DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

05 NOV 2007

MCHB-TS-RDE

MEMORANDUM FOR Command Surgeon (MAJ (b) (6) U.S. Central Command, 7115 South Boundary Boulevard, MacDill Air Force Base, FL 33621-5101

SUBJECT: Deployment Occupational and Environmental Health Risk Characterization, Ambient Air Volatile Organic Compound Samples, Al Asad, Iraq, 26–29 September 2007, U_IRQ_ALASAD_CM_A17_20070929

1. The enclosed report details the occupational and environmental health (OEH) risk characterization for six volatile organic compound (VOC) ambient air samples collected by Forward Deployable Preventive Medicine Unit–North personnel from Al Asad, Iraq, 26–29 September 2007.

2. The OEH risk estimate for exposure to VOCs in the ambient air at Al Asad, Iraq is **low**. The concentration of benzene in one sample was greater than its 1-year military exposure guideline. However, it is unlikely that many personnel are actually exposed to benzene at the level detected in the one sample downwind from the burn pit. Exposure to the VOCs in the ambient air at Al Asad, Iraq is expected to have little or no impact on unit readiness.

FOR THE COMMANDER:

(b) (6)

Encl

Director, Health Risk Management

CF: (w/encl)
FDPMU-North (Environmental Health Officer/LT (b) (6)
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U.S. Army Center for Health Promotion and Preventive Medicine

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR VOLATILE ORGANIC COMPOUND SAMPLES
AL ASAD, IRAQ
26–29 SEPTEMBER 2007
U_IRQ_ALASAD_CM_A17_20070929

USCHPPM

Readiness Thru Health

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR VOLATILE ORGANIC COMPOUND SAMPLES
AL ASAD, IRAQ
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1. REFERENCES.

a. U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Technical Guide (TG) 230, Chemical Exposure Guidelines for Deployed Military Personnel, Version 1.3, May 2003 with the January 2004 addendum.

b. Department of the Army, Field Manual (FM) 5–19, Composite Risk Management, 21 August 2006.

2. PURPOSE. According to U.S. Department of Defense medical surveillance requirements, this occupational and environmental health (OEH) risk characterization documents the identification and assessment of chemical hazards that pose potential health and operational risks to deployed troops. Specifically, the samples and information provided on the associated field data sheets were used to estimate the operational health risk associated with exposure to identified chemical hazards in the air at the above-mentioned location.

3. SCOPE. This assessment addresses the analytical results of six volatile organic compounds (VOCs) air samples collected from Al Asad, Iraq, 26–29 September 2007. These samples are limited in time, area, and media. Therefore, this report should not be considered a complete assessment of the overall OEH hazards to which troops may be exposed at this location. However, this assessment has been performed using operational risk management (ORM) doctrine FM 5–19 and the relatively conservative (protective) assumptions and methods provided in TG 230 to facilitate decision making that can minimize the likelihood of significant risks.

4. BACKGROUND AND EXPOSURE ASSUMPTIONS. The samples were obtained to assess the potential for adverse health effects to troops routinely and continuously breathing the ambient air at Al Asad, Iraq. Four samples were collected at the life support area (LSA), which is approximately 1 kilometer away from the burn pit, and one sample was collected from the Marine mounted combat patrol. Both sample sites were upwind of the burn pit on the sampling days. One sample was collected downwind from the burn pit. While is expected that all personnel are exposed to the ambient air at the LSA, only 10–25 percent of the personnel will be exposed to the ambient air at the Marine mounted combat patrol, and few if any personnel will be directly exposed to the ambient air directly downwind of the burn pit. Personnel are expected to remain at this location for approximately 1 year. In addition, it is assumed that control measures and/or personal protective equipment are not used.

5. METHOD. The USACHPPM Deployment Environmental Surveillance Program (DESP) uses the TG 230 methodology and associated military exposure guidelines (MEGs) to assess identified hazards and estimate risk in a manner consistent with doctrinal risk management procedures and terminology. This method includes identification of the hazard(s), assessment of the hazard severity and probability, and determination of a risk estimate and associated level of confidence. As part of the hazard identification step, the long-term (1-year) MEGs are used as screening criteria to identify those hazards that are potential health threats. These 1-year MEGs represent exposure concentrations at or below which no significant health effects (including delayed or chronic disease or significant increased risk of cancer) are anticipated even after 1 year of continuous daily exposures, based on currently available data. Information about potential health effects are obtained from data provided with the exposure values used to derive the MEGs and symptoms reported from occupational exposures. The quality and quantity of dose and response information available varies with the hazard and the determination of precise "no-effect" levels for low-level exposures for extended and duration involves professional judgment. Hazards with exposure concentrations greater than comparison levels are identified as potential health threats carried through the hazard assessment process, and assigned a risk estimate consistent with ORM methodology. Hazards that are either not detected or are present only at levels below the 1-year MEGs are not considered health threats and, therefore, are automatically assigned a low-operational risk estimate.

6. HAZARD IDENTIFICATION.

a. Sample Information. Six valid samples were submitted for analysis as were three associated field blanks.

b. Laboratory Analysis. The six valid samples and three blanks were analyzed by the USACHPPM–Headquarters laboratory for VOCs. Concentrations of VOCs detected above the laboratory reporting limit were compared to MEGs presented in TG 230. Appendix A provides a summary of the samples assessed in this report. Appendix B contains a summary of the sample results. Appendix C presents detailed laboratory results.

c. Assessment.

(1) Benzene. Benzene was detected at 59 micrograms per cubic meter (µg/m^3) in the one sample downwind of the burn pit, which is above the 1-year MEG of 39 µg/m^3. Therefore, benzene is identified as a potential health threat requiring further assessment. Benzene is typically found in the air from emissions of burning coal and oil, gasoline service stations and motor vehicle exhaust. It is not uncommon to detect benzene in the ambient air at burn pits.

(2) Other Parameters. None of the other parameters detected in the samples were present at concentrations greater than their respective MEGs. Therefore, no potential health threats were identified and the risk estimate for exposure to those VOCs in the ambient air is considered **low**.

7. HAZARD ASSESSMENT.

a. Hazard Severity. The hazard severity for the potential health threat of concern was determined by comparison of detected concentrations to the MEGs published in TG 230 and using TG 230, Table 3–1. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidences of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. The U.S. Environmental Protection Agency has classified benzene as a Group A human carcinogen. However, the average concentration of benzene for all of the samples (10 $\mu g/m^3$) was well below the 1-year MEG (39 $\mu g/m^3$) and the concentration of the burn pit sample detected above the 1-year MEG (59 $\mu g/m^3$) was below the 14-day MEG (160 $\mu g/m^3$) and 8-hour MEG (1600 $\mu g/m^3$). Therefore, no health effects are expected during the mission and the hazard severity is considered **negligible**.

b. Hazard Probability. The hazard probability was based on an approximation of the percentage of personnel that would be exposed to an identified hazard above the MEG (in terms of concentration and as well as exposure assumptions) and using TG 230, Table 3–2. Though the closest personnel who work near the burn pit are approximately 100 meters away, they were indicated to be upwind of the burn pit. However, due to wind direction variation, the probability that personnel would be exposed to concentrations of benzene above the 1-year MEG is considered **occasional**.

c. Risk Estimate and Confidence. The hazard severity and probability levels described above were used with the ORM matrix in TG 230, Table 3–3, or FM 5–19 to provide a risk estimate for exposure to the identified hazard. Table 1 summarizes the risk estimate for the identified hazard. The risk estimate for exposure to VOCs in the ambient air at Al Asad, Iraq is considered **low**. According to TG 230, Table 3–5, confidence in the risk estimate is considered **low** because only one sample was collected downwind of the burn pit (therefore, the sample is not representative of the entire camp), actual exposures are not well defined, and limited information about the burn pit was available. In general, the confidence level in risk estimates is usually low to medium due to consistent lack of specific exposure information associated with troop movement and activity patterns; other routes/sources of potential OEH hazards not

identified; and uncertainty regarding impacts of multiple chemicals present, particularly those affecting the same body organs/systems.

Table 1. Risk Estimate Summary for Exposure to VOCs in the Ambient Air, Al Asad, Iraq.

Parameter	Hazard Severity	Hazard Probability	Hazard-Specific Risk Estimate	Operational Risk Estimate	Confidence
Benzene	NEGLIGIBLE	OCCASIONAL	LOW	LOW	LOW
Other VOCs	None detected at concentrations greater than a MEG		LOW		

8. CONCLUSION. The OEH risk estimate for exposure to VOCs in the ambient air at Al Asad, Iraq is **low**. The concentration of benzene in one sample was greater than its 1-year MEG. However, it is unlikely that many personnel are actually exposed to benzene at the level detected in the one sample downwind from the burn pit. Exposure to the VOCs in the ambient air at Al Asad, Iraq is expected to have little or no impact on unit readiness. Confidence in the risk estimate is considered **low** because only one sample was collected downwind of the burn pit (therefore, the sample is not representative of the entire camp), actual exposures are not well defined, and limited information about the burn pit was available.

9. RECOMMENDATIONS AND NOTE.

a. Recommendations.

(1) Reduce exposure to the area downwind of the burn pit as much as possible to reduce the potential for adverse health effects.

(2) Resample the surrounding areas of the burn pit in multiple sites including locations downwind and upwind from the burn pit to better characterize the adjacent ambient air.

(3) Continue to collect samples from this location at least once every 6 days for the deployment duration (or as long as possible) to better characterize VOC concentrations in the ambient air to which personnel are typically exposed, and to increase confidence in risk estimates at this location.

(4) Minimize the amount of plastics disposed in the burn pit through recycling, use of reusable flatware in dining facilities, and other pollution reduction methods.

b. Note. This OEH risk assessment is specific to the exposure assumptions identified above and the sample results assessed in this report. If the assumed exposure scenario changes, provide

updated information so that the risk estimate can be reassessed. If additional samples from this location are collected, a new OEH risk assessment will be completed.

10. POINTS OF CONTACT. The USACHPPM points of contact for this assessment are Ms. (b) (6) and Mr. (b) (6). Ms. (b) may be contacted at e-mail (b) (6); and Mr. (b) (6) may be contacted at e-mail (b) (6), or DSN (b) (6) or commercial (b) (6)

(b) (6)
Environmental Scientist
Deployment Environmental Surveillance
Program

Approved by:

(b) (6)
Acting Program Manager
Deployment Environmental Surveillance

APPENDIX A

SAMPLING SUMMARY

Table A–1. Summary for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007

Field Identification Number	DESP Identification Number	Sample Location	Collection Date	Tube Identification Number	Sample Duration	Invalid Sample (Yes/No)
IRQALASADTO1707026 1	IRQ_2760_TO17_07269_01	LSA	26-Sep-07	C5188	525	No
IRQALASADTO1707027	IRQ_2760_TO17_07270_02	LSA	27-Sep-07	C3291	509	No
IRQALASADTO1707027 4	IRQ_2760_TO17_07270_01	LSA	27-Sep-07	C4661	513	No
IRQALASADTO17070928 1	IRQ_2760_TO17_07272_02	Burn Pit	29-Sep-07	C5434	513	No
IRQALASADTO17070928 2	IRQ_2760_TO17_07272_01	Marine Patrol	29-Sep-07	C5435	407	No
IRQALASADTO1726SEPT07 2	IRQ_2760_TO17_07269_02	LSA	26-Sep-07	C5415	484	No

APPENDIX B

SAMPLE RESULTS SUMMARY

Table B–1. Results Summary for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007

						Military Exposure Guidelines					
		Detection Rate		Concentration (µg/m^3)					1-hour		
Parameter detected above laboratory limit	Units	# detected / # samples	# detected above MEG / # samples	Maximum	Average	1-year	14-days	8-hours	Minimal	Severe	Significant
Benzene	µg/m^3	1 / 6	1 / 6	59.04787	10.05983	39	160	1600	160000	3200000	480000
Carbon tetrachloride	µg/m^3	4 / 6	0 / 6	0.54127	0.43323	320	1300	33000	75000	1100000	350000
Chlorobenzene	µg/m^3	1 / 6	0 / 6	1.42699	0.45635	400	No MEG	No MEG	130000	4000000	2000000
Cyclopentane	µg/m^3	1 / 6	0 / 6	1.85162	0.52752	42000	No MEG	No MEG	No MEG	No MEG	No MEG
Decane	µg/m^3	2 / 6	0 / 6	3.39525	0.86914	No MEG	No MEG	No MEG	7500	25000000	50000
Ethylbenzene	µg/m^3	1 / 6	0 / 6	17.2223	3.0889	3000	11000	440000	540000	8700000	3500000
Hexane	µg/m^3	1 / 6	0 / 6	1.62382	0.48916	4300	4300	180000	530000	3900000	880000
Isopropylbenzene	µg/m^3	1 / 6	0 / 6	2.85398	1.02196	2700	No MEG	No MEG	250000	4000000	250000
Methylene chloride	µg/m^3	2 / 6	0 / 6	22.90162	5.10742	2100	2100	175000	700000	14000000	2600000
n-Propylbenzene	µg/m^3	1 / 6	0 / 6	0.54127	0.30873	25	No MEG	No MEG	No MEG	No MEG	No MEG
Styrene	µg/m^3	1 / 6	0 / 6	54.12721	9.23972	2000	No MEG	No MEG	210000	4300000	1100000
Toluene	µg/m^3	1 / 6	0 / 6	22.14295	3.90901	4600	11000	750000	750000	11000000	2000000
1,2,4-Trimethylbenzene	µg/m^3	1 / 6	0 / 6	0.7381	0.34154	3100	No MEG	No MEG	No MEG	No MEG	No MEG
o-Xylene	µg/m^3	1 / 6	0 / 6	1.37778	0.44815	11000	11000	440000	650000	3900000	870000
m,p-Xylene	µg/m^3	1 / 6	0 / 6	1.5254	0.47275	No MEG	No MEG	No MEG	No MEG	No MEG	No MEG

Notes: Highlighted parameters indicate those constituents detected above a MEG; µg/m^3 - microgram per cubic meter;
No MEG - MEG not established

APPENDIX C

DETAILED SAMPLE RESULTS

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007

		Field ID	IRQALASADTO1707026 1	IRQALASADTO1707027	IRQALASADTO1707027 4
		DESP ID	IRQ_2760_TO17_07269_01	IRQ_2760_TO17_07270_02	IRQ_2760_TO17_07270_01
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	26-Sep-07	27-Sep-07	27-Sep-07
		Collection Time	8:50	0:02	0:05
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
1,1,1,2-Tetrachloroethane	630206	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,1,1-Trichloroethane	71556	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,1,2,2-Tetrachloroethane	79345	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,1,2-Trichloroethane	79005	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,1-Dichloroethane	75343	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,1-Dichloroethene	75354	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,1-Dichloropropene	563586	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,2,3-Trichlorobenzene	87616	µg/m^3	< 1.190625	< 1.271116	< 1.218171
1,2,3-Trichloropropane	96184	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,2,4-Trichlorobenzene	120821	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,2,4-Trimethylbenzene	95636	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,2-Dibromo-3-chloropropane	96128	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,2-Dibromoethane	106934	µg/m^3	< 0.47625	< 0.508446	< 0.487269

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007 (continued)

		Field ID	IRQALASADTO1707026 1	IRQALASADTO1707027	IRQALASADTO1707027 4
		DESP ID	IRQ_2760_TO17_07269_01	IRQ_2760_TO17_07270_02	IRQ_2760_TO17_07270_01
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	26-Sep-07	27-Sep-07	27-Sep-07
		Collection Time	8:50	0:02	0:05
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
1,2-Dichlorobenzene	95501	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,2-Dichloroethane	107062	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,2-Dichloropropane	78875	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,3,5-Trimethylbenzene	108678	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,3-Dichlorobenzene	541731	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,3-Dichloropropane	142289	µg/m^3	< 0.47625	< 0.508446	< 0.487269
1,4-Dichlorobenzene	106467	µg/m^3	< 0.47625	< 0.508446	< 0.487269
2,2-Dichloropropane	594207	µg/m^3	< 0.47625	< 0.508446	< 0.487269
2-Chlorotoluene	95498	µg/m^3	< 0.47625	< 0.508446	< 0.487269
4-Chlorotoluene	106434	µg/m^3	< 0.47625	< 0.508446	< 0.487269
4-Isopropyltoluene	99876	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Benzene	71432	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Bromobenzene	108861	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Bromochloromethane	74975	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Bromodichloromethane	75274	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Bromoform	75252	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Carbon tetrachloride	56235	µg/m^3	**0.47625**	< 0.508446	**0.487269**
Chlorobenzene	108907	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Chloroform	67663	µg/m^3	< 0.47625	< 0.508446	< 0.487269

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007 (continued)

		Field ID	IRQALASADTO1707026 1	IRQALASADTO1707027	IRQALASADTO1707027 4
		DESP ID	IRQ_2760_TO17_07269_01	IRQ_2760_TO17_07270_02	IRQ_2760_TO17_07270_01
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	26-Sep-07	27-Sep-07	27-Sep-07
		Collection Time	8:50	0:02	0:05
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
Cyclohexane	110827	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Cyclopentane	287923	µg/m^3	< 0.47625	< 0.508446	**1.85162**
Decane	124185	µg/m^3	< 0.47625	**0.762669**	< 0.487269
Dibromochloromethane	124481	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Dibromomethane	74953	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Ethylbenzene	100414	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Hexachlorobutadiene	87683	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Hexane	110543	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Isooctane	540841	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Isopropylbenzene	98828	µg/m^3	< 1.190625	< 1.271116	< 1.218171
Methylcyclopentane	96377	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Methylene chloride	75092	µg/m^3	**6.6675**	< 0.508446	**22.901621**
Styrene	100425	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Tetrachloroethene {PCE}	127184	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Toluene	108883	µg/m^3	< 0.47625	< 0.508446	< 0.487269
Trichloroethene {TCE}	79016	µg/m^3	< 0.47625	< 0.508446	< 0.487269
cis-1,2-Dichloroethene	156592	µg/m^3	< 0.47625	< 0.508446	< 0.487269
cis-1,3-Dichloropropene	10061015	µg/m^3	< 0.47625	< 0.508446	< 0.487269
m,p-Xylene	E966689	µg/m^3	< 0.47625	< 0.508446	< 0.487269

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007 (continued)

		Field ID	IRQALASADTO1707026 1	IRQALASADTO1707027	IRQALASADTO1707027 4
		DESP ID	IRQ_2760_TO17_07269_01	IRQ_2760_TO17_07270_02	IRQ_2760_TO17_07270_01
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	26-Sep-07	27-Sep-07	27-Sep-07
		Collection Time	8:50	0:02	0:05
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
n-Butylbenzene	104518	µg/m^3	< 0.47625	< 0.508446	< 0.487269
n-Propylbenzene	103651	µg/m^3	< 0.47625	< 0.508446	< 0.487269
o-Xylene	95476	µg/m^3	< 0.47625	< 0.508446	< 0.487269
sec-Butylbenzene	135988	µg/m^3	< 0.47625	< 0.508446	< 0.487269
tert-Butylbenzene	98066	µg/m^3	< 0.47625	< 0.508446	< 0.487269
trans-1,2-Dichloroethene	156605	µg/m^3	< 0.47625	< 0.508446	< 0.487269
trans-1,3-Dichloropropene	10061026	µg/m^3	< 0.47625	< 0.508446	< 0.487269

Note: Where parameters are not detected in a sample during analyses, half of the laboratory reportable limit is used in the average

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007 (continued)

		Field ID	IRQALASADTO17070928 1	IRQALASADTO17070928 2	IRQALASADTO1726SEPT07 2
		DESP ID	IRQ_2760_TO17_07272_02	IRQ_2760_TO17_07272_01	IRQ_2760_TO17_07269_02
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	29-Sep-07	29-Sep-07	26-Sep-07
		Collection Time	6:55	8:50	8:50
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
1,1,1,2-Tetrachloroethane	630206	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,1,1-Trichloroethane	71556	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,1,2,2-Tetrachloroethane	79345	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,1,2-Trichloroethane	79005	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,1-Dichloroethane	75343	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,1-Dichloroethene	75354	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,1-Dichloropropene	563586	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,2,3-Trichlorobenzene	87616	µg/m^3	< 1.230164	< 1.549573	< 1.326133
1,2,3-Trichloropropane	96184	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,2,4-Trichlorobenzene	120821	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,2,4-Trimethylbenzene	95636	µg/m^3	**0.738098**	< 0.619829	< 0.530453
1,2-Dibromo-3-chloropropane	96128	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,2-Dibromoethane	106934	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,2-Dichlorobenzene	95501	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,2-Dichloroethane	107062	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,2-Dichloropropane	78875	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,3,5-Trimethylbenzene	108678	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,3-Dichlorobenzene	541731	µg/m^3	< 0.492066	< 0.619829	< 0.530453

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007 (continued)

		Field ID	IRQALASADTO17070928 1	IRQALASADTO17070928 2	IRQALASADTO1726SEPT07 2
		DESP ID	IRQ_2760_TO17_07272_02	IRQ_2760_TO17_07272_01	IRQ_2760_TO17_07269_02
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	29-Sep-07	29-Sep-07	26-Sep-07
		Collection Time	6:55	8:50	8:50
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
1,3-Dichloropropane	142289	µg/m^3	< 0.492066	< 0.619829	< 0.530453
1,4-Dichlorobenzene	106467	µg/m^3	< 0.492066	< 0.619829	< 0.530453
2,2-Dichloropropane	594207	µg/m^3	< 0.492066	< 0.619829	< 0.530453
2-Chlorotoluene	95498	µg/m^3	< 0.492066	< 0.619829	< 0.530453
4-Chlorotoluene	106434	µg/m^3	< 0.492066	< 0.619829	< 0.530453
4-Isopropyltoluene	99876	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Benzene	71432	µg/m^3	**59.047868**	< 0.619829	< 0.530453
Bromobenzene	108861	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Bromochloromethane	74975	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Bromodichloromethane	75274	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Bromoform	75252	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Carbon tetrachloride	56235	µg/m^3	**0.541272**	< 0.619829	**0.530453**
Chlorobenzene	108907	µg/m^3	**1.42699**	< 0.619829	< 0.530453
Chloroform	67663	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Cyclohexane	110827	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Cyclopentane	287923	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Decane	124185	µg/m^3	**3.395252**	< 0.619829	< 0.530453
Dibromochloromethane	124481	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Dibromomethane	74953	µg/m^3	< 0.492066	< 0.619829	< 0.530453

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007 (continued)

		Field ID	IRQALASADTO17070928 1	IRQALASADTO17070928 2	IRQALASADTO1726SEPT07 2
		DESP ID	IRQ_2760_TO17_07272_02	IRQ_2760_TO17_07272_01	IRQ_2760_TO17_07269_02
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	29-Sep-07	29-Sep-07	26-Sep-07
		Collection Time	6:55	8:50	8:50
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
Ethylbenzene	100414	µg/m^3	**17.222295**	< 0.619829	< 0.530453
Hexachlorobutadiene	87683	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Hexane	110543	µg/m^3	**1.623816**	< 0.619829	< 0.530453
Isooctane	540841	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Isopropylbenzene	98828	µg/m^3	**2.85398**	< 1.549573	< 1.326133
Methylcyclopentane	96377	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Methylene chloride	75092	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Styrene	100425	µg/m^3	**54.127212**	< 0.619829	< 0.530453
Tetrachloroethene {PCE}	127184	µg/m^3	< 0.492066	< 0.619829	< 0.530453
Toluene	108883	µg/m^3	**22.14295**	< 0.619829	< 0.530453
Trichloroethene {TCE}	79016	µg/m^3	< 0.492066	< 0.619829	< 0.530453
cis-1,2-Dichloroethene	156592	µg/m^3	< 0.492066	< 0.619829	< 0.530453
cis-1,3-Dichloropropene	10061015	µg/m^3	< 0.492066	< 0.619829	< 0.530453
m,p-Xylene	E966689	µg/m^3	**1.525403**	< 0.619829	< 0.530453
n-Butylbenzene	104518	µg/m^3	< 0.492066	< 0.619829	< 0.530453
n-Propylbenzene	103651	µg/m^3	**0.541272**	< 0.619829	< 0.530453
o-Xylene	95476	µg/m^3	**1.377784**	< 0.619829	< 0.530453
sec-Butylbenzene	135988	µg/m^3	< 0.492066	< 0.619829	< 0.530453
tert-Butylbenzene	98066	µg/m^3	< 0.492066	< 0.619829	< 0.530453

Table C–1. Analytical Results for Ambient Air Samples Collected from Al Asad, Iraq, 26–29 September 2007 (continued)

		Field ID	IRQALASADTO17070928 1	IRQALASADTO17070928 2	IRQALASADTO1726SEPT07 2
		DESP ID	IRQ_2760_TO17_07272_02	IRQ_2760_TO17_07272_01	IRQ_2760_TO17_07269_02
		Location	AL ASAD	AL ASAD	AL ASAD
		Collection Date	29-Sep-07	29-Sep-07	26-Sep-07
		Collection Time	6:55	8:50	8:50
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration
trans-1,2-Dichloroethene	156605	µg/m^3	< 0.492066	< 0.619829	< 0.530453
trans-1,3-Dichloropropene	10061026	µg/m^3	< 0.492066	< 0.619829	< 0.530453