Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS): Shindand Air Base and vicinity, Afghanistan
Calendar Years: (2003 to 2014)

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

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Shindand Air Base (AB) and vicinity that includes Camp Henderson, Camp Shaf, Compound Camp Napier, Firebase Thomas, and Forward Operating Base (FOB) Shindand. It presents a qualitative summary of health risks identified at this location and their potential medical implications. The report is based on information collected from 01 January 2003 through 15 November 2014 to include deployment OEHS sampling and monitoring data (e.g., air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that environmental health sampling at Shindand AB and vicinity during this period was performed at representative exposure points selected to characterize health risks at the *population–level*. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to 01 January 2003 through 15 November 2014.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Shindand AB 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:

Shindand AB is an air base located in a mountainous rural area of western Afghanistan in the Herat province, approximately 1,150 meters (m) above sea level, on the site previously used as a Russian airfield. Shindand AB has a cold semi-arid climate which consists of a combination of hot, sometimes extremely hot summers and cold, sometimes very cold winters, with some snowfall during the winter. The prevailing winds come from a SSE direction. This air base operated as a large fixed facility providing Afghan National Army (ANA) Air Support U.S. Forces-Afghanistan (USFOR-A), NATO and Afghan National Security Forces (ANSF) in their efforts to enhance stability in Western Afghanistan. It is also used to train ANA pilots. There were a combination of tents and semi-permanent structures on the base with the majority of the roads throughout the base are dirt intermixed with a few gravel roads. Two concrete batch/cement plants were located nearby Shindand AB. Shindand AB was turned over to the ANSF on 15 November 2014.

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 Shindand AB 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 Shindand Air Base (AB) and vicinity that includes Camp Henderson, Camp Shaf, Compound Camp Napier, Firebase Thomas, and Forward Operating Base (FOB) Shindand:

Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}); 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, typhus-miteborne, leptospirosis, Tuberculosis (TB), rabies, anthrax, Q fever); and heat stress. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid/paratyphoid fever, brucellosis, hepatitis E). Risks from food/waterborne diseases may have been reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources in accordance with standing CENTCOM policy. For other vector-borne endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne), these diseases may constitute a significant risk due to exposure to biting vectors; risk reduced to 'Low' by proper wear of the treated uniform, application of repellent to exposed skin, bed net use, and appropriate chemoprophylaxis, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis), activities involving extensive contact with surface water increase risk. For respiratory diseases (TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (rabies, anthrax, Q fever), pose year-round risk. For heat stress, risk can be greater during months of June through September, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions, and those under operational constraints (equipment, PPE, vehicles). Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation.

Air quality: For inhalable coarse particulate matter (PM_{10}), the overall short-term risk was 'Low to high.' For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), the $PM_{2.5}$ overall short-term risk was 'Low.' 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 not enough air sampling data available to characterize risk, there were operating burn pits (and incinerators) utilized at or around Shindand Air Base and vicinity – 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 (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 Shindand Air Base 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 Shindand Air Base (AB) and vicinity that includes Camp Henderson, Camp Shaf, Compound Camp Napier, Firebase Thomas, and Forward Operating Base (FOB) Shindand:

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

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), the overall long-term risk was 'Low.' Inhalable coarse particulate (PM_{10}) 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} and for $PM_{2.5}$ was not evaluated due to not enough air sampling data available to characterize risk, there were operating burn pits (and incinerators) utilized at or around Shindand Air Base and vicinity, and conditions may have varied – see Section 10.7. 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 – Shindand AB and vicinity that includes Camp Shaf, Camp Napier, Camp Henderson and Firebase Thomas [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 to High, 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 to High, 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/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/existing respiratory diseases).
Metals	Short-term: no short term hazards based on the available data.		Short-term: no short term hazards based on the available data
	Long-term: no long term hazards based on the available data.		Long-term: no long term hazards based on the available data
Volatile Organic Compounds (VOC)	Short-term: Not enough data available		Short-term: Not enough data available
	Long-term: No enough data available		Long-term: Not enough data available
SOIL			
Metals	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: No data available		Long-term: No data available
Organic Compounds	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: No data available		Long-term: No data available
Inorganic Compounds	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: No data available		Long-term: No data available
Water			
Consumed Water (Water Used for Drinking)	Short-term: Not enough data available	U.S. Army Public Health Command (USAPHC) former U.S. Army Veterinary Command (VETCOM) approved bottled water and potable water only from approved water sources	Short-term: Low
	Long-term: Not enough data available		Long-term: Low
Water for Other Purposes	Short-term: Not enough data available.	Water treated in accordance with standards applicable to its	Short-term: Not enough data available.
	Long-term: Not enough data available.		Long-term: Not enough data available.

		intended use	
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) if ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, Typhoid fever, hepatitis E, brucellosis).	Preventive measures include Hepatitis A and Typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none
	Long-term: none identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable; High for malaria, Moderate for leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne; and Low for, the plague and West Nile fever.	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low for Leishmaniasis-visceral infection.		Long-term: No data available
Water-Contact (e.g. wading, swimming)	Short-term: Moderate for leptospirosis	Recreational swimming in surface waters not likely in this area of Afghanistan during this time period.	Short-term: Low for leptospirosis.
	Long-term: No data available		Long-term: No data available
Respiratory	Short-term: Variable; Moderate for tuberculosis (TB) to Low for meningococcal meningitis.	Providing adequate living and work space; medical screening; vaccination.	Short-term: Low
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Variable; Moderate for rabies, anthrax, Q-fever to Low for H5N1 avian influenza.	Prohibiting contact with, adoption, or feeding of feral animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: No data available
	Long-term: Low (Rabies)		Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling to potentially lethal effects	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 to potentially lethal effects.
	Long-term: No data available		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High for June-September, and Low for all other months.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT)	Short-term: Variable; Risk of heat injury in unacclimatized or susceptible personnel is Moderate for June-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.	monitoring.	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. Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.	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.
NOISE			
Continuous (Flightline, Power Production)	Short-term: Low Long-term: Low to moderate	Hearing protection used by personnel in higher risk areas	Short-term: Low Long-term: Low to moderate
Unique Incidents/ Concerns			
Burn Pits	Short-term: Not enough data available Long-term: Not enough data available	Control measures may have included locating burn pits downwind of prevailing winds, increased distance from living and working areas when possible, and improved waste segregation and management techniques	Short-term: Not enough data available Long-term: Not enough data available

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at Shindand AB and vicinity that includes, Camp Shaf, Camp Napier, Camp Henderson, and Firebase Thomas. It does not represent an individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may have been present in the environment, if a person did not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may have been no health risk. Alternatively, a person at a specific location may have experienced a unique exposure which could result in a significant individual exposure. Any such person seeking medical care should have their specific exposure documented in an SF600.

[2] This assessment is based on specific environmental sampling data and reports obtained from 1 January 2003 through 15 November 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 Shindand AB 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 Institute of Public Health (AIPH). 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 Shindand AB and vicinity, Afghanistan by Source

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

2 Air

2.1 Site-Specific Sources Identified

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

2.2 Particulate matter

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

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

2.3.1 Exposure Guidelines:

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

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

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

- Not defined and not available.

2.3.2 Sample data/Notes:

A total of 41 valid PM_{10} air samples were collected from 2009-2013. There were no data available for the years 2003-2008. The range of 24-hour PM_{10} concentrations was 4 $\mu g/m^3$ – 750 $\mu g/m^3$ with an average concentration of 182 $\mu g/m^3$. All PM_{10} samples were taken at Shindand AB, except for two samples taken during 2013 were taken at Camp Henderson and Firebase Thomas; these samples

were included in the assessment with the Shindand AB samples due to their close proximity to Shindand AB.

2.3.3 Short-term health risks:

Low to High: The short-term PM_{10} health risk assessment is Low to High based on average and peak PM_{10} sample concentrations, and the likelihood of exposure at these hazard severity levels. A High health risk assessment is expected to significantly degrade mission capabilities by lowering the execution standard, preventing completion of essential tasks, and jeopardizing mission completion if hazards arise during the mission. Some in-theater medical countermeasures and resources anticipated. (Reference 4, Table 3-2). Daily average health risk levels for PM_{10} show no hazard for 75%, low health risk for 17.5%, moderate health risk for 0%, and high health risk for 7.5% of the time. Confidence in the short-term PM_{10} health risk assessment is low (Reference 4, Table 3-6).

The hazard severity for average PM_{10} concentrations in samples was negligible. The results predict a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Service members with pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have experienced an exacerbation of their conditions (Reference 4, Table 3-11).

For the highest observed PM_{10} sample concentration, the hazard severity ranged from negligible to critical. During peak exposures at the critical hazard severity level (above 600 $\mu g/m^3$), the results predict that most, if not all, personnel would have experienced very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity. Some personnel will not have been able to perform their assigned duties. Some lost-duty days expected. Those with a history of asthma or cardiopulmonary disease will have experienced more severe symptoms. (Reference 4, Table 3-11).

2.3.4 Long-term health risk:

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

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

2.4.1 Exposure Guidelines:

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

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

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

- Negligible MEG = 15
- Marginal MEG = 65

2.4.2 Sample data/Notes:

Shindand AB: A total of 31 valid $PM_{2.5}$ air samples were collected from 9 January 2010 to 16 October 2014. No samples were available for the years 2003-2008 and 2011. There were two samples; one invalid sample for 2013 and one sample taken in 2014 that had no data results, which could not be used in the evaluation. The range of 24-hour $PM_{2.5}$ concentrations was 5.6 $\mu g/m^3$ – 232 $\mu g/m^3$ with an average concentration of 44 $\mu g/m^3$.

2.4.3 Short-term health risks:

Low: The short-term $PM_{2.5}$ health risk assessment is Low based on average and peak $PM_{2.5}$ sample concentrations, and the likelihood of exposure at these hazard severity levels. A Low health risk assessment is expected to have losses that will 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 92%, low health risk for 8%, moderate health risk for 0%, and high health risk for 0% of the time. Confidence in the short-term $PM_{2.5}$ health risk assessment was low (Reference 4, Table 3-6).

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

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

2.4.4 Long-term health risks:

Low: The long-term health risk assessment is Low based on average $PM_{2.5}$ concentration, and the likelihood of exposure at this hazard severity level. A Low health risk level suggests that long-term exposure to $PM_{2.5}$ is expected to have no specific medical action required. With repeated exposures above this, a small percentage of personnel may have increased risk for developing chronic conditions, or cardiopulmonary diseases. Personnel with a history of asthma or cardiopulmonary disease are considered to be at particular risk. (Reference 4, Table 3-3). Confidence in the long-term $PM_{2.5}$ health risk assessment is low (Reference 4, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ sample concentrations. The results suggest that with repeated exposures above the negligible hazard severity threshold, a small percentage of personnel may have increased risk for developing chronic conditions, such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with history of asthma or cardiopulmonary disease are considered to be at a higher risk of developing chronic conditions. Exposures below this are not expected to result in development of chronic health conditions in generally healthy troops (Reference 4, Table 3-12).

2.5 Airborne Metals

2.5.1 Sample data/Notes:

A total of 41 valid PM_{10} airborne metal samples were collected at Shindand AB from 19 March 2009 to 21 December 2013. No PM_{10}samples were above their short or long term MEGS.

A total of 31 valid $PM_{2.5}$ airborne metal samples were collected at Shindand AB from 9 January 2010 to 16 October 2014. No $PM_{2.5}$ samples were above their short or long term MEGS.

2.5.2 Short-term health risks:

None identified based on the available sampling data.

2.5.3 Long-term health risks:

None identified based on the available sampling data.

2.6 Volatile Organic Compounds (VOC)

2.6.1 Sample data/Notes:

There were only four valid volatile organic chemical air samples collected at Shindand AB. There were not enough samples to conduct a health risk assessment. Two of these samples were taken during July 2012 and the remaining two samples were taken in December 2013. There were 21 chemicals detected in the samples, however only benzene had two samples with detected values above the one year negligible MEG of 54.8 ug/m^3. The maximum detected value for benzene was 81 ug/m^3 and the average was 38ug/m^3. Even though the maximum values for benzene was above the 1 year negligible MEG, it was well below its short term, 14 day negligible MEG (638 ug/m^3) and the average concentration was also below its long term 1 year negligible MEG.

Benzene is commonly found in the environment mainly due to industrial processes and combustion emissions. Benzene can pass into the air from water and soil surfaces and once in the air it reacts with other chemicals and breaks down within a few days (Reference 11). Short term exposures to Benzene at high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. While long term exposure to benzene has been reported to cause cancers such as Leukemia and can also be harmful to the reproductive organs (Reference 11).

2.6.2 Short and long-term health risks:

Not enough data to determine a risk.

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

A total of 10 valid surface soil samples were collected from 13 January 2010 to 17 December 2013 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, herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e., total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). The percent of the population exposed to soil and associated dust in the sampled areas was > 75% for seven samples and between 25 to 50% for three samples. For the risk assessment, personnel are assumed to remain at this location for 6 months to 1 year.

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. Based on the information provided from the field, all samples for untreated water samples were associated with source water for treatment and no exposure pathways were associated with those samples. Therefore, untreated samples are not assessed as potential health hazards. It is assumed that 100% of all U.S. personnel at Camp Shindand AB and vicinity will be directly exposed to reverse osmosis water purification unit (ROWPU) treated water for cooking and disinfected fresh bulk water, for personal hygiene, showering, and for use at vehicle wash racks. Field data sheets indicate that bottled water was the approved source of drinking water.

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified

No bottled water samples were available for this evaluation. There were multiple bottled water brands sampled at Shindand AB, Firebase Thomas and Camp Henderson as reported in the OEHSA reports however, none of these samples' data were available for evaluation. The brands of bottled water reported as used at Shindand AB included Cristal, Kinley Dibba, Al Ain, Hayat, and Oasis. Firebase Thomas also used Cristal and Kinley bottled water brands.

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 15 L/day of bottled water for up to 365 days (1-year). It was further assumed that control measures were not used. No bottled water samples were available for evaluation. There were two ROWPU treated water samples that were listed as being used as drinking water, one sample was taken in 2004 and the other was taken in 2012. Due to the limited amount of samples no determination of risk can be done; however all of the detected contaminants in these two samples were below their respective 1 year negligible 5 liters per day (L/day) and/or negligible 14day 15 L/day MEGs.

4.1.3 Short-term and long-term health risk:

No sample data available for evaluation.

4.2 Non-Drinking Water: Disinfected/ROWPU treated

4.2.1 Site-Specific Sources Identified

Although the primary route of exposure for most microorganisms is ingestion of contaminated water, dermal exposure to some microorganisms, chemicals, and biologicals may also cause adverse health effects. Complete exposure pathways would include drinking, brushing teeth, personal hygiene,

cooking, providing medical and dental care using a contaminated water supply or during dermal contact at vehicle or aircraft wash racks.

4.2.2 Sample data/Notes:

Shindand AB:
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 5 L/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 six disinfected bulk water (Non-Drinking) samples from 2005, 2011, and 2013, along with one ROWPU treated sample taken in 2104 were available for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

Firebase Thomas:

All U.S. personnel at this location were expected to remain at this site for approximately 6-9 months. A conservative (protective) assumption is that personnel routinely consumed less than 5 L/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. There was one disinfected bulk water (Non-Drinking) sample taken during 2009. There were also five untreated water samples taken during 2011 and 2013. Even though there weren't enough samples to determine a health risk, of the samples available, no chemicals were detected at levels above the short or long-term MEGs with any of the samples available for Firebase Thomas.

4.2.3 Short and long-term health risks:

Not enough data available to evaluate a health risk.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS), or the Military Exposure Surveillance Library (MESL) from 1 January 2003 to 15 November 2014 timeframe (References 1 and 5).

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS, or MESL from 1 January 2003 to 15 November 2014 timeframe (References 1 and 5).

5.3 Ionizing Radiation

There is a medical x-ray machine and an industrial radiography at Shindand AB, no incidents associated with this type of ionizing radiation were documented in the DOEHRS, or MESL from 1 January 2003 to 15 November 2014 timeframe (References 1 and 5).

5.4 Non-Ionizing Radiation

There were several OE-254 satellite dishes and antennas located throughout the FOB and the distance from personnel varies from 10-1,000 feet (ft) away. There were also 20 Duke Systems, used to counter improvised explosive devices, on the FOB in 2010, 103 duke systems on the FOB in 2011 sources were documented in the DOEHRS, or MESL from 1 January 2003 to 15 November 2014 timeframe (References 1 and 5).

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) 11 (Reference 6) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Foodborne and Waterborne Diseases

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

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

6.1.1 Diarrheal diseases (bacteriological)

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

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

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

6.1.3 Short-term Health Risks:

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

6.1.4 Long-term Health Risks:

None identified based on available data.

6.2 Arthropod Vector-Borne Diseases

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

6.2.1 Malaria

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

6.2.2 Leishmaniasis

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

6.2.3 Crimean-Congo hemorrhagic fever

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

6.2.4 Sandfly fever

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

6.2.5 Plague

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

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

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

6.2.7 West Nile fever

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

6.2.8 Short -term health risks:

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

6.2.9 Long-term health risks:

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

6.3 Water Contact Diseases

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

6.3.1 Leptospirosis

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

6.3.2 Short-term health risks:

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

6.3.3 Long-term health risks:

None identified based on available data.

6.4 Respiratory Diseases

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

implementing head-to-toe sleeping in crowded housing units, implementation of proper personal protective equipment (PPE) when necessary for healthcare providers and detention facility personnel.

6.4.1 Tuberculosis (TB)

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

6.4.2 Meningococcal meningitis

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

6.4.3 Short-term health risks:

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

6.4.4 Long-term health risks:

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

6.5 Animal-Contact Diseases

6.5.1 Rabies

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

6.5.2 Anthrax

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

rare. Mitigation measures included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, vaccinations, and proper PPE for personnel working with animals.

6.5.3 Q-Fever

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

6.5.4 H5N1 avian influenza

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

6.5.5 Short-term health risks:

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

6.5.6 Long-term health risks:

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

7 Venomous Animal/Insect

All information was taken directly from the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 8). The species listed below have home ranges that overlap the location of Shindand AB 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 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.

- *Compsobuthus afghanus*, *Orthochirus bicolor, Orthochirus danielleae*, *Orthochirus erardi*, *Orthochirus heratensis, Orthochirus, Orthochirus monodi , Orthochirus pallidus, 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.

7.3 Snakes

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

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

- *Hemorrhis ravergieri* (mountain racer), and *Psammophis lineolatus* (Teer snake): Unlikely to cause significant envenoming. Bites require symptomatic treatment only.

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

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

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

8.1 Heat

Summer (June - September) monthly mean daily maximum temperatures range from 84 °F to 93 degrees Fahrenheit (°F) with an average temperature of 84 °F. The health risk of heat stress/injury based on temperatures alone is Low (< 78 °F) from November – April, Moderate (78-81.9°F) in October, high (82-87.9°F) in May and September, and extremely high (≥ 88°F) from June – August.

However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 9). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk factors (e.g., acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures

8.1.1 Short-term health risk:

Low to High, mitigated to Low: The risk of heat injury was reduced to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring Wet Bulb Globe Temperature (WBGT). However, the risk may be greater of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles). Confidence in the health risk estimate is medium (Reference 4, Table 3-6).

8.1.2 Long-term health risk:

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

8.2 Cold

8.2.1 Short-term health risks:

Winter (December - March) mean daily minimum temperatures range from 24 °F to 40 °F with an average temperature of 31 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. Because even on warm days a significant drop in temperature after sunset by as much as 40 °F can occur, there is a risk of cold stress/injury from December – March. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, is Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may encounter significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone (Reference 9).

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

8.2.2 Long-term health risk:

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

9 Noise

9.1 Continuous

Aircraft operations have the potential to cause significant noise hazard to flight line and helicopter landing zone support personnel. Because of the potential noise hazard inherent in flight line operations and the helicopter landing zone, personnel are required to wear dual hearing protection when working

on the flight line.

Personnel residing in close proximity to generators will routinely be exposed to noise levels as high as 82.0 dB. Although this is below the 85 dB threshold requiring hearing protection, it still presents a concern for hearing conservation.

9.1.1 Short health risks:

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

9.1.2 Long-term health risk:

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

9.2 Impulse

No specific hazard sources were documented in the DOEHRS or MESL from 01 January 2003 to 15 November 2014 timeframe.

9.2.1 Short-term and Long-term health risks:

Not evaluated.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

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

10.2 Waste Sites/Waste Disposal

The 2012 and 2013 Shindand AB Occupational and Environmental Health Site Assessments documented that there was a Hazardous Waste Yard located at Shindand AB, which was operated by a contracting company that stored the hazardous waste until it was transported off site by the contractors.

It was documented that approximately 20- 50 gallon plastic drums of POL waste were stored at the Hazmat yard as well as two pallets of batteries (Reference 15). It was also documented the ROWPU stored an unknown amount calcium hypochlorite in 55 gallon drums and the laundry point stored approximately six 55 gallon drums of cleaners and solvents (Reference 14). However, these hazardous materials stored at the ROWPU and the laundry points are used in the process of water chlorination and clothes washing and none is leftover as hazardous waste.

Between 31 July 2013 and 7 February 2014, approximately 440-gallons of liquid chlorine (55-gal drums) and 17,430 gallons of granular chlorine (85-gallon drums) were delivered to the Shindand DPW LSA. These chemical were identified as Hazwaste as they were expired and were to be used in treating wastewater effluent from the wastewater treatment plant. These chemicals were improperly stored and there is some indication some of the containers deteriorated due to exposure to the elements. A handful of personnel slept in transient tents for short periods of time within 30-50 feet away. A large population stayed in permanent Containerized Housing Units approximately 200 feet away. All personnel potentially exposed were contractors working for DPW. No measurements of air contaminants were taken. Medical encounter surveillance of the clinic at Shindand during this period indicated no visits due to chlorine gas exposure.

Solid waste:
Residential waste was stored in various trash cans and dumpsters that were then collected daily and prior to 2012 was sent to the burn pit, however in 2012 half of the waste was disposed of by the incinerator and half was sent to the burn pit. In 2013, all waste was disposed of in three incinerators in operation at the base. The incinerators were located on the east side of the base, approximately 600 meters away from any of the living areas. Medical waste is disposed of in the regulated medical waste incinerator.

There were a couple burn pits over the years however not all of them were in operation at the same time. All burn pits were substandard in construction. The third pit was built with the correct intentions; however, the local national contractor was not using the pit correctly. Instead of placing the trash in the pit itself to burn, they were placing in on the flat ground and burning it there. This was resulting in incomplete burning/ combustion. It also resulted in trash lying throughout the area. The burn pit also continued to be the primary feral animal feeding grounds, and rodent breeding area on the camp. The easy access to partially burned/buried food sources attracted feral animals, rodents, and insects. It also served as a major breeding area for filth flies. The pit was also burned at night when the winds shift towards the living area resulting in the living area being covered with the fumes of burning trash.

The burn pit was run by Afghans and it has been documented that even though incinerators were provided to the Afghans to use instead of the burn pit, they have chosen to continue operating the burn pit as they believe the cost of fuel for the incinerators is greater than the potential risk from the burn pits.

Wastewater:
According to the OESHA reports from 2010-2013, there have been three types of wastewater disposal throughout the years at Shindand AB, black water lagoons, a leach field, and then most recently a wastewater treatment plant.

The black water lagoons were located on the north side field and were operated by USFOR-A JENG. The black water was applied to a facultative pond approximately 75,000 gallons of black water was the estimated daily amount treated. The primary pond receives the wastewater via a built up ramp and at the other end is an overflow pipe that flows into a second pond or pit. Older lagoons are closed out, but occasionally trucks have used them, resulting in the erosion of the outer berm. Numerous leaks from the berms of the older lagoons were reported and in July of 2012 repairs were made.

The leach field located on the north end of the airfield was used for land disposal of grey water at approximately 80,000 gallons a day. It was also operated by USFOR-A JENG but contractors applied the material to the soil. Grey water was discharged from the trucks as they drove in serpentine patterns in the drainage field. Drainage is done through the field/soil. Evaporation also contributes to reduction/elimination of standing water. Neither the grey water nor the brine water were pre-filtered and disinfected to 5 ppm prior to being applied to the leach field. By not reducing the deposition of suspended solids, the pore space within the soil filled, resulting eventually in an impermeable condition that allowed the water to pond and become stagnant, which attracted mosquitoes and other insects.

Shindand wastewater treatment facility was reported in 2013 as the only type of wastewater treatment at the base. This facility was used to treat both black water and grey water at an estimated volume of 80,000 gallons a day. This facility is operated by U.S. Forces and local national contractors transport the wastewater from throughout the base in trucks to the facility for treatment. After the wastewater is treated it is piped off site directly outside of the base into an evaporation field.

General Sanitation:
Based on the available documents, the overall rating for sanitation at the camp was satisfactory. There were several mentions of trash cans and dumpsters without lids that attracted flies, insects, rodents and feral animals. It was also documented that unsanitary conditions persisted due to the overflowing septic tanks throughout the FOB that created unsanitary pools of standing water and waste. This area was attractive to pests as a feeding and breeding site and to feral animals as a source of water. Conditions such as these not only created a potential attractant for flies and rodents, but also increased the possibility of numerable diseases being transmitted mechanically as vectors come in contact with surfaces commonly utilized by personnel. It was also noted that the chemical latrines on Shindand AB were not always maintained and did not have sufficient blue chemical to assist with the decomposition of human waste and eliminate odors that attract flies.

On 22 March 2011, it was documented that some Air Force personnel were exposed to fecal matter. While Air Force personnel were trying to pull a stuck backhoe out of a culvert at the burn pit site they were working in and around fecal contaminated mud. This area had been previously used to empty the contents of the port-o-john cleaning truck. The fire department was notified and met Preventive Medicine personnel at the location to give decontamination assistance to personnel if needed. Personnel working in and around the area had their boots cleaned by the fire department in order to prevent spreading of possible fecal contaminated dirt in vehicles and personal areas. Personnel were advised to have exposure to fecal matter documented in their records, and to ensure that immediately upon returning to main FOB area, they conduct personal hygiene. Personnel were also advised to coordinate with Preventive Medicine when they turn in dirty uniforms to the laundry facility so that Preventive Medicine could give recommendations to the laundry point as to only wash those uniforms together and then sanitize washing machine upon completion of laundry. Shovels used in the operation were also cleaned by the fire department in efforts to help keep spread of fecal matter.

10.3 Fuel/petroleum products/industrial chemical spills

There are multiple fuel points on Shindand AB; two main ones were the Fuel Distribution Point (Far East) and the Forward Area Refueling Point (FARP) aviation. The Fuel Distribution Point (Far East) stored five-50,000 gallons of JP-8 in fuel blivets, one 20,000 gallons of JP-4 in a fuel blivet, and the one fuel blivet containing 20,000 gallons of gasoline. The FARP (aviation) stored six- 50,000 gallons of JP-8 in fuel blivets. There was also mention of a motor pool/maintenance garage located on the base but no further information was provided.

Camp Henderson had a refueling truck come around every 2-3 days as well as 5-gallon cans of fuel at most of the generators.

Firebase Thomas was documented as having approximately eight, 55-gallon fuel drums locate near generators.

On 11 Jan 2014, a contractor operated JP-8 fuel tanker overturned within a fuel tanker storage yard located adjacent to the Shindand AB that was within 100 feet of a local aqueduct that supplies the local population. Approximately 2500 gallons of JP-8 were released onto the unpaved surface of the tanker parking area. The spill covered approximately 6,000 ft^2, POL absorbent socks and soils were used to contain and divert the fuel away from the drainage gully. There was no immediate hazard from spilled materials. There were no reports of any other known spills documented in the various reports and documents available from review during this evaluation.

10.4 Pesticides/Pest Control:

The health risk of exposure to pesticide residues is considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed, such as enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use (RTU) methods such as aerosol cans and baits. The control of rodents required the majority of pest management inputs, with the acutely toxic rodenticides staged as solid formulation lethal baits placed in tamper-resistant bait stations indoors and outdoors throughout cantonment areas. Nuisance insects, including biting and stinging insects such as bees, wasps, and ants, also required significant pest management inputs. Use of pesticides targeting against these pests generally involved selection of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. No specific hazard sources were documented in DOEHRS or MESL data portal. Several monthly pesticide application reports in the MESL data portal for Shindand AB (June 2007 to September 2013) list the usage of pesticides on the site. For each pesticide product applied during this period, the EPA approved label has been archived, providing a framework how each pesticide handled and applied (see below).

10.4.1 Rodenticides

Bromadiolone and Brodifacoum were used to control rodents.

10.4.2 Insecticides

Insecticides used to control ants, bees, crickets, fleas, flies, lice, mosquitoes, spiders, termites, and wasps include: *Hydramethylnon,Pyrethrins, Piperonyl Butoxide, Methomyl, Z-9 Tricosene, delamethrin, Lambda-cyhalothrin, Imidacloprid, Nithiazine, β-Cyfluthrin, d-trans Allethrin, Phenothrin and Fipronil.*

10.4.3 Short-term and Long-term health risks

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

10.5 Asbestos

Two suspected asbestos containing material samples were taken on 9 March 2010 at an Old Russian building on Shindand AB. The results indicated that no asbestos fibers were detected in the material.

Only standard safety precautions are necessary if these materials were/will be disturbed.

10.6 Lead Based Paint

There was no data available to evaluate.

10.7 Burn Pit

While not specific to Shindand AB, 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 10). The Institute of Medicine committee's (Reference 10) 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.

The burn pit which was documented as being approximately 200 ft long by 100 ft wide, by 30 ft deep was located roughly to the west of the main Shindand AB living areas at approximately 1200 m away from troops. It is run by Afghans and it has been documented that even though incinerators were provided to the Afghans to use instead of the burn pit, they have chosen to continue operating the burn pit as they believe the cost of fuel for the incinerators is greater than the potential risk from the burn pits. Prior to 2012 all waste was sent to the burn pit, however, in 2012 half of the waste was disposed of by an incinerator and half was sent to the burn pit. In 2013, all waste generated by U.S. Forces was disposed of in the three incinerators in operation at the base.

There were a couple burn pits over the years. All burn pits were substandard in construction. The third pit was built with the correct intentions; however, the local national contractor was not using the pit correctly. Instead of placing the trash in the pit itself to burn, they were placing in on the flat ground and burning it there. This was resulting in incomplete burning/ combustion and trash left lying around throughout the area. The pit was also burned at night when the winds shift towards the living area resulting in the living area being covered with the fumes of burning trash.

Based on the data available for review, there were only two air samples taken at the burn pit, one PM_{10} sample that was invalid and one $PM_{2.5}$ sample that was taken in July 2012. The $PM_{2.5}$ sample had a level of 225 µg/m^3. This value is between the short term negligible MEG (65 ug/m^3) and the marginal MEG (250 ug/m^3) thus this sample falls into the negligible severity range. A few personnel may experience notable eye, nose, and throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated. No metals associated with this sample were detected above their respective 1 year negligible MEGs.

There was not enough data collected in the vicinity of the burn pits to evaluate any specific burn pit related health risk at Shindand AB.

11 References[1]

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

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

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

4. USA PHC TG230, June 2013 Revision.

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

6. Modification 11 to United States Central Command Individual Protection and Individual Unit Deployment Policy, 2 December 2011.

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

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

9. 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.

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

11. Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Public Health Statement for Benzene. Atlanta, GA: Department of Health and Human Services, Public Health Service.

12. Occupational and Environmental Health Site Assessment FOB Shindand, Afghanistan, 9 January 2010.

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

13. Occupational and Environmental Health Site Assessment FOB Shindand, Afghanistan, 12 January 2011.

14. Occupational and Environmental Health Site Assessment Shindand AB, 21June 2012.

15. Occupational and Environmental Health Site Assessment Shindand AB, 20 December 2013.

16. Occupational and Environmental Health Site Assessment Base Camp Henderson, 22 November 2013.

17. Occupational and Environmental Health Site Assessment Firebase Thomas, 22 November 2013.

12 Where Do I Get More Information?

If a provider feels that the Service member's or Veteran's current medical condition may be attributed to specific OEH exposures at this deployment location, he/she can contact the Service-specific organization below. Organizations external to DoD should contact DoD Force Health Protection and Readiness (FHP & R).
Army Institute of Public Health Phone: (800) 222-9698. http://phc.amedd.army.mil/
Navy and Marine Corps Public Health Center (NMCPHC) (formerly NEHC) Phone: (757) 953-0700. www.nmcphc.med.navy.mil
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD Force Health Protection and Readiness (FHP & R) Phone: (800) 497-6261. http://fhp.osd.mil