for the Westover ARB Historic District was defined as 1939-1974, after which the boundaries of the air base started to diminish as land was sold back to the local community. Although the boundaries of the district were not specifically drawn at that time, the MHC recommended that they include the 1974 installation boundary. Although only contributing buildings greater than 50 years old were specifically mentioned in the MHC inventory forms, for the purposes of this undertaking, all buildings and infrastructure dating to the period of significance within the former 1974 Westover ARB boundaries are considered to be potentially contributing to the historic district unless evaluated otherwise. Individual contributing elements that may be affected by the proposed undertaking include Hangars 7071, 7072 and 7073, Buildings 2426, 5103, 5375 and 1700. The remaining buildings, including 7045, 7046, 5377 and the parking ramp were constructed after the period of significance and are not considered to be historic properties.

Although archaeological remains, including prehistoric lithics and ceramics, as well scattered historic artifacts have been recovered from within the boundaries of the Westover ARB, no archaeological sites were identified during installation surveys. The landscape within Westover ARB was significantly modified during the construction of the airfield; and although there may have been prehistoric and historic occupation of the installation at one time, there is a low potential for intact archaeological resources to occur within the APE.

The USAF determines that the proposed undertaking will have an adverse effect on historic properties, in particular Hangar 7071 (built in 1941) and Building 2426 (an avionics shop built in 1960), both determined eligible for the NRHP as contributing elements to the Westover ARB Historic District. A site survey report for the beddown of the KC-46A aircraft at Westover ARB (see Attachment 3) identified that the only three-bay hangars that could house the KC-46A are currently devoted to C-5 flying and Regional Isochronal (RISO) operations that will continue. The remaining five hangars located at Westover were considered not adequately sized and due to deteriorating conditions could not be renovated to house the KC-46A aircraft. Therefore, the beddown would require construction of a new two-bay hangar in place of Hangar 7071 and Building 2426.

Hangar 7071 is one of four similar Hangars (7072, 7073, 7075) constructed in 1941 in the Art Moderne style. As part of the proposed undertaking, Hangars 7072 and 7073 as well as Building 5103 (a dormitory built in 1957) and Building 5375 (a base supply and equipment warehouse built in 1956) would be renovated in order to accommodate the beddown of the KC-46A aircraft operations. The four buildings (Hangar 7072, Hangar 7073, Building 5103 and Building 5375) are considered to be contributing resources to the Westover ARB Historic District. A revised eligibility assessment for the Westover ARB Historic District, currently under review by the MHC, considered the four buildings to have been substantially altered from their original design through a series of renovations that included replacement of doors, windows and siding that considerably diminished their ability to convey their historic character (see Ferguson 2011). The USAF has agreed for the proposed undertaking to renovate the buildings in keeping with the *Secretary of Interior's Standards for the Treatment of Historic Properties* (36 CFR 68), thereby avoiding further adverse effects to these resources.

A.5.4.1 Westover ARB NHPA Section 106 SHPO Consultation Response (Continued)

In addition to the construction of a new two-bay hangar, the proposed undertaking also entails new construction (as shown in attachment 2) and expansion of Building 1700 (a gymnasium built in 1949). In the 2011 revised eligibility assessment, Building 1700 was shown to have been substantially expanded since its original construction (Ferguson 2011: 56). The proposed undertaking will allow Building 1700 to continue to be used as a fitness center, and all building additions will be designed so as not to diminish the historic character of the building or the Westover ARB Historic District. As the proposed new facilities further the key Air Force mission at Westover ARB, and the Air Force proposes to design the facilities in keeping with 36 CFR 68, the new construction will have no adverse effect on historic properties.

The USAF respectfully requests concurrence from the MHC on the identification of historic properties within in the APE for the proposed undertaking and on the assessment of effects on those properties. In addition, in order to mitigate adverse effects of demolition of Hangar 7071 and Building 2426, the USAF is proposing HABS/HAER recordation of buildings proposed for demolition, mapping of the current and former boundaries of Westover ARB that identifies which of the original buildings and infrastructure existed and remains, and a reevaluation of the eligibility of the remaining portions of the district. The USAF at Westover ARB also invites the MHC to participate in the design review for new construction.

Please review the material enclosed and provide comment within 30 days. If you have any questions, the Westover ARB point of contact is Mr. John B. Moriarty, Chief Environmental Engineer, at (413) 557-2434.

Sincerely,

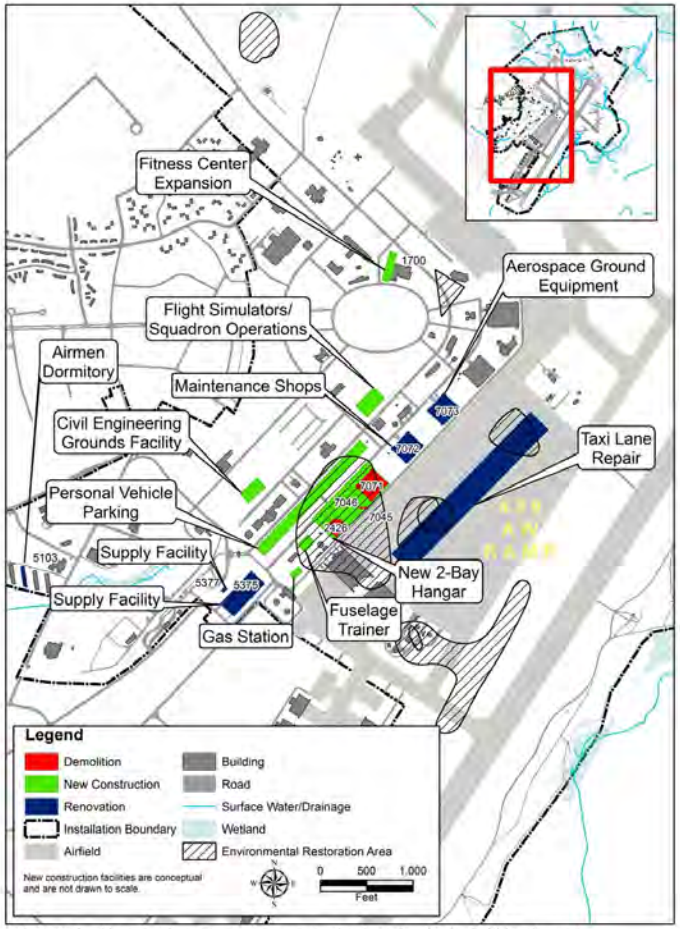
KAREN L. MAGNUS, Colonel, USAF
Commander

Attachment 1 – Map of APE for undertaking (former boundaries of Westover ARB)
Attachment 2 – Attachments for Westover ARB SHPO Letter for KC-46A MOB 3_EIS
Attachment 3 – KC-46A Site Survey Report

Ariel view of the Westover Air Reserve Base showing current (red line) and former (blue line) boundaries (taken from Ferguson 2015: 76).

A.5.4.1 Westover ARB NHPA Section 106 SHPO Consultation Response (Continued)

KC-46A Third Main Operating Base (MOB 3) Beddown EIS



The APE for this project is proposed as the construction footprints for the facilities shown above

Facilities and Infrastructure Projects for the KC-46A MOB 3 at Westover ARB

Table 1. Facilities and Infrastructure Projects for the KC-46A MOB 3 Beddown at Westover ARB

Project	Status	Year Constructed
Demolition		
Building 2426*	Contributing Element	1960
Building 7071*	Contributing Element	1941
Building 7045, Gas station relocation	Not Eligible**	1996
Building 7046, Gas station relocation	Not Eligible**	1996
Renovation		
Parking Ramp Taxi Lane Repair	Not Eligible**	1989
Building 7072, Maintenance Shops	Contributing Element	1941
Building 7073 (Hangar 5), AGE	Contributing Element	1941
Building 5103, Airmen Dormitory	Contributing Element	1957
Building 5375, Supply Facilities	Contributing Element	1956
Building 5377, Supply Facilities	Not Eligible**	2011
New Construction or Building Addition		
2-Bay Hanger (Fuel Cell, Corrosion Control, Wash-Rack, AMU, Back-Shops, and Personal Vehicle Parking)	NA	NA
Flight Simulators/Squadron Operations	NA	NA
Fuselage Trainer	NA	NA
Civil Engineering Grounds Facility	NA	NA
Gas Station (Relocate)	NA	NA
Building 1700 Fitness Center Expansion	Contributing Element	1949

Notes:

* *Potential relocation of underground cables, manholes, and duct work would be assessed with these projects.*

** *Not Eligible based on the recent construction dates and the lack of significant cultural context.*

A.5.4.1 Westover ARB NHPA Section 106 SHPO Consultation Response (Continued)

For Official Use Only

MAIN OPERATING BASE #3 KC-46A BEDDOWN
WESTOVER ARB, MA
1 – 5 JUNE 2015

HEADQUARTERS
AIR MOBILITY COMMAND
SCOTT AFB IL

CARLTON D. EVERHART, II
General, USAF
Commander

HEADQUARTERS
AIR FORCE RESERVE COMMAND
ROBINS AFB GA

JAMES F. JACKSON
Lt General, USAFR
Commander

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DEPARTMENT OF THE AIR FORCE
AIR FORCE RESERVE COMMAND

Colonel Karen L. Magnus
439 MSG/CC
250 Patriot Avenue, Box 35
Westover ARB, MA 01022-1670

3 August 2016

RECEIVED
AUG 04 2016
MASS. HIST. COMM

Mr. Ryan T. Maciej
Preservation Planner
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

RE: Section 106 Consultation on Proposed Air Force Beddown of the Third Main Operating Base of the KC-46A Tanker aircraft at Westover Air Reserve Base; MHC# RC.60033

Dear Mr. Maciej,

We have reviewed the Massachusetts Historical Commission (MHC) letter dated 28 April 2016, in response to our letter dated 29 March 2016 for the proposed undertaking of the beddown of the Third Main Operating Base (MOB 3) of the KC-46A Tanker aircraft and in support of the KC-46A MOB 3 Environmental Impact Statement (EIS), in which Westover Air Reserve Base (ARB) is identified as one of the reasonable alternatives. In response to your letter, the United States Air Force (USAF) has identified historic properties within the area of potential effect (APE) for the undertaking, including the Westover ARB Historic District (MHC# CHLAA), determined eligible for listing in the National Register of Historic Places (NRHP) in 1995 (MHC Opinion, 1 November 1995). The USAF has also determined that the proposed undertaking, which includes demolition of Hangar 7071 and Building 2426, contributing resources within the Westover ARB Historic District, will have an adverse effect on the historic property. Pursuant to 36 CFR 800.6, the USAF seeks consultation with the MHC in order to find ways to avoid, minimize or mitigate the potential adverse effects of the undertaking.

The USAF defines the Area of Potential Effect (APE) as the boundaries of the Westover ARB Historic District, including its viewshed, and areas of ground disturbance associated with construction, demolition, and renovation (see Attachment 1). The proposed beddown operation would demolish four buildings (Buildings 2426, 7071, 7045 and 7046), renovate five buildings (Buildings 7072, 7073, 5103, 5375 and 5377) and one parking ramp, relocate one gas station, and construct a new two-bay Hangar/Flight Simulator/Fuselage Trainer/Civil Engineering Grounds Facility, and expand the Building 1700 Fitness Center (see Attachment 2).

Although the proposed demolition, renovation and new construction for the beddown would occur in a limited area of the current Westover ARB boundaries, the undertaking has the potential to directly and indirectly affect the NRHP eligible Westover ARB Historic District, including portions of the district that may lie beyond the current installation boundary. The Westover ARB Historic District was determined eligible for listing in the NRHP under criteria A and C for its associations with military operations during World War II and the Cold War era and

A.5.4.1 Westover ARB NHPA Section 106 SHPO Consultation Response (Continued)

for the survival of historic building and structure types representative of air base design from those historic periods (MHC Inventory Form CHI.AA/LUD.G).

The period of significance for the Westover ARB Historic District was defined as 1939-1974, after which the boundaries of the air base started to diminish as land was sold back to the local community. Although the boundaries of the district were not specifically drawn at that time, the MHC recommended that they include the 1974 installation boundary. Although only contributing buildings greater than 50 years old were specifically mentioned in the MHC inventory forms, for the purposes of this undertaking, all buildings and infrastructure dating to the period of significance within the former 1974 Westover ARB boundaries are considered to be potentially contributing to the historic district unless evaluated otherwise. Individual contributing elements that may be affected by the proposed undertaking include Hangars 7071, 7072 and 7073, Buildings 2426, 5103, 5375 and 1700. The remaining buildings, including 7045, 7046, 5377 and the parking ramp were constructed after the period of significance and are not considered to be historic properties.

Although archaeological remains, including prehistoric lithics and ceramics, as well scattered historic artifacts have been recovered from within the boundaries of the Westover ARB, no archaeological sites were identified during installation surveys. The landscape within Westover ARB was significantly modified during the construction of the airfield; and although there may have been prehistoric and historic occupation of the installation at one time, there is a low potential for intact archaeological resources to occur within the APE.

The USAF determines that the proposed undertaking will have an adverse effect on historic properties, in particular Hangar 7071 (built in 1941) and Building 2426 (an avionics shop built in 1960), both determined eligible for the NRHP as contributing elements to the Westover ARB Historic District. A site survey report for the beddown of the KC-46A aircraft at Westover ARB (see Attachment 3) identified that the only three-bay hangars that could house the KC-46A are currently devoted to C-5 flying and Regional Isochronal (RISO) operations that will continue. The remaining five hangars located at Westover were considered not adequately sized and due to deteriorating conditions could not be renovated to house the KC-46A aircraft. Therefore, the beddown would require construction of a new two-bay hangar in place of Hangar 7071 and Building 2426.

Hangar 7071 is one of four similar Hangars (7072, 7073, 7075) constructed in 1941 in the Art Moderne style. As part of the proposed undertaking, Hangars 7072 and 7073 as well as Building 5103 (a dormitory built in 1957) and Building 5375 (a base supply and equipment warehouse built in 1956) would be renovated in order to accommodate the beddown of the KC-46A aircraft operations. The four buildings (Hangar 7072, Hangar 7073, Building 5103 and Building 5375) are considered to be contributing resources to the Westover ARB Historic District. A revised eligibility assessment for the Westover ARB Historic District, currently under review by the MHC, considered the four buildings to have been substantially altered from their original design through a series of renovations that included replacement of doors, windows and siding that considerably diminished their ability to convey their historic character (see Ferguson 2011). The USAF has agreed for the proposed undertaking to renovate the buildings in keeping with the *Secretary of Interior's Standards for the Treatment of Historic Properties* (36 CFR 68), thereby avoiding further adverse effects to these resources.

In addition to the construction of a new two-bay hangar, the proposed undertaking also entails new construction (as shown in attachment 2) and expansion of Building 1700 (a gymnasium built in 1949). In the 2011 revised eligibility assessment, Building 1700 was shown to have been substantially expanded since its original construction (Ferguson 2011: 56). The proposed undertaking will allow Building 1700 to continue to be used as a fitness center, and all building additions will be designed so as not to diminish the historic character of the building or the Westover ARB Historic District. As the proposed new facilities further the key Air Force mission at Westover ARB, and the Air Force proposes to design the facilities in keeping with 36 CFR 68, the new construction will have no adverse effect on historic properties.

The USAF respectfully requests concurrence from the MHC on the identification of historic properties within in the APE for the proposed undertaking and on the assessment of effects on those properties. In addition, in order to mitigate adverse effects of demolition of Hangar 7071 and Building 2426, the USAF is proposing HABS/HAER recordation of buildings proposed for demolition, mapping of the current and former boundaries of Westover ARB that identifies which of the original buildings and infrastructure existed and remains, and a reevaluation of the eligibility of the remaining portions of the district. The USAF at Westover ARB also invites the MHC to participate in the design review for new construction.

Please review the material enclosed and provide comment within 30 days. If you have any questions, the Westover ARB point of contact is Mr. John B. Moriarty, Chief Environmental Engineer, at (413) 557-2434.

Sincerely,

KAREN L. MAGNUS, Colonel, USAF
Commander

Attachment 1 – Map of APE for undertaking (former boundaries of Westover ARB)
Attachment 2 – Attachments for Westover ARB SHPO Letter for KC-46A MOB 3_EIS
Attachment 3 – KC-46A Site Survey Report

CONCURRENCE: Brona Simon
8/26/16
BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION
RC.60033

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A.6 NATURAL RESOURCES CONSULTATION

A.6.1 Grissom ARB Natural Resources Consultation Letters

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESERVE COMMAND

25 March 2016

Mr. Jeffrey A. Woodring
Chief, Environmental Flight
7104 S. Warthog Street
Grissom ARB, IN 46971-1632

Mr. Scott Pruitt, Field Supervisor
U.S. Fish and Wildlife Service
Bloomington Indiana Field Office
620 S. Walker Street Bloomington, Indiana 47403-2121

Dear Mr. Pruitt

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. Grissom Air Reserve Base (ARB), Indiana has been proposed as one of four alternative locations for this mission.

The MOB 3 mission involves the basing of 12 KC-46A aircraft. In addition to the aircraft, facilities, infrastructure and manpower would also be required to support the mission. For this beddown, the USAF intends to use as many existing facilities as possible, but recognizes that some new facilities would be required. Two new facilities would be constructed, several facilities would be renovated and two facilities would be demolished. In addition, the MOB 3 mission would require the repair of pavement on the existing KC-135 parking ramp. All construction or ground disturbance proposed by this project would be conducted within the current base boundary and no wetland areas would be impacted.

The addition of KC-46A operations would increase the total number of operations conducted at Grissom ARB by 17 percent. Approximately five percent of the total annual KC-46A sorties would be flown during acoustic night (between 10:00 PM and 7:00 AM). Practice approaches would be conducted by KC-46A aircrews at airfields other than Grissom ARB on an occasional basis. The KC-46A would be operated in existing airspace, and the types of flight operations would be similar to the existing KC-135 aircraft operations. KC-46A aircrews would use existing air refueling (AR) tracks and fuel jettison areas, if necessary. Flight activities involving refueling training would primarily occur in designated aerial refueling tracks. No new flight tracks are proposed for use.

The ROI for biological resources is defined as the land area (habitats) and airspace that could potentially be affected by infrastructure and construction projects, as well as airspace operations. Grissom Air Reserve Base carefully reviewed the U.S. Fish and Wildlife Service's (USFWS's) Information for Planning and Conservation (IPaC) online system on January 13, 2016, to identify current USFWS trust resources, such as migratory birds, species proposed or listed under the Endangered Species Act (ESA), inter-jurisdiction fishes, specific marine mammals, wetlands, and USFWS National Wildlife Refuge System lands with potential to be affected by the Proposed Action. Two separate submissions were completed to cover the area within the Region of Influence for biological resources:

Cass County, Indiana IPaC Trust Resource Report identified 1 threatened clam species, the rabbitsfoot (*Quadrula cylindrica cylindrica*); 1 endangered clam species, sheepnose mussel (*Plethobasus cyphyus*); 1 endangered mammal species, Indiana bat (*Myotis sodalis*); 1 threatened mammal species, northern long-eared bat (*Myotis septentrionalis*); 25 migratory birds; and several wetlands. No critical habitat was identified within the project area. No Wildlife Refuges were identified within Cass County. Please see Attachment 2 for a full copy of the Trust Resource Report.

Miami County, Indiana IPaC Trust Resource Report identified 1 threatened clam species, the rabbitsfoot (*Quadrula cylindrica cylindrica*); 1 threatened mammal species, Indiana bat (*Myotis sodalis*); 1 endangered mammal species, northern long-eared bat (*Myotis septentrionalis*); 27 migratory birds; and several wetlands. No critical habitat was identified within the project area. No Wildlife Refugees were identified within Miami County. Please see Attachment 2 for a full copy of the Trust Resource Report.

Additionally, special status species lists by county were obtained via the USFWS's Environmental Conservation Online System (ECOS) to identify species with the potential to occur within Cass and Miami Counties, Indiana. Attachment 3, Table 3-1, lists these species and their habitats.

In accordance with Section 7 of the ESA (16 U.S.C. §§ 1531–1544, as amended), the Sikes Act (16 U.S.C. 670a-670o, 74 Stat. 1052), and as part of the U.S. Air Force's Environmental Impact Analysis Process (EIAP), we request your input in identifying any additional species of concern, general or specific issues, or areas of concern you feel should be addressed in the EIS. The Air Force requests your agency's concurrence with the species list and effects determinations contained in Table 3-1. If your agency has any new or additional information other than that contained in Table 3-1, we request that you please provide your comments by April 25, 2016.

Please provide your comments directly to Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN; Building 171, 2261 Hughes Ave, Ste 155, Lackland AFB, TX 78236-9853 or to the project website at www.kc-46A-beddown.com. Thank you for your assistance in this matter.

Sincerely

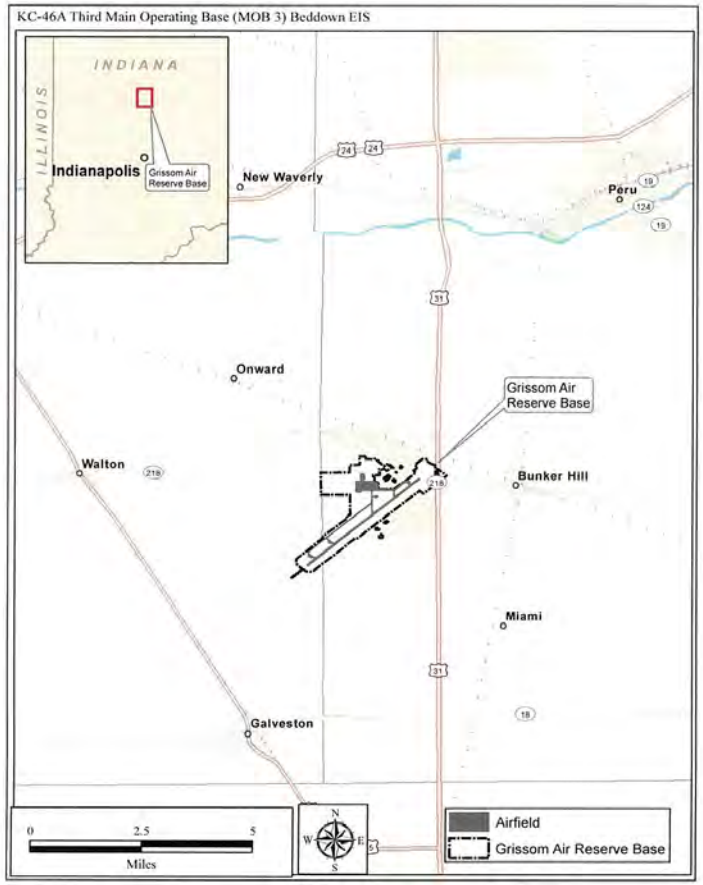
JEFFREY A. WOODRING, GS-12, P.E.
Chief, Environmental Flight

Attachments:
1. Grissom ARB Location Map
2. IPaC Trust Resource Reports for Cass and Miami Counties, Indiana
3. Table 3-1. Potential for Impacts from the Proposed Action to USFWS Special Status Species Known to or Believed to Occur in Cass and Miami Counties, Indiana

cc: Hamid Kamalpour, AFCEC/CZN

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

ATTACHMENT 1. GRISSOM ARB LOCATION MAP



A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

ATTACHMENT 2. IPaC TRUST RESOURCE REPORT

U.S. Fish & Wildlife Service

Grissom - Cass County, IN

IPaC Trust Resource Report

Generated January 13, 2016 09:27 AM MST, IPaC v2.3.3

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.

IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

US Fish & Wildlife Service

IPaC Trust Resource Report

NAME
Grissom - Cass County, IN

LOCATION
Cass County, Indiana

DESCRIPTION
MOB 3

IPAC LINK
https://ecos.fws.gov/ipac/project/7PJVT-CRHN5-DXNKF-YZN5J-JVR6UM

U.S. Fish & Wildlife Contact Information

Trust resources in this location are managed by:

Bloomington Ecological Services Field Office
620 South Walker Street
Bloomington, IN 47403-2121
(812) 334-4261

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require FWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from the Regulatory Documents section in IPaC.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Clams

Rabbitsfoot Quadrula cylindrica cylindrica — Threatened
CRITICAL HABITAT
There is **final** critical habitat designated for this species.
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F03X

Sheepnose Mussel Plethobasus cyphyus — Endangered
CRITICAL HABITAT
No critical habitat has been designated for this species.
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F046

Mammals

Indiana Bat Myotis sodalis — Endangered
CRITICAL HABITAT
No critical habitat has been designated for this species.
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A000

Northern Long-eared Bat Myotis septentrionalis — Threatened
CRITICAL HABITAT
No critical habitat has been designated for this species.
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A0JE

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

Critical Habitats

There are no critical habitats in this location

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/akn-histogram-tools.php

The following species of migratory birds could potentially be affected by activities in this location:

Acadian Flycatcher Empidonax virescens — Bird of conservation concern
Season: Breeding

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Bell's Vireo Vireo bellii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JX

Black-billed Cuckoo Coccyzus erythropthalmus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HI

Blue-winged Warbler Vermivora pinus — Bird of conservation concern
Season: Breeding

Bobolink Dolichonyx oryzivorus — Bird of conservation concern
Season: Breeding

Brown Thrasher Toxostoma rufum — Bird of conservation concern
Season: Breeding

Cerulean Warbler Dendroica cerulea — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09I

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

Dickcissel Spiza americana Season: Breeding	Bird of conservation concern
Field Sparrow Spizella pusilla Season: Breeding	Bird of conservation concern
Henslow's Sparrow Ammodramus henslowii Season: Breeding https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09D	Bird of conservation concern
Kentucky Warbler Oporornis formosus Season: Breeding	Bird of conservation concern
Least Bittern Ixobrychus exilis Season: Breeding	Bird of conservation concern
Loggerhead Shrike Lanius ludovicianus Season: Breeding https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY	Bird of conservation concern
Marsh Wren Cistothorus palustris Season: Breeding	Bird of conservation concern
Northern Flicker Colaptes auratus Year-round	Bird of conservation concern
Peregrine Falcon Falco peregrinus Season: Breeding https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU	Bird of conservation concern
Pied-billed Grebe Podilymbus podiceps Season: Breeding	Bird of conservation concern
Prothonotary Warbler Protonotaria citrea Season: Breeding	Bird of conservation concern
Red-headed Woodpecker Melanerpes erythrocephalus Year-round	Bird of conservation concern
Rusty Blackbird Euphagus carolinus Season: Wintering	Bird of conservation concern
Short-eared Owl Asio flammeus Season: Wintering https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD	Bird of conservation concern
Upland Sandpiper Bartramia longicauda Season: Breeding https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HC	Bird of conservation concern
Willow Flycatcher Empidonax traillii Season: Breeding https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F6	Bird of conservation concern
Wood Thrush Hylocichla mustelina Season: Breeding	Bird of conservation concern

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuges in this location

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

This location overlaps all or part of the following wetlands:

The area of this project is too large for IPaC to list all NWI wetlands in the area. The list below may be incomplete, or the acreages reported may be inaccurate. Please contact the local U.S. Fish & Wildlife office or visit the NWI map for a full list.

Freshwater Emergent Wetland

PEM1A	905.0 acres
PEM1C	103.0 acres
PEM1Ad	21.3 acres
PEM1F	19.5 acres
PEM1/UBF	13.2 acres
PEM1Cd	8.71 acres
PEM1/UBFh	1.07 acres

Freshwater Forested/shrub Wetland

PFO1A	544.0 acres
PFO1C	73.0 acres
PSS1/EM1C	40.8 acres
PSS1C	33.9 acres
PFO1/EM1A	28.1 acres
PFO1/SS1A	26.6 acres
PSS1A	21.2 acres
PFO1/EM1C	11.5 acres
PSS1/EM1A	9.16 acres
PFO1Cd	0.981 acre

Freshwater Pond

PAB4/EM2G	39.2 acres
PUBGx	24.2 acres
PAB4/UBF	16.3 acres
PAB/UBG	15.4 acres
PABG	13.2 acres
PAB4/UBG	12.7 acres
PAB/UBF	7.6 acres
PAB4/EM1F	7.21 acres
PUBF	5.48 acres
PUBG	3.29 acres
PAB4F	1.7 acres
PAB4/UBGx	1.29 acres
PABF	1.1 acres
PABGx	0.923 acre
PUBGh	0.637 acre
PAB/UBGx	0.53 acre
PUBFx	0.509 acre
PAB/UBFx	0.293 acre

Lake

L1UBHx	192.0 acres
L1UBH	44.1 acres

A full description for each wetland code can be found at the National Wetlands Inventory website: http://107.20.228.18/decoders/wetlands.aspx

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

U.S. Fish & Wildlife Service

Grissom - Miami County, IN

IPaC Trust Resource Report

Generated January 13, 2016 09:28 AM MST. IPaC v2.3.2

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.

IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

US Fish & Wildlife Service

IPaC Trust Resource Report

NAME
Grissom - Miami County, IN

LOCATION
Miami County, Indiana

DESCRIPTION
MOB 3

IPAC LINK
https://ecos.fws.gov/ipac/project/MXXIJ-72JY5-CALCQ-ZGUT5-YLVL5Q

U.S. Fish & Wildlife Contact Information

Trust resources in this location are managed by:

Bloomington Ecological Services Field Office
620 South Walker Street
Bloomington, IN 47403-2121
(812) 334-4261

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require FWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from the Regulatory Documents section in IPaC.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Clams

Rabbitsfoot Quadrula cylindrica cylindrica — Threatened

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F03X

Mammals

Indiana Bat Myotis sodalis — Endangered

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A000

Northern Long-eared Bat Myotis septentrionalis — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A0JE

Critical Habitats

There are no critical habitats in this location

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/akn-histogram-tools.php

The following species of migratory birds could potentially be affected by activities in this location:

Acadian Flycatcher Empidonax virescens — Bird of conservation concern
Season: Breeding

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Bell's Vireo Vireo bellii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JX

Black-billed Cuckoo Coccyzus erythropthalmus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HI

Black-crowned Night-heron Nycticorax nycticorax — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0EU

Blue-winged Warbler Vermivora pinus — Bird of conservation concern
Season: Breeding

Bobolink Dolichonyx oryzivorus — Bird of conservation concern
Season: Breeding

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

Brown Thrasher Toxostoma rufum — Bird of conservation concern
Season: Breeding

Cerulean Warbler Dendroica cerulea — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09I

Common Tern Sterna hirundo — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09G

Dickcissel Spiza americana — Bird of conservation concern
Season: Breeding

Field Sparrow Spizella pusilla — Bird of conservation concern
Season: Breeding

Henslow's Sparrow Ammodramus henslowii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09D

Kentucky Warbler Oporornis formosus — Bird of conservation concern
Season: Breeding

Least Bittern Ixobrychus exilis — Bird of conservation concern
Season: Breeding

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY

Marsh Wren Cistothorus palustris — Bird of conservation concern
Season: Breeding

Northern Flicker Colaptes auratus — Bird of conservation concern
Year-round

Peregrine Falcon Falco peregrinus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU

Pied-billed Grebe Podilymbus podiceps — Bird of conservation concern
Season: Breeding

Prothonotary Warbler Protonotaria citrea — Bird of conservation concern
Season: Breeding

Red-headed Woodpecker Melanerpes erythrocephalus — Bird of conservation concern
Year-round

Rusty Blackbird Euphagus carolinus — Bird of conservation concern
Season: Wintering

Short-eared Owl Asio flammeus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Upland Sandpiper Bartramia longicauda — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HC

Willow Flycatcher Empidonax traillii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F6

Wood Thrush Hylocichla mustelina — Bird of conservation concern
Season: Breeding

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

Refuge data is unavailable at this time.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS:

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS:

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Wetland data is unavailable at this time.

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

ATTACHMENT 3. POTENTIAL FOR IMPACTS FROM THE PROPOSED ACTION TO USFWS SPECIAL STATUS SPECIES KNOWN TO OR BELIEVED TO OCCUR IN CASS AND MIAMI COUNTIES, INDIANA

Table 3-1. Potential for Impacts from the Proposed Action to USFWS Species Known to or Believed to Occur in Cass and Miami Counties, Indiana

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Grissom Air Reserve Base?	Potential for Impacts from the Proposed Action/ Effects Determination
Clams					
Rabbitsfoot	*Quadrula cylindrica cylindrica*	Threatened	Prefer shallow areas with sand and gravel along the bank and next to shoals, which provide a refuge in fast-moving rivers. Found in 13 states from Pennsylvania to Oklahoma.	No	No. Habitat for rabbitsfoot does not occur on Base. No effects to aquatic habitats will occur as a result of the Proposed Action.
Sheepnose Mussel	*Plethobasus cyphyus*	Endangered	Found in shallow areas of rivers and streams with moderate to swift currents that flow over coarse sand and gravel. May sometimes be found in areas of mud, cobble and boulders, and in large rivers they may be found in deep runs.	No	No. Habitat for sheepnose mussel does not occur on Base. No effects to aquatic habitats will occur as a result of the Proposed Action.
Mammals					
Indiana Bat	*Myotis sodalis*	Endangered	Found over most of the eastern half of the United States. Almost half of them hibernate in caves in southern Indiana.	No	No. Lack of suitable roost or foraging habitat present on base. No effects to Indiana bat will occur as a result of the Proposed Action.
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened	Summer roosting habitat includes underneath bark, in cavities, or in crevices of both live and dead trees, caves and mines. Opportunistic in roost selection, using tree species based on suitability to retain bark or provide cavities or crevices. Winter hibernacula include caves and mines. Large caves or mines with large passages and entrances; constant temperatures; and high	No	No. Lack of suitable roost or foraging habitat present on base. No effects to northern long-eared bat will occur as a result of the Proposed Action.

A.6.1.1 Grissom ARB USFWS Section 7 Consultation Letter (Continued)

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Grissom Air Reserve Base?	Potential for Impacts from the Proposed Action/ Effects Determination
			humidity with no air currents are preferred.		

Source: Grissom ARB 2010; USFWS 2015a, d-g

References:

Grissom Air Reserve Base (ARB) 2010. Natural Resources Management. Grissom ARB, Indiana. January 2011.

U.S. Fish and Wildlife Service (USFWS) 2015a. Environmental Conservation Online System. Species by County Reports. Accessed: http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=18017 and http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=18103 on 13 January 2016.

USFWS 2015b. Critical Habitat Portal. Accessed: http://ecos.fws.gov/crithab/ on 13 January 2016.

USFWS 2015c. Information for Planning and Conservation (IPaC). Accessed: https://ecos.fws.gov/ipac/project/KGW6DBT2HVGJLPMZI7DLB4WWOM/resources on 13 January 2016.

USFWS 2015d. Species Profile: Rabbitsfoot (*Quadrula cylindrica cylindrica*). Accessed: http://www.fws.gov/midwest/Endangered/clams/rabbitsfoot/index.html on 19 January 2016.

USFWS 2015e. Endangered Species. Northern Long-Eared Bat (*Myotis septentrionalis*). Accessed: http://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html on 19 January 2016.

USFWS 2015f. Endangered Species. Indiana Bat (*Myotis sodalis*). Accessed: http://www.fws.gov/MIDWEST/endangered/mammals/inba/index.html on 19 January 2016.

USFWS 2015g. Endangered Species. Sheepnose Mussel (*Plethobasus cyphyus*). Accessed: http://www.fws.gov/Midwest/endangered/clams/sheepnose/index.html on 21 January 2016.

A.6.1.2 Grissom ARB USFWS Section 7 Consultation Response

United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

April 15, 2016

Mr. Hamid Kamalpour
United States Air Force
AFCEC/CZN; Building 171
2261 Hughes Avenue, Suite 155
Lackland Air Force Base, Texas 78236-9853

Project: Third Main Operating Base (MOB 3) of KC-46A Tanker Aircraft
Location: Grissom Air Reserve Base, Miami and Cass Counties, Indiana

Dear Mr. Kamalpour:

This responds to Mr. Jeffrey A. Woodring's letter dated March 25, 2016, requesting our comments on the aforementioned project.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et. seq.) and are consistent with the intent of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and the U. S. Fish and Wildlife Service's Mitigation Policy.

The U.S. Air Force is preparing an Environmental Impact Statement to assess potential environmental issues associated with the possible use of Grissom ARB as 1 of 4 alternative locations for basing KC-46A tanker aircraft and the associated manpower and facilities. It is expected that 2 new facilities would be constructed, several would be renovated, and 2 existing facilities would be demolished; the existing aircraft parking ramp would require repaving. Construction would occur within the current base boundary, although information on the exact locations was not provided in the letter. Flights in and out of the air base would increase by 17 percent.

Grissom ARB consists of 1 runway approximately 2.75 miles long, a parallel taxiway, aircraft parking ramps, repair facilities, and various other necessary buildings including offices and housing. The Miami Correctional Facility is located within the boundary fence but is not associated with air base functions. Much of the land is maintained in grass; the facility is surrounded by privately owned croplands and some small, widely scattered woodlands.

2

The extensive grasslands on the base property provide quality nesting habitat for a number of rare grassland bird species. Perhaps most significant is the Indiana endangered and USFWS species of conservation concern upland sandpiper (*Bartramia longicauda*), which has successfully nested for at least 2 years, as confirmed by birders in 2014 and 2015 (Enclosures No. 1, 2, and 3). Additional grassland and shrubland bird species of conservation concern that are known to nest include bobolink (*Dolichonyx oryzivorus*), brown thrasher (*toxostoma rufum*), dickcissel (*Spiza Americana*), field sparrow (*Spizella pusilla*), Eastern meadowlark (*Sturnella magna*), and grasshopper sparrow (*Ammodramus savannarum*). Also observed and expected to nest are Northern bobwhite (*Colinus virginianus*), savannah sparrow (*Passerculus sandwichensis*), song sparrow (*Melospiza melodia*), killdeer (*Charadrius vociferous*), willow flycatcher (*Empidonax traillii*), and horned lark (*Eremophila alpestris*). The Indiana endangered and USFWS species of conservation concern Northern harrier (*Circus cyaneus*) has been observed during the summer at Grissom ARB (Enclosure No. 4); however, this species forages over large areas and breeding has not been confirmed at or near the base.

We are not aware of any conflicts between these breeding birds at Grissom ARB and aircraft operations. However, bird species that are known to congregate in large flocks at various times of the year, such as European starling (*Sturnus vulgaris*) red-winged blackbird (*Agelaius pheoniceus*), common grackle (*Quiscalus quiscula*), and brown-headed cowbird (*Molothrus ater*), may present some problems. These species are attracted to waste grain in crop fields, which are not present on Grissom ARB but are the main land use surrounding the base.

Most of the other bird species listed in the IPaC Trust Species Reports for Miami and Cass Counties, which were provided with your letter, are not expected to be found at Grissom ARB because the habitats they require, which are wetlands (*e.g.* black-crowned night heron, common tern, pied-billed grebe, marsh wren), shrublands (*e.g.* loggerhead shrike, Bell's vireo, blue-winged warbler), or forestlands (*e.g.* Acadian flycatcher, wood thrush, cerulean warbler, prothonotary warbler) are not present. Henslow's sparrow (*Ammodramus henslowii*) and short-eared owl (*Asio flammeus*) are grassland species but we do not have information on their presence at Grissom ARB.

There is a winter roost of bald eagles (*Haliaeetus leucocephalus*) along the Mississinewa River downstream of Mississinewa Lake, where the river remains open due to water releases from the dam. Although the number of birds varies by weather conditions, which dictate the locations of open water around the state, as many as 89 eagles have been observed at one time (Enclosure No. 5). This roost is located approximately 8.75 miles northeast of the end of Grissom ARB Runway 23.

ENDANGERED SPECIES

Miami and Cass Counties are within the range of the Federally endangered Indiana bat (*Myotis sodalis*) and sheepnose mussel (*Plethobasus cyphyus*) and the threatened northern long-eared bat (*Myotis septentrionalis*) and rabbitsfoot mussel (*Quadrula cylindrica cylindrica*). However,

A.6.1.2 Grissom ARB USFWS Section 7 Consultation Response (Continued)

3

there is no habitat for these species at Grissom ARB. Critical Habitat has been designated for the Indiana bat and rabbitsfoot mussel, but no areas within Miami and Cass Counties are included within those designations. Therefore, we concur with your determination that the proposed project is not likely to adversely affect these endangered and threatened species.

This precludes the need for further consultation on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. However, should new information arise pertaining to project plans or a revised species list be published, please contact us for further coordination.

For further discussion, please contact Elizabeth McCloskey at (219) 983-9753 or elizabeth_mccloskey@fws.gov.

Sincerely yours,

Elizabeth S. McCloskey acting for

Scott E. Pruitt
Supervisor

[IN-BIRD-L] Grissom Uplands: nesting confirmed
1 message

James Haw <in-bird-l@list.indiana.edu> Sat, Jun 7, 2014 at 1:42 PM
Reply-To: jhawillet@aol.com
To: in-bird-l@list.indiana.edu

Thanks to Landon Neumann for finding and posting the 3 Upland Sandpipers at Grissom AFB, Miami Co. I went after them this morning, arriving at Grissom around 9:15. I found the pair of adults on the ground near the AFB fence. As I approached and stopped the car, I saw two half-grown chicks running away from the road and into taller grass while one of the adults gave a series of soft calls. Thus nesting at Grissom is confirmed.

The third adult Upland was on the fence farther west but still in Miami Co.

Since I had essentially no grassland birds on my Miami Co. list, I picked up four additional county birds at Grissom: Savannah Sparrow, Dickcissel, Bobolink, and Eastern Meadowlark.

I then headed to Mississinewa for an 11 a.m. picnic lunch. Finding bird activity slackening rapidly in the midday heat, the recreation areas full of people, and my day's energy expended,.I soon after lunch headed for home.

Jim Haw

ENCLOSURE NO. 1.

A.6.1.2 Grissom ARB USFWS Section 7 Consultation Response (Continued)

[IN-BIRD-L] Upland Sandpiper, Eurasian-collared Dove
1 message

Landon Neumann <landonneumann25@gmail.com> Thu, Jul 10, 2014 at 9:54 PM
Reply-To: Landon Neumann <landonneumann25@gmail.com>
To: in-bird-l@list.indiana.edu

This morning I birded Grissom Airfield. For the 7th time this summer I've had Upland Sandpiper here. Not surprisingly since they are about down nesting they have gotten much harder here. I lucked out and flushed one along the road. Other than that that was the only Upland that I had. Another big surprise was finding a Eurasian-collared Dove on the way back in Walton. This is the farthest east that collared dove have been found in Cass so far. Before this they were only in Royal Center and Young America which are on the far western side of Cass Co. Walton is located on the eastern side of the county.

Grissom Airbase
Northern Bobwhite 1 Cass
Red-tailed Hawk 1
Upland Sandpiper 1 Miami
Killdeer 5
Mourning Dove 5
Yellow-billed Cuckoo 1 Cass
Willow Flycatcher 1 Cass
Brown Thrasher 2
European Starling 25
Savannah Sparrow 5
Grasshopper Sparrow 3 Cass
Song Sparrow 2
Red-winged Blackbird 20
Eastern Meadowlark 30
Common Grackle 1

Walton

Eurasian-collared Dove

Landon Neumann
Logansport, Cass County

ENCLOSURE NO. 2.

[IN-BIRD-L] Upland Sandpiper at Grissom AFB (Miami County this morning.)
1 message

Bud Dodrill <bud1880@gmail.com> Mon, May 18, 2015 at 1:07 PM
Reply-To: Bud Dodrill <bud1880@gmail.com>
To: in-bird-l <in-bird-l@list.indiana.edu>

Keeping tabs on the Upland Sandpiper. Still hanging around Grissom.

Grissom Air Reserve Base, Miami, US-IN
May 18, 2015 8:50 AM - 9:10 AM
Protocol: Traveling
1.0 mile(s)
Comments: Went specifically to find Upland Sandpiper. Found sitting on a fence pole just inside the Miami County line, southeast side of the main runway.
12 species

Upland Sandpiper 1 Continuing bird.
Mourning Dove 1
Barn Swallow 2
American Robin 1
European Starling 1
Savannah Sparrow 2
Song Sparrow 1
Northern Cardinal 1
Red-winged Blackbird 30
Eastern Meadowlark 4
Common Grackle 2
Brown-headed Cowbird 6

View this checklist online at http://ebird.org/ebird/view/checklist?subID=S23513386

This report was generated automatically by eBird v3 (http://ebird.org)

ENCLOSURE NO. 3.

A.6.1.2 Grissom ARB USFWS Section 7 Consultation Response (Continued)

[IN-BIRD-L] Grissom - Northern Harrier x 2
1 message

Jeff Timmons <jeffreytimmons@comcast.net> Fri, Jul 31, 2015 at 5:42 PM
Reply-To: Jeff Timmons <jeffreytimmons@comcast.net>
To: in-bird-l <in-bird-l@list.indiana.edu>

On my way north I stopped at Grissom at daybreak to look for Upland Sandpiper. I was not able to locate them. However, as I drove along the airport there were two Northern Harrier flying low over the field. I noticed the long tail and white rump patch immediately on the brown birds. Lighting was terrible so I was not able to see much else.

Species	Count
Northern Harrier	2
Killdeer	1
Mourning Dove	8
American Kestrel	3
Horned Lark	6
European Starling	6
Savannah Sparrow	6
Grasshopper Sparrow	2
Song Sparrow	4
Eastern Meadowlark	1

Jeff Timmons

ENCLOSURE NO. 4.

Lynnanne <leavesofthefall@EMBARQMAIL.COM>
Sent by: Bird discussion list for Indiana <IN-BIRD-L@LISTSERV.INDIANA.EDU>

01/07/2011 09:39 PM

To IN-BIRD-L@LISTSERV.INDIANA.EDU
cc
bcc
Subject Re: [IN-BIRD-L] Super Eagle Day... Wabash, Miami counties

Hello,

It's been a long day. I forgot to mention the RED-SHOULDERED HAWK (Wabash Co.) located at Salamonie Dam tail waters. It flew from the south to north side of the water. We also had a COOPER'S (Lagro area) and SHARP-SHINNED HAWK (SR 124) (both Wabash Co).

1E
----- Original Message -----
From: "Lynnanne" <leavesofthefall@EMBARQMAIL.COM>
To: IN-BIRD-L@LISTSERV.INDIANA.EDU
Sent: Friday, January 7, 2011 9:24:09 PM
Subject: [IN-BIRD-L] Super Eagle Day... Wabash, Miami counties

John Castrale's post (along with another nudge, you know who you are) on the Parke County roost prompted me to do what I've wanted to do for a few years -- count the Miami roost as the birds take off in the morning. What a thrill!

I was there well before sunup, along with my son who helped tally. The first birds started taking off around 7:15 a.m. and continued until around 6:45 a.m. All total, there were 89 BALD EAGLES that took flight from the roost. I do believe, however, since this roost is on a bend of the river that I was only seeing a partial number of actual birds roosting here. At around 9 a.m., another bird flew in -- an IMMATURE GOLDEN EAGLE -- alongside a baldie. I can't be certain, but it's highly possible this bird has been roosting with the baldies. I didn't realize the two birds were coming in behind me until they crested my shoulder. It and the bald flew low over the river away from me, towards the roost. This is when I first noticed its tail and the wide black terminal band and white area. It landed in a sycamore along the river where I shot a few lousy photos. I didn't take my scope (???), so was only able to view it through binoculars. It's head looked smaller, and golden, but was it? (I emailed a photo to Don Gorney so he could ease my doubts. Thanks Don!) It then flew to the other side of the river (where I was able to get another view of its golden self) which is bordered by trees and field. I lost the bird in the brushy tree line.

ENCLOSURE NO. 5.

A.6.1.3 Grissom ARB IDNR Consultation Response

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

DNR #: ER-18973 **Request Received:** April 4, 2016

Requestor: United States Air Force, AFCEC/CZN
Mr. Hamid Kamalpour
2261 Hughes Avenue
Suite 155
Lackland AFB, TX 78236-9853

Project: Potential KC-46A Third Main Operation Base (MOB 3) Beddown at Grissom Air Reserve Base

County/Site info: Miami - Cass

The Indiana Department of Natural Resources has reviewed the above referenced project per your request. Our agency offers the following comments for your information and in accordance with the National Environmental Policy Act of 1969.

If our agency has regulatory jurisdiction over the project, the recommendations contained in this letter may become requirements of any permit issued. If we do not have permitting authority, all recommendations are voluntary.

Regulatory Assessment: Proposals at this site may require the formal approval of our agency pursuant to the Flood Control Act (IC 14-28-1) for any proposal to construct, excavate, or fill in or on the floodway of a stream or other flowing waterbody which has a drainage area greater than one square mile. Please submit more detailed plans to the Division of Water's Technical Services Section if you are unsure whether or not a permit will be required.

Natural Heritage Database: The Natural Heritage Program's data have been checked.
The Nickel Plate Trail and the species below have been documented within 1/2 mile northeast of the project area.

1. American Badger (Taxidea taxus), state species of special concern
2. Kidneyshell (Ptychobranchus fasciolaris), state species of special concern

Fish & Wildlife Comments: As long as standard erosion control measures area implemented, we do not foresee any impacts to the mussel species above as a result of this project. Also, badgers are a wide ranging species that prefer an open, prairie-type habitat, with Indiana being at the eastern edge of their natural range. The range of the badger continues to expand as a result of land-use changes from forest to farmland and open pastureland. Impacts to the American badger or its preferred habitat are unlikely as a result of this project.

We are unable to determine the full extent of potential impacts to fish, wildlife, and botanical resources based on the information provided. However, given the resources located at Grissom Air Reserve Base, we recommend a mitigation plan be developed (and submitted with the permit application, if required) if habitat impacts will occur. The DNR's Floodway Habitat Mitigation guidelines (and plant lists) can be found online at: http://www.in.gov/legislative/iac/20140806-IR-312140295NRA.xml.pdf.

Impacts to non-wetland forest of one (1) acre or more should be mitigated at a minimum 2:1 ratio. If less than one acre of non-wetland forest is removed in a rural setting, replacement should be at a 1:1 ratio based on area. Impacts to non-wetland forest under one (1) acre in an urban setting should be mitigated by planting five trees, at least 2 inches in diameter-at-breast height (dbh), for each tree which is removed that is 10" dbh or greater (5:1 mitigation based on the number of large trees).

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

The measures below should be implemented to avoid, minimize, or compensate for impacts to fish, wildlife, and botanical resources:
1. Revegetate all bare and disturbed areas with a mixture of grasses (excluding all varieties of tall fescue), legumes, and native shrub and hardwood tree species as soon as possible upon completion.
2. Minimize and contain within the project limits inchannel disturbance and the clearing of trees and brush.
3. Do not work in the waterway from April 1 through June 30 without the prior written approval of the Division of Fish and Wildlife.
4. Do not cut any trees suitable for Indiana bat or Northern Long-eared bat roosting (greater than 3 inches dbh, living or dead, with loose hanging bark, or with cracks, crevices, or cavities) from April 1 through September 30.
5. Appropriately designed measures for controlling erosion and sediment must be implemented to prevent sediment from entering the stream or leaving the construction site; maintain these measures until construction is complete and all disturbed areas are stabilized.

Contact Staff: Christie L. Stanifer, Environ. Coordinator, Fish & Wildlife
Our agency appreciates this opportunity to be of service. Please contact the above staff member at (317) 232-4080 if we can be of further assistance.

Christie L. Stanifer **Date:** April 22, 2016
Christie L. Stanifer
Environ. Coordinator
Division of Fish and Wildlife

A.6.2 Seymour Johnson AFB Natural Resources Consultation Letters

A.6.2.1 Seymour Johnson AFB USFWS Section 7 Consultation Letter

DEPARTMENT OF THE AIR FORCE
4TH FIGHTER WING (ACC)
SEYMOUR JOHNSON AIR FORCE BASE NC

Mr. Dennis G. Goodson, P.E.
Deputy Base Civil Engineer
1095 Peterson Ave
Seymour Johnson AFB, NC 27531-2355

Mr. John Hammond, Endangered Species Coordinator, Military Projects
U.S. Fish and Wildlife Service
Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726

Dear Mr. Hammond,

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. Seymour Johnson Air Force Base (AFB), North Carolina has been proposed as one of four alternative locations for this mission.

The MOB 3 mission involves the basing of 12 KC-46A aircraft. In addition to the aircraft, facilities, infrastructure and manpower would also be required to support the mission. For this beddown, the USAF intends to use as many existing facilities as possible, but recognizes that some new facilities would be required. Two new facilities would be constructed, several facilities would be renovated and two facilities would be demolished. All construction or ground disturbance proposed by this project would be conducted within the current base boundary and no wetland areas would be impacted.

The addition of KC-46A operations would increase the total number of operations conducted at Seymour Johnson AFB by 68 percent. Approximately five percent of the total annual KC-46A sorties would be flown during acoustic night (between 10:00 PM and 7:00 AM). Seymour Johnson AFB-based KC-46A aircrews would primarily use the Kinston Regional Jetport for off-station practice approaches, conducting up to 1,774 airfield operations at that location. Other airfields would be used on an occasional basis. The KC-46A would be operated in existing airspace, and the types of flight operations would be similar to the existing KC-135 aircraft operations. KC-46A aircrews would use existing air refueling (AR) tracks and fuel jettison areas, if necessary. Flight activities involving refueling training would primarily occur in designated aerial refueling tracks. No new flight tracks are proposed for use.

The ROI for biological resources is defined as the land area (habitats) and airspace that could potentially be affected by infrastructure and construction projects, as well as airspace operations. Seymour Johnson AFB carefully reviewed the U.S. Fish and Wildlife Service's (USFWS's) Information for Planning and Conservation (IPaC) online system on January 13, 2016, to identify current USFWS trust resources, such as migratory birds, species proposed or listed under the Endangered Species Act (ESA), inter-jurisdiction fishes, specific marine mammals, wetlands, and USFWS National Wildlife Refuge System lands with potential to be affected by the Proposed Action. A submission for Wayne County, North Carolina was completed to cover the area within the Region of Influence for biological resources:

Wayne County, North Carolina IPaC Trust Resource Report identified 1 endangered bird, the Red-cockaded Woodpecker (*Picoides borealis*), and 23 migratory birds. No wetlands, critical habitat, or Wildlife Refugees were identified within the project area. Please see Attachment 2 for a full copy of the Trust Resource Report.

Additionally, special status species lists by county were obtained via the USFWS's Environmental Conservation Online System (ECOS) to identify species with the potential to occur within Wayne County, North Carolina. Attachment 3, Table 3-1, lists these species and their habitats.

In accordance with Section 7 of the ESA (16 U.S.C. §§ 1531–1544, as amended), the Sikes Act (16 U.S.C. 670a-670o, 74 Stat. 1052), and as part of the U.S. Air Force's Environmental Impact Analysis Process (EIAP), we request your input in identifying any additional species of concern, general or specific issues, or areas of concern you feel should be addressed in the EIS. The Air Force requests your agency's concurrence with the species list and effects determinations contained in Table 3-1. If your agency has any new or additional information other than that contained in Table 3-1, we request that you please provide comment by April 30, 2016.

Please provide your comments directly to Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN; Building 171, 2261 Hughes Ave, Ste 155, Lackland AFB, TX 78236-9853 or to the project website at www.kc-46A-beddown.com. Thank you for your assistance in this matter.

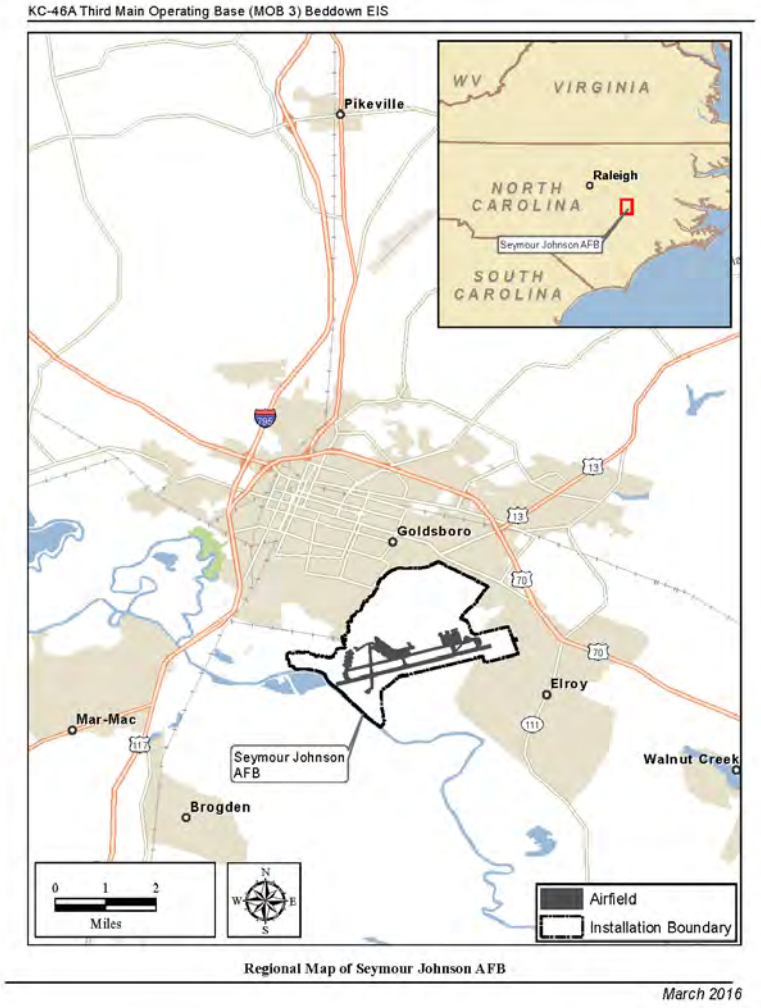
DENNIS G. GOODSON, P.E.

3 Attachments:
1. Seymour Johnson AFB Location Map
2. IPaC Trust Resource Report for Wayne County, North Carolina
3. Table 3-1. Potential for Impacts from the Proposed Action to USFWS Special Status Species Known to or Believed to Occur in Wayne County, North Carolina

cc: Hamid Kamalpour, AFCEC

A.6.2.1. Seymour Johnson AFB USFWS Section 7 Consultation Letter (Continued)

ATTACHMENT 1. SEYMOUR JOHNSON AFB LOCATION MAP



A.6.2.1. Seymour Johnson AFB USFWS Section 7 Consultation Letter (Continued)

ATTACHMENT 2. IPaC TRUST RESOURCE REPORT

U.S. Fish & Wildlife Service

Seymour Johnson

IPaC Trust Resource Report

Generated January 13, 2016 09:15 AM MST, IPaC v2.3.2

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.

IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

A.6.2.1. Seymour Johnson AFB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

US Fish & Wildlife Service

IPaC Trust Resource Report

NAME
Seymour Johnson

LOCATION
Wayne County, North Carolina

DESCRIPTION
MOB 3

IPAC LINK
https://ecos.fws.gov/ipac/project/SEJEI-IGUOJ-BABNL-HBYP3-DJ7XUA

U.S. Fish & Wildlife Contact Information

Trust resources in this location are managed by:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

01/13/2016 09:15 AM Information for Planning and Conservation (IPaC) v2.3.2 Page 2

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

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For project evaluations that require FWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from the Regulatory Documents section in IPaC.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Birds

Red-cockaded Woodpecker *Picoides borealis* Endangered

CRITICAL HABITAT
No critical habitat has been designated for this species

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B04F

Critical Habitats

There are no critical habitats in this location

A.6.2.1. Seymour Johnson AFB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/akn-histogram-tools.php

The following species of migratory birds could potentially be affected by activities in this location:

American Kestrel Falco sparverius paulus — Bird of conservation concern
Year-round

American Bittern Botaurus lentiginosus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F3

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B006

Black-throated Green Warbler Dendroica virens — Bird of conservation concern
Season: Breeding

Brown-headed Nuthatch Sitta pusilla — Bird of conservation concern
Year-round

Chuck-will's-widow Caprimulgus carolinensis — Bird of conservation concern
Season: Breeding

Fox Sparrow Passerella iliaca — Bird of conservation concern
Season: Wintering

Henslow's Sparrow Ammodramus henslowii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B08D

IPaC Trust Resource Report

Kentucky Warbler Oporornis formosus — Bird of conservation concern
Season: Breeding

Least Bittern Ixobrychus exilis — Bird of conservation concern
Season: Breeding

Lesser Yellowlegs Tringa flavipes — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MD

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY

Peregrine Falcon Falco peregrinus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU

Prairie Warbler Dendroica discolor — Bird of conservation concern
Season: Breeding

Prothonotary Warbler Protonotaria citrea — Bird of conservation concern
Season: Breeding

Red-headed Woodpecker Melanerpes erythrocephalus — Bird of conservation concern
Year-round

Rusty Blackbird Euphagus carolinus — Bird of conservation concern
Season: Wintering

Sedge Wren Cistothorus platensis — Bird of conservation concern
Season: Wintering

Short-eared Owl Asio flammeus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Swainson's Warbler Limnothlypis swainsonii — Bird of conservation concern
Season: Breeding

Wood Thrush Hylocichla mustelina — Bird of conservation concern
Season: Breeding

Worm Eating Warbler Helmitheros vermivorum — Bird of conservation concern
Season: Breeding

Yellow Rail Coturnicops noveboracensis — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JG

A.6.2.1. Seymour Johnson AFB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

Refuge data is unavailable at this time.

IPaC Trust Resource Report

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS
The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficd worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS
Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Wetland data is unavailable at this time.

A.6.2.1. Seymour Johnson AFB USFWS Section 7 Consultation Letter (Continued)

ATTACHMENT 3. POTENTIAL FOR IMPACTS FROM THE PROPOSED ACTION TO USFWS SPECIAL STATUS SPECIES KNOWN TO OR BELIEVED TO OCCUR IN WAYNE COUNTY, NORTH CAROLINA

Attachment 3

Table 3-1. Potential for Impacts from the Proposed Action to USFWS Species Known to or Believed to Occur in Wayne County, North Carolina

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at SJAFB?	Potential for Impacts from the Proposed Action/ Effects Determination
Birds					
Red-Cockaded woodpecker	*Picoides borealis*	Endangered	Inhabits mature pine forests such as Longleaf pines (*Pinus palustris*) and southern pine. Red-cockaded woodpeckers excavate cavities exclusively in living pine trees. Cavities are excavated in mature pines, generally over 80 years old.	No	No. Basewide surveys conducted in 2002 did not detect presence or potential habitat to support the red-cockaded woodpecker. A USFWS letter of concurrence received in 2002 stated that red-cockaded woodpecker is unlikely to utilize SJAFB for nesting or foraging (USFWS 2002). Additionally, potential nesting sites such as mature longleaf and loblolly pines will not be disturbed from construction as a result of the Proposed Action. SJAFB will continue to operate in compliance with the BASH plan which provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes (SJAFB 2015). No effects to red-cockaded woodpecker are anticipated as a result of the Proposed Action.

Source: USFWS 2015a & USFWS 2002

A.6.2.1. Seymour Johnson AFB USFWS Section 7 Consultation Letter (Continued)

References:

Seymour Johnson Air Force Base (SJAFB) 2015. Bird Aircraft Strike Hazard (BASH) Plan. Seymour Johnson Air Force Base Goldsboro, North Carolina. February 2015.

U.S. Fish and Wildlife Service (USFWS) 2002. Potential for Red-cockaded Woodpecker (*Picoides borealis*) and Its Habitat on Seymour Johnson Air Force Base, North Carolina.

USFWS 2015a. Environmental Conservation Online System. Species by County Reports. Accessed: http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=37191 on 13 January 2016.

USFWS 2015b. Critical Habitat Portal. Accessed. http://ecos.fws.gov/crithab/ on 13 January 2016.

USFWS 2015c. Information for Planning and Conservation (IPaC). Accessed: https://ecos.fws.gov/ipac/project/MSRW7UORLFHTTFDCWU2CUT26NKY/resources on 13 January 2016

USFWS 2015d. Environmental Conservation Online System (ECOS) Species Profile for Red-Cockaded woodpecker (*Picoides borealis*). Accessed: https://ecos.fws.gov/tess_public/profile/speciesProfile.action?specode=B04F on 19 January 2016.

A.6.2.2 Seymour Johnson AFB USFWS Section 7 Consultation Response

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh ES Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

May 9, 2016

Mr. Hamid Kamalpour
United State Air Force, AFCEC/CZN
Building 171
2261 Hughes Ave., Ste. 155
Lackland AFB, TX 78236-9853

Dear Mr. Kamalpour:

The Fish and Wildlife Service (Service) has reviewed the March 31, 2016 letter and enclosures from Mr. Dennis Goodson, P.E., Seymour Johnson Air Force Base (SJAFB), regarding the proposed beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft on Seymour Johnson Air Force Base (SJAFB), Goldsboro, Wayne County, North Carolina. SJAFB has been proposed as one of four alternative locations for siting of the proposed MOB 3 beddown. Mr. Goodson's letter indicates that in the process of identifying biological resources that could be affected by the proposed action, the United States Air Force (Air Force) found that there are element occurrences for the federally endangered red-cockaded woodpecker (*Picoides borealis*; RCW) within Wayne County. Our comments are provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 USC 1531 et seq.).

Accommodation of the MOB 3 at SJAFB would involve basing of 12 KC-46A Pegasus aircraft on the installation in Wayne County, North Carolina. The proposed action would also include fulfilling facilities, infrastructure and manpower needs associated with MOB 3 at SJAFB to accomplish the mission. The Air Force plans to use as many existing facilities as possible, although some new facility construction would be necessary. Mr. Goodson's letter states that two new buildings would be constructed, several structures would be renovated and two would be demolished. All construction or ground disturbance proposed by this project would be conducted within the current base boundary and no wetland areas would be affected.

The addition of KC-46A operations at SJAFB would increase the overall amount of operations on the installation by 68 percent. Of the total number of annual KC-46A sorties, about five percent would take place between 10:00 PM and 7:00 AM (acoustic night period). SJAFB aircrews would conduct up to 1,774 off-station practice approaches on the Kinston Regional Jetport (Lenoir County). Other airfields would be used on an occasional basis.

The KC-46A would be operated in existing airspace, and the types of flight operations would be similar to the existing KC-135 tanker aircraft operations. KC-46A aircrews would use existing air refueling (AR) tracks and fuel jettison areas, if necessary. Flight activities involving refueling training would primarily occur in designated aerial refueling tracks. No new flight tracks are proposed for use.

The biological evaluation enclosed with Mr. Goodson's March 31, 2016 letter indicates that the Air Force has considered the proposed project's effects on the RCW. There are no known records for RCWs on SJAFB. The installation's 2015 Integrated Natural Resource Management Plan (INRMP) points out that there are pine trees that may be old enough to be used by RCWs for cavity excavation. However, any potential foraging habitat present is sparse and fragmented.

Mr. Goodson's March 31, 2016 letter also points out that the proposed basing of the KC-46A at SJAFB would not require the removal of mature pine forest on the installation. Based on the sparse distribution of the small amounts of pine and mixed pine-hardwood forest on the installation, the Air Force has concluded that the proposed action will have no effect on the RCW.

Based on a review of the information provided, the Service concurs with the Air Force's determination that the proposed action, siting the KC-46A MOB 3 at SJAFB, will have no effect on the red-cockaded woodpecker or any other federally listed species and no federally designated critical habitat for protected species occurs on or in the vicinity of the project.

We believe that the requirements of section 7(a)(2) of the Act have been satisfied. We remind you that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

If you have any questions regarding this matter, please contact Mr. John Hammond at 919-856-4520 (Ext. 28). Thank you for your continued cooperation with our agency.

Sincerely,

for Pete Benjamin
Field Supervisor

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A.6.3 Tinker AFB Natural Resources Consultation Letters

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

17 March 2016

Mr. Tim Taylor
72 ABW/CEIEC
7535 5th Street
Tinker AFB, OK 73145

Mr. Ken Collins, T&E Branch Chief
U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428

Dear Mr. Collins,

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. Tinker Air Force Base (AFB), Oklahoma has been proposed as one of four alternative locations for this mission.

The MOB 3 mission involves the basing of 12 KC-46A aircraft. In addition to the aircraft, facilities, infrastructure and manpower would also be required to support the mission. For this beddown, the USAF intends to use as many existing facilities as possible, but recognizes that some new facilities would be required. Two new facilities would be constructed, several facilities would be renovated and five facilities would be demolished. In addition, the MOB 3 mission would require expansion of the ramp and shoulders along the existing aircraft parking ramp. All construction or ground disturbance proposed by this project would be conducted within the current base boundary. There is a potential that the proposed parking ramp expansion could have wetland impacts.

The addition of KC-46A operations would increase the total number of operations conducted at Tinker AFB by 168 percent. Approximately eleven percent of the total annual KC-46A sorties would be flown during acoustic night (between 10:00 PM and 7:00 AM). Practice approaches would be conducted by KC-46A aircrews at airfields other than Tinker AFB on an occasional basis. The KC-46A would be operated in existing airspace, and the types of flight operations would be similar to the existing KC-135 aircraft operations. KC-46A aircrews would use existing air refueling (AR) tracks and fuel jettison areas, if necessary. Flight activities involving refueling training would primarily occur in designated aerial refueling tracks. No new flight tracks are proposed for use.

The ROI for biological resources is defined as the land area (habitats) and airspace that could potentially be affected by infrastructure and construction projects, as well as airspace operations. Tinker AFB carefully reviewed the U.S. Fish and Wildlife Service's (USFWS's) Information for Planning and Conservation (IPaC) online system on January 13, 2016, to identify current USFWS trust resources, such as migratory birds, species proposed or listed under the Endangered Species

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

Act (ESA), inter-jurisdiction fishes, wetlands, and USFWS National Wildlife Refuge System lands with potential to be affected by the Proposed Action. A submission for Oklahoma County, Oklahoma was completed to cover the area within the Region of Influence for biological resources:

> **Oklahoma County, Oklahoma IPaC Trust Resource Report** identified 2 endangered bird species, the least tern (*Sterna antillarum*) and whooping crane (*Grus americana*), 2 threatened bird species, the piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*);1 threatened fish species, the Arkansas river shiner (*Notropis girardi*); 28 migratory birds, and several wetlands. No critical habitat or Wildlife Refugees were identified within the project location. Please see Attachment 2 for a full copy of the Trust Resource Report.

Additionally, special status species lists by county were obtained via the USFWS's Environmental Conservation Online System (ECOS) to identify species with the potential to occur within Oklahoma County, Oklahoma. Attachment 3, Table 3-1, lists these species and their habitats.

In accordance with Section 7 of the ESA (16 U.S.C. §§ 1531–1544, as amended), the Sikes Act (16 U.S.C. 670a-670o, 74 Stat. 1052), and as part of the U.S. Air Force's Environmental Impact Analysis Process (EIAP), we request your input in identifying any additional species of concern, general or specific issues, or areas of concern you feel should be addressed in the EIS. The Air Force requests your agency's concurrence with the species list and effects determinations contained in Table 3-1. If your agency has any new or additional information other than that contained in Table 3-1, we request that you please provide comment by April 26, 2016.

Please provide your comments directly to Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN; Building 171, 2261 Hughes Ave, Ste 155, Lackland AFB, TX 78236-9853 or to the project website at www.kc-46A-beddown.com. Thank you for your assistance in this matter.

Sincerely,

CATHY R. SCHEIRMAN, P.E.
Base Civil Engineer

Attachments:
1. Tinker AFB Location Map
2. IPaC Trust Resource Report for Oklahoma County, Oklahoma
3. Table 3-1, Potential for Impacts from the Proposed Action to USFWS Special Status Species Known to or Believed to Occur in Oklahoma County, Oklahoma

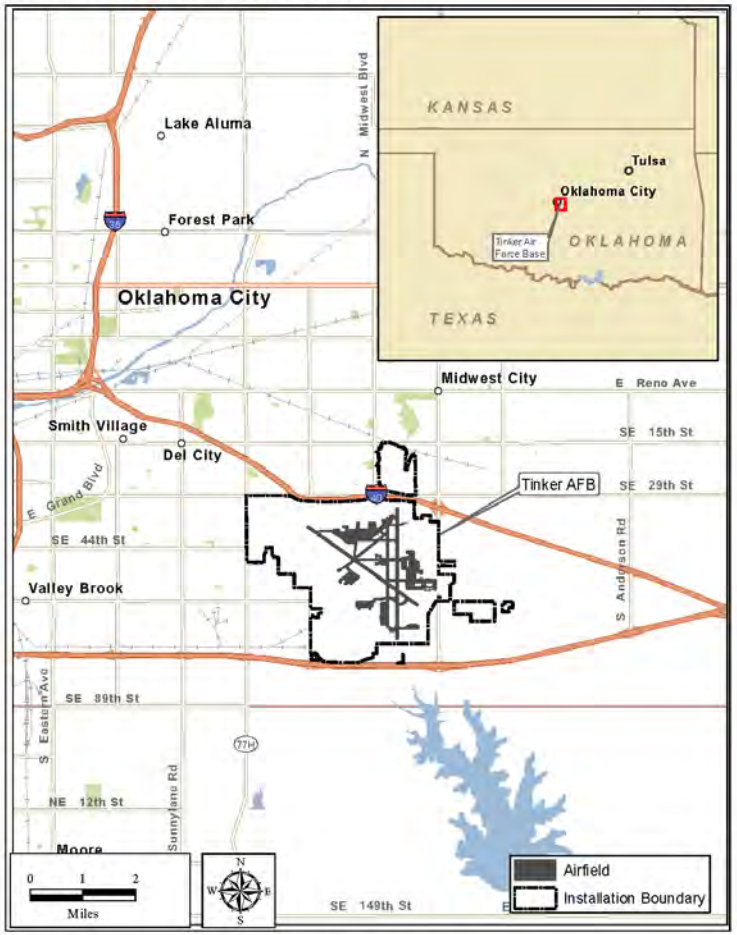
cc: Hamid Kamalpour, AFCEC

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

ATTACHMENT 1. TINKER AFB LOCATION MAP

KC-46A Third Main Operating Base (MOB 3) Beddown EIS



Regional Map of Tinker AFB

March 2016

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

ATTACHMENT 2. IPaC TRUST RESOURCE REPORT

U.S. Fish & Wildlife Service

Tinker

IPaC Trust Resource Report

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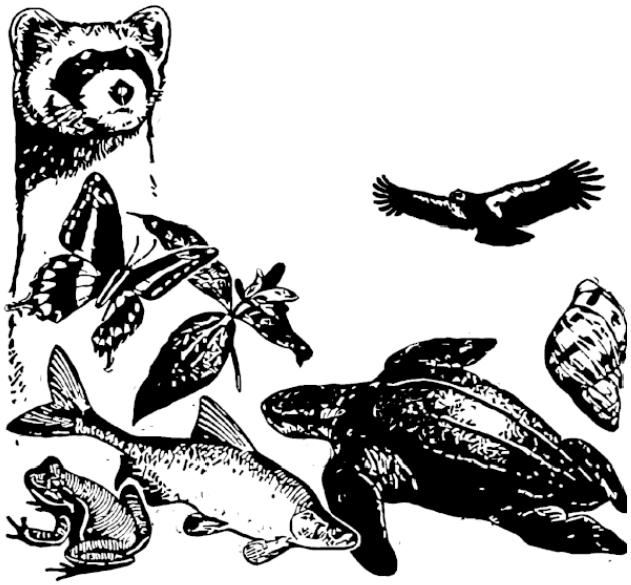

IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

US Fish & Wildlife Service

IPaC Trust Resource Report

NAME
Tinker

LOCATION
Oklahoma County, Oklahoma

DESCRIPTION
MOB 3

IPAC LINK
https://ecos.fws.gov/ipac/project/H2O4E-JL5CJ-FLFFG-IEP4S-IIUXEQ

U.S. Fish & Wildlife Contact Information

Trust resources in this location are managed by:

Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

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IPaC Trust Resource Report

Endangered Species

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For project evaluations that require FWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from the Regulatory Documents section in IPaC.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Birds

Least Tern Sterna antillarum — Endangered

THIS SPECIES ONLY NEEDS TO BE CONSIDERED IF ANY OF THE FOLLOWING CONDITIONS APPLY:
Towers (i.e. radio, television, cellular, microwave, meterological)
Wind Turbines and Wind Farms

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B07N

Piping Plover Charadrius melodus — Threatened

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B079

Red Knot Calidris canutus rufa — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0DM

Whooping Crane Grus americana — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B003

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

Fishes

Arkansas River Shiner Notropis girardi — Threatened

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E05X

Critical Habitats

There are no critical habitats in this location

IPaC Trust Resource Report

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/akn-histogram-tools.php

The following species of migratory birds could potentially be affected by activities in this location:

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Bell's Vireo Vireo bellii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JX

Burrowing Owl Athene cunicularia — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0NC

Cassin's Sparrow Aimophila cassinii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0K2

Chestnut-collared Longspur Calcarius ornatus — Bird of conservation concern
Season: Wintering

Dickcissel Spiza americana — Bird of conservation concern
Season: Breeding

Fox Sparrow Passerella iliaca — Bird of conservation concern
Season: Wintering

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

Golden Eagle Aquila chrysaetos — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0DV

Harris's Sparrow Zonotrichia querula — Bird of conservation concern
Season: Wintering

Hudsonian Godwit Limosa haemastica — Bird of conservation concern
Season: Migrating

Lark Bunting Calamospiza melanocorys — Bird of conservation concern
Season: Breeding

Le Conte's Sparrow Ammodramus leconteii — Bird of conservation concern
Season: Wintering

Least Bittern Ixobrychus exilis — Bird of conservation concern
Season: Breeding

Lewis's Woodpecker Melanerpes lewis — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HQ

Little Blue Heron Egretta caerulea — Bird of conservation concern
Season: Breeding

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY

Long-billed Curlew Numenius americanus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B08S

Mississippi Kite Ictinia mississippiensis — Bird of conservation concern
Season: Breeding

Orchard Oriole Icterus spurius — Bird of conservation concern
Season: Breeding

Painted Bunting Passerina ciris — Bird of conservation concern
Season: Breeding

Prothonotary Warbler Protonotaria citrea — Bird of conservation concern
Season: Breeding

Red-headed Woodpecker Melanerpes erythrocephalus — Bird of conservation concern
Year-round

Rufous-crowned Sparrow Aimophila ruficeps — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MX

Rusty Blackbird Euphagus carolinus — Bird of conservation concern
Season: Wintering

Scissor-tailed Flycatcher Tyrannus forficatus — Bird of conservation concern
Season: Breeding

Short-eared Owl Asio flammeus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

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IPaC Trust Resource Report

Sprague's Pipit Anthus spragueii — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0GD

Swainson's Hawk Buteo swainsoni — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B07Q

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A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuges in this location

IPaC Trust Resource Report

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Wetland data is unavailable at this time.

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
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ATTACHMENT 3. POTENTIAL FOR IMPACTS FROM THE PROPOSED ACTION TO USFWS SPECIAL STATUS SPECIES KNOWN TO OR BELIEVED TO OCCUR IN OKLAHOMA COUNTY, OKLAHOMA

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

Attachment 3

Table 3-1. Potential for Impacts from the Proposed Action to USFWS Species Known to or Believed to Occur in Oklahoma County, Oklahoma

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Tinker AFB?	Potential for Impacts from the Proposed Action/ Effects determination
Birds					
Whooping Crane	*Grus americana*	Endangered	May pass through Oklahoma each spring and fall during migration. Typically found in shallow wetlands, marshes, the margins of ponds and lakes, sandbars and shorelines of shallow rivers, wet prairies and crop fields near wetlands.	No	No. Suitable habitat for whooping crane is not location on Tinker AFB. Tinker AFB will continue to operate in compliance with the BASH plan which provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes (Tinker AFB 2014).
American Peregrine Falcon	*Falco peregrinus anatum*	Recovery	Global in distribution. General ecosystem types in which peregrine falcon occurs include arctic tundra, tropical ecosystems, deserts, wetlands, grasslands, mountainous regions, continental forests, maritime islands, and urban areas. In Texas and Oklahoma, peregrine falcons are resident in sand shinnery oak communities.	No	No. Tinker AFB will continue to operate in compliance with the BASH plan which provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes (Tinker AFB 2014).
Piping Plover	*Charadrius melodus*	Threatened	Found on mudflats, sandy beaches and shallow wetlands with sparse vegetation. May be found along the margins of lakes and large rivers where there is exposed (bare) sand or mud. There are two nesting records for the Piping Plover in the Oklahoma panhandle, but this species is normally a spring and fall migrant through the state.	Yes*	No. Suitable habitat for piping plover is not location on Tinker AFB. Tinker AFB will continue to operate in compliance with the BASH plan which provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes (Tinker AFB 2014).
Least Tern	*Sterna antillarum*	Endangered	Rare species in Oklahoma, but may be found during the late spring and summer breeding season (mid-May through late August) along portions of the Arkansas, Cimarron, Canadian and Red rivers. Lives along large rivers and may sometimes be found	No	No. Tinker AFB will continue to operate in compliance with the BASH plan which provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes

A.6.3.1 Tinker AFB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Tinker AFB?	Potential for Impacts from the Proposed Action' Effects determination
			hunting fish in shallow wetlands and the margins of ponds and lakes. Require bare sand and gravel for nesting and typically nest in small colonies consisting of two to 20 pairs along large rivers on sand bars and scoured beach		(Tinker AFB 2014)
Red Knot	*Calidris canutus rufa*	Threatened	Rare species in Oklahoma but may occur as a stopover migrant. Red knots use inland saline lakes as stopover habitat in the Northern Great Plains. May also use manmade freshwater habitats along inland migration routes.	No	No: Tinker AFB will continue to operate in compliance with the BASH plan which provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes (Tinker AFB 2014)
Fish					
Arkansas River Shiner	*Notropis girardi*	Threatened	Inhabits the shallow braided channels of wide sandy prairie rivers in the Arkansas River system. Schools of shiners often gather on the lee side of sandbars and ridges of sand in the river channel. In Oklahoma, nearly all of the remaining Arkansas River Shiners occur in the Canadian River.	No	No: Habitat for Arkansas river shiner does not occur on Base. No effects to the Arkansas river shiner will occur as a result of the proposed action.

*One piping plover has been documented at Tinker AFB, resulting from a bird aircraft strike. USFWS was contacted and the plover sent to verify identification. No other piping plovers have been observed resting or foraging on Tinker AFB property.
Source: ODWC 2011a,b,c,d; Tinker AFB 2014, 2015; USFWS 2014, 2015a, 2015b, 2015c; USFS 2016

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

References:

Oklahoma Department of Wildlife Conservation (ODWC) 2011a. Whooping Crane (*Grus americana*). Accessed: http://www.wildlifedepartment.com/wildlifemgmt/endangered/crane.htm on 21 January 2016

ODWC 2011b. Piping Plover (*Charadrius melodus*). Accessed: http://www.wildlifedepartment.com/wildlifemgmt/endangered/plover.htm on 21 January 2016

ODWC 2011c. Interior Least Tern (*Sterna antillarum*). Accessed: http://www.wildlifedepartment.com/wildlifemgmt/endangered/least_tern.htm on 21 January 2016.

ODWC 2011d. Arkansas River Shiner (*Notropis girardi*). Accessed: http://www.wildlifedepartment.com/wildlifemgmt/endangered/river_shiner.htm on 21 January 2016.

Tinker Air Force Base (AFB) 2014. Tinker AFB. Tinker AFB Plan 91-212, Bird/Wildlife-Aircraft Strike Hazard Plan (TAFB Plan 91-212). February 2014.

Tinker AFB 2015. Draft Integrated Natural Resources Management Plan (INRMP). Environmental Management Division, 72 ABW/CEVOE, Tinker Air Force Base, Oklahoma.

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U.S. Fish and Wildlife Service (USFWS) 2014. Rufa Red Knot Background Information and Threat Assessment. Supplement to Endangered and Threatened Wildlife and Plants; Final Threatened Status for the Rufa Red Knot (*Calidris canutus rufa*). Docket No. FWS–R5–ES–2013–0097; RIN AY17. Accessed: http://www.fws.gov/northeast/redknot/pdf/20141125_REKN_FL_supplemental_doc_FINAL.pdf on 21 January 2016.

USFWS 2015a. Environmental Conservation Online System. Species by County Reports. Accessed: http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=40109 on 13 January 2016.

USFWS 2015b. Critical Habitat Portal. Accessed: http://ecos.fws.gov/crithab/ on 13 January 2016.

USFWS 2015c. Information for Planning and Conservation (IPaC). Accessed: https://ecos.fws.gov/ipac/project/OG7U256FZJBUTPVM6UTXGACTRA/resources on 13 January 2016

A.6.3.2 Tinker AFB USFWS Section 7 Consultation Response

KC-46A MOB 3 Beddown EIS
Website Comment

Base	Commenter	Date Submitted	Comment
Tinker	Ken Collins	5/5/2016	The Oklahoma Ecological Services Field Office (OKESFO) received the March 17, 2016, request for information and concurrence with your species list. We have the following comments to offer. The OKESFO agrees that the list of species provided in the March 17, 2016, request is accurate and concur with the list, as provided. However, we cannot concur with your effects determination for the piping plover. Although piping plover habitat is unlikely to exist at Tinker Air Force Base, ongoing operations at Tinker have resulted in the documented take of a single piping plover due to an aircraft strike. Considering the proposed operation would result in an increase in the total number of flight operations at Tinker Air Force Base by 168 percent, the potential for additional aircraft strikes would not decrease under the proposed action. Consequently we believe the potential exists for additional take of piping plovers. We also have concerns with respect to other federally-listed migratory birds but do not have evidence that take may occur. Second, the March 17, 2016, letter states that wetlands may potentially be impacted by the proposed action, specifically the proposed parking ramp expansion. We request that the draft Environmental Impact Statement include a thorough discussion of the potential impacts to existing wetlands and any measures being implemented to minimize or offset the anticipated wetland impacts.

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

5 Aug 2016

Mr. Ken Collins, T&E Branch Chief
U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428

Mr. Laurence Levesque
U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428

RE: Biological Assessment (BA) for KC-46A Third Main Operating Base (MOB 3) Beddown Environmental Impact Statement (EIS), Tinker Air Force Base (AFB), Oklahoma

Dear Mr. Collins and Mr. Levesque,

In accordance with Section 7 of the Endangered Species Act (ESA) (16 U.S.C. §§ 1531–1544, as amended), the Sikes Act (16 U.S.C. 670a-670o, 74 Stat. 1052), and as part of the U.S. Air Force's Environmental Impact Analysis Process (EIAP), the United States Air Force (Air Force) is preparing a Biological Assessment (BA) to initiate formal consultation under Section 7(a)(2) of the ESA. The BA will facilitate the regulatory review of potential impacts to threatened and endangered species from the proposed KC-46A Third Main Operating Base (MOB 3) Beddown mission at Tinker Air Force Base (AFB), Oklahoma. The Region of Influence (ROI) for biological resources is defined as the land area (habitats) and airspace that could potentially be affected by infrastructure and construction projects, as well as local airspace affected by aircraft operations resulting from the proposed action.

Tinker AFB has carefully reviewed the U.S. Fish and Wildlife Service's (USFWS's) Information for Planning and Conservation (IPaC) online tool and the special status species lists by county (via the USFWS's Environmental Conservation Online System [ECOS]) to identify species with the potential to occur within Oklahoma County, Oklahoma. The following special status species have been identified for analysis in the BA: least tern, interior population (*Sterna antillarum*) – endangered; whooping crane (*Grus americana*) – endangered; piping plover (*Charadrius melodus*) – threatened; and red knot (*Calidris canutus rufa*) – threatened.

The BA will be prepared using readily available information such as the Oklahoma Department of Wildlife Conservation's (ODWC) threatened, endangered, and rare species profiles; USFWS ECOS species accounts; the installation Integrated Natural Resource Management Plan (INRMP); and migratory avian species inventory reports prepared by the Virginia Polytechnic

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

Institute and State University. Tinker AFB natural resource biologists currently use the following published resources to assist in identifying and managing endangered, threatened, candidate, rare, and other sensitive fauna species:

- U.S. Fish and Wildlife Service IPaC Trust Resource Report (2016)—Endangered and Threatened Species and Birds of Conservation Concern *https://ecos.fws.gov/ipac/*
- Oklahoma Natural Heritage Inventory Tracking List of Rare Oklahoma Vertebrates *http://www.oknaturalheritage.ou.edu/*
- NatureServe (2011) *http://www.natureserve.org/explorer/servlet/NatureServe?init=Species*
- Oklahoma Department of Wildlife Conservation (ODWC) Oklahoma Species List: Federally-listed, Proposed, Candidate, and Species Under Review (2015) *http://www.wildlifedepartment.com/wildlifemgmt/endangeredspecies.htm*

We formally request any additional species survey reports, GIS population accounts, or habitat surveys the USFWS Oklahoma Ecological Services Field Office may have for the least tern, whooping crane, piping plover, and red knot so that we may prepare our analysis with the most current and relevant species accounts/information to date. (Please see Attachment 1 for the current Data Resources/Reference List).

Additionally, the Air Force requests your input in identifying any additional issues, or areas of concern you feel should be addressed in the BA. We request that you please provide data or comment no later than 12 Aug 2016.

Questions may be directed to Mr. John Krupovage, (405) 739-7074 or john.krupovage@us.af.mil. Please provide your comments directly to Mr. John Krupovage, Civil Engineering Directorate, Building 400, 7535 5th Street, Tinker AFB, OK 73145-9010 and to the project website at www.kc-46A-beddown.com. Thank you for your assistance in this matter.

Sincerely,

for CATHY R. SCHEIRMAN, P.E.

BRAD C. BEAM, PE
Deputy Base Civil Engineer

Attachments:
1. Data Resources/ Reference List

cc:Mr. Hamid Kamalpour, AFCEC
cc:Mr. Tim Taylor, 72 ABW/CEIEC

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

DEPARTMENT OF THE AIR FORCE
72ND AIR BASE WING

ATTACHMENT 1

Data Resources/ Reference List
Oklahoma Department of Wildlife Conservation (ODWC) 2011a. Whooping Crane (*Grus americana*). Accessed: http://www.wildlifedepartment.com/wildlifemgmt/endangered/crane.htm
ODWC 2011b. Piping Plover (*Charadrius melodus*). Accessed: http://www.wildlifedepartment.com/wildlifemgmt/endangered/plover.htm
ODWC 2011c. Interior Least Tern (*Sterna antillarum*). Accessed: http://www.wildlifedepartment.com/wildlifemgmt/endangered/least_tern.htm
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St. Germain, Michael J. 2010. Inventory of Avian Species on Tinker Air Force Base (AFB) Oklahoma City, Oklahoma. Conservation Management Institute, Virginia Polytechnic Institute and State University, College of Natural Resources and Environment, Blacksburg, Virginia.
Tinker AFB 2015. Draft Integrated Natural Resources Management Plan (INRMP). Environmental Management Division, 72 ABW/CEIEC. Tinker Air Force Base, Oklahoma. (Note: See Chapter 2 for faunal resources descriptions; Appendix D for TAFB faunal list; and Appendix L for USDA Wildlife Services Cooperative Agreement)
Tinker AFB 2015. TAFB Plan 91-212, Bird/Wildlife-Aircraft Strike Hazard Plan
U.S. Forest Service (USFS) 2016. American Peregrine Falcon (*Falco peregrinus*). Accessed: http://www.fs.fed.us/database/feis/animals/bird/fape/all.html
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USFWS 2015c. Information for Planning and Conservation (IPaC). Accessed: https://ecos.fws.gov/ipac/project/OG7U256FZJBULPVM6ULXGACIRA/resources
USFWS 2015d. Environmental Conservation Online System Species Profile for Piping Plover (*Charadrius melodus*) Accessed: http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B079
USFWS 2015e. Environmental Conservation Online System Species Profile for Least Tern (*Sterna antillarum*). Accessed: http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B07N
USFWS 2015f. Environmental Conservation Online System Species Profile for Red Knot (*Calidris canutus rufa*). Accessed: http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B0DM
USFWS 2015g. Environmental Conservation Online System Species Profile for Arkansas River Shiner (*Notropis girardi*). Accessed: http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=E05X
USFWS 2015h. Environmental Conservation Online System Species Profile for Whooping crane (*Grus americana*). Accessed: http://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B003
U.S. Geological Service (USGS) Patuxent Wildlife Research Center. North American Breeding Bird Survey Routes. http://sagemap.wr.usgs.gov/FTP/unitedstates/NATLAS/birdm.htm

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

September 16, 2016

Mr. Ken Collins, T&E Branch Chief
U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428

Mr. Laurence Levesque
U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428

RE: Biological Evaluation (BE) for Air Operations at Tinker Air Force Base (AFB), Oklahoma, Including the Proposed KC-46A Third Main Operating Base (MOB 3) Beddown Mission

Dear Mr. Collins and Mr. Levesque,

In accordance with Section 7 of the Endangered Species Act (ESA) (16 U.S.C. §§ 1531–1544), the Sikes Act (16 U.S.C. 670a-670o), and the United States Air Force (Air Force) Environmental Impact Analysis Process (EIAP), the Air Force prepared the attached Biological Evaluation (BE) to assess the potential effects of current air operations and proposed future air operations at Tinker AFB, Oklahoma on avian species protected under the ESA. The Region of Influence used for biological resources evaluation is defined as the land area (habitats) and airspace that could potentially be affected by aircraft operations at Tinker AFB. Tinker AFB is currently being evaluated as one of four installations that could receive additional aircraft in the currently ongoing KC-46A Third Main Operating Base (MOB 3) Beddown Environmental Impact Statement (EIS) process. In accordance with our assessment, we have concluded that both the current air operations and proposed future operations result in a *may affect, is not likely to adversely affect* determination. Therefore, we are not seeking to initiate formal consultation. We seek your concurrence on this determination.

The BE was prepared using readily available information from the United States Fish and Wildlife Service (USFWS) Environmental Conservation ECOS species accounts, the Oklahoma Department of Wildlife Conservation's threatened, endangered, and rare species profiles, the Tinker AFB Integrated Natural Resource Management Plan (INRMP), and the avian species inventory reports prepared by the Virginia Polytechnic Institute and State University. Information from the Cornell Lab of Ornithology and Audubon Society on bird species life history and habitat preferences was also consulted. Based upon this information, the following special status species

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

were evaluated: Interior Least Tern (*Sterna antillarum*) – endangered, Whooping Crane (*Grus americana*) – endangered, Northern Great Plains Piping Plover (*Charadrius melodus*) – threatened, and Rufa Red Knot (*Calidris canutus rufa*) – threatened.

In addition to assessment of current aircraft operations at Tinker AFB, the BE assessed the potential impacts to threatened and endangered species and their habitat from the proposed bed down of additional aircraft currently being evaluated in the KC-46A Third Main Operating Base (MOB 3) Beddown Environmental Impact Statement (EIS). In that EIS, alternative installations are being evaluated for the bed down of new KC-46A aerial refueling aircraft. Note that the draft EIS does not indicate Tinker AFB as the preferred alternative (location) for KC-46A bed down. Rather, Seymour Johnson AFB in North Carolina is currently identified as the preferred alternative.

Past correspondence with the U.S. Fish and Wildlife Service Oklahoma Ecological Services Field Office includes the original March 17, 2016 letter announcing the Air Force's intent to prepare an EIS to analyze the effects of the proposed KC-46A MOB 3 mission bed down. On May 5, 2016 the USFWS Oklahoma Field Office submitted a comment on the EIS draft via the project website. On August 1, 2016, a teleconference occurred between the Air Force and your office regarding the DC-46A bed down, followed by a letter to your office dated August 5, 2016 in which Tinker AFB (72nd Air Base Wing) requested ESA Section 7 consultation.

Based on the information provided in the attached BE, the USAF requests written concurrence from the USFWS that the current air operations mission and the potential implementation of the KC-46A MOB 3 mission at Tinker AFB results in a *may affect, is not likely to adversely affect* determination for the Northern Great Plains Piping Plover, Interior Least Tern, Rufa Red Knot and Whooping Crane. Please address correspondence to Mr. Kevin Porteck, United States Air Force, AFCEC/CZTQ; 2261 Hughes Ave, Suite 155, Lackland AFB, TX 78236-9853, or electronically to the project website at www.kc-46A-beddown.com. For technical questions on this Biological Evaluation, please contact Mr. John Krupovage, (405) 739-7074, john.krupovage@us.af.mil.

Sincerely,

Kevin G. Porteck

KEVIN G PORTECK, GS-14, DAF
Natural Resources Specialist

Attachment:
Biological Evaluation for Air Operations, Tinker AFB

cc: Mr. John Krupovage, 72 ABW/CEIE

Biological Evaluation for Air Operations
Tinker Air Force Base, Oklahoma

September 16, 2016

Prepared for: **72nd Air Base Wing, Tinker Air Force Base**

Prepared by: **Air Force Civil Engineer Center**

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

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LIST OF ABBREVIATIONS / ACRONYMS

AFB	Air Force Base
AFRC	Air Force Reserve Command
AMC	Air Mobility Command
ANWR	Aransas National Wildlife Refuge
AOA	Air Operations Area
BE	Biological Evaluation
BO	Biological Opinion
BASH	Bird Aircraft Strike Hazard
DoD	Department of Defense
EIS	Environmental Impact Statement
ESA	Endangered Species Act
GI	Green Infrastructure
ILT	Interior Least Tern
INRMP	Integrated Natural Resources Management Plan
NRCS	Natural Resource Conservation Service
OC-ALC	Oklahoma City Air Logistics Complex
OKC	Oklahoma City
USAF	U.S. Air Force
USDA	U.S. Department of Agriculture
USDA-WS	U.S. Department of Agriculture – Wildlife Services
USFWS	U.S. Fish and Wildlife Service
WHIP	Wildlife Habitat Incentive Program

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

1.0 BACKGROUND/HISTORY

The primary purpose of this Biological Evaluation (BE) is to address the effect of the ongoing Tinker Air Force Base (AFB) flying and aircraft maintenance mission on species listed as endangered or threatened in accordance with the Endangered Species Act (ESA). In addition, this BE will evaluate the effect of a proposed action being evaluated in an Environmental Impact Statement (EIS) that will consider Tinker AFB as one of four alternative installations being considered for the beddown of a KC-46A MOB 3 mission for aerial refueling aircraft. Installations being considered in the EIS as reasonable alternatives for basing this new mission are: Seymour Johnson AFB, North Carolina, Grissom Air Reserve Base, Indiana, Tinker AFB, Oklahoma, and Westover Air Reserve Base, Massachusetts. Seymour Johnson AFB in North Carolina is currently identified in the draft EIS as the preferred alternative.

The federal action agency is Tinker AFB, which is under the command of the 72nd Air Base Wing (72 ABW). Tinker AFB includes the Oklahoma City Air Logistics Complex (OC-ALC) and other tenant units that support Air Force mission activities worldwide. Tinker AFB is located in the "Heart of Oklahoma," just 5 miles from downtown Oklahoma City (OKC). Tinker AFB is considered to be a vital part of the OKC metro area economy and culture. See Figure 1-1 below for a regional map of Tinker AFB and OKC vicinity.

The Tinker AFB flying and aircraft maintenance mission is one of the federal activities with a potential to affect federally listed species either directly by aircraft strikes, or by degradation of habitat. Under the requirements of Section 7 (a)(2) of the ESA, federal agencies are required, in consultation with, and the assistance of the Secretary of the Interior, to insure that any action, authorized, funded or carried out by such agency, is not likely to jeopardize the continued existence of any endangered or threatened species, or result in destruction or adverse modification of the habitat of such species. Details on the ongoing Tinker AFB flying and maintenance mission, and a proposed action to increase air operations, are provided herein.

Tinker's vital national defense mission is to provide logistics support to Air Force aerospace weapon systems, equipment, and commodity items, and this mission encompasses a myriad of responsibilities. OC-ALC performs full depot level maintenance (i.e., high level overhaul maintenance such as engine removal and rebuild, painting, etc. as opposed to routine maintenance) on more than 120 aircraft annually. It also organizes, directs, and controls total life-cycle management of over 1,100 aircraft. The Complex also manages the SRAM, SRAM II, ACLM, and GLCM missile systems, as well as the Air Force's Harpoon missile. The OC-ALC annually overhauls and maintains more than 3,000 major jet engine modules from 11 major commands as well as those from the Army, Navy, and numerous foreign countries. In addition to aircraft/missile maintenance, overhaul, and repair, Tinker AFB provides deployable communications, computer systems, navigational aids, and air traffic control services worldwide for Air Force, Department of Defense (DoD), and other U.S. commitments. See Figure 2.2 for locations of some of the main industrial buildings and roads at Tinker AFB.

In accordance with the Sikes Act (16 U.S.C. 670), Tinker AFB develops, maintains, and implements an Integrated Natural Resources Management Plan (INRMP) in collaboration with the United States Fish and Wildlife Service (USFWS) Ecological Services Field Office and the Oklahoma Department of Wildlife Conservation. The Tinker AFB INRMP provides goals and objectives for ecosystem management, to include objectives for the conservation of birds and other wildlife, and actions to mitigate conflicts between wildlife and aircraft operations. The USFWS last reviewed, approved, and signed the

Tinker AFB Integrated Natural Resources Management Plan on February 28, 2013, indicating concurrence with the installation's wildlife management practices. The Oklahoma Department of Wildlife Conservation last approved the INRMP by signature on October 18, 2013.

Tinker AFB maintains an active Bird/Wildlife Aircraft Strike Hazard (BASH) reduction program for the purpose of minimizing wildlife strikes by aircraft. In accordance with Air Force policy, BASH program managers report all bird strike occurrences by species, to include utilizing the services of Smithsonian Institute scientists to identify remains when the species is not obvious. On May 11 2009, the remains of a federally threatened Piping Plover that was struck and killed by an unknown aircraft were collected on the main runway, and was reported to the U.S. Fish and Wildlife Service (USFWS) and Oklahoma Department of Wildlife Conservation.

This BE, prepared by the Air Force Civil Engineer Center on behalf of the 72nd Air Base Wing, evaluates the Tinker AFB and OC-ALC current flying and maintenance mission, as well as the proposed beddown of a new KC-46A MOB 3 mission, for compliance with the requirements of Section 7(a)(2) of the ESA. Section 7 assures that, through consultation with the USFWS, a federal proponent's actions do not jeopardize the continued existence of any threatened, endangered or proposed species, or result in the destruction or adverse modification of critical habitat.

Figure 1-1. Regional Location of Tinker AFB

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

2.0 DESCRIPTION OF THE ACTION & ACTION AREA

Tinker AFB has been identified as one of four reasonable alternatives in a draft Environmental Impact Statement for the KC-46A MOB 3 mission. However, Seymour Johnson AFB in North Carolina is the preferred alternative identified in the EIS. The U.S. Air Force (USAF) is currently evaluating comments on the draft EIS in regards to the preferred alternative and the three reasonable alternative installations identified. This BE addresses both Tinker's on-going mission and the proposed KC-46A MOB 3 addition to the mission footprint if Tinker AFB were to replace Seymour Johnson AFB as the preferred alternative.

Tinker AFB's current flying and maintenance mission includes:

- An annual air traffic control traffic count is over 32,000 aircraft operations (takeoffs/landings/practice approaches), with annual ground vehicle traffic on the airfield at approximately 20,000 vehicles.
- Depot level maintenance (i.e., high level overhaul maintenance such as engine removal and rebuild, painting, etc. as opposed to routine maintenance) on more than 120 aircraft annually.
- Total life-cycle management of over 1,100 aircraft.
- Management of the SRAM, SRAM II, ACLM, and GLCM missile systems, as well as the Air Force's Harpoon missile.
- Overhaul and maintenance of more than 3,000 major jet engine modules from 11 Air Force major commands as well as engine modules from the Army, Navy, and numerous foreign countries.
- Management of deployable communications, computer systems, navigational aids, and air traffic control services worldwide for Air Force, the DoD, and other U.S. commitments.

Proposed Action: KC-46A MOB 3 Beddown Specifics

This section details the actions necessary at Tinker AFB, if selected, for the basing of the KC-46A MOB 3 mission. If Tinker AFB were to be selected for the proposed KC-46A MOB 3 mission, the eight KC-135 aircraft would be replaced by 12 KC46A tankers, resulting in an estimated 4,041 additional airfield operations per year on the runway. The increase would be attributed to an increase to 6,440 KC-46A tanker operations versus the current volume of 2,399 KC-135 tanker operations. The USAF determined that Tinker AFB's infrastructure and base resources could accommodate the new requirements for a KC-46A MOB 3 mission within the constraints set by the alternative narrowing process. Information about the existing KC-135 aircraft and the proposed new KC-46A aircraft are provided below.

The KC-135 Stratotanker currently provides the core aerial refueling capability for the USAF, and has excelled in this role for more than 50 years. This unique asset enhances the Air Force's capability to accomplish its primary mission of global reach. It also provides aerial refueling support to Air Force, Navy, Marine Corps and allied nation aircraft. The KC-135 is also capable of transporting litter and ambulatory patients using patient support pallets during aeromedical evacuations.

The KC-46A Pegasus is the first phase of a 3-phase effort to replace the USAF's aging KC-135 tanker fleet. With more refueling capacity and enhanced capabilities, improved efficiency and increased capabilities for cargo and aeromedical evacuation, the KC-46A will provide aerial refueling support to the Air Force, Navy, Marine Corps as well as allied nation coalition force aircraft.

Facilities and Infrastructure

Figure 2.1 provides an overview of Tinker AFB facilities. Tinker AFB has the basic physical real estate and infrastructure to beddown the KC-46A MOB 3 mission; however, certain projects are required to support the KC-46A MOB 3 beddown at Tinker AFB. A KC-46A aircraft mission beddown would require demolition and renovation of existing facilities, airfield ramp space, and aircraft hangars currently utilized for the day-to-day KC-135 missions. New construction would be limited to the existing development footprint of the aircraft maintenance infrastructure. See Table 2.1 below for details on Facilities and Infrastructure Projects that would occur if the proposed KC-46A MOB 3 Mission were to be placed at Tinker AFB.

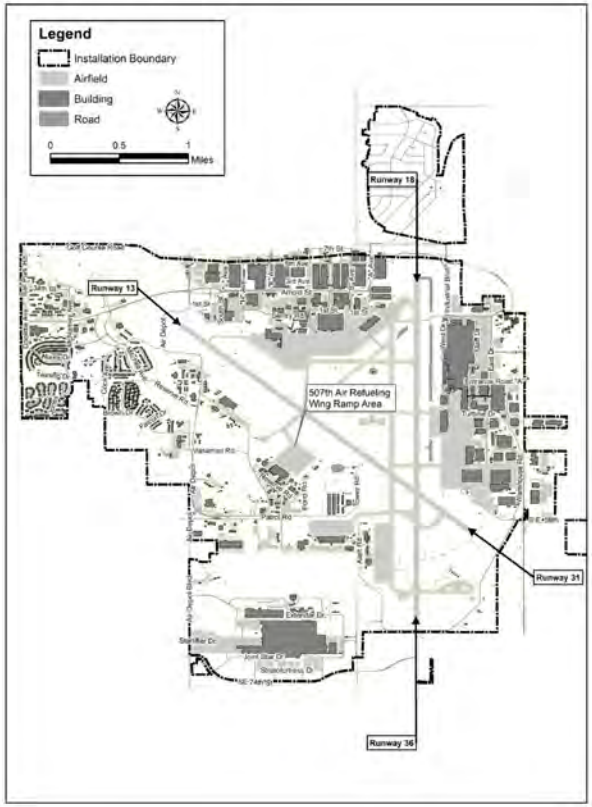
If the KC-46A MOB 3 Mission were to be located at Tinker AFB (Note: Seymour Johnson AFB is currently the preferred alternative), two new facilities and additional ramp space would be constructed to support the new mission. The largest new construction would be a 2-bay hangar constructed along the existing flightline. Construction of this facility would require the demolition of Buildings 1030, 1067, 1068, and 1069, and would also require the construction of new ramp space. Construction of the new ramp space would result in the demolition of an obsolete deicing detention basin. A new facility to house the KC-46A flight simulators would also be required. Renovations would be required in three facilities and within the current hydrant fueling system on the current KC-135 ramp.

If the KC-46A MOB 3 Mission were to be located at Tinker AFB, interior renovations would occur in Hangar 1053 and Buildings 1056 and 1082 to accommodate mission personnel and equipment storage. Although Buildings 11, 260, 469, 1048, 1059, 1071, and 1112 would be used to house various KC-46A functions, including logistics warehousing, engine storage, maintenance, squadron operations, and airfield equipment, no new renovations would be required for the use of these buildings. The aircraft requirements used to determine ramp parking would require a reconfiguration of parking spaces on the current KC-135 ramp. This relocation of parking spaces would require the existing hydrant pits associated with each KC-135 aircraft to be relocated to the proposed KC-46A parking locations. All proposed demolition and construction would occur within the existing airfield area. Figure 2.2 indicates the location of Facilities and Infrastructure Projects that would be associated with the beddown of the KC-46A MOB 3 Mission at Tinker AFB.

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

Biological Evaluation for
Tinker Air Force Base

Figure 2-1. Base Overview of Tinker AFB



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Biological Evaluation for
Tinker Air Force Base

Table 2-1. Facilities and Infrastructure Projects for the KC-46A MOB 3 Mission at Tinker AFB

Project	Facility Size (square feet)
Demolition	
Building 1030[a] (to make room for new 2-Bay Hanger with Apron Access)	99,184
Building 1067 (to make room for new 2-Bay Hanger with Apron Access)	11,460
Building 1068[a] (to make room for new 2-Bay Hanger with Apron Access)	19,775
Building 1069 (to make room for new 2-Bay Hanger with Apron Access)	250
Deicing Detention Basin	7,330
Total Square Feet	**137,999**
Renovation	
Hangar 1053, Various KC-46A Shops and Storage	10,000
Building 1056, Maintenance Leadership Facility	10,000
Building 1082, Fuselage Trainer (FuT)	15,000
Hydrant Pit repositioning	Not Applicable
Total Square Feet	**35,000**
New Construction	
2-Bay Hanger with Apron Access (Fuel Cell, Corrosion Control, Wash-Rack, AMU, Back-Shops)	200,000
Flight Simulators (WST, BOT)	10,500
Ramp and Shoulder expansion	114,000
Total Square Feet	**324,500**

[a] Potential relocation of underground cables, manholes, and duct were would be associated with these projects.

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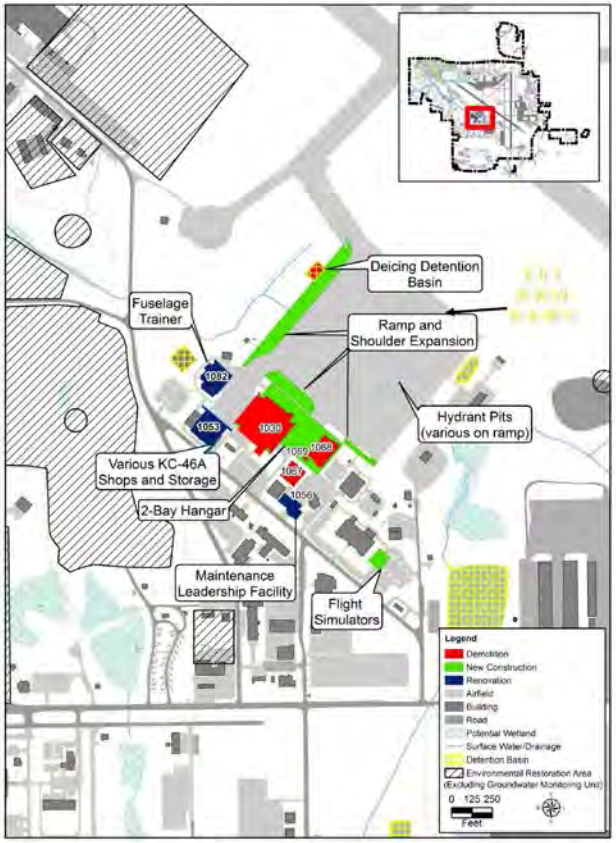
A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

Figure 2-2. Facilities and Infrastructure Projects for the KC-46A MOB 3 Mission at Tinker AFB



Personnel

See Table 2.2 below for existing and proposed changes to personnel that would result if Tinker AFB were chosen to be the preferred alternative for the KC-46A MOB 3 Mission. The 507 ARW at Tinker AFB currently has authorized 1,032 personnel. If the KC-46A MOB 3 Mission were to be located at Tinker AFB, authorized personnel would increase to 1,443 personnel. Air Mobility Command (AMC) would stand up an Active Duty unit associated with part-time Reservists within the Air Force Reserve Command (AFRC) host wing.

Table 2-2. Personnel Changes for the KC-46A MOB 3 Mission at Tinker AFB

Personnel	Current Authorized[1]	KC-46A MOB 3 Mission Related Changes[2]	Total
Full Time			
Active Associate	0	+159	159
Active Reserve	3	0	3
Dual Status Technician (reserve, civilians, federal)	214	+129	343
Non-Dual Status (DoD civilians)	27	+5	32
Contractors[3]	0	+15	15
Subtotal	**244**	**+308**	**552**
Part Time			
Drill Status Reservists	1,002	+232	1,234
Total Personnel Authorizations[4]	**1,246**	**+540**	**1,786**
Total Personnel on Base[4]	**1,032**	**+411**	**1,443**

[1] Contractors are not authorized on the UMD. They are categorized as "other base personnel."
[2] Some personnel work off-site but are assigned to the unit.
[3] Total personnel supporting the 507 ARW is the sum of all categories minus the number of people with dual status.

Replacement of the KC-135 mission with the KC-46A MOB 3 mission at Tinker AFB would result in a net increase of 411 on-base personnel. Dependents were estimated at 2.5 times per 65 percent of full-time personnel, excluding contractors. Approximately 397 dependents currently associated with the non-contractor, full-time personnel in the 507 ARW at Tinker AFB live in communities surrounding the installation. Approximately 476 dependents and family members would be anticipated to accompany the non-contractor, full-time personnel associated with the KC-46A MOB 3 mission.

Description of Current Aircraft Operations

Table 2-3 details current baseline airfield operations at Tinker AFB. The annual air traffic control traffic count is over 32,000 aircraft operations per year. An estimated 4,468 sorties (1 sortie = takeoff + landing) are conducted annually at Tinker AFB by KC-135, E-3, B-52, and B-1 aircraft as part of the depot maintenance mission. The 507th Air Reserve Wing (ARW) currently flies 400 sorties per year and an average of two additional practice touch and go approaches per sortie which adds to the total count of runway activity. Of the total annual operations flown by the 507 ARW, approximately 11 percent are flown during acoustic night (i.e., 10:00 p.m. to 7:00 a.m.). Other based aircraft (i.e., E-3, B-737, and E-6) conduct a combined total of 18,708 operations per year, with 10 percent of their total operations occurring during acoustic night. Also, a wide variety of transient aircraft also visit the base, averaging 4,988 operations annually. Depot and transient aircraft infrequently conduct flying operations during acoustic night.

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

Table 2-3. Baseline Airfield Operations at Tinker AFB

Aircraft	Departures		Arrivals		Patterns		Total[a]		Grand Total
	Day	Night	Day	Night	Day	Night	Day	Night[b]	
KC-135	400	0	360	40	1,371	228	2,131	268	2,399
Based Aircraft	2,025	75	1,877	223	12,877	1,631	16,779	1,929	18,708
Depot	659	0	659	0	4,786	0	6,104	0	6,104
Transient	981	9	981	9	3,008	0	4,970	18	4,988
Total	**4,065**	**84**	**3,877**	**272**	**22,042**	**1,859**	**29,984**	**2,215**	**32,199**

[a] An operation is the accomplishment of a single maneuver, such as a takeoff/departure, an arrival/landing, or half of an additional practice approach/closed pattern. Data are based on information provided by the 507 ARW.
[b] Night is defined as acoustic night (i.e., 10:00 p.m. to 7:00 a.m.). KC-135 aircrews could depart prior to 10:00 p.m. but return to base and conduct arrivals and approaches after 10:00 p.m.; thus they could conduct night operations (arrivals and patterns) without conducting night departures.

A beddown of new KC-46A aircrews associated with the proposed MOB 3 mission would result in approximately 1,150 annual sorties, and an average of 3.5 additional practice approaches per sortie, for a total of 6,440 operations per year (Table 2.4). The 168-percent increase in annual tanker operations would result from an increase in the number of assigned tanker aircraft (from eight KC-135 to 12 KC-46A), an increase in the frequency at which each aircraft is flown, and an increase in the number of practice approaches per sortie. KC-46A aircrews would conduct approximately 11 percent of total operations during acoustic night. KC-46A aircraft would begin to be processed through depot maintenance, increasing total depot airfield operations from 4,468 to 6,104 per year. Practice approaches would be conducted at airfields other than Tinker AFB on an occasional basis.

Table 2-4. Projected Annual KC-46A MOB 3 Mission End-State Airfield Operations at Tinker AFB

Aircraft	Departures		Arrivals		Patterns		Total[a]		Grand Total
	Day	Night	Day	Night	Day	Night	Day	Night[b]	
KC-46A	1,150	0	1,034	116	3,547	593	5,731	709	6,440
Based Aircraft	2,025	75	1,877	223	12,877	1,631	16,779	1,929	18,708
Depot	659	0	659	0	4,786	0	6,104	0	6,104
Transient	981	9	981	9	3,008	0	4,970	18	4,988
Total	**4,815**	**84**	**4,551**	**348**	**24,218**	**2,224**	**33,584**	**2,656**	**36,240**

[a] An operation is the accomplishment of a single maneuver, such as a takeoff/departure, an arrival/landing, or half of an additional approach/closed pattern.
[b] Night is defined as acoustic night (i.e., 10:00 p.m. to 7:00 a.m.). KC-46A aircrews could depart prior to 10:00 p.m. but return to base and conduct arrivals and approaches after 10:00 p.m.; thus they could conduct night operations (arrivals and patterns) without conducting night departures.
[c] The annual total represents a combination of operations resulting from local training sorties and mission sorties.

The Bird Aircraft Strike Hazard (BASH) Program

Tinker AFB currently maintains an active and dedicated BASH program, devoting resources and personnel to implement this program in order to minimize bird strikes on the airfield. Since 2001, the USAF has contracted with the U.S. Department of Agriculture (USDA) – Wildlife Services (USDA-WS) to provide daily wildlife control services for Tinker AFB. There are two full-time BASH program biologists on staff to assist with this program. They are housed with and work closely with Tinker AFB natural resources biologists, integrating airfield bird control within the overall management goals of Tinker AFB's INRMP. Their services include hazing and removing migrating and resident birds from the airfield.

The USDA BASH specialists conduct routine runway surveys for bird activity. These surveys are stepped up during or immediately following rain events in the spring and fall months due to increased shorebird (e.g., American Avocets, sandpipers, killdeer) and gull activity. They conduct bird metric surveys using methodology found within the INRMP and a Memorandum of Understanding between Tinker AFB and USDA-WS. These specialists document information such as date, time, weather conditions, species of birds observed, behavior, direction of movement, location on airfield and control methods, if applicable. They also perform small-scale passive services such as eliminating roosting sites, bird/wildlife proofing buildings and hangars and excluding bird/wildlife access to culverts. As needed, they employ active control methods such as the use of live-trapping and the use of pyrotechnics to disperse hazardous resident and migrating bird populations from the airfield. At times during significant threats to aircraft safety, birds persistently unresponsive to hazing (such as gulls and resident geese) may be killed if authorized by the Tinker AFB Natural Resources Specialists, and in accordance with the migratory bird depredation permit issued by the USFWS to conduct intentional takes of migratory birds. USDA-WS and Base Operations staff serve as sub-permittees on the bird depredation permit. The current depredation permit was issued to Tinker AFB by the USFWS in January 2016 with an expiration date of December 2016.

During and after rain events in spring and fall bird migration periods, and prior to aircraft taking off or landing at Tinker AFB, the USDA-WS BASH biologists typically make vehicular searches for birds on the entire length of the runway. This is done primarily for gulls, but shorebirds as well. Vehicular movement alone generally persuades birds to leave the runway. If this is ineffective, the biologist will initiate hazing with pyrotechnics, propane cannons, vehicle horns, and similar means to move birds. Occasionally, for federally unlisted birds unresponsive to hazing, lethal means are used to encourage movement. This is accomplished under the terms of the USFWS-issued depredation permit.

Tinker AFB conducts numerous other measures to prevent bird strikes. These include eliminating any areas of standing water or restricted drainage on the airfield, and seeding or sodding any bare non-grassy areas that could create an attraction for migrating birds. Tinker AFB maintains grass at a uniform height of seven to 14 inches on the airfield, to include the clear zones and lateral surface clear areas. Areas near the airfield with a variety of grass species are mowed when the average grass height, not including seed heads, exceeds tolerances. Most grass seeds found on the airfield are less desirable as food than available weed or native grass seeds. By regimented mowing, Tinker AFB reduces weed seeding to discourage seed-eating birds from feeding on the airfield. Grounds maintenance crews begin mowing areas adjacent to runways and finish in the infield or outermost grass areas. This causes insects and other animals to move away from aircraft takeoff and landing areas. The Natural Resources group at Tinker AFB has also identified species-specific measures to minimize bird use of the airfield. For example, for diving waterfowl species such as mergansers and loons, the installation has removed fish-producing ponds near the airfield.

The USAF implements a variety of different operational mitigation measures during migrations times to prevent bird strikes. With regard to aircraft flight operations, all flying organizations on Tinker AFB are provided information regarding bird activity on a daily basis. These involve changing pattern altitudes, changing pattern directions to avoid bird concentrations, and avoiding takeoffs/landings at dawn or dusk. During actual Phase II operations (high bird activity), Flight Commanders strongly consider reducing or eliminating flight operations within one hour before and after sunrise and sunset.

During periods of high bird activity, additional measures can be implemented by the Control Tower to avoid bird strikes. These include rescheduling local training or transition elsewhere, raising altitude assignments for aircraft enroute to training areas, limiting time on low-level routes to a minimum for

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

accomplishing training requirements, selection of routes or training areas based on bird hazard data from the USAF BASH team internet website (such as the Bird Avoidance Model, Avian Hazard Advisory System or Low-Level Route Analysis), discontinuation of multiple approaches, and making full-stop landings only by prohibiting touch and go landings used for training purposes.

To further improve aircraft safety, Tinker AFB strives to comply with the Federal Aviation Administration's Advisory Circular 150/5200-33B, Hazardous Wildlife Attractants on or Near Airports. This circular provides guidance on certain land uses that cause movement of hazardous wildlife onto, into, or across an airport's approach or departure airspace or air operations area (AOA). The circular recommends specific separation distances from the AOA within which wildlife attractants, such as retention/detention ponds, wetlands, and avoiding, eliminating, or mitigating certain types of agricultural and landscaping activities near the airfield.

Since the mid-1990s, Tinker has eliminated or modified three water bodies which were attracting hazardous levels of wildlife in close proximity of the airfield. A detention basin located adjacent to Landfill 5 (about 800 feet west of Runway 18/36) was outfitted with concrete trickle channels to eliminate standing water. The 10-acre Glenwood wetland, located ½ mile north of Runway 18, was removed. The five-acre Fire Pond located ½ mile west of Runway 18/36 was removed and mitigated off base in collaboration with the USDA's Natural Resource Conservation Service (NRCS) Partners for Wildlife Program. Mitigation required the wetland to be replaced, which was done 18 miles away from the base at an area elementary school in collaboration with NRCS through the Wildlife Habitat Incentive Program (WHIP) and with the help of other agencies. Also, although not removed due to hazardous wildlife attraction, the Fuel Control Facility Wetland, located about ¾ mile east of Runway 18/36, was removed for construction purposes.

In addition to the above mentioned actions, avoidance techniques are being employed, to include preventing the development of any additional ponds or wetlands on base, with the exception of relatively small detention ponds necessary to comply with storm water regulations and policies. For all other existing ponds and wetlands, mitigation is employed to maintain a safe flying environment. Specifically, USDA-WS staff monitor and manage hazardous wildlife populations associated with on- and off-base water bodies to ensure flight safety on and around Tinker AFB.

Although no federally listed species have been documented on the airfield at Tinker AFB before or after the fatal strike of the Northern Great Plains Piping Plover in 2009, if threatened and endangered species are encountered in the future, USDA-WS's contingency procedure is to make notifications to hold aircraft from taking off or landing until the birds move (Krupovage, Per. Comm. 2016). If the birds do not move, Tinker natural resources staff (USFWS depredation permit holder) would contact the USFWS to receive bird dispersal instructions which would allow aircraft flights to resume. Since no live threatened and endangered birds have ever been sighted on the airfield, this procedure has not been used; however, the BASH safeguards described above would further reduce the likelihood of threatened and endangered bird strikes on Tinker.

Tinker AFB covers approximately 5,580 acres of land. Structures include a 10,000-foot runway, 11,200-foot runway, almost 700 family housing units, 48 miles of road, 717 buildings, and 57 aircraft assigned to associate units. The BASH mitigation action area includes all lands within the boundaries of Tinker AFB, but concentrates on the airspace and runways which have the most potential to affect listed species. Direct effects upon listed species could include mortality by aircraft strikes, degradation of habitat from airfield run off into low lying areas and waterways, and depredation by airfield animal control officers. Other direct effects that could occur include loss of mating opportunities due to habitat fragmentation and reduction in numbers of partners, loss of metabolic energy due to course diversion around Tinker.

Indirect effects might result from the 476 additional people having to live and reside around Tinker AFB. More habitat fragmentation might result off base, when or if off-base housing is built in the vicinity of Tinker AFB.

3.0 LISTED SPECIES & CRITICAL HABITAT IN THE ACTION AREA

The following ESA-listed species have the potential to occur within the action area, or may be affected by the proposed action: Northern Great Plains Piping Plover (*Charadrius melodus*), Interior Least Tern (*Sterna antillarum*), Whooping Crane (*Grus Canadensis*), and "Rufa" Red Knot (*Calidris canutus rufa*). Rufa is used to refer to this particular subspecies of Red Knot. There is no designated critical habitat on, or in the vicinity of, Tinker AFB that may be affected by the proposed action. This list of species was generated by the November 23, 2015, USFWS IPaC Trust Resources Report, B7F6B-36Q4N-BETIZ SWYWF-MG3ESA.

The Northern Great Plains Piping Plover and the Rufa Red Knot are migrants that may pass through the Tinker airspace while making the trip between wintering grounds in Central and South America and the breeding grounds in the high tundra of the Canadian Arctic for the Red Knot, and the Great Plains of the northern United States and Canada for the Northern Great Plains Piping Plover. They are usually found near water, but may be found in a variety of habitats (Sibley, 2000). During migration, these shorebirds sometimes gather in large numbers at interior sites with water. Areas that attract the highest numbers of birds are typically shallow bodies of water covering large areas, including managed wetlands, rice fields, lakes, reservoirs and sewage ponds (Sibley, 2001).

Conservation of shorebirds is challenging because relatively little is known about their life cycle requirements and population trends. In addition, they utilize a wide variety of habitats during different times of the year. Loss and habitat by conversion to other land uses is the greatest known threat. In the U.S., about 50 percent of natural wetlands have been filled or drained, and the annual loss of wetlands is estimated to be about 35 square miles of wetland each year. Native prairies have suffered even greater losses resulting in restricted habitat for "grasspipers" passing through or nesting in prairies (O'Brien, et al., 2006). Other environmental factors may negatively affect shorebirds, including pollution, trash, disturbance of nesting birds on the beach by people, their pets and off-road vehicle use. Identifying, preserving and connecting remaining habitat is key to shorebird conservation. Where appropriate, restoring degraded grasslands to native vegetation and maintaining wetlands at a high functioning level (well away from the airfield) is essential. Even relatively narrow corridors (e.g., vegetated riparian zones) connecting larger more valuable tracts are essential as animals make their movements across the landscape. A lack of nearby suitable habitat for resting birds during migration may result in an attraction of migrating birds to an airfield environment.

Northern Great Plains Piping Plover

The Northern Great Plains Piping Plover (*Charadrius melodus*) is a small migratory member of the shorebird family (*Charadriidae*), approximately 6.7 to 7.1 inches long and 1.5 to 2.2 ounces in weight (Haig, 1992). The Piping Plover is about the size of a robin and it is one of six species of belted plovers in North America. During the breeding season, adults have single black bands across both the forehead and breast, orange legs and bill. The bill also has a black tip in breeding season. Their dorsal surface is a pale tan with a white belly. They are plump in appearance and tend to stand and visibly search and then run to find their prey of small invertebrates living in a sandy or muddy substrate. During the winter, the adults lose the black bands and their bill becomes grayish-black. The plumage of juveniles is similar to that of wintering adults.

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

The breeding range of the piping plover extends throughout the northern Great Plains, the Great Lakes, and the Atlantic Coast in the U.S. and Canada. The three breeding populations of piping plovers are referred to as the Northern Great Plains population, Great Lakes population, and Atlantic Coast population. Piping plovers require wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands. There is no habitat of this nature at Tinker AFB. (https://www.fws.gov/midwest/endangered/pipingplover/pipinepl.html).

Great Lakes piping plovers formerly nested throughout much of the Great Lakes region in the north-central United States and in south-central Canada, but currently nest only in northern Michigan and at two sites in northern Wisconsin. Piping Plovers that breed in the Great Lakes area nest along shorelines. However, according to the USFWS Recovery Plan for the Great Lakes Population of Piping Plovers dated September 16, 2003: "in 1987 and 1988 piping plovers nested at Optima Reservoir, Oklahoma. These are the only known nesting records for Oklahoma (Boyd 1991)." Optima Lake is located in the panhandle of Oklahoma in Texas County on the Beaver River, approximately 250 miles northwest of Tinker AFB.

On the Atlantic Coast, piping plovers nest from Newfoundland, southeastern Quebec, and New Brunswick to North Carolina. Sixty-eight percent of all Atlantic nesting pairs breed in Massachusetts, New York, New Jersey, and Virginia (USFWS 1999).

The Northern Great Plains Piping Plover is federally listed as a threatened species. The plover that was struck at Tinker AFB in 2009 is considered part of the Northern Great Plains population of the piping plover which was listed as threatened under the Endangered Species Act on January 10, 1986 (50 FR 50726). The breeding population of the Northern Great Plains piping plover extends from Nebraska north along the Missouri River through South Dakota, North Dakota, and eastern Montana, and on alkaline lakes along the Missouri River Coteau (a large plateau extending north and east of the Missouri River) in North Dakota, Montana, and extending into Canada. Wintering Piping Plovers in the U.S. are distributed along the Gulf Coast from Florida to Texas, with a small percentage of the population wintering along the Atlantic Coast and in the Bahamas. According to Bird Life International, the Northern Great Plains population was estimated to be about 58 percent of all the Piping Plover subspecies combined in 2009 (http://www.birdlife.org/datazone/speciesfactsheet.php?id=3127).

Interior Least Tern (ILT)

The Interior Least Tern (ITL) was listed as federally endangered on May 28, 1985. All currently recognized subspecies and populations are the smallest members of the subfamily Sternidae, family Laridae, of the diverse order Charadriiformes. They measure 8.2 to 9.4 inches long with a 20-inch wingspread. Sexes are alike, characterized by a black-crowned head with a white forehead, pale grey back, snowy white undersurfaces, and legs and beaks of various orange and yellow colors depending on sex. The male tern's legs and beak are more brightly colored than the female. The beak is tipped with black.

ILT's are only those least terns that breed and nest within the boundary of the continental U.S. on interior rivers and other water bodies. ILT breeding populations are associated with large river habitats from Montana southward through North Dakota, South Dakota, Nebraska, Colorado, Iowa, Kansas, Missouri, Illinois, Indiana and Kentucky to eastern New Mexico, Oklahoma, Arkansas, Tennessee, central Texas, central Louisiana, and central Mississippi. Other breeding populations of least terns are found along coastal and estuarine habitats in the U.S. from Texas to Maine, and along islands of the Gulf of Mexico, Atlantic Ocean, and Caribbean Sea. The ILT is separated from coastal populations by a combination of physical and ecological factors unique to their nesting habitats. Coastal habitats are created and maintained by daily and seasonal tidal and storm surges, while inland habitats of ILT are dynamic,

primarily created and maintained by fluctuating riverine hydrologic conditions. Foraging habitats and prey species differ markedly as well, with coastal least terns foraging on fish and invertebrate prey species associated with brackish and salt water habitats (e.g., anchovy, silversides), while ILT forage on freshwater prey species (e.g., shad, minnows).

The ILT and Eastern least tern are geographically separated from the California least tern (*S. antillarum browni*), which nest and forage in brackish and marine habitats of the Pacific coast of the U.S. and Mexico. Kirsch and Sidle (1999) observed that ILT population increases were not supported by available fledgling success estimates, and hypothesized that ILT increases since listing were due to immigration surges from least terns inhabiting the Gulf Coast. Lott (2006) has hypothesized a wide least tern metapopulation which includes the Gulf Coast and interior populations. Genetic studies indicate at least some degree of interbreeding and genetic exchange between populations of ILT, eastern least tern, and California least tern (Draheim *et al.* 2010). However, there are few banding or other observational data directly supporting the interchange of breeding individuals between interior and Gulf Coast populations.

ILT are migratory and historically bred all along the Mississippi River states, and along the Red and Rio Grande River systems of Texas. Least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake and reservoir shorelines, and occasionally gravel rooftops. They hover over and dive into standing or flowing water to catch small fish.

The ILT breeding season is April through August. Nesting in small colonies, least tern nests are shallow depressions scraped in open sandy areas, gravelly patches, or exposed flats. They are also known to nest on the flat roofs of large buildings. Both parents incubate their eggs for about 24 days. Chicks leave the nest only a few days after hatching, but the adults continue to care for them, leading them to shelter in nearby grasses and bringing them food.

Rufa Red Knot

The Rufa Red Knot was listed as federally threatened in 2014. The largest calidridine sandpiper of North America, and in the genus *Calidris* exceeded in size only by the Great Knot (*C. tenuirostris*) of northeastern Siberia, the Red Knot is primarily rusty-red in breeding plumage, changing to dull gray dorsally and white ventrally in Basic (winter) plumage, with few distinct markings. This species is a Holarctic breeder, mainly in middle- and high-arctic zones, with three subspecies (*islandica*, *rufa*, and *roselaari*) distributed in the Nearctic from Greenland to northern Alaska. This account focuses largely on the Western Hemisphere subspecies (Baker, et al. 2013).

Rufa Red Knots are noted for their extraordinary long-distance migrations of up to over 9,000 miles between circumpolar breeding habitats and marine wintering habitats in southern latitudes of South America, Africa, Europe, Australia and New Zealand. Population sizes for knots are in decline around the world, especially *C. c. rufa*, which declined from about 82,000 individuals in the 1980s to fewer than 30,000 in 2010. Historical records show Knots and other scolopacids were intensively hunted for sport and market sales (Sibley, 2001), as were many other types of birds nationwide to pack the "larders" of kitchens and restaurants in the mid-1800s in the Northeast. This intense harvest probably led to their original decline and when the harvest was stopped shortly thereafter, the birds slowly began to recover. Then, in the 1980s they began showing a second decline, which was probably mostly fueled by the over exploitation of horseshoe crabs for bait in their vital stopover location in Delaware Bay and vicinity. Historically, horseshoe crabs (*Limulus sp.*) came ashore and deposited copious amounts of eggs in late spring (http://www.nwf.org/Wildlife/Wildlife-Library/Invertebrates/Horseshoe-Crab.aspx). These eggs are important because several species of migratory and resident birds depend on their reliable presence to fatten up prior to migration. Furthermore, contributing to the decline were beach modification practices

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

and pressure from expanding human use of the beaches that the bird depends on to put on fat necessary for their probable non-stop flight to the Arctic.

Rufa Red Knots tend to concentrate in huge numbers at traditional staging grounds during migration. As stated previously, Delaware Bay is an important staging area during spring migration. It is estimated that nearly 90 percent of the entire population of the Red Knot subspecies, *C. c. rufa*, can be present on Delaware Bay in a single day.

Rufa Red Knots are a monogamous and single-brooded species, and like most other northern shorebirds typically lays a 4-egg clutch. Courtship is accompanied by elaborate flight, ground, and vocal displays. For nesting, this knot prefers drier tundra and sparsely vegetated gravel ridges. Rufa Red Knots are principally marine shorebirds in the non-breeding season, when they feed on polychaete worms, small crabs, and marine mollusks, especially bivalves that they swallow whole and crush in their muscular gizzard. During spring migration, however, large flocks switch to gorge on the eggs of horseshoe crabs at Delaware Bay. Recent studies Red Knots fitted with geolocators identified a final stopover at Nelson River in Hudson Bay, before the birds move on to breeding sites in the Arctic where they feed upon terrestrial invertebrates (https://www.allaboutbirds.org/guide/Red_Knot/lifehistory).

The knot's unique and impressive life history depends on suitable habitat, food and weather conditions at far-flung sites across the Western Hemisphere, from the extreme south of Tierra del Fuego to the far north of the central Canadian Arctic. Knots need to encounter favorable habitat, food and weather conditions within narrow seasonal windows as the birds hopscotch along migration stopovers between wintering and breeding areas. For example, the knot population decline that occurred in the 1980s to the 2000s was caused primarily by reduced food availability from increased harvests of horseshoe crabs, and then was exacerbated by small changes in the timing when the knots arrived at the Delaware Bay. Horseshoe crab harvests are now managed with explicit goals to stabilize and recover knot populations.

Rufa Red Knots tend to migrate in single-species flocks with departures typically occurring in the few hours before twilight on sunny days. Size of the departing flocks tends to be large (greater than 50 birds) (Niles et al. 2008, p. 28). Likewise, based on observations of other *Calidris canutus* subspecies departing from Iceland towards Nearctic breeding grounds in spring 1986 to 1988, Alerstam et al. (1990, p. 201) found mean flock sizes of 100 to 200 individuals. These *C. canutus* leaving Iceland in spring departed in flight formations during the afternoon or evening, and during rising or high tide; their departures had significant differences in daily timing between seasons that was associated with between-year differences in the tidal cycle. Within the season, departures took place earlier in relation to high tide as the season progressed (Alerstam et al. 1990, p. 201). Consistent with the afternoon and evening departures of *C. canutus* from Iceland, Red Knots are inferred to migrate during both night and day based on the duration and distance of migratory flight segments estimated from geolocator results (Normandeau Associates, Inc. 2011, p. 203).

Rufa Red Knots may be particularly vulnerable to climate change, which is likely to affect:

- the arctic tundra ecosystem where the knots breed
- coastal habitats due to rising sea levels
- availability of traditional food resources throughout the bird's range when present, and
- storm and weather patterns.

Rufa Red Knot numbers appear to have stabilized in the past few years, but they remain at low levels relative to earlier decades. Biologists from the USFWS, state natural resource agencies, and non-profit organizations all share a concern for this race of red knot and are pooling efforts to identify what needs to be done to prevent further losses.

Whooping Crane

Whooping Cranes are very large, tall birds with a slender build. They have long necks and long black legs. The blackish bill is stout and straight; the overall slender body widens to a plump "bustle" of feathers near the tail. In flight the wings are long and broad and the neck is fully extended. Adults are bright white birds with accents of red on the head. The wingtips are black. Immature birds are whitish below, but mottled brownish-rusty above. The Whooping Crane is listed as federally endangered.

The wild population nests in or near Wood Buffalo National Park in the Northwest Territories and adjacent areas of northeastern Alberta, Canada, and winters on the Texas coast on the Gulf of Mexico at the Aransas National Wildlife Refuge (ANWR) not far from the town of Austwell.

The Whooping Crane, a symbol of national and international efforts to recover endangered species, has returned from the brink of extinction but remains at risk. In the 1800s, this species was widespread but apparently never common in the tall- and mixed-grass prairie marshes of the north-central U.S. and southern Canada. In 1941, the species had reached a low of 15 or 16 migratory individuals wintering in Texas (Boyce, 1987) and 6 non-migratory birds in Louisiana. The small Louisiana population did not survive.

According to Cornell Lab's Birds of North America On-line (https://birdsna.org/Species-Account/bna/home), all Whooping Cranes alive today (437 in the wild + 162 in captivity = 599 as of August 2011 [Stehn, 2011]) are descendants of the small remnant flock in Texas in winter 1941-42 (Urbanek, et al 2015). Several factors, especially human development and long-term water mismanagement on the wintering grounds, continue to place the bird in jeopardy. Note that 437 is a 5-year old figure, the ANWR website indicates there are 329 based on estimates from their 2015-2016 survey. Data from the International Crane foundation (https://www.savingcranes.org/species-field-guide/whooping-crane/) also indicates there are 599 captive and wild cranes.

Despite intense management efforts since the 1940s, the Whooping Crane remains one of the rarest birds in North America. Establishment of additional populations by reintroduction has so far been unsuccessful, although progress has been made in reintroduction methods. Because of the concern this species has generated, it is arguably one of the best-studied birds in North America. Recovery actions are accomplished cooperatively by Canada and the U.S., assisted by provincial and state agencies, nongovernment groups, and the private sector.

In the breeding season, Whooping Cranes use the extensive open wetland marshes and associated habitat of the Peace-Athabasca Delta, a large inland freshwater deltas within the Wood Buffalo National Park and adjoining areas (http://www.pc.gc.ca/eng/pn-np/nt/woodbuffalo/natcul/natcul1.aspx). Outside of the breeding season, Whooping Cranes use fresh, brackish and saltwater marshes and inland habitat of the Aransas National Wildlife Refuge (https://www.fws.gov/refuge/Aransas/wwd/science/updates.html).

This species is perennially monogamous and typically begins egg production at ages 3 or 4 years in the wild, but often not until ages 5 to 11 in captivity. Females usually lay a 2-egg clutch annually but seldom fledge more than one young. Both parents care for the young for 10 to 11 months, and the young learn migration routes by following their parents. Wild birds may survive an estimated 25 years, captive birds 40 or more years.

Attempted reintroductions in the Rocky Mountains (migratory) and in Florida (non-migratory) were unable to produce self-sustaining populations and have been discontinued. Reintroduction of a population migrating between Wisconsin and Florida began in 2001 and met with initial success, but its future will depend on finding a solution to persistent nest failure. In 2010, a fourth reintroduction, to establish a non-

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

migratory population, began in Louisiana. As of June 2014, 164 birds are maintained in captivity: 152 at five captive propagation facilities (Patuxent Wildlife Research Center, Maryland; International Crane Foundation, Wisconsin; Calgary Zoo, Alberta; Audubon Species Survival Center, Louisiana; and San Antonio Zoo, Texas), and an additional 12 birds at seven display facilities (S. Zimorski pers. comm.). Today, the crane remains ecologically dependent on specific inland freshwater wetlands in Canada and, in winter, on coastal brackish wetlands along the Gulf Coast.

On June 25, 2015, Mr. Chester McConnell of Friends of the Wild Whoopers, contacted John Krupovage, Natural Resource manager at Tinker AFB, regarding the possibility of investigating whether there might be potential migratory stopover sites at Tinker AFB for the Whooping Crane (http://friendsofthewildwhoopers.org/).

As stated previously, Whooping Cranes make the long journey between the Aransas National Wildlife Refuge on the central Texas coast to Wood Buffalo Nation Park located in northeastern Alberta and southern Northwest Territories. Along the way, they must stop to seek shelter and food about once or twice a day. Friends of the Wild Whoopers believes that during migration the Cranes stop at relatively small ponds, sometimes on private property and elsewhere, to spend the night. Characteristics of these small ponds include:

- Size – 0.3 to 14 acres
- Some shallow areas with water 5 to 10 inches deep for roosting
- Gradual sloping banks
- Little or no emergent vegetation at the roosting area
- Extensive horizontal visibility from roosting area, and
- 300 yard or more from human disturbance or development.

Mr. McConnell and Mr. Krupovage visited the Prairie Pond Site on Tinker and agreed that it had the potential to be a Whooping Crane stopover site. This site not only has good potential as stopover for Whooping Cranes, but it is inhabited by resident bird species such as American Goldfinch (*Carduelis tristis*), *Empidonax* species (flycatcher) and Little Blue Heron (*Egretta caerulea*) as observed on the August 17-19, 2016 site visit. Much work has gone into this site and the water quality appears excellent and surrounding vegetation is healthy and aesthetically pleasing.

4.0 ENVIRONMENTAL BASELINE CONDITIONS

A brief description of environmental baseline conditions is provided below. Prior to its development into a large and highly urbanized and industrialized military landscape, Tinker AFB was already a highly altered human-dominated agricultural location. Early aerial photographs indicate the majority of land currently occupied by Tinker AFB was used for various agricultural purposes. Soil tillage and terracing are evident on historic aerial photographs, indicating much land was farmed before Tinker AFB was established.

Borrowing soil from various on-base locations to build up facility foundations and level the airfield was the primary soil impact during initial urbanization and industrialization of Tinker AFB. No topsoil was replaced at these locations; consequently, revegetation was slow and led to further soil loss and lack of native vegetation. Physical properties of soils have also been further altered by military construction and other activities. For example, vehicular traffic around construction sites and past practices of parking aircraft on grassed areas have compacted soils. Much soil was excavated and redistributed/compacted for projects such as large storm drainage systems and landfill caps across Tinker AFB.

Tinker AFB is located in the physiographic Central Redbed Plains section of the Central Lowland Province which is characterized by level to gently rolling hills, broad flat plains, and bottomlands bisected by small- to medium-sized water courses. Oklahoma County elevations range from about 850 feet above mean sea level (MSL) in the southeastern part to over 1,300 feet MSL in the northwestern part. Tinker AFB elevations range from approximately 1,200 feet MSL (Crutcho Creek – northwestern portion of Tinker AFB) to 1,310 feet MSL (southeast portion of Tinker AFB). Airfield elevation is approximately 1,291 feet MSL.

Based on topography and historical aerial photos, it appears that pre-settlement surface waters on land currently occupied by Tinker AFB consisted only of lotic waters (i.e., streams). There is no known evidence of the presence of lentic waters (e.g., ponds, lakes, wetlands) for that time period, although small beaver-created ponds and wetlands may have occurred along stream systems much as they do today. Streams consisted of intermittent, ephemeral, and possibly perennial flows in wooded or non-wooded stream systems which bisected gently rolling hills of tall/mixed grass prairie. These systems were typically shallow with broad, relatively flat floodplains. Floodplain areas closest to streams may have been heavily vegetated with riparian trees and shrubs; however, it is likely natural fire events would have kept most, if not all, woody vegetation suppressed such that land currently occupied by Tinker AFB may have been mostly treeless. Alternatively, it may have been just the more outlying floodplain fringes and the upper reaches of the first order stream segments that remained free of woody riparian vegetation.

Surface waters occurred in three main stream systems, one which drained to the north (current Crutcho Creek with Kuhlman and Soldier Creek tributaries) and two to the south (current East Elm Creek and West Hog Creek). The north-flowing stream system originated approximately 2 miles south of Tinker's current southern boundary with on-base portions of the system composed of 12 first-order segments (the initial and smallest section of a tributary system), two second-order segments, and one third-order segment (http://geography.about.com/od/physicalgeography/a/streamorder.htm). The south-flowing systems consisted of only first- and second-order tributaries with higher order tributaries located off-base. Stream flows were generated primarily by precipitation runoff and were probably relatively sluggish. Groundwater seepage and springs may have caused perennial flows in some of the higher-order stream segments, particularly in tributaries on the eastern side of Tinker AFB.

Historical stream channels have been substantially altered by activities such as channelization, native riparian vegetation removal, mowing, fire suppression, flood regime alteration, and exotic species invasion/introduction. Also, development activities have caused soil properties to change substantially over the years, consequently modifying the original plant community. Common soil disturbances include topsoil being removed and not replaced; exotic plant species being used to revegetate disturbed areas; and soil compaction resulting from off-road training exercises, military construction projects, past aircraft parking on airfield, and related activities.

Surface waters in the vicinity of Tinker AFB were historically degraded by accidental fuel spills and non-point source pollution. The most common non-point pollution examples include: sediment from soil erosion associated with construction/demolition activities, automobile oil/fluid runoff from parking lots, runoff from areas treated with fertilizers and pesticides, chemical substances from spills associated with industrial and aircraft activities, and deicing compounds from roadways, taxiways, runways, ramp areas, and aircraft.

Although water quality has degraded since pre-settlement times, improvements have occurred over the last 20 years based on the implementation of modern pollution prevention technology and supported by biological diversity surveys and weekly water quality monitoring. Tinker AFB collects and analyzes water samples from all Tinker AFB streams on a weekly basis. These samples are acquired to monitor

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

compliance with Oklahoma Water Quality Standards assigned to each creek under the National Pollutant Discharge Elimination System and associated installation stormwater permits. In addition to analytical monitoring, other conditions are noted at each creek outfall during each field visit. These parameters include: clarity, algae growth, odors, presence of foam, and presence of oil sheen. All of these indicators are used to locate and eliminate illicit or harmful discharges.

Much of the original prairie was farmed as evidenced by historical aerial photographs and remaining farmland terraces at numerous locations on Tinker AFB. Livestock grazing also appears to have been a significant past agricultural practice as seen by extant barbed wire fencing. Past grazing is also apparent by the absence of some plant species which would be expected to be present on existing prairie remnants had livestock grazing not occurred. Less than 2 percent of the pre-settlement prairie ecosystem currently remains on Tinker AFB. Very few, small, fragmented prairie remnants currently occur on Tinker AFB. These remnants total less than 100 acres and are in a degraded condition. Further native vegetation community change has occurred due to the exclusion of historical natural events such as wildfire and grazing by native herbivores such as bison. The elimination of these natural disturbance events favored the invasion trees, shrubs and non-native herbaceous plants on historical prairie areas. Although historical pristine native prairie and bottomland areas are lacking on the installation, an installation program to implement INRMP objectives for prairie restoration is active and ongoing. The INRMP directs the restoration of degraded areas to native grasses in some of these areas.

Within land areas which have been converted to urban and industrial use, the plant community is comprised primarily of turf grasses and ornamental trees and shrubs. The predominant turf grass on Tinker AFB is exotic Bermuda grass, although native buffalo grass is often found mixed with Bermuda grass. Other less maintained areas are typically a mixture of exotic and native plants. Trees and shrubs are composed of a mix of native and exotic plants and, contrary to pre-settlement plant distribution, woody plants have migrated from bottomland sites to more upland areas due to fire suppression and other environmental factors.

The highly urbanized area in the vicinity of Tinker AFB is host to people-tolerant wildlife such as raccoon (*Procyon lotor*), deer (*Odocoileus virginianus*) and coyote (*Canis latrans*). Other typical wildlife species that have been sighted within boundaries of Tinker AFB include the eastern fox squirrel (*Sciurus niger*), eastern cottontail rabbit (*Sylvilagus floridanus*), beaver (*Castor canadensis*), striped skunk (*Mephitis mephitis*), mourning dove (*Zenaida macroura*), barn swallow (*Hirundo rustica*), red-winged blackbird (*Agelaius phoeniceus*), meadowlark (*Sturnella* spp.), scissor-tailed flycatcher (*Tyrannus forficatus*), bobwhite quail (*Colinus virginianus*), Texas horned lizard (*Phrynosoma cornutum*), three-toed box turtle (*Terrapene carolina*), and bullfrog (*Rana catesbeiana*). Bobcats (*Lynx rufus*), grey fox (*Urocyon cinereoargenteus*) and turkey (*Meleagris gallopavo*) are also present (Krupovage, pers. comm. 2016). Other birds seen on the airfield during an August 16 through 17, 2016 reconaissance were American Kestral (*Falco sparverius*), Mississippi Kite (*Ictinia mississippiensis*), American Crow (*Corvus Brachyrynchos*), Meadowlark species (*Sturnella*) and Swainson's Hawk (*Buteo swainsoni*). In general, there is not enough food, water or habitat to attract the diversity of wildlife that would occur at less urbanized and more ecologically diverse areas in Oklahoma.

However, despite the degree of urbanization at Tinker AFB, much time, effort and money have been spent restoring approximately 200 acres of native habitat beginning in the 1990's (INRMP, 2014). Much of this work is still in progress. INRMP directed efforts include large scale eradication of numerous invasive species associated with a typical disturbed urban setting such as Johnson grass (*Sorghum halepense*), Bermuda grass (*Cynodon dactylon*), brome (*Bromus* spp.), Sericea lespedeza (*Lespedeza cuneata*) and crab grass (*Digitaria* species). Also being eliminated are non-native woody species such as

Siberian Elm (*Ulmus pumila*), lacebark elm (*Ulmus parvifolia*), Callery pear (*Pyrus calleryana*), bush honeysuckle (*Lonicera* spp.) and Japanese honeysuckle (*Lonicera japonica*). Native plantings in restoration areas include burr oak (*Quercus macrocarpa*), little blue stem (*Schizachium scoparium*), and Indian grass (*Sorghastrum nutans*). This considerable conservation and restoration effort is described in greater detail in the pages that follow.

The Canadian River, at its nearest point, lies approximately 15 miles to the southwest of Tinker AFB, and cuts a very winding path roughly west to east through the state of Oklahoma. Directly south of Oklahoma City and Tinker AFB is Lake Stanley Draper, and a little further south is Lake Thunderbird which is part of Lake Thunderbird State Park. The northern-most tip of Lake Stanley Draper is visible from the south end of runway 18-36. The Canadian River and the two reservoirs would provide suitable stop-overs for migratory birds. Details on the two reservoirs are provided in Table 4-1 below, and are derived from the Oklahoma Water Resources Board (https://www.owrb.ok.gov/).

Table 4-1. Reservoirs in the General Vicinity of Tinker AFB

Name	Year Built	Area (acres)	Shoreline (miles)	Maximum Depth (ft)
Lake Stanley Draper	1962	2,519	32	93
Lake Thunderbird	1965	5,377	59.6	58

There is potential shorebird habitat at these two lakes. Interior Least Terns have been observed foraging at Lake Stanley Draper by Tinker biologists. Use by other threatened and endangered species there is unknown.

The airspace above Tinker AFB is part of the Central Flyway for migratory birds. The Central Flyway is one of four major North American flyways and carries millions of avian migrants to the north and south on their two seasonal journeys. Migrating birds of all species from the smallest songbirds to the tallest bird in North America, the Whooping Crane, generally follow this route. When migrants fly over Tinker AFB itself, depending on the species, they may not see resources that would sustain them, so they continue on their way or stop at the Canadian River or the two large reservoirs mentioned above.

Commercial, military, and private air traffic in the vicinity of Oklahoma City and Tinker AFB potentially places birds within the Central Flyway on a lethal path with aircraft. BASH risk depends on the season of year and height of the bird's flight path. Even though preferred habitat for bird species is not technically present on Tinker, many species are attracted to the airfield environment, such as grassland songbirds, shorebirds, waterfowl and raptors. Large bodied birds that are attracted to the airfield present the biggest threat to aircraft and human safety, and these are the ones that are most strongly discouraged from utilizing the airfield and surrounding areas. However, smaller birds and mammals are discouraged as well because their presence attracts both avian and mammalian predators. In addition, flocks of smaller birds can also pose a significant hazard because of the increased probability of birds being ingested by one or more engines.

Restoration and Conservation of Natural Areas on Tinker AFB – Green Infrastructure Plan

This section discusses restoration and conservation efforts at Tinker AFB, and the philosophy that guides these efforts. One of the primary goals of the Tinker AFB Integrated Natural Resources Management Plan is to enhance degraded habitat away from the airfield for benefit of birds, pollinators and other wildlife, as well as to provide a landscape that enhances the quality of life for airmen, employees and visitors. Provided below are some definitions from the Green Infrastructure Plan (Tinker Air Force Base, 2015), a component plan of the INRMP.

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

Definitions:

- Regulated Areas – areas that contain environmentally sensitive features, such as waterways (and their associated buffers), 500-year floodplains, and wetlands that are regulated (i.e., protected) during the land development process.
- Green Infrastructure (GI) – An interconnected network of waterways, wetlands, woodlands, grasslands, and other natural areas of base-wide significance.
- Gray Infrastructure – buildings, roads, runways, ramps, utilities, and other man-made features in the landscape.
- Evaluation Areas – areas that contain environmentally sensitive features (or are adjacent to environmentally sensitive features) such as native grasslands/woodlands, sensitive wildlife species, or rare plant species that are not regulated (i.e., no regulatory stature) during the land development process. Evaluation areas will be considered during the review process as areas of high priority for ongoing conservation. These are developable areas; however, consideration must be given to natural resources that exist on the site and their priority for preservation and long term conservation.
- Network Gaps – areas either inside or outside regulated areas that are critical to the connection of fragmented natural areas. These have been included in the GI Plan to provide areas of possible connectivity. These areas should be evaluated during the land development review process for possible restoration opportunities to enhance the ecological functioning of the network and/or to make critical connections in the green infrastructure network.
- 500-year floodplain – the lowland and relatively flat areas adjoining waters, including at a minimum, that area subject to a 0.2-percent chance of flooding in any given year.
- Wetlands – areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

The Green Infrastructure Plan, first published in 2007, is a comprehensive vision for interconnecting and managing natural environmental systems on and adjacent to Tinker AFB to ensure the sustainability of both the ecosystem and the military mission. The Green Infrastructure Plan vision is to balance the natural infrastructure with build infrastructure and human needs. Sensitive environmental resources (e.g., floodplains, wetlands, creek systems) have been identified across the base, and the GI plan is intended to guide development to support current and future military mission needs while not degrading sensitive environments. A basic objective is to sustain a green infrastructure network to provide optimal military operational sustainability, and promote societal, economical, and ecological benefits for Tinker AFB and its neighboring communities in concert with the desired development pattern of the Installation Development Plan. Without this plan, rapid, and often times indiscriminate, land development could jeopardize future sustainability.

Developable land is very limited on Tinker AFB; therefore, every piece of land is extremely valuable and important for future mission needs. The Green Infrastructure Plan recognizes and supports this reality by encouraging development where it is most appropriate and setting forth recommendations to direct it away from areas where it is not appropriate. Tinker's total green infrastructure is comprised of 1,033 acres, or 21% of the total base land area (Figure 4-1). The majority of the on-base green infrastructure network is not on developable land as it lies within the 500-year floodplain which inherently has many development limitations. Some undeveloped lands are in regulated areas such as the safety clear zones around the airfield where certain habitat restoration goals would not apply under the current land use.

Regulated areas comprise 46% of the green infrastructure network; evaluation areas comprise 42%; and network gaps comprise 12%.

One of Tinker AFB's objectives reflects the commitment to natural resource via the GI Plan: "By 2020, continue to restore and maintain Tinker's green infrastructure to improve habitat structure/health for species at risk, reduce base mowing requirements, increase and sustain the free ecological services provided by the GI network, promote wildland fire safety, and enhance aesthetics for military personnel and visitors.

Outside of grey infrastructure (e.g., buildings and roads), most of the areas described above in Tinker AFB's Green Infrastructure Plan are where intense restoration and conservation are occurring.

Some guiding principles and restoration actions being accomplished by Tinker AFB include:

- Create and maintain a permanent healthy native prairie/savannah upland and wooded bottomland system that enhances fish and wildlife diversity
- Increase habitat complexity and structure
- Manage for a variety of restored prairie stages and disturbance regimes to increase faunal diversity and abundance
- Convert exotic turf grass to native grasses/forbs
- Remove invasive native and non-native grasses, forbs, vines, shrubs, and trees
- Plant a diversity of native aquatic plants in ponds
- Plant high diversity of sustainable grasses, forbs, and woody species consistent with local ecoregion
- Restore and maintain natural corridor connectivity wherever possible
- Employ natural vegetation patch stepping stones if continuous connectivity cannot be achieved
- Decrease stepping stone distance wherever possible
- Prioritize restoration by focusing first on higher order streams versus lower order streams and gaps away from roads as opposed to close to roads.
- Emphasize larger patches over smaller ones
- Provide both quality interior area and edge diversity
- Clear up pond turbidity
- Place/anchor artificial snags (standing tree stumps) and other natural log/root structures in ponds
- Stabilize shorelines
- Reintroduce native wildlife; and
- Burn/mow in blocks, always leaving some unburned.

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

Figure 4-1. Green Infrastructure Network Within and Around Tinker AFB

The Tinker AFB Green Infrastructure Plan implements a "land ethic" first expressed most convincingly by Aldo Leopold in 1949. For example, an area of Tinker AFB referred to as Glenwood is an area that used to contain base housing units, but no longer does, because of three plane crashes that occurred there. The houses were removed and the area is being restored with native plants. Since 2013, 36.5 acres of large eastern red cedars were removed in Glenwood in order to restore more open habitat to harbor the Texas Horned Lizard. The cedars were removed by masticators to create more open habitat for the Texas Horned Lizard and other grassland species. In addition, other "satellite" areas are also in the process of being restored to native ecosystems. See Tinker INRMP for more details of conservation activities on the installation.

Compliance with Federal Regulations and Policy

Implementation of the Tinker AFB Integrated Natural Resources Management Plan and associated Green Infrastructure Plan enhances and ensures proactive compliance with the following regulatory requirements, and ensures continued availability of land for military operations:

- Executive Order 11988, Floodplain Management (May 24, 1977, as amended)

- Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input (Jan 30, 2015)
- Executive Order 11990, Protection of Wetlands (May 24, 1977, as amended)
- Executive Order 13693, Planning for Federal Sustainability in the Next Decade (Mar 19, 2015)
- Council on Environmental Quality Instructions for Sustainable Locations for Federal Facilities (Sep 15, 2011)
- Guidance for Federal Agencies for Sustainable Practices for Designed Landscapes (Oct 31, 2011, as supplemented)
- Oct 22, 2014 Presidential Memorandum—Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators, and
- Section 438 of the Energy Independence and Security Act of 2007 (EISA).

Federally protected species

While it is possible that no nesting or loafing habitat exists on Tinker AFB for the Northern Great Plains Piping Plover, Interior Least Turn, Rufa Red Knot or Whooping Crane, plenty of other habitat is available for neotropical migrant birds (e.g. mature bur oak stands), other shore birds, heron, egrets and rails (ponds, wetlands, streams and restored grasslands), grassland birds (restored and unrestored native grasslands/turf), and raptors.

Figure 4-2. Photos of Ecosystem Restoration Efforts at Tinker AFB.

Reserve 1 of Tinker AFB Urban Greenway (before) with Bermuda grass (above) converted to mixed prairie (below).

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

Reserve 1 of Tinker AFB Urban Greenway After (above) converted to mixed prairie.

Close up of Reserve 1 of Tinker AFB Urban Greenway showing mixed grass prairie.

Above, Tinker AFB Urban Greenway Entrance dominated by exotic fescue circa 1994 (above) and transitioning to native prairie/savannah following restoration action circa 2012 – below.

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

In conclusion, the guiding principles discussed above and ongoing conservation actions demonstrate Tinker AFB's strong commitment to the military mission and the natural environment and the wildlife that depend on the landscape for food, water and habitat. In addition, military members and civilians benefit from the improved esthetic aspects of the "green" areas and screened off industrial areas while exercising or driving on Tinker Air Force Base.

5.0 EFFECTS OF THE ACTION

While Seymour-Johnson AFB is location of the preferred alternative, if Tinker AFB is chosen instead, implementation of the proposed KC-46A MOB 3 mission, concurrent with Tinker's ongoing flying and maintenance mission, would only increase total aircraft operations by less than 13%, or 4,041 operations per year at Tinker AFB. The greatest increase would attributed to the increase in air tanker refueling operations. There are eight KC-135 aircraft in use currently, and the proposed MOB 3 mission would replace these eight aircraft with 12 KC-46A aircraft. Although the USAF recognizes that aircraft operations at Tinker AFB would increase over time if the installation were to be selected for the additional mission, the USAF does not anticipate a relative increases in bird strikes because due to the mitigation measures to avoid bird strikes that are currently in place at Tinker AFB in accordance with the INRMP and BASH plan.

Discussion of Migratory Bird Species and Federally Listed Species at or in the Vicinity of Tinker AFB

In an extensive 2010 avian survey, there were 5,485 individual birds observed on Tinker AFB, representing 137 species reported in the study entitled: *Inventory of Avian Species on Tinker AFB, Oklahoma City, Oklahoma, 2010.* No federally listed threatened or endangered species were observed during this survey. This inventory noted that spring time represented the highest diversity with 107 species, followed by summer with 68 species, fall with 56 species, and winter with 49 species (St. Germain, 2010). Prior to the strike of the listed Northern Great Plains Piping Plover in 2009, no birds of this particular species have been documented at Tinker AFB. No Northern Great Plains Piping Plovers have been observed since that incident.

Smaller birds on the airfield present a serious hazard because some flock in large numbers during the migration and wintering periods. A solitary individual will potentially cause less damage to an aircraft than will a flock. Typically ducks, geese, herons, owls and doves collide with aircraft as individuals (Sodhi, 2002). However, shorebirds and starlings usually hit aircraft in flocks. The greatest flocking bird hazards to aircraft can be from European starlings during the fall months. Starlings constitute 37% of all observations on the airfield. However, only three strikes of European starlings have been reported, each occurring outside of the fall period (St. Germain, 2010).

On Tinker AFB, a most prevalent aircraft strike threats comes from the Eastern Meadowlark, which represents a significant proportion of detections during the fall (11%), spring (5%,), and summer (28%). The Meadowlark also constitutes 19.4% of the strikes reported on Tinker AFB with an even distribution among those three seasons. The Horned lark becomes the leading threat in the winter when the Meadowlark is predominantly absent. Horned larks represent 84% of the hazard and 71% of the observations; however they only represent 2.2% of the total strikes reported. Killdeer are significant contributors to the bird strikes on aircraft at Tinker AFB. Killdeer represent 11% of the total strikes reported, with most of them occurring in the fall. The Killdeer appears to have a lower threat level than other species with a 15% hazard based off 6.5% of the observations, however these calculations do not take into consideration behavior of the Killdeer. Most of the Killdeer observations came while the species

was actively on or near the edge of the runways and taxiways. This species often forages on the impervious surfaces the runways provide, and will nest on the gravelly edges of these surfaces or roads. It is these behavioral traits that put Killdeer at greater risk and hazard than the observational data (6.5%) indicates.

The species representing BASH threats described above have strong open habitat preferences that are met to varying degrees by the airfield environment (St. Germain, 2010). In other words, the airfield environment resembles the open grassland-type habitat which is preferred by Eastern Meadowlark, Horned Lark, Killdeer, shorebirds, several species of sparrows and other grassland birds.

Overall the density of birds is much lower on the airfield than in other survey regions of the installation. In the study entitled *Inventory of Avian Species on Tinker AFB, Oklahoma City, Oklahoma, 2010*, the author believes there is an over inflation of winter density estimations due to low sample sizes combined with high variance and large cluster (flock) sizes. In addition, the number of individuals, species richness, and diversity is also much lower on the airfield. This is a good indication that the management practices of keeping birds away from the airfield, while promoting them in the green-space, is thus far successful (St. Germain, 2010).

Northern Great Plains Piping Plover

The Plover that was struck at Tinker is considered to be part of the Northern Great Plains population of the Piping Plover that is classified as threatened. According to Bird Life International, there are an estimated 4,662 breeders composing the Northern Great Plains population (http://www.birdlife.org/datazone/speciesfactsheet.php?id=3127).

No statistical analysis is possible on the one Northern Great Plains Piping Plover strike at Tinker AFB in the 30-year period since the bird was listed as threatened in 1986. As stated previously, more than 192,000 aircraft operations have occurred at Tinker AFB since the single Northern Great Plains Piping Plover was struck by an aircraft in 2009, with no additional Northern Great Plains Piping Plover sightings or strikes on base occurring in the last seven years. In addition, no nesting habitat is known for this species at Tinker AFB proper, or currently in Oklahoma County. Therefore, any Northern Great Plains Piping Plovers occurring in the region are anticipated to be temporary migrants.

The Northern Great Plains Piping Plover is one of 137 documented species occurring at Tinker AFB. According to Lt Colonel Beth Dittner, Chief of Flight Safety at Tinker AFB, over the last 20 years, there have been over 383 bird fatalities, or approximately 20 strikes per year, resulting from collisions with aircraft at that installation. Likely due to its extreme rarity at Tinker, only one of those fatalities was a Northern Great Plains Piping Plover, and that fatality occurred over 7 years ago. The Air Force cannot entirely dismiss the possibility that the ongoing flying mission and proposed KC-46A MOB 3 mission could result in a aircraft strike of an individual Northern Great Plains Piping Plover species sometime in the future. Since the likelihood of striking another Northern Great Plains Piping Plover is very low, as evidenced by historical BASH records, the USAF determined that the ongoing flying mission, as well as the proposed KC-46A MOB 3 mission, may affect, but is not likely to adversely affect this species.

Interior Least Tern

The ILT population has been surveyed from 1984 to present. It was federally listed as endangered in 1985. Survey effort and coverage increased during 1984 through 1986, yet because colonies are

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

ephemeral, riverine nesting habitat is remote, and salt flat nesting habitat is vast, consistent timing and coverage of surveys have not currently been logistically possible. Colonies in interior sites are typically small: ranging from 5 to 20 nests, and rarely greater than 50 nests. Best information available suggests that the interior population has increased during the time period of 1986 to 1991 from approximately 4,125 to 6,830 (EMK and J. Sidle unpubl. data). Tern numbers increased one hundred percent along lower Mississippi River (Cape Girardeau, MO, to Vicksburg, MS) between 1989 and 1990 (from 2,503 to 5,038 birds), which cannot be accounted for by increased survey effort or change in survey method. This area of the lower Mississippi supports 52 to 65 percent of all known nesting ILTs (http://bna.birds.cornell.edu/bna/species/290/articles/demography).

In addition, the Interior Least Tern is increasingly using rooftops for nesting (especially from North Carolina southward), and dredged-material islands (Fisk 1978, Parnell et al. 1986, Hovis and Robson 1989, Gore 1991, M. Harris pers. comm., M. Dodd pers. comm.), but productivity at rooftop sites is highly variable relative to natural sites (Robertson and Woolfenden 1992).

The USFWS 1990 Recovery Plan for the ILT estimated that there were 5,000 ILTs at that time, and the plan set a recovery goal of 7,000 birds. Although serious threats to the Tern continues, and the best means to count them remains a challenge, current population numbers appear to suggest that the birds are holding their own. There is a potential possibility of ILT nesting on flat roofs at Tinker AFB. If such nesting were to occur, aircraft strikes would be more likely when the birds are on or near the airfield. It is also possible, but difficult to determine, whether the birds are more interested in foraging or loafing in the restored natural areas on Tinker AFB rather than on the airfield itself. ILTs have preference for larger bodies of water than those found in Tinker AFB's ongoing restoration of riparian corridor sites. In addition, quality habitat may exist at the two nearby lakes, Lake Stanley Draper and Lake Thunderbird.

Air Force BASH data has never recorded an aircraft strike of an Interior Least Tern at Tinker AFB. Given the apparent population growth, survival and adaptability of the Tern as described above, the USAF has determined that the ongoing flying mission, and proposed KC-46A MOB 3 mission, may affect, but is not likely to adversely affect, members of the ILT species.

Rufa Red Knot

As stated previously, Rufa Red Knot populations are in decline around the world, especially *C. c. rufa*, which declined from about 82,000 individuals in the 1980s to fewer than 30,000 in 2010.

Geolocator results from eight red knots (one with 2 years of data) wintering in Texas showed that all these birds used a central, overland flyway across the midwest United States. Birds flew 1,600 to 2,000 miles to the first stopover. A Northern Great Plains stopover (Saskatchewan, Canada, and North Dakota, United States) was used by five of six birds in 2010, while southern Hudson Bay in Manitoba, Canada (the Nelson River delta and James Bay), was used by one bird in 2010 and all three birds in 2011 (Newstead et al. 2013). These findings support earlier reports of large numbers (1,000 to 2,500) of red knots in Saskatchewan and Alberta, Canada, between January and June (Skagen et al. 1999).

All birds departed Texas in the second half of May, and spent an average of 18.3 ± 3.2 days (range of 13 to 22 days) at the northbound stopover (Newstead et al. 2013). Although these geolocator results show consistent use of the central flyway, re-sightings of marked birds suggest a more complex pattern of movements between Texas and the Atlantic coast, including both the Southeast wintering areas and Delaware Bay (BandedBirds.org 2012; D. Newstead pers. comm. August 20, 2012; Niles et al. 2008,

p.74). In addition, at least one bird marked in Argentina passed through Texas during spring migration (Niles et al. 2008, p. 74). Higher counts of roughly 700 to 2,500 knots have recently been made on Padre Island, Texas, during October, which could include wintering birds (Newstead et al. 2013; Niles et al. 2009, p. 1).

This paragraph focuses on the Rufa Red Knot's coastal nonbreeding habitats. Rufa Red Knots are restricted to ocean coasts during winter, and occur primarily along the coasts during migration. However, small numbers of Rufa Red Knots are reported annually across the interior United States (i.e., greater than 25 miles from the Gulf or Atlantic Coasts) during spring and fall migration. These reported sightings are concentrated along the Great Lakes, but multiple reports have been made from nearly every interior State (eBird.org, 2012). Information on the specific noncoastal stopover habitats used by Rufa Red Knots is lacking.

Based on the above information, Rufa Red Knots are moving through Texas and Oklahoma on their way either to the Great Lakes or Delaware Bay and/or their breeding grounds in northern Canada with an estimated arrival of June 10 based on geolocator data. They are most likely to pass over Tinker AFB during spring and fall. Rufa Red Knots tend to migrate in single-species flocks with departures typically occurring in the few hours before twilight on sunny days. Size of the departing flocks tends to be large (greater than 50 birds) (Niles et al. 2008, p. 28). Likewise, based on observations of other *Calidris canutus* subspecies departing from Iceland towards Nearctic breeding grounds in spring 1986 to 1988, Alerstam et al. (1990, p. 201) found mean flock sizes of 100 to 200 individuals.

It appears that migrating Red Knots would pass over Tinker AFB in single species flocks of anywhere from 50 to 200 birds. They are also a fairly good sized bird and a flock of 50 or more individuals would be easy to detect during the day, but not at night. Radar would be required to detect them at night.

Air Force BASH data has never recorded an aircraft strike of a Rufa Red Knot at Tinker AFB. Given their habits as described above, the ongoing flying mission, and proposed KC-46A MOB 3 mission, may affect, but is not likely to adversely affect, the Rufa Red Knot.

Whooping Crane

According to the Aransas National Wildlife Refuge website data for 2015-2016, there are only 329 Whooping Cranes living in the wild today; which is the flock that winters at the Aransas National Wildlife Refuge on the Texas coast and spends the spring and summer at Wood Buffalo National Park in the Northwest Territories and adjacent areas of northeastern Alberta, Canada.

Although Tinker AFB is potentially within the confines of the migratory path of this species, a Whooping Crane has never been observed at Tinker AFB. Due to its extreme rarity, it would be an exceptional occasion to observe a Whooping Crane at Tinker AFB. If observed, the air traffic control tower would be alerted so that an air strike could be prevented. Therefore, the USAF has determined that the ongoing flying mission and proposed KC-46A MOB 3 mission may affect, but is not likely to adversely affect, members of the Whooping Crane species.

Effects of the Proposed Action on Northern Great Plains Piping Plover, Interior Least Tern, Rufa Red Knot and Whooping Crane

With Tinker's flying mission in place for the last 75 or so years, and with passage of the ESA in 1973 and 43 years gone by since, and only one documented strike of the listed Northern Great Plains Piping Plover,

A.6.3.3 Tinker AFB USFWS Section 7 Correspondence (Continued)

it is unlikely that the four listed bird species will be struck and killed in significant enough numbers at Tinker AFB to affect their survival.

Based on the information listed above, the USAF does not anticipate that a proposed 13% increase in overall operations will increase the potential for a future bird strike involving the Interior Least Tern, Rufa Red Knot, Whooping Crane or Northern Great Plains Piping Plover. This determination is based on the fact that more than 192,000 aircraft operations have occurred at Tinker AFB since the single Northern Great Plains Piping Plover was struck by an aircraft in 2009, with no additional Northern Great Plains Piping Plover sightings or strikes occurring in the last 7 years. In addition, no nesting habitat is known for this species, or the Interior Least Tern, Rufa Red Knot or Whooping Crane at Tinker AFB proper, or currently in Oklahoma County. Therefore, any of these species occurring in the region are anticipated to be temporary migrants.

6.0 CUMULATIVE EFFECTS

No cumulative effects are expected to result from Tinker's ongoing flying mission. The installation has been an active Air Force Base since World War II. The ongoing flight mission represents baseline conditions.

Should the proposed KC-46A MOB 3 mission occur at Tinker AFB, there would be dust, noise and increased personnel (demolition and construction workers) present on the installation during the demolition and construction period. The effects of this are expected to be temporary and are only occurring on the airfield. There would also be increased traffic on the roads at Tinker AFB during construction, but this will decrease after demolition and construction. There would be a slight permanent increase of traffic on Tinker's road due to the increase in personnel associated with the proposed KC-46A MOB 3.

If chosen for the proposed KC-46A MOB 3 mission, aircraft operation at Tinker AFB would increase by 13 percent, and additional personnel required to staff the mission would increase the number of personnel on Tinker by 476. More housing and service oriented businesses might be required. However, the increase of 476 personnel is insignificant compared to the Oklahoma City proper area population of 579,999 and the Oklahoma City Metro, seven county population of 1,459,788 (source: suburbanstats website and Wikipedia).

There is no designated critical habitat at or in the vicinity of Tinker AFB, so there will be no impact upon critical habitat from the proposed action.

7.0 CONCLUSIONS

Based on the information provided in this BE, the USAF requests concurrence from the USFWS that the current mission and implementation of the KC-46A MOB 3 mission at Tinker AFB, *may affect, but is not likely to adversely affect,* the Northern Great Plains Piping Plover, Interior Least Tern, Rufa Red Knot or Whooping Crane. Although Tinker AFB is not currently the preferred alternative in the KC-46A MOB 3 beddow EIS, the USAF would engage with the USFWS if Tinker AFB were to be selected to implement any measures that could reduce and minimize the potential for future impacts to Northern Great Plains Piping Plovers, ILT, Rufa Red Knot and Whooping Crane. These measures would be incorporated into the installation Integrated Natural Resources Management Plan during the required annual review and update sessions with the USFWS and Oklahoma Department of Wildlife Conservation.

USDA-WS staff are already collecting extensive information on bird species at Tinker AFB, and are working with the USAF natural resources program staff to provide abundance and population trend data for listed birds and other bird species that may occur on Tinker AFB. Through the Sikes Act mandated collaboration on the INRMP, the USAF, USFWS, and State will continue to implement a well-defined monitoring plan for sensitive species to provide abundance numbers and trends for all species of concern.

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United States Fish and Wildlife Service: https://www.fws.gov/northeast/redknot/

United States Fish and Wildlife Service: Whooping Crane Survey Results: Winter 2015-2016 https://www.fws.gov/refuge/aransas/

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A.6.4 Westover ARB Natural Resources Consultation Letters

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter

DEPARTMENT OF THE AIR FORCE
439TH MISSION SUPPORT GROUP (AFRC)

29 March 2016

Mr. Wayne M. Williams, CFM
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Mr. John Warner, Assistant Supervisor Federal Activities/Endangered Species
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New England Ecological Services Field Office
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Dear Mr. Warner,

The United States Air Force (Air Force) is preparing an Environmental Impact Statement (EIS) to assess the potential environmental consequences associated with the beddown of the Third Main Operating Base (MOB 3) of the KC-46A tanker aircraft. Westover Air Reserve Base (ARB), Massachusetts has been proposed as one of four alternative locations for this mission.

The MOB 3 mission involves the basing of 12 KC-46A aircraft. In addition to the aircraft, facilities, infrastructure and manpower would also be required to support the mission. For this beddown, the USAF intends to use as many existing facilities as possible, but recognizes that some new facilities would be required. Six new facilities would be constructed, several facilities would be renovated and two facilities would be demolished. In addition, the MOB 3 mission would require the repair of the taxilane located in the center of the existing aircraft parking ramp. All construction or ground disturbance proposed by this project would be conducted within the current base boundary and no wetland areas would be impacted.

The addition of KC-46A operations would increase the total number of operations conducted at Westover ARB by 41 percent. Approximately five percent of the total annual KC-46A sorties would be flown during acoustic night (between 10:00 PM and 7:00 AM). Practice approaches would be conducted by KC-46A aircrews at airfields other than Westover ARB on an occasional basis. The KC-46A would be operated in existing airspace, and the types of flight operations would be similar to the existing C-5 aircraft operations. KC-46A aircrews would use existing air refueling (AR) tracks and fuel jettison areas, if necessary. Flight activities involving refueling training would primarily occur in designated aerial refueling tracks. No new flight tracks are proposed for use.

The ROI for biological resources is defined as the land area (habitats) and airspace that could potentially be affected by infrastructure and construction projects, as well as airspace operations. Westover ARB has carefully reviewed the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Conservation (IPaC) online system on January 13, 2016, to identify current USFWS trust resources, such as migratory birds, species proposed or listed under the Endangered Species Act (ESA), wetlands, and USFWS National Wildlife Refuge System lands with potential to be affected by the Proposed Action. A submission for Hampden County, Massachusetts was completed to cover the area within the Region of Influence for biological resources:

> "**Hampden County, Massachusetts IPaC Trust Resource Report** identified one threatened flowering plant, the small whorled pogonia (Isotria medeoloides); one threatened mammal species, the northern long-eared bat (Myotis septentrionalis); 19 migratory birds; and the Silvio O. Conte National Fish and Wildlife Refuge. No wetlands or critical habitats were identified within the project area. Please see Attachment 2 for a full copy of the Trust Resource Report."

Additionally, special status species lists by county were obtained via the USFWS's Environmental Conservation Online System (ECOS) to identify species with the potential to occur within Hampden County, Massachusetts. Attachment 3, Table 3-1, lists these species and their habitats.

In accordance with Section 7 of the ESA (16 U.S.C. §§ 1531–1544, as amended), the Sikes Act (16 U.S.C. 670a-670o, 74 Stat. 1052), and as part of the U.S. Air Force's Environmental Impact Analysis Process (EIAP), we request your input in identifying any additional species of concern, general or specific issues, or areas of concern you feel should be addressed in the EIS. The Air Force requests your agency's concurrence with the species list and effects determinations contained in Table 3-1. If your agency has any new or additional information other than that contained in Table 3-1, we request that you please provide your comments by April 25, 2016.

Please provide your comments directly to Mr. Hamid Kamalpour, United States Air Force, AFCEC/CZN; Building 171, 2261 Hughes Ave, Ste 155, Lackland AFB, TX 78236-9853 or to the project website at www.kc-46A-beddown.com. Thank you for your assistance in this matter.

Sincerely,

WAYNE M. WILLIAMS, CFM, GS-13, DAF
Base Civil Engineer

3 Attachments:
1. Westover ARB Location Map
2. IPaC Trust Resource Report for Hampden County, Massachusetts
3. Table 3-1. Potential for Impacts from the Proposed Action to USFWS Special Status Species Known to or Believed to Occur in Hampden County, Massachusetts

cc: Hamid Kamalpour, AFCEC

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 1. AREA OF POTENTIAL EFFECT MAP

KC-46A Third Main Operating Base (MOB 3) Beddown EIS

Regional Map of Westover ARB, Massachusetts

March 2016

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 2. IPaC TRUST RESOURCE REPORT

U.S. Fish & Wildlife Service

Westover

IPaC Trust Resource Report

Generated January 13, 2016 09:19 AM MST, IPaC v2.3.2

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.

IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter (Continued)

IPaC Trust Resource Report

US Fish & Wildlife Service

IPaC Trust Resource Report

NAME
Westover

LOCATION
Hampden County, Massachusetts

DESCRIPTION
MOB 3

IPAC LINK
https://ecos.fws.gov/ipac/project/GNKMG-ZHOVF-CF3NU-OZ3UO-OZOEHU

U.S. Fish & Wildlife Contact Information

Trust resources in this location are managed by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

01/13/2016 09:18 AM Information for Planning and Conservation (IPaC) v2.3.2 Page 2

IPaC Trust Resource Report

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require FWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from the Regulatory Documents section in IPaC.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Flowering Plants

Small Whorled Pogonia Isotria medeoloides — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=Q1XL

Mammals

Northern Long-eared Bat Myotis septentrionalis — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A0JE

Critical Habitats

There are no critical habitats in this location

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter (Continued)

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/akn-histogram-tools.php

The following species of migratory birds could potentially be affected by activities in this location:

American Bittern Botaurus lentiginosus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F3

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Black-billed Cuckoo Coccyzus erythropthalmus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HI

Blue-winged Warbler Vermivora pinus — Bird of conservation concern
Season: Breeding

Canada Warbler Wilsonia canadensis — Bird of conservation concern
Season: Breeding

Cerulean Warbler Dendroica cerulea — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09I

Fox Sparrow Passerella iliaca — Bird of conservation concern
Season: Wintering

Least Bittern Ixobrychus exilis — Bird of conservation concern
Season: Breeding

Louisiana Waterthrush Parkesia motacilla — Bird of conservation concern
Season: Breeding

Olive-sided Flycatcher Contopus cooperi — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0AN

Peregrine Falcon Falco peregrinus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU

Pied-billed Grebe Podilymbus podiceps — Bird of conservation concern
Year-round

Prairie Warbler Dendroica discolor — Bird of conservation concern
Season: Breeding

Purple Sandpiper Calidris maritima — Bird of conservation concern
Season: Wintering

Short-eared Owl Asio flammeus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Upland Sandpiper Bartramia longicauda — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HC

Willow Flycatcher Empidonax traillii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F6

Wood Thrush Hylocichla mustelina — Bird of conservation concern
Season: Breeding

Worm Eating Warbler Helmitheros vermivorum — Bird of conservation concern
Season: Breeding

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter (Continued)

PaC Trust Resource Report

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

This location overlaps all or part of the following National Wildlife Refuges:

Silvio O. Conte National Fish And Wildlife Refuge 340.91 acres

PHONE (413) 548-8002

ADDRESS
103 East Plumtree Road
Sunderland, MA 01375

http://www.fws.gov/refuges/profiles/index.cfm?id=53590

PaC Trust Resource Report

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS
The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS
Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Wetland data is unavailable at this time.

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

ATTACHMENT 3. POTENTIAL FOR IMPACTS FROM THE PROPOSED ACTION TO USFWS SPECIAL STATUS SPECIES KNOWN TO OR BELIEVED TO OCCUR IN HAMPDEN COUNTY, MASSACHUSETTS

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

Table 3-1. Potential for Impacts from the Proposed Action to USFWS Species Known to or Believed to Occur in Hampden County, Massachusetts

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Westover Air Reserve Base?	Potential for Impacts from the Proposed Action: Effects determination
Clams					
Dwarf wedgemussel	*Alasmidonta heterodon*	Endangered	May inhabit a variety of aquatic habitats from small streams to large rivers. Found in a variety of substrate types including clay, sand, gravel and pebble, and sometimes in silt depositional areas near banks; usually inhabits hydrologically stable areas, including very shallow water along streambanks and under root mats, but may be found at depths of 25 feet in the Connecticut River	No	No. No effects to aquatic habitats will occur as a result of the Proposed Action. Habitat for dwarf wedgemussel does not occur at Westover Air Reserve Base.
Flowering Plants					
Small whorled pogonia	*Isotria medeoloides*	Threatened	Grows in older hardwood stands of beech, birch, maple, oak, and hickory that have an open understory. May grow in stands of softwoods such as hemlock. Prefers acidic soils with a thick layer of dead leaves, often on slopes near small streams	No	No. No effects to native vegetation will occur as a result of the Proposed Action. Habitat for small whorled pogonia does not occur at Westover Air Reserve Base.
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	Threatened	Summer roosting habitat includes underneath bark, in cavities, or in crevices of live and dead trees; caves and mines. Opportunistic in roost selection, using tree species based on suitability to retain bark or provide cavities or crevices. Winter hibernacula include caves and mines. Large caves or mines with large passages and entrances, constant temperatures and high humidity with no air currents are preferred.	No	No. Species not detected during basewide surveys completed in 1995. No known roosting habitat occurs on Base. Potential foraging habitat, may be present, however no adverse effects to the northern long-eared bat are anticipated.

Source: USFWS 2015a, d-f, Westover ARB 2014

A.6.4.1 Westover ARB USFWS Section 7 Consultation Letter (Continued)

DEPARTMENT OF THE AIR FORCE
439th MISSION SUPPORT GROUP (AFRC)

References:

U.S. Fish and Wildlife Service (USFWS) 2015a. Environmental Conservation Online System. Species by County Reports. Accessed: http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=25013 on 13 January 2016.

USFWS 2015b. Critical Habitat Portal. Accessed: http://ecos.fws.gov/crithab/ on 13 January 2016.

USFWS 2015c. Information for Planning and Conservation (IPaC). Accessed: https://ecos.fws.gov/ipac/project/QZIQYV3DNJHAFPJWDX2A3ACVEU/resources on 13 January 2016.

USFWS 2015d. Species Profile: Dwarf wedgemussel (*Alasmidonta heterodon*) Accessed: http://www.fws.gov/raleigh/species/es_dwarf_wedgemussel.html on 19 January 2016.

USFWS 2015e. Endangered Species. Small Whorled Pogonia (*Isotria medeoloides*) Fact Sheet. Accessed: http://www.fws.gov/midwest/endangered/plants/smallwhorledpogoniafs.html on 19 January 2016.

USFWS 2015f. Endangered Species. Northern Long-Eared Bat (Myotis septentrionalis). Accessed: http://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html on 19 January 2016.

Westover Air Reserve Base (ARB) 2014. Draft Integrated Natural Resources Management Plan. Westover ARB, Massachusetts. Headquarters, Air Force Reserve Command Environmental Division. April 2005.

A.6.4.2 Westover ARB USFWS Section 7 Consultation Response

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

REF: Beddown, Third Main Operating Base, KC-46A tanker aircraft, Westover ARB, MA

June 30, 2016

Mr. Hamid Kamalpour
United States Air Force
AFCE/CZN
Building 171, 2261 Hughes Avenue, Suite 155
Lackland AFB, Texas 78236-9853

Dear Mr. Kamalpour:

This responds to a letter, dated March 29, 2016, from Wayne Williams of Westover Air Reserve Base (ARB), requesting our concurrence with the United States Air Force's (Air Force) determinations of effects on listed species that may occur as a result of the Air Force's proposed beddown of the Third Main Operating Base of the KC-46A tanker aircraft at the Westover ARB in Massachusetts. The request is pursuant to the Air Force's ongoing preparation of an Environmental Impact Statement evaluating the potential environmental consequences associated with the proposed project. The request and our comments are provided in accordance with the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531, *et seq.*) (Act).

We reviewed the Westover IPaC Trust Resource Report (Report), dated January 13, 2016, included with the March 29, 2016 letter, and determined the Report identifies all proposed, candidate, threatened, and endangered species that may occur in the proposed project area or could potentially be affected by the proposed action. We also reviewed Table 3-1 (Attachment 3 to the March 29, 2016 letter), entitled "Potential for Impacts from the Proposed Action to USFWS Species Known to or Believed to Occur in Hampden County, Massachusetts," and noted that the Air Force determined the project would have "no effect" on the dwarf wedgemussel (*Alasmidonta heterodon*), small whorled pogonia (*Isotria medeoloides*), or the northern long-eared bat (*Myotis septentrionalis*). We are not aware of any information at this time that would cause us to disagree with the Air Force's determinations.

In the future, we recommend that the Air Force generate official species lists from the Regulatory Documents page of the IPaC website, because it may negate the need for additional correspondence with this office. Please note that neither section 7 of the Act, nor the Act's implementing regulations (50 C.F.R. 402), require Federal agencies to obtain the U.S. Fish and Wildlife Service's concurrence for "no effect" determinations.

Preparation of a Biological Assessment is not necessary, and no further consultation with us under section 7 of the Act regarding the subject project is required for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available or the project description changes and listed or proposed species could be affected.

Thank you for your cooperation, and please contact Mr. Anthony Tur of this office at (603) 223-2541 if you need any further assistance.

Sincerely yours,

Acting for:

Thomas R. Chapman
Supervisor
New England Field Office

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A.7 DRAFT EIS DISTRIBUTION LIST

A.7.1 Grissom ARB, Indiana, Draft EIS Distribution List

Mrs. Susan Hovermale, Farm Service Agency
Ms. Susan Meadows, Natural Resources Conservation Service
Mr. Scott Pruitt, U.S. Fish and Wildlife Service
Ms. Jennifer Boyle-Warner, Indiana Association of Soil and Water Conservation Districts
Mr. Cameron Clark, Indiana Department of Natural Resources
Mr. Ted McKinney, Indiana State Department of Agriculture
Mr. Jason Hill, Ducks Unlimited
Mr. Andy Kron, Indiana Farm Bureau
Mr. Robert Suseland, Pheasants Forever
Ms. Mary McConnell, The Nature Conservancy
Mr. Steven Howell, Indiana Department of Environmental Management (IDEM)
Mr. Kenneth Westlake, U.S. Environmental Protection Agency Region V
Mr. Greg Goodnight, City of Kokomo
Ms. Brenda Brunnemer-Ott, City of Kokomo
Mr. Gabriel Greer, City of Peru
Ms. Trish Soldi, City of Peru
Mr. Dennis See, City of Peru
Mr. Dave Kitchell, City of Logansport
Ms. Carol Sue Hayworth, City of Logansport
Mr. CJ Crist, Town of Bunker Hill
Ms. Rose Jackson, Galveston Town Hall
Mr. Patrick Robinson, Walton Town Hall
Mr. Josh Francis, Miami County courthouse
Mr. James L. Sailors, Cass County
Mr. Arin Shaver, Cass County Government Building
Mr. Steven Ray, North Central Indiana Regional Planning Council
Mr. Paul Wyman, Howard County Administration Center
The Honorable, Mike Pence Indiana State House
The Honorable Eric Holcomb, Indiana State House
The Honorable James Buck, Indiana State House
The Honorable Randall Head, Indiana State House
The Honorable William Friend, Indiana State House
The Honorable Heath VanNatter, Indiana State House
Mr. Duane Embree, Indiana Office of Defense Development
Ms. Brandye Hendrickson, Indiana Department of Transportation
Mr. Jason Kaiser, INDOT
Mr. Jim Schellinger, Indiana Economic Development Corporation
Mr. Bill Konyha, Indiana Office of Community and Rural Affairs
Ms. Jennifer Vandenberg, Indiana Office of Community and Rural Affairs
The Honorable Dan Coats, Indiana U.S. Senators
The Honorable Joe Donnelly, Indiana U.S. Senators
The Honorable Jackie Walorski, Indiana U.S. Representatives
The Honorable Susan Brooks, Indiana U.S. Representatives
The Honorable Todd Rokita, Indiana U.S. Representatives

A.7.1 Grissom ARB, Indiana, Draft EIS Distribution List (Continued)

Mr. Barry Cooper, Federal Aviation Administration, Great Lakes Regional Office
Mr. Robert Kaplan, US EPA Region V
Ms. Sandy Chittum, Miami County Chamber of Commerce
Mr. Bill Cuppy, Logansport-Cass County Chamber of Commerce
Mr. Jim Tidd, Miami County Economic Development Authority
Ms. Christy Householder, Cass County Economic Development Authority
Mr. John Gilpin, Grissom Community Council
Mr. Timothy Cox, Grissom Community Council
Mr. Jim Price, Grissom Air Museum
Ms. Amy Pate, REALTORS Association of Central Indiana
Mr. Sean White, Montgomery Aviation, Inc.
Mr. Chris Renteria, Dean Baldwin Painting
Mr. Tom Davies, Associated Press
Mr. Brandon Smith, Indiana Public Broadcasting Stations
Mr. Jake Robinson, Network Indiana
Indiana Herald
Mr. Greg Andrews, Indianapolis Business Journal
Ms. Amanda Heckert, Indianapolis Monthly
Mr. Willam Mays, Indianapolis Recorder
Ms. Patricia Miller, Indianapolis Star
Ms. Julie Inskeep, Journal Gazette
Mr. Keith Smiley, WBRI-Radio
Ms. Michelle Kiefer, WNDE-Radio
Mr. Jay Michaels, WRWM-Radio
Mr. Bob Richards, WLHK-Radio
Ms. Michelle Johnson, WFYI-Radio
Mr. Chuck Williams, WTLC-Radio
Mr. Jim Ganley, WSQM-Radio
Mr. JR Ammons, WZPL-Radio
Ms. Tina Cosby, WISH/WNDY-TV
Mr. Jimmy Love, WRTV-TV
Ms. Julie McQuoid, WTHR-TV
Mr. Brad Norris, WXIN-TV
Ms. Shannon Crouch, Kokomo Herald
Mr. Pat Munsey, Kokomo Perspective
Mr. Jeff Kovaleski, Kokomo Tribune
Ms. Camellia Pflum, WZWZ-Radio
Mr. Allan James, WWKI-Radio
Ms. Michelle Dials, Cass County Info
Ms. Mitsy Knisely, Pharos-Tribune
Mr. Ken Holtzinger, WSAL-Radio
Ms. Linda Kelsay, Chronicle-Tribune
Mr. Ben Quiggle, Peru Tribune
Mr. Doug Roorbach, News Herald
Mr. Edward Thurman, WBAT/WCJC/WMRI/WXXC-Radio
Mr. Jack Crummer, WIWU-Radio

A.7.1 Grissom ARB, Indiana, Draft EIS Distribution List (Continued)

Mr. Wayne Rees, The Paper
Mr. Eric Seaman, Wabash Plain Dealer
Mr. Wade Weaver, WJOT-Radio
Ms. Toni Metzger, WKUZ-Radio
Ms. Maryann Farnham, Peru Public Library
Ms. Faith Brautigam, Kokomo-Howard County Public Library Main
Ms. Diane Hunter, Miami Tribe of Oklahoma
Chairman John "Rocky" Barrett, Citizen Potawatomi Nation
Chairman Harold "Gus" Frank, Forest County Potawatomi
Chairperson Kenneth Meshigaud, Hannahville Indian Community
Chairman Lester Randall, Kickapoo Tribe in Kansas
Chairman David Pacheco Jr., Kickapoo Tribe of Oklahoma
Chief John Froman, Peoria Tribe of Indians of Oklahoma
Chairperson Liana Onnen, Prairie Band of Potawatomi Nation
Dr. Andrea Hunter, Osage Nation
Mr. Rex Stitsworth, Individual
Mr. Jason Wesaw, Pokagon Band of Potawatomi Indians
Ms. Sheryl Wes, Individual
Mr. Michael Conner, Individual
Mr. Joshua Francis, Individual
Mr. Jason Kaiser, Individual
Mr. Jim Xates, Individual
Mr. James Todd, Individual
Mr. Hal Job, Individual
Mr. Steve Kitts, Individual

A.7.2 Seymour Johnson AFB, North Carolina, Draft EIS Distribution List

The Honorable Louis Pate, North Carolina State Senate
The Honorable Jimmy Dixon, North Carolina House of Representatives
The Honorable John Bell IV, North Carolina House of Representatives
The Honorable Larry Bell, North Carolina House of Representatives
The Honorable Pat McCrory, North Carolina Governor
The Honorable Howard Hunter, North Carolina House of Representatives
Mr. John Hammond, U.S. Fish and Wildlife Service
Mr. Michael P. Huerta, U.S. Department of Transportation
Mr. Chris Militscher, U.S. Environmental Protection Agency, Region IV
Ms. Heather McTeer Toney, U.S. Environmental Protection Agency, Region IV
Mr. Gordon Myers, North Carolina Wildlife Resources Commission
Ms. Renee Gledhill-Earley, North Carolina Department of Natural and Cultural Resources
Mr. Donald van der Vaart, North Carolina Department of Environmental Quality
Ms. Crystal Best, North Carolina State Environmental Review Clearinghouse
Ms. Sheila Holman, North Carolina Division of Air Quality
Mr. Braxton Davis, North Carolina Division of Coastal Management
Mr. Bobby Walston, North Carolina Division of Aviation
Secretary Nick Tennyson, North Carolina Department of Transportation
Mr. Gregory Richardson, North Carolina Commission of Indian Affairs

A.7.2 Seymour Johnson AFB, North Carolina, Draft EIS Distribution List (Continued)

The Honorable Chuck Allen, City of Goldsboro
Mr. George Wood, Wayne County Manager
Ms. Ashley Smith, Wayne County Soil & Water Conservation
Ms. Kate Daniels, Wayne County Chamber of Commerce
Mr. Davin Madden, Environmental Health Department
Mr. Chip Crumpler, Wayne County Planning Department
Mr. James Rowe, City of Goldsboro
Mr. Scott Stevens, City of Goldsboro
Mr. Joe Daughtery, Wayne County Board of Commissioners
Ms. Natasha Francois, Wayne County Public Library
Ms. Kim Webb, Seymour Johnson AFB Library
Mr. Dennis Hill, Goldsboro News-Argus
Mr. Thomas Vick, Goldsboro Daily News
Mr. Jared Brumbaugh, Public Radio East - NPR
Mr. Bruce Ferrell, WPTF - 680 AM
Mr. Rick Gall, WRAL-TV
Ms. Andrea Parquet-Taylor, WNCN-TV
Ms. Michelle Germano, WTVD-TV
Mr. Gregory Ruhl, Wayne Executive Jetport
Mr. BJ Murphy, Individual
Mr. Craig Hill, Individual
Ms. Monique Hicks, Individual
Mr. Richard Barkes, Kinston Regional Jetport
Mr. Greg Thompson, Kinston Department of Public Safety
The Honorable Richard, Burr U.S. Senate
The Honorable Thom, Tillis U.S. Senate
The Honorable G.K. Butterfield, U.S. House of Representatives
The Honorable George Holding, U.S. House of Representatives
Mr. Will Best, Individual
Mr. Allen Pedersen, Individual
Mr. Toney Denton, Curtis Media
Mr. Jimmy O'Neal, Individual
Mr. Archie Moore, Individual
Mr. Bruce Gates, MAC/NCAR
Mr. Philip Kerstetter, University of Mount Olive
Mr. Glenn Barwick, Landvest Development Co.
Mr. Bob Hill, MAC
Mr. Steve Herring, New-Argus
Mr. James Bryn, MAC
Mr. Ben Seegus, MAC
Mr. Wallace Brown, Individual
Mr. Ven Faulk, Shumate-Faulk Funeral Home
Mr. James Galimi, Individual
Mr. Chad Goggins, North Carolina Department of Transportation
Mr. Booker Pullen, North Carolina Department of Environmental Quality
Mr. Gene Aycole, City of Goldsboro

A.7.2 Seymour Johnson AFB, North Carolina, Draft EIS Distribution List (Continued)

Ms. Sarah Merritt, Arts Council of Wayne Co.
Ms. Shycole Simpson-Corter, City of Goldsboro
Mr. Charles Edwards, NC DOT
Mr. W.W. Albertson, Individual
Mr. James Rowe, City of Goldsboro
Mr. Tyrone Norris, Curtis Media
Ms. Joyce Doughtery, Individual
Mr. Jamie Livengood, Wayne County Schools
Mr. Lonnie C., Watchdogs
Mr. Mark Chenier, Individual
Mr. Dillon Wooten, Wooten Development Co.
Mr. Borden Parker, Individual
Mr. Jeremiah Daniels, NCMAC Wayne County MAC
Ms. Julie Metz, City of Goldsboro
Mr. Scott Stevens, City of Goldsboro
Mr. Rick Summer, Wooten Development Co.
Mr. Lee Perkins, Individual
Mr. David Sloan, Individual
Mr. George Wood, Wayne County
Mr. Elton Brewington, BM and I
Ms. Viola Figueroa, Citizens w/ concerns
Mr. Tom Dody, Individual
Ms. Kate Daniels, WC Chamber of Commerce
Ms. Anne Hornez, Individual
Mr. Stewart Bryan, Individual
Mr. Charles Perkins, Individual
Mr. Jack Best, Individual
Mr. John Bell, NC GA House of Representative
Ms. Karon Williford, Individual
Ms. Sherry Archibald, City of Goldsboro
Mr. Joe Doughtery, Wayne County
Ms. Betsy Rosemann, City of Goldsboro
Ms. Martha Bryan, DGDC Chamber
Mr. Mark Lesnav, North Carolina Community Federal Credit union (NCCFCU)
Mr. Will Bland, Individual
Mr. Scott LaFevers, LaFevers Dental Team
Mr. Chip Crumpler, Wayne County
Mr. Randy Guthrie, City of Goldsboro
Ms. Julie Daniels, MAC/BB&T
Mr. Thomas Vick Jr., Goldsboro Daily News
Mr. Bob Waller, Individual
Ms. Sandy Korschoh, Individual
Mr. Michael West, Police/City of Goldsboro
Mr. Sebastian Montange, NCDOT
Mr. George Aycock Jr., Wayne County
Mr. Darrel Horne, Individual

A.7.2 Seymour Johnson AFB, North Carolina, Draft EIS Distribution List (Continued)

Mr. Jim Womble, Individual
Mr. Hal Tanner III, News Argus
Mr. Edward Cromartie, Wayne County Commissioner
Mr. Don Davis, NC Senate
Ms. Sherry Frye, Individual
Ms. David Ham, City Council Member

A.7.3 Tinker AFB, Oklahoma, Draft EIS Distribution List

Mr. Brian Maughanm, Oklahoma County
Mr. Ken Collins, U.S. Fish and Wildlife Service
Mr. Gary O'Neill, U.S. Department of Agriculture
Mr. John Hendrix, U.S. Fish and Wildlife Services
Mr. Ross Richardson, Federal Emergency Management Association (FEMA)
Ms. Carolyn Schultz, U.S. Army Corps of Engineers, Tulsa District
Mr. Michael Jansky, U.S. Environmental Protection Agency, Region 6
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Chief Ryan Malonson, Wampanoag Tribe of Gay Head

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APPENDIX B

DEFINITION OF RESOURCE AND METHODOLOGY FOR ANALYSIS

APPENDIX B DEFINITION OF RESOURCE AND METHODOLOGY FOR ANALYSIS

This appendix directly corresponds to the environmental resource areas described in Volume I, Chapter 3, as the baseline conditions, and the analysis of consequences, as described in Volume I, Chapter 4, for each of the four bases under consideration. The environmental resource areas are ordered according to the order in Volume I, Chapters 3 and 4. For each environmental resource area, this appendix provides a definition of the resource, the regulatory setting, if applicable, and a description of the methodology used to evaluate the environmental resource area.

Because the same resource areas were analyzed for each of the four bases, the definition, regulatory setting, and methodology are the same for all four bases. The analysis methodology addresses both the context of the environmental resource and the intensity of potential consequences to the resource resulting from implementation of the KC-46A missions.

B.1 ACOUSTIC ENVIRONMENT

B.1.1 RESOURCE DEFINITION

The acoustic environment is the combination of useful or desirable sounds and noise. Sound is tiny vibrations in a medium (e.g., air or water) that are detected by the ear, and noise is specifically unwanted sound. Sound intensity is typically expressed in decibels (dB), a logarithmic system of denotation. Sounds are often 'A-weighted', a process by which sound energy at frequencies heard best by the human ear are emphasized while other frequencies are de-emphasized. Several metrics are used to describe sounds that vary through time. The highest A-weighted sound level measured during a single event is called the maximum A-weighted sound level (L_{Amax}). The 24-hour equivalent sound level (L_{eq24}) is a cumulative metric that decibel-averages all noise events in a 24-hour period. The Day-Night Average Sound Level (L_{Adn}) is the same as L_{eq24}, except that L_{Adn} applies a 10 dB penalty to events between 10:00 P.M. and 7:00 A.M (i.e., acoustic night). Although L_{Adn} does not reflect the sound level heard at any given moment, it does provide a single-number description of the overall noise level. Social surveys have found a strong correlation between L_{Adn} and the percent of the population that is highly annoyed by the noise (Schultz 1978; Finegold et al. 1994). Reactions to noises depend not only on the qualities of the noise (e.g., intensity, pitch, duration, or time of day), but also on the characteristics of the listener (e.g., sensitivity of the individual and attitude toward the noise source) and the activity in which the listener is engaged at the time the noise occurs. While the reaction of an individual to noise cannot be predicted accurately, the cumulative tendencies of large numbers of people can be predicted with a reasonable degree of confidence. The Region of Influence (ROI) for noise includes areas on and near each installation that experience aircraft noise levels greater than 65 dB L_{Adn} during aircraft operations, and the areas proposed for infrastructure development where construction noise could occur.

B.1.2 REGULATORY SETTING

Because legal limits on allowable noise levels could, in some cases, reduce the combat effectiveness of military equipment, military equipment has been exempted from regulations that impose noise limitations. However, several policies and regulations are in place to limit the effects of military noise.

The U.S. Air Force (USAF) recognizes that noise-sensitive land uses are not compatible with elevated aircraft noise levels and has implemented the Air Installations Compatible Use

Zones (AICUZ) program, as described in Air Force Instruction (AFI) 32-7063 and Department of Defense Instruction (DoDI) 4165.57, to minimize incompatible land use. In 1992, the Federal Interagency Committee on Noise (FICON) established a set of guidelines detailing which land uses are compatible at which noise levels; these guidelines have been adopted as part of the AICUZ program.

In June 1980, an *ad hoc* Federal Interagency Committee on Urban Noise (FICUN) published guidelines (FICUN 1980) relating L_{Adn} to compatible land uses. The FICUN guidelines consider areas with noise levels of 75 dB L_{Adn} or greater as unacceptable living environments. Areas between 65–74 dB L_{Adn} are considered "generally unacceptable" for noise-sensitive land uses (e.g., residences, schools, hospitals, and public services). Houses located in areas between 65–74 dB L_{Adn} may not qualify for Federal mortgage insurance without additional costs associated with installing noise attenuation. In the outdoor noise environment, levels greater than 65 dB L_{Adn} may be annoying to some people during communications. Generally, residential development is not recommended in areas experiencing noise levels of 65 dB L_{Adn} or greater. Although discouraged, residential development is compatible within the 65–69 and 70–74 dB L_{Adn} contours, provided noise reduction levels of 25 dB and 30 dB, respectively, are achieved. Commercial/retail businesses are compatible without restrictions up to 69 dB, and up to 79 dB L_{Adn}, provided that noise reduction levels of 25 dB and 30 dB, respectively, are achieved for public areas. Industrial/manufacturing, transportation, and utility companies have a high noise level compatibility, and, therefore, can be located within the higher noise zones.

On-base noise exposure to workers may exceed 80 dB L_{Adn}. Workers in known high noise exposure locations may be required to wear hearing protection devices including, but not limited to, earplugs and earmuffs. The hearing conservation programs at each base are conducted in accordance with Air Force Occupational Safety and Health Standard 48-20, "Occupational Noise and Hearing Conservation Program," DoDI 6055.12, "DoD Hearing Conservation Program," and Title 29 of the *Code of Federal Regulations (CFR)* Section 1910.95, "Occupational Noise Exposure." The Bioenvironmental Engineering Office administers the Hearing Conservation Program at each of the alternative bases. Representatives from the Bioenvironmental Engineering Office visit facilities in which workers could potentially be exposed to noise levels exceeding noise exposure thresholds. A health risk assessment is conducted involving dosimeter testing of a representative sample of employees. An audiometric monitoring program is initiated if noise exposure exceeds established thresholds.

Per U.S. Department of Defense (DoD) policy, the 80 dB L_{Adn} noise contour is used to identify populations most at risk of potential hearing loss (USD 2009). In cases in which people are exposed to noise levels greater than 80 dB L_{Adn} on a regular basis, the policy directs that methodology defined in U.S. Environmental Protection Agency (USEPA) report number 550/9-82-105 be used to quantify the risk (see Section B.1.3).

B.1.3 METHODOLOGY

B.1.3.1 Base Vicinity

Noise levels in the vicinity of the bases were modeled using NOISEMAP (Version 7.2). In accordance with current USAF policy, NOISEMAP runs were conducted using the topographic effects module. This module accounts for the effects of local terrain and ground surface type on the propagation of sound. In accordance with current USAF and DoD policies, noise levels were calculated for an Annual Average Day, which is defined as a day with 1/365th of total annual operations.

The areas exposed to elevated noise levels are shown using L_{Adn} noise contours at 5 dB increments from 65 dB to 85 dB. Elevated L_{Adn} implies that overflight noise is particularly frequent and intense. In general, noise levels are highest on and near the airfield itself and decrease with distance from the airfield. However, in a few instances, the overlapping of two or more flight paths generates a geographically separated area in which noise exceeds 65 dB L_{Adn}. These instances appear as small noise contour polygons separated from the larger noise contour set.

The number of off-base persons exposed to noise level increments was estimated using U.S. Census 2014 American Community Survey (ACS) data at the block group level. Noise contours were overlaid on census blocks to determine the fraction of each census block that lies within each noise level increment. Census block population was apportioned to inside or outside of the noise level increment based on the fraction of the census block affected. Population estimates were refined by excluding areas not classified in land use data provided by local governments as being used for residential purposes. This method assumes even distribution of population with the residential portions of census blocks. The U.S. Census counts permanent residents; non-permanent residents are not counted using this method.

Among populations exposed to 80 dB L_{Adn} or greater, long-term hearing loss cannot be ruled out (see Section B.1.2). The noise metric L_{eq24}, rather than $L_{Adn,}$ is recommended for use in assessing hearing impairment risk (DNWG 2013). The L_{eq24} metric is equivalent to L_{Adn}, but does not add a decibel weighting factor to late-night noise events. The decibel weighting factor is relevant to estimating annoyance, but is not relevant to the physical mechanisms that can result in hearing impairment. The USEPA's Guidelines for Noise Impact Analysis (report #550/9-82-105) were used to quantify hearing loss risk in terms of noise-induced permanent threshold shift (NIPTS), a quantity that defines the permanent change in the threshold level below which a sound cannot be heard. NIPTS is stated in terms of the average threshold shift at several frequencies that can be expected from daily exposure to noise during a normal working lifetime of 40 years, with the exposure beginning at the age of 20 years and lasting 8 hours per day for 5 days per week. The actual value of NIPTS for any given person depends on that individual's physical sensitivity to noise during a 40-year working lifetime; some people will experience more loss of hearing than others. Another factor that affects the risk of NIPTS is that many people would be inside their homes and would, therefore, be exposed to lower noise levels due to noise attenuation provided by the house structure. A 2-year, USEPA-sponsored telephone survey of more than 9,000 persons found that the average American spends approximately 87 percent of his or her time indoors (Klepeis et al. 2001). Table B-1 shows the "average NIPTS" (10th to 90th percentiles of the exposed population) and the "10th percentile" NIPTS (NIPTS for the most sensitive 10 percent of the population) as a function of L_{Adn} if the person is fully exposed to the noise level at his or her residence (i.e., outdoors 100 percent of the time) or if he or she is outdoors for the national average 13 percent of the day. The actual exposure of any given individual to noise depends on unknown factors, such as whether a person is at home during the daytime hours (when most flying occurs). For the purposes of this study, it was assumed that persons would be at their residences during these hours.

According to the USEPA documents Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety and Public Health and Welfare Criteria for Noise, changes in hearing levels of less than 5 dB are generally not considered noticeable (USEPA 1974). There is no known evidence that an NIPTS of less than 5 dB is perceptible or has any practical significance for the individual. Furthermore, the variability in audiometric testing (testing of hearing ability) is generally assumed to be ± 5 dB.

Table B-1. Estimated Average NIPTS and 10th Percentile NIPTS as a Function of L_{Adn}

L_{eq24}[a]	100 Percent of Time Outdoors		National Average Percent Time Indoors	
	Average NIPTS (dB)[b]	10th Percentile NIPTS (dB)[b]	Average NIPTS (dB)[b]	10th Percentile NIPTS (dB)[b]
80–81	3	7	n/a[c]	n/a[c]
81–82	3.5	8	n/a[c]	n/a[c]
82–83	4	9	1	3.5
83–84	4.5	10	1	4
84–85	5.5	11	1.5	4.5
85–86	6	12	2	5.5
86–87	7	13.5	2.5	6.5
87–88	7.5	15	3	7
88–89	8.5	16.5	3.5	8
89–90	9.5	18	4	9

[a] Relationships between L_{eq24} and NIPTS were derived from CHABA 1977.
[b] NIPTS values rounded to the nearest 0.5 dB.
[c] Equivalent exposure noise level is less than 75 dB L_{Adn}, below the threshold at which NIPTS has been demonstrated to occur.

The preponderance of available information on risk of hearing loss for the adult working population is from the workplace with continuous exposure throughout the day for many years. According to a report by Ludlow and Sixsmith, there were no significant differences in audiometric test results between military personnel who as children had lived in or near stations where jet operations were based and a similar group who had no such exposure as children (Ludlow and Sixsmith 1999). Thus, for the purposes of hearing loss analysis, it could be assumed that the limited data on hearing loss are applicable to the general population, including children, and provide a conservative estimate of hearing loss.

Noise levels generated by construction equipment were taken from the Federal Highway Administration Roadway Construction Noise Model Noise Emission Reference Level database (FHA 2006). Construction noise is generally localized and temporary.

B.1.3.2 Auxiliary Airfields

KC-46A Third Main Operating Base (MOB 3) aircrews would sometimes conduct practice approaches at airfields other than home-station. KC-135 aircraft assigned to the 916 Air Refueling Wing (ARW) at Seymour Johnson Air Force Base (AFB) conduct practice approaches at nearby Kinston Regional Jetport on a regular basis (966 airfield operations annually), because the traffic pattern at Seymour Johnson AFB is often full. KC-46A aircraft would conduct an estimated 1,623 airfield operations at Kinston Regional Jetport should Seymour Johnson AFB be selected for the proposed MOB 3 mission. This section describes the method used to estimate potential noise level increases associated with the proposed net annual increase of 657 airfield operations. The same method is used to assess potential increase at other airfields used less frequently than the Kinston Regional Jetport by the 916 ARW.

FAA records indicate that the Kinston Regional Jetport accommodated 21,112 airfield operations in 2015, and 9,758 of these operations were military aircraft (FAA 2016). Military operations consist of propeller-driven aircraft (10 percent of military), large cargo aircraft (70 percent of military), and fighter aircraft (20 percent of military) (Barkes 2016). For the purposes of this analysis, aircraft were categorized as either generating L_{Amax} equal to or greater than that of a KC-46A/KC-135 or, alternatively, as generating L_{Amax} less than that of a KC-46A/KC-135. To simplify the analysis and to ensure that impacts are not underestimated, all aircraft other than large military cargo and fighter aircraft were assumed to be aircraft that generate L_{Amax} less than

the KC-46A/KC-135, and were not counted in decibel scaling calculations. Not including these operations ensures that the relative importance of the KC-46A contribution to overall noise levels is not understated. Even though some of the aircraft types that use the Kinston Regional Jetport generate L_{Amax} substantially higher than that generated by the KC-46A/KC-135, all large military cargo and fighter aircraft were treated as generating the same noise level for the purposes of this analysis.

Operations at the Kinston Regional Jetport during acoustic night are currently rare, and would continue to be rare in the future (Barkes 2016). Therefore, operations during acoustic night were not considered mathematically in calculation of potential L_{Adn} change. KC-46A aircrews would follow the same flight procedures currently followed by KC-135 aircrews. KC-46A aircrews would be expected to overfly the same ground areas, use the same pattern altitudes, and conform to the same runway usage patterns as current KC-135 aircrews. Under these assumptions, the potential change in L_{Adn} can be calculated using Equation 1.

Equation 1:

$$\mathbf{L_{Adn_change} = 10\ LOG\ (N_{KC46A}) - 10\ LOG\ (N_{KC135})}$$

where:

L_{Adn_change} is the potential change in L_{Adn}
N_{KC46} is the number of operations that would occur with the proposed MOB 3 mission
N_{KC135} is the number of operations occurring under baseline conditions

Potential increases of 0.5 dB L_{Adn} or greater would be an indicator of a need to conduct more detailed noise analysis. At Kinston Regional Jetport, the potential increase in L_{Adn} associated with proposed MOB 3 operations was calculated as 0.3 dB (Table B-2).

Table B-2. Potential L_{Adn} Increase

Airport	Proposed	Existing		Conclusion	
	Net Increase in Airfield Operations	Existing Annual Operations According to FAA Database	Percent of Existing Operations As Loud or Louder than KC-46A	L_{Adn} Change	Requires Further Analysis?
Kinston Regional Jetport	657	21,112	42%	0.3	No
Piedmont Triad International	12	76,215	50%	0.001	No
Raleigh Durham International	12	182,308	50%	0.001	No
Wilmington International	16	48,874	50%	0.003	No

A similar process was followed at Piedmont Triad International, Raleigh Durham International, and Wilmington International. Aircraft from the 916 ARW at Seymour Johnson AFB would use these airports for practice approaches much less frequently than they would use the Kinston Regional Jetport. The net proposed increase in annual aircraft operations at these airports is 16 operations or less. If it is assumed that 50 percent of the aircraft that use these airfields are as loud or louder than the KC-135/KC-46, then the L_{Adn} increase at these airfields would not exceed 0.003 dB (Table B-2).

As shown in the Table B-2, the potential L_{Adn} increase would not exceed 0.3 dB L_{Adn} at any of the airports studied. Increases of less than 0.5 dB L_{Adn} would not be expected to be noticed by people near the airfield. Noise impacts would be minimal.

B.2 AIR QUALITY

B.2.1 RESOURCE DEFINITION

Air quality in a given location is defined by the size and topography of an air basin, the air emissions that occur within and outside of the air basin, local and regional meteorological influences, and the resulting types and concentrations of pollutants in the atmosphere. The significance of a pollutant concentration often is determined by comparing its concentration to an appropriate national or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The USEPA established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$), and lead. The short-term NAAQS generally may not be exceeded more than once per year, except for annual standards, which may never be exceeded. Units of concentration for these standards are generally expressed in parts per million (ppm) or micrograms per cubic meter (µg/m^3). Table B-3 presents the NAAQS.

Table B-3. National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards[a]	
		Primary[b]	Secondary[c]
Ozone	8-hour	0.070 ppm (137 µg/m^3)	Same as primary
Carbon monoxide	8-hour	9 ppm (10 mg/m^3)	–
	1-hour	35 ppm (40 mg/m^3)	–
Nitrogen dioxide	Annual	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.10 ppm (188 µg/m^3)	–
Sulfur dioxide	3-hour	–	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (105 µg/m^3)	–
PM_{10}	24-hour	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3
	24-hour	35 µg/m^3	Same as primary
Lead	Rolling 3-month period	0.15 µg/m^3	Same as primary

[a] Concentrations are expressed first in units in which they were promulgated. Equivalent units are included in parenthesis.
[b] Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
[c] Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

The NAAQS 8-hour O_3 standard is attained when the measured average of the annual fourth-highest daily maximum 8-hour average concentration is less than or equal to 0.070 ppm. For CO and PM_{10}, the NAAQS are not to be exceeded more than once per year. The NAAQS annual NO_2 standard is attained when the annual arithmetic mean concentration in a calendar year is less

than or equal to 0.053 ppm. The 1-hour NO_2 standard is attained when the 3-year average of the 98th percentile of the daily maximum 1-hour average concentration does not exceed 0.10 ppm. For SO_2, the primary NAAQS is attained if the 1-hour concentration is less than or equal to 0.075 $\mu g/m^3$. The NAAQS $PM_{2.5}$ standards are attained when the annual arithmetic mean concentration is less than or equal to 12 $\mu g/m^3$ and when the 98th percentile of the 24-hour concentration is less than or equal to 35 $\mu g/m^3$.

O_3 concentrations are highest during the warmer months of the year and coincide with the period of maximum insolation. Maximum O_3 concentrations tend to be homogeneously spread throughout a region, as it often takes several hours to convert precursor emissions to O_3 (mainly nitrogen oxides [NO_x] and photochemically reactive volatile organic compounds [VOCs]) in the atmosphere. Inert pollutants, such as CO, tend to have the highest concentrations during the colder months of the year, when light winds and nighttime/early morning surface-based temperature inversions inhibit atmospheric dispersion. Maximum inert pollutant concentrations are usually found near an emission source.

B.2.1.1 Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. GHG emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the earth's temperature. The U.S. Global Change Research Program report, *Climate Change Impacts in the United States - The Third National Climate Assessment*, states the following:

- Observations show that warming of the climate is unequivocal. The global warming observed over the past 50 years is due primarily to human-induced emissions of heat-trapping gases. These emissions come mainly from the burning of fossil fuels (coal, oil, and gas), with important contributions from the clearing of forests, agricultural practices, and other activities.
- Warming over this century is projected to be considerably greater than over the previous century. The global average temperature since 1900 has risen by about 1.5 degrees Fahrenheit (°F). The U.S. average temperature has increased by 1.3°F to 1.9°F since record keeping began in 1895; most of this increase has occurred since about 1970. By 2100, the global average temperature is projected to increase another 2°F to 11.5°F. Several factors will determine future temperature increases. Increases at the lower end of this range are more likely if global heat-trapping gas emissions are cut substantially. If emissions continue to rise at or near current rates, temperature increases are more likely to be near the upper end of the range. Volcanic eruptions or other natural variations could temporarily counteract some of the human-induced warming, slowing the rise in global temperature; however, these effects would only last a few years.
- Reducing emissions of carbon dioxide (CO_2) would lessen warming over this century and beyond. Sizable early cuts in emissions would significantly reduce the pace and the overall amount of climate change. Earlier cuts in emissions would have a greater effect in reducing climate change than comparable reductions made later. In addition, reducing emissions of some shorter-lived heat-trapping gases (e.g., methane [CH_4]) and some types of particles (e.g., black carbon) would begin to reduce warming within weeks to decades.
- Climate-related changes have already been observed globally and in the United States. These include increases in air and water temperatures, reduced frost days, increased frequency and intensity of heavy downpours, a rise in sea level, and reduced snow cover,

glaciers, permafrost, and sea ice. A longer ice-free period on lakes and rivers, lengthening of the growing season, and increased water vapor in the atmosphere have also been observed. Over the past 30 years, temperatures have risen faster in winter than in any other season, with average winter temperatures in the Midwest and northern Great Plains increasing more than 7°F. Some of the changes have occurred faster than previous assessments had suggested.

- These climate-related changes are expected to continue while new ones develop. Likely future changes for the United States and surrounding coastal waters include more intense hurricanes with related increases in wind, rain, and storm surges (but not necessarily an increase in the number of these storms that make landfall), as well as drier conditions in the Southwest and Caribbean. These changes will affect human health, water supply, agriculture, coastal areas, and many other aspects of society and the natural environment. (USGCRP 2014).

GHGs include water vapor, CO_2, CH_4, nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and ability to absorb and radiate infrared energy emitted from the earth's surface relative to CO_2. The GWP of CO_2 is 1, and is therefore the standard by which all other GHGs are measured. GHGs are often reported as carbon dioxide equivalent (CO_2e), which is used to express emissions of a GHG relative to emissions of CO_2.

The potential effects of GHG emissions from the proposed MOB 3 mission are by nature global. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, GHG emissions from the proposed MOB 3 basing alternatives have been quantified to the extent feasible in this Draft Environmental Impact Statement (EIS) for information and comparison purposes.

B.2.1.2 Ozone Depleting Substances

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer prohibited production of all Class I ozone depleting substances (ODSs) in signatory countries by 1996. The Clean Air Act (CAA) amendments of 1990 govern the consumption, transportation, use, and disposal of ODSs. Section 326 of the fiscal year 1993 National Defense Authorization Act requires Senior Acquisition Official approval for contracts requiring use of ODSs. The KC-46A will be the first Air Mobility Command (AMC) aircraft to be completely free of ODSs. The USAF-approved halon alternative is HSC-125. Handheld extinguishers used in the KC-46A will also be ODS-free, whereas commercial aircraft use ODSs for all fire suppression systems.

B.2.2 REGULATORY SETTING

The CAA and its subsequent amendments establish air quality regulations and the NAAQS, and delegate the enforcement of these standards to the states. The CAA establishes air quality planning processes and requires areas in nonattainment of an NAAQS to develop a State Implementation Plan (SIP) that details how the state will attain the standard within mandated timeframes. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area. The following summarizes the air quality rules and regulations that apply to the proposed MOB 3 mission.

B.2.2.1 Federal Regulations

CAA Section 176(c) and USEPA's General Conformity Rule generally prohibit Federal agencies from engaging in, supporting, permitting, or approving any activity that does not conform to the most recent USEPA-approved SIP in nonattainment or maintenance areas. This means that Federal projects in such areas or other activities using Federal funds or requiring Federal approval (1) will not cause or contribute to any new violation of an NAAQS; (2) will not increase the frequency or severity of any existing violation; or (3) will not delay the timely attainment of any standard, interim emission reduction, or other milestone. CAA Section 176(c) (42 *United States Code [USC]* 7506(c)) and 40 *CFR* 93, Subpart B, implement the USEPA General Conformity Rule.

The General Conformity Rule applies to Federal actions affecting areas that are in nonattainment of an NAAQS, and to designated maintenance areas (attainment areas that have been reclassified from a previous nonattainment status and are required to prepare an air quality maintenance plan). Conformity requirements only apply to nonattainment and maintenance pollutants and their precursor emissions. Conformity determinations are required when the annual direct and indirect emissions from a proposed Federal action equal or exceed an applicable *de minimis* threshold. These thresholds vary by pollutant and the severity of nonattainment conditions in the region affected by the proposed action. The General Conformity Rule does not apply to any basing facility proposed for the KC-46A MOB 3 mission, as these locations attain all NAAQS. However, with regard to the Westover Air Reserve Base (ARB) location, the urban area of Springfield, Massachusetts, is a CO maintenance area. Westover ARB is north of this CO maintenance area by approximately 2 miles. Any increase in commuter vehicular emissions generated within this area by the proposed MOB 3 mission would conform to the applicable SIP if their annual emissions remain below 100 tons per year of CO.

Under the CAA, state and local agencies may establish ambient air quality standards and regulations of their own, provided these are at least as stringent as the Federal requirements. These state and local standards and regulations are described in the affected environment sections for each base (see Volume I, Chapter 3, Sections 3.1.2, 3.2.2, 3.3.2, and 3.4.2).

B.2.2.2 Greenhouse Gases

The USEPA has promulgated several final regulations involving GHGs, either under the authority of the CAA, or as directed by Congress, but none of them apply directly to the proposed MOB 3 mission. On 18 December 2014, the Council on Environmental Quality (CEQ) released for public comment revised draft guidance that describes how Federal departments and agencies should consider the effects of GHGs and climate change in their National Environmental Policy Act (NEPA) reviews (CEQ 2014). The revised draft guidance supersedes the draft GHG and climate change guidance released by the CEQ in February 2010 (CEQ 2010). The revised draft guidance explains that agencies should consider the potential effects of a proposed action on climate change, as indicated by its estimated GHG emissions, and the implications of environmental effects that climate change would have on a proposed action. The guidance also emphasizes that agency analyses should be commensurate with projected GHG emissions and climate impacts and should employ appropriate quantitative or qualitative analytical methods to ensure useful information is developed to adequately distinguish between alternatives and mitigations. The guidance recommends that agencies consider 25,000 metric tons per year of CO_2e emissions as a reference point, below which a quantitative analysis of GHGs is not recommended unless it is easily accomplished based on available tools and data. Similar to the 2010 guidance, the revised guidance does not propose a reference point as an indicator of a level of GHG emissions that may significantly affect the quality of the human

environment. The purpose of quantitative analysis of CO_2e emissions in this Draft EIS is for its potential usefulness in making reasoned choices among alternatives.

B.2.3 METHODOLOGY

The air quality analysis estimated the magnitude of emissions that would occur from proposed KC-46A MOB 3 mission construction and operational activities at each proposed base location. The estimation of operational impacts is based on (1) the increase in emissions due to the addition of the proposed MOB 3 mission or (2) the net change in emissions due to the replacement of existing KC-135 operations with operations from the proposed KC-46A MOB 3 mission.

Potential impacts on air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. The CEQ defines significance in terms of context and intensity in 40 *CFR* 1508.27. This requires that the significance of an action be analyzed in respect to the setting of the action and based relative to the severity of the impact. The CEQ NEPA regulations (40 *CFR* 1508.27(b)) provide 10 key factors to consider in determining the intensity of an impact.

In the case of criteria pollutants for which the proposed project region is in attainment of a NAAQS, the analysis compared the net increase in annual air pollutant emissions estimated for each project alternative to the USEPA Prevention of Significant Deterioration (PSD) threshold for new major sources of 250 tons per year of a pollutant as an indicator of significance or non-significance of projected air quality impacts. In the case of criteria pollutants for which the proposed project region does not attain a NAAQS, the analysis compared the net increase in proposed annual emissions to the applicable pollutant threshold that requires a conformity determination for that region. It should be noted that these criteria are used only to determine if an impact occurs, as the proposed alternatives would not require formal PSD analyses or conformity determinations.

If proposed emissions exceed a PSD or conformity threshold, further analysis was conducted to determine whether impacts were significant. In such cases, if proposed emissions (1) do not contribute to an exceedance of an ambient air quality standard or (2) conform to the approved SIP, then impacts would be less than significant.

B.2.3.1 Construction

The KC-46A MOB 3 mission at each proposed location would require construction and/or renovation of airfield facilities, including training facilities, hangars, taxiways, and maintenance and fueling facilities. Air quality impacts due to proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) due to the operation of equipment on exposed soil. Construction activity data were developed to estimate proposed construction equipment usages and associated combustive and fugitive dust emissions for each proposed basing location.

Factors needed to derive construction source emission rates were obtained from the *Compilation of Air Pollutant Emission Factors*, AP-42, Volume I (USEPA 1995); the USEPA NONROAD2008a model for nonroad construction equipment (USEPA 2009a); and the USEPA MOVES2014a model for on-road vehicles (USEPA 2015).

Inclusion of standard construction practices and Leadership in Energy and Environmental Design (LEED) Silver certification into proposed construction activities would potentially reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by

50 percent from uncontrolled levels (Countess Environmental 2006). The standard construction practices for fugitive dust control include the following:

1. Use water trucks to keep areas of vehicle movement damp enough to minimize the generation of fugitive dust.
2. Minimize the amount of disturbed ground area at a given time.
3. Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site and stabilize all disturbed areas with water application.
4. Designate personnel to monitor the dust control program and to increase watering, as necessary, to minimize the generation of dust.

To be conservative, the air quality analysis assumed that all construction activities for the proposed MOB 3 mission would begin in calendar year (CY) 2017 and would finish in CY 2018.

B.2.3.2 Operations

Operational emissions due to existing KC-135 operations that would be replaced by the proposed MOB 3 mission at three of the four proposed basing locations occur from (1) KC-135 aircraft operations and engine maintenance/testing, (2) aerospace ground equipment (AGE), (3) onsite government motor vehicles (GMVs) and privately owned vehicles (POVs), (4) offsite POV commutes, (5) mobile fuel transfer operations, and (6) stationary and area sources. These data were developed in part from the air emissions inventory process conducted at each location and activity data collected for 2015 operations. Because data were not available, the usage of AGE by KC-135 aircraft at Seymour Johnson AFB was used as a surrogate to estimate emissions from the usage of AGE by KC-135 aircraft at Grissom ARB, Tinker AFB, and Westover ARB (Zapata Inc. and URS Group, Inc. 2015). Emission factors used to calculate combustive emissions for the KC-135 aircraft were based on emissions data developed by CFM International for the CFM56-2B1 engine (ICAO 2013a). The air quality analysis uses 2015 conditions to define baseline emissions that the proposed MOB 3 mission would replace at each basing location, as they represent the most recent calendar year of operational activities.

Operational emissions due to the proposed KC-46A MOB 3 mission at each basing location would include (1) aircraft operations and engine maintenance/testing, (2) AGE, (3) onsite GMVs and POVs, (4) offsite POV commutes, (5) mobile fuel transfer operations, and (6) stationary and area sources. Operational data used to calculate projected KC-46A aircraft emissions were obtained from data used in the project noise analyses. Factors used to calculate combustive emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (ICAO 2013b). The operational times in mode for the KC-46A engine are based on those for the KC-135 aircraft (AFCEC 2014a). Emissions from non-aircraft sources generated by the proposed MOB 3 mission were estimated by the following methods:

1. Emissions from on-wing testing of KC-46A aircraft engines are based on maintenance activities proposed for the MOB 1 mission at Fairchild AFB (AFCEC 2014b).
2. Specific activity data needed to estimate emissions from the usage of AGE for the KC-46A are not available. Therefore, the analysis assumed that the annual AGE usage of one KC-46A aircraft would equate to the annual AGE usage of one KC-135 aircraft, as inventoried at Seymour Johnson AFB in 2014 (Zapata Inc. and URS Group, Inc. 2015).

3. Emissions from POVs and GMVs were estimated by multiplying existing emissions generated at each basing location for these sources by the ratio of the base employment population for the proposed MOB 3 mission to the total existing base employment population.
4. Emissions from mobile fuel transfer operations and stationary and area sources were estimated by multiplying existing emissions generated at each basing location for these sources by the ratio of the number of proposed KC-46A landings and take-offs to the total existing base landings and take-offs. To be consistent, the analysis uses this approach to estimate stationary and source emissions at each of the four bases. In general, landings and take-offs are a good indicator of operational tempo at an AFB. Because aircraft maintenance and non-aircraft operations dominate activities at Tinker AFB, it is expected that this approach overestimates proposed MOB 3 emissions at Tinker AFB.

The air quality analysis assumed that the proposed MOB 3 mission would reach full operations and resulting emissions in 2019 after the completion of all construction activities required for the MOB 3 beddown. These estimates represent the peak year of operational emissions, as the project AGE, POV, and GMV fleets would gradually turnover in the future to newer equipment and vehicles with cleaner USEPA emission standards. Volume II, Appendix D of this Draft EIS includes estimations of criteria pollutant emissions, HAPs, and GHGs from existing and proposed sources for each MOB 3 mission basing location.

The analysis of proposed aircraft operations is limited to operations that occur within the lowest 3,000 feet (914 meters) of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

B.3 SAFETY

B.3.1 RESOURCE DEFINITION

Ground and flight safety involving aviation operations conducted by the USAF are addressed in this section. Because of the proposal to construct within portions of the airfield environment, the focus of this section is on safety-of-flight issues associated with airfield operations. Within the ground safety section, issues involving operations and maintenance (O&M) activities that support operation of the airfield are addressed. Also considered in this section is the safety of personnel and facilities on the ground that may be placed at risk from flight operations. Within the aircraft mishaps/flight safety section for each base, aircraft flight risks and safety issues associated with conducting aviation activities at the respective bases are addressed. Historic information on aircraft accidents for the primary aircraft at each base is also presented to give the reader perspective as to the frequency of major mishaps, which occurred during the lengthy service of the existing aircraft.

KC-46A flight risks and safety issues associated with conducting aviation activities at the base and in the near-base airspace are addressed. Any KC-46A accidents at the airfield would have direct impacts on the ground in the immediate vicinity of the mishap as a result of explosion/fire and debris spread.

The safety ROI includes activities and operations conducted on the base itself and aircraft operations conducted in the local airspace.

B.3.2 REGULATORY SETTING

Numerous Federal, civil, and military laws and regulations govern operations at bases and in the surrounding airspace. Individually and collectively, they prescribe measures, processes, and procedures required to ensure safe operations and to protect the public, military, and property.

B.3.3 METHODOLOGY

A variety of elements associated with implementation of the proposed KC-46A MOB 3 mission at any of the four bases that could potentially affect safety are evaluated relative to the degree to which the action increases or decreases safety risks to the public or private property. Flight and ground safety are assessed for the potential to increase risk and the capability to manage that risk by responding to emergencies.

Impacts to safety are assessed according to the potential to increase or decrease in safety risks to personnel, the public and property. The development activities associated with the proposed KC-46A missions are considered to determine whether additional or unique safety risks are associated with its undertaking. If any activity associated with the proposed KC-46A MOB 3 mission indicates a major variance from baseline conditions, it would be considered a significant safety impact.

B.3.3.1 Flight Safety

The primary public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of mid-air collisions, collisions with man-made structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird-aircraft collisions. Collisions with structures around the airfield are controlled through airfield setbacks and safety zones that restrict construction around the airfield so that both the ground surface is clear for ground maneuvering and the airspace is clear of obstructions such as groves of trees, poles and power lines, and tall structures. An AICUZ study defines the accident potential zones (APZs) around the airfield and prescribes restrictions on any construction in the clear zone (CZ) (see Figure B-1). Land use restrictions are recommended for APZs I and II, based mostly on the intensity of use. That is, activities where people congregate are not recommended, and uses where people spend a high percentage of time (such as residential) are also not recommended.

The USAF defines five major categories of aircraft mishaps: Classes A, B, C, D, and E, which includes high accident potential. Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $2 million, and/or destruction of an aircraft. Class B mishaps result in permanent partial disability or inpatient hospitalization of three or more personnel and/or a total cost of between $500,000 and up to $2 million. Class C mishaps involve an injury resulting in any loss of time from work beyond the day or shift on which it occurred, an occupational illness that causes loss of time from work at any time, or an occupational injury or illness resulting in permanent change of job and/or reportable damage of between $50,000 and up to $500,000. High accident potential events are any hazardous occurrence that has a high potential for becoming a mishap. Class C mishaps and high accident potential, the most common types of accidents, represent relatively unimportant incidents because they generally involve minor damage and injuries, and rarely affect property or the public.

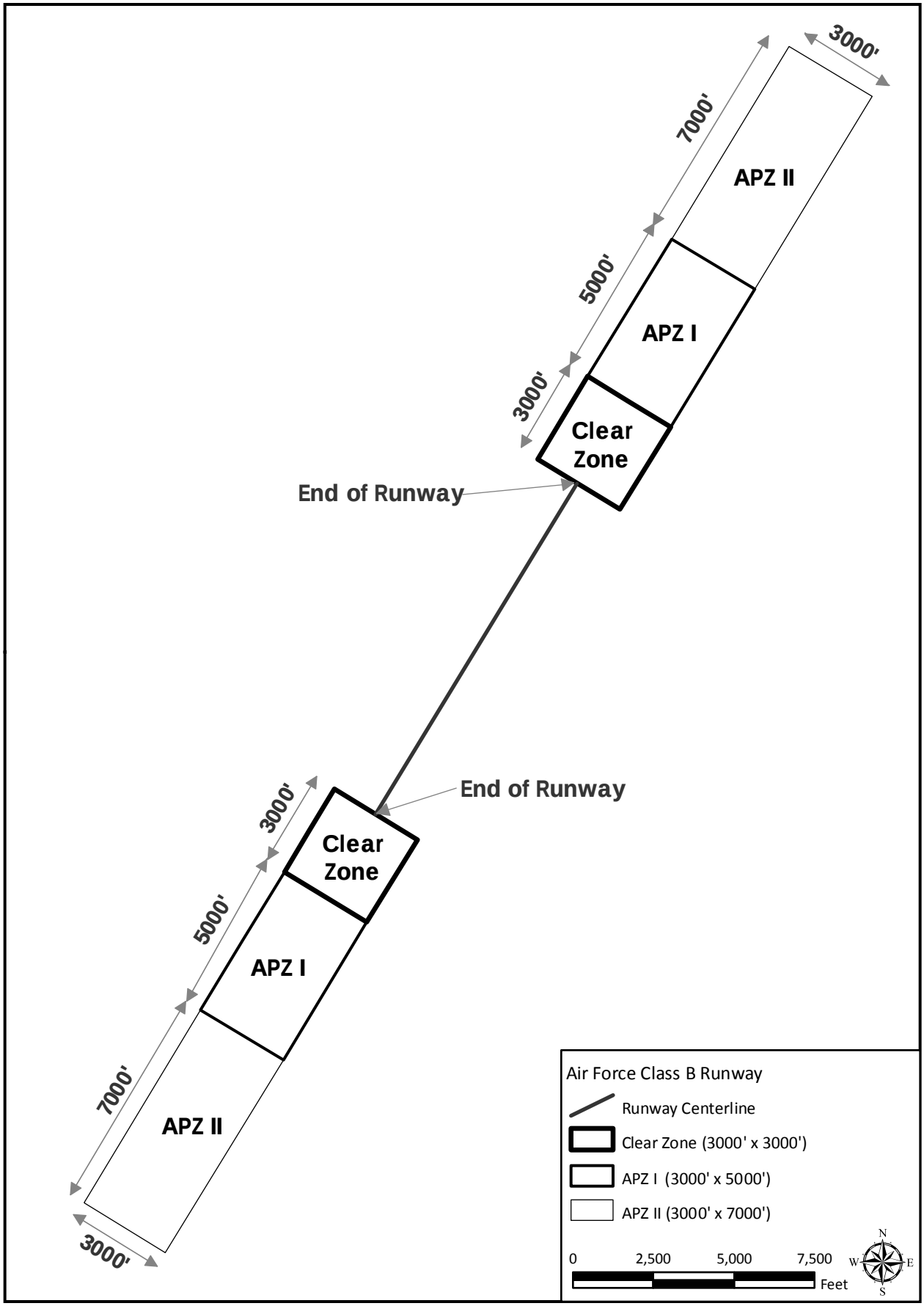

Figure B-1. Air Force Clear Zone and Accident Potential Zones for Class B Runways

Class D mishaps result in total cost of property damage of $20,000 or more, but less than $50,000; or a recordable injury or illness not otherwise classified as a Class A, B, or C mishap. Note that in 2010, the threshold for determining the class of mishaps was raised from $1 to $2 million for Class A mishaps, and the ceiling was raised for Class B from $1 million to $2 million.

Accident rates for commercial aircraft are determined using accidents per million departures (or flight cycles) since there is a stronger statistical correlation between accidents and departures than there is between accidents and flight hours, between accidents and the number of airplanes in service, or between accidents and passenger miles or freight miles.

This Draft EIS focuses on USAF Class A mishaps because of their potentially catastrophic results. Based on historical data on mishaps at the four bases, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Mishap rates do not consider combat losses due to enemy action. In evaluating this information, it should be emphasized that data presented are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft. Mishap rates are statistically assessed as an occurrence rate per 100,000 flying hours. For the purposes of this analysis, C-135 aircraft include the RC-135, EC-135, and the KC-135 since they share a common airframe based upon the Boeing 707, as modified for military use. Table B-4 reflects the cumulative average USAF Class A mishap rates of the C-135 for the periods for which accident records have been established. Cargo and Command and Control type aircraft were also included since their Mission-Design-Series are similar. The KC-135 entered service with the USAF in 1957; it is one of six military fixed-wing aircraft with over 50 years of continuous service with its original operator. Since the R model conversion of some of the fleet in the 1990s, the safety record of the KC-135 has been on par with that of any modern airliner.

Table B-4. Air Force Class A Mishap History for Selected Models of Transport Modified Mission Design/Code Aircraft

Aircraft	Reporting Period	Average Class A Mishap Rate per 100,000 Hours	Lifetime Hours Flown
C-135[a]	CY57-FY15	0.56	15,369,686
C-141	CY64-FY06	0.32	10,641,969
C-17	FY91-FY15	1.10	2,814,402
C-5	CY68-FY15	1.04	2,600,054
C-10	CY81-FY15	1.11	1,715,398

[a] Includes all variants such as EC and KC types, including EC-135, RC-135, and KC-135
Key: CY = calendar year; FY = fiscal year
Source: AFSEC 2016

An aircraft crash is what is known in the probability analysis world as a low probability, high consequence risk. Aircraft are designed to ensure that aircraft accidents are rare events. To minimize these accidents, factors causing or contributing to accidents must be understood and prevented. Previous research has studied accident data to determine these factors. The low rate of accidents, however, makes it difficult to discover repeating patterns of these factors.

Levels of safety for commercial airframes are typically measured by the number of accidents and incidents and their rates. An aircraft accident is defined as an occurrence associated with the operation of an aircraft in which people suffer death or injury, and/or in which the aircraft receives substantial damage.

Many scholarly papers have been written, and complex mathematical calculations developed, to try and predict where and when an aircraft or other low probability, high consequence risk might occur. However, none of these efforts have resulted in a consensus or an agreed upon methodology within the risk assessor community.

The methodology of using accident rates as a predictor of the likelihood of a crash is what is commonly used. For commercial aircraft, in general, this expression is a measure of accidents per million departures.

The accident rates for the KC-46A were determined using the accident rate for the B-767 jetliner, which is currently in service. The accident rate for commercial airliners is based upon departures (flight cycles). With takeoffs assumed to be one-half of the total projected departure airfield operations (see operational data contained in Volume I, Chapter 2), the formula $C_r x A_o = 1/X$ (where C_r = crash rate and A_o = departure airfield operations) shows that the frequency of an accident, even with increased operations, is not likely to occur in the foreseeable future.

While it is counterintuitive, an increase in operation tempo (OPTEMPO) may not result in higher accident rates, and no correlation has been proved or disproved. In a 2002 report to Congress on military aviation safety, the Congressional Research Service concluded, "While no correlation between high OPTEMPO and increased mishaps has been proved, it also hasn't been disproved. A great degree of uncertainty remains. Little is known, for example, of the OPTEMPO effects on maintenance, ammunition, training in country, living conditions, or personnel tempo" (CRS 2002). In other words, there are numerous unpredictable factors that may or may not contribute to an accident.

Bird/Wildlife-Aircraft Strike Hazard (BASH). Bird/wildlife-aircraft strikes constitute a safety concern for the USAF because they can result in damage to aircraft or injury to aircrews or local human populations if an aircraft crashes. Aircraft may encounter birds at altitudes up to 30,000 feet above mean sea level (AMSL) or higher. However, most birds fly close to the ground. More than 96 percent of reported bird strikes occur below 3,000 feet above ground level (AGL). Approximately 30 percent of bird strikes happen in the airport environment (takeoff/approaches/landing), and almost 47 percent occur during low-altitude flight training (AFSEC 2016).

To address the issues of aircraft bird strikes, the USAF has developed the Avian Hazard Advisory System to monitor bird activity and forecast bird strike risks. Using Next Generation Radar (NEXRAD) weather radars and models developed to predict bird movement, the Avian Hazard Advisory System is an online, near real time, geographic information system (GIS) used for bird strike risk flight planning across the continental United States and Alaska. Additionally, as part of an overall strategy to reduce BASH risks, the USAF has developed a Bird Avoidance Model using GIS technology as a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics and is combined with key environmental and man-made geospatial data. The model was created to provide USAF pilots and flight schedulers/planners with a tool for making informed decisions when selecting flight routes. The model was created in an effort to protect human lives, wildlife, and equipment during air operations. This information is integrated into required pilot briefings that take place prior to any sortie.

Fuel Jettison. The KC-46A, like the KC-135 aircraft, has the ability to jettison fuel in cases of emergency and non-emergency situations. Data on historical KC-135 operations show that slightly less than two sorties per thousand resulted in a release of fuel (USAF 2013).

The main environmental concern from fuel released from an aircraft is fuel deposition onto the ground and/or surface waters and any possible negative impacts on human health or natural

resources. The results of a definitive study on the fate of jettisoned fuel from large USAF aircraft (such as the KC-135) (Deepti 2003) were used to identify a reasonably conservative ground-level fuel deposition value for the KC-46A. This study used the Fuel Jettison Simulation model developed by the USAF to estimate the ground deposition of fuel from jettison events (Teske and Curbishley 2000). This maximum ground-level fuel deposition value identified for the KC-46A would result in effects that are well below known natural resource and human health thresholds for jet fuel. Therefore, the maximum fuel deposition value expected from the KC-46A would not produce substantial or significant impacts on human or natural resources.

It is the policy of the USAF Major Commands to follow AFIs or supplement those established AFIs. These policies require that pilots avoid fuel jettison, unless safety of flight dictates immediate jettison. For example, AMC policy, which covers all USAF tanker assets, requires that any fuel released from an aircraft must occur above 20,000 feet AGL (AMC 2004, 2012). Similar policy from AFRC covers aircrews during training (AFI 11-2KC-135V3). These policies are designed to minimize potential impacts of fuel jettison events. In view of this, no further analysis is included in this section.

B.3.3.2 Ground Safety

Day-to-day O&M activities conducted at USAF installations are performed in accordance with applicable USAF safety regulations, published Air Force Technical Orders, and standards prescribed by Air Force Occupational Safety and Health requirements. These are intended to standardize procedures and practices in all activities on USAF property to reduce occupational risks to government personnel and contractors and to protect other persons that reside on or visit the base or the vicinity of the base.

Anti-Terrorism/Force Protection. Anti-Terrorism/Force Protection (AT/FP) is a security program designed to protect USAF active-duty personnel, civilian employees, family members, and facilities and equipment in all locations and situations. The program is accomplished through the planned and integrated application of anti-terrorism measures, physical security, operations security, and personal protective services. It is supported by intelligence, counterintelligence, and other security programs. In response to terrorist attacks, several regulations have been promulgated to ensure that force protection standards are incorporated into the planning, programming, and budgeting for the design and construction of Military Construction-funded facilities. Unified Facilities Criteria (UFC) 04-010-01, *DoD Minimum Antiterrorism Standards for Buildings* (published in 2003 and updated in 2013) (DoD 2013) establishes minimum standoff distances that must be maintained between several categories of structures and areas that are relatively accessible to terrorists.

The intent of AT/FP and design guidance is to improve security, minimize fatalities, and limit damage to facilities in the event of a terrorist attack. Many military bases, including those under consideration for beddown of the KC-46A, were developed before such considerations became a critical concern. Thus, under current conditions, many units are not able to completely comply with all present AT/FP standards. However, as new construction and modification of facilities occurs, AT/FP standards would be incorporated to the maximum extent practicable.

Construction/Demolition Safety. Short-term safety risks are associated with any demolition and construction activity, including those activities proposed as part of this action. However, adherence to standard safety practices would minimize any potential risks.

Airfield Safety. Accident potential relies on identifying where most accidents have occurred in the past at military airfields (USAF 2002). This approach does not produce accident probability

statistics since the question of probability involves too many variables for an accurate prediction model to be developed. The analysis of the history of military aircraft accidents focuses on determining where (within the airfield environments) an accident is likely to occur and estimates the size of the impact area that is likely to result from any single accident. As per DoDI 4165.57, "AICUZ," all structures on the ground have the potential to create hazards to flight. The Federal Aviation Administration (FAA) provides detailed instructions for the marking of obstructions (i.e., paint schemes and lighting) to warn pilots of their presence. Any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 feet AGL or exceeds any obstruction standard contained in 14 *CFR* 77 should normally be marked and/or lighted. The FAA may also recommend marking and/or lighting a structure that does not exceed 200 feet AGL or 14 *CFR* 77 standards because of its particular location. The obstruction standards in 14 *CFR* 77 are primarily focused on structures in the immediate vicinity of airports and approach and departure corridors from airports (14 *CFR* 77).

B.4 SOILS AND WATER

B.4.1 RESOURCE DEFINITION

The ROI for soils and water includes the areas proposed for infrastructure upgrades and construction along with areas immediately downstream of base outfalls that could be impacted during construction. The term "soils" refers to unconsolidated materials formed from the underlying bedrock or other parent material. Soils play a critical role in both the natural and human environment.

Water resources include surface water, groundwater, and floodplains. Surface water resources include lakes, rivers, and streams and are important for a variety of reasons, including economic, ecological, recreational, and human health factors. Groundwater includes the subsurface hydrologic resources of the physical environment; its properties are often described in terms of depth to aquifer or water table, water quality, and surrounding geologic composition.

B.4.2 REGULATORY SETTING

The Clean Water Act (CWA) of 1977 (33 *USC* 1251 et seq.) and the USEPA Storm Water General Permit regulate pollutant discharges. Pollutants regulated under the CWA include "priority" pollutants, including various toxic pollutants, such as biochemical oxygen demand, total suspended solids, fecal coliform, oil and grease, and pH. Wetlands are discussed in the Biological Resources section below.

Section 438 of the Energy Independence and Security Act (EISA) (42 *USC* §17094) establishes into law stormwater design requirements for federal construction projects that disturb a footprint of greater than 5,000 square feet of land. EISA Section 438 requirements are independent of stormwater requirements under the CWA. The project footprint consists of all horizontal hard surface and disturbed areas associated with project development. Under these requirements, pre-development site hydrology must be maintained or restored to the maximum extent technically feasible with respect to temperature, rate, volume, and duration of flow. Pre-development hydrology shall be calculated using recognized tools and must include site-specific factors such as soil type, ground cover, and ground slope. Site design shall incorporate storm water retention and reuse technologies such as bioretention areas, permeable pavements, cisterns/recycling, and green roofs to the maximum extent technically feasible.

Post-construction analyses shall be conducted to evaluate the effectiveness of the as-built storm water reduction features (DoD 2010). These regulations were incorporated into applicable DoD Unified Facilities Criteria (UFC) in April 2010, which stated that low-impact design (LID) features need to be incorporated into new construction activities to comply with the restrictions on storm water management promulgated by EISA Section 438. LID is a storm water management strategy designed to maintain site hydrology and mitigate the adverse impacts of storm water runoff and non-point source pollution. LIDs can management the increase in runoff between pre- and post-development conditions on the project site through interception, infiltration, storage, and evapotranspiration processes before the runoff is conveyed to receiving waters. Examples of the methods that could reduce the potential impacts of a proposed action include bioretention, permeable pavements, cisterns/recycling, and green roofs (DoD 2010). Additional guidance is provided in USEPA's Technical Guidance on Implementing the Storm Water Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act (USEPA 2009).

With respect to soil erosion, Section 402(p) of the CWA regulates non-point source discharges of pollutants, under the National Pollutant Discharge Elimination System (NPDES) program, or state equivalent program. This section of the CWA was amended to require the USEPA to establish regulations for discharges from active construction sites. NPDES General Construction Permits require preparation of a Storm Water Pollution Prevention Plan for projects greater than 1 acre.

Executive Orders (EOs) that apply to Soils and Water are listed below:

- EO 11990, *Protection of Wetlands.*
- EO 13690, *Establishing a Federal Flood Risk Management Standard and Process for Further Soliciting and Considering Stakeholder Input*.

Indiana Flood Control Act

Indiana's Flood Control Act [Indiana Code (IC) 14-28-1] makes it unlawful to build any structure, place any obstruction, or make any deposit or excavation in any floodway with a drainage area greater than one square mile without a permit from IDNR.

B.4.3 METHODOLOGY

Impacts on soils and surface water can result from earth disturbance that would expose soil to wind or water erosion. Analysis of impacts on soils and surface water examines the potential for such erosion at each base and describes typical measures employed to minimize erosion. In addition, soil limitations and associated typical engineering remedial measures are evaluated with respect to proposed construction.

Criteria for evaluating impacts related to soil resources associated with implementation of the proposed KC-46A MOB 3 mission are impacts on unique soil resources, minimization of soil erosion, and the siting of facilities relative to potential soil limitations. If development proposed in the EIS were to substantially affect any of these features, impacts would be considered significant.

Soil disturbance at each base was calculated by summing the square footages of the new construction.

Criteria for evaluating impacts related to water resources associated with implementation of the proposed KC-46A MOB 3 mission are water availability, water quality, adherence to applicable regulations, and existence of floodplains. Impacts are measured by the potential to reduce water

availability to existing users; to endanger public health or safety by creating or worsening health hazards or safety conditions; or to violate laws or regulations adopted to protect or manage water resources.

Flooding impacts are evaluated by determining whether proposed construction is located within a designated floodplain. Groundwater impacts are evaluated by determining whether groundwater beneath the project site would be used for implementing the proposed KC-46A MOB 3 mission, and if so, by determining the potential to adversely affect those groundwater resources. Soils and water resource impacts are not evaluated for the areas below where the proposed KC-46A MOB 3 operations would be conducted because no ground-disturbing activities or use of water resources would occur at these locations.

B.5 BIOLOGICAL RESOURCES

B.5.1 RESOURCE DEFINITION

Biological resources include the native and introduced terrestrial and aquatic plants and animals found within the ROI. The ROI for biological resources is defined as the land area (habitats) and airspace that could potentially be affected by infrastructure and construction projects, as well as airspace operations. The ROI generally includes the developed cantonment and airfield areas of the respective bases, but may also include areas near but outside the base boundary. Examples of off-base areas include managed wildlife areas and surface waters that could be indirectly affected by noise or water quality alteration, respectively. Habitat types are based on floral, faunal, and geophysical characteristics.

Sensitive habitats include areas that the Federal government, state governments, or the DoD have designated as worthy of special protection due to certain characteristics such as high species diversity, special habitat conditions for rare species, or other unique features.

For purposes of analysis, biological resources were organized into four categories: vegetation, wildlife, special-status species, and wetlands. Vegetation includes existing terrestrial plant communities but does not include special-status plants, which are discussed below. Plant species composition within an area generally defines ecological communities and indicates the type of wildlife that may be present.

Wildlife includes all vertebrate animal species, with the exception of special-status species, which are discussed below. Typical wildlife includes animal groups such as large and small mammals, songbirds, waterfowl, reptiles, amphibians, and fish. The attributes and quality of available habitats influences the composition, diversity, and abundance of wildlife communities.

Special-status species are defined as those plant and animal species protected by various regulations established by Federal and state agencies. These regulations, and the species addressed by them, are described in the Regulatory Setting section below.

Wetlands are areas of transition between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water (Mitsch and Gosselink 2000).

B.5.2 REGULATORY SETTING

AFI 32-7064, “Integrated Natural Resources Management,” explains how to manage natural resources on USAF property in compliance with Federal, state, and local standards. The chief tool

for managing base ecosystems is the Integrated Natural Resources Management Plan (INRMP). Based on an interdisciplinary approach to ecosystem management, the INRMP ensures the successful accomplishment of the military mission by integrating all aspects of natural resources management with each other and the rest of the base's mission.

Special-status plant and wildlife species are subject to regulations under the authority of Federal and state agencies. Special-status species include species designated as threatened, endangered, or candidate species by state or Federal agencies. Under the Endangered Species Act (ESA) (16 *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. Candidate species are those species for which the U.S. Fish and Wildlife Service (USFWS) has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher-priority listing activities. Although candidate species receive no statutory protection under the ESA, the USFWS believes it is important to advise government agencies, industry, and the public that these species are at risk and could warrant protection under the ESA.

The Migratory Bird Treaty Act (MBTA) of 1918 (16 *USC* 703-712) is the domestic law that affirms, or implements, the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protect selected species of birds that are common to both countries (i.e., species occur in both countries at some point during their annual life cycle). The act protects all migratory birds and their parts (including eggs, nests, and feathers).

The Bald and Golden Eagle Protection Act (BGEPA) (16 *USC* 668-668d) is legislation in the United States that protects two species of eagles. The BGEPA prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles. Taking involves molesting or disturbing birds, their parts, nests, or eggs. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald or golden eagles... [or any golden eagle], alive or dead, or any part, nest, or egg thereof."

Section 404 of the CWA established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. The U.S. Army Corps of Engineers (USACE) is the lead agency in protecting wetland resources. This agency maintains jurisdiction over Federal wetlands (33 *CFR* 328.3) under Section 404 of the CWA (33 *CFR* 323.3) and Section 10 of the Rivers and Harbors Act (30 *CFR* 329). The USEPA assists the USACE (in an administrative capacity) in the protection of wetlands (40 *CFR* 225.1 to 233.71). In addition, the USFWS and the National Marine Fisheries Service provide support with important advisory roles.

Furthermore, EO 11990, *Protection of Wetlands*, requires Federal agencies, including the USAF, to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. EO 11990 requires Federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands

wherever there is a practicable alternative; if construction in wetlands cannot be avoided, the USAF will issue a Finding of No Practicable Alternative (FONPA).

Under CWA Section 401, applicants for a Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a Federal component and may affect state water quality (including projects that require Federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401.

B.5.3 METHODOLOGY

The first step in the analysis of potential impacts on biological resources was to determine the locations of sensitive habitats and species in relation to the proposed action. Maps were examined to locate sensitive habitats and species, and where necessary, site visits and additional surveys were conducted to confirm locations. Next, areas of overlap for the proposed development and sensitive habitats and species were identified. Scientific literature was reviewed for studies that examined similar types of impacts on biological resources. The literature review included a review of basic characteristics and habitat requirements of each sensitive species. Where available, information was also gathered relative to management considerations, incompatible resource management activities, and threats to each sensitive species. Impact analyses were then conducted based on the information gathered from the literature review. The analyses included an assessment of the impacts on biological resources resulting from both construction activities and daily operations. Measures to avoid and/or minimize adverse impacts on biological resources are also presented. The following criteria were evaluated when determining the significance of an effect on biological resources resulting from implementation of actions described in Volume I, Chapter 2:

- The direct impact or taking of a protected special-status species, including habitat alteration.
- The importance (legal, commercial, ecological, or scientific) of the resource.
- The relative sensitivity of biological resources to potential effects of the actions.
- The quantity or percentage of biological resources affected by the actions relative to overall abundance in the ROI.
- The expected duration of potential impacts resulting from implementation of the actions.

Determination of the significance of wetland impacts is based on (1) loss of wetland acreage, (2) the function and value of the wetland, (3) the proportion of the wetland that would be affected relative to the occurrence of similar wetlands in the region, (4) the sensitivity of the wetland to proposed activities, and (5) the duration of ecological ramifications. Impacts on wetland resources are considered significant if high-value wetlands would be adversely affected or if wetland acreage is lost.

B.6 CULTURAL RESOURCES

B.6.1 RESOURCE DEFINITION

Cultural resources are districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. They include archaeological resources, historic architectural/engineering resources, and traditional resources. Only significant cultural resources are considered for potential adverse impacts from an action. Significant cultural resources are historic properties as defined by the National Register of Historic Places (NRHP) (36 *CFR* 60.4,) or resources identified as important to tribes or other traditional groups, as outlined in the American Indian Religious Freedom Act; the Native American Graves Protection and Repatriation Act; and EO 13007, *Indian Sacred Sites*. Historic properties are any prehistoric, historic or traditional resource included in or eligible for inclusion in the NRHP 36 *CFR* 800.16(l).

For a cultural resource to be considered eligible for the NRHP, it must possess integrity of location, design, setting, materials, workmanship, feeling, or association, and it must meet one or more of the following criteria (36 *CFR* 60.4):

- Association with events that have made a significant contribution to the broad patterns of our history (criterion a).
- Association with the lives or persons significant in our past (criterion b).
- Embodiment of distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction (criterion c).
- Have yielded, or may be likely to yield, information important in prehistory or history (criterion d).

In general, these resources must be more than 50 years old; however, younger resources may be eligible if they are exceptionally significant or date to a defined period of historic significance, such as the Cold War.

Section 101(d)(6)(A) of the National Historic Preservation Act (NHPA) states that properties of traditional religious and cultural importance to a tribe or Native Hawaiian organization may be determined to be eligible for inclusion in the NRHP. NRHP Bulletin 38 (NPS 1998) defines a traditional cultural property (TCP), as a resource that is eligible for inclusion in the NRHP. Reasons for eligibility could be because of its association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. TCPs can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, landscapes, and minerals that tribes and other groups consider essential for the continuance of traditional cultures.

Properties of traditional religious and cultural importance need not be determined eligible for the NRHP to be a significant cultural resource considered for potential adverse impacts from an action. On 21 November 1999, the DoD promulgated its American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis (DoD 1999). The policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly

affect protected tribal resources, tribal rights, and tribal and Alaska Native lands, before decisions are made by the services. DoDI 4710.02, "DoD Interactions with Federally-Recognized Tribes," implements DoD policy, assigns responsibilities, and provides procedures for DoD interactions with federally recognized tribes in accordance with its American Indian and Alaska Native Policy and other DoD directives and policies. The USAF implements DoDI 4710.02 through AFI 90-2002, "Air Force Interactions with Federally-Recognized Tribes."

EO 13007 defines sacred sites as any specific, discrete, narrowly delineated location on Federal land that is identified by a tribe or individual as sacred by virtue of its established religious significance to or ceremonial use by a tribal religion and identified as such to the land managing agency. EO 13007 also requires agencies to accommodate access to, and ceremonial use of, sacred sites by tribal religious practitioners and to avoid adversely affecting their physical integrity.

B.6.2 REGULATORY SETTING

DoDI 4715.16, "Cultural Resources Management" (DoD 2008), and AFI 32-7065, "Cultural Resources Management" (USAF 2014), outline and specify proper procedures for cultural resource management on USAF bases.

Laws pertinent to the proposed action include the NHPA of 1966, as amended; the Antiquities Act of 1906; the Historic Sites Act of 1935; NEPA; the Archaeological and Historic Preservation Act of 1974; the Archaeological Resources Protection Act of 1979; the Native American Graves Protection and Repatriation Act of 1990; and the American Indian Religious Freedom Act of 1978.

Under Section 106 of the NHPA, the USAF is required to consider the effects of its undertakings at each location on historic properties listed, or eligible for listing, in the NRHP and to consult with the State Historic Preservation Office (SHPO), Tribal Historic Preservation Office, and others regarding potential effects as per 36 *CFR* 800. Under AFI 32-7065, recorded cultural resources not evaluated for NRHP eligibility must be managed as eligible. Under Section 110 of the NHPA, each location is mandated to maintain an active historic preservation program and provide stewardship of cultural resources "consistent with the preservation of such properties and the mission of the agency (Section 470 h-2(a))."

Federal regulations governing cultural resource activities include the following: 36 *CFR* 800, *Protection of Historic Properties* (incorporating amendments effective 5 August 2004); 36 *CFR* 79, *Curation of Federally Owned and Administered Archaeological Collections*; 43 *CFR* 7, *Protection of Archaeological Resources*; 36 *CFR* 60, *National Register of Historic Places*; and 36 *CFR* 63, *Determinations of Eligibility for Inclusion in the National Register*. Cultural resource-related EOs that may affect the locations include: EO 11593, *Protection and Enhancement of the Cultural Environment*; EO 13007, *Indian Sacred Sites*; EO 13175, *Consultation and Coordination with Indian Tribal Governments*; and EO 13287, *Preserve America*.

B.6.3 METHODOLOGY

Impact analysis for cultural resources focuses on assessing whether the proposed KC-46A MOB 3 mission would have the potential to affect cultural resources that are eligible for listing in the NRHP or have traditional significance for tribes. For this EIS, impact analysis for cultural resources focuses on, but is not limited to, guidelines and standards set forth in NHPA Section 106's implementing regulations (36 *CFR* 800). Under Section 106 of the NHPA, the proponent of the action is responsible for determining whether any historic properties are

located in the area, assessing whether the proposed undertaking would adversely affect the resources, and notifying the SHPO of any adverse effects. An adverse effect is any action that may directly or indirectly change the characteristics that make the historic property eligible for listing in the NRHP. If an adverse effect is identified, the Federal agency consults with the SHPO and federally recognized tribes to develop measures to avoid, minimize, or mitigate the adverse effects of the undertaking.

Analysis of potential impacts on cultural resources considers both direct and indirect impacts.

Impacts may occur through the following:

- Physically altering, damaging, or destroying all or part of a resource.
- Altering characteristics of the surrounding environment that contribute to the resource's significance.
- Introducing visual or audible elements that are out of character with the property or alter its setting.
- Neglecting the resource to the extent that it deteriorates or is destroyed.

Direct impacts are assessed by (1) identifying the nature and location of all elements of the proposed action and alternatives; (2) comparing those locations with identified historic properties, sensitive areas, and surveyed locations; (3) determining the known or potential significance of historic properties that could be affected; and (4) assessing the extent and intensity of the effects. Indirect impacts occur later in time or farther from the proposed action. Indirect impacts on cultural resources generally result from the effects of project-induced population increases, such as the need to develop new housing areas, utility services, and other support functions to accommodate population growth, or increased visitation of a remote area due to improved vehicle access. These activities and the subsequent use of the facilities can impact cultural resources.

A key component of this analysis is defining the area of potential effect, defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 *CFR* 800.16(d)). For the proposed MOB 3 beddown, the area of potential effect is defined as the viewshed for historic facilities and the areas of ground disturbance associated with construction, demolition and renovation at each base.

Archaeological and historic architectural resources at the bases were characterized using existing survey and analysis information from Integrated Cultural Resources Management Plans (ICRMPs), archaeological survey reports, historic buildings survey reports, local histories, and the records of the NRHP and National Historic Landmarks. These documents provided information on known locations of significant resources. In compliance with Section 106 of the NHPA, the USAF consulted with the relevant SHPOs regarding the area of potential effect and potential cultural resource concerns for the proposed action. NRHP-eligible or -listed properties at each base are identified in the base-specific sections.

The potential for traditional resources at the bases was identified using ICRMPs and information provided by base cultural resource management staff. Potentially interested tribes were contacted to request information on potential concerns about the proposed action.

In this analysis, demolition, construction, and other base-specific actions needed to support the KC-46A basing are part of the alternatives. The assessment of adverse effects takes into account both the potential for physical damage or destruction of historic properties at the bases and the

potential adverse effects of visual intrusions, noise, and vibration on historic properties at the bases. Impacts on properties of traditional religious and cultural importance (hereafter referred to as "traditional cultural resources") can result from noise and visual effects of aircraft overflights on rituals and ceremonies and on wildlife resources.

B.7 LAND USE

B.7.1 RESOURCE DEFINITION

Land use describes the way the natural landscape has been modified or managed to provide for human needs. In developed and urbanized areas, land uses typically include residential, commercial, industrial, utilities and transportation, recreation, open space, and mixes of these basic types. Other uses such as mining, extractive activities, agriculture, forestry, and specially protected areas (such as larger monuments, parks, and preserves) are usually found on the fringes or outside of urbanized areas. Plans and policies guide how land resources are allocated and managed to best serve multiple needs and interests. Ordinances and regulations define specific limitations on uses.

The attributes of land use addressed in this analysis include general land use patterns within and surrounding each military base and the land use regulatory setting. The regulatory setting is the framework for managing land use and approving new development. It pertains to Federal, state, and local statutes, regulations, plans, programs, and ordinances.

The following is a list of the typical land use categories that are found on most USAF bases:

- Airfield (Primary Surface and Clear Zones)
- Airfield (Runways, Taxiways and Aprons)
- Aircraft Operations and Maintenance
- Industrial
- Administrative
- Community Commercial
- Community Service
- Housing (Accompanied)
- Housing (Unaccompanied)
- Medical
- Outdoor Recreation
- Open Space
- Water

The ROI for the land use analyses in this Draft EIS includes the land within and surrounding each base. The analysis considers an area that encompasses the full extent of airfield accident zones, and areas exposed to noise levels of concern, plus a reasonable buffer of a few miles. This ROI provides for a wider context of jurisdictional divisions that influence land use patterns around each base.

B.7.2 REGULATORY SETTING

The regulatory setting for land use includes the key Federal, state, and local statutes, regulations, plans, policies, and programs applicable to land use on and near each base. The land use discipline assumed the Federal noise compatibility requirements as identified below.

Airfield and Heliport Planning and Design – DoD UFC 3-260-01. Several siting criteria have been established specific to land development and use at commercial and military airfields. To maintain safety, the USAF adheres to guidelines set forth in UFC 3-260-01, *Airfield and Heliport Planning and Design* (UFC 3-260-01). These criteria include CZs, APZs, and other obstruction zones relative to airfield environments. These and other criteria related to safety, security, and other land use issues are used to assist planners and decision makers with appropriate siting of facilities affecting design and physical layout of USAF bases.

FICUN Land Use Guidelines (1980). In 1980, FICUN was formed to develop Federal policy and guidance on noise. The committee included the USEPA, FAA, Federal Highway Administration, DoD, Department of Housing and Urban Development, and the U.S. Department of Veterans Affairs. The designations contained in the FICUN compatibility table for land use do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities.

Air Installation Compatibility Use Zone (AICUZ) Program (DoDI 4165.57). Establishes the AICUZ program, which is similar to the FAA's Federal Aviation Regulations Part 150 program for civil airports. The AICUZ program is a DoD discretionary program designed to promote compatible land use around military airfields. The military services maintain an AICUZ program to protect the operational integrity of their flying mission.

Areas around airfields are exposed to the potential of aircraft accidents despite well-maintained aircraft with highly trained aircrews. DoD developed the AICUZ program to aid in the development of planning mechanisms that protect the safety and health of personnel on and near military airfields and to preserve operational capabilities. The AICUZ program consists of the following distinct parts: CZs, APZs, hazards to air navigation (height and obstruction criteria established by the FAA), and noise zones.

Bases use the AICUZ program to provide land use compatibility guidelines for areas exposed to increased safety risks and noise near the airfield. The noise compatibility guidelines recommended in the AICUZ program are similar to those used by the U.S. Department of Housing and Urban Development (HUD) and FAA to provide information to surrounding jurisdictions to guide planning and regulation of land use. When noise levels exceed an L_{Adn} of 65 dB, residential land uses are normally considered incompatible.

Off-base land uses are usually generalized in AICUZ studies into one of the following six categories:

- Residential: Includes all types of residential activity, such as single and multi-family residences and mobile homes, at a density greater than one dwelling unit per acre.
- Commercial: Offices, retail, restaurants, and other types of commercial establishments.
- Industrial: Includes manufacturing, warehousing, and other similar uses.

- Public/Quasi-Public: This category includes publicly owned lands and/or land to which the public has access, including military reservations and training grounds, public buildings, schools, churches, cemeteries, and hospitals.
- Recreational: Land areas designated for recreational activity including parks, wilderness areas and reservations, conservation areas, and areas designated for trails, hikes, camping, etc.
- Open/Agricultural/Low Density: Incudes undeveloped land areas, agricultural areas, grazing lands, and areas with residential activity at densities less than or equal to one dwelling unit per acre.

B.7.3 METHODOLOGY

Potential impacts on land use can result from actions that (1) change the suitability of a location for its current or planned use (e.g., noise exposure in residential areas); (2) cause conditions that are unsafe for the public welfare; (3) conflict with the current and planned use of the area based on current zoning, amendments, agreements, regulatory restrictions, management, and land use plans; or (4) displace a current use with a use that does not meet the goals, objectives, and desired use for an area based on public plans or resolutions. The degree of land use effects (negligible, minor, moderate, or significant) is based on the level of land use sensitivity in areas affected by a proposed action, the magnitude of change, and the compatibility of a proposed action with existing or planned land uses. The assessment considers multiple contextual factors that are both quantified and qualitative.

The evaluation primarily focuses on changes resulting from the action that may affect off-base areas. Also considered are potential effects on community amenities within the base such as schools, child care facilities, and housing areas. For each base, the following land use impact drivers are considered:

- Construction and demolition on base (effects such as temporary dust, noise and traffic and longer-term noise or visual changes affecting community areas and nearby off-base locations). The assessment considers the extent of redevelopment, duration, and proximity to sensitive locations of on-base and off-base areas.
- O&M activities for the new mission (generating noise, odors, or traffic). The assessment considers whether the action involves any unusual or new activities, and proximity to sensitive locations of on-base and off-base areas.
- Aircraft operations at the base and in the surrounding area, including engine run ups, takeoffs and landings, and closed pattern work. The assessment evaluates changes in noise exposure levels and the location of noise relative to existing land use, planned uses, and zoning, focusing on land use compatibility with projected noise levels and accident potential following DoD guidelines.
- Change in base population (causing indirect impacts such as congestion in nearby neighborhoods).

The following steps are used to evaluate the impacts on land use from the proposed alternatives:

1. Characterize and describe existing land use and conditions (Volume I, Chapter 3).
    a. Describe general context for the base in the local area (whether urbanized, rural, or natural) and describe jurisdictional boundaries within the area around the airfield.

b. Describe the overall organization of functions on the base (using site plans, Installation Development Plans, other NEPA documents).

c. Describe the land use setting surrounding the base, using aerial photography (National Agriculture Imagery Program [NAIP] 1-meter aerial imagery), notes from site visits, land use plans by local jurisdictions, current zoning.

d. Describe current compatibility planning efforts for the base and status of compatibility around the airfield (based on AICUZ studies, Joint Land Use Studies, airfield zoning districts, airfield noise complaint logs).

e. Identify current noise exposure for land uses surrounding the airfield (using maps with baseline noise contours superimposed on aerial photography), describe noise levels affecting current uses and compatibility of the current exposure levels, and identify specific sensitive receptors affected by incompatible noise levels (such as schools and child development centers [CDCs]) based on the DoD noise compatibility guidelines.

1. Evaluate effects on land use of new construction and demolition. The analysis considers direct and indirect effects of redevelopment based on size of construction effort, location of projects relative to sensitive uses (for example, new industrial-type functions relative to family housing areas), and duration of construction.

2. Evaluate effects on land use of new O&M activities. Qualitatively consider if changes in O&M activities can have indirect effects on the suitability of areas outside the base for their current or planned uses. These effects may include dust, noise, traffic, visual modifications.

3. Assess whether any induced changes such as new housing demands in the local area pose any particular concerns for land use.

4. Quantify and locate changes in noise exposure from aircraft operations.

   a. Estimate change in acreage of land on and off the base exposed to noise levels of 65 dB L_{Adn} and greater at 5 dB intervals. Consider the relative degree of change in exposure in the surrounding area.

   b. Overlay projected and baseline noise contours on aerial photographs to locate where changes in noise exposure would occur. Identify projected noise exposure for land uses surrounding the airfield (using maps with baseline noise contours superimposed on aerial photography). Describe where the changes occur, what land use is affected, degree of change (decibel increase), and compatibility of the land use with the change.

   c. Where changes in exposure interact with incompatible land use, a more careful evaluation of the zoning and potential future development of the affected area is included. This considers potential for future changes in land use or infill that could heighten an existing incompatible condition. Where residential land is impacted, review of aerial photography and zoning ordinances is used to determine the relative density of homes and potential for future infill. The analysis also identifies how and if current noise compatibility planning is adequate to protect airfield and community interests.

5. The impact assessment considers the degree or intensity of projected accident risk at the airfield in combination with current or possible future incompatible uses in the APZs (context). The analysis rates the degree of existing land use compatibility in the CZs and APZs based on DoD's land use compatibility guidelines using levels of incompatible land uses and occupied structures within the APZs and CZs. Because accident risk is extremely low, the current condition of land use compatibility in the APZs and CZs is the dominant criteria in assessing impacts on land use.

B.8 INFRASTRUCTURE

B.8.1 RESOURCE DEFINITION

Infrastructure consists of the systems and physical structures that enable the population of a USAF base to function. Infrastructure is primarily 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 built environment. The availability of infrastructure and its capacity for expansion are essential to the ability of the base to carry out a specific mission, operations, and provide for the needs of the employees and residents.

Utilities analyzed for each of the four bases in this Draft EIS include water supply and distribution, sanitary sewer and wastewater systems, stormwater drainage, electrical system, natural gas, solid waste, and transportation. Solid waste management primarily relates to the availability of systems and landfills to support a population's residential, commercial, and industrial needs. AFI 32-7042, "Waste Management," incorporates the requirements of Subtitle D, 40 *CFR* 240 through 244, 257, and 258, applicable Federal regulations, AFIs, and DoD directives. It also establishes the requirement for bases to have a solid waste management plan; procedures for handling, storage, collection, and disposal of solid waste; record keeping and reporting; and pollution prevention (USAF 2009). The infrastructure information contained in this section provides a brief overview of each infrastructure component and describes its capacities, effectiveness, deficiencies, and existing general condition.

Transportation infrastructure includes the public roadway network, public transportation systems, airports, railroads, pedestrian/bicycle facilities, and waterborne transportation required for the movement of people, materials, and goods. The proposed action has the potential to impact the public roadways that provide access to the bases, base access control points or gates, and the internal roadway systems of the bases. Roadways are typically assigned a functional classification by state departments of transportation. Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. The three main functional classifications for roadways include:

- Arterial – These roadways provided mobility so traffic can move from one place to another quickly and safely.
- Collector – These roadways link arterials and local roads and perform some of the duties of each.
- Local – These roadways provide access to homes, businesses, and other property.

The ROI for the infrastructure analyses in this Draft EIS includes the areas proposed for infrastructure upgrades on each base and areas surrounding each base where traffic from implementation of the proposed MOB 3 mission could affect.

B.8.2 REGULATORY SETTING

There is no applicable regulatory setting for infrastructure and transportation resources.

B.8.3 METHODOLOGY

Effects on infrastructure were evaluated for the proposed KC-46A MOB 3 mission based on the potential for disruption or improvement of existing levels of service and additional needs for water, energy and natural gas consumption, wastewater and stormwater drainage systems, and solid waste system availability. Changes in population and proposed development were used to determine impact on infrastructure. At each installation, the maximum demand or impact to capacity was calculated for the potable water, wastewater, electric and natural gas systems based on the change in population. For the transportation analysis, any change in population was assumed to reside off base.

The impact analysis consisted of a quantitative assessment, based on available information for average and peak use and demand data for each on-base utility and the ability of a utility provider to absorb a given level of demand increase for its service area, and a qualitative assessment of the physical condition of each on-base system. Impacts might arise from physical changes to utility supply and distribution systems over their design life cycle and energy needs created by either direct or indirect workforce and population changes related to base activities. An effect would be considered adverse if the proposed MOB 3 mission requirements caused any of the following:

- A violation of a permit condition or contract with a utility provider.
- A capacity exceedance of a utility or solid waste facility.
- If a system could not sustain a mission increase due to poor condition, inefficient function, or operation.
- If a mission increase would require costly upgrades.
- A long-term interruption of a utility.

To assess the potential environmental consequences associated with transportation resources, increased utilization of the existing roadway system and base access gates due to the potential increase of personnel is analyzed, as well as potential effects of construction activities. Impacts could arise from physical changes to circulation, construction-related traffic delays, and changes in traffic volumes. Adverse impacts on roadway capacities would be significant if roads with no history of capacity exceedance had to operate at or above their full design capacity as a result of implementation of the proposed KC-46A MOB 3 mission.

B.9 HAZARDOUS MATERIALS AND WASTE

B.9.1 RESOURCE DEFINITION

The terms “hazardous materials” and “hazardous waste” refer to substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristic, may present substantial danger to public health or the environment when released into the environment.

Products containing hazardous materials that may result in the generation of hazardous waste include aviation fuel, adhesives, sealants, conversion coatings, corrosion preventative compounds, hydraulic fluids, lubricants, oils, paints, polishes, thinners, and cleaners.

The ROI for hazardous materials and waste encompasses areas that could be impacted by the proposed KC-46A MOB 3 beddown and mission related changes to hazardous materials usage and management, hazardous waste generation and management, and hazardous waste disposal at each installation. Therefore, the ROI for the hazardous materials and waste analysis are defined as the boundary of each base.

The ROI for environmental restoration sites is the footprint of the proposed construction projects described in Chapter 2 of the EIS.

B.9.2 REGULATORY SETTING

The key Federal regulatory requirements related to hazardous materials and waste include:

- Resource Conservation and Recovery Act of 1976 (42 *USC* 6901 et seq.)
- Emergency Planning and Community Right-to-Know Act of 1986 (42 *USC* 11001-11050)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 *USC* 9601-9675)
- Community Environmental Response Facilitation Act of 1992 (42 *USC* 9620)
- Asbestos Hazard Emergency Response Act (15 *USC* 2651)
- Spill Prevention, Control and Countermeasure Rule (40 *CFR* 112)
- USEPA Regulation on Identification and Listing of Hazardous Waste (40 *CFR* 261)
- USEPA Regulation on Standards for the Management of Used Oil (40 *CFR* 279)
- USEPA Regulation on Designation, Reportable Quantities, and Notification (40 *CFR* 302)
- EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*
- Toxic Substances Control Act of 1976 (40 *CFR* 700–766)
- Clean Air Act of 1970, including the 1990 Clean Air Act Amendments (40 *CFR* 61)

Several USAF regulations address the management and safe handling of hazardous materials and wastes in accordance with applicable Federal and state regulations. These include:

- AFI 32-7086, “Hazardous Material Management”
- AFI 32-7042, “Solid and Hazardous Waste Compliance”
- AFI 32-1052, “Facility Asbestos Management”

B.9.3 METHODOLOGY

The exact amounts of hazardous waste that would be generated under each alternative are unknown at this time. The qualitative and quantitative assessment of impacts from hazardous materials and waste management focuses on how (context) and to what degree (intensity) each location could affect hazardous materials usage and management, hazardous waste generation and management, and hazardous waste disposal. Potential impacts related to hazardous materials and wastes were analyzed for the following five effects:

1. Generation of hazardous material/waste types or quantities could not be accommodated by the current management system.

2. Increased likelihood of an uncontrolled release of hazardous materials that could contaminate the soil, surface water, groundwater, or air.
3. Non-compliance with applicable Federal and state regulations as a result of the proposed action.
4. Disturbance or creation of contaminated sites, resulting in adverse effects on human health and/or the environment.
5. Established management policies, procedures, and handling capacities could not accommodate the proposed action.

B.10 SOCIOECONOMICS

B.10.1 RESOURCE DEFINITION

Socioeconomics refers to features or characteristics of the social and economic environment. The main concern for socioeconomic resources is the change in personnel associated with the proposed KC-46A MOB 3 mission that could potentially impact population, employment, earnings, housing, education, and public services. The ROI for this analysis is different for each of the four bases but generally includes the county area or areas where the installation is located.

B.10.2 REGULATORY SETTING

There is no applicable regulatory setting for socioeconomics.

B.10.3 METHODOLOGY

The socioeconomic analysis focuses on the effects resulting from the personnel changes, as well as construction and/or operation and maintenance under each alternative. To estimate the changes in population to the ROI, the total number of non-contractor, full time personnel, and dependents and family members as indicated in Sections 2.5.1.2.2, 2.5.2.2.2, 2.5.3.2.2 and 2.5.4.2.2 were added together and assumed to be migrating to the area. For this analysis, any contractors identified in Volume I, Chapter 2, associated with the proposed KC-46A MOB 3 mission, or the existing missions were assumed to be from the local population and were not considered to be incoming personnel. Therefore, under these assumptions, the changes to the number of part-time drill status Reservists, and contractors would not impact population, housing, education, or public services.

To determine the change in on-base jobs, the total change in full-time military personnel, students (if any), DoD civilians, and contractors was added to the existing on-base total work force. Part-time Reservists were not considered to be part of the work force, because individuals in the AFRC typically only serve one weekend per month, in any areas they choose to live, and are on temporary duty assignment two weeks a year. For this reason, any change in the number of part-time Reservists were also not considered as part of the incoming population that would impact housing, economic activity, education, public services, and base services.

The economic impact analysis used to determine the effect of construction and operation and maintenance costs (if any) was conducted using the Impact Analysis for Planning (IMPLAN) economic forecasting model. The IMPLAN model uses data from the U.S. Bureau of Labor Statistics and the U.S. Bureau of Economic Analysis to construct a mathematical representation of the local economics using the region-specific spending patterns, economic multipliers, and

industries (MIG 2012). In this analysis, the IMPLAN model provided representations of the county-wide economy at each location. Economic impacts are analyzed by introducing a change to a specific industry in the form of increased or decreased employment or spending; the IMPLAN model mathematically calculates the resulting changes in the local economy. In this analysis, the IMPLAN model estimates the economic effects of the incoming personnel on spending and employment in the established ROI. The economic impacts analysis separates effects into three components: direct, indirect, and induced. Direct effects are the change in employment and income generated directly by the expenditures of the incoming or outgoing personnel. To produce the goods and services demanded by the incoming personnel, businesses, in turn, may need to purchase additional goods and services from other businesses. The employment and incomes generated by these secondary purchases would result in the indirect effects. Induced effects are the increased household spending generated by the direct and indirect effects. The overall effect from the economic impact analysis is the total number of jobs created throughout the ROI by the direct, indirect, and induced effects. The construction and O&M costs used in the economic activity section were provided by the USAF during the site survey reports.

To determine whether the local housing market could support the personnel associated with the proposed MOB 3 mission, several assumptions were made. The first assumption was that part-time Reservists and contractors were already residing in the local population and any change to the number of these personnel would not influence the local housing market. The second assumption was that the total number of homes required off base was equal to the total number of incoming full-time military personnel. This number was compared against the number of vacant housing units as defined by the American Community Survey 5 year estimate for years 2010-2014. If the number of incoming full-time military personnel did not exceed the number of vacant housing units as defined by the American Community Survey estimates, the housing market in the ROI was anticipated to be able to support the incoming population.

To determine the total dependents for each base associated with the proposed MOB 3 mission, 65 percent of all non-contractor, full-time military personnel, as identified in the personnel tables in Volume I, Chapter 2 (See Tables 2-4, 2-8, 2-12, 2-13, and 2-16), were assumed to be accompanied. Each accompanied military member was assumed to be accompanied by 2.5 dependents, or 1 spouse and approximately 1.5 children. All children were assumed to be of school age. Therefore, to determine the total number of school-aged children, a multiplier of 1.5 was applied to 65 percent of the non-contractor, full-time military personnel.

Public services were analyzed by considering the overall percentage change to the county population. Base services were analyzed by considering the capacity, staffing, and infrastructure available to support the incoming personnel.

The magnitude of potential impacts can vary greatly, depending on the location of the proposed action. If potential socioeconomic changes were to result in substantial shifts in population trends or a decrease in regional spending or earning patterns, those effects would be considered adverse. A proposed action could have an effect with respect to socioeconomic conditions in the surrounding ROI if the following were to occur:

- Change in the local business volume, employment, or population that exceeds the ROI's historical annual change
- Adverse change on social services or social conditions, including property values, school enrollment, county or municipal expenditures, or crime rates

B.11 ENVIRONMENTAL JUSTICE AND OTHER SENSITIVE RECEPTORS

B.11.1 RESOURCE DEFINITION

The resource considered for environmental justice is potentially affected populations that meet certain characteristics based on race, income, and age. The resource is defined relatively, in order to understand if impacts from an action are occurring in areas that are disproportionately composed of minorities and low-income persons. While not specifically part of environmental justice analysis, this section also considers similar impacts to youth and elderly populations. This concern arises because large impact projects have historically used sites where real estate values are lower and/or more industrialized. Locations with low property values have tended to attract development of affordable and marginal housing. This dynamic tends to perpetuate and often pre-dates the enactment of community land use ordinances. The intent of environmental justice is to reduce the burden of impacts on socially and economically vulnerable populations.

B.11.2 REGULATORY SETTING

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to address environmental and human health conditions in minority and low-income communities. In addition to environmental justice issues are concerns pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which directs Federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

USAF guidance for implementation of the EO is contained in the *Guide for Environmental Justice Analysis under the Environmental Impact Analysis Process (EIAP)*, dated November 2014 (USAF 2014). That guidance also explains the need to address impacts which may adversely impact elderly (65 and over) populations.

The terms “minority” and low income” are defined below for purposes of this analysis.

- Minority: The term “minority” for purposes of environmental justice analysis includes those individuals who have identified themselves as having one of the following origins: “Hispanic,” “Asian-American,” “Native Hawaiian and other Pacific Islander,” “Black or African-American” “American Indian or Alaskan Native,” or “Some Other Race” (which does not include “White,” “Black or African-American,” “American Indian or Alaska Native,” “Asian,” and “Native Hawaiian or Other Pacific Islander” race categories) (USAF 2014).
- Low Income: the U.S. Census Bureau defines the term “poverty” (also referred to as “low income” as “a set of money income threshold that vary by family size and composition to determine who is in poverty” (U.S. Census Bureau 2015). A family and each individual in the family is considered in poverty if the total family income is less than the family’s threshold or the dollar amount calculated by the U.S. Census to determine poverty status.

Although youth (under 18) and the elderly (65 and over) are not specifically included as environmental justice populations, they are identified as sensitive receptors in the guidelines (USAF 2014). Children are vulnerable to environmental exposure and potential health and safety effects to children are considered in this EIS under the guidelines established by EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. For purposes of this analysis, the term “children” refers to any person under 18. The USEPA and the USAF

Environmental Impact Analysis Process (EIAP) guidance identify the importance of considering an elderly person as a sensitive receptor to potential environmental impacts. The term "elderly" refers to any person age 65 or over.

B.11.3 METHODOLOGY

Analysis of environmental justice is conducted pursuant to EO 12898 and EO 13045 and follows the guidelines outlined in the 2014 USAF EIAP (USAF 2014). Environmental justice analysis focuses on the off-base populations in the affected area defined as those areas off-base that are exposed to noise levels of 65 dB L_{Adn} or greater. Since the proposed construction activities would occur within the base boundaries, the only action with the potential to cause adverse impacts is related to the new noise levels generated in the vicinity of each of the bases under consideration for the proposed MOB 3 mission.

In accordance with USAF EIAP guidelines, the community of comparison (COC) in environmental justice analysis is the "smallest set of Census data encompassing the ROI for each resource and is used to establish appropriate threshold for comparison analysis" (USAF 2014). The county data that encompass the affected area is the COC. For environmental justice minority and low-income populations, and for the youth and elderly populations, the most recent American Community Survey (ACS) 2010-2014 data for census block groups were used to calculate the populations in each ROI. The affected area used to define the COC and each ROI was calculated by Environmental Research Systems Incorporated (ESRI) ArcMap version 10.2 geographic information system (GIS) to overlap the noise contours onto the census block group data, where the population was assumed to be within only those areas of residential land use. The proportion of the area covered in each census block group was then applied to the total population in the entire block group to determine the population within the affected area. The percentages for minority, low-income, youth, and elderly provided in the ACS 2010-2014 5-year estimate, were then applied to the population in the affected area for each census block group (ROI) to determine the number of people in the ROI that would comprise those environmental justice, minority and low-income population categories. The same methodology was used to calculate comparable numbers for youth and elderly populations.

The potential for disproportionate impacts to minority or low-income populations was determined by comparing the percent of each population in the respective ROI with the percent of each population in the respective COC. If the ROI percent is less than the COC percent, then there would be no disproportionate impacts. If, however, the ROI percent is greater than or equal to the COC percent, disproportionate effects could be present and require mitigation (USAF 2014).

For all youth and elderly populations, disproportionate impact is inherent. The extent to which youth and the elderly will be impacted is disproportionate due to their inherent vulnerabilities. Pursuant to EO 13045, due to age-related physiological differences in types and levels of exposure, the evaluation of environmental impacts to children (youth under 18) is different from the evaluation of environmental impacts to adults (e.g., because children breathe more rapidly than adults and their bodies are not yet fully developed, they have different responses to environmental impacts).

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29 *CFR* 1910.95 – Occupational Noise Exposure

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33 *CFR* 323.3 – Discharges Requiring Permits

33 *CFR* 328.3 – Definition of Waters of the United States

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EO 13175 – Consultation and Coordination with Indian Tribal Governments

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APPENDIX C

BACKGROUND INFORMATION FOR THE ACOUSTIC ENVIRONMENT ANALYSIS

APPENDIX C BACKGROUND INFORMATION FOR THE NOISE ANALYSIS

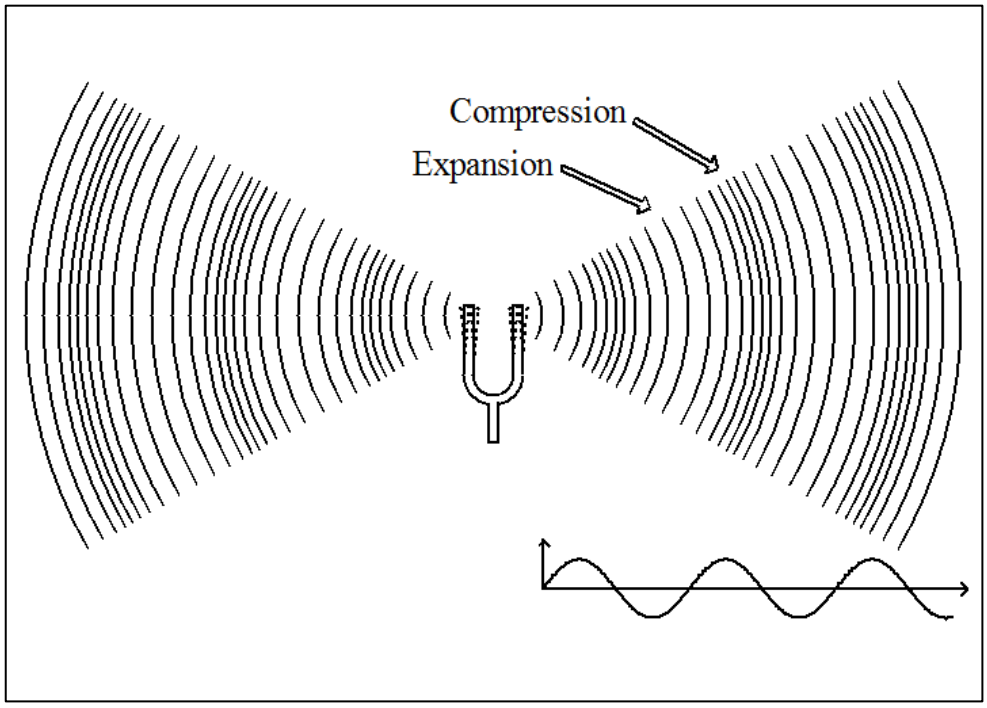
This appendix describes sound and noise potential effects on the human and natural environment. This appendix also reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. Representative flight profiles used in the noise modeling for the proposed KC-46A MOB 3 mission at each alternative base are contained in Attachment C-1.

C.1 BASICS OF SOUND

The following four subsections describe sound waves, sounds levels and types of sounds, and workplace noise.

C.1.1 SOUND WAVES AND DECIBELS

Sound consists of minute vibrations in the air that travel through the air and are sensed by the human ear. Figure C-1 is a sketch of sound waves from a tuning fork. The waves move outward as a series of crests where the air is compressed and troughs where the air is expanded. The height of the crests and the depth of the troughs are the amplitude or sound pressure of the wave. The pressure determines its energy or intensity. The number of crests or troughs that pass a given point each second is called the frequency of the sound wave.



Source: Wyle Laboratories

Figure C-1. Sound Waves from a Vibrating Tuning Fork

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration.

- Intensity is a measure of the acoustic energy of the sound and is related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.

- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.
- Duration or the length of time the sound can be detected.

As shown in Figure C-1, the sound from a tuning fork spreads out uniformly as it travels from the source. The spreading causes the sound's intensity to decrease with increasing distance from the source. For a source such as an aircraft in flight, the sound level will decrease by about 6 dB for every doubling of the distance. For a busy highway, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from the source it also gets absorbed by the air. The amount of absorption depends on the frequency composition of the sound, the temperature, and the humidity conditions. Sound with high frequency content gets absorbed by the air more than sound with low frequency content. More sound is absorbed in colder and drier conditions than in hot and wet conditions. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover) and structures.

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall 1995).

Because of the logarithmic nature of the decibel unit, sound levels cannot simply be added or subtracted and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness. This relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because the human ear does not respond linearly.

Sound frequency is measured in terms of cycles per second or hertz (Hz). The normal ear of a young person can detect sounds that range in frequency from about 20 Hz to 20,000 Hz. As

humans get older, humans lose the ability to hear high frequency sounds. Not all sounds in this wide range of frequencies are heard equally. Human hearing is most sensitive to frequencies in the 1,000 to 4,000 Hz range. The notes on a piano range from over 27 Hz to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simple pure tones like the tuning fork in Figure C-1, but contain a mix, or spectrum, of many frequencies.

Sounds with different spectra are perceived differently even if the sound levels are the same. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. A-weighting puts emphasis on the 1,000 to 4,000 Hz range.

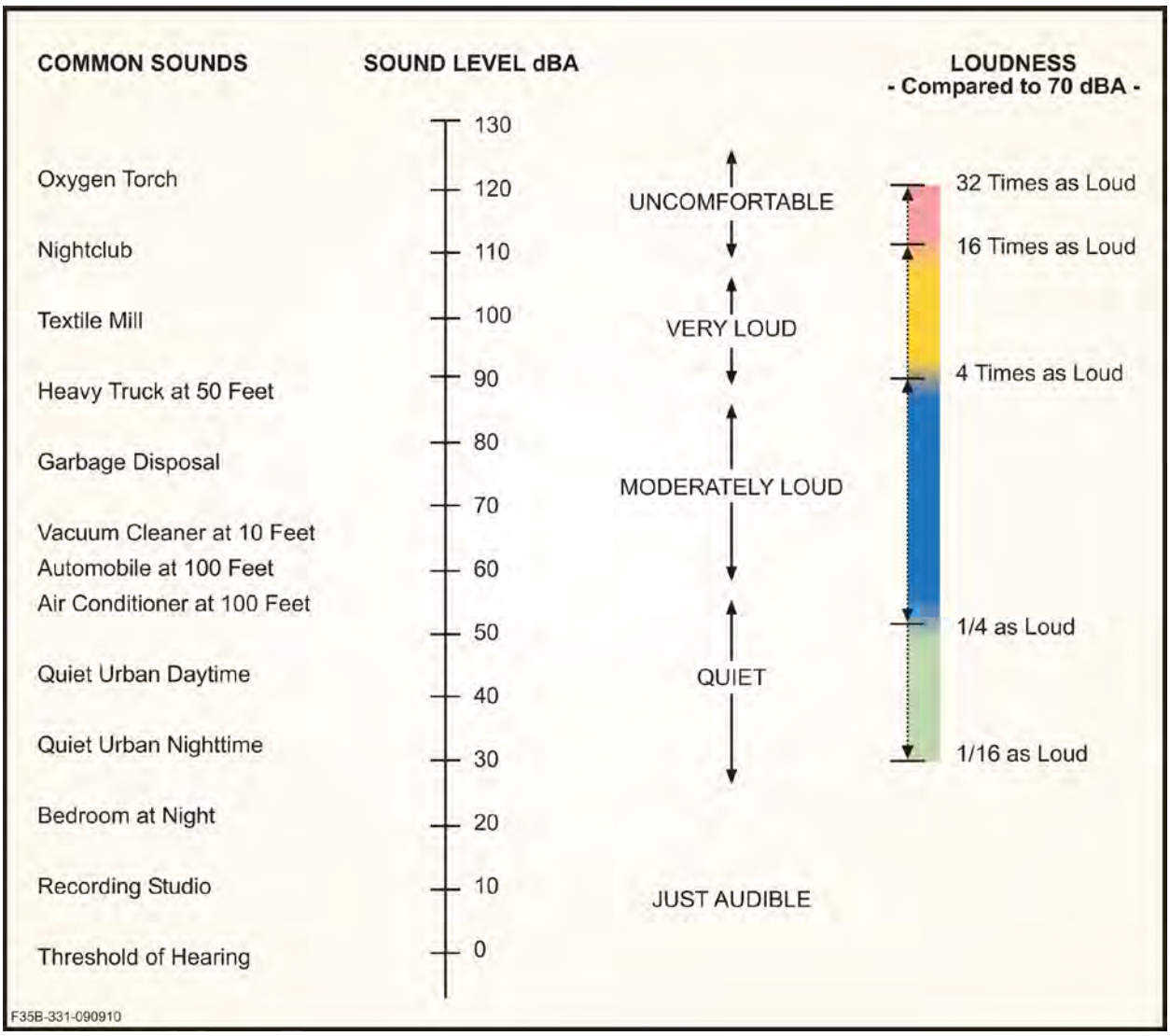
C.1.2 SOUND LEVELS AND TYPES OF SOUNDS

Most environmental sounds are measured using A-weighting. They are called A-weighted sound levels, and sometimes use the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term “A-weighted” is often omitted and the unit dB is used. Unless otherwise stated, dB units refer to A-weighted sound levels.

Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound. Noise can become an issue when its level exceeds the ambient or background sound level. Ambient noise in urban areas typically varies from 60 to 70 dB, but can be as high as 80 dB in the center of a large city. Quiet suburban neighborhoods experience ambient noise levels around 45-50 dB (USEPA 1978).

Figure C-2 is a chart of A-weighted sound levels from common sources. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like “urban daytime” and “urban nighttime” are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods.

Aircraft noise consists of two major types of sound events: flight (including takeoffs, landings and flyovers), and stationary, such as engine maintenance run-ups. The former are intermittent and the latter primarily continuous. Noise from aircraft overflights typically occurs beneath main approach and departure paths, in local air traffic patterns around the airfield, and in areas near aircraft parking ramps and staging areas. As aircraft climb, the noise received on the ground drops to lower levels, eventually fading into the background or ambient levels.



Sources: Harris 1979; FICAN 1997

Figure C-2. Typical A-weighted Sound Levels of Common Sound

C.1.3 WORKSPACE NOISE

In 1972, the National Institute for Occupational Safety and Health (NIOSH) published a criteria document with a recommended exposure limit of 85 dB as an 8-hour time-weighted average. This exposure limit was reevaluated in 1998 when NIOSH made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss (NIOSH 1998). Following the reevaluation using a new risk assessment technique, NIOSH published another criteria document in 1998 which reaffirmed the 85 dB recommended exposure limit (NIOSH 1998). Active-duty and reserve components of the Air Force (including the ANG), as well as civilian employees and contracted personnel working on Air Force bases and Air Guard stations must comply with Occupational Safety and Health Administration (OSHA) regulations (29 CFR § 1910.95 Occupational Noise Exposure), DoD Instruction 6055.12, Hearing Conservation Program; Air Force Occupational Safety and Health (AFOSH) Standard 48-20 (June 2006), and Occupational Noise and Hearing Conservation Program (including material derived from the International Standards Organization 1999.2 Acoustics-Determination of Occupational Noise Exposure and Estimation of Noise Induced

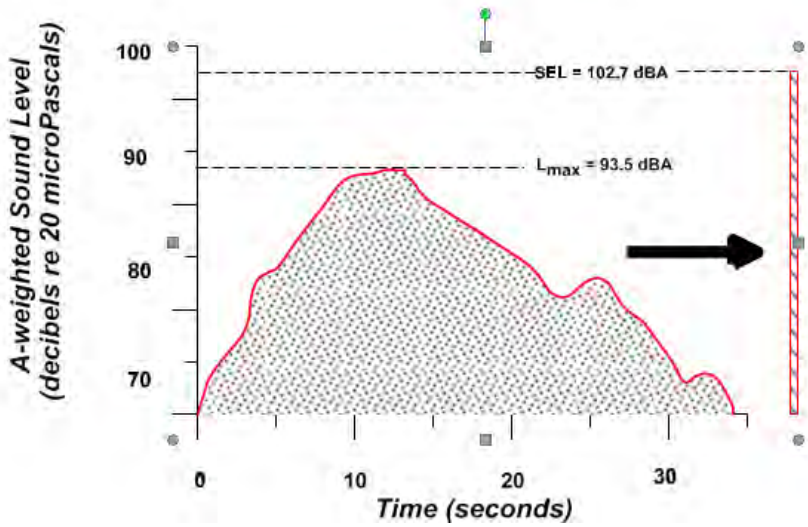
Impairment). Per AFOSH Standard 48-20, the Hearing Conservation Program is designed to protect workers from the harmful effects of hazardous noise by identifying all areas where workers are exposed to hazardous noise. The following are main components of the program:

- Identify noise hazardous areas or sources and ensure these areas are clearly marked.
- Use engineering controls as the primary means of eliminating personnel exposure to potentially hazardous noise. All practical design approaches to reduce noise levels to below hazardous levels by engineering principles shall be explored. Priorities for noise control resources shall be assigned based on the applicable risk assessment code. Where engineering controls are undertaken, the design objective shall be to reduce steady-state levels to below 85 dBA, regardless of personnel exposure time, and to reduce impulse noise levels to below 140 dB peak sound pressure level.
- Ensure workers with an occupational exposure to hazardous noise complete an initial/reference audiogram within 30 days from the date of the workers' initial exposure to hazardous noise.
- Ensure new equipment being considered for purchase has the lowest sound emission levels that are technologically and economically possible and compatible with performance and environmental requirements. 42 USC § 4914, Public Health and Welfare, Noise Control, Development of Low-Noise Emission Products, applies.
- Education and training regarding potentially noise hazardous areas and sources, use and care of hearing protective devices, the effects of noise on hearing, and the Hearing Conservation Program.

C.2 NOISE METRICS

Noise metrics quantify sounds so they can be compared with each other, and with their effects, in a standard way. The simplest metric is the A-weighted level, which is appropriate by itself for constant noise such as an air conditioner. Aircraft noise varies with time. During an aircraft overflight, noise starts at the background level, rises to a maximum level as the aircraft flies close to the observer, then returns to the background as the aircraft recedes into the distance. Over time there can be a number of events, not all the same.

There are a number of metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. This section describes the metrics relevant to environmental noise analysis.



Source: Wyle Laboratories

Figure C-3. Example Time History of Aircraft Noise Flyover

C.2.1 SINGLE-EVENTS

C.2.1.1 Sound Level (L_{max})

The highest A-weighted sound level measured during a single event in which the sound changes with time is called the maximum A-weighted sound level or Maximum Sound Level and is abbreviated L_{max}. The L_{max} is depicted for a sample event in Figure C-3.

L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted "slow" response. L_{max} is important in judging if a noise event will interfere with conversation, TV or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise, because it does not account for how long the sound is heard.

Table C-1 reflects L_{max} values for typical aircraft associated with this assessment operating at the indicated flight profiles and power settings. On takeoff through 1,000 feet AGL, the F-22 has the highest L_{max} of 112 dB with the F-35A ranked a close second with 111 dB L_{max}. On approach through 1,000 feet AGL, the F-22 has the highest L_{max} of 104 dB with the B-1 and F-15 tied for second with 97 dB L_{max}.

Table C-1. Representative Instantaneous Maximum Sound Levels (L_{max})[a]

Aircraft (engine type)	Power Setting	Power Unit[b]	Lmax (dBA) At Varying Altitudes (feet)				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations[c]							
A-10A	6,200	NF	100	92	82	68	58
B-13	97.5%	RPM	113	105	97	84	72
F-15 (PW220)	90%	NC	111	104	97	85	75
F-16 (PW229)	93%	NC	114	106	98	86	76
F-22	100%	ETR	120	112	105	93	83
F-35A	100%	ETR	119	111	103	91	81
Landing/Arrival Operations[d]							
A-10A	5,225	NF	97	89	79	60	46
B-1	90%	RPM	104	97	89	76	65
F-15 (PW220)	75%	NC	104	97	89	77	66
F-16 (PW229)	83.5%	NC	93	86	78	66	56
F-22	43%	ETR	111	104	96	84	73
F-35A[e]	40%	ETR	100	93	85	73	62

***Source*:** NOISEMAP OPX file using standard weather conditions of 59 degrees Fahrenheit and 70 percent relative humidity.

a. Power settings indicated may not be comparable across aircraft that all numbers are rounded, and power settings are typical but not constant for departure/arrival operations.

b. RPM—Revolutions Per Minute; ETR—Engine Thrust Request; NC—Engine Core RPM; and NF—Engine Fan RPM.

c. B-1 Takeoff/Departure modeled with Afterburner, all other departure aircraft modeled without afterburner (if available).

d. All Landing/Arrival aircraft modeled with "parallel-interpolation" power setting for gear down configuration (except if noted).

e. Based on 2013 Edwards measurements.

C.2.1.2 Sound Exposure Level (SEL)

Sound Exposure Level combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event.

Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time, but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Table C-2 shows SEL values corresponding to the aircraft and power settings reflected in Table C-1. At 1,000 feet AGL on takeoff, the F-22 has the highest SEL of 121 dB, with the F-35A closed behind with 119 dB SEL. At 1,000 feet AGL on approach, the F-22 has the highest SEL of 109 dB, with the B-1 ranked second with 105 dB SEL.

C-weighted SEL can be computed for impulsive sounds, and the results denoted CSEL or LCE. SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A-weighted sounds and CSEL for C-weighted.

C.2.2 CUMULATIVE EVENTS

C.2.2.1 Equivalent Sound Level (L_{eq})

Equivalent Sound Level is a “cumulative” metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average SEL of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given time period.

The time period of an L_{eq} measurement is usually related to some activity, and is given along with the value. The time period is often shown in parenthesis (e.g., $L_{eq(24)}$ for 24 hours). The L_{eq} from 7 a.m. to 3 p.m. may give exposure of noise for a school day.

Figure C-4 gives an example of $L_{eq(24)}$ using notional hourly average noise levels ($L_{eq(h)}$) for each hour of the day as an example. The $L_{eq(24)}$ for this example is 61 dB.

Table C-2. Representative Sound Exposure Levels (SEL)[a]

Aircraft (engine type)	Power Setting	Power Unit[b]	SEL (dBA) At Varying Altitudes (feet)				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations[c, d]							
A-10A	6,200	NF	105	99	91	80	71
B-14	97.5%	RPM	119	113	106	96	86
F-15 (PW220)	90%	NC	120	115	109	100	91
F-16 (PW229)	93%	NC	119	114	107	98	89
F-22	100%	ETR	127	121	115	106	98
F-35A	100%	ETR	125	119	113	103	95
Landing/Arrival Operation[e]							
A-10A	5,225	NF	98	92	83	67	55
B-1	90%	RPM	111	105	98	88	79
F-15 (PW220)	75%	NC	99	94	88	79	71
F-16 (PW229)	83.5%	NC	97	92	86	77	68
F-22	43%	ETR	115	109	103	94	85
F-35A[f]	40%	ETR	107	102	95	86	76

Source: NOISEMAP OPX file using standard weather conditions of 59 degrees Fahrenheit and 70 percent relative humidity.

a. Power settings indicated may not be comparable across aircraft, that all numbers are rounded, and power settings are typical but not constant for departure/arrival operations.

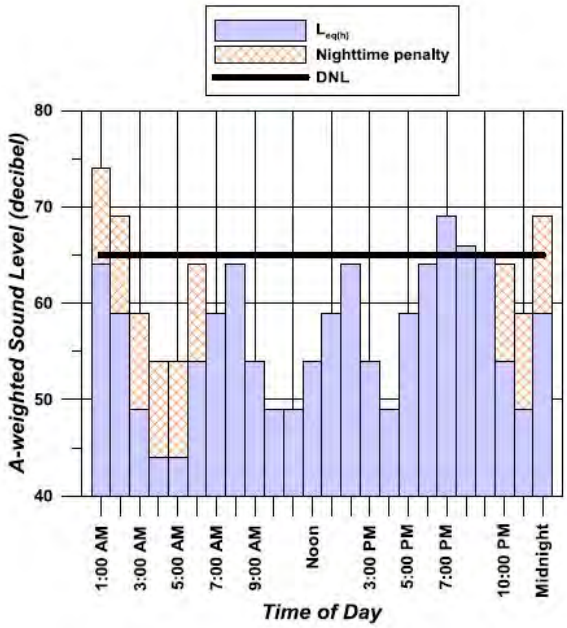
b. RPM—Revolutions Per Minute; ETR—Engine Thrust Request; NC—Engine Core RPM; and NF—Engine Fan RPM.

c. Takeoff/Departure modeled at 160 knots airspeed for SEL purposes.

d. B-1 Takeoff/Departure modeled with Afterburner, all other departure aircraft modeled without afterburner (if available).

e. All Landing/Arrival aircraft modeled at 160 knots airspeed for SEL purposes.

f. Based on 2013 Edwards measurements.



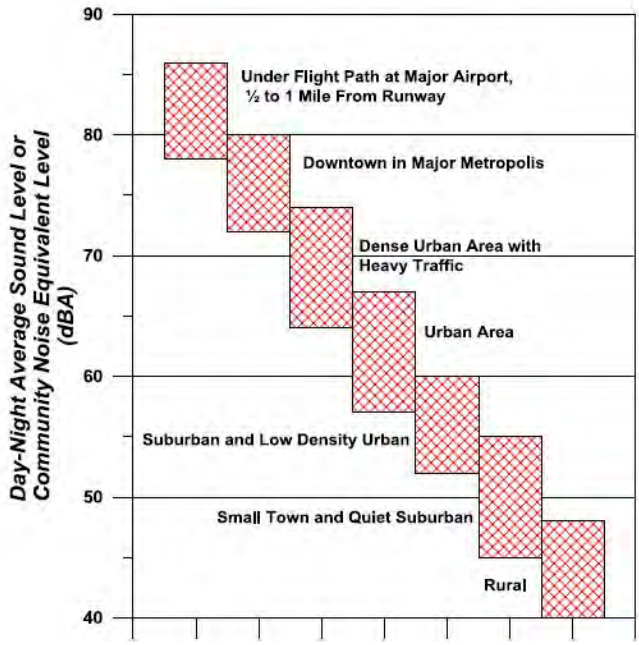
Source: Wyle Laboratories

Figure C-2. Example of $L_{eq(24)}$, DNL Computed from Hourly Equivalent Sound Levels

C.2.2.2 Day-Night Average Sound Level (DNL or L_{dn})

Day-Night Average Sound Level is a cumulative metric that accounts for all noise events in a 24-hour period. However, unlike $L_{eq(24)}$, DNL contains a nighttime noise penalty. To account for our increased sensitivity to noise at night, DNL applies a 10 dB penalty to events during the nighttime period, defined as 10:00 p.m. to 7:00 a.m. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent.

For airports and military airfields outside of California, DNL represents the average sound level for annual average daily aircraft events. Figure C-4 gives an example of DNL using notional hourly average noise levels ($L_{eq(h)}$) for each hour of the day as an example. Note the $L_{eq(h)}$ for the hours between 10 p.m. and 7 a.m. have a 10 dB penalty assigned. The DNL for this example is 65 dB. Figure C-5 shows the ranges of DNL that occur in various types of communities. Under a flight path at a major airport the DNL may exceed 80 dB, while rural areas may experience DNL less than 45 dB.



Source: DoD 1978

Figure C-3. Typical DNL Ranges in Various Types of Communities

The decibel summation nature of these metrics causes the noise levels of the loudest events to control the 24-hour average. As a simple example, consider a case in which only one aircraft overflight occurs during the daytime over a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.9 dB. Assume, as a second example that 10 such 30- second overflights occur during daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24- hour period is 75.5 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events.

A feature of the DNL metric is that a given DNL value could result from a very few noisy events or a large number of quieter events. For example, 1 overflight at 90 dB creates the same DNL as 10 overflights at 80 dB.

DNL does not represent a level heard at any given time, but represent long term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz 1978; USEPA 1978).

C.2.3 SUPPLEMENTAL METRICS

C.2.3.1 Number-of-Events Above (NA) a Threshold Level (L)

The Number-of-Events Above (NA) metric gives the total number of events that exceed a noise level threshold (L) during a specified period of time. Combined with the selected threshold, the metric is denoted NAL. The threshold can be either SEL or L_{max}, and it is important that this selection is shown in the nomenclature. When labeling a contour line or point of interest (POI), NAL is followed by the number of events in parentheses. For example, where 10 events exceed

an SEL of 90 dB over a given period of time, the nomenclature would be NA90SEL(10). Similarly, for L_{max} it would be $NA90L_{max(10)}$. The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA is a supplemental metric. It is not supported by the amount of science behind DNL/CNEL, but it is valuable in helping to describe noise to the community. A threshold level and metric are selected that best meet the need for each situation. An L_{max} threshold is normally selected to analyze speech interference, while an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

C.2.3.2 Time Above (TA) a Specified Level (L)

The Time Above (TA) metric is the total time, in minutes, that the A-weighted noise level is at or above a threshold. Combined with the threshold level (L), it is denoted TAL. TA can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data for that time.

TA is a supplemental metric, used to help understand noise exposure. It is useful for describing the noise environment in schools, particularly when assessing classroom or other noise sensitive areas for various scenarios. TA can be shown as contours on a map similar to the way DNL contours are drawn.

TA helps describe the noise exposure of an individual event or many events occurring over a given time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis so the results show not only how many events occur, but also the total duration of those events above the threshold.

C.3 ACOUSTIC ENVIRONMENT EFFECTS

Noise is of concern because of potential adverse effects. The following subsections describe how noise can affect communities and the environment, and how those effects are quantified. The specific topics discussed are:

- Annoyance;
- Land Use Compatibility
- Speech interference;
- Sleep disturbance;
- Noise-induced hearing impairment;
- Non-auditory health effects;
- Performance effects;
- Noise effects on children;
- Property values;
- Noise-induced vibration effects on structures and humans;
- Noise effects on terrain;
- Noise effects on historical and archaeological sites;
- Effects on domestic animals and wildlife; and

C.3.1 ANNOYANCE

With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith *et al.* (1953) and Stevens *et al.* (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its "Levels Document" (USEPA 1974) that reviewed the factors that affected communities. DNL (still known as L_{dn} at the time) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents.

Surveys in the early years had a range of designs and formats, and needed some interpretation to find common ground. In 1978, Schultz showed that the common ground was the number of people "highly annoyed," defined as the upper 28 percent range of whatever response scale a survey used (Schultz 1978). With that definition, he was able to show a remarkable consistency among the majority of the surveys for which data were available. Figure C-6 shows the result of his study relating DNL to individual annoyance measured by percent highly annoyed (%HA).

Schultz's original synthesis included 161 data points. Figure C-7 compares revised fits of the Schultz data set with an expanded set of 400 data points collected through 1989 (Finegold *et al.* 1994). The new form is the preferred form in the US, endorsed by the FICAN (FICAN 1997). Other forms have been proposed, such as that of Fidell and Silvati (2004), but have not gained widespread acceptance.

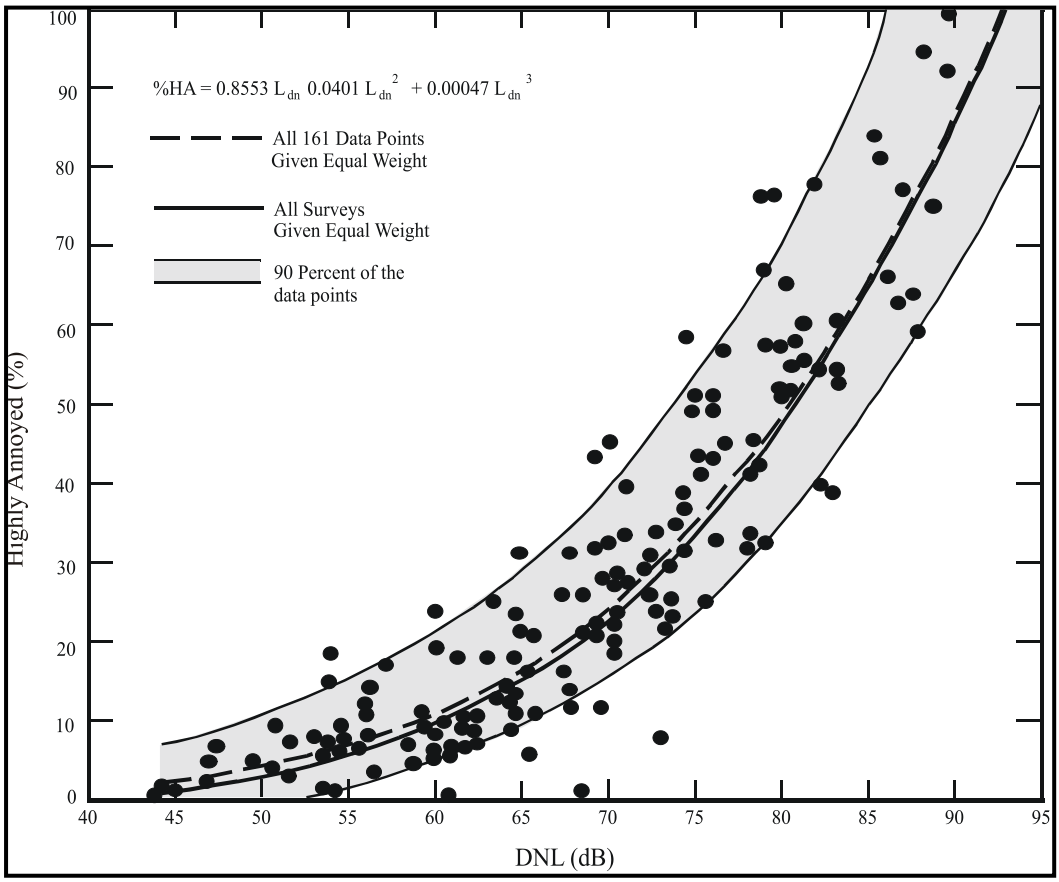


Figure C-6. Schultz Curve Relating Noise Annoyance to DNL (Schultz 1978)

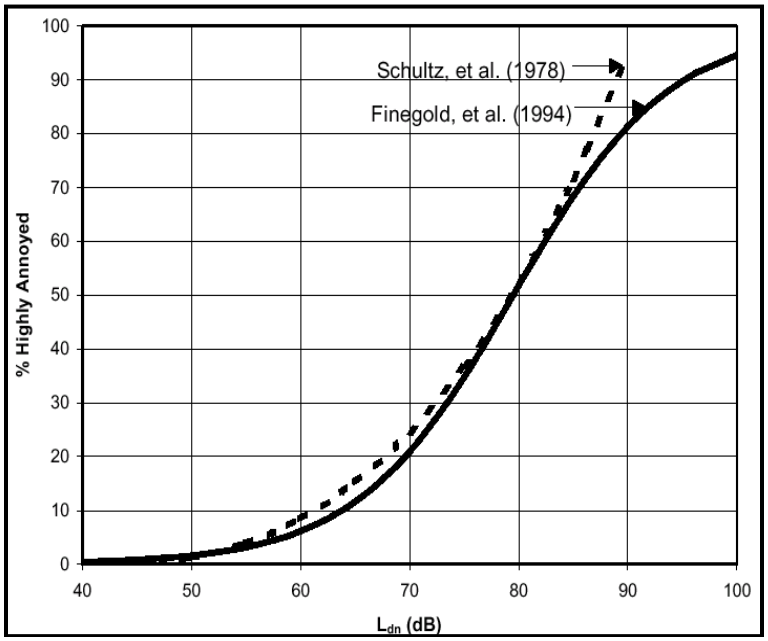


Figure C-7. Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold *et al.* (1994)

When the goodness of fit of the Schultz curve is examined, the correlation between groups of people is high, in the range of 85-90 percent. The correlation between individuals is lower, 50 percent or less. This is not surprising, given the personal differences between individuals. The surveys underlying the Schultz curve include results that show that annoyance to noise is also affected by non-acoustical factors. Newman and Beattie (1985) divided the non-acoustic factors into the emotional and physical variables shown in Table C-3.

Table C-3. Non-Acoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables	Physical Variables
Feeling about the necessity or preventability of the noise	Type of neighborhood
Judgment of the importance and value of the activity that is producing the noise	Time of day
Activity at the time an individual hears the noise	Season
Attitude about the environment	Predictability of noise
General sensitivity to noise	Control over the noise source
Belief about the effect of noise on health	Length of time individual is exposed to a noise
Feeling of fear associated with the noise	

Schreckenberg and Schuemer (2010) recently examined the importance of some of these factors on short term annoyance. Attitudinal factors were identified as having an effect on annoyance. In formal regression analysis, however, sound level (L_{eq}) was found to be more important than attitude.

A recent study by Plotkin *et al.* (2011) examined updating DNL to account for these factors. It was concluded that the data requirements for a general analysis were much greater than most existing studies. It was noted that the most significant issue with DNL is that it is not readily understood by the public, and that supplemental metrics such as TA and NA were valuable in addressing attitude when communicating noise analysis to communities (DoD 2009a).

A factor that is partially non-acoustical is the source of the noise. Miedema and Vos (1998) presented synthesis curves for the relationship between DNL and percentage "Annoyed" and percentage "Highly Annoyed" for three transportation noise sources. Different curves were found for aircraft, road traffic, and railway noise. Table C-4 summarizes their results. Comparing the updated Schultz curve suggests that the percentage of people highly annoyed by aircraft noise may be higher than previously thought.

Table C-4. Percent Highly Annoyed for Different Transportation Noise Sources

(dB)	Percent Highly Annoyed (%HA)			
	Miedema and Vos			Schultz
	Air	Road	Rail	Combined
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema and Vos 1998.

As noted by the World Health Organization (WHO), however, even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO 1999).

Consistent with WHO's recommendations, the Federal Interagency Committee on Noise (FICON 1992) considered the Schultz curve to be the best source of dose information to predict community response to noise, but recommended further research to investigate the differences in perception of noise from different sources.

C.3.2 LAND USE COMPATIBILITY

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the DNL or L_{dnmr} for military overflights. Impulsive noise can be assessed by relating CDNL to an "equivalent annoyance" DNL.

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise published guidelines (Federal Interagency Committee on Urban Noise 1980) relating DNL to compatible land uses. This committee was composed of representatives from DoD, Transportation, and Housing and Urban Development; USEPA; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, the DoD adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. Air Force guidelines are presented in Table C-5, along with the explanatory notes included in the regulation. These guidelines are not mandatory (note the footnote "*" in the table), rather they are recommendations to provide the best means for determining noise impact for communities adjacent to bases. Again, these are recommendations only; it is up to the city/county zoning and planning entities to determine what land uses are compatible and how they will deal with incompatibilities (e.g., what type of development is allowed, instituting residential buyouts, or whether noise attenuation efforts will be done in residential units). In general, residential land uses normally are not compatible with outdoor DNL values above 65 dB, and the extent of land areas and populations exposed to DNL of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions. In some cases a change in noise level, rather than an absolute threshold, may be a more appropriate measure of impact.

Table C-5. Air Force Land Use Compatibility Recommendations

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	**Name**	**Clear Zone**	**APZ I**	**APZ II**	**65-69 dB**	**70-74 dB**	**75-79 dB**	**80+ dB**
10	**Residential**							
11	**Household units**							
11.11	Single units; detached	N	N	Y[1]	A[11]	B[11]	N	N
11.12	Single units; semidetached	N	N	N	A[11]	B[11]	N	N
11.13	Singe units; attached row	N	N	N	A[11]	B[11]	N	N
11.21	Two units; side-by-side	N	N	N	A[11]	B[11]	N	N
11.22	Two units; one above the other	N	N	N	A[11]	B[11]	N	N
11.31	Apartments; walk up	N	N	N	A[11]	B[11]	N	N
11.32	Apartments; elevator	N	N	N	A[11]	B[11]	N	N
12	Group quarters	N	N	N	A[11]	B[11]	N	N
13	Residential hotels	N	N	N	A[11]	B[11]	N	N
14	Mobile home parks or courts	N	N	N	N	N	N	N

Table C-5. Air Force Land Use Compatibility Recommendations (Continued)

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
15	Transient lodgings	N	N	N	A[11]	B[11]	C[11]	N
16	Other residential	N	N	N[1]	A[11]	B[11]	N	N
20	Manufacturing							
21	Food and kindred products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
22	Textile mill products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
24	Lumber and wood products (except furniture); manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
25	Furniture and fixtures; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
26	Paper and allied products; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
27	Printing, publishing, and allied industries	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
28	Chemicals and allied products; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
29	Petroleum refining and related industries	N	N	N	Y	Y[12]	Y[13]	Y[14]
30	**Manufacturing**							
31	Rubber and misc. plastic products, manufacturing	N	N[2]	N[2]	Y	Y[12]	Y[13]	Y[14]
32	Stone, clay and glass products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
33	Primary metal industries	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
34	Fabricated metal products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks; manufacturing	N	N	N[2]	Y	A	B	N
39	Miscellaneous manufacturing	N	Y[2]	Y[2]	Y	Y[12]	Y[13]	Y[14]
40	**Transportation, communications, and utilities**							
41	Railroad, rapid rail transit, and street railroad transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
42	Motor vehicle transportation	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
43	Aircraft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
44	Marine craft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
45	Highway and street right-of-way	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
46	Automobile parking	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
47	Communications	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
48	Utilities	N[3]	Y[4]	Y	Y	Y	Y[12]	Y[13]
49	Other transportation communications and utilities	N[3]	Y[4]	Y	Y	A[15]	B[15]	N

Table C-5. Air Force Land Use Compatibility Recommendations (Continued)

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
50	**Trade**							
51	Wholesale trade	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
52	Retail trade-building materials, hardware and farm equipment	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
53	Retail trade-general merchandise	N[2]	N[2]	Y[2]	Y	A	B	N
54	Retail trade-food	N[2]	N[2]	Y[2]	Y	A	B	N
55	Retail trade-automotive, marine craft, aircraft and accessories	N[2]	N[2]	Y[2]	Y	A	B	N
56	Retail trade-apparel and accessories	N[2]	N[2]	Y[2]	Y	A	B	N
57	Retail trade-furniture, home furnishings and equipment	N[2]	N[2]	Y[2]	Y	A	B	N
58	Retail trade-eating and drinking establishments	N	N	N[2]	Y	A	B	N
59	Other retail trade	N	N[2]	Y[2]	Y	A	B	N
60	**Services**							
61	Finance, insurance, and real estate services	N	N	Y[6]	Y	A	B	N
62	Personal services	N	N	Y[6]	Y	A	B	N
62.4	Cemeteries	N	Y[7]	Y[7]	Y	Y[12]	Y[13]	Y[14,2,1]
63	Business services	N	Y[8]	Y[8]	Y	A	B	N
64	Repair services	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
65	Professional services	N	N	Y[6]	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y[6]	Y	Y	A	B	N
67	Governmental services	N[6]	N	Y[6]	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N[2]	Y[2]	Y	A	B	N
70	**Cultural, entertainment and recreational**							
71	Cultural activities (including churches)	N	N	N[2]	A*	B*	N	N
71.2	Nature exhibits	N	Y[2]	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y[17]	Y[17]	N	N
73	Amusements	N	N	Y[8]	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N Y	Y[8,9,10]	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y[8]	Y[8]	Y*	Y*	N	N
79	Other cultural, entertainment, and recreation	N[9]	Y[9]	Y[9]	Y*	Y*	N	N

Table C-5. Air Force Land Use Compatibility Recommendations (Continued)

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
80	**Resources production and extraction**							
81	Agriculture (except livestock)	Y[16]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
82	Agricultural related activities	N	Y[5]	Y	Y[18]	Y[19]	N	N
83	Forestry activities and related services	N[5]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
84	Fishing activities and related services	N[5]	Y[5]	Y	Y	Y	Y	Y
85	Mining activities and related services	N	Y[5]	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y[5]	Y	Y	Y	Y	Y

[1] Suggested maximum density of 1-2 dwelling units per acre possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.

[2] Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible in any APZ.

[3] The placing of structures, buildings, or above ground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFI 32-7063 and AFI 32-1026 for specific guidance.

[4] No passenger terminals and no major above ground transmission lines in APZ I.

[5] Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.

[6] Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.

[7] Excludes chapels.

[8] Facilities must be low intensity.

[9] Clubhouse not recommended.

[10] Areas for gatherings of people are not recommended.

[11a] Although local conditions may require residential use, it is discouraged in DNL 65-69 dB and strongly discouraged in DNL 70-74 dB. An evaluation should be conducted prior to approvals, indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones, and that there are no viable alternative locations.

[11b] Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 dB and DNL 70-74 dB should be incorporated into building codes and considered in individual approvals.

[11c] NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.

[12] Measures to achieve the same NLR as required for facilities in the DNL 65-69 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where normal noise level is low.

[13] Measures to achieve the same NLR as required for facilities in the DNL 70-74 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

[14] Measures to achieve the same NLR as required for facilities in the DNL 75-79 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

[15] If noise sensitive, use indicated NLR; if not, the use is compatible.

[16] No buildings.

[17] Land use is compatible provided special sound reinforcement systems are installed.

[18] Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.

[19] Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.

[20] Residential buildings are not permitted.

[21] Land use is not recommended. If the community decides the use is necessary, hearing protection devices should be worn by personnel.

Key:

SLUCM = Standard Land Use Coding Manual, U.S. Department of Transportation

Y = Yes; land use and related structures are compatible without restriction.

N = No; land use and related structures are not compatible and should be prohibited.

A, B, or C = Land use and related structures generally compatible; measures to achieve Noise Level Reduction of A (25 dB), B (30 dB), or C (35 dB) should be incorporated into the design and construction of structures.

A*, B*, or C* = Land use generally compatible with Noise Level Reduction. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.

* = The designation of these uses as “compatible” in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

C.3.3 SPEECH INTERFERENCE

Speech interference from noise is a primary cause of annoyance for communities. Disruption of routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.

There are two measures of speech comprehension:

1. *Word Intelligibility* – the percent of words spoken and understood. This might be important for students in the lower grades who are learning the English language, and particularly for students who have English as a Second Language.
2. *Sentence Intelligibility* – the percent of sentences spoken and understood. This might be important for high-school students and adults who are familiar with the language, and who do not necessarily have to understand each word in order to understand sentences.

C.3.3.1 U.S. Federal Criteria for Interior Noise

In 1974, the USEPA identified a goal of an indoor $L_{eq(24)}$ of 45 dB to minimize speech interference based on sentence intelligibility and the presence of steady noise (USEPA 1974). Figure C-8 shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background indoor sound levels of less than 45 dB L_{eq} are expected to allow 100 percent sentence intelligibility.

The curve in Figure C-8 shows 99 percent intelligibility at L_{eq} below 54 dB, and less than 10 percent above 73 dB. Recalling that L_{eq} is dominated by louder noise events, the USEPA $L_{eq(24)}$ goal of 45 dB generally ensures that sentence intelligibility will be high most of the time.

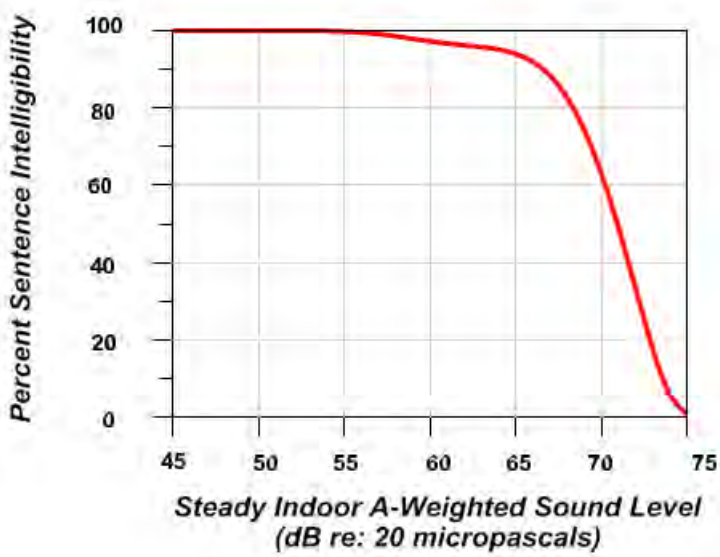


Figure C-8. Speech Intelligibility Curve (digitized from USEPA 1974)

C.3.3.2 Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise has to be below the teacher's voice level. Intermittent noise events that momentarily drown out the teacher's voice need to be kept to a minimum. It is therefore important to evaluate the steady background level, the level of voice communication, and the single-event level due to aircraft overflights that might interfere with speech.

Lazarus (1990) found that for listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., a comparison of the level of the sound to the level of background noise) is in the range of 15 to 18 dB. The initial ANSI classroom noise standard (ANSI 2002) and American Speech-Language-Hearing Association (ASLHA 1995) guidelines concur, recommending at least a 15 dB signal-to-noise ratio in classrooms. If the teacher's voice level is at least 50 dB, the background noise level must not exceed an average of 35 dB. The National Research Council of Canada (Bradley 1993) and WHO (1999) agree with this criterion for background noise.

For eligibility for noise insulation funding, the Federal Aviation Administration (FAA) guidelines state that the design objective for a classroom environment is 45 dB L_{eq} during normal school hours (FAA 1985).

Most aircraft noise is not continuous. It consists of individual events. Since speech interference in the presence of aircraft noise is caused by individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate. In addition to the background level criteria described above, single-event criteria that account for those noisy events are also needed.

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500-2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A-weighted L_{max} of 50 dB for aircraft noise (Wesler 1986).

Lind *et al*. (1998) also concluded that an L_{max} criterion of 50 dB would result in 90 percent word intelligibility. Bradley (1985) recommends SEL as a better indicator. His work indicates that 95 percent word intelligibility would be achieved when indoor SEL did not exceed 60 dB. For typical flyover noise this corresponds to an L_{max} of 50 dB. While WHO (1999) only specifies a background L_{max} criterion, they also note the SIL frequencies and that interference can begin at around 50 dB.

The United Kingdom Department for Education and Skills (UKDfES) established in its classroom acoustics guide a 30-minute time-averaged metric of $L_{eq(30min)}$ for background levels and the metric of $L_{A1,30min}$ for intermittent noises, at thresholds of 30-35 dB and 55 dB, respectively. LA1,30min represents the A-weighted sound level that is exceeded 1 percent of the time (in this case, during a 30-minute teaching session) and is generally equivalent to the L_{max} metric (UKDfES 2003).

Table C-6 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, they are consistent with a limit on indoor background noise of 35-40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table C-6. Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
U.S. FAA (1985)	$L_{eq(during\ school\ hours)}$=45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.
Lind *et al.* (1998), Sharp and Plotkin (1984) Wesler (1986)	L_{max}=50 dB/SIL 45	Single-event level permissible in the classroom.
WHO (1999)	L_{eq}=35 dB L_{max}=50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.
U.S. ANSI (2010)	L_{eq}=35 dB, based on room volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
U.K. DFES (2003)	$L_{eq(30\ min)}$=30-35 dB L_{max}=55 dB	Minimum acceptable in classroom and most other learning environs.

C.3.4 SLEEP DISTURBANCE

Sleep disturbance is a major concern for communities exposed to aircraft noise at night. A number of studies have attempted to quantify the effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies. Emphasis is on studies that have influenced U.S. federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on sleep observations performed under laboratory conditions.
2. Later studies performed in the 1990s up to the present, where the research was focused onfield observations.

C.3.4.1 Initial Studies

The relation between noise and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep and the noise level, but also on the non-acoustic factors cited for annoyance. The easiest effect to measure is the number of arousals or awakenings from noise events. Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

FICON's 1992 review of airport noise issues (FICON 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn 1978; Lukas 1978; Pearsons *et al*. 1989). Because of large variability in the data, FICON did not endorse the reliability of those results.

FICON did recommend, however, an interim dose-response curve, awaiting future research. That curve predicted the percent of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the U.S. Air Force (USAF) (Finegold 1994). The data included most of the research performed up to that point, and predicted a 10 percent probability of awakening when exposed to an interior SEL of 58 dB. The data used to derive this curve were primarily from controlled laboratory studies.

C.3.4.2 Recent Sleep Disturbance Research – Field and Laboratory Studies

It was noted that early sleep laboratory studies did not account for some important factors. These included habituation to the laboratory, previous exposure to noise, and awakenings from noise other than aircraft. In the early 1990s, field studies in people's homes were conducted to validate the earlier laboratory work conducted in the 1960s and 1970s. The field studies of the 1990s

found that 80-90 percent of sleep disturbances were not related to outdoor noise events, but rather to indoor noises and non-noise factors. The results showed that, in real life conditions, there was less of an effect of noise on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies because people who sleep in their own homes are used to their environment and, therefore, do not wake up as easily (FICAN 1997).

C.3.4.3 Federal Interagency Committee on Aviation Noise

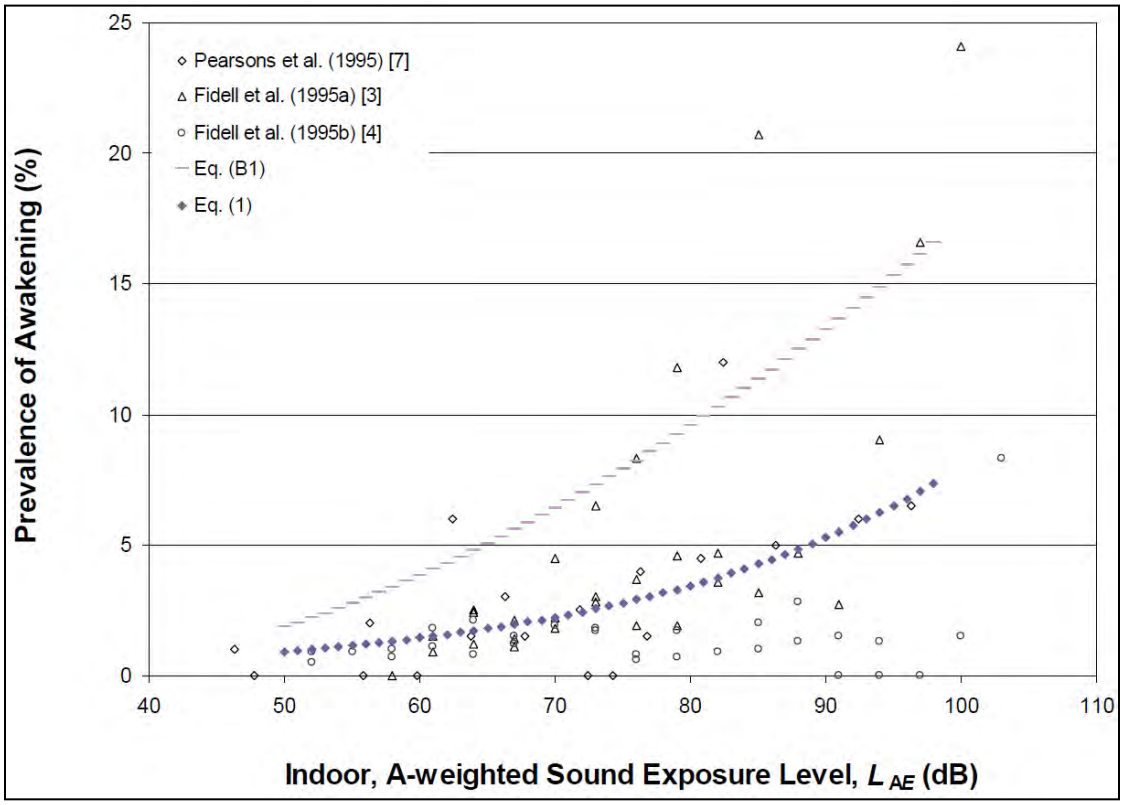
Based on this new information, in 1997 Federal Interagency Committee on Aviation Noise (FICAN) recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN 1997). Figure C-13 shows FICAN's curve, the red dashed line, which is based on the results of three field studies shown in the figure (Ollerhead *et al*. 1992; Fidell *et al*. 1994; Fidell *et al*. 1995a, 1995b), along with the data from six previous field studies.

The 1997 FICAN curve represents the upper envelope of the latest field data. It predicts the maximum percent awakened for a given residential population. According to this curve, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB. An indoor SEL of 58 dB is equivalent to an outdoor SEL of 83 dB, with the windows closed (73 dB with windows open).

C.3.4.4 Number of Events and Awakenings

It is reasonable to expect that sleep disturbance is affected by the number of events. The German Aerospace Center (DLR Laboratory) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner 2004). The DLR study was one of the largest studies to examine the link between aircraft noise and sleep disturbance. It involved both laboratory and in-home field research phases. The DLR investigators developed a dose-response curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

A different approach was taken by an ANSI standards committee (ANSI 2008). The committee used the average of the data shown in Figure C-9 (i.e., the blue dashed line) rather than the upper envelope, to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.



Source: DoD 2009

Figure C-9. Sleep Disturbance Dose-Response Relationships

Currently, there are no established criteria for evaluating sleep disturbance from aircraft noise, although recent studies have suggested a benchmark of an outdoor SEL of 90 dB as an appropriate tentative criterion when comparing the effects of different operational alternatives. The corresponding indoor SEL would be approximately 25 dB lower (at 65 dB) with doors and windows closed, and approximately 15 dB lower (at 75 dB) with doors or windows open. According to the ANSI (2008) standard, the probability of awakening from a single aircraft event at this level is between 1 and 2 percent for people habituated to the noise sleeping in bedrooms with windows closed, and 2-3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at noise levels of 90 dB SEL is shown in Table C-7.

Table C-7. Probability of Awakening from NA90SEL

Number of Aircraft Events at 90 Db SEL for Average 9-Hour Night	Minimum Probability of Awakening at Least Once	
	Windows Closed	Windows Open
1	1%	2%
3	4%	6%
5	7%	10%
9 (1 per hour)	12%	18%
18 (2 per hour)	22%	33%
27 (3 per hour)	32%	45%

Source: DoD 2009.

In December 2008, FICAN recommended the use of this new standard. FICAN also recognized that more research is underway by various organizations, and that work may result in changes to

FICAN's position. Until that time, FICAN recommends the use of the ANSI (2008) standard (FICAN 2008).

C.3.4.5 Summary

Sleep disturbance research still lacks the details to accurately estimate the population awakened for a given noise exposure. The procedure described in the ANSI (2008) Standard and endorsed by FICAN is based on probability calculations that have not yet been scientifically validated. While this procedure certainly provides a much better method for evaluating sleep awakenings from multiple aircraft noise events, the estimated probability of awakenings can only be considered approximate.

C.3.5 NOISE-INDUCED HEARING IMPAIRMENT

Residents in surrounding communities express concerns regarding the effects of aircraft noise on hearing. This section provides a brief overview of hearing loss caused by noise exposure. The goal is to provide a sense of perspective as to how aircraft noise (as experienced on the ground) compares to other activities that are often linked with hearing loss.

C.3.5.1 Hearing Threshold Shifts

Hearing loss is generally interpreted as a decrease in the ear's sensitivity or acuity to perceive sound (i.e., a shift in the hearing threshold to a higher level). This change can either be a Temporary Threshold Shift (TTS) or a Permanent Threshold Shift (PTS) (Berger *et al*. 1995).

TTS can result from exposure to loud noise over a given amount of time. An example of TTS might be a person attending a loud music concert. After the concert is over, there can be a threshold shift that may last several hours. While experiencing TTS, the person becomes less sensitive to low-level sounds, particularly at certain frequencies in the speech range (typically near 4,000 Hz). Normal hearing eventually returns, as long as the person has enough time to recover within a relatively quiet environment.

PTS usually results from repeated exposure to high noise levels, where the ears are not given adequate time to recover. A common example of PTS is the result of regularly working in a loud factory. A TTS can eventually become a PTS over time with repeated exposure to high noise levels. Even if the ear is given time to recover from TTS, repeated occurrence of TTS may eventually lead to permanent hearing loss. The point at which a TTS results in a PTS is difficult to identify and varies with a person's sensitivity.

C.3.5.2 Criteria for Permanent Hearing Loss

It has been well established that continuous exposure to high noise levels will damage human hearing (USEPA 1978). A large amount of data on hearing loss have been collected, largely for workers in manufacturing industries, and analyzed by the scientific/medical community. The Occupational Safety and Health Administration (OSHA) regulation of 1971 places the limit on workplace noise exposure at an average level of 90 dB over an 8-hour work period or 85 dB over a 16-hour period (U.S. Department of Labor 1971). Some hearing loss is still expected at those levels. The most protective criterion, with no measurable hearing loss after 40 years of exposure, is an average sound level of 70 dB over a 24-hour period.

The USEPA established 75 dB $L_{eq(8)}$ and 70 dB $L_{eq(24)}$ as the average noise level standard needed to protect 96 percent of the population from greater than a 5 dB PTS (USEPA 1978). The National Academy of Sciences Committee on Hearing, Bioacoustics, and Biomechanics (CHABA) identified

75 dB as the lowest level at which hearing loss may occur (CHABA 1977). WHO concluded that environmental and leisure-time noise below an $L_{eq(24)}$ value of 70 dB "will not cause hearing loss in the large majority of the population, even after a lifetime of exposure" (WHO 1999).

C.3.5.3 Hearing Loss and Aircraft Noise

The 1982 USEPA Guidelines report (USEPA 1982) addresses noise-induced hearing loss in terms of the "Noise-Induced Permanent Threshold Shift" (NIPTS). This defines the permanent change in hearing caused by exposure to noise. Numerically, the NIPTS is the change in threshold that can be expected from daily exposure to noise over a normal working lifetime of 40 years. A grand average of the NIPTS over time and hearing sensitivity is termed the Average NIPTS, or Ave. NIPTS for short. The Ave. NIPTS that can be expected for noise measured by the $L_{eq(24)}$ metric is given in Table C-8 and assumes exposure to the full outdoor noise throughout the 24 hours. When inside a building, the exposure will be less (Eldred and von Gierke 1993).

Table C-8. Average NIPTS and 10th Percentile NIPTS as a Function of DNL

DNL	Ave. NIPTS dB*	10th Percentile NIPTS dB*
75-76	1.0	4.0
76-77	1.0	4.5
77-78	1.6	5.0
78-79	2.0	5.5
79-80	2.5	6.0
80-81	3.0	7.0
81-82	3.5	8.0
82-83	4.0	9.0
83-84	4.5	10.0
84-85	5.5	11.0
85-86	6.0	12.0
86-87	7.0	13.5
87-88	7.5	15.0
88-89	8.5	16.5
89-90	9.5	18.0

Source: DoD 2012
* = Rounded to the nearest 0.5 dB

The Ave. NIPTS is estimated as an average over all people exposed to the noise. The actual value of NIPTS for any given person will depend on their physical sensitivity to noise – some will experience more hearing loss than others. The USEPA Guidelines provide information on this variation in sensitivity in the form of the NIPTS exceeded by 10 percent of the population, which is included in the Table C-9 in the "10th Percentile NIPTS" column (USEPA 1982). For individuals exposed to $L_{eq(24)}$ of 80 dB, the most sensitive of the population would be expected to show degradation to their hearing of 7 dB over time.

To put these numbers in perspective, changes in hearing level of less than 5 dB are generally not considered noticeable or significant. Furthermore, there is no known evidence that a NIPTS of 5 dB is perceptible or has any practical significance for the individual. Lastly, the variability in audiometric testing is generally assumed to be ±5 dB (USEPA 1974).

The scientific community has concluded that noise exposure from civil airports has little chance of causing permanent hearing loss (Newman and Beattie 1985). For military airbases, DoD policy requires that hearing risk loss be estimated for population exposed to L_{dn} of 80 dB or higher (DoD 2009c), including residents of on-base housing. Exposure of workers inside the base boundary is assessed using DoD regulations for occupational noise exposure.

Noise in low-altitude military airspace, especially along MTRs where L_{max} can exceed 115 dB, is of concern. That is the upper limit used for occupational noise exposure (e.g., U.S. Department of Labor 1971). One laboratory study (Ising *et al*. 1999) concluded that events with L_{max} above 114 dB have the potential to cause hearing loss. Another laboratory study of participants exposed to levels between 115 and 130 dB (Nixon *et al*. 1993), however, showed conflicting results. For an exposure to four events across that range, half the subjects showed no change in hearing, a quarter showed a temporary 5 dB decrease in sensitivity, and a quarter showed a temporary 5 dB increase in sensitivity. For exposure to eight events of 130 dB, subjects showed an increase in sensitivity of up to 10 dB (Nixon *et al*. 1993).

C.3.5.4 Summary

Aviation noise levels are not comparable to the occupational noise levels associated with hearing loss of workers in manufacturing industries. There is little chance of hearing loss at levels less than 75 dB DNL. Noise levels equal to or greater than 75 dB DNL can occur near military airbases, and DoD policy specifies that NIPTS be evaluated when exposure exceeds 80 dB L_{dn} (DoD 2009c). There is some concern about L_{max} exceeding 115 dB in low altitude military airspace, but no research results to date have definitely related permanent hearing impairment to aviation noise.

C.3.6 NON-AUDITORY HEALTH EFFECTS

Studies have been performed to see whether noise can cause health effects other than hearing loss. The premise is that annoyance causes stress. Prolonged stress is known to be a contributor to a number of health disorders. Cantrell (1974) confirmed that noise can provoke stress, but noted that results on cardiovascular health have been contradictory. Some studies have found a connection between aircraft noise and blood pressure (e.g., Michalak *et al*. 1990; Rosenlund *et al*. 2001), while others have not (e.g., Pulles *et al*. 1990).

Kryter and Poza (1980) noted, “It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body.”

The connection from annoyance to stress to health issues requires careful experimental design. Some highly publicized reports on health effects have, in fact, been rooted in poorly done science. Meecham and Shaw (1979) apparently found a relation between noise levels and mortality rates in neighborhoods under the approach path to Los Angeles International Airport. When the same data were analyzed by others (Frerichs *et al.* 1980) no relationship was found. Jones and Tauscher (1978) found a high rate of birth defects for the same neighborhood. But when the Centers For Disease Control performed a more thorough study near Atlanta’s Hartsfield International Airport, no relationships were found for levels above 65 dB (Edmonds *et al.* 1979).

A carefully designed study, Hypertension and Exposure to Noise near Airports (HYENA), was conducted around six European airports from 2002 through 2006 (Jarup *et al.* 2005, 2008). There were 4,861 subjects, aged between 45 and 70. Blood pressure was measured, and questionnaires administered for health, socioeconomic and lifestyle factors, including diet and physical exercise. Hypertension was defined by WHO blood pressure thresholds (WHO 2003). Noise from aircraft and highways was predicted from models.

HYENA results were presented as an odds ratio (OR). An OR of 1 means there is no added risk, while an OR of 2 would mean risk doubles. An OR of 1.14 was found for nighttime aircraft noise,

measured by L_{night}, the L_{eq} for nighttime hours. For daytime aircraft noise, measured by $L_{eq(16)}$, the OR was 0.93. For road traffic noise, measured by the full day $L_{eq(24)}$, the OR was 1.1.

Note that OR is a statistical measure of change, not the actual risk. Risk itself and the measured effects were small, and not necessarily distinct from other events. Haralabidis *et al*. (2008) reported an increase in systolic blood pressure of 6.2 millimeters of mercury (mmHg) for aircraft noise, and an increase of 7.4 mmHg for other indoor noises such as snoring.

It is interesting that aircraft noise was a factor only at night, while traffic noise is a factor for the full day. Aircraft noise results varied among the six countries so that result is pooled across all data. Traffic noise results were consistent across the six countries.

One interesting conclusion from a 2013 study of the HYENA data (Babisch *et al*. 2013) states there is some indication that noise level is a stronger predictor of hypertension than annoyance. That is not consistent with the idea that annoyance is a link in the connection between noise and stress. Babisch *et al*. (2012) present interesting insights on the relationship of the results to various modifiers.

Two recent studies examined the correlation of aircraft noise with hospital admissions for cardiovascular disease. Hansell *et al*. (2013) examined neighborhoods around London's Heathrow airport. Correia *et al*. (2013) examined neighborhoods around 89 airports in the United States. Both studies included areas of various noise levels. They found associations that were consistent with the HYENA results. The authors of these studies noted that further research is needed to refine the associations and the causal interpretation with noise or possible alternative explanations.

C.3.6.1 Summary

The current state of scientific knowledge cannot yet support inference of a causal or consistent relationship between aircraft noise exposure and non-auditory health consequences for exposed residents. The large scale HYENA study, and the recent studies by Hansell *et al.* (2013) and Correia *et al.* (2013) offer indications, but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

C.3.7 PERFORMANCE EFFECTS

The effect of noise on the performance of activities or tasks has been the subject of many studies. Some of these studies have found links between continuous high noise levels and performance loss.

Noise-induced performance losses are most frequently reported in studies where noise levels are above 85 dB. Little change has been found in low-noise cases. Moderate noise levels appear to act as a stressor for more sensitive individuals performing a difficult psychomotor task.

While the results of research on the general effect of periodic aircraft noise on performance have yet to yield definitive criteria, several general trends have been noted including:

- A periodic intermittent noise is more likely to disrupt performance than a steady-state continuous noise of the same level. Flyover noise, due to its intermittent nature, might be more likely to disrupt performance than a steady-state noise of equal level.
- Noise is more inclined to affect the quality than the quantity of work.
- Noise is more likely to impair the performance of tasks that place extreme demands on workers.

C.3.8 NOISE EFFECTS ON CHILDREN

Recent studies on school children indicate a potential link between aircraft noise and both reading comprehension and learning motivation. The effects may be small but may be of particular concern for children who are already scholastically challenged.

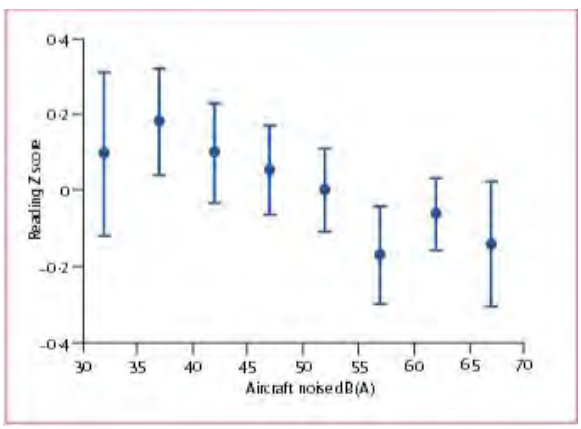
C.3.8.1 Effects on Learning and Cognitive Abilities

Early studies in several countries (Cohen *et al*. 1973, 1980, 1981; Bronzaft and McCarthy 1975; Green *et al*. 1982; Evans *et al*. 1998; Haines *et al*. 2002; Lercher *et al*. 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies noise exposed children were less likely to solve difficult puzzles or more likely to give up.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld *et al*. 2005; Clark *et al*. 2005) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects, and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better performance in high road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Stansfeld *et al*. 2005; Clark *et al*. 2006).

Figure C-10 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at L_{eq} greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.



Sources: Stansfeld *et al*. 2005; Clark *et al.* 2006

Figure C-10. RANCH Study Reading Scores Varying with L_{eq}

An observation of the RANCH study was that children may be exposed to aircraft noise for many of their childhood years and the consequences of long-term noise exposure were unknown. A follow-up study of the children in the RANCH project is being analyzed to examine the long-term effects on children's reading comprehension (Clark *et al*. 2009). Preliminary analysis indicated a trend for reading comprehension to be poorer at 15-16 years of age for children who attended noise-exposed primary schools. There was also a trend for reading comprehension to be

poorer in aircraft noise exposed secondary schools. Further analysis adjusting for confounding factors is ongoing, and is needed to confirm these initial conclusions.

FICAN funded a pilot study to assess the relationship between aircraft noise reduction and standardized test scores (Eagan *et al*. 2004; FICAN 2007). The study evaluated whether abrupt aircraft noise reduction within classrooms, from either airport closure or sound insulation, was associated with improvements in test scores. Data were collected in 35 public schools near three airports in Illinois and Texas. The study used several noise metrics. These were, however, all computed indoor levels, which makes it hard to compare with the outdoor levels used in most other studies.

The FICAN study found a significant association between noise reduction and a decrease in failure rates for high school students, but not middle or elementary school students. There were some weaker associations between noise reduction and an increase in failure rates for middle and elementary schools. Overall the study found that the associations observed were similar for children with or without learning difficulties, and between verbal and math/science tests. As a pilot study, it was not expected to obtain final answers, but provided useful indications (FICAN 2007).

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO 2000; WHO 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI 2002).

C.3.8.2 Health Effects

A number of studies, including some of the cognitive studies discussed above, have examined the potential for effects on children's health. Health effects include annoyance, psychological health, coronary risk, stress hormones, sleep disturbance and hearing loss.

Annoyance. Chronic noise exposure causes annoyance in children (Bronzaft and McCarthy 1975; Evans *et al.* 1995). Annoyance among children tends to be higher than for adults, and there is little habituation (Haines *et al.* 2001a). The RANCH study found annoyance may play a role in how noise affects reading comprehension (Clark *et al.* 2005).

Psychological Health. Lercher *et al.* (2002) found an association between noise and teacher ratings of psychological health, but only for children with biological risk defined by low birth weight and/or premature birth. Haines *et al.* (2001b) found that children exposed to aircraft noise had higher levels of psychological distress and hyperactivity. Stansfeld *et al.* (2009) replicated the hyperactivity result, but not distress.

As with studies of adults, the evidence suggests that chronic noise exposure is probably not associated with serious psychological illness, but there may be effects on well-being and quality of life. Further research is needed, particularly on whether hyperactive children are more susceptible to stressors such as aircraft noise.

Coronary Risk. The HYENA study discussed earlier indicated a possible relation between noiseand hypertension in older adults. Cohen *et al.* (1980, 1981) found some increase in blood pressure among school children, but within the normal range and not indicating hypertension. Hygge *et al.* (2002) found mixed effects. The RANCH study found some effect for children at home and at night, but not at school. Overall the evidence for noise effects on children's blood pressure is mixed, and less certain than for older adults.

Stress Hormones. Some studies investigated hormonal levels between groups of children exposed to aircraft noise compared to those in a control group. Two studies analyzed cortisol and urinary catecholamine levels in school children as measurements of stress response to aircraft noise (Haines *et al.* 2001a, 2001b). In both instances, there were no differences between the aircraft-noise-exposed children and the control groups.

Sleep Disturbance. A sub-study of RANCH in a Swedish sample used sleep logs and the monitoring of rest/activity cycles to compare the effect of road traffic noise on child and parent sleep (Ohrstrom *et al.* 2006). An exposure-response relationship was found for sleep quality and daytime sleepiness for children. While this suggests effects of noise on children's sleep disturbance, it is difficult to generalize from one study.

Hearing loss. A few studies have examined hearing loss from exposure to aircraft noise. Noise-induced hearing loss for children who attended a school located under a flight path near a Taiwan airport was greater than for children at another school far away (Chen *et al.* 1997). Another study reported that hearing ability was reduced significantly in individuals who lived near an airport and were frequently exposed to aircraft noise (Chen and Chen 1993). In that study, noise exposure near the airport was greater than 75 dB DNL and L_{max} were about 87 dB during overflights. Conversely, several other studies reported no difference in hearing ability between children exposed to high levels of airport noise and children located in quieter areas (Andrus *et al.* 1975; Fisch 1977; Wu *et al.* 1995). It is not clear from those results whether children are at higher risk than adults, but the levels involved are higher than those desirable for learning and quality of life.

Ludlow and Sixsmith (1999) conducted a cross-sectional pilot study to examine the hypothesis that military jet noise exposure early in life is associated with raised hearing thresholds. The authors concluded that there were no significant differences in audiometric test results between military personnel who as children had lived in or near stations where fast jet operations were based, and a similar group who had no such exposure as children.

C.3.9 PROPERTY VALUES

Noise can affect the value of homes. Economic studies of property values based on selling prices and noise have been conducted to find a direct relation.

The value-noise relation is usually presented as the Noise Depreciation Index (NDI) or Noise Sensitivity Depreciation Index (NSDI), the percent loss of value per dB (measured by the DNL metric). An early study by Nelson (1978) at three airports found an NDI of 1.8-2.3 percent per dB. Nelson also noted a decline in NDI over time which he theorized could be due to either a change in population or the increase in commercial value of the property near airports. Crowley (1978) reached a similar conclusion. A larger study by Nelson (1980) looking at 18 airports found an NDI from 0.5 to 0.6 percent per dB.

In a review of property value studies, Newman and Beattie (1985) found a range of NDI from 0.2 to 2 percent per dB. They noted that many factors other than noise affected values.

Fidell *et al.* (1996) studied the influence of aircraft noise on actual sale prices of residential properties in the vicinity of a military base in Virginia and one in Arizona. They found no meaningful effect on home values. Their results may have been due to non-noise factors, especially the wide differences in homes between the two study areas.

Recent studies of noise effects on property values have recognized the need to account for non-noise factors. Nelson (2004) analyzed data from 33 airports, and discussed the need to account for those

factors and the need for careful statistics. His analysis showed NDI from 0.3 to 1.5 percent per dB, with an average of about 0.65 percent per dB. Nelson (2007) and Andersson et al. (2013) discuss statistical modeling in more detail.

Enough data is available to conclude that aircraft noise has a real effect on property values. This effect falls in the range of 0.2 to 2.0 percent per dB, with the average on the order of 0.5 percent per dB. The actual value varies from location to location, and is very often small compared to non-noise factors.

C.3.10 NOISE-INDUCED VIBRATION EFFECTS ON STRUCTURES AND HUMANS

High noise levels can cause buildings to vibrate. If high enough, building components can be damaged. The most sensitive components of a building are the windows, followed by plaster walls and ceilings. Possibility of damage depends on the peak sound pressures and the resonances of the building. In general, damage is possible only for sounds lasting more than one second above an unweighted sound level of 130 dB (CHABA 1977). That is higher than expected from normal aircraft operations. Even low altitude flyovers of heavy aircraft do not reach the potential for damage (Sutherland 1990a).

Noise-induced structural vibration may cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle", of objects within the dwelling – hanging pictures, dishes, plaques, and bric-a-brac. Loose window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, rattling occurs at peak unweighted sound levels that last for several seconds at levels above 110 dB, which is well above that considered normally compatible with residential land use Thus, assessments of noise exposure levels for compatible land use will also be protective of noise-induced rattle.

The sound from an aircraft overflight travels from the exterior to the interior of the house in one of two ways: through the solid structural elements and directly through the air. Sound transmission through walls starts with noise impinging on the wall exterior. Some of this sound energy will be reflected away and some will make the wall vibrate. The vibrating wall radiates sound into the airspace, which in turn sets the interior finish surface vibrating, with some energy lost in the airspace. This surface then radiates sound into the dwelling interior. Vibrational energy also bypasses the air cavity by traveling through the studs and edge connections.

Normally, the most sensitive components of a structure to airborne noise are the windows, followed by plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at unweighted sound levels above 130 dB, there is the possibility of structural damage. While certain frequencies (such as 30 Hertz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a unweighted sound level of 130 dB are potentially damaging to structural components (von Gierke and Ward 1991).

In the assessment of vibration on humans, the following factors determine if a person will perceive and possibly react to building vibrations:

1. Type of excitation: steady state, intermittent, or impulsive vibration.

2. Frequency of the excitation. International Organization for Standardization (ISO) standard 2631-2 (ISO 1989) recommends a frequency range of 1 to 80 Hz for the assessment of vibration on humans.
3. Orientation of the body with respect to the vibration.
4. The use of the occupied space (i.e., residential, workshop, hospital).
5. Time of day.

Table C-9 lists the whole-body vibration criteria from ISO 2631-2 for one-third octave frequency bands from 1 to 80 Hz.

Table C-9. Vibration Criteria for the Evaluation of Human Exposure to Whole-Body Vibration

(Hz)	RMS Acceleration (m/s/s)		
	Combined Criteria Base Curve	Residential Night	Residential Day
1.00	0.0036	0.0050	0.0072
1.25	0.0036	0.0050	0.0072
1.60	0.0036	0.0050	0.0072
2.00	0.0036	0.0050	0.0072
2.50	0.0037	0.0052	0.0074
3.15	0.0039	0.0054	0.0077
4.00	0.0041	0.0057	0.0081
5.00	0.0043	0.0060	0.0086
6.30	0.0046	0.0064	0.0092
8.00	0.0050	0.0070	0.0100
10.00	0.0063	0.0088	0.0126
12.50	0.0078	0.0109	0.0156
16.00	0.0100	0.0140	0.0200
20.00	0.0125	0.0175	0.0250
25.00	0.0156	0.0218	0.0312
31.50	0.0197	0.0276	0.0394
40.00	0.0250	0.0350	0.0500
50.00	0.0313	0.0438	0.0626
63.00	0.0394	0.0552	0.0788
80.00	0.0500	0.0700	0.1000

Source: ISO 1989.

C.3.11 NOISE EFFECTS ON TERRAIN

It has been suggested that noise levels associated with low-flying aircraft may affect the terrain under the flight path by disturbing fragile soil or snow, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such events. It is improbable that such effects would result from routine subsonic aircraft operations.

C.3.12 NOISE EFFECTS ON HISTORICAL AND ARCHAEOLOGICAL SITES

Historical buildings and sites can have elements that are more fragile than conventional structures. Aircraft noise may affect such sites more severely than newer, modern structures. In older structures, seemingly insignificant surface cracks caused by vibrations from aircraft noise may lead to greater damage from natural forces (Hanson *et al*. 1991). There are few scientific studies of such effects to provide guidance for their assessment.

For example, one study involved measurements of noise and vibration in a restored plantation house, originally built in 1795. It is located 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. The aircraft measured was the Concorde. There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning (Wesler 1977).

As for conventional structures, noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites. Unique sites should, of course, be analyzed for specific exposure.

C.3.13 EFFECTS ON DOMESTIC ANIMALS AND WILDLIFE

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, has not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci *et al.* (1988), assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intra-inter specific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft have on animals.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system, and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci *et al*. 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights.

Secondary effects may include non-auditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects, and

include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects, and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith *et al*. 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci *et al*. 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith *et al*. 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci *et al*. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci *et al.* (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

C.3.13.1 Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci *et al.* 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

C.3.13.1.1 *Cattle*

In response to concerns about overflight effects on pregnant cattle, milk production, and cattle safety, the USAF prepared a handbook for environmental protection that summarized the literature on the impacts of low-altitude flights on livestock (and poultry) and includes specific case studies conducted in numerous airspaces across the country. Adverse effects have been found in a few studies but have not been reproduced in other similar studies. One such study,

conducted in 1983, suggested that 2 of 10 cows in late pregnancy aborted after showing rising estrogen and falling progesterone levels. These increased hormonal levels were reported as being linked to 59 aircraft overflights. The remaining eight cows showed no changes in their blood concentrations and calved normally. A similar study reported abortions occurred in three out of five pregnant cattle after exposing them to flyovers by six different aircraft. Another study suggested that feedlot cattle could stampede and injure themselves when exposed to low-level overflights (USAF 1994a).

A majority of the studies reviewed suggests that there is little or no effect of aircraft noise on cattle. Studies presenting adverse effects to domestic animals have been limited. A number of studies (Parker and Bayley 1960; Casady and Lehmann 1967; Kovalcik and Sottnik 1971) investigated the effects of jet aircraft noise on the milk production of dairy cows. Through the compilation and examination of milk production data from areas exposed to jet aircraft noise, it was determined that milk yields were not affected. This was particularly evident in those cows that had been previously exposed to jet aircraft noise.

A study examined the causes of 1,763 abortions in Wisconsin dairy cattle over a 1-year time period and none were associated with aircraft disturbances (USAF 1993). In 1987, researchers contacted seven livestock operators for production data, and no effects of low-altitude flights were noted. Of the 43 cattle previously exposed to low-altitude flights, 3 showed a startle response to an F/A-18 aircraft flying overhead at 500 feet above ground level (AGL) and 400 knots by running less than 10 meters (m). They resumed normal activity within 1 minute (USAF 1994a). Beyer (1983) found that helicopters caused more reaction than other low-aircraft overflights, and that the helicopters at 30-60 feet overhead did not affect milk production and pregnancies of 44 cows in a 1964 study (USAF 1994a).

Additionally, Beyer (1983) reported that five pregnant dairy cows in a pasture did not exhibit fright flight tendencies or disturb their pregnancies after being overflown by 79 low-altitude helicopter flights and 4 low-altitude, subsonic jet aircraft flights. A 1956 study found that the reactions of dairy and beef cattle to noise from low-altitude, subsonic aircraft were similar to those caused by paper blowing about, strange persons, or other moving objects (USAF 1994a).

In a report to Congress, the U. S. Forest Service concluded that "evidence both from field studies of wild ungulates and laboratory studies of domestic stock indicate that the risks of damage are small (from aircraft approaches of 50-100 m), as animals take care not to damage themselves (U.S. Forest Service 1992). If animals are overflown by aircraft at altitudes of 50-100 m, there is no evidence that mothers and young are separated, that animals collide with obstructions (unless confined) or that they traverse dangerous ground at too high a rate." These varied study results suggest that, although the confining of cattle could magnify animal response to aircraft overflight, there is no proven cause-and-effect link between startling cattle from aircraft overflights and abortion rates or lower milk production.

C.3.13.1.2 *Horses*

Horses have also been observed to react to overflights of jet aircraft. Several of the studies reviewed reported a varied response of horses to low-altitude aircraft overflights. Observations made in 1966 and 1968 noted that horses galloped in response to jet flyovers (USAF 1993). Bowles (1995) cites Kruger and Erath as observing horses exhibiting intensive flight reactions, random movements, and biting/kicking behavior. However, no injuries or abortions occurred, and there was evidence that the mares adapted somewhat to the flyovers over the course of a month (USAF 1994a). Although horses were observed noticing the overflights, it did not appear

to affect either survivability or reproductive success. There was also some indication that habituation to these types of disturbances was occurring.

LeBlanc *et al.* (1991) studied the effects of F-14 jet aircraft noise on pregnant mares. They specifically focused on any changes in pregnancy success, behavior, cardiac function, hormonal production, and rate of habituation. Their findings reported observations of "flight-fright" reactions, which caused increases in heart rates and serum cortisol concentrations. The mares, however, did habituate to the noise. Levels of anxiety and mass body movements were the highest after initial exposure, with intensities of responses decreasing thereafter. There were no differences in pregnancy success when compared to a control group.

C.3.13.1.3 *Swine*

Generally, the literature findings for swine appear to be similar to those reported for cows and horses.

While there are some effects from aircraft noise reported in the literature, these effects are minor. Studies of continuous noise exposure (i.e., 6 hours, 72 hours of constant exposure) reported influences on short-term hormonal production and release. Additional constant exposure studies indicated the observation of stress reactions, hypertension, and electrolyte imbalances (Dufour 1980). A study by Bond *et al.* (1963), demonstrated no adverse effects on the feeding efficiency, weight gain, ear physiology, or thyroid and adrenal gland condition of pigs subjected to observed aircraft noise. Observations of heart rate increase were recorded; noting that cessation of the noise resulted in the return to normal heart rates. Conception rates and offspring survivorship did not appear to be influenced by exposure to aircraft noise.

Similarly, simulated aircraft noise at levels of 100-135 dB had only minor effects on the rate of feed utilization, weight gain, food intake, or reproduction rates of boars and sows exposed, and there were no injuries or inner ear changes observed (Gladwin *et al.* 1988; Manci *et al.* 1988).

C.3.13.1.4 *Domestic Fowl*

According to a 1994 position paper by the USAF on effects of low-altitude overflights (below 1,000 feet) on domestic fowl, overflight activity has negligible effects (USAF 1994b). The paper did recognize that given certain circumstances, adverse effects can be serious. Some of the effects can be panic reactions, reduced productivity, and effects on marketability (e.g., bruising of the meat caused during "pile-up" situations).

The typical reaction of domestic fowl after exposure to sudden, intense noise is a short-term startle response. The reaction ceases as soon as the stimulus is ended, and within a few minutes all activity returns to normal. More severe responses are possible depending on the number of birds, the frequency of exposure, and environmental conditions. Large crowds of birds, and birds not previously exposed, are more likely to pile up in response to a noise stimulus (USAF 1994b). According to studies and interviews with growers, it is typically the previously unexposed birds that incite panic crowding, and the tendency to do so is markedly reduced within five exposures to the stimulus (USAF 1994b). This suggests that the birds habituate relatively quickly. Egg productivity was not adversely affected by infrequent noise bursts, even at exposure levels as high as 120-130 dB.

Between 1956 and 1988, there were 100 recorded claims against the Navy for alleged damage to domestic fowl. The number of claims averaged three per year, with peak numbers of claims following publications of studies on the topic in the early 1960s. Many of the claims were disproved or did not have sufficient supporting evidence. The claims were filed for the following

alleged damages: 55 percent for panic reactions, 31 percent for decreased production, 6 percent for reduced hatchability, 6 percent for weight loss, and less than 1 percent for reduced fertility (USAF 1994b).

C.3.13.2 Wildlife

Studies on the effects of overflights on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock. This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci *et al.* 1988).

C.3.13.3 Mammals

C.3.13.3.1 Terrestrial Mammals

Studies of terrestrial mammals have shown that noise levels of 120 dB can damage mammals' ears, and levels at 95 dB can cause temporary loss of hearing acuity. Noise from aircraft has affected other large carnivores by causing changes in home ranges, foraging patterns, and breeding behavior. One study recommended that aircraft not be allowed to fly at altitudes below 2,000 feet AGL over important grizzly and polar bear habitat. Wolves have been frightened by low-altitude flights that were 25-1,000 feet AGL. However, wolves have been found to adapt to aircraft overflights and noise as long as they were not being hunted from aircraft (Dufour 1980).

Wild ungulates (American bison, caribou, bighorn sheep) appear to be much more sensitive to noise disturbance than domestic livestock (Weisenberger et al. 1996). Behavioral reactions may be related to the past history of disturbances by such things as humans and aircraft. Common reactions of reindeer kept in an enclosure exposed to aircraft noise disturbance were a slight startle response, rising of the head, pricking ears, and scenting of the air. Panic reactions and extensive changes in behavior of individual animals were not observed. Observations of caribou in Alaska exposed to fixed-wing aircraft and helicopters showed running and panic reactions occurred when overflights were at an altitude of 200 feet or less. The reactions decreased with increased altitude of overflights, and, with more than 500 feet in altitude, the panic reactions stopped. Also, smaller groups reacted less strongly than larger groups. One negative effect of the running and avoidance behavior is increased expenditure of energy. For a 90-kilogram animal, the calculated expenditure due to aircraft harassment is 64 kilocalories per minute when running and 20 kilocalories per minute when walking. When conditions are favorable, this expenditure can be counteracted with increased feeding; however, during harsh winter conditions, this may not be possible. Incidental observations of wolves and bears exposed to fixed-wing aircraft and helicopters in the northern regions suggested that wolves are less disturbed than wild ungulates, while grizzly bears showed the greatest response of any animal species observed (Weisenberger et al. 1996).

It has been proven that low-altitude overflights do induce stress in animals. Increased heart rates, an indicator of excitement or stress, have been found in pronghorn antelope, elk, and bighorn sheep. As such reactions occur naturally as a response to predation, infrequent overflights may not, in and of themselves, be detrimental. However, flights at high frequencies over a long period of time may cause harmful effects. The consequences of this disturbance, while cumulative,

are not additive. It may be that aircraft disturbance may not cause obvious and serious health effects, but coupled with a harsh winter, it may have an adverse impact. Research has shown that stress induced by other types of disturbances produces long-term decreases in metabolism and hormone balances in wild ungulates.

Behavioral responses can range from mild to severe. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate disturbance may be nervous behaviors, such as trotting a short distance. Escape is the typical severe response.

C.3.13.3.2 Marine Mammals

Many marine mammals, including beluga whales, use sound rather than sight for many important functions (e.g., communication, location of prey, and navigation). The effects of human-caused noise on beluga whales and associated increased background noises may be similar to reduced visibilities when humans are confronted with heavy fog or darkness. These effects depend on several factors including the intensity, frequency, and duration of the noise, the location and behavior of the whale, and the nature of the acoustic environment. High frequency noise diminishes more rapidly than low frequency noises. Sound also dissipates more rapidly in shallow waters and over soft bottoms (sand and mud). Beluga whales in the Beaufort Sea have been observed to dive or swim away when low-flying (less than 500 meters) aircraft passed directly over them Richardson et al. (1995). Visual cues, including the sight of the aircraft or its shadow, have been hypothesized to contribute to the reaction of belugas to low-level overflight by survey aircraft. However, beluga survey aircraft flying at approximately 244 meters in Cook Inlet observed little or no change in beluga swim directions (Rugh et al. 2005). This is likely because belugas in Cook Inlet have habituated to routine small aircraft overflights. Belugas may be less sensitive to aircraft noise than vessel noise, but individual responses may be highly variable and may depend on previous experiences, beluga activity at the time of the noise, and characteristics of the noise. A large portion of the acoustic energy generated by an aircraft overflight is reflected from the air-water interface during transmission of sound from air to water. For an overhead sound source such as an aircraft much of the sound at angles greater than 13 degrees from the vertical is reflected and does not penetrate the water (Richardson et al. 1995).

C.3.13.4 Birds

Auditory research conducted on birds indicates that they fall between the reptiles and the mammals relative to hearing sensitivity. According to Dooling (1978), within the range of 1,000 to 5,000 Hz, birds show a level of hearing sensitivity similar to that of the more sensitive mammals. In contrast to mammals, bird sensitivity falls off at a greater rate to increasing and decreasing frequencies. Passive observations and studies examining aircraft bird strikes indicate that birds nest and forage near airports. Aircraft noise in the vicinity of commercial airports apparently does not inhibit bird presence and use.

High-noise events (like a low-altitude aircraft overflight) may cause birds to engage in escape or avoidance behaviors, such as flushing from perches or nests (Ellis *et al*. 1991). These activities impose an energy cost on the birds that, over the long term, may affect survival or growth. In addition, the birds may spend less time engaged in necessary activities like feeding, preening, or caring for their young because they spend time in noise-avoidance activity. However, the long-term significance of noise-related impacts is less clear. Several studies on nesting raptors have indicated that birds become habituated to aircraft overflights and that long-term reproductive success is not affected (Ellis *et al*. 1991; Grubb and King 1991). Threshold noise levels for

significant responses range from 62 dB for Pacific black brant to 85 dB for crested tern (Brown 1990; Ward and Stehn 1990).

Manci *et al*. (1988), reported a reduction in reproductive success in some small territorial passerines (i.e., perching birds or songbirds) after exposure to low-altitude overflights. However, it has been observed that passerines are not driven any great distance from a favored food source by a nonspecific disturbance, such as aircraft overflights (USFS 1992). Further study may be warranted.

A cooperative study between the DoD and the U.S. Fish and Wildlife Service (USFWS), assessed the response of the red-cockaded woodpecker to a range of military training noise events, including artillery, small arms, helicopter, and maneuver noise (Pater *et al.* 1999). The project findings show that the red-cockaded woodpecker successfully acclimates to military noise events. Depending on the noise level that ranged from innocuous to very loud, the birds responded by flushing from their nest cavities. When the noise source was closer and the noise level was higher, the number of flushes increased proportionately. In all cases, however, the birds returned to their nests within a relatively short period of time (usually within 12 minutes). Additionally, the noise exposure did not result in any mortality or statistically detectable changes in reproductive success (Pater *et al.* 1999). Red-cockaded woodpeckers did not flush when artillery simulators were more than 122 m away and SELs were 70 dB.

C.3.13.4.1 Raptors

In a literature review of raptor responses to aircraft noise, Manci *et al*. (1988) found that most raptors did not show a negative response to overflights. When negative responses were observed they were predominantly associated with rotor-winged aircraft or jet aircraft that were repeatedly passing within 0.5 mile of a nest.

Ellis *et al*. (1991), performed a study to estimate the effects of low-level military jet aircraft on nesting peregrine falcons and seven other raptors (common black-hawk, Harris' hawk, zone-tailed hawk, red-tailed hawk, golden eagle, prairie falcon, bald eagle). They observed responses to test stimuli, determined nest success for the year of the testing, and evaluated site occupancy the following year. Both long- and short-term effects were noted in the study. The results reported the successful fledging of young in 34 of 38 nest sites (all eight species) subjected to low-level flight. Twenty-two of the test sites were revisited in the following year, and observations of pairs or lone birds were made at all but one nest. Nesting attempts were underway at 19 of 20 sites that were observed long enough to be certain of breeding activity. Re-occupancy and productivity rates were within or above expected values for self-sustaining populations.

Short-term behavior responses were also noted. Overflights at a distance of 150 m or less produced few significant responses and no severe responses. Typical responses consisted of crouching or very rarely, flushing from the perch site. Significant responses were most evident before egg laying and after young were "well grown." Incubating or brooding adults never burst from the nest, thus preventing egg breaking or knocking chicks out of the nest. Jet passes often caused noticeable alarm; however, significant negative responses were rare and did not appear to limit productivity or re-occupancy. Due to the locations of some of the nests, some birds may have been habituated to aircraft noise. There were some test sites located at distances far from zones of frequent military aircraft usage, and the test stimuli were often closer, louder, and more frequent than would be likely for a normal training situation (Ellis *et al.* 1991).

Manci *et al.* (1988) noted that a female northern harrier was observed hunting on a bombing range in Mississippi during bombing exercises. The harrier was apparently unfazed by the exercises, even when a bomb exploded within 200 feet. In a similar case of habituation/non-disturbance, a study on the Florida snail-kite stated the greatest reaction to overflights (approximately 98 dB) was "watching the aircraft fly by." No detrimental impacts to distribution, breeding success, or behavior were noted.

Bald Eagle. A study by Grubb and King (1991) on the reactions of the bald eagle to human disturbances showed that terrestrial disturbances elicited the greatest response, followed by aquatic (i.e., boats) and aerial disturbances. The disturbance regime of the area where the study occurred was predominantly characterized by aircraft noise. The study found that pedestrians consistently caused responses that were greater in both frequency and duration. Helicopters elicited the highest level of aircraft-related responses. Aircraft disturbances, although the most common form of disturbance, resulted in the lowest levels of response. This low response level may have been due to habituation; however, flights less than 170 m away caused reactions similar to other disturbance types. Ellis *et al.* (1991) showed that eagles typically respond to the proximity of a disturbance, such as a pedestrian or aircraft within 100 m, rather than the noise level. Fleischner and Weisberg (1986) stated that reactions of bald eagles to commercial jet flights, although minor (e.g., looking), were twice as likely to occur when the jets passed at a distance of 0.5 mile or less. They also noted that helicopters were four times more likely to cause a reaction than a commercial jet and 20 times more likely to cause a reaction than a propeller plane.

The USFWS advised Cannon AFB that flights at or below 2,000 feet AGL from 1 October through 1 March could result in adverse impacts to wintering bald eagles (USFWS 1998). However, Fraser et al. (1985) suggested that raptors habituate to overflights rapidly, sometimes tolerating aircraft approaches of 65 feet or less.

Golden Eagle. In their guidelines for aerial surveys, USFWS (Pagel *et al.* 2010) summarized paststudies by stating that most golden eagles respond to survey aircraft (fixed- and rotary-wing) by remaining on their nests, and continuing to incubate or roost. Surveys take place generally as close as 10 to 20 meters from cliffs (including hovering less than 30 seconds if necessary to count eggs) and no farther than 200 meters from cliffs depending on safety (Pagel *et al.* 2010).

Grubb *et al*. (2007) experimented with multiple exposure to two helicopter types and concluded that flights with a variety of approach distances (800, 400, 200, and 100 meters) had no effect on golden eagle nesting success or productivity rates within the same year or on rates of renewed nesting activity the following year when compared to the corresponding figures for the larger population of non-manipulated nest sites (Grubb *et al*. 2007). They found no significant, detrimental, or disruptive responses in 303 helicopter passes near eagles. In 227 AH-64 Apache helicopter experimental passes (considered twice as loud as a civilian helicopter also tested) at test distances of 0–800 meters from nesting golden eagles, 96 percent resulted in no more response than watching the helicopter pass. No greater reactions occurred until after hatching when individual golden eagles exhibited five flatten and three fly behaviors at three nest sites. The flight responses occurred at approach distances of 200 meters or less. No evidence was found of an effect on subsequent nesting activity or success, despite many of the helicopter flights occurring during early courtship and nest repair. None of these responding pairs failed to successfully fledge young, except for one nest that fell later in the season. Excited, startled, avoidance reactions were never observed. Non-attending eagles or those perched away from the nests were more likely to fly than attending eagles, but also with less potential consequence

to nesting success (Grubb *et al.* 2007). Golden eagles appeared to become less responsive with successive exposures. Much of helicopter sound energy may be at a lower frequency than golden eagles can hear, thus reducing expected impacts. Grubb *et al.* (2007) found no relationship between helicopter sound levels and corresponding eagle ambient behaviors or limited responses, which occurred throughout recorded test levels (76.7–108.8 dB, unweighted). The authors thought that the lower than expected behavioral responses may be partially due to the fact that the golden eagles in the area appear acclimated to the current high levels of outdoor recreational, including aviation, activities. Based on the results of this study, the authors recommended reduction of existing buffers around nest sites to 100 meters (325 feet) for helicopter activity.

Richardson and Miller (1997) reviewed buffers as protection for raptors against disturbance from ground-based human activities. No consideration of aircraft activity was included. They stressed a clear line of sight as an important factor in a raptor's response to a particular disturbance, with visual screening allowing a closer approach of humans without disturbing a raptor. A GIS-assisted viewshed approach combined with a designated buffer zone distance was found to be an effective tool for reducing potential disturbance to golden eagles from ground-based activities (Richardson and Miller 1997). They summarized recommendations that included a median 0.5-mile (800-meter) buffer (range = 200-1,600 m, n = 3) to reduce human disturbances (from ground-based activities such as rock climbing, shooting, vehicular activity) around active golden eagle nests from February 1 to August 1 based on an extensive review of other studies (Richardson and Miller 1997). Physical characteristics (i.e., screening by topography or vegetation) are important variables to consider when establishing buffer zones based on raptors' visual- and auditory-detection distances (Richardson and Miller 1997).

Osprey. A study by Trimper *et al.* (1998), in Goose Bay, Labrador, Canada, focused on the reactions of nesting osprey to military overflights by CF-18 Hornets. Reactions varied from increased alertness and focused observation of planes to adjustments in incubation posture. No overt reactions (e.g., startle response, rapid nest departure) were observed as a result of an overflight. Young nestlings crouched as a result of any disturbance until 1 to 2 weeks prior to fledging. Helicopters, human presence, float planes, and other ospreys elicited the strongest reactions from nesting ospreys. These responses included flushing, agitation, and aggressive displays. Adult osprey showed high nest occupancy rates during incubation regardless of external influences. The osprey observed occasionally stared in the direction of the flight before it was audible to the observers. The birds may have been habituated to the noise of the flights; however, overflights were strictly controlled during the experimental period. Strong reactions to float planes and helicopter may have been due to the slower flight and therefore longer duration of visual stimuli rather than noise-related stimuli.

Red-tailed Hawk. Anderson *et al.* (1989), conducted a study that investigated the effects of low-level helicopter overflights on 35 red-tailed hawk nests. Some of the nests had not been flown over prior to the study. The hawks that were naïve (i.e., not previously exposed) to helicopter flights exhibited stronger avoidance behavior (9 of 17 birds flushed from their nests) than those that had experienced prior overflights. The overflights did not appear to affect nesting success in either study group. These findings were consistent with the belief that red-tailed hawks habituate to low-level air traffic, even during the nesting period.

C.3.13.4.2 Upland Game Birds

Greater Sage-grouse. The greater sage-grouse was recently designated as a candidate species for protection under the Endangered Species Act after many years of scrutiny and research

(USFWS 2010). This species is a widespread and characteristic species of the sagebrush ecosystems in the Intermountain West. Greater sage-grouse, like most bird species, rely on auditory signals as part of mating. Sage-grouse are known to select their leks based on acoustic properties and depend on auditory communication for mating behavior (Braun 2006).

Booth *et al.* (2009) found, while attempting to count sage-grouse at leks (breeding grounds) using light sport aircraft at 150 meters (492 feet) to 200 meters (650 feet) AGL, that sage-grouse flushed from leks on 12 of 14 approaches when the airplane was within 656 to 984 feet (200–300 meters) of the lek. In the other two instances, male grouse stopped exhibiting breeding behavior and crouched but stayed on the lek. The time to resumption of normal behavior after disturbance was not provided in this study. Strutting ceased around the time when observers on the ground heard the aircraft. The light sport aircraft could be safely operated at very low speed (68 kilometers per hour or 37 nautical miles per hour) and was powered by either a two-stroke or a four-stroke engine. It is unclear how the response to the slow-flying light sport aircraft used in the study would compare to overflight by military jets, operating at speeds 10 to 12 times as great as the aircraft used in the study. It is possible that response of the birds was related to the slow speed of the light sport aircraft causing it to resemble an aerial predator.

Other studies have found disturbance from energy operations and other nearby development have adversely affected breeding behavior of greater sage-grouse (Holloran 2005; Doherty 2008; Walker *et al*. 2007; Harju *et al*. 2010). These studies do not specifically address overflight and do not isolate noise disturbance from other types (e.g., visual, human presence) nor do they generally provide noise levels or qualification of the noise source (e.g., continuous or intermittent, frequency, duration).

C.3.13.4.3 Migratory Waterfowl

Fleming *et al.* (1996) conducted a study of caged American black ducks found that noise had negligible energetic and physiologic effects on adult waterfowl. Measurements included body weight, behavior, heart rate, and enzymatic activity. Experiments also showed that adult ducks exposed to high noise events acclimated rapidly and showed no effects.

The study also investigated the reproductive success of captive ducks, which indicated that duckling growth and survival rates at Piney Island, North Carolina, were lower than those at a background location. In contrast, observations of several other reproductive indices (i.e., pair formation, nesting, egg production, and hatching success) showed no difference between Piney Island and the background location. Potential effects on wild duck populations may vary, as wild ducks at Piney Island have presumably acclimated to aircraft overflights. It was not demonstrated that noise was the cause of adverse impacts. A variety of other factors, such as weather conditions, drinking water and food availability and variability, disease, and natural variability in reproduction, could explain the observed effects. Fleming noted that drinking water conditions (particularly at Piney Island) deteriorated during the study, which could have affected the growth of young ducks. Further research would be necessary to determine the cause of any reproductive effects (Fleming *et al.* 1996).

Another study by Conomy *et al*. (1998) exposed previously unexposed ducks to 71 noise events per day that equaled or exceeded 80 dB. It was determined that the proportion of time black ducks reacted to aircraft activity and noise decreased from 38 percent to 6 percent in 17 days and remained stable at 5.8 percent thereafter. In the same study, the wood duck did not appear to habituate to aircraft disturbance. This supports the notion that animal response to aircraft noise

is species-specific. Because a startle response to aircraft noise can result in flushing from nests, migrants and animals living in areas with high concentrations of predators would be the most vulnerable to experiencing effects of lowered birth rates and recruitment over time. Species that are subjected to infrequent overflights do not appear to habituate to overflight disturbance as readily.

Black brant studied in the Alaska Peninsula were exposed to jets and propeller aircraft, helicopters, gunshots, people, boats, and various raptors. Jets accounted for 65 percent of all the disturbances. Humans, eagles, and boats caused a greater percentage of brant to take flight. There was markedly greater reaction to Bell-206-B helicopter flights than fixed wing, single-engine aircraft (Ward *et al.* 1986).

The presence of humans and low-flying helicopters in the Mackenzie Valley North Slope area did not appear to affect the population density of Lapland longspurs, but the experimental group was shown to have reduced hatching and fledging success and higher nest abandonment. Human presence appeared to have a greater impact on the incubating behavior of the black brant, common eider, and Arctic tern than fixed-wing aircraft (Gunn and Livingston 1974).

Gunn and Livingston (1974) found that waterfowl and seabirds in the Mackenzie Valley and North Slope of Alaska and Canada became acclimated to float plane disturbance over the course of three days. Additionally, it was observed that potential predators (bald eagle) caused a number of birds to leave their nests. Non-breeding birds were observed to be more reactive than breeding birds. Waterfowl were affected by helicopter flights, while snow geese were disturbed by Cessna 185 flights. The geese flushed when the planes were less than 1,000 feet, compared to higher flight elevations. An overall reduction in flock sizes was observed. It was recommended that aircraft flights be reduced in the vicinity of pre-migratory staging areas.

Manci *et al*. 1988, reported that waterfowl were particularly disturbed by aircraft noise. The most sensitive appeared to be snow geese. Canada geese and snow geese were thought to be more sensitive than other animals such as turkey vultures, coyotes, and raptors (Edwards *et al.* 1979).

C.3.13.4.4 Wading and Shorebirds

Black *et al*. (1984), studied the effects of low-altitude (less than 500 feet AGL) military training flights with sound levels from 55 to 100 dB on wading bird colonies (i.e., great egret, snowy egret, tricolored heron, and little blue heron). The training flights involved three or four aircraft, which occurred once or twice per day. This study concluded that the reproductive activity—including nest success, nestling survival, and nestling chronology—was independent of F-16 overflights. Dependent variables were more strongly related to ecological factors, including location and physical characteristics of the colony and climatology.

Another study on the effects of circling fixed-wing aircraft and helicopter overflights on wading bird colonies found that at altitudes of 195 to 390 feet, there was no reaction in nearly 75 percent of the 220 observations. Approximately 90 percent displayed no reaction or merely looked toward the direction of the noise source. Another 6 percent stood up, 3 percent walked from the nest, and 2 percent flushed (but were without active nests) and returned within 5 minutes (Kushlan 1978). Apparently, non-nesting wading birds had a slightly higher incidence of reacting to overflights than nesting birds. Seagulls observed roosting near a colony of wading birds in another study remained at their roosts when subsonic aircraft flew overhead (Burger 1981). Colony distribution appeared to be most directly correlated to available wetland community types and was found to be distributed randomly with respect to military training

routes. These results suggest that wading bird species presence was most closely linked to habitat availability and that they were not affected by low-level military overflights (USAF 2000).

Burger (1986) studied the response of migrating shorebirds to human disturbance and found that shorebirds did not fly in response to aircraft overflights, but did flush in response to more localized intrusions (i.e., humans and dogs on the beach). Burger (1981) studied the effects of noise from JFK Airport in New York on herring gulls that nested less than 1 kilometer from the airport. Noise levels over the nesting colony were 85-100 dB on approach and 94-105 dB on takeoff. Generally, there did not appear to be any prominent adverse effects of subsonic aircraft on nesting, although some birds flushed when the Concorde flew overhead and, when they returned, engaged in aggressive behavior. Groups of gulls tended to loaf in the area of the nesting colony, and these birds remained at the roost when the Concorde flew overhead. In addition, laboratory tests of exposure of eggs to impulsive noises (Cottereau 1972; Cogger and Zegarra 1980; Bowles *et al.* 1991, 1994) failed to show adverse effects on hatching of eggs.

Burger (1981) observed no effects of subsonic aircraft on herring gulls in the vicinity of JFK International Airport. The Concorde aircraft did cause more nesting gulls to leave their nests (especially in areas of higher density of nests), causing the breakage of eggs and the scavenging of eggs by intruder prey. Clutch sizes were observed to be smaller in areas of higher-density nesting (presumably due to the greater tendency for panic flight) than in areas where there were fewer nests.

C.3.13.5 Fish and Amphibians

The effects of overflight noise on fish and amphibians have not been well studied, but conclusions regarding their expected responses have involved speculation based upon known physiologies and behavioral traits of these taxa (Gladwin et al. 1988). Although fish do startle in response to low- flying aircraft noise, and probably to the shadows of aircraft, they have been found to habituate to the sound and overflights. Amphibians that respond to low frequencies and those that respond to ground vibration, such as spadefoot toads, may be affected by noise.

C.3.13.6 Summary

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects. The relationships between physiological effects and how species interact with their environments have not been thoroughly studied. Therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle

response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

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ATTACHMENT C-1 REPRESENTATIVE FLIGHT PROFILES

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C-1.1 REPRESENTATIVE FLIGHT PROFILES FOR GRISSOM ARB

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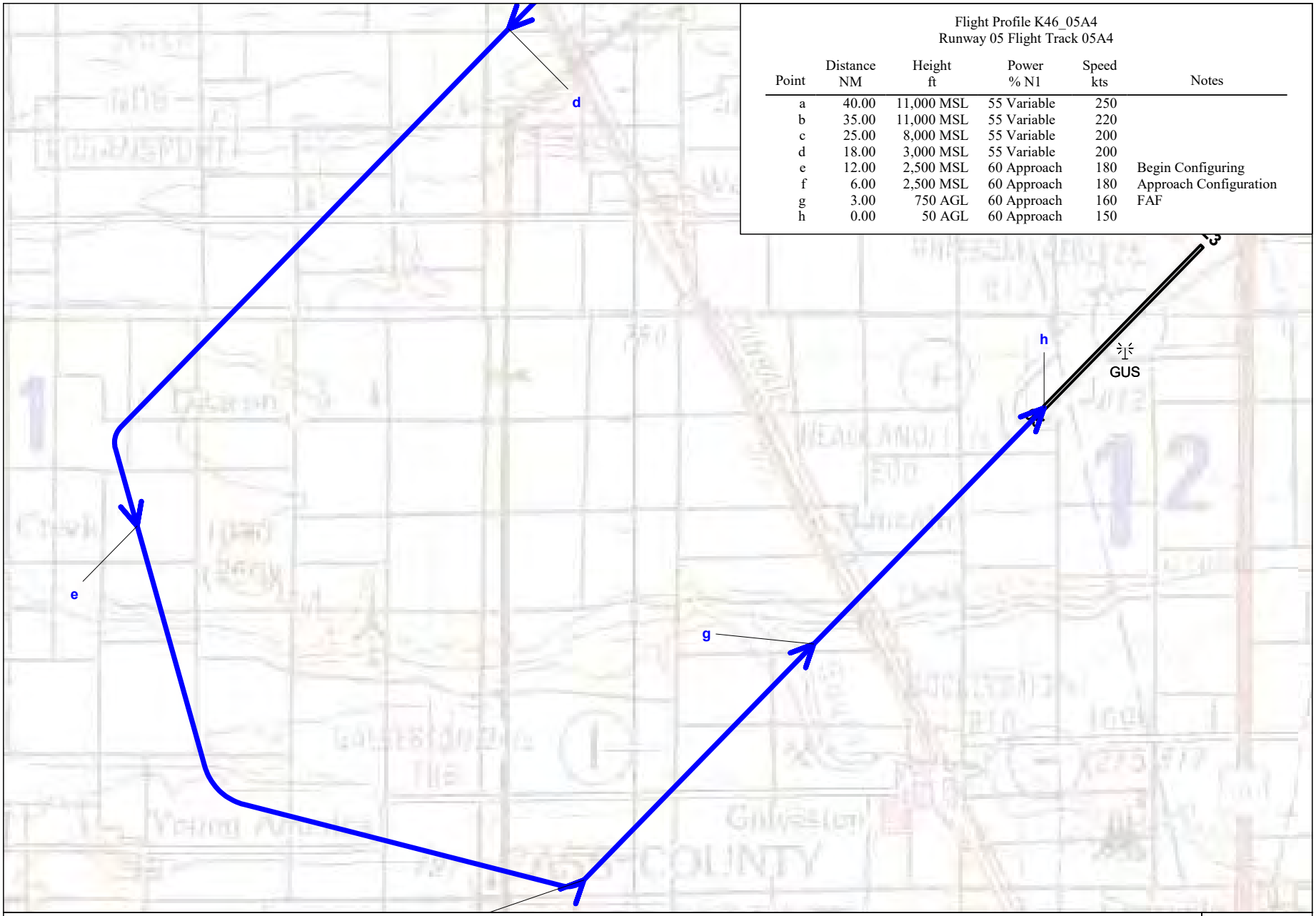
Flight Profile K46_05A4
Runway 05 Flight Track 05A4

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	40.00	11,000 MSL	55 Variable	250	
b	35.00	11,000 MSL	55 Variable	220	
c	25.00	8,000 MSL	55 Variable	200	
d	18.00	3,000 MSL	55 Variable	200	
e	12.00	2,500 MSL	60 Approach	180	Begin Configuring
f	6.00	2,500 MSL	60 Approach	180	Approach Configuration
g	3.00	750 AGL	60 Approach	160	FAF
h	0.00	50 AGL	60 Approach	150	

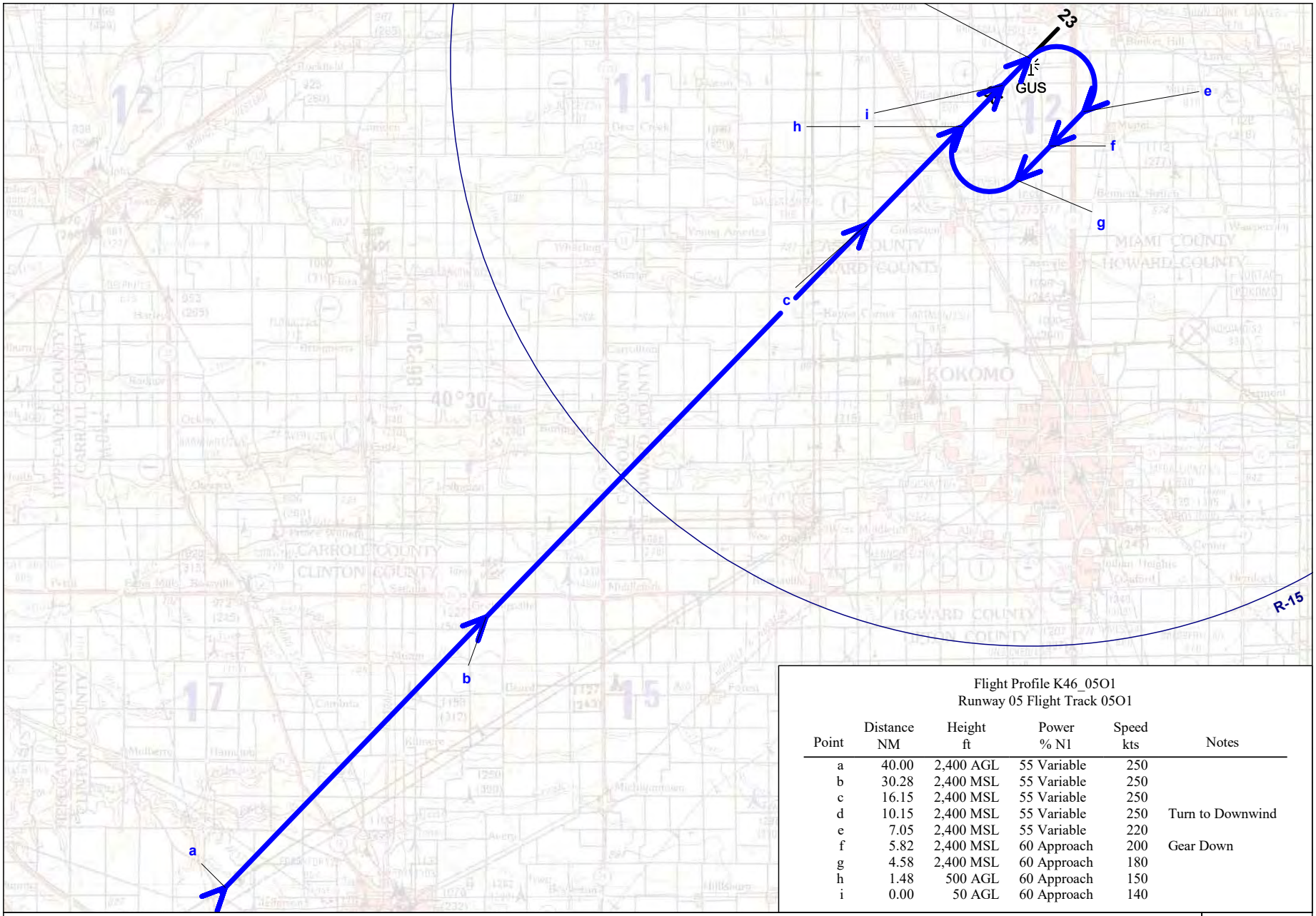


Flight Profile K46_05A4

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:84,700 (1 inch = 7,050 feet)

N



Flight Profile K46_05O1
Runway 05 Flight Track 05O1

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	40.00	2,400 AGL	55 Variable	250	
b	30.28	2,400 MSL	55 Variable	250	
c	16.15	2,400 MSL	55 Variable	250	
d	10.15	2,400 MSL	55 Variable	250	Turn to Downwind
e	7.05	2,400 MSL	55 Variable	220	
f	5.82	2,400 MSL	60 Approach	200	Gear Down
g	4.58	2,400 MSL	60 Approach	180	
h	1.48	500 AGL	60 Approach	150	
i	0.00	50 AGL	60 Approach	140	

Flight Profile K46_05O1

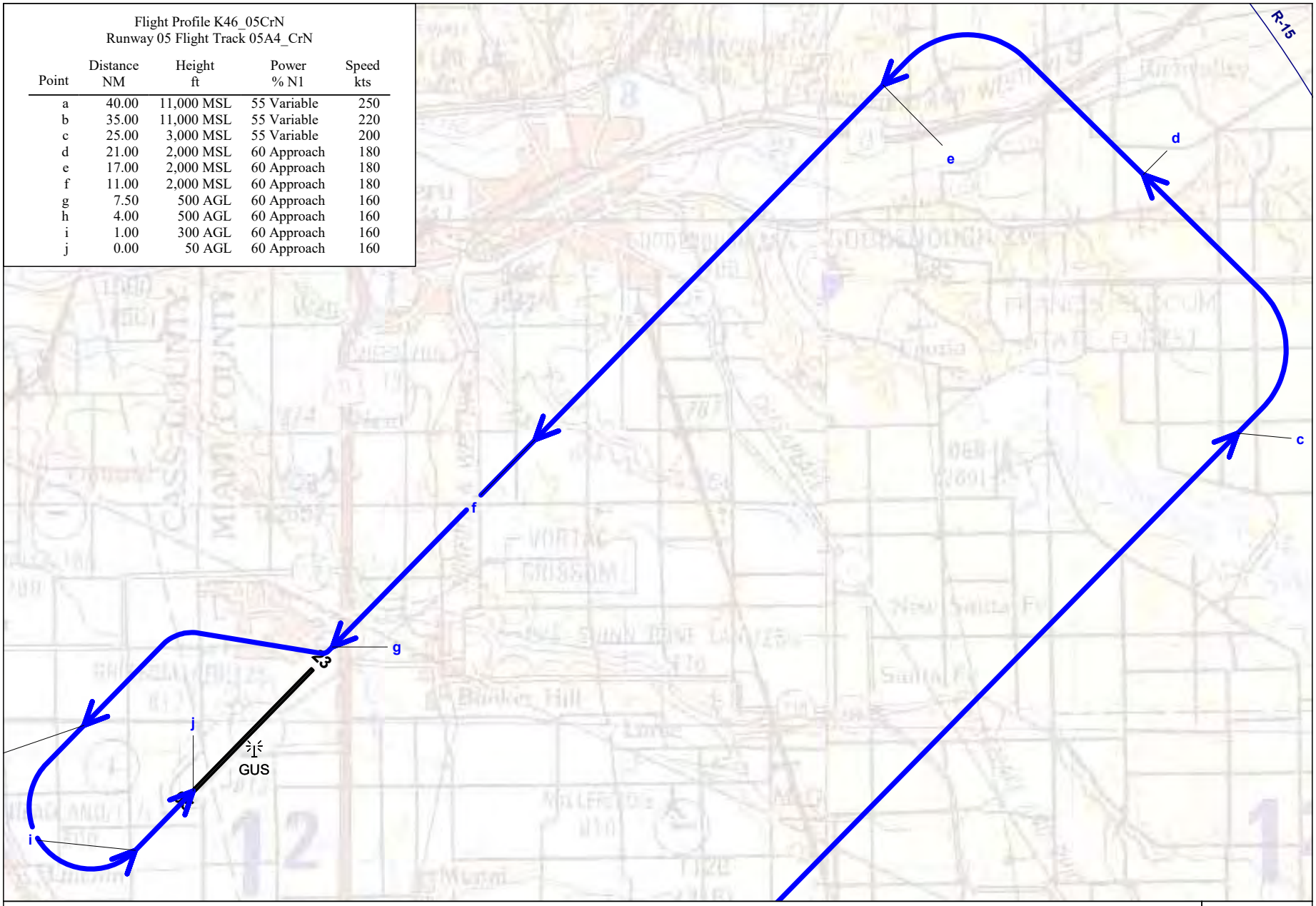
0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000

Scale in Feet 1:240,000 (1 inch = 20,000 feet)

N

Flight Profile K46_05CrN
Runway 05 Flight Track 05A4_CrN

Point	Distance NM	Height ft	Power % N1	Speed kts
a	40.00	11,000 MSL	55 Variable	250
b	35.00	11,000 MSL	55 Variable	220
c	25.00	3,000 MSL	55 Variable	200
d	21.00	2,000 MSL	60 Approach	180
e	17.00	2,000 MSL	60 Approach	180
f	11.00	2,000 MSL	60 Approach	180
g	7.50	500 AGL	60 Approach	160
h	4.00	500 AGL	60 Approach	160
i	1.00	300 AGL	60 Approach	160
j	0.00	50 AGL	60 Approach	160

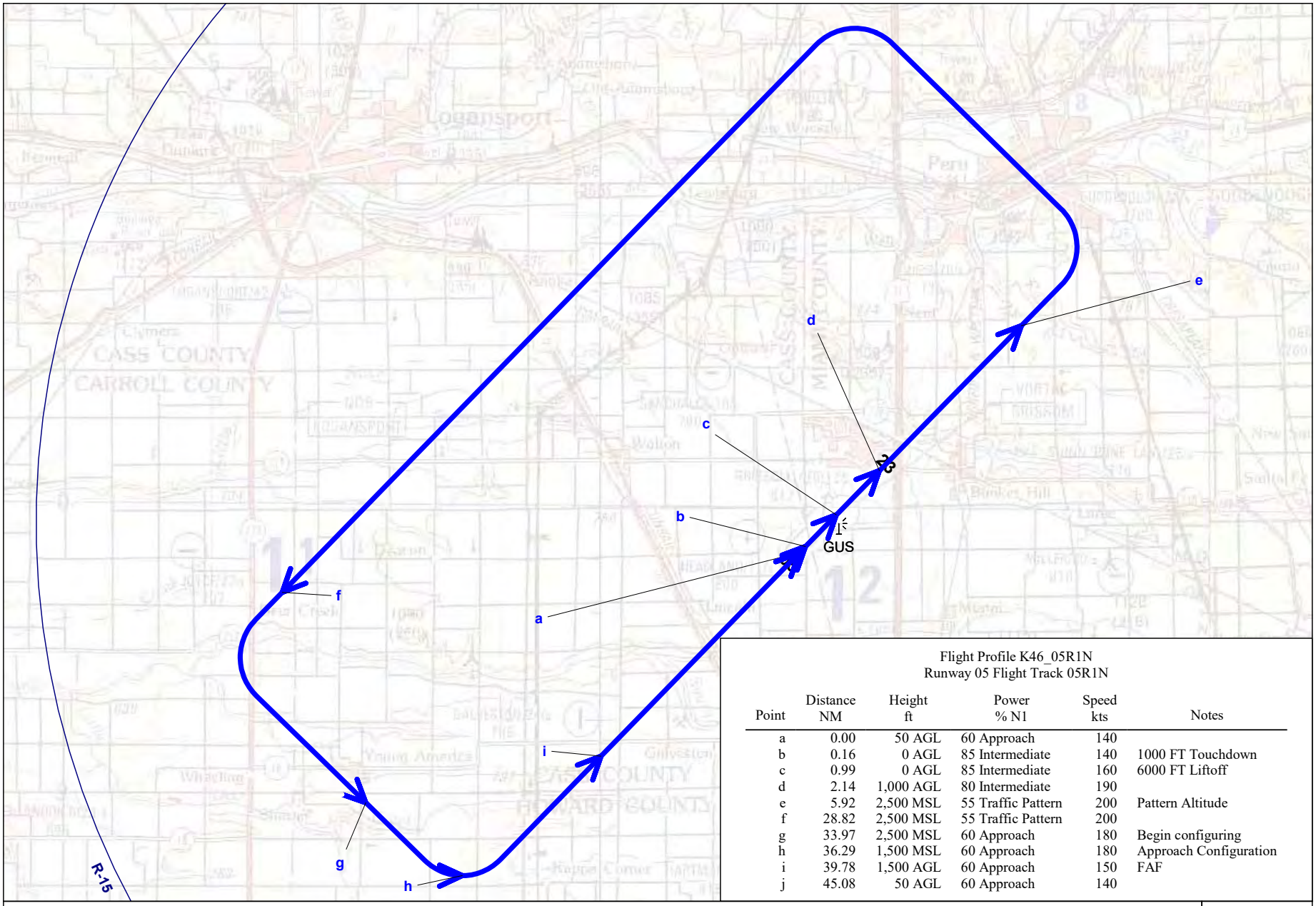


Flight Profile K46_05CrN
Circle

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:112,000 (1 inch = 9,370 feet)

N



Flight Profile K46_05R1N
Runway 05 Flight Track 05R1N

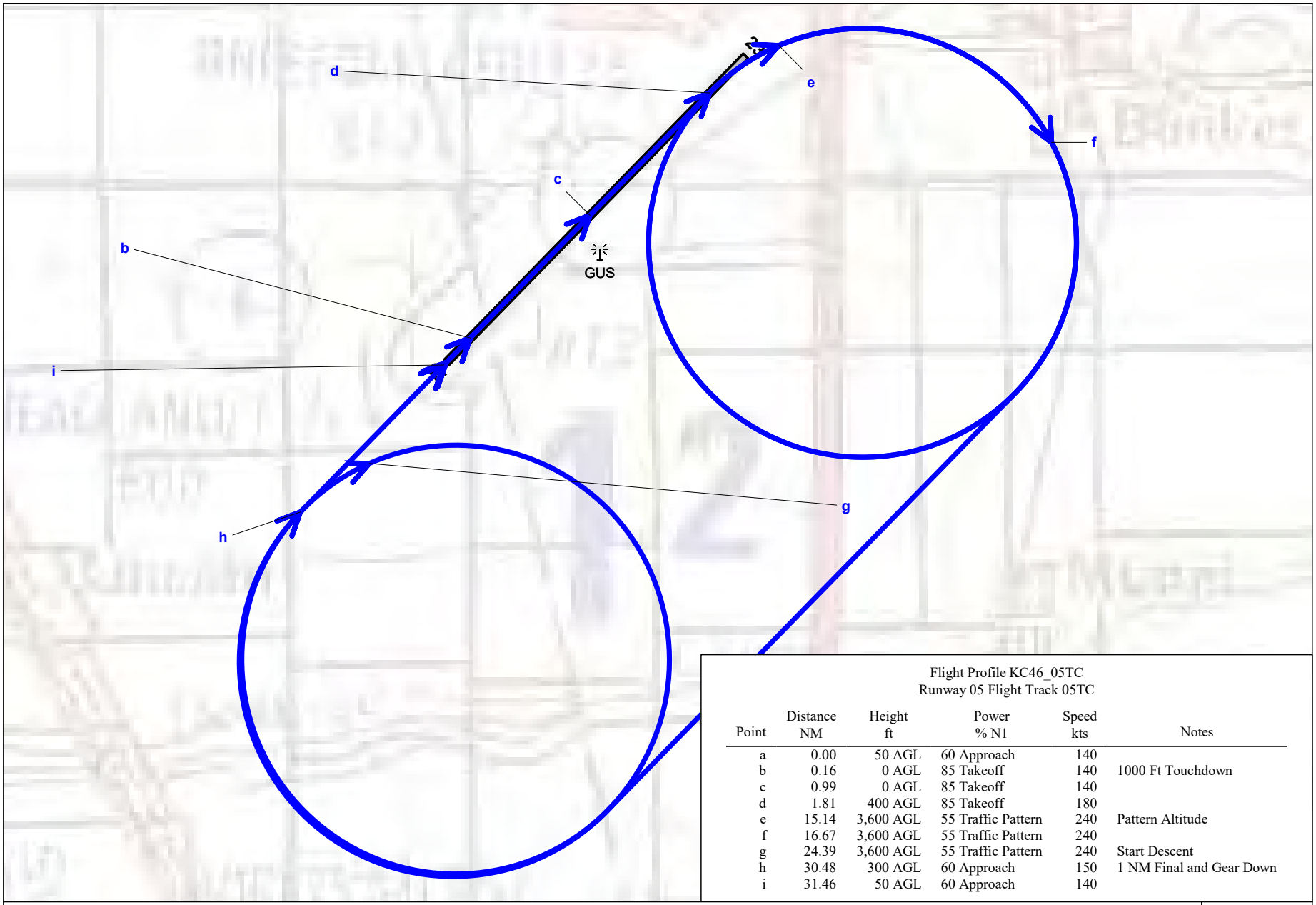
Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.16	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	0.99	0 AGL	85 Intermediate	160	6000 FT Liftoff
d	2.14	1,000 AGL	80 Intermediate	190	
e	5.92	2,500 MSL	55 Traffic Pattern	200	Pattern Altitude
f	28.82	2,500 MSL	55 Traffic Pattern	200	
g	33.97	2,500 MSL	60 Approach	180	Begin configuring
h	36.29	1,500 MSL	60 Approach	180	Approach Configuration
i	39.78	1,500 AGL	60 Approach	150	FAF
j	45.08	50 AGL	60 Approach	140	

Flight Profile K46_05R1N
RADAR - PRECISION North

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:174,000 (1 inch = 14,500 feet)

N



Flight Profile KC46_05TC
Runway 05 Flight Track 05TC

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.16	0 AGL	85 Takeoff	140	1000 Ft Touchdown
c	0.99	0 AGL	85 Takeoff	140	
d	1.81	400 AGL	85 Takeoff	180	
e	15.14	3,600 AGL	55 Traffic Pattern	240	Pattern Altitude
f	16.67	3,600 AGL	55 Traffic Pattern	240	
g	24.39	3,600 AGL	55 Traffic Pattern	240	Start Descent
h	30.48	300 AGL	60 Approach	150	1 NM Final and Gear Down
i	31.46	50 AGL	60 Approach	140	

Flight Profile KC46_05TC
TAC SPIRALUP-----SPIRAL DOWN

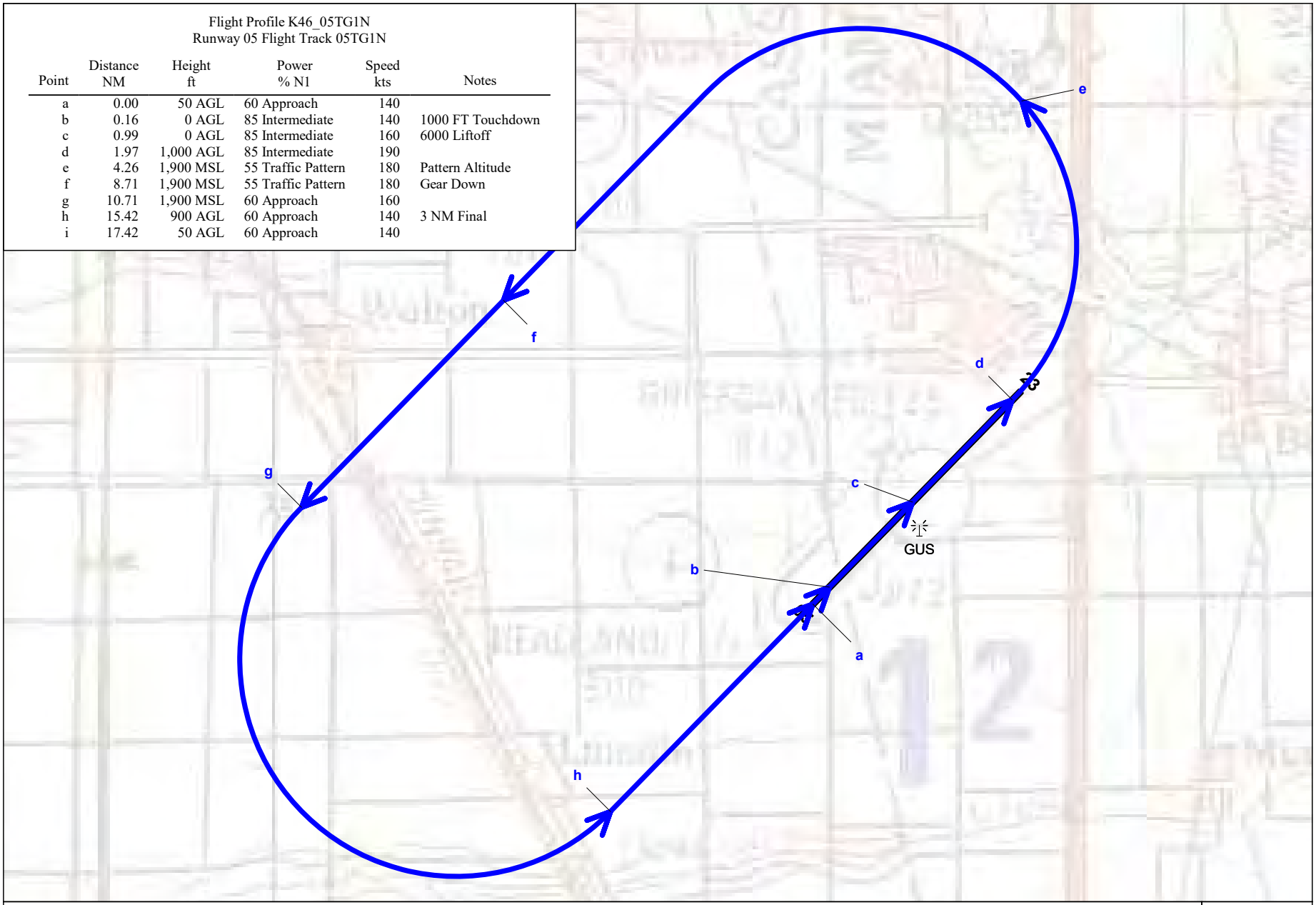
0 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Scale in Feet 1:44,700 (1 inch = 3,720 feet)

N

Flight Profile K46_05TG1N
Runway 05 Flight Track 05TG1N

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.16	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	0.99	0 AGL	85 Intermediate	160	6000 Liftoff
d	1.97	1,000 AGL	85 Intermediate	190	
e	4.26	1,900 MSL	55 Traffic Pattern	180	Pattern Altitude
f	8.71	1,900 MSL	55 Traffic Pattern	180	Gear Down
g	10.71	1,900 MSL	60 Approach	160	
h	15.42	900 AGL	60 Approach	140	3 NM Final
i	17.42	50 AGL	60 Approach	140	



Flight Profile K46_05TG1N
VISUAL CLOSED PATTERN North

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:64,400 (1 inch = 5,370 feet)

N

C-1.2 REPRESENTATIVE FLIGHT PROFILES FOR SEYMOUR JOHNSON AFB

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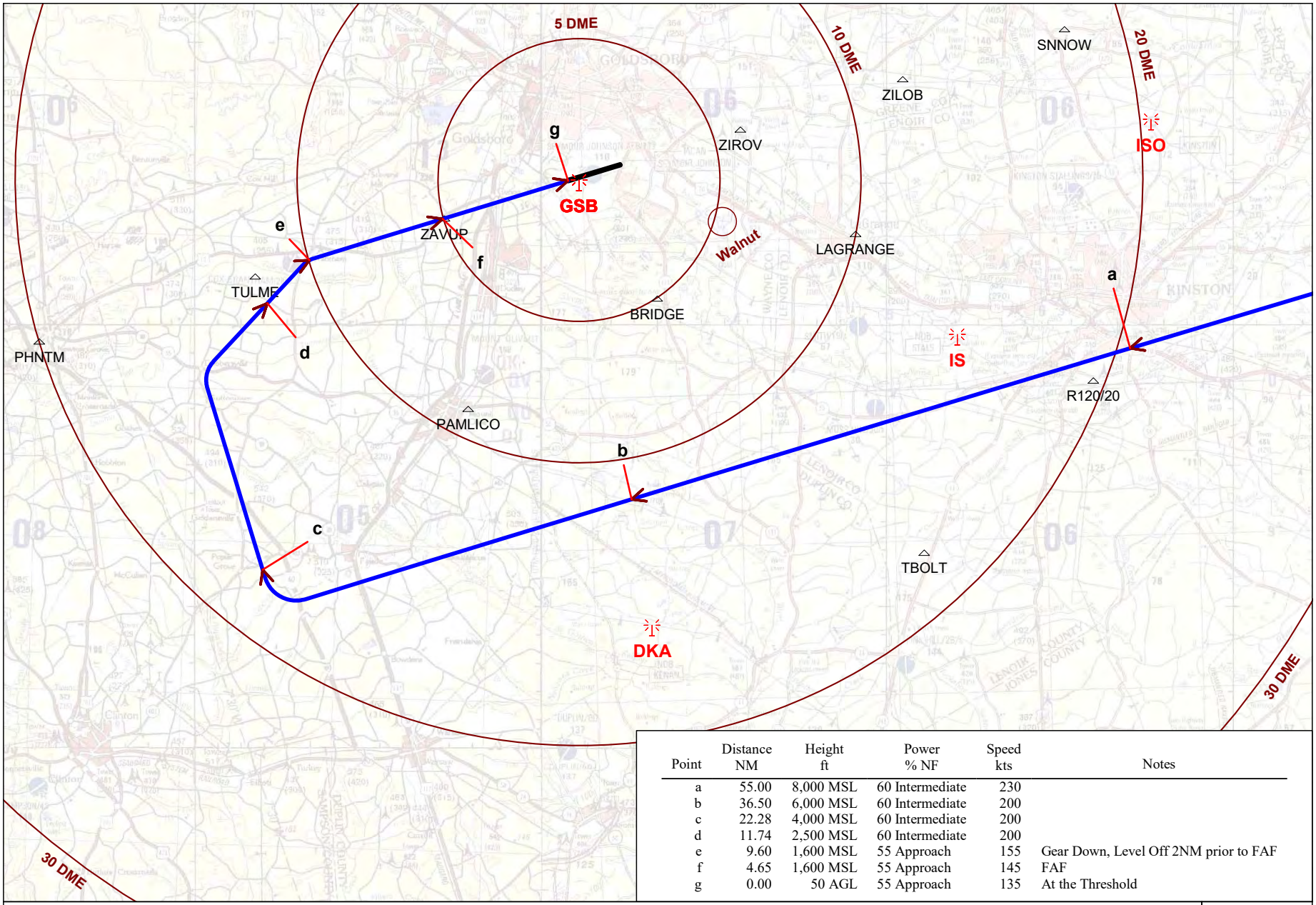


Point	Distance NM	Height ft	Power % NF	Speed kts	Notes
a	55.00	8,000 MSL	60 Intermediate	230	
b	36.50	6,000 MSL	60 Intermediate	200	
c	22.28	4,000 MSL	60 Intermediate	200	
d	11.74	2,500 MSL	60 Intermediate	200	
e	9.60	1,600 MSL	55 Approach	155	Gear Down, Level Off 2NM prior to FAF
f	4.65	1,600 MSL	55 Approach	145	FAF
g	0.00	50 AGL	55 Approach	135	At the Threshold

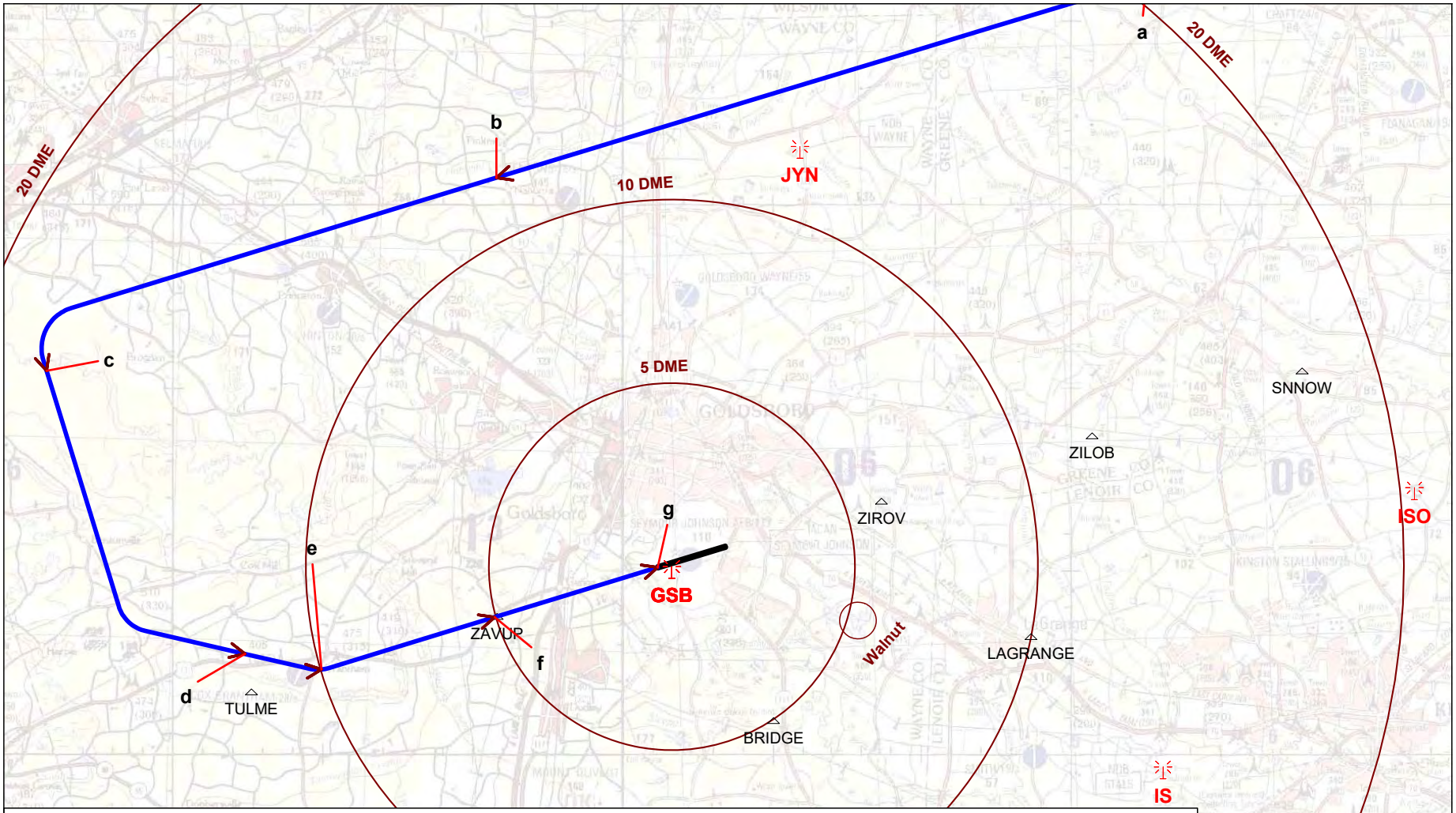
Flight Profile KC135RA02 on Flight Track 08A13

916ARW - VECTORS FROM THE EAST (SOUTHEAST)

0 20,000 40,000 60,000 80,000 100,000

Scale in Feet 1:330,000 (1 inch = 27,500 feet)

N



Point	Distance NM	Height ft	Power % NF	Speed kts	Notes
a	55.00	8,000 MSL	60 Intermediate	230	
b	36.50	6,000 MSL	60 Intermediate	200	
c	22.28	4,000 MSL	60 Intermediate	200	
d	11.74	2,500 MSL	60 Intermediate	200	
e	9.60	1,600 MSL	55 Approach	155	Gear Down, Level Off 2NM prior to FAF update to ILS chart, updated 2 dec to 155 kts updated power 2 Dec 15
f	4.65	1,600 MSL	55 Approach	145	FAF, updated airspeed, updated 2 dec to 145 kts updated power 2 Dec 15
g	0.00	50 AGL	55 Approach	135	At the Threshold, updated airspeed, updated 2 dec to 135 kts, updated power 2 Dec 15

Flight Profile KC135RA01 on Flight Track 08A12

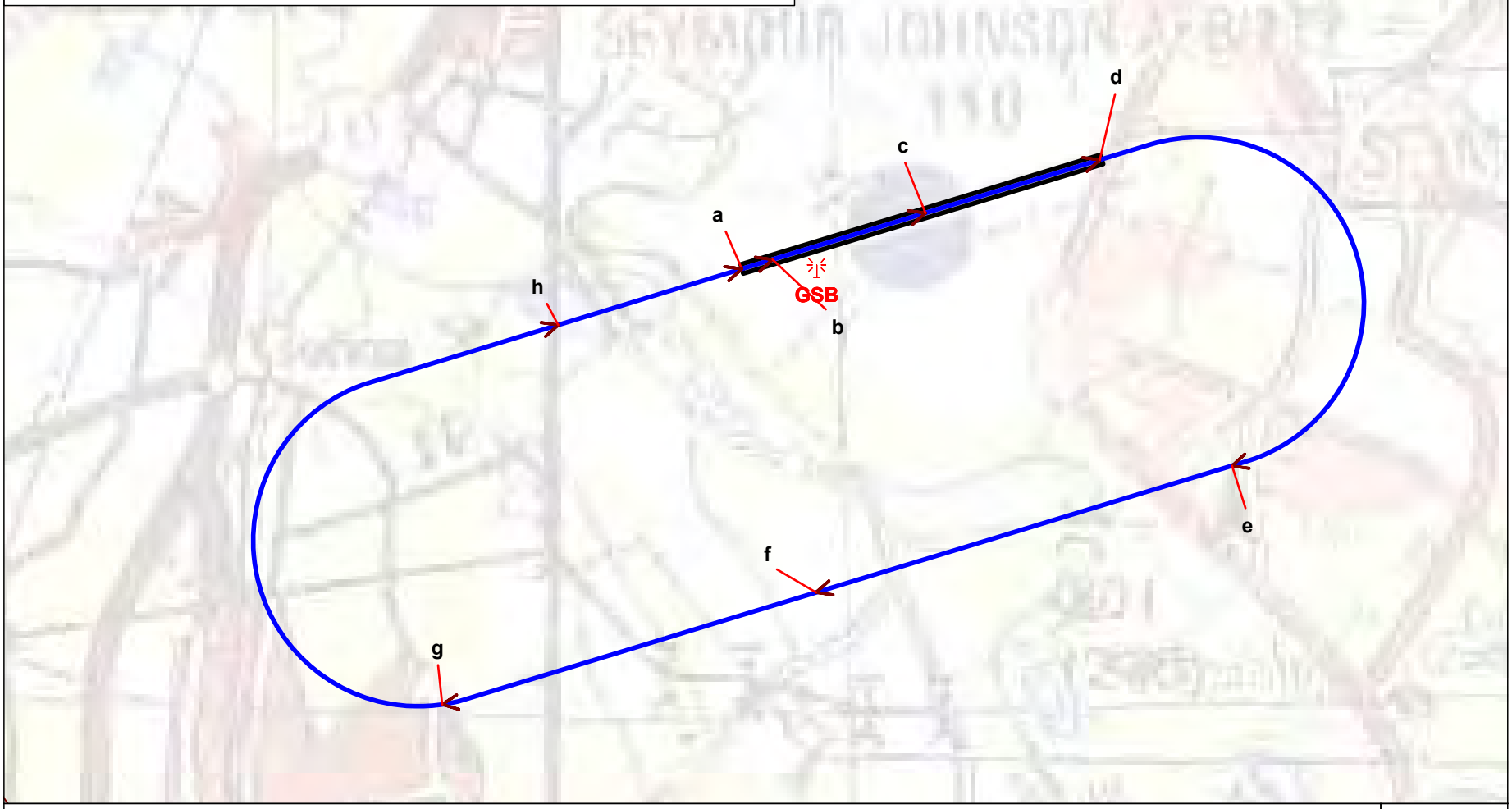
916ARW - VECTORS FROM THE NORTH !!!!! changed

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000

Scale in Feet 1:281,000 (1 inch = 23,400 feet)

N

Point	Distance NM	Height ft	Power % NF	Speed kts	Notes
a	0.00	50 AGL	50 Approach	150	At the Threshold upated
b	0.16	0 AGL	80 Intermediate	135	1000 FT TOUCHDOWN
c	0.99	0 AGL	80 Intermediate	147	6000 FT LIFTOFF
d	1.93	400 AGL	80 Intermediate	185	
e	4.95	1,300 AGL	55 Variable	180	updated power 2 Dec 15
f	7.19	1,300 AGL	60 Approach	180	GEAR DOWN, updated power 2 Dec 15
g	9.20	1,300 AGL	55 Approach	160	updated power 2 Dec 15
h	12.75	300 AGL	55 Approach	150	1 NM, updated as updated power 2 Dec 15
i	13.74	50 AGL	50 Approach	150	updated as updated power 2 Dec 15

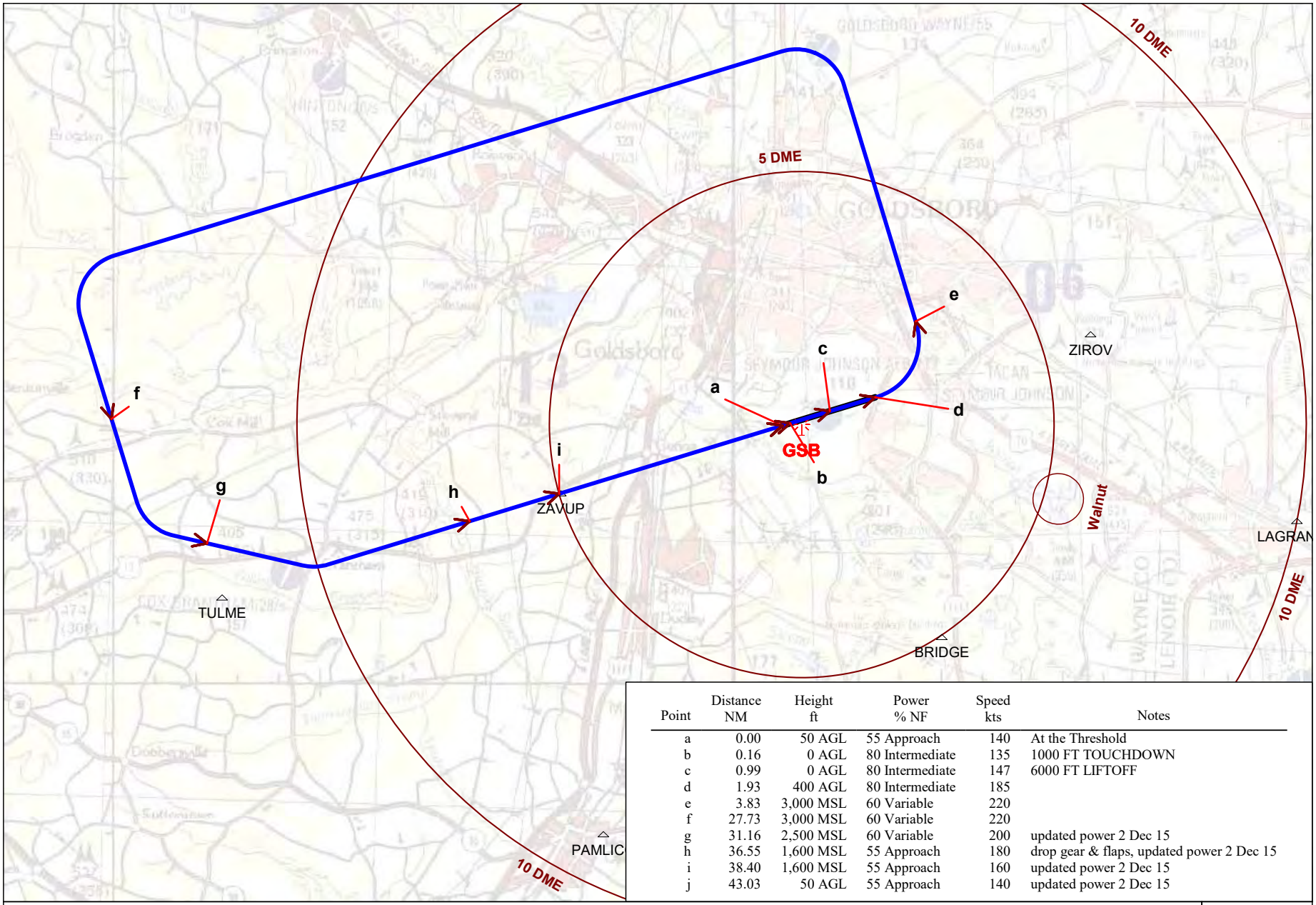


Flight Profile KC135RC05 on Flight Track 08C05
916ARW - VFR closed !!!!! Changed

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000

Scale in Feet 1:55,000 (1 inch = 4,580 feet)

N



Point	Distance NM	Height ft	Power % NF	Speed kts	Notes
a	0.00	50 AGL	55 Approach	140	At the Threshold
b	0.16	0 AGL	80 Intermediate	135	1000 FT TOUCHDOWN
c	0.99	0 AGL	80 Intermediate	147	6000 FT LIFTOFF
d	1.93	400 AGL	80 Intermediate	185	
e	3.83	3,000 MSL	60 Variable	220	
f	27.73	3,000 MSL	60 Variable	220	
g	31.16	2,500 MSL	60 Variable	200	updated power 2 Dec 15
h	36.55	1,600 MSL	55 Approach	180	drop gear & flaps, updated power 2 Dec 15
i	38.40	1,600 MSL	55 Approach	160	updated power 2 Dec 15
j	43.03	50 AGL	55 Approach	140	updated power 2 Dec 15

Flight Profile KC135RC01 on Flight Track 08C01

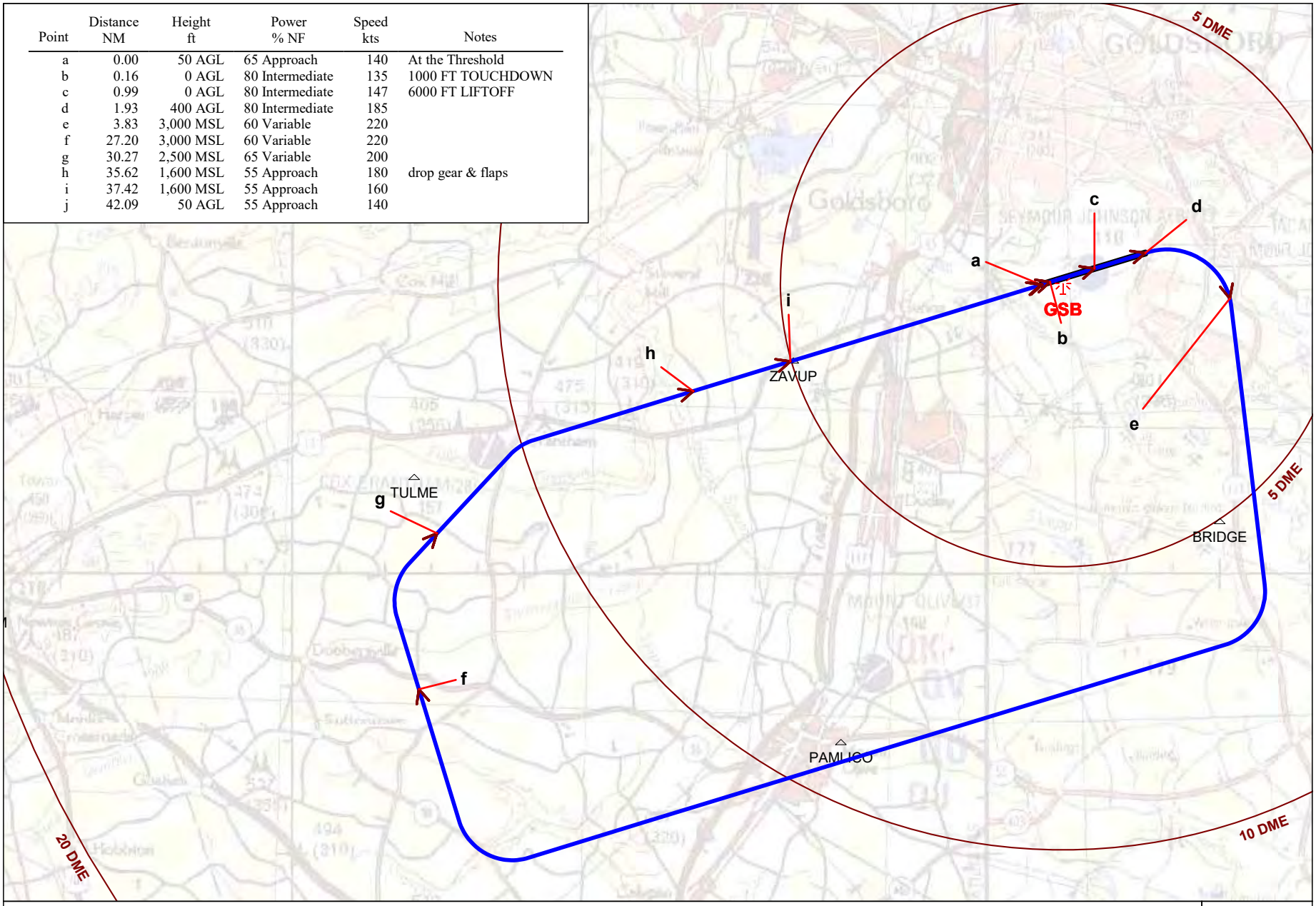
916ARW - IFR NORTH RADAR PATTERN !!!!! changed

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:184,000 (1 inch = 15,400 feet)

N

Point	Distance NM	Height ft	Power % NF	Speed kts	Notes
a	0.00	50 AGL	65 Approach	140	At the Threshold
b	0.16	0 AGL	80 Intermediate	135	1000 FT TOUCHDOWN
c	0.99	0 AGL	80 Intermediate	147	6000 FT LIFTOFF
d	1.93	400 AGL	80 Intermediate	185	
e	3.83	3,000 MSL	60 Variable	220	
f	27.20	3,000 MSL	60 Variable	220	
g	30.27	2,500 MSL	65 Variable	200	
h	35.62	1,600 MSL	55 Approach	180	drop gear & flaps
i	37.42	1,600 MSL	55 Approach	160	
j	42.09	50 AGL	55 Approach	140	

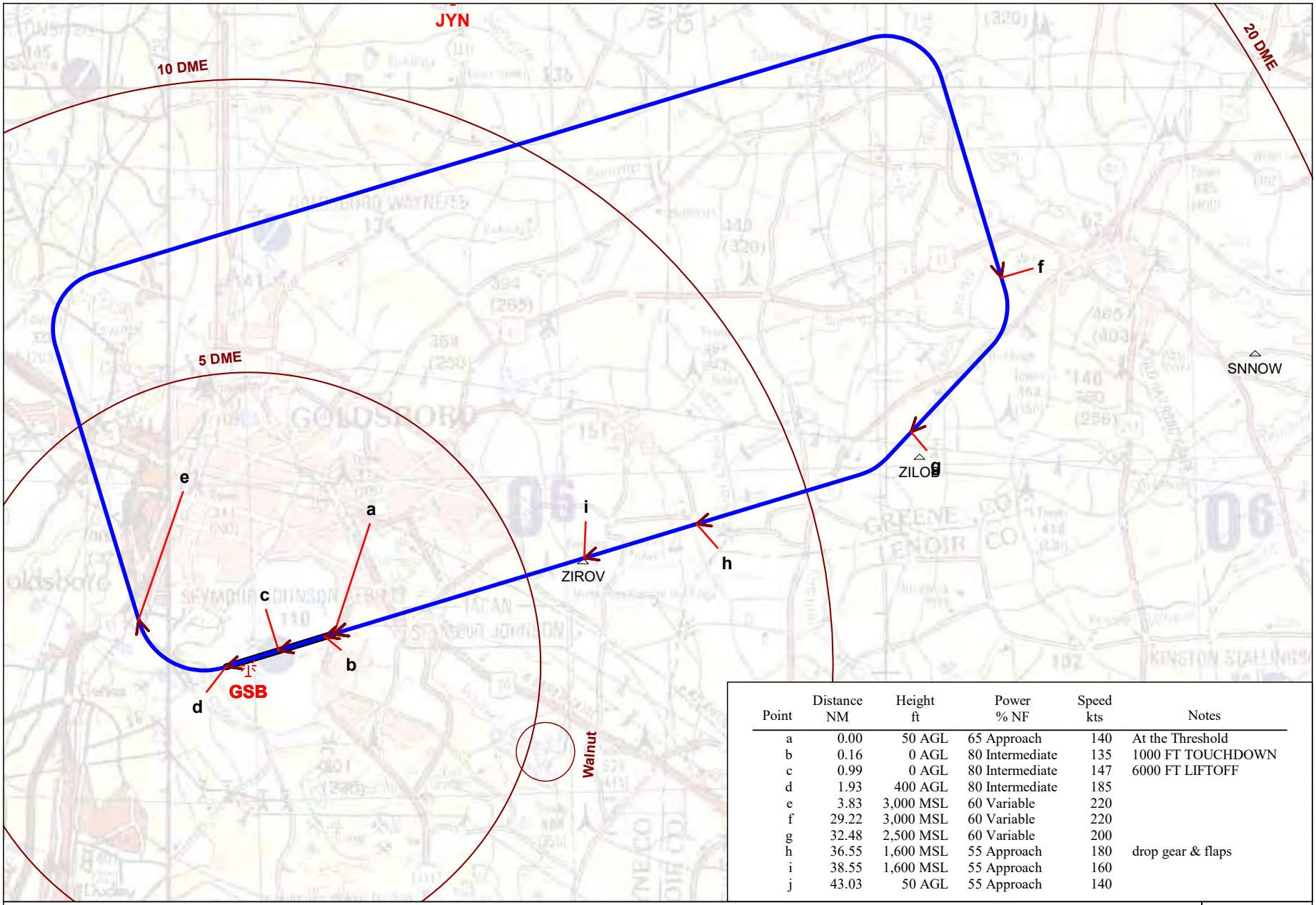


Flight Profile KC135RC02 on Flight Track 08C02
916ARW - IFR SOUTH RADAR PATTERN

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:165,000 (1 inch = 13,700 feet)

N



Point	Distance NM	Height ft	Power % NF	Speed kts	Notes
a	0.00	50 AGL	65 Approach	140	At the Threshold
b	0.16	0 AGL	80 Intermediate	135	1000 FT TOUCHDOWN
c	0.99	0 AGL	80 Intermediate	147	6000 FT LIFTOFF
d	1.93	400 AGL	80 Intermediate	185	
e	3.83	3,000 MSL	60 Variable	220	
f	29.22	3,000 MSL	60 Variable	220	
g	32.48	2,500 MSL	60 Variable	200	
h	36.55	1,600 MSL	55 Approach	180	drop gear & flaps
i	38.55	1,600 MSL	55 Approach	160	
j	43.03	50 AGL	55 Approach	140	

Flight Profile KC135RC07 on Flight Track 26C01
916ARW - IFR NORTH RADAR PATTERN

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:159,000 (1 inch = 13,300 feet)

N

C-1.3 REPRESENTATIVE FLIGHT PROFILES FOR TINKER AFB

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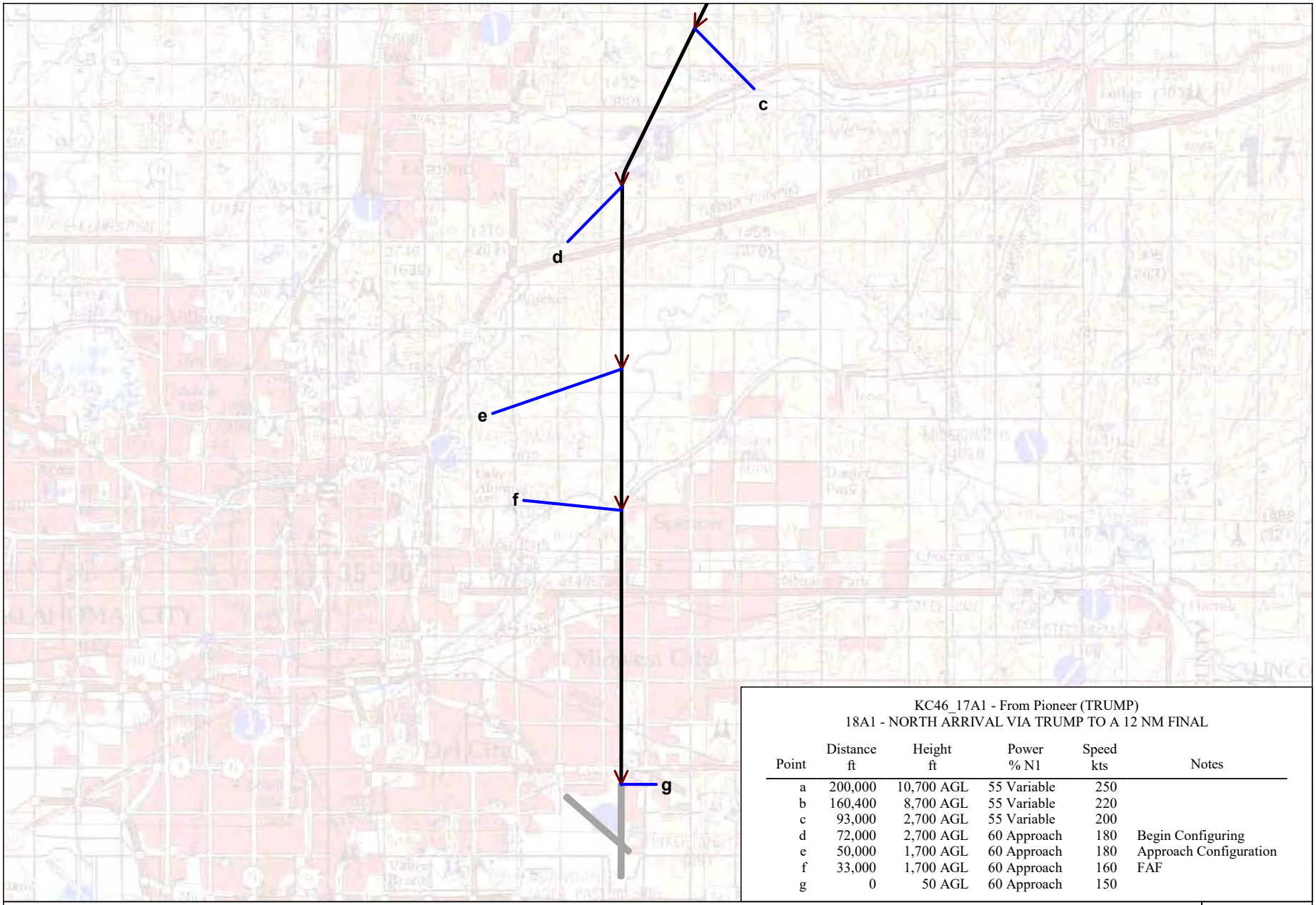


KC46_17A1 - From Pioneer (TRUMP)
18A1 - NORTH ARRIVAL VIA TRUMP TO A 12 NM FINAL

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	200,000	10,700 AGL	55 Variable	250	
b	160,400	8,700 AGL	55 Variable	220	
c	93,000	2,700 AGL	55 Variable	200	
d	72,000	2,700 AGL	60 Approach	180	Begin Configuring
e	50,000	1,700 AGL	60 Approach	180	Approach Configuration
f	33,000	1,700 AGL	60 Approach	160	FAF
g	0	50 AGL	60 Approach	150	

Flight Profile KC46_17A1
From Pioneer (TRUMP)

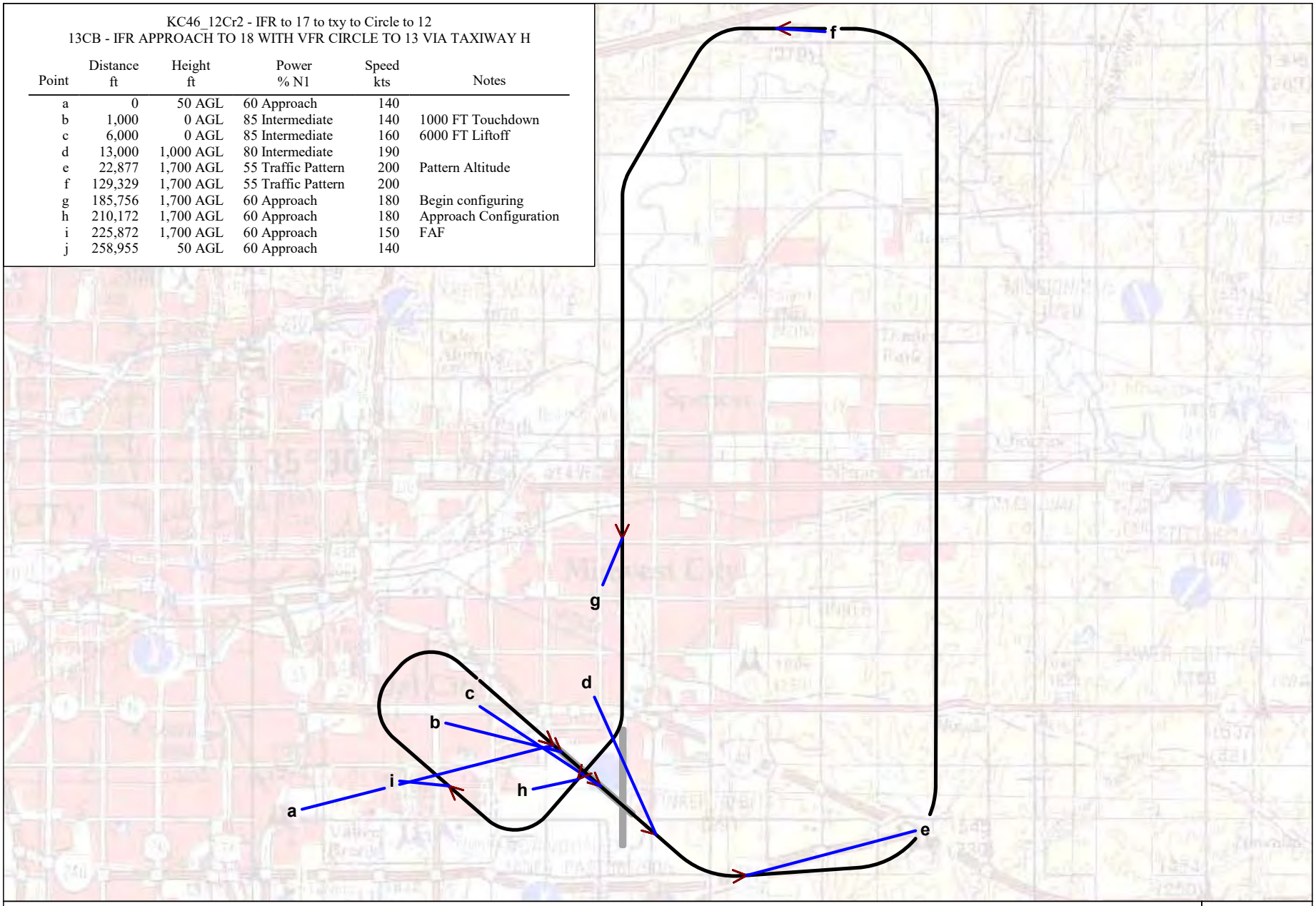
0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:185,000 (1 inch = 15,400 feet)

N

KC46_12Cr2 - IFR to 17 to txy to Circle to 12
13CB - IFR APPROACH TO 18 WITH VFR CIRCLE TO 13 VIA TAXIWAY H

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	60 Approach	140	
b	1,000	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	6,000	0 AGL	85 Intermediate	160	6000 FT Liftoff
d	13,000	1,000 AGL	80 Intermediate	190	
e	22,877	1,700 AGL	55 Traffic Pattern	200	Pattern Altitude
f	129,329	1,700 AGL	55 Traffic Pattern	200	
g	185,756	1,700 AGL	60 Approach	180	Begin configuring
h	210,172	1,700 AGL	60 Approach	180	Approach Configuration
i	225,872	1,700 AGL	60 Approach	150	FAF
j	258,955	50 AGL	60 Approach	140	

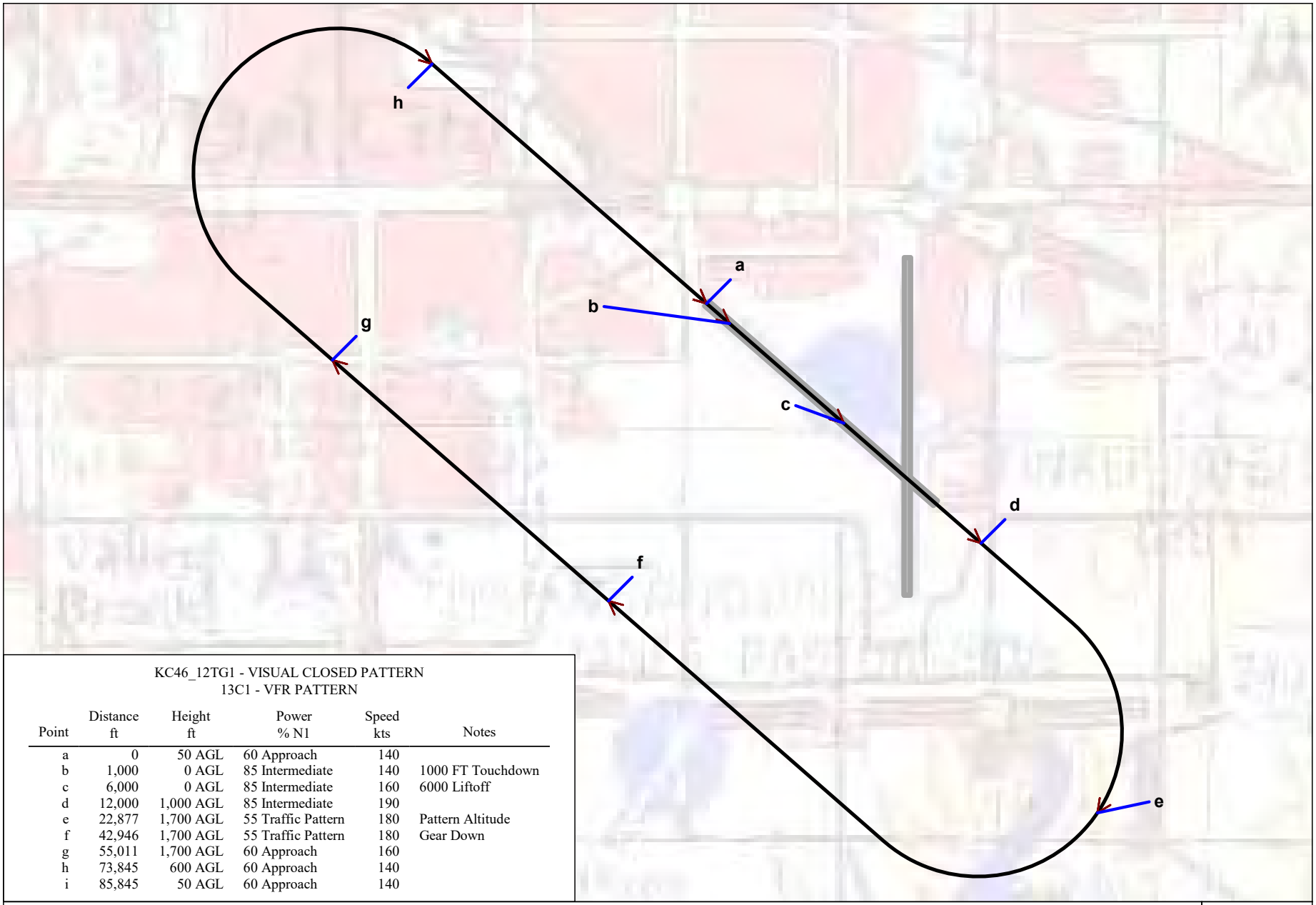


Flight Profile KC46_12Cr2
IFR to 17 to txy to Circle to 12

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000 52,000

Scale in Feet 1:146,000 (1 inch = 12,200 feet)

N



KC46_12TG1 - VISUAL CLOSED PATTERN
13C1 - VFR PATTERN

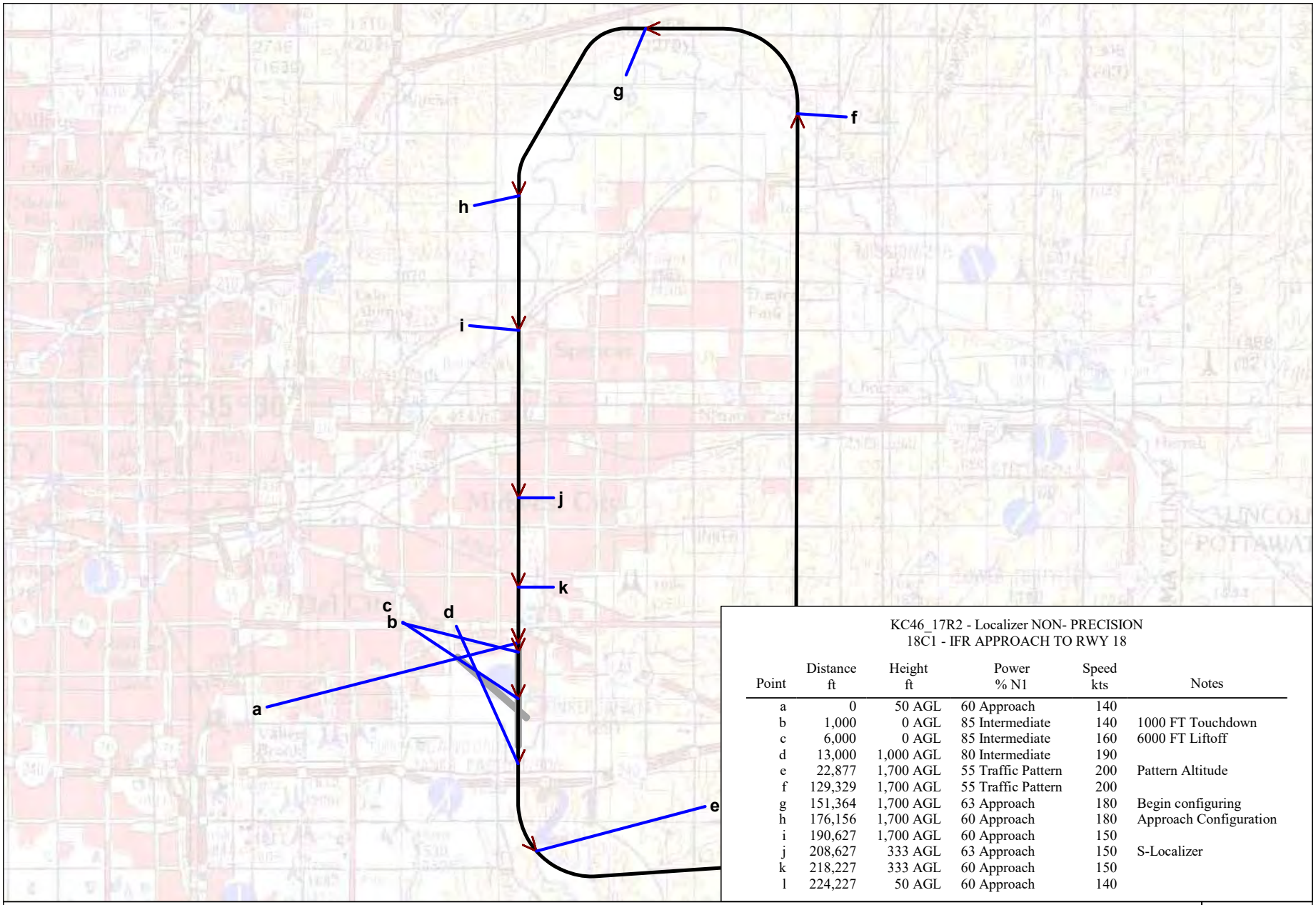
Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	60 Approach	140	
b	1,000	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	6,000	0 AGL	85 Intermediate	160	6000 Liftoff
d	12,000	1,000 AGL	85 Intermediate	190	
e	22,877	1,700 AGL	55 Traffic Pattern	180	Pattern Altitude
f	42,946	1,700 AGL	55 Traffic Pattern	180	Gear Down
g	55,011	1,700 AGL	60 Approach	160	
h	73,845	600 AGL	60 Approach	140	
i	85,845	50 AGL	60 Approach	140	

Flight Profile KC46_12TG1
VISUAL CLOSED PATTERN

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000

Scale in Feet 1:50,500 (1 inch = 4,200 feet)

N



KC46_17R2 - Localizer NON- PRECISION
18C1 - IFR APPROACH TO RWY 18

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	60 Approach	140	
b	1,000	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	6,000	0 AGL	85 Intermediate	160	6000 FT Liftoff
d	13,000	1,000 AGL	80 Intermediate	190	
e	22,877	1,700 AGL	55 Traffic Pattern	200	Pattern Altitude
f	129,329	1,700 AGL	55 Traffic Pattern	200	
g	151,364	1,700 AGL	63 Approach	180	Begin configuring
h	176,156	1,700 AGL	60 Approach	180	Approach Configuration
i	190,627	1,700 AGL	60 Approach	150	
j	208,627	333 AGL	63 Approach	150	S-Localizer
k	218,227	333 AGL	60 Approach	150	
l	224,227	50 AGL	60 Approach	140	

Flight Profile KC46_17R2
Localizer NON- PRECISION

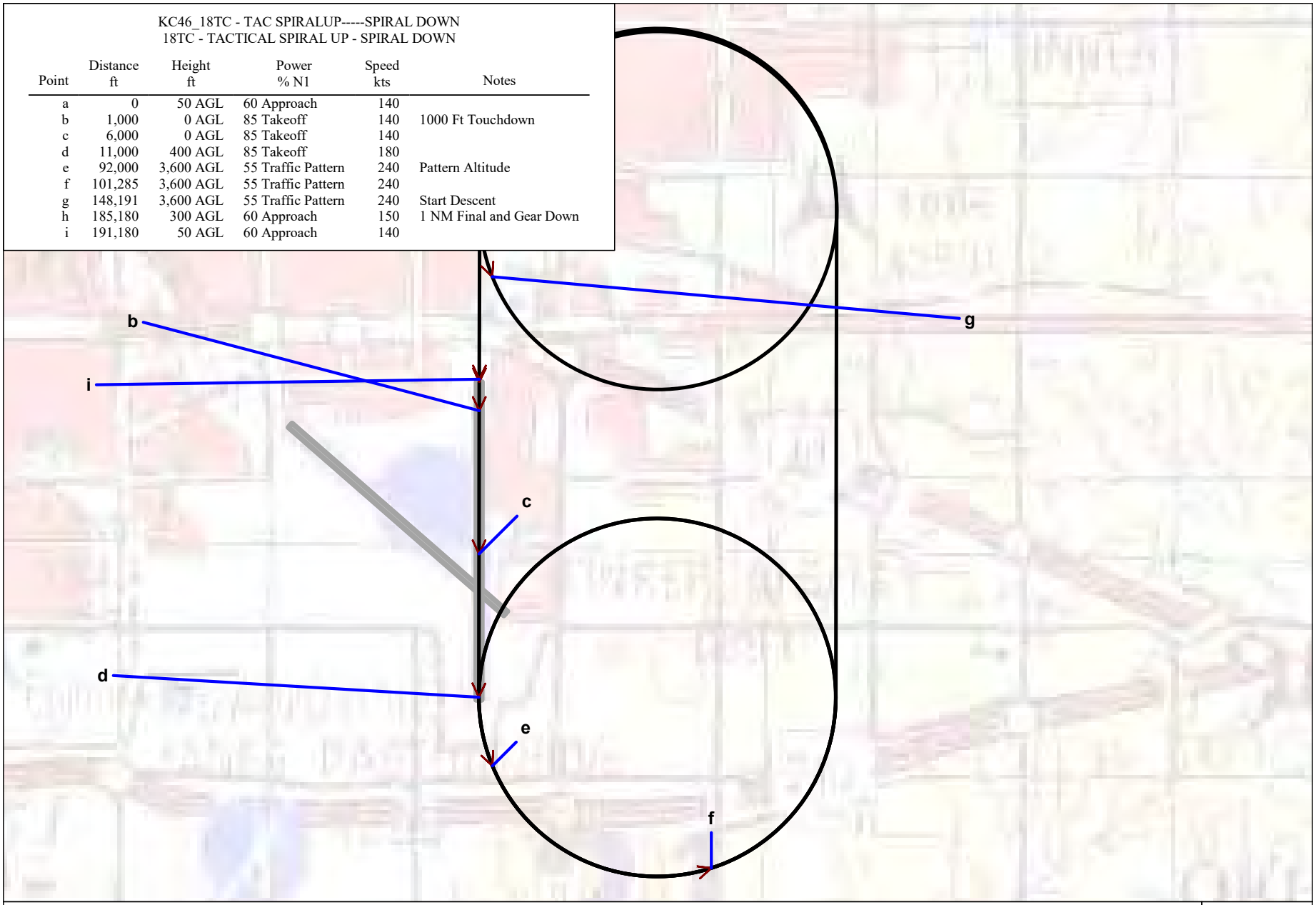
0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:165,000 (1 inch = 13,800 feet)

N

KC46_18TC - TAC SPIRALUP-----SPIRAL DOWN
18TC - TACTICAL SPIRAL UP - SPIRAL DOWN

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	60 Approach	140	
b	1,000	0 AGL	85 Takeoff	140	1000 Ft Touchdown
c	6,000	0 AGL	85 Takeoff	140	
d	11,000	400 AGL	85 Takeoff	180	
e	92,000	3,600 AGL	55 Traffic Pattern	240	Pattern Altitude
f	101,285	3,600 AGL	55 Traffic Pattern	240	
g	148,191	3,600 AGL	55 Traffic Pattern	240	Start Descent
h	185,180	300 AGL	60 Approach	150	1 NM Final and Gear Down
i	191,180	50 AGL	60 Approach	140	

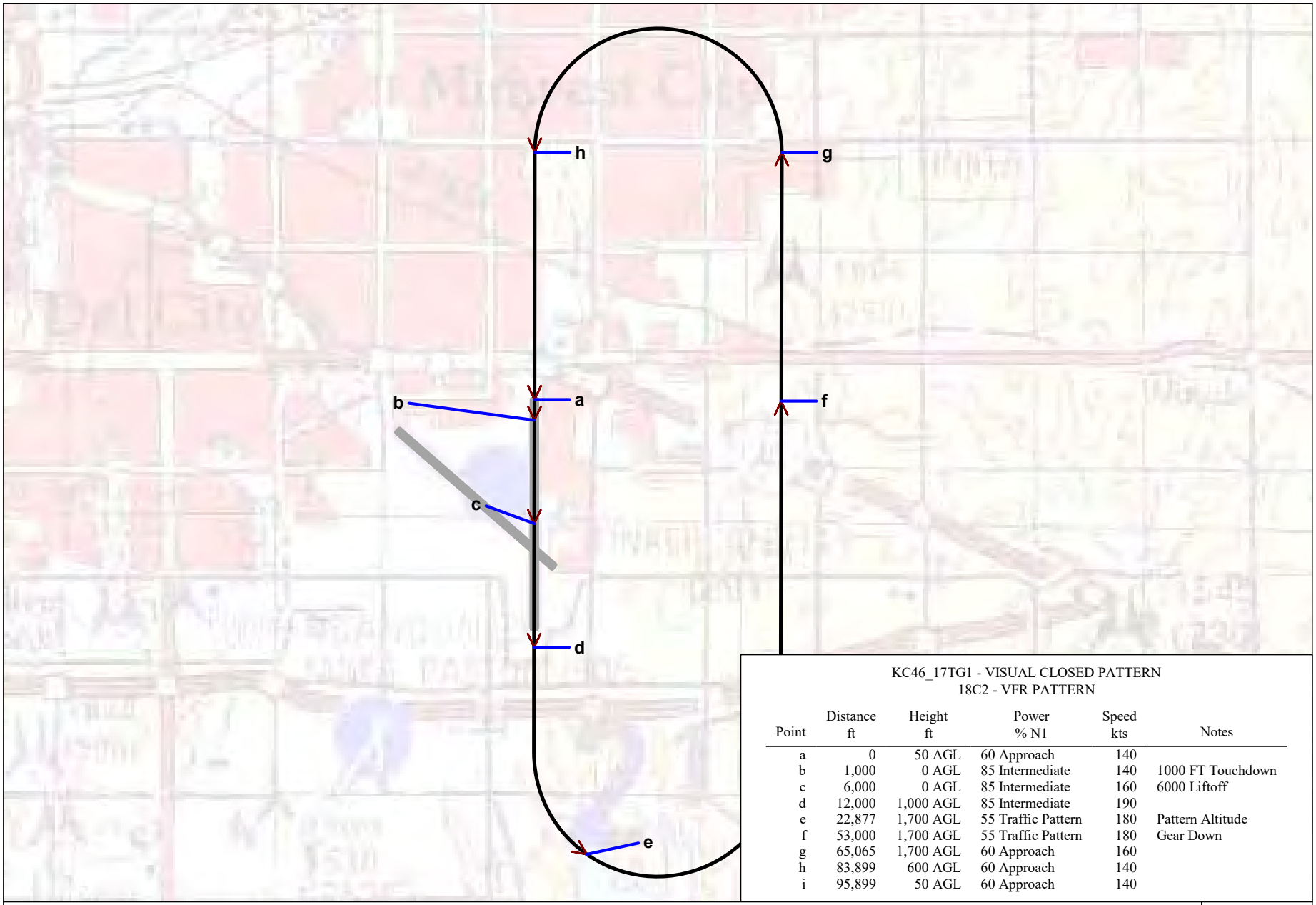


Flight Profile KC46_18TC
TAC SPIRALUP-----SPIRAL DOWN

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000

Scale in Feet 1:53,600 (1 inch = 4,460 feet)

N



KC46_17TG1 - VISUAL CLOSED PATTERN
18C2 - VFR PATTERN

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	60 Approach	140	
b	1,000	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	6,000	0 AGL	85 Intermediate	160	6000 Liftoff
d	12,000	1,000 AGL	85 Intermediate	190	
e	22,877	1,700 AGL	55 Traffic Pattern	180	Pattern Altitude
f	53,000	1,700 AGL	55 Traffic Pattern	180	Gear Down
g	65,065	1,700 AGL	60 Approach	160	
h	83,899	600 AGL	60 Approach	140	
i	95,899	50 AGL	60 Approach	140	

Flight Profile KC46_17TG1
VISUAL CLOSED PATTERN

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:74,400 (1 inch = 6,200 feet)

N

C-1.4 REPRESENTATIVE FLIGHT PROFILES FOR WESTOVER ARB

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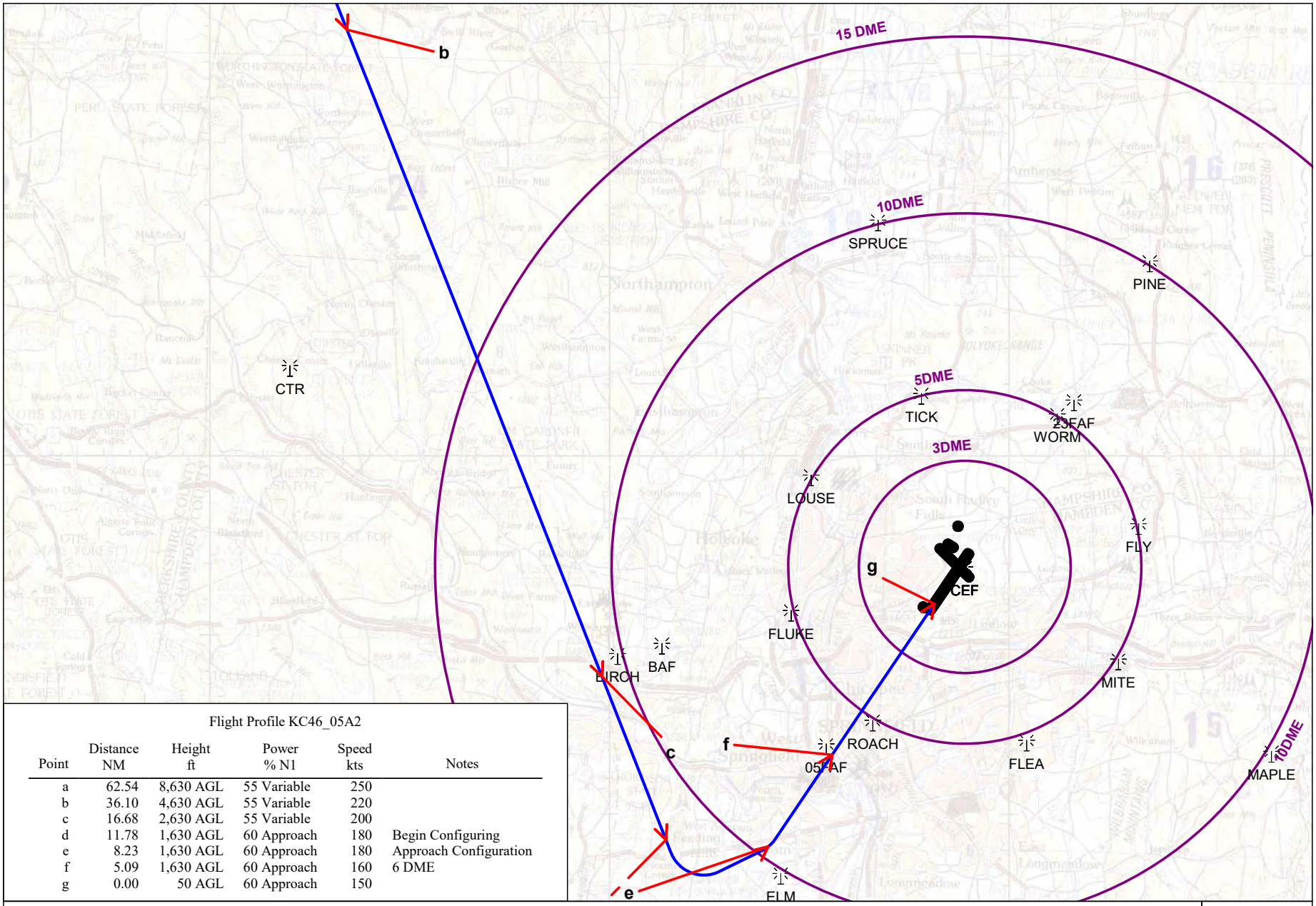


Flight Profile KC46_05A2

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	62.54	8,630 AGL	55 Variable	250	
b	36.10	4,630 AGL	55 Variable	220	
c	16.68	2,630 AGL	55 Variable	200	
d	11.78	1,630 AGL	60 Approach	180	Begin Configuring
e	8.23	1,630 AGL	60 Approach	180	Approach Configuration
f	5.09	1,630 AGL	60 Approach	160	6 DME
g	0.00	50 AGL	60 Approach	150	

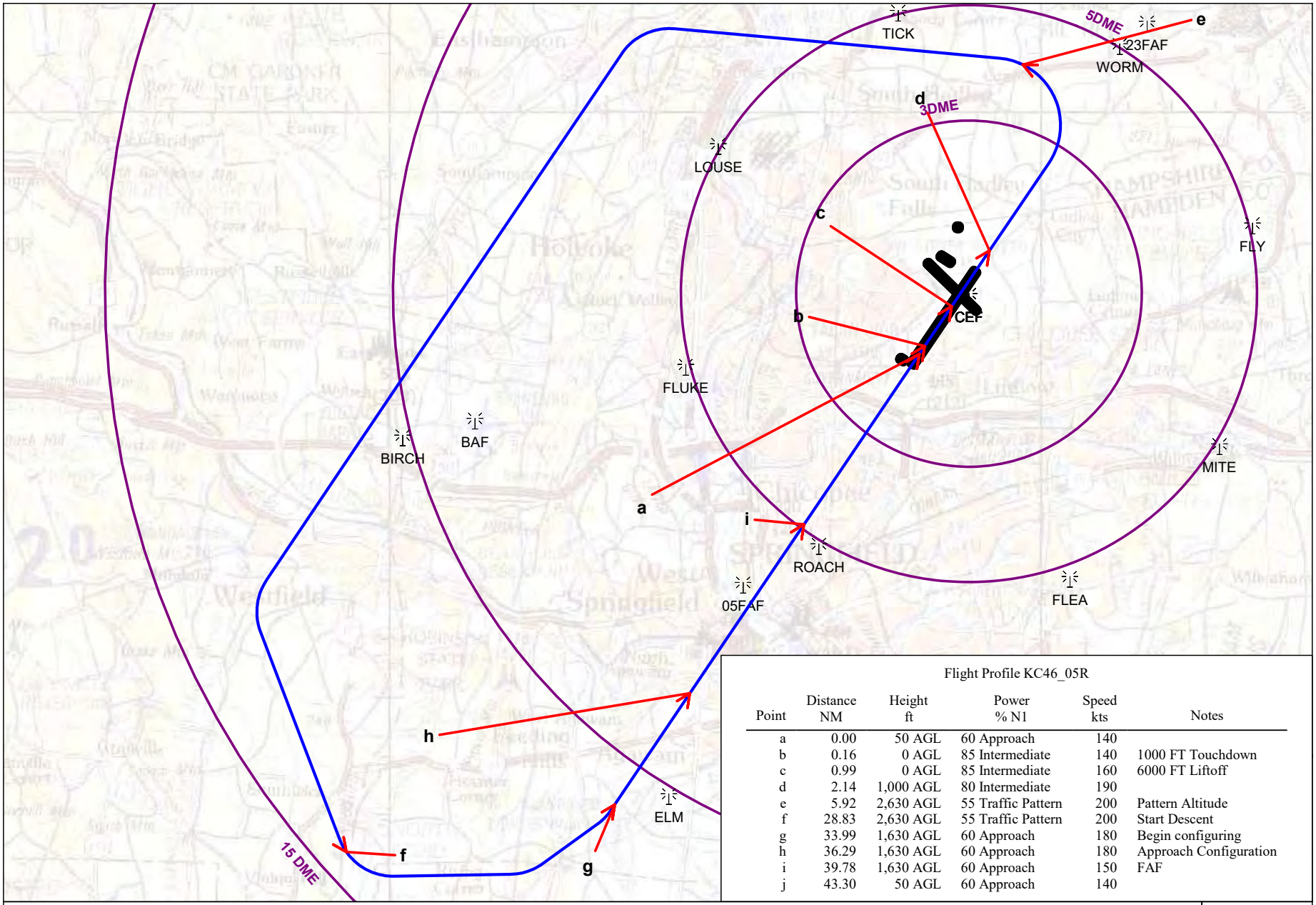
05_A2 - NW: IFR & VFR

Flight Profile KC46_05A2

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000

Scale in Feet 1:260,000 (1 inch = 21,700 feet)

N



Flight Profile KC46_05R

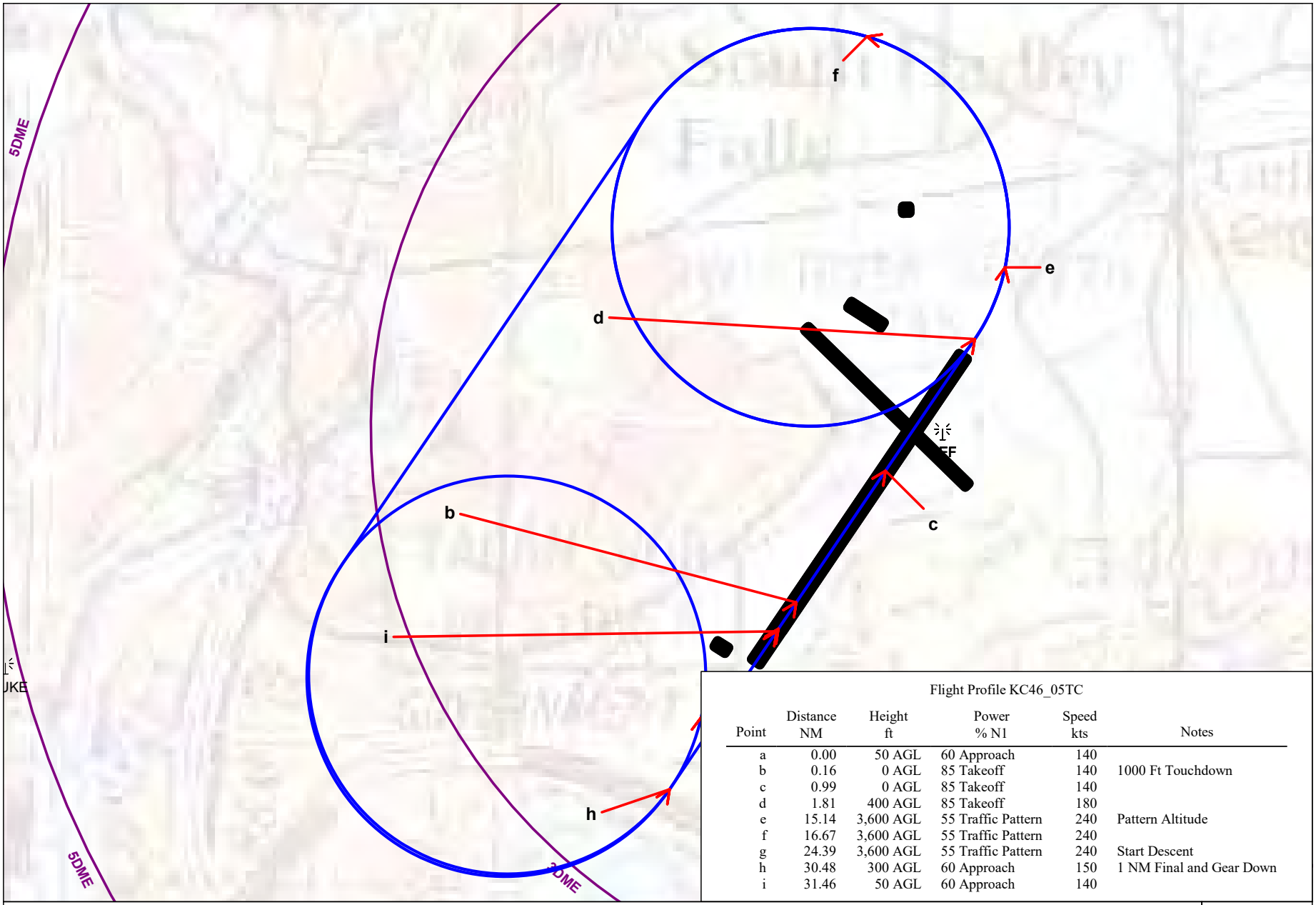
Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.16	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	0.99	0 AGL	85 Intermediate	160	6000 FT Liftoff
d	2.14	1,000 AGL	80 Intermediate	190	
e	5.92	2,630 AGL	55 Traffic Pattern	200	Pattern Altitude
f	28.83	2,630 AGL	55 Traffic Pattern	200	Start Descent
g	33.99	1,630 AGL	60 Approach	180	Begin configuring
h	36.29	1,630 AGL	60 Approach	180	Approach Configuration
i	39.78	1,630 AGL	60 Approach	150	FAF
j	43.30	50 AGL	60 Approach	140	

05_CR1 - IFR Pattern
Flight Profile KC46_05R

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:159,000 (1 inch = 13,300 feet)

N



Flight Profile KC46_05TC

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.16	0 AGL	85 Takeoff	140	1000 Ft Touchdown
c	0.99	0 AGL	85 Takeoff	140	
d	1.81	400 AGL	85 Takeoff	180	
e	15.14	3,600 AGL	55 Traffic Pattern	240	Pattern Altitude
f	16.67	3,600 AGL	55 Traffic Pattern	240	
g	24.39	3,600 AGL	55 Traffic Pattern	240	Start Descent
h	30.48	300 AGL	60 Approach	150	1 NM Final and Gear Down
i	31.46	50 AGL	60 Approach	140	

05_TC - TACTICAL SPIRAL UP - SPIRAL DOWN

Flight Profile KC46_05TC

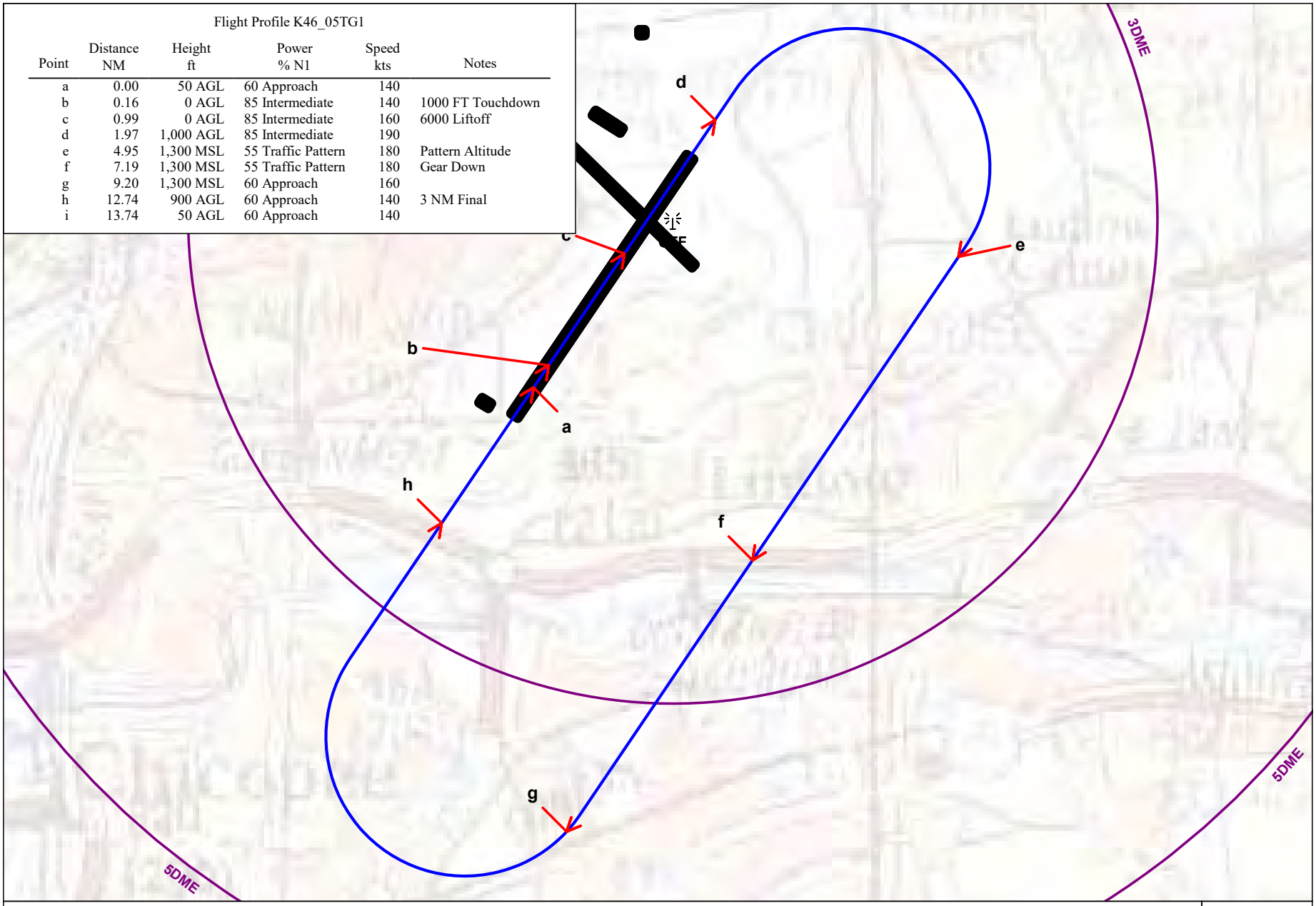
0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000

Scale in Feet 1:48,200 (1 inch = 4,010 feet)

N

Flight Profile K46_05TG1

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.16	0 AGL	85 Intermediate	140	1000 FT Touchdown
c	0.99	0 AGL	85 Intermediate	160	6000 Liftoff
d	1.97	1,000 AGL	85 Intermediate	190	
e	4.95	1,300 MSL	55 Traffic Pattern	180	Pattern Altitude
f	7.19	1,300 MSL	55 Traffic Pattern	180	Gear Down
g	9.20	1,300 MSL	60 Approach	160	
h	12.74	900 AGL	60 Approach	140	3 NM Final
i	13.74	50 AGL	60 Approach	140	

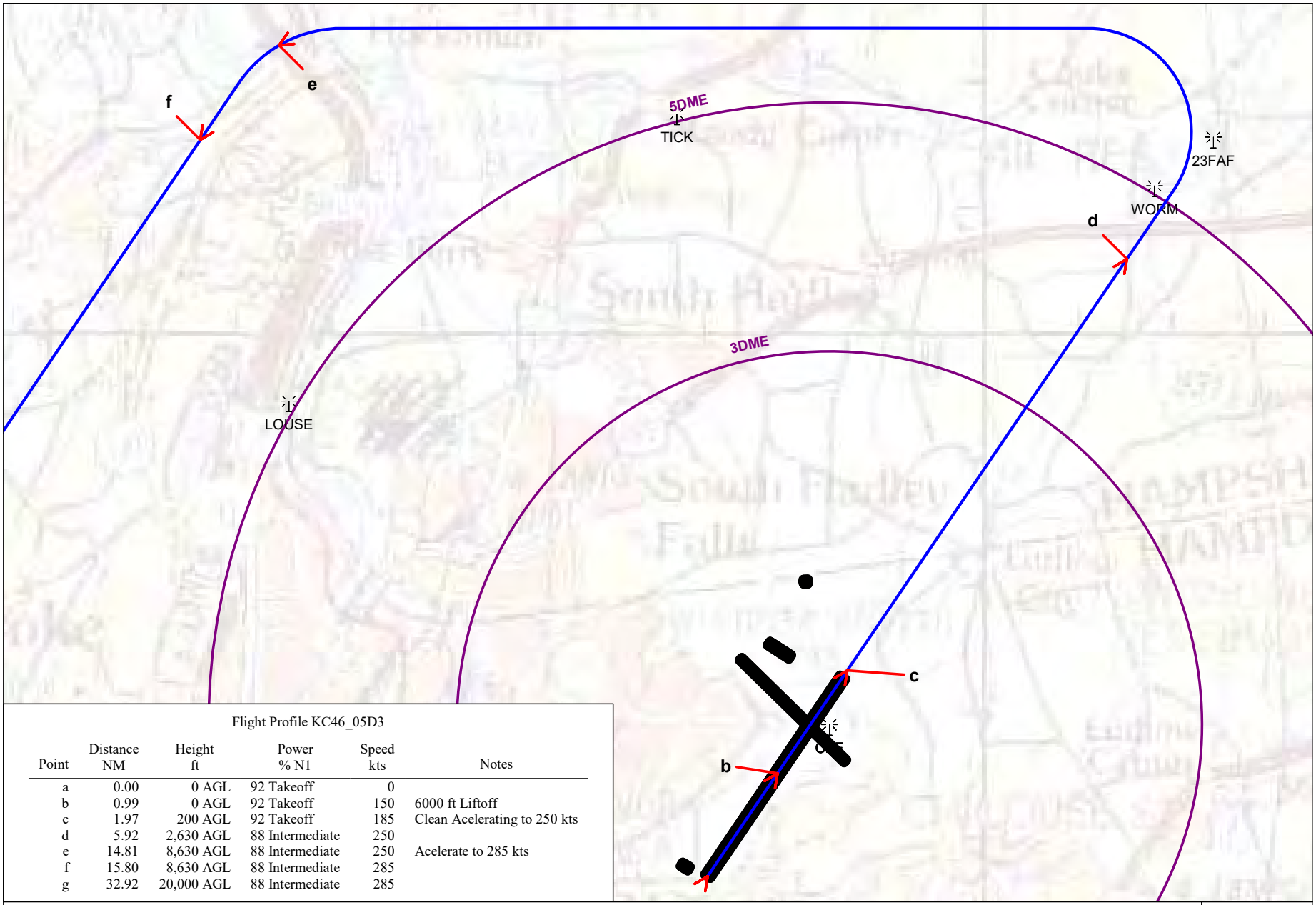


05_TG1 - KC-46A VFR PATTERN
Flight Profile K46_05TG1

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000

Scale in Feet 1:56,800 (1 inch = 4,740 feet)

N



Flight Profile KC46_05D3

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	0 AGL	92 Takeoff	0	
b	0.99	0 AGL	92 Takeoff	150	6000 ft Liftoff
c	1.97	200 AGL	92 Takeoff	185	Clean Acelerating to 250 kts
d	5.92	2,630 AGL	88 Intermediate	250	
e	14.81	8,630 AGL	88 Intermediate	250	Acelerate to 285 kts
f	15.80	8,630 AGL	88 Intermediate	285	
g	32.92	20,000 AGL	88 Intermediate	285	

05_D4 - Southwest

Flight Profile KC46_05D3

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:73,900 (1 inch = 6,160 feet)

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APPENDIX D AIR QUALITY BACKGROUND INFORMATION AND EMISSION CALCULATIONS

This appendix includes air quality background information for each of the four bases under consideration for the KC-46A Third Main Operating Base (MOB 3) mission. This background information includes the regional climate information, along with the spreadsheets that were used to complete the air quality analysis contained in Volume I, Chapter 4 (see Sections 4.1.2, 4.2.2, 4.3.2, and 4.4.2).

The following provides example calculations to assist in understanding the operational emission derivations presented in tabular form for each proposed basing location in Appendix D Sections D.1.1 through D.4.1. The estimation of operational air emissions for the proposed KC-46A MOB 3 mission are based on two sets of general parameters: (1) operational or activity data (such as number of aircraft operations, fuel usage, or equipment expenditure of energy in horsepower-hours [hp-hr]) and (2) emission factors in units of mass of air pollutant per operational or activity data (such as pounds of a pollutant per 1,000 pounds [lb] of fuel consumed or grams [gm] per hp-hr). The following example emission calculations are for (1) KC-46A landing and take-offs (LTOs) and (2) on base travel for privately owned vehicles (POVs) at Grissom Air Reserve Base (ARB).

KC-46A Landing and Take-Offs. The following presents the calculation of annual volatile organic compound (VOC) emissions generated during idling mode for a proposed KC-46A LTO, as presented in Table D.1-14, Annual Air Emissions from Proposed KC-46A Aircraft Operations at Grissom ARB - MOB 3 Scenario Year 2019. All other air pollutant emissions presented in Table D.1-14 are calculated in a similar manner as the following example:

- Total annual hours of idling (Table D.1-12): 969 hr.
- Hourly fuel usage for one P&W 4062 engine in idle mode (Table D.1-1): 1,663 lb/hr.
- VOC emission factor for one P&W 4062 engine in idle mode (Table D.1-1): 12.49 lb of VOC/1,000 lb fuel consumption.
- Number of P&W 4062 engines in a KC-46A aircraft: 2.

Annual Volatile Organic Compound Emissions (Table D.1-14)

(969 hr x 1,633 lb/hr x 12.49 lb VOC/1000 lb fuel x 2 engines) / 2000 lb/ton = 20.13 tons of VOC.

On-Base Privately Owned Vehicles Travel. The following presents the calculation of annual NO_x emissions generated from POVs that travel on base under the existing conditions scenario (year 2015), as presented in Table D.1-25, Annual Emissions from On Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Scenarios. All other air pollutant emissions presented in Table D.1-25 are calculated in a similar manner as the following example:

- Total on base vehicle miles travelled (VMT) for Year 2015 (Table D.1-23): 276,753 miles (mi).
- NOx composite vehicle emission factor (Table D.1-24): 0.52 gm per mi.

Annual Nitrogen Oxide Emissions (Table D.1-25)

(276,753 mi x 0.52 gm/mi) / (453.6 gm/lb * 2000 lb/ton) = 0.16 tons of NO_x.

D.1 GRISSOM AIR RESERVE BASE REGIONAL CLIMATE

Grissom ARB has a continental climate, characterized by warm and wet summers and cold winters with ample precipitation. Meteorological data collected at Logansport in Cass County, Indiana, are used to describe the climatic conditions of the Grissom ARB project region (Indiana State Climate Office 2016).

Temperature. The average high and low temperatures during the summer months at Grissom ARB range from approximately 84 degrees Fahrenheit (°F) to 53 °F. The average high and low temperatures during the winter months range from 48 °F to 16 °F.

Precipitation. Average annual precipitation at Grissom ARB is 40 inches. Precipitation is greatest during the warmer months of the year, and the peak monthly average of 4.7 inches occurs in July. Precipitation is at a minimum during the winter, with the lowest monthly average of 2 inches occurring in February. Snow is common during the colder months of the year, and the average annual snowfall is 28 inches.

Prevailing Winds. The winds at Grissom ARB prevail from the south to southwest during the warmer months of the year and from the southwest to west during the winter (National Oceanic and Atmospheric Administration [NOAA] 1998). The annual average wind speed for Grissom ARB is 8 miles per hour. The months from December through March are generally the windiest of the year, and January has a peak average monthly value of 12 miles per hour.

D.1.1 OPERATIONS EMISSION CALCULATIONS FOR THE KC-46A MOB 3 MISSION AT GRISSOM ARB

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Table D.1-1. Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft

Engine Type/ Throttle Setting	Fuel Flow (Pounds/ Hour)	Emission Factors (Pounds/1000 Pounds Fuel) [a b]									
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
CFM56-2B-1[c]											
Idle (7%)	1,014	2.10	30.70	4.00	1.06	0.06	0.06	3,216	0.09	0.10	3,249
Approach (30%)	2,463	0.09	4.20	8.20	1.06	0.06	0.06	3,216	0.09	0.10	3,249
Climbout (85%)	6,486	0.06	0.09	16.00	1.06	0.05	0.05	3,216	0.09	0.10	3,249
Take-off (100%)	7,801	0.05	0.09	18.50	1.06	0.07	0.07	3,216	0.09	0.10	3,249
55%	4,292	0.08	2.33	11.75	1.06	0.06	0.06	3,216	0.09	0.10	3,249
60%	4,658	0.07	1.96	12.45	1.06	0.05	0.05	3,216	0.09	0.10	3,249
P&W 4062[d]											
Idle (7%)	1,663	12.49	42.61	3.78	1.06	0.11	0.10	3,216	0.09	0.10	3,249
Approach (30%)	5,702	0.10	1.93	12.17	1.06	0.05	0.04	3,216	0.09	0.10	3,249
Climbout (85%)	16,870	0.08	0.50	25.98	1.06	0.07	0.06	3,216	0.09	0.10	3,249
Take-off (100%)	21,622	0.09	0.61	34.36	1.06	0.08	0.07	3,216	0.09	0.10	3,249
55%	10,778	0.09	1.28	18.45	1.06	0.06	0.05	3,216	0.09	0.10	3,249
60%	11,794	0.09	1.15	19.70	1.06	0.06	0.05	3,216	0.09	0.10	3,249
KC-46A APU [e]											
Pounds per Hour	–	0.04	0.33	6.72	0.56	0.05	0.04	1,373	0.04	0.04	1,387

Table D.1-1. Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft (Continued)

Engine Type/ Throttle Setting	Fuel Flow (Pounds/ Hour)	Emission Factors (Pounds/1000 Pounds Fuel) [a b]									
		Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
CFM56-2B-1[c]											
Idle (7%)	1,014	0.0810	0.0537	0.2155	0.0311	0.0017	0.0015	0.0027	0.0025	0.0004	0.0019
Approach (30%)	2,463	0.0052	0.0019	0.0031	–	0.0000	0.0001	0.0004	0.0003	0.0001	0.0000
Climbout (85%)	6,486	0.0011	0.0003	0.0015	0.0001	0.0002	0.0002	0.0006	0.0005	0.0003	0.0001
Take-off (100%)	7,801	0.0010	0.0001	0.0008	–	0.0001	0.0001	0.0004	0.0008	0.0000	0.0000
55%	4,292	0.0033	0.0012	0.0024	0.0000	0.0001	0.0002	0.0005	0.0004	0.0002	0.0001
60%	4,658	0.0029	0.0010	0.0022	0.0001	0.0001	0.0002	0.0005	0.0004	0.0002	0.0001
P&W 4062[d]											
Idle (7%)	1,663	0.4808	0.3185	1.2789	0.1848	0.0100	0.0087	0.0162	0.0150	0.0025	0.0112
Approach (30%)	5,702	0.0058	0.0022	0.0035	–	0.0000	0.0001	0.0004	0.0004	0.0001	0.0001
Climbout (85%)	16,870	0.0015	0.0004	0.0021	0.0001	0.0003	0.0003	0.0009	0.0007	0.0005	0.0001
Take-off (100%)	21,622	0.0021	0.0002	0.0016	–	0.0002	0.0002	0.0008	0.0017	0.0001	0.0000
55%	10,778	0.0017	0.0005	0.0024	0.0002	0.0003	0.0003	0.0010	0.0008	0.0005	0.0001
60%	11,794	0.0017	0.0005	0.0024	0.0002	0.0003	0.0003	0.0010	0.0008	0.0005	0.0001
KC-46A APU [e]											
Pounds per Hour	–	0.0017	0.0011	0.0045	0.0006	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000

Table D.1-1. Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft (Continued)

Engine Type/ Throttle Setting	Fuel Flow (Pounds/ Hour)	Emission Factors (Pounds/1000 Pounds Fuel) [a b]										
		2,4-Dinitro-phenol	Di(2-Ethylhexyl) Phthalate (DEHP)	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	Methyl tert-Butyl Ether (MTBE)	Methylethyl benzene	Naphth-alene	Phenol
CFM56-2B-1[c]												
Idle (7%)	1,014	0.0008	0.0061	0.0354	0.8330	–	–	0.0259	–	–	0.0867	0.0436
Approach (30%)	2,463	0.0002	0.0007	0.0002	0.0378	–	–	0.0066	–	–	0.0004	0.0189
Climbout (85%)	6,486	0.0002	0.0015	0.0002	0.0127	–	–	0.0136	–	–	0.0002	0.0001
Take-off (100%)	7,801	–	0.0010	0.0001	0.0045	–	–	0.0154	–	–	0.0001	0.0000
55%	4,292	0.0002	0.0011	0.0002	0.0264	–	–	0.0098	–	–	0.0003	0.0103
60%	4,658	0.0002	0.0011	0.0002	0.0241	–	–	0.0104	–	–	0.0003	0.0086
P&W 4062[d]												
Idle (7%)	1,663	0.0050	0.0362	0.2098	4.9431	–	–	0.1536	–	–	0.5145	0.2585
Approach (30%)	5,702	0.0002	0.0008	0.0003	0.0426	–	–	0.0074	–	–	0.0004	0.0212
Climbout (85%)	16,870	0.0003	0.0020	0.0002	0.0178	–	–	0.0191	–	–	0.0003	0.0001
Take-off (100%)	21,622	–	0.0021	0.0002	0.0090	–	–	0.0308	–	–	0.0001	0.0000
55%	10,778	0.0004	0.0024	0.0003	0.0205	–	–	0.0221	–	–	0.0003	0.0001
60%	11,794	0.0004	0.0023	0.0003	0.0201	–	–	0.0216	–	–	0.0003	0.0001
KC-46A APU [e]												
Pounds per Hour	–	0.0000	0.0001	0.0007	0.0173	–	–	0.0005	–	–	0.0018	0.0009

Table D.1-1. Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft (Continued)

Engine Type/ Throttle Setting	Fuel Flow (Pounds/ Hour)	Emission Factors (Pounds/1000 Pounds Fuel) [a b]										
		Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
CFM56-2B-1[c]												
Idle (7%)	1,014	0.0362	0.0008	0.0459	0.0019	0.0021	0.1029	0.0015	–	0.0090	0.0673	0.0290
Approach (30%)	2,463	0.0023	–	0.0003	0.0001	0.0002	0.0011	0.0001	–	0.0002	0.0007	0.0002
Climbout (85%)	6,486	0.0044	–	0.0001	0.0001	0.0003	0.0009	0.0001	–	0.0004	0.0007	0.0001
Take-off (100%)	7,801	0.0079	–	0.0000	0.0000	0.0002	0.0004	0.0001	–	0.0007	0.0006	0.0001
55%	4,292	0.0032	–	0.0002	0.0001	0.0002	0.0010	0.0001	–	0.0003	0.0007	0.0002
60%	4,658	0.0034	–	0.0002	0.0001	0.0002	0.0010	0.0001	–	0.0003	0.0007	0.0002
P&W 4062[d]												
Idle (7%)	1,663	0.2148	0.0050	0.2723	0.0112	0.0125	0.6107	0.0087	–	0.0537	0.3996	0.1723
Approach (30%)	5,702	0.0025	–	0.0004	0.0001	0.0002	0.0012	0.0001	–	0.0002	0.0008	0.0003
Climbout (85%)	16,870	0.0061	–	0.0002	0.0002	0.0004	0.0013	0.0002	–	0.0006	0.0010	0.0002
Take-off (100%)	21,622	0.0158	–	0.0001	0.0001	0.0005	0.0008	0.0001	–	0.0014	0.0012	0.0003
55%	10,778	0.0071	–	0.0002	0.0002	0.0004	0.0015	0.0002	–	0.0007	0.0011	0.0002
60%	11,794	0.0069	–	0.0002	0.0002	0.0004	0.0015	0.0002	–	0.0007	0.0011	0.0002
KC-46A APU [e]												
Pounds per Hour	–	0.0008	0.0000	0.0010	0.0000	0.0000	0.0021	0.0000		0.0002	0.0014	0.0006

[a] Data are for 1 engine. The KC-135/KC-46A have 4/2 engines. VOC data estimated by multiplying THC source test data by 1.15 (USEPA and FAA 2009).

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 2-11 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Data are for the KC-135 aircraft. Criteria pollutant data from ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - ENGINE IDENTIFICATION: CFM56-2B-1 (ICAO 1987).

[d] ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - ENGINE IDENTIFICATION: PW4062 (ICAO 2013).

[e] The APU is a Honeywell 331-400C unit - Doug P. DuBois email of 4/26/13.

– = Source does not emit particular pollutant

Table D.1-2. Land and Take-off/Touch and Go Times in Modes and Fuel Usages - KC-135 and KC-46A Aircraft

Aircraft/Mode (Engine Throttle Setting)	Land and Take-Off			Touch and Go	
	Time in Mode (TIM)		Fuel Usage	TIM	Fuel Usage
	(Minutes)	(Hours)	(Pounds)[a]	(Hours)	(Pounds)[a]
KC-135[b]					
Taxi Out (Idle)	32.8	0.55	2,217	–	–
Take-off (Military)	0.7	0.01	364	0.01	364
Climbout (Intermediate)	1.6	0.03	692	0.03	692
Approach	5.2	0.09	854	0.09	854
Taxi In (Idle)	14.9	0.25	1,007	–	–
Totals	**55.2**	**0.92**	**5,134**	**0.13**	**1,910**
KC-46A[b]					
Taxi Out (Idle)	32.8	0.55	1,818	–	–
Take-off (Military)	0.7	0.01	505	0.01	505
Climbout (Intermediate)	1.6	0.03	900	0.03	900
Approach	5.2	0.09	988	0.09	988
Taxi In (Idle)	14.9	0.25	826	–	–
Totals	**55.2**	**0.92**	**5,037**	**0.13**	**2,393**

[a] Fuel usage per aircraft.

[b] TIM data from Table 2-4 (AFCEC 2014).

Table D.1-3. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft

Aircraft/ Mode	Fuel Usage (Pounds)	Emissions (Pounds)									
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Land and Take-Off											
KC-135	5,134	6.92	102.65	37.70	5.44	0.30	0.30	16,510	0.46	0.51	16,678
KC-46A	5,037	33.25	115.35	62.73	5.34	0.44	0.39	16,199	0.45	0.50	16,365
Touch and Go											
KC-135	1,910	0.14	3.68	24.81	2.02	0.11	0.11	6,142	0.17	0.19	6,205
KC-46A	2,393	0.22	2.67	52.74	2.54	0.15	0.13	7,695	0.21	0.24	7,773

Table D.1-3. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft (Continued)

Aircraft/ Mode	Fuel Usage (Pounds)	Emissions (Pounds)									
		Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Land and Take-Off											
KC-135	5,134	0.267	0.175	0.699	0.100	0.006	0.005	0.010	0.009	0.002	0.006
KC-46A	5,037	1.280	0.845	3.388	0.489	0.027	0.024	0.045	0.041	0.007	0.030
Touch and Go											
KC-135	1,910	0.006	0.002	0.004	0.000	0.000	0.000	0.001	0.001	0.000	0.000
KC-46A	2,393	0.008	0.003	0.006	0.000	0.000	0.000	0.002	0.002	0.001	0.000

Table D.1-3. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft (Continued)

Aircraft/ Mode	Fuel Usage (Pounds)	Emissions (Pounds)										
		2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Land and Take-Off												
KC-135	5,134	0.003	0.022	0.114	2.728	–	–	0.104	–	–	0.280	0.157
KC-46A	5,037	0.014	0.099	0.555	13.135	–	–	0.446	–	–	1.361	0.705
Touch and Go												
KC-135	1,910	0.000	0.002	0.000	0.043	–	–	0.021	–	–	0.001	0.016
KC-46A	2,393	0.001	0.004	0.001	0.063	–	–	0.040	–	–	0.001	0.021

Table D.1-3. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft (Continued)

Aircraft/ Mode	Fuel Usage (Pounds)	Emissions (Pounds)										
		Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Land and Take-Off												
KC-135	5,134	0.125	0.003	0.148	0.006	0.007	0.333	0.005	–	0.030	0.218	0.094
KC-46A	5,037	0.584	0.013	0.721	0.030	0.034	1.618	0.023	–	0.143	1.059	0.456
Touch and Go												
KC-135	1,909.829	0.008	–	0.000	0.000	0.000	0.002	0.000	–	0.001	0.001	0.000
KC-46A	2,393	0.016	–	0.001	0.000	0.001	0.003	0.000	–	0.001	0.002	0.001

– = Source does not emit particular pollutant

Table D.1-4. Annual Air Operations for Aircraft at Grissom ARB - KC-46A MOB 3 Mission Existing Conditions

Year/Aircraft	Number of Operations				
	LTO	TGO	LFB	LFP	Total
Year 2002 (1)					
KC-135	6,702	44,520	–	–	**95,742**
Transient	195	–	–	–	**195**
Totals	**3,403**	**768**	–	–	**4,171**
Year 2015 (2)					
KC-135	1,100	–	–	6,600	**7,700**
Transient	1,111	–	–	428	**1,539**
Civilian	2,309	–	–	–	**2,309**
Totals	**2,211**	–	–	**7,028**	**9,239**

Key: (1) Grissom AEI file page 112; (2) EIS Table 2-5.

Table D.1-5. 2015 Aircraft Closed Pattern Operations at Grissom ARB - KC-46A MOB 3 Mission Existing Conditions

Aircraft Type/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		55%	60%	Climbout	Takeoff	55%	60%	Climbout	Takeoff
KC-135									
Closed Pattern - Radar & Initial to Overhead	3,069	12.0	2.0	–	1.0	614	102	–	51
Closed Pattern - VFR	2,085	5.0	2.0	–	1.0	174	69	–	35
Closed Pattern - Tactical	1,446	8.0	2.0	2.0	1.0	193	48	48	24
Total TIMs - Hours						**980**	**220**	**48**	**110**

[a] Distribution of operations based on assumptions obtained during site survey 8 December 2015.

Table D.1-6. 2015 KC-135 Aircraft Existing Emissions for the 434 ARW at Grissom ARB - KC-46A MOB 3 Mission

Operation/Source	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
LTOs										
KC-135 Aircraft Operations	3.81	56.46	20.74	2.99	0.17	0.17	9,080	0.25	0.28	9,173
Subtotal - LTOs	**3.81**	**56.46**	**20.74**	**2.99**	**0.17**	**0.17**	**9,080**	**0.25**	**0.28**	**9,173**
Closed Patterns										
KC-135 - 55%	0.64	19.62	98.84	8.92	0.47	0.47	27,064	0.75	0.84	27,340
KC-135 - 60%	0.15	4.01	25.52	2.17	0.11	0.11	6,591	0.18	0.20	6,658
KC-135 - Climbout	0.04	0.06	10.01	0.66	0.03	0.03	2,011	0.06	0.06	2,032
KC-135 - Take-off	0.08	0.15	31.75	1.82	0.12	0.12	5,520	0.15	0.17	5,576
Subtotal - Closed Patterns	**0.91**	**23.85**	**166.12**	**13.57**	**0.73**	**0.73**	**41,185**	**1.14**	**1.28**	**41,606**
Total KC-135 Aircraft Operations	**4.71**	**80.30**	**186.86**	**16.57**	**0.90**	**0.90**	**50,266**	**1.39**	**1.56**	**50,779**

Table D.1-6. 2015 KC-135 Aircraft Existing Emissions for the 434 ARW at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Operation/Source	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butad-iene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
LTOs										
KC-135 Aircraft Operations	0.147	0.096	0.384	0.055	0.003	0.003	0.005	0.005	0.001	0.003
Subtotal - LTOs	**0.147**	**0.096**	**0.384**	**0.055**	**0.003**	**0.003**	**0.005**	**0.005**	**0.001**	**0.003**
Closed Patterns										
KC-135 - 55%	0.028	0.010	0.020	0.000	0.001	0.001	0.004	0.003	0.002	0.000
KC-135 - 60%	0.006	0.002	0.005	0.000	0.000	0.000	0.001	0.001	0.000	0.000
KC-135 - Climbout	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KC-135 - Take-off	0.002	0.000	0.001	–	0.000	0.000	0.001	0.001	0.000	0.000
Subtotal - Closed Patterns	**0.036**	**0.012**	**0.027**	**0.001**	**0.001**	**0.002**	**0.006**	**0.006**	**0.002**	**0.001**
Total KC-135 Aircraft Operations	**0.183**	**0.109**	**0.411**	**0.056**	**0.004**	**0.005**	**0.012**	**0.011**	**0.003**	**0.004**

Table D.1-6. 2015 KC-135 Aircraft Existing Emissions for the 434 ARW at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Operation/Source	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methyleth ylbenzene	Naphth-alene	Phenol
LTOs											
KC-135 Aircraft Operations	0.002	0.012	0.063	1.500	–	–	0.057	–	–	0.154	0.086
Subtotal - LTOs	**0.002**	**0.012**	**0.063**	**1.500**	–	–	0.06	–	–	**0.154**	**0.086**
Closed Patterns											
KC-135 - 55%	0.002	0.009	0.002	0.222	–	–	0.082	–	–	0.003	0.087
KC-135 - 60%	0.000	0.002	0.000	0.049	–	–	0.021	–	–	0.001	0.018
KC-135 - Climbout	0.000	0.001	0.000	0.008	–	–	0.009	–	–	0.000	0.000
KC-135 - Take-off	–	0.002	0.000	0.008	–	–	0.026	–	–	0.000	0.000
Subtotal - Closed Patterns	**0.002**	**0.014**	**0.002**	**0.287**	–	–	**0.139**	–	–	**0.003**	**0.105**
Total KC-135 Aircraft Operations	**0.004**	**0.026**	**0.065**	**1.788**	–	–	**0.196**	–	–	**0.157**	**0.191**

Table D.1-6. 2015 KC-135 Aircraft Existing Emissions for the 434 ARW at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Operation/Source	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
LTOs											
KC-135 Aircraft Operations	0.068	0.001	0.082	0.003	0.004	0.183	0.003	–	0.016	0.120	0.052
Subtotal - LTOs	**0.068**	**0.001**	**0.082**	**0.003**	**0.004**	**0.183**	**0.003**	**–**	**0.016**	**0.120**	**0.052**
Closed Patterns											
KC-135 - 55%	0.027	–	0.002	0.001	0.002	0.009	0.001	–	0.003	0.006	0.002
KC-135 - 60%	0.007	–	0.000	0.000	0.000	0.002	0.000	–	0.001	0.001	0.000
KC-135 - Climbout	0.003	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.000	0.000
KC-135 - Take-off	0.014	–	0.000	0.000	0.000	0.001	0.000	–	0.001	0.001	0.000
Subtotal - Closed Patterns	**0.050**	**–**	**0.002**	**0.001**	**0.003**	**0.012**	**0.001**	**–**	**0.005**	**0.009**	**0.002**
Total KC-135 Aircraft Operations	**0.119**	**0.001**	**0.084**	**0.005**	**0.007**	**0.195**	**0.004**	**–**	**0.021**	**0.129**	**0.054**

– = Source does not emit particular pollutant

Table D.1-7. KC-135 Aircraft On-Wing Engine Testing Activity Data for the 434 ARW at Grissom ARB - KC-46A MOB 3 Mission - 2015

Aircraft/Test Type	Tests/ Year	# of Engines	Duration (Minutes)	Engine Setting/Annual Engine Hours			
				Idle	Approach	Intermediate	Takeoff
KC-135 [a]							
60-HR INSPECTION	35	4	15	35.2	–	–	–
120-HR INSPECTION	35	4	15	35.2	–	–	–
Idle runs for maintenance	69	1	15	17.3	–	–	–
Idle runs for maintenance	55	2	15	27.7	–	–	–
Idle runs for maintenance	14	4	15	13.9	–	–	–
141 ARW EXPO SORTIE PREFLIGHT	237	4	10	158.1	–	–	–
141 ARW EXPO SORTIE POST-FLIGHT	237	4	6	94.8	–	–	–
DEFUELING	14	1	60	13.9	–	–	–
PREFLIGHT	548	4	10	365.2	–	–	–
P0STFLIGHT	548	2	5	91.3	–	–	–
HIGH POWER ENGINE RUNS	43	2	90	128.0	–	–	–
HIGH POWER ENGINE RUNS	43	2	15	–	21.3	–	–
HIGH POWER ENGINE RUNS	43	2	30	–	–	42.7	–
HIGH POWER ENGINE RUNS	43	2	15	–		–	21.3
Total TIMs - KC-135				**981**	**21**	**43**	**21**

[a] Fairchild baseline BaseOps-Aircraft Maintenance - Noise.pdf, then factored these data by 30 KC-135s stationed at FAFB by the 16 KC-135s at Grissom ARB.

Table D.1-8. Annual Air Emissions from KC-135 Aircraft On-Wing Engine Testing Activities for the 434 ARW at Grissom ARB - 2015

Aircraft/Throttle Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-135										
Idle	1.05	15.26	1.99	0.53	0.03	0.03	1,598	0.044	0.050	1,615
Approach	0.00	0.11	0.22	0.03	0.00	0.00	84	0.002	0.003	85
Intermediate	0.01	0.01	2.21	0.15	0.01	0.01	445	0.012	0.014	450
Military	0.00	0.01	1.54	0.09	0.01	0.01	268	0.007	0.008	270
Total Emissions - 2015	**1.06**	**15.39**	**5.96**	**0.79**	**0.04**	**0.04**	**2,396**	**0.07**	**0.07**	**2,420**

Table D.1-8. Annual Air Emissions from KC-135 Aircraft On-Wing Engine Testing Activities for the 434 ARW at Grissom ARB - 2015 (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons									
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dibutyl Phthalate	1,2-Dichloropropane
KC-135										
Idle	0.040	0.027	0.107	0.015	0.001	0.001	0.001	0.001	0.000	0.001
Approach	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Military	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions - 2015	**0.041**	**0.027**	**0.107**	**0.015**	**0.001**	**0.001**	**0.001**	**0.001**	**0.000**	**0.001**

Table D.1-8. Annual Air Emissions from KC-135 Aircraft On-Wing Engine Testing Activities for the 434 ARW at Grissom ARB - 2015 (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons										
	2,4-Dinitrophenol	DEHP	Ethylbenzene	Formaldehyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphthalene	Phenol
KC-135											
Idle	0.000	0.003	0.018	0.414	–	–	0.013	–	–	0.043	0.022
Approach	0.000	0.000	0.000	0.001	–	–	0.000	–	–	0.000	0.000
Intermediate	0.000	0.000	0.000	0.002	–	–	0.002	–	–	0.000	0.000
Military	–	0.000	0.000	0.000	–	–	0.001	–	–	0.000	0.000
Total Emissions - 2015	**0.000**	**0.003**	**0.018**	**0.417**	–	–	**0.016**	–	–	**0.043**	**0.022**

Table D.1-8. Annual Air Emissions from KC-135 Aircraft On-Wing Engine Testing Activities for the 434 ARW at Grissom ARB - 2015 (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-135											
Idle	0.018	0.000	0.023	0.001	0.001	0.051	0.001	–	0.004	0.033	0.014
Approach	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Intermediate	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Military	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Total Emissions - 2015	**0.019**	**0.000**	**0.023**	**0.001**	**0.001**	**0.051**	**0.001**	**–**	**0.005**	**0.034**	**0.014**

– = Source does not emit particular pollutant

Table D.1-9. 2014 AGE Usages for the KC-135R Detachment at Seymour Johnson AFB

Source	Fuel Type	Hp	Load Factor	Hours/Year	Annual Hp-Hours
Air Compressor - MC-2A	JP-8	10.5	0.48	60	302
Floodlight (FL-1D & NF2D & lightcart)	JP-8	10.5	0.74	100	777
Next Generation Heater (NGH)	JP-8	7.0	0.95	50	333
Subtotal - 7-11 Hp					**1,412**
Jacking Manifold	JP-8	30.0	0.51	100	1,530
Subtotal - 26-40 Hp					**1,530**
Air Compressor - MC20	JP-8	50.0	1.00	120	6,000
Nitrogen Servicing Cart	JP-8	49.0	0.51	200	4,998
Subtotal - 41-50 Hp					**10,998**
Air Compressor - MC-7	JP-8	52.0	0.48	150	3,744
Generator Set - A/M32A-86D	JP-8	96.5	0.95	750	68,742
Subtotal - 76-100 Hp					**72,486**
Air Conditioners - MA-3D	JP-8	120.0	0.28	150	5,040
Hyd Test Stand - MJ-2	JP-8	125.0	0.51	75	4,781
Start Cart - A/M32A-95	JP-8	155.0	0.95	40	5,890
Subtotal - 101-175 Hp					**15,711**

Note: These data used as surrogates for AGE usages for KC-135 and KC-46A aircraft at all proposed basing locations.
Source: Seymour Johnson AFB Mobile AEI APIMS Data Entry_8Oct15.xlsx 'GSE', but some Hp ratings obtained from 5-2014 Seymour Johnson AFB Mobile AEI Process Calc Summary.pdf

Table D.1-10. Nonroad Diesel Equipment Emission Factors for 2015 - Grissom ARB

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
Nonroad Equipment - 7-11 Hp	0.72	4.67	4.72	0.00	0.46	0.45	591	0.094	0.007	595
Nonroad Equipment - 26-40 Hp	0.49	2.16	4.29	0.00	0.35	0.34	634	0.094	0.007	638
Nonroad Equipment - 41-50 Hp	0.41	1.80	4.20	0.00	0.29	0.28	627	0.094	0.007	631
Nonroad Equipment - 76-100 Hp	0.69	4.23	3.82	0.00	0.61	0.59	644	0.094	0.007	648
Nonroad Equipment - 101-175 Hp	0.32	1.24	2.67	0.00	0.27	0.26	565	0.094	0.007	569

Table D.1-10. Nonroad Diesel Equipment Emission Factors for 2015 - Grissom ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
Nonroad Equipment - 7-11 Hp	0.086	0.010	0.105	0.004	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.059	0.007	0.072	0.003	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.049	0.006	0.059	0.002	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.082	0.010	0.100	0.004	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.039	0.005	0.047	0.002	–	–	–	–	–	–

Table D.1-10. Nonroad Diesel Equipment Emission Factors for 2015 - Grissom ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
Year 2015											
Nonroad Equipment - 7-11 Hp	–	–	–	0.132	–	–	–	–	–	0.009	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.091	–	–	–	–	–	0.006	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.075	–	–	–	–	–	0.005	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.126	–	–	–	–	–	0.009	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.059	–	–	–	–	–	0.004	–

Table D.1-10. Nonroad Diesel Equipment Emission Factors for 2015 - Grissom ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
Nonroad Equipment - 7-11 Hp	–	0.001	–	–	–	0.046	–	–	–	–	0.032
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.031	–	–	–	–	0.022
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.026	–	–	–	–	0.018
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.044	–	–	–	–	0.030
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.021	–	–	–	–	0.014

[a] Criteria pollutant factors estimated with the use of the USEPA NONROAD2008a model for Miami County, IN.

[b] HAPs factors estimated with VOC speciation data presented in Table 4-3 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.1-11. Annual Air Emissions for AGE Usages from Existing KC-135 Aircraft at Grissom ARB - KC-46A MOB 3 Mission

Year/HP Category	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 [a]										
Nonroad Equipment - 7-11 Hp	0.00	0.01	0.01	0.00	0.00	0.00	0.92	0.00	0.00	0.93
Nonroad Equipment - 26-40 Hp	0.00	0.00	0.01	0.00	0.00	0.00	1.07	0.00	0.00	1.08
Nonroad Equipment - 41-50 Hp	0.00	0.02	0.05	0.00	0.00	0.00	7.60	0.00	0.00	7.65
Nonroad Equipment - 76-100 Hp	0.05	0.34	0.31	0.00	0.05	0.05	51.42	0.01	0.00	51.75
Nonroad Equipment - 101-175 Hp	0.01	0.02	0.05	0.00	0.00	0.00	9.79	0.00	0.00	9.86
Total - Year 2015	**0.07**	**0.39**	**0.42**	**0.00**	**0.06**	**0.06**	**70.81**	**0.01**	**0.00**	**71.26**

Table D.1-11. Annual Air Emissions for AGE Usages from Existing KC-135 Aircraft at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 [a]										
Nonroad Equipment - 7-11 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.001	0.000	0.001	0.000	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.007	0.001	0.008	0.000	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.001	0.000	0.001	0.000	–	–	–	–	–	–
Total - Year 2015	**0.008**	**0.001**	**0.010**	**0.000**	–	–	–	–	–	–

Table D.1-11. Annual Air Emissions for AGE Usages from Existing KC-135 Aircraft at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
Year 2015 [a]											
Nonroad Equipment - 7-11 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.010	–	–	–	–	–	0.001	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Total - Year 2015	–	–	–	**0.012**	–	–	–	–	–	**0.001**	–

Table D.1-11. Annual Air Emissions for AGE Usages from Existing KC-135 Aircraft at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 [a]											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.003	–	–	–	–	0.002
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Total - Year 2015	–	**0.000**	–	–	–	**0.004**	–	–	–	–	**0.003**

[a] 2014 Seymour Johnson AFB AGE hp-hr * (2015 Grissom ARB KC-135 LTOs [1,100] / 2014 Seymour Johnson AFB KC-135 LTOs [1,100]) * (2015 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.1-12. KC-46A Aircraft Operations at Grissom ARB - KC-46A MOB 3 Mission

Scenario/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		Idle	Approach	Climbout	Takeoff	Idle	Approach	Climbout	Takeoff
Landings and Take-offs									
Landings and Take-offs	1,219	47.7	5.2	1.6	0.7	969	106	33	14
Scenario/Operation	**Operations/ Year [b]**	**Engine Setting/Time in Mode per Operation (Minutes)**				**Engine Setting Annual Hours**			
		55%	**60%**	**Climbout**	**Takeoff**	**55%**	**60%**	**Climbout**	**Takeoff**
Closed Patterns									
Closed Pattern - Radar & Initial to Overhead	2,226	12.0	2.0	–	1.0	445	74	–	37
Closed Pattern - VFR	1,512	5.0	2.0	–	1.0	126	50	–	25
Closed Pattern - Tactical	1,049	8.0	2.0	2.0	1.0	140	35	35	17
Total TIMs - KC-46A MOB 3						**711**	**160**	**35**	**80**

[a] Source: EIS Table 2-13.

[b] EIS Table 2-13 and KC-46 MOB CP Ops Data for Emissions.xlsx. Closed Pattern - Tactical ops reduced by 7.5% to reflect amount of time above 3,000' AGL.

Table D.1-13. APU Usage per LTO for the KC-46A Aircraft

Equipment Type/Mode	Hours/Mode
APU	
Pre-Flight - OBIGGS + Electric + Maximum ECS	1.50
Pre-Flight - Main Engine Start + Electric	0.03
Post-Flight - Electric + Minimum ECS	0.58
Total Hours per LTO	**2.12**

Source: Doug P. DuBois email of 4/4/13 (in my 4/8 email)

Table D.1-14. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Grissom ARB - MOB 3 Mission 2019

Operation/Engine Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Landings and Take-offs										
Idle	20.13	68.68	6.09	1.71	0.18	0.16	5,184	0.14	0.16	5,237
Approach	0.06	1.16	7.33	0.64	0.03	0.02	1,937	0.05	0.06	1,957
Climbout	0.04	0.27	14.25	0.58	0.04	0.03	1,764	0.05	0.05	1,782
Take-off	0.03	0.19	10.57	0.33	0.02	0.02	989	0.03	0.03	999
APU	0.06	0.43	8.67	0.73	0.06	0.06	1,771	0.05	0.06	1,789
Subtotal MOB 3 LTOs	**20.32**	**70.73**	**46.91**	**3.98**	**0.33**	**0.30**	**11,645**	**0.32**	**0.36**	**11,764**
Closed Patterns										
55%	0.71	9.81	141.38	8.12	0.45	0.38	24,648	0.68	0.77	24,900
60%	0.17	2.16	37.08	1.99	0.11	0.10	6,052	0.17	0.19	6,114
Climbout	0.05	0.29	15.32	0.63	0.04	0.04	1,897	0.05	0.06	1,916
Take-off	0.16	1.05	59.27	1.83	0.14	0.12	5,548	0.15	0.17	5,604
Subtotal Closed Patterns	**1.09**	**13.32**	**253.06**	**12.57**	**0.75**	**0.63**	**38,145**	**1.06**	**1.19**	**38,534**
Total MOB 3 Operations	**21.41**	**84.06**	**299.96**	**16.55**	**1.08**	**0.92**	**49,789**	**1.38**	**1.55**	**50,298**

Table D.1-14. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Grissom ARB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Landings and Take-offs										
Idle	0.775	0.513	2.061	0.298	0.016	0.014	0.026	0.024	0.004	0.018
Approach	0.004	0.001	0.002	–	0.000	0.000	0.000	0.000	0.000	0.000
Climbout	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Take-off	0.001	0.000	0.000	–	0.000	0.000	0.000	0.001	0.000	0.000
APU	0.002	0.001	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal MOB 3 LTOs	**0.782**	**0.516**	**2.071**	**0.299**	**0.016**	**0.014**	**0.027**	**0.025**	**0.004**	**0.018**
Closed Patterns										
55%	0.013	0.004	0.019	0.001	0.002	0.002	0.008	0.006	0.004	0.001
60%	0.003	0.001	0.004	0.000	0.001	0.001	0.002	0.001	0.001	0.000
Climbout	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Take-off	0.004	0.000	0.003	–	0.000	0.000	0.001	0.003	0.000	0.000
Subtotal Closed Patterns	**0.021**	**0.005**	**0.027**	**0.002**	**0.004**	**0.003**	**0.012**	**0.011**	**0.005**	**0.001**
Total MOB 3 Operations	**0.803**	**0.521**	**2.098**	**0.300**	**0.020**	**0.018**	**0.039**	**0.036**	**0.010**	**0.019**

Table D.1-14. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Grissom ARB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Landings and Take-offs											
Idle	0.008	0.058	0.338	7.967	–	–	0.248	–	–	0.829	0.417
Approach	0.000	0.000	0.000	0.026	–	–	0.004	–	–	0.000	0.013
Climbout	0.000	0.001	0.000	0.010	–	–	0.010	–	–	0.000	0.000
Take-off	–	0.001	0.000	0.003	–	–	0.009	–	–	0.000	0.000
APU	0.000	0.000	0.001	0.022	–	–	0.001	–	–	0.002	0.001
Subtotal MOB 3 LTOs	**0.008**	**0.061**	**0.339**	**8.028**	–	–	**0.273**	–	–	**0.832**	**0.431**
Closed Patterns											
55%	0.003	0.018	0.002	0.157	–	–	0.169	–	–	0.003	0.001
60%	0.001	0.004	0.000	0.038	–	–	0.041	–	–	0.001	0.000
Climbout	0.000	0.001	0.000	0.010	–	–	0.011	–	–	0.000	0.000
Take-off	–	0.004	0.000	0.016	–	–	0.053	–	–	0.000	0.000
Subtotal Closed Patterns	**0.004**	**0.027**	**0.003**	**0.221**	–	–	**0.274**	–	–	**0.004**	**0.001**
Total MOB 3 Operations	**0.012**	**0.088**	**0.342**	**8.249**	–	–	**0.547**	–	–	**0.836**	**0.432**

Table D.1-14. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Grissom ARB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Landings and Take-offs											
Idle	0.346	0.008	0.439	0.018	0.020	0.984	0.014	–	0.087	0.644	0.278
Approach	0.002	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Climbout	0.003	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Take-off	0.005	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.001	0.000	0.001	0.000	0.000	0.003	0.000	–	0.000	0.002	0.001
Subtotal MOB 3 LTOs	**0.357**	**0.008**	**0.440**	**0.018**	**0.021**	**0.989**	**0.014**	–	**0.088**	**0.647**	**0.279**
Closed Patterns											
55%	0.054	–	0.001	0.002	0.003	0.011	0.002	–	0.005	0.009	0.002
60%	0.013	–	0.000	0.000	0.001	0.003	0.000	–	0.001	0.002	0.000
Climbout	0.004	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Take-off	0.027	–	0.000	0.000	0.001	0.001	0.000	–	0.002	0.002	0.000
Subtotal Closed Patterns	**0.098**	–	**0.002**	**0.002**	**0.005**	**0.016**	**0.003**	–	**0.009**	**0.013**	**0.003**
Total MOB 3 Operations	**0.455**	**0.008**	**0.442**	**0.020**	**0.026**	**1.005**	**0.017**	–	**0.097**	**0.661**	**0.282**

– = Source does not emit particular pollutant

Table D.1-15. KC-46A Aircraft On-Wing Engine Testing Activity Data for Grissom ARB - KC-46A MOB 3 Mission

Aircraft/Test Type	Tests/ Year	# of Engines	Duration (Minutes)	Engine Setting/Annual Engine Hours			
				Idle	Approach	Intermediate	Takeoff
KC-46A - MOB 3[b]							
Leak Checks/Troubleshooting	208	2	45	312.0	–	–	–
Fuel Transfer	69	1	80	92.4	–	–	–
Troubleshooting - High Power	35	1	40	11.6	2.9	2.9	5.8
Troubleshooting - High Power	35	2	15	17.3	–	–	–
Engine Trims	4	1	40	1.3	0.3	0.3	0.7
Engine Trims	4	2	10	1.3	–	–	–
ISO Runs	12	2	35	14.0	–	–	–
Backline Runs	12	2	69	465.8	6.9		10.4
Post ISO Runs	12	2	55	192.5	–	–	11.0
Total TIMs - KC-46A MOB 3				**1,108**	**10**	**3**	**28**

[a] Altus FTU BaseOps-Aircraft Maintenance-Noise.pdf (April 16, 2013).

[b] Altus MOB BaseOps-Aircraft Maintenance-Noise.pdf (April 16, 2013).

[c] The APU operates for the same amount of time as the main engines during testing activities.

Table D.1-16. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Grissom ARB - KC-46A MOB 3 Mission

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-46A - MOB 3										
Idle	11.51	39.27	3.48	0.98	0.10	0.09	2,964	0.08	0.09	2,994
Approach	0.00	0.06	0.35	0.03	0.00	0.00	93	0.00	0.00	94
Intermediate	0.00	0.01	0.71	0.03	0.00	0.00	87	0.00	0.00	88
Military	0.03	0.18	10.32	0.32	0.02	0.02	966	0.03	0.03	976
APU	0.03	0.19	3.86	0.32	0.03	0.02	789	0.02	0.02	797
Total KC-46A MOB 3	**11.57**	**39.71**	**18.73**	**1.68**	**0.16**	**0.14**	**4,899**	**0.14**	**0.15**	**4,950**

Table D.1-16. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-46A - MOB 3										
Idle	0.443	0.294	1.179	0.170	0.009	0.008	0.015	0.014	0.002	0.010
Approach	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Military	0.001	0.000	0.000	–	0.000	0.000	0.000	0.001	0.000	0.000
APU	0.001	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total KC-46A MOB 3	**0.445**	**0.294**	**1.182**	**0.171**	**0.009**	**0.008**	**0.015**	**0.014**	**0.002**	**0.010**

Table D.1-16. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
KC-46A - MOB 3											
Idle	0.005	0.033	0.193	4.556	–	–	0.142	–	–	0.474	0.238
Approach	0.000	0.000	0.000	0.001	–	–	0.000	–	–	0.000	0.001
Intermediate	0.000	0.000	0.000	0.000	–	–	0.001	–	–	0.000	0.000
Military	–	0.001	0.000	0.003	–	–	0.009	–	–	0.000	0.000
APU	0.000	0.000	0.000	0.010	–	–	0.000	–	–	0.001	0.001
Total KC-46A MOB 3	**0.005**	**0.034**	**0.194**	**4.570**	–	–	**0.152**	–	–	**0.475**	**0.239**

Table D.1-16. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-46A - MOB 3											
Idle	0.198	0.005	0.251	0.010	0.012	0.563	0.008	–	0.049	0.368	0.159
Approach	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Intermediate	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Military	0.005	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.000	0.000	0.001	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Total KC-46A MOB 3	**0.203**	**0.005**	**0.252**	**0.010**	**0.012**	**0.564**	**0.008**	–	**0.050**	**0.370**	**0.159**

– = Source does not emit particular pollutant

Table D.1-17. Nonroad Diesel Equipment Emission Factors for 2019 - Grissom ARB

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019										
Nonroad Equipment - 7-11 Hp	0.67	4.56	4.48	0.00	0.40	0.39	591	0.094	0.007	595
Nonroad Equipment - 26-40 Hp	0.30	1.17	3.60	0.00	0.18	0.18	634	0.094	0.007	638
Nonroad Equipment - 41-50 Hp	0.25	0.91	3.49	0.00	0.14	0.13	628	0.094	0.007	632
Nonroad Equipment - 76-100 Hp	0.49	2.94	2.52	0.00	0.40	0.39	644	0.094	0.007	648
Nonroad Equipment - 101-175 Hp	0.25	0.70	1.48	0.00	0.15	0.14	566	0.094	0.007	570

Table D.1-17. Nonroad Diesel Equipment Emission Factors for 2019 - Grissom ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019										
Nonroad Equipment - 7-11 Hp	0.079	0.010	0.097	0.004	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.036	0.004	0.043	0.002	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.030	0.004	0.037	0.002	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.058	0.007	0.071	0.003	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.030	0.004	0.036	0.002	–	–	–	–	–	–

Table D.1-17. Nonroad Diesel Equipment Emission Factors for 2019 - Grissom ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methyleth ylbenzene	Naphth-alene	Phenol
Year 2019											
Nonroad Equipment - 7-11 Hp	–	–	–	0.122	–	–	–	–	–	0.001	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.055	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.090	–	–	–	–	–	0.001	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–

Table D.1-17. Nonroad Diesel Equipment Emission Factors for 2019 - Grissom ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.042	–	–	–	–	0.030
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.019	–	–	–	–	0.013
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.031	–	–	–	–	0.022
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011

[a] Criteria pollutant factors estimated with the use of the USEPA NONROAD2008a model for Miami County, IN.

[b] HAPs factors estimated with VOC speciation data presented in Table 4-3 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.1-18. Annual Air Emissions for AGE Usages from KC-46A Aircraft at Grissom ARB - KC-46A MOB 3 Mission

Year/HP Category	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.00	0.01	0.01	0.00	0.00	0.00	1.02	0.00	0.00	1.03
Nonroad Equipment - 26-40 Hp	0.00	0.00	0.01	0.00	0.00	0.00	1.19	0.00	0.00	1.19
Nonroad Equipment - 41-50 Hp	0.00	0.01	0.05	0.00	0.00	0.00	8.43	0.00	0.00	8.49
Nonroad Equipment - 76-100 Hp	0.04	0.26	0.22	0.00	0.04	0.03	57.04	0.01	0.00	57.40
Nonroad Equipment - 101-175 Hp	0.00	0.01	0.03	0.00	0.00	0.00	10.85	0.00	0.00	10.93
Total - Year 2019	**0.05**	**0.30**	**0.31**	**0.00**	**0.04**	**0.04**	**78.53**	**0.01**	**0.00**	**79.03**

Table D.1-18. Annual Air Emissions for AGE Usages from KC-46A Aircraft at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.005	0.001	0.006	0.000	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.001	0.000	0.001	0.000	–	–	–	–	–	–
Total - Year 2019	**0.006**	**0.001**	**0.008**	**0.000**	–	–	–	–	–	–

Table D.1-18. Annual Air Emissions for AGE Usages from KC-46A Aircraft at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methyleth ylbenzene	Naphth-alene	Phenol
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.008	–	–	–	–	–	0.000	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Total - Year 2019	–	–	–	**0.010**	–	–	–	–	–	**0.000**	–

Table D.1-18. Annual Air Emissions for AGE Usages from KC-46A Aircraft at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.003	–	–	–	–	0.002
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Total - Year 2019	–	**0.000**	–	–	–	**0.003**	–	–	–	–	**0.002**

[a] 2014 Seymour Johnson AFB AGE hp-hr * (2019 Grissom ARB MOB 3 KC-46A LTOs [1,219] / 2014 Seymour Johnson AFB KC-135 LTOs [1,100]) * (2019 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.1-19. Annual Vehicle Miles Travelled (VMT) for GOVs - Grissom ARB 2002

Vehicle Class	Annual VMT
LDGV	85,593
LDGT1	55,346
LDGT2	107,836
LDDT	66,150
HDDV	47,060
Total VMT	**361,985**

Source: 2002 Grissom ARB AEI Table CC-7.

Table D.1-20. Annual Number of Workers at Grissom ARB - KC-46A MOB 3 Mission

Scenario	Total Base Workers	434 ARW Staff Year 2015	MOB 3 Staff
Year 2002 [a]	1,952	–	–
Year 2015 434 ARW [b]	–	1,715	–
Year 2019 MOB 3 [b]	–	–	1,770

[a] Source: 2002 Grissom ARB AEI.

[b] Source: # of Workers from EIS Table 2-4.

Table D.1-21. Annual Average On-Road Vehicle Emission Factors for GOVs - Grissom ARB KC-46A MOB 3 Mission

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.06	2.12	0.28	0.01	0.05	0.01	283	–	–	283
LDGT1 - 25 mph	0.26	5.78	0.92	0.01	0.06	0.02	395	–	–	395
LDGT2 - 25 mph	0.23	5.49	0.89	0.01	0.06	0.01	393	–	–	393
LDDT - 25 mph	0.25	2.20	1.29	0.00	0.12	0.07	518	–	–	518
HDDV - 25 mph	0.41	1.79	6.29	0.01	0.52	0.29	1,546	–	–	1,546
Year 2019										
LDGV - 25 mph	0.03	2.24	0.14	0.00	0.07	0.01	347	–	–	347
LDGT1 - 25 mph	0.13	5.98	0.48	0.00	0.08	0.02	499	–	–	499
LDGT2 - 25 mph	0.12	5.83	0.45	0.00	0.08	0.02	496	–	–	496
LDDT - 25 mph	0.17	2.05	1.07	0.01	0.12	0.05	636	–	–	636
HDDV - 25 mph	0.27	1.31	4.52	0.02	0.49	0.20	2,020	–	–	2,020

Table D.1-21. Annual Average On-Road Vehicle Emission Factors for GOVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.036	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.004	0.001	0.144	0.002	–	–	–	–	–	–
LDGT2 - 25 mph	0.004	0.001	0.131	0.001	–	–	–	–	–	–
LDDT - 25 mph	–	–	0.072	0.004	–	–	–	–	–	–
HDDV - 25 mph	–	–	–	–	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.017	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.002	0.001	0.072	0.001	–	–	–	–	–	–
LDGT2 - 25 mph	0.002	0.000	0.066	0.001	–	–	–	–	–	–
LDDT - 25 mph	–	–	0.048	0.002	–	–	–	–	–	–
HDDV - 25 mph	–	–	–	–	–	–	–	–	–	–

Table D.1-21. Annual Average On-Road Vehicle Emission Factors for GOVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.006	0.009	0.005	–	–	0.000	0.000	0.000	–
LDGT2 - 25 mph	–	–	0.005	0.008	0.004	–	–	0.000	0.000	0.000	–
LDDT - 25 mph	–	–	0.001	–	0.000	–	–	–	0.002	–	–
HDDV - 25 mph	–	–	0.005	–	0.010	–	–	–	0.010	–	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
LDGT2 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
LDDT - 25 mph	–	–	0.001	–	0.000	–	–	–	0.001	–	–
HDDV - 25 mph	–	–	0.004	–	0.007	–	–	–	0.007	–	–

Table D.1-21. Annual Average On-Road Vehicle Emission Factors for GOVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.007	–	0.001	–	–	0.006
LDGT1 - 25 mph	–	–	0.000	–	–	0.004	–	0.010	–	–	0.021
LDGT2 - 25 mph	–	–	0.000	–	–	0.004	–	0.009	–	–	0.019
LDDT - 25 mph	–	–	–	–	–	0.005	–	0.000	–	–	0.005
HDDV - 25 mph	–	–	0.008	–	–	–	–	0.000	–	–	–
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGT1 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
LDGT2 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.010
LDDT - 25 mph	–	–	–	–	–	0.003	–	0.000	–	–	0.003
HDDV - 25 mph	–	–	0.006	–	–	–	–	0.000	–	–	–

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Miami County, IN.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.1-22. Annual Emissions from GOV Activities - Grissom ARB KC-46A MOB 3 Mission

Scenario/Vehicle Class	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 434 ARW [a]										
LDGV	0.01	0.18	0.02	0.00	0.00	0.00	23.43	–	–	23.43
LDGT	0.01	0.31	0.05	0.00	0.00	0.00	21.18	–	–	21.18
HDGV	0.02	0.57	0.09	0.00	0.01	0.00	41.01	–	–	41.01
HDDV	0.02	0.14	0.08	0.00	0.01	0.00	33.16	–	–	33.16
Total - Year 2015	**0.06**	**1.20**	**0.25**	**0.00**	**0.02**	**0.01**	**118.77**	–	–	**118.77**
Year 2019 MOB 3 [b]										
LDGV	0.00	0.19	0.01	0.00	0.01	0.00	29.71	–	–	29.71
LDGT	0.01	0.33	0.03	0.00	0.00	0.00	27.63	–	–	27.63
HDGV	0.01	0.63	0.05	0.00	0.01	0.00	53.48	–	–	53.48
HDDV	0.01	0.14	0.07	0.00	0.01	0.00	42.08	–	–	42.08
Total - Year 2019	**0.03**	**1.29**	**0.16**	**0.00**	**0.03**	**0.01**	**152.89**	–	–	**152.89**

Table D.1-22. Annual Emissions from GOV Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 434 ARW [a]										
LDGV	0.000	0.000	0.003	0.000	–	–	–	–	–	–
LDGT	0.000	0.000	0.008	0.000	–	–	–	–	–	–
HDGV	0.000	0.000	0.014	0.000	–	–	–	–	–	–
HDDV	–	–	0.005	0.000	–	–	–	–	–	–
Total - Year 2015	**0.001**	**0.000**	**0.029**	**0.000**	–	–	–	–	–	–
Year 2019 MOB 3 [b]										
LDGV	0.000	0.000	0.001	0.000	–	–	–	–	–	–
LDGT	0.000	0.000	0.004	0.000	–	–	–	–	–	–
HDGV	0.000	0.000	0.007	0.000	–	–	–	–	–	–
HDDV	–	–	0.003	0.000	–	–	–	–	–	–
Total - Year 2015	**0.000**	**0.000**	**0.016**	**0.000**	–	–	–	–	–	–

Table D.1-22. Annual Emissions from GOV Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methyleth ylbenzene	Naphth-alene	Phenol
Year 2015 434 ARW [a]											
LDGV	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
HDGV	–	–	0.001	0.001	0.000	–	–	0.000	0.000	0.000	–
HDDV	–	–	0.000		0.000	–	–	–	0.000	–	–
Total - Year 2015	–	–	**0.001**	**0.001**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–
Year 2019 MOB 3 [b]											
LDGV	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
HDGV	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
HDDV	–	–	0.000		0.000	–	–	–	0.000	–	–
Total - Year 2015	–	–	**0.001**	**0.001**	**0.000**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.1-22. Annual Emissions from GOV Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 434 ARW [a]											
LDGV	–	–	0.000	–	–	0.001	–	0.000	–	–	0.000
LDGT	–	–	0.000	–	–	0.000	–	0.001	–	–	0.001
HDGV	–	–	0.000	–	–	0.000	–	0.001	–	–	0.002
HDDV	–	–	–	–	–	0.000	–	0.000	–	–	0.000
Total - Year 2015	–	–	**0.000**	–	–	**0.002**	–	**0.002**	–	–	**0.004**
Year 2019 MOB 3 [b]											
LDGV	–	–	0.000	–	–	0.000	–	0.000	–	–	0.000
LDGT	–	–	0.000	–	–	0.000	–	0.000	–	–	0.001
HDGV	–	–	0.000	–	–	0.000	–	0.001	–	–	0.001
HDDV	–	–	–	–	–	0.000	–	0.000	–	–	0.000
Total - Year 2015	–	–	**0.000**	–	–	**0.001**	–	**0.001**	–	–	**0.002**

[a] 2015 emissions = 2002 GOV VMT * (2015 Grissom ARB worker population/2002 Grissom ARB worker population) * 2015 vehicle emission factors.

[b] 2019 emissions = 2002 GOV VMT * (2019 Grissom ARB worker population/2002 Grissom ARB worker population) * 2019 vehicle emission factors.

– = Source does not emit particular pollutant

Table D.1-23. Annual On-Base On-Road Vehicle Mileage Calculations - Grissom ARB KC-46A MOB 3 Mission

Scenario/ Staff Type	# of Workers [b]	Vehicle Occupancy Rate	On-Base Miles per Round Trip [a]	Days per Year [a]	On-Base Miles per year
Year 2002 [a]					
Onbase Personnel	511	1.0	2.0	250	255,500
Reservists Near	725	1.0	2.0	24	34,800
Reservists Far	598	1.0	2.0	12	14,352
Contractors and Vendors	50	1.0	3.0	247	37,050
Total Onbase VMT - Year 2002					**341,702**
Year 2015 434 ARW [a]					
Onbase Personnel	293	1.0	2.0	250	146,500
Reservists Near	719	1.0	2.0	24	34,511
Reservists Far	593	1.0	2.0	12	14,233
Contractors and Vendors	110	1.0	3.0	247	81,510
Total Onbase VMT - Year 2015					**276,753**
Year 2019 MOB 3 [a]					
Onbase Personnel	450	1.0	2.0	250	225,000
Reservists Near	655	1.0	2.0	24	31,433
Reservists Far	540	1.0	2.0	12	12,963
Contractors and Vendors	125	1.0	3.0	247	92,625
Total Onbase VMT - Year 2019					**362,022**

[a] Source: 2002 Grissom ARB AEI.

[b] Source: # of Workers from EIS Table 2-4.

Table D.1-24. Annual Average On-Road Vehicle Emission Factors for On-Base POVs - Grissom ARB KC-46A MOB 3 Mission

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.06	2.12	0.28	0.01	0.05	0.01	283	–	–	283
LDGT1 - 25 mph	0.26	5.78	0.92	0.01	0.06	0.02	395	–	–	395
Composite [c]	**0.13**	**3.48**	**0.52**	**0.01**	**0.06**	**0.01**	**324**	–	–	**324**
Year 2019										
LDGV - 25 mph	0.03	2.24	0.14	0.00	0.07	0.01	347	–	–	347
LDGT1 - 25 mph	0.13	5.98	0.48	0.00	0.08	0.02	499	–	–	499
Composite [c]	**0.07**	**3.62**	**0.26**	**0.00**	**0.07**	**0.02**	**404**	–	–	**404**

Table D.1-24. Annual Average On-Road Vehicle Emission Factors for On-Base POVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.036	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.004	0.001	0.144	0.002	–	–	–	–	–	–
Composite [c]	**0.002**	**0.000**	**0.076**	**0.001**	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.017	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.002	0.001	0.072	0.001	–	–	–	–	–	–
Composite [c]	**0.001**	**0.000**	**0.038**	**0.000**	–	–	–	–	–	–

Table D.1-24. Annual Average On-Road Vehicle Emission Factors for On-Base POVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.006	0.009	0.005	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.003**	**0.004**	**0.002**	–	–	**0.000**	**0.000**	**0.000**	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.002**	**0.002**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.1-24. Annual Average On-Road Vehicle Emission Factors for On-Base POVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.007	–	0.001	–	–	0.006
LDGT1 - 25 mph	–	–	0.000	–	–	0.004	–	0.010	–	–	0.021
Composite [c]	–	–	**0.000**	–	–	**0.006**	–	**0.005**	–	–	**0.011**
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGT1 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
Composite [c]	–	–	**0.000**	–	–	**0.003**	–	**0.002**	–	–	**0.006**

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Miami County, IN.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Equal to 63/37% LDGV/LDGT1 and based on 2002 Grissom ARB AEI vehicle fleet mix.

Table D.1-25. Annual Emissions from On-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 434 ARW [a]	0.04	1.06	0.16	0.00	0.02	0.00	98.91	–	–	98.91
Year 2019 MOB 3 [b]	0.03	1.45	0.11	0.00	0.03	0.01	161.04	–	–	161.04

Table D.1-25. Annual Emissions from On-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 434 ARW [a]	0.001	0.000	0.023	0.000	–	–	–	–	–	–
Year 2019 MOB 3 [b]	0.000	0.000	0.015	0.000	–	–	–	–	–	–

Table D.1-25. Annual Emissions from On-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methyleth ylbenzene	Naphth-alene	Phenol
Year 2015 434 ARW [a]	–	–	0.001	0.001	0.001	–	–	0.000	0.000	0.000	–
Year 2019 MOB 3 [b]	–	–	0.001	0.001	0.000	–	–	0.000	0.000	0.000	–

Table D.1-25. Annual Emissions from On-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 434 ARW [a]	–	–	0.000	–	–	0.002	–	0.001	–	–	0.003
Year 2019 MOB 3 [b]	–	–	0.000	–	–	0.001	–	0.001	–	–	0.002

[a] 2015 emissions = 2015 Total On-base VMT * 2015 composite emission factors.

[b] 2019 emissions = 2019 Total On-base VMT * 2019 composite emission factors.

– = Source does not emit particular pollutant

Table D.1-26. Annual Off-Base On-Road Vehicle Mileage Calculations - Grissom ARB KC-46A MOB 3 Mission

Scenario/ Staff Type	# of Workers [b]	Vehicle Occupancy Rate	Off-Base Miles per Round Trip [a]	Days per Year [a]	Off-Base Miles per year
Year 2002 [a]					
Onbase Personnel	511	1.0	27.3	250	3,487,575
Reservists Near	725	1.0	41.4	24	720,360
Reservists Far	598	1.0	98.7	12	708,271
Contractors and Vendors	50	1.0		247	
Total Onbase VMT - Year 2002					**4,916,206**
Year 2015 434 ARW [a]					
Onbase Personnel	293	1.0	2.0	250	1,999,725
Reservists Near	719	1.0	2.0	24	714,371
Reservists Far	593	1.0	2.0	12	702,382
Contractors and Vendors	110	1.0	3.0	247	
Total Onbase VMT - Year 2015					**3,416,478**
Year 2019 MOB 3 [a]					
Onbase Personnel	450	1.0	2.0	250	3,071,250
Reservists Near	655	1.0	2.0	24	650,665
Reservists Far	540	1.0	2.0	12	639,746
Contractors and Vendors	125	1.0	3.0	247	
Total Onbase VMT - Year 2019					**4,361,661**

[a] Source: 2002 Grissom ARB AEI.

[b] Source: # of Workers from EIS Table 2-4.

Table D.1-27. Annual Average On-Road Vehicle Emission Factors for Off-Base POVs - Grissom ARB KC-46A MOB 3 Mission

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.06	2.12	0.28	0.01	0.05	0.01	283	–	–	283
LDGV - 55 mph	0.04	1.78	0.27	0.00	0.02	0.01	222	–	–	222
LDGT1 - 25 mph	0.26	5.78	0.92	0.01	0.06	0.02	395	–	–	395
LDGT1 - 55 mph	0.11	4.77	0.94	0.01	0.02	0.01	321	–	–	321
Composite [c]	**0.08**	**3.03**	**0.52**	**0.01**	**0.03**	**0.01**	**275**	–	–	**275**
Year 2019										
LDGV - 25 mph	0.03	2.24	0.14	0.00	0.07	0.01	347	–	–	347
LDGV - 55 mph	0.02	1.95	0.14	0.00	0.02	0.01	272	–	–	272
LDGT1 - 25 mph	0.13	5.98	0.48	0.00	0.08	0.02	499	–	–	499
LDGT1 - 55 mph	0.06	5.34	0.50	0.00	0.03	0.01	405	–	–	405
Composite [c]	**0.04**	**3.31**	**0.27**	**0.00**	**0.04**	**0.01**	**342**	–	–	**342**

Table D.1-27. Annual Average On-Road Vehicle Emission Factors for Off-Base POVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.036	0.000	–	–	–	–	–	–
LDGV - 55 mph	0.000	0.000	0.024	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.004	0.001	0.144	0.002	–	–	–	–	–	–
LDGT1 - 55 mph	0.002	0.000	0.061	0.001	–	–	–	–	–	–
Composite [c]	**0.001**	**0.000**	**0.047**	**0.001**	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.017	0.000	–	–	–	–	–	–
LDGV - 55 mph	0.000	0.000	0.013	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.002	0.001	0.072	0.001	–	–	–	–	–	–
LDGT1 - 55 mph	0.001	0.000	0.034	0.000	–	–	–	–	–	–
Composite [c]	**0.001**	**0.000**	**0.025**	**0.000**	–	–	–	–	–	–

Table D.1-27. Annual Average On-Road Vehicle Emission Factors for Off-Base POVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGV - 55 mph	–	–	0.001	0.000	0.001	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.006	0.009	0.005	–	–	0.000	0.000	0.000	–
LDGT1 - 55 mph	–	–	0.002	0.004	0.002	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.002**	**0.002**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGV - 55 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
LDGT1 - 55 mph	–	–	0.001	0.002	0.001	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.001**	**0.001**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.1-27. Annual Average On-Road Vehicle Emission Factors for Off-Base POVs - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.007	–	0.001	–	–	0.006
LDGV - 55 mph	–	–	0.000	–	–	0.005	–	0.001	–	–	0.004
LDGT1 - 25 mph	–	–	0.000	–	–	0.004	–	0.010	–	–	0.021
LDGT1 - 55 mph	–	–	0.000	–	–	0.002	–	0.004	–	–	0.009
Composite [c]	–	–	**0.000**	–	–	**0.004**	–	**0.003**	–	–	**0.007**
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGV - 55 mph	–	–	0.000	–	–	0.002	–	0.000	–	–	0.002
LDGT1 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
LDGT1 - 55 mph	–	–	0.000	–	–	0.001	–	0.002	–	–	0.005
Composite [c]	–	–	**0.000**	–	–	**0.002**	–	**0.001**	–	–	**0.004**

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Miami County, IN.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Equal to 63/37% LDGV/LDGT1 and based on 2002 Grissom ARB AEI vehicle fleet mix.

Table D.1-28. Annual Emissions from Off-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 434 ARW [a]	0.31	11.42	1.95	0.02	0.11	0.04	1,036	–	–	1,036
Year 2019 MOB 3 [b]	0.21	15.91	1.30	0.01	0.18	0.05	1,645	–	–	1,645

Table D.1-28. Annual Emissions from Off-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 434 ARW [a]	0.004	0.001	0.179	0.002	–	–	–	–	–	–
Year 2019 MOB 3 [b]	0.002	0.001	0.120	0.001	–	–	–	–	–	–

Table D.1-28. Annual Emissions from Off-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methyleth ylbenzene	Naphth-alene	Phenol
Year 2015 434 ARW [a]	–	–	0.007	0.008	0.005	–	–	0.000	0.001	0.000	–
Year 2019 MOB 3 [b]	–	–	0.005	0.005	0.004	–	–	0.000	0.000	0.000	–

Table D.1-28. Annual Emissions from Off-Base On-Road Vehicle Activities - Grissom ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 434 ARW [a]	–	–	0.000	–	–	0.016	–	0.011	–	–	0.027
Year 2019 MOB 3 [b]	–	–	0.000	–	–	0.010	–	0.007	–	–	0.018

[a] 2015 emissions = 2015 Total Off-base VMT * 2015 composite emission factors.

[b] 2019 emissions = 2019 Total Off-base VMT * 2019 composite emission factors.

– = Source does not emit particular pollutant

Table D.1-29. Annual Number of Workers at Grissom ARB - KC-46A MOB 3 Mission

Scenario	Number of LTOs
Year 2014 All Grissom ARB	3,403
Year 2015 434 ARW	1,100
Year 2019 MOB 3	1,219

Source: EIS Table 2-8 and 2-10.

Table D.1-30. Annual Emissions from Point and Area Sources - Grissom ARB KC-46A MOB 3 Mission

Scenario Year/ Source Type	Tons per Year									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
2014 All Grissom ARB [a]										
Abrasive Cleaning	–	–	–	–	0.00	0.00	–	–	–	–
Above Ground Storage Tanks	0.46	–	–	–	–	–	–	–	–	–
Misc Chemical Usage	0.35	–	–	–	–	–	–	–	–	–
Degreasing/Solvent Cleaning	–	–	–	–	–	–	–	–	–	–
External Combustion	0.01	0.18	0.21	0.00	0.02	0.02	–	–	–	–
Fire Training	0.04	0.02	0.09	0.00	0.02	0.02	–	–	–	–
Internal Combustion	0.08	0.22	1.03	0.07	0.07	0.07	–	–	–	–
Surface Coating	0.14	–	–	–	0.00	–	–	–	–	–
Underground Storage Tank	0.00	–	–	–	–	–	–	–	–	–
Welding/Soldering/Cutting	–	–	–	–	0.00	–	–	–	–	–
Total - Year 2014	**1.09**	**0.42**	**1.33**	**0.07**	**0.11**	**0.10**	–	–	–	–
2015 434 ARW [b]										
Abrasive Cleaning	–	–	–	–	0.00	0.00	–	–	–	–
Above Ground Storage Tanks	0.15	–	–	–	–	–	–	–	–	–
Misc Chemical Usage	0.11	–	–	–	–	–	–	–	–	–
Degreasing/Solvent Cleaning	–	–	–	–	–	–	–	–	–	–
External Combustion	0.00	0.06	0.07	0.00	0.01	0.01	–	–	–	–
Fire Training	0.01	0.01	0.03	0.00	0.00	0.00	–	–	–	–
Internal Combustion	0.03	0.07	0.33	0.02	0.02	0.02	–	–	–	–
Surface Coating	0.05	–	–	–	0.00	–	–	–	–	–
Underground Storage Tank	–	–	–	–	–	–	–	–	–	–
Welding/Soldering/Cutting	–	–	–	–	0.00	–	–	–	–	–
Total - Year 2015	**0.35**	**0.14**	**0.43**	**0.02**	**0.04**	**0.03**	–	–	–	–
2019 MOB 3 Scenario [b]										
Abrasive Cleaning	–	–	–	–	0.00	0.00	–	–	–	–
Above Ground Storage Tanks	0.16	–	–	–	–	–	–	–	–	–
Misc Chemical Usage	0.13	–	–	–	–	–	–	–	–	–
Degreasing/Solvent Cleaning	–	–	–	–	–	–	–	–	–	–
External Combustion	0.00	0.06	0.08	0.00	0.01	0.01	–	–	–	–
Fire Training	0.01	0.01	0.03	0.00	0.01	0.01	–	–	–	–
Internal Combustion	0.03	0.08	0.37	0.02	0.03	0.03	–	–	–	–
Surface Coating	0.05	–	–	–	0.00	–	–	–	–	–
Underground Storage Tank	–	–	–	–	–	–	–	–	–	–
Welding/Soldering/Cutting	–	–	–	–	0.00	–	–	–	–	–
Total - 2019 MOB 3 Scenario	**0.39**	**0.15**	**0.48**	**0.02**	**0.04**	**0.04**	–	–	–	–

[a] Source Grissom ARB 2015.

[b] 2014 emissions * future year LTOs/2014 LTOs.

– = Source does not emit particular pollutant

Table D.1-31. 2015 Existing Emissions for the KC-135 434 ARW at Grissom ARB - KC-46A MOB 3 Mission

Source Type	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-135 Aircraft Operations	4.71	80.30	186.86	16.57	0.90	0.90	50,266	1.39	1.56	46,163
On-Wing Aircraft Engine Testing - KC-135	1.06	15.39	5.96	0.79	0.04	0.04	2,396	0.07	0.07	2,200
Aerospace Ground Support Equipment	0.07	0.39	0.42	0.00	0.06	0.06	71	0.01	0.00	65
GOVs/Nonroad Equipment	0.06	1.20	0.25	0.00	0.02	0.01	119	–	–	108
Privately-Owned Vehicles - On-Base	0.04	1.06	0.16	0.00	0.02	0.00	99	–	–	90
Privately-Owned Vehicles - Off-Base	0.31	11.42	1.95	0.02	0.11	0.04	1,036	–	–	942
Point and Area Sources	0.35	0.14	0.43	0.02	0.04	0.03	–	–	–	–
Total Emissions	**6.60**	**109.90**	**196.02**	**17.40**	**1.19**	**1.08**	**53,986**	**1.47**	**1.64**	**49,567**

Table D.1-31. 2015 Existing Emissions for the KC-135 434 ARW at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Source Type	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-135 Aircraft Operations	0.183	0.109	0.411	0.056	0.004	0.005	0.012	0.011	0.003	0.004
On-Wing Aircraft Engine Testing - KC-135	0.041	0.027	0.107	0.015	0.001	0.001	0.001	0.001	0.000	0.001
Aerospace Ground Support Equipment	0.008	0.001	0.010	0.000	–	–	–	–	–	–
GOVs/Nonroad Equipment	0.001	0.000	0.029	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	0.001	0.000	0.023	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - Off-Base	0.004	0.001	0.179	0.002	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.237**	**0.138**	**0.759**	**0.074**	**0.005**	**0.005**	**0.013**	**0.012**	**0.003**	**0.005**

Table D.1-31. 2015 Existing Emissions for the KC-135 434 ARW at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
KC-135 Aircraft Operations	0.004	0.026	0.065	1.788	–	–	0.196	–	–	0.157	0.191
On-Wing Aircraft Engine Testing - KC-135	0.000	0.003	0.018	0.417	–	–	0.016	–	–	0.043	0.022
Aerospace Ground Support Equipment	–	–	–	0.012	–	–	–	–	–	0.001	–
GOVs/Nonroad Equipment	–	–	0.001	0.001	0.001	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - On-Base	–	–	0.001	0.001	0.001	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	0.007	0.008	0.005	–	–	0.000	0.001	0.000	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.005**	**0.029**	**0.092**	**2.228**	**0.007**		**0.212**	**0.000**	**0.001**	**0.202**	**0.213**

Table D.1-31. 2015 Existing Emissions for the KC-135 434 ARW at Grissom ARB - KC-46A MOB 3 Mission (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-135 Aircraft Operations	0.1189	0.001	0.084	0.005	0.007	0.195	0.004	–	0.021	0.129	0.054
On-Wing Aircraft Engine Testing - KC-135	0.0193	0.000	0.023	0.001	0.001	0.051	0.001	–	0.005	0.034	0.014
Aerospace Ground Support Equipment	–	0.000	–	–	–	0.004	–	–	–	–	0.003
GOVs/Nonroad Equipment	–	–	0.000	–	–	0.002	–	0.002	–	–	0.004
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.002	–	0.001	–	–	0.003
Privately-Owned Vehicles - Off-Base	–	–	0.000	–	–	0.016	–	0.011	–	–	0.027
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.1382**	**0.002**	**0.107**	**0.006**	**0.008**	**0.270**	**0.005**	**0.014**	**0.026**	**0.163**	**0.106**

– = Source does not emit particular pollutant

Table D.1-32. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Grissom ARB - 2019

Source Type	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-46A Aircraft Operations	21.41	84.06	299.96	16.55	1.08	0.92	49,789	1.38	1.55	45,725
On-Wing Aircraft Engine Testing - KC-46A	11.57	39.71	18.73	1.68	0.16	0.14	4,899	0.14	0.15	4,500
Aerospace Ground Support Equipment - KC-46A	0.05	0.30	0.31	0.00	0.04	0.04	79	0.01	0.00	72
Government-Owned Vehicles	0.03	1.29	0.16	0.00	0.03	0.01	153	–	–	139
Privately-Owned Vehicles - On-Base	0.03	1.45	0.11	0.00	0.03	0.01	161	–	–	146
Privately-Owned Vehicles - Off-Base	0.21	15.91	1.30	0.01	0.18	0.05	1,645	–	–	1,495
Point and Area Sources	0.39	0.15	0.48	0.02	0.04	0.04		–	–	–
Total Proposed Emissions - 2019	**33.69**	**142.86**	**321.04**	**18.27**	**1.55**	**1.21**	**56,726**	**1.53**	**1.70**	**52,077**
Year 2015 Base Case Emissions	**(6.60)**	**(109.90)**	**(196.02)**	**(17.40)**	**(1.19)**	**(1.08)**	**(53,986)**	**(1.47)**	**(1.64)**	**(49,567)**
Proposed minus Base Case Emissions	**27.09**	**32.96**	**125.02**	**0.86**	**0.36**	**0.13**	**2,740**	**0.06**	**0.06**	**2,510**
Miami/Cass County PSD Thresholds	**250**	**250**	**250**	**250**	**250**	**250**	–	–	–	–

Table D.1-32. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Grissom ARB - 2019 (Continued)

Source Type	Annual Emissions (Tons)									
	Acetalde-hyde	**Acrolein**	**Benzene**	**1,3-Butadiene**	**Carbon Disulfide**	**Carbon Tetra-chloride**	**Chloro-form**	**Chloro-methane**	**Dibutyl Phthalate**	**1,2-Dichloro-propane**
KC-46A Aircraft Operations	0.803	0.521	2.098	0.300	0.020	0.018	0.039	0.036	0.010	0.019
On-Wing Aircraft Engine Testing - KC-46A	0.445	0.294	1.182	0.171	0.009	0.008	0.015	0.014	0.002	0.010
Aerospace Ground Support Equipment - KC-46A	0.006	0.001	0.008	0.000	–	–	–	–	–	–
Government-Owned Vehicles	0.000	0.000	0.016	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	0.000	0.000	0.015	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - Off-Base	0.002	0.001	0.120	0.001	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**1.257**	**0.817**	**3.438**	**0.473**	**0.029**	**0.026**	**0.054**	**0.050**	**0.012**	**0.030**
Year 2015 Base Case Emissions	**(0.237)**	**(0.138)**	**(0.759)**	**(0.074)**	**(0.005)**	**(0.005)**	**(0.013)**	**(0.012)**	**(0.003)**	**(0.005)**
Proposed minus Base Case Emissions	**1.021**	**0.680**	**2.679**	**0.399**	**0.024**	**0.021**	**0.041**	**0.038**	**0.009**	**0.025**

Table D.1-32. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Grissom ARB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
KC-46A Aircraft Operations	0.012	0.088	0.342	8.249	–	–	0.547	–	–	0.836	0.432
On-Wing Aircraft Engine Testing - KC-46A	0.005	0.034	0.194	4.570	–	–	0.152	–	–	0.475	0.239
Aerospace Ground Support Equipment - KC-46A	–	–	–	0.010	–	–	–	–	–	0.000	–
Government-Owned Vehicles	–	–	0.001	0.001	0.000	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - On-Base	–	–	0.001	0.001	0.000	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	0.005	0.005	0.004	–	–	0.000	0.000	0.000	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.017**	**0.122**	**0.542**	**12.836**	**0.004**	–	**0.699**	**0.000**	–	**1.311**	**0.671**
Year 2015 Base Case Emissions	**(0.005)**	**(0.029)**	**(0.092)**	**(2.228)**	**(0.007)**	–	**(0.212)**	**(0.000)**	–	**(0.202)**	**(0.213)**
Proposed minus Base Case Emissions	**0.012**	**0.093**	**0.450**	**10.608**	**(0.002)**	–	**0.486**	**(0.000)**	–	**1.110**	**0.459**

Table D.1-32. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Grissom ARB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	**Pyrene**	**Styrene**	**1,1,2,2-Tetrachloroethane**	**Tetrachloroethene**	**Toluene**	**1,1,1-Trichloroethane**	**2,2,4-Trimethylpentane**	**Vinyl Acetate**	**mp-Xylene**	**o-Xylene**
KC-46A Aircraft Operations	0.4552	0.008	0.442	0.020	0.026	1.005	0.017	–	0.097	0.661	0.282
On-Wing Aircraft Engine Testing - KC-46A	0.2034	0.005	0.252	0.010	0.012	0.564	0.008	–	0.050	0.370	0.159
Aerospace Ground Support Equipment - KC-46A	–	0.000	–	–	–	0.003	–	–	–	–	0.002
Government-Owned Vehicles	–	–	0.000	–	–	0.001	–	0.001	–	–	0.002
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.001	–	0.001	–	–	0.002
Privately-Owned Vehicles - Off-Base	–	–	0.000	–	–	0.010	–	0.007	–	–	0.018
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.6586**	**0.013**	**0.694**	**0.031**	**0.038**	**1.585**	**0.025**	**–**	**0.147**	**1.030**	**0.466**
Year 2015 Base Case Emissions	**(0.1382)**	**(0.002)**	**(0.107)**	**(0.006)**	**(0.008)**	**(0.270)**	**(0.005)**	**–**	**(0.026)**	**(0.163)**	**(0.106)**
Proposed minus Base Case Emissions	**0.5203**	**0.011**	**0.587**	**0.025**	**0.030**	**1.315**	**0.020**	**–**	**0.121**	**0.867**	**0.360**

– = Source does not emit particular pollutant

D.2 SEYMOUR JOHNSON AIR FORCE BASE REGIONAL CLIMATE

Seymour Johnson Air Force Base (AFB) has a temperate continental climate, characterized by hot and humid summers and mild winters. Meteorological data collected at Goldsboro, North Carolina, are used to describe the climate of the Seymour Johnson AFB project region (State Climate Office of North Carolina 2016).

Temperature. The average high and low temperatures during the summer months at Seymour Johnson AFB range from approximately 91 °F to 64 °F. The average high and low temperatures during the winter months range from 66 °F to 33 °F.

Precipitation. The average annual precipitation at Seymour Johnson AFB is 49.8 inches. Precipitation is greatest during the summer months, and the peak monthly average of 5.7 inches occurs in August. Tropical storms can produce substantial amounts of precipitation during late summer. Precipitation is at a minimum during the fall, with the lowest monthly average of 3.1 inches occurring in October.

Prevailing Winds. The winds at Seymour Johnson AFB prevail from the southwest quadrant with a secondary peak from the northeast quadrant. The annual average wind speed at Seymour Johnson AFB is 6.5 miles per hour. The windiest time of year occurs during the months of February through April, with the average wind speed approximately 7 miles per hour for each month (NOAA 1998).

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D.2.1 OPERATIONS EMISSION CALCULATIONS FOR THE KC-46A MOB 3 MISSION AT SEYMOUR JOHNSON AFB

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Table D.2-1. Annual Aircraft Operations at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions

Year/Aircraft	Number of Operations				
	LTO	TGO	LFB	LFP	Total
Year 2014 [a]					
F-15	11,669	–	–	–	**11,669**
KC-135R	1,100	–	–	–	**1,100**
Transient	–	–	–	–	–
Totals	**12,769**	–	–	–	**12,769**
Year 2015 [b]					
F-15	18,000	–	–	19,800	**37,800**
KC-135R	756	–	–	1,056	**1,812**
Transient	471	–	–	–	**471**
Totals	**19,227**	–	–	**20,856**	**40,083**

[a] Seymour Johnson AFB Mobile AEI APIMS Data Entry_8Oct15.xlsx 'AOPS'.

[b] EIS Table 2-9.

Table D.2-2. 2015 KC-135 Closed Pattern Operations for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions

Aircraft Type/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		55%	60%	Climbout	Takeoff	55%	60%	Climbout	Takeoff
KC-135									
Closed Pattern - Radar & Initial to Overhead	482	12.0	2.0	–	1.0	96	16	–	8
Closed Pattern - VFR	328	5.0	2.0	–	1.0	27	11	–	5
Closed Pattern - Tactical	246	8.0	2.0	2.0	1.0	33	8	8	4
Total TIMs - Hours						**157**	**35**	**8**	**18**

[a] Distribution of operations based on assumptions obtained during site survey 2 December 2015.

Table D.2-3. 2015 KC-135 Aircraft Emissions for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions

Operation/Source	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
LTOs										
KC-135 Aircraft Operations	2.62	38.80	14.25	2.06	0.12	0.12	6,241	0.17	0.19	6,304
Subtotal - LTOs	**2.62**	**38.80**	**14.25**	**2.06**	**0.12**	**0.12**	**6,241**	**0.17**	**0.19**	**6,304**
Closed Patterns										
KC-135 - 55%	0.10	3.13	15.79	1.42	0.07	0.07	4,322	0.12	0.13	4,367
KC-135 - 60%	0.02	0.64	4.08	0.35	0.02	0.02	1,055	0.03	0.03	1,065
KC-135 - Climbout	0.01	0.01	1.70	0.11	0.01	0.01	342	0.01	0.01	345
KC-135 - Take-off	0.01	0.02	5.08	0.29	0.02	0.02	883	0.02	0.03	892
Subtotal - Closed Patterns	**0.15**	**3.81**	**26.65**	**2.18**	**0.12**	**0.12**	**6,602**	**0.18**	**0.21**	**6,669**
Total KC-135 Aircraft Operations	**2.76**	**42.61**	**40.90**	**4.23**	**0.23**	**0.23**	**12,843**	**0.36**	**0.40**	**12,974**

Table D.2-3. 2015 KC-135 Aircraft Emissions for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Operation/Source	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butad-iene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
LTOs										
KC-135 Aircraft Operations	0.101	0.066	0.264	0.038	0.002	0.002	0.004	0.003	0.001	0.002
Subtotal - LTOs	**0.101**	**0.066**	**0.264**	**0.038**	**0.002**	**0.002**	**0.004**	**0.003**	**0.001**	**0.002**
Closed Patterns										
KC-135 - 55%	0.004	0.002	0.003	0.000	0.000	0.000	0.001	0.001	0.000	0.000
KC-135 - 60%	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KC-135 - Climbout	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KC-135 - Take-off	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal - Closed Patterns	**0.006**	**0.002**	**0.004**	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.000**	**0.000**
Total KC-135 Aircraft Operations	**0.107**	**0.068**	**0.268**	**0.038**	**0.002**	**0.002**	**0.005**	**0.004**	**0.001**	**0.002**

Table D.2-3. 2015 KC-135 Aircraft Emissions for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Operation/Source	Annual Emissions - Tons										
	2,4-Dinitro-phenol	Di(2-Ethylhexyl) Phthalate (DEHP)	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	Methyl tert-Butyl Ether (MTBE)	Methylethyl benzene	Naphth-alene	Phenol
LTOs											
KC-135 Aircraft Operations	0.001	0.008	0.043	1.031	–	–	0.039	–	–	0.106	0.059
Subtotal - LTOs	**0.001**	**0.008**	**0.043**	**1.031**	–	–	0.039	–	–	**0.106**	**0.059**
Closed Patterns											
KC-135 - 55%	0.000	0.001	0.000	0.035	–	–	0.013	–	–	0.000	0.014
KC-135 - 60%	0.000	0.000	0.000	0.008	–	–	0.003	–	–	0.000	0.003
KC-135 - Climbout	0.000	0.000	0.000	0.001	–	–	0.001	–	–	0.000	0.000
KC-135 - Take-off	–	0.000	0.000	0.001	–	–	0.004	–	–	0.000	0.000
Subtotal - Closed Patterns	**0.000**	**0.002**	**0.000**	**0.046**	–	–	**0.022**	–	–	**0.001**	**0.017**
Total KC-135 Aircraft Operations	**0.002**	**0.010**	**0.044**	**1.077**	–	–	**0.062**	–	–	**0.106**	**0.076**

Table D.2-3. 2015 KC-135 Aircraft Emissions for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Operation/Source	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
LTOs											
KC-135 Aircraft Operations	0.047	0.001	0.056	0.002	0.003	0.126	0.002	–	0.011	0.083	0.036
Subtotal - LTOs	**0.047**	**0.001**	**0.056**	**0.002**	**0.003**	**0.126**	**0.002**	**–**	**0.011**	**0.083**	**0.036**
Closed Patterns											
KC-135 - 55%	0.004	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
KC-135 - 60%	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
KC-135 - Climbout	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
KC-135 - Take-off	0.002	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Subtotal - Closed Patterns	**0.008**	**–**	**0.000**	**0.000**	**0.000**	**0.002**	**0.000**	**–**	**0.001**	**0.001**	**0.000**
Total KC-135 Aircraft Operations	**0.055**	**0.001**	**0.056**	**0.003**	**0.003**	**0.128**	**0.002**	**–**	**0.012**	**0.084**	**0.036**

Table D.2-4. 2015 KC-135 On-Wing Engine Testing Activity Data for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions

Aircraft/Test Type	Tests/ Year	# of Engines	Duration (Minutes)	Engine Setting/Annual Engine Hours			
				Idle	Approach	Intermediate	Takeoff
KC-135 [a]							
60-HR INSPECTION	35	4	15	35.2	–	–	–
120-HR INSPECTION	35	4	15	35.2	–	–	–
Idle runs for maintenance	69	1	15	17.3	–	–	–
Idle runs for maintenance	55	2	15	27.7	–	–	–
Idle runs for maintenance	14	4	15	13.9	–	–	–
141 ARW EXPO SORTIE PREFLIGHT	237	4	10	158.1	–	–	–
141 ARW EXPO SORTIE POST-FLIGHT	237	4	6	94.8	–	–	–
DEFUELING	14	1	60	13.9	–	–	–
PREFLIGHT	548	4	10	365.2	–	–	–
P0STFLIGHT	548	2	5	91.3	–	–	–
HIGH POWER ENGINE RUNS	43	2	90	128.0	–	–	–
HIGH POWER ENGINE RUNS	43	2	15	–	21.3	–	–
HIGH POWER ENGINE RUNS	43	2	30	–	–	42.7	–
HIGH POWER ENGINE RUNS	43	2	15	–	–	–	21.3
Total TIMs - KC-135				**981**	**21**	**43**	**21**

[a] Fairchild baseline BaseOps-Aircraft Maintenance - Noise.pdf, then factored these data by 30 KC-135s stationed at FAFB by the 16 KC-135s at Seymour Johnson AFB.

Table D.2-5. 2015 Emissions from On-Wing Engine Testing for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions

Aircraft/Throttle Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-135										
Idle	1.05	15.26	1.99	0.53	0.03	0.03	1,598	0.044	0.050	1,615
Approach	0.00	0.11	0.22	0.03	0.00	0.00	84	0.002	0.003	85
Intermediate	0.01	0.01	2.21	0.15	0.01	0.01	445	0.012	0.014	450
Military	0.00	0.01	1.54	0.09	0.01	0.01	268	0.007	0.008	270
Total Emissions - 2015	**1.06**	**15.39**	**5.96**	**0.79**	**0.04**	**0.04**	**2,396**	**0.07**	**0.07**	**2,420**

Table D.2-5. 2015 Emissions from On-Wing Engine Testing for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons									
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dibutyl Phthalate	1,2-Dichloropropane
KC-135										
Idle	0.040	0.027	0.107	0.015	0.001	0.001	0.001	0.001	0.000	0.001
Approach	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Military	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions - 2015	**0.041**	**0.027**	**0.107**	**0.015**	**0.001**	**0.001**	**0.001**	**0.001**	**0.000**	**0.001**

Table D.2-5. 2015 Emissions from On-Wing Engine Testing for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons										
	2,4-Dinitrophenol	DEHP	Ethylbenzene	Formaldehyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphthalene	Phenol
KC-135											
Idle	0.000	0.003	0.018	0.414	–	–	0.013	–	–	0.043	0.022
Approach	0.000	0.000	0.000	0.001	–	–	0.000	–	–	0.000	0.000
Intermediate	0.000	0.000	0.000	0.002	–	–	0.002	–	–	0.000	0.000
Military	–	0.000	0.000	0.000	–	–	0.001	–	–	0.000	0.000
Total Emissions - 2015	**0.000**	**0.003**	**0.018**	**0.417**	–	–	**0.016**	–	–	**0.043**	**0.022**

Table D.2-5. 2015 Emissions from On-Wing Engine Testing for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-135											
Idle	0.018	0.000	0.023	0.001	0.001	0.051	0.001	–	0.004	0.033	0.014
Approach	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Intermediate	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Military	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Total Emissions - 2015	**0.019**	**0.000**	**0.023**	**0.001**	**0.001**	**0.051**	**0.001**	**–**	**0.005**	**0.034**	**0.014**

– = Source does not emit particular pollutant

Table D.2-6. 2014 AGE Usages for the KC-135R Detachment at Seymour Johnson AFB

Source	Fuel Type	Hp	Load Factor	Hours/Year	Annual Hp-Hours
Air Compressor - MC-2A	JP-8	10.5	0.48	60	302
Floodlight (FL-1D & NF2D & lightcart)	JP-8	10.5	0.74	100	777
Next Generation Heater (NGH)	JP-8	7.0	0.95	50	333
Subtotal - 7-11 Hp					**1,412**
Jacking Manifold	JP-8	30.0	0.51	100	1,530
Subtotal - 26-40 Hp					**1,530**
Air Compressor - MC20	JP-8	50.0	1.00	120	6,000
Nitrogen Servicing Cart	JP-8	49.0	0.51	200	4,998
Subtotal - 41-50 Hp					**10,998**
Air Compressor - MC-7	JP-8	52.0	0.48	150	3,744
Generator Set - A/M32A-86D	JP-8	96.5	0.95	750	68,742
Subtotal - 76-100 Hp					**72,486**
Air Conditioners - MA-3D	JP-8	120.0	0.28	150	5,040
Hyd Test Stand - MJ-2	JP-8	125.0	0.51	75	4,781
Start Cart - A/M32A-95	JP-8	155.0	0.95	40	5,890
Subtotal - 101-175 Hp					**15,711**

Note: These data used as surrogates for AGE usages for KC-135 and KC-46A aircraft at all proposed basing locations.
Source: Seymour Johnson AFB Mobile AEI APIMS Data Entry_8Oct15.xlsx 'GSE', but some Hp ratings obtained from 5-2014 Seymour Johnson AFB Mobile AEI Process Calc Summary.pdf

Table D.2-7. Nonroad Diesel Equipment Emission Factors for 2015 - Seymour Johnson AFB

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
Nonroad Equipment - 7-11 Hp	0.72	4.67	4.72	0.00	0.46	0.45	591	0.094	0.007	595
Nonroad Equipment - 26-40 Hp	0.49	2.16	4.29	0.00	0.35	0.34	634	0.094	0.007	638
Nonroad Equipment - 41-50 Hp	0.41	1.80	4.20	0.00	0.29	0.28	627	0.094	0.007	631
Nonroad Equipment - 76-100 Hp	0.69	4.23	3.82	0.00	0.61	0.59	644	0.094	0.007	648
Nonroad Equipment - 101-175 Hp	0.32	1.24	2.67	0.00	0.27	0.26	565	0.094	0.007	569

Table D.2-7. Nonroad Diesel Equipment Emission Factors for 2015 - Seymour Johnson AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
Nonroad Equipment - 7-11 Hp	0.086	0.010	0.105	0.004	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.059	0.007	0.072	0.003	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.049	0.006	0.059	0.002	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.082	0.010	0.100	0.004	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.039	0.005	0.047	0.002	–	–	–	–	–	–

Table D.2-7. Nonroad Diesel Equipment Emission Factors for 2015 - Seymour Johnson AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
Nonroad Equipment - 7-11 Hp	–	–	–	0.132	–	–	–	–	–	0.009	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.091	–	–	–	–	–	0.006	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.075	–	–	–	–	–	0.005	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.126	–	–	–	–	–	0.009	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.059	–	–	–	–	–	0.004	–

Table D.2-7. Nonroad Diesel Equipment Emission Factors for 2015 - Seymour Johnson AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
Nonroad Equipment - 7-11 Hp	–	0.001	–	–	–	0.046	–	–	–	–	0.032
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.031	–	–	–	–	0.022
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.026	–	–	–	–	0.018
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.044	–	–	–	–	0.030
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.021	–	–	–	–	0.014

[a] Criteria pollutant factors estimated with the use of the USEPA NONROAD2008a model for Wayne County, NC.

[b] HAPs factors estimated with VOC speciation data presented in Table 4-3 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.2-8. 2015 Emissions from AGE Usages for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions

Year/HP Category	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 [a]										
Nonroad Equipment - 7-11 Hp	0.00	0.00	0.01	0.00	0.00	0.00	0.63	0.00	0.00	0.64
Nonroad Equipment - 26-40 Hp	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.74
Nonroad Equipment - 41-50 Hp	0.00	0.02	0.04	0.00	0.00	0.00	5.23	0.00	0.00	5.26
Nonroad Equipment - 76-100 Hp	0.04	0.23	0.21	0.00	0.03	0.03	35.34	0.01	0.00	35.56
Nonroad Equipment - 101-175 Hp	0.00	0.01	0.03	0.00	0.00	0.00	6.73	0.00	0.00	6.78
Total - Year 2015	**0.05**	**0.27**	**0.29**	**0.00**	**0.04**	**0.04**	**48.66**	**0.01**	**0.00**	**48.98**

Table D.2-8. 2015 Emissions from AGE Usages for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Year/HP Category	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 [a]										
Nonroad Equipment - 7-11 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.004	0.001	0.005	0.000	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.000	0.000	0.001	0.000	–	–	–	–	–	–
Total - Year 2015	**0.006**	**0.001**	**0.007**	**0.000**	–	–	–	–	–	–

Table D.2-8. 2015 Emissions from AGE Usages for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Year/HP Category	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 [a]											
Nonroad Equipment - 7-11 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.007	–	–	–	–	–	0.000	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Total - Year 2015	–	–	–	**0.008**	–	–	–	–	–	**0.001**	–

Table D.2-8. 2015 Emissions from AGE Usages for the 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Year/HP Category	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 [a]											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.002	–	–	–	–	0.002
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Total - Year 2015	–	**0.000**	–	–	–	**0.003**	–	–	–	–	**0.002**

[a] 2014 Seymour Johnson AFB AGE hp-hr * (2015 Seymour Johnson AFB KC-135 LTOs [756] / 2014 Seymour Johnson AFB KC-135 LTOs [1,100]) * (2015 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.2-9. KC-46A Aircraft Operations at Seymour Johnson AFB - KC-46A MOB 3 Mission

Scenario/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		Idle	Approach	Climbout	Takeoff	Idle	Approach	Climbout	Takeoff
Landings and Take-offs									
Landings and Take-offs	1,270	47.7	5.2	1.6	0.7	1,010	110	34	15
Scenario/Operation	**Operations/ Year [b]**	**Engine Setting/Time in Mode per Operation (Minutes)**				**Engine Setting Annual Hours**			
		55%	**60%**	**Climbout**	**Takeoff**	**55%**	**60%**	**Climbout**	**Takeoff**
Closed Patterns									
Closed Pattern - Radar & Initial to Overhead	811	12.0	2.0	–	1.0	162	27	–	14
Closed Pattern - VFR	551	5.0	2.0	–	1.0	46	18	–	9
Closed Pattern - Tactical	413	8.0	2.0	2.0	1.0	55	14	14	7
Total TIMs - KC-46A MOB 3						**263**	**59**	**14**	**30**

[a] EIS Table 2-10.

[b] EIS Table 2-10 and KC-46 MOB CP Ops Data for Emissions.xlsx. Closed Pattern - Tactical ops reduced by 7.5% to reflect amount of time above 3,000' AGL.

Table D.2-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Seymour Johnson AFB - MOB 3 Mission 2019

Operation/Engine Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Landings and Take-offs										
Idle	20.97	71.55	6.35	1.78	0.18	0.17	5,400	0.15	0.17	5,456
Approach	0.06	1.21	7.64	0.67	0.03	0.03	2,019	0.06	0.06	2,039
Climbout	0.05	0.29	14.84	0.61	0.04	0.03	1,837	0.05	0.06	1,856
Take-off	0.03	0.20	11.01	0.34	0.03	0.02	1,030	0.03	0.03	1,041
APU	0.06	0.45	9.03	0.76	0.06	0.06	1,845	0.05	0.06	1,864
Subtotal LTOs	**21.17**	**73.69**	**48.87**	**4.15**	**0.34**	**0.31**	**12,132**	**0.34**	**0.38**	**12,256**
Closed Patterns										
55%	0.26	3.63	52.30	3.01	0.17	0.14	9,118	0.25	0.28	9,211
60%	0.06	0.80	13.74	0.74	0.04	0.04	2,243	0.06	0.07	2,266
Climbout	0.02	0.12	6.03	0.25	0.02	0.01	747	0.02	0.02	754
Take-off	0.06	0.39	21.97	0.68	0.05	0.04	2,056	0.06	0.06	2,077
Subtotal Closed Patterns	**0.40**	**4.94**	**94.04**	**4.67**	**0.28**	**0.23**	**14,163**	**0.39**	**0.44**	**14,308**
Total MOB 3 Operations	**21.58**	**78.63**	**142.91**	**8.81**	**0.62**	**0.54**	**26,295**	**0.73**	**0.82**	**26,564**

Table D.2-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Seymour Johnson AFB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Landings and Take-offs										
Idle	0.807	0.535	2.148	0.310	0.017	0.015	0.027	0.025	0.004	0.019
Approach	0.004	0.001	0.002	–	0.000	0.000	0.000	0.000	0.000	0.000
Climbout	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Take-off	0.001	0.000	0.001	–	0.000	0.000	0.000	0.001	0.000	0.000
APU	0.002	0.002	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal LTOs	**0.815**	**0.538**	**2.158**	**0.311**	**0.017**	**0.015**	**0.028**	**0.026**	**0.005**	**0.019**
Closed Patterns										
55%	0.005	0.001	0.007	0.000	0.001	0.001	0.003	0.002	0.001	0.000
60%	0.001	0.000	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Climbout	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Take-off	0.001	0.000	0.001	–	0.000	0.000	0.000	0.001	0.000	0.000
Subtotal Closed Patterns	**0.008**	**0.002**	**0.010**	**0.001**	**0.001**	**0.001**	**0.004**	**0.004**	**0.002**	**0.000**
Total MOB 3 Operations	**0.823**	**0.540**	**2.168**	**0.312**	**0.018**	**0.016**	**0.033**	**0.030**	**0.007**	**0.019**

Table D.2-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Seymour Johnson AFB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Landings and Take-offs											
Idle	0.008	0.061	0.352	8.301	–	–	0.258	–	–	0.864	0.434
Approach	0.000	0.001	0.000	0.027	–	–	0.005	–	–	0.000	0.013
Climbout	0.000	0.001	0.000	0.010	–	–	0.011	–	–	0.000	0.000
Take-off	–	0.001	0.000	0.003	–	–	0.010	–	–	0.000	0.000
APU	0.000	0.000	0.001	0.023	–	–	0.001	–	–	0.002	0.001
Subtotal LTOs	**0.009**	**0.063**	**0.354**	**8.364**	–	–	**0.284**	–	–	**0.867**	**0.449**
Closed Patterns											
55%	0.001	0.007	0.001	0.058	–	–	0.063	–	–	0.001	0.000
60%	0.000	0.002	0.000	0.014	–	–	0.015	–	–	0.000	0.000
Climbout	0.000	0.000	0.000	0.004	–	–	0.004	–	–	0.000	0.000
Take-off	–	0.001	0.000	0.006	–	–	0.020	–	–	0.000	0.000
Subtotal Closed Patterns	**0.001**	**0.010**	**0.001**	**0.082**	–	–	**0.102**	–	–	**0.001**	**0.000**
Total MOB 3 Operations	**0.010**	**0.073**	**0.355**	**8.446**	–	–	**0.386**	–	–	**0.868**	**0.449**

Table D.2-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Seymour Johnson AFB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Landings and Take-offs											
Idle	0.361	0.008	0.457	0.019	0.021	1.026	0.015	–	0.090	0.671	0.289
Approach	0.002	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Climbout	0.003	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Take-off	0.005	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.001	0.000	0.001	0.000	0.000	0.003	0.000	–	0.000	0.002	0.001
Subtotal LTOs	**0.372**	**0.008**	**0.459**	**0.019**	**0.022**	**1.030**	**0.015**	**–**	**0.091**	**0.674**	**0.291**
Closed Patterns											
55%	0.020	–	0.001	0.001	0.001	0.004	0.001	–	0.002	0.003	0.001
60%	0.005	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Climbout	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Take-off	0.010	–	0.000	0.000	0.000	0.001	0.000	–	0.001	0.001	0.000
Subtotal Closed Patterns	**0.036**	**–**	**0.001**	**0.001**	**0.002**	**0.006**	**0.001**	**–**	**0.003**	**0.005**	**0.001**
Total MOB 3 Operations	**0.408**	**0.008**	**0.460**	**0.020**	**0.023**	**1.036**	**0.016**	**–**	**0.095**	**0.679**	**0.292**

– = Source does not emit particular pollutant

Table D.2-11. KC-46A Aircraft On-Wing Engine Testing Activity Data for Seymour Johnson AB - KC-46A MOB 3 Mission

Aircraft/Test Type	Tests/ Year	# of Engines	Duration (Minutes)	Engine Setting/Annual Engine Hours			
				Idle	Approach	Intermediate	Takeoff
KC-46A - MOB 3[a]							
Leak Checks/Troubleshooting	208	2	45	312.0	–	–	–
Fuel Transfer	69	1	80	92.4	–	–	–
Troubleshooting - High Power	35	1	40	11.6	2.9	2.9	5.8
Troubleshooting - High Power	35	2	15	17.3	–	–	–
Engine Trims	4	1	40	1.3	0.3	0.3	0.7
Engine Trims	4	2	10	1.3	–	–	–
ISO Runs	12	2	35	14.0	–	–	–
Backline Runs	12	2	69	465.8	6.9	–	10.4
Post ISO Runs	12	2	55	192.5	–	–	11.0
Total TIMs - KC-46A MOB 3				**1,108**	**10**	**3**	**28**

[a] Altus FTU BaseOps-Aircraft Maintenance-Noise.pdf (April 16, 2013).

Note: The APU operates for the same amount of time as the main engines during testing activities.

Table D.2-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Seymour Johnson AFB - KC-46A MOB 3 Mission

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-46A - MOB 3										
Idle	11.51	39.27	3.48	0.98	0.10	0.09	2,964	0.08	0.09	2,994
Approach	0.00	0.06	0.35	0.03	0.00	0.00	93	0.00	0.00	94
Intermediate	0.00	0.01	0.71	0.03	0.00	0.00	87	0.00	0.00	88
Military	0.03	0.18	10.32	0.32	0.02	0.02	966	0.03	0.03	976
APU	0.03	0.19	3.86	0.32	0.03	0.02	789	0.02	0.02	797
Total KC-46A MOB 3	**11.57**	**39.71**	**18.73**	**1.68**	**0.16**	**0.14**	**4,899**	**0.14**	**0.15**	**4,950**

Table D.2-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Seymour Johnson AFB - Proposed MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-46A - MOB 3										
Idle	0.443	0.294	1.179	0.170	0.009	0.008	0.015	0.014	0.002	0.010
Approach	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Military	0.001	0.000	0.000	–	0.000	0.000	0.000	0.001	0.000	0.000
APU	0.001	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total KC-46A MOB 3	**0.445**	**0.294**	**1.182**	**0.171**	**0.009**	**0.008**	**0.015**	**0.014**	**0.002**	**0.010**

Table D.2-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Seymour Johnson AFB - Proposed MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
KC-46A - MOB 3											
Idle	0.005	0.033	0.193	4.556	–	–	0.142	–	–	0.474	0.238
Approach	0.000	0.000	0.000	0.001	–	–	0.000	–	–	0.000	0.001
Intermediate	0.000	0.000	0.000	0.000	–	–	0.001	–	–	0.000	0.000
Military	–	0.001	0.000	0.003	–	–	0.009	–	–	0.000	0.000
APU	0.000	0.000	0.000	0.010	–	–	0.000	–	–	0.001	0.001
Total KC-46A MOB 3	**0.005**	**0.034**	**0.194**	**4.570**	–	–	**0.152**	–	–	**0.475**	**0.239**

Table D.2-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Seymour Johnson AFB - Proposed MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-46A - MOB 3											
Idle	0.198	0.005	0.251	0.010	0.012	0.563	0.008	–	0.049	0.368	0.159
Approach	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Intermediate	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Military	0.005	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.000	0.000	0.001	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Total KC-46A MOB 3	**0.203**	**0.005**	**0.252**	**0.010**	**0.012**	**0.564**	**0.008**	**–**	**0.050**	**0.370**	**0.159**

– = Source does not emit particular pollutant

Table D.2-13. KC-46A Aircraft Closed Pattern Operations at Kinston Regional Jetport - KC-46A MOB 3 Mission

Scenario/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		55%	60%	Climbout	Takeoff	55%	60%	Climbout	Takeoff
Closed Patterns									
Closed Pattern - Radar & Initial to Overhead	811	12.0	2.0	–	1.0	162	27	–	14
Closed Pattern - VFR	551	5.0	2.0	–	1.0	46	18	–	9
Closed Pattern - Tactical	413	8.0	2.0	2.0	1.0	55	14	14	7
Total TIMs - KC-46A MOB 3						**263**	**59**	**14**	**30**

[a] EIS Page 2-21 and KC-46 MOB CP Ops Data for Emissions.xlsx. Closed Pattern - Tactical ops reduced by 7.5% to reflect amount of time above 3,000' AGL.

Table D.2-14. Annual Air Emissions from KC-46A Aircraft Closed Pattern Operations at Kinston Regional Jetport - KC-46A MOB 3 Mission

Operation/Engine Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Closed Patterns										
55%	0.26	3.63	52.30	3.01	0.17	0.14	9,118	0.25	0.28	9,211
60%	0.06	0.80	13.74	0.74	0.04	0.04	2,243	0.06	0.07	2,266
Climbout	0.02	0.12	6.03	0.25	0.02	0.01	747	0.02	0.02	754
Take-off	0.06	0.39	21.97	0.68	0.05	0.04	2,056	0.06	0.06	2,077
Subtotal Closed Patterns	**0.40**	**4.94**	**94.04**	**4.67**	**0.28**	**0.23**	**14,163**	**0.39**	**0.44**	**14,308**

Table D.2-14. Annual Air Emissions from KC-46A Aircraft Closed Pattern Operations at Kinston Regional Jetport - KC-46A MOB 3 Mission (Continued)

Operation/Engine Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Closed Patterns										
55%	0.005	0.001	0.007	0.000	0.001	0.001	0.003	0.002	0.001	0.000
60%	0.001	0.000	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Climbout	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Take-off	0.001	0.000	0.001	–	0.000	0.000	0.000	0.001	0.000	0.000
Subtotal Closed Patterns	**0.008**	**0.002**	**0.010**	**0.001**	**0.001**	**0.001**	**0.004**	**0.004**	**0.002**	**0.000**

Table D.2-14. Annual Air Emissions from KC-46A Aircraft Closed Pattern Operations at Kinston Regional Jetport - KC-46A MOB 3 Mission (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Closed Patterns											
55%	0.001	0.007	0.001	0.058	–	–	0.063	–	–	0.001	0.000
60%	0.000	0.002	0.000	0.014	–	–	0.015	–	–	0.000	0.000
Climbout	0.000	0.000	0.000	0.004	–	–	0.004	–	–	0.000	0.000
Take-off	–	0.001	0.000	0.006	–	–	0.020	–	–	0.000	0.000
Subtotal Closed Patterns	**0.001**	**0.010**	**0.001**	**0.082**	–	–	**0.102**	–	–	**0.001**	**0.000**

Table D.2-14. Annual Air Emissions from KC-46A Aircraft Closed Pattern Operations at Kinston Regional Jetport - KC-46A MOB 3 Mission (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Closed Patterns											
55%	0.020	–	0.001	0.001	0.001	0.004	0.001	–	0.002	0.003	0.001
60%	0.005	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Climbout	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Take-off	0.010	–	0.000	0.000	0.000	0.001	0.000	–	0.001	0.001	0.000
Subtotal Closed Patterns	**0.036**	–	**0.001**	**0.001**	**0.002**	**0.006**	**0.001**	–	**0.003**	**0.005**	**0.001**

Table D.2-15. Nonroad Diesel Equipment Emission Factors for 2019 - Seymour Johnson AFB

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019										
Nonroad Equipment - 7-11 Hp	0.67	4.56	4.48	0.00	0.40	0.39	591	0.094	0.007	595
Nonroad Equipment - 26-40 Hp	0.30	1.17	3.60	0.00	0.18	0.18	634	0.094	0.007	638
Nonroad Equipment - 41-50 Hp	0.25	0.91	3.49	0.00	0.14	0.13	628	0.094	0.007	632
Nonroad Equipment - 76-100 Hp	0.49	2.94	2.52	0.00	0.40	0.39	644	0.094	0.007	648
Nonroad Equipment - 101-175 Hp	0.25	0.70	1.48	0.00	0.15	0.14	566	0.094	0.007	570

Table D.2-15. Nonroad Diesel Equipment Emission Factors for 2019 - Seymour Johnson AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019										
Nonroad Equipment - 7-11 Hp	0.079	0.010	0.097	0.004	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.036	0.004	0.043	0.002	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.030	0.004	0.037	0.002	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.058	0.007	0.071	0.003	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.030	0.004	0.036	0.002	–	–	–	–	–	–

Table D.2-15. Nonroad Diesel Equipment Emission Factors for 2019 - Seymour Johnson AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2019											
Nonroad Equipment - 7-11 Hp	–	–	–	0.122	–	–	–	–	–	0.001	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.055	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.090	–	–	–	–	–	0.001	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–

Table D.2-15. Nonroad Diesel Equipment Emission Factors for 2019 - Seymour Johnson AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.042	–	–	–	–	0.030
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.019	–	–	–	–	0.013
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.031	–	–	–	–	0.022
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011

[a] Criteria pollutant factors estimated with the use of the USEPA NONROAD2008a model for Wayne County, NC.

[b] HAPs factors estimated with VOC speciation data presented in Table 4-3 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.2-16. Annual Air Emissions for AGE Usages - Seymour Johnson AFB KC-46A MOB 3 Mission

Year/HP Category	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.00	0.01	0.01	0.00	0.00	0.00	0.73	0.00	0.00	0.74
Nonroad Equipment - 26-40 Hp	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.85
Nonroad Equipment - 41-50 Hp	0.00	0.01	0.03	0.00	0.00	0.00	6.04	0.00	0.00	6.08
Nonroad Equipment - 76-100 Hp	0.03	0.19	0.16	0.00	0.03	0.02	40.84	0.01	0.00	41.10
Nonroad Equipment - 101-175 Hp	0.00	0.01	0.02	0.00	0.00	0.00	7.77	0.00	0.00	7.83
Total - Year 2019	**0.04**	**0.21**	**0.22**	**0.00**	**0.03**	**0.03**	**56.23**	**0.01**	**0.00**	**56.59**

Table D.2-16. Annual Air Emissions for AGE Usages - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.004	0.000	0.005	0.000	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Total - Year 2019	**0.005**	**0.001**	**0.006**	**0.000**	–	–	–	–	–	–

Table D.2-16. Annual Air Emissions for AGE Usages - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.006	–	–	–	–	–	0.000	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Total - Year 2019	–	–	–	**0.007**	–	–	–	–	–	**0.000**	–

Table D.2-16. Annual Air Emissions for AGE Usages - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.002	–	–	–	–	0.001
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Total - Year 2019	–	**0.000**	–	–	–	**0.002**	–	–	–	–	**0.002**

[a] 2014 Seymour Johnson AFB AGE hp-hr * (2019 Seymour Johnson AFB MOB 3 KC-46A LTOs [1,270] / 2014 Seymour Johnson AFB KC-135 LTOs [1,100]) * (2019 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.2-17. 2014 VMT for GOVs by Vehicle Class - Seymour Johnson AFB

Vehicle Class	Annual VMT
LDGV	275,522
LDGT	735,646
HDGV	19,134
HDDV	408,203
Total VMT	**1,438,505**

Source: Seymour Johnson AFB Mobile AEI APIMS Data Entry_8Oct15.xlsx GOV sheet

Table D.2-18. Annual Number of Workers at Seymour Johnson AFB - KC-46A MOB 3 Mission

Scenario	Total Base Workers	916 ARW Staff Year 2015	MOB 3 Staff
Year 2014 [a]	7,731	–	–
Year 2015 916 ARW [b]	–	1,141	–
Year 2019 MOB 3 [b]	–	–	1,214

[a] Source: Seymour Johnson AFB Mobile AEI APIMS Data Entry_8Oct15.xlsx POV sheet.

[b] Source: EIS Table 2-8.

Table D.2-19. Annual Average On-Road Vehicle Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.09	3.50	0.38	0.01	0.07	0.01	394	–	–	394
LDGT - 25 mph	0.36	9.50	1.23	0.01	0.08	0.02	550	–	–	550
HGDV - 25 mph	0.33	9.06	1.18	0.01	0.08	0.02	547	–	–	547
HDDV - 25 mph	0.55	2.39	7.97	0.02	0.69	0.39	2,148	–	–	2,148
Year 2019										
LDGV - 25 mph	0.03	2.54	0.14	0.00	0.07	0.01	358	–	–	358
LDGT - 25 mph	0.14	6.76	0.48	0.00	0.08	0.02	514	–	–	514
HGDV - 25 mph	0.12	6.60	0.45	0.00	0.08	0.02	511	–	–	511
HDDV - 25 mph	0.27	1.31	4.39	0.02	0.49	0.20	2,077	–	–	2,077

Table D.2-19. Annual Average On-Road Vehicle Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.051	0.000	–	–	–	–	–	–
LDGT - 25 mph	0.006	0.001	0.205	0.002	–	–	–	–	–	–
HGDV - 25 mph	–	–	0.006	–	–	–	–	–	–	–
HDDV - 25 mph	–	–	–	–	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.018	0.000	–	–	–	–	–	–
LDGT - 25 mph	0.002	0.001	0.076	0.001	–	–	–	–	–	–
HGDV - 25 mph	–	–	0.002	–	–	–	–	–	–	–
HDDV - 25 mph	–	–	–	–	–	–	–	–	–	–

Table D.2-19. Annual Average On-Road Vehicle Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT - 25 mph	–	–	0.008	0.012	0.007	–	–	0.000	0.001	0.000	–
HGDV - 25 mph	–	–	0.002	–	0.006	–	–	–	–	–	–
HDDV - 25 mph	–	–	0.007	–	0.013	–	–		0.013	–	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT - 25 mph	–	–	0.003	0.005	0.002	–	–	0.000	0.000	0.000	–
HGDV - 25 mph	–	–	0.001	–	0.002	–	–	–	–	–	–
HDDV - 25 mph	–	–	0.004	–	0.007	–	–	–	0.007	–	–

Table D.2-19. Annual Average On-Road Vehicle Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.010	–	0.002	–	–	0.008
LDGT - 25 mph	–	–	0.000	–	–	0.006	–	0.015	–	–	0.030
HGDV - 25 mph	–	–	–	–	–	0.011	–	0.005	–	–	0.010
HDDV - 25 mph	–	–	0.011	–	–	–	–	0.000	–	–	–
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGT - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
HGDV - 25 mph	–	–	–	–	–	0.004	–	0.002	–	–	0.004
HDDV - 25 mph	–	–	0.006	–	–	–	–	0.000	–	–	–

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Wayne County, NC.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.2-20. Annual Emissions from GOV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario/Vehicle Class	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 916 ARW [a]										
LDGV	0.00	0.16	0.02	0.00	0.00	0.00	17.66	–	–	17.66
LDGT	0.04	1.14	0.15	0.00	0.01	0.00	65.82	–	–	65.82
HDGV	0.00	0.03	0.00	0.00	0.00	0.00	1.70	–	–	1.70
HDDV	0.04	0.16	0.53	0.00	0.05	0.03	142.64	–	–	142.64
Total - Year 2015	**0.08**	**1.48**	**0.70**	**0.00**	**0.06**	**0.03**	**227.82**	–	–	**227.82**
Year 2019 MOB 3 [b]										
LDGV	0.01	0.82	0.05	0.00	0.02	0.00	115.63	–	–	115.63
LDGT	0.12	5.83	0.41	0.00	0.07	0.01	443.53	–	–	443.53
HDGV	0.00	0.15	0.01	0.00	0.00	0.00	11.46	–	–	11.46
HDDV	0.13	0.63	2.10	0.01	0.23	0.10	994.20	–	–	994.20
Total - Year 2019	**0.26**	**7.43**	**2.57**	**0.01**	**0.33**	**0.12**	**1,564.82**	–	–	**1,564.82**

Table D.2-20. Annual Emissions from GOV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 916 ARW [a]										
LDGV	0.000	0.000	0.002	0.000	–	–	–	–	–	–
LDGT	0.001	0.000	0.024	0.000	–	–	–	–	–	–
HDGV	–	–	0.000	–	–	–	–	–	–	–
HDDV	–	–	–	–	–	–	–	–	–	–
Total - Year 2015	**0.001**	**0.000**	**0.027**	**0.000**	–	–	–	–	–	–
Year 2019 MOB 3 [b]										
LDGV	0.000	0.000	0.006	0.000	–	–	–	–	–	–
LDGT	0.002	0.000	0.066	0.001	–	–	–	–	–	–
HDGV	–	–	0.000	–	–	–	–	–	–	–
HDDV	–	–	–	–	–	–	–	–	–	–
Total - Year 2015	**0.002**	**0.000**	**0.072**	**0.001**	–	–	–	–	–	–

Table D.2-20. Annual Emissions from GOV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 916 ARW [a]											
LDGV	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT	–	–	0.001	0.001	0.001	–	–	0.000	0.000	0.000	–
HDGV	–	–	0.000	–	0.000	–	–	–	–	–	–
HDDV	–	–	0.000	–	0.001	–	–	–	0.001	–	–
Total - Year 2015	–	–	**0.002**	**0.002**	**0.002**	–	–	**0.000**	**0.001**	**0.000**	–
Year 2019 MOB 3 [b]											
LDGV	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
HDGV	–	–	0.000	–	0.000	–	–	–	–	–	–
HDDV	–	–	0.002	–	0.003	–	–	–	0.003	–	–
Total - Year 2015	–	–	**0.005**	**0.004**	**0.005**	–	–	**0.000**	**0.003**	**0.000**	–

Table D.2-20. Annual Emissions from GOV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 916 ARW [a]											
LDGV	–	–	0.000	–	–	0.000	–	0.000	–	–	0.000
LDGT	–	–	0.000	–	–	0.001	–	0.002	–	–	0.004
HDGV	–	–	–	–	–	0.000	–	0.000	–	–	0.000
HDDV	–	–	0.001	–	–	–	–	0.000	–	–	–
Total - Year 2015	–	–	**0.001**	–	–	**0.001**	–	**0.002**	–	–	**0.004**
Year 2019 MOB 3 [b]											
LDGV	–	–	0.000	–	–	0.001	–	0.000	–	–	0.001
LDGT	–	–	0.000	–	–	0.002	–	0.005	–	–	0.010
HDGV	–	–	–	–	–	0.000	–	0.000	–	–	0.000
HDDV	–	–	0.003	–	–	–	–	0.000	–	–	–
Total - Year 2015	–	–	**0.003**	–	–	**0.003**	–	**0.005**	–	–	**0.011**

[a] 2015 emissions = 2014 GOV VMT * (2015 Seymour Johnson AFB worker population/2014 Seymour Johnson AFB worker population) * 2015 vehicle emission factors.

[b] 2019 emissions = 2014 GOV VMT * (2019 Seymour Johnson AFB worker population/2014 Seymour Johnson AFB worker population) * 2019 vehicle emission factors.

– = Source does not emit particular pollutant

Table D.2-21. Annual On-Base On-Road Vehicle Mileage Calculations - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario	# of Workers	Vehicle Occupancy Rate	On-Base Miles per Round Trip [a]	Days per Year [a]	On-Base Miles per year [b]
Year 2014	7,731	1.0	4.0	30,924	8,040,240
Year 2015 916 ARW [c]	1,141	1.0	4.0	4,564	1,186,640
Year 2019 MOB 3 [c]	1,241	1.0	4.0	4,964	1,290,640

[a] Source: Seymour Johnson AFB Mobile AEI - file 5-2014 SJAFB Mobile AEI Process Calc Summary.pdf page 23.

[b] Based on 260 days per year.

[c] EIS Table 2-8.

Table D.2-22. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.09	3.50	0.38	0.01	0.07	0.01	394	–	–	394
LDGT1 - 25 mph	0.36	9.50	1.23	0.01	0.08	0.02	550	–	–	550
Composite [c]	**0.16**	**5.00**	**0.59**	**0.01**	**0.07**	**0.02**	**433**	–	–	**433**
Year 2019										
LDGV - 25 mph	0.03	2.54	0.14	0.00	0.07	0.01	358	–	–	358
LDGT1 - 25 mph	0.14	6.76	0.48	0.00	0.08	0.02	514	–	–	514
Composite [c]	**0.06**	**3.60**	**0.23**	**0.00**	**0.07**	**0.01**	**397**	–	–	**397**

Table D.2-22. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.051	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.006	0.001	0.205	0.002	–	–	–	–	–	–
Composite [c]	**0.002**	**0.001**	**0.089**	**0.001**	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.018	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.002	0.001	0.076	0.001	–	–	–	–	–	–
Composite [c]	**0.001**	**0.000**	**0.033**	**0.000**	–	–	–	–	–	–

Table D.2-22. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.008	0.012	0.007	–	–	0.000	0.001	0.000	–
Composite [c]	–	–	**0.004**	**0.004**	**0.003**	–	–	**0.000**	**0.000**	**0.000**	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.003	0.005	0.002	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.001**	**0.001**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.2-22. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	Propanal	**Pyrene**	**Styrene**	**1,1,2,2-Tetrachloroethane**	**Tetrachloroethene**	**Toluene**	**1,1,1-Trichloroethane**	**2,2,4-Trimethylpentane**	**Vinyl Acetate**	**mp-Xylene**	**o-Xylene**
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.010	–	0.002	–	–	0.008
LDGT1 - 25 mph	–	–	0.000	–	–	0.006	–	0.015	–	–	0.030
Composite [c]	–	–	**0.000**	–	–	**0.009**	–	**0.005**	–	–	**0.014**
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGT1 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
Composite [c]	–	–	**0.000**	–	–	**0.003**	–	**0.002**	–	–	**0.005**

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Wayne County, NC.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Equal to 75/25% LDGV/LDGT1.

– = Source does not emit particular pollutant

Table D.2-23. Annual Emissions from On-Base On-Road Vehicle Activities - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 916 ARW [a]	0.20	6.54	0.77	0.01	0.10	0.02	566.34	–	–	566.34
Year 2019 MOB 3 [b]	0.08	5.12	0.32	0.00	0.10	0.02	564.64	–	–	564.64

Table D.2-23. Annual Emissions from On-Base On-Road Vehicle Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 434 ARW [a]	0.002	0.001	0.116	0.001	–	–	–	–	–	–
Year 2019 MOB 3 [b]	0.001	0.000	0.047	0.000	–	–	–	–	–	–

Table D.2-23. Annual Emissions from On-Base On-Road Vehicle Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 434 ARW [a]	–	–	0.005	0.005	0.003	–	–	0.000	0.000	0.000	–
Year 2019 MOB 3 [b]	–	–	0.002	0.002	0.001	–	–	0.000	0.000	0.000	–

Table D.2-23. Annual Emissions from On-Base On-Road Vehicle Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 434 ARW [a]	–	–	0.000	–	–	0.011	–	0.007	–	–	0.018
Year 2019 MOB 3 [b]	–	–	0.000	–	–	0.004	–	0.003	–	–	0.007

[a] 2015 emissions = 2015 Total On-base VMT * 2015 composite emission factors.

[b] 2019 emissions = 2019 Total On-base VMT * 2019 composite emission factors.

– = Source does not emit particular pollutant

Table D.2-24. Annual Off-Base On-Road Vehicle Mileage Calculations - Seymour Johnson AFB KC-46A MOB 3 Project Mission

Scenario	# of Workers	Vehicle Occupancy Rate	Off-Base Miles per Round Trip	Days per Year	Off-Base Miles per year [a]
Year 2014	7,731	0.8	10.0	57,983	15,075,450
Year 2015 916 ARW	1,141	0.8	10.0	8,558	2,224,950
Year 2019 MOB 3	1,241	0.8	10.0	9,308	2,419,950

[a] Based on 260 days per year.

Table D.2-25. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.09	3.50	0.38	0.01	0.07	0.01	394	–	–	394
LDGV - 55 mph	0.06	2.96	0.36	0.01	0.02	0.01	307	–	–	307
LDGT1 - 25 mph	0.36	9.50	1.23	0.01	0.08	0.02	550	–	–	550
LDGT1 - 55 mph	0.16	7.93	1.24	0.01	0.03	0.01	443	–	–	443
Composite [c]	**0.10**	**4.40**	**0.58**	**0.01**	**0.04**	**0.01**	**364**	–	–	**364**
Year 2019										
LDGV - 25 mph	0.03	2.54	0.14	0.00	0.07	0.01	358	–	–	358
LDGV - 55 mph	0.02	2.23	0.14	0.00	0.02	0.01	279	–	–	279
LDGT1 - 25 mph	0.14	6.76	0.48	0.00	0.08	0.02	514	–	–	514
LDGT1 - 55 mph	0.06	6.07	0.50	0.00	0.03	0.01	415	–	–	415
Composite [c]	**0.04**	**3.29**	**0.23**	**0.00**	**0.03**	**0.01**	**334**	–	–	**334**

Table D.2-25. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.051	0.000	–	–	–	–	–	–
LDGV - 55 mph	0.000	0.000	0.035	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.006	0.001	0.205	0.002	–	–	–	–	–	–
LDGT1 - 55 mph	0.003	0.001	0.087	0.001	–	–	–	–	–	–
Composite [c]	**0.001**	**0.000**	**0.058**	**0.001**	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.018	0.000	–	–	–	–	–	–
LDGV - 55 mph	0.000	0.000	0.014	0.000	–	–	–	–	–	–
LDGT1 - 25 mph	0.002	0.001	0.076	0.001	–	–	–	–	–	–
LDGT1 - 55 mph	0.001	0.000	0.036	0.000	–	–	–	–	–	–
Composite [c]	**0.000**	**0.000**	**0.022**	**0.000**	–	–	–	–	–	–

Table D.2-25. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGV - 55 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.008	0.012	0.007	–	–	0.000	0.001	0.000	–
LDGT1 - 55 mph	–	–	0.004	0.005	0.003	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.002**	**0.002**	**0.002**	–	–	**0.000**	**0.000**	**0.000**	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGV - 55 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT1 - 25 mph	–	–	0.003	0.005	0.002	–	–	0.000	0.000	0.000	–
LDGT1 - 55 mph	–	–	0.001	0.002	0.001	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.001**	**0.001**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.2-25. Annual Average On-Road Emission Factors - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.010	–	0.002	–	–	0.008
LDGV - 55 mph	–	–	0.000	–	–	0.007	–	0.001	–	–	0.006
LDGT1 - 25 mph	–	–	0.000	–	–	0.006	–	0.015	–	–	0.030
LDGT1 - 55 mph	–	–	0.000	–	–	0.003	–	0.006	–	–	0.013
Composite [c]	–	–	**0.000**	–	–	**0.006**	–	**0.003**	–	–	**0.009**
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGV - 55 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.002
LDGT1 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
LDGT1 - 55 mph	–	–	0.000	–	–	0.001	–	0.003	–	–	0.005
Composite [c]	–	–	**0.000**	–	–	**0.002**	–	**0.001**	–	–	**0.003**

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Wayne County, NC.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Equal to 75/25% LDGV/LDGT1 and 75/25% 55/25 mph.

– = Source does not emit particular pollutant

Table D.2-26. Annual Emissions from Off-Base POV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 916 ARW [a]	0.25	10.79	1.43	0.02	0.09	0.03	892	–	–	892
Year 2019 MOB 3 [b]	0.10	8.78	0.61	0.01	0.09	0.02	891	–	–	891

Table D.2-26. Annual Emissions from Off-Base POV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 916 ARW [a]	0.002	0.001	0.142	0.001	–	–	–	–	–	–
Year 2019 MOB 3 [b]	0.001	0.000	0.060	0.001	–	–	–	–	–	–

Table D.2-26. Annual Emissions from Off-Base POV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 916 ARW [a]	–	–	0.006	0.006	0.004	–	–	0.000	0.000	0.000	–
Year 2019 MOB 3 [b]	–	–	0.003	0.002	0.002	–	–	0.000	0.000	0.000	–

Table D.2-26. Annual Emissions from Off-Base POV Activities - Seymour Johnson AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 916 ARW [a]	–	–	0.000	–	–	0.016	–	0.008	–	–	0.022
Year 2019 MOB 3 [b]	–	–	0.000	–	–	0.006	–	0.003	–	–	0.009

[a] 2015 emissions = 2015 Total Off-base VMT * 2015 composite emission factors.

[b] 2019 emissions = 2019 Total Off-base VMT * 2019 composite emission factors.

– = Source does not emit particular pollutant

Table D.2-27. Annual Number of Aircraft LTOs - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario	Number of LTOs
Year 2014 All SJAFB	12,769
Year 2015 916 ARW	756
Year 2019 MOB 3	1,270

Source: EIS Tables 2-9 and 2-10.

Table D.2-28. Annual Emissions from Point and Area Sources - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario Year/ Source Type	Tons per Year									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
2014 All Seymour Johnson AFB [a]										
Abrasive Cleaning	–	–	–	–	0.00	0.00	–	–	–	–
Above Ground Storage Tanks	0.46	–	–	–	–	–	–	–	–	–
Fuel Cell Maintenance - 90% F-15s	0.35	–	–	–	–	–	–	–	–	–
Misc Chemical Usage	–	–	–	–	–	–	–	–	–	–
Degreasing/Solvent Cleaning	–	–	–	–	–	–	–	–	–	–
Fuel Dispensing	–	–	–	–	–	–	–	–	–	–
Fuel Loading Racks	–	–	–	–	–	–	–	–	–	–
Internal Combustion	–	–	–	–	–	–	–	–	–	–
Jet Engine Testing - F-15 Only	–	–	–	–	–	–	–	–	–	–
Munitions	–	–	–	–	–	–	–	–	–	–
Open Burn/Open Detonation	0.01	0.18	0.21	0.00	0.02	0.02	–	–	–	–
Spills/Release	0.04	0.02	0.09	0.00	0.02	0.02	–	–	–	–
Surface Coating	0.08	0.22	1.03	0.07	0.07	0.07	–	–	–	–
Underground Storage Tank	0.14	–	–	–	0.00	–	–	–	–	–
Welding/Soldering/Cutting	0.00	–	–	–	–	–	–	–	–	–
Woodworking	–	–	–	–	0.00	–	–	–	–	–
Total - Year 2014	**1.09**	**0.42**	**1.33**	**0.07**	**0.11**	**0.10**	–	–	–	–
2015 916 ARW [b]										
Abrasive Cleaning	–	–	–	–	0.00	0.00	–	–	–	–
Above Ground Storage Tanks	0.03	–	–	–	–	–	–	–	–	–
Fuel Cell Maintenance	0.00	–	–	–	–	–	–	–	–	–
Misc Chemical Usage	–	–	–	–	–	–	–	–	–	–
Degreasing/Solvent Cleaning	–	–	–	–	–	–	–	–	–	–
Fuel Dispensing	–	–	–	–	–	–	–	–	–	–
Fuel Loading Racks	–	–	–	–	–	–	–	–	–	–
Internal Combustion	–	–	–	–	–	–	–	–	–	–
Munitions	–	–	–	–	–	–	–	–	–	–
Open Burn/Open Detonation	0.00	0.01	0.01	0.00	0.00	0.00	–	–	–	–
Spills/Release	0.00	–	–	–	–	–	–	–	–	–
Surface Coating	0.00	–	–	–	0.00	0.00	–	–	–	–
Underground Storage Tank	0.01	–	–	–	–	–	–	–	–	–
Welding/Soldering/Cutting	–	–	–	–	–	–	–	–	–	–
Woodworking	–	–	–	–	0.00	–	–	–	–	–
Total - Year 2015	**0.05**	**0.01**	**0.01**	**0.00**	**0.01**	**0.01**	–	–	–	–
2019 MOB 3 Scenario [b]										
Abrasive Cleaning	–	–	–	–	0.00	0.00	–	–	–	–

Table D.2-28. Annual Emissions from Point and Area Sources - Seymour Johnson AFB KC-46A MOB 3 Mission

Scenario Year/ Source Type	Tons per Year									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Above Ground Storage Tanks	0.05	–	–	–	–	–	–	–	–	–
Fuel Cell Maintenance	0.00	–	–	–	–	–	–	–	–	–
Misc Chemical Usage	–	–	–	–	–	–	–	–	–	–
Degreasing/Solvent Cleaning	–	–	–	–	–	–	–	–	–	–
Fuel Dispensing	–	–	–	–	–	–	–	–	–	–
Fuel Loading Racks	–	–	–	–	–	–	–	–	–	–
Internal Combustion	–	–	–	–	–	–	–	–	–	–
Munitions	–	–	–	–	–	–	–	–	–	–
Open Burn/Open Detonation	0.00	0.02	0.02	0.00	0.00	0.00	–	–	–	–
Spills/Release	0.00	–	–	–	–	–	–	–	–	–
Surface Coating	0.01	–	–	–	0.01	0.01	–	–	–	–
Underground Storage Tank	0.01	–	–	–	–	–	–	–	–	–
Welding/Soldering/Cutting	–	–	–	–	–	–	–	–	–	–
Woodworking	–	–	–	–	0.00	–	–	–	–	–
Total - 2019 MOB 3 Scenario	**0.08**	**0.02**	**0.02**	**0.00**	**0.01**	**0.01**	–	–	–	–

[a] Source: 2014 Criteria Pollutant Emissions - Comprehensive Stationary AEI (Seymour Johnson AFB 2015).

[b] 2014 emissions * future year LTOs/2014 LTOs.

– = Source does not emit particular pollutant

Table D.2-29. 2015 Emissions for the KC-135 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions

Source Type	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-135 Aircraft Operations	2.76	42.61	40.90	4.23	0.23	0.23	12,843	0.36	0.40	11,794
On-Wing Aircraft Engine Testing - KC-135	1.06	15.39	5.96	0.79	0.04	0.04	2,396	0.07	0.07	2,200
Aerospace Ground Support Equipment	0.05	0.27	0.29	0.00	0.04	0.04	49	0.01	0.00	45
GOVs/Nonroad Equipment	0.08	1.48	0.70	0.00	0.06	0.03	228	–	–	207
Privately-Owned Vehicles - On-Base	0.20	6.54	0.77	0.01	0.10	0.02	566	–	–	515
Privately-Owned Vehicles - Off-Base	0.25	10.79	1.43	0.02	0.09	0.03	892	–	–	811
Point and Area Sources	0.05	0.01	0.01	0.00	0.01	0.01	–	–	–	–
Total Emissions	**4.45**	**77.09**	**50.06**	**5.05**	**0.57**	**0.40**	**16,973**	**0.43**	**0.47**	**15,572**

Table D.2-29. 2015 Emissions for the KC-135 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Source Type	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-135 Aircraft Operations	0.107	0.068	0.268	0.038	0.002	0.002	0.005	0.004	0.001	0.002
On-Wing Aircraft Engine Testing - KC-135	0.041	0.027	0.107	0.015	0.001	0.001	0.001	0.001	0.000	0.001
Aerospace Ground Support Equipment	0.006	0.001	0.007	0.000	–	–	–	–	–	–
GOVs/Nonroad Equipment	0.001	0.000	0.027	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	0.002	0.001	0.116	0.001	–	–	–	–	–	–
Privately-Owned Vehicles - Off-Base	0.002	0.001	0.142	0.001	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.158**	**0.097**	**0.668**	**0.057**	**0.003**	**0.003**	**0.006**	**0.006**	**0.001**	**0.003**

Table D.2-29. 2015 Emissions for the KC-135 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
KC-135 Aircraft Operations	0.002	0.010	0.044	1.077	–	–	0.062	–	–	0.106	0.076
On-Wing Aircraft Engine Testing - KC-135	0.000	0.003	0.018	0.417	–	–	0.016	–	–	0.043	0.022
Aerospace Ground Support Equipment	–	–	–	0.008	–	–	–	–	–	0.001	–
GOVs/Nonroad Equipment	–	–	0.002	0.002	0.002	–	–	0.000	0.001	0.000	–
Privately-Owned Vehicles - On-Base	–	–	0.005	0.005	0.003	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	0.006	0.006	0.004	–	–	0.000	0.000	0.000	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.002**	**0.014**	**0.074**	**1.515**	**0.009**	**–**	**0.078**	**0.000**	**–**	**0.150**	**0.098**

Table D.2-29. 2015 Emissions for the KC-135 916 ARW at Seymour Johnson AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-135 Aircraft Operations	0.0552	0.001	0.056	0.003	0.003	0.128	0.002	–	0.012	0.084	0.036
On-Wing Aircraft Engine Testing - KC-135	0.0193	0.000	0.023	0.001	0.001	0.051	0.001	–	0.005	0.034	0.014
Aerospace Ground Support Equipment	–	0.000	–	–	–	0.003	–	–	–	–	0.002
GOVs/Nonroad Equipment	–	–	0.001	–	–	0.001	–	0.002	–	–	0.004
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.011	–	0.007	–	–	0.018
Privately-Owned Vehicles - Off-Base	–	–	0.000	–	–	0.016	–	0.008	–	–	0.022
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.0745**	**0.001**	**0.081**	**0.004**	**0.004**	**0.210**	**0.003**	**–**	**0.017**	**0.118**	**0.096**

– = Source does not emit particular pollutant

Table D.2-30. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Seymour Johnson AFB - 2019

Source Type	Annual Emissions (Tons)								
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
KC-46A Aircraft Operations	21.58	78.63	142.91	8.81	0.62	0.54	26,295	0.73	0.82
On-Wing Aircraft Engine Testing - KC-46A	11.57	39.71	18.73	1.68	0.16	0.14	4,899	0.14	0.15
Aerospace Ground Support Equipment - KC-46A	0.04	0.21	0.22	0.00	0.03	0.03	56	0.01	0.00
Government-Owned Vehicles	0.26	7.43	2.57	0.01	0.33	0.12	1,565	–	–
Privately-Owned Vehicles - On-Base	0.08	5.12	0.32	0.00	0.10	0.02	565	–	–
Privately-Owned Vehicles - Off-Base	0.10	8.78	0.61	0.01	0.09	0.02	891	–	–
Point and Area Sources	0.08	0.02	0.02	0.00	0.01	0.01		–	–
Total Proposed Emissions - 2019	**33.71**	**139.90**	**165.38**	**10.51**	**1.33**	**0.88**	**34,271**	**0.87**	**0.97**
Year 2015 Base Case Emissions	**(4.45)**	**(77.09)**	**(50.06)**	**(5.05)**	**(0.57)**	**(0.40)**	**(16,973)**	**(0.43)**	**(0.47)**
Proposed minus Base Case Emissions	**29.26**	**62.81**	**115.32**	**5.46**	**0.77**	**0.48**	**17,298**	**0.44**	**0.50**
Miami/Cass County PSD Thresholds	**250**	**250**	**250**	**250**	**250**	**250**	–	–	–

Table D.2-30. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Seymour Johnson AFB - 2019 (Continued)

		Annual Emissions (Tons)									
CO_2e	**Source Type**	**Acetalde-hyde**	**Acrolein**	**Benzene**	**1,3-Butadiene**	**Carbon Disulfide**	**Carbon Tetra-chloride**	**Chloro-form**	**Chloro-methane**	**Dibutyl Phthalate**	**1,2-Dichloro-propane**
24,149	KC-46A Aircraft Operations	0.823	0.540	2.168	0.312	0.018	0.016	0.033	0.030	0.007	0.019
4,500	On-Wing Aircraft Engine Testing - KC-46A	0.445	0.294	1.182	0.171	0.009	0.008	0.015	0.014	0.002	0.010
51	Aerospace Ground Support Equipment - KC-46A	0.005	0.001	0.006	0.000	–	–	–	–	–	–
1,423	Government-Owned Vehicles	0.002	0.000	0.072	0.001	–	–	–	–	–	–
513	Privately-Owned Vehicles - On-Base	0.001	0.000	0.047	0.000	–	–	–	–	–	–
810	Privately-Owned Vehicles - Off-Base	0.001	0.000	0.060	0.001	–	–	–	–	–	–
–	Point and Area Sources	–	–	–	–	–	–	–	–	–	–
31,446	**Total Proposed Emissions - 2019**	**1.276**	**0.836**	**3.533**	**0.485**	**0.028**	**0.024**	**0.048**	**0.045**	**0.009**	**0.030**
(15,572)	**Year 2015 Base Case Emissions**	**(0.158)**	**(0.097)**	**(0.668)**	**(0.057)**	**(0.003)**	**(0.003)**	**(0.006)**	**(0.006)**	**(0.001)**	**(0.003)**
15,874	**Proposed minus Base Case Emissions**	**1.118**	**0.739**	**2.865**	**0.428**	**0.024**	**0.021**	**0.042**	**0.039**	**0.008**	**0.026**
–											

Table D.2-30. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Seymour Johnson AFB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
KC-46A Aircraft Operations	0.010	0.073	0.355	8.446	–	–	0.386	–	–	0.868	0.449
On-Wing Aircraft Engine Testing - KC-46A	0.005	0.034	0.194	4.570	–	–	0.152	–	–	0.475	0.239
Aerospace Ground Support Equipment - KC-46A	–	–	–	0.007	–	–		–	–	0.000	–
Government-Owned Vehicles	–	–	0.005	0.004	0.005	–	–	0.000	0.003	0.000	–
Privately-Owned Vehicles - On-Base	–	–	0.002	0.002	0.001	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	0.003	0.002	0.002	–	–	0.000	0.000	0.000	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.015**	**0.108**	**0.558**	**13.032**	**0.009**	**–**	**0.538**	**0.000**	**0.004**	**1.344**	**0.689**
Year 2015 Base Case Emissions	**(0.002)**	**(0.014)**	**(0.074)**	**(1.515)**	**(0.009)**	**–**	**(0.078)**	**(0.000)**	**(0.150)**	**(0.098)**	**(0.074)**
Proposed minus Base Case Emissions	**0.013**	**0.094**	**0.484**	**11.517**	**(0.001)**	**–**	**0.460**	**(0.000)**	**(0.147)**	**1.246**	**0.614**

Table D.2-30. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Seymour Johnson AFB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	**Pyrene**	**Styrene**	**1,1,2,2-Tetrachloroethane**	**Tetrachloroethene**	**Toluene**	**1,1,1-Trichloroethane**	**2,2,4-Trimethylpentane**	**Vinyl Acetate**	**mp-Xylene**	**o-Xylene**
KC-46A Aircraft Operations	0.4083	0.008	0.460	0.020	0.023	1.036	0.016	–	0.095	0.679	0.292
On-Wing Aircraft Engine Testing - KC-46A	0.2034	0.005	0.252	0.010	0.012	0.564	0.008	–	0.050	0.370	0.159
Aerospace Ground Support Equipment - KC-46A	–	0.000	–	–	–	0.002	–	–	–	–	0.002
Government-Owned Vehicles	–	–	0.003	–	–	0.003	–	0.005	–	–	0.011
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.004	–	0.003	–	–	0.007
Privately-Owned Vehicles - Off-Base	–	–	0.000	–	–	0.006	–	0.003	–	–	0.009
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.6118**	**0.013**	**0.714**	**0.030**	**0.035**	**1.617**	**0.024**	**0.011**	**0.145**	**1.049**	**0.480**
Year 2015 Base Case Emissions	**(0.0015)**	**(0.081)**	**(0.004)**	**(0.004)**	**(0.210)**	**(0.003)**	**(0.017)**	**(0.118)**	**(0.096)**	**–**	**–**
Proposed minus Base Case Emissions	**0.6103**	**(0.068)**	**0.711**	**0.026**	**(0.175)**	**1.614**	**0.007**	**(0.107)**	**0.049**	**1.049**	**0.480**

– = Source does not emit particular pollutant

D.3 TINKER AIR FORCE BASE REGIONAL CLIMATE

The region surrounding Tinker AFB has a continental climate, characterized by pronounced variations in daily and seasonal temperatures and seasonal and annual precipitation. Meteorological data collected within Oklahoma County, Oklahoma, are used to describe the climate of the Tinker AFB project area (Oklahoma Climatological Survey 2015).

Temperature. Oklahoma County is known for high temperatures in the summer months and cool conditions during the winter. The average high and low temperatures during the summer months at Oklahoma City range from approximately 93 °F to 62 °F. The average high and low temperatures during the winter months range from 50 °F to 26 °F.

Precipitation. Average annual precipitation for Oklahoma City is 36 inches. Precipitation is greatest during the warmer months of the year, and the peak monthly average of 5.5 inches occurs in May. Precipitation is at a minimum during the winter, with the lowest monthly average of 1.3 inch occurring in January. Snow is not uncommon during winter, but the average annual snowfall is only 9 inches.

Prevailing Winds. The winds in the region prevail from the south to southeast during the warmer months of the year and from the north mainly during winter (NOAA 1998). The region experiences breezy conditions, with the annual average wind speed of 13 miles per hour for Oklahoma City. March and April are generally the windiest months of the year.

Severe Weather. Thunderstorms occur an average of approximately 49 days each year and predominantly in the spring and summer. Tornadoes also occur in the region, and 86 were recorded in Oklahoma County during the period of 1950 through 2003. Within the county, hail exceeds 1 inch in diameter during approximately 4 events per year.

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D.3.1 OPERATIONS EMISSION CALCULATIONS FOR THE KC-46A MOB 3 MISSION AT TINKER AFB

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Table D.3-1. Annual Aircraft Operations at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions

Year/Aircraft	Number of Operations				
	LTO	TGO	LFB	LFP	Total
Year 2009 [a]					
KC-135R	1,269	768	–	–	**2,037**
Other	3,924	–	–	–	**3,924**
Totals	**5,193**	**768**	–	–	**5,961**
Year 2015 [b]					
KC-135R	400	–	–	1,599	**1,999**
Based Aircraft	2,100	–	–	14,508	**16,608**
Depot	386	–	–	3,696	**4,082**
Transient	990	–	–	3,008	**3,998**
Totals	**3,876**	–	–	**22,811**	**26,687**

Sources: (1) CH2MHill. 2010. Final - Tinker AFB 2009 Mobile Source Emission Inventory
(2) EIS Table 2-13

Table D.3-2. 2015 KC-135 Closed Pattern Operations for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions

Aircraft Type/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		55%	60%	Climbout	Takeoff	55%	60%	Climbout	Takeoff
KC-135									
Closed Pattern - Radar & Initial to Overhead	731	12.0	2.0	–	1.0	146	24	–	12
Closed Pattern - VFR	496	5.0	2.0	–	1.0	41	17	–	8
Closed Pattern - Tactical	372	8.0	2.0	2.0	1.0	50	12	12	6
Total TIMs - Hours						**237**	**53**	**12**	**27**

[a] Distribution of operations based on assumptions obtained during site survey 15 December 2015.

Table D.3-3. 2015 KC-135 Aircraft Emissions for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions

Operation/Source	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
LTOs										
KC-135 Aircraft Operations	1.38	20.53	7.54	1.09	0.06	0.06	3,302	0.09	0.10	3,336
Subtotal - LTOs	**1.38**	**20.53**	**7.54**	**1.09**	**0.06**	**0.06**	**3,302**	**0.09**	**0.10**	**3,336**
Closed Patterns										
KC-135 - 55%	0.16	4.75	23.90	2.16	0.11	0.11	6,545	0.18	0.20	6,612
KC-135 - 60%	0.04	0.97	6.18	0.53	0.03	0.03	1,597	0.04	0.05	1,613
KC-135 - Climbout	0.01	0.01	2.58	0.17	0.01	0.01	518	0.01	0.02	523
KC-135 - Take-off	0.02	0.04	7.69	0.44	0.03	0.03	1,337	0.04	0.04	1,351
Subtotal - Closed Patterns	**0.22**	**5.77**	**40.36**	**3.29**	**0.18**	**0.18**	**9,997**	**0.28**	**0.31**	**10,099**
Total KC-135 Aircraft Operations	**1.60**	**26.30**	**47.90**	**4.38**	**0.24**	**0.24**	**13,299**	**0.37**	**0.41**	**13,435**

Table D.3-3. 2015 KC-135 Aircraft Emissions for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Operation/Source	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butad-iene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
LTOs										
KC-135 Aircraft Operations	0.053	0.035	0.140	0.020	0.001	0.001	0.002	0.002	0.000	0.001
Subtotal - LTOs	**0.053**	**0.035**	**0.140**	**0.020**	**0.001**	**0.001**	**0.002**	**0.002**	**0.000**	**0.001**
Closed Patterns										
KC-135 - 55%	0.007	0.002	0.005	0.000	0.000	0.000	0.001	0.001	0.000	0.000
KC-135 - 60%	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KC-135 - Climbout	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
KC-135 - Take-off	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal - Closed Patterns	**0.009**	**0.003**	**0.007**	**0.000**	**0.000**	**0.000**	**0.002**	**0.001**	**0.001**	**0.000**
Total KC-135 Aircraft Operations	**0.062**	**0.038**	**0.146**	**0.020**	**0.001**	**0.001**	**0.003**	**0.003**	**0.001**	**0.001**

Table D.3-3. 2015 KC-135 Aircraft Emissions for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Operation/Source	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
LTOs											
KC-135 Aircraft Operations	0.001	0.004	0.023	0.546	–	–	0.021	–	–	0.056	0.031
Subtotal - LTOs	**0.001**	**0.004**	**0.023**	**0.546**	–	–	**0.021**	–	–	**0.056**	**0.031**
Closed Patterns											
KC-135 - 55%	0.000	0.002	0.000	0.054	–	–	0.020	–	–	0.001	0.021
KC-135 - 60%	0.000	0.001	0.000	0.012	–	–	0.005	–	–	0.000	0.004
KC-135 - Climbout	0.000	0.000	0.000	0.002	–	–	0.002	–	–	0.000	0.000
KC-135 - Take-off	–	0.000	0.000	0.002	–	–	0.006	–	–	0.000	0.000
Subtotal - Closed Patterns	**0.001**	**0.003**	**0.001**	**0.070**	–	–	**0.034**	–	–	**0.001**	**0.025**
Total KC-135 Aircraft Operations	**0.001**	**0.008**	**0.023**	**0.615**	–	–	**0.055**	–	–	**0.057**	**0.057**

Table D.3-3. 2015 KC-135 Aircraft Emissions for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Operation/Source	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
LTOs											
KC-135 Aircraft Operations	0.025	0.001	0.030	0.001	0.001	0.067	0.001	–	0.006	0.044	0.019
Subtotal - LTOs	**0.025**	**0.001**	**0.030**	**0.001**	**0.001**	**0.067**	**0.001**	**–**	**0.006**	**0.044**	**0.019**
Closed Patterns											
KC-135 - 55%	0.007	–	0.000	0.000	0.000	0.002	0.000	–	0.001	0.001	0.000
KC-135 - 60%	0.002	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
KC-135 - Climbout	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
KC-135 - Take-off	0.003	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Subtotal - Closed Patterns	**0.012**	**–**	**0.001**	**0.000**	**0.001**	**0.003**	**0.000**	**–**	**0.001**	**0.002**	**0.001**
Total KC-135 Aircraft Operations	**0.037**	**0.001**	**0.030**	**0.002**	**0.002**	**0.070**	**0.001**	**–**	**0.007**	**0.046**	**0.019**

Table D.3-4. 2015 KC-135 On-Wing Engine Testing Activity Data for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions

Aircraft/Test Type	Tests/ Year	# of Engines	Duration (Minutes)	Engine Setting/Annual Engine Hours			
				Idle	Approach	Intermediate	Takeoff
KC-135 [a]							
60-HR inspection	18	4	15	17.6	–	–	–
120-HR inspection	18	4	15	17.6	–	–	–
Idle runs for maintenance	35	1	15	8.7	–	–	–
Idle runs for maintenance	28	2	15	13.9	–	–	–
Idle runs for maintenance	7	4	15	6.9	–	–	–
141 ARW expo sortie preflight	119	4	10	79.0	–	–	–
141 ARW expo sortie post-flight	119	4	6	47.4	–	–	–
Defueling	7	1	60	6.9	–	–	–
Preflight	274	4	10	182.6	–	–	–
Post-flight	274	2	5	45.6	–	–	–
High power engine runs	21	2	90	64.0	–	–	–
High power engine runs	21	2	15	–	10.7	–	–
High power engine runs	21	2	30	–	–	21.3	
High power engine runs	21	2	15	–	–	–	10.7
Total TIMs - KC-135				**490**	**11**	**21**	**11**

[a] Fairchild baseline BaseOps-Aircraft Maintenance - Noise.pdf, then factored these data by 30 KC-135s stationed at FAFB by the 8 KC-135s at Tinker AFB.

Table D.3-5. 2015 Emissions from On-Wing Engine Testing for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions

Aircraft/Throttle Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-135										
Idle	0.52	7.63	0.99	0.26	0.01	0.01	799	0.022	0.025	807
Approach	0.00	0.06	0.11	0.01	0.00	0.00	42	0.001	0.001	43
Intermediate	0.00	0.01	1.11	0.07	0.00	0.00	223	0.006	0.007	225
Military	0.00	0.00	0.77	0.04	0.00	0.00	134	0.004	0.004	135
Total Emissions - 2015	**0.53**	**7.69**	**2.98**	**0.39**	**0.02**	**0.02**	**1,198**	**0.03**	**0.04**	**1,210**

Table D.3-5. 2015 Emissions from On-Wing Engine Testing for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons									
	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dibutyl Phthalate	1,2-Dichloropropane
KC-135										
Idle	0.020	0.013	0.054	0.008	0.000	0.000	0.001	0.001	0.000	0.000
Approach	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Military	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions - 2015	**0.020**	**0.013**	**0.054**	**0.008**	**0.000**	**0.000**	**0.001**	**0.001**	**0.000**	**0.000**

Table D.3-5. 2015 Emissions from On-Wing Engine Testing for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons										
	2,4-Dinitrophenol	DEHP	Ethylbenzene	Formaldehyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphthalene	Phenol
KC-135											
Idle	0.000	0.002	0.009	0.207	–	–	0.006	–	–	0.022	0.011
Approach	0.000	0.000	0.000	0.000	–	–	0.000	–	–	0.000	0.000
Intermediate	0.000	0.000	0.000	0.001	–	–	0.001	–	–	0.000	0.000
Military	–	0.000	0.000	0.000	–	–	0.001	–	–	0.000	0.000
Total Emissions - 2015	**0.000**	**0.002**	**0.009**	**0.209**	–	–	**0.008**	–	–	**0.022**	**0.011**

Table D.3-5. 2015 Emissions from On-Wing Engine Testing for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Aircraft/Throttle Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-135											
Idle	0.009	0.000	0.011	0.000	0.001	0.026	0.000	–	0.002	0.017	0.007
Approach	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Intermediate	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Military	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Total Emissions - 2015	**0.010**	**0.000**	**0.011**	**0.000**	**0.001**	**0.026**	**0.000**	**–**	**0.002**	**0.017**	**0.007**

Table D.3-6. 2014 AGE Usages for the KC-135R Detachment at Seymour Johnson AFB

Source	Fuel Type	Hp	Load Factor	Hours/Year	Annual Hp-Hours
Air Compressor - MC-2A	JP-8	10.5	0.48	60	302
Floodlight (FL-1D & NF2D & lightcart)	JP-8	10.5	0.74	100	777
Next Generation Heater (NGH)	JP-8	7.0	0.95	50	333
Subtotal - 7-11 Hp					**1,412**
Jacking Manifold	JP-8	30.0	0.51	100	1,530
Subtotal - 26-40 Hp					**1,530**
Air Compressor - MC20	JP-8	50.0	1.00	120	6,000
Nitrogen Servicing Cart	JP-8	49.0	0.51	200	4,998
Subtotal - 41-50 Hp					**10,998**
Air Compressor - MC-7	JP-8	52.0	0.48	150	3,744
Generator Set - A/M32A-86D	JP-8	96.5	0.95	750	68,742
Subtotal - 76-100 Hp					**72,486**
Air Conditioners - MA-3D	JP-8	120.0	0.28	150	5,040
Hyd Test Stand - MJ-2	JP-8	125.0	0.51	75	4,781
Start Cart - A/M32A-95	JP-8	155.0	0.95	40	5,890
Subtotal - 101-175 Hp					**15,711**

Note: These data used as surrogates for AGE usages for KC-135 and KC-46A aircraft at all proposed basing locations.
Source: Seymour Johnson AFB Mobile AEI APIMS Data Entry_8Oct15.xlsx 'GSE', but some Hp ratings obtained from 5-2014 Seymour Johnson AFB Mobile AEI Process Calc Summary.pdf

Table D.3-7. Nonroad Diesel Equipment Emission Factors - Tinker AFB

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
Nonroad Equipment - 7-11 Hp	0.72	4.67	4.72	0.00	0.46	0.45	591	0.094	0.007	595
Nonroad Equipment - 26-40 Hp	0.49	2.16	4.29	0.00	0.35	0.34	634	0.094	0.007	638
Nonroad Equipment - 41-50 Hp	0.41	1.80	4.20	0.00	0.29	0.28	627	0.094	0.007	631
Nonroad Equipment - 76-100 Hp	0.69	4.23	3.82	0.00	0.61	0.59	644	0.094	0.007	648
Nonroad Equipment - 101-175 Hp	0.32	1.24	2.67	0.00	0.27	0.26	565	0.094	0.007	569

Table D.3-7. Nonroad Diesel Equipment Emission Factors - Tinker AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
Nonroad Equipment - 7-11 Hp	0.086	0.010	0.105	0.004	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.059	0.007	0.072	0.003	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.049	0.006	0.059	0.002	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.082	0.010	0.100	0.004	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.039	0.005	0.047	0.002	–	–	–	–	–	–

Table D.3-7. Nonroad Diesel Equipment Emission Factors - Tinker AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
Nonroad Equipment - 7-11 Hp	–	–	–	0.132	–	–	–	–	–	0.009	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.091	–	–	–	–	–	0.006	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.075	–	–	–	–	–	0.005	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.126	–	–	–	–	–	0.009	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.059	–	–	–	–	–	0.004	–

Table D.3-7. Nonroad Diesel Equipment Emission Factors - Tinker AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
Nonroad Equipment - 7-11 Hp	–	0.001	–	–	–	0.046	–	–	–	–	0.032
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.031	–	–	–	–	0.022
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.026	–	–	–	–	0.018
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.044	–	–	–	–	0.030
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.021	–	–	–	–	0.014

[a] Criteria pollutant factors estimated with the use of the USEPA NONROAD2008a model for Oklahoma County, OK.

[b] HAPs factors estimated with VOC speciation data presented in Table 4-3 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.3-8. 2015 Emissions from AGE Usages for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions

Year/HP Category	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 [a]										
Nonroad Equipment - 7-11 Hp	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.34
Nonroad Equipment - 26-40 Hp	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.39
Nonroad Equipment - 41-50 Hp	0.00	0.01	0.02	0.00	0.00	0.00	2.76	0.00	0.00	2.78
Nonroad Equipment - 76-100 Hp	0.02	0.12	0.11	0.00	0.02	0.02	18.70	0.00	0.00	18.82
Nonroad Equipment - 101-175 Hp	0.00	0.01	0.02	0.00	0.00	0.00	3.56	0.00	0.00	3.59
Total - Year 2015	**0.02**	**0.14**	**0.15**	**0.00**	**0.02**	**0.02**	**25.75**	**0.00**	**0.00**	**25.91**

[a] 2014 SJAFB AGE hp-hr * (2015 TAFB KC-135 LTOs [400] / 2014 SJAFB KC-135 LTOs [1,100]) * (2015 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.3-8. 2015 Emissions from AGE Usages for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Year/HP Category	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 [a]										
Nonroad Equipment - 7-11 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.002	0.000	0.003	0.000	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Total - Year 2015	**0.003**	**0.000**	**0.004**	**0.000**	–	–	–	–	–	–

Table D.3-8. 2015 Emissions from AGE Usages for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Year/HP Category	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 [a]											
Nonroad Equipment - 7-11 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.004	–	–	–	–	–	0.000	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Total - Year 2015	–	–	–	**0.004**	–	–	–	–	–	**0.000**	–

Table D.3-8. 2015 Emissions from AGE Usages for the 507 ARW at Tinker AFB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Year/HP Category	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 [a]											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.001	–	–	–	–	0.001
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Total - Year 2015	–	**0.000**	–	–	–	**0.002**	–	–	–	–	**0.001**

[a] 2014 Seymour Johnson AFB AGE hp-hr * (2015 Tinker AFB KC-135 LTOs [400] / 2014 Seymour Johnson AFB KC-135 LTOs [1,100]) * (2015 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.3-9. KC-46A Aircraft Operations at Tinker AFB - KC-46A MOB 3 Mission

Scenario/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		Idle	Approach	Climbout	Takeoff	Idle	Approach	Climbout	Takeoff
Landings and Take-offs									
Landings and Take-offs	1,150	47.7	5.2	1.6	0.7	914	100	31	13
Scenario/Operation	**Operations/ Year [b]**	**Engine Setting/Time in Mode per Operation (Minutes)**				**Engine Setting Annual Hours**			
		55%	**60%**	**Climbout**	**Takeoff**	**55%**	**60%**	**Climbout**	**Takeoff**
Closed Patterns									
Closed Pattern - Radar & Initial to Overhead	1,892	12.0	2.0	–	1.0	378	63	–	32
Closed Pattern - VFR	1,285	5.0	2.0	–	1.0	107	43	–	21
Closed Pattern - Tactical	964	8.0	2.0	2.0	1.0	128	32	32	16
Total TIMs - KC-46A MOB 3						**614**	**138**	**32**	**69**

[a] EIS Table 2-14.

[b] EIS Table 2-14 and KC-46 MOB CP Ops Data for Emissions.xlsx. Closed Pattern - Tactical ops reduced by 7.5% to reflect amount of time above 3,000' AGL.

Table D.3-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Tinker AFB - KC-46A MOB 3 Mission 2019

Operation/Engine Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Landings and Take-offs										
Idle	18.99	64.79	5.75	1.61	0.17	0.15	4,890	0.14	0.15	4,940
Approach	0.06	1.10	6.92	0.60	0.03	0.02	1,828	0.05	0.06	1,846
Climbout	0.04	0.26	13.44	0.55	0.04	0.03	1,664	0.05	0.05	1,681
Take-off	0.03	0.18	9.97	0.31	0.02	0.02	933	0.03	0.03	942
APU	0.05	0.41	8.18	0.68	0.06	0.05	1,671	0.05	0.05	1,688
Subtotal LTOs	**19.17**	**66.73**	**44.25**	**3.75**	**0.31**	**0.28**	**10,985**	**0.30**	**0.34**	**11,098**
Closed Patterns										
55%	0.62	8.47	122.06	7.01	0.39	0.32	21,279	0.59	0.66	21,496
60%	0.15	1.87	32.07	1.73	0.10	0.08	5,234	0.14	0.16	5,288
Climbout	0.04	0.27	14.08	0.57	0.04	0.03	1,743	0.05	0.05	1,760
Take-off	0.14	0.91	51.26	1.58	0.12	0.10	4,798	0.13	0.15	4,847
Subtotal Closed Patterns	**0.94**	**11.52**	**219.46**	**10.89**	**0.65**	**0.54**	**33,053**	**0.91**	**1.03**	**33,391**
Total MOB 3 Operations	**20.12**	**78.25**	**263.71**	**14.65**	**0.96**	**0.82**	**44,039**	**1.22**	**1.37**	**44,489**

Table D.3-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Tinker AFB - KC-46A MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Landings and Take-offs										
Idle	0.731	0.484	1.945	0.281	0.015	0.013	0.025	0.023	0.004	0.017
Approach	0.003	0.001	0.002	–	0.000	0.000	0.000	0.000	0.000	0.000
Climbout	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Take-off	0.001	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
APU	0.002	0.001	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal LTOs	**0.738**	**0.487**	**1.954**	**0.282**	**0.015**	**0.014**	**0.026**	**0.024**	**0.004**	**0.017**
Closed Patterns										
55%	0.011	0.003	0.016	0.001	0.002	0.002	0.007	0.005	0.003	0.001
60%	0.003	0.001	0.004	0.000	0.001	0.001	0.002	0.001	0.001	0.000
Climbout	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Take-off	0.003	0.000	0.002	–	0.000	0.000	0.001	0.002	0.000	0.000
Subtotal Closed Patterns	**0.018**	**0.004**	**0.024**	**0.001**	**0.003**	**0.003**	**0.010**	**0.009**	**0.005**	**0.001**
Total MOB 3 Operations	**0.756**	**0.492**	**1.977**	**0.283**	**0.019**	**0.017**	**0.036**	**0.033**	**0.009**	**0.018**

Table D.3-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Tinker AFB - KC-46A MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Landings and Take-offs											
Idle	0.008	0.055	0.319	7.516	–	–	0.234	–	–	0.782	0.393
Approach	0.000	0.000	0.000	0.024	–	–	0.004	–	–	0.000	0.012
Climbout	0.000	0.001	0.000	0.009	–	–	0.010	–	–	0.000	0.000
Take-off	–	0.001	0.000	0.003	–	–	0.009	–	–	0.000	0.000
APU	0.000	0.000	0.001	0.021	–	–	0.001	–	–	0.002	0.001
Subtotal LTOs	**0.008**	**0.057**	**0.320**	**7.574**	–	–	**0.257**	–	–	**0.785**	**0.406**
Closed Patterns											
55%	0.003	0.016	0.002	0.136	–	–	0.146	–	–	0.002	0.001
60%	0.001	0.004	0.000	0.033	–	–	0.035	–	–	0.001	0.000
Climbout	0.000	0.001	0.000	0.010	–	–	0.010	–	–	0.000	0.000
Take-off	–	0.003	0.000	0.013	–	–	0.046	–	–	0.000	0.000
Subtotal Closed Patterns	**0.003**	**0.023**	**0.003**	**0.192**	–	–	**0.237**	–	–	**0.003**	**0.001**
Total MOB 3 Operations	**0.011**	**0.081**	**0.323**	**7.765**	–	–	**0.495**	–	–	**0.788**	**0.407**

Table D.3-10. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Tinker AFB - KC-46A MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Landings and Take-offs											
Idle	0.327	0.008	0.414	0.017	0.019	0.929	0.013	–	0.082	0.608	0.262
Approach	0.001	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.000	0.000
Climbout	0.003	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.000	0.000
Take-off	0.005	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.001	0.000	0.001	0.000	0.000	0.003	0.000	–	0.000	0.002	0.001
Subtotal LTOs	**0.337**	**0.008**	**0.415**	**0.017**	**0.019**	**0.933**	**0.014**	**–**	**0.083**	**0.611**	**0.263**
Closed Patterns											
55%	0.047	–	0.001	0.001	0.003	0.010	0.002	–	0.005	0.007	0.002
60%	0.011	–	0.000	0.000	0.001	0.002	0.000	–	0.001	0.002	0.000
Climbout	0.003	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Take-off	0.024	–	0.000	0.000	0.001	0.001	0.000	–	0.002	0.002	0.000
Subtotal Closed Patterns	**0.085**	**–**	**0.002**	**0.002**	**0.004**	**0.014**	**0.002**	**–**	**0.008**	**0.012**	**0.002**
Total MOB 3 Operations	**0.422**	**0.008**	**0.417**	**0.019**	**0.024**	**0.947**	**0.016**	**–**	**0.091**	**0.622**	**0.266**

– = Source does not emit particular pollutant

Table D.3-11. KC-46A Aircraft On-Wing Engine Testing Activity Data for Tinker AB - KC-46A MOB 3 Mission

Aircraft/Test Type	Tests/ Year	# of Engines	Duration (Minutes)	Engine Setting/Annual Engine Hours			
				Idle	Approach	Intermediate	Takeoff
KC-46A - MOB 3[a]							
Leak Checks/Troubleshooting	208	2	45	312.0	–	–	–
Fuel Transfer	69	1	80	92.4	–	–	–
Troubleshooting - High Power	35	1	40	11.6	2.9	2.9	5.8
Troubleshooting - High Power	35	2	15	17.3	–	–	–
Engine Trims	4	1	40	1.3	0.3	0.3	0.7
Engine Trims	4	2	10	1.3	–	–	–
ISO Runs	12	2	35	14.0	–	–	–
Backline Runs	12	2	69	465.8	6.9	–	10.4
Post ISO Runs	12	2	55	192.5	–	–	11.0
Total TIMs - KC-46A MOB 3				**1,108**	**10**	**3**	**28**

[a] Altus FTU BaseOps-Aircraft Maintenance-Noise.pdf (April 16, 2013).

Note: The APU operates for the same amount of time as the main engines during testing activities.

Table D.3-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Tinker AFB - Proposed MOB 3 Mission

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-46A - MOB 3										
Idle	11.51	39.27	3.48	0.98	0.10	0.09	2,964	0.08	0.09	2,994
Approach	0.00	0.06	0.35	0.03	0.00	0.00	93	0.00	0.00	94
Intermediate	0.00	0.01	0.71	0.03	0.00	0.00	87	0.00	0.00	88
Military	0.03	0.18	10.32	0.32	0.02	0.02	966	0.03	0.03	976
APU	0.03	0.19	3.86	0.32	0.03	0.02	789	0.02	0.02	797
Total KC-46A MOB 3	**11.57**	**39.71**	**18.73**	**1.68**	**0.16**	**0.14**	**4,899**	**0.14**	**0.15**	**4,950**

Table D.3-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Tinker AFB - Proposed MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-46A - MOB 3										
Idle	0.443	0.294	1.179	0.170	0.009	0.008	0.015	0.014	0.002	0.010
Approach	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Military	0.001	0.000	0.000	–	0.000	0.000	0.000	0.001	0.000	0.000
APU	0.001	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total KC-46A MOB 3	**0.445**	**0.294**	**1.182**	**0.171**	**0.009**	**0.008**	**0.015**	**0.014**	**0.002**	**0.010**

Table D.3-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Tinker AFB - Proposed MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
KC-46A - MOB 3											
Idle	0.005	0.033	0.193	4.556	–	–	0.142	–	–	0.474	0.238
Approach	0.000	0.000	0.000	0.001	–	–	0.000	–	–	0.000	0.001
Intermediate	0.000	0.000	0.000	0.000	–	–	0.001	–	–	0.000	0.000
Military	–	0.001	0.000	0.003	–	–	0.009	–	–	0.000	0.000
APU	0.000	0.000	0.000	0.010	–	–	0.000	–	–	0.001	0.001
Total KC-46A MOB 3	**0.005**	**0.034**	**0.194**	**4.570**	**–**	**–**	**0.152**	**–**	**–**	**0.475**	**0.239**

Table D.3-12. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Tinker AFB - Proposed MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-46A - MOB 3											
Idle	0.198	0.005	0.251	0.010	0.012	0.563	0.008	–	0.049	0.368	0.159
Approach	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Intermediate	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Military	0.005	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.000	0.000	0.001	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Total KC-46A MOB 3	**0.203**	**0.005**	**0.252**	**0.010**	**0.012**	**0.564**	**0.008**	**–**	**0.050**	**0.370**	**0.159**

– = Source does not emit particular pollutant

Table D.3-13. Nonroad Diesel Equipment Emission Factors for 2019 - Tinker AFB

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019										
Nonroad Equipment - 7-11 Hp	0.67	4.56	4.48	0.00	0.40	0.39	591	0.094	0.007	595
Nonroad Equipment - 26-40 Hp	0.30	1.17	3.60	0.00	0.18	0.18	634	0.094	0.007	638
Nonroad Equipment - 41-50 Hp	0.25	0.91	3.49	0.00	0.14	0.13	628	0.094	0.007	632
Nonroad Equipment - 76-100 Hp	0.49	2.94	2.52	0.00	0.40	0.39	644	0.094	0.007	648
Nonroad Equipment - 101-175 Hp	0.25	0.70	1.48	0.00	0.15	0.14	566	0.094	0.007	570

Table D.3-13. Nonroad Diesel Equipment Emission Factors for 2019 - Tinker AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019										
Nonroad Equipment - 7-11 Hp	0.079	0.010	0.097	0.004	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.036	0.004	0.043	0.002	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.030	0.004	0.037	0.002	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.058	0.007	0.071	0.003	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.030	0.004	0.036	0.002	–	–	–	–	–	–

Table D.3-13. Nonroad Diesel Equipment Emission Factors for 2019 - Tinker AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2019											
Nonroad Equipment - 7-11 Hp	–	–	–	0.122	–	–	–	–	–	0.001	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.055	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.090	–	–	–	–	–	0.001	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–

Table D.3-13. Nonroad Diesel Equipment Emission Factors for 2019 - Tinker AFB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.042	–	–	–	–	0.030
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.019	–	–	–	–	0.013
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.031	–	–	–	–	0.022
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011

[a] Criteria pollutant factors estimated with the use of the USEPA NONROAD2008a model for Oklahoma County, OK.

[b] HAPs factors estimated with VOC speciation data presented in Table 4-3 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.3-14. Annual Air Emissions for AGE Usages - Tinker AFB KC-46A MOB 3 Mission

Year/HP Category	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.00	0.01	0.01	0.00	0.00	0.00	0.96	0.00	0.00	0.97
Nonroad Equipment - 26-40 Hp	0.00	0.00	0.01	0.00	0.00	0.00	1.12	0.00	0.00	1.13
Nonroad Equipment - 41-50 Hp	0.00	0.01	0.04	0.00	0.00	0.00	7.95	0.00	0.00	8.01
Nonroad Equipment - 76-100 Hp	0.04	0.25	0.21	0.00	0.03	0.03	53.81	0.01	0.00	54.15
Nonroad Equipment - 101-175 Hp	0.00	0.01	0.03	0.00	0.00	0.00	10.24	0.00	0.00	10.31
Total - Year 2019	**0.05**	**0.28**	**0.29**	**0.00**	**0.04**	**0.04**	**74.08**	**0.01**	**0.00**	**74.56**

Table D.3-14. Annual Air Emissions for AGE Usages - Tinker AFB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.005	0.001	0.006	0.000	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.001	0.000	0.001	0.000	–	–	–	–	–	–
Total - Year 2019	**0.006**	**0.001**	**0.007**	**0.000**	–	–	–	–	–	–

Table D.3-14. Annual Air Emissions for AGE Usages - Tinker AFB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.007	–	–	–	–	–	0.001	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Total - Year 2019	–	–	–	**0.009**	–	–	–	–	–	**0.001**	–

Table D.3-14. Annual Air Emissions for AGE Usages - Tinker AFB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.003	–	–	–	–	0.002
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Total - Year 2019	–	**0.000**	–	–	–	**0.003**	–	–	–	–	**0.002**

[a] 2014 Seymour Johnson AFB AGE hp-hr * (2019 Seymour Johnson AFB MOB 3 KC-46A LTOs [1,150] / 2014 Seymour Johnson AFB KC-135 LTOs [1,100]) * (2019 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.3-15. Annual VMT for GOVs by Vehicle Class - Tinker AFB 2009

Vehicle Class	Annual VMT
LDGV	267,636
LDGT1	912,825
LDGT2	186,417
LDGT3	481,071
LDGT4	127,526
LDDT12	229,897
LDDT34	124,785
HDGV2B	562,573
HDGV3	36,588
HDGV4	4,020
HDVG8B	4,910
HDDV2B	50,666
HDDV3	25,698
HDDV4	13,098
HDDV5	13,381
HDDV6	85,275
HDDV7	45,717
HDDV8A	134,719
HDDV8B	56,617
School Bus	23,702
Total VMT	**3,387,121**

Source: 2009 Tinker AFB Air Emissions Inventory (Tinker AFB 2010).

Table D.3-16. Annual Number of Workers at Tinker AFB - KC-46A MOB 3 Mission

Scenario	Total Base Workers	916 ARW Staff Year 2015	MOB 3 Staff
Year 2011 All Tinker AFB [a]	24,414	–	–
Year 2015 507 ARW [b]	–	1,032	–
Year 2019 MOB 3 [b]	–	–	1,443

[a] Source: Socioeconomic Data 2014.pdf for 2011. Used as a surrogate for 2009.

[b] Source: EIS Table 2-12.

Table D.3-17. Annual Average On-Road Vehicle Emission Factors - Tinker AFB KC-46A MOB 3 Mission

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGT1 - 25 mph	0.35	9.55	1.26	0.01	0.08	0.02	552	–	–	552
HDGV2B - 25 mph	0.32	9.10	1.21	0.01	0.08	0.02	549	–	–	549
HDDV8A - 25 mph	0.55	2.39	8.05	0.02	0.69	0.39	2,157	–	–	2,157
Year 2019										
LDGT1 - 25 mph	0.13	6.87	0.49	0.00	0.08	0.02	516	–	–	516
HDGV2B - 25 mph	0.12	6.71	0.47	0.00	0.08	0.02	513	–	–	513
HDDV8A - 25 mph	0.27	1.31	4.43	0.02	0.49	0.20	2,085	–	–	2,085

Table D.3-17. Annual Average On-Road Vehicle Emission Factors - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGT1 - 25 mph	0.006	0.001	0.197	0.002	–	–	–	–	–	–
HDGV2B - 25 mph	–	–	0.006	–	–	–	–	–	–	–
HDDV8A - 25 mph	–	–	–	–	–	–	–	–	–	–
Year 2019										
LDGT1 - 25 mph	0.002	0.001	0.074	0.001	–	–	–	–	–	–
HDGV2B - 25 mph	–	–	0.002	–	–	–	–	–	–	–
HDDV8A - 25 mph	–	–	–	–	–	–	–	–	–	–

Table D.3-17. Annual Average On-Road Vehicle Emission Factors - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGT1 - 25 mph	–	–	0.008	0.012	0.006	–	–	0.000	–	0.000	–
HDGV2B - 25 mph	–	–	0.002	–	0.005	–	–	–	–	–	–
HDDV8A - 25 mph	–	–	0.007	–	0.013	–	–	–	–	–	–
Year 2019											
LDGT1 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	–	0.000	–
HDGV2B - 25 mph	–	–	0.001	–	0.002	–	–	–	–	–	–
HDDV8A - 25 mph	–	–	0.004	–	0.007	–	–	–	–	–	–

Table D.3-17. Annual Average On-Road Vehicle Emission Factors - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGT1 - 25 mph	–	–	0.000	–	–	0.006	–	0.014	–	–	0.029
HDGV2B - 25 mph	–	–	–	–	–	0.010	–	0.005	–	–	0.010
HDDV8A - 25 mph	–	–	0.011	–	–	–	–	0.000	–	–	–
Year 2019											
LDGT1 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
HDGV2B - 25 mph	–	–	–	–	–	0.004	–	0.002	–	–	0.004
HDDV8A - 25 mph	–	–	0.006	–	–	–	–	0.000	–	–	–

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Oklahoma County, OK.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.3-18. Annual Emissions from GOV Activities - Tinker AFB KC-46A MOB 3 Mission

Scenario/Vehicle Class	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 507 ARW [a b]										
LDGT1	0.03	0.86	0.11	0.00	0.01	0.00	49.68	–	–	49.68
HDGV2B	0.02	0.50	0.07	0.00	0.00	0.00	30.33	–	–	30.33
HDDV8A	0.01	0.03	0.10	0.00	0.01	0.00	27.23	–	–	27.23
Total - Year 2015	**0.06**	**1.39**	**0.28**	**0.00**	**0.02**	**0.01**	**107.25**	–	–	**107.25**
Year 2019 MOB 3 [a c]										
LDGT1	0.02	0.86	0.06	0.00	0.01	0.00	64.94	–	–	64.94
HDGV2B	0.01	0.52	0.04	0.00	0.01	0.00	39.62	–	–	39.62
HDDV8A	0.00	0.02	0.08	0.00	0.01	0.00	36.81	–	–	36.81
Total - Year 2019	**0.03**	**1.40**	**0.18**	**0.00**	**0.02**	**0.01**	**141.37**	–	–	**141.37**

Table D.3-18. Annual Emissions from GOV Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 507 ARW [a b]										
LDGT1	0.001	0.000	0.018	0.000	–	–	–	–	–	–
HDGV2B	–	–	0.000	–	–	–	–	–	–	–
HDDV8A	–	–	–	–	–	–	–	–	–	–
Total - Year 2015	**0.001**	**0.000**	**0.018**	**0.000**	–	–	–	–	–	–
Year 2019 MOB 3 [a c]										
LDGT1	0.000	0.000	0.009	0.000	–	–	–	–	–	–
HDGV2B	–	–	0.000	–	–	–	–	–	–	–
HDDV8A	–	–	–	–	–	–	–	–	–	–
Total - Year 2019	**0.000**	**0.000**	**0.009**	**0.000**	–	–	–	–	–	–

Table D.3-18. Annual Emissions from GOV Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 507 ARW [a b]											
LDGT1	–	–	0.001	0.001	0.001	–	–	0.000	–	0.000	–
HDGV2B	–	–	0.000	–	0.000	–	–	–	–	–	–
HDDV8A	–	–	0.000	–	0.000	–	–	–	–	–	–
Total - Year 2015	–	–	**0.001**	**0.001**	**0.001**	–	–	**0.000**	–	**0.000**	–
Year 2019 MOB 3 [a c]											
LDGT1	–	–	0.000	0.001	0.000	–	–	0.000	–	0.000	–
HDGV2B	–	–	0.000	–	0.000	–	–	–	–	–	–
HDDV8A	–	–	0.000	–	0.000	–	–	–	–	–	–
Total - Year 2019	–	–	**0.001**	**0.001**	**0.001**	–	–	**0.000**	–	**0.000**	–

Table D.3-18. Annual Emissions from GOV Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 507 ARW [a b]											
LDGT1	–	–	0.000	–	–	0.001	–	0.001	–	–	0.003
HDGV2B	–	–	–	–	–	0.001	–	0.000	–	–	0.001
HDDV8A	–	–	0.000	–	–	–	–	0.000	–	–	–
Total - Year 2015	–	–	**0.000**	–	–	**0.001**	–	**0.002**	–	–	**0.003**
Year 2019 MOB 3 [a c]											
LDGT1	–	–	0.000	–	–	0.000	–	0.001	–	–	0.001
HDGV2B	–	–	–	–	–	0.000	–	0.000	–	–	0.000
HDDV8A	–	–	0.000	–	–	–	–	0.000	–	–	–
Total - Year 2019	–	–	**0.000**	–	–	**0.001**	–	**0.001**	–	–	**0.002**

[a] LDGT1/HDGV2B/HDDV8A vehicles would perform 57/35/8% of the total annual GOV VMT.

[b] 2015 emissions = 2009 GOV VMT * (2015 Tinker AFB worker population/2009 Tinker AFB worker population) * 2015 vehicle emission factors.

[c] 2019 emissions = 2009 GOV VMT * (2019 Tinker AFB worker population/2009 Tinker AFB worker population) * 2019 vehicle emission factors.

– = Source does not emit particular pollutant

Table D.3-19. Annual On-Base On-Road Vehicle Mileage Calculations - Tinker AFB MOB 3 Mission

Scenario	# of Workers [a]	Vehicle Occupancy Rate	On-Base Miles per Round Trip [b]	Days per Year	On-Base Miles per year
Year 2015 507 ARW					
Onbase Personnel	30	1.0	2.0	250	15,000
Reservists Near	1,002	1.0	2.0	24	48,096
Reservists Far	–	1.0	2.0	12	–
Contractors and Vendors	–	1.0	3.0	247	–
Total Onbase VMT - Year 2015	–	–	–	–	**63,096**
Year 2019 MOB 3					
Onbase Personnel	194	1.0	2.0	250	97,000
Reservists Near	1,234	1.0	2.0	24	59,232
Reservists Far	–	1.0	2.0	12	–
Contractors and Vendors	15	1.0	3.0	247	11,115
Total Onbase VMT - Year 2019 MOB 3 Scenario	–	–	–	–	**167,347**

[a] # of Workers from EIS Table 2-12.

[b] Source: 2010 Tinker AFB AEI.

Table D.3-20. Annual Average On-Road Emission Factors - Tinker AFB KC-46A MOB 3 Mission

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.08	3.52	0.38	0.01	0.07	0.01	396	–	–	396
LDGT2 - 25 mph	0.35	9.55	1.26	0.01	0.08	0.02	552	–	–	552
HDGV2B - 25 mph	0.32	9.10	1.21	0.01	0.08	0.02	549	–	–	549
Year 2019										
LDGV - 25 mph	0.03	2.59	0.14	0.00	0.07	0.01	359	–	–	359
LDGT2 - 25 mph	0.13	6.87	0.49	0.00	0.08	0.02	516	–	–	516
HDGV2B - 25 mph	0.12	6.71	0.47	0.00	0.08	0.02	513	–	–	513

Table D.3-20. Annual Average On-Road Emission Factors - Tinker AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.049	0.000	–	–	–	–	–	–
LDGT2 - 25 mph	0.006	0.001	0.197	0.002	–	–	–	–	–	–
HDGV2B - 25 mph	–	–	0.006	–	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.018	0.000	–	–	–	–	–	–
LDGT2 - 25 mph	0.002	0.001	0.074	0.001	–	–	–	–	–	–
HDGV2B - 25 mph	–	–	0.002	–	–	–	–	–	–	–

Table D.3-20. Annual Average On-Road Emission Factors - Tinker AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	–	0.000	–
LDGT2 - 25 mph	–	–	0.008	0.012	0.006	–	–	0.000	–	0.000	–
HDGV2B - 25 mph	–	–	0.002	–	0.005	–	–	–	–	–	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	–	0.000	–
LDGT2 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	–	0.000	–
HDGV2B - 25 mph	–	–	0.001	–	0.002	–	–	–	–	–	–

Table D.3-20. Annual Average On-Road Emission Factors - Tinker AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.009	–	0.002	–	–	0.008
LDGT2 - 25 mph	–	–	0.000	–	–	0.006	–	0.014	–	–	0.029
HDGV2B - 25 mph	–	–	–	–	–	0.010	–	0.005	–	–	0.010
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGT2 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
HDGV2B - 25 mph	–	–	–	–	–	0.004	–	0.002	–	–	0.004

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Oklahoma County, OK.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.3-21. Annual Emissions from On-Base On-Road Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 507 ARW [a]										
LDGV	0.00	0.21	0.02	0.00	0.00	0.00	23.39	–	–	23.39
LDGT2	0.00	0.10	0.01	0.00	0.00	0.00	5.76	–	–	5.76
HDGV2B	0.00	0.03	0.00	0.00	0.00	0.00	1.91	–	–	1.91
Total	**0.01**	**0.34**	**0.04**	**0.00**	**0.01**	**0.00**	**31.06**	–	–	**31.06**
Year 2019 MOB 3 [b]										
LDGV	0.00	0.41	0.02	0.00	0.01	0.00	56.35	–	–	56.35
LDGT2	0.00	0.19	0.01	0.00	0.00	0.00	14.29	–	–	14.29
HDGV2B	0.00	0.06	0.00	0.00	0.00	0.00	4.73	–	–	4.73
Total	**0.01**	**0.66**	**0.04**	**0.00**	**0.01**	**0.00**	**75.37**	–	–	**75.37**

Table D.3-21. Annual Emissions from On-Base On-Road Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 507 ARW [a]										
LDGV	0.000	0.000	0.003	0.000	–	–	–	–	–	–
LDGT2	0.000	0.000	0.002	0.000	–	–	–	–	–	–
HDGV2B	–	–	0.000	–	–	–	–	–	–	–
Total	**0.000**	**0.000**	**0.005**	**0.000**	–	–	–	–	–	–
Year 2019 MOB 3 [b]										
LDGV	0.000	0.000	0.003	0.000	–	–	–	–	–	–
LDGT2	0.000	0.000	0.002	0.000	–	–	–	–	–	–
HDGV2B	–	–	0.000	–	–	–	–	–	–	–
Total	**0.000**	**0.000**	**0.005**	**0.000**	–	–	–	–	–	–

Table D.3-21. Annual Emissions from On-Base On-Road Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 507 ARW [a]											
LDGV	–	–	0.000	0.000	0.000	–	–	0.000	–	0.000	–
LDGT2	–	–	0.000	0.000	0.000	–	–	0.000	–	0.000	–
HDGV2B	–	–	0.000	–	0.000	–	–	–	–	–	–
Total	–	–	**0.000**	**0.000**	**0.000**	–	–	**0.000**	–	**0.000**	–
Year 2019 MOB 3 [b]											
LDGV	–	–	0.000	0.000	0.000	–	–	0.000	–	0.000	–
LDGT2	–	–	0.000	0.000	0.000	–	–	0.000	–	0.000	–
HDGV2B	–	–	0.000	–	0.000	–	–	–	–	–	–
Total	–	–	**0.000**	**0.000**	**0.000**	–	–	**0.000**	–	**0.000**	–

Table D.3-21. Annual Emissions from On-Base On-Road Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 507 ARW [a]											
LDGV	–	–	0.000	–	–	0.001	–	0.0001	–	–	0.000
LDGT2	–	–	0.000	–	–	0.000	–	0.0001	–	–	0.000
HDGV2B	–	–	–	–	–	0.000	–	0.0000	–	–	0.000
Total	–	–	**0.000**	–	–	**0.001**	–	**0.0003**	–	–	**0.001**
Year 2019 MOB 3 [b]											
LDGV	–	–	0.000	–	–	0.001	–	0.0001	–	–	0.000
LDGT2	–	–	0.000	–	–	0.000	–	0.0001	–	–	0.000
HDGV2B	–	–	–	–	–	0.000	–	0.0000	–	–	0.000
Total	–	–	**0.000**	–	–	**0.001**	–	**0.0003**	–	–	**0.001**

[a] 2015 emissions = 2015 Total On-base VMT * 2015 composite emission factors.

[b] 2019 emissions = 2019 Total On-base VMT * 2019 composite emission factors.

– = Source does not emit particular pollutant

Table D.3-22. 2009 Off-Base On-Road Vehicle Mileages - Tinker AFB

Vehicle Class	Off-Base Miles per year [a]
LDGV	112,342,270
LDDV	99,986
LDGT1	4,204,665
LDDT1	495
LDGT2	24,175,126
LDDT2	3,698
LDGT3	10,367,029
LDDT3	130,283
LDGT4	1,441,758
LDDT4	18,114
HDGV2B	9,537,016
HDD2B	2,595,416
HDGV3	74,696
HDDV3	231,088
HDG4	19,522
HDDV4	81,278
HDGV5	955,167
HDDV5	557,553
HDGV6	155,303
HDDV6	227,233
HDGV7	25,741
HDDV7	145,619
HDGV8A	24
HDDV8A	30,216
HDDV8B	20,160
School Bus	1,114,344
Transit Bus	19,656
MC	1,019,448
Total VMT	**169,592,904**

[a] Source: 2010 Tinker AFB AEI.

Table D.3-23. Annual Off-Base On-Road Vehicle Mileage Calculations - Tinker AFB KC-46A MOB 3 Mission

Scenario	# of Workers	Off-Base Miles per year
Year 2011 Total Tinker AFB (1)(2)	24,414	169,592,904
Year 2015 507 ARW (3)	1,032	7,168,833
Year 2019 MOB 3 (3)	1,443	10,023,862

Notes:

(1) Three of the 4 largest contributors of total on-base on-road vehicle VMT in 2009 were were LDGV, LDGT2, and HDGV2B.

The analysis estimates emissions for these vehicles as surrogates for all on-road vehicles that access Tinker AFB.

VMT for post-2009 years = 2009 Total Tinker AFB VMT * future year LTOs/2009 Tinker AFB LTOs.

(2) Source: Socioeconomic Data 2014.pdf for 2011

(3) # of Workers from EIS Table 2-12.

Table D.3-24. Annual Average On-Road Emission Factors for Off-Site Activities - Tinker AFB KC-46A MOB 3 Mission

Project Year/Source Type [c]	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.08	3.52	0.38	0.01	0.07	0.01	396	–	–	396
LDGV - 55 mph	0.06	2.98	0.37	0.01	0.02	0.01	308	–	–	308
Composite [d]	**0.06**	**3.12**	**0.37**	**0.01**	**0.04**	**0.01**	**330**	–	–	**330**
LDGT2 - 25 mph	0.35	9.55	1.26	0.01	0.08	0.02	552	–	–	552
LDGT2 - 55 mph	0.15	7.98	1.27	0.01	0.03	0.01	445	–	–	445
Composite [d]	**0.20**	**8.37**	**1.27**	**0.01**	**0.04**	**0.02**	**472**	–	–	**472**
HDGV2B - 25 mph	0.32	9.10	1.21	0.01	0.08	0.02	549	–	–	549
HDGV2B - 55 mph	0.13	7.51	1.22	0.01	0.03	0.01	437	–	–	437
Composite [d]	**0.18**	**7.91**	**1.22**	**0.01**	**0.04**	**0.01**	**465**	–	–	**465**
Year 2019										
LDGV - 25 mph	0.03	2.59	0.14	0.00	0.07	0.01	359	–	–	359
LDGV - 55 mph	0.02	2.27	0.14	0.00	0.02	0.01	280	–	–	280
Composite [d]	**0.02**	**2.35**	**0.14**	**0.00**	**0.03**	**0.01**	**300**	–	–	**300**
LDGT2 - 25 mph	0.13	6.87	0.49	0.00	0.08	0.02	516	–	–	516
LDGT2 - 55 mph	0.05	5.92	0.49	0.00	0.03	0.01	408	–	–	408
Composite [d]	**0.07**	**6.16**		**0.00**	**0.04**	**0.01**	**435**	–	–	**435**
HDGV2B - 25 mph	0.12	6.71	0.47	0.00	0.08	0.02	513	–	–	513
HDGV2B - 55 mph	0.06	6.17	0.51	0.00	0.03	0.01	416	–	–	416
Composite [d]	**0.08**	**6.31**	**0.50**	**0.00**	**0.04**	**0.01**	**440**	–	–	**440**

Table D.3-24. Annual Average On-Road Emission Factors for Off-Site Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type [c]	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.049	0.000	–	–	–	–	–	–
LDGV - 55 mph	0.000	0.000	0.033	0.000	–	–	–	–	–	–
Composite [d]	**0.000**	**0.000**	**0.037**	**0.000**	–	–	–	–	–	–
LDGT2 - 25 mph	0.006	0.001	0.197	0.002	–	–	–	–	–	–
LDGT2 - 55 mph	0.002	0.001	0.084	0.001	–	–	–	–	–	–
Composite [d]	**0.003**	**0.001**	**0.112**	**0.001**	–	–	–	–	–	–
HDGV2B - 25 mph	–	–	0.006	–	–	–	–	–	–	–
HDGV2B - 55 mph	–	–	0.002	–	–	–	–	–	–	–
Composite [d]	–	–	**0.003**	–	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.018	0.000	–	–	–	–	–	–
LDGV - 55 mph	0.000	0.000	0.013	0.000	–	–	–	–	–	–
Composite [d]	**0.000**	**0.000**	**0.014**	**0.000**	–	–	–	–	–	–
LDGT2 - 25 mph	0.002	0.001	0.074	0.001	–	–	–	–	–	–
LDGT2 - 55 mph	0.001	0.000	0.030	0.000	–	–	–	–	–	–
Composite [d]	**0.001**	**0.000**	**0.041**	**0.000**	–	–	–	–	–	–
HDGV2B - 25 mph	–	–	0.002	–	–	–	–	–	–	–
HDGV2B - 55 mph	–	–	0.001	–	–	–	–	–	–	–
Composite [d]	–	–	**0.001**	–	–	–	–	–	–	–

Table D.3-24. Annual Average On-Road Emission Factors for Off-Site Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type [c]	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	–	0.000	–
LDGV - 55 mph	–	–	0.001	0.001	0.001	–	–	0.000	–	0.000	–
Composite [d]	–	–	**0.002**	**0.001**	**0.001**	–	–	**0.000**	–	**0.000**	–
LDGT2 - 25 mph	–	–	0.008	0.012	0.006	–	–	0.000	–	0.000	–
LDGT2 - 55 mph	–	–	0.003	0.005	0.003	–	–	0.000	–	0.000	–
Composite [d]	–	–	**0.005**	**0.007**	**0.004**	–	–	**0.000**	–	**0.000**	–
HDGV2B - 25 mph	–	–	0.002	–	0.005	–	–	–	–	–	–
HDGV2B - 55 mph	–	–	0.001	–	0.002	–	–	–	–	–	–
Composite [d]	–	–	**0.001**	–	**0.003**	–	–	–	–	–	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	–	0.000	–
LDGV - 55 mph	–	–	0.001	0.000	0.000	–	–	0.000	–	0.000	–
Composite [d]	–	–	**0.001**	**0.000**	**0.000**	–	–	**0.000**	–	**0.000**	–
LDGT2 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	–	0.000	–
LDGT2 - 55 mph	–	–	0.001	0.002	0.001	–	–	0.000	–	0.000	–
Composite [d]	–	–	**0.002**	**0.002**	**0.001**	–	–	**0.000**	–	**0.000**	–
HDGV2B - 25 mph	–	–	0.001	–	0.002	–	–	–	–	–	–
HDGV2B - 55 mph	–	–	0.000	–	0.001	–	–	–	–	–	–
Composite [d]	–	–	**0.001**	–	**0.001**	–	–	–	–	–	–

Table D.3-24. Annual Average On-Road Emission Factors for Off-Site Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type [c]	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.009	–	0.002	–	–	0.008
LDGV - 55 mph	–	–	0.000	–	–	0.006	–	0.001	–	–	0.005
Composite [d]	–	–	**0.000**	–	–	**0.007**	–	**0.001**	–	–	**0.006**
LDGT2 - 25 mph	–	–	0.000	–	–	0.006	–	0.014	–	–	0.029
LDGT2 - 55 mph	–	–	0.000	–	–	0.002	–	0.006	–	–	0.012
Composite [d]	–	–	**0.000**	–	–	**0.003**	–	**0.008**	–	–	**0.016**
HDGV2B - 25 mph	–	–	–	–	–	0.010	–	0.005	–	–	0.010
HDGV2B - 55 mph	–	–	–	–	–	0.004	–	0.002	–	–	0.004
Composite [d]	–	–	–	–	–	**0.006**	–	**0.003**	–	–	**0.005**
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.003	–	0.001	–	–	0.003
LDGV - 55 mph	–	–	0.000	–	–	0.002	–	0.001	–	–	0.002
Composite [d]	–	–	**0.000**	–	–	**0.003**	–	**0.001**	–	–	**0.002**
LDGT2 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.011
LDGT2 - 55 mph	–	–	0.000	–	–	0.001	–	0.002	–	–	0.004
Composite [d]	–	–	**0.000**	–	–	**0.001**	–	**0.003**	–	–	**0.006**
HDGV2B - 25 mph	–	–	0.000	–	–	0.002	–	0.002	–	–	0.011
HDGV2B - 55 mph	–	–	0.000	–	–	0.001	–	0.001	–	–	0.005
Composite [d]	–	–	–	–	–	–	–	**0.001**	–	–	–

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Oklahoma County, OK.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Three of the 4 largest contributors of total on-base on-road vehicle VMT in 2009 were LDGV, LDGT2, and HDGV2B. The analysis estimates emissions for these vehicles assuming they would perform 77%, 17%, and 7% of the total on-base VMT per year.

[d] Equal to 75/25% 55/25 mph.

– = Source does not emit particular pollutant

Table D.3-25. Annual Emissions from Off-Base Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 507 ARW [a b]										
LDGV	0.38	18.96	2.25	0.04	0.21	0.06	2,006	–	–	2,006
LDGT2	0.27	11.25	1.70	0.01	0.06	0.02	634	–	–	634
HDGV2B	0.10	4.37	0.67	0.01	0.02	0.01	257	–	–	257
Total	**0.75**	**34.58**	**4.63**	**0.06**	**0.30**	**0.09**	**2,897**	–	–	**2,897**
Year 2019 MOB 3 [a c]										
LDGV	0.21	19.97	1.22	0.02	0.27	0.07	2,551	–	–	2,551
LDGT2	0.14	11.57	0.92	0.01	0.07	0.02	818	–	–	818
HDGV2B	0.06	4.88	0.39	0.00	0.03	0.01	341	–	–	341
Total	**0.40**	**36.41**	**2.53**	**0.02**	**0.38**	**0.10**	**3,710**	–	–	**3,710**

Table D.3-25. Annual Emissions from Off-Base Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 507 ARW [a b]										
LDGV	0.001	0.001	0.226	0.002	–	–	–	–	–	–
LDGT2	0.004	0.001	0.150	0.002	–	–	–	–	–	–
HDGV2B	–	–	0.002	–	–	–	–	–	–	–
Total	**0.006**	**0.002**	**0.378**	**0.004**	–	–	–	–	–	–
Year 2019 MOB 3 [a c]										
LDGV	0.001	0.000	0.121	0.001	–	–	–	–	–	–
LDGT2	0.002	0.001	0.077	0.001	–	–	–	–	–	–
HDGV2B	–	–	0.001	–	–	–	–	–	–	–
Total	**0.003**	**0.001**	**0.199**	**0.002**	–	–	–	–	–	–

Table D.3-25. Annual Emissions from Off-Base Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 507 ARW [a b]											
LDGV	–	–	0.010	0.004	0.006	–	–	0.000	–	0.000	–
LDGT2	–	–	0.006	0.009	0.005	–	–	0.000	–	0.000	–
HDGV2B	–	–	0.001	–	0.002	–	–	–	–	–	–
Total	–	–	**0.017**	**0.013**	**0.012**	–	–	**0.000**	–	**0.000**	–
Year 2019 MOB 3 [a c]											
LDGV	–	–	0.005	0.002	0.003	–	–	0.000	–	0.000	–
LDGT2	–	–	0.003	0.005	0.002	–	–	0.000	–	0.000	–
HDGV2B	–	–	0.000	–	0.001	–	–	–	–	–	–
Total	–	–	**0.009**	**0.007**	**0.007**	–	–	**0.000**	–	**0.000**	–

Table D.3-25. Annual Emissions from Off-Base Vehicle Activities - Tinker AFB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 507 ARW [a b]											
LDGV	–	–	0.000	–	–	0.043	–	0.009	–	–	0.036
LDGT2	–	–	0.000	–	–	0.004	–	0.011	–	–	0.022
HDGV2B	–	–	–	–	–	0.003	–	0.002	–	–	0.003
Total	–	–	**0.001**	–	–	**0.050**	–	**0.021**	–	–	**0.061**
Year 2019 MOB 3 [a c]											
LDGV	–	–	0.000	–	–	0.023	–	0.005	–	–	0.020
LDGT2	–	–	0.000	–	–	0.002	–	0.006	–	–	0.011
HDGV2B	–	–	–	–	–	0.002	–	0.001	–	–	0.002
Total	–	–	**0.000**	–	–	**0.027**	–	**0.011**	–	–	**0.033**

[a] LDGV/LDGT2/HDGV2B vehicles would perform 77/17/7% of the total annual Offbase VMT.

[b] 2015 emissions = 2015 Total On-base VMT * 2015 composite emission factors.

[c] 2019 emissions = 2019 Total On-base VMT * 2019 composite emission factors.

– = Source does not emit particular pollutant

Table D.3-26. Annual Number of Aircraft LTOs - Tinker AFB KC-46A MOB 3 Mission

Scenario	Number of LTOs
Year 2012 All Tinker AFB (1)	4,288
Year 2015 507 ARW (2)	400
Year 2019 MOB 3 (3)	1,150

(1) Source: Tinker AFB Aircraft Data 2011-2015.xlsx

(2) # of LTOs from EIS Table 2-13.

(3) # of LTOs from EIS Table 2-14.

Table D.3-27. Annual Emissions from Point and Area Sources - Tinker AFB KC-46A MOB 3 Mission

Scenario Year/ Source Type	Tons per Year									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2012 All Tinker AFB [a]										
Total - Year 2012	**254.00**	**119.00**	**156.00**	**10.90**	**13.10**	**9.50**	–	–	–	–
Year 2015 507th ARW [b]										
Total - Year 2015	**23.69**	**11.10**	**14.55**	**1.02**	**1.22**	**0.89**	–	–	–	–
Year 2019 MOB 3 Scenario [b]										
Total - Year 2019 MOB 3 Scenario	**68.12**	**31.91**	**41.84**	**2.92**	**3.51**	**2.55**	–	–	–	–

[a] Source: Maintenance EA Table 3-6 (Tinker AFB 2012).

[b] 2012 emissions * future year scenario LTOs/Tinker AFB 2012 LTOs.

– = Source does not emit particular pollutant

Table D.3-28. 2015 Existing Emissions for the KC-135 507 ARW at Tinker AFB - KC-46A MOB 3 Mission

Source Type	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e (mt)
KC-135 Aircraft Operations	1.60	26.30	47.90	4.38	0.24	0.24	13,299	0.37	0.41	12,213
On-Wing Aircraft Engine Testing - KC-135	0.53	7.69	2.98	0.39	0.02	0.02	1,198	0.03	0.04	1,100
Aerospace Ground Support Equipment	0.02	0.14	0.15	0.00	0.02	0.02	26	0.00	0.00	24
GOVs/Nonroad Equipment	0.06	1.39	0.28	0.00	0.02	0.01	107	–	–	97
Privately-Owned Vehicles - On-Base	0.01	0.34	0.04	0.00	0.01	0.00	31	–	–	28
Privately-Owned Vehicles - Off-Base	0.75	34.58	4.63	0.06	0.30	0.09	2,897	–	–	2,633
Point and Area Sources	23.69	11.10	14.55	1.02	1.22	0.89	–	–	–	–
Total Emissions	**26.67**	**81.55**	**70.53**	**5.86**	**1.82**	**1.27**	**17,557**	**0.41**	**0.45**	**16,096**

Table D.3-28. 2015 Existing Emissions for the KC-135 507 ARW at Tinker AFB - KC-46A MOB 3 Mission (Continued)

Source Type	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-135 Aircraft Operations	0.062	0.038	0.146	0.020	0.001	0.001	0.003	0.003	0.001	0.001
On-Wing Aircraft Engine Testing - KC-135	0.020	0.013	0.054	0.008	0.000	0.000	0.001	0.001	0.000	0.000
Aerospace Ground Support Equipment	0.003	0.000	0.004	0.000	–	–	–	–	–	–
GOVs/Nonroad Equipment	–	–	–	–	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	0.000	0.000	0.005	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - Off-Base	–	–	–	–	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.085**	**0.052**	**0.209**	**0.028**	**0.002**	**0.002**	**0.004**	**0.004**	**0.001**	**0.002**

Table D.3-28. 2015 Existing Emissions for the KC-135 507 ARW at Tinker AFB - KC-46A MOB 3 Mission (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
KC-135 Aircraft Operations	0.001	0.008	0.023	0.615	–	–	0.055	–	–	0.057	0.057
On-Wing Aircraft Engine Testing - KC-135	0.000	0.002	0.009	0.209	–	–	0.008	–	–	0.022	0.011
Aerospace Ground Support Equipment	–	–	–	0.004	–	–	–	–	–	0.000	–
GOVs/Nonroad Equipment	–	–	–	–	–	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	–	–	0.000	0.000	0.000	–	–	0.000	–	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	–	–	–	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.001**	**0.009**	**0.032**	**0.828**	**0.000**	**–**	**0.063**	**0.000**	**–**	**0.079**	**0.068**

Table D.3-28. 2015 Existing Emissions for the KC-135 507 ARW at Tinker AFB - KC-46A MOB 3 Mission (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-135 Aircraft Operations	0.0372	0.001	0.030	0.002	0.002	0.070	0.001	–	0.007	0.046	0.019
On-Wing Aircraft Engine Testing - KC-135	0.0097	0.000	0.011	0.000	0.001	0.026	0.000	–	0.002	0.017	0.007
Aerospace Ground Support Equipment	–	0.000	–	–	–	0.002	–	–	–	–	0.001
GOVs/Nonroad Equipment	–	–	–	–	–	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.001	–	–	–	–	0.001
Privately-Owned Vehicles - Off-Base	–	–	–	–	–	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.0468**	**0.001**	**0.042**	**0.002**	**0.003**	**0.097**	**0.002**	**–**	**0.009**	**0.063**	**0.029**

– = Source does not emit particular pollutant

Table D.3-29. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Tinker AFB - 2019

Source Type	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-46A Aircraft Operations	20.12	78.25	263.71	14.65	0.96	0.82	44,039	1.22	1.37	40,444
On-Wing Aircraft Engine Testing - KC-46A	11.57	39.71	18.73	1.68	0.16	0.14	4,899	0.14	0.15	4,500
Aerospace Ground Support Equipment - KC-46A	0.05	0.28	0.29	0.00	0.04	0.04	74	0.01	0.00	68
Government-Owned Vehicles	0.03	1.40	0.18	0.00	0.02	0.01	141	–	–	129
Privately-Owned Vehicles - On-Base	0.01	0.66	0.04	0.00	0.01	0.00	75	–	–	69
Privately-Owned Vehicles - Off-Base	0.40	36.41	2.53	0.02	0.38	0.10	3,710	–	–	3,372
Point and Area Sources	68.12	31.91	41.84	2.92	3.51	2.55	–	–	–	–
Total Proposed Emissions - 2019	**100.30**	**188.64**	**327.32**	**19.28**	**5.08**	**3.66**	**52,939**	**1.37**	**1.52**	**48,581**
Year 2015 Base Case Emissions	**(26.67)**	**(81.55)**	**(70.53)**	**(5.86)**	**(1.82)**	**(1.27)**	**(17,557)**	**(0.41)**	**(0.45)**	**(16,096)**
Proposed minus Base Case Emissions	**73.63**	**107.09**	**256.78**	**13.42**	**3.26**	**2.39**	**35,381**	**0.96**	**1.07**	**32,485**
Oklahoma County PSD Thresholds	**250**	**250**	**250**	**250**	**250**	**250**	–	–	–	–

Table D.3-29. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Tinker AFB - 2019 (Continued)

Source Type	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-46A Aircraft Operations	0.756	0.492	1.977	0.283	0.019	0.017	0.036	0.033	0.009	0.018
On-Wing Aircraft Engine Testing - KC-46A	0.445	0.294	1.182	0.171	0.009	0.008	0.015	0.014	0.002	0.010
Aerospace Ground Support Equipment - KC-46A	0.006	0.001	0.007	0.000	–	–	–	–	–	–
Government-Owned Vehicles	–	–	–	–	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	0.000	0.000	0.005	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - Off-Base	0.003	0.001	0.199	0.002	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**1.210**	**0.788**	**3.370**	**0.456**	**0.028**	**0.025**	**0.051**	**0.048**	**0.011**	**0.028**
Year 2015 Base Case Emissions	**(0.085)**	**(0.052)**	**(0.209)**	**(0.028)**	**(0.002)**	**(0.002)**	**(0.004)**	**(0.004)**	**(0.001)**	**(0.002)**
Proposed minus Base Case Emissions	**1.124**	**0.736**	**3.162**	**0.428**	**0.026**	**0.023**	**0.047**	**0.044**	**0.010**	**0.027**

Table D.3-29. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Tinker AFB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
KC-46A Aircraft Operations	0.011	0.081	0.323	7.765	–	–	0.495	–	–	0.788	0.407
On-Wing Aircraft Engine Testing - KC-46A	0.005	0.034	0.194	4.570	–	–	0.152	–	–	0.475	0.239
Aerospace Ground Support Equipment - KC-46A	–	–	–	0.009	–	–	–	–	–	0.001	–
Government-Owned Vehicles	–	–	–	–	–	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	–	–	0.000	0.000	0.000	–	–	0.000	–	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	0.009	0.007	0.007	–	–	0.000	–	0.000	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.016**	**0.115**	**0.526**	**12.351**	**0.007**	–	**0.646**	**0.000**	–	**1.264**	**0.647**
Year 2015 Base Case Emissions	**(0.001)**	**(0.009)**	**(0.032)**	**(0.828)**	**(0.000)**	–	**(0.063)**	**(0.000)**	–	**(0.079)**	**(0.068)**
Proposed minus Base Case Emissions	**0.015**	**0.106**	**0.493**	**11.523**	**0.007**	–	**0.584**	**0.000**	–	**1.186**	**0.579**

Table D.3-29. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Tinker AFB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	**Pyrene**	**Styrene**	**1,1,2,2-Tetrachloroethane**	**Tetrachloroethene**	**Toluene**	**1,1,1-Trichloroethane**	**2,2,4-Trimethylpentane**	**Vinyl Acetate**	**mp-Xylene**	**o-Xylene**
KC-46A Aircraft Operations	0.4218	0.008	0.417	0.019	0.024	0.947	0.016	–	0.091	0.622	0.266
On-Wing Aircraft Engine Testing - KC-46A	0.2034	0.005	0.252	0.010	0.012	0.564	0.008	–	0.050	0.370	0.159
Aerospace Ground Support Equipment - KC-46A	–	0.000	–	–	–	0.003	–	–	–	–	0.002
Government-Owned Vehicles	–	–	–	–	–	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.001	–	–	–	–	0.001
Privately-Owned Vehicles - Off-Base	–	–	0.000	–	–	0.027	–	–	–	–	0.033
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.6252**	**0.012**	**0.669**	**0.030**	**0.036**	**1.542**	**0.024**	**–**	**0.141**	**0.992**	**0.460**
Year 2015 Base Case Emissions	**(0.0468)**	**(0.001)**	**(0.042)**	**(0.002)**	**(0.003)**	**(0.097)**	**(0.002)**	**–**	**(0.009)**	**(0.063)**	**(0.029)**
Proposed minus Base Case Emissions	**0.5784**	**0.011**	**0.628**	**0.028**	**0.033**	**1.445**	**0.022**	**–**	**0.131**	**0.929**	**0.432**

– = Source does not emit particular pollutant

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D.4 WESTOVER AIR RESERVE BASE REGIONAL CLIMATE

Westover ARB has a humid continental climate, characterized by warm wet summers and cold and snowy winters. Meteorological data collected at Westfield Barnes Municipal Airport in Massachusetts are used to describe the climate of the Westover ARB project area (National Climatic Data Center 2016).

Temperature. The average high and low temperatures during the summer months for Westover ARB range from approximately 83 °F to 62 °F. The average high and low temperatures during the winter months range from 36 °F to 13 °F.

Precipitation. The average annual precipitation for Westover ARB is 48.4 inches. Precipitation peaks in late spring and early fall, and the peak monthly average of 4.8 inches occurs in October. Precipitation is at a minimum during the winter, with the lowest monthly average of 2.8 inches occurring in February. Snow is common during the colder months of the year, and the average annual snowfall amounts to 49 inches.

Prevailing Winds. The winds in the region prevail from the south during the warmer months and from the west-northwest to north during winter (NOAA 1998). The annual average wind speed at Westover ARB is approximately 6 miles per hour. Spring is generally the windiest season, with the peak average monthly speeds of 8 miles per hour occurring in March and April.

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D.4.1 OPERATIONS EMISSION CALCULATIONS FOR THE KC-46A MOB 3 MISSION AT WESTOVER ARB

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Table D.4-1. KC-46A Aircraft Landings and Take-Offs at Westover ARB - KC-46A MOB 3 Mission

Scenario/Operation	Operations/ Year [a]	Engine Setting/Time in Mode per Operation (Minutes)				Engine Setting Annual Hours			
		Idle	Approach	Climbout	Takeoff	Idle	Approach	Climbout	Takeoff
Landings and Take-offs									
Landings and Take-offs	647	47.7	5.2	1.6	0.7	514	56	17	8
Scenario/Operation	**Operations/ Year [b]**	**Engine Setting/Time in Mode per Operation (Minutes)**				**Engine Setting Annual Hours**			
		55%	**60%**	**Climbout**	**Takeoff**	**55%**	**60%**	**Climbout**	**Takeoff**
Closed Patterns									
Closed Pattern - Radar & Initial to Overhead	2,622	12.0	2.0	–	1.0	524	87	–	44
Closed Pattern - VFR	1,781	5.0	2.0	–	1.0	148	59	–	30
Closed Pattern - Tactical	1,336	8.0	2.0	2.0	1.0	178	45	45	22
Total TIMs - KC-46A MOB 3						**851**	**191**	**45**	**96**

[a] EIS Table 2-18.

[b] EIS Table 2-18 and KC-46 MOB CP Ops Data for Emissions.xlsx. Closed Pattern - Tactical ops reduced by 7.5% to reflect amount of time above 3,000' AGL.

Table D.4-2. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Westover ARB - MOB 3 Mission 2019

Operation/Engine Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Landings and Take-offs										
Idle	10.68	36.45	3.23	0.91	0.09	0.09	2,751	0.08	0.09	2,779
Approach	0.03	0.62	3.89	0.34	0.02	0.01	1,028	0.03	0.03	1,039
Climbout	0.02	0.15	7.56	0.31	0.02	0.02	936	0.03	0.03	946
Take-off	0.02	0.10	5.61	0.17	0.01	0.01	525	0.01	0.02	530
APU	0.03	0.23	4.60	0.38	0.03	0.03	940	0.03	0.03	950
Subtotal LTOs	**10.79**	**37.54**	**24.90**	**2.11**	**0.18**	**0.16**	**6,181**	**0.17**	**0.19**	**6,244**
Closed Patterns										
55%	0.85	11.74	169.17	9.72	0.54	0.45	29,492	0.82	0.92	29,793
60%	0.21	2.59	44.44	2.39	0.14	0.11	7,254	0.20	0.23	7,329
Climbout	0.06	0.38	19.51	0.80	0.05	0.05	2,415	0.07	0.08	2,440
Take-off	0.19	1.26	71.05	2.19	0.17	0.14	6,650	0.18	0.21	6,718
Subtotal Closed Patterns	**1.31**	**15.97**	**304.17**	**15.10**	**0.90**	**0.75**	**45,812**	**1.27**	**1.42**	**46,280**
Total MOB 3 Operations	**12.09**	**53.51**	**329.07**	**17.21**	**1.07**	**0.91**	**51,992**	**1.44**	**1.62**	**52,523**

Table D.4-2. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Westover ARB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Landings and Take-offs										
Idle	0.411	0.272	1.094	0.158	0.009	0.007	0.014	0.013	0.002	0.010
Approach	0.002	0.001	0.001	–	0.000	0.000	0.000	0.000	0.000	0.000
Climbout	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Take-off	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
APU	0.001	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal LTOs	**0.415**	**0.274**	**1.099**	**0.159**	**0.009**	**0.008**	**0.014**	**0.013**	**0.002**	**0.010**
Closed Patterns										
55%	0.016	0.004	0.022	0.001	0.003	0.003	0.009	0.007	0.005	0.001
60%	0.004	0.001	0.005	0.000	0.001	0.001	0.002	0.002	0.001	0.000
Climbout	0.001	0.000	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Take-off	0.004	0.001	0.003	–	0.000	0.000	0.002	0.003	0.000	0.000
Subtotal Closed Patterns	**0.025**	**0.006**	**0.033**	**0.002**	**0.004**	**0.004**	**0.014**	**0.013**	**0.006**	**0.001**
Total MOB 3 Operations	**0.440**	**0.280**	**1.132**	**0.161**	**0.013**	**0.012**	**0.028**	**0.026**	**0.009**	**0.011**

Table D.4-2. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Westover ARB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Landings and Take-offs											
Idle	0.004	0.031	0.179	4.229	–	–	0.131	–	–	0.440	0.221
Approach	0.000	0.000	0.000	0.014	–	–	0.002	–	–	0.000	0.007
Climbout	0.000	0.001	0.000	0.005	–	–	0.006	–	–	0.000	0.000
Take-off	–	0.000	0.000	0.001	–	–	0.005	–	–	0.000	0.000
APU	0.000	0.000	0.001	0.012	–	–	0.000	–	–	0.001	0.001
Subtotal LTOs	**0.004**	**0.032**	**0.180**	**4.261**	**–**	**–**	**0.145**	**–**	**–**	**0.442**	**0.229**
Closed Patterns											
55%	0.004	0.022	0.002	0.188	–	–	0.202	–	–	0.003	0.001
60%	0.001	0.005	0.001	0.045	–	–	0.049	–	–	0.001	0.000
Climbout	0.000	0.002	0.000	0.013	–	–	0.014	–	–	0.000	0.000
Take-off	–	0.004	0.000	0.019	–	–	0.064	–	–	0.000	0.000
Subtotal Closed Patterns	**0.005**	**0.033**	**0.004**	**0.266**	**–**	**–**	**0.329**	**–**	**–**	**0.004**	**0.002**
Total MOB 3 Operations	**0.009**	**0.065**	**0.184**	**4.527**	**–**	**–**	**0.474**	**–**	**–**	**0.446**	**0.230**

Table D.4-2. Annual Air Emissions from Proposed KC-46A Aircraft Operations at Westover ARB - MOB 3 Mission 2019 (Continued)

Operation/Engine Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Landings and Take-offs											
Idle	0.184	0.004	0.233	0.010	0.011	0.522	0.007	–	0.046	0.342	0.147
Approach	0.001	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Climbout	0.002	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Take-off	0.003	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.001	0.000	0.001	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Subtotal LTOs	**0.189**	**0.004**	**0.234**	**0.010**	**0.011**	**0.525**	**0.008**	**–**	**0.047**	**0.344**	**0.148**
Closed Patterns											
55%	0.065	–	0.002	0.002	0.004	0.014	0.002	–	0.006	0.010	0.002
60%	0.016	–	0.000	0.000	0.001	0.003	0.001	–	0.002	0.002	0.001
Climbout	0.005	–	0.000	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Take-off	0.033	–	0.000	0.000	0.001	0.002	0.000	–	0.003	0.003	0.001
Subtotal Closed Patterns	**0.118**	**–**	**0.003**	**0.003**	**0.006**	**0.020**	**0.003**	**–**	**0.011**	**0.016**	**0.003**
Total MOB 3 Operations	**0.307**	**0.004**	**0.236**	**0.012**	**0.017**	**0.544**	**0.011**	**–**	**0.058**	**0.360**	**0.151**

– = Source does not emit particular pollutant

Table D.4-3. KC-46A Aircraft On-Wing Engine Testing Activity Data for Westover ARB - KC-46A MOB 3 Mission

Aircraft/Test Type	Tests/ Year	# of Engines	Duration (Minutes)	Engine Setting/Annual Engine Hours			
				Idle	Approach	Intermediate	Takeoff
KC-46A - MOB 3[a]							
Leak Checks/Troubleshooting	208	2	45	312.0	–	–	–
Fuel Transfer	69	1	80	92.4	–	–	–
Troubleshooting - High Power	35	1	40	11.6	2.9	2.9	5.8
Troubleshooting - High Power	35	2	15	17.3	–	–	–
Engine Trims	4	1	40	1.3	0.3	0.3	0.7
Engine Trims	4	2	10	1.3	–	–	–
ISO Runs	12	2	35	14.0	–	–	–
Backline Runs	12	2	69	465.8	6.9	–	10.4
Post ISO Runs	12	2	55	192.5	–	–	11.0
Total TIMs - KC-46A MOB 3				**1,108**	**10**	**3**	**28**

[a] Altus FTU BaseOps-Aircraft Maintenance-Noise.pdf (April 16, 2013).

Note: The APU operates for the same amount of time as the main engines during testing activities.

Table D.4-4. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Westover ARB - Proposed KC-46A MOB 3 Mission

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-46A - MOB 3										
Idle	11.51	39.27	3.48	0.98	0.10	0.09	2,964	0.08	0.09	2,994
Approach	0.00	0.06	0.35	0.03	0.00	0.00	93	0.00	0.00	94
Intermediate	0.00	0.01	0.71	0.03	0.00	0.00	87	0.00	0.00	88
Military	0.03	0.18	10.32	0.32	0.02	0.02	966	0.03	0.03	976
APU	0.03	0.19	3.86	0.32	0.03	0.02	789	0.02	0.02	797
Total KC-46A MOB 3	**11.57**	**39.71**	**18.73**	**1.68**	**0.16**	**0.14**	**4,899**	**0.14**	**0.15**	**4,950**

Table D.4-4. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Westover ARB - Proposed KC-46A MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-46A - MOB 3										
Idle	0.443	0.294	1.179	0.170	0.009	0.008	0.015	0.014	0.002	0.010
Approach	0.000	0.000	0.000	–	0.000	0.000	0.000	0.000	0.000	0.000
Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Military	0.001	0.000	0.000	–	0.000	0.000	0.000	0.001	0.000	0.000
APU	0.001	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total KC-46A MOB 3	**0.445**	**0.294**	**1.182**	**0.171**	**0.009**	**0.008**	**0.015**	**0.014**	**0.002**	**0.010**

Table D.4-4. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Westover ARB - Proposed KC-46A MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
KC-46A - MOB 3											
Idle	0.005	0.033	0.193	4.556	–	–	0.142	–	–	0.474	0.238
Approach	0.000	0.000	0.000	0.001	–	–	0.000	–	–	0.000	0.001
Intermediate	0.000	0.000	0.000	0.000	–	–	0.001	–	–	0.000	0.000
Military	–	0.001	0.000	0.003	–	–	0.009	–	–	0.000	0.000
APU	0.000	0.000	0.000	0.010	–	–	0.000	–	–	0.001	0.001
Total KC-46A MOB 3	**0.005**	**0.034**	**0.194**	**4.570**	–	–	**0.152**	–	–	**0.475**	**0.239**

Table D.4-4. Annual Emissions from KC-46A Aircraft On-Wing Engine Testing Activities at Westover ARB - Proposed KC-46A MOB 3 Mission (Continued)

Aircraft Scenario/Throttle Setting	Annual Emissions - Tons										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
KC-46A - MOB 3											
Idle	0.198	0.005	0.251	0.010	0.012	0.563	0.008	–	0.049	0.368	0.159
Approach	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Intermediate	0.000	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
Military	0.005	–	0.000	0.000	0.000	0.000	0.000	–	0.000	0.000	0.000
APU	0.000	0.000	0.001	0.000	0.000	0.001	0.000	–	0.000	0.001	0.000
Total KC-46A MOB 3	**0.203**	**0.005**	**0.252**	**0.010**	**0.012**	**0.564**	**0.008**	**–**	**0.050**	**0.370**	**0.159**

Table D.4-5. 2014 AGE Usages for the KC-135R Detachment at Seymour Johnson AFB

Source	Fuel Type	Hp	Load Factor	Hours/Year	Annual Hp-Hours
Air Compressor - MC-2A	JP-8	10.5	0.48	60	302
Floodlight (FL-1D & NF2D & lightcart)	JP-8	10.5	0.74	100	777
Next Generation Heater (NGH)	JP-8	7.0	0.95	50	333
Subtotal - 7-11 Hp					**1,412**
Jacking Manifold	JP-8	30.0	0.51	100	1,530
Subtotal - 26-40 Hp					**1,530**
Air Compressor - MC20	JP-8	50.0	1.00	120	6,000
Nitrogen Servicing Cart	JP-8	49.0	0.51	200	4,998
Subtotal - 41-50 Hp					**10,998**
Air Compressor - MC-7	JP-8	52.0	0.48	150	3,744
Generator Set - A/M32A-86D	JP-8	96.5	0.95	750	68,742
Subtotal - 76-100 Hp					**72,486**
Air Conditioners - MA-3D	JP-8	120.0	0.28	150	5,040
Hyd Test Stand - MJ-2	JP-8	125.0	0.51	75	4,781
Start Cart - A/M32A-95	JP-8	155.0	0.95	40	5,890
Subtotal - 101-175 Hp					**15,711**

Note: These data used as surrogates for AGE usages for KC-135 and KC-46A aircraft at all proposed basing locations.
Source: Seymour Johnson AFB Mobile AEI APIMS Data Entry_8Oct15.xlsx 'GSE', but some Hp ratings obtained from 5-2014 Seymour Johnson AFB Mobile AEI Process Calc Summary.pdf

Table D.4-6. Nonroad Diesel Equipment Emission Factors for 2019 - Westover ARB

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019										
Nonroad Equipment - 7-11 Hp	0.67	4.56	4.48	0.00	0.40	0.39	591	0.094	0.007	595
Nonroad Equipment - 26-40 Hp	0.30	1.17	3.60	0.00	0.18	0.18	634	0.094	0.007	638
Nonroad Equipment - 41-50 Hp	0.25	0.91	3.49	0.00	0.14	0.13	628	0.094	0.007	632
Nonroad Equipment - 76-100 Hp	0.49	2.94	2.52	0.00	0.40	0.39	644	0.094	0.007	648
Nonroad Equipment - 101-175 Hp	0.25	0.70	1.48	0.00	0.15	0.14	566	0.094	0.007	570

Table D.4-6. Nonroad Diesel Equipment Emission Factors for 2019 - Westover ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019										
Nonroad Equipment - 7-11 Hp	0.079	0.010	0.097	0.004	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.036	0.004	0.043	0.002	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.030	0.004	0.037	0.002	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.058	0.007	0.071	0.003	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.030	0.004	0.036	0.002	–	–	–	–	–	–

Table D.4-6. Nonroad Diesel Equipment Emission Factors for 2019 - Westover ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2019											
Nonroad Equipment - 7-11 Hp	–	–	–	0.122	–	–	–	–	–	0.001	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.055	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.090	–	–	–	–	–	0.001	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.046	–	–	–	–	–	0.000	–

Table D.4-6. Nonroad Diesel Equipment Emission Factors for 2019 - Westover ARB (Continued)

Year/HP Category	Emission Factors (Grams/Horsepower) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.042	–	–	–	–	0.030
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.019	–	–	–	–	0.013
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.031	–	–	–	–	0.022
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.016	–	–	–	–	0.011

[a] Criteria pollutant factors estimated with the use of the USEPA NONROAD2008a model for Hampden County, MA.

[b] HAPs factors estimated with VOC speciation data presented in Table 4-3 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.4-7. Annual Air Emissions for AGE Usages - Westover ARB KC-46A MOB 3 Mission

Year/HP Category	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.37
Nonroad Equipment - 26-40 Hp	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.44
Nonroad Equipment - 41-50 Hp	0.00	0.00	0.02	0.00	0.00	0.00	3.08	0.00	0.00	3.10
Nonroad Equipment - 76-100 Hp	0.02	0.10	0.08	0.00	0.01	0.01	20.81	0.00	0.00	20.94
Nonroad Equipment - 101-175 Hp	0.00	0.00	0.01	0.00	0.00	0.00	3.96	0.00	0.00	3.99
Total - Year 2019	**0.02**	**0.11**	**0.11**	**0.00**	**0.02**	**0.01**	**28.65**	**0.00**	**0.00**	**28.83**

Table D.4-7. Annual Air Emissions for AGE Usages - Westover ARB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2019 [a]										
Nonroad Equipment - 7-11 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 26-40 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 41-50 Hp	0.000	0.000	0.000	0.000	–	–	–	–	–	–
Nonroad Equipment - 76-100 Hp	0.002	0.000	0.003	0.000	–	–	–	–	–	–
Nonroad Equipment - 101-175 Hp	0.001	0.000	0.001	0.000	–	–	–	–	–	–
Total - Year 2019	**0.003**	**0.000**	**0.004**	**0.000**	–	–	–	–	–	–

Table D.4-7. Annual Air Emissions for AGE Usages - Westover ARB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 26-40 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 41-50 Hp	–	–	–	0.000	–	–	–	–	–	0.000	–
Nonroad Equipment - 76-100 Hp	–	–	–	0.003	–	–	–	–	–	0.000	–
Nonroad Equipment - 101-175 Hp	–	–	–	0.001	–	–	–	–	–	0.000	–
Total - Year 2019	–	–	–	**0.005**	–	–	–	–	–	**0.000**	–

Table D.4-7. Annual Air Emissions for AGE Usages - Westover ARB KC-46A MOB 3 Mission (Continued)

Year/HP Category	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2019 [a]											
Nonroad Equipment - 7-11 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 26-40 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 41-50 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Nonroad Equipment - 76-100 Hp	–	0.000	–	–	–	0.001	–	–	–	–	0.001
Nonroad Equipment - 101-175 Hp	–	0.000	–	–	–	0.000	–	–	–	–	0.000
Total - Year 2019	–	**0.000**	–	–	–	**0.002**	–	–	–	–	**0.001**

[a] 2014 Seymour Johnson AFB AGE hp-hr * (2019 Westover ARB MOB 3 KC-46A LTOs [647] / 2014 Seymour Johnson AFB KC-135 LTOs [1,100]) * (2019 Nonroad EFs).

– = Source does not emit particular pollutant

Table D.4-8. Annual VMT for GOVs by Vehicle Class - Westover ARB 2014

Vehicle Class	Annual VMT
LDGV	1,152,280
LDGT	10,613
HDGV	10,613
HDDV	795,350
Total VMT	**1,968,855**

Note: Developed from 2014 Westover ARB GHG Emissions Report (Westover ARB 2015a).

Table D.4-9. Annual Number of Workers at Westover ARB - KC-46A MOB 3 Mission

Scenario	Total Base Workers
Year 2013 Westover ARB Total [a]	3,813
Year 2015 Westover ARB Total [b]	2,654
Year 2019 MOB 3 [b]	627

[a] Source: 439 AW Westover ARB 2014 Westover EIA Report.pdf

[b] Source: EIS Table 2-16.

Table D.4-10. Annual Average On-Road Vehicle Emission Factors - Westover ARB KC-46A MOB 3 Mission

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.07	2.56	0.33	0.01	0.07	0.02	382	–	–	382
LDGT - 25 mph	0.33	7.74	1.20	0.01	0.08	0.02	533	–	–	533
HGDV - 25 mph	0.30	7.35	1.15	0.01	0.08	0.02	530	–	–	530
HDDV - 25 mph	0.55	2.38	8.24	0.02	0.69	0.39	2,101	–	–	2,101
Year 2019										
LDGV - 25 mph	0.02	1.77	0.11	0.00	0.06	0.01	316	–	–	316
LDGT - 25 mph	0.12	5.52	0.47	0.00	0.08	0.02	498	–	–	498
HGDV - 25 mph	0.11	5.39	0.44	0.00	0.08	0.02	495	–	–	495
HDDV - 25 mph	0.27	1.31	4.54	0.02	0.49	0.20	2,031	–	–	2,031

Table D.4-10. Annual Average On-Road Vehicle Emission Factors - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.040	0.000	–	–	–	–	–	–
LDGT - 25 mph	0.005	0.001	0.185	0.002	–	–	–	–	–	–
HGDV - 25 mph	–	–	0.006	–	–	–	–	–	–	–
HDDV - 25 mph	–	–	–	–	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.013	0.000	–	–	–	–	–	–
LDGT - 25 mph	0.002	0.000	0.068	0.001	–	–	–	–	–	–
HGDV - 25 mph	–	–	0.002	–	–	–	–	–	–	–
HDDV - 25 mph	–	–	–	–	–	–	–	–	–	–

Table D.4-10. Annual Average On-Road Vehicle Emission Factors - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT - 25 mph	–	–	0.008	0.011	0.006	–	–	0.000	0.000	0.000	–
HGDV - 25 mph	–	–	0.002	–	0.005	–	–	–	–	–	–
HDDV - 25 mph	–	–	0.007	–	0.013	–	–	–	0.013	–	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
HGDV - 25 mph	–	–	0.001	–	0.002	–	–	–	–	–	–
HDDV - 25 mph	–	–	0.004	–	0.007	–	–	–	0.007	–	–

Table D.4-10. Annual Average On-Road Vehicle Emission Factors - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class-Speed	Emission Factors (Grams/Mile) ~~a b~~										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.008	–	0.002	–	–	0.006
LDGT - 25 mph	–	–	0.000	–	–	0.005	–	0.013	–	–	0.027
HGDV - 25 mph	–	–	–	–	–	0.010	–	0.005	–	–	0.009
HDDV - 25 mph	–	–	0.011	–	–	–	–	0.000	–	–	–
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.002	–	0.000	–	–	0.002
LDGT - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.010
HGDV - 25 mph	–	–	–	–	–	0.004	–	0.002	–	–	0.003
HDDV - 25 mph	–	–	0.006	–	–	–	–	0.000	–	–	–

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Hampden County, MA.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

– = Source does not emit particular pollutant

Table D.4-11. Annual Emissions from GOV Activities - Westover ARB KC-46A MOB 3 Mission

Scenario/Vehicle Class	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 Westover ARB Total [a]										
LDGV	0.06	2.26	0.29	0.01	0.06	0.01	338	–	–	338
LDGT	0.00	0.06	0.01	0.00	0.00	0.00	4	–	–	4
HDGV	0.00	0.06	0.01	0.00	0.00	0.00	4	–	–	4
HDDV	0.33	1.45	5.03	0.01	0.42	0.24	1,282	–	–	1,282
Total - Year 2015	**0.40**	**3.84**	**5.34**	**0.02**	**0.49**	**0.25**	**1,629**	–	–	**1,629**
Year 2019 MOB 3 [a]										
LDGV	0.00	0.37	0.02	0.00	0.01	0.00	66	–	–	66
LDGT	0.00	0.01	0.00	0.00	0.00	0.00	1	–	–	1
HDGV	0.00	0.01	0.00	0.00	0.00	0.00	1	–	–	1
HDDV	0.04	0.19	0.65	0.00	0.07	0.03	293	–	–	293
Total - Year 2019	**0.04**	**0.58**	**0.68**	**0.00**	**0.08**	**0.03**	**361**	–	–	**361**

Table D.4-11. Annual Emissions from GOV Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 Westover ARB Total [a]										
LDGV	0.000	0.000	0.035	0.000	–	–	–	–	–	–
LDGT	0.000	0.000	0.002	0.000	–	–	–	–	–	–
HDGV	–	–	0.000	–	–	–	–	–	–	–
HDDV	–	–	–	–	–	–	–	–	–	–
Total - Year 2015	**0.000**	**0.000**	**0.037**	**0.000**	–	–	–	–	–	–
Year 2019 MOB 3 [a]										
LDGV	0.000	0.000	0.003	0.000	–	–	–	–	–	–
LDGT	0.000	0.000	0.000	0.000	–	–	–	–	–	–
HDGV	–	–	0.000	–	–	–	–	–	–	–
HDDV	–	–	–	–	–	–	–	–	–	–
Total - Year 2019	**0.000**	**0.000**	**0.003**	**0.000**	–	–	–	–	–	–

Table D.4-11. Annual Emissions from GOV Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 Westover ARB Total [a]											
LDGV	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
HDGV	–	–	0.000	–	0.000	–	–	–	–	–	–
HDDV	–	–	0.004	–	0.008	–	–	–	0.008	–	–
Total - Year 2015	–	–	**0.006**	**0.001**	**0.009**	–	–	**0.000**	**0.008**	**0.000**	–
Year 2019 MOB 3 [a]											
LDGV	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
HDGV	–	–	0.000	–	0.000	–	–	–	–	–	–
HDDV	–	–	0.001	–	0.001	–	–	–	0.001	–	–
Total - Year 2019	–	–	**0.001**	**0.000**	**0.001**	–	–	**0.000**	**0.001**	**0.000**	–

Table D.4-11. Annual Emissions from GOV Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario/Vehicle Class	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 Westover ARB Total [a]											
LDGV	–	–	0.000	–	–	0.007	–	0.001	–	–	0.006
LDGT	–	–	0.000	–	–	0.000	–	0.000	–	–	0.000
HDGV	–	–	–	–	–	0.000	–	0.000	–	–	0.000
HDDV	–	–	0.007	–	–	–	–	0.000	–	–	–
Total - Year 2015	–	–	**0.007**	–	–	**0.007**	–	**0.002**	–	–	**0.006**
Year 2019 MOB 3 [a]											
LDGV	–	–	0.000	–	–	0.001	–	0.000	–	–	0.000
LDGT	–	–	0.000	–	–	0.000	–	0.000	–	–	0.000
HDGV	–	–	–	–	–	0.000	–	0.000	–	–	0.000
HDDV	–	–	0.001	–	–	–	–	0.000	–	–	–
Total - Year 2019	–	–	**0.001**	–	–	**0.001**	–	**0.000**	–	–	**0.000**

[a] 2014 Westover ARB GOV VMT * (Scenario Year Population/Westover ARB 2014 Population) * future year vehicle emission factors.

– = Source does not emit particular pollutant

Table D.4-12. Annual On-Base On-Road Vehicle Mileage Calculations - Westover ARB MOB 3 Mission

Scenario	# of Workers [a]	Vehicle Occupancy Rate	On-Base Miles per Round Trip	Days per Year	On-Base Miles per year
Year 2015 Westover ARB Total a					
Onbase Personnel	630	1.0	2.0	250	315,000
Reservists	2,024	1.0	2.0	24	97,152
Total Onbase VMT - Year 2015					**412,152**
Year 2019 MOB 3					
Onbase Personnel	159	1.0	2.0	250	79,500
Reservists	453	1.0	2.0	24	21,744
Contractors and Vendors	15	1.0	3.0	247	11,115
Total Onbase VMT - Year 2019 MOB 3 Scenario					**112,359**

[a] # of Workers from EIS Table 2-16.

Table D.4-13. Annual Average On-Road Emission Factors - Westover ARB KC-46A MOB 3 Mission

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.07	2.56	0.33	0.01	0.07	0.02	382	–	–	382
LDGT1 - 25 mph	0.33	7.74	1.20	0.01	0.08	0.02	533	–	–	533
Composite [c]	**0.16**	**4.48**	**0.65**	**0.01**	**0.08**	**0.02**	**438**	–	–	**438**
Year 2019										
LDGV - 25 mph	0.02	1.77	0.11	0.00	0.06	0.01	316	–	–	316
LDGT2 - 25 mph	0.12	5.52	0.47	0.00	0.08	0.02	498	–	–	498
Composite [c]	**0.06**	**3.15**	**0.24**	**0.00**	**0.06**	**0.01**	**384**	–	–	**384**

Table D.4-13. Annual Average On-Road Emission Factors - Westover ARB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.040	0.000	–	–	–	–	–	–
LDGT2 - 25 mph	0.005	0.001	0.185	0.002	–	–	–	–	–	–
Composite [c]	**0.002**	**0.001**	**0.094**	**0.001**	–	–	–	–	–	–
Year 2019										
LDGV - 25 mph	0.000	0.000	0.013	0.000	–	–	–	–	–	–
LDGT2 - 25 mph	0.002	0.000	0.068	0.001	–	–	–	–	–	–
Composite [c]	**0.001**	**0.000**	**0.033**	**0.000**	–	–	–	–	–	–

Table D.4-13. Annual Average On-Road Emission Factors - Westover ARB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT2 - 25 mph	–	–	0.008	0.011	0.006	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.004**	**0.005**	**0.003**	–	–	**0.000**	**0.000**	**0.000**	–
Year 2019											
LDGV - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT2 - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
Composite [c]	–	–	**0.001**	**0.002**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.4-13. Annual Average On-Road Emission Factors - Westover ARB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.008	–	0.002	–	–	0.006
LDGT2 - 25 mph	–	–	0.000	–	–	0.005	–	0.013	–	–	0.027
Composite [c]	–	–	**0.000**	–	–	**0.007**	–	**0.006**	–	–	**0.014**
Year 2019											
LDGV - 25 mph	–	–	0.000	–	–	0.002	–	0.000	–	–	0.002
LDGT2 - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.010
Composite [c]	–	–	**0.000**	–	–	**0.002**	–	**0.002**	–	–	**0.005**

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Hampden County, MA.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Equal to 63/37% LDGV/LDGT1.

– = Source does not emit particular pollutant

Table D.4-14. Annual Emissions from On-Base On-Road Vehicle Activities - Westover ARB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 Westover Total [a]	0.07	2.03	0.29	0.00	0.03	0.01	199.10	–	–	199.10
Year 2019 MOB 3 [a]	0.01	0.39	0.03	0.00	0.01	0.00	47.53	–	–	47.53

Table D.4-14. Annual Emissions from On-Base On-Road Vehicle Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 Westover Total [a]	0.001	0.000	0.043	0.000	–	–	–	–	–	–
Year 2019 MOB 3 [a]	0.000	0.000	0.004	0.000	–	–	–	–	–	–

Table D.4-14. Annual Emissions from On-Base On-Road Vehicle Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 Westover Total [a]	–	–	0.002	0.002	0.001	–	–	0.000	0.000	0.000	–
Year 2019 MOB 3 [a]	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–

Table D.4-14. Annual Emissions from On-Base On-Road Vehicle Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 Westover Total [a]	–	–	0.000	–	–	0.003	–	0.003	–	–	0.006
Year 2019 MOB 3 [a]	–	–	0.000	–	–	0.000	–	0.000	–	–	0.001

[a] Scenario on-base VMT * scenario year composite emission factors.

– = Source does not emit particular pollutant

Table D.4-15. Annual Off-Base On-Road Vehicle Mileage Calculations - Westover ARB MOB 3 Mission

Scenario	# of Workers [a]	Vehicle Occupancy Rate	On-Base Miles per Round Trip [b]	Days per Year	On-Base Miles per year
Year 2015 Westover ARB Total a					
Onbase Personnel	630	1.0	20.0	250	3,150,000
Reservists	2,024	1.0	100.0	24	4,857,600
Total Offbase VMT - Year 2015					**8,007,600**
Year 2019 MOB 3					
Onbase Personnel	159	1.0	20.0	250	795,000
Reservists	453	1.0	100.0	24	1,087,200
Contractors and Vendors	15	1.0	20.0	247	74,100
Total Offbase VMT - Year 2019 MOB 3 Scenario					**1,956,300**

[a] # of Workers from EIS Table 2-16.

[b] Source: ConformityAnalysis_ArmyBRACtoWestover.pdf but lowered onbase personnel off-base VMT to 20 miles/RT.

Table D.4-16. Annual Average On-Road Emission Factors for Off-Site Activities - Westover ARB KC-46A MOB 3 Mission

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015										
LDGV - 25 mph	0.07	2.56	0.33	0.01	0.07	0.02	382	–	–	382
LDGV - 55 mph	0.05	2.34	0.33	0.01	0.03	0.01	303	–	–	303
LDGT1 - 25 mph	0.33	7.74	1.20	0.01	0.08	0.02	533	–	–	533
LDGT1 - 55 mph	0.14	6.71	1.22	0.01	0.04	0.02	438	–	–	438
Composite [c]	**0.10**	**4.09**	**0.66**	**0.01**	**0.04**	**0.02**	**374**	–	–	**374**
Year 2019										
LDGV - 25 mph	0.02	1.77	0.11	0.00	0.06	0.01	316	–	–	316
LDGV - 55 mph	0.02	1.74	0.12	0.00	0.02	0.01	276	–	–	276
Composite [d]	**0.02**	**1.74**	**0.12**	**0.00**	**0.03**	**0.01**	**286**	–	–	**286**
LDGT1 - 25 mph	0.12	5.52	0.47	0.00	0.08	0.02	498	–	–	498
LDGT1 - 55 mph	0.06	5.16	0.49	0.00	0.03	0.01	410	–	–	410
Composite [d]	**0.07**	**5.25**	**0.48**	**0.00**	**0.04**	**0.01**	**432**	–	–	**432**

Table D.4-16. Annual Average On-Road Emission Factors for Off-Site Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015										
LDGV - 25 mph	0.000	0.000	0.040	0.000	–	–	–	–	–	–
LDGT2 - 25 mph	0.000	0.000	0.028	0.000	–	–	–	–	–	–
LDGT2 - 55 mph	0.005	0.001	0.185	0.002	–	–	–	–	–	–
HDGV2B - 55 mph	0.002	0.001	0.079	0.001	–	–	–	–	–	–
Composite [d]	**0.001**	**0.000**	**0.059**	**0.001**	–	–	–	–	–	–
Year 2019										
LDGT2 - 25 mph	0.000	0.000	0.013	0.000	–	–	–	–	–	–
LDGT2 - 55 mph	0.000	0.000	0.011	0.000	–	–	–	–	–	–
Composite [d]	**0.000**	**0.000**	**0.011**	**0.000**	–	–	–	–	–	–
HDGV2B - 25 mph	0.002	0.000	0.068	0.001	–	–	–	–	–	–
HDGV2B - 55 mph	0.001	0.000	0.032	0.000	–	–	–	–	–	–
Composite [d]	**0.001**	**0.000**	**0.041**	**0.000**	–	–	–	–	–	–

Table D.4-16. Annual Average On-Road Emission Factors for Off-Site Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015											
LDGV - 25 mph	–	–	0.002	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT2 - 25 mph	–	–	0.001	0.001	0.001	–	–	0.000	0.000	0.000	–
LDGT2 - 55 mph	–	–	0.008	0.011	0.006	–	–	0.000	0.000	0.000	–
HDGV2B - 55 mph	–	–	0.003	0.005	0.003	–	–	0.000	0.000	0.000	–
Composite [d]	–	–	**0.002**	**0.003**	**0.002**	–	–	**0.000**	**0.000**	**0.000**	–
Year 2019											
LDGT2 - 25 mph	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT2 - 55 mph	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
Composite [d]	–	–	**0.000**	**0.000**	**0.000**	–	–	**0.000**	**0.000**	**0.000**	–
HDGV2B - 25 mph	–	–	0.003	0.004	0.002	–	–	0.000	0.000	0.000	–
HDGV2B - 55 mph	–	–	0.001	0.002	0.001	–	–	0.000	0.000	0.000	–
Composite [d]	–	–	**0.002**	**0.002**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.4-16. Annual Average On-Road Emission Factors for Off-Site Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Project Year/Source Type	Emission Factors (Grams/Mile) [a b]										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015											
LDGV - 25 mph	–	–	0.000	–	–	0.008	–	0.002	–	–	0.006
LDGT2 - 25 mph	–	–	0.000	–	–	0.005	–	0.001	–	–	0.005
LDGT2 - 55 mph	–	–	0.000	–	–	0.005	–	0.013	–	–	0.027
HDGV2B - 55 mph	–	–	0.000	–	–	0.002	–	0.006	–	–	0.011
Composite [d]	–	–	**0.000**	–	–	**0.005**	–	**0.004**	–	–	**0.009**
Year 2019											
LDGT2 - 25 mph	–	–	0.000	–	–	0.002	–	0.000	–	–	0.002
LDGT2 - 55 mph	–	–	0.000	–	–	0.002	–	0.000	–	–	0.002
Composite [d]	–	–	**0.000**	–	–	**0.002**	–	**0.000**	–	–	**0.002**
HDGV2B - 25 mph	–	–	0.000	–	–	0.002	–	0.005	–	–	0.010
HDGV2B - 55 mph	–	–	0.000	–	–	0.001	–	0.002	–	–	0.005
Composite [d]	–	–	**0.000**	–	–	**0.001**	–	**0.003**	–	–	**0.006**

[a] Estimated with the use of the USEPA MOVES2014a model for default conditions in Hampden County, MA.

[b] HAPs factors estimated with the use of VOC speciation data presented in Table 5-43 of Air Emissions Guide for Air Force Mobile Sources (AFCEC 2014).

[c] Equal to 63/37% LDGV/LDGT and 75/25% 55/25 mph.

[d] Equal to 75/25% 55/25 mph.

– = Source does not emit particular pollutant

Table D.4-17. Annual Emissions from Off-Base Vehicle Activities - Westover ARB KC-46A MOB 3 Mission

Scenario	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2015 Westover Total [a]										
Total	**0.91**	**36.07**	**5.79**	**0.07**	**0.37**	**0.14**	**3,305**	–	–	**3,305**
Year 2019 MOB 3 [b]										
LDGV	0.03	2.37	0.17	0.00	0.04	0.01	389	–	–	389
LDGT	0.06	4.19	0.39	0.00	0.03	0.01	345	–	–	345
Total	**0.08**	**6.56**	**0.55**	**0.00**	**0.07**	**0.02**	**733**	–	–	**733**

Table D.4-17. Annual Emissions from Off-Base Vehicle Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
Year 2015 Westover Total [a]										
Total	**0.011**	**0.003**	**0.517**	**0.005**	–	–	–	–	–	–
Year 2019 MOB 3 [a]										
LDGV	0.000	0.000	0.015	0.000	–	–	–	–	–	–
LDGT	0.001	0.000	0.033	0.000	–	–	–	–	–	–
Total	**0.001**	**0.000**	**0.048**	**0.001**	–	–	–	–	–	–

Table D.4-17. Annual Emissions from Off-Base Vehicle Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
Year 2015 Westover Total [a]											
Total	–	–	**0.022**	**0.024**	**0.016**	–	–	**0.000**	**0.001**	**0.000**	–
Year 2019 MOB 3 [a]											
LDGV	–	–	0.001	0.000	0.000	–	–	0.000	0.000	0.000	–
LDGT	–	–	0.001	0.002	0.001	–	–	0.000	0.000	0.000	–
Total	–	–	**0.002**	**0.002**	**0.001**	–	–	**0.000**	**0.000**	**0.000**	–

Table D.4-17. Annual Emissions from Off-Base Vehicle Activities - Westover ARB KC-46A MOB 3 Mission (Continued)

Scenario	Annual Emissions (Tons)										
	Propanal	Pyrene	Styrene	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	2,2,4-Trimethylpentane	Vinyl Acetate	mp-Xylene	o-Xylene
Year 2015 Westover Total [a]											
Total	–	–	**0.001**	–	–	**0.043**	–	**0.031**	–	–	**0.078**
Year 2019 MOB 3 [a]											
LDGV	–	–	0.000	–	–	0.003	–	0.001	–	–	0.002
LDGT	–	–	0.000	–	–	0.001	–	0.002	–	–	0.005
Total	–	–	**0.000**	–	–	**0.004**	–	**0.003**	–	–	**0.007**

[a] 2015 emissions = 2015 Total Off-base VMT * 2015 composite emission factors.

[b] 2019 emissions = 2019 Total Off-base VMT * 2019 composite emission factors.

– = Source does not emit particular pollutant

Table D.4-18. Annual Number of Aircraft LTOs - Westover ARB KC-46A MOB 3 Mission

Scenario	Number of LTOs
Year 2013 All Westover ARB (1)	1,963
Year 2015 Westover Total (2)	1,782
Year 2019 MOB 3 (2)	647

Notes:

(1) Source: For # of Workers (439 AW Westover ARB 2014 Westover EIA Report.pdf) and for # of LTOs 2013 AICUZ Study.

(2) Source: EIS Tables 2-16 thru 18. For 2015 Westover Total, excluded civilian aircraft. as these ops not part of the Westover ARB stn source emissions.

Table D.4-19. Annual Emissions from Point and Area Sources - Westover ARB KC-46A MOB 3 Mission

Scenario Year/ Source Type	Tons per Year									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Year 2013 All Westover ARB [a]										
Total - Year 2013	**1.72**	**4.41**	**6.52**	**0.08**	**0.51**	**0.41**	**6,739**	–	–	–
Year 2015 All Westover [b]										
Total - Year 2015	**1.56**	**4.00**	**5.92**	**0.07**	**0.46**	**0.37**	**6,118**	–	–	–
Year 2019 MOB 3 Scenario [b]										
Total - Year 2019 MOB 3 Scenario	**0.57**	**1.45**	**2.15**	**0.03**	**0.17**	**0.14**	**2,221**	–	–	–

[a] Source: Westover ARB 2013 Air Emissions Report (Westover ARB 2014).

[b] 2013 emissions * future year scenario LTOs/Westover ARB year 2013 LTOs.

– = Source does not emit particular pollutant

Table D.4-20. 2015 Non-Aircraft Emissions for Westover ARB - KC-46A MOB 3 Mission Existing Conditions

Source Type	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e (mt)
KC-135 Aircraft Operations	–	–	–	–	–	–	–	–	–	–
On-Wing Aircraft Engine Testing - KC-135	–	–	–	–	–	–	–	–	–	–
Aerospace Ground Support Equipment	–	–	–	–	–	–	–	–	–	–
GOVs/Nonroad Equipment	0.40	3.84	5.34	0.02	0.49	0.25	1,629	–	–	1,480
Privately-Owned Vehicles - On-Base	0.07	2.03	0.29	0.00	0.03	0.01	199	–	–	181
Privately-Owned Vehicles - Off-Base	0.91	36.07	5.79	0.07	0.37	0.14	3,305	–	–	3,004
Point and Area Sources	1.56	4.00	5.92	0.07	0.46	0.37	6,118	–	–	5,561
Total Emissions	**2.94**	**45.95**	**17.34**	**0.16**	**1.35**	**0.77**	**11,250**	–	–	**10,227**
Mobile Sources Only	**1.38**	**41.95**	**11.42**	**0.09**	**0.89**	**0.40**	**5,133**	–	–	**4,666**

Table D.4-20. 2015 Non-Aircraft Emissions for Westover ARB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Source Type	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-135 Aircraft Operations	–	–	–	–	–	–	–	–	–	–
On-Wing Aircraft Engine Testing - KC-135	–	–	–	–	–	–	–	–	–	–
Aerospace Ground Support Equipment	–	–	–	–	–	–	–	–	–	–
GOVs/Nonroad Equipment	0.000	0.000	0.037	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	0.001	0.000	0.043	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - Off-Base	0.011	0.003	0.517	0.005	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–
Total Emissions	**0.012**	**0.004**	**0.597**	**0.006**	–	–	–	–	–	–

Table D.4-20. 2015 Non-Aircraft Emissions for Westover ARB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethyl benzene	Naphth-alene	Phenol
KC-135 Aircraft Operations	–	–	–	–	–	–	–	–	–	–	–
On-Wing Aircraft Engine Testing - KC-135	–	–	–	–	–	–	–	–	–	–	–
Aerospace Ground Support Equipment	–	–	–	–	–	–	–	–	–	–	–
GOVs/Nonroad Equipment	–	–	0.006	0.001	0.009	–	–	0.000	0.008	0.000	–
Privately-Owned Vehicles - On-Base	–	–	0.002	0.002	0.001	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	0.022	0.024	0.016	–	–	0.000	0.001	0.000	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	–	–	**0.029**	**0.027**	**0.026**	–	–	**0.000**	**0.010**	**0.000**	–

Table D.4-20. 2015 Non-Aircraft Emissions for Westover ARB - KC-46A MOB 3 Mission Existing Conditions (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	**Pyrene**	**Styrene**	**1,1,2,2-Tetrachloroethane**	**Tetrachloroethene**	**Toluene**	**1,1,1-Trichloroethane**	**2,2,4-Trimethylpentane**	**Vinyl Acetate**	**mp-Xylene**	**o-Xylene**
KC-135 Aircraft Operations	–	–	–	–	–	–	–	–	–	–	–
On-Wing Aircraft Engine Testing - KC-135	–	–	–	–	–	–	–	–	–	–	–
Aerospace Ground Support Equipment	–	–	–	–	–	–	–	–	–	–	–
GOVs/Nonroad Equipment	–	–	0.007	–	–	0.007	–	0.002	–	–	0.006
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.003	–	0.003	–	–	0.006
Privately-Owned Vehicles - Off-Base	–	–	0.001	–	–	0.043	–	0.031	–	–	0.078
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Emissions	–	–	**0.008**	–	–	**0.053**	–	**0.036**	–	–	**0.091**

– = Source does not emit particular pollutant

Table D.4-21. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Westover ARB - 2019

Source Type	Annual Emissions (Tons)									
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
KC-46A Aircraft Operations	12.09	53.51	329.07	17.21	1.07	0.91	51,992	1.44	1.62	47,749
On-Wing Aircraft Engine Testing - KC-46A	11.57	39.71	18.73	1.68	0.16	0.14	4,899	0.14	0.15	4,500
Aerospace Ground Support Equipment - KC-46A	0.02	0.11	0.11	0.00	0.02	0.01	29	0.00	0.00	26
Government-Owned Vehicles	0.04	0.58	0.68	0.00	0.08	0.03	361	–	–	328
Privately-Owned Vehicles - On-Base	0.01	0.39	0.03	0.00	0.01	0.00	48	–	–	43
Privately-Owned Vehicles - Off-Base	0.08	6.56	0.55	0.00	0.07	0.02	733	0.00	0.00	667
Point and Area Sources	0.57	1.45	2.15	0.03	0.17	0.14	2,221	–	–	2,019
Total Proposed Emissions - 2019	**24.38**	**102.32**	**351.32**	**18.92**	**1.58**	**1.26**	**60,283**	**1.58**	**1.77**	**55,332**
Hampden County PSD Thresholds	**250**	**250**	**250**	**250**	**250**	**250**	–	–	–	–

Table D.4-21. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Westover ARB - 2019 (Continued)

Source Type	Annual Emissions (Tons)									
	Acetalde-hyde	Acrolein	Benzene	1,3-Butadiene	Carbon Disulfide	Carbon Tetra-chloride	Chloro-form	Chloro-methane	Dibutyl Phthalate	1,2-Dichloro-propane
KC-46A Aircraft Operations	0.440	0.280	1.132	0.161	0.013	0.012	0.028	0.026	0.009	0.011
On-Wing Aircraft Engine Testing - KC-46A	0.445	0.294	1.182	0.171	0.009	0.008	0.015	0.014	0.002	0.010
Aerospace Ground Support Equipment - KC-46A	0.003	0.000	0.004	0.000	–	–	–	–	–	–
Government-Owned Vehicles	0.000	0.000	0.003	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - On-Base	0.000	0.000	0.004	0.000	–	–	–	–	–	–
Privately-Owned Vehicles - Off-Base	0.001	0.000	0.048	0.001	–	–	–	–	–	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.889**	**0.575**	**2.372**	**0.332**	**0.022**	**0.020**	**0.044**	**0.041**	**0.011**	**0.021**

Table D.4-21. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Westover ARB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	2,4-Dinitro-phenol	DEHP	Ethyl-benzene	Formalde-hyde	Hexane	Methanol	Methylene Chloride	MTBE	Methylethylbenzene	Naphth-alene	Phenol
KC-46A Aircraft Operations	0.009	0.065	0.184	4.527	–	–	0.474	–	–	0.446	0.230
On-Wing Aircraft Engine Testing - KC-46A	0.005	0.034	0.194	4.570	–	–	0.152	–	–	0.475	0.239
Aerospace Ground Support Equipment - KC-46A	–	–	–	0.005	–	–	–	–	–	0.000	–
Government-Owned Vehicles	–	–	0.001	0.000	0.001	–	–	0.000	0.001	0.000	–
Privately-Owned Vehicles - On-Base	–	–	0.000	0.000	0.000	–	–	0.000	0.000	0.000	–
Privately-Owned Vehicles - Off-Base	–	–	0.002	0.002	0.001	–	–	0.000	0.000	0.000	–
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.014**	**0.099**	**0.380**	**9.104**	**0.003**	**–**	**0.626**	**0.000**	**0.001**	**0.922**	**0.470**

Table D.4-21. Annual Emissions Associated with the Proposed KC-46A MOB 3 Mission at Westover ARB - 2019 (Continued)

Source Type	Annual Emissions (Tons)										
	Propanal	**Pyrene**	**Styrene**	**1,1,2,2-Tetrachloroethane**	**Tetrachloroethene**	**Toluene**	**1,1,1-Trichloroethane**	**2,2,4-Trimethylpentane**	**Vinyl Acetate**	**mp-Xylene**	**o-Xylene**
KC-46A Aircraft Operations	0.3073	0.004	0.236	0.012	0.017	0.544	0.011	–	0.058	0.360	0.151
On-Wing Aircraft Engine Testing - KC-46A	0.2034	0.005	0.252	0.010	0.012	0.564	0.008	–	0.050	0.370	0.159
Aerospace Ground Support Equipment - KC-46A	–	0.000	–	–	–	0.002	–	–	–	–	0.001
Government-Owned Vehicles	–	–	0.001	–	–	0.001	–	0.000	–	–	0.000
Privately-Owned Vehicles - On-Base	–	–	0.000	–	–	0.000	–	0.000	–	–	0.001
Privately-Owned Vehicles - Off-Base	–	–	0.000	–	–	0.004	–	0.003	–	–	0.007
Point and Area Sources	–	–	–	–	–	–	–	–	–	–	–
Total Proposed Emissions - 2019	**0.5107**	**0.009**	**0.489**	**0.023**	**0.029**	**1.115**	**0.019**	**0.003**	**0.108**	**0.729**	**0.320**

– = Source does not emit particular pollutant

Table D.4-22. Increase in Annual CO Emissions within the Springfield City CO Maintenance Area Due to the KC-46A MOB 3 Mission at Westover ARB

Source Type	Annual Emissions (Tons)						
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2
LTOs - KC-46A [a]	–	0.07	–	–	–	–	–
Closed Patterns - KC-46A [b]	–	0.34	–	–	–	–	–
POVs Off-Base [c]	–	1.64	–	–	–	–	–
Total MOB 3 Scenario	–	**2.04**	–	–	–	–	–
Springfield City Conformity Threshold	–	**100**	–	–	–	–	–

[a] Noise profiles show that ~6.3% of the LTOs would occur below 3,000 feet AGL and within the CO maintenance area

[b] Noise profiles show that ~2.1% of the closed patterns would occur below 3,000 feet AGL and within the CO maintenance area

[c] Assumes that 25% of the offbase commuting VMT would occur within the CO maintenance areas.

– = Source does not emit particular pollutant

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APPENDIX E

COMMON FLORA AND FAUNA KNOWN TO OCCUR AT EACH ALTERNATIVE INSTALLATION

APPENDIX E COMMON FLORA AND FAUNA KNOWN TO OCCUR AT EACH ALTERNATIVE BASE

Appendix E, Tables E-1 through E-4, lists common flora and fauna (common and scientific names) known to occur at each of the proposed KC-46A Third Main Operating Base (MOB 3) beddown alternative locations. Tables E-1 lists common flora and fauna known to occur at Grissom Air Reserve Base (ARB). Table E-2 lists common flora and fauna known to occur at Seymour Johnson Air Force Base (AFB). Table E-3 lists common flora and fauna known to occur at Tinker AFB. Tables E-4 lists common flora and fauna known to occur at Westover ARB.

Table E-1. Common Flora and Fauna Known to Occur at Grissom ARB[a]

Common Name	Scientific Name
Grasses	
colonial bent grass	*Agrostis tenuis*
brome	*Bromus macrostachys*
tall fescue	*Festuca arundinacea*
meadow fescue	*Festuca elatior*
Kentucky bluegrass	*Poa pratensis*
Shrubs	
eastern red cedar	*Juniperus virginiana*
spreading yew	*Taxus caspidata*
pyramidal yew	*Taxus caspidata capitata*
northern white-cedar	*Thuja occidentalis*
eastern hemlock	*Tsuga canadensis*
Trees	
sugar maple	*Acer saccharum*
American beech	*Fagus grandifolia*
white pine	*Pinus strobus*
American sycamore	*Platanus occidentalis*
eastern cottonwood	*Populus deltoides*
white oak	*Quercus alba*
Mammals	
coyote	*Canis latrans*
woodchuck	*Marmota monax*
white-tailed deer	*Odocoileus virginianus*
cotton mouse	*Peromyscus gossypinus*
white-footed mouse	*Peromyscus leucopus*
raccoon	*Procyon lotor*
gray squirrel	*Sciurus carolinensis*
eastern cottontail	*Sylvilagus floridanus*
eastern chipmunk	*Tamias striatus*
red fox	*Vulpes vulpes*
Birds	
red-winged black bird	*Agelaius phoeniceus*
mallard	*Anas platyrhynchos*
black duck	*Anas rubripes*
great blue heron	*Ardea herodias*
American bittern	*Botaurus lentiginosus*
Canada goose	*Branta canadensis*
red-tailed hawk	*Buteo jamaicensis*
red-shouldered hawk	*Buteo lineatus*
cardinal	*Cardinalis cardinalis*
turkey vulture	*Cathartes aura*
killdeer	*Charadrius vociferus*
American kestrel	*Falco sparverius*
American coot	*Fulica americana*
northern mockingbird	*Mimus polyglottos*
black-crowned night heron	*Nycticorax nycticorax*
house sparrows	*Passer domesticus*
yellow-rumped warbler	*Setophaga coronata*
common starling	*Sturnus vulgaris*
American robin	*Turdus migratorius*
mourning dove	*Zenaida macroura*
white-throated sparrow	*Zonotrichia albicollis*

Table E-1. Common Flora and Fauna Known to Occur at Grissom ARB[a] (Continued)

Common Name	Scientific Name
Amphibians and Reptiles	
northern leopard frog	*Lithobates pipiens*
box turtle	*Terrapene carolina*
common garter snake	*Thamnophis sirtalis*
Fish	
central stoneroller	*Campostoma anomalum*
speckled chub	*Extrarius aestivalis*
redfin shiner	*Lythrurus umbratilis*
bluntnose minnow	*Pimephales notatus*
blacknose dace	*Rhinichthys atratulus*

[a] Grissom ARB 2011.

Table E-2. Common Flora and Fauna Known to Occur at Seymour Johnson AFB[a]

Common Name	Scientific Name
Grasses	
onion grass	*Allium canadense*
yellow thistle	*Cirsium horridulum*
Bermuda grass	*Cynodon dactylon*
crab grass	*Digitaria sanguinalis*
goose grass	*Eleusine indica*
Shrubs	
switchcane	*Arundinaria gigantea* ssp. *tecta*
possumhaw	*Ilex decidua*
yaupon	*Ilex vomitoria*
Japanese honeysuckle	*Lonicera japonica*
wax myrtle	*Morella cerifera*
saw greenbrier	*Smilax bona-nox*
roundleaf greenbrier	*Smilax rotundifolia*
sweetleaf	*Symplocos tinctoria*
Munson's grape	*Vitis rotundifolia*
Trees	
red maple	*Acer rubrum*
flowering dogwood	*Cornus florida*
crapemyrtle	*Lagerstroemia indica*
sweetgum	*Liquidambar styraciflua*
longleaf pine	*Pinus palustris*
loblolly pine	*Pinus taeda*
ornamental pear	*Pyrus* sp.
southern red oak	*Quercus falcata*
water oak	*Quercus nigra*
willow oak	*Quercus phellos*
Mammals	
Virginia opossum	*Didelphis virginiana*
white-tailed deer	*Odocoileus virginianus*
raccoon	*Procyon lotor*
gray squirrel	*Sciurus carolinensis*
Birds	
grasshopper sparrows	*Ammodramus savannarum*
northern cardinal	*Cardinalis cardinalis*
gray catbird	*Dumetella carolinensis*
wood thrush	*Hylocichla mustelina*
woodpeckers	*Picidae family*
Carolina chickadee	*Poecile carolinensis*
white-eyed vireo	*Vireo griseus*
red-eyed vireo	*Vireo olivaceus*
Amphibians and Reptiles	
common snapping turtle	*Chelydra serpentina*
eastern painted turtle	*Chrysemys picta*
southern leopard frog	*Lithobates sphenocephala*
redbellied water snake	*Nerodia erythrogaster*
southern water snake	*Nerodia fasciata*
brown water snake	*Nerodia taxispilota*
northern red-bellied turtle	*Pseudemys rubriventris*

Table E-2. Common Flora and Fauna Known to Occur at Seymour Johnson AFB[a] (Continued)

Common Name	Scientific Name
Fish	
mud sunfish	*Acantharchus pomotis*
bluespotted sunfish	*Enneacanthus gloriosus*
banded sunfish	*Enneacanthus obesus*
redfin pickerel	*Esox americanus*
chain pickerel	*Esox niger*
channel catfish	*Ictalurus punctatus*
gar	*Lepisosteus osseus*
white perch	*Morone americana*
yellow perch	*Perca flavescens*

[a] Seymour Johnson AFB 2015.

Table E-3. Common Flora and Fauna Known to Occur at Tinker AFB[a]

Common Name	Scientific Name
Grasses	
buffalograss	*Buchloe dactyloides*
Bermuda grass	*Cynodon dactylon*
fescue	*Festuca* spp.
Shrubs	
Amur honeysuckle	*Lonicera maackii*
Morrow's honeysuckle	*Lonicera morrowii*
smooth sumac	*Rhus glabra*
saw greenbrier	*Smilax bona-nox*
roundleaf greenbrier	*Smilax rotundifolia*
Trees	
redbud	*Cercis canadensis*
persimmon	*Diospyros virginiana*
green ash	*Fraxinus pennsylvanica*
black walnut	*Juglans nigra*
eastern red cedar	*Juniperus virginiana*
osage orange	*Maclura pomifera*
cottonwood	*Populus* spp.
bur oak	*Quercus macrocarpa*
black willow	*Salix nigra*
American elm	*Ulmus americana*
slippery elm	*Ulmus rubra*
Mammals	
beaver	*Castor canadensis*
Virginia opossum	*Didelphis virginiana*
eastern woodrat	*Neotoma floridana*
white-tailed deer	*Odocoileus virginianus*
deer mouse	*Peromyscus maniculatus*
raccoon	*Procyon lotor*
fox squirrel	*Sciurus niger*
Hispid cotton rat	*Sigmodon hispidus*
eastern cottontail rabbit	*Sylvilagus floridanus*
Birds	
northern cardinal	*Cardinalis cardinalis*
barn swallow	*Hirundo rustica*
Franklin gull	*Leucophaeus pipixcan*
eastern meadowlark	*Sturnella magna*
European starling	*Sturnus vulgaris*
mourning dove	*Zenaida macroura*
Amphibians and Reptiles	
gray tree frog	*Hyla versicolor*
plain bellied water snake	*Nerodia erythrogaster*
three-toed box turtle	*Terrapene carolina*
red-eared slider	*Trachemys [Pseudemys] scripta*

Table E-3. Common Flora and Fauna Known to Occur at Tinker AFB[a] (Continued)

Common Name	Scientific Name
Fish	
red shiner	*Cyprinella lutrensis*
western mosquitofish	*Gambusia affinis*
channel catfish	*Ictalurus punctatus*
spotted gar	*Lepisosteus oculatus*
green sunfish	*Lepomis cyanellus*
bluegill sunfish	*Lepomis macrochirus*
bluegill x redear sunfish	*Lepomis macrochirus x microlophus*
longear sunfish	*Lepomis megalotis*
largemouth bass	*Micropterus salmoides*
golden shiner	*Notemigonus crysoleucas*
sand shiner	*Notropis stramineus*
bluntnose minnow	*Pimephales notatus*
fathead minnow	*Pimephales promelas*
rosy-red fathead minnow	*Pimephales promelas 'Golden Strain'*
bullhead minnow	*Pimephales vigilax*

[a] Tinker AFB 2015.

Table E-4. Common Flora and Fauna Known to Occur at Westover ARB[a]

Common Name	Scientific Name
Grasses	
colonial bent grass	*Agrostis tenuis*
chewing fescue	*Festuca altissima*
tall fescue	*Festuca arundinacea*
creeping red fescue	*Festuca rubra*
perennial ryegrass	*Lolium perenne*
timothy	*Phleum pratense*
Kentucky bluegrass	*Poa pratensis*
Shrubs	
eastern red cedar	*Juniperus virginiana*
spreading yew	*Taxus caspidata*
northern white-cedar	*Thuja occidentalis*
Trees	
red maple	*Acer rubrum*
Norway spruce	*Picea abies*
white pine	*Pinus strobus*
Scotch pine	*Pinus sylvestris*
white oak	*Quercus alba*
red oak	*Quercus rubra*
Mammals	
coyote	*Canis latrans*
beaver	*Castor canadensis*
porcupine	*Erethizon dorsatum*
southern flying squirrel	*Glaucomys volans*
river otter	*Lontra canadensis*
woodchuck	*Marmota monax*
striped skunk	*Mephitus mephitis*
white-tailed deer	*Odocoileus virginianus*
muskrat	*Ondatra zibethicus*
white-footed mouse	*Peromyscus leucopus*
raccoon	*Procyon lotor*
gray squirrel	*Sciurus carolinensis*
eastern cottontail	*Sylvilagus floridanus*
eastern chipmunk	*Tamias striatus*
red fox	*Vulpes vulpes*

Table E-4. Common Flora and Fauna Known to Occur at Westover ARB[a] (Continued)

Common Name	Scientific Name
Birds	
red-winged black bird	*Agelaius phoeniceus*
red-tailed hawk	*Buteo jamaicensis*
rough-legged hawk	*Buteo lagopus*
red-shouldered hawk	*Buteo lineatus*
broad-winged hawk	*Buteo platypterus*
turkey vulture	*Cathartes aura*
killdeer	*Charadrius vociferus*
American crow	*Corvus brachyrhynchos*
blue jay	*Cyanocitta cristata*
bobolink	*Dolichonyx oryzivorus*
American kestrel	*Falco sparverius*
eastern screech owl	*Otus asio*
black-capped chickadee	*Poecile atricapilla*
eastern phoebe	*Sayornis phoebe*
barred owl	*Strix varia*
brown thrasher	*Toxostoma rufum*
American robin	*Turdus migratorius*
eastern king bird	*Tyrannus tyrannus*
mourning dove	*Zenaida macroura*
Amphibians and Reptiles	
American toad	*Bufo americanus*
Fowler's toad	*Bufo fowleri*
common snapping turtle	*Chelydra serpentina serpentina*
eastern painted turtle	*Chrysemys picta picta*
northern black racer	*Coluber constrictor constrictor*
northern ringneck snake	*Diadophis punctatus edwardsii*
gray treefrog	*Hyla versicolor*
northern water snake	*Nerodia sipedon*
eastern newt	*Notophthalmus viridescens*
redback salamander	*Plethodon cinereus*
spring peeper	*Pseudacris crucifer*
bullfrog	*Rana catesbeiana*
green frog	*Rana clamitans*
wood frog	*Rana sylvatica*
common garter snake	*Thamnophis sirtalis*
Fish	
yellow bullhead	*Ameriurus natalis*
white sucker	*Catostomus commersoni*
chain pickerel	*Esox niger*
brown bullhead	*Ictalurus nebulosus*
pumpkinseed sunfish	*Lepomis gibbosus*
bluegill	*Lepomis macrochirus*
largemouth bass	*Micropterus salmoides*
golden shiner	*Notemigonus crysoleucus*
yellow perch	*Perca flavescens*
brook trout	*Salvelinus fontialis*

[a] Westover ARB 2016.

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APPENDIX F

BUILDINGS KNOWN TO CONTAIN ASBESTOS, LEAD-BASED PAINT, OR POLYCHLORINATED BIPHENYLS

APPENDIX F BUILDINGS KNOWN TO CONTAIN ASBESTOS, LEAD-BASED PAINT, OR POLYCHLORINATED BIPHENYLS

Appendix F, Tables F-1 through F-4, summarizes the buildings that would be affected by the proposed KC-46A Third Main Operating Base (MOB 3) beddown-related demolition and renovation; their years of construction; and their potential to contain toxic substances (asbestos-containing material [ACM], lead-based paint [LBP], and polychlorinated biphenyls [PCBs]). Tables F-1 summarizes the project-related toxic substance information for the MOB 3 mission at Grissom Air Reserve Base (ARB). Table F-2 summarizes this information for the MOB 3 mission at Seymour Johnson Air Force Base (AFB). Table F-3 summarizes this information for the MOB 3 mission at Tinker AFB. Tables F-4 summarizes this information for the MOB 3 mission at Westover ARB.

Table F-1. Toxic Substances Associated with Projects for the KC-46A MOB 3 Mission at Grissom ARB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Building 437 (Hangar 5)	1959	X	X	[c]
Building 438 (Hangar 3)	1959	X	[b]	[c]
Renovation				
Building 209, Logistics Readiness Squadron (Internal fencing and vault)	1956	X	X	[c]
Building 426, Wing Air Refueling Pod (WARP) storage and maintenance	1960	[a]	[b]	[c]
Building 434, (Hangar 6) FuT	1959	[a]	[b]	[c]
Building 436, (Hangar 2) AME	1959	[a]	[b]	[c]
Building 439, (Hangar 1) Maintenance/Various Shops	1959	[a]	[b]	[c]
Building 453, Composite Maintenance Shop	1988			[c]
Building 473, Renovate Lodging (convert rooms into first-term Airmen/Single Airman Quarters)	2004			[c]
Building 663, Squadron Operations	1988			[c]
Building 668, Flight Simulators (WST/BOT)	1959	[a]	[b]	[c]
Relocation of two portable sheds (PB-56 and unnamed)	Unknown	[a]	[b]	[c]

[a] Building assumed to potentially contain ACM based on construction year of 1980 or older (Grissom ARB 2010).
[b] Building assumed to potentially contain LBP. A facility inspection is conducted prior to any renovation or demolition work at pre-1980 facilities at Grissom ARB (Grissom ARB 2012).
[c] Base is PCB free (Walters 2015).
Key: X = Toxic substance known to occur in the building.

Table F-2. Toxic Substances Associated with Projects for the KC-46A MOB 3 Mission at Seymour Johnson AFB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Hangar 4909	1957	X	X	[b]
Building 4911	1986		[a]	
Renovation				
Building 4810, Logistics Readiness Squadron/Supply	1962	X	X	[b]
Building 4822, FuT	2009		[a]	
Building 4828, KC-46A Various Shops	1963	X	X	[b]
Building 4908, Maintenance	1957	X	X	[b]
Building 4916, Flight Simulators (WST/BOT), Squadron Operations	2009		[a]	

[a] Lead containing. Any detectable amount under OSHA.
[b] None of the electrical transformers have PCB-containing oil (Young 2011). However, there may be PCBs in caulking and sealants (Owen 2016). Caulk or sealant manufactured prior to 1980 may contain PCBs at levels above 50 ppm.
Key: X = Toxic substance known to occur in the building.

Table F-3. Toxic Substances Associated with Projects for the KC-46A MOB 3 Mission at Tinker AFB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Building 1030	1960	[a]	[b]	[c]
Building 1067	1983			[c]
Building 1068	1985			[c]
Building 1069	1987			[c]
Deicing Detention Basin	Unknown			[c]
Renovation				
Hangar 1053, Various KC-46A Shops and Storage	2012			[c]
Building 1056, Maintenance Leadership Facility	1999			[c]
Building 1082, FuT	1999			[c]

[a] Buildings constructed before 1980 are assumed to potentially have ACM (thermal system insulation and asphalt and vinyl flooring materials) (AFI 32-1052). High probability of containing ACM (Tinker AFB 2012)

[b] Building constructed before 1980 and is assumed to have LBP. (Tinker AFB 2010).

[c] Tinker AFB is reportedly PCB free (Kline 2015).

Key: X = Toxic substance known to occur in the building.

Table F-4. Toxic Substances Associated with Projects for the KC-46A MOB 3 Mission at Westover ARB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Building 2426	1960	X	[b]	[c]
Building 7071	1941	[a]	[b]	[c]
Building 7045, Gas station relocation	1996			
Building 7046, Gas station relocation	1996			
Renovation				
Building 7072, Maintenance Shops	1941	[a]	[b]	[c]
Building 7073 (Hangar 5), AGE	1941	[a]	[b]	[c]
Building 5103, Airmen Dormitory	1957	[a]	[b]	[c]
Building 5375 and 5377, Supply Facilities (secure storage vault and fencing)	1956, 2011	[a]	[b]	[c]

[a] Building assumed to potentially contain ACM based on construction year of 1980 or older (AFI-32-1052).

[b] Building assumed to potentially contain LBP based on construction year of 1980 or older (Westover ARB 2013).

[c] None of the electrical transformers have PCB-containing oil (Moriarty 2015), however sampling should be conducted based on the year of construction.

Key: X=Toxic substance known to occur in the building.

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PUBLIC DOCUMENTS

Air Force Instructions

AFI 32-1052 – Facility Asbestos Management

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