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

21 NOV 2008

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, IBN Sina Hospital, Iraq, 13 June–25 August 2008, U_IRQ_IBNSINA_CM_A17_20080825

1. The enclosed report details the occupational and environmental health (OEH) risk characterization for 13 valid volatile organic compounds (VOCs) ambient air samples collected by 86th Combat Support Hospital–Preventive Medicine personnel from IBN Sina Hospital, Iraq, 13 June–25 August 2008. Two additional samples were invalid due to damaged sample media.

2. The OEH risk estimate for exposure to VOCs in the ambient air at IBN Sina Hospital, Iraq is **low**. While a peak concentration of benzene was above the 1-year military exposure guideline on 1 sampling day, neither that concentration nor the overall average concentration represents levels at which chronic or acute effects would be expected. Therefore, exposure to the benzene or other VOCs in the ambient air at IBN Sina Hospital, Iraq is expected to have little or no impact on unit readiness.

FOR THE COMMANDER:

(b) (6)

Director, Health Risk Management

Encl

CF: (w/encl)
86th CSH TF Baghdad (SSG (b) (6))
86th CSH TF Baghdad (SPC (b) (6))
MNC-I (Command Surgeon/LTC (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
IBN SINA HOSPITAL, IRAQ
13 JUNE–25 AUGUST 2008
U_IRQ_IBNSINA_CM_A17_20080825

USCHPPM

Readiness Thru Health

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
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1. REFERENCES.

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

b. 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.

c. USACHPPM Reference Document (RD) 230, Chemical Exposure Guidelines for Deployed Military Personnel, Version 1.3, May 2003 with January 2004 addendum.

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 IBN Sina Hospital, Iraq.

3. SCOPE. This assessment addresses the analytical results of 13 valid volatile organic compounds (VOCs) air samples collected from IBN Sina Hospital, Iraq, 13 June–25 August 2008. 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 collected to assess the potential for adverse health effects to troops routinely and continuously breathing the ambient air at IBN Sina Hospital, Iraq. Samples were collected from three sites, the Emergency Room, Carl Hall, and the incinerator, on each of the 5 sample days. No significant weather conditions were reported and there is no active industry present around the sampling locations. It is expected that 50 to75 percent of personnel will be exposed to the ambient air at these sample

sites for a deployment duration of 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 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, probability, 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. Short-term MEGs are used to assess brief one time or intermittent exposures. The underlying toxicological basis for the MEGs is addressed in RD 230. Since toxicological information about potential health effects varies among different chemicals, the determination of severity of effects when MEGs are exceeded involves professional judgment. Hazards with exposure concentrations greater than MEGs 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. Thirteen valid samples were submitted for analysis. Two samples were invalid due to damaged sample media.

b. Laboratory Analysis. The 13 valid samples were analyzed by the USACHPPM–Headquarters laboratory for volatile organic compounds (VOCs). Concentrations of VOCs detected above the laboratory reporting limit were compared to MEGs presented in TG 230. Two samples were not analyzed for an unknown reason. 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 a concentration of 47 micrograms per cubic meter ($\mu g/m^3$) in one sample, which is above its 1-year MEG of 39 $\mu g/m^3$. 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 or in laboratory areas.

(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. Benzene can cause acute effects as well as chronic effects under appropriate exposure conditions. 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, such effects occur when exposures are continuous for long periods. Since the average benzene concentration for all of the samples (12 µg/m^3) was below the 1-year MEG (39 µg/m^3) and benzene was detected in only 1 of 4 samples, no chronic effects are expected. Brief or short-term inhalation exposure to benzene may cause acute effects, such as drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation. At high concentrations unconsciousness can occur. Since the peak benzene concentration on 25 August 2008 (47 µg/m^3) was below the short term MEGs (14-day MEG =160 µg/m^3 and 8-hour MEG =1600 µg/m^3), no acute health effects are expected during the mission. Therefore, acute and chronic hazard severity levels are both 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. Benzene concentrations were consistent from all three sampling locations on each day sampling occurred. Since samples collected on one of the five sampling days contained benzene at a concentration above its MEG, the probability that personnel at IBN Sina Hospital, Iraq would be exposed to concentrations of benzene above the 1-year MEG is considered **seldom**. Since none of the samples contained benzene at concentrations above a short term MEG, the probability that personnel will be exposed to benzene above short term MEGs in the sampled areas is considered **unlikely**.

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 IBN Sina Hospital, Iraq is considered **low**. According to TG 230, Table 3–5, confidence in the risk estimate is considered **medium** because the results captured in this entire sampling event are fairly consistent with prior VOC sampling at and around IBN Sina Hospital, Iraq. Peak benzene levels have historically been shown to be elevated above the 1-year MEG on certain days for undetermined reasons, but the overall average concentration has remained below the 1-year MEG. Therefore, it is believed that these results are representative of typical ambient air VOC levels at IBN Sina Hospital, Iraq. 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, IBN Sina Hospital, Iraq

Parameter	Exposure	Hazard Severity	Hazard Probability	Hazard-Specific Risk Estimate	Operational Risk Estimate	Confidence
Benzene	Acute	NEGLIGIBLE	UNLIKELY	LOW	LOW	MEDIUM
Benzene	Chronic	NEGLIGIBLE	SELDOM	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 IBN Sina Hospital, Iraq is **low**. While a peak concentration of benzene was above the 1-year MEG on one sampling day, neither that concentration nor the overall average concentration represent levels at which chronic or acute effects would be expected. Therefore, exposure to the benzene or other VOCs in the ambient air at IBN Sina Hospital, Iraq is expected to have little or no impact on unit readiness. Confidence in the risk estimate is considered **medium** because the results captured during this sampling event are fairly consistent with prior VOC sampling at and around IBN Sina Hospital, Iraq.

9. RECOMMENDATION AND NOTE.

a. Recommendation. 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. Each sample site should be sampled with three sorbent tubes that represent two colocated samples and a field blank.

b. Note. This OEH risk assessment is specific to the exposure assumptions identified in this report 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 Mr. (b) (6) and Ms. (b) (6). Mr. (b) (6) may be contacted at e-mail (b) (6); Ms. (b) (6) may be contacted at e-mail (b) (6) or DSN (b) (6) or commercial (b) (6).

(b) (6)

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

Approved by:

(b) (6)

MAJ, MS
Program Manager
Deployment Environmental Surveillance

APPENDIX A

SAMPLING SUMMARY

Table A–1. Summary for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–25 August 2008

Sample ID	Field/Local Sample ID	Location	Start Date/Time	Sample Time
00000EBB	IRQ_IBNSIN_TO17_08165	IBN SINA HOSPITAL	2008/06/13 1600	479.0 min
00000EBC	IRQ_IBNSIN_TO17_08165-1	IBN SINA HOSPITAL	2008/06/13 1600	479.0 min
00000EBF	IRQ_IBNSIN_TO17_08165-2	IBN SINA HOSPITAL	2008/06/13 1600	479.0 min
00000EAO	IRQ_IBNSIN_TO17_08171	IBN SINA HOSPITAL	2008/06/19 1600	479.0 min
00000EAP	IRQ_IBNSIN_TO17_08171-1	IBN SINA HOSPITAL	2008/06/19 1600	479.0 min
00000EAY	IRQ_IBNSIN_TO17_08171-2	IBN SINA HOSPITAL	2008/06/19 1600	479.0 min
00000EB4	IRQ_IBNSIN_TO17_08178	IBN SINA HOSPITAL	2008/06/26 1600	479.0 min
00000EB8	IRQ_IBNSIN_TO17_08178-2	IBN SINA HOSPITAL	2008/06/26 1600	479.0 min
00000EAA	IRQ_IBNSIN_TO17_08185	IBN SINA HOSPITAL	2008/07/03 1600	479.0 min

Table A–1. Summary for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–25 August 2008 (continued)

Sample ID	Field/Local Sample ID	Location	Start Date/Time	Sample Time
00000EAE	IRQ_IBNSIN_TO17_08185-2	IBN SINA HOSPITAL	2008/07/03 1600	479.0 min
00000EAH	IRQ_IBNSIN_TO17_08185-3	IBN SINA HOSPITAL	2008/07/03 1600	479.0 min
00000EAI	IRQ_IBNSIN_TO17_08	IBN SINA HOSPITAL	2008/08/25 1600	479.0 min
00000EAM	IRQ_IBNSIN_TO17_08-2	IBN SINA HOSPITAL	2008/08/25 1600	479.0 min

APPENDIX B

SAMPLE RESULTS SUMMARY

Table B–1. Results Summary for Ambient Air Samples Collected at Carl Hall, IBN Sina Hospital, Iraq, 13 June–25 August 2008

Analyte	Units	Result		Samples		USACHPPM TG230 Military Exposure Guideline 1yr	
		Max	Avg	#	# > Reporting Limit	# > MEG	MEG
1,2,4-Trimethylbenzene	µg/m^3	25.052	8.4864	5	4	0	3100
1,3,5-Trimethylbenzene	µg/m^3	12.526	4.0188	5	2	0	3100
Benzene	µg/m^3	2.5574	1.1065	5	3	0	39
Chlorobenzene	µg/m^3	2.1399	0.63674	5	1	0	400
Cyclohexane	µg/m^3	0.78288	0.36534	5	1	0	4100
Cyclopentane	µg/m^3	7.3069	1.6701	5	1	0	42000
Ethylbenzene	µg/m^3	1.1482	0.43841	5	1	0	3000
Hexane	µg/m^3	5.7411	1.357	5	1	0	4300
Isopropylbenzene	µg/m^3	3.1315	1.0125	5	2	0	2700
Methylene chloride	µg/m^3	0.57411	0.32359	5	1	0	2100
n-Propylbenzene	µg/m^3	8.8727	2.7871	5	2	0	25
o-Xylene	µg/m^3	1.8789	0.8977	5	3	0	11000
Toluene	µg/m^3	4.8539	1.3048	5	2	0	4600

Table B–2. Results Summary for Ambient Air Samples Collected from the Emergency Room, IBN Sina Hospital, Iraq, 13 June–25 August 2008

Analyte	Units	Result		Samples		USACHPPM TG230 Military Exposure Guidelines 1yr	
		Max	Avg	#	# > Reporting Limit	# > MEG	MEG
Benzene	µg/m^3	47.495	12.069	4	1	1	39
1,2,4-Trimethylbenzene	µg/m^3	27.14	9.499	4	3	0	3100
1,2-Dichloroethane	µg/m^3	1.3048	0.52192	4	1	0	180
1,3,5-Trimethylbenzene	µg/m^3	7.8288	3.249	4	3	0	3100
1,4-Dichlorobenzene	µg/m^3	0.88727	0.41754	4	1	0	1700
Cyclohexane	µg/m^3	9.3946	2.5444	4	1	0	4100
Cyclopentane	µg/m^3	1.5136	0.57411	4	1	0	42000
Ethylbenzene	µg/m^3	20.877	5.4149	4	1	0	3000
Hexane	µg/m^3	156.58	39.34	4	1	0	4300
Isopropylbenzene	µg/m^3	2.0355	0.83507	4	2	0	2700
n-Propylbenzene	µg/m^3	5.0104	2.166	4	3	0	25
o-Xylene	µg/m^3	28.184	7.2416	4	1	0	11000
Styrene	µg/m^3	3.1315	0.9786	4	1	0	2000
Toluene	µg/m^3	88.727	22.377	4	1	0	4600

Table B–3. Results Summary for Ambient Air Samples Collected the Incinerator, IBN Sina Hospital, Iraq, 13 June–25 August 2008

Analyte	Units	Result		Samples		USACHPPM TG230 Military Exposure Guideline 1yr	
		Max	Avg	#	# > Reporting Limit	# > MEG	MEG
1,2,4-Trimethylbenzene	µg/m^3	17.223	4.619	4	2	0	3100
1,3,5-Trimethylbenzene	µg/m^3	8.8727	2.4139	4	1	0	3100
Benzene	µg/m^3	0.73069	0.37839	4	1	0	39
Cyclopentane	µg/m^3	6.785	1.892	4	1	0	42000
Isopropylbenzene	µg/m^3	2.2965	0.76983	4	1	0	2700
Methylene chloride	µg/m^3	1.5136	0.57411	4	1	0	2100
n-Propylbenzene	µg/m^3	6.263	1.7615	4	1	0	25
o-Xylene	µg/m^3	1.2526	0.50887	4	1	0	11000
Toluene	µg/m^3	0.6263	0.3523	4	1	0	4600

APPENDIX C

DETAILED SAMPLE RESULTS

Table C–1. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–25 August 2008

Sample ID		00000EAA	00000EAE	00000EAH	00000EAI	00000EAM	00000EAO
Field/Local Sample ID		IRQ_IBNSIN_ TO17_08185	IRQ_IBNSIN_ TO17_08185-2	IRQ_IBNSIN_ TO17_08185-3	IRQ_IBNSIN_ TO17_08	IRQ_IBNSIN_ TO17_08-2	IRQ_IBNSIN_ TO17_08171
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/07/03 1600	2008/07/03 1600	2008/07/03 1600	2008/08/25 1600	2008/08/25 1600	2008/06/19 1600
Analyte	Units	Results					
1,1,1,2-Tetrachloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1,1-Trichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1,2,2-Tetrachloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1,2-Trichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1-Dichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1-Dichloroethene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1-Dichloropropene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,3-Trichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,3-Trichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,4-Trichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,4-Trimethylbenzene	µg/m^3	0.73069	7.3069	25.052	27.14	1.7223	17.223

Table C–1. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–25 August 2008 (continued)

Sample ID		00000EAA	00000EAE	00000EAH	00000EAI	00000EAM	00000EAO
Field/Local Sample ID		IRQ_IBNSIN_TO17_08185	IRQ_IBNSIN_TO17_08185-2	IRQ_IBNSIN_TO17_08185-3	IRQ_IBNSIN_TO17_08	IRQ_IBNSIN_TO17_08-2	IRQ_IBNSIN_TO17_08171
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/07/03 1600	2008/07/03 1600	2008/07/03 1600	2008/08/25 1600	2008/08/25 1600	2008/06/19 1600
Analyte	Units	Results					
1,2-Dibromo-3-chloropropane	µg/m^3	< 1.3048	< 1.3048	< 1.3048	< 1.3048	< 1.3048	< 1.3048
1,2-Dibromoethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2-Dichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2-Dichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	1.3048	< 0.52192	< 0.52192
1,2-Dichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,3,5-Trimethylbenzene	µg/m^3	< 0.52192	3.4969	12.526	7.8288	< 0.52192	8.8727
1,3-Dichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,3-Dichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,4-Dichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	0.88727	< 0.52192	< 0.52192
2,2-Dichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
2-Chlorotoluene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
4-Chlorotoluene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
4-Isopropyltoluene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	0.88727	< 0.52192	< 0.52192
Benzene	µg/m^3	< 0.52192	< 0.52192	1.2526	47.495	2.5574	0.73069
Bromobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Bromochloromethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192

Table C–1. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–25 August 2008 (continued)

Sample ID		00000EAA	00000EAE	00000EAH	00000EAI	00000EAM	00000EAO
Field/Local Sample ID		IRQ_IBNSIN_TO17_08185	IRQ_IBNSIN_TO17_08185-2	IRQ_IBNSIN_TO17_08185-3	IRQ_IBNSIN_TO17_08	IRQ_IBNSIN_TO17_08-2	IRQ_IBNSIN_TO17_08171
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/07/03 1600	2008/07/03 1600	2008/07/03 1600	2008/08/25 1600	2008/08/25 1600	2008/06/19 1600
Analyte	Units	Results					
Bromodichloromethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Bromoform	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Carbon tetrachloride	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Chlorobenzene	µg/m^3	< 0.52192	< 0.52192	2.1399	< 0.52192	< 0.52192	< 0.52192
Chloroform	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Cyclohexane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	9.3946	0.78288	< 0.52192
Cyclopentane	µg/m^3	< 0.52192	1.5136	7.3069	< 0.52192	< 0.52192	6.785
Decane	µg/m^3	< 0.52192	< 0.52192	0.57411	20.355	2.2965	0.57411
Dibromochloromethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Dibromomethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Ethylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	20.877	1.1482	< 0.52192
Hexachlorobutadiene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Hexane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	156.58	5.7411	< 0.52192
Isooctane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Isopropylbenzene	µg/m^3	< 0.52192	0.78288	3.1315	2.0355	< 0.52192	2.2965
Methylcyclopentane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	21.399	1.4614	< 0.52192
Methylene chloride	µg/m^3	< 0.52192	< 0.52192	0.57411	< 0.52192	< 0.52192	1.5136

Table C–1. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–25 August 2008 (continued)

Sample ID		00000EAA	00000EAE	00000EAH	00000EAI	00000EAM	00000EAO
Field/Local Sample ID		IRQ_IBNSIN_TO17_08185	IRQ_IBNSIN_TO17_08185-2	IRQ_IBNSIN_TO17_08185-3	IRQ_IBNSIN_TO17_08	IRQ_IBNSIN_TO17_08-2	IRQ_IBNSIN_TO17_08171
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/07/03 1600	2008/07/03 1600	2008/07/03 1600	2008/08/25 1600	2008/08/25 1600	2008/06/19 1600
Analyte	Units	Results					
Styrene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	3.1315	< 0.52192	< 0.52192
Tetrachloroethene {PCE}	µg/m^3	< 0.52192	< 0.52192	< 0.52192	1.2004	< 0.52192	< 0.52192
Toluene	µg/m^3	< 0.52192	< 0.52192	0.88727	88.727	4.8539	0.6263
Trichloroethene {TCE}	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
cis-1,2-Dichloroethene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
cis-1,3-Dichloropropene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
m,p-Xylene	µg/m^3	< 0.52192	< 0.52192	1.2004	62.63	3.3403	0.78288
n-Butylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
n-Propylbenzene	µg/m^3	< 0.52192	2.2965	8.8727	5.0104	< 0.52192	6.263
o-Xylene	µg/m^3	< 0.52192	< 0.52192	1.8789	28.184	1.4614	1.2526
sec-Butylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
tert-Butylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
trans-1,2-Dichloroethene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
trans-1,3-Dichloropropene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192

Table C–2. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

Sample ID		00000EAP	00000EAY	00000EB4	00000EB8	00000EBB	00000EBC
Field/Local Sample ID		IRQ_IBNSIN_TO17_08171-1	IRQ_IBNSIN_TO17_08171-2	IRQ_IBNSIN_TO17_08178	IRQ_IBNSIN_TO17_08178-2	IRQ_IBNSIN_TO17_08165	IRQ_IBNSIN_TO17_08165-1
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/06/19 1600	2008/06/19 1600	2008/06/26 1600	2008/06/26 1600	2008/06/13 1600	2008/06/13 1600
Analyte	Units	Results					
1,1,1,2-Tetrachloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1,1-Trichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1,2,2-Tetrachloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1,2-Trichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1-Dichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1-Dichloroethene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,1-Dichloropropene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,3-Trichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,3-Trichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,4-Trichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2,4-Trimethylbenzene	µg/m^3	14.614	< 0.52192	0.78288	< 0.52192	3.2881	< 0.52192
1,2-Dibromo-3-chloropropane	µg/m^3	< 1.3048	< 1.3048	< 1.3048	< 1.3048	< 1.3048	< 1.3048
1,2-Dibromoethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2-Dichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,2-Dichloroethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192

Table C–2. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

Sample ID		00000EAP	00000EAY	00000EB4	00000EB8	00000EBB	00000EBC
Field/Local Sample ID		IRQ_IBNSIN_TO17_08171-1	IRQ_IBNSIN_TO17_08171-2	IRQ_IBNSIN_TO17_08178	IRQ_IBNSIN_TO17_08178-2	IRQ_IBNSIN_TO17_08165	IRQ_IBNSIN_TO17_08165-1
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/06/19 1600	2008/06/19 1600	2008/06/26 1600	2008/06/26 1600	2008/06/13 1600	2008/06/13 1600
Analyte	Units	Results					
1,2-Dichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,3,5-Trimethylbenzene	µg/m^3	6.785	< 0.52192	< 0.52192	< 0.52192	1.4092	< 0.52192
1,3-Dichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,3-Dichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
1,4-Dichlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
2,2-Dichloropropane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
2-Chlorotoluene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
4-Chlorotoluene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
4-Isopropyltoluene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Benzene	µg/m^3	1.2004	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Bromobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Bromochloromethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Bromodichloromethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Bromoform	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Carbon tetrachloride	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Chlorobenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Chloroform	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192

Table C–2. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

Sample ID		00000EAP	00000EAY	00000EB4	00000EB8	00000EBB	00000EBC
Field/Local Sample ID		IRQ_IBNSIN_TO17_08171-1	IRQ_IBNSIN_TO17_08171-2	IRQ_IBNSIN_TO17_08178	IRQ_IBNSIN_TO17_08178-2	IRQ_IBNSIN_TO17_08165	IRQ_IBNSIN_TO17_08165-1
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/06/19 1600	2008/06/19 1600	2008/06/26 1600	2008/06/26 1600	2008/06/13 1600	2008/06/13 1600
Analyte	Units	Results					
Cyclohexane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Cyclopentane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Decane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Dibromochloromethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Dibromomethane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Ethylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Hexachlorobutadiene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Hexane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Isooctane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Isopropylbenzene	µg/m^3	1.1482	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Methylcyclopentane	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Methylene chloride	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Styrene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Tetrachloroethene {PCE}	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Toluene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
Trichloroethene {TCE}	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192

Table C–2. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

Sample ID		00000EAP	00000EAY	00000EB4	00000EB8	00000EBB	00000EBC
Field/Local Sample ID		IRQ_IBNSIN_TO17_08171-1	IRQ_IBNSIN_TO17_08171-2	IRQ_IBNSIN_TO17_08178	IRQ_IBNSIN_TO17_08178-2	IRQ_IBNSIN_TO17_08165	IRQ_IBNSIN_TO17_08165-1
Country		Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
Location		IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL	IBN SINA HOSPITAL
Start Date		2008/06/19 1600	2008/06/19 1600	2008/06/26 1600	2008/06/26 1600	2008/06/13 1600	2008/06/13 1600
Analyte	Units	Results					
cis-1,2-Dichloroethene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
cis-1,3-Dichloropropene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
m,p-Xylene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
n-Butylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
n-Propylbenzene	µg/m^3	4.2797	< 0.52192	< 0.52192	< 0.52192	1.096	< 0.52192
o-Xylene	µg/m^3	0.6263	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
sec-Butylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
tert-Butylbenzene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
trans-1,2-Dichloroethene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192
trans-1,3-Dichloropropene	µg/m^3	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192	< 0.52192

Table C–3. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

	Sample ID	00000EBF
	Field/Local Sample ID	IRQ_IBNSIN_TO17_08165-2
	Country	Iraq
	Location	IBN SINA HOSPITAL
	Start Date	2008/06/13 1600
Analyte	Units	Results
1,1,1,2-Tetrachloroethane	µg/m^3	< 0.52192
1,1,1-Trichloroethane	µg/m^3	< 0.52192
1,1,2,2-Tetrachloroethane	µg/m^3	< 0.52192
1,1,2-Trichloroethane	µg/m^3	< 0.52192
1,1-Dichloroethane	µg/m^3	< 0.52192
1,1-Dichloroethene	µg/m^3	< 0.52192
1,1-Dichloropropene	µg/m^3	< 0.52192
1,2,3-Trichlorobenzene	µg/m^3	< 0.52192
1,2,3-Trichloropropane	µg/m^3	< 0.52192
1,2,4-Trichlorobenzene	µg/m^3	< 0.52192
1,2,4-Trimethylbenzene	µg/m^3	< 0.52192
1,2-Dibromo-3-chloropropane	µg/m^3	< 1.3048
1,2-Dibromoethane	µg/m^3	< 0.52192
1,2-Dichlorobenzene	µg/m^3	< 0.52192
1,2-Dichloroethane	µg/m^3	< 0.52192
1,2-Dichloropropane	µg/m^3	< 0.52192
1,3,5-Trimethylbenzene	µg/m^3	< 0.52192
1,3-Dichlorobenzene	µg/m^3	< 0.52192

Table C–3. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

	Sample ID	00000EBF
	Field/Local Sample ID	IRQ_IBNSIN_TO17_08165-2
	Country	Iraq
	Location	IBN SINA HOSPITAL
	Start Date	2008/06/13 1600
Analyte	Units	Results
1,3-Dichloropropane	µg/m^3	< 0.52192
1,4-Dichlorobenzene	µg/m^3	< 0.52192
2,2-Dichloropropane	µg/m^3	< 0.52192
2-Chlorotoluene	µg/m^3	< 0.52192
4-Chlorotoluene	µg/m^3	< 0.52192
4-Isopropyltoluene	µg/m^3	< 0.52192
Benzene	µg/m^3	< 0.52192
Bromobenzene	µg/m^3	< 0.52192
Bromochloromethane	µg/m^3	< 0.52192
Bromodichloromethane	µg/m^3	< 0.52192
Bromoform	µg/m^3	< 0.52192
Carbon tetrachloride	µg/m^3	< 0.52192
Chlorobenzene	µg/m^3	< 0.52192
Chloroform	µg/m^3	< 0.52192
Cyclohexane	µg/m^3	< 0.52192
Cyclopentane	µg/m^3	< 0.52192
Decane	µg/m^3	< 0.52192
Dibromochloromethane	µg/m^3	< 0.52192

Table C–3. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

	Sample ID	00000EBF
	Field/Local Sample ID	IRQ_IBNSIN_TO17_08165-2
	Country	Iraq
	Location	IBN SINA HOSPITAL
	Start Date	2008/06/13 1600
Analyte	Units	Results
Dibromomethane	µg/m^3	< 0.52192
Ethylbenzene	µg/m^3	< 0.52192
Hexachlorobutadiene	µg/m^3	< 0.52192
Hexane	µg/m^3	< 0.52192
Isooctane	µg/m^3	< 0.52192
Isopropylbenzene	µg/m^3	< 0.52192
Methylcyclopentane	µg/m^3	< 0.52192
Methylene chloride	µg/m^3	< 0.52192
Styrene	µg/m^3	< 0.52192
Tetrachloroethene {PCE}	µg/m^3	< 0.52192
Toluene	µg/m^3	< 0.52192
Trichloroethene {TCE}	µg/m^3	< 0.52192
cis-1,2-Dichloroethene	µg/m^3	< 0.52192
cis-1,3-Dichloropropene	µg/m^3	< 0.52192
m,p-Xylene	µg/m^3	< 0.52192
n-Butylbenzene	µg/m^3	< 0.52192
n-Propylbenzene	µg/m^3	< 0.52192
o-Xylene	µg/m^3	< 0.52192

Table C–3. Analytical Results for Ambient Air Samples Collected, IBN Sina Hospital, Iraq, 13 June–26 September 2008 (continued)

	Sample ID	00000EBF
	Field/Local Sample ID	IRQ_IBNSIN_TO17_08165-2
	Country	Iraq
	Location	IBN SINA HOSPITAL
	Start Date	2008/06/13 1600
Analyte	Units	Results
sec-Butylbenzene	µg/m^3	< 0.52192
tert-Butylbenzene	µg/m^3	< 0.52192
trans-1,2-Dichloroethene	µg/m^3	< 0.52192
trans-1,3-Dichloropropene	µg/m^3	< 0.52192