



DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
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MCHB-TS-RDE

68 FEB 2008

MEMORANDUM FOR Command Surgeon (LTC (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, Camp Liberty, Iraq, 21–29 December 2007,
U_IRQ_LIBERTY_CM_A17_20071229

1. The enclosed report details the occupational and environmental health (OEH) risk characterization for four volatile organic compound (VOC) ambient air samples collected by 345th Medical Detachment personnel, Camp Liberty, Iraq, 21–29 December 2007.
2. The OEH risk estimate for exposure to VOCs in the ambient air surrounding the burn pit of Camp Liberty, Iraq is **low**. None of the VOCs detected were found at concentrations above their military exposure guidelines. Therefore, exposure to VOCs in the ambient air for those working near the burn pit is expected to have little or no impact on unit readiness.

FOR THE COMMANDER:

(b) (6)

Encl

Director, Health Risk Management

CF: (w/encl)

345th MED DET (Commander/LTC (b) (6))

MNC-I (Command Surgeon/MAJ (b) (6))

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U.S. Army Center for Health Promotion and Preventive Medicine

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DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR VOLATILE ORGANIC COMPOUND SAMPLES
CAMP LIBERTY, IRAQ
21-29 DECEMBER 2007
U_IRQ_LIBERTY_CM_A17_20071229

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CHPPMFORM 433-E (MCHB-CS-IPD), OCT 03

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DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR VOLATILE ORGANIC COMPOUND SAMPLES
CAMP LIBERTY, IRAQ
21–29 DECEMBER 2007
U_IRQ_LIBERTY_CM_A17_20071229

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 the above mentioned location.

3. SCOPE. This assessment addresses the analytical results of four volatile organic compound (VOC) air samples collected from Camp Liberty, Iraq, 21–29 December 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 collected to assess the potential for adverse health effects to troops routinely and continuously breathing the ambient air at Camp Liberty, Iraq. One sample was collected from an area referred to as the ‘lay down yard’, near the burn pit. The prevailing winds were blowing toward the sampler during collection. Three additional samples were collected from Log Base Seitz, opposite the same burn pit. Smoke was indicated to be in the air from a near by incinerator. It is expected that 50–75 percent of the personnel will be exposed to the ambient air near the ‘lay down yard’ and more than 75 percent will be exposed to the air at Log base Seitz for approximately 1 year. No

significant weather conditions were reported. 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. Short-term MEGs are used to assess brief one time or intermittent exposures. The underlying toxicological basis for the MEGs is addressed in the RD 230. It is noted that toxicological information about potential health effects varies among different chemicals; therefore, 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. Four valid samples and two field blanks were submitted for analysis. One field blank is associated with the burn pit sampling and the other is associated with the Log Base Seitz sampling.

b. Laboratory Analysis. The four samples and both 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. Risk Estimate. None of the VOCs 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 VOCs in the ambient air is considered **low**.

7. **CONCLUSION.** The OEH risk estimate for exposure to VOCs in the ambient air surrounding the burn pit of Camp Liberty, Iraq is **low**. None of the VOCs detected were found at concentrations above their MEGs. Therefore, exposure to VOCs in the ambient air for those

working near the burn pit is expected to have little or no impact on unit readiness. Confidence in the risk estimate is considered **low** because limited historical data from this location is available, and these results are only based on four samples which may not be representative of conditions for the deployment duration. 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.

8. RECOMMENDATIONS AND NOTE.

a. Recommendations.

(1) 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.

(2) Attempt to collect VOC samples when the smoke plume is blowing more consistently in an area frequented by personnel.

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.

Deployment OEH Risk Characterization, Ambient Air VOC Samples, Camp Liberty, Iraq,
21-29 Dec 07, U_IRQ_LIBERTY_CM_A17_20071229

9. POINTS OF CONTACT. The USACHPPM points of contact for this assessment are
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Acting Program Manager
Deployment Environmental Surveillance

Deployment OEH Risk Characterization, Ambient Air VOC Samples, Camp Liberty, Iraq, 21–29 Dec 07,
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APPENDIX A
 SAMPLING SUMMARY

Table A–1. Summary for Ambient Air Samples Collected, Camp Liberty, Iraq, 21–29 December 2007

Field Identification Number	DESP Identification Number	Sample Location	Collection Date	Tube Identification Number	Sample Duration	Invalid Sample (Yes/No)	Field Notes
IRQ_LIBERT_07347	IRQ_2712_TO17_07355_01	Burn Pit	21-Dec-07	C5569	469	No	DOWNWIND OF BURN PIT.
IRQ_LIBERT_07355	IRQ_2712_TO17_07363_01	Log Base Seitz	29-Dec-07	C5560	320	No	SMOKE FUMES IN AIR FROM INCINERATOR ONLY RAN FOR ABOUT 6 HRS.
IRQ_LIBERT_07355_1	IRQ_2712_TO17_07363_02	Log Base Seitz	29-Dec-07	C3435	320	No	SMOKE IN AIR ONLY RAN FOR ABOUT 6 HRS.
IRQ_LIBERT_07355_2	IRQ_2712_TO17_07363_03	Log Base Seitz	29-Dec-07	C4494	480	No	SMOKE IN AIR.

APPENDIX B

SAMPLE RESULTS SUMMARY

Table B–1. Results Summary for Ambient Air Samples Collected, Camp Liberty, Iraq, 21–29 December 2007

		Detection Rate		Concentration ($\mu\text{g}/\text{m}^3$)		Military Exposure Guidelines					
Parameter detected above laboratory limit	Units	# detected / # samples	# detected above MEG / # samples	Maximum	Average				1-hour		
						1-year	14-days	8-hours	Minimal	Severe	Significant
Benzene	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	33.3002	22.58768	39	160	1600	160000	3200000	480000
Carbon tetrachloride	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	0.53469	0.45401	320	1300	33000	75000	1100000	350000
Cyclohexane	$\mu\text{g}/\text{m}^3$	3 / 4	0 / 4	3.45116	2.36574	4100	No MEG	No MEG	3000000	4000000	4000000
Decane	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	17.89264	12.62748	No MEG	No MEG	No MEG	7500	25000000	50000
1,4-Dichlorobenzene	$\mu\text{g}/\text{m}^3$	3 / 4	0 / 4	0.97216	0.65244	1700	No MEG	No MEG	No MEG	No MEG	No MEG
Ethylbenzene	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	16.89861	11.39763	3000	11000	440000	540000	8700000	3500000
Hexachlorobutadiene	$\mu\text{g}/\text{m}^3$	1 / 4	0 / 4	0.43081	0.27087	5.2	5	240	32000	320000	107000
Hexane	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	28.33002	19.50068	4300	4300	180000	530000	3900000	880000
Isopropylbenzene	$\mu\text{g}/\text{m}^3$	3 / 4	0 / 4	3.92644	2.85073	2700	No MEG	No MEG	250000	4000000	250000
n-Propylbenzene	$\mu\text{g}/\text{m}^3$	3 / 4	0 / 4	1.79849	1.26864	25	No MEG	No MEG	No MEG	No MEG	No MEG
Styrene	$\mu\text{g}/\text{m}^3$	3 / 4	0 / 4	8.94632	5.79384	2000	No MEG	No MEG	210000	4300000	1100000
Toluene	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	36.77932	23.92743	4600	11000	750000	750000	11000000	2000000
1,2,4-Trichlorobenzene	$\mu\text{g}/\text{m}^3$	1 / 4	0 / 4	0.36454	0.2543	1400	No MEG	No MEG	No MEG	No MEG	No MEG
1,3,5-Trimethylbenzene	$\mu\text{g}/\text{m}^3$	3 / 4	0 / 4	2.91647	2.00678	3100	No MEG	No MEG	No MEG	No MEG	No MEG

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Table B–1. Results Summary for Ambient Air Samples Collected, Camp Liberty, Iraq, 21–29 December 2007 (continued)

		Detection Rate				Concentration ($\mu\text{g}/\text{m}^3$)		Military Exposure Guidelines				
Parameter detected above laboratory limit	Units	# detected / # samples	# detected above MEG / # samples	Maximum	Average	1-year	14-days	8-hours	1-hour			
									Minimal	Severe	Significant	
1,2,4-Trimethylbenzene	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	10.93439	7.53322	3100	No MEG	No MEG	No MEG	No MEG	No MEG	
o-Xylene	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	7.45527	4.99437	11000	11000	440000	650000	3900000	870000	
4-Isopropyltoluene*	$\mu\text{g}/\text{m}^3$	3 / 4	0 / 4	0.64612	0.47371	No MEG	No MEG	No MEG	No MEG	No MEG	No MEG	
Methylcyclopentane*	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	5.4672	3.77789	No MEG	No MEG	No MEG	No MEG	No MEG	No MEG	
m,p-Xylene	$\mu\text{g}/\text{m}^3$	4 / 4	0 / 4	17.89264	12.07698	11000	11000	440000	650000	3900000	870000	

Notes:

$\mu\text{g}/\text{m}^3$ - microgram per cubic meter

No MEG – MEG not established

* Toxicity data not currently available to develop MEG

Deployment OEH Risk Characterization, Ambient Air VOC Samples, Camp Liberty, Iraq, 21–29 Dec 07,
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APPENDIX C

DETAILED SAMPLE RESULTS

Table C–1. Analytical Results for Ambient Air Samples Collected from Camp Liberty, Iraq, 21–29 December 2007

Field ID		IRQ_LIBERT_07347	IRQ_LIBERT_07355	IRQ_LIBERT_07355_1	IRQ_LIBERT_07355_2	
DESP ID		IRQ_2712_TO17_07355_01	IRQ_2712_TO17_07363_01	IRQ_2712_TO17_07363_02	IRQ_2712_TO17_07363_03	
Location		LIBERTY	LIBERTY	LIBERTY	LIBERTY	
Collection Date		21-Dec-07	29-Dec-07	29-Dec-07	29-Dec-07	
Collection Time		22:54	20:55	20:55	20:55	
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration	Concentration
1,1,1,2-Tetrachloroethane	630206	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,1,1-Trichloroethane	71556	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,1,2,2-Tetrachloroethane	79345	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,1,2-Trichloroethane	79005	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,1-Dichloroethane	75343	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,1-Dichloroethene	75354	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,1-Dichloropropene	563586	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,2,3-Trichlorobenzene	87616	µg/m ³	< 0.828488	< 1.215197	< 1.242545	< 0.805558
1,2,3-Trichloropropane	96184	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,2,4-Trichlorobenzene	120821	µg/m ³	0.364535	< 0.486079	< 0.497018	< 0.322223
1,2,4-Trimethylbenzene	95636	µg/m ³	1.093604	10.693732	10.934394	7.411131
1,2-Dibromo-3-chloropropane	96128	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223

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 U_IRQ_LIBERTY_CM_A17_20071229

Table C–1. Analytical Results for Ambient Air Samples Collected from Camp Liberty, Iraq, 21–29 December 2007 (continued)

Field ID			IRQ_LIBERT_07347	IRQ_LIBERT_07355	IRQ_LIBERT_07355_1	IRQ_LIBERT_07355_2
DESP ID			IRQ_2712_TO17_07355_01	IRQ_2712_TO17_07363_01	IRQ_2712_TO17_07363_02	IRQ_2712_TO17_07363_03
Location			LIBERTY	LIBERTY	LIBERTY	LIBERTY
Collection Date			21-Dec-07	29-Dec-07	29-Dec-07	29-Dec-07
Collection Time			22:54	20:55	20:55	20:55
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration	Concentration
1,2-Dibromoethane	106934	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,2-Dichlorobenzene	95501	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,2-Dichloroethane	107062	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,2-Dichloropropane	78875	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,3,5-Trimethylbenzene	108678	µg/m ³	< 0.331395	2.916472	2.882704	2.062228
1,3-Dichlorobenzene	541731	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,3-Dichloropropane	142289	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
1,4-Dichlorobenzene	106467	µg/m ³	< 0.331395	0.972157	0.795229	0.676668
2,2-Dichloropropane	594207	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
2-Chlorotoluene	95498	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
4-Chlorotoluene	106434	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
4-Isopropyltoluene	99876	µg/m ³	< 0.331395	0.631902	0.646123	0.451112
Benzene	71432	µg/m ³	2.419184	31.109037	33.300199	23.522285
Bromobenzene	108861	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Bromochloromethane	74975	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Bromodichloromethane	75274	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Bromoform	75252	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Carbon tetrachloride	56235	µg/m ³	0.397674	0.534687	0.497018	0.386668
Chlorobenzene	108907	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223

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Table C–1. Analytical Results for Ambient Air Samples Collected from Camp Liberty, Iraq, 21–29 December 2007 (continued)

Field ID			IRQ_LIBERT_07347	IRQ_LIBERT_07355	IRQ_LIBERT_07355_1	IRQ_LIBERT_07355_2
DESP ID			IRQ_2712_TO17_07355_01	IRQ_2712_TO17_07363_01	IRQ_2712_TO17_07363_02	IRQ_2712_TO17_07363_03
Location			LIBERTY	LIBERTY	LIBERTY	LIBERTY
Collection Date			21-Dec-07	29-Dec-07	29-Dec-07	29-Dec-07
Collection Time			22:54	20:55	20:55	20:55
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration	Concentration
Chloroform	67663	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Cyclohexane	110827	µg/m ³	< 0.331395	3.451159	3.429423	2.416673
Cyclopentane	287923	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Decane	124185	µg/m ³	2.551742	17.498833	17.892644	12.5667
Dibromochloromethane	124481	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Dibromomethane	74953	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Ethylbenzene	100414	µg/m ³	0.729069	16.040597	16.898608	11.922254
Hexachlorobutadiene	87683	µg/m ³	0.430814	< 0.486079	< 0.497018	< 0.322223
Hexane	110543	µg/m ³	1.988371	27.706486	28.33002	19.977831
Isooctane	540841	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Isopropylbenzene	98828	µg/m ³	< 0.828488	3.840022	3.926441	3.222231
Methylcyclopentane	96377	µg/m ³	0.430814	5.346866	5.467197	3.866677
Methylene chloride	75092	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Styrene	100425	µg/m ³	< 0.331395	8.263338	8.946322	5.800015
Tetrachloroethene {PCE}	127184	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
Toluene	108883	µg/m ³	2.518603	32.567273	36.779324	23.844508
Trichloroethene {TCE}	79016	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
cis-1,2-Dichloroethene	156592	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223

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Table C–1. Analytical Results for Ambient Air Samples Collected from Camp Liberty, Iraq, 21–29 December 2007 (continued)

Field ID			IRQ_LIBERT_07347	IRQ_LIBERT_07355	IRQ_LIBERT_07355_1	IRQ_LIBERT_07355_2
DESP ID			IRQ_2712_TO17_07355_01	IRQ_2712_TO17_07363_01	IRQ_2712_TO17_07363_02	IRQ_2712_TO17_07363_03
Location			LIBERTY	LIBERTY	LIBERTY	LIBERTY
Collection Date			21-Dec-07	29-Dec-07	29-Dec-07	29-Dec-07
Collection Time			22:54	20:55	20:55	20:55
Parameter	Chemical Abstract Number	Units	Concentration	Concentration	Concentration	Concentration
cis-1,3-Dichloropropene	10061015	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
m,p-Xylene	E966689	µg/m ³	0.994185	17.498833	17.892644	11.922254
n-Butylbenzene	104518	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
n-Propylbenzene	103651	µg/m ³	< 0.331395	1.798491	1.789264	1.321115
o-Xylene	95476	µg/m ³	0.397674	7.291181	7.455268	4.833346
sec-Butylbenzene	135988	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
tert-Butylbenzene	98066	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
trans-1,2-Dichloroethene	156605	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223
trans-1,3-Dichloropropene	10061026	µg/m ³	< 0.331395	< 0.486079	< 0.497018	< 0.322223

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