Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS): Forward Operating Base Farah and vicinity, Afghanistan
Calendar Years: (2004 to 2013)

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

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Forward Operating Base (FOB) Farah, Provincial Reconstruction Team (PRT) Chaghcharan, FOB Leimbach, Joint Combat Outpost (JCOP) Pusht-Rod, FOB Rescorla, FOB Shewan Garrison, FOB Bakwa, JCOP Dukin, FOB Heredia, Khak-E-Safed, JCOP Masaw, Pasaw, Provincial Reconstruction and Development Center (PRDC), Snow, and Camp Sayar, Afghanistan. It presents a qualitative summary of OEH risks identified at this location and their potential medical implications. The report is based on information collected from 02 May 2004 through 18 September 2013 to include deployment OEHS 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 Farah 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 02 May 2004 through 18 September 2013.

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

SITE DESCRIPTION:

FOB Farah was a forward operating base for U.S. and Italian personnel located in southwestern Afghanistan near the Farah River. The region surrounding FOB Farah consists of mostly undeveloped land and barren desert. FOB Farah is surrounded by mountains at 650 meters (2,133 feet) above sea level. This POEMS also addresses FOB Leimbach, JCOP Pusht-Rod, FOB Rescorla, and FOB Shewan because they were located in relative close proximity to FOB Farah. FOB Rescorla is located north of FOB Farah. JCOP Pusht-Rod, Dukin and FOB Shewan are located 25 miles, 25 miles and 15 miles, respectively, from FOB Farah. Chagcharan is located in Ghor Province and is 318 miles from FOB Farah. Bakwa and Khak-E-Safed are located 55 miles and 45 miles, respectively, from FOB Farah. This POEMS document consist of six additional basecamps. The proximity of the other basecamps relative to FOB Farah was not identified in documents.

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 Farah and vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risk were factored into this assessment. In some cases, e.g., ambient air, specific controls are noted, but not routinely available/feasible.

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

Short-term health risks & medical implications:

The following hazards may be associated with potential acute health effects in some personnel during deployment at FOB Farah 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. 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 major sources of continuous noise such as flightline (e.g., helicopters and cargo aircraft) and power production (e.g., generators)).

Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust, the PM_{10} overall short-term risk was 'Low' for FOB Farah and vicinity. For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the $PM_{2.5}$ overall short-term risk was 'Low' for FOB Farah and vicinity. However, the entire FOB Farah and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic. Consequently, exposures to PM_{10} and $PM_{2.5}$ may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and $PM_{2.5}$, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects. For FOB Farah and vicinity, the PM_{10} and the $PM_{2.5}$ overall short-term risks specifically for burn pits were not evaluated due to 'insufficient environmental samples collected near burn pits provided for analysis' – see Section 10.7. For burn pits, exposures may vary, and exposure to high levels of PM_{10} and to $PM_{2.5}$ in the smoke may also result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups while at this site. Although most short-term health effects from exposure to particulate matter and burn pit smoke should have resolved post-deployment, providers should be prepared to consider the relationship between deployment exposures and current complaints. Some individuals may have sought treatment for acute respiratory irritation during their time at FOB Farah 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 Farah 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 major sources of continuous noise such as flightline (e.g., helicopters and cargo aircraft) and power production (e.g., generators)).

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the overall long-term risk was 'Low' for FOB Farah and vicinity. Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust was not evaluated for long-term risk due to no available health guidelines. However, the entire FOB Farah and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic, and conditions may have varied. For burn pits, the PM_{10} and the $PM_{2.5}$ overall long-term risks were not evaluated at the burn pit locations at FOB Farah and vicinity due to 'insufficient environmental samples collected near burn pits provided for analysis' and due to no available health guidelines for PM_{10} - see Section 10.7. However, burn pit exposures may vary, as conditions may have varied. For inhalational exposure to high levels of dust, PM_{10} and $PM_{2.5}$, such as during high winds

or dust storms, and for exposure to burn pit smoke, it is considered possible that some otherwise healthy personnel who were exposed for a long-term period to dust and particulate matter while at FOB Farah and vicinity could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter exposures and exposures to burn pits are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits/barrels, incinerators, occupational or specific personal dosimeter data) when assessing individual concerns. Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).

Table 2. Population-Based Health Risk Estimates – FOB Farah 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: Low, Daily levels vary acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/existing respiratory diseases).	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low, Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/existing respiratory diseases).
	Long-term: No health guidelines		Long-term: No health guidelines
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Low. A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low. A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: Low. 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).
Military Unique			
Non-ionizing Radiation	Short-term: Low		Short-term: Low
	Long-term: Low		Long-term: Low
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: Variable; High (bacterial diarrhea, hepatitis A, typhoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E) to Low (FOB Farah 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, hepatitis E, brucellosis).	Preventive measures include Hepatitis A and Typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none
	Long-term: none identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable; High (malaria), to Moderate (leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne) to Low (plague, West Nile fever).	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low (leishmaniasis-visceral infection.		Long-term: No data available
Water-Contact (e.g. wading, swimming)	Short-term: Moderate (leptospirosis).	Recreational swimming in surface waters not likely in this area of Afghanistan during this time period.	Short-term: Low (leptospirosis).
	Long-term: No data available		Long-term: No data available
Respiratory	Short-term: Variable; Moderate	Providing adequate living	Short-term: Low

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	(tuberculosis (TB)) to Low (meningococcal meningitis).	and work space; medical screening; vaccination.	
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Variable; Moderate (rabies, anthrax, Q-fever) to Low (H5N1 avian influenza).	Prohibiting contact with, adoption, or feeding of feral animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: No data available
	Long-term: Low (Rabies)		Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. *Scorpiops lindbergi*) 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 lindbergi*) to potentially lethal effects (e.g. *Gloydius halys*).
	Long-term: No data available		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High for May-September, and Low for all other months.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Variable; Risk of heat injury in unacclimatized or susceptible personnel is Moderate for May-September and Low for all others.
	Long-term: Low, The long-term risk was Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.		Long-term: Low, The long-term risk is Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.
Cold	Short-term: Low risk of cold stress/injury.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper wear of issued protective clothing.	Short-term: Low risk of cold stress/injury.
	Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.		Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.
NOISE			
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.

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Unique Incidents/ 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 10.4	Short-term: Low
	Long-term: Low		Long-term: Low
Burn Pits	FOB Farah and vicinity had burn pits located either inside the fence line (JCOP Pusht-Rod) or outside of the fence line (FOB Farah, FOB Leimbach, FOB Rescorla, and FOB Shewan) that were used to dispose of garbage/rubbish. Insufficient environmental samples were collected near the burn pit 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}. Not enough samples taken near the burn pit to evaluate long-term health risk for $PM_{2.5}$.

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at FOB Farah 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 health sampling data and reports obtained from through May 2004 through September 2013. 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 Farah and vicinity. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the Army Public Health Center (Provisional) (APHC (Prov)). Where applicable, "None Identified" is used when though a potential exposure is identified, and no health risks of either a specific acute or chronic health effects are determined. More detailed descriptions of OEH exposures that are evaluated but determined to pose no health risk are discussed in the following sections of this report.

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

1 Discussion of Health Risks at FOB Farah 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

FOB Farah was situated in a dusty semi-arid desert environment. Inhalational exposure to high levels of dust and particulate matter (PM), such as during high winds or dust storms, may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) are at greatest risk of developing notable health effects.

2.2 Particulate matter

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

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

2.3.1 Exposure Guidelines:

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

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

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

- Not defined and not available.

2.3.2 Sample data/Notes:

A total of 32 valid PM_{10} air samples were collected from 2009-2012. The range of 24-hour PM_{10} concentrations was 23 $\mu g/m^3$ – 402 $\mu g/m^3$ with an average concentration of 98 $\mu g/m^3$.

FOB Farah: A total of 13 valid PM_{10} air samples were collected from 2009-2012. The range of 24-hour PM_{10} concentrations was 33 $\mu g/m^3$ – 402 $\mu g/m^3$ with an average concentration of 137 $\mu g/m^3$.

Bakwa: One valid PM_{10} air sample was collected from 2012. The 24-hour PM_{10} concentration was 89 $\mu g/m^3$.

PRT Chaghcharan: A total five valid PM_{10} air samples were collected from 2010. The range of 24-hour PM_{10} concentrations was 7 $\mu g/m^3$ – 65 $\mu g/m^3$ with an average concentration of 39 $\mu g/m^3$.

FOB Leimbach: A total of three valid PM_{10} air samples were collected from 2010-2011. The range of 24-hour PM_{10} concentrations was 88 $\mu g/m^3$ – 116 $\mu g/m^3$ with an average concentration of 99 $\mu g/m^3$.

JCOP Pusht-Rod: A total of two valid PM_{10} air samples were collected from 2010. The range of 24-hour PM_{10} concentrations was 67 $\mu g/m^3$ – 74 $\mu g/m^3$ with an average concentration of 71 $\mu g/m^3$.

FOB Rescorla: A total of two valid PM_{10} air samples were collected from 2011. The range of 24-hour PM_{10} concentrations was 67$\mu g/m^3$ – 119 $\mu g/m^3$ with an average concentration of 93 $\mu g/m^3$.

FOB Shewan: A total of six valid PM_{10} air samples were collected from 2010-2011. The range of 24-hour PM_{10} concentrations was 64 $\mu g/m^3$ – 104 $\mu g/m^3$ with an average concentration of 77 $\mu g/m^3$.

There were no sampling data for 2004-2008 and 2013.

2.3.3 Short-term health risk:

Low: The short-term PM_{10} health risk assessment estimate was low based on typical and peak PM_{10} concentrations, and the likelihood of exposure at these hazard severity levels. A low short-term health risk assessment estimate for typical and peak PM_{10} exposure concentrations at FOB Farah and vicinity suggested the expected losses may have little or no impact on accomplishing the mission (Reference 4, Table 3-2). Daily average health risk levels for PM_{10} show no hazard for 94% and low health risk for 6% of the time.

The hazard severity was negligible for the average and highest observed PM_{10} sample concentrations. The results indicated that a few personnel may have experienced notable eye, nose, and throat irritation; most personnel may experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated (Reference 4, Table 3-10).

2.3.4 Long-term health risk:

Not Evaluated-no available health guidelines. The U.S. Environmental Protection Agency (EPA) has retracted its long-term National Ambient Air Quality Standards (NAAQS) for PM_{10} due to an inability to clearly link chronic health effects with chronic PM_{10} exposure levels.

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

2.4.1 Exposure Guidelines:

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

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

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

- Negligible MEG = 15
- Marginal MEG = 65

2.4.2 Sample data/Notes:

A total of 32 valid $PM_{2.5}$ air samples were collected from 2009-2010 and 2012-2013. The range of 24-hour $PM_{2.5}$ concentrations was 3 $\mu g/m^3$ – 108 $\mu g/m^3$ with an average concentration of 40 $\mu g/m^3$.

Bakwa: One valid $PM_{2.5}$ air sample was collected in 2012. The 24-hour $PM_{2.5}$ concentration was 19 $\mu g/m^3$.

PRT Chaghcharan: A total of six valid $PM_{2.5}$ air samples were collected from 2010-2012. The range of 24-hour $PM_{2.5}$ concentrations was 26 $\mu g/m^3$ – 62 $\mu g/m^3$ with an average concentration of 45 $\mu g/m^3$.

FOB Farah: A total of 13 valid $PM_{2.5}$ air samples were collected from 2009-2013. The range of 24-hour $PM_{2.5}$ concentrations was 14 $\mu g/m^3$ – 96 $\mu g/m^3$ with an average concentration of 42 $\mu g/m^3$.

Heredia: One valid $PM_{2.5}$ air samples was collected in 2013. The 24-hour $PM_{2.5}$ concentration was 108 $\mu g/m^3$.

FOB Leimbach: A total of three valid $PM_{2.5}$ air samples were collected from 2009-2012. The range of 24-hour $PM_{2.5}$ concentrations was 3 $\mu g/m^3$ – 56 $\mu g/m^3$ with an average concentration of 29 $\mu g/m^3$.

FOB Pusht-Rod: A total of four valid $PM_{2.5}$ air samples were collected in 2010. The range of 24-hour PM2.5 concentrations was 18 $\mu g/m^3$ – 60 $\mu g/m^3$ with an average concentration of 37 $\mu g/m^3$.

FOB Shewan: A total of four valid $PM_{2.5}$ air samples were collected in 2010. The range of 24-hour PM2.5 concentrations was 18 $\mu g/m^3$ – 40 $\mu g/m^3$ with an average concentration of 28 $\mu g/m^3$.

There were no sampling data for 2004-2008 and 2011.

2.4.3 Short-term health risk:

Low: The short-term $PM_{2.5}$ health risk assessment estimate was low based on typical and peak $PM_{2.5}$ concentrations, and the likelihood of exposure at these hazard severity levels. A low short-term health risk assessment estimate for typical and peak $PM_{2.5}$ exposure concentrations at FOB Farah and vicinity suggested the expected losses may have little or no impact on accomplishing the mission (Reference 4, Table 3-2). Daily average health risk levels for $PM_{2.5}$ show no hazard for 91% and low health risk for 9% of the time.

The hazard severity was negligible for the average and highest observed $PM_{2.5}$ exposures. The results indicated that a few personnel may have experienced notable eye, nose, and throat irritation; most personnel may experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated (Reference 4, Table 3-10). However, the data quantity was insufficient to characterize the potential short-term health risk from $PM_{2.5}$ exposure to U.S. personnel (Reference 4, Table 3-10).

2.4.4 Long-term health risk:

In 2009, 2010, 2012, and 2013, the $PM_{2.5}$ long-term Negligible MEG of 15 $\mu g/m^3$ was exceeded by the average $PM_{2.5}$ PEPC (25 $\mu g/m^3$, 40 $\mu g/m^3$, 33 $\mu g/m^3$, and 102 $\mu g/m^3$ respectively). With repeated exposures above this MEG, it was considered possible that a small percentage of personnel may have increased risk for developing chronic conditions, such as reduced lung function or exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with history of asthma or cardiopulmonary disease were

considered to be at particular risk. However, the data quantity was insufficient to characterize the potential long-term health risk from $PM_{2.5}$ exposure to U.S. personnel. Confidence in the risk estimate was low because of the small sample size.

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

2.5.1 Sample data/Notes:

Thirty-two valid PM_{10} and 32 valid $PM_{2.5}$ airborne metal samples were collected at FOB Farah and vicinity from 2009-2013.

2.5.2 Short-term and long-term health risks:

None of the detected samples exceeded the 1-year Negligible MEG. Confidence in the risk estimate is low (Reference 4, Table 3-6).

2.6 Volatile Organic Compounds (VOC)

2.6.1 Sample data/Notes:

The health risk assessment is based on average and peak concentration of 11 valid volatile organic chemical (VOC) air samples collected from PRT Chaghcharan (four samples), FOB Farah (three samples), FOB Leimbach (two samples) and FOB Shewan (two samples) in 2010 and 2012, and the likelihood of exposure. There were no sampling data from 2004-2009, 2011, and 2013.

2.6.2 Short-term and long-term health risks:

No parameters exceeded the 1-year Negligible MEGs. However, the data quantity was insufficient to characterize the potential short-term and long-term health risks from VOCs exposure to U.S. personnel. Confidence in the risk estimate is low (Reference 4, Table 3-6).

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

A total of 31 valid surface soil samples were collected 2007-2012, to assess OEH health risk to deployed personnel. The primary soil contamination exposure pathways are dermal contact and dust inhalation. Typical parameters analyzed for included semi volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e., total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). There were no sampling data for 2004-2006 and 2013.

3.3 Short-term health risk:

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

3.4 Long-term health risk:

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

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the USAPHC 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. The water exposures considered were the ingestion of water used for drinking and the use of disinfected fresh non-potable bulk water for non-drinking purposes (such as personal hygiene, or showering).

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified

Water used as drinking water was from bottled water and reverse osmosis water purification unit (ROWPU) sources.

4.1.2 Sample data/Notes:

To assess the potential for adverse health effects to troops, the following assumptions were made about dose and duration: A conservative (protective) assumption was that personnel routinely ingested 5 liters per day (L/day) of bottled water for up to 365 days (1-year). It was further assumed that control measures were not used. A total of 26 valid drinking water samples were collected from 2004-2005 and 2007-2012. There were no samples from 2006 and 2013.

4.1.3 Short-term and long-term health risks:

None identified based on available sample data. All collected samples were below the short- and long-term Negligible MEGs. There were not enough data to evaluate short-term or long-term health risks.

4.2 Non-Drinking Water: Disinfected

4.2.1 Site-Specific Sources Identified

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

4.2.2 Sample data/Notes:

To assess the potential for adverse health effects to troops the following assumptions were made about dose and duration: All U.S. personnel at this location were expected to remain at this site for approximately 1 year. A conservative (protective) assumption is that personnel routinely consumed less than 5L/day of non-drinking water for up to 365 days (1-year). It is further assumed that control measures and/or personal protective equipment were not used. A total of seven disinfected bulk water

(non-drinking) samples collected from 2010-2012 were evaluated for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

4.2.3 Short- term and long-term health risks:

None identified based on available sample data. However, there were not enough data to evaluate short-term or long-term health risks. All collected samples were below the short- and long-term Negligible MEGs.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) or the Military Exposure Surveillance Library (MESL) from 2004 to 2013 timeframe (References 1 and 11).

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS or MESL from 2004 to 2013 timeframe. According to the DoD, depleted uranium has not been used in Afghanistan (References 1 and 11).

5.3 Ionizing Radiation

The MESL data portal identified that FOB Farah and FOB Rescorla used industrial radiography (x-rays) 5-10 times/week. PRT Chaghcharan also used an x-ray machine. The documentation did not identify ionizing radiation related injuries.

5.4 Non-Ionizing Radiation

There were several sources of non-ionizing radiation at FOB Farah 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

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

6.1 Food borne and Waterborne Diseases

Food borne and waterborne diseases in the area are transmitted through the consumption of local food and water. Local unapproved food and water sources (including ice) are heavily contaminated with pathogenic bacteria, parasites, and viruses to which most U.S. Service Members have little or no natural immunity. Effective host nation disease surveillance does not exist within the country. Only a small fraction of diseases are identified or reported in host nation personnel. Diarrheal diseases are

expected to temporarily incapacitate a very high percentage of U.S. personnel within days if local food, water, or ice is consumed. Hepatitis A and typhoid fever infections typically cause prolonged illness in a smaller percentage of unvaccinated personnel. Vaccinations are required for DoD personnel and contractors. In addition, although not specifically assessed in this document, significant outbreaks of viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus*) may occur. Key disease risks are summarized below:

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

6.1.1 FOB Farah Gastroenteritis/Food Poisoning
Low: A comprehensive data search found several facility inspection documents and base camp assessments from 2004-2005, 2007 and 2009-2013. There were no food service sanitation documents from 2006 and 2008. Deficiencies identified from the inspection documents and base camp 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: Diarrheal diseases are expected to temporarily incapacitate a very high percentage of personnel (potentially over 50% per month) within days if local food, water, or ice is consumed. Field conditions (including lack of hand washing and primitive sanitation) may facilitate person-to-person spread and epidemics. Typically mild disease treated in outpatient setting; recovery and return to duty in less than 72 hours with appropriate therapy. A small proportion of infections may require greater than 72 hours limited duty, or hospitalization.

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

6.1.4 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.

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

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

6.2 Arthropod Vector-Borne Diseases

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

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

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

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

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

care followed by return to duty.

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

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

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

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

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

6.3 Water Contact Diseases

Operations or activities that involve extensive water contact may result in personnel being temporarily debilitated with leptospirosis in some locations. Leptospirosis health risk typically increases during flooding. In addition, although not specifically assessed in this document, bodies of surface water are likely to be contaminated with human and animal waste. Activities such as wading or swimming may

result in exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may lead to the development of a variety of potentially debilitating skin conditions such as bacterial or fungal dermatitis. Mitigation strategies were in place and included avoiding water contact and recreational water activities, proper wear of uniform (especially footwear), and protective coverings for cuts/abraded skin.

6.3.1 Leptospirosis

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

6.3.2 Short-term health risk:

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

6.3.3 Long-term health risk:

None identified based on available data.

6.4 Respiratory Diseases

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

6.4.1 Tuberculosis (TB)

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

6.4.2 Meningococcal meningitis

Low: Meningococcal meningitis poses a low risk and is transmitted from person to person through droplets of respiratory or throat secretions. Close and prolonged contact facilitates the spread of this disease. Meningococcal meningitis is potentially a very severe disease typically requiring intensive

care; fatalities may occur in 5-15% of cases.

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

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

6.5 Animal-Contact Diseases

6.5.1 Rabies
Moderate, mitigated to Low: Rabies posed a year-round moderate risk. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs are the primary reservoir of rabies in Afghanistan, and a frequent source of human exposure. Rabies is transmitted by exposure to the virus-laden saliva of an infected animal, typically through bites, but could occur from scratches contaminated with the saliva. A U.S. Army Soldier deployed to Afghanistan from May 2010 to May 2011 died of rabies in New York on 31 August 2011 (Reference 13). Laboratory results indicated the Soldier was infected from contact with a dog while deployed. Although the vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1B, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Anthrax
Low: Anthrax cases are rare in indigenous personnel, and pose a low risk to U.S. personnel. Anthrax is a naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat may result in contracting gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of spores and is extremely rare. Mitigation measures included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, vaccinations, and proper PPE for personnel working with animals.

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

6.5.4 H5N1 avian influenza
Low: Potential health risk to U.S. personnel is low. Although H5N1 avian influenza (AI) is easily transmitted among birds, bird-to-human transmission is extremely inefficient. Human-to-human transmission appears to be exceedingly rare, even with relatively close contact. Extremely rare cases (less than 0.01% per month attack rate) could occur. Incidence could result in very severe illness with

fatality rate higher than 50 percent in symptomatic cases. Mitigation strategies included avoidance of birds/poultry and proper cooking temperatures for poultry products.

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

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

7 Venomous Animal/Insect

All information was taken directly from the Armed Forces Pest Management Board (Reference 14) and the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 15). The species listed below have home ranges that overlap the location of FOB Farah and vicinity, and may present a health risk if they are encountered by personnel. See Section 9 for more information about pesticides and pest control measures.

7.1 Spiders

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

7.2 Scorpions

- *Androctonus afghanus, Androctonus amoreuxi,* and *Androctonus baluchicus*: Severe envenoming possible, potentially lethal. Severe envenoming may produce direct or indirect cardio toxicity, with cardiac arrhythmias, cardiac failure. 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*: 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 and 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 pit viper): Potentially lethal envenoming, though unlikely, cannot be excluded. Bites cause in 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 16).

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 Farah 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 hazard sources were documented in the DOEHRS or MESL from 2004 to 2013 timeframe (References 1 and 11).

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

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

10.2 Waste Sites/Waste Disposal

10.2.1 Hazardous and Non-hazardous Waste
FOB Farah and vicinity had burn pits located either inside the fence line (JCOP Pusht-Rod) or outside the fence line (FOB Farah, FOB Leimbach, FOB Rescorla, and FOB Shewan) for the disposal of

garbage/rubbish. All petroleum, oil, and lubricants (POL) waste from the base camps was shipped to Kandahar Air Base for disposal. JCOP Dukin and JCOP Masaw also had burn pits.

FOB Farah had an inoperable medical waste incinerator during this timeframe. Medical waste was disposed of via the local burn pit operated outside of the fence line. No documentation exists indicating whether the medical incinerator was ever operational. FOB Rescorla used a medical burner for disposal of sharps and small medical waste.

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

10.2.2 Solid Waste Management
A review of Field Sanitation Assessments and Comprehensive Food Establishment Inspections identified uncovered and/or overflowing solid waste receptacles as an issue. Burn pits were used for waste disposal.

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. An outbreak of disease can affect the mission.

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

The overall risk estimate for solid waste management was low.

10.3 Fuel/petroleum products/industrial chemical spills

Large, dark rubber fuel bladders were located on FOB Farah and vicinity. The DOEHRS and MESL databases were searched for any information on this topic. Several reports identified several POL spills throughout the base camps. However, information was not available on whether the spills were remediated.

10.4 Pesticides/Pest Control:

Several reports for food and general sanitation documented issues with flies, rodents, mosquitoes, 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 identified that contractors oversaw pest management control at the base camps. Monthly assessments were conducted and re-baiting of rodent traps was done during the assessments. The contractor stored all the chemicals, equipment, and supplies. There were no reports that indicated accidents, misuse, misapplication or other hazards associated with pesticides use.

10.4.1 Rodenticides
Rodenticides used to control rodents were bromadiolone and brodifacoum. Rodenticide usage information for the other basecamps was not available.

10.4.2 Insecticides
Insecticides used to control ants, bed bugs, flies, mosquitoes, and spiders include: ß-cyfluthrin, *Bacillus thuringiensis* subspecies *israelensis*, pyrethrins, piperonyl butoxide, imidacloprid, Z-9 tricosene, and hydramethylnon.

Insecticides used to control flies include: imidacloprid, methomyl, polybutylenes, polyisobutylenes, and Z-9 tricosene.

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

10.5 Asbestos

No specific hazards were documented in DOEHRS or MESL data portals from the 2004 through 2013 timeframe (References 1 and 11).

10.6 Lead Based Paint

No specific hazards were documented in DOEHRS or MESL data portals from the 2004 through 2013 timeframe (References 1 and 11).

10.7 Burn Pit

FOB Farah had a burn pit located 1,000 meters outside of the fence line and a medical incinerator located inside the fence line that was inoperable. Medical waste was disposed of in the burn pit.

FOB Leimbach had burn pits located 150 meters outside of the fence line.

JCOP Pusht-Rod was the only base camp with a burn pit inside of the fence line. The burn pit was located 10-20 yards from living and working areas. The burn pit operated daily regardless of wind direction. The base camp was possibly constantly covered in smoke.

FOB Rescorla had a burn pit located 1,000 meters outside of the fence line and a medical burner that was used to burn sharps and small medical waste items.

FOB Shewan had a burn pit located 200 meters outside of the fence line.

JCOP Dukin and JCOP Masaw had burn pits. However, the location of the burn pits was not identified.

There were no air samples taken near the burn pits. However, in the notes for JCOP Pusht-Rod, five air samples were taken at locations near the burn pit. Short- and long-term health risk could not be assessed due to insufficient data quantity.

While not specific to FOB Farah 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 17). The Institute of Medicine committee's (Reference 17) 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[1]

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

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

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

4. USA PHC TG230, June 2013 Revision.

5. Occupational and Environmental Health Site Assessment, FOB Farah, Afghanistan, 03 January 2011 (unclassified).

6. Occupational and Environmental Health Site Assessment, FOB Leimbach, Afghanistan, December 2009.

7. Occupational and Environmental Health Site Assessment, JCOP Pusht-Rud, Afghanistan, 18 October 2010-20 October 2010 (unclassified).

8. Occupational and Environmental Health Site Assessment, FOB Rescorla, Afghanistan, December 2009.

9. Occupational and Environmental Health Site Assessment, Shewan Garrison, Afghanistan, 14 January 2011 (unclassified).

10. Occupational and Environmental Health Site Assessment, FOB Whiskey, Chaghcharan, Afghanistan, February 2010.

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

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

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

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

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

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

16. 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.

17. 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) 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