Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS): Kandahar Airfield and vicinity, Afghanistan
Calendar Years: 2019-2021

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

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Kandahar Airfield (KAF) and vicinity that includes Combat Outpost (COP) Ahmad Khan (also known as [aka] COP Admadkhan), Afghan National Civil Order Police Headquarters (ANCOP HQ), Alizi, Afghan National Police (ANP) Hill, Ainsworth (aka Emarat), Area Control Station (ACS) 14-2, ACS 4, ACS 5, COP Ashoque, COP Azim Jan Kariz (AJK), Forward Operation Base (FOB) Aziz Ullah, Babaghday, Bagh E Pol (aka Bagh E Pul), Camp Baker, Camp Belambay (aka Camp Belambai), FOB Belanday, Camp Brown, Burmohommad, Busha (aka Panjsher), Cabacoy (aka Zalakhan), COP Caron (aka COP Caran), Checkpoint One, Checkpoint Two, Checkpoint 72, Checkpoint 7-2, Chineh, Deh Qobad, Demaiwand, Diwar, Strong Point Edgerton (aka Dand District), Ezabad (aka Maiwand), Fathollah, Folad, Checkpoint Gerandai, Strong Point Gharibon, Camp Ghecko, COP Ghundy Ghar, Strong Point Gorgon, Strong Point Haji Ramuden, Strong Point Haji Ramuddin II, Camp Hero, FOB Howz-E-Madad (aka Panjawa Howze Madad), COP Hutal (aka COP Rath), Jawkari, COP Johnston, Joint Regional Afghan National Police Center (JRAC), COP Jelawur, Kandahar Airfield, COP Kandalay, COP Khenjakak, COP Kolk, COP Lakhokhel, Camp/FOB Lindsey, Loy Kariz, COP Luke, COP Macthab (aka COP Ballpeen, aka Area Control Point 15), COP Makuan, FOB Masum Ghar, Millet (aka Deh Kuchay), Checkpoint Mullah Mahdi, COP Mushan, COP Nalgham, Camp Nathan Smith, COP Nejat, COP Neshin (aka COP Neshan), New Provincial Headquarters (PHQ), COP Now Ruzi, Operations Coordination Center Province (OCCP) Kandahar, Operations Coordination Center District-Panjawi (OCCD-P), Old Corps, Old PHQ (aka Old ANP), Outpost (OP)-971, Pa'in Kelay, Palace, Panjawi (aka Pajwai), COP Pashmul South, Checkpoint Perozi, Police Substation 1, Police Substation 2, Police Substation 3, Police Substation 7, Police Substation 8, Police Substation 9, Police Substation 10, Police Substation 12, Police Substation 16, Provincial Reserve Kandahar, Pul, Rostum, COP Sablaghay, FOB Sakari Karez (aka FOB Ramrod), Salim Aka, COP Sangsar, FOB Scorpion, Shobat (aka Sohbat), FOB Shoja, Shurandam, FOB Siah Choy, Camp Simmons 2, COP Sperwan Ghar, COP Talukan, COP Tarnak (aka COP Marianne), COP Terminator (aka COP Atta Mohammed Khan), Strong Point Theinhart (aka Strong Point Theinert), Walakan, FOB Walton, COP Ware (aka Charbaugh), Camp Wilson (aka Pasab), FOB Zangabad (aka FOB Saidon), Zhari Dosht (aka Zhari Dasht), and COP Zharif Kel (aka COP Zarifkhel). 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 2019 through 30 June 2021 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 KAF 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 2019 through 30 June 2021.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to KAF and vicinity during the period of this assessment. However, it does not represent an individual's 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 at a particular location. Individual outdoor activities and associated routes of exposure are extremely variable and could not 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:

KAF was located in Kandahar province at the northern end of the Southwestern Plateau of Afghanistan, near the southern slopes of the Hindu Kush Mountains (the western most range of the Himalayan Chain). The elevation of KAF was about 1,000 meters above sea level. The land surrounding the base was rural and semi-arid. KAF housed the Regional Command-South (RC-S) headquarters and was the largest base in terms of population and land area within the RC-S. The locations included in this POEMS were provided by US CENTCOM and were located in the RC-S near Kandahar City. All U.S. forces were off KAF by 30 June 2021 and it was handed back to the Afghan government.

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 KAF and vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risks were factored into this assessment. In some cases, e.g., ambient air, specific controls are noted, but are 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 KAF and vicinity:

For heat stress, risk can be greater during months of April through October, 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 coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust (including burn pits), the PM_{10} overall short-term health risk was not evaluated due to no data for analysis. For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust (including burn pits), the $PM_{2.5}$ overall short-term health risk was "Low to Moderate." However, the KAF and vicinity area is a dust-prone desert environment, with a semi-arid climate, 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/cardiopulmonary conditions) are at greatest risk of developing notable health effects. Burn pits were not located on KAF and vicinity during the January 2019 to June 2021 timeframe. A burn pit was located approximately 2km from the south perimeter of KAF and used by the Afghan National Army to burn garbage. Where burn pits exist, exposures may vary, and exposures to high levels of PM_{10} and $PM_{2.5}$ from smoke may 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. Although most short-term health effects from exposure to particulate matter and/or 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 while at KAF and vicinity. Personnel who reported with symptoms or required treatment while at site(s) with burn pit/box activity 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 KAF and vicinity:

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust (including burn pits), the overall long-term health risk was "Low." Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust (including burn pits) was not evaluated for long-term health risk due to no data for analysis and no available health guidelines. However, the KAF and vicinity area is a dust-prone desert environment with a semi-arid climate, also subject to vehicle traffic, and conditions may have varied. Burn pits were not located at KAF and vicinity during the January 2019 to June 2021 timeframe. A burn pit was located approximately 2km from the south perimeter of KAF and used by the Afghan National Army to burn garbage. Where burn pits exist, exposures may vary, as conditions may have varied. For inhalational exposure to high levels of dust containing PM_{10} and $PM_{2.5}$, such as during high winds or dust storms, and for exposures 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, 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/boxes, 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 - KAF 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 to Moderate. 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. 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).
WATER			
Non-Drinking Water	Short-term: Low. During periods of high sulfate concentrations, diarrhea and nausea may occur.	Water treated in accordance with standards applicable to its intended use	Short-term: Low. During periods of high sulfate concentrations, diarrhea and nausea may occur.
	Long-term: None identified based on available data. All parameters were below the negligible MEGs.		Long-term: None identified based on available data. All parameters were below the negligible MEGs.
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological) Arthropod Vector Borne Water-Contact (e.g., wading, swimming) Respiratory Animal Contact Aerosolized Dust or Soil-contact	Risk levels are no longer provided in Section 6 (Endemic Diseases) for each endemic disease since the National Center for Medical Intelligence website is no longer being updated. OEHSA's provide risk levels for particular endemic diseases; however, it is not specified how the risk levels were obtained. Although risk levels are no longer provided, country specific endemic diseases can be found in Section 6.	Refer to Section 6 for preventive measures	Risk levels are no longer provided in Section 6 (Endemic Diseases) for each endemic disease since the National Center for Medical Intelligence website is no longer being updated. OEHSA's provide risk levels for particular endemic diseases; however, it is not specified how the risk levels were obtained. Although risk levels are no longer provided, country specific endemic diseases can be found in Section 6.
VENOMOUS ANIMALS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g., *Scorpiops lindberg*) to potentially lethal effects (e.g., *Gloydius halys*).	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., *Scorpiops lindberg*) to potentially lethal effects (e.g., *Gloydius halys*).
	Long-term: None identified		Long-term: None identified
HEAT/COLD STRESS			
Heat	Short-term: Low to Extremely High; Risk of heat injury is Extremely High for May-September, High in April, Moderate in October, and Low for all other months.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Low; Risk of heat injury in unacclimatized or susceptible personnel is Extremely High for May-September, High in April, Moderate in October, and Low for all other months.

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	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 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.
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.
Unique Incidents/ Concerns			
Burn Pits	Short-term: No data available. Burn pits were not located on KAF or any of the associated camps during the January 2019 to June 2021 timeframe. A burn pit was located approximately 2km from the south perimeter of KAF and used by the Afghan National Army to burn garbage. The PM_{10} and the $PM_{2.5}$ overall short-term health risks specifically from burn pits were not evaluated – see Section 10.7. Exposure to burn pit smoke is variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ from smoke may 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, such as those with pre-existing health conditions (e.g., asthma, or cardiopulmonary disease, which may be exacerbated). Additionally other contaminants expected from burning trash such as volatile or semi-volatile organic chemicals, dioxins, furans or acid gases were not characterized.		Short-term: No data available. Burn pits were not located on KAF or any of the associated camps during the January 2019 to June 2021 timeframe. A burn pit was located approximately 2km from the south perimeter of KAF and used by the Afghan National Army to burn garbage. The PM10 and the PM2.5 overall short-term health risks specifically from burn pits were not evaluated – see Section 10.7. Exposure to burn pit smoke is variable. Exposure to high levels of PM10 and PM2.5 from smoke may 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, such as those with pre-existing health conditions (e.g., asthma, or cardiopulmonary disease, which may be exacerbated). Additionally other contaminants expected from burning trash such as volatile or semi-volatile organic chemicals, dioxins, furans or acid gases were not characterized.
	Long-term: No data available. Burn pits were not located on KAF or any of the associated camps during the January 2019 to June 2021 timeframe. A burn pit was located approximately 2km from the south perimeter of KAF and used by the Afghan National Army to burn garbage. The overall long-term risks cannot be evaluated, see Section 10.7. Typically, exposure to burn pit smoke is variable. Exposure to high		Long-term: No data available. Burn pits were not located on KAF or any of the associated camps during the January 2019 to June 2021 timeframe. A burn pit was located approximately 2km from the south perimeter of KAF and used by the Afghan National Army to burn garbage. The overall long-term risks cannot be evaluated, see Section 10.7. Typically, exposure to burn pit smoke is variable. Exposure to high levels of PM10 and PM2.5 in the

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	levels of PM_{10} and $PM_{2.5}$ in the smoke may be associated with some otherwise healthy personnel, who were exposed for a long-term period, possibly developing 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. Additionally other contaminants expected from burning trash such as volatile or semi-volatile organic chemicals, dioxins, furans or acid gases were not characterized.		smoke may be associated with some otherwise healthy personnel, who were exposed for a long-term period, possibly developing 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. Additionally other contaminants expected from burning trash such as volatile or semi-volatile organic chemicals, dioxins, furans or acid gases were not characterized.

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 KAF 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 2019 through 30 June 2021. 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 KAF 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 KAF 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 4). All OEH risk estimates represent the 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 material, there are limited preventive measures available, and those available measures have little efficacy in reducing exposure to ambient conditions.

When suitable, the USEPA ProUCL version 5.0 software package was used for statistical analyses (Reference 5). 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).

2 Air

2.1 Site-Specific Sources Identified

KAF and locations in the vicinity were situated in a dusty semi-arid desert environment. Inhalational exposure to high levels of particulate matter, such as during high winds or dust storms, may have resulted 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) were at greatest risk of developing notable health effects.

The main roads on KAF were paved; however, the side roads and parking lots were mostly dirt and gravel. There was significant dust due to the heavy aircraft, vehicle and foot traffic on the loose soil. There was also industrial and institutional development along the highway near the eastern perimeter of KAF, contributing to potential air pollution.

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 (Reference 5).

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

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

- Negligible MEG = 15

- Marginal MEG = 250
- Critical MEG = 500

- Marginal MEG = 65

2.3.2 Sample data/Notes:

A total of thirty valid $PM_{2.5}$ air samples (21 from KAF and 9 from Scorpion) were collected from 14 January 2019 – 12 March 2021. The range of 24-hour $PM_{2.5}$ concentrations was 16 $\mu g/m^3$ – 501 $\mu g/m^3$ with an average concentration of 86 $\mu g/m^3$. The 95% Upper Confidence Limit (UCL) of the mean was 123 $\mu g/m^3$.

2.3.3 Short-term health risks:

Variable (Low to Moderate): The short-term $PM_{2.5}$ health risk varied because of significant fluctuations in daily concentrations. The following health risk determinations were made for typical (estimated using the average) and peak $PM_{2.5}$ sample concentrations. The reported risk levels were determined using the hazard severity (estimated from the possible health effects resulting from exposure at those concentrations) and the hazard probability (or likelihood those health effects occurring). After determining both of these variables, the risk level was selected using Table 3-1 in Reference 4.

For exposures at the average (or typical) concentration, the hazard severity was Negligible because the 95 UCL of the mean concentration was between 65 $\mu g/m^3$ and 250 $\mu g/m^3$. For exposures at the Negligible hazard severity level, a few personnel may experience notable mild eye, nose, or throat irritation; but most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated (Reference 4, Table 3-11). At average concentrations, these effects were expected to occur intermittently and the hazard probability chosen was Seldom (Table 3-5, Reference 4). The resulting risk level was estimated to be Low. Confidence in the short-term $PM_{2.5}$ health risk assessment was low (Reference 4, Table 3-6).

For exposures near the peak concentration, the hazard severity was Critical because the maximum concentration was above 500 $\mu g/m^3$. For exposures at the Critical hazard severity level, most if not all personnel will have or experience very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity (Reference 4, Table 3-11). At peak concentrations, these effects were expected to occasionally occur and the hazard probability chosen was Seldom (Table 3-5, Reference 4). The resulting risk level was estimated to be Moderate. Confidence in the short-term $PM_{2.5}$ health risk assessment was low (Reference 4, Table 3-6).

2.3.4 Long-term health risks:

Low: The following health risk determinations were made for typical (estimated using the mean) $PM_{2.5}$ sample concentrations. The reported risk levels were determined using the hazard severity (estimated from the possible health effects resulting from exposure at those concentrations) and the hazard probability (or likelihood those health effects occurring). After determining both of these variables, the risk level was selected using Table 3-1 in Reference 4.

For exposures at the average (or typical) concentration, the hazard severity was Marginal because the 95 UCL of the mean concentration was above 65 $\mu g/m^3$. With repeated exposures above this, 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). At average concentrations, these effects were expected to occur intermittently and the hazard probability chosen

was Seldom (Table 3-5, Reference 4). The resulting risk level was estimated to be Low. Confidence in the short-term $PM_{2.5}$ health risk assessment was low (Reference 4, Table 3-6).

2.4 Airborne Metals

2.4.1 Airborne Metals from $PM_{2.5}$

2.4.1.1 Sample data/Notes:

A total of thirty valid $PM_{2.5}$ airborne metal samples were collected from 14 January 2019 – 12 March 2021. No metals were detected above their respective MEG and, as a result, no metals were considered to be a hazard.

2.4.1.2 Short-term and long-term health risks:

None identified based on available sampling data.

2.5 Volatile Organic Compounds

2.5.1 Sample data/Notes:

No volatile organic compound samples were collected at KAF and vicinity between 01 January 2019 and 30 June 2021.

2.5.2 Short and long-term health risks:

No data available to assess health risks.

3 Soil

3.1 Sample data/Notes:

No soil samples were collected at KAF and vicinity between 01 January 2019 and 30 June 2021.

3.2 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.

3.3 Long-term health risk:

No data available to assess long-term health 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. It is assumed that 100% of all U.S. personnel at KAF and vicinity were directly exposed to reverse osmosis water purification unit (ROWPU) treated and disinfected fresh bulk water since these classifications of water are primarily used for personal hygiene, showering, cooking, and for use at vehicle wash racks. Bottled water was assumed to be the only source for primary drinking water.

Untreated well water was used as a treatment source so no exposure is expected, therefore, these samples were not assessed. 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.

4.1 Drinking Water: Bottled or Treated

4.1.1 Site-Specific Sources Identified

Cristal®, Aria® and Aquafina®[1] were the primary brands of bottled waters (US Army VETCOM approved sources) used on KAF and the surrounding basecamps.

4.1.2 Sample data/Notes:

Although bottled water was the primary drinking water source, no valid samples were collected at any of the locations between 01 January 2019 and 30 June 2021.

4.1.3 Short-term and long-term health risk:

No data available to assess short and long-term health risk from drinking water

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 incidental ingestion from drinking, brushing teeth, personal hygiene, cooking, and providing medical and dental care using a contaminated water supply. It could also result from dermal contact at vehicle or aircraft wash racks. The water on KAF used for non-drinking purposes is well water which has been ROWPU treated, stored in tanks and then piped to various locations around the installation. Water from the treatment facility is delivered to the dining facility via tanker truck.

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).

Samples of untreated water were taken (14 from KAF and 2 from Scorpion). The water was well water used as a treatment source and had no complete exposure pathway. The water was also used at a wash rack, having minimal contact. The untreated water did not exceed non-drinking water MEGs and therefore is not a health risk.

KAF: Nine samples of ROWPU and disinfected treated water were collected between 25 February 2019 and 12 February 2021. One sample contained sulfate concentrations which were above the Negligible 14-day non-drinking water MEG (750 mg/L). Sulfate is both naturally occurring and a

[1] Identification of a trademarked product does not imply endorsement by the Army

disinfectant byproduct that can cause aesthetically unpleasant taste and smell in the water. During periods where the sulfate concentrations were high, diarrhea and nausea may have occurred and there was a greater risk of dehydration if the water was used as drinking water.

Scorpion: Three samples of ROWPU and disinfected treated water were taken between 15 January 2019 and 18 May 2019. No chemical concentrations exceeded the short or long term non-drinking water MEGs; therefore, there was no risk.

4.2.3 Short-term health risks:

Low. Gastrointestinal upset may have occurred during periods when the sulfate concentration was high if the water was used for drinking.

4.2.4 Long-term health risks:

None identified based on available sampling data

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 2019 to 30 June 2021 (Reference 1).

5.2 Depleted Uranium

No specific hazard sources were documented in DOEHRS from 1 January 2019 to 30 June 2021 (Reference 1).

5.3 Ionizing Radiation

Medical radiological equipment was located in KAF medical treatment facilities. Personnel using this equipment were trained and wore appropriate personal protective equipment (References 8 and 9).

5.4 Non-Ionizing Radiation

Satellite and radio communication equipment was located throughout KAF. Along with countermeasure radiofrequency jammers. Any communication antennas, lasers, etc. were partitioned off from the general population. When they were accessed, proper PPE was worn by trained personnel (References 8 and 9).

6 Endemic Diseases

This document lists the endemic diseases reported in the region by the U.S. Centers for Disease Control and Prevention (CDC) (Reference 9). CENTCOM Modification (MOD) 13, 14 and 15 (References 10-12) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS. Additionally, some information was provided under the disease threats section in the OEHSAs for KAF. Information from the OEHSA is summarized in Table 3 below. It was not specified in the OEHSAs how the risk estimates were obtained (References 7 and 8).

Table 3. Disease Threat Assessment in KAF OEHSA

Disease Threat	Hazard Severity	Hazard Probability	Risk Estimate
Leishmaniasis (Other or unspecified)	Negligible	Seldom	Low
Malaria (Unspecified)	Negligible	Seldom	Low
Sand Fly Fever	Negligible	Unlikely	Low
Rabies	Negligible	Seldom	Low
Other Arthropod-Borne Viruses	Negligible	Seldom	Low

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. Ingesting local food and water can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid/paratyphoid fever, brucellosis, hepatitis E). Risks from food/waterborne diseases 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.

6.1.1 Diarrheal diseases (bacteriological)

Diarrheal diseases are expected to temporarily incapacitate a very high percentage of personnel within days if local food, water, or ice is consumed. Field conditions (including lack of hand washing and primitive sanitation) may also facilitate person-to-person spread and epidemics. Typically mild disease is treated in an outpatient setting. Personnel typically recover 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.

6.1.1.1 Hepatitis A Virus (HAV), typhoid/paratyphoid fever, and diarrhea-protozoal

HAV, typhoid/paratyphoid fever, and diarrhea-protozoal disease may cause prolonged illness in a small percentage of unvaccinated personnel. HAV is transmitted through direct person to person contact or through ingestion of contaminated food or water. HAV can survive in the environment for prolonged periods of time and it can be transmitted through ice and frozen foods. Individuals are most infectious 1-2 weeks before the onset of clinical signs and symptoms. Typhoid and paratyphoid fever are acquired through consumption of water or food contaminated by feces of an acutely infected person. Hepatitis A and Typhoid can be prevented through immunization (Reference 10).

6.1.3 Polio

According to the CDC, Afghanistan remains at high risk for polio outbreaks due to low immunization rates. Polio is a highly infectious disease that invades the nervous system. The virus enters through the mouth and multiplies in the throat and gastrointestinal tract. The virus may be excreted in nasopharyngeal secretions for up to two weeks and in stool for up to six weeks, even in people who do not develop symptoms after infection. Most polio infections are asymptomatic and about 25% cause minor illness with total recovery, while 0.5% of infected people may develop acute paralysis. Polio may

be prevented through immunization (Reference 10).

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. Mitigation strategies include a self-service station for dispensing of insect repellents. Personnel are also prescribed chemoprophylaxis. When infestation is high, weekly fogging is performed under contract (References 7 and 8).

6.2.1 Malaria

Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems and standing water, which provide breeding habitats for vectors. Malaria is caused by protozoan parasites of the genus Plasmodium. Malaria is transmitted by the bite of an infected female mosquito. Occasionally, transmission can occur from blood transfusion, organ transplantation, needle sharing, or from mother to fetus. Malaria is characterized by fever and influenza like symptoms, including chills, headache, myalgias, and malaise. In severe disease, seizures, metal confusion, kidney failure, acute respiratory distress syndrome, coma, and death may occur. Malaria symptoms develop as early as 7 days after being bitten by an infected mosquito. Anyone with symptoms of malaria should seek immediate medical attention. As of October 2021, Malaria can be prevented through immunization (Reference 9)

6.2.2 Leishmaniasis/Sand Fly Fever

Leishmaniasis and Sand Fly Fever is transmitted by sand flies. There was not much information provided for Sand Fly Fever provided by the CDC. There are two forms of the disease Leishmaniasis; cutaneous (acute form) and visceral (a more latent form of the disease). The most common symptom of cutaneous leishmaniasis is skin sores that can change in size and appearance over time. The symptoms of visceral leighmaniasis are fever, weight loss, enlarged spleen and liver, low red blood cell count, platelet count and white blood cell count. Some people may have no symptoms. There is no vaccine for leishmaniasis so personnel must protect themselves by using permethrin-treated clothing and insect repellent (Reference 9).

6.2.3 Crimean-Congo hemorrhagic fever (CCHF)

Crimean-Congo hemorrhagic fever is transmitted by Ixodid tick bites. The onset of the disease typically requires intensive care with fatality rates from 5% to 50%. The onset of CCFG is sudden, with initial signs and symptoms that include headache high fever, back pain, joint pain, stomach pain and vomiting. Treatment for CCFG is supportive care as there is no effective medication to combat it. Recovery is slow and long-term effects are unknown. There is no safe and effective vaccine currently available for human use so preventive measure include tick repellant and screening for ticks (Reference 9).

6.2.4 Dengue

The dengue virus is spread to people through the bite of an infected mosquito. Dengue symptoms typically start within a few days of being bitten. Symptoms can be mild or severe and can include fever, nausea, vomiting, rash, headache, eye pain, joint and muscle pain and minor bleeding. There is no

immunization for Dengue at this time (one is pending approval) so preventive measure including insect repellent and clothing treated with permethrin are necessary (Reference 9).

6.2.5 Plague

Plague is a rare bacterial disease that affects animals and humans and is spread by infected fleas. Humans are infected when they are bitten by infected fleas. Wild and domestic carnivore animals (especially cats) can also become infected by eating flees or infected rodents. Bubonic plague is the most common form of plague and includes sudden onset of fever, chills, headache, malaise and swollen glands. No vaccine exists so it must be prevented by keeping fleas away by applying insect repellent with DEET (Reference 9).

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

Mite-borne typhus is a significant cause of febrile illness in local populations with rural exposures in areas where the disease is endemic. The most common symptom of infection is a fever, headache, body ache and rash as the site of the bite. Typhus is treated with the antibiotic doxycycline. No vaccine is available to prevent typhus but the risk can be reduced by application of insect repellents containing DEET and avoiding contact with mites (Reference 9).

6.2.7 West Nile

West Nile fever 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. There is no vaccine or treatment for West Nile virus so the best prevention is to protect from mosquito bites by using insect repellent and treating uniforms with permethrin (Reference 9).

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 is a disease caused by bacteria that infected animals spread through their urine. Some people with leptospirosis will not have symptoms. When symptoms do occur, they include fever, headache, chills, muscle aches, vomiting, jaundice, red eyes, stomach pain, diarrhea, and sometimes a rash. Without antibiotic treatment kidney and liver damage may occur. There is no vaccine approved in the United States to prevent leptospirosis. Prevention includes avoiding contact with water or soil that have the potential to be contaminated and wearing footwear and other protective clothing (Reference 9).

6.4 Respiratory Diseases

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. Covid-19 and Influenza are of particular concern because of their ability to debilitate large numbers of unvaccinated personnel for several days. Mitigation strategies included routine medical screenings, vaccination, enforcing minimum

space allocation in housing units, implementing head-to-toe sleeping in crowded housing units and implementation of proper personal protective equipment (PPE) when necessary for healthcare providers and detention facility personnel. Respiratory infections identified by the CDC to be of particular concern in Afghanistan are discussed below.

6.4.1 Tuberculosis (TB)

TB is a disease caused by bacteria that is spread in the air to others when coughing, speaking or singing. Tuberculosis bacteria in the lungs can move through the blood to infect other parts of the body, such as the kidney, spine, and brain. Symptoms of TB disease in the lungs include a cough, pain, weakness, weight loss, chills, fever, and night sweats (Reference 9).

6.4.2 Covid-19

According to the CDC, Covid-19 has a high level of infection in Afghanistan. The incubation period for Covid-19 is 3-14 days from exposure. Symptoms can include fever, cough, shortness of breath, fatigue, muscle and body aches, headache, loss of taste or smell, nausea and diarrhea. Several effective vaccines are currently available to help prevent Covid-19. In the U.S. full approval has been granted for the Pfizer-BioNtech vaccine and emergency use authorization have been granted for the Moderna and Johnson & Johnson Vaccines (Reference 9).

6.4.3 Hantavirus

Hantavirus is spread through the air or by eating food contaminated with urine or droppings from rodents. Hantavirus can cause organ damage, especially to the kidneys and blood vessels. Complete recovery can take weeks to months. Symptoms of hantavirus usually develop 3 to 4 weeks after infection but can occur as early as 1 week from exposure. Symptoms can include fatigue, fever, muscle aches, headaches, dizziness, chills, nausea, vomiting, diarrhea, and abdominal pain. There are no vaccines to prevent hantavirus disease but personnel can protect themselves by avoiding rodents while in Afghanistan (Reference 9).

6.5 Animal-Contact Diseases

6.5.1 Rabies

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. In the U.S. rabies mainly occurs in wild animals. However, in Afghanistan bites from dogs are the main source of rabies. Rabies affects the central nervous system and without appropriate medical care, rabies causes brain disease and death. Symptoms include weakness or discomfort, fever, and headache. As time progress an infected person may become delirious, hallucinate and become unable to swallow. A vaccine is available in the U.S. to prevent rabies (Reference 9).

6.5.3 Q-Fever

Q-fever is caused by infection with the bacteria Coxiella burnetii. Cattle, sheep, and goats can be infected and people are exposed by breathing in dust contaminated with infected animal body fluids. About half of people infected with Q-fever will develop symptoms. Symptoms develop 2-3 weeks after exposure and include fever, fatigue, headache, chest pain, vomiting, weight loss and cough. Treatment

can include doxycycline antibiotics. Vaccines for Q-fever are not available in the U.S. but risk of infection can be reduced by avoiding contact with animals and avoiding consumption of raw milk (Reference 9).

6.6 Soil-transmitted helminths (ascaris, whipworm, hookworm)

Soil-transmitted helminths (ascaris, whipworm, and hookworm) refer to the intestinal worms infecting humans that are transmitted through contaminated soil. Helminths live in the intestine and their eggs are passed in the feces of infected persons. Ascaris and whipworm can also be transmitted hand to mouth when hands are infected with contaminated dirt or by consuming vegetables or fruits that have not been cooked or washed. Heavy infections cause abdominal pain, diarrhea, blood and protein loss and rectal prolapse. Soil-transmitted helminth infections are treatable with medication prescribed by a health care provider (Reference 9).

7 Venomous Animals

All information was taken directly from the Clinical Toxicology Resources web site from the University of Adelaide, Australia (Reference 13). The species listed below have home ranges that overlap the locations of KAF and vicinity and may present a health risk if they are encountered by personnel. See Section 10.4 for more information about pesticides and pest control measures.

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.

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. Hypovolaemic hypotension possible in severe cases due to fluid loss through vomiting and sweating.

- *Afghanobuthus nuamanni, Buthacus striffleri*, *Compsobuthus afghanus*, *Compsobuthus rugosulus, Compsobuthus tofti*, *Mesobuthus caucasicus, Mesobuthus eupeus, Mesobuthus macmahoni, Orthochirus afghanus*, *Orthochirus bicolor, Orthochirus danielleae, Orthochirus erardi*, *Orthochirus heratensis, Orthochirus Jalalabadensis, Orthochirus monodi, Orthochirus pallidus, Orthochirus samrchelsis*, *Orthochirus scrobiculosus,* and *Sassanidotus gracilis*: While there are a number of dangerous Buthid scorpions, most are known to cause minimal effects only. Without clinical data it is unclear which species fit within that spectrum.

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

- *Scorpiops afghanus* and *Scorpiops lindbergi*: 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.

Snakes

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

- Eryx Johnii (Brown Sand Boa), Eryx Miliaris (Dwarf Sand Boa), and Eryx Tataricus (Tartar Sand Boa): Bite unlikely to cause fatality, but death from constriction possible.

- Hemorrhois Ravergieri (Mountain Racer), Lycodon Straiatus (Northern Wolf Snake), Oligodon Taeniolatus (Sreaked Kukri Snake), Platyceps Karelini (Spotted Snake), Platyceps Rhodorachis (Jan's Desert Racer), Platyceps Ventromaculatus (Hand Snake): Non-lethal and there is insufficient clinical reports to determine other effects.

- *Macrovipera lebetina obtuse* (Levantine Viper), and *Macrovipera lebetina turanica* (Levantine Viper): Severe envenoming possible, potentially lethal. Common, moderate to severe coagulopathy and haemorrhagins causing extensive bleeding is common. Shock is also possible.

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

- *Pseudocerastes persicus* (Persian dwarf snake): Unlikely to cause significant envenoming; limited clinical data suggest bites result in local effects only.

- *Gloydius halys* (Halys pit viper): Potentially lethal envenoming; although unlikely, it cannot be excluded. Bites can cause systemic effects including necrosis, coagulopathy, renal failure and shock.

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.

Long-term health risk:

None identified

8 Heat/Cold Stress

8.1 Heat

Average monthly peak temperature during the summer months (June – September) was 104.4 degrees Fahrenheit (°F). The health risk from heat stress/injury based on temperatures alone was Low (< 78 °F)

from November – March, Moderate (78-81.9°F) in October, high (82-87.9°F) in April, and extremely high (≥ 88°F) from May – September. However, work intensity and clothing/equipment worn pose a greater health risk of heat stress/injury than environmental factors alone (Reference 15). 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 Extremely High, mitigated to Low: The risk of heat injury was 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) was Extremely High from May – September, High in April, Moderate in October, and Low from November – March. 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 was Low. However, the risk was increased in 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 increased 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 ranged from 33.8 °F to 36.3°F. Because even on warm days a significant drop in temperature after sunset, by as much as 40 °F, can occur, there was increased risk for cold stress/injury from September – April. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, was Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may have encountered 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, not from environmental factors alone.

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

8.1.2 Long-term health risk:

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

9 Noise

9.1 Continuous

Fixed wing and rotary aircraft frequented the airstrips and airfields on KAF. Generator farms were located throughout the installation as well. All noise sources that could be harmful to personnel were

only encountered intermittently and PPE was required when entering those areas (References 7 and 8).

9.1.1 Short and long-term health risks:

Not evaluated

9.2 Impulse

No specific hazard sources were documented in DOEHRS from 1 January 2019 to 30 June 2021 (Reference 1).

9.2.1 Short and long-term health risks:

Not evaluated

10 Unique Incidents/Concerns

10.1 Other potential occupational and environmental contamination sources

DoD personnel were exposed to various chemical, physical, ergonomic, and biological hazards in the course of performing their mission. These types of hazards depended on the mission of the unit and the operations and tasks which the personnel were required to perform to complete their mission. The health risk associated with these hazards depended on a number of elements including what materials were used, how long the exposure lasted, what was done to the material, the environment where the task or operation was performed, and what controls were used. The hazards could 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 occurred while performing maintenance tasks such as painting, grinding, welding, engine repair, or movement through contaminated areas. Exposures to these occupational hazards could 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

Defense Logistics Agency, DynCorp and Afghan First Initiative disposed of all hazardous materials located on KAF. Malika & Refa Environmental Solutions (LN Contractor) removed the HazMat waste form the HazMat yard. A medical waste incinerator was operated on south KAF (References 7 and 8).

10.3 Fuel/petroleum products/industrial chemical spills

Petroleum distribution points and hazardous waste storage were present on KAF. Any uncontrolled releases were remediated to acceptable levels by contractors (References 7 and 8).

10.4 Pesticides/Pest Control:

The health risk of exposure to pesticide residues was considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed. These include 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 the pest

management effort, 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 efforts. Contractors utilize dtraps, bait stations, poisons, fogging, and hands-on capture to control the pests. Use of pesticides targeting 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. Overall Pest control at KAF and vicinity was handled by contractors (References 8 and 9).

10.5 Asbestos

No specific hazard sources were documented in DOEHRS from 1 January 2019 to 30 June 2021 (Reference 1).

10.6 Lead Based Paint

No specific hazard sources were documented in DOEHRS from 1 January 2019 to 30 June 2021 (Reference 1).

10.7 Burn Pits

Burn pits were not located on KAF and vicinity facilities during the January 2019 to June 2021 timeframe. However, a burn pit was located approximately 2km from the south perimeter of KAF and used by the Afghan National Army to burn garbage. A health risk estimate specific to burn pit emissions exposure could not be determined because burn pit emissions cannot be evaluated independently from the overall ambient air. While the results were not specific to KAF, Afghanistan, the following paragraph summarizes a 2011 study conducted by the Institute of Medicine (IOM), now the National Academy of Medicine, of the long-term health effects resulting from burn pit exposure in Iraq and Afghanistan (Reference 15).

In the 2011 study, the IOM committee was unable to determine if exposure to emissions from burn pits was associated with long-term health effects. This was primarily due to both unavailable or poor supporting epidemiologic evidence and significant gaps in monitoring data, resulting in the inability to accurately characterize exposure to burn pit emissions. However, the committee's review of the existing literature at the time, and the early available sampling data from Afghanistan and Iraq suggested that, in general, service in Iraq or Afghanistan may be associated with long-term health effects. This could be particularly true for susceptible (e.g. those with asthma) or highly exposed subpopulations (e.g. those who worked at the burn pit). If that broader exposure turns out to be relevant, the related health effects of concern are respiratory and cardiovascular effects and cancer. Additionally, susceptibility to the health effects from particulate matter could be exacerbated by other factors including stress, smoking, local climatic conditions, and co-exposure to other chemicals that affect the same biological or chemical processes.

The IOM study focused on burn pit exposure in Iraq and Afghanistan. It should be noted that the air quality at locations with burn pits will vary from country to country and basecamp to basecamp. Additionally, proximity to a burn pit, the types and amount of material burned, operational process at the burn pit, meteorological conditions, and the presence of other pollution sources would also affect the exposures experienced by deployed Service members.

11 References

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15. 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 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