NAC/AEGL Meeting 40: September 6-8, 2006

ACCEPT MINUTES JUNE 13-15, 2005 + FEB 1-3, 2006 MINUTES

Chemical: MINUTES * **CAS Reg. No.:**

Action: Proposed_____ **Interim**_____ **Other**_____ Appendix A

Chemical Manager: **Staff Scientist:**

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson				
Steven Barbee				
Marc Baril				
Lynn Beasley				
Alan Becker				
Robert Benson				
George Cushmac				
Ernest Falke				
Alfred Feldt				
Roberta Grant				
Dieter Heinz				
John Hinz				
Jim Holler				

NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg				
Elaine Krueger				
Glenn Leach				
Richard Niemeier				
Marinelle Payton				
Susan Ripple				
George Rodgers				
Marc Ruijten				
George Rusch, Chair				
Daniel Sudakin				
Richard Thomas				
Calvin Willhite				
George Woodall				
TALLY				
PASS/ FAIL				

* UNANIMOUS BY MEMBER QUORUM (NIEMEIER, FELDT, PAYTON, JEDERBERG ABSENT)

PPM, (mg/m^3)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,( )	,( )	,( )	,( )	,( )
AEGL 2	,( )	,( )	,( )	,( )	,( )
AEGL 3	,( )	,( )	,( )	,( )	,( )
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.

** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to_____

AEGL 1 **Motion by:** Hinz **Second by:** Ruijten

AEGL 2 **Motion by:**_____ **Second by:**_____

AEGL 3 **Motion by:**_____ **Second by:**_____

LOA **Motion by:**_____ **Second by:**_____

Approved by Chair: [signature] **DFO:** [signature] **Date:** 9/6/2006

National Advisory Committee (NAC)
for Acute Exposure Guideline Levels (AEGLs) for Hazardous Substances

February 1-3, 2006

Final Meeting-39 Highlights

U.S. Department of Labor
Rooms 5515 1A and 1B
200 Constitution Ave., N.W.
Washington, DC 20210

INTRODUCTION

Chairman George Rusch welcomed the committee, and announced that the NAC AEGL committee was well represented at the Toxicology Forum held January 31 in Washington, D. C. Participants in the AEGL session of the Toxicology Forum included Drs. Rusch, Don Gardner (chairman of the AEGL COT subcommittee), Ernest Falke, Bob Benson, Marc Ruijten, and George Woodall.

The chair also noted that as a consequence of political concerns the AEGL meeting for December, 2005, had to be canceled, and the agenda for this meeting was severely shortened. He stated that it was unfortunate that these political concerns interfered with the technical responsibility of the AEGL Committee to provide additional guidance to emergency responders.

Dr. Rusch also thanked retiring NAC members Jonathan Borak, Bill Bress, Tom Hornshaw, Nancy Kim, and John Morawetz for their many years of service to the committee.

The draft NAC/AEGL-38 meeting highlights were reviewed. Marc Ruijten suggested including a statement that a white paper regarding the use of RD_{50} for AEGL value derivation would be prepared and included as part of the SOP. This suggestion was incorporated into the highlights. A motion was made by George Rodgers and seconded by Nancy Kim to accept the meeting highlights as presented with the aforementioned revision. The motion passed unanimously by a show of hands (Appendix A). The final version of the NAC/AEGL-38 meeting highlights is attached (Appendix B).

The highlights of the NAC/AEGL-39 meeting are summarized below along with the Meeting Agenda (Attachment 1) and the Attendee List (Attachment 2). The subject categories of the highlights do not necessarily follow the order listed in the NAC/AEGL-39 Agenda.

HUMAN STUDIES ISSUES

Ernest Falke presented a synopsis of the Final Rule on Protections for Subjects in Human Research (Attachment 3) regarding use of third party human pesticide data including how this may impact the AEGL program. The Final Rule was expected to be published within one week. The Agency has interpreted this law to include both pesticides and industrial chemicals. Dr. Falke pointed out that the most important Section impacting the AEGL program is Subpart Q-Ethical Standards for Assessing Whether to Rely on the Results of Human Research in EPA Actions.

AEGL DATA BASES

Richard Williams, intern with the AEGL program, provided information and demonstrations of the AEGL Expert System data base and AEGL Derivation data base (Attachment 4). The AEGL Expert System data base is designed to examine AEGL chemicals using a chemical class approach and to compile a broad range of safety and emergency data (Federal and nongovernmental) for these chemicals. The AEGL Derivation data base is designed to store and categorize data pertaining to the development of AEGL values. The AEGL expert system data base will be publically available; whereas, the Derivation data base will be available to AEGL program staff and NAC members. Both data bases were well received by NAC members. Several suggestions for improvement were offered and are presented in Attachment 5.

USE OF OCCUPATIONAL STANDARDS AND RECOMMENDATIONS IN SETTING AEGL VALUES

John Morawetz discussed the use of occupational standards in the context of derivation of AEGL values (Attachment 6). Different occupational standards were defined, and Mr. Morawetz pointed out that occupational values provide no specific information that AEGL-1 effects will not occur in the public at recommended occupational exposure limits.

REVIEW of PRIORITY CHEMICALS

Cyclohexyl Isocyanate (CAS No. 3173-53-3)

Staff Scientist: Carol Wood, ORNL
Chemical Manager: Marc Ruijten, RIVM

Cheryl Bast presented this chemical on behalf of Carol Wood. AEGL-3 values (0.14 ppm for 10- and 30- min, 0.11 ppm for 1-hr, 0.072 ppm for 4-hrs, and 0.047 ppm for 8-hrs) for cyclohexyl isocyanate were derived at NAC-38 (September, 2005). The point-of-departure (1.88 ppm) was a calculated $BMCL_{05}$ from a 6-hour rat study (Eastman Kodak, 1990; 1992) (Attachment 7). However, the $BMCL_{05}$ was calculated incorrectly; the correct value is 1.67 ppm, yielding AEGL-3 values of 0.13 ppm for 10- and 30- min, 0.10 ppm for 1-hr, 0.064 ppm for 4-hrs, and 0.042 ppm for 8-hrs. A motion was made by Richard Niemier and seconded by George Woodall to adopt the revised AEGL-3 values based on the $BMCL_{05}$ of 1.67 ppm. Uncertainty factors (3 each for inter- and intraspecies extrapolation), modifying factor (3 for sparse data base), and time scaling (default values of n = 1 or n =3) remained unchanged. The motion carried (YES: 21; NO: 0; ABSTAIN: 0) (APPENDIX C).

Summary of AEGL Values for Cyclohexyl Isocyanate						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	NR	NR	NR	NR	NR	Not recommended: Insufficient data
AEGL–2	NR	NR	NR	NR	NR	Not recommended: Insufficient data
AEGL–3	~~0.14 ppm~~ 0.13 ppm	~~0.14 ppm~~ 0.13 ppm	~~0.11 ppm~~ 0.10 ppm	~~0.072 ppm~~ 0.064 ppm	~~0.047 ppm~~ 0.042 ppm	6-hr $BMCL_{05}$ in rats (Eastman Kodak, 1990; 1992)

Silane (CAS No. 7803-62-5)

Staff Scientist: Dana Glass, ORNL
Chemical Manager: Bob Benson, U.S. EPA

Bob Benson, chemical manager, made a few introductory remarks about the issues regarding silane. The data base is limited. There are only limited data that could be used to determine the value of n for time scaling. In addition, there are no data that can be used to estimate the intrahuman variability in response. Dana Glass then discussed the data summarized in the TSD (Attachment 8). The key study for determining the AEGL-3 values is Takebayashi et al. (1993). This study was conducted in mice with exposures at 0, 2500, 5000, or 10,000 ppm for 4 hours. At

5000 ppm there was no mortality but the animals showed renal lesions even after a two week recovery period. At 10,000 ppm, 6 of 8 animals died. AEGL-3 values were determined from the 5000 ppm exposure for 4 hours using a total uncertainty factor of 30, the default scaling procedure (n = 3 for shorter durations and n = 1 for longer durations), with the 10 minute value set at the 30 minute value because the primary study used an exposure duration of 4 hours. The interspecies uncertainty factor was 3 because other data (MacEwen and Vernot, 1972) identified the mouse as the most sensitive species. The intraspecies uncertainty factor was set at the default value of 10 as there are no data to estimate intrahuman variability and the chemical is not acting as a direct chemical irritant. The calculated values are 300 ppm for 10 and 30 minutes, 270 ppm for 1 hour, 170 ppm for 4 hours, and 80 ppm for 8 hours. After discussion, a motion was made by Bob Benson and seconded by Ernest Falke to adopt AEGL-3 values as proposed. The motion carried (YES: 19; NO: 0; ABSTAIN: 3) (APPENDIX D).

The key study for determining AEGL-2 values is also Takebayashi et al. (1993). At an exposure of 2500 ppm for 4 hours, the animals showed reversible renal lesions. Renal lesions that were present after a two day recovery period were not present after a 2 week recovery period. This is considered the no effect level for irreversible effects and is used to derive quantitative values using the uncertainty factors and time scaling as described above. The calculated values are 170 ppm for 10 and 30 minutes, 130 ppm for 1 hour, 80 ppm for 4 hours, and 42 ppm for 8 hours. A motion was made by Bob Benson and seconded by Richard Thomas to adopt AEGL-2 values as proposed. The motion carried (YES: 21; NO: 0; ABSTAIN: 1) (APPENDIX D).

The key study for determining AEGL-1 values is Omae et al. (1992). In this study, mice were exposed to 0 or 1000 ppm for 1, 2, 4, or 8 hours. Additional animals were exposed for 6 hours/day, 5 days/week for 2 and 4 weeks. Signs of minor irritation were observed (increased face washing and mild irritation in the nasal cavity after 4 weeks of exposure). No renal lesions were observed in the study. Mark Ruijten made a motion to base AEGL-1 values on the 1000 ppm exposure with a total uncertainty factor of 10 and no time scaling. The interspecies and intraspecies uncertainty factors were both 3 because the only effect observed is mild irritation and this response is not expected to vary greatly among species or among humans. Because of the conflict with AEGL-2 at longer times, AEGL-1 values for 4 and 8 hours were not recommended. The AEGL-1 values are 100 ppm for 10, 30, and 60 minutes. Steve Barbee seconded the motion. The motion passed. The motion carried (YES: 13; NO: 3; ABSTAIN: 6) (APPENDIX D).

Summary of AEGL Values for Silane

Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL-1	100 ppm	100 ppm	100 ppm	NR	NR	NOEL for irritation in mice (Omae et al., 1992)
AEGL-2	170 ppm	170 ppm	130 ppm	80 ppm	42 ppm	Reversible renal lesions in mice (Takebayashi , 1993)
AEGL-3	300 ppm	300 ppm	270 ppm	170 ppm	80 ppm	NOEL for lethality in mice (Takebayashi , 1993)

Trimethoxysilane (CAS No. 2487-90-3)

Staff Scientist: Dana Glass, ORNL
Chemical Manager: Bob Benson, U.S. EPA

Bob Benson, chemical manager, made a few introductory remarks about the issues regarding trimethoxysilane. The data base is limited. In the only single exposure study available (Nachreiner and Dodd, 1988), the effects observed at the lowest exposure tested were more severe than the definition of AEGL-2. It might be possible to use a repeated dose study to derive AEGL-1 values. The data for deriving the value of n for time scaling are also limited. Dana Glass then discussed the data summarized in the TSD (Attachment 9). The key study for determining the AEGL-3 values is Nachreiner and Dodd (1988). In this study rats were exposed for 1 hour to 68, 155, 342, or 643 ppm and for 4 hours to 19, 39, 71, or 166 ppm. No deaths were observed at the lowest exposures, but there were severe lung lesions at this exposure. The $BMCL_{05}$ for 1 hour is 60 ppm and for 4 hours is 22 ppm. AEGL-3 values were calculated using the $BMCL_{05}$ values, a total uncertainty factor of 30, and the default time scaling procedure ($n = 3$ for shorter durations and $n = 1$ for longer durations). The interspecies uncertainty factor of 3 was used because another study (Dow Corning, 1981) showed similar effects in rats, mice, and hamsters. The default value of 10 was used as the intraspecies uncertainty factor as there are no data to estimate intrahuman variability and it is not clear that trimethoxysilane is acting as a simple chemical irritant in the lung. The proposed AEGL-3 values were 3.6 ppm for 10 minutes, 2.5 ppm for 30 minutes, 2.0 ppm for 1 hour, 0.73 ppm for 4 hours, and 0.37 ppm for 8 hours. Mark Ruitjen had used the original data on mortality and the ten Berge program to calculate an n value of 1.45. Using this as the value of n, the calculated AEGL-3 values are 8.8 ppm for 10 minutes, 4.1 ppm for 30 minutes, 2.5 ppm for 1 hour, 0.98 ppm for 4 hours, and 0.61 ppm for 8 hours. Ernie Falke made a motion to accept the values based on the time scaling exponent of n= 1.45. Richard Thomas seconded the motion. The motion passed (YES: 18; NO: 2; ABSTAIN: 1) (APPENDIX E).

As noted above, the lowest exposure from Nachreiner and Dodd (1988) gave effects more severe than the definition of AEGL-2. Because of the limited data and the steep dose response curve, Bob Benson made a motion to derive the AEGL-2 values by dividing the AEGL-3 values by 3. (2.9 ppm for 10 minutes, 1.4 ppm for 30 minutes, 0.83 ppm for 1 hour, 0.33 ppm for 4 hours, and 0.20 ppm for 8 hours). John Hinz seconded the motion. The motion passed (YES: 21; NO: 1; ABSTAIN: 0) (APPENDIX E).

There are no single exposure studies with endpoints consistent with the definition of AEGL-1. There was some discussion of using a repeat dosing study to derive these values. A four week study at 0.5 ppm showed no effects. However, because trimethodysilane does not have good warning properties based on odor and because the resulting calculated values would be very low,

this option was not further discussed. Bob Benson made a motion to not recommend derivation of AEGL-1 values. Richard Thomas seconded the motion. The motion passed (YES: 18; NO: 1; ABSTAIN: 2) (APPENDIX E).

Summary of AEGL Values for Trimethoxysilane						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	NR	NR	NR	NR	NR	Not Recommended due to insufficient data
AEGL–2	2.9 ppm	1.4 ppm	0.83 ppm	0.33 ppm	0.20 ppm	⅓ the AEGL-3 values
AEGL–3	8.8 ppm	4.1 ppm	2.5 ppm	0.98 ppm	0.61 ppm	$BMCL_{05}$ in rats (Nachreiner and Dodd , 1988)

Tetramethoxysilane (CAS No. 681-84-5)

Staff Scientist: Dana Glass, ORNL
Chemical Manager: Bob Benson, U.S. EPA

Bob Benson, the chemical manager, made a few introductory remarks about the issues regarding tetramethoxysilane. The data base is limited. In the only single exposure study available (Dow Corning, 1992), the effects observed at the lowest exposure were more severe than the definition of AEGL-2. The options to be considered include setting the AEGL-2 values based on 1/3 of the AEGL-3 values or using a repeat exposure study as the basis of AEGL-2. It might also be possible to use the repeat exposure study to derive AEGL-1 values. There are no data to derive a value of n for time scaling. Dana Glass then discussed the data summarized in the TSD (Attachment 9). The key study for deriving AEGL-3 values is Dow Corning (1992). Rats were exposed to 31, 50, or 88 ppm for 4 hours. There were no deaths at 31 ppm. Deaths were observed at both higher exposures. At 31 ppm there was lung damage in all animals. The lung damage was more severe at higher exposure. The $BMCL_{05}$ for 4 hours is 26 ppm. Based on the $BMCL_{05}$ for 4 hours of 26 ppm, a total uncertainty factor of 30, and the default time scaling procedure (n = 3 for shorter durations and n = 1 for longer durations), the calculated AEGL-3 values are 1.7 ppm for 10 and 30 minutes, 1.4 ppm for 1 hour, 0.87 ppm for 4 hours, and 0.43 ppm for 8 hours. The interspecies uncertainty factor of 3 was used because in studies with trimethoxysilane, rats, mice, and hamsters show similar effects. The default value of 10 was used as the intraspecies uncertainty factor as there are no data to estimate intrahuman variability and it is not clear that tetramethoxysilane is acting as a simple chemical irritant in the lung. Bob

Benson made a motion to accept these AEGL-3 values. Nancy Kim seconded the motion. The motion passed (YES: 20; NO: 1; ABSTAIN: 1) (APPENDIX F). .

As noted above, the lowest exposure from Dow Corning (1992) gave effects more severe than the AEGL-2 definition. A repeat exposure study (Kolesar et al. 1989) exposed rats for 6 hours/day, 5 days/week for 28 days at 0, 1, 5, or 10 ppm (phase 1) and 0, 15, 30, or 45 ppm (phase 2). At 30 ppm there were changes in the respiratory tract in most of the animals. In the nasal cavity there was ulceration in 18/20 animals; mild squamous metaplasia in the lung in 15/20 animals; and bilateral corneal lesions including desquamation of the central corneal epithelium. These effects are more severe than the definition of AEGL-2. At 15 ppm there was minimal acute inflammation of the respiratory epithelium in 2/20 animals; no lesions in the lung and only minimal acute inflammation in the larynx in 1/20 animals; and minimum acute keratitis in the corneal epithelium. Clinical observations at 15 ppm included lethargy, rough coat, and eye squinting. From this study, 15 ppm is considered a no effect level for irreversible effects. There were no significant respiratory or ocular changes reported at 10 ppm. Based on the point of departure of 15 ppm for 6 hours, a total uncertainty factor of 30, and the default time scaling, the calculated AEGL-2 values are 1.1 ppm for 10 and 30 minutes, 0.91 ppm for 1 hour, 0.57 ppm for 4 hours, and 0.38 ppm for 8 hours. These values are greater than those derived by dividing AEGL-3 values by 3. The rationales for the uncertainty factor and time scaling are the same as described for AEGL-3 above. Bob Benson made a motion to accept these AEGL-2 values. Ernie Falke seconded the motion. The motion passed (YES: 14; NO: 2; ABSTAIN: 6) (APPENDIX F).

There was discussion of using the 10 ppm level from the repeat exposure study of Kolesar et al. (1989) to derive AEGL-1 values. However, as there would be very little difference between AEGL-1 and AEGL-2 using this approach and considering that tetramethoxysilane does not have good odor warning properties, this approach was not adopted. Bob Benson made a motion to adopt AEGL-1 values of not recommended due to inadequate data. Bill Bress seconded the motion. The motion passed (YES: 14; NO: 0; ABSTAIN: 1) (APPENDIX F).

Summary of AEGL Values for Tetramethoxysilane

Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL-1	NR	NR	NR	NR	NR	Not Recommended due to insufficient data
AEGL-2	1.1 ppm	1.1 ppm	0.91 ppm	0.57 ppm	0.38 ppm	NOEL for irreversible effects in rats (Kolesar et al., 1989)
AEGL-3	1.7 ppm	1.7 ppm	1.4 ppm	0.87 ppm	0.43 ppm	4-hr rat $BMCL_{05}$ (Dow Corning , 1992)

Sulfuryl Chloride (CAS No. 7791-25-5)

Staff Scientist: Robert Young, ORNL
Chemical Manager: Steven Barbee, Arch Chemical

Steve Barbee, chemical manager, provided introductory remarks regarding the discrepancy in the 1-hr (Stauffer Chemical) and 4-hr (DuPont) data sets for sulfuryl chloride. Bob Young reviewed the data for sulfuryl chloride (Attachment 10). AEGL-1 values were not recommended because of insufficient data. Proposed AEGL-2 values (4.7 ppm for 10-min, 4.7 for 30-min, 3.7 ppm for 1-hr, 2.3 ppm for 4-hr, and 1.2 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. Proposed AEGL-3 values (14 ppm for 10-min, 14 for 30-min, 11 ppm for 1-hr, 7.0 ppm for 4-hr, and 3.5 ppm for 8-hr) were based on a 4-hour $BMCL_{05}$ in rats of 70.1 ppm (Du Pont, 1982). Uncertainty factors of 3 each were applied for inter- and intraspecies extrapolation because sulfuryl chloride is a direct contact irritant. Time scaling was accomplished using the default values of n =1 or n = 3; the 30-min value was adopted as the 10-min value. After a thorough discussion, a motion was made by Marc Ruijten and seconded by Richard Niemier to accept AEGL-3 values as proposed. The motion passed (YES: 15; NO: 1; ABSTAIN: 1) (APPENDIX G). A motion was then made by George Woodall and seconded by Bob Benson to accept AEGL-2 values as proposed. The motion passed (YES: 14; NO: 4; ABSTAIN: 0) (APPENDIX G). A statement will be added to the revised TSD stating that sulfuryl chloride and phosgene have similar modes of action and that the ratio of the data-derived AEGL-3 to AEGL-2 values for phosgene is approximately 3. This will strengthen the justification of the sulfuryl chloride AEGL-2 values. A motion was then made by Bob Benson and seconded by Ernest Falke to not recommend AEGL-1 values because of insufficient data. The motion passed unanimously by a show of hands (APPENDIX G).

Summary of AEGL Values for Sulfuryl Chloride

Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL–1	NR	NR	NR	NR	NR	Not Recommended due to insufficient data
AEGL–2	4.7 ppm	4.7 ppm	3.7 ppm	2.3 ppm	1.2 ppm	⅓ the AEGL-3 values
AEGL–3	14 ppm	14 ppm	11 ppm	7.0 ppm	3.5 ppm	4-hour $BMCL_{05}$ in rats (DuPont , 1982)

SELECTED CHLOROFORMATES

Methyl Chloroformate (CAS Reg. No. 79-22-1)
Ethyl Chloroformate (CAS Reg. No. 541-41-3)
Propyl Chloroformate (CAS Reg. No. 109-61-5)
Isopropyl Chloroformate (CAS Reg. No. 108-23-6)
Allyl Chloroformate (CAS Reg. No. 2937-50-0)
n-Butyl Chloroformate (CAS Reg. No. 593-34-7)
Isobutyl Chloroformate (CAS Reg. No. 543-27-1)
sec-Butyl Chloroformate (CAS Reg. No. 17462-58-7)
Ethyl Chlorothioformate (CAS Reg. No. 2941-64-2)
Diphosgene (CAS Reg. No. 503-38-8)

Staff Scientist: Cheryl Bast, ORNL
Chemical Manager: Ernest Falke, U.S. EPA

Overview

Cheryl Bast thanked Dr. Roland Rossbacher, representing BASF, Germany, for providing unpublished industry data on the chloroformates. These data were used as key and supporting studies for many of the chloroformates. Cheryl then discussed the overall data set available for the chloroformates (Attachment 11). Although data sets for individual chloroformates are sparse, the total data set for all chloroformates helped increase confidence in the derived AEGL values. All of the title chloroformates are direct-acting contact irritants and are corrosive to the eyes, skin, gastrointestinal, and respiratory tracts. Therefore, when AEGL values were derived, uncertainty factors of 3 each were applied for inter- and intraspecies extrapolation (total UF = 10). Time scaling for all chloroformates was done using the default values of n =1 (shorter-to- longer time) or n =3 (longer-to-shorter time), because data were not sufficient to derive chemical-specific exponents. Summaries of AEGL development for the title chloroformates are provided below.

Methyl Chloroformate (CAS Reg. No. 79-22-1)

AEGL-1 values for methyl chloroformate were not recommended due to insufficient data. Proposed AEGL-2 values (2.8 ppm for 10-min, 2.8 ppm for 30-min, 2.2 ppm for 1-hr, 1.4 ppm for 4 -hr, and 0.70 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. This approach is justified based on a steep concentration-response curve. Proposed AEGL-3 values (8.5 ppm for 10-min, 8.5 ppm for 30-min, 6.7 ppm for 1-hr, 4.2 ppm for 4 -hr, and 2.1 ppm for 8-hr) were based on a 4-hr $BMCL_{05}$ in rats of 42.4 ppm (Hoechst, 1986). Uncertainty factor application and time scaling were applied as discussed above in the overview section. After discussion, a motion was made by Bob Benson and seconded by George Woodall to accept AEGL-3 values as proposed except to time scale to the 10-min value (10-min AEGL-3 = 12 ppm), rather than flat-lining the 30-min value. Time scaling from 4-hr to 10-min is justified for this chemical based on

a 1-hr LC_{50} study (Bio-Test, 1975); utilizing the $BMCL_{05}$ from this study yields a 10-min AEGL-3 value of 13 ppm, which supports the time-scaled value of 12 ppm calculated from Hoechst (1986). The motion carried (YES: 19; NO: 0; ABSTAIN: 0) (APPENDIX H). A motion was then made by Richard Thomas and seconded by Bob Benson to adopt AEGL-2 values based on ⅓ the AEGL-3 values. The motion carried (YES: 20; NO: 0; ABSTAIN: 0) (APPENDIX H). Finally, a motion was made by George Woodall and seconded by Bob Benson to not recommend AEGL-1 values due to insufficient data. The motion carried unanimously by a show of hands (APPENDIX H).

Summary of AEGL Values for Methyl Chloroformate						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL–2	4.0 ppm	2.8 ppm	2.2 ppm	1.4 ppm	0.70 ppm	1/3 the AEGL-3 values
AEGL-3	12 ppm	8.5 ppm	6.7 ppm	4.2 ppm	2.1 ppm	4-hr $BMCL_{05}$ in rats (Hoechst, 1986)

Ethyl Chloroformate (CAS Reg. No. 541-41-3)

AEGL-1 values for ethyl chloroformate were not recommended due to insufficient data. Proposed AEGL-2 values (2.9 ppm for 10-min, 2.0 ppm for 30-min, 1.6 ppm for 1-hr, 0.40 ppm for 4 -hr, and 0.20 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. This approach is justified based on a steep concentration-response curve. Proposed AEGL-3 values (8.8 ppm for 10-min, 6.1 ppm for 30-min, 4.8 ppm for 1-hr, 1.2 ppm for 4 -hr, and 0.60 ppm for 8-hr) were based on an estimated 1-hr lethality threshold in rats of 48 ppm (⅓ of the most conservative LC_{50}; 145 ppm x ⅓ = 48 ppm) (Vernot et al., 1977). Uncertainty factor application and time scaling were applied as discussed above in the overview section. After discussion, a motion was made by George Rodgers and seconded by Richard Niemier to accept AEGL-1, AEGL-2, and AEGL-3 values as proposed. The motion carried (YES: 20; NO: 0; ABSTAIN: 0) (APPENDIX I).

Summary of AEGL Values for Ethyl Chloroformate						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL–2	2.9 ppm	2.0 ppm	1.6 ppm	0.40 ppm	0.20 ppm	1/3 the AEGL-3 values
AEGL-3	8.8 ppm	6.1 ppm	4.8 ppm	1.2 ppm	0.60 ppm	Estimated 1-hr lethality threshold in rats (Vernot et al., 1977)

Propyl Chloroformate (CAS Reg. No. 109-61-5)

AEGL-1 values for propyl chloroformate were not recommended due to insufficient data. Proposed AEGL-2 values (4.3 ppm for 10-min, 3.0 ppm for 30-min, 2.4 ppm for 1-hr, 0.60 ppm for 4 -hr, and 0.30 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. This approach is justified based on a steep concentration-response curve. Proposed AEGL-3 values (13 ppm for 10-min, 9.1 ppm for 30-min, 7.2 ppm for 1-hr, 1.8 ppm for 4 -hr, and 0.90 ppm for 8-hr) were based on an estimated 1-hr $BMCL_{05}$ in rats of 216 ppm (Bio-Test, 1970). Uncertainty factor application and time scaling were applied as discussed above in the overview section. Additionally, a modifying factor of 3 was proposed because the key study reported nominal, rather than analytical concentrations and there were no confirmatory studies. After discussion, a motion was made by George Woodall and seconded by Marc Ruijten to accept AEGL-1, AEGL-2, and AEGL-3 values as proposed except that a MF of 2, rather than 3, be applied. The application of a MF of 2 yields AEGL values for propyl chloroformate that are more consistent with the overall chloroformate data base regarding relative toxicity. The motion carried (AEGL-1: YES: 20; NO: 0; ABSTAIN: 0) (AEGL-2: YES: 16; NO: 4; ABSTAIN: 0) (AEGL-3: YES: 16; NO: 4; ABSTAIN: 0) (APPENDIX J).

Summary of AEGL Values for Propyl Chloroformate						
Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL-1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL-2	6.7 ppm	4.7 ppm	3.7 ppm	0.90 ppm	0.47 ppm	1/3 the AEGL-3 values
AEGL-3	20 ppm	14 ppm	11 ppm	2.7 ppm	1.4 ppm	1-hr $BMCL_{05}$ in rats (Bio-Test, 1970)

Isopropyl Chloroformate (CAS Reg. No. 108-23-6)

AEGL-1 values for isopropyl chloroformate were not recommended due to insufficient data. Proposed AEGL-2 values (6.0 ppm for 10-min, 4.3 ppm for 30-min, 3.3 ppm for 1-hr, 0.83 ppm for 4 -hr, and 0.43 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. Proposed AEGL-3 values (18 ppm for 10-min, 13 ppm for 30-min, 10 ppm for 1-hr, 2.5 ppm for 4 -hr, and 1.3 ppm for 8-hr) were based on an estimated 1-hr lethality threshold in rats of 100 ppm (⅓ of the LC_{50}; 300 ppm x ⅓ = 100 ppm) (Bio-Test, 1970). Uncertainty factor application and time scaling were applied as discussed above in the overview section. After discussion, a motion was made by Richard Thomas and seconded by Marc Ruijten to accept AEGL-1, AEGL-2, and AEGL-3 values as proposed. The motion carried (AEGL-1: YES: 20; NO: 0; ABSTAIN: 1) (AEGL-2: YES: 19; NO: 1; ABSTAIN: 1) (AEGL-3: YES: 20; NO: 1; ABSTAIN: 1) (APPENDIX K).

Summary of AEGL Values for Isopropyl Chloroformate						
Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL-1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL-2	6.0 ppm	4.3 ppm	3.3 ppm	0.83 ppm	0.43 ppm	1/3 the AEGL-3 values
AEGL-3	18 ppm	13 ppm	10 ppm	2.5 ppm	1.3 ppm	Estimated 1-hr lethality threshold in rats (Bio-Test, 1970)

Allyl Chloroformate (CAS Reg. No. 2937-50-0)

AEGL-1 values for allyl chloroformate were not recommended due to insufficient data. Proposed AEGL-2 values (1.3 ppm for 10-min, 0.87 ppm for 30-min, 0.70 ppm for 1-hr, 0.18 ppm for 4 -hr, and 0.09 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. This approach is justified by the steep concentration-response curve. Proposed AEGL-3 values (3.8 ppm for 10-min, 2.6 ppm for 30-min, 2.1 ppm for 1-hr, 0.53 ppm for 4 -hr, and 0.26 ppm for 8-hr) were based on a 1-hour rat $BMCL_{05}$ of 21 ppm (Stillmeadow, 1987). Uncertainty factor application and time scaling were applied as discussed above in the overview section. After discussion, a motion was made by Marc Riujten and seconded by Steve Barbee to accept AEGL-1, AEGL-2, and AEGL-3 values as proposed. The motion carried (AEGL-1: YES: 19; NO: 0; ABSTAIN: 0) (AEGL-2: YES: 17; NO: 3; ABSTAIN: 1) (AEGL-3: YES: 17; NO: 3; ABSTAIN: 1) (APPENDIX L).

Summary of AEGL Values for Allyl Chloroformate						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL-1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL-2	1.3 ppm	0.87 ppm	0.70 ppm	0.18 ppm	0.09 ppm	1/3 the AEGL-3 values
AEGL-3	3.8 ppm	2.6 ppm	2.1 ppm	0.53 ppm	0.26 ppm	1-hr $BMCL_{05}$ in rats (Stillmeadow, 1987)

n-Butyl Chloroformate (CAS Reg. No. 593-34-7)

AEGL-1 values for n-butyl chloroformate were not recommended due to insufficient data. Proposed AEGL-2 values (4.0 ppm for 10-min, 2.8 ppm for 30-min, 2.2 ppm for 1-hr, 0.57 ppm for 4 -hr, and 0.28 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. Proposed AEGL-3 values (12 ppm for 10-min, 8.4 ppm for 30-min, 6.7 ppm for 1-hr, 1.7 ppm for 4 -hr, and 0.83 ppm for 8-hr) were based on an estimated 1-hr lethality threshold in rats of 66.7 ppm (⅓ of the concentration causing death in 4/10 rats; 200 ppm x ⅓ = 66.7 ppm) (BASF, 1970). Uncertainty factor application

and time scaling were applied as discussed above in the overview section. After discussion, a motion was made by Marc Ruijten and seconded by Bob Benson to accept AEGL-1, AEGL-2, and AEGL-3 values as proposed. The motion carried (YES: 20; NO: 0; ABSTAIN: 1) (APPENDIX M).

Summary of AEGL Values for n-Butyl Chloroformate						
Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL–1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL–2	4.0 ppm	2.8 ppm	2.2 ppm	0.57 ppm	0.28 ppm	1/3 the AEGL-3 values
AEGL-3	12 ppm	8.4 ppm	6.7 ppm	1.7 ppm	0.83 ppm	Estimated 1-hr lethality threshold in rats (BASF, 1970)

Isobutyl Chloroformate (CAS Reg. No. 543-27-1)
sec-Butyl Chloroformate (CAS Reg. No. 17462-58-7)

No AEGL-1, AEGL-2, or AEGL-3 values were proposed for isobutyl chloroformate or sec-butyl chloroformate due to insufficient data. However, these chloroformates are structural analogs of n-butyl chloroformate and mouse RD_{50} data (Carpenter, 1982) suggest that isobutyl chloroformate, and sec-butyl chloroformate are of similar toxicity to n-butyl chloroformate. Therefore, a motion was made by George Woodall and seconded by Richard Thomas to adopt the AEGL-1, AEGL-2, and AEGL-3 values for n-butyl chloroformate as surrogates for isobutyl- and sec-butyl chloroformate. The motion carried (YES: 19; NO: 2; ABSTAIN: 0) (APPENDICES N and O). The no-data chapters for isobutyl chloroformate and sec-butyl chloroformate will be removed from the chloroformate TSD and an explanation will be provided in the n-butyl chloroformate chapter stating that values for sec-butyl and isobutyl chloroformate were derived by analogy to n-butyl chloroformate.

Summary of AEGL Values for Isobutyl Chloroformate and sec-Butyl Chloroformate						
Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL–1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL–2	4.0 ppm	2.8 ppm	2.2 ppm	0.57 ppm	0.28 ppm	By analogy to n-butyl chloroformate
AEGL-3	12 ppm	8.4 ppm	6.7 ppm	1.7 ppm	0.83 ppm	By analogy to n-butyl chloroformate

Ethyl Chlorothioformate (CAS Reg. No. 2941-64-2)

AEGL-1 values for ethylchlorothioformate were not recommended due to insufficient data. Proposed AEGL-2 values (0.47 ppm for 10-min, 0.47 ppm for 30-min, 0.37 ppm for 1-hr, 0.23 ppm for 4 -hr, and 0.12 ppm for 8-hr) were derived by dividing the AEGL-3 values by 3. This approach is justified by the steep concentration-response curve. Proposed AEGL-3 values (1.4 ppm for 10-min, 1.4 ppm for 30-min, 1.1 ppm for 1-hr, 0.70 ppm for 4 -hr, and 0.35 ppm for 8-hr) were based on a 4-hour rat $BMCL_{05}$ of 21 ppm (Stauffer, 1983). Uncertainty factor application and time scaling were applied as discussed above in the overview section. An additional modifying factor of 3 was proposed to account for possible delayed effects of the thio moiety. Discussion focused on whether the calculated $BMCL_{05}$ was valid because of the absence of a zero response concentration in the key study. Another point of discussion was whether the intraspecies UF should be increased to 10 and the proposed MF of 3 should be removed. After discussion, a motion was made by George Woodall and seconded by Bob Benson to accept AEGL-1 values of NR, AEGL-2 values of ⅓ the AEGL-3 values, and AEGL-3 values based on a point-of-departure of ⅓ the 4-hr rat LC_{50} from the Stauffer (1983) study (45 ppm x ⅓ = 15). An interspecies uncertainty factor of 3 was applied, and an intraspecies UF of 10 was applied to account for systemic effects from the thio moiety. Time scaling used default values of n =1 or n = 3. The motion carried (AEGL-1: YES: 18; NO: 0; ABSTAIN: 0) (AEGL-2: YES: 17; NO: 1; ABSTAIN: 0) (AEGL-3: YES: 17; NO: 1; ABSTAIN: 0) (APPENDIX P).

Summary of AEGL Values for Ethylchlorothioformate						
Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL–1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL–2	0.33 ppm	0.33 ppm	0.26 ppm	0.17 ppm	0.083 ppm	1/3 the AEGL-3 values
AEGL-3	1.0 ppm	1.0 ppm	0.79 ppm	0.50 ppm	0.25 ppm	Estimated 4-hr lethality threshold in rats (Stauffer, 1983)

Diphosgene (CAS Reg. No. 503-38-8)

No AEGL-1, AEGL-2, or AEGL-3 values were proposed for diphosgene due to insufficient data. A motion was made by Bob Benson and seconded by John Hinz to not recommend AEGL-1, AEGL-2, or AEGL-3 values for diphosgene. The motion carried unanimously by a show of hands (APPENDIX Q). The diphosgene chapter will be removed from the chloroformate TSD and the chemical will be placed in "holding" status.

Summary of AEGL Values for Diphosgene						
Classification	10-minute	30-minute	1-hour	4-hour	8-hour	Endpoint (Reference)
AEGL–1	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL–2	NR	NR	NR	NR	NR	Not recommended due to insufficient data
AEGL-3	NR	NR	NR	NR	NR	Not recommended due to insufficient data

Summary: An analysis comparing the relative toxicity of the chloroformates vs. the derived AEGL values will be presented at NAC-40. Also, chapters for benzyl chloroformate, phenyl chloroformate, and 2-ethylhexyl chloroformate will be prepared and discussed at NAC-40.

ADMINISTRATIVE MATTERS

The site and time of future meetings is as follows:

NAC/AEGL-40: May 31, June 1-2, 2006, Washington DC
NAC/AEGL-41: September, 2006 (Exact dates and location to be determined)
NAC/AEGL-42: December 11-13, 2006, Washington DC

All items in the agenda were discussed as thoroughly as the time permitted. The meeting highlights were prepared by Cheryl Bast and Robert Young, Oak Ridge National Laboratory, and Robert Benson, U.S. EPA, with input from the respective staff scientists, chemical managers, and other contributors.

National Advisory Committee (NAC)
for Acute Exposure Guideline Levels (AEGLs) for Hazardous Substances

June 13-15, 2005

Final Meeting-37 Highlights

U.S. Department of Labor
Rooms 3437 A, B, & C
200 Constitution Ave., N.W.
Washington, DC 20210

INTRODUCTION

Chairman George Rusch welcomed the committee. Sharon Frazier was introduced to the Committee and spoke about travel procedures, including travel authorizations and vouchers. Ernest Falke announced that the next NAS/COT Subcommittee meeting (NAS-16) will be August 31 and September 1-2, 2005, in Woods Hole MA. The next NAC meeting (NAC-38) will be September 28-30, 2005, in Washington, D.C.

The draft NAC/AEGL-36 meeting highlights were reviewed. Marc Ruijten stated that he obtained raw data for MTBE from Dr. ten Berge, not LC_{01} data as stated in the draft highlights. He also stated that, in his opinion, AEGL values should not have been developed for nitrogen mustards due to the sparse data base. Bob Benson requested that the Point-of-departure discussion be clarified for hexafluoroacetone. George Woodall stated that he had provided uncertainty factor database information to Iris Camacho. John Morawetz will work with Kowetha Davidson to clarify the human study descriptions for peracetic acid. Mr. Morawetz also had suggestions regarding AEGL definitions on the web site. These suggestions were incorporated into the highlights. A motion was made by Nancy Kim and seconded by John Hinz to accept the meeting highlights as presented with the aforementioned revisions. The motion passed unanimously by a show of hands (Appendix A). The final version of the NAC/AEGL-36 meeting highlights is attached (Appendix B).

The highlights of the NAC/AEGL-37 meeting are summarized below along with the Meeting Agenda (Attachment 1) and the Attendee List (Attachment 2). The subject categories of the highlights do not necessarily follow the order listed in the NAC/AEGL-37 Agenda.

STATUS REPORT OF UNCERTAINTY FACTOR ANALYSIS

Iris Camacho provided information on the status of the Uncertainty Factor analysis (Attachment 3). A database has been created using information provided by chemical managers. George Rusch encouraged chemical managers who had not yet provided information to do so in a timely manner so that the database work may progress. Dr. Camacho informed the NAC that the database will be distributed to committee members when it is complete.

SOP PBPK White Paper

Jim Dennison discussed revisions to the PBPK white paper. There were two issues: (1) workload, and (2) UF application. Dr. Dennison said that workload could affect CNS depressants (e.g. xylenes) 2-4 fold. He mentioned that AEGLs for resting and workload conditions would be provided to the NAC members to help them in the UF selection. He also indicated that the white paper has taken a flexible approach. Marc Ruijten liked the idea that the current version of the PBPK white paper gives flexibility. He liked the initial option of the default approach and flexibility to deviate from it. Tom Hornshaw was concerned that the NAC committee did not have the technical expertise to run the PBPK models. Regarding the issue on the selection of UFs, the white paper proposes to apply UFs to the dosimetric as the default option, but if need be, modeler can deviate from this approach. George Woodall suggested that TSD should capture the variability of the parameters (input, etc.) so the process is more transparent. A motion was made by Susan Ripple and seconded by George Woodall to send the white paper to the COT Subcommittee. The motion carried (YES:16; NO: 0; ABSTAIN: 1) (Appendix C).

REVIEW AND RESOLUTION OF COT/AEGL COMMENTS ON INTERIM AEGL VALUES

Sulfur Dioxide (CAS No. 7446-09-5)

Chemical Manager: George Woodall, U.S. EPA
Staff Scientist: Cheryl Bast, ORNL

Cheryl Bast discussed the data set and COT/AEGL's comments (Attachment 4). The COT/AEGL suggested that the AEGL-1 and AEGL-2 values be revised to be more protective of asthmatic humans. The originally derived AEGL-1 value was 0.25 ppm across all time points; the POD was a weight-of-evidence approach showing mild bronchoconstriction in exercising asthmatics. The COT/AEGL suggested that the value be revised to 0.20 ppm across all time points, because moderate bronchoconstriction was noted in one study at 0.25 ppm with low humidity. The originally derived AEGL-2 values were 1.0 ppm for 10-min, 30-min, and 1-hr, and 0.75 ppm for 4- and 8-hours based on a weight-of-evidence approaching showing moderate to severe, but reversible respiratory responses in asthmatics at 1.0 ppm for up to 40 minutes

exposure. The COT/AEGL suggested that the value be revised to 0.75 ppm across all time points, as a NOEL for severe bronchoconstriction. After discussion, a motion was made by Steve Barbee and seconded by John Hinz to adopt AEGL-1 and AEGL-2 values as proposed. The motion carried (YES: 17; NO: 0; ABSTAIN: 1) (APPENDIX D).

Summary of AEGL Values for Sulfur Dioxide						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	0.20 ppm	0.20 ppm	0.20 ppm	0.20 ppm	0.20 ppm	NOEL for bronchoconstriction in exercising asthmatics (weight of evidence)
AEGL–2	0.75 ppm	0.75 ppm	0.75 ppm	0.75 ppm	0.75 ppm	NOEL for severe bronchoconstriction in exercising asthmatics (weight of evidence)

Chloroform(CAS No. 67-66-3)

Chemical Manager: Steve Barbee, Arch Chemicals
Staff Scientist: Bob Young, ORNL

Bob Young discussed the data set and COT/AEGL's comments (Attachment 5). The COT/AEGL concurred with the AEGL-1 and AEGL-2 values for chloroform, but was concerned that the AEGL-3 values were overly conservative. A PBPK model suggests that the rate of chloroform metabolism in mice is 25-50x greater than humans; therefore, the interspecies UF is likely <1. No data exist to decrease intraspecies UF to less than 3. Therefore, Bob Young proposed using a weight-of-evidence factor of 1/3 to account for rodent/human metabolism and dosimetry differences. After much discussion, a motion was made by Bob Benson and seconded by John Hinz to adopt AEGL-3 values of 4000 ppm for 10- and 30-minutes, 3200 ppm for 1 hour, 2000 ppm for 4 hours, and 1600 ppm for 8 hours. The point-of-departure is an estimated threshold for lethality in mice (540 minute LC_{50} of 4500 ÷ 3 = 1500 ppm) (Gehring, 1968). Time scaling was accomplished using default values of n =1 or n =3. An interspecies UF of 1, intraspecies UF of 3, and modifying factor of 1/3 were proposed. The motion carried (YES: 14; NO: 0; ABSTAIN: 3) (APPENDIX E).

Summary of AEGL Values for Chloroform						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–3	4000 ppm	4000 ppm	3200 ppm	2000 ppm	1600 ppm	Estimated lethality threshold in mice (Gehring, 1958)

Carbon Tetrachloride (CAS No. 56-23-5)

Chemical Manager: Bill Bress, Vermont
Staff Scientist: Robert Young, ORNL

Bob Young discussed the data set and COT/AEGL's comments (Attachment 6). The COT/AEGL was concerned that the AEGL-1, AEGL-2, and AEGL-3 values were overly conservative due to the use of excessive uncertainty factors. Dr. Young proposed developing AEGL-1 values of 58 ppm for 10- and 30-minutes, 44 ppm for 1 hour, 25 ppm for 4 hours, and 19 ppm for 8 hours. based on no CNS or renal effects in humans exposed to 76 ppm for 4-hours (Davis, 1934) and applying an intraspecies UF of 3. Proposed AEGL-2 values of 380 ppm for 10-minutes, 250 ppm for 30-minutes, 190 ppm for 1 hour, 100 ppm for 4 hours, and 81 ppm for 8 hours were based on nausea, vomiting, and headache in humans exposed to 1191 ppm for 9 minutes (Davis, 1934). An intraspecies UF of 3 was applied. Proposed AEGL-3 values of 1000 ppm for 10-minutes, 690 ppm for 30-minutes, 500 ppm for 1 hour, 300 ppm for 4 hours, and 230 ppm for 8 hours were based on a 1-hour LC_{01} value in rats (Adams et al., 1952; Dow Chemical, 1986). An intraspecies UF of 10, interspecies UF of 3, and weight-of-evidence factor of 1/3 were proposed. After a lengthy discussion, a motion was made by Ernie Falke and seconded by Bill Bress to accept the revised values as proposed with the exception of applying an interspecies UF of 1 and intraspecies UF of 10 (supported by human P450 data) for the AEGL-3 derivation. Also, the monkey repeated-exposure data will be used as support for AEGL-1 values. The motion carried (YES: 11; NO: 3; ABSTAIN: 3) (APPENDIX F).

Summary of AEGL Values for Carbon Tetrachloride						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	58 ppm	58 ppm	44 ppm	25 ppm	19 ppm	NOEL for CNS & renal effects in humans (Davis, 1934)
AEGL–2	380 ppm	250 ppm	190 ppm	100 ppm	81 ppm	Nausea, vomiting, headache in humans (Davis, 1934)
AEGL–3	1100 ppm	680 ppm	520 ppm	300 ppm	220 ppm	1-hour rat LC01 (Adams et al., 1952; Dow Chemical, 1986)

Ethylene Oxide (CAS No. 75-21-8)

Chemical Manager: Susan Ripple, Dow Chemical
Staff Scientist: Kowetha Davidson, ORNL

Kowetha Davidson discussed the data set and COT/AEGL's comments (Attachment 7). The COT/AEGL's major concern involved the use of growth retardation from a repeated-exposure developmental toxicity study in rats as the point-of-departure for AEGL-2. Other issues included use of PBPK modeling for interspecies extrapolation and time scaling and justification for the AEGL-3 key study. Jim Dennison stated that PBPK should not be used for the developmental toxicity endpoint, but may be applicable to AEGL-3, depending on the mechanism of death. A discussion on the use of the fetal body weight change focused on the fact that while the 5% change may be biologically significant, it may not represent an AEGL-2 endpoint. George Woodall then presented a benchmark analysis for the rat fetal data (Attachment 8). Bill Snellings indicated that use of the Weller eye data was not appropriate for derivation of AEGL values; he also reminded the committee that his last presentation proposed use of the Sallenfait study (Attachment 9). Because a new approach (fetal benchmark) was presented and the meeting was running out of time, George Rusch postponed discussions on ethylene oxide to the next meeting. Kowetha Davidson, George Woodall, and chemical manager Susan Ripple will work together to resolve issues.

Allyl Alcohol (CAS No. 107-18-6)

Chemical Manager: Nancy Kim, New York
Staff Scientist: Claudia Troxel, CMTox

Claudia Troxel discussed the data set and COT/AEGL's comments (Attachment 10). The COT/AEGL's major concern involved justification of uncertainty factors and rounding of the time scaling exponent 'n' for AEGL-3 values. After discussion, a motion was made by George Woodall and seconded by John Hinz to adopt AEGL-3 values of 36 ppm for 10-minutes, 25 ppm for 30-minutes, 20 ppm for 1 hour, 10 ppm for 4 hours, and 10 ppm for 8 hours. The point-of-departure is a 1-hour NOEL for lethality of 200 ppm in rats, mice, and rabbits (Union Carbide, 1951). Time scaling was accomplished using the default value of n=3 to time scale to the 10- and 30-minute time periods. A MF of 2 was applied to the 1-hour value to obtain the 4- and 8-hour values because only a decrease in body weight was noted in a repeated-exposure study in rats at 20 ppm. The default 'n' value was used because LC_{50} data were not credible for derivation of a chemical-specific exponent. The motion carried (YES: 13; NO: 0; ABSTAIN: 4) (APPENDIX G).

Summary of AEGL Values for Allyl ALcohol						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–3	36 ppm	25 ppm	20 ppm	10 ppm	10 ppm	NOEL lethality in rats, mice, and rabbits (Union Carbide, 1951)

Xylenes (CAS No. 1330-20-7)

Chemical Manager: Robert Benson, U.S. EPA
Staff Scientist: Claudia Troxel, CMTox

Claudia Troxel discussed the data set and COT/AEGL's comments (Attachment 11). This xylene TSD is a case study for the PBPK methodology and values proposed followed methodology consistent with the PBPK white paper being sent to the COT. Key issues were whether to apply the UF to the dose-metric or to the human equivalent concentration and whether or not to consider work. Proposed AEGL-1 values were 130 ppm for all time points based on ocular irritation in humans exposed to 400 ppm for 30 minutes (Hastings et al., 1986) with the application of an intraspecies UF of 3. Proposed AEGL-2 values were 2500 ppm for 10-minutes, 1300 ppm for 30-minutes, 920 ppm for 1 hour, 500 ppm for 4 hours, and 500 ppm for 8 hours, and proposed AEGL-3 values were 7200 ppm for 10-minutes, 3600 ppm for 30-minutes, 2500 ppm for 1 hour, 1300 ppm for 4 hours, and 1000 ppm for 8 hours. Proposed AEGL-2 and AEGL-3 values utilized the PBPK modelwith the UF applied to the dose metric. After discussion, a motion was made by Bob Benson and seconded by Bill Bress to adopt AEGL-1, AEGL-2, and AEGL-3 values as proposed. The motion carried (AEGL-1: YES: 13; NO: 0; ABSTAIN: 4) (AEGL-2: YES: 12; NO: 1; ABSTAIN: 4) (AEGL-3: YES: 12; NO: 0; ABSTAIN: 5) (APPENDIX H).

Summary of AEGL Values for Xylenes						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	130 ppm	130 ppm	130 ppm	130 ppm	130 ppm	Eye irritation in humans (Hastings et al., 1986)
AEGL–2	2500 ppm	1300 ppm	920 ppm	500 ppm	400 ppm	PBPK Model
AEGL–3	7200 ppm	3600 ppm	2500 ppm	1300 ppm	1000 ppm	PBPK Model

Bromine (CAS No. 7726-95-6)

Chemical Manager: Ernest Falke, U.S. EPA
Staff Scientist: Sylvia Talmage, ORNL

Sylvia Talmage discussed the data set and COT/AEGL's comments (Attachment 12). The main COT concern was the sparse and conflicting data set. A proposal was made to base the bromine AEGL values on the chlorine AEGL values using a relative toxicity approach. Chlorine has a much more robust database. After discussion, the NAC decided that there was not enough data to merit deriving bromine AEGL values using a relative toxicity approach. A motion was made by Bob Benson and seconded by John Morawetz to revise the AEGL-1 values to be consistent with the SOP. The AEGL-1 was based on eye irritation in humans exposed to 0.1 ppm for 30-minutes; an intraspecies UF of 3 was applied. The AEGL-1 values had previously been scaled across time. The motion was to revise the AEGL-1 values to be constant across all time periods because the endpoint is minor irritation. The resulting value os 0.033 ppm. The motion carried (YES: 17; NO: 0; ABSTAIN: 1) (APPENDIX I).

Summary of AEGL Values for Bromine						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	0.033 ppm	0.033 ppm	0.033 ppm	0.033 ppm	0.033 ppm	Eye irritation in humans (Rupp & Henschler, 1967)

Methyl Ethyl Ketone (CAS No. 78-93-3)

Chemical Manager: Bill Bress, Vermont
Staff Scientist: Sylvia Talmage, ORNL

Sylvia Talmage discussed the data set and COT/AEGL's comments (Attachment 13). The COT had suggested using PBPK modeling to derive AEGL values for methyl ethyl ketone. After discussion, the NAC agreed that there is a robust human data set for methyl ethyl ketone and that modeling is not necessary. There were no changes in AEGL values.

REVIEW of PRIORITY CHEMICALS

Hexafluoroacetone (CAS No. 684-16-2)

Staff Scientist: Robert Young, ORNL
Chemical Manager: Paul Tobin, U.S. EPA

Bob Young gave a status update for hexafluoroacetone (HFA) (Attachment 14). At NAC/AEGL-36, a suggestion was made to calculate a $BMDL_{05}$ for the AEGL-2 developmental malformation data from the du Pont (1989) rat study. A $BMDL_{05}$ was calculated, and because this is essentially the same as the 1.0 ppm initially used to develop the AEGL-2 values (tentatively approved by a majority vote), no adjustment is needed in the proposed values. The TSD will be revised to reflect the use of the $BMDL_{05}$ assessment in the development of the AEGL-2 values.

SELECTED METAL PHOSPHIDES

ALUMINUM PHOSPHIDE (CAS Reg. No. 20859-73-8)
POTASSIUM PHOSPHIDE (CAS Reg. No. 20770-41-6)
SODIUM PHOSPHIDE (CAS Reg. No. 12058-85-4)
ZINC PHOSPHIDE (CAS Reg. No. 1314-84-7)
CALCIUM PHOSPHIDE (CAS Reg. No. 1305-99-3)
MAGNESIUM PHOSPHIDE (CAS Reg. No. 12057-74-8)
STRONTIUM PHOSPHIDE (CAS Reg. No. 12504-13-1)

MAGNESIUM ALUMINUM PHOSPHIDE (CAS Reg. No. None)

Staff Scientist: Cheryl Bast, ORNL
Chemical Manager: George Cushmac, U.S. DOT

Cheryl Bast reviewed the available data (Attachment15). Appropriate chemical-specific data are not available for derivation of AEGL values for aluminum phosphide, potassium phosphide, sodium phosphide, zinc phosphide, calcium phosphide, magnesium phosphide, strontium phosphide, or magnesium aluminum phosphide.

In the absence of appropriate chemical-specific data for aluminum phosphide, zinc phosphide, calcium phosphide, potassium phosphide, magnesium phosphide, sodium phosphide, strontium phosphide, or magnesium aluminum phosphide, it was proposed that the AEGL-2 and AEGL-3 values for phosphine be used to obtain AEGL-2 and AEGL-3 values, respectively, for the title metal phosphides. The use of phosphine as a surrogate for the metal phosphides is deemed appropriate because qualitative (clinical signs) and quantitative (phosphine blood level) data suggest that the phosphine hydrolysis product is responsible for acute toxicity from metal phosphides. Because one mole of phosphine is produced for each mole of aluminum phosphide, potassium phosphide, or sodium phosphide hydrolyzed, it was proposed that the phosphine AEGL-2 and AEGL-3 values be adopted as AEGL-2 and AEGL-3 values, respectively, for aluminum phosphide, potassium phosphide, and sodium phosphide. Because a maximum of two moles of phosphine may be produced for each mole of zinc phosphide, calcium phosphide, magnesium phosphide, or strontium phosphide hydrolyzed, it was proposed that the phosphine AEGL-2 and AEGL-3 values be divided by a molar adjustment factor of 2 to derive AEGL-2 and AEGL-3 values, respectively, for zinc phosphide, calcium phosphide, magnesium phosphide, and strontium phosphide. Because a maximum of three moles of phosphine may be produced for each mole of magnesium aluminum phosphide hydrolyzed, it was proposed that the phosphine AEGL-2 and AEGL-3 values be divided by a molar adjustment factor of 3 to derive AEGL-2 and AEGL-3 values, respectively, for magnesium aluminum phosphide. Because AEGL-1 values for phosphine are not recommended (due to insufficient data), AEGL-1 values for the title metal phosphides are also not recommended.

After a short discussion, a motion was made by Richard Niemier and seconded by Susan Ripple to accept the values as proposed. The motion carried (YES: 17; NO: 0; ABSTAIN: 1) (APPENDIX J).

AEGL VALUES FOR METAL PHOSPHIDES* (EXPRESSED AS PPM OR MG/M^3 PHOSPHINE)							
Compound(s)	**Classification**	**10-min**	**30-min**	**1-hr**	**4-hr**	**8-hr**	**Endpoint (Reference)**
Aluminum Phosphide **Potassium Phosphide** **Sodium Phosphide**	**AEGL-1**	NR	NR	NR	NR	NR	Appropriate data not available
	AEGL-2	4.0 ppm (5.6 mg/m^3)	4.0 ppm (5.6 mg/m^3)	2.0 ppm (2.8 mg/m^3)	0.50 ppm (0.71 mg/m^3)	0.25 ppm (0.35 mg/m^3)	Phosphine AEGL-2 values adopted as aluminum phosphide, potassium phosphide, and sodium phosphide AEGL-2 values (NAC/AEGL, 2004).
	AEGL-3	7.2 ppm (10 mg/m^3)	7.2 ppm (10 mg/m^3)	3.6 ppm (5.1 mg/m^3)	0.90 ppm (1.3 mg/m^3)	0.45 ppm (0.63 mg/m^3)	Phosphine AEGL-3 values adopted as aluminum phosphide, potassium phosphide, and sodium phosphide AEGL-3 values (NAC/AEGL, 2004).
Zinc Phosphide **Calcium Phosphide** **Magnesium Phosphide** **Strontium Phosphide**	**AEGL-1**	NR	NR	NR	NR	NR	Appropriate data not available
	AEGL-2	2.0 ppm (2.8 mg/m^3)	2.0 ppm (2.8 mg/m^3)	1.0 ppm (1.4 mg/m^3)	0.25 ppm (0.36 mg/m^3)	0.13 ppm (0.19 mg/m^3)	Phosphine AEGL-2 values divided by molar adjustment factor of 2 adopted as zinc phosphide, calcium phosphide, magnesium phosphide, and strontium phosphide AEGL-2 values (NAC/AEGL, 2004).
	AEGL-3	3.6 ppm (5.0 mg/m^3)	3.6 ppm (5.0 mg/m^3)	1.8 ppm (2.6 mg/m^3)	0.45 ppm (0.65 mg/m^3)	0.23 ppm (0.32 mg/m^3)	Phosphine AEGL-3 values divided by molar adjustment factor of 2 adopted as zinc phosphide, calcium phosphide, magnesium phosphide, and strontium phosphide AEGL-3 values (NAC/AEGL, 2004).
Magnesium Aluminum Phosphide	**AEGL-1**	NR	NR	NR	NR	NR	Appropriate data not available
	AEGL-2	1.3 ppm (1.9 mg/m^3)	1.3 ppm (1.9 mg/m^3)	0.67 ppm (0.93 mg/m^3)	0.17 ppm (0.24 mg/m^3)	0.08 ppm (0.12 mg/m^3)	Phosphine AEGL-2 values divided by molar adjustment factor of 3 adopted as magnesium aluminum phosphide AEGL-2 values (NAC/AEGL, 2004).
	AEGL-3	2.4 ppm (3.3 mg/m^3)	2.4 ppm (3.3 mg/m^3)	1.2 ppm (1.7 mg/m^3)	0.30 ppm (0.43 mg/m^3)	0.15 ppm (0.21 mg/m^3)	Phosphine AEGL-3 values divided by molar adjustment factor of 3 adopted as magnesium aluminum phosphide AEGL-3 values (NAC/AEGL, 2004).

DIMETHYLAMINE (CAS No. 124-40-3)

Staff Scientist: Alexander A. Maslennikov, RIHTOP
Chemical Manager: Ernest Falke, U.S. EPA

Alexander Maslennikov reviewed the data set for dimethylamine (Attachment 16). Vladimir Tchernov served as the translator. AEGL-1 and AEGL-3 values were balloted at NAC-35 (December, 2004) as draft provisional values; therefore, AEGL-2 was emphasized in the presentation. Proposed AEGL-1 values were based on a NOEL for destruction of olfactory epithelium in rats and mice exposed to 10 ppm dimethylamine 6 hours/day, 5 days/week for 6 months (Buckley et al., 1985; CIIT, 1982-83). Uncertainty factors of 3 each for inter- and intraspecies extrapolation were applied. The value was held constant across time. The proposed AEGL-1 value was 10 ppm at all time points. Proposed AEGL-2 values (78 ppm for 10-min, 49 ppm for 30-min, 37 ppm for 1-hour, 21 ppm for 4-hours, and 16 ppm for 8-hours) were based on a NOEL for histopathology in rats exposed to 100 ppm for 6 hours (Gross et al., 1987). An interspecies UF of 3, intraspecies UF of 10, and adjustment factor of 1/3 were proposed. Time scaling was accomplished using an exponent 'n' of 2.4, derived from combined rat and mouse data ranging from 6 to 360 minutes. Proposed AEGL-3 values (560 ppm for 10-min, 350 ppm for 30-min, 260 ppm for 1-hour, 150 ppm for 4-hours, and 110 ppm for 8-hours) were based on a 2 hour rat $BMCL_{05}$ of 1978 ppm (Mezentseva, 1956). Uncertainty factor application and time scaling were proposed as described for AEGL-2.

After discussion, a motion was made by Marc Ruijten and seconded by Richard Niemier to accept AEGL-1 values as proposed. The motion carried (YES: 15; NO: 0; ABSTAIN: 3) (APPENDIX K).

Discussion then focused on AEGL-2 values. The NAC recalculated the value of 'n' for combined rat and mouse data including the Koch data, and obtained a value of n = 2.8. A show-of-hands suggested that there was more support for n = 2.8 for time scaling (rather than the proposed value of 2.6). A motion was then made by Marc Ruijten and seconded by Bob Benson to adopt AEGL-2 values of 130 ppm for 10-min, 85 ppm for 30-min, 66 ppm for 1-hour, 40 ppm for 4-hours, and 32 ppm for 8-hours based on very mild pulmonary irritation in rats exposed to 175 ppm for 6 hours (Gross et al., 1987). Uncertainty factors of 3 each were applied for inter- and intraspecies extrapolation and an adjustment factor of ½ was applied because of the minor effect noted at the POD. Time scaling used n = 2.8, and scaling across time was done for all time points because the n value was calculated from lethality data ranging from 6 minutes to 6 hours. The motion carried (YES: 18; NO: 0; ABSTAIN: 0) (APPENDIX K).

A motion was then made by Marc Ruijten and seconded by John Hinz to adopt AEGL-3 values of 480 ppm for 10-min, 320 ppm for 30-min, 250 ppm for 1-hour, 150 ppm for 4-hours, and 120 ppm for 8-hours based on the proposed POD (2 hour rat $BMCL_{05}$ of 1978 ppm (Mezentseva, 1956). Uncertainty factors of 3 each were applied for inter- and intraspecies extrapolation. Time scaling used n = 2.8. The motion carried (YES: 17; NO: 0; ABSTAIN: 1) (APPENDIX K).

Summary of AEGL Values for Dimethylamine						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	10 ppm	10 ppm	10 ppm	10 ppm	10 ppm	NOEL for epithelial damage in in rats and mice in a repeated-exposure study (Buckley et al., 1985; CIIT, 1982-83)
AEGL–2	130 ppm	85 ppm	66 ppm	40 ppm	32 ppm	Mild pulmonary irritation in rats (Gross et al., 1987)
AEGL–3	480 ppm	320 ppm	250 ppm	150 ppm	120 ppm	$BMCL_{05}$ in rats (Mezentseva, 1956)

METHYLAMINE (CAS No. 74-89-5)

Staff Scientist: Lyudmila Tochilkina, RIHTOP
Chemical Manager: Marquea King, U.S. EPA

Marquea King presented the review of methylamine on behalf of Lyudmila Tochilkina (Attachment 17). Proposed AEGL-1 values (15 ppm at all time points) were based on a NOAEL for notable signs of clinical discomfort in rats exposed to 465 ppm for 30 minutes (Jeevaratnam and Srirmachari, 1994). An interspecies UF of 10 and interspecies UF of 3 were proposed. Proposed AEGL-2 values (160 ppm for 10-min, 92 ppm for 30-min, 64 ppm for 1-hour, 31 ppm for 4-hours, and 21 ppm for 8-hours) were based on a NOAEL for lung lesions in rats exposed to 250 ppm methylamine 6 hours/day, 5 days/week for 2 weeks (Kinney et al., 1990). An interspecies UF of 3, intraspecies UF of 10, and adjustment factor of 1/3 were proposed. Time scaling was accomplished using n = 1.9, derived from rat lethality data ranging from 6 to 60 minutes. Proposed AEGL-3 values (1100 ppm for 10-min, 590 ppm for 30-min, 410 ppm for 1-hour, 200 ppm for 4-hours, and 140 ppm for 8-hours) were based on the highest experimental concentration (4100 ppm) causing no lethality in rats exposed to methylamine for 60 minutes (Ulrich et al., 1994). An interspecies UF of 3, intraspecies UF of 10, and adjustment factor of 1/3 were proposed. Time scaling was accomplished using n = 1.9.

After much discussion, a motion was made by Marc Ruijten and seconded by Richard Niemier to adopt AEGL-1 values of 15 ppm for all time points. There will be two key studies, both having equal weight. From the Kinney et al. (1990) study, the POD is 75 ppm for 6 hours. Interspecies UFs of 3 each are applied for inter- and intraspecies extrapolation, which yields a value of 15 ppm. The second key study is as proposed in the draft TSD. The motion carried (YES: 18; NO: 0; ABSTAIN: 0) (APPENDIX L). A motion was then made by Bob Benson and seconded by Richard Niemier to accept AEGL-2 values as proposed except that inter- and intraspecies UFs will be 3 each (total = 10). These UFs are considered sufficient and no adjustment factor is needed because the dimethylamine data suggest a similar, but less severe, effect after a single exposure. The motion carried (YES: 15; NO: 1; ABSTAIN: 2) (APPENDIX L). A motion was then made by Richard Niemier and seconded by John Hinz to adopt AEGL-3 values as proposed except that UFs of 3 each

will be applied for inter- and intraspecies extrapolation. The motion carried (YES: 17; NO: 0; ABSTAIN: 0) (APPENDIX L).

Summary of AEGL Values for Methylamine						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	15 ppm	15 ppm	15 ppm	15 ppm	15 ppm	NOEL for clinical signs in rats (Kinney et al., 1990; Jeevaratnam and Sriramachari, 1994)
AEGL–2	160 ppm	92 ppm	64 ppm	31 ppm	21 ppm	NOEL for lung lesions in rats- repeated exposure (Kinney et al., 1990)
AEGL–3	910 ppm	510 ppm	350 ppm	170 ppm	110 ppm	NOEL for lethality in rats (Ulrich et al., 1994)

TRIMETHYLAMINE (CAS No. 75-50-3)

Staff Scientist: Valentin Ye. Zhukov, RIHTOP
Chemical Manager: Iris Camacho, U.S. EPA

Iris Camacho presented the review of trimethylamine on behalf of Valentin Ye. Zhukov (Attachment 18). No AEGL-1 values were proposed because of insufficient data. Proposed AEGL-2 values (100 ppm for 10-min, 68 ppm for 30-min, 51 ppm for 1-hour, 29 ppm for 4-hours, and 22 ppm for 8-hours) were based on a NOAEL for tracheal effects in rats exposed to 250 ppm trimethylamine, 6 hours/day, 5 days/week for 2 weeks (Kinney et al., 1990). An interspecies UF of 3 was proposed because lethality data from rats and mice suggest little interspecies variability. An intraspecies UF of 10 was proposed due to metabolic polymorphism in humans, and an adjustment factor of 1/3 was proposed to obtain AEGL-2 values consistent with the total database. Time scaling was accomplished using n= 2.5, derived from rat lethality data ranging from 20-min to 4-hours. Proposed AEGL-3 values (750 ppm for 10-min, 490 ppm for 30-min, 380 ppm for 1-hour, 220 ppm for 4-hours, and 170 ppm for 8-hours) were based on 20-minute and 1-hr $BMCL_{05}$ values in rats (IRDC, 1992). An interspecies UF of 3 was proposed because lethality data from rats and mice suggest little interspecies variability. An intraspecies UF of 10 was proposed due to metabolic polymorphism in humans, and an adjustment factor of 1/3 was proposed to obtain AEGL-2 values consistent with the total database. Time scaling was accomplished using n= 2.5, derived from rat lethality data ranging from 20 min to 4 hours.

After discussion, a motion was made by Tom Hornshaw and seconded by Ernest Falke to adopt AEGL-1 values of 8 ppm for all time points. This is based on human occupational monitoring data (AIHA, 1980) indicating no toxic effects in workers exposed to 0.1-8 ppm trimethylamine. This value also is supported by the relative toxicity to dimethylamine. The motion carried (YES: 12; NO: 1; ABSTAIN: 5) (APPENDIX M). A motion was then made by Marc Ruijten and seconded by Ernest Falke to adopt AEGL-2 values of (240 ppm for 10-min, 150 ppm for 30-min, 120 ppm for 1-hour, 67 ppm for 4-hours, and 51 ppm for 8-hours). The point-of-departure is an estimated threshold

for AEGL-2 effects (Kinney, 1990); no rats died when exposed to 2000 ppm for 4 hours; however, 3/6 rats died at 3500 ppm. The 2000 ppm concentration was divided by 3 to obtain the POD. Inter- and intraspecies UFs of 3 each were applied, and time scaling was performed as proposed in the TSD. The motion carried (YES: 18; NO: 0; ABSTAIN: 0) (APPENDIX M). Finally, a motion was made by Bob Benson and seconded by Steve Barbee to accept the AEGL-3 values as proposed except to apply inter- and intraspecies UFs of 3 each and eliminate the adjustment factor. The motion carried (YES: 12; NO: 1; ABSTAIN: 5) (APPENDIX M).

Summary of AEGL Values for Trimethylamine						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL-1	8.0 ppm	8.0 ppm	8.0 ppm	8.0 ppm	8.0 ppm	NOEL for effects in workers (AIHA, 1980)
AEGL-2	240 ppm	150 ppm	120 ppm	67 ppm	51 ppm	Estimated threshold for AEGL-2 effects (Kinney et al., 1990)
AEGL-3	750 ppm	490 ppm	380 ppm	220 ppm	170 ppm	20-min and 1-hr $BMCL_{05}$ in rats (IRDC, 1992)

ETHYLAMINE (CAS No. 75-04-7)

Staff Scientist: Valery Kiryukhin, RIHTOP
Chemical Manager: Marquea King, U.S. EPA

Marquea King presented the review of ethylamine on behalf of Valery Kiryukhin (Attachment 19). No AEGL-1 values were proposed because of insufficient data. Proposed AEGL-2 values (260 ppm for 10-min, 180 ppm for 30-min, 57 ppm for 1-hour, 25 ppm for 4-hours, and 16 ppm for 8-hours) were one-third the proposed AEGL-3 values. Proposed AEGL-3 values (770 ppm for 10-min, 530 ppm for 30-min, 170 ppm for 1-hour, 74 ppm for 4-hours, and 49 ppm for 8-hours) were based on 6-min, 20-min and 60-min $BMCL_{05}$ values in rats (IRDC, 1993). An interspecies UF of 3, intraspecies UF of 10, and adjustment factor of 1/3 were proposed. Time scaling was accomplished using n = 1.7, derived from rat lethality data ranging from 6-minutes to 1-hour).

A motion was made by Bob Benson and seconded by Tom Hornshaw to accept the AEGL-3 values as proposed, except to use n = 1.6 (810 ppm for 10-min, 420 ppm for 30-min, 270 ppm for 1-hour, 120 ppm for 4-hours, and 76 ppm for 8-hours), calculated by Marc Ruijten at the meeting (rather than n= 1.7, proposed in the TSD). The motion carried (YES: 18; NO: 0; ABSTAIN: 1) (APPENDIX N). {The AEGL-1 and AEGL-2 discussions were deferred until the three other amine chemicals were discussed.]

A motion was then made by Marc Ruijten and seconded by Bob Benson to adopt AEGL-2 values of (150 ppm for 10-min, 76 ppm for 30-min, 49 ppm for 1-hour, 22 ppm for 4-hours, and 14 ppm for 8-hours) based on one-third the AEGL-3 values. The motion carried (YES: 18; NO: 0; ABSTAIN: 0) (APPENDIX N). A motion was then made by Tom Hornshaw and seconded by Richard Niemier to adopt AEGL-1 values for ethylamine by dividing the methylamine AEGL-1 values by 2 (applying a

MF of 2). Support for this approach is that the RD_{50} values are similar for methylamine and ethylamine and that there are no appropriate data for ethylamine (MF support). This yields an AEGL-1 of 7.5 ppm for all time points. The motion carried (YES: 17; NO: 0; ABSTAIN: 1) (APPENDIX N).

Summary of AEGL Values for Ethylamine						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	7.5 ppm	7.5 ppm	7.5 ppm	7.5 ppm	7.5 ppm	Methylamine AEGL-1 values ÷2
AEGL–2	150 ppm	76 ppm	49 ppm	22 ppm	14 ppm	1/3 AEGL-3 values
AEGL–3	810 ppm	420 ppm	270 ppm	120 ppm	76 ppm	6-min, 20-min and 1-hr $BMCL_{05}$ in rats (IRDC, 1993)

LEVEL OF ODOR AWARENESS (LOA)

DIMETHYLAMINE(CAS No. 124-40-3)
METHYLAMINE(CAS No. 74-89-5)
TRIMETHYLAMINE(CAS No. 75-50-3)
ETHYLAMINE (CAS No. 75-04-7)

After the discussions of the four amine chemicals were complete, a motion was made by Marc Ruijten and seconded by Bob Benson to adopt LOA values of 0.53 ppm for dimethylamine, 0.56 ppm for methylamine, 0.00051 ppm for trimethylamine, and 0.74 ppm for ethylamine. The motion carried unanimously be a show of hands (Appendix O).

Bis-Chloromethyl Ether (BCME) (CAS No. 542-88-1)

Staff Scientist: Sylvia Milanez
Chemical Manager: Ernest Falke, U.S. EPA

Sylvia Milanez discussed the available data (Attachment 20). AEGL-1 values were not recommended because effects exceeding the severity of AEGL-1 occurred at concentrations that did not produce sensory irritation. Proposed AEGL-2 values (0.055 ppm for 10-min, 0.055 ppm for 30-min, 0.044 ppm for 1-hour, 0.028 ppm for 4-hours, and 0.020 ppm for 8-hours) were based on an estimated NOAEL for irreversible respiratory lesions in rats and hamsters (Drew et al., 1975). Animals exposed to 0.7 ppm for 7 hours and observed for a lifetime, showed increased lung to body weight ratio. This 0.7 ppm concentration was divided by 3 to obtain the POD of 0.23 ppm. An interspecies UF of 3 was applied and is considered sufficient because BCME caused a similar response in two species. An intraspecies UF of 3 was also applied because BCME is a proximally-acting irritant with a steep concentration-response curve. Time scaling was performed with the default values of n = 1 or n = 3. Proposed AEGL-3 values (0.23 ppm for 10-min, 0.23 ppm for 30-

min, 0.18 ppm for 1-hour, 0.11 ppm for 4-hours, and 0.075 ppm for 8-hours) were based on a NOEL for lethality from lung lesions in rats and hamsters exposed to 1 ppm for 6 hours (Drew et al., 1975). Uncertainty factor application and time scaling were proposed similar to AEGL-2.

After discussion, a motion was made by Marc Ruijten and seconded by Bob Benson to adopt all values as proposed with a notation on every table containing AEGL-2 values stating that cancer risk is greater than AEGL-2 values. Also, cancer risk will be calculated at the AEGL-2 and AEGL-3 cvalue concentrations and will be included in the TSD. The motion carried (YES: 15; NO: 3; ABSTAIN: 0) (APPENDIX P).

Summary of AEGL Values for BCME						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	NR	NR	NR	NR	NR	Not recommended
AEGL–2	0.055 ppm	0.055 ppm	0.044 ppm	0.028 ppm	0.020 ppm	Estimated NOAEL for irreversible respiratory lesions in rats and hamsters (Drew et al., 1975)
AEGL–3	0.23 ppm	0.23 ppm	0.18 ppm	0.11 ppm	0.075 ppm	NOEL for lethality from lung lesions in rats and hamsters (Drew et al., 1975).

Chloromethyl Methyl Ether (CMME) (CAS No. 107-30-2)

Staff Scientist: Sylvia Milanez
Chemical Manager: Ernest Falke, U.S. EPA

Sylvia Milanez discussed the available data (Attachment 21). (This TSD is interim status and has previously been to the COT subcommittee; however, the summary is presented here because of the relationship of CMME and BCME). AEGL-1 values were not recommended because no studies were available in which toxicity was limited to AEGL-1 effects. Proposed AEGL-2 values (0.34 ppm for 10-min, 0.34 ppm for 30-min, 0.27 ppm for 1-hour, 0.17 ppm for 4-hours, and 0.12 ppm for 8-hours) were based on an estimated NOAEL for irreversible respiratory lesions in rats and hamsters (Drew et al., 1975). Animals exposed to 12.5 ppm for 7 hours and observed for 14-days, showed increased lung congestion, edema, and hemorrhage. This 12.5 ppm concentration was divided by 3 to obtain the POD of 4.3 ppm. An interspecies UF of 3 was applied and is considered sufficient because CMME caused a similar response in two species. An intraspecies UF of 3 was also applied because CMME is a proximally-acting irritant. A modifying factor of 3 was applied because the content of BCME (which is more toxic than CMME) in technical grade CMME in the key study is unknown, and 3 is the geometric mean of the typical range of 1-10% BCME concentration. Time scaling was performed with the default values of n = 1 or n = 3. Proposed AEGL-3 values (1.4 ppm for 10-min, 1.4 ppm for 30-min, 1.1 ppm for 1-hour, 0.72 ppm for 4-hours, and 0.53 ppm for 8-

hours) were based on a 7 hour $BMCL_{05}$ of 18 ppm in hamsters (Drew et al., 1975). Uncertainty factor and modifying factor application and time scaling were proposed similarly to AEGL-2.

After discussion, a motion was made by Richard Niemier and seconded by John Hinz to adopt AEGL values as proposed except to apply a modifying factor of 1.7, rather than 3. This MF of 1.7 is based on relative potency calculations as follows: MF = (0.1 x 55/7) + (0.9 x 1) = 1.7. The motion carried (YES: 16; NO: 1; ABSTAIN: 0) (Appendix Q).

Summary of AEGL Values for CMME						
Classification	**10-minute**	**30-minute**	**1-hour**	**4-hour**	**8-hour**	**Endpoint (Reference)**
AEGL–1	NR	NR	NR	NR	NR	Not recommended
AEGL–2	0.60 ppm	0.60 ppm	0.47 ppm	0.30 ppm	0.22 ppm	Estimated NOAEL for irreversible respiratory lesions in rats and hamsters (Drew et al., 1975)
AEGL–3	2.6 ppm	2.6 ppm	2.0 ppm	1.3 ppm	0.93 ppm	7-hr $BMCL_{05}$ in hamsters (Drew et al., 1975).

ADMINISTRATIVE MATTERS

The site and time of future meetings is as follows:

NAC/AEGL-38: September 28-30, 2005, Washington DC
NAC/AEGL-39: December 13-15, 2005, Washington DC

All items in the agenda were discussed as thoroughly as the time permitted. The meeting highlights were prepared by Cheryl Bast and Bob Young, Oak Ridge National Laboratory, with input from the respective staff scientists, chemical managers, and other contributors.

NAC/AEGL Meeting 40: September 6-8, 2006

Chemical: 1,2,3- / 1,2,4-TRIMETHYL BENZENE (MESITYLENE) 1,3,5- **CAS Reg. No.:** 526-73-8 / 95-63-6 / 108-67-8

Action: Proposed ✓ **Interim** _____ **Other** _____

Chemical Manager: JOHN HINZ **Staff Scientist:** CAROL WOOD

NAC Member	AEGL1	AEGL2	AEGL3	LOA	NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Henry Anderson	Y	Y	Y		Warren Jederberg	A	A	A	
Steven Barbee	Y	Y	Y		Elaine Krueger	Y	Y	Y	
Marc Baril	Y	Y	Y		Glenn Leach	A	A	A	
Lynn Beasley	Y	Y	Y		Richard Niemeier	A	A	A	
Alan Becker	Y	Y	Y		Marinelle Payton	A	A	A	
Robert Benson	Y	Y	Y		Susan Ripple	Y	Y	Y	
George Cushmac	Y	Y	Y		George Rodgers	N	Y	Y	
Ernest Falke	Y	Y	Y		Marc Ruijten	Y	Y	Y	
Alfred Feldt	A	A	A		George Rusch, Chair	Y	Y	Y	
Roberta Grant	Y	Y	Y		Daniel Sudakin	Y	Y	Y	
Dieter Heinz	Y	Y	Y		Richard Thomas	Y	Y	Y	
John Hinz	Y	Y	Y		Calvin Willhite	Y	Y	Y	
Jim Holler	Y	Y	Y		George Woodall	Y	Y	Y	
					TALLY				
					PASS/ FAIL				

PPM, (mg/m³)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(180)	,(180)	,(140)	,(90)	,(45)
AEGL 2	,(460)	,(460)	,(360)	,(230)	,(150)
AEGL 3	,(NR)	,(NR)	,(NR)	,(NR)	,(NR)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.

** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

* NR due to inadequate data

NR= Not Recommended due to _____

AEGL 1 Motion by: Willhite **Second by:** Hinz

AEGL 2 Motion by: Willhite **Second by:** Hinz

AEGL 3 Motion by: _____ **Second by:** _____

LOA Motion by: _____ **Second by:** _____

Approved by Chair: _____ **DFO:** _____ **Date:** 9/6/2006

NAC/AEGL Meeting 40: September 6-8, 2006

Chemical: ETHYLENE OXIDE **CAS Reg. No.:** 75-21-8

Action: Proposed_____ **Interim**_____ **Other** ✓ Return from NAS

Chemical Manager: SUSAN RIPPLE **Staff Scientist:** KOWETHA DAVIDSON

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson		Y		
Steven Barbee		Y		
Marc Baril		Y		
Lynn Beasley		Y		
Alan Becker		Y		
Robert Benson		Y		
George Cushmac		Y		
Ernest Falke		Y		
Alfred Feldt		AB		
Roberta Grant		Y		
Dieter Heinz		Y		
John Hinz		Y		
Jim Holler		Y		

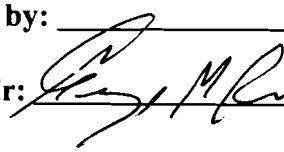
NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg		AB		
Elaine Krueger		AB		
Glenn Leach		AB		
Richard Niemeier		AB		
Marinelle Payton		AB		
Susan Ripple		Y		
George Rodgers		Y		
Marc Ruijten		Proxy		
George Rusch, Chair		Proxy		
Daniel Sudakin		Y		
Richard Thomas		Y		
Calvin Willhite		Y		
George Woodall		N		
TALLY				
PASS/ FAIL		17/18		

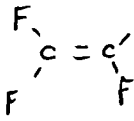
PPM, (mg/m^3)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,( )	,( )	,( )	,( )	,( )
AEGL 2	,(80)	,(80)	,(45)	,(14)	,(7.9)
AEGL 3	,( )	,( )	,( )	,( )	,( )
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to_____

AEGL 1 Motion by:_____ **Second by:**_____
AEGL 2 Motion by: Henry **Second by:** Thomas
AEGL 3 Motion by:_____ **Second by:**_____
LOA Motion by:_____ **Second by:**_____

Approved by Chair:  **DFO:** Paul S. Tobin **Date:** 9/6/2006



NAC/AEGL Meeting 40: September 6-8, 2006

Appendix F

Chemical: TRIFLUOROCHLOROETHYLENE **CAS Reg. No.:** 79-38-9

Action: Proposed ✓ **Interim** _____ **Other** _____

Chemical Manager: GEORGE RUSCH **Staff Scientist:** SYLVIA TALMAGE

*RE-BALLOT ON *NEW AEGL-3 VALUES

NAC Member	AEGL1	AEGL2	AEGL3	~~LOA~~ *	NAC Member	AEGL1	AEGL 2	AEGL3	~~LOA~~ *
Henry Anderson	N	N	N	N	Warren Jederberg	Ab	Ab	Ab	Ab
Steven Barbee	Y	Y	Y	Y	Elaine Krueger	Y	Y	N	N
Marc Baril	Y	Y	Pass	Y	Glenn Leach	Ab	Ab	Ab	Ab
Lynn Beasley	Y	Y	Y	Ab	Richard Niemeier	Ab	Ab	Ab	Ab
Alan Becker	Y	Y	Pass	Y	Marinelle Payton	Ab	Ab	Ab	Ab
Robert Benson	Y	Y	Y	Y	Susan Ripple	Y	Y	Y	Pass
George Cushmac	Y	Y	Y	Y	George Rodgers	N	N	Y	Y
Ernest Falke	Y	Y	Y	Y	Marc Ruijten	Y	Y	N	Y
Alfred Feldt	Ab	Ab	Ab	Y	George Rusch, Chair	Pass	Pass	Pass	Pass
Roberta Grant	N	N	Y	N	Daniel Sudakin	N	Y	Y	Y
Dieter Heinz	Pass	Pass	Pass	Y	Richard Thomas	Y	Y	Y	Y
John Hinz	Y	Y	N	Y	Calvin Willhite	N	N	N	Ab
Jim Holler	Y	Y	Y	Y	George Woodall	Ab	Ab	Ab	Ab
					TALLY				
					PASS/ FAIL	13/18	14/18	11/16	14/17

PPM, (mg/m³)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(29)	,(20)	,(16)	,(10)	,(10)
AEGL 2	,(160)	,(110)	,(86)	,(54)	,(54)
~~AEGL 3~~	~~,(360)~~	~~,(250)~~	~~,(200)~~	,(130)	~~,(100)~~
~~LOA~~ * AEGL3	1500	690	420	150	91
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to _____

AEGL 1 Motion by: Ripple **Second by:** Heinz
AEGL 2 Motion by: ↓ **Second by:** ↓
AEGL 3 Motion by: * RUIJTEN **Second by:** * HEINZ
LOA Motion by: _____ **Second by:** _____

Approved by Chair: _____ **DFO:** _____ **Date:** 9/6/2006
* _____ * _____ 9/8/2006

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Appendix G

Chemical: HEXAFLUOROPROPYLENE **CAS Reg. No.:** 116-15-4

Action: Proposed ✓ **Interim**_____ **Other**_____

Chemical Manager: GEORGE RUSCH **Staff Scientist:** BOB YOUNG

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson	Y	Y	Y	
Steven Barbee	Y	Y	Y	
Marc Baril	Y	Y	Y	
Lynn Beasley	Y	Y	Y	
Alan Becker	Y	Y	Y	
Robert Benson	Y	Y	Y	
George Cushmac	Y	Y	Y	
Ernest Falke	Y	Y	Y	
Alfred Feldt	Y	Y	Y	
Roberta Grant	Y	Y	Y	
Dieter Heinz	Y	Y	Y	
John Hinz	Y	Y	Y	
Jim Holler	Y	Y	Y	

NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg	Ab	Ab	Ab	
Elaine Krueger	Y	Y	Y	
Glenn Leach	Ab	Ab	Ab	
Richard Niemeier	Ab	Ab	Ab	
Marinelle Payton	Ab	Ab	Ab	
Susan Ripple	Y	Y	Y	
George Rodgers	Y	Y	Y	
Marc Ruijten	Y	Y	Y	
George Rusch, Chair	Y	Y	Y	
Daniel Sudakin	Y	Y	Y	
Richard Thomas	Y	Y	Y	
Calvin Willhite	Y	Y	Y	
George Woodall	Y	Y	Y	
TALLY	22/22	22/22	22/22	
PASS/ FAIL	PASS	PASS	PASS	

PPM, (mg/m³)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	150 ,([redacted])	67 ,([redacted])	[redacted] ,(40)	,(14)	,(8.3)
AEGL 2	,(350)	,(150)	,(91)	,(32)	,(19)
AEGL 3	,(1800)	,(800)	,(481)	,(170)	,(100)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to_____

AEGL 1 Motion by: Ruijten **Second by:** Thomas
AEGL 2 Motion by: Anderson **Second by:** Benson
AEGL 3 Motion by: Benson **Second by:** Hinz
LOA Motion by: _____ **Second by:** _____

Approved by Chair: [signature] **DFO:** [signature] **Date:** 9/8/2006

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Chemical: TETRAFLUOROETHYLENE **CAS Reg. No.:** 116-14-3

Action: Proposed ✓ **Interim**_____ **Other**_____

Chemical Manager: G. RUSCH **Staff Scientist:** SYLVIA TALMAGE

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson	Y	Y	Y	
Steven Barbee	Y	Y	Y	
Marc Baril	Y	Y	Y	
Lynn Beasley	Y	Y	Y	
Alan Becker	Y	Y	Y	
Robert Benson	Y	Y	Y	
George Cushmac	Y	Y	Y	
Ernest Falke	Y	Y	Pass	
Alfred Feldt	Y	Y	Y	
Roberta Grant	Y	Y	Y	
Dieter Heinz	Y	Y	Y	
John Hinz	Pass	Pass	Pass	
Jim Holler	Y	Y	Y	

NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg	Ab	Ab	Ab	
Elaine Krueger	Y	Y	Y	
Glenn Leach	Ab	Ab	Ab	
Richard Niemeier	Ab	Ab	Ab	
Marinelle Payton	Ab	Ab	Ab	
Susan Ripple	Y	Y	Y	
George Rodgers	Y	Y	Y	
Marc Ruijten	NR	Pass	Y	
George Rusch, Chair	Y	Y	Y	
Daniel Sudakin	Y	Y	Y	
Richard Thomas	Y	Y	Y	
Calvin Willhite	Y	Y	Y	
George Woodall	Ab	Y	Y	
TALLY	19/19	20/20	20/20	
PASS/ FAIL				

PPM, (mg/m^3)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(270)	,(270)	,(220)	,(140)	,(90)
AEGL 2	,(690)	,(690)	,(550)	,(349)	,(230)
AEGL 3	,(4200)	,(4200)	,(3300)	,(2100)	,(1000)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to_____

AEGL 1 Motion by: [redacted] Rodgers **Second by:** [redacted] Baril
AEGL 2 Motion by: Benson **Second by:** Barbee
AEGL 3 Motion by: Benson **Second by:** Rodgers
LOA Motion by: _____ **Second by:** _____

Approved by Chair: [signature] **DFO:** Paul Shoaf **Date:** 9/7/2006

NAC/AEGL Meeting 40: September 6-8, 2006

Chemical: PHENYL CHLOROFORMATE **CAS Reg. No.:** 1885-14-9

Action: Proposed ✓ **Interim**_____ **Other**_____

Chemical Manager: E. FALKE **Staff Scientist:** C. BAST

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson	Y	Y	Y	
Steven Barbee	Y	Y	Y	
Marc Baril	Y	Y	Y	
Lynn Beasley	Y	Y	Y	
Alan Becker	Y	Y	Y	
Robert Benson	Y	Y	Y	
George Cushmac	Y	Y	Y	
Ernest Falke	Y	Y	Y	
Alfred Feldt	Y	Y	Y	
Roberta Grant	Y	Y	Y	
Dieter Heinz	Y	Y	Y	
John Hinz	Para	Para	Para	
Jim Holler	Y	Y	Y	

NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg	Ab	→	→	
Elaine Krueger	Y	Y	Y	
Glenn Leach	Ab	→	→	
Richard Niemeier	Ab	→	→	
Marinelle Payton	Ab	→	→	
Susan Ripple	Y	Y	Y	
George Rodgers	Y	Y	Y	
Marc Ruijten	Y	Y	Y	
George Rusch, Chair	Y	Y	Y	
Daniel Sudakin	Y	Y	Y	
Richard Thomas	Ab	Ab	Ab	
Calvin Willhite	Para	Para	Para	
George Woodall	Ab	Ab	Ab	
TALLY				
PASS/ FAIL				

PPM, (mg/m³)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(NR)	,(NR)	,(NR)	,(NR)	,(NR)
AEGL 2	,(0.24)	,(.24)	,(.19)	,(.12)	,(.06)
AEGL 3	,(0.72)	,(0.72)	,(0.57)	,(0.36)	,(0.18)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to Lack of data

AEGL 1 Motion by: Rodgers **Second by:** Heinz
AEGL 2 Motion by: Rodgers **Second by:** Heinz
AEGL 3 Motion by: Rodgers **Second by:** Heinz
LOA Motion by: _____ **Second by:** _____

Approved by Chair: [signature] **DFO:** [signature] **Date:** 9/7/06

NAC/AEGL Meeting 40: September 6-8, 2006

Chemical: 2-ETHYLHEXYL CHLOROFORMATE **CAS Reg. No.:** 24468-13-1

Action: Proposed ✓ **Interim**_____ **Other**_____

Chemical Manager: E. FALKE **Staff Scientist:** C. BAST

NAC Member	AEGL1	AEGL2	AEGL3	LOA	NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Henry Anderson	Y	Y	Y		Warren Jederberg	Ab	→	→	
Steven Barbee	Y	Y	Y		Elaine Krueger	Y	Y	Y	
Marc Baril	Jan	Jan	Jan		Glenn Leach	Ab	→	→	
Lynn Beasley	Y	Y	Y		Richard Niemeier	Ab	→	→	
Alan Becker	Y	Y	Y		Marinelle Payton	Ab	→	→	
Robert Benson	Y	Y	Y		Susan Ripple	Y	Y	Y	
George Cushmac	Y	Y	Y		George Rodgers	Y	Y	Y	
Ernest Falke	Y	Y	Y		Marc Ruijten	Y	Y	Y	
Alfred Feldt	Y	Y	Y		George Rusch, Chair	Y	Y	Y	
Roberta Grant	Y	Y	Y		Daniel Sudakin	Y	Y	Y	
Dieter Heinz	Y	Y	Y		Richard Thomas	Ab	Ab	Ab	
John Hinz	Y	Y	Y		Calvin Willhite	Jan	→	→	
Jim Holler	Y	Y	Y		George Woodall	Ab	→	→	
					TALLY	18/18	18/18	18/18	
					PASS/ FAIL				

PPM, (mg/m³)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(NR)	,(NR)	,(NR)	,(NR)	,(NR)
AEGL 2	,(1.2)	,(1.2)	,(0.97)	,(0.60)	,(0.30)
AEGL 3	,(3.6)	,(3.6)	,(2.9)	,(1.8)	,(0.91)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.

** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to Lack of Data

AEGL 1 Motion by: Rodgers **Second by:** Heinz

AEGL 2 Motion by: ↓ **Second by:** ↓

AEGL 3 Motion by: ↓ **Second by:** ↓

LOA Motion by: _____ **Second by:** _____

Approved by Chair: [signature] **DFO:** [signature] **Date:** 2/7/13

NAC/AEGL Meeting 40: September 6-8, 2006

Appendix K

Chemical: BENZYL CHLOROFORMATE **CAS Reg. No.:** 501-53-1

Action: Proposed ✓ **Interim**_____ **Other**_____

Chemical Manager: E. FALKE **Staff Scientist:** C. BAST

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson	Y	→	→	
Steven Barbee	Y	→	→	
Marc Baril	N	→	→	
Lynn Beasley	Y	→	→	
Alan Becker	Y	→	→	
Robert Benson	Y	→	→	
George Cushmac	Y	→	→	
Ernest Falke	Y	→	→	
Alfred Feldt	Y	→	→	
Roberta Grant	Y	→	→	
Dieter Heinz	Y	→	→	
John Hinz	Y	→	→	
Jim Holler	Y	→	→	

NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg	AB	→	→	
Elaine Krueger	Y	→	→	
Glenn Leach	AB	→	→	
Richard Niemeier	AB	→	→	
Marinelle Payton	AC	→	→	
Susan Ripple	Y	→	→	
George Rodgers	Y	→	→	
Marc Ruijten	Y	→	→	
George Rusch, Chair	Y	→	→	
Daniel Sudakin	Y	→	→	
Richard Thomas	AB	→	→	
Calvin Willhite	Phone	→	→	
George Woodall	AB	→	→	
TALLY				
PASS/ FAIL				

PPM, (mg/m^3)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(NR)	,(NR)	,(NR)	,(NR)	,(NR)
AEGL 2	,(1.2)	,(1.2)	,(0.97)	,(0.63)	,(0.31)
AEGL 3	,(3.7)	,(3.7)	,(2.9)	,(1.9)	,(0.93)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to Lack of Data

AEGL 1 Motion by: Rodgers **Second by:** Heinz
AEGL 2 Motion by:_____ **Second by:**_____
AEGL 3 Motion by: ↓ **Second by:** ↓
LOA Motion by:_____ **Second by:**_____

Approved by Chair: [signature] **DFO:** [signature] **Date:** 2/7/03

NAC/AEGL Meeting 40: September 6-8, 2006

Chemical: DIBROMOETHANE **CAS Reg. No.:** 106-93-4

Action: Proposed ✓ **Interim**_____ **Other**_____

Chemical Manager: B. BENSON **Staff Scientist:** K. DAVIDSON

(a) 9/6/06

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson	Y	Y	Y	
Steven Barbee	Y	Y	Y	
Marc Baril	Y	Pass	NR	
Lynn Beasley	Ab	Ab	Ab	
Alan Becker	Pass	Pass	Pass	
Robert Benson	Y	Y	Y	
George Cushmac	Ab	Y	Y	
Ernest Falke	Y	Y	Y	
Alfred Feldt	Y	Y	Y	
Roberta Grant	Y	Y	Y	
Dieter Heinz	Y	Y	Y	
John Hinz	Ab	Ab	Pass	
Jim Holler	Y	Y	NR	

NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg	Ab	Ab	Ab	
Elaine Krueger	Y	Y	Y	
Glenn Leach	Ab	Ab	Ab	
Richard Niemeier	Ab	Ab	Ab	
Marinelle Payton	Ab	Ab	Ab	
Susan Ripple	Y	Y	Y	
George Rodgers	Y	NR	NR	
Marc Ruijten	Pass	Y	Y	
George Rusch, Chair	Y	Y	Y	
Daniel Sudakin	Y	Y	Y	
Richard Thomas	Ab	Y	Y	
Calvin Willhite	Y	Y	Y	
George Woodall	Ab	Ab	Ab	
TALLY	15/15	16/17	15/16	
PASS/ FAIL	Pass	Pass	Pass	

PPM, (mg/m³)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(52)	,(26)	,(17)	,(7.1)	,(4.6)
AEGL 2	,(73)	,(37)	,(24)	,(10)	,(6.5)
AEGL 3	,(170)	,(76)	,(46)	,(17)	,(10)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to_____

AEGL 1 Motion by: Benson **Second by:** Willhite
AEGL 2 Motion by: Willhite **Second by:** Heinz
AEGL 3 Motion by: Benson **Second by:** Willhite
LOA Motion by:_____ **Second by:**_____

Approved by Chair: [signature] **DFO:** [signature] **Date:** 9/7/06

+ 9/6/06 AEGL-2 #3

EIA EHS DOT

NAC/AEGL Meeting 40: September 6-8, 2006

Appendix M

Chemical: PHENYL MERCAPTAN **CAS Reg. No.:** 108-98-5

Action: Proposed ✓ **Interim**_____ **Other**_____

Chemical Manager: S. BARBEE **Staff Scientist:** C. BAST

NAC Member	AEGL1	AEGL2	AEGL3	LOA
Henry Anderson	Y	Y	Y	
Steven Barbee	Y	Y	Y	
Marc Baril	Y	Y	Y	
Lynn Beasley	Ab	Ab	Ab	
Alan Becker	Y	Y	Y	
Robert Benson	Y	Y	Y	
George Cushmac	Y	Y	Y	
Ernest Falke	Y	Y	Y	
Alfred Feldt	Y	Y	Y	
Roberta Grant	Y	Y	Y	
Dieter Heinz	Y	Y	Y	
John Hinz	Y	Y	Y	
Jim Holler	Y	Y	Y	

NAC Member	AEGL1	AEGL 2	AEGL3	LOA
Warren Jederberg	Ab	Ab		
Elaine Krueger	Y	Y	Y	
Glenn Leach	Ab	Ab		
Richard Niemeier	Ab	Ab		
Marinelle Payton	Ab	Ab		
Susan Ripple	Y	Y	Y	
George Rodgers	Y	N	Y	
Marc Ruijten	Y	Y	Y	
George Rusch, Chair	Y	Y	Y	
Daniel Sudakin	Ab	Ab	Ab	
Richard Thomas	Y	Y	Y	
Calvin Willhite	Ab	Ab	Ab	
George Woodall	Ab	Ab	Ab	
TALLY	18/18	16/17	18/18	
PASS/ FAIL	PASS	Pass	PASS	

PPM, (mg/m^3)	10 Min	30 Min	1 Hr	4 Hr	8 Hr
AEGL 1	,(NR)	,(NR)	,(NR)	,(NR)	,(NR)
AEGL 2	,(1.0)	,(0.70)	,(0.53)	,(0.33)	,(0.17)
AEGL 3	,(3.0)	,(2.1)	,(1.6)	,(1.0)	,(0.52)
LOA					
* = ≥10% LEL					
** = ≥ 50% LEL					
*** = ≥100% LEL					

*Safety considerations against the hazard(s) of explosion(s) must be taken into account.
** and ***Extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

NR= Not Recommended due to_____

AEGL 1 Motion by: Hinz **Second by:** Ripple
AEGL 2 Motion by: Barbee **Second by:** Heinz
AEGL 3 Motion by: Rodgers **Second by:** Ruijten
LOA Motion by: _____ **Second by:** _____

Approved by Chair: [signature] **DFO:** [signature] **Date:** 9/8/06