Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS): Forward Operating Base Frontenac and Vicinity, Afghanistan: 2007 to 2014

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

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risks for Arghestan Village Stability Platform (VSP), Babur, Baghak, Bagh E Pul, Baghtu, Chenar, Combat Outpost (COP) 9-1, CP 72, CP 7-4, CP 8-1, COP Darham (Durham Charqolba SOFLA), Darvishan, Dashtu, Forward Operating Base (FOB) Frontenac, Ghecko, Ghorak VSP, Infante, Jannat/Kowajeh, Jelawar, COP Kessler (Sakari Bagh), Kowall, Kulak (Kuhak), VSP Lam, Lane, Lion, COP Little Blue, Maholic, Mien Shayen, Mohammed, Nagahan Embed Site, Nolen, Now Ruzi, District Police Center-Arghandab, Pacemaker, Pittman, Robyn, COP Senjaray, Shah Wali Kot, Simmons, Stansbery, Stout, FOB Terra Nova, COP Timothy Johnson, COP Tynes, Weaver, and Winkleman, Afghanistan. It presents a qualitative summary of OEH health risks identified at these locations and their potential medical implications. The report is based on information collected from 01 June 2007 through 10 July 2014 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 FOB Frontenac 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 June 2007 through 10 July 2014.

The POEMS can be useful to inform healthcare providers and others of environmental health conditions experienced by individuals deployed to FOB Frontenac 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: FOB Frontenac was a forward operating base located in Arghandab District, Kandahar. FOB Frontenac supported COP Little Blue, which was near but not connected to the FOB. The region surrounding FOB Frontenac consisted of mostly undeveloped land and barren desert. This POEMS document also addresses 45 additional basecamps.

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 FOB Frontenac 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.

POEMS
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 FOB Frontenac and vicinity:

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

Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}), the overall short-term risk was not evaluated due to insufficient data. For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), the overall short-term risk was not evaluated due to insufficient data. However, exposures to PM_{10} and $PM_{2.5}$ may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and $PM_{2.5}$, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects. For burn pits, although the short-term risk for PM_{10} and for $PM_{2.5}$ was not evaluated due to no data, there were operating burn pits utilized until June 2013 at or around FOB Frontenac and vicinity – see Section 10.8. For burn pits, exposures may vary, and exposure to high levels of PM_{10} and to $PM_{2.5}$ in the smoke may also result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel (e.g., burn pit workers and any other personnel who worked at or in close proximity of the burn pits) and certain subgroups (e.g., those with pre-existing asthma/cardio-pulmonary conditions) while at this site. Although most short-term health effects from exposure to particulate matter and burn pit smoke should have resolved post-deployment, providers should be prepared to consider the relationship between deployment exposures and current complaints. Some individuals may have sought treatment for acute respiratory irritation during their time at FOB Frontenac and vicinity. Personnel who reported with symptoms or required treatment while at this site should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (*Chronological Record of Medical Care*).

Long-term health risks & medical implications:

The following hazards may be associated with potential chronic health effects in some personnel during deployment at FOB Frontenac and vicinity:

For continuous noise exposure, the long-term risk was 'High to Low.' 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 power production).

Air quality: For inhalable $PM_{2.5}$, the overall long-term risk was not evaluated due to insufficient data. The PM_{10} exposure was not evaluated for long-term risk due to no available health guidelines. However, the area was a dusty desert

environment, and conditions may have varied. In addition, for burn pits, although the long-term risk for PM_{10} was not evaluated for long-term risk due to no available health guidelines (and no data), and the risk for $PM_{2.5}$ was not evaluated due to no air sampling data available to characterize risk. There were operating burn pits utilized at or around FOB Frontenac and vicinity, and conditions may have varied – see Section 10.8. For inhalational exposure to high levels of dust, PM_{10} and $PM_{2.5}$, such as during high winds or dust storms, and for exposure to burn pit smoke, it is considered possible that some otherwise healthy personnel who were exposed for a long-term period to dust and particulate matter could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter exposures and exposures to burn pits are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits/barrels, incinerators, occupational or specific personal dosimeter data) when assessing individual concerns. Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).

Table 2. Population-Based Health Risk Estimates – FOB Frontenac and vicinity, Afghanistan [1, 2]

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
AIR			
Particulate matter less than 10 micrometers in diameter (PM_{10})	Short-term: Data quantity insufficient to characterize risk. Long-term: No health guidelines	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Data quantity insufficient to characterize risk. Long-term: No health guidelines
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Data quantity insufficient to characterize risk. Long-term: Data quality insufficient to characterize risk.	Limiting strenuous physical activities when air quality is especially poor; and action such as closing tent flaps, windows, and doors.	Short-term: Data quantity insufficient to characterize risk. Long-term: Data quantity insufficient to characterize risk.
MILITARY UNIQUE			
Non-ionizing Radiation	Short-term: Low Long-term: Low		Short-term: Low to none Long-term: Low to none
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: High (Bacterial diarrhea, Hepatitis A, Typhoid fever) to Moderate (Diarrhea-cholera, Diarrhea-protozoal, Brucellosis, Hepatitis E) to Low (FOB Frontenac Gastroenteritis/Food Poisoning, polio). If ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, Brucellosis, Hepatitis E). Long-term: Not an identified source of health risk.	Preventive measures include Hepatitis A and Typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none Long-term: No data available
Arthropod Vector Borne	Short-term: High (Malaria), to Moderate (Leishmaniasis-cutaneous, Crimean-Congo hemorrhagic fever, Typhus-miteborne, Sandfly fever) to Low (Plague, West Nile fever). Long-term: Low (Leishmaniasis-visceral infection)	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin and bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low Long-term: No data available
Water-Contact (e.g., wading, swimming)	Short-term: Moderate (Leptospirosis) Long-term: No data available	Recreational swimming in surface waters not likely in this area of Afghanistan during this time period.	Short-term: Low to none Leptospirosis Long-term: No data available
Respiratory	Short-term: Moderate [Tuberculosis (TB)] and Low (Meningococcal meningitis). Long-term: No data available	Providing adequate work and living space, medical screening, and vaccination.	Short-term: Low to none Long-term: No data available
Animal Contact	Short-term: Moderate (Rabies, Anthrax, Q-fever), Low (H5N1 Avian Influenza)	Prohibiting contact with, adoption, or feeding of feral animals in	Short-term: Low to none

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	Long-term: Low (Rabies)	accordance with U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low, if encountered, effects of venom vary with species from mild localized swelling (e.g., *Scorpiops lindberg*) to potentially lethal effects (e.g.,*Gloydius halys*).	Risk reduced by avoiding contact, proper wear of the uniform (especially footwear), 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: Not an identified source of health risk.		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: High to Moderate, high risk of heat injury in unacclimatized personnel.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Low
	Long-term: Low, However, the health 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; 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	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 were rare but could occur, especially from more serious injuries such as frostbite.		Long-term: Low; Long-term health implications from cold injuries were rare but could occur, especially from more serious injuries such as frostbite.
NOISE			
Continuous (Flightline, Power Production)	Short-term: High to Low, High risk to individuals working near major noise sources without proper hearing protection.	Hearing protection used by personnel in higher risk areas.	Short-term: Low risk to the majority of personnel and to individuals working near major noise sources who use proper hearing protection.
	Long-term: High to Low, High risk to individuals working near major noise sources without proper hearing protection.		Long-term: Low risk to the majority of personnel and to individuals working near major noise sources who use proper hearing protection.
Unique Incidents/			

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Concerns			
Waste Sites/Waste Disposal:	Short-term: Low		Short-term: Low
	Long-term: Low		Long-term: Low
General and Field Sanitation	Short-term: Low		Short-term: Low
	Long-term: None identified		Long-term: None identified
Pesticides/Pest Control	Short-term: Low	See Section 10.3	Short-term: Low
	Long-term: Low		Long-term: Low
Burn Pits	FOB Frontenac and vicinity had burn pits located either inside the fence line or outside of the fence line. No samples were collected near the burn pits to evaluate short-and long-term health risk. Short-term health effects could have included eye, nose, throat, and lung irritation. More serious effects were possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).	Control measures may have included locating burn pits downwind of prevailing winds, increased distance from living and working areas when possible, and improved waste segregation and management techniques	Long-term: Not evaluated-no available health guidelines for PM_{10}. No samples were collected near the burn pits to evaluate long-term health risk for $PM_{2.5}$ or other potential hazards.

[1] This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the general ambient and occupational environment conditions at FOB Frontenac and vicinity. It does not represent a unique individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may be present in the environment, if a person does not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may be no health risk. Alternatively, a person at a specific location may experience 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 health sampling data and reports obtained from June 2007 through July 2014. Sampling locations are assumed to be representative of exposure points for the camp population but may not reflect all the fluctuations in environmental quality or capture unique exposure incidents.

[3] This Summary Table is organized by major categories of identified sources of health risk. It only lists those sub-categories specifically identified and addressed at FOB Frontenac and vicinity. The health risks are presented as Low, Moderate, High or Extremely High for both short- and long-term health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the Army Public Health Center (Provisional) (APHC (Prov)). Where applicable, "None Identified" is used when though an exposure was identified, no health risk of either a specific short- or long-term health effects were determined. More detailed descriptions of OEH exposures that were 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 FOB Frontenac 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 residual risk after accounting for preventive controls in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures. For environmental

exposures related to airborne dust, there are limited preventive measures available, and available measures have little efficacy in reducing exposure to ambient conditions.

2 Air

2.1 Site-Specific Sources Identified

Personnel deployed to FOB Frontenac and vicinity were exposed to various airborne contaminants as identified by monitoring and sampling efforts between June 2007 and July 2014. Sources of airborne contaminants at the base camp included diesel vehicle and generator exhaust, dust from unpaved roads and surfaces, year-round construction activities, agriculture located off base, aircraft exhaust, a batch cement plant, incinerators, and burn pits. In addition, dust storms, periods of high winds, and vehicle traffic passing through moon dust (very fine silts with the consistency of talcum powder) contributed to particulate matter (PM) exposures above health-based MEGs.

2.2 Particulate Matter

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

2.3 Particulate Matter, less than 10 microns (PM_{10})

2.3.1 Exposure Guidelines:

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

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

Long-term (1-year) PM_{10} MEG ($\mu g/m^3$):

- Not defined and not available.

2.3.2 Sample data/Notes:

Sixteen valid PM_{10} air samples were collected in 2010, and from 2012-2014 for FOB Frontenac and vicinity. The range of 24-hour PM_{10} concentrations was 36 $\mu g/m^3$ to 261 $\mu g/m^3$ with an average concentration of 149 $\mu g/m^3$. There was no sampling data for 2007-2009, and 2011.

2.3.3 *Short-term and long-term health risks:*

The data quantity was insufficient to characterize the potential short- and long-term health risks from PM_{10} exposure to U.S. personnel. The U.S. Environmental Protection Agency (EPA) retracted its long-term National Ambient Air Quality Standard (NAAQS) for PM_{10} due to an inability to link chronic health effects with chronic PM_{10} exposure levels.

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

2.4.1 Exposure Guidelines:

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

- 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

2.4.2 Sample data/Notes:

Fifteen valid $PM_{2.5}$ air samples were collected from 2009-2010, and 2012-2014 for FOB Frontenac and vicinity. The range of 24-hour PM_{10} concentrations was 11 $\mu g/m^3$ to 223 $\mu g/m^3$ with an average concentration of 88 $\mu g/m^3$. There were no sampling data for 2007-2008, and 2011.

2.4.3 Short-term and long-term health risks:

The data quantity was insufficient to characterize the potential short- and long-term health risks from $PM_{2.5}$ exposure to U.S. personnel.

2.5 Airborne Metals from PM_{10} and $PM_{2.5}$

2.5.1 Sample data/Notes:

Sixteen valid PM_{10} airborne metal samples were collected at FOB Frontenac and vicinity from 2010, and 2012-2014. There were no sampling data for 2007-2009, and 2011.

Fifteen valid $PM_{2.5}$ airborne metal samples were collected at FOB Frontenac and vicinity from 2009-2010, and 2012-2014. There were no sampling data for 2007-2009, and 2011.

2.5.2 Short-term and long-term health risks:

The data quantity was insufficient to characterize the potential short- and long-term health risks from PM_{10} and $PM_{2.5}$ airborne metals exposure to U.S. personnel. However, the available samples did not identify any potential health risks.

2.6 Volatile Organic Compounds (VOCs)

The likely sources of VOCs on FOB Frontenac and vicinity were the result of fuel storage and transfers between storage tanks, vehicles and aircraft.

2.6.1 Sample data/Notes:

The health risk assessment was based on average and peak concentration of 35 valid VOCs air samples collected from FOB Frontenac and vicinity in 2010, and 2012-2013 and the likelihood of exposure. There were no sampling data for 2007-2009, 2011, and 2014.

2.6.2 Short-term and long-term health risks:

The data quantity was insufficient to characterize the potential short-term and long-term health risks from VOCs exposure to U.S. personnel. However, the available samples did not identify any potential health risks.

3 Soil

FOB Frontenac and vicinity were surrounded mostly by undeveloped land and barren desert. Soil release occurred when the surface was disturbed by vehicle traffic on unpaved roads, gusting winds from thunderstorms, and agricultural activities.

3.1 Site-Specific Sources Identified

3.1.1 Sample data/Notes:

A total of 22 valid surface soil samples were collected from 2007-2014 at FOB Frontenac and vicinity were assessed for metals, inorganic and organic chemicals, pesticides and herbicides. For the health risk assessment, personnel were assumed to remain at this location for approximately one year.

3.1.2 Short-term health risk:

Currently, sampling data for soil are not evaluated for short-term (acute) health risk.

3.1.3 Long-term health risk:

The data quantity was insufficient to characterize the potential long-term health risk from soil exposure to U.S. personnel. However, no parameters exceeded 1-year Negligible MEGs in the available samples.

4 Water

In order to assess the risk to U.S. personnel from exposure to water in theater, the APHC (Prov) identified the most probable exposure pathways based on available information. The water exposures considered were the ingestion of water used for drinking and the use of water for non-drinking purposes (such as personal hygiene, or showering).

4.1 Drinking Water

4.1.1 Site-Specific Sources Identified:

Water used as drinking water was from bottled water. The bottle water brands used at FOB Frontenac and vicinity were Kinley®, Cristal®, and Quench®. There were no drinking water samples from FOB Frontenac and vicinity.

4.1.2 *Short-term and long-term health risks:*

Not evaluated because drinking water samples were not available.

4.2 Water: Used for Other Purposes (Personal Hygiene, Showering, etc.)

4.2.1 Site-Specific Sources Identified:

U.S. personnel used the Reverse Osmosis Water Purification Unit (ROWPU)-treated water supply and raw well water at FOB Frontenac and vicinity for non-drinking purposes (i.e., personal hygiene, and showering, etc.).

4.2.2 Sample data/Notes:

Forty-six samples taken in 2007-2014 represented non-drinking water exposures at FOB Frontenac and vicinity.

4.2.3 Short-term health risk:
The data quantity was insufficient to characterize the potential short-term health risk from non-drinking water exposure to U.S. personnel. However, based on the available samples, in 2008 and 2009, sulfate (867 milligrams per liter (mg/L) and 917 mg/L, respectively) exceeded its14-day 5L/day Negligible MEG (750 mg/L) for short-term health risk.

4.2.4 Long-term health risk:
Based on the available non-drinking water samples, the environmental health risk assessment identified dichloroacetic acid, chloride, chromium, magnesium, sulfate, thallium, and trichloroacetic acid as potential long-term health hazards. Long-term MEGs are not available for dichloroacetic acid, chloride, chromium, magnesium, sulfate, thallium, and trichloroacetic acid, therefore long-term health risk associated with these chemicals could not be evaluated.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons:

No specific hazard sources were documented in Defense Occupational and Environmental Health Readiness System (DOEHRS) or the Military Exposure Surveillance Library (MESL) data portal from the June 2007 through July 2014 timeframe (References 1 and 8).

5.2 Depleted Uranium (DU):

No specific hazards were documented in DOEHRS or MESL data portals from the June 2007 through July 2014 timeframe. According to the DOD, depleted uranium has not been used in Afghanistan (References 1 and 8).

5.3 Ionizing Radiation:

No specific hazards were documented in DOEHRS or MESL data portals from the June 2007 through July 2014 timeframe (References 1 and 8).

5.4 Non-Ionizing Radiation:

There were several sources of non-ionizing radiation at FOB Frontenac and vicinity. There were multiple communication antennas and satellite dishes located throughout the camp, as well as Counter Remote Control Improvised Explosive Device (CIED) Electronic warfare (CREW) Systems in the convoy vehicles and possibly soldier backpacks. Available documentation did not identify any non-ionizing radiation related injuries.

Short-term and long-term health risks: Low, with a medium confidence level.

6 Endemic Diseases[1]

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. In addition, site-specific information from the MESL database was used. CENTCOM Modification (MOD) 12 (Reference 9) lists deployment requirements, to include immunization and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Food borne and Waterborne Diseases

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

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

6.1.1 FOB Frontenac Gastroenteritis/Food Poisoning

Low: A MESL data search found several facility inspection documents and basecamp assessments. Deficiencies identified from the inspection documents and basecamp assessments included:

- Filth fly issue in the dining area of DFAC;
- Potentially hazardous foods not held at correct temperatures;
- Food lying on the floor instead of on pallets;
- Food with expired dates;
- Overflow of raw sewage;
- Lack of equipment; and
- Employee hygiene (glove use/hand wash).

6.1.2 Diarrheal diseases (bacteriological)

High, mitigated to Low: Unmitigated health risk to U.S. personnel was high year round. Diarrheal diseases (bacteriological) could be expected to temporarily incapacitate a very high percentage of

[1] NOTE: "Risk" level refers to both severity of disease (without controls, for example vaccinations) and probability of disease based on local rates/endemic status. Diseases described are those presenting greater risk when compared with U.S. conditions. Most identified disease risks can and are being mitigated with military preventive medicine measures/policies.

personnel (potentially over 50 percent per month) within days if local food, water, or ice was consumed. Field conditions (including lack of hand washing and primitive sanitation) may facilitate person-to-person spread and epidemics. Typically, these result in mild disease treated in outpatient setting; recovery and return to duty in less than 72 hours with appropriate therapy. A small proportion of infections may require greater than 72 hours limited duty, or hospitalization.

6.1.3 Hepatitis A

High, mitigated to Low: Unmitigated health risk to U.S. personnel was high year round. U.S. Personnel did not drink untreated water, and vaccination for Hepatitis A is required for deployment into the CENTCOM Area of Responsibility (AOR). Hepatitis A typically occurs after consumption of fecally contaminated food or water or through direct fecal-oral transmission under conditions of poor hygiene and sanitation. Field conditions (including primitive sanitation, lack of hand washing) may facilitate outbreaks driven by person-to-person spread. A typical case involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more.

6.1.4 Typhoid/paratyphoid Fever

High, mitigated to Low: Unmitigated health risk to U.S. personnel was high year round. Risk was typically highest following spring floods. Typhoid and paratyphoid fever are acquired through the consumption of fecally contaminated food or water. The two diseases are clinically similar, and in areas where they are endemic, typhoid typically accounts for 90 percent of cases. Asymptomatic carriers are common with typhoid and contribute to sustained transmission. In countries with a mixture of primitive and modern sanitation and hygiene, outbreaks of typhoid fever can occur and may involve all age groups. A small number of cases (less than 1% per month attack rate) could occur among unvaccinated personnel consuming local food, water, or ice. With appropriate treatment, typhoid and paratyphoid fever are debilitating febrile illnesses typically requiring 1 to 7 days of supportive care, followed by return to duty.

6.1.5 Diarrhea - protozoal

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. In general, *Cryptosporidium* spp., *Entamoeba histolytica*, and *Giardia lamblia* were the most common protozoal causes of diarrhea wherever sanitary conditions were significantly below U.S. standards. A small number of cases (less than 1% per month attack rate) could occur among personnel consuming local food, water, or ice. Outbreaks affecting a higher percentage of personnel were possible with *Cryptosporidium*. Symptomatic cases may vary in severity; typically mild disease demonstrating recovery and return to duty in less than 72 hours with appropriate therapy; severe cases may require 1 to 7 days of supportive care, followed by return to duty.

6.1.6 Brucellosis

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Brucellosis is a common disease in cattle, sheep, goats, swine, and some wildlife species in most developing countries. Humans contract brucellosis through consumption of contaminated dairy products (or foods made with such products) or by occupational exposures to infected animals. The health risk from direct animal contact was likely to be highest in rural areas where livestock were present. The health risk from contaminated dairy products exists countrywide, including urban areas. Rare cases (less than 0.1% per month attack rate) could occur among personnel consuming local dairy products or having direct contact with livestock. With appropriate treatment, brucellosis is a febrile illness of variable severity, potentially requiring inpatient care; convalescence is usually over 7 days even with appropriate treatment.

6.1.7 Diarrhea - Cholera

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Development of symptomatic cholera requires exposure to large inoculums and typically is associated with ingestion of heavily contaminated food or water. Person-to-person spread of cholera occurs very infrequently, if at all. The majority of infections (75 percent or more, depending on biotype) among healthy adults are very mild or asymptomatic. Only a small percentage of infections are severe. Because cholera frequently causes serious public health impact, cholera cases are more likely to be reported under the International Health Regulations than other types of diarrhea. Rare cases (less than 0.1% per month attack rate) could occur among personnel consuming local food, water, or ice. Most symptomatic cases are mild, with recovery and return to duty in less than 72 hours on appropriate outpatient treatment; severe cases may require 1-7 days of supportive or inpatient care, followed by return to duty.

6.1.8 Hepatitis E

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Risk was typically highest following spring floods. Hepatitis E occurs in four major genotypes. Genotypes 1 and 2, found primarily in Africa and Asia, cause large numbers of sporadic cases, as well as large outbreaks. Fecal contamination of drinking water is the most common source of exposure for these genotypes. Large outbreaks are usually associated with particularly severe breakdowns in baseline sanitation, as often occurs during heavy rainfall which increases mixing of sewage and drinking water sources. Secondary household cases from person-to-person transmission are uncommon. Unlike hepatitis A, where local populations living in poor sanitary conditions were usually highly immune from childhood exposures, immunity levels for hepatitis E were often much lower, even in areas of extremely poor sanitation. Typically, outbreaks of hepatitis E occur primarily among adults. Although data are insufficient to assess potential disease rates, we cannot rule out rates approaching 1 percent per month among personnel consuming local food, water, or ice. Rates may exceed 1 percent per month for personnel heavily exposed during outbreaks in the local population. Typical case involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more.

6.1.9 Polio

Low: Potential health risk to U.S. personnel is Low. Despite a concerted global eradication campaign, poliovirus continues to affect children and adults in Afghanistan. Polio is a highly infectious disease that invades the nervous system. The virus is transmitted by person-to-person, typically by hands, food or water contaminated with fecal matter or through direct contact with the infected person's saliva. An infected person may spread the virus to others immediately before and about 1 to 2 weeks after symptoms appear. The virus can live in an infected person’s feces for many weeks. About 90% of people infected have no symptoms, and about 1% have a very severe illness leading to muscle weakness, difficulty breathing, paralysis, and sometimes death. People who do not have symptoms can still pass the virus to others and make them sick.

6.1.10 Short-term health risk:

Low: The overall short-term unmitigated health risk associated with other food borne and waterborne diseases at FOB Frontenac and vicinity was considered high (bacterial diarrhea, hepatitis A, typhoid fever), to moderate (diarrhea-protozoal, diarrhea-cholera, brucellosis, Hepatitis E), to low (FOB Frontenac and vicinity gastroenteritis/Food poisoning, polio) if local food or water was consumed. Preventive Medicine measures reduced the risk to low. Confidence in the risk estimate was medium.

6.1.11 Long-term health risk:
None identified based on available data. Confidence in the risk estimate was medium.

6.2 Arthropod Vector-Borne Diseases

During the warmer months (typically from April through November), the climate and ecological habitat support populations of arthropod vectors, including mosquitoes, ticks, and sandflies, with variable rates of disease transmission. Significant disease transmission is sustained countrywide, including urban areas. Mitigation strategies were in place and included proper wear of treated uniforms, application of repellent to exposed skin, and use of bed nets and chemoprophylaxis (when applicable). Additional methods included the use of pesticides, reduction of pest/breeding habitats, and engineering controls.

6.2.1 Malaria
High, mitigated to Low: Unmitigated health risk to U.S. personnel was high with seasonal transmission (April-November). Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems, which provide breeding habitats for vectors. Malaria incidents can 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, and fatalities can occur. Note: antimalarials are required for U.S. personnel deploying to Afghanistan.

6.2.2 Sandfly fever
Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (March-November). Sandfly fever potential disease rates are from 1% to 10% per month under worst-case conditions. Mitigation measures reduced the risk to low. The disease is transmitted by sandflies and occurs more commonly in children though adults are still at risk. Sandfly fever disease typically resulted in debilitating febrile illness requiring 1 to 7 days of supportive care followed by return to duty.

6.2.3 Leishmaniasis
Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (March-November). Leishmaniasis is transmitted by sand flies. There are two forms of the disease; cutaneous (acute form) and visceral (a more latent form of the disease). The leishmaniasis parasites may survive for years in infected individuals and this infection may go unrecognized by physicians in the U.S. when infections become symptomatic years later. Cutaneous infection is unlikely to be debilitating, though lesions may be disfiguring. Visceral leishmaniasis disease can cause severe febrile illness, which typically requires hospitalization with convalescence over 7 days.

6.2.4 Crimean-Congo hemorrhagic fever
Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round (peak exposure March-November). 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%.

6.2.5 Typhus-miteborne (scrub typhus)
Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. 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 that 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.

6.2.6 Sandfly fever

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (March-November). Sandfly fever potential disease rates can range from 1% to 10% per month under worst-case conditions. Mitigation measures reduced the risk to low. The disease is transmitted by sandflies and occurs more commonly in children though adults are still at risk. Sandfly fever disease typically resulted in debilitating febrile illness requiring 1 to 7 days of supportive care followed by return to duty.

6.2.7 Plague

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

6.2.8 West Nile fever

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (March-November). West Nile fever was present and maintained by the bird population and mosquitoes that help to transfer the diseases from birds to humans. The majority of infections in young, healthy adults are asymptomatic although it can result in fever, headache, tiredness, and body aches, occasionally with a skin rash (on the trunk of the body) and swollen lymph glands. West Nile fever is a febrile illness typically requiring 1-7 days of inpatient care followed by return to duty; convalescence may be prolonged.

6.2.9 Short-term health risk:

Low: The overall short-term unmitigated health risk associated with arthropod vector-borne diseases at FOB Frontenac and vicinity was considered high (malaria) to moderate (sandfly fever, leishmaniasis (cutaneous and visceral), typhus-miteborne and Crimean-Congo hemorrhagic fever) to low (West Nile fever, and plague). Health risk is reduced to low by proper wear of the uniform, application of repellent to exposed skin, and appropriate chemoprophylaxis. Confidence in the risk estimate was medium (Reference 4, Table 3-6).

6.2.10 Long-term health risk:

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

6.3 Water Contact Diseases

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

6.3.1 Leptospirosis

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (March-November). Leptospirosis is present in Afghanistan but at unknown levels. Human infection occurs through exposure to water or soil contaminated by infected animals and has been 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 pass directly into surface waters. *Leptospira* can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Ingestion of contaminated water can also lead to infection. The acute generalized illness associated with infection can 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.

6.3.2 *Short-term health risk:*

Low: The overall short-term unmitigated health risk associated with water contact diseases at FOB Frontenac and vicinity was considered moderate (for leptospirosis). Preventive measures such as avoiding water contact and recreational water activities; and protective coverings for cuts/abraded skin reduced the health risk to low to none. Confidence in the risk estimate was medium.

6.3.3 *Long-term health risk:*

None identified based on available data. Confidence in the risk estimate was medium.

6.4 Respiratory Diseases

Although not specifically assessed in this document, deployed U.S. Forces may be exposed to a wide variety of common respiratory infections in the local population. These include influenza, pertussis, viral upper respiratory infections, viral and bacterial pneumonia, and others. The U.S. military populations living in close-quarter conditions are at risk for substantial person-to-person spread of respiratory pathogens. Influenza is of particular concern because of its ability to debilitate large numbers of unvaccinated personnel for several days. Mitigation strategies were in place and included routine medical screenings, vaccination, enforcing minimum space allocation in housing units, implementing head-to-toe sleeping in crowded housing units, implementation of proper personal protective equipment (PPE) when necessary for healthcare providers and detention facility personnel. Additional mitigation included active case isolation in negative pressure rooms, where available.

6.4.1 Tuberculosis (TB)

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Tuberculosis (TB) is usually transmitted through close and prolonged exposure to an active case of pulmonary or laryngeal TB, but can also occur with incidental contact. The risk of TB in U.S. Forces varies with individual exposure. The Army Surgeon General has defined increased risk in deployed Soldiers as indoor exposure to locals or third country nationals of greater than one hour per week in a highly endemic active TB region.

6.4.2 Meningococcal meningitis

Low: Unmitigated health risk to U.S. personnel was low year round. Meningococcal meningitis is transmitted from person to person through droplets of respiratory or throat secretions. Risk is comparable to the U.S. among unvaccinated personnel who have close contact with the local population. Close and prolonged contact facilitates the spread of this disease. Meningococcal meningitis is a potentially very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases.

6.4.3 Short-term health risk:

Low: The overall short-term unmitigated health risk associated with respiratory diseases at FOB Frontenac and vicinity was considered moderate (for tuberculosis) to low (for meningococcal meningitis). Preventive measures reduced the health risk to low. Confidence in the risk estimate was medium.

6.4.4 Long-term health risk:

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

6.5 Animal-Contact Diseases

6.5.1 Rabies

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs were 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 10). Laboratory results indicated the Soldier was infected from contact with a dog while deployed. Although, the vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1B, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Q-Fever

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Rare cases were possible among personnel exposed to aerosols from infected animals, with clusters of cases possible in some situations. Significant outbreaks (affecting 1-50 percent) could 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. Q-Fever is a debilitating febrile illness, sometimes presenting as

pneumonia, typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies include consuming approved food sources, avoidance of animals and farms, dust abatement when working in these areas (wet mop, water sprayed on high volume traffic areas, etc.), and proper PPE for personnel working with animals.

6.5.3 Anthrax

Low: Unmitigated health risk to U.S. personnel was low year round. Cutaneous and gastrointestinal anthrax are the most common forms of naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat can result in contracting gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of spores and is extremely rare. Cutaneous anthrax typically requires 1 to 7 days of supportive care with subsequent return to duty; gastrointestinal anthrax typically requires hospitalization, and has a high fatality rate if untreated. Mitigation strategies include consuming approved food sources, avoidance of animals and farms, dust abatement when working in these areas (wet mop, water sprayed on high volume traffic areas, etc.), and proper PPE for personnel working with animals, and immunization.

6.5.4 H5N1 avian influenza

Low: Unmitigated health risk to U.S. personnel was low year round. Extremely rare cases could occur in U.S. personnel who have close contact with birds or poultry infected with H5N1. H5N1 is a very severe illness. The fatality rate is higher than 50 percent in symptomatic cases. Mitigation strategies include avoidance with birds/poultry and proper cooking temperatures for poultry products.

6.5.5 Short-term health risk:

Low: The overall short-term unmitigated health risk associated with animal contact diseases at FOB Frontenac and vicinity was considered moderate (for rabies, Q-fever) to low (for anthrax, H5N1 avian influenza). Preventive measures reduced the health risk to low. Confidence in risk estimate was medium.

6.5.6 Long-term health risk:

Low: The long-term risk for rabies is low because the incubation period for rabies can be several years in rare cases.

7 Venomous Animal/Insect

All information was taken directly from the Armed Forces Pest Management Board (Reference 11) and the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 12). The species listed below have home ranges that overlap the location of FOB Frontenac and vicinity, and may present a health risk if they are encountered by personnel.

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. 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 monody, Orthochirus pallidus, Orthochirus samrchelsis*, *Orthochirus scrobiculosus,* and *Sassanidotus gracilis*: 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.

- *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.

- *Scorpiops afghanus, 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.

7.3 Snakes

- *Echis carinatus multisquamatus* (central Asian saw-scaled viper), *Echis carinatus 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.

- *Eristocophis mcmahoni* (McMahon's Viper): Severe envenoming possible, potentially lethal. Venom shows strong hemorrhagic activity. Mild to Moderate neurotoxic effects may occur.

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

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

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

- *Bungarus caeruleus* (Common krait): Severe envenoming likely, high lethality potential. Krait bites can cause moderate to severe flaccid paralysis, respiratory failure, requiring intubation & ventilation in severe cases. Most victims bitten while asleep in huts at night. Bites may produce invisible or barely perceptible puncture marks. Human mortality rate is high without use of antivenom. Antivenom may prevent worsening of paralysis, but may not reverse established paralysis.

- *Gloydius himalayanus* (Himalayan pit viper), *Gloydius intermedius* (Central Asian pitviper): Potentially lethal envenoming, though unlikely, cannot be excluded. Bites cause local and sometimes systemic effects including necrosis, coagulopathy, and renal failure.

7.4 Short-term health risk:

Low: If encountered, effects of venom vary with species from mild localized swelling (e.g., widow spider) to potentially lethal effects (e.g., Haly's Pit Viper). See effects of venom above. Mitigation strategies included avoiding contact, proper wear of uniform (especially footwear), and timely medical

treatment. Confidence in the health risk estimate is low (Reference 4, Table 3-6).

7.5 Long-term health risk:
None identified.

8 Heat/Cold Stress

Between May and September, the average daily maximum temperature reached the low 90s degrees Fahrenheit (ºF), and the high may reach the low 120s ºF. In winter, the average temperature was in the mid-50s ºF, and the temperature occasionally dropped below freezing. The mean annual average precipitation was 3.5 inches, with the majority of the recorded precipitation occurring in February and March. Heat stress/injuries and cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone (Reference 13).

8.1 Heat

8.1.1 Short-term health risk:
High. The short-term risk of heat injury is high in unacclimated personnel. Risk is reduced to moderate through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring Wet Bulb Glove Temperature (WBGT) (Reference 4, Table 3-6).

8.1.2 Long-term health risk:
Low. The long-term risk is low. However, the risk may be greater to 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 can occur–especially from more serious heat injuries such as heat stroke. It is possible that high heat in conjunction with various chemical exposures can increase long-term health risks, though specific scientific evidence is not conclusive. Confidence in these risk estimates is medium (Reference 4, Table 3-6).

8.2 Cold

Short-term and long-term health risks: **Low.** The risk of cold injury was low. Confidence in this risk estimate was medium.

9 Noise

9.1 Continuous:

FOB Frontenac and vicinity had commercial and tactical generators throughout the FOB. In addition, helicopters and small cargo aircrafts contributed to noise levels.

Short-term and long-term risks: **Low**. The unmitigated health risk was high for individuals working near major noise sources without proper hearing protection. Risk was reduced to low through use of proper hearing protection. Confidence in risk estimate was medium.

9.2 Impulse:

No specific hazards were documented in DOEHRS or MESL data portals from the June 2007 through July 2014 timeframe (References 1 and 8).

10 Other Unique Occupational Hazards

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 that 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 exposures 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 Fuel/Petroleum Products/Industrial Chemical Spills

Large, dark rubber fuel bladders and aboveground storage tanks were located on FOB Frontenac and vicinity. Several reports identified fuel spills and petroleum, oil and lubricant (POL) spills throughout the base camps. However, information was not available on whether the spills were remediated.

10.3 Pesticides/Pest Control

Several reports for food and general sanitation documented issues with flies, rodents, mosquitoes, ants, mice, and possible ticks and fleas from feral animals. Personnel employed personal protective measures such as wearing permethrin-treated clothing, applying a topical insect repellent to exposed skin, using bed nets, or taking prescribed chemoprophylaxis (for Malaria). Pretreated uniforms were standard issue.

A search of the MESL database indicated that contractors or Army personnel oversaw pest management control depending on the basecamp. The reports identified rodent bait stations, fly baits and snap traps were used. For each pesticide product applied during this period, the EPA approved label has been archived, providing a framework how each pesticide handled and applied. There were no reports that indicated accidents, misuse, misapplication or other hazards associated with pesticides use.

Short-term and long-term risks: **Low**. Confidence in this risk estimate was low to medium.

10.4 Waste Sites/Waste Disposal

10.4.1 Hazardous and Non-hazardous Waste

A search of the MESL database identified some of the basecamps had burn pits for disposal of solid waste and regulated medical waste. For some of the basecamps, solid waste was collected and hauled off site daily by local national contractors. POL waste from the basecamps was shipped to Kandahar Air Base for disposal or burned in dedicated burn barrels.

Short-term and long-term health risks: **Low**. Confidence in the risk estimate was medium.

10.4.2 Solid Waste Management

A search of the MESL database identified uncovered and/or overflowing solid waste receptacles as an issue. Burn pits were used for waste disposal at some of the basecamps.

Short-term health risk: **Low**. Improper solid waste storage, uncovered and/or overflowing solid waste receptacles attracts flies, rodent, dogs and cats that could cause an outbreak of disease.

Long-term health risk: Improper solid waste storage presented a low health risk.

The overall risk estimate for solid waste management was low.

10.5 General and Field Sanitation

Several reports from the databases were assessed for waste collection/storage; latrine, shower and laundry facilities; hand washing stations; sanitary practices in barber/beauty shops and gymnasiums; living accommodations; and vector/pest problems. Several basecamp assessments identified sanitation concerns at FOB Frontenac and vicinity. These included insect/rodent control/flies; living space allocation; feral animals, primarily cats and dogs migrating onto FOB; standing water; and ripped/torn gym equipment.

Short-term health risk: **Low:** Preventive measures such as trash disposal education; Soldiers policing up after themselves; disinfecting gym equipment; pop-up sleeping nets; and removing stray animals reduced the health risk.

Long-term health risk: None identified based on available data.

The overall risk estimate was low.

10.6 Lead- based Paint

No specific hazards were documented in DOEHRS or MESL data portals from the June 2007 through July 2014 timeframe.

10.7 Asbestos

No specific hazards were documented in DOEHRS or MESL data portals from the June 2007 through July 2014 timeframe.

10.8 Burn Pits

A search of the MESL and Occupational and Environmental Health Site Assessments (OEHSAs)identified several of the basecamps had burn pits up until June 2013. The operational timelines were not available for the burn pits. However, air samples were not collected near the burn pits. Short- and long-term health risks could not be assessed.

While not specific to FOB Frontenac and vicinity, the consolidated epidemiological and environmental sampling and studies on burn pits that have been conducted as of the date of this publication have been unable to determine whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Reference 14). The Institute of Medicine committee's (Reference 14) review of the literature and the data suggests that service in Iraq or

Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g., those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit. Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes. Individually, the chemicals measured at burn pit sites in the study were generally below concentrations of health concern for general populations in the United States. However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn pit emissions and emissions from other sources.

11 References[2]

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

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

3. Joint Staff Memorandum (MCM) 0028-07, Procedures for Deployment Health Surveillance, 2012.

4. USAPHC TG230, June 2013 Revision, Final Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel TG230.

5. Occupational and Environmental Health Site Assessment, FOB Frontenac, Afghanistan, July 2010.

6. Occupational and Environmental Health Site Assessment, Base Camp Mien Shuyans, Afghanistan, 20 June 2012-21 June 2012.

7. Occupational and Environmental Health Site Assessment, Base Camp Durham, Afghanistan, 29 June 2012-30 June 2012.

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

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

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

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

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

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

13. 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.

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