Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS): Camp Arifjan, Kuwait
Calendar years: 2016-2018

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) 0017-12, (References 1-3).

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of deployment occupational and environmental health (OEH) risk for Camp Arifjan. It presents a qualitative summary of health risks identified at this location and their potential medical implications. The report is based on information collected from 01 January 2016 through 31 December 2018 to include deployment OEHS sampling and monitoring data (e.g., air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that the OEH sampling for Camp Arifjan during this period was performed at representative exposure points selected to characterize health risks at the *population–level*. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to 01 January 2016 through 31 December 2018.

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

SITE DESCRIPTIONS: Camp Arifjan is located in the Kuwaiti desert. Funded and built by the government of Kuwait, Camp Arifjan is located south of Kuwait City, and west of the Shuaiba Port (Military Sea Port of Debarkation/Embarkation, or SPOD) and Kuwait Naval Base (KNB). The base accommodates elements of the U.S. Air Force, Navy, Marine Corps and Coast Guard.

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

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

Short-term health risks & medical implications:

The following hazards may be associated with potential acute health effects in some personnel during deployment at Camp Arifjan:

Food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal); other endemic diseases (leishmaniasis-cutaneous (acute), typhus-miteborne (scrub typhus), leptospirosis, Tuberculosis (TB), Q fever; heat stress; and continuous noise. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid/paratyphoid fever). 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 (leishmaniasis-cutaneous (acute), typhus-miteborne (scrub typhus)), these diseases may constitute a significant risk due to exposure to biting vectors; risk reduced to 'Low' by proper wear of the treated uniform, application of repellent to exposed skin, bed net use, and appropriate chemoprophylaxis, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (Q fever), pose year-round risk. For heat stress, risk can be greater during months of May through October, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions, and those under operational constraints (equipment, PPE, vehicles). Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation. For continuous noise exposure, the short-term risk was 'High to Low'; risk may have been reduced by appropriate hearing protection used by personnel in higher risk areas (around sources of continuous noise such as flighlines, generators and power production).

Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust, the PM_{10} overall short-term health risk was not evaluated due to no data for analysis. For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the $PM_{2.5}$ overall short-term health risk was 'Moderate to Low.' However, the Camp Arifjan and vicinity area is a dust-prone desert environment, with a semi-arid climate, also subject to vehicle traffic. Consequently, exposures to PM_{10} and $PM_{2.5}$ may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and $PM_{2.5}$, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects. Although most short-term health 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 while at Camp Arifjan and vicinity. Personnel who reported with symptoms or required treatment while at site(s) with burn pit activity should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (*Chronological Record of Medical Care*).

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Table 1: Continued

Long-term health risks & medical implications:

The following hazards may be associated with potential chronic health effects in some personnel during deployment at Camp Arifjan:

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

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the overall long-term health risk was "Low.' Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust was not evaluated for long-term health risk due to no data for analysis and no available health guidelines. However, the Camp Arifjan and vicinity area is a dust-prone desert environment with a semi-arid climate, also subject to vehicle traffic, and conditions may have varied. For inhalational exposure to high levels of dust containing PM_{10} and $PM_{2.5}$, such as during high winds or dust storms, it is considered possible that some otherwise healthy personnel, who were exposed for a long-term period to dust and particulate matter, could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter exposures and exposures to burn pits are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits/barrels, incinerators, occupational or specific personal dosimeter data) when assessing individual concerns. Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).

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Table 2. Population-Based Health Risk Estimates –Camp Arifjan [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: No data were available for analysis to characterize health risk. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during days with elevated PM levels. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-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: No data were available for analysis to characterize health risk. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during days with elevated PM levels. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-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: Moderate to Low, a majority of the time mild acute (short term) health effects are anticipated. Elevated levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low, a majority of the time mild acute (short term) health effects are anticipated. Elevated levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: Low. A small percentage of personnel may be at increased risk for developing chronic conditions, particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).		Long-term: Low. A small percentage of personnel may be at increased risk for developing chronic conditions, particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: Variable, High (for bacterial diarrhea), to Moderate (for hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal,), to Low (for brucellosis, hepatitis E). If local food/water were consumed, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid/paratyphoid 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: none identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable, Moderate (for leishmaniasis-cutaneous, scrub Typhus (mite-borne), Low (for Sandfly fever, Sindbis, West Nile fever)	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, and bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low (leishmaniasis-visceral infection)		Long-term: No data available
	Short-term: Moderate (leptospirosis)		Short-term: Moderate for leptospirosis

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Water-Contact (e.g., wading, swimming)	Long-term: No data available	Control measures implemented: Avoid water contact and recreational water activities, properly wear of the uniform (especially footwear), and utilize protective coverings for cuts/abraded skin.	Long-term: No data available
Respiratory	Short-term: Moderate (tuberculosis (TB) to Low (meningococcal meningitis).	Providing adequate living and work space; medical screening; vaccination	Short-term: Low
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Moderate (Q-fever) to Low (rabies, avian Influenza) to No Risk (anthrax)	Prohibiting contact with, adoption, or feeding of feral animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1C. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: No data available
	Long-term: Low (rabies)		Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g., *Scorpio maurus*) to potentially lethal effects (e.g., *Androctonus crassicauda*).	Risk reduced by avoiding contact, proper wear of uniform (especially footwear), and proper and timely treatment.	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g., *Scorpio maurus*) to potentially lethal effects (e.g., *Androctonus crassicauda*).
	Long-term: No data available		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High (for May – October), Low for all other months.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Variable; Risk of heat injury is High (for May – October), Low for all other months.
	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.		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 risk of cold stress/injury.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper	Short-term: Low risk of cold stress/injury.
	Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.		Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.

		wear of issued protective clothing.	
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.

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

[2] This assessment is based on specific environmental sampling data and reports obtained from 01 January 2016 through 31 December 2018. 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 Camp Arifjan. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the Army Public Health Center (APHC). Where applicable, "None Identified" is used when though a potential exposure is identified, and no health risks of either a specific acute or chronic health effects are determined. More detailed descriptions of OEH exposures that are evaluated but determined to pose no health risk are discussed in the following sections of this report.

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

1 Discussion of Health Risks at Camp Arifjan by Source

The following sections provide additional information about the deployment 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.

The ProUCL version 5.1 software package was used for statistical analyses (Reference 5). Means are followed by standard deviation (SD). Risk characterization was based on the 95 percent upper confidence level of the arithmetic mean (95% UCL) or the arithmetic mean depending on the quality and quantity of the data being evaluated. The sample mean is an uncertain estimate of the true mean of the population exposure point concentration (PEPC). The 95% UCL reduces the uncertainty inherent in the sample mean and states with a higher level of confidence that the mean PEPC is no greater than the 95% UCL.

2 Air

2.1 Site-Specific Sources Identified

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

Personnel deployed to the Camp Arifjan are potentially exposed to various airborne constituents that have been identified through monitoring and sampling efforts over the years. One constituent of concern is ambient particulate matter (PM) which comes primarily from windblown dust and sand. PM levels at this location fluctuate over time (for instance seasonal variation in the data indicates higher levels in warmer months (summer)). In addition to PM, there are a number of industrial activities (e.g., manufacturing, construction, chemical and fuel storage/ distribution, and asphalt /concrete production. Primary sources are routine industrial emissions (facilities at the site have less environmental controls than would be required in U.S.), or other man-made sources (e.g., vehicles).

2.2 Particulate Matter

Particulate matter 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 micron ($PM_{2.5}$), which can reach the deepest regions of the lungs when inhaled. Exposure to excessive PM is linked to a variety of potential health effects (Reference 6).

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

No PM_{10} samples were provided for analysis between 01 January 2016 through 31 December 2018.

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

2.4.1 Exposure Guidelines:

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

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

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

- Negligible MEG = 15
- Marginal MEG = 65

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2.4.2 Sample data/Notes:
A total of 216 valid $PM_{2.5}$ air samples were collected from 01 January 2016 – 31 December 2018. The range of 24-hour $PM_{2.5}$ concentrations was 14 µg/m^3 – 344 µg/m^3 with an average concentration of 79 µg/m^3, SD = 46 µg/m^3. The 95% UCL was 93 µg/m^3.

2.4.3 Short-term health risk:
Variable (Low to Moderate). The short-term health risk is based on a comparison of air concentrations to 24-hour MEGs. The variable risk is due to significant fluctuation in daily concentrations. Confidence in the short-term $PM_{2.5}$ health risk assessment was medium to high (Reference 4, Table 3-6).

The short-term $PM_{2.5}$ health risk is Low based on the 95% UCL of 93 µg/m^3 and Moderate based on a peak concentration of 344 µg/m^3. Daily risk levels for $PM_{2.5}$ show no hazard for 41%, low health risk for 58%, moderate health risk for 1%, and high health risk for 0% of the time.

The hazard severity was Negligible for average $PM_{2.5}$ sample concentrations. During average exposures at the negligible hazard severity level, a few personnel may experience notable mild, eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated (Reference 4, Table 3-11).

The hazard severity was Marginal for peak $PM_{2.5}$ sample concentrations. During peak exposures at the marginal hazard severity level, a majority of personnel will experience notable eye, nose, and throat irritation and some respiratory effects. Some lost-duty days are expected. Significant aerobic activity will increase risk. Those with a history of asthma or cardiopulmonary disease are expected to experience increased symptoms. (Reference 4, Table 3-11).

2.4.4 Long-term health risk:
Low. The long-term health risk is Low and is based on a comparison of air concentrations to a 1-year Negligible MEG. Confidence in the long-term $PM_{2.5}$ health risk assessment was medium to high (Reference 4, Table 3-6).

The long-term $PM_{2.5}$ health risk is Low based on the 95% UCL of 93 µg/m^3 and the likelihood of exposure at these hazard severity levels.

The hazard severity was Marginal for average $PM_{2.5}$ sample concentrations. During average exposures at the marginal hazard severity level, it is plausible that the development of chronic health conditions such as reduced lung function or exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, or other cardiopulmonary diseases could occur in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk (Reference 4, Table 3-11).

2.5 Airborne Metals

2.5.1 Sample data/Notes:
A total of 216 $PM_{2.5}$ airborne samples were collected for metal analyses. Of the valid samples, chromium was detected in 61 samples, manganese was detected in four samples, nickel was

detected in two samples and zinc was detected in one sample. None of the detected metals had a peak concentration above the 1-year Negligible MEGs.

2.5.2 Short- and long-term health risks:
None identified based on the available sampling data. No parameters exceeded its respective 1-year Negligible MEGs.

2.6 Volatile Organic Compounds (VOC)

The likely sources of VOCs on Camp Arifjan were fuel storage, fuel transfers between storage tanks, and vehicle and aircraft emissions.

No VOCs samples were provided for analysis between 01 January 2016 through 31 December 2018.

3 Soil

3.1 Site-Specific Sources Identified:

3.2 Sample data/Notes:
A total of three valid surface soil samples were collected from 01 January 2016 through 31 December 2018, to assess OEH health risk to deployed personnel at Camp Arifjan. The primary soil contamination exposure pathways are dermal contact and dust inhalation. Typical parameters analyzed for included semi volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCBs), pesticides, herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e., Total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). For the risk assessment, personnel are assumed to remain at this location for 6 months to 1 year.

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

3.4 Long-term health risk:
None identified based on available sample data. No parameters exceeded 1-year negligible MEGs.

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the Army Public Health Command (APHC) identified the most probable exposure pathways. These are based on the administrative information provided on the field data sheets submitted with the samples taken over the time period being evaluated. At this time, the exposure pathways are primary ingestion from municipal treated water and non-drinking municipal water.

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified
To assess the potential for adverse health effects to troops, the following assumptions were made about dose and duration: A conservative (protective) assumption was that personnel routinely ingested 15 liters per day (L/day) of bottled water for up to 365 days (1-year).

4.1.2 Sample data/Notes:
A total of two water samples (municipal) were collected on 10 March 2017 and 13 July 2018. No chemicals were detected above the short- or long-term MEGs.

4.1.3 Short-term and long-term health risks:
None identified based on available sample data. No health risks from drinking water exposures were identified based on the available data. All collected samples were below the short- and long-term negligible MEGs.

4.2 Non-Drinking Water: Used for Other Purposes (Personal Hygiene, Cooking, Showering, etc.)

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

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

One valid water sample (municipal) was collected on 5 March 2016. No chemicals were detected above the short- or long-term MEGs.

4.2.3 Short-term and long-term health risks:
None identified based on available sample data. No health risks from non-drinking exposures were identified based on the available data. All collected samples were below the short and long-term negligible MEGs.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons:

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) from 01 January 2016 – 31 December 2018 timeframe (Reference 1).

5.2 Depleted Uranium (DU):

No specific hazard sources were documented in DOEHRS from 01 January 2016 – 31 December 2018 timeframe (Reference 1).

5.3 Ionizing Radiation:

The Vehicle and Cargo Inspection Systems (VACIS) is a truck mounted and/or ground mounted gamma-ray imaging system for inspecting vehicles and cargo at entry checkpoints. No elevated doses are observed by contractors (VECTRUS/KBoss) or reported in the environmental baseline survey for Camp Arifjan. Elevated doses are not expected and are measured twice daily by triple canopy security personnel at all checkpoints equipped with the VACIS. Monthly compliance is maintained by VECTRUS/Excelis (References 7 and 8).

5.4 Non-Ionizing Radiation:

Plasma arc, oxy-fuel, and MIG/TIG welding are conducted by trained personnel at the motor pool and contractor maintenance yards at Camp Arifjan (References 7 and 8).

6 Endemic Diseases

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

6.1 Food borne and Waterborne Diseases

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

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

6.1.1 Diarrheal diseases (bacteriological)

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

6.1.2 Hepatitis A, typhoid fever, and diarrhea-protozoal

High, mitigated to Low: Unmitigated health risk to U.S. personnel is High year round for hepatitis A and typhoid/paratyphoid fever, and moderate for diarrhea-protozoal. Hepatitis A, typhoid fever, and diarrhea-protozoa can cause prolonged illness. Hepatitis A and typhoid fever can cause prolonged illness in a small percentage of personnel, (less than 1 percent per month) and have a high risk estimate if no preventative medicine measures are taken. However, because all deployed U.S. Forces, including civilians and contractors, are supposed to be vaccinated for Hepatitis A and Typhoid fever, no risk is identified for U.S. Forces from Hepatitis A and Typhoid fever. Diarrhea-cholera and diarrhea-protozoal have a moderate risk estimate if no preventive medicine measures are taken to mitigate, although cases for all are rare. A typical case of Hepatitis A involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more. With appropriate treatment, typhoid fever is a debilitating febrile illness that typically requires 1 to 7 days of supportive care, followed by return to duty. Symptomatic cases of diarrhea – protozoal 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.

6.1.3 Short-term health risk:

Variable (Low to High): The overall unmitigated short-term risk associated with Food borne and Waterborne diseases at Camp Arifjan is considered High for bacterial diarrhea, Moderate for diarrhea-cholera, diarrhea-protozoal, Hepatitis A, and typhoid fever, and Low for brucellosis and Hepatitis E if local food or water is consumed. Confidence in risk estimate is medium.

6.1.4 Long-term health risk:

None identified based on available data.

6.2 Arthropod Vector-Borne Diseases

During the warmer months, the climate and ecological habitat support populations of arthropod vectors, including mosquitoes, ticks, mites, and sandflies. Significant disease transmission is sustained countrywide, including urban areas. 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 Leishmaniasis

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was Moderate with seasonal transmission (March-November. Leishmaniasis is transmitted by sandflies. 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 can be disfiguring. Visceral leishmaniasis causes a severe febrile illness, which typically requires hospitalization with convalescence over 7 days. Mitigation measures in place include individual protective measures (i.e., permethrin treated uniforms). Definitive treatment previously required non-urgent evacuation to the continental United States; currently, not all cases require evacuation.

6.2.2 Typhus-miteborne

Moderate: Unmitigated health risk to U.S. personnel was Moderate. Typhus-miteborne potential disease rates are from 1 percent to 10 percent of personnel could be affected per month under worst-case conditions. The disease is transmitted by the larval stage of trombiculid mites (chiggers), which are typically found in areas of grassy or scrubby vegetation. The disease can cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty.

6.2.3 Sindbis

Low: Unmitigated health risk to U.S. personnel was Low with seasonal transmission (April-October). The Sindbis Virus (SINV) is transmitted by mosquitoes (*Culex* spp.) and causes sindbis fever in humans. The symptoms include arthralgia, rash, and malaise. The Sindbis virus is an "arbovirus" (arthropod-borne) 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. Sindbis and Sindbis-like viruses are among the most geographically widespread of all arboviral diseases. Sindbis presents a low risk to personnel but is potentially present year-round.

6.2.4 Sandfly fever

Low: Unmitigated health risk to U.S. personnel was Low with seasonal transmission. Sandfly fever potential disease rates are from 1 percent to 10 percent of personnel could be affected per month under worst-case conditions. It is transmitted by sandflies and occurs more commonly in children though adults are still at risk. Incidents can result in debilitating febrile illness typically requiring 1-7 days of supportive care followed by return to duty.

6.2.5 West Nile fever

Low: Unmitigated health risk to U.S. personnel was Low with seasonal transmission. West Nile fever is present and is 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.

6.2.6 Short-term health risk:

Low: The overall short-term unmitigated health risk associated with arthropod vector-borne diseases at Camp Arifjan was considered Moderate (for leishmaniasis (cutaneous and visceral) and typhus-miteborne), and Low (for sindbis, sandfly fever, and West Nile fever). Preventive measures such as proper wear of treated uniforms and application of repellent to exposed skin reduced the health risk to Low to None for arthropod vector-borne diseases.

6.2.7 Long-term health risk:

Low: Low (for the visceral [chronic] leishmaniasis). Confidence in the risk estimate is medium.

6.3 Water Contact Diseases

Tactical operations or recreational activities that involve extensive contact with surface water such as lakes, streams, rivers, or flooded fields may result in significant exposure to leptospirosis. These diseases can debilitate personnel for up to a week or more. Leptospirosis 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 exposure to enteric diseases including 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 including 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. Leptospirosis is present in Kuwait but at unknown levels. Human infection occurs through exposure to water or soil contaminated by infected animals and has been associated with wading, and swimming in contaminated, untreated open water. The occurrence of flooding after heavy rainfall facilitates the spread of the organism because, as water saturates the environment, Leptospira present in the soil pass directly into surface waters. Leptospira can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Ingestion of contaminated water can also lead to infection. The acute generalized illness associated with infection can mimic other tropical diseases (for example, dengue fever, malaria, and typhus), and common symptoms include fever, chills, myalgia, nausea, diarrhea, cough, and conjunctival suffusion. Manifestations of severe disease can include jaundice, renal failure, hemorrhage, pneumonitis, and hemodynamic collapse. Recreational activities involving extensive water contact may result in personnel being temporarily debilitated with leptospirosis.

6.3.2 Short-term health risk:

Low: The overall short-term unmitigated health risk associated with water contact diseases at Camp Arifjan was considered Moderate (leptospirosis). Preventive measures, such as avoiding water contact, recreational water activities and protective coverings for cuts/abraded skin reduced the health risk to Low to None. Confidence in the risk estimate was medium.

6.3.3 Long-term health risk:

None identified based on available data.

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 personnel for several days. Mitigation strategies were in place and included routine medical screenings, vaccination, enforcing minimum space allocation in housing units, implementing head-to-toe sleeping in crowded housing units, implementation of proper Personal Protective Equipment (PPE) when necessary for healthcare providers and detention facility personnel.

6.4.1 Tuberculosis (TB)

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was Moderate year round. Tuberculosis is usually transmitted through close and prolonged exposure to an active case of pulmonary or laryngeal tuberculosis, but can also occur with incidental contact. The Army SG has defined increased risk in deployed Soldiers as indoor exposure to locals or third country nationals of greater than one hour per week in a highly-endemic active TB region. Additional mitigation included active case isolation in negative pressure rooms, where available.

6.4.2 Meningococcal meningitis

Low: 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. Close and prolonged contact facilitates the spread of this disease. Asymptomatic colonization and carriage of meningococcal bacteria are common worldwide, including within U.S. military populations; rare symptomatic cases may occur periodically in military populations, regardless of geographic location. Neisseria meningitides group A predominates regionally. Meningococcal meningitis is potentially a very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases.

6.4.3 Short-term health risk:

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

6.4.4 Long-term health risk:

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

6.5 Animal-Contact Diseases

6.5.1 Q-Fever

Moderate, mitigated to Low: Unmitigated health risk to U.S. personnel was Moderate year round. Rare cases are possible among personnel exposed to aerosols from infected animals, with clusters of cases possible in some situations. Significant outbreaks (affecting 1-50 percent) can occur in personnel with heavy exposure to barnyards or other areas where animals are kept. Unpasteurized milk may also transmit infection. The primary route of exposure is respiratory, with an infectious dose as low as a single organism. Incidence could result in debilitating febrile illness, sometimes presenting as pneumonia, typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies included command emphasis of CENTCOM GO 1C, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites. .

6.5.2 Rabies

Low: Unmitigated health risk to U.S. personnel was Low year round. Occurrence is comparable to U.S. levels. 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. Personnel bitten by potentially infected reservoir species may develop rabies in the absence of appropriate prophylaxis. The circumstances of the bite should be considered in evaluating individual health risk; in addition to dogs and cats, bats or wild carnivores should be regarded as rabid unless proven otherwise. General Order 1B mitigates rabies risk by prohibiting contact with or adoption or feeding of feral animals. Very severe illness with near 100% fatality rate can occur 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. Mitigation strategies in place as listed in paragraph 6.5.1 except for vaccinations.

6.5.3 Avian Influenza

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

6.5.4 Anthrax

No Risk: Anthrax does not pose a risk to U.S. personnel. Anthrax is a naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat may result in contracting gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of spores and is extremely rare. Mitigation measures included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, vaccinations, and proper PPE for personnel working with animals.

6.5.5 Short-term health risk:

Low: The overall short-term unmitigated health risk associated with animal contact diseases at Camp Arifjan was considered Moderate (Q-fever) to Low (rabies, avian influenza) and No risk for anthrax. Preventive measures reduced the health risk to Low. Confidence in the risk estimate is medium.

6.5.6 Long-term health risk:

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

7 Venomous Animal/Insect

All information was taken directly from the Armed Forces Pest Management Board (Reference 13) and the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 14). The species listed below have home ranges that overlap the location of Camp Arifjan, and may present a health risk if they are encountered by personnel. See Section 10.5 for more information about pesticides and pest control measures.

7.1 Spiders

No spiders were identified.

7.2 Scorpions

- *Androctonus crassicauda* (black scorpion): *Severe envenoming possible and potentially lethal, however most stings cause only severe local pain.*

- *Apistobuthus pterygocercus, Buthacus leptochelys, Compsobuthus arabicus, Orthochirus scrobiculosus*: Clinical effects unknown; 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 this species fits within that spectrum.

- *Scorpio maurus*: Mild envenoming only, not likely to prove lethal.

7.3 Snakes

- *Astrotia stokesii, Hydrophis gracilis, Hydrophis lapemoides, Hydrophis spiralis, Lapemis curtus, Thalassophina viperina* : Clinical effects uncertain, but related to medically important species, therefore major envenoming cannot be excluded.

- *Cerastes gasperettii:* Unknown, but potentially lethal envenoming, though unlikely, cannot be excluded.

- *Echis sochureki, Enhydrina schistose, Hydrophis cyanocinctus, Hydrophis ornatus, Pelamis platurus, Vipera albicornuta*: *S*evere envenoming possible, potentially lethal.

- *Malpolon monspessulanus*: Moderate envenoming possible but unlikely to prove lethal

- *Eryx jayakari*: Bite most unlikely to cause fatality.

- *Lytorhynchus diadema, Malpolon moilensis, Platyceps rhodorachis, Platyceps ventromaculatus, Pseudocerastes persicus* : Not likely to cause significant effects; non-lethal.

7.4 Short-term health risk:
Low: If encountered, effects of venom vary with species from mild localized swelling (e.g., *S. maurus*) to potentially lethal effects (e.g., *V. albicornuta*). 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.

7.5 Long-term he5alth risk:
None identified.

8 Heat/Cold Stress

8.1 Heat

Extended summer months (May through October) exhibit a maximum high temperature of 115 degrees Fahrenheit (ºF) and a minimum low of 73ºF, with a mean daily high temperature of 108ºF and a mean daily low temperature of 81ºF. Diurnal temperatures can vary as much as 25ºF. The health risk of heat stress/injury based on temperatures alone is high (≥ 88°F) from May – October. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 15). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk factors (e.g., acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures.

8.1.1 Short-term health risk:
High, mitigated to Low: The risk of heat injury was reduced to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring Wet Bulb Globe Temperature

(WBGT). Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) is High from May – October. Confidence in the health risk estimate is low.

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

8.2 Cold

Extended winter months(November through April) exhibit a maximum high temperature of 88ºF and a minimum low temperature of 46ºF, with a mean daily high temperature of 73ºF and a mean daily low temperature of 54ºF. Because even on warm days a significant drop in temperature after sunset by as much as 40 °F can occur, there is a risk of cold stress/injury from month – month. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, is Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may encounter significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone.

8.2.1 Short-term and long-term health risks:
Low: The health risk of cold injury is Low. Confidence in the health risk estimate is medium.

9 Noise

9.1 Continuous:

Noise from generators, aircraft at Patton Airfield, and cutting and grinding tools used in motor pools, maintenance shops, and workshops were observed at Camp Arifjan. However, noise levels did not exceed limits at Camp Arifjan (References 9-11).

9.1.1 Short-term and long-term health risks:
High to Low: High to moderate risk for personnel not wearing hearing protection (dependent on magnitude, frequency and duration of exposures). Low risk for personnel working near major noise sources who wear proper hearing protection.

9.2 Impulse:

No specific hazard sources were documented in DOEHRS from 01 January 2016 – 31 December 2018 timeframe.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

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

10.2 Waste Sites/Waste Disposal:

All wastes are removed by contract personnel to Kuwait landfills/disposal sites for proper disposal.

Regulated Medical Waste is collected on an as needed basis and transported for disposal to the Kuwait Ministry Incinerator (Reference 11).

10.2.1 Short-term and long-term health risks:
Low: Short-term and long-term health risk is low.

10.3 Fuel/petroleum products/industrial chemical spills

10.3.1 Short-term and long-term health risks:
Low: The health risk is Moderate for individuals conducting specific operations without proper personal protection. Risk was reduced to Low with proper protection to mitigate exposure/contact.

10.4 Lead Based Paint

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) from 01 January 2016 – 31 December 2018 timeframe (Reference 1).

10.5 Pesticides/Pest Control

The health risk of exposure to pesticide residues is considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed, such as enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use (RTU) methods such as aerosol cans and baits. The control of rodents required the majority of pest management inputs, with the acutely toxic rodenticides staged as solid formulation lethal baits placed in tamper-resistant bait stations indoors and outdoors throughout cantonment areas. Nuisance insects, including biting and stinging insects such as bees, wasps, and ants, also required significant pest management inputs. Use of pesticides targeting against these pests generally involved selection

of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. No specific hazard sources were documented in DOEHRS or MESL. Overall Pest control at Camp Arifjan is handled by contractors (Reference 9).

10.5.1 Short-term and long-term health risks:
Low: Short-term and long-term health risks are Low. Confidence in the health risk assessment is medium.

10.6 Asbestos

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) from 01 January 2016 – 31 December 2018 timeframe (Reference 1).

10.7 Burn Pits

There are no known burn pits located on Camp Arifjan.

11 References

1. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/. Department of Defense (DoD) Instruction 6490.03, *Deployment Health*, 2006.
2. DoDI 6055.05, Occupational and Environmental Health, 2008.
3. Joint Staff Memorandum (MCM) 0017-12, Procedures for Deployment Health Surveillance, 2012.
4. USAPHC 2013 TG230: Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel. June 2013 Revision.
5. Singh, A. and Singh, A.K., 2013. ProUCL Version 5.0. 00 Technical Guide-Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA: Washington, WA, USA.
6. USACHPPM 2008. Particulate Matter Factsheet; 64-009-0708, 2008.
7. Occupational and Environmental Health Site Assessment (OEHSA) Survey Report, KW, Arifjan KW108, Kuwait. 227th Medical Detachment. January 2016.
8. Occupational and Environmental Health Site Assessment (OEHSA) Survey Report, KW, Arifjan KW108, Kuwait. 223rd Medical Detachment. January 2018.
9. Base Camp Assessment, Camp Arifjan, Kuwait, 25-29 July 2016.
10. Base Camp Assessment, Camp Arifjan, Kuwait, 05-16 June 2017.
11. Base Camp Assessment, Camp Arifjan, Kuwait, 25-27 June 2018.
12. Modification 12 to United States Central Command Individual Protection and Individual Unit Deployment Policy, 2 December 2013.
13. Armed Forces Pest Management Board: http://www.afpmb.org/content/venomous-animals-country-k#Kuwait. U.S. Army Garrison - Forest Glen, Silver Spring, MD.
14. Clinical Toxinology Resources: http://www.toxinology.com/. University of Adelaide, Australia.
15. 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.

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12 Where Do I Get More Information?

If a provider feels that the Service member's or Veteran's current medical condition may be attributed to specific OEH exposures at this deployment location, he/she can contact the Service-specific organization below. Organizations external to DoD should contact Deputy Assistant Secretary of Defense for Health Readiness Policy and Oversight (HRP&O).
U.S. Army Public Health Center (USAPHC) Phone: (800) 222-9698. https://phc.amedd.army.mil/Pages/default.aspx
Navy and Marine Corps Public Health Center (NMCPHC) (formerly NEHC) Phone: (757) 953-0700. http://www.med.navy.mil/sites/nmcphc/Pages/Home.aspx
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam/
DoD Health Readiness Policy and Oversight (HRP & O) Phone: (800) 497-6261. https://health.mil/Military-Health-Topics/Health-Readiness

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