Table 1. Summary of Chemical Agent Air* Exposure Values: Existing Information as of 8/03/04 POC: V. Hauschild, USACHPPM, 410-436-5213

Media – AIR	Standard Name	Population	Exposure Scenario	H/HD/HT	GA (Tabun)	GB (Sarin)	GD/GF	VX	Lewisite	Notes/ Status
Airborne Exposure Limits (AELs) mg/m^3	**IDLH** (Immediately Dangerous to Life/Health)	civilian/ DoD worker	one time exposure	NA	~~0.2~~	~~0.2~~	~~0.06~~	~~0.02~~	NA	US Army established new policy 18 June 2004 (***ref a***), re: Airborne Exposure Limits for Nerve and Blister Agents. The implementing policy endorses use of CDC's recently recommended new AELs for agents GA, GB, VX {*Federal Register* notice 9 Oct 2003; ***ref b}***, and sulfur mustard (H, HD) {*FR* notice 3 May 2004; ***ref c}***, as well as new AELs for additional agents GD, GF (these other agents were based on relative potency to the new CDC value of GB per ***ref d***). The Army policy applies to all agent operations and activities except tactical military operations and training. The policy includes new procedures including use of the STEL, which is a new AEL not addressed by previous Army Regs/DA Pams or related procedures. In general, the STEL is considered a more appropriate value for many alarm-based procedures that previously were based on the 8-hr TWA (WPL). The policy supersedes existing DA policies, regs, and DA Pams where guidance conflicts. † Note that the GD/GF STEL value (0.0002) in DA 2004 policy was a typo. ** See next page for info re: new VX data. ***Since no longer in US Stockpile, no re-evaluation of Lewisite performed since 1988 CDC-approved AELs. (see more next page)
				0.7 [a,b] [3E-3]	0.1 [a,c] [1E-4]	0.1 [a,c] [1E-4]	0.05 [a,d] [5E-5]	0.003 [a,c] ** [1E-5]**		
	STEL (Short-Term Exposure Limit)	civilian/DoD worker	occasional 15-minute exposure	0.003 [a,b] [3E-3]	0.0001 [a,c] [1E-4]	0.0001 [a,c] [1E-4]	0.00005 †[d] [5E-5]	0.00001 [a,c] [1E-5]**		
	WPL (Worker Population Limit)	civilian/DoD worker	Time-weighted average (TWA) for daily, 8-hour, 30 year exposure	~~0.003~~	~~0.0001~~	~~0.0001~~	~~0.00003~~	~~0.00001~~	0.003 [e,f***]	
				0.0004 [a,b] [4E-4]	0.00003 [a,c] [3E-5]	0.00003 [a,c] [3E-5]	0.00003 [a,d] [3E-5]	0.000001 [a,c] [1E-6]**	--	
	GPL (General Population Limit)	civilian general population	24-hour/daily, lifetime TWA	~~0.0001~~	~~0.000003~~	~~0.000003~~	~~0.000001~~	~~0.000001~~	0.003 [e,f***]	
				0.00002 [a,b] [2E-5]	0.000001 [a,c] [1E-6]	0.000001 [a,c] [1E-6]	0.000001 [a,d] [1E-6]	0.0000006 [a,c] [6E-7]**	--	
Acute Exposure Guideline Levels* (AEGLs) mg/m^3	**AEGL - LEVEL 1** Potential minor discomfort or noticeable effects; reversible	civilian general population; one time exposure for emergency/ accident scenario	10 MIN:	0.40	0.0069	0.0069	0.0035	0.00057	NA¥	***No changes to AEGL values*** ¥Lewisite AEGLs are now under development by the National Advisory Committee on AEGLs, anticipated proposal of draft values in mid-2005 Final CWA AEGLs were published in May 04 by National Research Council (NRC) Committee on Toxicology (COT) (available at www.nap.edu) ***ref g***; AEGLs are guidelines not regulatory standards. However, there is an Army-FEMA policy letter requiring use of these AEGLs for the Chemical Stockpile Emergency Planning Program (CSEPP) ***ref h***. Associated CSEPP guidance provides suggested use (such as AEGL 2 as action level for shelter in place/evacuation); but policy includes allowance for site-specific (State, local) decision-making. USACHPPM has also prepared fact sheets on AEGLs and their use, available at http://chppm-www.apgea.army.mil/chemicalagent/
			30 MIN:	0.13	0.0040	0.0040	0.0020	0.00033		
			1 HR:	0.067	0.0028	0.0028	0.0014	0.00017		
			4 HR:	0.017	0.0014	0.0014	0.00070	0.00010		
			8HR:	0.0083	0.0010	0.0010	0.00050	0.000071		
	AEGL- LEVEL 2 Level where more obvious effects begin; potentially impacting functional abilities or ability to escape; potential delayed recovery		10 MIN:	0.60	0.087	0.087	0.044	0.0072		
			30 MIN:	0.20	0.050	0.050	0.025	0.0042		
			1 HR:	0.10	0.035	0.035	0.018	0.0029		
			4 HR:	0.025	0.017	0.017	0.0085	0.0015		
			8HR:	0.013	0.013	0.013	0.0065	0.00104		
	AEGL - LEVEL 3 Life threatening; Level of potential initial fatalities		10 MIN:	3.9	0.76	0.38	0.38	0.029		
			30 MIN:	2.7	0.38	0.19	0.19	0.015		
			1 HR:	2.1	0.26	0.13	0.13	0.010		
			4 HR:	0.53	0.14	0.070	0.070	0.0052		
			8HR:	0.27	0.10	0.051	0.051	0.0038		
MEGs mg/m^3	**Military Exposure Guidelines (Air)**	USACHPPM Technical Guide 230 (***ref i***) provides MEGs (for industrial chemicals as well as the agents listed here) and application guidance for assessing/characterizing exposures to military personnel in deployed settings as required by DoD Force Health Protection policy. The TG 230 was recently reviewed by the NRC and will be updated (next version due out Jan-Feb 2005) to accommodate several NRC recommendations and other new information. The new versions will include slightly modified CWA MEGs which will be based on findings of USACHPPM Technical Report 47-EM-5863-04 (see ***ref j*** below)								

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HIGHLIGHTED values indicate changes from previous version (April 03) of this Table
BLACK Numbers are final approved values documented by official Army regulation/policy as well as CDC
GREEN Numbers are final approved values documented by official Army regulation/policy but are not addressed by CDC/other Federal agency
BLUE Numbers have been developed/endorsed by non-DoD federal proponents for Army and non-Army use
RED indicates previous official DA/CDC values that are now obsolete; outdated/superseded references
* The criteria listed in this Table are designed for protection from inhalation and ocular exposures as most sensitive exposure routes; separate vapor exposure limits for percutaneous vapor absorption are also now officially endorsed by Army for occupational use [in mg/m^3 GA = 11.1; GB = 6.0; GD/GF= 1.5; VX= 0.13; and H=0.1; per ***ref d***)
** New 2004 data generated from animal toxicological studies specifically performed to assess validity of previous assumption re: VX toxicity (which is the warfare agent that had particularly limited toxicity data and was recommended to be studied further by the National Research Committee) are showing that the VX AELs may over estimate its toxicity (and thus be overly protective (low) AELs). Army has requested that the CDC consider the new data which is to be published in a report being prepared by the US Army Edgewood Chemical and Biological Center (ECBC) and is expected to be published @ end 2004. It is not yet known whether this will result in future reconsideration of the AELs for VX.
*** Lewisite AELs are all based on detection; no true IDLH exists (AR 385-61, Table 2-2 and 2-3)

REFERENCES:

a) Department of the Army, Memorandum Subject: *Implementation Guidance Policy for New Airborne Exposure Limits for GB. GA, GD, GF, VX, H, HD, and HT*; signed by Mr. Raymond J. Fatz, Deputy Assistant Secretary of the Army, (Environment, Safety and Occupational Health); OASA(I&E), **June 18 2004**.
b) Department of Health and Human Services (DHHS) Centers for Disease Control (CDC); Interim Recommendations for Airborne Exposure Limits for Chemical Warfare Agents H and HD (Sulfur Mustard); Federal Register, vol 69, No 85, pp 24164-2468, **May 3 2004.**
c) Department of Health and Human Services (DHHS) Centers for Disease Control (CDC); Final Recommendations for Protecting Human Health from Potential Adverse Effects of Exposure to Agents GA, GB, and VX; Federal Register, vol 68, No 196, pp58348-58351, **Oct 9 2003**.
d) Department of the Army Office of the Surgeon General Memorandum, Subject: *Nerve Agent Percutaneous Exposure Criteria and Airborne Exposure Levels (AELs) for GD.GF in Use of Interim DA Guidance on Implementation of the New AELs,* **29 June 2004**
e) Department of Health and Human Services (DHHS) Centers for Disease Control (CDC); *Recommendations for Protecting Human Health and Safety Against Potential Adverse Effects of Long-Term Exposure to Low-Doses of Agents GA, GB, VX, Mustard Agents (H. HT, HD) and Lewisite (L), Federal Register*, Vol. 53 No 50, page 8504, Tuesday, March 15, 1988.
SUPERCEDED BY ABOVE, EXCEPT FOR LEWISITE
f) AR 385-61: *The Army Chemical Agent Safety Program*; Safety; 28 February 1997 **PARTS OF THIS DOCUMENT ARE NOW SUPERCEDED BY Reference a.**
g) National Research Council (NRC) Volume 3, Acute Exposure Guidelines for Selected Airborne Chemicals, National Academy Press, Pre-Publication Advance Public copy 14 March, 2003, www.nap.edu
h) Chemical Stockpile Emergency Preparedness Program, US Army and US Federal Emergency Management Agency (FEMA) Policy Paper #20 (Revised), Subject: Adoption of Acute Exposure Guidelines Levels (AEGLs); **February 2003**.
i) USACHPPM Technical Guide (TG) 230, Chemical Exposure Guidelines for Deployed Military Personnel, Current version: Version 1.3 with **May 2004 Update**; new version to be published in Jan-Feb 2005 – will have new CWA MEGs based on findings and conclusions of USACPPM Technical Report 47-EM-5863-04 (see ***ref j*** below).
j) USACHPPM Technical Report 47-EM-5863-04; Acute Toxicity Estimation and Operational Risk Management of Chemical Warfare Agent Exposures; **May 2004**.

The following are references that were cited as key sources of values in the previous Update Table(s) but which are now largely superseded by newer references/policies listed above.

- ~~DA Pamphlet 40-173: *Occupational Health Guidelines for the Evaluation and Control of Exposure to Nerve Agents GA, GB, GD, and VX*; Medical Services, 4 Dec **1990**~~
- ~~DA Pamphlet 40-8: *Occupational Health Guidelines for the Evaluation and Control of Exposure to Mustard Agents H, HD, and HT*; Medical Services, August **1991**~~
- ~~**Draft REV Jan 03** DA Pmt 40-173: *Occupational Health Guidelines for the Evaluation and Control of Exposure to Nerve Agents GA, GB, GD, and VX*; Med Services,~~ new draft pending, currently superseded by ref a
- ~~**Draft REV Jan 03** DA Pam 40-8: *Occupational Health Guidelines for the Evaluation and Control of Exposure to Mustard Agents H, HD, and HT*; Medical Services~~, new draft pending, currently superseded by ref a
- USACHPPM Technical Report: *Evaluation of Airborne Exposure Limits for Sulfur Mustard (HD): Occupational and General Population Exposure Criteria,* Technical Report 47-EM-3767-00, November, 2000
- Mioduszewski et al.; *Evaluation of Airborne Exposure Limits for G-Agents: Occupational and General Population Exposure Criteria*, ERDEC-TR-489; April 1998. (and February, 2000 Errata Summary)
- Reutter et al.; *Evaluation of Airborne Exposure Limits for VX: Occupational and General Population Exposure Criteria*; ECBC-TR-074; February 2000.