Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS): Forward Operating Base Sharana, Afghanistan: 2003 to 2010

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

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risks for Forward Operating Base (FOB) Sharana, Afghanistan. It presents a qualitative summary of health risks identified at these locations and their potential medical implications. The report is based on information collected from January 2003 through December 2010 to include deployment OEH surveillance sampling and monitoring data (e.g., air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that environmental sampling at FOB Sharana 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 January 2003 through December 2010.

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

SITE DESCRIPTION: FOB Sharana, established in 2001, is located south of the town of Sharan, Paktika Province of Eastern Afghanistan. It is a logistics and infantry base supporting several satellites (FOBs) in Regional Command East. FOB Sharana appears to be about three square miles in size, with a one-mile long runway. The base camp straddles multiple wadis and ridges, with most of the facilities built upon the ridges. The elevation of FOB Sharana is 2141 meters (m) (approximately 7000 feet (ft)) above sea level. It is a barren, arid region with sparse vegetation.

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

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

Short-term health risks & medical implications:

The following may be associated with potential acute health effects in some personnel during deployment at FOB Sharana:

Inhalable coarse particulate matter less than 10 micrometers in diameter (PM10); food/waterborne diseases (e.g., gastroenteritis /food poisoning, bacterial diarrhea, Hepatitis A, Typhoid fever, Brucellosis, diarrhea-cholera, diarrhea-protozoal, Hepatitis E); other endemic diseases (malaria, cutaneous leishmaniasis, Crimean-Congo hemorrhagic fever, Sandfly fever, Leptospirosis, Tuberculosis (TB), Rabies, Anthrax, Q fever); heat stress; continuous noise; waste sites/waste disposal concerns; and burn pits. For food/waterborne diseases (e.g., gastroenteritis /food poisoning, bacterial diarrhea, Hepatitis A, Typhoid fever, Brucellosis, diarrhea-cholera, diarrhea-protozoal, Hepatitis E), if ingesting food and water off post, the health effects could have temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, Hepatitis E, and Brucellosis). 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, Crimean-Congo hemorrhagic fever, Sandfly fever), these diseases may constitute a significant risk due to exposure to biting vectors; risk is reduced to low by proper wear of treated uniform, application of repellent to exposed skin and bed net, and appropriate chemoprophylaxis. For water-contact diseases (Leptospirosis), activities involving extensive contact with surface water increase risk. For respiratory diseases (Tuberculosis (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 for susceptible persons including those older than 45, of low fitness level, unacclimatized personnel, or individuals with underlying medical conditions. Risks from heat stress may have been reduced with preventive medicine controls, proper work-rest cycles, and mitigation. For continuous noise, risk is to personnel working near major noise sources; risk is reduced to personnel working near major noise sources by consistently wearing proper hearing protection. Health risks due to solid waste disposal and/or storage deficiencies may have been avoided or reduced with appropriate sanitation and waste management practices.

Air quality: For inhalational exposure to high levels of dust and PM10, such as during high winds or dust storms, exposures 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, and certain subgroups of the deployed forces (e.g., those with pre-existing asthma/respiratory and cardio-pulmonary conditions) are at greatest risk of developing notable health effects. Likewise, for burn pits, exposures to high levels of PM10 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 effects from exposure to PM10 and to 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 Sharana, Afghanistan. Personnel who reported with symptoms or required treatment while at this site should have exposure/treatment noted in medical record on a Standard Form (SF) 600 (Chronological Record of Medical Care).

Long-term health risks & medical implications:

The following may be associated with potential chronic health effects in some personnel during deployment at FOB Sharana:

The hazards associated with potential long-term health effects at FOB Sharana, Afghanistan, include inhalable particulate matter less than 2.5 micrometers in diameter (PM2.5) and continuous noise. For continuous noise, risk is to personnel working near major noise sources; long-term risk is reduced to personnel working near major noise sources by consistently wearing proper hearing protection.

Air Quality: It is considered possible that some otherwise healthy personnel who were exposed for a long-term period to particulate matter less than 2.5 micrometers in diameter (PM2.5) 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 PM exposures are documented and archived, at this time there are 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, or 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 Sharana, 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 to High, Daily levels varied; acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects were 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 None, 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 action 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: Moderate, A small percentage of persons 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: Data quantity insufficient to characterize risk.
Military Unique			
Non-ionizing Radiation	Short-term: Low		Short-term: Low to none
	Long-term: Low		Long-term: Low to none
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: High, (Bacterial diarrhea, Hepatitis A, Typhoid fever) to Moderate (FOB Sharana Gastroenteritis/Food Poisoning, 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, Brucellosis, Hepatitis E).	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: Not an identified source of health risk.		Long-term: No data available
Arthropod Vector Borne	Short-term: High (Malaria), Moderate, (Leishmaniasis-cutaneous, Crimean-Congo hemorrhagic fever, Typhus-miteborne, Sandfly fever) to Low	Preventive measures include proper wear of treated uniform, application of repellent to	Short-term: Low

	(Plague, West Nile fever). Long-term: Low (Leishmaniasis-visceral infection)	exposed skin and bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	 Long-term: No data available
Water-Contact (e.g. wading, swimming)	Short-term: Moderate for Leptospirosis Long-term: No data available	Recreational swimming in surface waters not likely in this area of Afghanistan during this time period.	Short-term: Low to none Leptospirosis Long-term: No data available
Respiratory	Short-term: Moderate [Tuberculosis (TB)] and Low (Meningococcal meningitis). Long-term: No data available	Providing adequate work and living space, medical screening, and vaccination.	Short-term: Low to none Long-term: No data available
Animal Contact	Short-term: Moderate (Rabies, Anthrax, Q-fever), Low (H5N1 Avian Influenza) Long-term: Low (Rabies)	Prohibiting contact with, adoption, or feeding of feral animals in accordance with U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: Low to none Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low, if encountered, effects of venom vary with species from mild localized swelling (e.g., *Scorpiops lindberg*) to potentially lethal effects (e.g.,*Gloydius halys*). Long-term: Not an identified source of health risk.	Risk reduced by avoiding contact, proper wear of the uniform (especially footwear), and timely treatment.	Short-term: Low, if encountered, effects of venom vary with species from mild localized swelling (e.g., *Scorpiops lindberg*) to potentially lethal effects (e.g., *Gloydius halys*). Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: High to Moderate, high risk of heat injury in unacclimatized personnel. Long-term: Low, However, the health risk may be greater to certain susceptible persons–those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Low Long-term: Low; However, the risk may be greater to certain susceptible persons–those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.
Cold	Short-term: Low	Risks from cold stress reduced with protective	Short-term: Low risk of cold stress/injury.

	Long-term: Low, Long-term health implications from cold injuries were rare but could occur, especially from more serious injuries such as frostbite.	measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper wear of issued protective clothing.	Long-term: Low; Long-term health implications from cold injuries were rare but could occur, especially from more serious injuries such as frostbite.
NOISE			
Continuous (Flightline, Power Production)	Short-term: High to Low, High risk to individuals working near major noise sources without proper hearing protection.	Hearing protection used by personnel in higher risk areas.	Short-term: Low risk to the majority of personnel and to individuals working near major noise sources who use proper hearing protection.
	Long-term: High to Low, High risk to individuals working near major noise sources without proper hearing protection.		Long-term: Low risk to the majority of personnel and to individuals working near major noise sources who use proper hearing protection.
Unique Incidents/ Concerns			
Fuel/Petroleum Products/Industrial Chemical Spills	Short-term: Low		Short-term: Low
	Long-term: Low		Long-term: Low
Waste Sites/Waste Disposal:	Short-term: Moderate, Risks due to solid waste deficiencies management may have been avoided or reduced with appropriate sanitation and waste management practices.		Short-term: Low
	Long-term: Low		Long-term: Low
General and Field Sanitation	Short-term: Low		Short-term: Low
	Long-term: None identified		Long-term: None identified
Pesticides/Pest Control	Short-term: Low	See Section 10.3	Short-term: Low
	Long-term: Low		Long-term: Low
Burn Pits	There is a five-bay burn pit facility, located in the northeast part of FOB Sharana. Short-term: Not enough samples taken near the burn pit to evaluate short-term health risk. Short-term health effects could include eye, nose, throat, and lung irritation. More serious effects are possible in susceptible persons (e.g., those with asthma/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 general ambient and occupational environment conditions at FOB Sharana. It does not represent a unique individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may be present in the environment, if a person does not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may be no health risk. Alternatively, a person at a specific location may experience a unique exposure which could result in a significant individual exposure. Any such person seeking medical care should have their specific exposure documented in an SF600.

[2] This assessment is based on specific environmental sampling data and reports obtained from January 2003 through December 2010. 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 Sharana. The health risks are presented as Low, Moderate, High or Extremely High for both short- and long-term health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the USAPHC/Army Institute of Public Health (AIPH). Where applicable, "None Identified" is used when though an exposure was identified, no health risk of either a specific short- or long-term health effects were determined. More detailed descriptions of OEH exposures that were evaluated but determined to pose no health risk are discussed in the following sections of this report.

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

1 Discussion of Health Risks at FOB Sharana, 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

Personnel deployed to FOB Sharana were exposed to various airborne contaminants as identified by monitoring and sampling efforts between January 2003 and December 2010. Sources of airborne contaminants at the base camp included diesel vehicle and generator exhaust, dust from unpaved roads and surfaces, year-round construction activities, agriculture located off base, aircraft exhaust, a batch cement plant, incinerators, and burn pits. In addition, dust storms, periods of high winds, and vehicle traffic passing through moon dust (very fine silts with the consistency of talcum powder) contributed to particulate matter (PM) exposures above health-based MEGs.

FOB Sharana operates a five-bay burn pit facility located in the northeast part of the FOB near the Helicopter Landing Zone (HLZ). There is a DOD run HLZ, a contractor run HLZ, fire station and a few guard towers near the burn pit. There are burn barrels on FOB Sharana located between 15 and 20 feet from the living quarters, gym and the forward surgical team. Prevailing wind directions (from the East and Southeast) bring smoke and fumes over the FOB from the burn pits.

2.2 Particulate Matter

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

particles with a diameter of 10 micrometers or less, and fine particles less than 2.5 micrometers ($PM_{2.5}$), which can reach the deepest regions of the lungs when inhaled. Exposure to excessive PM is linked to a variety of potential health effects.

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

2.3.1 Exposure Guidelines:

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

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

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

- Not defined and not available.

2.3.2 Sample data/Notes:

A total of 72 valid PM_{10} air samples were collected from 2007-2009. The range of 24-hour PM_{10} was 36 to 882 $\mu g/m^3$ with an average concentration was 178 $\mu g/m^3$.

There was no sampling data for 2003-2006 and 2010.

2.3.3 Short-term health risk:

Variable (Low to High): The short-term PM_{10} health risk assessment estimate was low to high 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 PM_{10} exposure concentrations at FOB Sharana suggested the expected losses may have little or no impact on accomplishing the mission. A high short-term health risk assessment estimate for peak PM_{10} exposure concentrations suggested a significant degradation of mission capabilities with the inability to accomplish all parts of the mission, or the inability to complete the mission to standard if hazards occur during the mission (Reference 4, Table 3-2). Daily average health risk levels for PM_{10} show no hazard for 81%, low health risk for 12%, moderate health risk for 4%, and high health risk for 3% of the time.

The hazard severity was negligible for average 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).

The hazard severity was critical for the highest observed PM_{10} sample concentrations. During peak exposures at the critical hazard severity level, most, if not all, personnel may have experienced very notable eye, nose and throat irritation respiratory effects. Some personnel may not be able to perform assigned duties. Some lost-duty days may be expected. Those with a history of asthma or cardiopulmonary disease may experience more severe symptoms (Reference 4, Table 3-10).

2.3.4 Long-term health risk:

Not evaluated because there are no available health guidelines. The EPA retracted its long-term National Ambient Air Quality Standard (NAAQS) for PM_{10} due to an inability to link chronic health effects with chronic PM_{10} exposure levels.

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

2.4.1 Exposure Guidelines:

Short Term (24-hour) $PM_{2.5}$ MEGs ($\mu g/m^3$):
- Negligible MEG = 65
- Marginal MEG = 250
- Critical MEG = 500

Long-term (1-year) $PM_{2.5}$ MEGs ($\mu g/m^3$):
- Negligible MEG = 15
- Marginal MEG = 65

2.4.2 Sample data/Notes:

A total of 35 valid $PM_{2.5}$ samples were collected in 2008-2009. The range of 24-hour $PM_{2.5}$ concentrations was 6 $\mu g/m^3$ to 303 $\mu g/m^3$ with an average concentration of 92 $\mu g/m^3$. There were no sampling data for 2003-2007 and 2010.

2.4.3 Short-term health risk:

Low: The short-term $PM_{2.5}$ health risk assessment estimate was low to high 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 $PM_{2.5}$ exposure concentrations at FOB Sharana suggested the expected losses may have little or no impact on accomplishing the mission. A high short-term health risk assessment estimate for peak $PM_{2.5}$ exposure concentrations suggested a significant degradation of mission capabilities with the inability to accomplish all parts of the mission, or the inability to complete the mission to standard if hazards occur during the mission (Reference 4, Table 3-2).

The hazard severity was negligible for average $PM_{2.5}$ 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.

The hazard severity was marginal for the highest observed $PM_{2.5}$ sample concentrations. During peak exposures at the marginal hazard severity level, a majority of personnel may have experienced notable eye, nose and throat irritation and some respiratory effects. Some lost-duty days may be expected. Those with a history of asthma or cardiopulmonary disease may experience increased symptoms (Reference 4, Table 3-10).

2.4.4 Long-term health risk:

Moderate: The $PM_{2.5}$ long-term marginal MEG of 65 $\mu g/m^3$ was exceeded by the average $PM_{2.5}$ concentrations in all years sampled. With repeated exposures above the MEG, a small percentage of personnel may have increased risk for developing chronic health conditions such as reduced lung function or exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with a history of asthma or cardiopulmonary disease were considered to be at particular risk (Reference 4, Table 3-11). However, the data quantity was insufficient to characterize the potential long-term health risk from $PM_{2.5}$ exposure to U.S. personnel.

2.5 Airborne Metals from PM_{10}

2.5.1 Sample data/Notes:
A total of 72 valid PM_{10} airborne metal samples were collected at FOB Sharana from 2007-2009. There were no sampling data for 2003-2006 and 2010.

2.5.2 Short-term and long-term health risks:
None identified based on the available sampling data. Confidence in the risk estimate is low (Reference 4, Table 3-6).

2.6 Volatile Organic Compounds (VOCs)

The likely sources of VOCs on FOB Sharana were the result of fuel storage and transfers between storage tanks, vehicles and aircraft. Large, dark rubber fuel bladders and steel aboveground storage tanks, which offer little control for volatilization of fuel, are located on FOB Sharana.

2.6.1 Sample data/Notes:
In 2009, 16 samples were analyzed for VOCs using EPA Method TO17. None of the analyzed VOCs were found at concentrations above a short- or long-term MEG.

2.6.2 Short and long-term health risks:
None identified based on available sampling data**.** However, the data quantity was insufficient to characterize the potential short-term and long-term health risk from VOCs exposure to U.S. personnel. Confidence in the risk estimate is low (Reference 4, Table 3-6).

3 Soil

FOB Sharana straddles multiple wadis and ridges, with most of the facilities built upon the ridges. The region consists of barren desert and mountainous terrain with concentrated areas of low lying agricultural fields.

3.1 Site-Specific Sources Identified

3.1.1 Sample data/Notes:
A total of 12 valid surface soil samples collected at FOB Sharana from 2007-2009 was assessed for metals, inorganic and organic chemicals, pesticides and herbicides. For the health risk assessment, personnel were assumed to remain at this location for approximately one year. No health hazards were identified from surface soil samples collected.

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

3.1.3 Long-term health risks:
No parameters exceeded 1-year Negligible MEGs. However, the data quantity was insufficient to characterize the potential long-term health risk from soil exposure to U.S. personnel.

4 Water

In order to assess the risk to U.S. personnel from exposure to water in theater, the Army Institute of Public Health (AIPH) identified the most probable exposure pathways based on available information.

The water exposures considered were the ingestion of water used for drinking and the use of water for non-drinking purposes (such as personal hygiene, or showering).

4.1 Drinking Water

4.1.1 Site-Specific Sources Identified

Water used as drinking water was from bottled water and reverse osmosis water purification unit (ROWPU) sources. There is only one sample, taken in 2009, representing drinking water exposures at FOB Sharana. There was not enough data to evaluate short-term or long-term health risk.

4.1.2 Short-term and long-term health risk

There was not enough data to evaluate a short-term or long-term health risk. Confidence in the risk estimate is low because of the small sample size (Reference 4, Table 3-6).

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

4.2.1 Site-Specific Sources Identified

U.S. personnel used the ROWPU-treated water supply and raw well water at FOB Sharana for non-drinking purposes (i.e., personal hygiene, and showering, etc.).

4.2.2 Sample data/Notes

Eight non-drinking water samples were assessed to determine the short and long-term health risk. Water samples representing non-drinking water were collected in 2008, 2009, and 2010 for ROWPU-treated water and in 2007 and 2008 for untreated, raw well water sources.

4.2.3 Short-term and long-term health risk:

There was not enough data to evaluate a short-term or long-term health risk. Confidence in risk estimate is low because of the small sample size (Reference 4, Table 3-6).

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons:

No specific hazard were documented in Defense Occupational and Environmental Health Readiness System (DOEHRS), or the Military Exposure Surveillance Library (MESL) data portal from the 2003 through 2010 timeframe (References 1 and 7).

5.2 Depleted Uranium (DU):

No specific hazard were documented in DOEHRS or the MESL data portal from the 2003 through 2010 timeframe. According to the DOD, depleted uranium has not been used in Afghanistan (References 1 and 7).

5.3 Ionizing Radiation:

No specific hazards were documented in DOEHRS or MESL data portals from the 2003 through 2010 timeframe (References 1 and 7).

5.4 Non-Ionizing Radiation:

There are a few different sources of non-ionizing radiation at FOB Sharana. There are multiple communication antennas and satellite dishes located throughout the camp, as well as duke systems in the convoy vehicles. The documentation does not mention any types of controls being used, nor have there been any non-ionizing radiation related injuries.

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

6 Endemic Disease[1]

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. In addition, site-specific information from the MESL database was used. CENTCOM Modification (MOD) 11 (Reference 8) lists deployment requirements, to include immunization 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 FOB Sharana Gastroenteritis/Food Poisoning

Moderate, mitigated to Low: A comprehensive data search found three dining facilities inspected between August 2004-July 2005. The inspection data was reported by preventive medicine personnel using DA Form 5161-R, Comprehensive Food Establishment Inspection, or in a narrative (memorandum) format summarizing base camp assessment findings. All three dining facilities had critical deficiencies in food handling, facility sanitation and personal hygiene, which included but not limited to:

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

- Infestation with flies due to doors being kept open, spoil foods and poorly maintained trash receptacles inside and outside the facility;
- Sanitizer and sanitizing rinse was not used on equipment and during warewashing [3-compartment sink];
- Reoccurring deficiencies included but not limited to fly infestations; food debris accumulated on floors and in refrigerators; storing produce, frozen meats, and semi-perishable products directly on the floor; absence of hand washing devices; overcrowding of food storage containers and refrigeration units; and spoilage of fresh fruits and vegetables;
- Improper holding temperatures for refrigerated or frozen foods and hot foods during serving;
- Use of non-potable water to conduct warewashing and facility sanitation activities.

Although all the dining facilities received unsatisfactory ratings, no foodborne illness outbreaks were identified/confirmed during the period of the review.

6.1.2 Diarrheal diseases (bacteriological)

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

6.1.3 Hepatitis A

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

6.1.4 Typhoid/paratyphoid Fever

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

6.1.5 Diarrhea - protozoal

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. In general, *Cryptosporidium* spp., *Entamoeba histolytica*, and *Giardia lamblia* were the most common

protozoal causes of diarrhea wherever sanitary conditions were significantly below U.S. standards. A small number of cases (less than 1% per month attack rate) could occur among personnel consuming local food, water, or ice. Outbreaks affecting a higher percentage of personnel were possible with *Cryptosporidium*. Symptomatic cases may vary in severity; typically mild disease demonstrating recovery and return to duty in less than 72 hours with appropriate therapy; severe cases may require 1 to 7 days of supportive care, followed by return to duty.

6.1.6 Brucellosis

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

6.1.7 Diarrhea - cholera

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

6.1.8 Hepatitis E

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

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

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

6.2 Arthropod Vector-Borne Diseases

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

6.2.1 Malaria
High, mitigated to Low: Unmitigated health risk to U.S. personnel was high with seasonal transmission (April-November). Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems, which provide breeding habitats for vectors. Malaria incidents can cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty. Severe cases may require intensive care or prolonged convalescence, and fatalities can occur. Note: antimalarials are required for U.S. personnel deploying to Afghanistan.

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

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

6.2.4 Crimean-Congo hemorrhagic fever
Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round (peak exposure March-November). Crimean-Congo hemorrhagic fever occurs in rare cases (less than 0.1% per month attack rate in indigenous personnel) and is transmitted by tick bites or

occupational contact with blood or secretions from infected animals. The disease typically requires intensive care with fatality rates from 5% to 50%.

6.2.5 *Typhus-miteborne (scrub typhus)*

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. 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.

6.2.6 Sandfly fever

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

6.2.7 Plague

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

6.2.8 West Nile fever

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

6.2.9 Short-term health risks:

Low: The overall short-term unmitigated health risk associated with arthropod vector-borne diseases at FOB Sharana was considered high (malaria) to moderate (sandfly fever, leishmaniasis (cutaneous and visceral), typhus-miteborne and Crimean-Congo hemorrhagic fever) to low (West Nile fever, and plague). Preventive measures such as IPM practices, proper wear of treated uniforms and application

of repellent to exposed skin reduced the health risk to low to none for arthropod vector-vector borne diseases. Confidence in the risk estimate was medium (Reference 4, Table 3-6).

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

6.3 Water Contact Diseases

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

6.3.1 Leptospirosis
Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (March-November). Leptospirosis is present in Afghanistan but at unknown levels. Human infection occurs through exposure to water or soil contaminated by infected animals and has been associated with wading, and swimming in contaminated, untreated open water. The occurrence of flooding after heavy rainfall facilitates the spread of the organism because, as water saturates the environment, Leptospirosis present in the soil pass directly into surface waters. Leptospirosis can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Ingestion of contaminated water can also lead to infection. The acute generalized illness associated with infection can mimic other tropical diseases (for example, dengue fever, malaria, and typhus), and common symptoms include fever, chills, myalgia, nausea, diarrhea, cough, and conjunctival suffusion. Manifestations of severe disease can include jaundice, renal failure, hemorrhage, pneumonitis, and hemodynamic collapse. Recreational activities involving extensive water contact may result in personnel being temporarily debilitated with leptospirosis.

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

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

6.4 Respiratory Diseases

Although not specifically assessed in this document, deployed U.S. forces may be exposed to a wide variety of common respiratory infections in the local population. These include influenza, pertussis, viral upper respiratory infections, viral and bacterial pneumonia, and others. The U.S. military populations living in close-quarter conditions are at risk for substantial person-to-person spread of

respiratory pathogens. Influenza is of particular concern because of its ability to debilitate large numbers of unvaccinated personnel for several days. Mitigation strategies were in place and included routine medical screenings, vaccination, enforcing minimum space allocation in housing units, implementing head-to-toe sleeping in crowded housing units, implementation of proper personal protective equipment (PPE) when necessary for healthcare providers and detention facility personnel. Additional mitigation included active case isolation in negative pressure rooms, where available.

6.4.1 Tuberculosis (TB)

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

6.4.2 Meningococcal meningitis

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

6.4.3 Short-term health risks:

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

6.4.4 Long-term health risks:

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

6.5 Animal-Contact Diseases

6.5.1 Rabies

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs were the primary reservoir of rabies in Afghanistan, and a frequent source of human exposure. Rabies is transmitted by exposure to the virus-laden saliva of an infected animal, typically through bites, but could occur from scratches contaminated with the saliva. A U.S. Army Soldier stationed in Afghanistan died of rabies on 31 August 2011 (Reference 9). Laboratory results indicated the Soldier was infected from contact with a dog while deployed. Although, the vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1B, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Q-Fever

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was moderate year round. Rare cases were possible among personnel exposed to aerosols from infected animals, with clusters of cases possible in some situations. Significant outbreaks (affecting 1-50 percent) could occur in personnel with heavy exposure to barnyards or other areas where animals are kept. Unpasteurized milk may also transmit infection. The primary route of exposure is respiratory, with an infectious dose as low as a single organism. Q-Fever is a debilitating febrile illness, sometimes presenting as pneumonia, typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies include consuming approved food sources, avoidance of animals and farms, dust abatement when working in these areas (wet mop, water sprayed on high volume traffic areas, etc.), and proper PPE for personnel working with animals.

6.5.3 Anthrax

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

6.5.4 H5N1 avian influenza

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

6.5.5 Short-term health risks:

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

6.5.6 Long-term health risks:

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

7 Venomous Animal/Insect

All information was taken directly from the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 10). The species listed below have home ranges that overlap the location of FOB Sharana, and may present a health risk if they are encountered by personnel.

7.1 Spiders

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

7.2 Scorpions

- *Androctonus afghanus, Androctonus amoreuxi,* and *Androctonus baluchicus*: Severe envenoming possible, potentially lethal. Severe envenoming may produce direct or indirect cardio toxicity, with cardiac arrhythmias, cardiac failure. Hypovolaemic hypotension possible in severe cases due to fluid loss through vomiting and sweating.

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

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

- *Scorpiops afghanus, Scorpiops lindbergi:* Mild envenoming only, not likely to prove lethal. Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

7.3 Snakes

- *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.

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

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

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

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

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

FOB Sharana is located at 2141 m (approximately 7000 ft.) above sea level. Precipitation is concentrated in the winter (snow) and spring months. Summers are long and hot (temperatures range from 58 to 90 °F) but have very low humidity. Fall (October and November) is warm and dry. Winters are cold but short, lasting from December to March (temperature range: 19-40 °F). The mean annual average precipitation for the region is 13.9 inches, with the majority of the recorded precipitation occurring February through April. Heat stress/injuries and cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone (Reference 10).

8.1 Heat

8.1.1 Short-term health risk:
Moderate. 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 risks:
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:

A generator farm is located on the south side of the FOB, near the end of the runway and a mile away from the billeting structures. There are several stand-alone generators located throughout FOB Sharana. There are also helicopters, small cargo aircrafts and year round construction that contribute to noise levels.

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

9.2 Impulse:

No specific hazards were documented in DOEHRS or MESL data portals from 2003 through 2010.

10 Other Unique Occupational Hazards

10.1 Potential environmental contamination sources

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

10.2 Fuel/Petroleum Products/Industrial Chemical Spills

An environmental conditions report completed in February 2009 by the US Army Corps of Engineers and the US Air Force identified several fuel spills at FOB Sharana. The largest fuel spill occurred at the Fuel Point on 31 January 2009. About 1200 gallons of JP-8 was released from an over-filled fuel bladder. Remediation consisted of applying clean soil to soak up the fuel and excavation of contaminated soil and gravel to the former wastewater lagoon area where it was treated. Contaminated soil in excess of 2-ft deep was left in place under the bag farm's secondary containment walls to avoid structural compromise.

The second largest spill occurred on 28 January 2009, when a contracted AN-28 cargo plane crashed near the runway. At least 600 gallons of fuel leaked from the center and starboard wing tanks during and after impact. Clayey soil was scraped and bulldozed down to a small dry gulley, and pushed downstream. Remediation consisted of excavation of contaminated soil to the former sewage lagoon where it was treated

Two spills at the Fuel Point's Jingle Truck fuel transfer area were excavated to a depth of 3 ft. The contaminated soil was removed and taken to the burn pit for thermal treatment.

Short-term and Long-term risks: Low. The large spills at the fuel point and airfield were remediated, but some contaminated soils remain. Confidence in this risk estimate is medium.

10.3 Pesticides/Pest Control

Several reports for food and general sanitation documented issues with flies, rodents, mosquitoes and possible ticks and fleas from feral dogs and cats. Personnel do not employ individual vector controls such as wearing clothing that have been pre-treated with insect repellent, applying a topical insect repellent to skin, using bed nets, or taking prescribed chemoprophylasix (for Malaria). Pretreated uniforms are standard issue.

A search of the DOD OEHS Data Portal for FOB Sharana identified two Pest Management Reports, dated November 2006 and January 2007. There were no reports that indicated accidents, misuse, misapplication or other hazards associated with pesticides use. Chemical pesticides used at FOB Sharana include:

- Rodenticides: Bromadialone, brodifacoum
- Insecticides: Methomyl

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

10.4 Waste Sites/Waste Disposal

10.4.1 Hazardous and Non-hazardous Waste

The 2009 environmental conditions report identified incompatibly stored hazardous and non-hazardous wastes in a Connex on FOB Sharana in December 2008. The potential for similar situations elsewhere on the FOB is high (other collections of drums were identified on the FOB). The Connex containing the incompatible HazMat had no secondary containment, but the spent oil filters were in UN-approved steel drums. The materials were safely removed from the Connex. Non-hazardous materials (41 empty cylinders) were placed back into the Connex. Hazardous materials (wet cell batteries, communication equipment batteries, spent fuel, and oil filters) and the 161 drums of various non-hazardous material scattered throughout the FOB was transported to KBR's HazMat facility at Bagram Air Field (BAF), Afghanistan.

Two regulated medical waste (RMW) incinerators were assembled in June 2010 and at least one is operational as of 2011. Pre-RMW incinerators, RMW was red-bagged and stockpiled in a designated Connex awaiting incineration.

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

10.4.2 Solid Waste Management

Three documents (an Environmental Conditions Report and two Field Sanitation Assessments) identified solid waste management issues. Information was collected 30 August 2004 through 6 February 2009 (the dates encompassed by reports available for LSA Adder on the DOEHS Portal). Issues included lids not being replaced on trashcans and litter strewn about the camps; dumpsters not kept closed; and food waste receptacles not being emptied or cleaned on a regular basis. A large debris pile provides harborage for feral dogs and cats, and UXO is occasionally identified at the burn pit. Waste is disposed of using a five-bay burn pit facility.

Short-term health risk: **Moderate**. Improper solid waste storage is a moderate health risk. An outbreak of disease could temporarily impact the mission.

Long-term health risk: Improper solid waste storage is a low health risk. The overall risk estimate for solid waste management is moderate.

10.5 General and Field Sanitation

Several reports and databases were assessed for waste collection/storage; latrine, shower and laundry facilities; hand washing stations; sanitary practices in barber/beauty shops and gymnasiums; living accommodations and report vector/pest problems. A total of nine base camp assessments from August 2002 through July 2005 characterized overall sanitation conditions at three distinct communities occupying FOB Sharana.

Sanitation concerns that can affect or potentially affect personnel stationed at FOB Sharana included documentation of raw sewage from latrines; consumption of non-potable water from wells, local municipalities, or surface reservoirs (streams, rivers, lakes); unsatisfactory waste management operations and free standing water; sanitation team or the FOB engineering support element not implementing local pest control activities; feral dogs and cats migrating onto FOB and/or are allowed to breed on the FOB and poor sanitation at the barber/beauty shop (does not wash and sanitize scissors), and gym (gym equipment not disinfected and sanitized).

Short-term health risk: Low risk with the potential of diarrheal disease.

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

The overall risk estimate is low.

10.6 Lead- based Paint

No specific hazards were documented in DOEHRS or MESL data portals from the 2003 through 2010 timeframe.

10.7 Asbestos

No specific hazards were documented in DOEHRS or MESL data portals from the 2003 through 2010 timeframe.

10.8 Burn Pits

Burn pits at FOB Sharana have been used since it was first occupied to dispose of municipal solid waste, debris, etc. FOB Sharana currently operates a five-bay burn pit facility located in the northeast part of the FOB near the Helicopter Landing Zone (HLZ). There is a DOD ran HLZ, a contractor ran HLZ, fire station and a few guard towers near the burn pit. There are burn barrels on FOB Sharana located between 15 and 20 feet from the living quarters, gym and the forward surgical team. Prevailing wind directions (East and Southeast) bring smoke and fumes over the FOB from the burn pit.

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 11). The Institute of Medicine committee's (Reference 11) 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 following two sections reflect deployment OEHS sampling for particulate matter in relation to FOB Sharana burn pits.

10.8.1 Particulate Matter, 10 microns (PM_{10})

10.8.2 Exposure Guidelines:

Short-term (24-hour) PM_{10} MEGs (µg/m^3):
- Negligible MEG = 250
- Marginal MEG = 420
- Critical MEG = 600

Long-term (1-year) PM_{10} MEG (µg/m^3):
- Not defined and not available.

10.8.2.1 Sample data/Note:

There were five 24-hour PM_{10} samples taken near the burn pit. The samples' concentrations range was 120 to 682 µg/m^3 with an average concentration of 292 µg/m^3. Due to the limited number of samples taken near the burn pits, a risk assessment could not be conducted.

Short-term and long-term health risks: Not enough data to evaluate a short-term or long-term health risk.

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

10.8.4 Exposure Guidelines:

Short-term (24-hour) $PM_{2.5}$ MEGs (µg/m^3):
- Negligible MEG = 65
- Marginal MEG = 250
- Critical MEG = 500

Long-term (1-year) $PM_{2.5}$ MEGs (µg/m^3):
- Negligible MEG = 15
- Mariginal MEG = 65

There was only one 24-hour $PM_{2.5}$ sample taken near the burn pit. The sample concentration was 33 µg/m^3. Due to the limited number of samples taken near the burn pits, a risk assessment could not be conducted.

Short-term and long-term health risks: Not enough data to evaluate a short-term or long-term health risk.

11 References[2]

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

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

3. Joint Staff Memorandum (MCM) 0028-07, Procedures for Deployment Health Surveillance, 2007.

4. USAPHC TG230, June 2010 Revision, Final Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel TG230.

5. USACE. Final Task Force Castle Environmental Conditions Report FOB Sharana, Afghanistan, 6 February 2009.

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

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

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

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

10. 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.

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

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

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).
U.S. Army Public Health Command (USAPHC) [(formerly the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)] 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