Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Eskan Village, Kingdom of Saudi Arabia
Calendar Years: October 1999 to October 2012

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.

PURPOSE: This POEMS documents the DoD assessment of base camp level Occupational and Environmental Health Surveillance (OEHS) exposure data for Eskan Village. It presents the identified health risks and assessments along with the possible associated medical implications. The findings were based on information collected from October 1999 through October 2012 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. While this assessment may reflect similar exposures and health risks pertaining to historic or future conditions at this site, the underlying data were limited to the time period(s) and area(s) sampled and thus may not reflect fluctuations or unique occurrences. It also may not have been fully representative of all the fluctuations during the timeframe. To the extent that the data allowed, this summary describes the general ambient conditions at the site and characterizes the health risks at the population–level. While useful to inform providers and others of potential health effects and associated medical implications, it does not represent an individual exposure profile. Actual individual exposures and specific resulting health effects depend on many variables and, should be addressed in individual medical records by providers as appropriate at the time of an evaluation of a unique exposure.

SITE DESCRIPTION: Eskan Village (population 840) is located southeast of the city Riyadh (population 6 million) in the Kingdom of Saudi Arabia. It is situated in a broad desert plain near the center of the Arab Peninsula 600 meters above sea level. Primary U.S. mission operations are the 64th Air Expeditionary Group, U.S. Military Training Mission and Office of the Program Manager Saudi Arabian National Guard (OPM-SANG). Eskan Village does not have a runway or any aircraft operations. Eskan Village is also located 2 kilometers northwest of a nearby industrial area that contains Saudi Carbonate Factory, United Wood Products Factory, Nestle Water Factory, Adwan Chemicals, and other industrial corporations that cover a 24 square kilometer area. Also, the Aramco Riyadh Oil Refinery lies 5 kilometers to the south and covers a 9 square kilometer area. Eskan Village was initially developed for the Bedouins and is therefore like a large suburban community. The majority of the base consists of housing units (villas). The villas serve as both residential and work areas.

SUMMARY: Summarized below are the key health risk estimates along with recommended follow-on medical actions, if any, that providers should be aware of. The following pages provide a list of all the identified health risks at Eskan Village (Table 1). As indicated in the detailed sections that follow the table, controls that have been effectively established to reduce health risk levels have been factored into this overall assessment.

Short-term health risks & medical implications:

The following may have caused acute health effects in some personnel during deployment at Eskan Village:

Food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-protozoal) if consuming unapproved food and/or water sources.

Other endemic diseases (e.g., crimean congo hemorrhagic fever, leishmaniasis-cutaneous/visceral, sandfly fever, plague, typhus-fleaborn, west nile fever, tick-borne rickettsioses, sindbis**,** leptospirosis, schistosomiasis, Tuberculosis (TB), meningoccal meningitis, rabies, Q fever, H5N1 fever, anthrax)

Venomous animals/insects.

For personnel that consume non-approved local food, ice or water, there is a varying potential for food/waterborne diseases, (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-protozoal). The health effects of these diseases can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A). Risks from food/waterborne diseases should be reduced with preventive medicine controls and mitigation, which includes hepatitis A vaccinations and only drinking from approved water sources eating from approved food sources in accordance with standing CENTCOM policy.

For other vector-borne endemic diseases (crimean congo hemorrhagic fever, leishmaniasis-cutaneous/visceral, sandfly fever, plague, typhus-fleaborn, west nile fever, tick-borne rickettsioses, sindbis), 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 and bed net, efforts by Pest Management to minimize the biting vectors and appropriate chemoprophylaxis.

For water contact diseases (leptospirosis, schistosomiasis) activities involving extensive contact with surface water increase risk.

For respiratory diseases (tuberculosis, meningococcal meningitis) personnel in close-quarter conditions could have been at risk for person-to-person spread.

Animal contact diseases (rabies, Q fever, H5N1 fever, anthrax), pose year-round risk. For venomous animals and insects, if encountered, effects of venom varied with species from mild localized swelling to potentially lethal effects; risks reduced by avoiding contact and proper and timely treatment.

For heat stress, risk can be greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions. Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, and mitigation.

Air quality: 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. For 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.

Although most effects from exposure to particulate matter 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 Eskan Village. Personnel who reported with symptoms or required treatment while at this site should have exposure/treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care).

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Table 1. Population-Based Health Risk Estimates - Eskan Village, Saudi Arabia [1, 2, 5]

Source of Identified Health Risk[3]			
AIR	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented**	**Residual Health Risk Estimate[4]**
PM_{10}	Short-term: Low-High, Daily levels varied, acute health effects (e.g., upper respiratory tract irritation) 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-High, Daily levels varied, acute health effects (e.g., upper respiratory tract irritation) were possible in susceptible persons (e.g., those with asthma/existing respiratory diseases).
	Long-term: No health guidelines		Long-term: No health guidelines
$PM_{2.5}$	Short-term: Low-High, A majority of the time mild acute (short term) health effects were anticipated; certain peak levels may have produced mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated.	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low-High, A majority of the time mild acute (short term) health effects were anticipated; certain peak levels may have produced mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated.
	Long-term: Moderate, Small percentage of persons may have been at increased risk for developing chronic conditions (particularly those more susceptible to acute (short term) effects (e.g., those with asthma/existing respiratory diseases).		Long-term: Moderate, Small percentage of persons may have been at increased risk for developing chronic conditions (particularly those more susceptible to acute (short term) effects (e.g., those with asthma/existing respiratory diseases).
Metals	Short-term: None Identified		Short-term: None Identified
	Long-term: None Identified		Long-term: None Identified
VOCs	Short-term: None Identified		Short-term: None Identified
	Short-term: None Identified		Short-term: None Identified
Soil	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented**	**Residual Health Risk Estimate[4]**
Various Analytes	Short-term: No health guidelines		Short-term: No health guidelines
	Long-term: None Identified		Long-term: None Identified
Water	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented**	**Residual Health Risk Estimate[4]**
Consumed water	Short-term: None Identified	Potable water used from approved sources	Short-term: None Identified
	Long-term: None Identified		Long-term: None Identified
Water used for other purposes	Short-Term: None Identified		Short-term: None Identified
	Long-Term: None Identified		Long-term: None Identified
ENDEMIC DISEASE	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented**	**Residual Health Risk Estimate[4]**
Food borne/ Waterborne	Short-term: Variable: High (Bacterial Diarrhea) to Moderate (Hepatitis A, Typhoid/Paratyphoid Fever, Diarrhea-Protozoal). If	Preventive measures included Hepatitis A vaccination, consumption of food and water used only from approved	Short-term: Low

	ingesting local food/water, the health effects could have been temporarily incapacitating to personnel (Diarrhea) or resulted in prolonged illness (Hepatitis A).	sources and routinely monitored. (MOD 11)	
	Long-term: None Identified		Long-term: None Identified
Arthropod Vector Borne	Short-term: Moderate (Crimean Congo Hemorrhagic Fever, Leishmaniasis) to Low (Sandfly Fever, Plague, Typhus-Fleaborn, West Nile Fever, Tick-borne Rickettsioses, Sindbis)	Preventive measures included proper wear of the treated uniform and application of repellent to exposed skin and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: None identified		Long-term: None identified
Water-Contact (e.g. wading, swimming)	Short-term: Moderate (Leptospirosis, Schistosomiasis)		Short-term: Moderate
	Long-term: None Identified		Long-term: None Identified
Respiratory	Short-term: Low (Tuberculosis (TB), Meningococcal Meningitis).	Providing adequate living and work space; medical screening; vaccination	Short-term: Low
	Long-term: None Identified		Long-term: None Identified
Animal Contact	Short-term: Moderate (Q-Fever) to Low (Rabies, Anthrax, H5N1 avian influenza)	Prohibiting contact with, adoption, or feeding of feral animals IAW CENTCOM GO 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW the CDC's ACIP guidelines.	Short-term: Moderate (Q-Fever), Low (Rabies, Anthrax, H5N1 avian influenza)
	Long-term: Low (Rabies)		Long-term: Low (Rabies)
VENOMOUS ANIMAL/INSECTS	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented**	**Residual Health Risk Estimate[4]**
Snakes, Scorpions, Snails, Fish	Short-term: Low to High	Risks reduced by education, avoiding contact, and proper and timely reporting and treatment.	Short-term: Low to High (If encountered, effects of venom varied with species from mild localized swelling to potentially lethal)
	Long-term: None Identified		Long-term: None Identified
HEAT/COLD STRESS	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented**	**Residual Health Risk Estimate[4]**
Heat	Short-term: Low to High	Work-rest cycles, proper hydration and nutrition, and WBGT Monitoring.	Short-term: Low to High
	Long-term: Low		Long-term: Low
Cold	Short-term: Low	Risks from cold stress reduced with protective measures such as use of the buddy system, proper wear of protective clothing, and proper hydration and nutrition.	Short-term: Low
	Long-term: Low		Long-term: Low
NOISE	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented**	**Residual Health Risk Estimate[4]**
Continuous (Power generation equipment) Impulse (Weapon firing)	Short-term: Low	Hearing protection used by personnel in higher risk areas	Short-term: Low
	Long-term: Low		Long-term: Low

[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 Eskan Village. 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 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 have resulted in a significant individual exposure. Any such person seeking medical care should have their specific exposure documented in an SF600.

[2] This assessment was based on specific data and reports obtained from the October 1999 through October 2012 timeframe. It was considered a current representation of general site conditions but may not reflect certain fluctuations or unique exposure incidents. Acute health risk estimates were generally consistent with field-observed health effects.

[3] This Summary Table was organized by major categories of identified sources of health risk. It only lists those sub-categories specifically identified and addressed at the site(s) evaluated. The health risks were presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level was based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the APHC/AIPH. Where applicable, "None Identified" was used when an exposure was identified and no health risk of either a specific acute or chronic 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 were 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 Eskan Village, Saudi Arabia by Source

The following sections describe the major source categories of potential health risk that were evaluated at Eskan Village. For each category, the evaluation process includes identifying what, if any, specific sub-categories/health concerns were present.

2 Air

2.1 Site-Specific Sources Identified

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

Environmental surveillance occurred between 1999 and 2012. The summary of results follows.

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

2.2.1 Sample data/Notes:

Exposure Guidelines:

Short-term (24-hour) PM_{10} ($\mu g/m^3$): Negligible MEG=250, Marginal MEG=420, Critical MEG=600.
Long-term PM_{10} MEG ($\mu g/m^3$): Not Available.

The range of 24-hour PM_{10} concentrations in 338 samples was 1 to 1035 $\mu g/m^3$.

2.2.2 Short-term health risks:

Low-High: Short term risk is based on comparison of daily concentrations to 24-hr MEGs. The variability in the risk is due to significant fluctuation in the daily concentrations. The risk assessment is based on sampling data from 1999-2012.

Overall 308/338 (91%) of the sampling days had concentrations below the 24-hour negligible MEG (LOW Risk); 22/338 (7%) of the sampling days were between the 24-hour negligible MEG and the 24-hour marginal MEG (LOW Risk); 7/338 (2%) of the sampling days were between the 24-hour marginal and the 24-hour critical MEG (MODERATE Risk); 1/338 (<1%) of the sampling days were greater than the critical MEG (HIGH risk). Confidence is low based on limitations in sampling data.

Respiratory effects can increasingly impact real-time health and mission capabilities as they exceed higher levels of MEGs. Acute effects to relatively healthy troops are mostly eye, nose, and throat irritation, and respirator effects (sneezing, adaptive responses such as coughing, sinus congestion and drainage) that can be exacerbated by increased activity.

2.2.3 Long-term health risk:

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

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

2.3.1 Sample data/Notes:

Exposure Guidelines:
Short-term (24-hour) $PM_{2.5}$ MEGs (µg/m^3): Negligible MEG=65, Marginal MEG=250, Critical MEG=500.
Long-term $PM_{2.5}$ MEGs: Negligible MEG=15, Marginal MEG=65.

The range of 24-hour $PM_{2.5}$ concentrations in 32 samples collected November 2009, April 2011-March 2012 was 18-907 µg/m^3, with an average concentration during April 2011-March 2012 of 109 µg/m^3.

2.3.2 Short-term risk:

Overall 20/32 (63%) of the sampling days had concentrations below the 24-hour negligible MEG (LOW Risk); 9/32 (28%) of the sampling days were between the 24-hour negligible MEG and the 24-hour marginal MEG (LOW Risk); 2/32 (6%) of the sampling days were between the 24-hour marginal and the 24-hour critical MEG (MODERATE Risk); 1/32 (3%) of the sampling days were greater than the critical MEG (HIGH risk). Confidence is low based on limitations in sampling data.

Low-High: Short term risk is based on comparison of daily concentrations to 24-hr MEGs. The variability in the risk is due to significant fluctuation in the daily concentrations. The risk assessment is based on sampling data from 2009, 2011-2012.

2.3.3 Long-term health risks:

Overall 20/32 (63%) had concentrations between the negligible and marginal MEG; 12/32 (38%) of the sampling days had concentrations above the marginal MEG.

Moderate: The long-term $PM_{2.5}$ health risk assessment for Eskan Village was moderate based on $PM_{2.5}$ concentrations and the likelihood of exposure at these hazard severity levels. A moderate health risk assessment suggests that long-term exposure to peak $PM_{2.5}$ concentrations at Eskan Village were expected to have degraded mission capabilities in terms of the required mission standard and would result in reduced mission capability if hazards occurred during the mission. Confidence in the short-term $PM_{2.5}$ health risk assessment was low (TG 230, Table 3-6).

2.4 Airborne Metals from PM_{10}

2.4.1 Sample data/Notes:

Exposure Guidelines:

The health risk assessment was based on average and peak concentration of 338 PM_{10} airborne metal samples collected at Eskan Village from 1999-2012, and the likelihood of exposure. Risks are determined based on comparison to available MEGs.

2.4.2 Short and long-term health risks:

None identified based on the available sampling data: All contaminants were measured at concentrations below MEGs. Three contaminants have detection limits greater than the MEG (Beryllium, Cadmium, and Vanadium). Since these contaminants weren't detected in any of the samples and/or there is no expected source of these contaminants, no further assessment was needed

(based on guidance in TG 230 paragraph 3.4.4.4). Confidence in this risk assessment is low based on limitations in sampling data and analytical limits of detection.

2.5 Volatile Organic Compounds (VOC)

2.5.1 The health risk assessment was based on average and peak concentration of 235 valid volatile organic chemical (VOC) air samples collected at Eskan Village in 1999, 2000, 2009 and 2011, and the likelihood of exposure.

Six samples were analyzed for acrolein, 2 of which were detected at levels of 1.2-1.4 ug/mg^3 which exceeds the 1 year MEG but is below all short term MEGs. The detection limit for acrolein also exceeds the 1 year MEG (see TG 230, Section 3.4.4.4).

Acrolein MEGs					
1 year	1 hour critical	1 hour marginal	1 hour negligible	8 hr negligible	14 day negligible
0.14 ug/m^3	3200 ug/m^3	230 ug/m^3	70 ug/m^3	70 ug/m^3	46 ug/m^3

All other VOCs were detected in some of the samples, but at levels below pertinent MEGs. Risks are determined based on comparison to available MEGs.

2.5.2 Short and long-term health risks:

The hazard severity for acrolein is considered negligible because the sample concentrations were not greater than any of the short-term (1-hour) MEGs. The lowest of these is the minimal 1-hour MEG of 70 µg/m³, which is the level above which there is the potential for chronic respiratory disease. Because the detected concentrations are far below this level, as well as below the levels at which severe acute effects would occur, little or no adverse impact to the mission is anticipated. Acrolein will be retained as a hazard for future sampling and risk assessments.

No long or short-term health risks were identified from all other VOCs based on the available sampling data and no parameters exceeding 1-year Negligible MEGs.

3 Soil

3.1 Site-Specific Sources Identified

The region is extremely arid with little vegetation and mostly sandy soils. The subsurface conditions are divided into three distinctive layers. The first layer consists of silty sands with some clay approximately 7.5 feet in depth. The second layer is highly weathered limestone 11.5 feet thick and the third layer is a highly weathered limestone with cracks and voids (over 10% water loss) approximately 13 feet thick.

3.2 Sample data/Notes:

A total of 25 soil samples were collected from Eskan Village in 1999, 2003, 2004 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 SVOCs, radionuclides, heavy metals, 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).

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. All contaminants were measured at concentrations below MEGs.

4 Water

In order to assess the health risk to US personnel from exposure to water in theater, the USAPHC identified the most probable exposure pathways. These were based on the administrative information provided on the field data sheets submitted with the samples taken over the time period being evaluated.

Bottled water is the primary source of drinking water for all deployed personnel in Saudi Arabia.

Eskan Village draws its hard-piped water (used for personal hygiene and cooking) from Riyadh Water Authority (RWA). RWA water comes from a variety of sources; ground water, ground water under the influence of surface water and desalinated water.

4.1 Drinking Water: Bottled

4.1.1 Site-Specific Sources Identified

All bottled water is from U.S. Army Public Health Command-approved sources (Nova and Nestle). Each shipment of bottled water is tested upon receipt. The monitoring includes total coliform presence/absence and E. coli. In addition, broad spectrum analysis has been performed on bottled water.

4.1.2 Sample data/Notes:

3 broad spectrum analysis samples were collected in 2004. All analytes were not detected at levels above the short or long term exposure levels.

Routine monitoring results are within acceptable limits.

4.1.3 Short-term and long-term health risks:

None identified based on available sample data.

4.2 Non-Drinking Water: Treated/Disinfected

4.2.1 Site-Specific Sources Identified

Although the primary route of exposure for most microorganisms was ingestion of the contaminated water, dermal exposure to some microorganisms, chemicals, and biological contaminants may have also caused adverse health effects. Complete exposure pathways would have included 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.

The tap water at Eskan Village is tested monthly by the AF clinic. Routine monitoring includes total coliform and *E. coli* bacteria using the presence/absence method. In addition, broad spectrum analysis has been performed on tap water at Eskan Village.

4.2.2 Sample data/Notes:

Exposure Guidelines:

11 broad spectrum analysis samples collected in 1999, 2003, 2004, 2005, 2009 and 2012 were evaluated for this health risk assessment.

Broad spectrum analytes were not routinely detected at levels above the short or long term MEGs.

Records indicate that the routinely monitored parameters (pH, chlorine, bacteriological) are typically within acceptable limits. Deviations from acceptable limits are investigated and corrected as they occur.

4.2.3 Short and long-term health risks:

None identified based on available sample data

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources documented in DOEHRS or MESL

5.2 Depleted Uranium (DU)

No specific hazard sources documented in DOEHRS or MESL

5.3 Ionizing Radiation

5.3.1 Security Forces personnel use an x-ray backscatter device (Rapiscan), located in the ESFS Visitor Control Center, for vehicles entering the gate. Radiation protection survey performed in 2011, verified that shielding and precautions taken are adequate for current operations and shows compliance with occupational and general public radiation safety standards.

5.3.2 Short-term and long-term health risks:

Low: Procedures are in place to maintain exposures as low as reasonable achievable. Confidence in this risk is high.

5.4 Non-Ionizing Radiation

5.4.1 Radar and communication antennas, which emit radio frequency radiation, are scattered throughout the base. Exposure potential is low due to elevated antennas, restricted areas, warning signs, and safe standard operating procedures.

5.4.2 Short and long-term health risks:

Low: Procedures are in place to maintain exposures below the permissible exposure limits. Confidence in this risk assessment is medium.

6 Endemic Disease[1]

All information was taken directly from the National Center for Medical Intelligence (NCMI) (https://www.intelink.gov/ncmi), Infectious Disease Risk Assessment for Saudi Arabia 29 March 2011. This document lists the endemic disease reported in the region, its specific risks and severity and general health information about the disease. The general information on meningococcal meningitis regarding how it is transmitted from person to person came from the World Health Organization's Fact Sheet No. 141 on Meningococcal Meningitis. USCENTCOM MOD 11 (Reference 12 of this document) lists deployment requirements, to include immunization and chemoprophylaxis, in effect during the time frame covered by this POEMS.

6.1 Foodborne and Waterborne Diseases

Food borne and waterborne diseases in the area were potentially transmitted through the consumption of local food and water. Sanitation was poor throughout the country, including major urban areas. Local food and water sources were 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 did not exist within the country. Only a small fraction of diseases were identified or reported in host nation personnel. Diarrheal diseases could have been expected to temporarily incapacitate a very high percentage of U.S. personnel within days if local food or water was consumed. Hepatitis A and typhoid fever could have caused prolonged illness in a smaller percentage of unvaccinated personnel. Vaccination was required for DOD personnel and contractors. In addition, although not specifically assessed in this document, viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., Bacillus cereus, Clostridium perfringens, and Staphylococcus) may have caused significant outbreaks. Key disease risks are summarized below:

6.1.1 Diarrheal Diseases (Bacteriological)

Unmitigated High - Mitigated Low: Mitigation was in place, U.S. Forces were provided food and water from approved sources. Diarrheal diseases can 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 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

Unmitigated Moderate - Mitigated Low: Unmitigated health risk to U.S. personnel was moderate year round. Mitigation was in place, US Personnel did not drink untreated water and vaccination with Hepatitis A vaccine is required for deployment into the CENTCOM AOR. Water consumed by US/DOD

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

personnel was treated on military camps. 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.

6.1.3 Typhoid / Paratyphoid Fever

Unmitigated Moderate – Mitigated Low: Unmitigated health risk to U.S. personnel was moderate year round. Mitigation measures include mandatory Typhoid vaccination for US deployers to the CENTCOM AOR. Risk was typically highest following spring floods. Typhoid and paratyphoid were potentially acquired through the consumption of fecally contaminated food or water. Asymptomatic carriers are common with typhoid and contribute to sustained transmission. A small number of cases (less than 1% per month attack rate) could have occurred among unvaccinated personnel who consumed local food, water, or ice. Common source outbreaks may have occurred. Mitigation was in place, US personnel did not drink untreated water. 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.

6.1.4 Diarrhea - Protozoal

Unmitigated Moderate – Mitigated Low: Mitigation was in place, US personnel do did not drink untreated water. Risk was typically highest following spring floods. In general, Cryptosporidium spp., Entamoeba histolytica, and Giardia lamblia were the most common protozoal causes of diarrhea wherever sanitary conditions are significantly below U.S. standards. A small number of cases (less than 1% per month attack rate) could have occurred among personnel consuming local food, water, or ice. Outbreaks affecting a higher percentage of personnel were possible with Cryptosporidium. Symptomatic cases varied 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.

6.1.5 Short-term Health Risks:

Unmitigated Moderate to High – Mitigated Low: The overall short-term unmitigated risk associated with food borne and waterborne diseases was considered High (for bacterial diarrhea) to Moderate (for hepatitis A and diarrhea-protozoal) if local food or water is consumed. Preventive medicine measures such as vaccinations reduce the risk estimate to none (for Hepatitis A). Additionally, U.S. Forces were provided food and water from approved sources. Confidence in the health risk estimate was Medium

6.1.6 Long-term Health Risks:

None identified based on available data.

6.2 Arthropod Vector-Borne Diseases

During warmer months (approximately April to November), ecological conditions in rural and periurban areas support arthropod vectors, including ticks with variable rates of disease transmission. Because Saudi Arabia lacks adequate diagnostic capability, vector-borne diseases frequently are underreported, and there is a reliance on clinical (symptom-based, vs. laboratory confirmation- based) diagnosis. Vector-borne diseases were transmitted at low or unknown levels and may have constituted a significant health risk in the absence of mitigation measures. See Section 10.4 for more information about pesticides and pest control measures.

6.2.1 Crimean-Congo hemorrhagic fever

Unmitigated Moderate – Mitigated Low: Potential unmitigated health risk to U.S. personnel was Moderate year round with peak transmission from March through November, but reduced to low with mitigation measures. For U.S. personnel, risk mitigation included proper wear of treated uniforms and application of repellent to exposed skin. Risk from tick-borne transmission was limited primarily to warmer months. Risk of transmission from animal contact was present year-round. Most primary Crimean-Congo hemorrhagic fever (CCHF) infections occur as sporadic cases or clusters of cases, and are associated with tick bites or occupational contact with blood or secretions from infected animals. Outbreaks of CCHF occur infrequently, but may be associated with changes in agricultural land use that increase tick contact or incursions of susceptible populations into areas where the disease is endemic. Rare cases (less than 0.1% per month attack rate) could have occurred among personnel exposed to tick bites. Direct contact with blood and body fluids of an infected animal or person may also have transmitted infection. It is a very severe illness typically requiring intensive care with fatality rates from five to fifty percent.

6.2.2 Leishmaniasis – Cutaneous/Visceral

Unmitigated Moderate – Mitigated Low: Potential health risk to U.S. personnel was Moderate year round. For U.S. personnel, risk mitigation included proper wear of treated uniforms, application of repellent to exposed skin, and minimizing outdoor activities (when possible) between dusk and dawn. Leishmaniasis is transmitted by sandflies. Transmission generally was limited to the warmer months. A small number of cases (less than 1% per month attack rate) could occur among personnel exposed to sandfly bites in areas with infected people, rodents, dogs, or other reservoir animals. Asymptomatic chronic infections may have occurred, which may become symptomatic years later. Cutaneous infection was unlikely to be debilitating, though lesions can be disfiguring. Definitive treatment previously required non-urgent evacuation to the continental United States; currently, not all cases require evacuation.

6.2.3 Sandfly Fever

Low: Potential health risk to U.S. personnel was Low and transmission generally was limited to the warmer months. The disease is transmitted by sandflies, which typically bite at night and breed in dark places rich in organic matter, particularly in rodent or other animal burrows. Other suitable habitats include leaf litter, rubble, loose earth, caves, and rock holes. Sandflies may be common in peridomestic settings. Abandoned dwellings, sometimes used by troops as temporary quarters, also can harbor significant numbers of sandflies. Stables and poultry pens in peridomestic areas also may harbor sandflies. Although data were insufficient to assess potential disease rates, 1 to 10 percent of personnel could have been affected per month under worst case conditions. In small groups, exposed to heavily infected sandfly populations in focal areas, attack rates could have been very high (over 50 percent). Incidents can result in debilitating febrile illness typically requiring 1 to 7 days of supportive care followed by return to duty.

6.2.4 Plague

Low: Potential health risk to U.S. personnel was Low year round. Bubonic plague typically occurs 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.

6.2.5 Typhus-Fleaborn

Low: Potential health risk to U.S. personnel was Low. The disease is transmitted by fleas, usually on rats. While rat fleas are the most common vectors, cat fleas and mouse fleas are less common modes of transmission. These fleas are not affected by the infection. Human infection occurs because of flea-fecal contamination of the bites on human skin.

6.2.6 West Nile Fever

Low: Potential health risk to U.S. personnel was Low with transmission generally limited to the warmer months. West Nile fever was present and was maintained by bird populations and multiple species of Culex 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.

6.2.7 Tick-borne rickettsioses (Spotted fever group)

Low: Potential health risk to U.S. personnel was Low with rare cases present. The disease is transmitted to humans through bites of certain species of ticks.

6.2.8 Sindbis (and Sindbis-like virus)

Low: Potential health risk to U.S. personnel was Low with rare cases present. The virus is transmitted by mosquitoes and is maintained in nature by transmission between vertebrate (bird) hosts and invertebrate (mosquito) vectors. Humans are infected with Sindbis virus when bitten by an infected mosquito.

6.2.9 Short and long-term health risks:

Moderate: The unmitigated health risk estimate was moderate. Health risk was reduced to low by proper wear of the uniform, application of repellent to exposed skin, and appropriate chemoprophylaxis. Confidence in health risk estimate was medium.

6.2.10 Long-term health risks:

None identified based on available data.

6.3 Water Contact Diseases

Operations or activities that involved extensive water contact may have resulted 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 were likely to be contaminated with human and animal waste. Activities such as wading or swimming may have resulted in exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may have also lead to the development of a variety of potentially debilitating skin conditions such as bacterial or fungal dermatitis.

6.3.1 Leptospirosis

Unmitigated – Moderate / Mitigated - Low: Leptospirosis unmitigated risk is moderate year-round with peak season April through October. The disease is present in Saudi Arabia, but at unknown levels. Data are insufficient to assess potential disease rates, up to 1-10 percent of personnel wading or swimming in bodies of water such as lakes, streams, or irrigated fields could be affected per month. 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. 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. Mitigation strategies included avoiding water contact and recreational water activities, proper wear of uniform (especially footwear), and protective coverings for cuts/abraded skin.

6.3.2 Schistosomiasis

Unmitigated – Moderate / Mitigated - Low: Schistosomiasis unmitigated risk is moderate with peak season April through November. Human release schistosome eggs through urine and feces, which may be contaminating surface water. When water temperatures in lakes, streams, and rivers are at or above 68^{o}F, the eggs hatch and release the larvae into the water. If the right type of freshwater snail is present, the larvae penetrate the snail, develop, and emerge as free-swimming cercariae that can infect humans by penetrating the skin of people while wading or swimming. Mitigation strategies are the same as listed above.

6.3.3 Short-term health risks:

Unmitigated – Moderate / Mitigated - Low: Health risk of leptospirosis and schistosomiasis was moderate without mitigation strategies in place. Confidence in the health risk estimate was medium

6.3.4 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 have been exposed to a wide variety of common respiratory infections in the local population. These included influenza, pertussis, viral upper respiratory infections, viral and bacterial pneumonia, and others. U.S. military populations living in close-quarter conditions were at risk for substantial person-to-person spread of respiratory pathogens. Influenza was of particular concern because of its ability to debilitate large numbers of unvaccinated personnel for several days.

6.4.1 Tuberculosis (TB)

Low: Potential unmitigated health risk to U.S. personnel was Low year round. Transmission typically requires close and prolonged contact with an active case of pulmonary or laryngeal tuberculosis (TB), although it also can occur with more incidental contact. The likelihood of exposure to an active case varies with the overall incidence and the degree of contact with the local population, particularly those living in conditions of crowding and poverty. Tuberculin skin test (TST) conversion rates may have been elevated over baseline for personnel with prolonged close exposure to local populations. A TST screening to detect latent infection may have been warranted in personnel with a history of prolonged close exposure to local populations. Tuberculosis exposure and infection is evaluated as part of the Post Deployment Health Assessment (PDHA) process.

6.4.2 Meningococcal Meningitis

Low: Potential unmitigated health risk to U.S. personnel was Low year round. However, the health risk may have been elevated during cooler months. Asymptomatic colonization and carriage of meningococcal bacteria was common worldwide, including within U.S. military populations; rare symptomatic cases may have occured periodically in military populations, regardless of geographic location. 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: Confidence in the health risk estimate was Medium

6.4.4 Long-term health risks:

None identified based on available data.

6.5 Animal-Contact Diseases

6.5.1 Q-Fever

Unmitigated – Moderate / Mitigated - Low: Potential 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%) could have occurred in personnel with heavy exposure to barnyards or other areas where animals are kept. Unpasteurized milk may also have transmitted 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 included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, and proper PPE for personnel working with animals.

6.5.2 Rabies

Low: Potential unmitigated health risk to U.S. personnel was Low year round. Rabies is transmitted by exposure to virus-laden saliva of an infected animal, typically through bites. Prevalence in feral and wildlife populations was well above U.S. levels due to the lack of organized control programs. Personnel bitten by potentially infected reservoir species may have developed rabies in the absence of appropriate prophylaxis. The circumstances of the bite should have been considered in evaluating individual health risk; in addition to dogs and cats, bats or wild carnivores should also have been

regarded as rabid unless proven otherwise. General Order 1B mitigated rabies risk by prohibiting contact with or adoption or feeding of feral animals. Very severe illness with near 100% fatality rate could have occurred in the absence of post-exposure prophylaxis. Typically the time period from exposure to the onset of symptoms is 2 – 12 weeks, but can rarely take several years.

6.5.3 Anthrax

Low: Potential unmitigated health risk to U.S. personnel was Low year round. Anthrax is a naturally occurring infection of livestock and wild herbivores with a worldwide distribution. Rare cases (less than 0.1% per month attack rate) could have occurred among personnel with occupational-type exposure to livestock or wild herbivores, hides, wool products from these species, as well as handling or consumption of undercooked meat. In the absence of such exposures, the health risk was essentially zero. Inhalation cases raise the possibility of weaponized agent. Cutaneous and gastrointestinal anthrax are the most common forms of naturally occurring anthrax. The health risk of naturally acquired inhalation (pulmonary) anthrax is remote. 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. Inhalation anthrax is very severe, often requiring intensive care; fatalities may occur even in treated cases.

6.5.4 H5N1 avian influenza

Low: Potential unmitigated health risk to U.S. personnel was Low. Although H5N1 avian influenza (AI) is easily transmitted among birds, bird-to-human transmission is extremely inefficient. Human infections have occurred on a very rare basis and have been associated with activities involving close, direct contact with infected poultry, such as plucking, slaughter, or other handling. There is no health risk from consumption of properly cooked poultry products. Human-to-human transmission appears to be exceedingly rare, even among relatively close contacts. Extremely rare cases (less than 0.01% per month attack rate) could have occurred. Incidence could have resulted in very severe illness with fatality rate higher than 50 percent in symptomatic cases.

6.5.5 Short-term health risks:

Unmitigated – Varies / Mitigated - Low: Low for rabies, H5N1 avian influenza and anthrax, Moderate for Q-fever. Confidence in the health risk estimate was Medium.

6.5.6 Long-term health risks:

Low: The long term risk for rabies was Low.

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7 Venomous Animal/Insect

All information was taken directly from the Clinical Toxinology Resources web site (http://www.toxinology.com) from the University of Adelaide, Australia and from the Armed Forces Pest Management Board Living Hazards Database (http://www.afpmb.org/content/living-hazards-database). The species listed below have home ranges that overlap the location of Saudi Arabia and may have presented a health risk if they were encountered by personnel. Personnel at Eskan Village experience minimal sightings or contact.

7.1 Scorpions

- Androctonus crassicauda (Black Scorpion), Androctonus amoreuxi, Androctonus australis (Fat-

tailed scorpion), Leiurus jordanensis, Leiurus quinquestriatus (Death Stalker): Severe envenoming possible, potentially lethal. Cardiotoxicity may be direct or indirect, but is a feature of severe envenoming, with cardiac arrhythmias, cardiac failure.

- There are a number of dangerous Buthid scorpions, but also others known to cause minimal effects only. Without clinical data it is unclear where this species fits within that spectrum.

7.2 Snakes

- Astrotia stokesii (Stokes' Sea Snake), Enhydrina schistosa (Beaked Sea Snake), Hydrophis cyanocinctus (Asian Annulated Sea Snake), Hydrophis gracilis (Graceful Small-headed Sea Snake) Hydrophis lapemoides (Persian Gulf Sea Snake) Hydrophis ornatus (Reef Sea Snake), Hydrophis spiralis (Yellow Sea Snake), Lapemis curtus (Shaw's Sea Snake), Thalassophina viperina (Olive Sea Snake): Sea snake bites vary from trivial to lethal envenoming.

- Cerastes gasperettii (Gasperetti's Horned Sand Viper): Significant local effects and systemic effects, including coagulopathy can occur.

- Atractaspis engaddensis (Ein Geddi Burrowing Asp), Bitis arietans (Puff Adder), Echis coloratus (Burton's carpet viper), Echis khosatskii (Dhofar Carpet Viper), Echis pyramidum (Geoffroy's Carpet Viper), Echis sochureki (Sochurek's Saw-scaled Viper), Naja haje (Arabian Cobra): Severe envenoming possible, potentially lethal.

7.3 Snails/Fish

- Conus textile (Snails): Serious & painful envenomations (sometimes fatal) usually occur when swimmers (waders) pick up shells with live snails still inside
- Synanceja trachynis (Stone fish), Pterois volitans (Lionfish): Very potent neurotoxin w/ cytotoxic & possibly hemolytic factors

7.4 Short-term health risk:

Unmitigated – High / Mitigated - Low: If encountered, effects of venom varied with species from mild localized swelling (to potentially lethal effects. 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 was low (TG 230 Table 3-6).

7.5 Long-term health risk:

None identified.

8 Heat/Cold Stress

Predominant winds are from the North from June through September, and are mixed (both blowing from the North or South) the rest of the year.

8.1 Heat

The health risk of heat stress/injury based on temperatures alone is Low (< 78 °F) in December - February, High (82-87.9°F) in March, November and extremely high (≥ 88°F) from April – October. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Goldman, 2001).

Personnel are educated on dangers of heat stress, water intake and work/rest cycles.

8.1.1 Short-term health risk:

Unmitigated – High / Mitigated - Low: Risk of heat injury in unacclimatized personnel, susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) from April to October was High, and Low for all other months. The risk of heat injury was reduced through preventive measures. Because the occurrence of heat stress/injury is strongly dependent on operational factors (work intensity and clothing), confidence in the health risk estimate was low (TG 230, Table 3-6).

8.1.2 Long-term health risk:

Low: Long-term health implications from heat injuries are rare but can occur, especially from more serious injuries such as heat stroke. 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. The long-term health risk was Low; confidence in the health risk estimates was medium (TG 230, Table 3-6).

8.2 Cold

Even on warm days there can be a significant drop in temperature after sunset by as much as 40 °F. There is a risk of cold stress/injury when temperatures fall below 60 °F, which can occur from November to March. The health risk assessment for non-freezing cold injuries (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. With protective measures in place the health risk assessment is low for cold stress/injury; confidence in the health risk estimate is medium.

8.2.1 Short-term health risks:

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

Power generation taking place at Eskan Village create outdoor noise levels that occasionally fluctuate above the threshold level requiring single-level hearing protection (85 A-weighted decibels (dBA)). For the majority of personnel on this site, noise levels above the hearing protection threshold are for short durations and average daily exposures are below levels requiring participation in a hearing conservation program.

9.1.1 Short-term health risks:

Low: Short-term risk of noise injury with appropriate hearing protection use is Low. Confidence in the health risk assessment is medium (TG 230, Table 3-6).

9.1.2 Long-term health risks:

Low: Long-term risk of noise injury with appropriate hearing protection use is Low. Confidence in the health risk assessment is medium (TG 230, Table 3-6).

9.2 Impulse

Personnel at this site do not participate in convoy operations. Weapon firing is limited to mostly training. Exposure is intermittent.
9.2.1 Short-term health risks

Low: Short-term risk of noise injury with appropriate hearing protection use is Low. Confidence in the health risk assessment is medium (TG 230, Table 3-6).

9.2.2 Long-term health risks:

Low: Long-term risk of noise injury with appropriate hearing protection use is Low. Confidence in the health risk assessment is medium (TG 230, Table 3-6).

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. These process and hazards are identified and evaluated in DOEHRS for the corresponding work centers. Exposures to these occupational hazards can occur through inhalation (air), skin contact, or ingestion; however exposures through air are generally associated with the highest health risk.

10.2 Waste Sites/Waste Disposal

10.2.1 Site specific sources identified:

Solid waste is removed by a local contractor and disposed of in an off-base host nation landfill. Medical waste is transported to local hospital for incineration. Due to the limited industrial operations on base, minimal hazardous wastes are generated (mostly used POL products). Personnel handling these wastes have proper personal protective equipment available in their workplace. Finally, there is a burn barrel used to dispose of classified documents.

10.2.2 Short and Long-Term Health Risks:

Low: US personnel have little exposure to waste materials. Confidence in this evaluation is medium.

10.3 Fuel/petroleum products/industrial chemical spills:

No Fuel/petroleum products/industrial chemical spills documented in DOEHRS or MESL

10.4 Pesticides/Pest Control:

10.4.1 Site specific sources identified

There are various types of pest control measures utilized at Eskan Village. Glue traps are used to control rates when reported in area. CE & Environmental Health trap cats and the Veterinarian vaccinates them and clips a portion of the ear for identification purposes then releases the cat back to where they found it as it is good in controlling rats/mice. Ants are controlled via Integrated Pest Management (eradicate the source, then use traps, then spray as a last resort). Pesticide spraying for mosquitoes was discontinued in 2010 because vector present is extremely mild.

10.4.2 Short-term and Long-term health risks

Low: Long term health risk is Low. Confidence in the health risk assessment is medium (TG 230 Table 3-6).

10.5 Asbestos

10.5.1 Site specific sources identified

A single sample collected on 11 Dec 96 by Bioenvironmental Engineering personnel detected 15-30% Chrysotile asbestos from roof tile at building 906 (a warehouse in the old BX area). No systematic base-wide survey has occurred. It is not uncommon for countries outside the US to use materials that contain asbestos. Asbestos-containing materials that are intact and managed in place, present minimal hazards to US personnel.

10.5.2 Short and long-term health risks:

Low. Confidence is this risk assessment is low-medium due to limited data availability.

10.6 Lead Based Paint

There is no specific information available to assess this hazard.

11 References[2]

1. Armed Forces Pest Management Board Living Hazards Database: http://www.afpmb.org/content/living-hazards-database

2. Casarett and Doull's Toxicology: the Basic Science of Exposures, Chapter 2- Principles of Toxicology; Fifth Edition, McGraw Hill, New York.

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

4. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/.

5. Department of Defense (DoD) Instruction 6490.03, Deployment Health, 2006.

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

7. 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.

8. 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.

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

10. National Center for Medical Intelligence (NCMI): https://www.intelink.gov/ncmi/index.php.

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

12. USA PHC TG230, June 2010 Revision.

13. USACHPPM 2008 Particulate Matter Factsheet; 64-009-0708, 2008.

[2] NOTE. The data are currently assessed using the 2010 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.

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. http://www-nehc.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