Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Bagram Airfield and vicinity, Afghanistan
Calendar Years: 2016-2018

AUTHORITY: This POEMS has been developed in accordance with Department of Defense Instructions (DoDI) 6490.03, 6055.05 and Joint Chiefs of Staff memorandum (MCM) 0017-12 (References 2-4).

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 and Sabalu-Harrison, Baghak, Charikar (Parwan RTC), Cherry-Beasly, Dandar, Dragon, Hassanbat, Hutnik, Jangali, Kho-e-Safi (Koh e Safi), Montrond, Naghlu, Pul-A-Sayad, Parwan, and Pushtaysark (Red Hill). It presents a qualitative summary of health risks identified at these locations and their potential medical implications. The report is based on information collected from 01 January 2016 through 31 December 2018 to include deployment OEH surveillance 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 01 January 2016 through 31 December 2018.

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 records 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 BAF and vicinity:

For heat stress, risk can be greater during months of April through November (high June through September), and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions, and those under operational constraints (equipment, PPE, vehicles). 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 fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the $PM_{2.5}$ overall short-term health risk was 'Low.' However, the BAF and vicinity area is a dusty semi-arid desert region and may have experienced dust-prone environmental conditions, also subject to vehicle traffic. Consequently, exposures to $PM_{2.5}$ and PM_{10} 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 $PM_{2.5}$ and PM_{10}, 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. Although most short-term health effects from exposure to particulate matter 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 while at BAF and vicinity. Personnel who reported with symptoms or required treatment while at 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 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 flight line and landing zones, generators 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 health risk was 'Low.' However, the BAF and vicinity area is a semi-arid desert region and may have experienced dust-prone environmental conditions, also subject to vehicle traffic, and conditions may have varied. For inhalational exposure to high levels of dust containing $PM_{2.5}$ and PM_{10} such as during high winds or dust storms, it is considered possible that some otherwise healthy personnel, who were exposed for a long-term period to dust and particulate matter, 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 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 - BAF 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 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Low. Daily levels however may vary; acute health effects (e.g., upper respiratory tract irritation) may be more pronounced during days with elevated PM levels. 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 taking actions such as closing tent flaps, windows, and doors.	Short-term: Low. Daily levels however may vary; acute health effects (e.g., upper respiratory tract irritation) may be more pronounced during days with elevated PM levels. 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. 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. 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).
Metals	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: Not an identified source of health risk.		Long-term: Not an identified source of health risk.
Volatile Organic Compounds (VOC)	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: Insufficient data to assess long-term health risk.		Long-term: Insufficient data to assess long-term health risk.
SOIL			
Metals, Organic Compounds, Inorganic Compounds	No data available		No data available
WATER			
Consumed Water (Water Used for Drinking)	Short-term: Not an identified source of health risk.	U.S. Army Public Health Center (USAPHC) [former U.S. Army Veterinary Command (VETCOM)] approved bottled water and potable water only from approved water sources	Short-term: Not an identified source of health risk.
	Long-term: Not an identified source of health risk.		Long-term: Not an identified source of health risk.
Water for Other Purposes	Short-term: Not an identified source of health risk.	Water treated in accordance with standards applicable to its intended use	Short-term: Not an identified source of health risk.
	Long-term: Not an identified source of health risk.		Long-term: Not an identified source of health risk.
VENOMOUS ANIMALS			
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

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High from June - September, Moderate from April – May and October – November, and Low from December – March.	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 Moderate for June-September and Low to Moderate 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			
Continuous (Flight Line, Power Production)	Short-term: Low	Risk may have been reduced by appropriate hearing protection used by personnel in higher risk areas (around major sources of continuous noise such as flight line and landing zone, and power production (e.g., generators)).	Short-term: Low
	Long-term: Low to Moderate		Long-term: Low to Moderate

1 This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational and environment health conditions at BAF and vicinity. 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 01 January 2016 through 31 December 2018. 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 BAF 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 APHC. 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 (USAPHC) Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (Reference 5). 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.

The ProUCL version 5.0 software package was used for statistical analyses (Reference 6). Means are followed by standard deviation (SD). Risk characterization was based on the 95 percent upper confidence level of the arithmetic mean (95% UCL) or the arithmetic mean depending on the quality and quantity of the data being evaluated. The sample mean is an uncertain estimate of the true mean of the population exposure point concentration (PEPC). The 95% UCL reduces the uncertainty inherent in the sample mean and states with a higher level of confidence that the mean PEPC is no greater than the 95% UCL.

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 (solid waste incinerators 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/cardiopulmonary conditions) are at greatest risk of developing notable health effects. The air pollution exposure risks assessed in this POEMS focuses on ambient exposures as indicated through sampling records.

Air sample data were only available for BAF; no other base camps in the vicinity of Bagram were sampled. 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, 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. Since $PM_{2.5}$ is the best biological indicator of health, PM_{10} was not evaluated.

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

2.3.1 Exposure Guidelines:

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

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

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

- Negligible MEG = 15
- Marginal MEG = 65

2.3.2 Sample data/Notes:

A total of 40 valid $PM_{2.5}$ air samples were collected on 39 unique sampling days from 01 July 2016 – 28 December 2018. The range of 24-hour $PM_{2.5}$ concentrations was 5 $\mu g/m^3$ – 181 $\mu g/m^3$ with an average concentration of 45 $\mu g/m^3$. The Standard Deviation was 35 $\mu g/m^3$ and the 95% Upper Confidence Limit of the mean was 56 $\mu g/m^3$.

2.3.3 Short-term health risks:

Low: The short-term $PM_{2.5}$ health risk assessment is Low based on the 95% UCL of the mean and peak $PM_{2.5}$ sample concentrations, and the likelihood of exposure at these hazard severity levels. A Low health risk is expected little or no impact on accomplishing the mission (Reference 5, Table 3-2). Confidence in the short-term $PM_{2.5}$ health risk assessment was low (Reference 5, Table 3-6).

The 95% UCL was less than the lower bound of Negligible (>65 $\mu g/m^3$) hazard severity, though the peak $PM_{2.5}$ sample concentration did exceed the Negligible hazard severity. For exposures at the Negligible hazard severity level, a few personnel may experience notable eye, nose, and throat irritation; most personnel will experience only mild effects. (Reference 5, Table 3-10).

2.3.4 Long-term health risks:

Low: The long-term health risk assessment is Low based on the 95% UCL of the mean $PM_{2.5}$ concentration, and the likelihood of exposure at this hazard severity level. A Low health risk level suggests that long-term exposure to $PM_{2.5}$ is expected to have no specific medical actions required. Documentation of environmental data in the designated DoD archive is anticipated (Reference 5, Table 3-3). Confidence in the long-term $PM_{2.5}$ health risk assessment is low (Reference 5, Table 3-6) because 34 of the 39 sampling days were between July and December of each year.

The hazard severity was negligible (15 – 64 µg/m^3) for the 95% UCL of the average $PM_{2.5}$ sample concentrations. With repeated exposures above the negligible severity threshold, a small percentage of personnel may have increased risk for developing chronic conditions, such as reduced lung function or exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, or other cardiopulmonary diseases. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk. Exposures below this are not expected to result in development of chronic health conditions in generally healthy troops (Reference 5, Table 3-12).

2.4 Airborne Metals

2.4.1 Sample data/Notes:

A total of 40 valid $PM_{2.5}$ airborne metal samples were collected from 01 July 2016 – 28 December 2018. No metals were detected above their respective short- or long-term MEGs.

2.4.2 Short-term and long-term health risks:

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

2.5 Volatile Organic Compounds

2.5.1 Exposure Guidelines

Short-Term Acrolein MEGs (µg/m^3):
- 8-hour Negligible MEG=70.0
- 14-day Negligible MEG=46.0

Long-Term Acrolein MEG (µg/m^3):
- 1-year Negligible MEG=0.14

Short-Term Chloroform MEGs (µg/m^3):
- 8-hour Negligible MEG=48,800
- 14-day Negligible MEG=4,880

Long-Term Chloroform MEG (µg/m^3):
- 1-year Negligible MEG=167

Short-Term 1,2,4-Trichlorobenzene (TCB) MEGs (µg/m^3):
- 1-hour Negligible MEG=5,000
- 8-hour Negligible MEG=none

Long-Term 1,2,4-TCB MEG (µg/m^3):
- 1-year Negligible MEG=13.7

2.5.2 Sample data/Notes:

Craig Joint Theater Hospital (CJTH): Three samples were collected in the vicinity of CJTH on 29 April and 02 August 2016, and 03 May 2018. Acrolein was detected in 2 samples at concentrations of 0.8 and 1.2 µg/m^3, respectively, both of which exceeded the 1-year Negligible MEG (0.14 µg/m^3) but were more than an order of magnitude below the 14-day Negligible MEG (46.0 µg/m^3). Health effects from long-term exposures to acrolein are currently not known (Reference 13). One sample contained 1,2,4-trichlorobenzene at a concentration of 15 µg/m^3, slightly above its 1-year Negligible MEG (13.7 µg/m^3).

Camp Andy Lab: Three indoor samples were collected on separate days in 2016 (19 April, 02 August, and 09 August) inside a forensics laboratory due to lingering odors reported after a suspected spill of phenol chloroform was cleaned up. Two of three detections of chloroform (1,000 and 290 µg/m^3) were above the 1-year Negligible MEG (167 µg/m^3) but well below the 14-day Negligible MEG (4,880 µg/m^3). The lab was reported to be occupied less than 4 hours per day.

Solid Waste Management Yard: One ambient air sample was collected on 11 September 2017, a day when medical supplies were noted as being incinerated in a regulated medical waste incinerator. No detected concentrations were above their respective short- or long-term MEGs.

2.5.3 Short-term health risks:

None identified based on available sampling data

2.5.4 Long-term health risk

Insufficient data available to assess chronic risk

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

No soil samples were collected at any of the locations in 2016-2018.

3.3 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.

3.4 Long-term health risk:

No data available to assess chronic risk

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the APHC 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. Field data sheets indicate that bottled water is the only approved source of drinking water. It is assumed that 100% of all U.S. personnel at BAF and vicinity were directly exposed to reverse osmosis water purification unit (ROWPU) treated, nanofiltration treated, and disinfected fresh bulk water since this classification of water is primarily used for personal hygiene, showering, cooking, and for use at vehicle wash racks. There is a possibility that personnel, particularly at small outlying camps, may use water that is not regularly disinfected for showering, personal hygiene, or cleaning. Based on the information provided from the field, all untreated water samples were associated with source water for treatment or vehicle wash water and no exposure pathways were associated with those samples. Therefore, untreated samples are not assessed as potential health hazards.

4.1 Drinking Water: Bottled

4.1.1 Site-Specific Sources Identified

Drinking water is procured from local water bottling plants, each of which are U.S. Army Public Health Center approved sources (reference 7). Aria®, Cristal®, and Kinley® are the primary brands of bottled water at BAF and vicinity. Note that BAF serves as a central distribution hub for bottled water to U.S.

locations in eastern Afghanistan. Bottled water sampling and analysis from the BAF supply is intended to serve as routine surveillance of these brands regardless of final usage location.

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 proper storage (e.g., under cover, not exposed to direct sunlight, not adjacent to potential contaminants such as fuel) were the only control measures used. Five valid bottled drinking water samples were collected in 2016-2018 from locations on BAF.

One shipment of Cristal® brand bottled water (production date: 9/21/16) was received at BAF and noted to have a yellowish tint. The supply was held and not distributed. Analytical results showed excessive iron content and upon inspection, the water production facility was found to have failing iron pipes. The entire shipment of water was destroyed so there was no exposure to the water. The piping was replaced with food-grade plastic piping and the plant returned to compliance with all bottled water quality, processing, and packaging requirements.

Field test results for turbidity, total dissolved solids, pH, total coliforms, and *Escherichia coli* were recorded in DOEHRS for approximately 300 samples of treated, disinfected fresh, or bottled water supplies from 2016 – 2018. All results met potability standards.

4.1.3 Short-term and long-term health risk:

None identified based on available sample data. All parameters were below their respective 1-year 5 L/day Negligible MEGs.

4.2 Non-Drinking Water: Disinfected Fresh/Treated

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 (PPE) were not used.

Bagram: During 2016-2018 two treated water samples were collected from each of the three nanofiltration plants (water treatment plants #1, #2, and #3) on Bagram and 2 additional samples were collected from points of use in the distribution system. One sample was collected from the disinfected fresh water supply from the East treatment plant (chlorine-only). No chemical concentrations exceeded the short- or long-term MEGs.

Raw (untreated) water: Fourteen untreated well water samples were collected during 2016-2018. Each was collected prior to any treatment or disinfection. Although there was no reported exposure to these sources, note that no chemical concentrations in these samples exceeded the 1-year 5 L/day MEGs.

4.2.3 Short-term and long-term health risks:

None identified based on available sample data. All treated water parameters were below their respective 1-year 5 L/day Negligible MEGs.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) from 1 January 2016 to 31 December 2018 (Reference 1).

5.2 Depleted Uranium

No specific hazard sources were documented in DOEHRS from 01 January 2016 through 31 December 2018 timeframe (Reference 1).

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 5, Table 3-6).

5.4 Non-Ionizing Radiation

The BAF Occupational and Environmental Health and Safety Assessment (OEHSA) for 2016, 2017, and 2018 listed typical communication antennas being 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 DOEHRS.

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. Two CENTCOM Modifications (MOD) 12 and 13 (References 8, 9) list deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Foodborne and Waterborne Diseases

Foodborne 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* spp.) may occur. Key disease threats 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)

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. Mitigation strategies in place include consumption of approved food, water, and ice; hand washing; and applied food/water safety mechanisms. Field conditions (including lack of hand washing and primitive sanitation) may facilitate person-to-person spread and epidemics. Typically diarrheal diseases are a mild disease treated in an outpatient setting with 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

Unmitigated health risk to U.S. personnel is elevated year round for hepatitis A and typhoid/paratyphoid fever, and diarrhea-protozoal. Mitigation strategies in place include immunization, consumption of approved food, water, and ice; hand washing; and applied food/water safety mechanisms. U.S. Personnel did not drink untreated water, and vaccination for Hepatitis A is required for deployment into the CENTCOM Area or Responsibility (AOR). 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 risk include: hepatitis E, diarrhea-cholera, and brucellosis.

6.1.3 Polio

Potential health risk to U.S. personnel exists. Despite a concerted global eradication campaign, both wild and vaccine-derived poliovirus continue to affect children and adults in Afghanistan. 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% develops 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.

6.2 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

Potential unmitigated risk to U.S. personnel is higher during warmer months (typically April through November) but reduced 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. Mitigation strategies in place include Individual Protective Measure (IPM) practices, taking anti-malaria chemoprophylaxis, permethrin treated uniforms, pesticides, reduction of pest/breading habitats, and engineering controls.

6.2.2 Leishmaniasis

The disease risk is higher during the warmer months when sandflies are most prevalent, but reduced with mitigation measures. Mitigation strategies in place include IPM practices, permethrin treated uniforms, pesticides, reduction of pest/breeding habitats, and engineering controls. Leishmaniasis is transmitted by sand flies. A small number of cases (less than 1% per month attack rate) could occur among personnel exposed to sandfly bites in areas with infected people, rodents, dogs, or other reservoir animals. In groups of personnel exposed to heavily infected sandflies in focal areas, attack rates can be very high (over 50%). 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

Unmitigated risk is present but is reduced 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

Sandfly fever poses a risk with potential disease rates from 1% to 10% per month; under worst case conditions disease rates can be as high as 50%. Mitigation measures (IPM practices, permethrin treated uniforms, pesticides, reduction of pest/breeding habitats, and engineering controls) reduce the risk. The disease is transmitted by sandflies and occurs more commonly in children though adults are still at risk. Sandfly fever disease typically results in debilitating febrile illness requiring 1 to 7 days of supportive care followed by return to duty.

6.2.5 Plague

Plague is a potential threat to U.S. personnel 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)

Potential health risk to U.S. personnel is higher during warmer months (typically March through November) when vector activity is highest. Mitigation measures can reduce the risk. 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

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 are asymptomatic although fever, headache, tiredness, body aches (occasionally with a skin rash on trunk of body), and swollen lymph glands can occur.

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

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. Mitigation strategies in place include avoiding water contact and recreational water activities; proper wear of uniform, especially footwear, and protective coverings for cuts/abraded skin.

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, measles, 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 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 PPE when necessary for healthcare providers and detention facility personnel.

6.4.1 Tuberculosis (TB)

Potential health risk to U.S. personnel is present year round but can be mitigated. 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.

6.4.2 Meningococcal meningitis

Meningococcal meningitis poses a 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 Middle East respiratory syndrome coronavirus (MERS-CoV)

Although no cases have been reported in Afghanistan, Middle East respiratory syndrome coronavirus (MERS-CoV) is known to occur within the region. Most MERS patients developed severe acute respiratory illness with symptoms of fever, cough and shortness of breath. MERS-CoV has spread from ill people to others through close contact, such as caring for or living with an infected person. The incubation period for MERS-CoV is usually about 5 to 6 days, but can range from 2 to 14 days. .

6.5 Animal-Contact Diseases

6.5.1 Rabies

Rabies poses a year-round 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 14). 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 1C, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Anthrax

Anthrax cases are rare in indigenous personnel, and pose a slight 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

Potential health risk to U.S. personnel exists year round but can be mitigated. 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 included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, and proper PPE for personnel working with animals.

6.5.4 Avian influenza

Although 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.

6.6 Soil-transmitted helminths (hookworm, strongyloidiasis, cutaneous larva migrans)

Potential health risk to U.S. personnel is higher during warmer months (typically April through November) when vector activity is highest. Mitigation measures can reduce the risk. A small number of cases (less than 1% per month attack rate) could occur among personnel with direct skin exposure to soil contaminated with human or animal feces (including sleeping on bare ground, walking barefoot). Initial skin symptoms typically are mild and are not debilitating. However, systemic symptoms of fever, cough, abdominal pain, nausea, and diarrhea may develop weeks to months after initial infection with hookworm or *Strongyloides* spp. More severe infections with high worm burden may be debilitating in some cases. Rates of infection in U.S. personnel will be highly variable, depending on specific local environmental conditions. Rates of infection in U.S. personnel are expected to be less than 1 percent per month in most locations. However, rates in some focal areas with heavily contaminated soil could exceed 1 percent per month.

7 Venomous Animals

All information was taken directly from the Armed Forces Pest Management Board (Reference 10) and the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 11). 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.

- *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.

- *Mesobuthus caucasicus, Mesobuthus eupeus, Mesobuthus macmahoni, Orthochirus afghanus, Orthochirus. Jalalabadensis, Orthochirus pallidus, Orthochirus samrchelsis*: There are a number of dangerous Buthid scorpions, but there are also some known to cause minimal effects only. Without clinical data it is unclear where these species fit within that spectrum.

- *Scorpiops afghanus*: Mild envenoming only, not likely 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.

- *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 obtusa* (Lebetine viper), *and Macrovipera lebetina turanica* (*Turan blunt-nosed 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.

- *Platyceps rhodorachis* (Jan's desert racer): Mild envenoming only, not likely to prove lethal. Requires symptomatic treatment only.

7.4 Short-term health risk:

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.

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 but have very low humidity. Fall (October and November) is warm and dry. Winters are cold but short, lasting from December to March. Spring in Bagram starts in late March and is the wettest time of the year.

8.1 Heat

Summer (June - September) average monthly high temperatures range from 87 degrees Fahrenheit (°F) to 96 °F with an average high temperature of 92 °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 high temperatures alone is Low (< 78 °F) from October – April and High (82-87.9°F) from May – September. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 12). 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: The risk of heat injury is reduced to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring Wet Bulb Globe Temperature (WBGT). 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 June - September, Moderate from April – May and October – November, and Low from December – March. Confidence in the health risk estimate is low (Reference 5, 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 5, Table 3-6).

8.2 Cold

8.2.1 Short-term health risks:

Winter (December - March) mean daily minimum temperatures range from 29 °F to 42 °F. 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 12).

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. Noise levels were reported in the 2018 OEHSA as measuring 90-120 A weighted decibels (dBA) at a distance of 500 meters from the air field source, though personnel were reported to be 200 meters from the noise source. Exposure durations were noted as between 20 and 60 minutes per day. Personnel in close proximity to generators will routinely be exposed to noise levels as high as 70.0 dBA (measured at 20 meters from the source, which was the minimum distance noted between generators and personnel). 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 risk:

Low: The short-term risk of noise injury with appropriate hearing protection use is low. No specific continuous noise data was available for individuals. Few exposed personnel (if any) are expected to have noticeable health effects during mission. Confidence in the risk assessment is low (Reference 5, 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) 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 5, Table 3-6).

9.2 Impulse

No specific hazard sources were documented in DOEHRS from 01 January 2016 through 31 December 2018.

9.2.1 Short 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

Contracted personnel perform all waste transport on BAF. Solid waste is transferred to the solid waste incinerators for disposal. Regulated medical waste is disposed in medical waste incinerators. Hazardous waste is disposed off-site; the specific disposition of the hazardous waste was not noted in the OEHSAs or other documents in DOEHRS. Non-combustible solid wastes such as construction debris are buried on site. Wastewater is disposed at the on-site wastewater treatment facility. No waste management information was recorded in DOEHRS for the other locations in the vicinity of BAF during 2016 – 2018.

10.3 Fuel/petroleum products/industrial chemical spills

No spills were documented in DOEHRS for 2016 – 2018.

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 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.

Bagram: Preventive medicine personnel conduct surveillance and trapping for mosquitoes. Surveillance for animals and other pests and vector control actions are performed by the Base Operating Contractor. Bedbugs were noted in the 2018 OEHSA as a concern in foreign housing; no issues were identified in U.S. housing areas. Pests noted as present but controlled include mice, cats, midges, sand and black flies, wasps, bees, hornets, German roaches, birds (finches, doves, crows), house flies, filth flies, rats, ants, beetles, ticks, and bats.

Vicinity of BAF: No information was documented in DOEHRS for 2016 – 2018.

10.5 Asbestos

No specific hazard sources were documented in DOEHRS from 01 January 2016 through 31 December 2018 timeframe (Reference 1).

10.6 Lead Based Paint

No specific hazard sources were documented in DOEHRS from 01 January 2016 through 31 December 2018 timeframe (Reference 1).

10.7 Burn Pit and Smoke

Burn pits were not located at BAF and vicinity during the 2016 – 2018 timeframe; the BAF burn pit was closed in June 2013. No local (off-site) burn pits that could affect personnel were observed or documented during the annual OEHSAs. Local brick-firing plants were noted starting approximately 3 miles south of BAF; stack emissions (visible smoke) can be seen during flight operations but were not identified as affecting BAF.

11 References

1. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH Module) at https://doehrs-ih.csd.disa.mil/Doehrs/.

2. Department of Defense (DoD) Instruction 6490.03, *Deployment Health*, 2006.

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

4. Joint Chiefs of Staff. Procedures for Deployment Health Surveillance, MCM 0017-12, 7 December 2012.

5. USAPHC Technical Guide 230, June 2013 Revision.

6. Singh, A. and Singh, A.K. 2013. ProUCL Version 5.0. 00 Technical Guide-Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA: Washington, WA, USA.

7. Worldwide Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement at https://phc.amedd.army.mil/topics/foodwater/ca/Pages/DoDApprovedFoodSources.aspx.

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

9. Modification 13 to United States Central Command Individual Protection and Individual Unit Deployment Policy, 23 March 2017.

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

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

12. 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.

13. ATSDR. 1998. Toxicological Profile for Acrolein. http://www.atsdr.cdc.gov/ToxProfiles/TP.asp?id=557&tid=102. April 2019.

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

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 Deputy Assistant Secretary of Defense for Health Readiness Policy and Oversight (HRP&O).
Army Public Health Center Phone: (800) 222-9698. http://phc.amedd.army.mil/
Navy and Marine Corps Public Health Center (NMCPHC) Phone: (757) 953-0700. http://www.med.navy.mil/sites/nmcphc/Pages/Home.aspx
U.S. Air Force School of Aerospace Medicine (USAFSAM) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD Health Readiness Policy and Oversight (HRP&O) Phone: (800) 497-6261. http://fhpr.dhhq.health.mil/home.aspx