Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Bagram Airfield and vicinity, Afghanistan
Calendar Years: (2013 to 2014)

AUTHORITY: This periodic occupational and environmental monitoring summary (POEMS) has been developed in accordance with Department of Defense (DoD) Instructions 6490.03, 6055.05, and JCSM (MCM) 0028-07 (References 1-3).

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Bagram Airfield (BAF) and vicinity that includes Bagram (Camp Albert, Camp Cunningham, Camp Civilian, Camp Bulldog), Baghak, Bamyan, Charikar (Parwan RTC), Cherry-Beasly, Dandar, Dragon, Hassanbat, Hutnik, Jangali, Kho-e-Safi (Koh e Safi), Lacey, Montrond, Naghlu, Pul-A-Sayad, OCC Parwan, Pushtaysark (Red Hill) and Sabalu-Harrison. It presents a qualitative summary of health risks identified at this location and their potential medical implications for 1 January 2013 to 31 December 2014. The report is based on information collected during this timeframe to include deployment OEHS sampling and monitoring data (e.g., air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that environmental sampling at BAF and vicinity during this period was performed at representative exposure points selected to characterize health risks at the *population–level*. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to 1 January 2013 to 31 December 2014. The following sites were not included in the previous 2010-2013 BAF POEMS and data were incorporated from 2005-2014: Cherry-Beasly, Kho-e-Safi (Koh e Safi), Parwan, Bamyan, Hassanbat, Hutnik, Jangali and Naghlu.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to BAF and vicinity during the period of this assessment. However, it does not represent an individual exposure profile. Individual exposures depend on many variables such as; how long, how often, where and what someone is doing while working and/or spending time outside. Individual outdoor activities and associated routes of exposure are extremely variable and cannot be identified from or during environmental sampling. Individuals who sought medical treatment related to OEH exposures while deployed should have exposure/treatment noted in their medical record on a Standard Form (SF) 600 (Chronological Record of Medical Care).

SITE DESCRIPTION: The BAF is located in the Parwan Province of northern Afghanistan approximately 11 km southwest of the city of Charikar, 47 km north of Kabul and is situated approximately 1,500 m above sea level. The climate is semi-arid with precipitation (snow and rain) concentrated in the winter months. Strong winds (above 25 knots) can create intense dust storms, especially during the spring and summer. The airfield is approximately 38,000 acres in size and serves as a hub for air freight and the movement of military personnel for eastern Afghanistan, and receives and stages larger freight transported overland from the Port of Karachi. The BAF has three large hangers, a control tower, and numerous support buildings.

SUMMARY: Conditions that may pose a Moderate or greater health risk are summarized in Table 1. Table 2 provides population based risk estimates for identified OEH conditions at BAF and vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risk were factored into this assessment. In some cases, e.g. ambient air, specific controls are noted, but not routinely available/feasible.

Table 1: Summary of Occupational and Environmental Conditions with MODERATE or Greater Health Risk

Short-term health risks & medical implications:

The following hazards may be associated with potential acute health effects in some personnel during deployment at Bagram Airfield (BAF) and vicinity:

Food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E); other endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus (mite-borne), leptospirosis, Tuberculosis (TB), rabies, anthrax, Q fever); and heat stress. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid/paratyphoid fever, brucellosis, hepatitis E). Risks from food/waterborne diseases may have been reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources in accordance with standing CENTCOM policy. For other vector-borne endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus (mite-borne), these diseases may constitute a significant risk due to exposure to biting vectors; risk reduced to 'Low' by proper wear of the treated uniform, application of repellent to exposed skin, bed net use, and appropriate chemoprophylaxis, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (rabies, anthrax, Q fever), pose year-round risk. For heat stress, risk can be greater during months of June through August, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions. Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation.

Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust, the PM_{10} overall short-term risk was not evaluated due to insufficient data for BAF and vicinity. For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the $PM_{2.5}$ overall short-term risk was 'Low' for BAF and vicinity. However, the entire BAF and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic. Consequently, exposures to PM_{10} and $PM_{2.5}$ may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and $PM_{2.5}$, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects. For BAF and vicinity, the PM_{10} and the $PM_{2.5}$ overall short-term risks specifically for burn pits were not evaluated due to 'no samples from operating burn pits collected and provided for analysis' – see Section 10.7. For burn pits, exposures may vary, and exposure to high levels of PM_{10} and to $PM_{2.5}$ in the smoke may also result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups while at this site. Although most short-term health effects from exposure to particulate matter and burn pit smoke should have resolved post-deployment, providers should be prepared to consider the relationship between deployment exposures and current complaints. Some individuals may have sought treatment for acute respiratory irritation during their time at BAF and vicinity. Personnel who reported with symptoms or required treatment while at this site should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care).

Long-term health risks & medical implications:

The following hazards may be associated with potential chronic health effects in some personnel during deployment at Bagram Airfield (BAF) and vicinity:

For continuous noise exposure, the long-term risk was 'Low to Moderate'; risk may have been reduced by appropriate hearing protection used by personnel in higher risk areas (around sources of continuous noise such as flightline and power production).

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the overall long-term risk was 'Low to Moderate' for BAF and vicinity. Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust was not evaluated for long-term risk due to no available health guidelines. However, the entire BAF and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic, and conditions may have varied. For burn pits, the PM_{10} and the $PM_{2.5}$ overall long-term risks were not evaluated at the burn pit locations at BAF and vicinity due to 'no samples from operating burn pits collected and provided for analysis' and due to no available health guidelines for PM_{10} - see Section 10.7. However, burn pit exposures may vary, as conditions may have varied. For inhalational exposure to high levels of dust, PM_{10} and $PM_{2.5}$, such as during high winds or dust storms, and for exposure to burn pit smoke, it is considered possible that some otherwise healthy personnel who were exposed for a long-term period to dust and particulate matter while at BAF and vicinity could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter

exposures and exposures to burn pits are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits/barrels, incinerators, occupational or specific personal dosimeter data) when assessing individual concerns. Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).

Table 2. Population-Based Health Risk Estimates – Bagram Airfield and vicinity[1, 2]

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
AIR			
Particulate matter less than 10 micrometers in diameter (PM_{10})	Short-term: Not evaluated due to insufficient data. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Not evaluated due to insufficient data. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).
	Long-term: No health guidelines available and insufficient data to characterize risk.		Long-term: No health guidelines available and insufficient data to characterize risk.
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Low , a majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low, a majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: Low to Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions, particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).		Long-term: Low to Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions, particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).
Volatile Organic Compounds (VOC)	Short-term: No short term hazards identified based on the available data.		Short-term: No short term hazards identified based on the available data.
	Long-term: Low for Acrolein and Benzoic acid.		Long-term: Low for Acrolein and Benzoic acid.
Military Unique			
Ionizing Radiation	Short-term: None based on available data.		Short-term: None based on available data.
	Long-term: Low		Long-term: Low
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: Variable; High (bacterial diarrhea, hepatitis A, typhoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E) to Low (polio) if ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid fever, hepatitis E, brucellosis).	Preventive measures include Hepatitis A and typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none
	Long-term: None identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable; High for malaria, Moderate for leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne; and Low for, the plague and West Nile fever.	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, bed net use, minimizing areas of standing water and	Short-term: Low
	Long-term: Low for Leishmaniasis-		Long-term: No data available

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	visceral infection.	appropriate chemoprophylaxis.	
Water-Contact (e.g. wading, swimming)	Short-term: Moderate for leptospirosis	Recreational swimming in surface waters not likely in this area of Afghanistan during this time period.	Short-term: Low for leptospirosis.
	Long-term: No data available		Long-term: No data available
Respiratory	Short-term: Variable; Moderate for tuberculosis (TB) to Low for meningococcal meningitis.	Providing adequate living and work space; medical screening; vaccination.	Short-term: Low
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Variable; Moderate for rabies, anthrax, Q-fever to Low for H5N1 avian influenza.	Prohibiting contact with, adoption, or feeding of feral animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: No data available
	Long-term: Low (Rabies)		Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. widow spider) to potentially lethal effects (e.g., Haly's Pit Viper).	Risk reduced by avoiding contact, proper wear of uniform (especially footwear), and proper and timely treatment.	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. widow spider) to potentially lethal effects (e.g., Haly's Pit Viper).
	Long-term: No data available		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High for July-August, Moderate for June and Low for all other months.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Variable; Risk of heat injury in unacclimatized or susceptible personnel is High for July-August, Moderate for June and Low for all others.
	Long-term: Low, The long-term risk was Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.		Long-term: Low, The long-term risk is Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.
Cold	Short-term: Low risk of cold stress/injury.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper wear of issued protective clothing.	Short-term: Low risk of cold stress/injury.
	Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.		Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.
NOISE			

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Continuous (Flightline, Power Production)	Short-term: Low	Hearing protection used by personnel in higher risk areas	Short-term: Low
	Long-term: Low to Moderate		Long-term: Low to Moderate
Unique Incidents/ Concerns			
Pesticides/Pest Control	Short-term: Low	See Section 10.4	Short-term: Low
	Long-term: Low		Long-term: Low
Burn Pits	Short-term: No data available to evaluate. A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Control measures may have included locating burn pits downwind of prevailing winds, increased distance from living and working areas when possible, and improved waste segregation and management techniques	Short-term: No data available to evaluate. A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: No data available to evaluate.		Long-term: No data available to evaluate.

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at Bagram Airfield and vicinity that includes includes Bagram (Camp Albert, Camp Cunningham, Camp Civilian, Camp Bulldog), Charikar (Parwan RTC), Cherry-Beasly, Dandar, Dragon, Kho-e-Safi (Koh e Safi), Lacey, Montrond, Pul-A-Sayad, OCC Parwan, Pushtaysark (Red Hill), Sabalu-Harrison, Baghak, Bamyan, Hassanbat, Hutnik, Jangali and Naghlu.. It does not represent an individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may have been present in the environment, if a person did not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may have been no health risk. Alternatively, a person at a specific location may have experienced a unique exposure which could result in a significant individual exposure. Any such person seeking medical care should have their specific exposure documented in an SF600.

[2] This assessment is based on specific environmental sampling data and reports obtained from 1 January 2013 to 31 December 2014. Sampling locations are assumed to be representative of exposure points for the camp population but may not reflect all the fluctuations in environmental quality or capture unique exposure incidents.

[3]This Summary Table is organized by major categories of identified sources of health risk. It only lists those sub-categories specifically identified and addressed at Bagram Airfield and vicinity. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the Army Public Health Center (Provisional) [APHC (PROV)]. Where applicable, "None Identified" is used when though a potential exposure is identified, and no health risks of either a specific acute or chronic health effects are determined. More detailed descriptions of OEH exposures that are evaluated but determined to pose no health risk are discussed in the following sections of this report.

[4]Health risks in this Summary Table are based on quantitative surveillance thresholds (e.g. endemic disease rates; host/vector/pathogen surveillance) or screening levels, e.g., Military Exposure Guidelines (MEGs) for chemicals. Some previous assessment reports may provide slightly inconsistent health risk estimates because quantitative criteria such as MEGs may have changed since the samples were originally evaluated and/or because this assessment makes use of all historic site data while previous reports may have only been based on a select few samples.

1 Discussion of Health Risks at Bagram Airfield and Vicinity, Afghanistan by Source

The following sections provide additional information about the OEH conditions summarized above. All risk assessments were performed using the methodology described in the U.S. Army Public Health Command Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (Reference 4). All OEH risk estimates represent residual risk after accounting for preventive controls in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures. For environmental exposures related to airborne dust, there are limited preventive measures available, and available measures have little efficacy in reducing exposure to ambient conditions.

2 Air

2.1 Site-Specific Sources Identified

Vehicle emissions are considered a major contributor to air pollution in the nearby city of Charikar, which has a population of over 75,000 people. According to the Afghan National Environmental Protection Agency, most of these vehicles are over 10 years old, and generally use substandard fuels. Some of the more common industries (e.g., brick factories) burn tire rubber, plastic waste and other combustibles as cheap energy sources. Additionally, rationed power exacerbates the situation as it forces people to use more polluting fuel sources such as wood, coal and heating oil for cooking and heating.

Additional emissions from military operations included power generators, vehicular traffic, a medical waste incinerator, waste burning (burn pit and air curtain incinerators), and other local sources also contributed to the ambient environment at these locations.

Inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms, may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) are at greatest risk of developing notable health effects. The air pollution exposure risks assessed in this POEMS focuses on ambient exposures, and exposures near fuel sources (e.g., petroleum distribution points and storage) as indicated through sampling records.

Air sample data were not available for all the base camps in the vicinity of Bagram. Air sampling data were available for BAF, Camp Sabalu-Harrison (located on BAF), Naghlu and Bamyan. The geographic features along with the relatively consistent land-use practices (agriculture, industrial, residential, etc.) facilitate treating the vicinity as one air shed. Therefore, the air sampling results collected from BAF are considered similar to the expected air quality at the other base camps in the vicinity.

2.2 Particulate matter

Particulate matter (PM) is a complex mixture of extremely small particles suspended in the air. The PM includes solid particles and liquid droplets emitted directly into the air by sources such as: power plants, motor vehicles, aircraft, generators, construction activities, fires, and natural windblown dust. The PM can include sand, soil, metals, volatile organic compounds (VOC), allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. The PM composition and particle size vary considerably depending on the source. Generally, PM of health concern is divided into two fractions: PM_{10}, which includes coarse particles with a diameter of 10 micrometers or less, and fine particles less than 2.5 micrometers ($PM_{2.5}$), which can reach the deepest

regions of the lungs when inhaled. Exposure to excessive PM is linked to a variety of potential health effects.

2.3 Particulate matter, less than10 micrometers (PM_{10})

2.3.1 Exposure Guidelines:

Short Term (24-hour) PM_{10} (micrograms per cubic meter, $\mu g/m^3$):

- Negligible MEG = 250
- Marginal MEG = 420
- Critical MEG = 600

Long-term PM_{10} MEG ($\mu g/m^3$):

- Not defined and not available.

2.3.2 Sample data/Notes:

Bagram airfield and vicinity: A total of two valid PM_{10} air samples were collected from BAF on 22 October 2013 and 25 September 2014. One sample was collected from Bamyan on 24 July 2012. The range of 24-hour PM_{10} concentrations was 62 $\mu g/m^3$ – 205 $\mu g/m^3$ with an average concentration of 153 $\mu g/m^3$.

2.3.3 Short-term health risks:

None identified based on the available sampling data. No parameters exceeded 1-year Negligible MEGs, however very few samples were available.

2.3.4 Long-term health risk:

Not Evaluated-no available health guidelines. The U.S. Environmental Protection Agency (EPA) has retracted its long-term standard (national ambient air quality standards, NAAQS) for PM_{10} due to an inability to clearly link chronic health effects with chronic PM_{10} exposure levels.

2.4 Particulate Matter, less than 2.5 micrometers ($PM_{2.5}$)

2.4.1 Exposure Guidelines:

Short Term (24-hour) $PM_{2.5}$ ($\mu g/m^3$):

- Negligible MEG = 65
- Marginal MEG = 250
- Critical MEG = 500

Long-term (1year) $PM_{2.5}$ MEGs ($\mu g/m^3$):

- Negligible MEG = 15
- Marginal MEG = 65

2.4.2 Sample data/Notes:

Bagram airfield and vicinity: A total of 112 valid $PM_{2.5}$ air samples were collected at BAF and Sabalu-Harrison from 9 May 2013 to 30 December 2014. One sample was collected from Bamyan on 23 July 2012. The range of 24-hour $PM_{2.5}$ concentrations was 24 $\mu g/m^3$ – 230 $\mu g/m^3$ with an overall average concentration of 51 $\mu g/m^3$.

2.4.3 Short-term health risks:

Low: The short-term $PM_{2.5}$ health risk assessment is Low based on average sample concentrations in 2013 and peak $PM_{2.5}$ sample concentrations in 2013 and 2014, and the likelihood of exposure at these

hazard severity levels. Average sample concentrations in 2014 were below 24-hour MEGs. A Low health risk assessment is expected to have little to no impact on accomplishing the mission (Reference 4, Table 3-2). Confidence in the short-term $PM_{2.5}$ health risk assessment was medium (Reference 4, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ sample concentrations. The results indicate that a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Service Members with pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have experienced an exacerbation of their conditions (Reference 4, Table 3-11).

For the highest observed $PM_{2.5}$ exposure, the hazard severity was negligible. During peak exposures at the negligible hazard severity level, a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Service Members with pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have experienced an exacerbation of their conditions (Reference 4, Table 3-11).

2.4.4 Long-term health risks:

Low to Moderate: The long-term health risk assessment is Low in 2014 and Moderate in 2013 based on average $PM_{2.5}$ concentration, and the likelihood of exposure at this hazard severity level. A Moderate health risk level suggests that long-term exposure to $PM_{2.5}$ is expected to have some future medical surveillance activities and related resources such as documentation of environmental data in the designated DoD archive is anticipated. Consider documenting exposed groups or personnel of surveillance interest. (Reference 4, Table 3-3). Confidence in the long-term $PM_{2.5}$ health risk assessment is medium (Reference 4, Table 3-6).

The hazard severity was marginal (>65 $\mu g/m^3$) for average $PM_{2.5}$ sample concentrations in 2013 and negligible (15 $\mu g/m^3$ – 64 $\mu g/m^3$) for average $PM_{2.5}$ sample concentrations in 2014. The results suggest that with repeated exposures above the marginal severity threshold, it is plausible that development of chronic health conditions such as reduced lung function, or exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis or other cardiopulmonary diseases could occur in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk. This guideline is an uncertain screening value it is not a known health effects concentration (Reference 4, Table 3-12).

2.5 Airborne Metals

2.5.1 Sample data/Notes:

A total of two valid PM_{10} airborne metal samples were collected at Bagram airfield on 22 October 2013 and 25 September 2014 and one at Bamyan on 24 July 2012.

2.5.2 Short and Long-term health risks:

None identified based on the available sampling data. No parameters exceeded 1-year Negligible MEGs, however very few samples were available.

2.6 Volatile Organic Compounds (VOC)

2.6.1 Exposure Guidelines:

Acrolein:

Short Term (1-hour) $PM_{2.5}$ (µg/m^3):

- Negligible MEG = 70

Long-term (1year) $PM_{2.5}$ MEGs (µg/m^3):

- Negligible MEG = 0.14

Benzoic Acid:

Short Term (1-hour) $PM_{2.5}$ (µg/m^3):

- Negligible MEG = 12,500

Long-term (1year) $PM_{2.5}$ MEGs (µg/m^3):

- Negligible MEG = 1.37

2.6.2 Sample data/Notes:

The health risk assessment was based on average and peak concentrations of 40 valid ambient volatile organic compounds (VOC) air samples collected using the EPA sampling methods TO-9, 44 valid VOC air samples collected using the EPA sampling methods TO-14 and 37 valid ambient VOC air samples collected using the sampling method TO-17 from 20 March 2013 to 26 September 2013, and the likelihood of exposure. Acrolein and Benzoic acid were reported at concentrations above long-term MEGs.

Acrolein was detected in 10 out of 14 valid TO-14 samples at BAF with a yearly average concentration of 2 ug/m^3, which exceeded the negligible 1 year MEG of 0.14 ug/m^3. It was also detected at Camp Sabalu-Harrison with a yearly average concentration of 0.79 ug/m^3, which exceeded the negligible 1 year MEG of 0.14 ug/m^3.

Benzoic acid was detected in 26 out of 30 valid TO-9 samples at BAF with a yearly average concentration of 1.9 ug/m^3, which exceeded its negligible 1 year MEG of 1.37 ug/m^3.

2.6.3 Short-term health risks:

None identified based on the available sampling data. No parameters exceeded 1 hour Negligible MEGs.

2.6.4 long-term health risks:

Low: Acrolein had yearly average (2 ug/m^3 at BAF and 0.79 ug/m^3 at Camp Sabalu-Harrison) sample concentrations that exceeded the long term MEG (0.14 ug/m^3). The long-term health risk assessment for acrolein sample concentrations is Low, based on a negligible hazard severity and an occasional hazard probability rank. Confidence in the health risk assessment is medium (Reference 4, Table 3-6).

Benzoic acid had yearly average (1.9 ug/m^3) sample concentrations that exceeded the long term MEG (1.37 ug/m^3). The long-term health risk assessment for benzoic acid sample concentrations is Low, based on a negligible hazard severity and an occasional hazard probability rank. Confidence in the health risk assessment is low (Reference 4, Table 3-6).

3 Soil

3.1 Site-Specific Sources Identified

3.1.2 Sample data/Notes:

A total of 22 valid surface soil samples (one sample on Naghlu, one sample on Sabalu-Harrison, three on Charikar and 17 on Bamyan) were collected from 5 November 2006 to 25 August 2014 to assess OEH health risk to deployed personnel. The primary soil contamination exposure pathways are dermal contact and dust inhalation. Typical parameters analyzed for included semi volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e., total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). The percent of the population exposed to soil and associated dust in the sampled areas was > 75% for 17 samples. For the risk assessment, personnel are assumed to remain at this location for 6 months to 1 year.

3.1.3 Short-term health risk:

Not an identified source of health risk. Currently, sampling data for soil are not evaluated for short term (acute) health risks**.**

3.1.4 Long-term health risk:

None identified based on available sample data. No parameters exceeded 1-year Negligible MEGs.

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the APHC (Prov) identified the most probable exposure pathways. These are based on the administrative information provided on the field data sheets submitted with the samples taken over the time period being evaluated. Based on the information provided from the field, all untreated water samples were associated with source water for treatment and no exposure pathways were associated with those samples. Therefore, untreated samples are not assessed as potential health hazards. It is assumed that 100% of all U.S. personnel at BAF and vicinity will be directly exposed to reverse osmosis water purification unit (ROWPU) treated and disinfected fresh non-potable bulk water, since this classification of water is primarily used for personal hygiene, showering, cooking, and for use at vehicle wash racks. Field data sheets indicate that bottled water is the only approved source of drinking water.

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified

There were multiple bottled water brands used for drinking at BAF. The brands sampled included Cristal®, Aria ® and Kinley® of bottled water.

4.1.2 Sample data/Notes:

To assess the potential for adverse health effects to troops, the following assumptions were made about dose and duration: A conservative (protective) assumption was that personnel routinely ingested 5 liters per day (L/day) of bottled water for up to 365 days (1-year). It was further assumed that control

measures were not used. A total of eight valid bottled water samples were collected from 20 November 2013 to 18 June 2014.

4.1.3 Short-term health risk:

None identified based on available sample data. Antimony had a sample concentration (0.024 milligrams per L, mg/L) that exceeded the short-term MEG (0.014 mg/L) in one Cristal® bottle sample at Bagram Airfield. This bottle had extreme acidity (incident report 191806 in DOEHRS). Due to the limited nature of the incident, limited sample data and the water not being consumed, further evaluation was not conducted.

4.1.4 Long-term health risk:

None identified based on available sample data. All collected samples were below the long-term Negligible MEGs.

4.2 Non-Drinking Water: Disinfected

4.2.1 Site-Specific Sources Identified

Although the primary route of exposure for most microorganisms is ingestion of contaminated water, dermal exposure to some microorganisms, chemicals, and biologicals may also cause adverse health effects. Complete exposure pathways would include drinking, brushing teeth, personal hygiene, cooking, providing medical and dental care using a contaminated water supply or during dermal contact at vehicle or aircraft wash racks.

4.2.2 Sample data/Notes:

To assess the potential for adverse health effects to troops the following assumptions were made about dose and duration: All U.S. personnel at this location were expected to remain at this site for approximately 1 year. A conservative (protective) assumption is that personnel routinely consumed less than 5L/day of non-drinking water for up to 365 days (1-year). It is further assumed that control measures and/or personal protective equipment were not used. A total of 20 disinfected bulk water (Non-Drinking) samples (three from Sabalu-Harrison (2013-2014), 12 from Bamyan (2006-2011) and five from BAF (2013-2014)) were evaluated for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

4.2.3 Short-term health risks:

None identified based on available sample data. All collected samples were below the short-term Negligible MEGs.

4.2.4 long-term health risks:

None identified based on available sample data. 2-methyl-4-chlorophenoxyacetic acid had one sample concentration (0.046 mg/L) in 2009 and one in 2011 (0.051 mg/L) at Bamyan that exceeded the long-term MEG (0.0175 mg/L). Due to the samples being singular samples in a year, further evaluation was not conducted.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) or the Military Exposure Surveillance Library (MESL) from 1 January 2013 to 31 December 2014 (References 1 and 5).

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2013 to 31 December 2014 (References 1 and 5).

5.3 Ionizing Radiation

Medical and dental radiography are utilized at Craig Joint Theater Hospital (CJTH). Radiology personnel are enrolled in the thermoluminescent dosimetry (TLD) program. Permitted radioactive materials and generally licensed devices are used in chemical, biological, radiological, nuclear and high-yield explosives (CBRNE) detection equipment, moisture density gauges and targeting pods.

Backscatter x-ray systems and mobile vehicle and cargo systems (MVACIS) are used for screening personnel and/or vehicles at the installation Entry Control Points (ECPs). Two separate systems are in use, one for pedestrians and one for vehicles. The MVACIS use a Cobalt 60 source which emit a gamma beam to scan vehicles passing through ECPs. MVACIS are believed to be in use at the other ECPs on BAF to include the entry way into Sabalu-Harrison.

Rapiscan Secure 1000 is a walk-up system used for screening personnel (pedestrians) entering the base. All non-U.S. personnel entering the installation are screened using the Rapiscan.

5.3.1 Short -term health risks:

None identified based on the available data.

5.3.2 Long-term health risks:

Low: As currently configured, radiation exposure is insignificant for Z-Backscatter van operators as well as the Rapiscan operators at entry control points. Although no exposure limits were exceeded, the As Low As Reasonably Achievable (ALARA) principle applies. Long-term health risk is considered low. Confidence for risk assessments was low (Reference 4, Table 3-6).

5.4 Non-Ionizing Radiation

In 2012, a BAF Occupational and Environmental Health and Safety Assessment (OEHSA) listed typical communication antennas being on site and are assumed to still be on site. These communication antennas are radio frequency radiating (RFR) sources, which only emit RFR when transmitting. Ground-based radio frequency emitters have administrative processes in place to reduce the potential for exposures and ensure personnel are not within the uncontrolled environment hazard distance. No other specific hazard sources were documented in the DOEHRS or MESL from 1 January 2013 to 31 December 2014.

6 Endemic Diseases

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. CENTCOM Modification (MOD) 12 (Reference 6) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Food borne and Waterborne Diseases

Food borne and waterborne diseases in the area are transmitted through the consumption of local food and water. Local unapproved food and water sources (including ice) are heavily contaminated with pathogenic bacteria, parasites, and viruses to which most U.S. Service Members have little or no natural immunity. Effective host nation disease surveillance does not exist within the country. Only a small fraction of diseases are identified or reported in host nation personnel. Diarrheal diseases are expected to temporarily incapacitate a very high percentage of U.S. personnel within days if local food, water, or ice is consumed. Hepatitis A and typhoid fever infections typically cause prolonged illness in a smaller percentage of unvaccinated personnel. Vaccinations are required for DoD personnel and contractors. In addition, although not specifically assessed in this document, significant outbreaks of viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus*) may occur. Key disease risks are summarized below:

Mitigation strategies were in place and included consuming food and water from approved sources, vaccinations (when available), frequent hand washing and general sanitation practices.

6.1.1 Diarrheal diseases (bacteriological)

High, mitigated to Low: Diarrheal diseases are expected to temporarily incapacitate a very high percentage of personnel (potentially over 50% per month) within days if local food, water, or ice is consumed. Field conditions (including lack of hand washing and primitive sanitation) may facilitate person-to-person spread and epidemics. Typically mild disease treated in outpatient setting; recovery and return to duty in less than 72 hours with appropriate therapy. A small proportion of infections may require greater than 72 hours limited duty, or hospitalization.

6.1.2 Hepatitis A, typhoid/paratyphoid fever, and diarrhea-protozoal

High, mitigated to Low: Unmitigated health risk to U.S. personnel is high year round for hepatitis A and typhoid/paratyphoid fever, and Moderate for diarrhea-protozoal. Mitigation was in place to reduce the risks to low. Hepatitis A, typhoid/paratyphoid fever, and diarrhea-protozoal disease may cause prolonged illness in a small percentage of personnel (less than 1% per month). Although much rarer, other potential diseases in this area that are also considered a Moderate risk include: hepatitis E, diarrhea-cholera, and brucellosis.

6.1.3 Polio

Low: Potential health risk to U.S. personnel is Low. Despite a concerted global eradication campaign, poliovirus continues to affect children and adults in Afghanistan, Pakistan and some African countries. Polio is a highly infectious disease that invades the nervous system. The virus is transmitted by person-to-person, typically by hands, food or water contaminated with fecal matter or through direct contact with the infected person's saliva. An infected person may spread the virus to others immediately before and about 1 to 2 weeks after symptoms appear. The virus can live in an infected person’s feces for many weeks. About 90% of people infected have no symptoms, and about 1% have

a very severe illness leading to muscle weakness, difficulty breathing, paralysis, and sometimes death. People who do not have symptoms can still pass the virus to others and make them sick.

6.1.4 Short-term Health Risks:

Low: The overall unmitigated short-term risk associated with food borne and waterborne diseases are considered High (bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E) to Low (polio) if local food or water is consumed. Preventive Medicine measures reduced the risk to Low. Confidence in the health risk estimate is high.

6.1.5 Long-term Health Risks:

None identified based on available data.

6.2 Arthropod Vector-Borne Diseases

During the warmer months, the climate and ecological habitat support populations of arthropod vectors, including mosquitoes, ticks, mites, and sandflies. Significant disease transmission is sustained countrywide, including urban areas. Malaria, the major vector-borne health risk in Afghanistan, is capable of debilitating a high percentage of personnel for up to a week or more. Mitigation strategies were in place and included proper wear of treated uniforms, application of repellent to exposed skin, and use of bed nets and chemoprophylaxis (when applicable). Additional methods included the use of pesticides, reduction of pest/breeding habitats, and engineering controls.

6.2.1 Malaria

High, mitigated to Low: Potential unmitigated risk to U.S. personnel is High during warmer months (typically April through November) but reduced to low with mitigation measures. Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems and standing water, which provide breeding habitats for vectors. A small number of cases may occur among personnel exposed to mosquito (Anopheles spp.) bites. Malaria incidents may cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty. Severe cases may require intensive care or prolonged convalescence.

6.2.2 Leishmaniasis

Moderate, mitigated to Low: The disease risk is Moderate during the warmer months when sandflies are most prevalent, but reduced to low with mitigation measures. Leishmaniasis is transmitted by sand flies. There are two forms of the disease; cutaneous (acute form) and visceral (a more latent form of the disease). The leishmaniasis parasites may survive for years in infected individuals and this infection may go unrecognized by physicians in the U.S. when infections become symptomatic years later. Cutaneous infection is unlikely to be debilitating, though lesions may be disfiguring. Visceral leishmaniasis disease can cause severe febrile illness which typically requires hospitalization with convalescence over 7 days.

6.2.3 Crimean-Congo hemorrhagic fever

Moderate, mitigated to Low: Unmitigated risk is moderate, but reduced to low with mitigation measures. Crimean-Congo hemorrhagic fever occurs in rare cases (less than 0.1% per month attack rate in indigenous personnel) and is transmitted by tick bites or occupational contact with blood or secretions from infected animals. The disease typically requires intensive care with fatality rates from 5% to 50%.

6.2.4 Sandfly fever

Moderate, mitigated to Low: Sandfly fever has a Moderate risk with potential disease rates from 1% to 10% per month under worst case conditions. Mitigation measures reduced the risk to low. The disease is transmitted by sandflies and occurs more commonly in children though adults are still at risk. Sandfly fever disease typically resulted in debilitating febrile illness requiring 1 to 7 days of supportive care followed by return to duty.

6.2.5 Plague

Low: Potential health risk to U.S. personnel is Low year round. Bubonic plague typically occurred as sporadic cases among people who come in contact with wild rodents and their fleas during work, hunting, or camping activities. Outbreaks of human plague are rare and typically occur in crowded urban settings associated with large increases in infected commensal rats (Rattus rattus) and their flea populations. Some untreated cases of bubonic plague may develop into secondary pneumonic plague. Respiratory transmission of pneumonic plague is rare but has the potential to cause significant outbreaks. Close contact is usually required for transmission. In situations where respiratory transmission of plague is suspected, weaponized agent must be considered. Extremely rare cases (less than 0.01% per month attack rate) could occur. Incidence could result in potentially severe illness which may require more than 7 days of hospitalization and convalescence.

6.2.6 Typhus-miteborne (scrub typhus**)**

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate during warmer months (typically March through November) when vector activity is highest. Mitigation measures reduced the risk to low. Mite-borne typhus is a significant cause of febrile illness in local populations with rural exposures in areas where the disease is endemic. Large outbreaks have occurred when non-indigenous personnel such as military forces enter areas with established local transmission. The disease is transmitted by the larval stage of trombiculid mites (chiggers), which are typically found in areas of grassy or scrubby vegetation, often in areas which have undergone clearing and regrowth. Habitats may include sandy beaches, mountain deserts, cultivated rice fields, and rain forests. Although data are insufficient to assess potential disease rates, attack rates can be very high (over 50%) in groups of personnel exposed to heavily infected "mite islands" in focal areas. The disease can cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty.

6.2.7 West Nile fever

Low: West Nile fever is present. The disease is maintained by the bird population and transmitted to humans via mosquito vector. Typically, infections in young, healthy adults were asymptomatic although fever, headache, tiredness, body aches (occasionally with a skin rash on trunk of body), and swollen lymph glands can occur. This disease is associated with a low risk estimate.

6.2.8 Short -term health risks:

Low: The unmitigated health risk estimate is High for malaria (infection rate of less than 1% per month), Moderate for leishmaniasis-cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne; and Low for, the plague and West Nile fever. Health risk is reduced to low by proper wear of the uniform, application of repellent to exposed skin, and appropriate chemoprophylaxis. Confidence in health risk estimate was high.

6.2.9 Long-term health risks:

Low: The unmitigated risk is moderate for leishmaniasis-visceral (chronic). Risk is reduced to Low by proper wear of the uniform and application of repellent to exposed skin. Confidence in the risk estimate is high.

6.3 Water Contact Diseases

Operations or activities that involve extensive water contact may result in personnel being temporarily debilitated with leptospirosis in some locations. Leptospirosis health risk typically increases during flooding. In addition, although not specifically assessed in this document, bodies of surface water are likely to be contaminated with human and animal waste. Activities such as wading or swimming may result in exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may lead to the development of a variety of potentially debilitating skin conditions such as bacterial or fungal dermatitis. Mitigation strategies were in place and included avoiding water contact and recreational water activities, proper wear of uniform (especially footwear), and protective coverings for cuts/abraded skin.

6.3.1 Leptospirosis

Moderate, mitigated to Low: Human infections occur seasonally (typically April through November) through exposure to water or soil contaminated by infected animals and is associated with wading, and swimming in contaminated, untreated open water. The occurrence of flooding after heavy rainfall facilitates the spread of the organism because as water saturates the environment *Leptospira* present in the soil passes directly into surface waters. *Leptospira* can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Infection may also occur from ingestion of contaminated water. The acute, generalized illness associated with infection may mimic other tropical diseases (for example, dengue fever, malaria, and typhus), and common symptoms include fever, chills, myalgia, nausea, diarrhea, cough, and conjunctival suffusion. Manifestations of severe disease can include jaundice, renal failure, hemorrhage, pneumonitis, and hemodynamic collapse. Recreational activities involving extensive water contact may result in personnel being temporarily debilitated with leptospirosis. Incidence could result in debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty; some cases may require prolonged convalescence. This disease is associated with a Moderate health risk estimate.

6.3.2 Short-term health risks:

Low: Unmitigated Health risk of leptospirosis is Moderate during warmer months. Mitigation measures reduce the risk to Low. Confidence in the health risk estimate is high.

6.3.3 Long-term health risks:

None identified based on available data.

6.4 Respiratory Diseases

Although not specifically assessed in this document, deployed U.S. forces may be exposed to a wide variety of common respiratory infections in the local population. These include influenza, pertussis, viral upper respiratory infections, viral and bacterial pneumonia, and others. The U.S. military populations living in close-quarter conditions are at risk for substantial person-to-person spread of respiratory pathogens. Influenza is of particular concern because of its ability to debilitate large numbers of unvaccinated personnel for several days. Mitigation strategies were in place and included

routine medical screenings, vaccination, enforcing minimum space allocation in housing units, implementing head-to-toe sleeping in crowded housing units, implementation of proper personal protective equipment (PPE) when necessary for healthcare providers and detention facility personnel.

6.4.1 Tuberculosis (TB)

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate, mitigated to Low, year round. Transmission typically requires close and prolonged contact with an active case of pulmonary or laryngeal TB, although it also can occur with more incidental contact. Individuals with prolonged indoor exposure to the local population are at increased risk for latent TB infection. Additional mitigation included active case isolation in negative pressure rooms, where available.

6.4.2 Meningococcal meningitis

Low: Meningococcal meningitis poses a Low risk and is transmitted from person to person through droplets of respiratory or throat secretions. Close and prolonged contact facilitates the spread of this disease. Meningococcal meningitis is potentially a very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases.

6.4.3 Short-term health risks:

Low: Moderate (TB) to Low (for meningococcal meningitis). Overall risk was reduced to Low with mitigation measures. Confidence in the health risk estimate is high.

6.4.4 Long-term health risks:

None identified based on available data. Tuberculosis is evaluated as part of the post deployment health assessment (PDHA). A TB skin test is required post-deployment if potentially exposed and is based upon individual service policies.

6.5 Animal-Contact Diseases

6.5.1 Rabies

Moderate, mitigated to Low: Rabies posed a year-round moderate risk. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs are the primary reservoir of rabies in Afghanistan, and a frequent source of human exposure. Rabies is transmitted by exposure to the virus-laden saliva of an infected animal, typically through bites, but could occur from scratches contaminated with the saliva. A U.S. Army Soldier deployed to Afghanistan from May 2010 to May 2011 died of rabies in New York on 31 August 2011 (Reference 7). Laboratory results indicated the Soldier was infected from contact with a dog while deployed. Although the vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1B, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Anthrax

Low: Anthrax cases are rare in indigenous personnel, and pose a Low risk to U.S. personnel. Anthrax is a naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat may result in contracting

gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of spores and is extremely rare. Mitigation measures included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, vaccinations, and proper PPE for personnel working with animals.

6.5.3 Q-Fever

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate, but mitigated to Low, year round. Rare cases are possible among personnel exposed to aerosols from infected animals, with clusters of cases possible in some situations. Significant outbreaks (affecting 1-50%) can occur in personnel with heavy exposure to barnyards or other areas where animals are kept. Unpasteurized milk may also transmit infection. The primary route of exposure is respiratory, with an infectious dose as low as a single organism. Incidence could result in debilitating febrile illness, sometimes presenting as pneumonia, typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies in place as listed in paragraph 6.5.2 except for vaccinations.

6.5.4 H5N1 avian influenza

Low: Potential health risk to U.S. personnel is Low. Although H5N1 avian influenza (AI) is easily transmitted among birds, bird-to-human transmission is extremely inefficient. Human-to-human transmission appears to be exceedingly rare, even with relatively close contact. Extremely rare cases (less than 0.01% per month attack rate) could occur. Incidence could result in very severe illness with fatality rate higher than 50 percent in symptomatic cases. Mitigation strategies included avoidance of birds/poultry and proper cooking temperatures for poultry products.

6.5.5 Short-term health risks:

Low: The short-term unmitigated risk is Moderate for rabies, and Q-fever, to Low for anthrax, and H5N1 avian influenza. Mitigation measures reduced the overall risk to Low. Confidence in risk estimate is high.

6.5.6 Long-term health risks:

Low: A Low long term risk exists for rabies because, in rare cases, the incubation period for rabies can be several years.

7 Venomous Animal/Insect

All information was taken directly from the Armed Forces Pest Management Board (Reference 8) and the Clinical Toxicology Resources web site from the University of Adelaide, Australia (Reference 9). The species listed below have home ranges that overlap the location of BAF and vicinity, and may present a health risk if they are encountered by personnel. See Section 9 for more information about pesticides and pest control measures.

7.1 Spiders

- *Latrodectus dahlia* (widow spider): Severe envenoming possible, potentially lethal. However, venom effects are mostly minor and even significant envenoming is unlikely to be lethal.

7.2 Scorpions

- *Androctonus afghanus* ,*Androctonus amoreuxi,* and *Androctonus baluchicus*: Severe

envenoming possible, potentially lethal. Severe envenoming may produce direct or indirect cardio toxicity, with cardiac arrhythmias, cardiac failure. Hypovolemic hypotension possible in severe cases due to fluid loss through vomiting and sweating.

- *Afghanobuthus nuamanni*: Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

- *Compsobuthus rugosulus, Compsobuthus tofti*: Severe envenoming possible, potential lethality and systemic effects unknown.

- *Mesobuthus caucasicus, Mesobuthus eupeus, Mesobuthus macmahoni*: Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

- *Orthochirus afghanus, Orthochirus bicolor, Orthochirus. Jalalabadensis, Orthochirus pallidus, Orthochirus samrchelsis*, *Orthochirus scrobiculosus*: Severe envenoming possible, potential lethality and systemic effects unknown.

- *Hottentotta alticola*, and *Hottentotta saulcyi*: Moderate envenoming possible but unlikely to prove lethal. Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

7.3 Snakes

- *Boiga trigonata* (Common Cat Snake), and *Telescopus rhinopoma* (leopard viper): Unlikely to cause significant envenoming; bites by these rear fanged Colubrid snakes are rarely reported. They are likely to cause minimal to moderate local effects and no systemic effects.

- *Echis multisquamatus* (central Asian saw-scaled viper), *Echis sochureki* (Sochurek's saw-scaled viper), *Gloydius halys* (Haly's Pit Viper): Severe envenoming possible, potentially lethal. Bites may cause moderate to severe coagulopathy and haemorrhagins causing extensive bleeding.

- *Hemorrhis ravergieri* (mountain racer): Unlikely to cause significant envenoming. Bites require symptomatic treatment only.

- *Macrovipera lebetina turanica* (Levantine Viper): Severe envenoming possible, potentially lethal. Bites may cause mild to severe local effects, shock & coagulopathy.

- *Naja oxiana* (Oxus cobra): Severe envenoming possible, potentially lethal. Bites can cause systemic effects, principally flaccid paralysis.

7.4 Short-term health risk:

Low: If encountered, effects of venom vary with species from mild localized swelling (e.g. widow spider) to potentially lethal effects (e.g., Haly's Pit Viper). See effects of venom above. Mitigation strategies included avoiding contact, proper wear of uniform (especially footwear), and timely medical treatment. Confidence in the health risk estimate is low (Reference 4, Table 3-6).

7.5 Long-term health risk:

None identified.

8 Heat/Cold Stress

The BAF is located at 1,500 meters above sea level. Precipitation is concentrated in the winter (snow) and spring months. Summers are long and hot (temperatures range from 70 – 91 degrees Fahrenheit (°F) but have very low humidity. Fall (October and November) is warm and dry. Winters are cold but short, lasting from December to March (temperature range: 19 - 50 °F). Spring in Bagram starts in late March and is the wettest time of the year.

8.1 Heat

Summer (June - September) average monthly temperatures range from 74 °F to 84 °F with an average temperature of 80 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. The health risk of heat stress/injury based on monthly average temperatures alone is Low (< 78 °F) from September – May, Moderate (78-81.9°F) from June, high (82-87.9°F) from July to August. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 10). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk factors (e.g. acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures

8.1.1 Short-term health risk:

Low to High, mitigated to Low: Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) is High from July -September, Moderate in June, and Low from October - May. The risk of heat injury is reducible to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring WBGT. Confidence in the health risk estimate is low (Reference 4, Table 3-6).

8.1.2 Long-term health risk:

Low: The long-term risk is Low. However, the risk may be greater for certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions. Long-term health implications from heat injuries are rare but may occur, especially from more serious injuries such as heat stroke. It is possible that high heat in conjunction with various chemical exposures may increase long-term health risks, though specific scientific evidence is not conclusive. Confidence in these risk estimates is medium (Reference 4, Table 3-6).

8.2 Cold

8.2.1 Short-term health risks:

Winter (December - March) mean daily minimum temperatures range from 34 °F to 53 °F with an average temperature of 41 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. Because even on warm days a significant drop in temperature after sunset by as much as 40 °F can occur, there is a risk of cold stress/injury from December – March. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, is Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may encounter significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone (Reference 10).

Low: The health risk of cold injury is Low. Confidence in the health risk estimate is medium.

8.2.2 Long-term health risk:

Low: The health risk of cold injury is Low. Confidence in the health risk estimate is high.

9 Noise

9.1 Continuous

Aircraft operations have the potential to cause significant noise hazard to flight line support personnel. Especially during intermediate and full power runs of fixed wing aircraft (e.g., F-15 and F-16 engine tests). Because of the potential noise hazard inherent in flight line operations, personnel are required to wear dual hearing protection when working on the flight line and are enrolled in the Hearing Conservation Program. Personal noise dosimetry was performed on 3 November 2010 to measure ground technician exposure during engine run-ups. Most sustained engine run events were identified below 110 A weighted decibels (dBA), which do not present a significant hazard when double hearing protection is worn. For example, the effective noise reduction rate (NRR) of 22 dBA, when double hearing protection is worn, will reduce 110 dBA to 88 dBA which has a 4 hour exposure limit per day). Extreme noise events during engine runs (intermediate and full-power runs) produced sustained dBA of 123.6 (14 minute exposure) and 135.1 dBA (32 minute exposure) and may have exceeded the dosimeter upper measurement limit of 140 dBA. Existing control (double hearing protection) is inadequate to fully protect personnel against noise hazard during these extreme events (Reference 12).Personnel residing in close proximity to generators will routinely be exposed to noise levels as high as 82.0 dBA. Although this is below the 85 dB threshold requiring hearing protection, it still presents a concern for hearing conservation.

9.1.1 Short-term health risks:

Low: The short-term risk of noise injury with appropriate hearing protection use is low. Few exposed personnel (if any) are expected to have noticeable health effects during mission. Confidence in the risk assessment is low (Reference 4, Table 3-6).

9.1.2 Long-term health risk:

Low to moderate: The long-term risk of noise injury with appropriate hearing protection use is low with few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. If protective measures are not used, the risk is elevated to moderate and many exposed personnel are plausibly expected to develop delayed onset, irreversible effects. Confidence in risk assessment is low (Reference 4, Table 3-6).

9.2 Impulse

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2013 to 31 December 2014.

9.2.1 Short-term and Long-term health risks:

Not evaluated.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

DoD personnel are exposed to various chemical, physical, ergonomic, and biological hazards in the course of performing their mission. These types of hazards depend on the mission of the unit and the operations and tasks which the personnel are required to perform to complete their mission. The health risk associated with these hazards depends on a number of elements including what materials are used, how long the exposure last, what is done to the material, the environment where the task or operation is performed, and what controls are used. The hazards can include exposures to heavy metal particulates (e.g. lead, cadmium, manganese, chromium, and iron oxide), solvents, fuels, oils, and gases (e.g. carbon monoxide, carbon dioxide, oxides of nitrogen, and oxides of sulfur). Most of these exposures occur when performing maintenance task such as painting, grinding, welding, engine repair, or movement through contaminated areas. Exposures to these occupational hazards can occur through inhalation (air), skin contact, or ingestion; however exposures through air are generally associated with the highest health risk.

10.2 Waste Sites/Waste Disposal

Hazardous materials such as used oil, diesel fuel, JP-8, antifreeze, and filter oil are stored in 55-gallon drums at the Hazmat Yard. The storage containers for the Hazmat Yard have secondary containment. The water that is collected in the POL storage secondary containment is disposed as hazardous waste unless the fuels and liquids can be separated from the water. BAF has a “regulated” waste disposal facility which mostly relies on chemical neutralization to treat hazardous types of chemical wastes [Note: Several kinds of hazardous waste streams comprise regulated waste]. This facility became fully operational around October 2013.

On 1 September 2012 the burn pit was closed and a new burn pit was opened adjacent to Camp Sabalu-Harrison. The burn pit was operated by a local Afghan contractor. There were also two 16-ton incinerators, totaling 32- tons/per day operated by contractors at the new burn pit site. Construction began on a MILCON project for an additional 200-ton capacity. In 2012, BAF reportedly disposed of 60-70% of their solid waste by open burning, 25-30% by incineration, and 15-20% through recycling. Regulated medical waste was disposed of by two medical waste incinerators located on the installation. Open burning at Sabalu-Harrison ceased in July 2013 and waste was either incinerated in one of the onsite incinerators or trucked off site.

10.3 Fuel/petroleum products/industrial chemical spills

There are multiple fuel points on BAF; however, a comprehensive list of their locations, storage volumes, and fuel types was not available. In 2011, the North Fuel Point (NFP) stored diesel fuel in two types of storage containers. The NFP had two bunker tanks storing 4.2 million liters and 18 bladders storing 800,000 liters of diesel fuel. In 2012, a site visit by PM personnel was only documented for the retail fuel point. The retail fuel point had secondary containment, spill kits, eye wash and shower stations and was stocked with PPE. The retail fuel point was comprised of three-20,000 gallon bladders with one bladder each for storing JP-8, gasoline or mogas, and diesel fuel. According to a report received by the PM detachment in 2012, total JP-8 fuel storage, mogas/gasoline, and diesel storage exceeded 15 million gallons, 303,000 gallons, and 474,000 gallons; respectively. There areunderground fuel piping systems with concrete containment around them on BAF. In the past, leaks have been reported, but in depth information is not known about these situations according to a 2014 OEHSA. The BAF does have a soil reclamation point where soil exposed to petroleum products is placed.

10.4 Pesticides/Pest Control:

The health risk of exposure to pesticide residues is considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed, such as enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use (RTU) methods such as aerosol cans and baits. The control of rodents required the majority of pest management inputs, with the acutely toxic rodenticides staged as solid formulation lethal baits placed in tamper-resistant bait stations indoors and outdoors throughout cantonment areas. Nuisance insects, including biting and stinging insects such as bees, wasps, and ants, also required significant pest management inputs. Use of pesticides targeting against these pests generally involved selection of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. No specific hazard sources were documented in DOEHRS or MESL data portal. A total of 25 monthly pesticide application reports in the MESL data portal for BAF and vicinity (2013-2014) list the usage of pesticides on the site. For each pesticide product applied during this period, the EPA approved label has been archived, providing a framework how each pesticide handled and applied (see below).

10.4.1 Rodenticides

Bromadiolone, Brodifacoum and Diphacinone were used to control rodents.

10.4.2 Insecticides

Insecticides used to control ants, bees, crickets, fleas, flies, lice, mosquitoes, spiders, termites, and wasps incude: Pyrethrins, Piperonyl Butoxide, Imidacloprid, Z- 9- Tricosene, *Bacillus thuringiensis* subspecies *israelensis*, Cypermethrin, ß-Cyfluthrin, Methomyl, d-trans Allethrin, Phenothrin, DEET, Isopropanol, Hydramethylnon, Bifenthrin, Fipronil, Deltamethrin, (S)-Hydroprene, Chlorfenapyr, (S)-Methoprene, ß-Cyfluthrin and Imidacloprid.

10.4.2 Herbicides

Prometon was used to control weeds.

10.4.3 Short-term and Long-term health risks

Low: Long term health risk is Low. Confidence in the health risk assessment is medium (Reference 4, Table 3-6).

10.5 Asbestos

There were 118 samples taken during an industrial hygiene field services building assessment at BAF conducted during 24 July-12 August 2011 (References 13-17). Seven samples at five different buildings came back positive for asbestos containing materials (ACMs). The ACM samples were found at Building 14895-Warehouse Psy Ops, Building 15804-Motel 6, Building 15805-Motel 8, Building 24002-JAC and Building 25059. The majority of the ACM samples were found in attics, either as attic residue or as thermal system insulation on the attic piping, other ACM samples were found in boiler room insulation and a couple fire doors. The ACMS were found in locations not likely to be entered or disturbed by military personnel. Recommendations were made in the building assessment report to remove all ACM before beginning any renovation or demolition projects and to post warning notices at the entrances to rooms with ACMs and require individuals entering these areas to wear proper personal protective equipment. As of 25 April 2014, two of the four buildings have asbestos hazard warning signs posted.

10.6 Lead Based Paint

A total of 406 paint chip samples were taken as part of an industrial hygiene field services building assessment for BAF conducted 24 July-12 August 2012 to test for lead based paint (LBP). Fourteen samples from 11 different buildings contained concentration levels of lead above the regulatory level and were classified as LBP. The LBP was found in Building 23176, Building 23075, Building 23166, Building 25112, Building 13955, Building 13974, Building 13982, Building 14843A–PX, Building 14895, Building 15906, and Building 23194. Recommendations were made to remove and manage the LBP according to the U.S. Housing and Urban Development Guidelines and ensure that proper protection is worn during any demolition/renovation activities. No further documentation of this LBP remediation was available in the MESL.

10.7 Burn Pit

No samples from operating burn pits were collected and provided for analysis. While not specific to BAF and vicinity, the consolidated epidemiological and environmental sampling and studies on burn pits that have been conducted as of the date of this publication have been unable to determine whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Reference 11). The Institute of Medicine committee's (Reference 11) review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g., those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit. Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes. Individually, the chemicals measured at burn pit sites in the study were generally below concentrations of health concern for general populations in the United States. However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn pit emissions and emissions from other sources.

10.8 Mold

Mold was an issue in improperly constructed B-Huts on BAF starting in 2013. There is a DOEHRS Incident Report filed for this event (Report ID: 200676). All residents were relocated by 1 February 2014 and remediation begun.

11 References[1]

1. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/. Department of Defense (DoD) Instruction 6490.03, *Deployment Health*, 2006.

2. DoDI 6055.05, Occupational and Environmental Health, 2008.

3. Joint Staff Memorandum (MCM) 0017-12, Procedures for Deployment Health Surveillance, 2012.

4. USA PHC TG230, June 2013 Revision.

5. DoD MESL Data Portal: https://mesl.apgea.army.mil/mesl/.Some of the data and reports used may be classified or otherwise have some restricted distribution.

6. Modification 12 to United States Central Command Individual Protection and Individual Unit Deployment Policy, 02 December 2013.

7. CDC. 2012. Morbidity and Mortality Weekly Report. Imported Human Rabies in a U.S. Army Soldier. May 4, 2012. 61(17); 302-305.

8. Armed Forces Pest Management Board: http://www.afpmb.org/content/venomous-animals-country#Afghanistan. U.S. Army Garrison - Forest Glen, Silver Spring, MD.

9. Clinical Toxinology Resources: http://www.toxinology.com/. University of Adelaide, Australia.

10. Goldman RF. 2001. Introduction to heat-related problems in military operations. *In*: Textbook of military medicine: medical aspects of harsh environments Vol. 1, Pandolf KB, and Burr RE (Eds.), Office of the Surgeon General, Department of the Army, Washington DC.

11. IOM (Institute of Medicine). 2011. Long-term health consequences of exposure to burn pits in Iraq and Afghanistan. Washington, DC: The National Academies Press.

12. Air Force Occupational Safety and Health Standards 48-20. Aerospace Medicine. Occupational Noise and Hearing Conservation Program. 30 June 2006.

13. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 14895 Assessment, Bagram, Afghanistan. 3-4 August 2011.

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[1] NOTE. The data are currently assessed using the 2013 TG230. The general method involves an initial review of the data which eliminates all chemical substances not detected above 1-yr negligible MEGs. Those substances screened out are not considered acute or chronic health hazards so are not assessed further. For remaining substances, acute and chronic health effects are evaluated separately for air water (soil is only evaluated for long term risk). This is performed by deriving separate short-term and long term population exposure level and estimates (referred to as population exposure point concentrations (PEPC)) that are compared to MEGs derived for similar exposure durations. If less than or equal to negligible MEG the risk is Low. If levels are higher than negligible then there is a chemical-specific toxicity and exposure evaluation by appropriate SMEs, which includes comparison to any available marginal, critical or catastrophic MEGs. For drinking water 15 L/day MEGs are used for the screening while site specific 5-15 L/day are used for more detailed assessment. For nondrinking water (such as that used for personal hygiene or cooking) the 'consumption rate' is limited to 2 L/day (similar to the EPA) which is derived by multiplying the 5 L/day MEG by a factor of 2.5. This value is used to conservatively assess non drinking uses of water.

14. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 15804 Assessment, Bagram, Afghanistan. 2 August 2011.

15. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 15805 Assessment, Bagram, Afghanistan. 3 August 2011.

16. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 24002 Assessment, Bagram, Afghanistan. 6 August 2011.

17. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 25059 Assessment, Bagram, Afghanistan. 7 August 2011.

12 Where Do I Get More Information?

If a provider feels that the Service member's or Veteran's current medical condition may be attributed to specific OEH exposures at this deployment location, he/she can contact the Service-specific organization below. Organizations external to DoD should contact DoD Deputy Assistant Secretary of Defense (DASD) for Health Readiness Policy and Oversight
Army Public Health Center (Provisional ; APHC (Prov)) Phone: (800) 222-9698. http://phc.amedd.army.mil/Pages/default.aspx
Navy and Marine Corps Public Health Center (NMCPHC) (formerly NEHC) Phone: (757) 953-0700. www.nmcphc.med.navy.mil
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD Deputy Assistant Secretary of Defense (DASD) for Health Readiness Policy and Oversight Phone: (800) 497-6261. http://www.health.mil/Military-Health-Topics/Health-Readiness