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To: Mr. Willard Hanks
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

From: John Wolber

Date: June 11, 1996

Subject: Foamex, L.P. - Request for Permit Amendment
Permit No. AC48-214902A

Project Number: 26005.F21.816

Willard:

Please find attached three (3) additional copies of the June 3, 1996 Request for Permit Amendment for Foamex, L.P. (Permit No. AC48-214902A) without the modeling output listings.

Also attached is a corrected page 25 for Attachment C (Revise Pages to Volume II: Dispersion Modeling Analysis) to be inserted in the original submission. The date of the referenced Request for Permit Amendment was corrected on this page.

If you have any questions or require any additional information, please call Kay Rykowski or me.

JOHN

JMW/26005W25.DOC

Attachments

cc: Kay Rykowski

Harding Lawson Associates
Engineering and Environmental Services
4763 South Conway Road
Orlando, Florida 32812 - (407) 851-1484

14.0 RESULTS

The ISCST2 modeling was conducted for each compound and each averaging using the emission rates presented in Section 13.0. The overall maximum ground level concentrations from the ISCST2 modeling for each case are presented in Table 8 below. The output listings for each case are presented in Appendixes D through J. For comparison, Table 8 also shows the applicable FDEP ARC's for each compound and averaging time. For the 8-hour and 24-hour averaging times for each compound the maximum ground level concentrations are less than 90% of the applicable FDEP ARC's. Therefore, based on the results of this dispersion modeling analysis, the emissions from the Foamex facility comply with FDEP's **8-hour and 24-hour ARC's.**

The resulting maximum annual ground level concentration for methylene chloride is 2.73 $\mu g/m^3$, which is greater than the FDEP annual ARC for methylene chloride of 2.0 $\mu g/m^3$. Therefore, based on Foamex's commitment to reduce the annual usage of methylene chloride as a blowing agent after five years to less than half of the current usage rate of 720,000 lbs/yr, a risk assessment was conducted to show that the exposure to the estimated methylene chloride emissions from the facility over a lifetime (70 years) pose less than a one-in-one-million increased cancer risk. The risk assessment was submitted to FDEP as an attachment to Foamex's Request for Permit Ammendment, dated June 3, 1996.

Table 8. ISCST2 Modeling Results and Comparison with FDEP ARC's
Foamex, L.P. - Orlando, Florida

Compound	Averaging Time	Maximum ISCST2 Ground Level Concentration ($\mu g/m^3$)	FDEP ARC ($\mu g/m^3$)
Methylene Chloride	8-hour	1,538.9	1,740
	24-hour	250.8	414
	Annual	2.73	2.0
Toluene Diisocyanate	8-hour	0.3	0.4
	24-hour	0.05	0.09
1,1,1-Trichloroethane	8-hour	10.1	19,000
	24-hour	6.7	4,524

Harding Lawson Associates

June 3, 1996

26005.F21.816

Mr. C. H. Fancy, P.E.
Chief
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Request for Permit Amendment
Foamex, L.P.
Permit No. AC48-214902A

Dear Mr. Fancy:

INTRODUCTION

This letter is to request an amendment to Construction Permit AC48-214902A, issued to Foamex, L.P. This letter presents a summary of the requested changes to Specific Conditions 1, 2, and 4 issued by FDEP. The requested changes include an increase in the annual methylene chloride usage in the slabstock foam production process and a modification to the enhanced exhaust system for the rebond foam production process. This amendment is requested to allow Foamex to increase slabstock foam production at their Orlando facility in the short term, for a period of up to five years, in preparation for the installation of an alternate manufacturing technology that will reduce the annual usage of methylene chloride as a blowing agent in the slabstock foam production process to less than half of the requested usage rate.

As discussed in the following comments and supported by the attachments, the predicted maximum ground level concentration for toluene diisocyanate (TDI) does not exceed the FDEP Ambient Reference Concentration (ARC) and the methylene chloride emissions from the facility pose a less than a one-in-one-million increased cancer risk as a result of the requested changes to Specific Conditions 1, 2, and 4.

COMMENT 1

Foamex requests a change to increase the number of exhaust fans for the rebond foam production process from two exhaust fans to three exhaust fans. This change is requested to increase the rebond foam production at the facility. Foamex will be adding a second mold to the rebond foam production process and relocating the process approximately 60 feet to the northeast of its current location. The addition of a second mold will require a third exhaust fan to vent the emissions from the rebond process to the atmosphere. The modification to the rebond process will also include a recirculating dust filter/collection system, which does not vent to the atmosphere. The increase in rebond foam production requires an increase in TDI usage in the process from the current usage rate of 164 lbs/hr to 328 lbs/hr. Based on the TDI emission factor of 0.000028 lb emitted/lb used,

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presented in the permit application, this will result in an increase of TDI emissions from 0.0046 lbs/hr (0.02 TPY) to 0.0092 lbs/hr (0.04 TPY) from the rebond foam production process.

The modeling analysis has been revised to account for the modifications to the rebond foam production process, including 1) the increase in TDI emissions, 2) the addition of a third exhaust fan, and 3) the relocation of the rebond process. The modification only impacts the modeling results for TDI, since it is the only pollutant emitted from the rebond process exhaust fans. The results of the revised modeling analysis, presented below, show that the 8-hour and 24-hour maximum ground level concentrations for TDI are below the applicable FDEP ARC's.

Compound	Averaging Time	Revised Maximum ISCST2 Ground Level Concentration ($\mu g/m^3$)	FDEP ARC ($\mu g/m^3$)
Toluene Diisocyanate	8-hour 24-hour	0.3 0.05	0.4 0.09

The revised pages, based on the requested changes, of Volume I and Volume II: Dispersion Modeling Analysis of the permit application along with the output listings from the revised modeling analysis are attached.

The requested change in Specific Condition 1 is given below.

From:

1. The enhanced exhaust systems shall meet or exceed the following specifications. The systems shall include: two 2.8 ft. diameter by 125 ft. high stacks, each handling 30,000 acfm of air; three roof exhaust fans with 3.6 ft. diameter 53 ft. high stacks, each handling 50,000 acfm of air; and two roof exhaust fans with 2 ft. diameter by 53 ft. high stacks, each handling 15,000 acfm of air. The two 125 ft. high stacks shall be equipped with stack sampling facilities meeting the specifications listed in Rule 62-297.345, F.A.C. Tank No. 10 shall be equipped with a pressure/vacuum relief valve.

To:

1. The enhanced exhaust systems shall meet or exceed the following specifications. The systems shall include: two 2.8 ft. diameter by 125 ft. high stacks, each handling 30,000 acfm of air; three roof exhaust fans with 3.6 ft. diameter 53 ft. high stacks, each handling 50,000 acfm of air; and **three** roof exhaust fans with 2 ft. diameter by 53 ft. high stacks, each handling 15,000 acfm of air. The two 125 ft. high stacks shall be equipped with stack sampling facilities meeting the specifications listed in Rule 62-297.345, F.A.C. Tank No. 10 shall be equipped with a pressure/vacuum relief valve.

COMMENT 2

Foamex requests a change in the limits on the annual quantity of methylene chloride used at the facility, as stated in Specific Condition 2. An increase in the annual usage rate of methylene chloride from 551,192 lbs/yr (275.6 TPY) to 720,000 lbs/yr (360.0 TPY) is requested to maximize slabstock foam production in the short term, in preparation for the installation of an alternate manufacturing technology that will reduce the annual usage of methylene chloride as a blowing agent in the slabstock foam production process. The new manufacturing technology is expected to be in place and fully operational within five years. At that time the annual usage rate of methylene chloride is expected to be less than half of the requested usage rate of 720,000 lbs/yr (360.0 TPY), or less than 360,000 lbs/yr (180.0 TPY). Depending on the success of the implementation of the new process technology for the production of all grades of foam, the annual usage rate of methylene chloride may be reduced well below this level. However, it is difficult to establish a more reliable estimate at this time. Foamex will continue to reassess their ability to lower the usage of methylene chloride throughout the next five years, in order to commit to the lowest usage rate possible as a permit condition.

The requested annual increase only affects the annual average emission rates and does not affect the maximum hourly or daily emissions of methylene chloride from the slabstock foam production process. The dispersion modeling analysis has been revised based on the requested increase in the annual methylene chloride usage.

A risk assessment was also conducted to show that the increased methylene chloride emissions from the facility over a five year period and the reduced emissions after the five year period pose less than a one-in-one-million increased cancer risk over a lifetime (70 years). The risk assessment is presented as Attachment A to this letter. The basis of the risk assessment was to calculate the maximum off-site annual methylene chloride concentration due to emissions from the facility averaged over a lifetime (70 years) and compare that concentration with an annual ambient reference concentration that represents a one-in-a-million cancer risk as a result of exposure over a lifetime. The FDEP annual ARC for methylene chloride of 2.0 $\mu g/m^3$ is based on an ambient concentration that represents a one-in-one-million increased cancer risk as a result of exposure to that level over a lifetime (70 years). It was calculated by dividing 1.0E-6 by the EPA unit risk factor of 4.7E-7 $(\mu g/m^3)^{-1}$. As part of the risk assessment, additional modeling was conducted to determine the maximum off-site annual ground level concentration due to the reduced methylene chloride emissions after the five year period of increased emissions. The maximum off-site annual concentration due to the increased emissions for five years is 2.73 $\mu g/m^3$ and the maximum off-site annual concentration due the reduced methylene chloride usage is 1.38 $\mu g/m^3$. The maximum off-site annual methylene chloride concentration due to emissions from the facility averaged over a lifetime (70 years) is calculated as follows:

$$[(2.73\ \mu g/m^3 \times 5\ \text{years}) + (1.38\ \mu g/m^3 \times 65\ \text{years})] \div 70\ \text{years} = 1.48\ \mu g/m^3$$

The resulting off-site annual methylene concentration averaged over a lifetime was then compared with the FDEP annual ARC for methylene chloride. The results, presented below, show that the maximum off-site annual ground level concentration of methylene chloride is less than the FDEP ARC and, therefore, the exposure to the estimated methylene chloride emissions from the facility over a lifetime pose less than a one-in-one-million increased cancer risk.

Compound	Averaging Time	Maximum Off-Site Annual Ground Level Concentration Averaged Over a Lifetime ($\mu g/m^3$)	FDEP Annual ARC Representing a One-in-One-Million Increased Cancer Risk Over a Lifetime ($\mu g/m^3$)
Methylene Chloride	Annual	1.48	2.0

The revised pages, based on the requested change, of Volume I and Volume II: Dispersion Modeling Analysis of the permit application along with the output listings from the revised modeling analysis are attached.

It should be noted that the USEPA is currently developing NESHAP regulations for the Flexible Polyurethane Foam Manufacturing Industry that will require Maximum Achievable Control Technology (MACT) for facilities that have emissions of methylene chloride or any other single hazardous air pollutant (HAP) greater than 10 tons per year. It is expected that these regulations will be promulgated within the next one to two years.

The requested change in Specific Condition 2, which includes the increase in annual TDI usage as discussed in Comment 2, is given below.

From:

2. The methylene chloride used as a blowing agent in the Slabstock Polyurethane Foam Process at the facility shall not exceed 551,192 lbs/yr (275.6 TPY) during any twelve month period. The other chemicals used in the manufacturing processes at the facility shall not exceed the following quantities during any twelve month period: 1,000,000 lbs/yr (500 TPY) polymer; 15,000,000 lbs/yr (7,500 TPY) polyol; and 10,000,000 lbs/yr (5,000 TPY) toluene diisocyanate. Cleanup solvent losses shall not exceed: 20 gallons/month isopropyl alcohol; 5,770 lbs/yr 1,1,1-trichloroethane with silicone lubricant; and 1,000 lbs/yr mineral spirits.

   Compliance with this condition shall be determined by records of purchases, inventory changes, and receipts for chemicals disposed of off site. The permittee shall maintain a log showing the amount of chemicals used each month to document compliance with these limitations.

MAXIMUM POTENTIAL EMISSIONS FROM INDIVIDUAL OPERATIONS ARE ESTIMATED TO BE:

		Emissions	
	Operation/chemical	lbs/hr	TPY
I.	Slabstock Polyurethane Foam Production/ toluene diisocyanate	0.37	0.404
II.	Foam Line Stack/ methylene chloride	1,400	165.36
III.	Long Bun Storage Room Stack/ methylene chloride	816.67	96.46
IV.	Foam Fabrication Operations/ methylene chloride	5.32	15.39
	1,1,1-trichloroethane	2.5	1.86
V.	Rebond Polyurethane Foam Production/ toluene diisocyanate	0.0046	0.02
VI.	Tank Storage (Tank No. 10)/ methylene chloride	0.66	2.92
VII.	Steam Boiler	Trace amounts of the normal products of combustion (less than 1 lb/hr of all pollutants)	
VIII.	Environmental Heating	Trace amounts of the normal products of combustion (less than 1 lb/hr of all pollutants)	

To:

4. For inventory purposes, the estimated emissions from this facility (based on the emission factors listed in the application, the limitations on operation time, and chemical usage) are:

AVERAGE EMISSIONS FROM FACILITY OPERATIONS:

Chemicals	Emissions lbs/hr	Emissions TPY
methylene chloride	**2,223.64**	**364.64**
1,1,1-trichloroethane	2.5	1.86
toluene diisocyanate	**0.3792**	**0.444**

MAXIMUM POTENTIAL EMISSIONS FROM INDIVIDUAL OPERATIONS ARE ESTIMATED TO BE:

	Operation/chemical	Emissions lbs/hr	Emissions TPY
I.	Slabstock Polyurethane Foam Production/ toluene diisocyanate	0.37	0.404
II.	Foam Line Stack/ methylene chloride	1,400	**216**
III.	Long Bun Storage Room Stack/ methylene chloride	816.67	**126**
IV.	Foam Fabrication Operations/ methylene chloride	**6.28**	**19.61**
	1,1,1-trichloroethane	2.5	1.86
V.	Rebond Polyurethane Foam Production/ toluene diisocyanate	**0.0092**	**0.04**
VI.	Tank Storage (Tank No. 10)/ methylene chloride	**0.69**	**3.03**
VII.	Steam Boiler	Trace amounts of the normal products of combustion (less than 1 lb/hr of all pollutants)	
VIII.	Environmental Heating	Trace amounts of the normal products of combustion (less than 1 lb/hr of all pollutants)	

CLOSING

Should you require any additional information or have any questions regarding these issues please contact Kay Rykowski at (407)851-1484.

Yours very truly,

HARDING LAWSON ASSOCIATES

John Wolber
Project Scientist

Joseph L. Tessitore, P.E.
Managing Principal
State of Florida P.E. Registration Number 23374

JMW/JLT/jmw
26005W06.DOC/

Attachments:
- A. Risk Assessment of Methylene Chloride Emissions
- B. Revised pages to Volume I of Original Permit Application
- C. Revised pages to Volume II: Dispersion Modeling Analysis of Original Permit Application
- D. Output Listings from Revised Modeling (Appendixes C, F, G, and H of Volume II of Original Permit Application)

cc: Mr. Raphael Rodriguez, Foamex, L.P., Orlando, Florida
Mr. Tom Burghardt, Foamex, L.P., Linwood, Pennsylvania
Ms. Teri Copeland, HLA, Irvine, California

Attachment A

Risk Assessment of Methylene Chloride Emissions
Foamex, L.P., Orlando, Florida

RISK ASSESSMENT OF METHYLENE CHLORIDE EMISSIONS
FOAMEX, L.P.
ORLANDO, FLORIDA

Prepared for

Foamex, L.P.
1353 Gemini Boulevard
Orlando, Florida 32837

HLA Project No. 26005.F21.816

Joseph L. Tessitore, P.E.
Managing Principal
State of Florida P.E. Registration No. 23374

Teri L. Copeland, DABT
Principal Toxicologist

June 3, 1996

Harding Lawson Associates
Engineering and Environmental Services
4763 South Conway Road
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INTRODUCTION

Foamex, L.P. is requesting an amendment to FDEP Construction Permit AC48-214902, to change the limit on the annual quantity of methylene chloride used as a blowing agent in the slabstock foam production process at the facility from 551,192 lbs/yr (275.6 TPY) to 720,000 lbs/yr (360.0 TPY). The increase is requested to maximize slabstock foam production in the short term, in preparation for the installation of an alternate manufacturing technology that will reduce the annual usage of methylene chloride as a blowing agent in the slabstock foam production process. The new manufacturing technology is expected to be in place and fully operational within five years. At that time the annual usage rate of methylene chloride is expected to be less than half of the requested annual usage rate of 720,000 lbs/yr (360.0 TPY), or less than 360,000 lbs/yr (180.0 TPY).

In support of Foamex, L.P.'s request for a permit amendment, Harding Lawson Associates (HLA) has prepared this risk assessment to show that the increased methylene chloride emissions from the facility over a five year period and the reduced emissions after the five year period pose less than a one-in-one-million increased cancer risk over a lifetime (70 years). Based on discussions with FDEP, the risk assessment is limited to methylene chloride, because the results of the modeling presented in Volume II: Dispersion Modeling Analysis of the permit application show that

- the estimated maximum off-site concentrations due to the emissions of all other compounds from the facility meet the applicable FDEP Ambient Reference Concentrations (ARCs); and
- the estimated maximum off-site annual concentration of methylene chloride due to the increased emissions from the facility exceeds the FDEP annual ARC for methylene chloride.

The basis of the risk assessment was to calculate the maximum off-site annual methylene chloride concentration due to emissions from the facility averaged over a lifetime (70 years) and compare that concentration with an annual ambient reference concentration that represents a one-in-one-million cancer risk as a result of exposure over a lifetime. The risk assessment is presented in the following three sections:

1) Exposure Assessment which identifies the compound of concern, exposure pathway, exposed populations, exposure duration, and estimated off-site exposure concentration;

2) Toxicity Assessment which provides a discussion of the cancer unit risk factor used to assess the risk and the weight of evidence for carcinogenicity; and

3) Risk Characterization which compares the results of the estimated maximum off-site air concentration with the annual ambient reference concentration associated with an incremental lifetime cancer risk of one-in-one-million.

EXPOSURE ASSESSMENT

Foamex currently uses methylene chloride as the blowing agent in its slabstock polyurethane foam production process. In the process the raw materials (toluene diisocyanate, polyol, water, catalysts, surfactants, pigment and/or flame retardant additives, and methylene chloride) are mixed and discharged into a trough where the mixture begins to react and flow down the trough in an enclosed tunnel. Heat generated by the exothermic reaction volatilizes the methylene chloride which serves to reduce the foam density and to provide cooling of the mixture as it discharges energy during the exothermic reaction. The foam continues down the foam line conveyor in the enclosed tunnel and is cut into "buns" and stored in the long bun storage room. The foam releases 60% of the methylene chloride as it travels through the tunnel before reaching the long bun storage room and these emissions are vented to the atmosphere via a 125 ft high exhaust stack. The foam buns are stored temporarily in the long bun storage room during a twelve hour cure period, during which time the foam continues to release 35% of the remaining methylene chloride at a diminishing rate. Negative pressure is maintained in the long bun storage room and the methylene chloride emissions are vented to the atmosphere via another 125 ft high exhaust stack. The remaining 5% of the methylene chloride in the foam is released during subsequent foam fabrication operations along in three isolated areas at the facility and is vented to the atmosphere via three 53 ft high exhaust stacks. Also, a small amount of methylene chloride is emitted from the glue used during the foam fabrication operations through the same three exhaust stacks. (A more detailed discussion of the production process can be found in the permit application.)

Since the methylene chloride used in the production process is emitted to the atmosphere as a vapor, the only complete route of exposure to the methylene chloride is inhalation.

To be conservative, the potential exposed populations to the emissions of methylene chloride were assumed to be exposed to the maximum off-site air concentration. Therefore, the maximum off-site annual ground level concentration of methylene chloride was estimated in Volume II: Dispersion Modeling Analysis of the permit application based on the increased annual methylene chloride usage of 720,000 lbs/yr. Using the EPA Industrial Source Complex-Short Term (ISCST2) model, the estimated maximum off-site annual concentration is 2.73 $\mu g/m^3$. A detailed discussion of the modeling can be found in Volume II: Dispersion Modeling Analysis of the permit application.

As part of the risk assessment, additional modeling was conducted to determine the maximum off-site annual ground level concentration based on the reduced methylene chloride usage of 360,000 lbs/yr after the five year period of increased emissions. The resulting annual concentration from the reduced emissions is 1.38 $\mu g/m^3$. This modeling was conducted in the same manner as the modeling presented in Volume II: Dispersion Modeling Analysis of the permit application with reduced methylene chloride emission rates. The emission rates used and the ISCST2 output listing from this modeling are presented in Appendix A of this risk assessment.

As previously discussed, the increased emissions of methylene chloride will occur for a maximum of five years. Therefore, the duration of the exposure to the estimated concentration at the increased emission rate will not exceed five years and the exposure duration to the estimated concentration at the reduced emission rate will be for the remainder of a lifetime exposure of 70 years, or 65 years.

TOXICITY ASSESSMENT

Information regarding the toxicity of methylene chloride was obtained from the EPA Integrated Risk Information System (IRIS) database. Methylene chloride is classified by EPA as a probable human carcinogen (EPA Weight-of-Evidence Classification B2) with sufficient evidence of carcinogenicity in animals and inadequate human data. The IRIS database provides additional toxicity data for methylene chloride including an inhalation exposure unit risk factor based on lifetime exposure to methylene chloride in air of 4.7E-7 $(\mu g/m^3)^{-1}$. A printout of the IRIS database information for methylene chloride is included as Appendix B.

The FDEP annual ARC for methylene chloride of 2.0 $\mu g/m^3$ is based on an ambient concentration that represents a one-in-a-million increased cancer risk as a result of exposure to that level over a lifetime (70 years). It was calculated by dividing 1.0E-6 by the EPA unit risk factor of 4.7E-7 $(\mu g/m^3)^{-1}$.

RISK CHARACTERIZATION

In order to characterize the risk of the increased methylene chloride emissions from the facility over a five year period and the reduced emissions after the five year period, an maximum off-site annual methylene chloride concentration due to emissions from the facility averaged over a lifetime (70 years) is calculated as follows:

$$[(2.73\ \mu g/m^3 \times 5\ \text{years}) + (1.38\ \mu g/m^3 \times 65\ \text{years})] \div 70\ \text{years} = 1.48\ \mu g/m^3$$

The resulting off-site annual methylene concentration averaged over a lifetime was then compared with an annual ambient reference concentration that represents a one-in-one-million cancer risk as a result of exposure over a lifetime, which is the basis of the FDEP annual ARC for methylene chloride of 2.0 $\mu g/m^3$. The results, presented below, show that the maximum off-site annual ground level concentration of methylene chloride averaged over a lifetime is less than the FDEP ARC and, therefore, the exposure to the estimated methylene chloride emissions from the facility over a lifetime pose less than a one-in-one-million increased cancer risk.

Compound	Averaging Time	Maximum Off-Site Annual Ground Level Concentration Averaged Over a Lifetime ($\mu g/m^3$)	FDEP Annual ARC Representing a One-in-One-Million Increased Cancer Risk Over a Lifetime ($\mu g/m^3$)
Methylene Chloride	Annual	1.48	2.0

Appendix A

Emission Rates and ISCST2 Output Listing for Reduced Methylene Chloride Emissions

Emission Rate Calculations for Reduced Methylene Chloride Usage

Slabstock Foam Production Methylene Chloride emission distribution:

Foam Line Stack	=	60%
Long Bun Storage Room Stack	=	35%
3 Exhaust Fans	=	5%

It is assumed that the 3 exhaust fans' emissions are equally distributed among all 3 exhaust fans.

Maximum annual slabstock foam production methylene chloride usage = 360,000 lb/yr

Annual slabstock foam production average methylene chloride emission rate = 360,000 lb/yr ÷ 8,760 hr/yr
= 41.096 lb/hr

Distributed annual slabstock foam production average methylene chloride emission rates:

Foam Line Stack	=	41.096 lb/hr x 60%	=	24.6576 lb/hr
Long Bun Storage Room Stack	=	41.096 lb/hr x 35%	=	14.3836 lb/hr
3 Exhaust Fans	=	41.096 lb/hr x 5%	=	2.0548 lb/hr

Maximum annual glue usage = 4,600 lb/yr

Annual gluing process average methylene chloride emission rate = 4,600 lb/yr x 70% ÷ 8,760 hr/yr
= 0.3676 lb/hr

Distributed annual average total methylene chloride emission rates:

Foam Line Stack	=	24.6576 lb/hr		
Long Bun Storage Room Stack	=	14.3836 lb/hr		
3 Exhaust Fans	=	2.0548 lb/hr + 0.3676 lb/hr	=	2.4224 lb/hr
Each Exhaust Fan	=	2.4224 lb/hr ÷ 3	=	0.8075 lb/hr

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                ISCST2 - (DATED 93109)

                IBM-PC VERSION (2.11 ) ISCST2F
                (C) COPYRIGHT 1992, TRINITY CONSULTANTS, INC.
                SERIAL NUMBER 10573 SOLD TO CROSS, TESSITORE & ASSOC.

Run Began on  6/01/1996 at 13:00:42


*** TRINITY SOURCE FILE NAME: C:\PROJECT\26005\MODELDAT\FMXSRCA.PNT
*** TRINITY DOWNWASH FILE NAME: C:\PROJECT\26005\MODELDAT\FMXBPIP.WAK
*** TRINITY RECEPTOR FILE NAME: C:\PROJECT\26005\MODELDAT\FMXREC.REC
CO STARTING
CO TITLEONE Foamex;125' Foam Line & LBSR Stacks(GEP);53' Exhaust Fan Stacks (3)
CO TITLETWO Methlyene Chloride Rolling Annual Average Emissions; 360,000 lb/yr
CO MODELOPT DFAULT CONC RURAL
CO AVERTIME PERIOD
CO POLLUTID MC_AN_X
CO TERRHGTS FLAT
CO ELEVUNIT FEET
CO RUNORNOT RUN
CO FINISHED
SO STARTING
SO LOCATION FOAMLINE POINT     175.87     119.79       0.00
SO SRCPARAM FOAMLINE 3.106802      38.10     299.82    24.5307      0.857
SO LOCATION LONGBUN POINT     152.40      17.07       0.00
SO SRCPARAM LONGBUN 1.812301      38.10     299.82    24.5307      0.857
SO LOCATION EXFAN_7 POINT     108.51     152.71       0.00
SO SRCPARAM EXFAN_7 0.101743      16.15     299.82    24.6109      1.105
SO LOCATION EXFAN_12 POINT     147.52     110.64       0.00
SO SRCPARAM EXFAN_12 0.101743      16.15     299.82    24.6109      1.105
SO LOCATION EXFAN_19 POINT     182.88     102.56       0.00
SO SRCPARAM EXFAN_19 0.101743      16.15     299.82    24.6109      1.105
SO BUILDHGT FOAMLINE    15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT FOAMLINE    12.19    12.19    12.19    12.19    12.19    12.19
SO BUILDHGT FOAMLINE    12.19    12.19    15.24    15.24    15.24    12.19
SO BUILDHGT FOAMLINE    12.19    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT FOAMLINE    12.19    12.19    12.19    12.19    12.19    12.19
SO BUILDHGT FOAMLINE    12.19    12.19    15.24    15.24    15.24    15.24
SO BUILDWID  FOAMLINE      80.42    88.29    93.48    95.83    95.26    91.81
SO BUILDWID  FOAMLINE      39.97    39.64    38.10    39.64    39.97    39.09
SO BUILDWID  FOAMLINE      37.02    33.83    93.48    88.29    80.42    12.19
SO BUILDWID  FOAMLINE      18.62    88.29    93.48    95.83    95.26    91.81
SO BUILDWID  FOAMLINE      39.97    39.64    38.10    39.64    39.97    39.09
SO BUILDWID  FOAMLINE      37.02    33.83    93.48    88.29    80.42    70.11
SO BUILDHGT LONGBUN     15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT LONGBUN     15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT LONGBUN     15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT LONGBUN     15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT LONGBUN     15.24    15.24    15.24    15.24    15.24    15.24
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SO BUILDHGT LONGBUN    15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDWID  LONGBUN      80.42    88.29    93.48    95.83    95.26    91.81
SO BUILDWID  LONGBUN      85.56    76.71    65.53    76.71    85.56    91.81
SO BUILDWID  LONGBUN      95.26    95.83    93.48    88.29    80.42    70.11
SO BUILDWID  LONGBUN      80.42    88.29    93.48    95.83    95.26    91.81
SO BUILDWID  LONGBUN      85.56    76.71    65.53    76.71    85.56    91.81
SO BUILDWID  LONGBUN      95.26    95.83    93.48    88.29    80.42    70.11
SO BUILDHGT EXFAN_7    10.67    10.67    10.67    10.67    10.67    10.67
SO BUILDHGT EXFAN_7    10.67    10.67    10.67    10.67    10.67    10.67
SO BUILDHGT EXFAN_7    10.67    10.67    10.67    10.67    10.67    10.67
SO BUILDHGT EXFAN_7    10.67    10.67    10.67    10.67    10.67    10.67
SO BUILDHGT EXFAN_7    10.67    10.67    10.67    10.67    10.67    10.67
SO BUILDHGT EXFAN_7    15.24    15.24    15.24    15.24    15.24    10.67
SO BUILDWID  EXFAN_7     116.96   132.83   144.67   152.11   154.93   153.04
SO BUILDWID  EXFAN_7     146.50   135.51   120.40   129.50   140.77   147.76
SO BUILDWID  EXFAN_7     150.26   148.19   141.62   130.75   115.90    97.54
SO BUILDWID  EXFAN_7     116.96   132.83   144.67   152.11   154.93   153.04
SO BUILDWID  EXFAN_7     146.50   135.51   120.40   129.50   140.77   147.76
SO BUILDWID  EXFAN_7      95.26    95.83    93.48    88.29    80.42    97.54
SO BUILDHGT EXFAN_12    15.24    15.24    15.24    15.24    15.24    12.19
SO BUILDHGT EXFAN_12    12.19    12.19    12.19    12.19    12.19    15.24
SO BUILDHGT EXFAN_12    15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT EXFAN_12    15.24    15.24    15.24    15.24    15.24    12.19
SO BUILDHGT EXFAN_12    12.19    12.19    12.19    12.19    12.19    15.24
SO BUILDHGT EXFAN_12    15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDWID  EXFAN_12     80.42    88.29    93.48    95.83    95.26    39.09
SO BUILDWID  EXFAN_12     39.97    39.64   103.63   114.23    39.97    91.81
SO BUILDWID  EXFAN_12     95.26    95.83    93.48    88.29    80.42    70.11
SO BUILDWID  EXFAN_12     80.42    88.29    93.48    95.83    95.26    39.09
SO BUILDWID  EXFAN_12     39.97    39.64    38.10    39.64    39.97    91.81
SO BUILDWID  EXFAN_12     95.26    95.83    93.48    88.29    80.42    70.11
SO BUILDHGT EXFAN_19    15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT EXFAN_19    15.24    12.19    12.19    12.19    12.19    12.19
SO BUILDHGT EXFAN_19    12.19    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT EXFAN_19    15.24    15.24    15.24    15.24    15.24    15.24
SO BUILDHGT EXFAN_19    15.24    12.19    12.19    12.19    12.19    12.19
SO BUILDHGT EXFAN_19    12.19    15.24    15.24    15.24    15.24    15.24
SO BUILDWID  EXFAN_19     80.42    88.29    93.48    95.83    95.26    91.81
SO BUILDWID  EXFAN_19     85.56    39.64    38.10    39.64    39.97    39.09
SO BUILDWID  EXFAN_19     37.02    95.83    93.48    88.29    80.42    70.11
SO BUILDWID  EXFAN_19     80.42    88.29    93.48    95.83    95.26    91.81
SO BUILDWID  EXFAN_19     85.56    39.64    38.10    39.64    39.97    39.09
SO BUILDWID  EXFAN_19     37.02    95.83    93.48    88.29    80.42    70.11
SO EMISUNIT 1000000.000000 GRAMS/SEC MICROGRAMS/M**3
SO SRCGROUP ALL
SO FINISHED
RE STARTING
RE GRIDPOLR POLAR_1  STA
RE GRIDPOLR POLAR_1  ORIG 106.68 110.64
RE GRIDPOLR POLAR_1  DIST 150.00 200.00 250.00 300.00
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RE GRIDPOLR POLAR_1  DIST 350.00 400.00 450.00 500.00
RE GRIDPOLR POLAR_1  DIST 550.00 600.00 650.00 700.00
RE GRIDPOLR POLAR_1  DIST 750.00 800.00 850.00 900.00
RE GRIDPOLR POLAR_1  DIST 950.00 1000.00
RE GRIDPOLR POLAR_1  GDIR 36 10.00 10.00
RE GRIDPOLR POLAR_1  END
RE DISCCART 0.00 0.00
RE DISCCART 15.24 0.00
RE DISCCART 30.48 0.00
RE DISCCART 45.72 0.00
RE DISCCART 60.96 0.00
RE DISCCART 76.20 0.00
RE DISCCART 91.44 0.00
RE DISCCART 106.68 0.00
RE DISCCART 121.92 0.00
RE DISCCART 137.16 0.00
RE DISCCART 152.40 0.00
RE DISCCART 167.64 0.00
RE DISCCART 182.88 0.00
RE DISCCART 198.12 0.00
RE DISCCART 213.36 0.00
RE DISCCART 213.36 15.24
RE DISCCART 213.36 30.48
RE DISCCART 213.36 45.72
RE DISCCART 213.36 60.96
RE DISCCART 213.36 76.20
RE DISCCART 213.36 91.44
RE DISCCART 213.36 106.68
RE DISCCART 213.36 121.92
RE DISCCART 213.36 137.16
RE DISCCART 213.36 152.40
RE DISCCART 213.36 167.64
RE DISCCART 213.36 182.88
RE DISCCART 213.36 198.12
RE DISCCART 213.36 213.36
RE DISCCART 213.36 220.98
RE DISCCART 198.12 220.98
RE DISCCART 182.88 220.98
RE DISCCART 167.64 220.98
RE DISCCART 152.40 220.98
RE DISCCART 137.16 220.98
RE DISCCART 121.92 220.98
RE DISCCART 106.68 220.98
RE DISCCART 91.44 220.98
RE DISCCART 76.20 220.98
RE DISCCART 60.96 220.98
RE DISCCART 45.72 220.98
RE DISCCART 30.48 220.98
RE DISCCART 15.24 220.98
RE DISCCART 0.00 220.98
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RE DISCCART 0.00 213.36
RE DISCCART 0.00 198.12
RE DISCCART 0.00 182.88
RE DISCCART 0.00 167.64
RE DISCCART 0.00 152.40
RE DISCCART 0.00 137.16
RE DISCCART 0.00 121.92
RE DISCCART 0.00 106.68
RE DISCCART 0.00 91.44
RE DISCCART 0.00 76.20
RE DISCCART 0.00 60.96
RE DISCCART 0.00 45.72
RE DISCCART 0.00 30.48
RE DISCCART 0.00 15.24
RE FINISHED
ME STARTING
ME INPUTFIL C:\PROJECT\26005\MODELDAT\ORLPRE86.BIN UNFORM
ME ANEMHGHT   10.000 METERS
ME SURFDATA 12815 1986 ORLANDO
ME UAIRDATA 12842 1986 TAMPA
ME STARTEND 1986 1 1 1 1986 12 31 24
ME FINISHED
OU STARTING
OU FINISHED

************************************
*** SETUP Finishes Successfully ***
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*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** MODEL SETUP OPTIONS SUMMARY ***

- -

**Model Is Setup For Calculation of Average CONCentration Values.

**Model Uses RURAL Dispersion.

**Model Uses Regulatory DEFAULT Options:
1. Final Plume Rise.
2. Stack-tip Downwash.
3. Buoyancy-induced Dispersion.
4. Use Calms Processing Routine.
5. Not Use Missing Data Processing Routine.
6. Default Wind Profile Exponents.
7. Default Vertical Potential Temperature Gradients.
8. "Upper Bound" Values for Supersquat Buildings.
9. No Exponential Decay for RURAL Mode

**Model Assumes Receptors on FLAT Terrain.

**Model Assumes No FLAGPOLE Receptor Heights.

**Model Calculates PERIOD Averages Only

**This Run Includes: 5 Source(s); 1 Source Group(s); and 706 Receptor(s)

**The Model Assumes A Pollutant Type of: MC_AN_X

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
Model Outputs Tables of PERIOD Averages by Receptor

**NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours
m for Missing Hours
b for Both Calm and Missing Hours

**Misc. Inputs: Anem. Hgt. (m) = 10.00 ; Decay Coef. = 0.0000 ; Rot. Angle = 0.0
Emission Units = GRAMS/SEC ; Emission Rate Unit Factor = 0.10000E+07
Output Units = MICROGRAMS/M**3

**Input Runstream File: C:\PROJECT\26005\MODELDAT\FMXMCANX.DAT ; **Output Print File: C:\PROJECT\26005\MODELDAT\FMXMCANX.LST

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (USER UNITS)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
FOAMLINE	0	0.31068E+01	175.9	119.8	0.0	38.10	299.82	24.53	0.86	YES	
LONGBUN	0	0.18123E+01	152.4	17.1	0.0	38.10	299.82	24.53	0.86	YES	
EXFAN_7	0	0.10174E+00	108.5	152.7	0.0	16.15	299.82	24.61	1.11	YES	
EXFAN_12	0	0.10174E+00	147.5	110.6	0.0	16.15	299.82	24.61	1.11	YES	
EXFAN_19	0	0.10174E+00	182.9	102.6	0.0	16.15	299.82	24.61	1.11	YES	

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
ALL	FOAMLINE, LONGBUN , EXFAN_7 , EXFAN_12, EXFAN_19,

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** DIRECTION SPECIFIC BUILDING DIMENSIONS ***

SOURCE ID: FOAMLINE

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	15.2,	80.4,	0	2	15.2,	88.3,	0	3	15.2,	93.5,	0	4	15.2,	95.8,	0	5	15.2,	95.3,	0	6	15.2,	91.8,	0
7	12.2,	40.0,	0	8	12.2,	39.6,	0	9	12.2,	38.1,	0	10	12.2,	39.6,	0	11	12.2,	40.0,	0	12	12.2,	39.1,	0
13	12.2,	37.0,	0	14	12.2,	33.8,	0	15	15.2,	93.5,	0	16	15.2,	88.3,	0	17	15.2,	80.4,	0	18	12.2,	12.2,	0
19	12.2,	18.6,	0	20	15.2,	88.3,	0	21	15.2,	93.5,	0	22	15.2,	95.8,	0	23	15.2,	95.3,	0	24	15.2,	91.8,	0
25	12.2,	40.0,	0	26	12.2,	39.6,	0	27	12.2,	38.1,	0	28	12.2,	39.6,	0	29	12.2,	40.0,	0	30	12.2,	39.1,	0
31	12.2,	37.0,	0	32	12.2,	33.8,	0	33	15.2,	93.5,	0	34	15.2,	88.3,	0	35	15.2,	80.4,	0	36	15.2,	70.1,	0

SOURCE ID: LONGBUN

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	15.2,	80.4,	0	2	15.2,	88.3,	0	3	15.2,	93.5,	0	4	15.2,	95.8,	0	5	15.2,	95.3,	0	6	15.2,	91.8,	0
7	15.2,	85.6,	0	8	15.2,	76.7,	0	9	15.2,	65.5,	0	10	15.2,	76.7,	0	11	15.2,	85.6,	0	12	15.2,	91.8,	0
13	15.2,	95.3,	0	14	15.2,	95.8,	0	15	15.2,	93.5,	0	16	15.2,	88.3,	0	17	15.2,	80.4,	0	18	15.2,	70.1,	0
19	15.2,	80.4,	0	20	15.2,	88.3,	0	21	15.2,	93.5,	0	22	15.2,	95.8,	0	23	15.2,	95.3,	0	24	15.2,	91.8,	0
25	15.2,	85.6,	0	26	15.2,	76.7,	0	27	15.2,	65.5,	0	28	15.2,	76.7,	0	29	15.2,	85.6,	0	30	15.2,	91.8,	0
31	15.2,	95.3,	0	32	15.2,	95.8,	0	33	15.2,	93.5,	0	34	15.2,	88.3,	0	35	15.2,	80.4,	0	36	15.2,	70.1,	0

SOURCE ID: EXFAN_7

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	10.7,	117.0,	0	2	10.7,	132.8,	0	3	10.7,	144.7,	0	4	10.7,	152.1,	0	5	10.7,	154.9,	0	6	10.7,	153.0,	0
7	10.7,	146.5,	0	8	10.7,	135.5,	0	9	10.7,	120.4,	0	10	10.7,	129.5,	0	11	10.7,	140.8,	0	12	10.7,	147.8,	0
13	10.7,	150.3,	0	14	10.7,	148.2,	0	15	10.7,	141.6,	0	16	10.7,	130.8,	0	17	10.7,	115.9,	0	18	10.7,	97.5,	0
19	10.7,	117.0,	0	20	10.7,	132.8,	0	21	10.7,	144.7,	0	22	10.7,	152.1,	0	23	10.7,	154.9,	0	24	10.7,	153.0,	0
25	10.7,	146.5,	0	26	10.7,	135.5,	0	27	10.7,	120.4,	0	28	10.7,	129.5,	0	29	10.7,	140.8,	0	30	10.7,	147.8,	0
31	15.2,	95.3,	0	32	15.2,	95.8,	0	33	15.2,	93.5,	0	34	15.2,	88.3,	0	35	15.2,	80.4,	0	36	10.7,	97.5,	0

SOURCE ID: EXFAN_12

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	15.2,	80.4,	0	2	15.2,	88.3,	0	3	15.2,	93.5,	0	4	15.2,	95.8,	0	5	15.2,	95.3,	0	6	12.2,	39.1,	0
7	12.2,	40.0,	0	8	12.2,	39.6,	0	9	12.2,	103.6,	0	10	12.2,	114.2,	0	11	12.2,	40.0,	0	12	15.2,	91.8,	0
13	15.2,	95.3,	0	14	15.2,	95.8,	0	15	15.2,	93.5,	0	16	15.2,	88.3,	0	17	15.2,	80.4,	0	18	15.2,	70.1,	0
19	15.2,	80.4,	0	20	15.2,	88.3,	0	21	15.2,	93.5,	0	22	15.2,	95.8,	0	23	15.2,	95.3,	0	24	12.2,	39.1,	0
25	12.2,	40.0,	0	26	12.2,	39.6,	0	27	12.2,	38.1,	0	28	12.2,	39.6,	0	29	12.2,	40.0,	0	30	15.2,	91.8,	0
31	15.2,	95.3,	0	32	15.2,	95.8,	0	33	15.2,	93.5,	0	34	15.2,	88.3,	0	35	15.2,	80.4,	0	36	15.2,	70.1,	0

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** DIRECTION SPECIFIC BUILDING DIMENSIONS ***

SOURCE ID: EXFAN_19

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	15.2,	80.4,	0	2	15.2,	88.3,	0	3	15.2,	93.5,	0	4	15.2,	95.8,	0	5	15.2,	95.3,	0	6	15.2,	91.8,	0
7	15.2,	85.6,	0	8	12.2,	39.6,	0	9	12.2,	38.1,	0	10	12.2,	39.6,	0	11	12.2,	40.0,	0	12	12.2,	39.1,	0
13	12.2,	37.0,	0	14	15.2,	95.8,	0	15	15.2,	93.5,	0	16	15.2,	88.3,	0	17	15.2,	80.4,	0	18	15.2,	70.1,	0
19	15.2,	80.4,	0	20	15.2,	88.3,	0	21	15.2,	93.5,	0	22	15.2,	95.8,	0	23	15.2,	95.3,	0	24	15.2,	91.8,	0
25	15.2,	85.6,	0	26	12.2,	39.6,	0	27	12.2,	38.1,	0	28	12.2,	39.6,	0	29	12.2,	40.0,	0	30	12.2,	39.1,	0
31	12.2,	37.0,	0	32	15.2,	95.8,	0	33	15.2,	93.5,	0	34	15.2,	88.3,	0	35	15.2,	80.4,	0	36	15.2,	70.1,	0

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** GRIDDED RECEPTOR NETWORK SUMMARY ***

*** NETWORK ID: POLAR_1 ; NETWORK TYPE: GRIDPOLR ***

*** ORIGIN FOR POLAR NETWORK ***

X-ORIG = 106.68 ; Y-ORIG = 110.64 (METERS)

*** DISTANCE RANGES OF NETWORK ***
(METERS)

150.0,	200.0,	250.0,	300.0,	350.0,	400.0,	450.0,	500.0,	550.0,	600.0,
650.0,	700.0,	750.0,	800.0,	850.0,	900.0,	950.0,	1000.0,		

*** DIRECTION RADIALS OF NETWORK ***
(DEGREES)

10.0,	20.0,	30.0,	40.0,	50.0,	60.0,	70.0,	80.0,	90.0,	100.0,
110.0,	120.0,	130.0,	140.0,	150.0,	160.0,	170.0,	180.0,	190.0,	200.0,
210.0,	220.0,	230.0,	240.0,	250.0,	260.0,	270.0,	280.0,	290.0,	300.0,
310.0,	320.0,	330.0,	340.0,	350.0,	360.0,				

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZFLAG)
(METERS)

```
(     0.0,      0.0,      0.0,      0.0);      (    15.2,      0.0,      0.0,      0.0);
(    30.5,      0.0,      0.0,      0.0);      (    45.7,      0.0,      0.0,      0.0);
(    61.0,      0.0,      0.0,      0.0);      (    76.2,      0.0,      0.0,      0.0);
(    91.4,      0.0,      0.0,      0.0);      (   106.7,      0.0,      0.0,      0.0);
(   121.9,      0.0,      0.0,      0.0);      (   137.2,      0.0,      0.0,      0.0);
(   152.4,      0.0,      0.0,      0.0);      (   167.6,      0.0,      0.0,      0.0);
(   182.9,      0.0,      0.0,      0.0);      (   198.1,      0.0,      0.0,      0.0);
(   213.4,      0.0,      0.0,      0.0);      (   213.4,     15.2,      0.0,      0.0);
(   213.4,     30.5,      0.0,      0.0);      (   213.4,     45.7,      0.0,      0.0);
(   213.4,     61.0,      0.0,      0.0);      (   213.4,     76.2,      0.0,      0.0);
(   213.4,     91.4,      0.0,      0.0);      (   213.4,    106.7,      0.0,      0.0);
(   213.4,    121.9,      0.0,      0.0);      (   213.4,    137.2,      0.0,      0.0);
(   213.4,    152.4,      0.0,      0.0);      (   213.4,    167.6,      0.0,      0.0);
(   213.4,    182.9,      0.0,      0.0);      (   213.4,    198.1,      0.0,      0.0);
(   213.4,    213.4,      0.0,      0.0);      (   213.4,    221.0,      0.0,      0.0);
(   198.1,    221.0,      0.0,      0.0);      (   182.9,    221.0,      0.0,      0.0);
(   167.6,    221.0,      0.0,      0.0);      (   152.4,    221.0,      0.0,      0.0);
(   137.2,    221.0,      0.0,      0.0);      (   121.9,    221.0,      0.0,      0.0);
(   106.7,    221.0,      0.0,      0.0);      (    91.4,    221.0,      0.0,      0.0);
(    76.2,    221.0,      0.0,      0.0);      (    61.0,    221.0,      0.0,      0.0);
(    45.7,    221.0,      0.0,      0.0);      (    30.5,    221.0,      0.0,      0.0);
(    15.2,    221.0,      0.0,      0.0);      (     0.0,    221.0,      0.0,      0.0);
(     0.0,    213.4,      0.0,      0.0);      (     0.0,    198.1,      0.0,      0.0);
(     0.0,    182.9,      0.0,      0.0);      (     0.0,    167.6,      0.0,      0.0);
(     0.0,    152.4,      0.0,      0.0);      (     0.0,    137.2,      0.0,      0.0);
(     0.0,    121.9,      0.0,      0.0);      (     0.0,    106.7,      0.0,      0.0);
(     0.0,     91.4,      0.0,      0.0);      (     0.0,     76.2,      0.0,      0.0);
(     0.0,     61.0,      0.0,      0.0);      (     0.0,     45.7,      0.0,      0.0);
(     0.0,     30.5,      0.0,      0.0);      (     0.0,     15.2,      0.0,      0.0);
```

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

* SOURCE-RECEPTOR COMBINATIONS LESS THAN 1.0 METER OR 3*ZLB *
IN DISTANCE. CALCULATIONS MAY NOT BE PERFORMED.

SOURCE ID	- - RECEPTOR LOCATION - - XR (METERS)	YR (METERS)	DISTANCE (METERS)
LONGBUN	121.9	0.0	34.93
LONGBUN	137.2	0.0	22.88
LONGBUN	152.4	0.0	17.07
LONGBUN	167.6	0.0	22.88
LONGBUN	182.9	0.0	34.93
EXFAN_19	213.4	91.4	32.45
EXFAN_19	213.4	106.7	30.76
EXFAN_19	213.4	121.9	36.11

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

```
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1
```

METEOROLOGICAL DATA PROCESSED BETWEEN START DATE: 86 1 1 1
AND END DATE: 86 12 31 24

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	-.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***

(DEGREES KELVIN PER METER)

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: C:\PROJECT\26005\MODELDAT\ORLPRE86.BIN FORMAT: UNFORM
SURFACE STATION NO.: 12815 UPPER AIR STATION NO.: 12842
NAME: ORLANDO NAME: TAMPA
YEAR: 1986 YEAR: 1986

YEAR	MONTH	DAY	HOUR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEIGHT (M) RURAL	URBAN
86	1	1	1	1.0	3.60	289.3	4	639.0	639.0
86	1	1	2	168.0	5.14	288.7	4	639.0	639.0
86	1	1	3	124.0	3.09	288.2	4	639.0	639.0
86	1	1	4	353.0	2.57	288.2	4	639.0	639.0
86	1	1	5	333.0	2.57	288.7	4	639.0	639.0
86	1	1	6	332.0	2.57	288.7	4	639.0	639.0
86	1	1	7	335.0	3.09	288.7	4	639.0	639.0
86	1	1	8	3.0	3.60	289.3	4	639.0	639.0
86	1	1	9	347.0	3.60	289.8	4	639.0	639.0
86	1	1	10	1.0	5.14	292.0	4	639.0	639.0
86	1	1	11	14.0	4.63	292.6	4	639.0	639.0
86	1	1	12	16.0	4.12	294.3	4	639.0	639.0
86	1	1	13	73.0	3.09	295.4	4	639.0	639.0
86	1	1	14	49.0	3.60	297.0	4	639.0	639.0
86	1	1	15	142.0	2.06	296.5	4	639.0	639.0
86	1	1	16	144.0	2.06	295.9	4	639.0	639.0
86	1	1	17	261.0	2.06	295.4	4	639.0	639.0
86	1	1	18	257.0	2.06	292.6	4	644.0	644.0
86	1	1	19	274.0	3.60	291.5	4	655.0	655.0
86	1	1	20	227.0	3.09	290.9	4	666.0	666.0
86	1	1	21	230.0	3.09	290.9	4	678.0	678.0
86	1	1	22	252.0	2.57	290.4	5	689.0	477.0
86	1	1	23	290.0	2.06	290.4	4	700.0	700.0
86	1	1	24	290.0	1.00	290.4	4	712.0	712.0

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FOAMLINE, LONGBUN , EXFAN_7 , EXFAN_12, EXFAN_19,

*** NETWORK ID: POLAR_1 ; NETWORK TYPE: GRIDPOLR ***

** CONC OF MC_AN_X IN MICROGRAMS/M**3 **

DIRECTION (DEGREES)	DISTANCE (METERS) 150.00	200.00	250.00	300.00	350.00	400.00	450.00	500.00	550.00
10.00	0.35356	0.56611	0.76407	0.93495	1.06480	1.15177	1.20823	1.24167	1.25936
20.00	0.34522	0.53345	0.71341	0.86466	0.97895	1.05618	1.10587	1.13561	1.15063
30.00	0.29893	0.46166	0.60857	0.74824	0.85627	0.92668	0.96806	0.99048	0.99902
40.00	0.24833	0.38612	0.53899	0.68893	0.81235	0.89913	0.95322	0.98614	1.00321
50.00	0.21243	0.35705	0.51419	0.66531	0.78559	0.86884	0.92033	0.95093	0.96620
60.00	0.17677	0.30140	0.44605	0.59430	0.72545	0.82580	0.89535	0.94239	0.97159
70.00	0.11851	0.23351	0.38675	0.55058	0.70181	0.82069	0.90529	0.96335	1.00005
80.00	0.10644	0.19862	0.32737	0.48225	0.63406	0.75060	0.82657	0.87060	0.89088
90.00	0.05020	0.12436	0.25479	0.41847	0.56522	0.66833	0.72913	0.76063	0.77079
100.00	0.04668	0.12130	0.25575	0.42421	0.57315	0.67407	0.72828	0.75143	0.75288
110.00	0.06822	0.15369	0.30908	0.50779	0.68814	0.81701	0.89402	0.93391	0.94617
120.00	0.08483	0.18127	0.33718	0.54475	0.74557	0.90109	1.00485	1.06766	1.09766
130.00	0.09419	0.19073	0.32940	0.52029	0.71116	0.85872	0.95412	1.00780	1.02969
140.00	0.10327	0.20015	0.30173	0.44725	0.59905	0.71833	0.79700	0.84122	0.86038
150.00	0.12609	0.21357	0.31039	0.42427	0.53889	0.63100	0.69454	0.73378	0.75605
160.00	0.14532	0.24611	0.35136	0.45492	0.55196	0.63219	0.69388	0.73779	0.76924
170.00	0.16264	0.27320	0.38971	0.51350	0.63049	0.72361	0.79132	0.83535	0.86371
180.00	0.17791	0.28392	0.39811	0.51657	0.62720	0.71801	0.78781	0.83943	0.88023
190.00	0.19808	0.29348	0.40447	0.51604	0.61313	0.68664	0.73758	0.77091	0.79311
200.00	0.23494	0.33202	0.44203	0.54842	0.63650	0.70144	0.74443	0.77131	0.78789
210.00	0.30011	0.42097	0.55277	0.67354	0.76540	0.82858	0.86683	0.88886	0.90121
220.00	0.37006	0.53244	0.70656	0.85902	0.96864	1.03964	1.07900	1.09748	1.10263
230.00	0.38744	0.60577	0.81698	0.99194	1.12033	1.20899	1.26540	1.29790	1.31453
240.00	0.38013	0.62167	0.84817	1.02608	1.15202	1.23861	1.29616	1.33311	1.35666
250.00	0.35576	0.59522	0.81522	0.98437	1.10007	1.17514	1.21889	1.24156	1.25129
260.00	0.35658	0.58853	0.79838	0.95934	1.07308	1.15147	1.20184	1.23275	1.25096
270.00	0.37397	0.61423	0.82608	0.98773	1.10371	1.18578	1.24091	1.27703	1.30026
280.00	0.38258	0.62718	0.83507	0.98551	1.08733	1.15459	1.19625	1.22103	1.23538
290.00	0.38606	0.62659	0.82859	0.97103	1.06347	1.12052	1.15200	1.16694	1.17208
300.00	0.40825	0.65539	0.85801	0.99752	1.08520	1.13787	1.16549	1.17741	1.18053
310.00	0.43551	0.67950	0.87401	0.99972	1.06953	1.10221	1.10867	1.09924	1.08211
320.00	0.41862	0.65120	0.82443	0.92984	0.98226	1.00108	0.99644	0.97853	0.95431
330.00	0.38122	0.59923	0.76531	0.86752	0.91856	0.93559	0.93041	0.91287	0.88961
340.00	0.35864	0.57473	0.74749	0.86385	0.93360	0.97103	0.98756	0.99014	0.98467

350.00	0.36872	0.60035	0.79521	0.93974	1.03609	1.09403	1.12541	1.13770	1.13797
360.00	0.35850	0.57775	0.77486	0.92785	1.03511	1.10319	1.14645	1.17143	1.18478

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FOAMLINE, LONGBUN , EXFAN_7 , EXFAN_12, EXFAN_19,

*** NETWORK ID: POLAR_1 ; NETWORK TYPE: GRIDPOLR ***

** CONC OF MC_AN_X IN MICROGRAMS/M**3 **

DIRECTION	DISTANCE (METERS)								
(DEGREES)	600.00	650.00	700.00	750.00	800.00	850.00	900.00	950.00	1000.00
10.00	1.26642	1.26608	1.25998	1.24938	1.23537	1.21835	1.19964	1.17743	1.15331
20.00	1.15569	1.15388	1.14682	1.13530	1.12052	1.10291	1.08364	1.06153	1.03724
30.00	0.99903	0.99428	0.98656	0.97658	0.96507	0.95236	0.93861	0.92343	0.90612
40.00	1.00966	1.00953	1.00470	0.99601	0.98457	0.97079	0.95529	0.93870	0.91869
50.00	0.97144	0.97060	0.96590	0.95819	0.94839	0.93686	0.92387	0.90987	0.89361
60.00	0.98810	0.99602	0.99827	0.99617	0.99082	0.98315	0.97331	0.96211	0.94901
70.00	1.02043	1.02953	1.03075	1.02594	1.01654	1.00389	0.98854	0.97156	0.95318
80.00	0.89468	0.88860	0.87698	0.86195	0.84502	0.82687	0.80811	0.78911	0.77013
90.00	0.76683	0.75468	0.73850	0.72003	0.70062	0.68074	0.66089	0.64134	0.62226
100.00	0.74102	0.72248	0.70146	0.67969	0.65822	0.63735	0.61731	0.59817	0.57989
110.00	0.93998	0.92330	0.90140	0.87683	0.85136	0.82574	0.80053	0.77603	0.75238
120.00	1.10421	1.09635	1.08030	1.05936	1.03575	1.01056	0.98485	0.95905	0.93340
130.00	1.02884	1.01444	0.99254	0.96643	0.93808	0.90863	0.87889	0.84935	0.82032
140.00	0.86177	0.85256	0.83758	0.81936	0.79965	0.77907	0.75818	0.73753	0.71721
150.00	0.76675	0.77036	0.76965	0.76587	0.76016	0.75233	0.74318	0.73320	0.72191
160.00	0.79248	0.81000	0.82326	0.83266	0.83914	0.84236	0.84293	0.84123	0.83730
170.00	0.88143	0.89184	0.89703	0.89818	0.89615	0.89100	0.88352	0.87426	0.86331
180.00	0.91315	0.94062	0.96362	0.98294	0.99839	1.00977	1.01807	1.02259	1.02297
190.00	0.80773	0.81752	0.82381	0.82800	0.83008	0.83002	0.82884	0.82586	0.81935
200.00	0.79757	0.80284	0.80492	0.80513	0.80353	0.80012	0.79572	0.79033	0.78088
210.00	0.90774	0.91098	0.91159	0.91067	0.90766	0.90306	0.89703	0.88980	0.87708
220.00	1.09952	1.09151	1.08026	1.06737	1.05290	1.03785	1.02241	1.00638	0.98549
230.00	1.32056	1.31937	1.31309	1.30323	1.29025	1.27578	1.25920	1.24055	1.21621
240.00	1.37139	1.37960	1.38307	1.38235	1.37816	1.37134	1.36153	1.34763	1.32706
250.00	1.25322	1.24990	1.24325	1.23386	1.22241	1.20933	1.19492	1.17725	1.15427
260.00	1.26030	1.26311	1.26077	1.25413	1.24408	1.23113	1.21584	1.19674	1.17082
270.00	1.31382	1.31968	1.31922	1.31341	1.30332	1.28965	1.27320	1.25254	1.22401
280.00	1.24247	1.24425	1.24195	1.23618	1.22763	1.21670	1.20383	1.18677	1.16273
290.00	1.17046	1.16387	1.15349	1.13992	1.12384	1.10573	1.08606	1.06274	1.03420
300.00	1.17787	1.17090	1.16047	1.14744	1.13207	1.11501	1.09630	1.07417	1.04651
310.00	1.06115	1.03812	1.01403	0.98959	0.96521	0.94120	0.91746	0.89275	0.86494
320.00	0.92777	0.90050	0.87352	0.84721	0.82183	0.79740	0.77366	0.74943	0.72419
330.00	0.86512	0.84115	0.81823	0.79702	0.77735	0.75907	0.74174	0.72395	0.70532
340.00	0.97520	0.96338	0.94986	0.93555	0.92050	0.90501	0.88915	0.87132	0.85234

350.00	1.13139	1.12043	1.10627	1.09023	1.07278	1.05400	1.03470	1.01276	0.99000
360.00	1.19098	1.19257	1.19048	1.18603	1.17917	1.17025	1.16028	1.14592	1.13017

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** THE PERIOD (8760 HRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): FOAMLINE, LONGBUN , EXFAN_7 , EXFAN_12, EXFAN_19,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF MC_AN_X IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
0.00	0.00	0.39942	15.24	0.00	0.34865
30.48	0.00	0.29540	45.72	0.00	0.24263
60.96	0.00	0.19961	76.20	0.00	0.15582
91.44	0.00	0.12584	106.68	0.00	0.10558
121.92	0.00	0.09333	137.16	0.00	0.09136
152.40	0.00	0.08897	167.64	0.00	0.09084
182.88	0.00	0.09538	198.12	0.00	0.09340
213.36	0.00	0.11053	213.36	15.24	0.08936
213.36	30.48	0.06939	213.36	45.72	0.05627
213.36	60.96	0.04702	213.36	76.20	0.03210
213.36	91.44	0.01870	213.36	106.68	0.01988
213.36	121.92	0.02076	213.36	137.16	0.05270
213.36	152.40	0.07464	213.36	167.64	0.10952
213.36	182.88	0.14105	213.36	198.12	0.18089
213.36	213.36	0.22111	213.36	220.98	0.23912
198.12	220.98	0.23587	182.88	220.98	0.22882
167.64	220.98	0.22219	152.40	220.98	0.22683
137.16	220.98	0.20198	121.92	220.98	0.19132
106.68	220.98	0.18979	91.44	220.98	0.20494
76.20	220.98	0.21037	60.96	220.98	0.23077
45.72	220.98	0.27321	30.48	220.98	0.32797
15.24	220.98	0.38600	0.00	220.98	0.44556
0.00	213.36	0.42312	0.00	198.12	0.37624
0.00	182.88	0.32024	0.00	167.64	0.26326
0.00	152.40	0.22711	0.00	137.16	0.20535
0.00	121.92	0.19333	0.00	106.68	0.18755
0.00	91.44	0.18725	0.00	76.20	0.19571
0.00	60.96	0.22543	0.00	45.72	0.27104
0.00	30.48	0.31474	0.00	15.24	0.36033

*** MODELING OPTIONS USED: CONC   RURAL FLAT   DFAULT

*** THE SUMMARY OF MAXIMUM PERIOD (8760 HRS) RESULTS ***

** CONC OF MC_AN_X IN MICROGRAMS/M**3   **

GROUP ID		AVERAGE CONC		RECEPTOR (XR,	YR,	ZELEV,	ZFLAG)	OF TYPE	NETWORK GRID-ID
ALL	1ST HIGHEST VALUE IS	1.38307	AT (	-499.54,	-239.36,	0.00,	0.00)	GP	POLAR_1
	2ND HIGHEST VALUE IS	1.38235	AT (	-542.84,	-264.36,	0.00,	0.00)	GP	POLAR_1
	3RD HIGHEST VALUE IS	1.37960	AT (	-456.24,	-214.36,	0.00,	0.00)	GP	POLAR_1
	4TH HIGHEST VALUE IS	1.37816	AT (	-586.14,	-289.36,	0.00,	0.00)	GP	POLAR_1
	5TH HIGHEST VALUE IS	1.37139	AT (	-412.94,	-189.36,	0.00,	0.00)	GP	POLAR_1
	6TH HIGHEST VALUE IS	1.37134	AT (	-629.44,	-314.36,	0.00,	0.00)	GP	POLAR_1

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** MODELING OPTIONS USED: CONC RURAL FLAT DFAULT

*** Message Summary For ISC2 Model Execution ***

--------- Summary of Total Messages --------

A Total of 0 Fatal Error Message(s)
A Total of 0 Warning Message(s)
A Total of 328 Informational Message(s)

A Total of 328 Calm Hours Identified

******** FATAL ERROR MESSAGES ********
*** NONE ***

******** WARNING MESSAGES ********
*** NONE ***

****
*** ISCST2 Finishes Successfully ***
****

Appendix B

EPA IRIS Database Information for Methylene Chloride

0070

Dichloromethane; CASRN 75-09-2 (07/01/93)

Health risk assessment information on a chemical is included in IRIS only after a comprehensive review of chronic toxicity data by work groups composed of U.S. EPA scientists from several Program Offices. The summaries presented in Sections I and II represent a consensus reached in the review process. The other sections contain U.S. EPA information which is specific to a particular EPA program and has been subject to review procedures prescribed by that Program Office. The regulatory actions in Section IV may not be based on the most current risk assessment, or may be based on a current, but unreviewed, risk assessment, and may take into account factors other than health effects (e.g., treatment technology). When considering the use of regulatory action data for a particular situation, note the date of the regulatory action, the date of the most recent risk assessment relating to that action, and whether technological factors were considered. Background information and explanations of the methods used to derive the values given in IRIS are provided in the five Background Documents in Service Code 5, which correspond to Sections I through V of the chemical files.

STATUS OF DATA FOR Dichloromethane

File On-Line 01/31/87

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	on-line	03/01/88
Inhalation RfC Assessment (I.B.)	pending	09/01/91
Carcinogenicity Assessment (II.)	on-line	01/01/91
Drinking Water Health Advisories (III.A.)	on-line	03/01/88
U.S. EPA Regulatory Actions (IV.)	on-line	01/01/92
Supplementary Data (V.)	no data	

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_I. CHRONIC HEALTH HAZARD ASSESSMENTS FOR NONCARCINOGENIC EFFECTS

__I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride
Last Revised -- 03/01/88

The Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis, but may not exist for other toxic effects such as carcinogenicity. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to Background Document 1 in Service Code 5 for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of compounds which are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file when a review of that evaluation is completed.

___I.A.1. ORAL RfD SUMMARY

Critical Effect	Experimental Doses*	UF	MF	RfD
Liver toxicity 2-Year Rat Drinking Water Bioassay National Coffee Association, 1982	NOAEL: 5.85 and 6.47 mg/kg/day for males and females, respectively LOAEL: 52.58 and 58.32 mg/kg/day for males and females, respectively	100	1	6E-2 mg/kg/day

*Conversion Factors: Doses reflect actual values and not nominal ones.

___I.A.2. PRINCIPAL AND SUPPORTING STUDIES (ORAL RfD)

National Coffee Association. 1982. 24-Month chronic toxicity and oncogenicity study of methylene chloride in rats. Final Report. Prepared by Hazleton Laboratories America, Inc., Vienna, VA. (Unpublished)

The chosen study appears to have been very well conducted, with 85 rats/ sex at each of four nominal dose groups (i.e., 5, 50, 125 and 250 mg/kg/day) for 2 years. A high-dose recovery group of 25 rats/sex, as well as two control groups of 85 and 50 rats/sex, was also tested. Many effects were monitored. Treatment related histological alterations of the liver were evident at nominal doses of 50 mg/kg/day or higher. The low nominal dose of 5 mg/kg/day was a NOAEL.

The supporting data base is limited. A NOAEL of 87 mg/cu.m was reported in one inhalation study (Haun et al., 1972). [The equivalent oral dose is about 28 mg/kg bw/day (i.e., 87 mg/cu.m x 0.5 x 0.223 cu.m/day/0.35 kg; these exposure values are for rats).]

___I.A.3. UNCERTAINTY AND MODIFYING FACTORS (ORAL RfD)

UF -- (10a x 10h) The 100-fold factor accounts for both the expected intra- and interspecies variability to the toxicity of this chemical in lieu of specific data.

MF -- None

___I.A.4. ADDITIONAL COMMENTS (ORAL RfD)

None.

___I.A.5. CONFIDENCE IN THE ORAL RfD

Study -- High
Data Base -- Medium
RfD -- Medium

The study is given a high confidence rating because a large number of animals of both sexes were tested in four dose groups, with a large number of controls. Many effects were monitored and a dose-related increase in severity was observed. The data base is rated medium to low because only a few studies support the NOAEL. Medium confidence in the RfD follows.

___I.A.6. EPA DOCUMENTATION AND REVIEW OF THE ORAL RfD

Source Document -- U.S. EPA, 1985

Other EPA Documentation -- None

Agency Work Group Review -- 06/24/85, 07/08/85, 11/06/85

Verification Date -- 11/06/85

___I.A.7. EPA CONTACTS (ORAL RfD)

Krishan Khanna / OST -- (202)260-7588

Michael L. Dourson / OHEA -- (513)569-7533

__I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride

A risk assessment for this substance/agent is under review by an EPA work group.

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_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride
Last Revised -- 01/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification --B2; probable human carcinogen

Basis -- Based on inadequate human data and sufficient evidence of carcinogenicity in animals; increased incidence of hepatocellular neoplasms and alveolar/bronchiolar neoplasms in male and female mice, and increased incidence of benign mammary tumors in both sexes of rats, salivary gland sarcomas in male rats and leukemia in female rats. This classification is supported by some positive genotoxicity data, although results in mammalian systems are generally negative.

___II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. Neither of two studies of chemical factory workers exposed to dichloromethane showed an excess of cancers (Ott et al., 1983; Friedlander et al., 1978; Hearne and Friedlander, 1981). The Ott et al. (1983) study was designed to examine cardiovascular effects, and consequently the study period was too short to allow for latency of site-specific cancers. In the Friedlander et al. (1978) study, exposures were low, but the data provided some suggestion of an increased incidence of pancreatic tumors. This study was recently updated to include a larger cohort, followed through 1984, and an investigation of possible confounding factors (Hearne et al., 1986, 1987). A nonsignificant excess in pancreatic cancer deaths was observed, which was interpreted by EPA (1987a) as neither clear evidence of carcinogenicity in humans, nor evidence of noncarcinogenicity. An update of the Ott et al. (1983) study, based on longer follow-up, indicated possible elevation of liver and biliary tract cancers (TSCA section 8(e) submission no. 8eHQ-0198-0772 FLWP et seq., 1989).

___II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. Dichloromethane administered in the drinking water induced a significant increase in combined hepatocellular carcinoma and neoplastic nodules in female F344 rats and a nonsignificant increase in combined hepatocellular carcinoma and neoplastic nodules in male B6C3F1 mice (NCA, 1982, 1983). Two inhalation studies with dichloromethane have shown an increased incidence of benign mammary tumors in both sexes of Sprague-Dawley (Burek et al., 1984) and F344 (NTP, 1986) rats. Male Sprague-Dawley rats had increased salivary gland sarcoma (Burek et al., 1984) and female F344 rats had increased leukemia incidence (NTP, 1986). Both sexes of B6C3F1 mice developed liver and lung tumors after dichloromethane treatment (NTP, 1986).

In a 2-year study by the National Coffee Association (1982, 1983), groups of 85 F344 rats/sex/dose received 5, 50, 125, or 250 (mg/kg)/day of dichloromethane in the drinking water. Control groups consisted of 135 rats/sex. In female rats the incidence of combined hepatocellular carcinoma and neoplastic nodules was statistically significantly increased in the 50 and 250 mg/kg dose groups when compared with matched controls (0/134, 1/85, 4/83, 1/85, and 6/85 in the five dose groups 0, 5, 50, 125, and 250 (mg/kg)/day, respectively). The incidence of hepatocellular carcinoma alone was not significantly increased (0/134, 0/85, 2/83, 0/85, 2/85). The combined incidence of hepatocellular carinoma and neoplastic nodules in controls and the 4 dose groups (472 rats: 4 with carcinoma and 8 with neoplastic nodules) was similar to that for historical controls (419 rats; 5 with carcinoma, 19 with neoplastic nodules). Male rats showed no increase in liver tumors.

In the same National Coffee Association study (1982, 1983), B6C3F1 mice received 0, 60, 125, 185, or 250 (mg/kg)/day of dichloromethane in drinking water. Treatment groups consisted of 50 female mice and 200, 100, 100, and 125 male mice (low to high dose). One hundred females and 125 males served as controls. Male mice had an increased incidence of combined neoplastic nodules and hepatocellular carcinoma (24/125, 51/200, 30/100, 31/99, 35/125). The increase was not dose-related, but the pairwise comparisons for the two mid-dose groups were reported to be statistically significant (U.S. EPA, 1985a). The hepatocellular carcinoma incidence alone for male mice (which was about 55 to 65% of the total) was not significantly elevated. Female mice did not have increased liver tumor incidence. The EPA (1985b) regarded this study as suggestive but not conclusive evidence for carcinogenicity of dichloromethane.

A gavage bioassay of dichloromethane conducted by NTP (1982) has not been published because of high mortality, much of which was attributed to gavage accidents.

Inhalation exposure of 107 to 109 Syrian hamsters/sex/dose to 0, 500, 1500, or 3500 ppm of dichloromethane for 6 hours/day, 5 days/week for 2 years did not induce neoplasia (Burek et al., 1984). Sprague-Dawley rats (129/sex/dose) were exposed under the same conditions. Female rats administered the highest dose experienced significantly reduced survival from 18-24 months. Female rats showed a dose-related increase in the average number of benign mammary tumors per rat (1.7, 2.3, 2.6, 3.0), although the numbers of rats with tumors were not significantly increased. A similar response was observed in male rats, but to a lesser degree. In the male rats there was a statistically significant positive trend in the incidence of sarcomas of the salivary gland (1/93, 0/94, 5/91, 11/88); the incidence was significantly elevated at the high dose. There is a question as to whether these doses reached the MTD, particularly in the hamsters and the male rats. In another study (Dow Chemical Co., 1982), 90 Sprague-Dawley rats/sex were exposed by inhalation to 0, 50, 200, or 500 ppm dichloromethane for 20 months (male) or 24 months (female). No salivary tumors were observed, but there was an exposure-related increase in the total number of benign mammary tumors in female rats, although the increase was not statistically significant in any individual exposure group.

Groups of 50 each male and female F344/N rats and B6C3F1 mice were exposed to dichloromethane by inhalation, 6 hours/day, 5 days/week for 2 years (NTP, 1986). Exposure concentrations were 0, 1000, 2000, or 4000 ppm for rats and 0, 2000, or 4000 ppm for mice. Survival of male rats was low; however, this apparently was not treatment-related. Survival was decreased in a treatment-related fashion for male and female mice and female rats. Mammary adenomas and fibroadenomas were significantly increased in male and female rats after survival adjustment, as were mononuclear cell leukemias in female rats. Among treated mice of both sexes there were significantly increased incidences of hepatocellular adenomas and carcinomas, and of alveolarbronchiolar adenomas and carcinomas, by life table tests. Adenomas and carcinomas were significantly increased alone as well as in combination. In addition, there were significant dose-related increases in the number of lung tumors per animal multiplicity in both sexes of mice.

Two inhalation assays using dogs, rabbits, guinea pigs, and rats showed no tumors, but were not conducted for the lifetime of the animals (Heppel et al., 1944; MacEwen et al., 1972). Theiss et al., (1977) injected Strain A male mice intraperitoneally with 0, 160, 400, or 800 mg/kg of dichloromethane 16 to 17 times, over 5 to 6 weeks. Survival of the animals was poor. The animals remaining 24 weeks after the first treatment were killed and examined for lung tumors; pulmonary adenomas were found.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Dichloromethane was mutagenic for Salmonella typhimurium with or without the addition of hepatic enzymes (Green, 1983) and produced mitotic recombination in yeast (Callen et al., 1980). Results in cultured mammalian cells have generally been negative, but dichloromethane has been shown to transform rat embryo cells and to enhance viral transformation of Syrian hamster embryo cells (Price et al., 1978; Hatch et al., 1983). Although chlorinated solvents have often been suspected of acting through a nongenotoxic mechanism of cell proliferation, Lefevre and Ashby (1989) found methylene chloride to be unable to induce hepatocellular division in mice.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

___II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 7.5E-3 per (mg/kg)/day

Drinking Water Unit Risk -- 2.1E-7 per (ug/L)

Extrapolation Method -- Linearized multistage procedure, extra risk

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	5E+2 ug/L
E-5 (1 in 100,000)	5E+1 ug/L
E-6 (1 in 1,000,000)	5E+0 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- hepatocellular adenomas or carcinomas (NTP) and hepatocellular cancer and neoplastic nodules (NCA)
Test Animals -- mouse/B6C3F1 (female, NTP; male, NCA)
Route -- inhalation (NTP); drinking water (NCA)
Reference -- NTP, 1986; National Coffee Association (NCA), 1983

Dose				
Administered (ppm)	Administered mg/kg/day	Human Equivalent (mg/kg)/day	Tumor Incidence	Reference
0	0	0	3/50	NTP, 1986
2000	1582	122	16/48	
4000	3162	244	40/48	
	0	0	24/125	NCA, 1983
	60	4.5	51/200	
	125	9.4	30/100	
	185	14.0	31/99	
	250	18.9	35/125	

___II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

The slope factor is an arithmetic mean of slope factors derived from NTP(1986) and the National Coffee Association (1983) data, 2.6E-3 per (mg/kg)/day and 1.2E-2 per (mg/kg)/day, respectively. The use of liver tumor data from the NTP inhalation bioassay was considered valid since dichloromethane is rapidly absorbed following either inhalation or ingestion.

Dose conversions used the mean body weight for female mice at the midpoint of the bioassay, and an estimated inhalation rate of 0.0407 cu.m/day. To obtain estimates of unit risk for humans, an inhalation rate of 20 cu.m/day was assumed. Dichloromethane was considered to be well-absorbed as a vapor at low doses. No pharmacokinetic or metabolism data have been used to modify the oral unit risk estimate, because such analyses have not yet been carried out.

The unit risk should not be used if the water concentration exceeds 5E+4 ug/L, since above this concentration the unit risk may not be appropriate.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

Adequate numbers of animals were used in both assays. Risk estimates were based on the more sensitive sex in each study. The two risk estimates were within a factor of 5.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 4.7E-7 per (ug/cu.m)

Extrapolation Method -- Linearized multistage procedure, extra risk

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	2E+2 ug/cu.m
E-5 (1 in 100,000)	2E+1 ug/cu.m
E-6 (1 in 1,000,000)	2E+0 ug/cu.m

II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- combined adenomas and carcinomas
Test Animals -- mouse/B6C3F1, female
Route -- inhalation
Reference -- NTP, 1986

	Dose			
Tumor Type	Administered (ppm)	Transformed Animal (mg/kg)/day	Human Equivalent (mg/kg)/day	Tumor Incidence
Liver	0	0	0	3/45
	2000	1582	356	16/46
	4000	3162	712	40/46
Lung	0	0	0	3/45
	2000	1582	356	30/46
	4000	3162	712	41/46

II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk of 4.7E-7 per (ug/cu.m), which incorporates information on pharmacokinetics and metabolism of dichloromethane, is approximately nine-fold lower than the previous applied dose estimate (U.S. EPA, 1987a,b). Internal dose estimates were based on the metabolism of dichloromethane by the glutathione-s-transferase pathway, as estimated by the model developed by

Andersen et al. (1987). The internal dose was corrected for interspecies differences in sensitivity by using the surface area correction factor.

Calculation of a slope factor from the unit risk is inappropriate when pharmacokinetic models are used. (When dose-response relationships are figured on the basis of internal or metabolized dose, a slope factor in terms of per (mg/kg)/day represents a back calculation using different absorption assumptions than the pharmacokinetic models. This introduces possible contradictions.)

The unit risk should not be used if the air concentration exceeds 2E+4 ug/cu.m, since above this concentration the unit risk may differ from that stated. Since the unit risk is based on a pharmacokinetic model, the risk may change with alterations in exposure patterns. Thus, the unit risk presented here may not be applicable to acute, high exposures.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

Adequate numbers of animals were observed and tumor incidences were significantly increased in a dose-dependent fashion. Analysis excluding animals that died before observation of the first tumors produced similar risk estimates, as did time-to-tumor analysis. The use of animal and human metabolism and pharmacokinetic data reduces some of the uncertainty typically associated with dose-risk extrapolation. A great deal of uncertainty still exists, however, in the estimates of internal dose generated by the model of Andersen et al. (1987). Important uncertainties remain regarding the pharmacokinetics, pharmacodynamics, and mechanisms of carcinogenicity for dichloromethane.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

Source Document -- U.S. EPA, 1985a,b, 1987a,b

The Addendum to the Health Assessment Document, the Update to the Health Assessment Document and Addendum, and the Technical Analysis of New Methods and Data for dichloromethane have received Agency and external review, including a review by the Science Advisory Board (SAB). Although the last two documents are not yet finalized and the SAB comments are not yet incorporated, these do not alter this document's analyses or conclusions.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

Agency Work Group Review -- 11/12/86, 12/04/86, 04/06/89

Verification Date -- 04/06/89

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Lorenz Rhomberg / OHEA -- (202)260-5723

Dharm V. Singh / OHEA -- (202)260-5898

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_III. HEALTH HAZARD ASSESSMENTS FOR VARIED EXPOSURE DURATIONS

__III.A. DRINKING WATER HEALTH ADVISORIES

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride
Last Revised -- 03/01/88

The Office of Drinking Water provides Drinking Water Health Advisories (HAs) as technical guidance for the protection of public health. HAs are not enforceable Federal standards. HAs are concentrations of a substance in drinking water estimated to have negligible deleterious effects in humans, when ingested, for a specified period of time. Exposure to the substance from other media is considered only in the derivation of the lifetime HA. Given the absence of chemical-specific data, the assumed fraction of total intake from drinking water is 20%. The lifetime HA is calculated from the Drinking Water Equivalent Level (DWEL) which, in turn, is based on the Oral Chronic Reference Dose. Lifetime HAs are not derived for compounds which are potentially carcinogenic for humans because of the difference in assumptions concerning toxic threshold for carcinogenic and noncarcinogenic effects. A more detailed description of the assumptions and methods used in the derivation of HAs is provided in Background Document 3 in Service Code 5.

___III.A.1. ONE-DAY HEALTH ADVISORY FOR A CHILD

One-day HA -- 1.33E+1 mg/L

LOAEL -- 1326 mg/kg/day
UF -- 1000 (allows for interspecies and intrahuman variability with the use of
a LOAEL from an animal study)
Assumptions -- 1 L/day water consumption for a 10-kg child

Principal Study -- Kimura et al., 1971

Single oral doses of dichloromethane were administered to young adult Sprague-Dawley rats. An approximate dose of 1.3 g/kg was the lowest dose to induce the first observable gross signs of toxicity.

___III.A.2. TEN-DAY HEALTH ADVISORY FOR A CHILD

Ten-day HA -- 1.5E+0 mg/L

NOAEL -- 15 mg/kg/day
UF -- 100 (allows for interspecies and intrahuman variability with the use of a NOAEL from an animal study)
Assumptions -- 1 L/day water consumption for a 10-kg child

Principal Study -- Bornmann and Loeser, 1967

Male and female Wistar rats were administered dichloromethane in drinking water for 13 weeks at a dose of 15 mg/kg/day. No treatment-related effects were observed.

___III.A.3. LONGER-TERM HEALTH ADVISORY FOR A CHILD

Appropriate data for calculating a Longer-term HA is not available. It is recommended that a modified DWEL (adjusted for a 10-kg child) of 0.5 mg/L be used as the Longer-term HA.

___III.A.4. LONGER-TERM HEALTH ADVISORY FOR AN ADULT

Appropriate data for calculating a Longer-term HA is not available. It is recommended that the DWEL of 1.75 mg/L be used as the Longer-term HA for the 70-kg adult.

___III.A.5. DRINKING WATER EQUIVALENT LEVEL / LIFETIME HEALTH ADVISORY

DWEL -- 1.75E+0 mg/L

Assumptions -- 2 L/day water consumption for a 70-kg adult

RfD Verification Date = 11/06/85

Lifetime HA -- None

Dichloromethane is considered to be a probable human carcinogen. Refer to Section II of this file for information on the carcinogenicity of this substance.

Principal Study (DWEL) -- National Coffee Association, 1982 (This study was used in the derivation of the chronic oral RfD; see Section I.A.2.)

___III.A.6. ORGANOLEPTIC PROPERTIES

No data available

___III.A.7. ANALYTICAL METHODS FOR DETECTION IN DRINKING WATER

Analysis of dichloromethane is by a purge-and-trap gas chromatographic procedure used for the detection of volatile organohalides in drinking water. Confirmatory analysis is by mass spectrometry.

___III.A.8. WATER TREATMENT

The available information suggests that adsorption by granular activated carbon and air stripping are feasible technologies to remove dichloromethane from drinking water.

___III.A.9. DOCUMENTATION AND REVIEW OF HAs

U.S. EPA. 1985. Final Draft of the Drinking Water Criteria Document on Dichloromethane. Office of Drinking Water, Washington, DC.

EPA review of HAs in 1985.

Public review of HAs following notification of availability in October, 1985.

Scientific Advisory Panel review of HAs in January, 1986.

Preparation date of this IRIS summary -- 06/24/87

___III.A.10. EPA CONTACTS

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Edward V. Ohanian / OST -- (202)260-7571

__III.B. OTHER ASSESSMENTS

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride

Content to be determined.

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_IV. U.S. EPA REGULATORY ACTIONS

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride
Last Revised -- 01/01/92

EPA risk assessments may be updated as new data are published and as assessment methodologies evolve. Regulatory actions are frequently not updated at the same time. Compare the dates for the regulatory actions in this section with the verification dates for the risk assessments in sections I and II, as this may explain inconsistencies. Also note that some regulatory actions consider factors not related to health risk, such as technical or economic feasibility. Such considerations are indicated for each action. In addition, not all of the regulatory actions listed in this section involve enforceable federal standards. Please direct any questions you may have concerning these regulatory actions to the U.S. EPA contact listed for that particular action. Users are strongly urged to read the background information on each regulatory action in Background Document 4 in Service Code 5.

__IV.A. CLEAN AIR ACT (CAA)

No data available

__IV.B. SAFE DRINKING WATER ACT (SDWA)

___IV.B.1. MAXIMUM CONTAMINANT LEVEL GOAL (MCLG) for Drinking Water

Value -- 0 mg/L (Proposed, 1990)

Considers technological or economic feasibility? -- NO

Discussion -- The proposed MCLG for dichloromethane is zero based on the evidence of carcinogenic potential (B2).

Reference -- 55 FR 30370 (07/25/90)

EPA Contact -- Health and Ecological Criteria Division / OST / (202) 260-7571 / FTS 260-7571; or Safe Drinking Water Hotline / (800) 426-4791

___IV.B.2. MAXIMUM CONTAMINANT LEVEL (MCL) for Drinking Water

Value -- 0.005 mg/L (Proposed, 1990)

Considers technological or economic feasibility? -- YES

Discussion -- The proposed MCL is equal to the PQL of 0.005 and is associated with a maximum lifetime individual risk of E-5.

Monitoring requirements -- All systems monitored every 3 or 5 years (dependent upon system size), except for non-vulnerable surface water systems with no detection of VOCs; vulnerable systems to be monitored quarterly; repeat monitoring dependent upon vulnerability, detection and system size.

Analytical methodology -- Purge and trap gas chromatography (EPA 503.1); purge and trap gas chromatographic/mass spectrometry (EPA 524.1): PQL= 0.005 mg/L.

Best available technology -- Packed tower aeration.

Reference -- 55 FR 30370 (07/25/90)

EPA Contact -- Drinking Water Standards Division / OGWDW / (202) 260-7575 / FTS 260-7575; or Safe Drinking Water Hotline / (800) 426-4791

___IV.B.3. SECONDARY MAXIMUM CONTAMINANT LEVEL (SMCL) for Drinking Water

No data available

___IV.B.4. REQUIRED MONITORING OF "UNREGULATED" CONTAMINANTS

Status -- Listed (Final, 1987)

Discussion -- "Unregulated" contaminants are those contaminants for which EPA establishes a monitoring requirement but which do not have an associated final MCLG, MCL, or treatment technique. EPA may regulate these contaminants in the future.

Monitoring requirement -- Monitoring required for all water systems at a minimum frequency of once every 5 years.

Analytical methodology -- Gas chromatography (EPA 502.1, 502.2, 503.1); gas chromatographic/mass spectrometry (EPA 524.1, 524.2).

Reference -- 56 FR 25690 (07/08/87)

EPA Contact -- Drinking Water Standards Division / OGWDW /
(202) 260-7575 / FTS 260-7575; or Safe Drinking Water Hotline / (800) 426-4791

__IV.C. CLEAN WATER ACT (CWA)

___IV.C.1. AMBIENT WATER QUALITY CRITERIA, Human Health

Water and Fish Consumption: 1.9E-1 ug/L

Fish Consumption Only: 1.57E+1 ug/L

Considers technological or economic feasibility? -- NO

Discussion -- Methylene chloride is classified as a carcinogen, and under the assumption of no threshold for a carcinogen, the recommended WQC is zero. However, if zero cannot be obtained and exposure is via ingestion of water and aquatic organisms, 0.19 ug/L is associated with an upper-bound excess lifetime risk of 1.0E-6 [other risk levels to consider: 1.0E-5 (1.9 ug/L) and 1.0E-7 (0.019 ug/L)]. If exposure is only via ingestion of aquatic organisms, the WQC associated with an upper-bound excess lifetime risk of 1.0E-6 is 15.7 ug/L.
The criteria are based on halomethanes as a class.

Reference -- 45 FR 79318 (11/13/80)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

___IV.C.2. AMBIENT WATER QUALITY CRITERIA, Aquatic Organisms

Freshwater:

Acute LEC -- 1.1E+4 ug/L
Chronic -- None

Marine:

Acute LEC -- 1.2E+4 ug/L
Chronic LEC -- 6.4E+3 ug/L

Considers technological or economic feasibility? -- NO

Discussion -- The values that are indicated as "LEC" are not criteria, but are the lowest effect levels found in the literature. LECs are given when the minimum data required to derive water quality criteria are not available. The values given represent halomethanes as a class.

Reference -- 45 FR 79318 (11/13/80)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

__IV.D. FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

No data available

__IV.E. TOXIC SUBSTANCES CONTROL ACT (TSCA)

___IV.E.1. TSCA, SECTION 6

Status -- Advance Notice of Proposed Rulemaking (ANPR) (1985)

Discussion -- Initiated priority review under TSCA, sect. 6, of risks from cancer which may be associated with certain exposures to methylene chloride. Receipt of a positive NTP bioassay triggered an accelerated analysis under TSCA, sect. 4(f). Based on its preliminary analysis, the Agency decided that methylene chloride should be classified as a B2 probable human carcinogen under its Interim Cancer Guidelines. TSCA, sect. 4(f), requires that the Agency initiate appropriate action under sect. 5, 6, or 7 within a 180-day period of receipt of health effect information which triggers a sect. 4(f) decision. The sect. 6 ANPR initiated appropriate action.

Reference: 50 FR 42005 (10/17/85)

EPA Contact -- Chemical Control Division / OTS (202)260-3749 / FTS 260-3749

__IV.F. RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

___IV.F.1. RCRA APPENDIX IX, for Ground Water Monitoring

Status -- Listed

Reference -- 52 FR 25942 (07/09/87)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

__IV.G. SUPERFUND (CERCLA)

___IV.G.1. REPORTABLE QUANTITY (RQ) for Release into the Environment

Value (status) -- 1000 pounds (Final, 1985)

Considers technological or economic feasibility? -- NO

Discussion -- The final adjusted RQ of 1000 pounds is based upon a chronic toxicity score of 10. This substance has recently been identified for assessment of carcinogenicity, and the RQ will be reevaluated when that assessment is completed.

Reference -- 50 FR 13456 (04/04/85); 54 FR 33418 (08/14/89)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

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_V. SUPPLEMENTARY DATA

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride

Not available at this time.

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_VI. BIBLIOGRAPHY

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride
Last Revised -- 08/01/91

__VI.A. ORAL RfD REFERENCES

Haun, C.C., E.H. Vernot, K.I. Darmer Jr. and S.S. Diamond. 1972. Continous animal exposure to low levels of dichloromethane. AMRL-TR-72-13. In: Proceedings of the 3rd Annual Conference on Environmental Toxicology, Wright-Patterson Air Force Base, Ohio, Aerospace Medical Research Laboratory. p. 199-208.

National Coffee Association. 1982. 24-Month chronic toxicity and oncogenicity study of methylene chloride in rats. Final Report. Prepared by Hazleton Laboratories America, Inc., Vienna, VA. (Unpublished)

U.S. EPA. 1985. Drinking Water Criteria Document for Methylene Chloride. Office of Drinking Water, Washington, DC.

__VI.B. INHALATION RfD REFERENCES

None

VI.C. CARCINOGENICITY ASSESSMENT REFERENCES

Andersen, M.E., H.J. Clewell, III, M.L. Gargas, F.A. Smith and R.H. Reitz. 1987. Physiologically based pharmacokinetics and the risk assessment process for methylene chloride. Toxicol. Appl. Pharmacol. 87: 185-205.

Burek, J.D., K.D. Nitschke, T.J. Bell, et al. 1984. Methylene chloride: A two year inhalation toxicity and oncogenicity study in rats and hamsters. Fund. Appl. Toxicol. 4: 30-47.

Callen, D.F., C.R. Wolf and R.M. Philpot. 1980. Cytochrome P-450 mediated genetic activity and cytotoxicity of seven halogenated aliphatic hydrocarbons in Saccharomyces cerevisiae. Mutat. Res. 77: 55-63.

Dow Chemical Company. 1982. Methylene chloride: A two-year inhalation and oncogenicity study in rats. Toxicology Research Laboratory, Health and Environmental Sciences, Dow Chemical Company, Midland, MI.

Friedlander, B.R., F.T. Hearne and S. Hall. 1978. Epidemiologic investigation of employees chronically exposed to methylene chloride. J. Occup. Med. 20(10): 657-666.

Green, T. 1983. The metabolic activation of dichloromethane and chlorofluoromethane in a bacterial mutation assay using Salmonella typhimurium. Mutat. Res. 118(4): 277-288.

Hatch, G.G., P.D. Mamay, M.L. Ayer, B.C. Casto and S. Nesnow. 1983. Chemical enhancement of viral transformation in Syrian hamster embryo cells by gaseous and volatile chlorinated methanes and ethanes. Cancer Res. 43: 1945-1950.

Hearne, F.T. and B.R. Friedlander. 1981. Follow-up of methylene chloride study. J. Occup. Med. 23: 660.

Hearne, F.T., F. Grose, J.W. Pifer and B.R. Friedlander. 1986. Methylene chloride mortality study update. Eastman Kodak Company, Rochester, NY. June 16.

Hearne, F.T., F Grose, J.W. Pifer, B.R. Friedlander and R.L. Raleigh. 1987. Methylene Chloride mortality study: dose-response characterization and animal model comparison. J. Occup. Med. 29 (3): 217-228.

Heppel, L.A., P.A. Neal, T.L. Perrin, M.L. Orr and V.T. Porterfield. 1944. Toxicology of dichloromethane (methylene chloride). I. Studies on effects of daily inhalation. J. Ind. Hyg. Toxicol. 26(1): 8-21.

Lefevre, P.A. and J. Ashby. 1989. Evaluation of dichloromethane as an inducer of DNA synthesis in B6C3F1 mouse liver. Carcinogenesis. 10(6): 1067-1072.

MacEwen, J.D., E.H. Vernot and C.C. Haun. 1972. Continuous animal exposure to dichloromethane. AMRL-TR-72-28, Systems Corporation Report No. W-71005. Wright Patterson Air Force Base, Ohio, Aerospace Medical Research. AD746295.

NCA (National Coffee Association). 1982. Twenty-four-month chronic toxicity and oncogenicity study of methylene chloride in rats. Final Report. Prepared by Hazleton Laboratories, America, Inc., Vienna, VA. Unpublished.

NCA (National Coffee Association). 1983. Twenty-four month oncogenicity study of methylene chloride in mice. Final Report. Prepared by Hazleton Laboratories, America, Inc., Vienna, VA.

NTP (National Toxicology Program). 1982. Draft technical report on the carcinogenesis bioassay of dichloromethane (methylene chloride) (CAS No. 75-09-2) in F344/N rats and B6C3F1 mice (gavage study). Research Triangle Park, NC and Bethesda, MD. Unpublished. NTP-82-061.

NTP (National Toxicology Program). 1986. Toxicology and carcinogenesis studies of dichloromethane (methylene chloride) (CAS No. 75-09-2) in F344/N rats and B6C3F1 mice (inhalaltion studies). NTP-TRS-306.

Ott, M.G., L.K. Skory, B.B. Holder, J.M. Bronson and P.R. Williams. 1983. Health evaluation of employees occupationally exposed to methylene chloride: Mortality. Scand. J. Work Environ. Health. 9(Suppl. 1): 8-16.

Price, P.J., C.M. Hassett and J.I. Mansfield. 1978. Transforming activities of trichloroethylene and proposed industrial alternatives. In Vitro. 14(3): 290-293.

Thiess, J.C., G.D. Stoner, M.B. Shimkin and E.K. Weisburger. 1977. Test for carcinogenicity of organic contaminants of United States drinking waters by pulmonary tumor response in strain A mice. Cancer Res. 37: 2717-2720.

Toxic Substances Control Act. 1989. Section 8(e) submission no. 8eHQ-0198-0772 FLWP et seq.

U.S. EPA. 1985a. Health Assessment Document for Dichloromethane (Methylene Chloride). Final Report. Office of Health and Environmental Assessment, Washington, D.C. EPA/600/8-82/004F.

U.S. EPA. 1985b. Addendum to the Health Assessment Document for Dichloromethane (methylene chloride). Updated carcinogenicity assessment. Prepared by the Carcinogen Assessment Group, OHEA, Washington, DC. EPA/600/8-82/004FF.

U.S. EPA. 1987a. Update to the Health Assessment Document and Addendum for Dichloromethane (Methylene Chloride): Pharmacokinetics, Mechanism of Action and Epidemiology. Review Draft. Office of Health and Environmental Assessment, Washington, DC. EPA/600/8-87/030A.

U.S. EPA. 1987b. Technical Analysis of New Methods and Data Regarding Dichloromethane Hazard Assessments. Review Draft. Office of Health and Environmental Assessment, Washington, DC. EPA/600/8- 87/029A.

VI.D. DRINKING WATER HA REFERENCES

Bornmann, G., and A. Loeser. 1967. Zur Frage einer chronisch-toxischen Wirkung von Dichloromethan. Z. Lebensm.-Unters. Forsch. 136: 14-18.

Kimura, E.T., D.M. Ebert and P.W. Dodge. 1971. Acute toxicity and limits of solvent residue for sixteen organic solvents. Toxicol. Appl. Pharmacol. 19: 699-704.

National Coffee Association. 1982. 24-Month chronic toxicity and oncogenicity
study of methylene chloride in rats. Final Report. Prepared by Hazleton Laboratories America, Inc., Vienna, VA. (Unpublished)

U.S. EPA. 1985. Final Draft of the Drinking Water Criteria Document on Dichloromethane. Office of Drinking Water, Washington, DC.

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_VII. REVISION HISTORY

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride

Date	Section	Description
04/20/87	II.C.1.	Unit Risk corrected from 4.1E-4 to 4.1E-6
05/21/87	II.A.2.	Missing text replaced in 3rd paragraph
03/01/88	I.A.1.	Dose conversion clarified
03/01/88	I.A.2.	Text revised
03/01/88	II.B.3.	Text revised
03/01/88	II.B.4.	Confidence statement revised
03/01/88	II.C.3.	Text revised
03/01/88	II.C.4.	Confidence statement revised
03/01/88	II.D.3.	Primary contact changed
03/01/88	III.A.	Health Advisory added
01/01/89	II.	Carcinogen summary noted as pending change
10/01/89	II.B.3.	Inhalation rate corrected in paragraph 1
10/01/89	II.C.2.	Dose corrections in mg/kg/day
10/01/89	II.C.3.	Inhalation rate corrected in paragraph 1
10/01/89	II.D.3.	Contacts phone number changed
08/01/90	IV.F.1.	EPA contact changed
09/01/90	II.	Carcinogen assessment revised following re-evaluation
09/01/90	II.C.1.	Inhalation unit risk changed
09/01/90	VI.	Bibliography on-line
01/01/91	II.C.1.	Paragraph moved to II.C.3.
01/01/91	II.C.1.	Inhalation slope factor removed (global change)
08/01/91	VI.C.	Citations clarified
09/01/91	I.B.	Inhalation RfC now under review
01/01/92	IV.	Regulatory actions updated

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SYNONYMS

Substance Name -- Dichloromethane
CASRN -- 75-09-2
Primary Synonym -- Methylene Chloride
Last Revised -- 01/31/87

75-09-2
Aerothene MM
Chlorure de methylene
DCM
Dichlormethan, uvasol
Dichloromethane
1,1-Dichloromethane.
Freon 30
Methane dichloride
Methane, dichloro-
Methylene bichloride
Methylene Chloride
Methylene dichloride
Metylenu chlorek
Narkotil
NCI-C50102
R 30
Solaesthin
Solmethine
WLN: G1G

Attachment B

Revised Pages to Volume I of Original Permit Application

compressed under an air cylinder to a designated size. The product is steamed from the bottom of the mold, which cures the foam . The resulting cylinder of foam is referred to as a log. The foam log is then peeled into a continuous sheet with a thickness of 1/4 to 3/4 inch, per customer specifications. The foam sheet product is then bonded to a polyethylene film. Finally the foam sheet product is cut to length and packaged into rolls, per customer order.

The TDI emissions from the Rebond process are currently vented to the atmosphere through two identical 1,000 CFM exhaust fans located in the ceiling directly above the process.

In order to increase production the rebond process will be modified to include an additional mold and relocated approximately 60 feet to the northeast of is current location. The modified rebond process will require three 15,000 CFM exhaust fans, located in the ceiling above the process, with stack heights of 53 feet above ground level. The two existing 1,000 CFM fans will no longer serve the rebond process. The modification to the rebond process will also include a recirculating dust filter/collection system.

2.2.3 Tank Storage

The Foamex facility includes eleven above ground storage tanks for receiving and holding of the various raw materials used in the foam production processes. Table 3.3 provides a summary of the tanks, dimensions and products stored. Only one tank, Tank 10, is used for storage of methylene chloride. Foamex proposes to install a pressure relief valve on Tank 10 to minimize standing losses of methylene chloride. No physical or operational changes to the remaining storage tanks are proposed.

2.2.4 Steam Boiler

Foamex operates a natural gas fired industrial boiler rated at 100 HP. This boiler is used to convert an average of 1,570 gallons of water to steam each day for use in the Rebond process. No changes to the operation of the steam boiler are proposed.

2.2.5 Environmental Heating

There are thirteen indirect natural gas fired heaters existing at the Foamex facility. Of these, nine are used as needed during the winter months for heating the manufacturing and administrative areas of the facility. It is estimated that these heaters operate less than 400 hours per year. The remaining four heaters are not operational. Table 3.4 provides a listing of the individual heaters and the rated capacity of each heater.

2.2.6 Foam Fabrication Operations

During foam fabrication operations, the foam buns manufactured during the Slabstock process are cut to size, assembled, and glued according to customer specifications. The fabrication operations take place only in those areas of the facility isolated for foam fabrication operations. Approximately 3.1 lbs/hr of glue is used during these operations. Foamex primarily uses methylene chloride based glue in the foam fabrication operations, but may also occasionally use 1,1,1-trichloroethane based glue. The methylene chloride based glue has a maximum methylene chloride content of 70% by weight. The 1,1,1-trichloroethane based glue has a maximum concentration of 1,1,1-trichloroethane of 81% by weight. The emissions from the gluing process are vented to the atmosphere through the three ceiling exhaust fans located in the areas isolated for foam fabrication operations, which will be modified as part of the proposed enhanced collection and dispersion system as described in Section 2.2.1.

2.3 Requested Permitted Operating Time

For the processes and supporting operations discussed above, the requested hours of operation in the permit application are as follows:

- Slabstock Polyurethane Foam Production: 6 hrs/day; 7 days/wk; 52 wks/yr;
- Rebond Polyurethane Foam Production: 24 hrs/day, 7 days/wk, 52 wks/yr;
- Tank Storage: 24 hrs/day, 7 days/wk, 52 wks/yr;
- Steam Boiler: 24 hrs/day, 7 days/wk, 52 wks/yr;
- Environmental Heating: 400 hrs/yr; and
- Foam Fabrication Operations: 24 hrs/day, 7 days/wk, 52 wks/yr.

Table 2.1. Summary of Emission Sources
Foamex, L.P. - Orlando, Florida

Process Emission Source	Emission Point Number	Description
Slabstock Polyurethane Foam Production	1	Foam Line Stack
Slabstock Polyurethane Foam Production	2	Long Bun Storage Room Stack
Not operational as part of enhanced exhaust system	3	Exhaust Fan
Not operational as part of enhanced exhaust system	4	Exhaust Fan
Not operational as part of enhanced exhaust system	5	Exhaust Fan
Not operational as part of enhanced exhaust system	6	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	7	Exhaust Fan
Not operational as part of enhanced exhaust system	8	Exhaust Fan
Not operational as part of enhanced exhaust system	9	Exhaust Fan
Not operational as part of enhanced exhaust system	10	Exhaust Fan
Not operational as part of enhanced exhaust system	11	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	12	Exhaust Fan
Not operational as part of enhanced exhaust system	13	Exhaust Fan
Not operational as part of enhanced exhaust system	14	Exhaust Fan
Not operational as part of enhanced exhaust system	15	Exhaust Fan
Not operational as part of enhanced exhaust system	16	Exhaust Fan
Not operational as part of enhanced exhaust system	17	Exhaust Fan
Not operational as part of enhanced exhaust system	18	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	19	Exhaust Fan
Rebond Polyurethane Foam Production	20	Rebond Exhaust Fan
Rebond Polyurethane Foam Production	21	Rebond Exhaust Fan
Rebond Polyurethane Foam Production	**22**	**Rebond Exhaust Fan**
Tank Storage	23	Tank #10
Steam Boiler	24	Boiler Stack
Environmental Heating	25	Natural Gas Heaters

To calculate the maximum hourly usage rate of methylene chloride it is necessary to define the "worst case" maximum daily usage of methylene chloride. The "worst case" maximum daily methylene chloride usage is 14,000 lb/day.

The maximum hourly usage rate of methylene chloride is then calculated as follows:

Maximum hourly usage = 14,000 lb/day ÷ 6 hr/day = 2,333.33 lb/hr

The maximum annual usage of methylene chloride at the facility will be limited to **720,000** lbs/yr.

3.1.2 Rebond Polyurethane Foam Production

A summary of the typical material input and production rates for the Rebond process are provided in Table 3.2.

Table 3.2. Rebond Polyurethane Foam Production Process Rates
Foamex, L.P. - Orlando, Florida

Substance	Process Input Rate (lbs/hr)	Production Rate (lbs/hr)
Raw Materials:		
Scrap Foam	11,216	0
Polyol	918	0
TDI	328	0
Product:		
Rebond Foam Product	0	12,462

3.1.3 Tank Storage

As stated previously in Section 2.2.3 of this application, the Foamex facility includes eleven above ground storage tanks. The current estimated maximum annual material throughput for each tank is shown in Table 3.3 below.

Table 3.3. Tanks Storage Process Rates
Foamex, L.P. - Orlando, Florida

Tank Number	Product	Height (feet)	Diameter (feet)	Throughput (lbs/yr)
1	Polyol	35	12	Note 1
2	Polyol	35	12	Note 1
3	TDI	35	12	Note 2
4	Polyol	35	12	Note 1
5	Polyol	35	12	Note 1
6	TDI	35	12	Note 2
7	Empty	16	10.5	0
8	Polymer	16	10.5	1,000,000
9	Empty	35	12	0
10	Methylene Chloride	37 (long)	7	720,000
11	Empty	30 (long)	7	0

Note 1: Total Polyol Throughput = 15,000,000 lbs/yr
Note 2: Total TDI Throughput = 10,000,000 lbs/yr

3.1.4 Steam Boiler

The industrial boiler used for steam production is rated at 100 hp and is fired by natural gas. The boiler is used to convert an average of 1,570 gallons of water to steam each day for the Rebond process. The maximum heat input for the boiler is 4.2 mmBtu/hr with a maximum natural gas consumption rate of 4,200 cf/hr. The maximum operating schedule for the boiler is 8760 hrs/yr.

3.1.5 Environmental Heating

There are thirteen indirect natural gas fired heaters at the Foamex facility. Of these, nine are used as needed during the winter months for heating the manufacturing and administrative areas of the facility. It is estimated that these heaters operate less than 400 hours per year. The total maximum heat input for the heaters is 1.85 mmBtu/hr, with a maximum natural gas usage rate of 1850 cf/hr. On an average basis, the natural gas usage rate is 200 cf/hr. Table 3.4 provides a listing of the individual heaters and heat input rates.

Table 3.4. Indirect Fired Heaters Process Rates
Foamex, L.P. - Orlando, Florida

Heater Number	Manufacturer	Model Number	Operational?	Maximum Heat Input (Btu/hr)
1	Bryant	200-341	Yes	200,000
2	Bryant	200-341	No	200,000
3	Hastings	GF200XE	Yes	200,000
4	Hastings	GF200XE	No	200,000
5	Hastings	GF200XE	Yes	200,000
6	Hastings	GF200XE	Yes	200,000
7	Hastings	GF200XE	Yes	200,000
8	Hastings	GF200XE	Yes	200,000
9	Hastings	GF200XE	Yes	200,000
10	Hastings	GF200XE	Yes	200,000
11	Bryant	200-341	No	200,000
12	Bryant	200-341	No	200,000
13	Peereless	1067	Yes	250,000
TOTAL (operational heaters only)				1,850,000

3.1.6 Foam Fabrication Operations

During Foam Fabrication Operations, the foam buns manufactured during the Slabstock process are cut and glued according to customer specifications. Approximately 3.1 lbs/hr of glue is used during these operations. The maximum annual usage rate of glue at the facility is 4,600 lb/yr, or 2.3 tons/yr.

3.2 Emissions Calculations

3.2.1 Slabstock Polyurethane Foam Production

3.2.1.1 Methylene Chloride

As stated in Section 3.1.1 of this application, methylene chloride represents the only significant emissions associated with this process. Currently, it is the only blowing agent used. In this process, all of the blowing agent used is emitted to the atmosphere and does not end up in the foam product. Based on industry and product information, it is assumed for this permit application, that 60% of the methylene chloride is released from the foam in the foam line enclosure before it reaches the Long Bun Storage Room and 35% is released during the twelve hour cure period in the Long Bun Storage Room. The remaining 5% of the methylene chloride is released during subsequent foam fabrication operations prior to shipment of the final product. The total uncontrolled process emissions of methylene chloride on an annual basis can, therefore, be estimated directly from the annual methylene chloride usage rate in Section 3.1.1.

Maximum annual methylene chloride usage = **720,000** lbs/yr

Maximum annual methylene chloride emissions = **720,000** lbs/yr ÷ 2,000 lbs/ton
= **360.0** tons/yr

The values shown above represent the total methylene chloride emissions from the slabstock foam production process. However, these emissions are distributed between each of the two stacks serving the process, the Foam Line Stack and the Long Bun Storage Room Stack, and the three exhaust ceiling exhaust fans serving the Foam Fabrication Operations area. Both short term and long term emission rates must be calculated for the Foam Line Stack and Long Bun Storage Room Stack. Emissions calculations for the Foam Fabrication Operations are included under that heading in Section 3.2.6. Long term or annual emissions from the Foam Line and Long Bun Storage Room can be calculated by multiplying the distribution factors for each (60% and 35%, respectively) by the total maximum annual emissions specified above.

Foam Line Stack:

Maximum annual methylene chloride emissions = **720,000** lbs/yr x 0.60
= **432,000** lb/yr

Maximum annual methylene chloride emissions = **432,000** lbs/yr ÷ 2,000 lbs/ton
= **216.0** tons/yr

Long Bun Storage Room Stack:

Maximum annual methylene chloride emissions = **720,000** lbs/yr x 0.35
= **252,000** lb/yr

Maximum annual methylene chloride emissions = **252,000** lbs/yr ÷ 2,000 lbs/ton
= **126.0** tons/yr

The first step in developing an estimate of the maximum hourly emission rate for the Foam Line and Long Bun Storage Room is to define the "worst case" maximum daily methylene chloride usage. For this purpose, the "worst case" daily usage of methylene chloride, as defined in Section 3.1.1 of this application, is 14,000 lbs/day over six hours of operation (2,333.33 lb/hr). Assuming that 60% of this quantity is released during the pour period in the foam line enclosure as the foam travels along the process line conveyor before it reaches the Long Bun Storage Room, the Foam Line Stack emits a total of 8,400 pounds of methylene chloride over the six hour pour period. As the buns enter the Long Bun Storage Room, the remaining methylene chloride which is contained in the foam material begins to be released. Assuming that 35% of the methylene chloride used during the pour is released in the Long Bun Storage Room during the cure period, a total of 4,900 pounds of methylene chloride is emitted from the Long Bun Storage Room Stack. The 5% (700 pounds) of the methylene chloride remaining after the cure period in the foam product after it is removed from the Long Bun Storage Room is emitted during the foam fabrication operations through the three ceiling exhaust fans located in the foam fabrication areas.

As stated previously, the Long Bun Storage Room emissions decay at an exponential rate over the foam cure period. Appendix A provides a detailed analysis of the actual emission rate profile for the Long Bun Storage Room. However, for emission calculation purposes, a more simple approach representing a worst case scenario is used. This approach ignores the decay profile and the foam cure period and instead assumes that the total quantity of emissions is released at a steady rate during the pour period only. Because the length of the pour period is shorter than the cure period, the resulting maximum short term emission rate is higher. Thus, this approach represents a worst case scenario. The following provides a simple summary of this mass balance.

Table 3.5. TDI Emissions Test Summary
Foamex, L.P. - Orlando, Florida

	TDI Isomer Emissions (lb/hr)		
	2,4-TDI	2,6-TDI	Total
Run 1	0.10	0.27	0.37
Run 2	0.04	0.10	0.14
Run 3	0.07	0.15	0.22
Average	0.07	0.17	0.24

Based on the highest results for a single run, the maximum TDI emissions are 0.37 lbs/hr. The maximum operating schedule of the Slabstock process is specified in Section 2.3 of this application as 6 hrs/day, 7 days/wk, 52 wks/yr. Therefore, the maximum annual hours during which TDI emissions occur based on the hours of operation is 2,184 hrs/yr. Therefore, the annual emissions of TDI are be calculated as follows:

Maximum hourly emission rate = 0.37 lbs/hr

Maximum annual emissions = (0.37 lbs/hr) x (2,184 hrs/yr) ÷ (2000 lbs/ton)
= 0.404 tons/yr

3.2.2 Rebond Polyurethane Foam Production

The TDI emissions estimated above for the Slabstock process are due to due evaporation of the chemical during its use. Although no testing has been conducted, it is assumed that similar emissions are generated from the Rebond process. To estimate the quantity of TDI emissions from the Rebond process, an emission factor was developed based on the maximum hourly emission rate and the typical TDI usage rate specified in section 3.2.1 for the Slabstock process. This emission factor can then be applied to the TDI usage rate for the Rebond process to obtain the emission rate. This emission rate is calculated as follows:

TDI emission factor = (0.37 lbs/hr emissions) ÷ (13,420 lbs/hr usage)
= 0.000028 lbs/lb

Maximum hourly Rebond process TDI emission rate = 0.000028 lbs/lb x 328 lbs/hr
= 0.0092 lbs/hr

Using the maximum operating schedule for the Rebond process of 24 hrs/day, 7 days/wk, 52 wks/yr (8,760 hrs/yr), the maximum annual emissions are calculated as follows:

Maximum annual Rebond process TDI emissions = 0.0092 lbs/hr x 8,760 hrs/yr
= 80.592 lbs/yr
= 0.04 tons/yr

3.2.3 Tank Storage

Appendix C provides detailed reports of emissions calculations for Tank 10, the methylene chloride storage tank. These reports were generated using EPA's TANKS Storage Tank Emissions Calculation Software, version 2.0, which is based on the calculation procedures specified in AP-42 section 12. The calculations were conducted based on the maximum annual methylene chloride throughput for the facility of 720,000 lb/yr. The calculations represented in Appendix C were conducted based on the existing tank design, which includes a breather vent with no pressure setting. Thus, breathing losses, also referred to as standing losses, are not limited in any way. The following provides a summary of the results of the calculations. However, Foamex proposes to install a pressure relief vent for this tank such that standing losses would be minimized.

Total standing losses	=	**5,026.50** lbs/yr
Total working losses	=	**1,037.55** lbs/yr
Maximum annual emissions	=	(**5,026.50** lbs/yr) + (**1,037.55** lbs/yr)
	=	**6,064.05** lbs/yr
	=	(**6,064.05** lbs/yr) ÷ (2000 lbs/ton)
	=	**3.03** tons/yr
Annual average emission rate	=	(**6,064.05** lbs/yr lbs/yr) ÷ (8,760 hrs/yr)
	=	**0.69** lbs/hr

3.2.4 Steam Boiler

Emissions from the Steam Boiler are generated through natural gas combustion. Appendix D provides calculations of the fuel combustion emissions based on the procedures specified in AP-42 section 1.4. A copy of this AP-42 section is also included in Appendix D. Table 3.6 provides a summary of the results of these calculations.

Table 3.6. Steam Boiler Emission Rates
Foamex, L.P. - Orlando, Florida

Compound	Maximum Hourly Emission Rate (lbs/hr)	Maximum Annual Emissions (tons/yr)
Particulate	0.021	0.092
Sulfur dioxide	0.0025	0.011
Nitrogen oxide	0.59	2.58
Carbon monoxide	0.147	0.64
Total hydrocarbons	0.013	0.055

3.2.5 Environmental Heating

Emissions from Environmental Heating are generated through natural gas combustion. Appendix E provides calculations of the fuel combustion emissions based on the procedures specified in AP-42 section 1.4. A copy of this AP-42 section is also included in Appendix D. Table 3.7 provides a summary of the results of these calculations.

Table 3.7. Environmental Heating Emission Rates
Foamex, L.P. - Orlando, Florida

Compound	Maximum Hourly Emission Rate (lbs/hr)	Maximum Annual Emissions (tons/yr)
Particulate	0.00925	0.00185
Sulfur dioxide	0.00111	0.000222
Nitrogen oxide	0.259	0.0518
Carbon monoxide	0.06475	0.01295
Total hydrocarbons	0.00555	0.00111

3.2.6 Foam Fabrication Operations

3.2.6.1 Methylene Chloride

As stated above, after the foam bun cure period ends 5% of the total methylene chloride used is still retained in the foam buns. This quantity is not released until the buns leave the Long Bun Storage Room and are cut or processed during Foam Fabrication operations. This remaining 5% is emitted from the foam into the areas isolated for foam fabrication operations and discharged to the atmosphere through the three ceiling exhaust fans located in these areas. Further, since an inventory of foam product is always present in the foam fabrication areas, these emissions are released at a constant rate throughout the year. The maximum annual emissions and maximum hourly emission rates for these emissions from the three foam fabrication operations exhaust fans are calculated as follows.

Maximum annual emissions	=	**720,000** lbs/yr x 0.05
	=	**36,000** lbs/yr
	=	**18.0** tons/yr
Maximum hourly emissions	=	**36,000** lbs/yr ÷ 8,760 hr/yr
	=	**4.11** lb/hr

In the gluing process Foamex uses a methylene chloride based glue, therefore, methylene chloride emissions must be calculated for the gluing process. In section 3.1.6, the annual and hourly usage rates of glue used in these operations are presented. Based on the Material Safety Data Sheet (MSDS) for this glue, the maximum methylene chloride content of the glue is 70% by weight. Copies of relevant MSDS are provided in Appendix F. Using the glue usage rates of 3.1 lbs/hr and 4,600 lb/yr the methylene chloride emissions are calculated as follows:

Maximum hourly emissions	=	3.1 lbs/hr x 0.70
	=	2.17 lbs/hr
Maximum annual emissions	=	4,600 lbs/yr x 0.70 ÷ 2,000 lbs/ton
	=	1.61 tons/yr

The total methylene chloride emissions from the foam fabrication operations are calculated as follows:

Maximum hourly emissions	=	**4.11** lb/hr + 2.17 lbs/hr

	=	**6.28** lbs/hr
Maximum annual emissions	=	**18.0** tons/yr + 1.61 tons/yr
	=	**19.61** tons/yr

3.2.6.2 1,1,1-Trichloroethane

In the gluing process Foamex may also use a 1,1,1-trichloroethane based glue, therefore, 1,1,1-trichloroethane emissions must be calculated for the gluing process. In section 3.1.6, the annual and hourly usage rates of glue used in these operations are presented. Based on the Material Safety Data Sheet (MSDS) for this glue, the maximum 1,1,1-trichloroethane content of the glue is 81% by weight. Copies of relevant MSDS are provided in Appendix F. Using the glue usage rates of 3.1 lbs/hr and 4,600 lb/yr the 1,1,1-trichloroethane emissions are calculated as follows:

Maximum hourly emissions	=	3.1 lbs/hr x 0.81
	=	2.5 lbs/hr
Maximum annual emissions	=	4,600 lbs/yr x 0.81 ÷ 2,000 lbs/ton
	=	1.86 tons/yr

3.2.7 Emissions Summary

A summary of the maximum hourly and annual emission rates for each process is provided in Table 3.8. Emission rates calculated on an 8-hour average and 24-hour average are also provided in Volume II of this application, the Dispersion Modeling Analysis, which is submitted under separate cover.

Table 3.8. Emissions Summary
Foamex, L.P. - Orlando Facility

Contaminant	Emission Source	Emissions[1] Maximum (lbs/hr)	Emissions[1] Actual (T/yr)	Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emissions (lbs/hr)	Potential[4] Emissions (lbs/hr)	Potential[4] Emissions (T/yr)
Methylene Chloride	Slabstock Process	2216.67	342.00	N/A	N/A	2216.67	342.00
	Tank Storage	0.69	3.03	N/A	N/A	0.69	3.03
	Foam Fabrication	6.28	19.61	N/A	N/A	6.28	19.61
	Subtotal	2223.64	364.64	N/A	N/A	2223.64	364.64
1,1,1-Trichloroethane	Foam Fabrication	2.5	1.86	N/A	N/A	2.5	1.86
	Subtotal	2.5	1.86	N/A	N/A	2.5	1.86
Toluene Diisocyanate	Slabstock Process	0.37	0.404	N/A	N/A	0.37	0.404
	Rebond Process	0.0092	0.04	N/A	N/A	0.0092	0.04
	Subtotal	0.3792	0.444	N/A	N/A	0.3792	0.444
Particulate	Steam Boiler	0.021	0.092	N/A	N/A	0.021	0.092
	Environmental Heating	0.00925	0.00185	N/A	N/A	0.00925	0.00185
	Subtotal	0.03025	0.09385	N/A	N/A	0.03025	0.09385
Sulfur Dioxide	Steam Boiler	0.0025	0.011	N/A	N/A	0.0025	0.011
	Environmental Heating	0.00111	0.000222	N/A	N/A	0.00111	0.000222
	Subtotal	0.00361	0.011222	N/A	N/A	0.00361	0.011222
Nitrogen Oxides	Steam Boiler	0.59	2.58	N/A	N/A	0.59	2.58
	Environmental Heating	0.259	0.0518	N/A	N/A	0.259	0.0518
	Subtotal	0.849	2.6318	N/A	N/A	0.849	2.6318
Carbon Monoxide	Steam Boiler	0.147	0.64	N/A	N/A	0.147	0.64
	Environmental Heating	0.06475	0.01295	N/A	N/A	0.06475	0.01295
	Subtotal	0.21175	0.65295	N/A	N/A	0.21175	0.65295
Total Hydrocarbons	Steam Boiler	0.013	0.055	N/A	N/A	0.013	0.055
	Environmental Heating	0.00555	0.00111	N/A	N/A	0.00555	0.00111
	Subtotal	0.01855	0.05611	N/A	N/A	0.01855	0.05611

1. See Section V, Item 2 (Application Section 3.2).
2. Reference applicable emission standards and units (e.g. Rule 17-2.6000(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input).
3. Calculated from operating data and applicable standard.
4. Emission, if source operated without control (See Section V, Item 3).

3.3 Emission Stack Data

Table 3.9 provides a summary of the geometry and flow characteristics for each stack located at the Foamex, L.P. facility.

Table 3.9. Stack and Exhaust Fan Stack Parameters
Foamex, L.P. - Orlando, Florida

Source Number	Description	Stack Height[a] Above Ground Level (feet)	Stack Inside Diameter (inches)	Stack Gas Flow Rate (ACFM)	Stack Gas Exit Temp. (°F)	Stack Gas Exit Velocity (ft/sec)	Water Vapor Content
1	Foam Line Stack	125	33.75	30,000	80	80.481	Ambient
2	Long Bun Storage Room Stack	125	33.75	30,000	80	80.481	Ambient
3	Exhaust Fan		Not operational as part of enhanced exhaust system				
4	Exhaust Fan		Not operational as part of enhanced exhaust system				
5	Exhaust Fan		Not operational as part of enhanced exhaust system				
6	Exhaust Fan		Not operational as part of enhanced exhaust system				
7	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
8	Exhaust Fan		Not operational as part of enhanced exhaust system				
9	Exhaust Fan		Not operational as part of enhanced exhaust system				
10	Exhaust Fan		Not operational as part of enhanced exhaust system				
11	Exhaust Fan		Not operational as part of enhanced exhaust system				
12	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
13	Exhaust Fan		Not operational as part of enhanced exhaust system				
14	Exhaust Fan		Not operational as part of enhanced exhaust system				
15	Exhaust Fan		Not operational as part of enhanced exhaust system				
16	Exhaust Fan		Not operational as part of enhanced exhaust system				
17	Exhaust Fan		Not operational as part of enhanced exhaust system				
18	Exhaust Fan		Not operational as part of enhanced exhaust system				
19	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
20	Rebond Exhaust Fan	53	24	15,000	80	79.577	Ambient
21	Rebond Exhaust Fan	53	24	15,000	80	79.577	Ambient
22	Rebond Exhaust Fan	53	24	15,000	80	79.577	Ambient

a. Elevation of top of stack above ground level. Stack base elevation = 0 feet.

APPENDIX C

TANK EMISSIONS CALCULATIONS

TANK IDENTIFICATION AND PHYSICAL CHARACTERISTICS

Identification
- Identification No.: Tank-10
- City: Orlando
- State: FL
- Company: Foamex.L.P.
- Type of Tank: Horizontal Fixed Roof

Tank Dimensions
- Shell Length (ft): 37
- Diameter (ft): 7
- Volume(gallons): 10651
- Is tank underground? (Y/N): N
- Turnovers: 6
- Net Throughput (gal/yr): 65455

Paint Characteristics
- Shell Color/Shade: White/White
- Shell Condition: Good

Breather Vent Settings
- Vacuum Setting (psig): 0.00
- Pressure Setting (psig): 0.00

Meteorological Data Used in Emission Calculations: Orlando, Florida

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methylene chloride	All	74.41	68.90	79.92	72.42	7.8380	6.9245	8.8479	84.940			84.94	Option 2: A=7.4090, B=1325.900, C=252.600

Annual Emissions Report

Liquid Contents	Losses (lbs.): Standing	Withdrawal	Total
Methylene chloride	5026.50	1037.55	6064.05
Total:	5026.50	1037.55	6064.05

Attachment C

Revised Pages to Volume II: Dispersion Modeling Analysis of Original Permit Application

50,000 CFM general exhaust fans located in the ceiling in the areas of the facility isolated for foam fabrication operations. To provide enhanced dispersion, these three exhaust fans will be fitted with extensions to increase the their stack heights to 53 feet above ground level. As part of the proposed system the remaining fourteen ceiling exhaust fans not used as part of the foam fabrication operations exhaust system will not be operational.

Based on industry and product information, it is assumed for this analysis and the permit application, that 60% of the methylene chloride is released from the foam in the foam line enclosure before it reaches the Long Bun Storage Room and 35% is released during the twelve hour cure period in the Long Bun Storage Room. The remaining 5% of the methylene chloride is released during subsequent foam fabrication operations prior to shipment of the final product. Also, all TDI emissions associated with the Slabstock production occur within the foam line enclosure and are emitted to the atmosphere via the foam line stack.

2.2 Rebond Polyurethane Foam Production

In the Rebond process, scrap polyurethane foam, either purchased or recovered from the slabstock manufacturing process, is granulated into small pieces approximately 3/4 to one inch in size. This granulated foam is stored by grade, density, and/or by composition in large storage bins. The scrap pieces of polyurethane foam are mixed with an adhesive binder in a blend tank. The binder is a mixture of TDI and polyol. The mixture of scrap foam and binder is then transferred from the blend tank to the mold where it is compressed under an air cylinder to a designated size. The product is steamed from the bottom of the mold, which cures the foam . The resulting cylinder of foam is referred to as a log. The foam log is then peeled into a continuous sheet with a thickness of 1/4 to 3/4 inch, per customer specifications. The foam sheet product is then bonded to a polyethylene film. Finally the foam sheet product is cut to length and packaged into rolls, per customer order.

The TDI emissions from the Rebond process are currently vented to the atmosphere through two identical 1,000 CFM exhaust fans located in the ceiling directly above the process.

In order to increase production the rebond process will be modified to include an additional mold and relocated approximately 60 feet to the noetheast of is current location. The modified rebond process will require three 15,000 CFM exhaust fans, located in the ceiling above the process, with stack heights of 53 feet above ground level. The two existing 1,000 CFM fans will no longer serve the rebond process. The modification to the rebond process will also include a recirculating dust filter/collection system.

2.3 Tank Storage

The Foamex facility includes eleven above ground storage tanks for receiving and holding of the various raw materials used in the foam production processes. Table 1 provides a summary of the tanks, dimensions and products stored. Only one tank, Tank 10, is used for storage of methylene chloride. Methylene chloride emissions from Tank 10 were calculated using EPA's Storage Tank Emissions Calculation program, TANKS version 2.0, and are presented in the permit application. Foamex proposes to install a pressure relief valve on Tank 10 to minimize standing losses of methylene chloride. No physical or operational changes to the remaining storage tanks are proposed. Based on previous submittals to FDEP, methylene chloride emissions from Tank 10 are not addressed in this dispersion modeling analysis.

3.0 DISPERSION MODELING METHODOLOGY

As previously stated, the dispersion modeling analysis presented in this report only addresses the following emissions from the Foamex facility:

- Methylene Chloride from the slabstock foam manufacturing process and from the gluing process during foam fabrication operations;
- Toluene Diisocyanate from the slabstock foam manufacturing process and rebond foam manufacturing process; and
- 1,1,1-Trichloroethane from the gluing process during foam fabrication operations.

The methodology followed in the dispersion modeling analysis is as follows:

1) A downwash/Good Engineering Practice (GEP) stack height analysis was conducted utilizing EPA's new Building Profile Input Program (BPIP), dated 94074.
2) Emission rates for each compound and process were calculated based on maximum daily and annual usage of each compound.
3) The EPA Industrial Source Complex - Short Term model (ISCST2), dated 93109, was used to predict the 8-hour and 24-hour impacts of each compound and annual impacts of methylene chloride from the facility.
4) The resulting concentrations were then compared with FDEP's **Ambient Reference Concentrations (ARC's)** for each compound to determine if they are below the ARC's.

4.0 SOURCE DATA

The source data used in the dispersion modeling analysis are presented in Table 3 below. The location of each source is shown in Figure 2.

Table 3. Stack and Exhaust Fan Stack Parameters
Foamex, L.P. - Orlando, Florida

Source Number	Description	Stack Height[a] Above Ground Level (feet)	Stack Inside Diameter (inches)	Stack Gas Flow Rate (ACFM)	Stack Gas Exit Temp. (°F)	Stack Gas Exit Velocity (ft/sec)	Stack Location Coordinates[b] (feet) East	North
1	Foam Line Stack	125	33.75	30,000	80	80.481	577	393
2	Long Bun Storage Room Stack	125	33.75	30,000	80	80.481	500	56
3	Exhaust Fan	Not operational as part of enhanced exhaust system					356	319
4	Exhaust Fan	Not operational as part of enhanced exhaust system					356	363
5	Exhaust Fan	Not operational as part of enhanced exhaust system					356	393
6	Exhaust Fan	Not operational as part of enhanced exhaust system					356	445
7	Exhaust Fan	53	43.5	50,000	80	80.744	356	501
8	Exhaust Fan	Not operational as part of enhanced exhaust system					356	554
9	Exhaust Fan	Not operational as part of enhanced exhaust system					356	603
10	Exhaust Fan	Not operational as part of enhanced exhaust system					356	633
11	Exhaust Fan	Not operational as part of enhanced exhaust system					484	319
12	Exhaust Fan	53	43.5	50,000	80	80.744	484	363
13	Exhaust Fan	Not operational as part of enhanced exhaust system					484	393
14	Exhaust Fan	Not operational as part of enhanced exhaust system					484	445
15	Exhaust Fan	Not operational as part of enhanced exhaust system					484	501
16	Exhaust Fan	Not operational as part of enhanced exhaust system					484	554
17	Exhaust Fan	Not operational as part of enhanced exhaust system					484	603
18	Exhaust Fan	Not operational as part of enhanced exhaust system					484	633
19	Exhaust Fan	53	43.5	50,000	80	80.744	600	336.5
20	Rebond Exhaust Fan	53	24	15,000	80	79.577	464	590
21	Rebond Exhaust Fan	53	24	15,000	80	79.577	494	590
22	Rebond Exhaust Fan	53	24	15,000	80	79.577	524	590

a. Elevation of top of stack above ground level. Stack base elevation = 0 feet.

b. See Figure 2 for stack locations.

Figure 2. Stack Locations, Downwash Structures, and Property Line Receptors
Foamex, L.P. - Orlando Facility

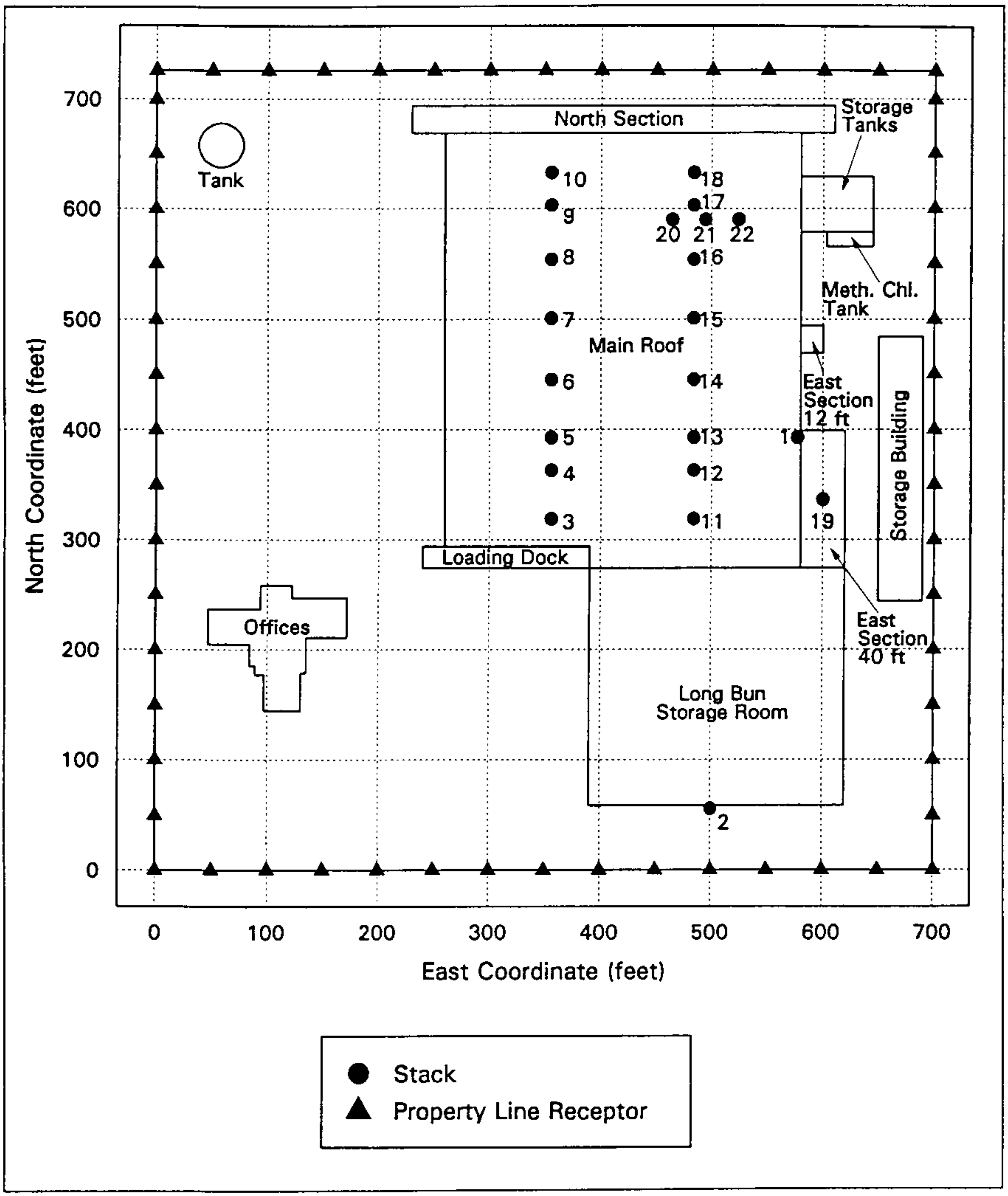

Table 5. GEP Stack Heights and Modeled Stack Heights
Foamex, L.P. - Orlando Facility

		Stack Heights Above Ground Level	
Source Number	Description	GEP (feet)	Modeled (feet)
1	Foam Line Stack	125	125
2	Long Bun Storage Room Stack	125	125
3	Exhaust Fan	Not modeled[a]	
4	Exhaust Fan	Not modeled[a]	
5	Exhaust Fan	Not modeled[a]	
6	Exhaust Fan	Not modeled[a]	
7	Exhaust Fan	125	53
8	Exhaust Fan	Not modeled[a]	
9	Exhaust Fan	Not modeled[a]	
10	Exhaust Fan	Not modeled[a]	
11	Exhaust Fan	Not modeled[a]	
12	Exhaust Fan	125	53
13	Exhaust Fan	Not modeled[a]	
14	Exhaust Fan	Not modeled[a]	
15	Exhaust Fan	Not modeled[a]	
16	Exhaust Fan	Not modeled[a]	
17	Exhaust Fan	Not modeled[a]	
18	Exhaust Fan	Not modeled[a]	
19	Exhaust Fan	125	53
20	Rebond Exhaust Fan	90	53
21	Rebond Exhaust Fan	90	53
22f	**Rebond Exhaust Fan**	**100**	**53**

a. Exhaust fans 3 - 6, 8 - 11, and 13 - 17 are not operational as part of enhanced exhaust system and therefore were not modeled.

11.0 COMPOUNDS AND APPLICABLE STANDARDS

The impacts of the compounds listed in Table 6 below were examined in this dispersion modeling analysis. The resulting concentrations were then compared with the listed applicable FDEP ARC's to determine if they are below the ARC's.

Table 6. Compounds Analyzed and ARC's
Foamex, L.P. - Orlando, Florida

Compound	Averaging Time	FDEP ARC ($\mu g/m^3$)
Methylene Chloride	8-hour	1,740
	24-hour	414
	Annual	2.0
Toluene Diisocyanate	8-hour	0.4
	24-hour	0.09
1,1,1-Trichloroethane	8-hour	19,000
	24-hour	4,524

12.0 CONCENTRATIONS CALCULATED

For comparison with the FDEP ARC's the maximum concentrations were calculated for each compound by the ISCST2 model for the 8-hour and 24-hour averaging times. The annual average concentration was also calculated for methylene chloride by the ISCST2 model by using the PERIOD keyword in the averaging times parameter list.

Distributed 8-hour average total methylene chloride emission rates:

Foam Line Stack	=	1,050.0 lb/hr		
Long Bun Storage Room Stack	=	612.5 lb/hr		
3 Exhaust Fans	=	87.5 lb/hr + 2.17 lb/hr	=	89.67 lb/hr
Each Exhaust Fan	=	89.67 lb/hr ÷ 3	=	29.89 lb/hr

24-hour average slabstock foam production methylene chloride emission rate = 14,000 lb/day ÷ 24 hr/day
= 583.333 lb/hr

Distributed 24-hour average slabstock foam production methylene chloride emission rates:

Foam Line Stack	=	583.333 lb/hr x 60%	=	350.0 lb/hr
Long Bun Storage Room Stack	=	583.333 lb/hr x 35%	=	204.167 lb/hr
3 Exhaust Fans	=	583.333 lb/hr x 5%	=	29.167 lb/hr

24-hour average gluing process methylene chloride emission rate:

3 Exhaust Fans	=	2.17 lb/hr x 24 hr/day ÷ 24 hr/day	=	2.17 lb/hr

Distributed 24-hour average total methylene chloride emission rates:

Foam Line Stack	=	350.0 lb/hr		
Long Bun Storage Room Stack	=	204.167 lb/hr		
3 Exhaust Fans	=	29.167 lb/hr + 2.17 lb/hr	=	31.337 lb/hr
Each Exhaust Fan	=	31.337 lb/hr ÷ 3	=	10.4457 lb/hr

Maximum annual slabstock foam production methylene chloride usage = 720,000 lb/yr

Annual slabstock foam production average methylene chloride emission rate = 720,000 lb/yr ÷ 8,760 hr/yr
= 82.192 lb/hr

Distributed annual slabstock foam production average methylene chloride emission rates:

Foam Line Stack	=	82.192 lb/hr x 60%	=	49.3152 lb/hr
Long Bun Storage Room Stack	=	82.192 lb/hr x 35%	=	28.7672 lb/hr
3 Exhaust Fans	=	82.192 lb/hr x 5%	=	4.1096 lb/hr

Maximum annual glue usage = 4,600 lb/yr

Annual gluing process average methylene chloride emission rate = 4,600 lb/yr x 70% ÷ 8,760 hr/yr
= 0.3676 lb/hr

Distributed annual average total methylene chloride emission rates:

Foam Line Stack	=	**49.3152** lb/hr		
Long Bun Storage Room Stack	=	**28.7672** lb/hr		
3 Exhaust Fans	=	**4.1096** lb/hr + 0.3676 lb/hr	=	**4.4772** lb/hr
Each Exhaust Fan	=	**4.4772** lb/hr ÷ 3	=	**1.4924** lb/hr

Maximum slabstock foam production TDI emission rate = 0.37 lb/hr

Maximum daily slabstock foam production hours of operation = 6.0 hr/day

Maximum daily slabstock foam production TDI emissions = 0.37 lb/hr x 6.0 hr/day = 2.22 lb/day

TDI emission factor = 0.000028 lb emitted/lb used

Maximum hourly rebond process TDI usage rate = **328** lb/hr

Maximum hourly rebond process TDI emission rate = **328** lb/hr x 0.000028 lb/lb = **0.0092** lb/hr

Maximum daily rebond process hours of operation = 24.0 hr/day

8-hour average TDI emission rates:

Foam Line Stack	=	2.22 lb/day ÷ 8 hr/day	=	0.2775 lb/hr
3 Rebond Exhaust Fans	=	**0.0092** lb/hr x 8 hr/day ÷ 8 hr/day	=	**0.0092** lb/hr
Each Rebond Exhaust Fan	=	**0.0092** lb/hr ÷ **3**	=	**0.0031** lb/hr

24-hour average TDI emission rates:

Foam Line Stack	=	2.22 lb/day ÷ 24 hr/day	=	0.0925 lb/hr
3 Rebond Exhaust Fans	=	**0.0092** lb/hr x 24 hr/day ÷ 24 hr/day	=	**0.0092** lb/hr
Each Rebond Exhaust Fan	=	**0.0092** lb/hr ÷ **3**	=	**0.0031** lb/hr

Maximum hourly glue usage rate = 3.1 lb/hr

Maximum 1,1,1-trichloroethane content of glue = 81%

Maximum hourly 1,1,1-trichloroethane emission rate = 3.1 lb/hr x 81% = 2.5 lb/hr

Maximum daily foam fabrication hours of operation = 24.0 hr/day

8-hour average 1,1,1-trichloroethane emission rates:

3 Exhaust Fans	=	2.5 lb/hr x 8 hr/day ÷ 8 hr/day	=	2.5 lb/hr
Each Exhaust Fan	=	2.5 lb/hr ÷ 3	=	0.83333 lb/hr

24-hour average 1,1,1-trichloroethane emission rates:

3 Exhaust Fans	= 2.5 lb/hr x 24 hr/day ÷ 24 hr/day	=	2.5 lb/hr
Each Exhaust Fan	= 2.5 lb/hr ÷ 3	=	0.83333 lb/hr

Table 7. Emission Rates
Foamex, L.P. - Orlando, Florida

		Emission Rates for Compounds Modeled						
		Methylene Chloride			Toluene Diisocyanate		1,1,1-Trichloroethane	
Source Number	Source Description	8-hour (lb/hr)	24-hour (lb/hr)	Annual (lb/hr)	8-hour (lb/hr)	24-hour (lb/hr)	8-hour (lb/hr)	24-hour (lb/hr)
1	Foam Line Stack	1,050.0	350.0	49.3152	0.2775	0.0925	0.0	0.0
2	Long Bun Storage Room Stack	612.5	204.167	28.7672	0.0	0.0	0.0	0.0
3	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Exhaust Fan	29.89	10.4457	1.4924	0.0	0.0	0.83333	0.83333
8	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Exhaust Fan	29.89	10.4457	1.4924	0.0	0.0	0.83333	0.83333
13	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	Exhaust Fan[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	Exhaust Fan	29.89	10.4457	1.4924	0.0	0.0	0.83333	0.83333
20	Rebond Exhaust Fan	0.0	0.0	0.0	0.0031	0.0031	0.0	0.0
21	Rebond Exhaust Fan	0.0	0.0	0.0	0.0031	0.0031	0.0	0.0
21	**Rebond Exhaust Fan**	0.0	0.0	0.0	0.0023	0.0023	0.0	0.0

a. Exhaust fans 3 - 6, 8 - 11, and 13 - 17 are not operational as part of enhanced exhaust system and therefore were not modeled.

14.0 RESULTS

The ISCST2 modeling was conducted for each compound and each averaging using the emission rates presented in Section 13.0. The overall maximum ground level concentrations from the ISCST2 modeling for each case are presented in Table 8 below. The output listings for each case are presented in Appendixes D through J. For comparison, Table 8 also shows the applicable FDEP ARC's for each compound and averaging time. For the 8-hour and 24-hour averaging times for each compound the maximum ground level concentrations are less than 90% of the applicable FDEP ARC's. Therefore, based on the results of this dispersion modeling analysis, the emissions from the Foamex facility comply with FDEP's 8-hour and 24-hour ARC's.

The resulting maximum annual ground level concentration for methylene chloride is 2.73 $\mu g/m^3$, which is greater than the FDEP annual ARC for methylene chloride of 2.0 $\mu g/m^3$. Therefore, based on Foamex's commitment to reduce the annual usage of methylene chloride as a blowing agent after five years to less than half of the current usage rate of 720,000 lbs/yr, a risk assessment was conducted to show that the exposure to the estimated methylene chloride emissions from the facility over a lifetime (70 years) pose less than a one-in-a-million increased cancer risk. The risk assessment was submitted to FDEP as an attachment to Foamex's Request for Permit Ammendment, dated June XX, 1996.

Table 8. ISCST2 Modeling Results and Comparison with FDEP ARC's
Foamex, L.P. - Orlando, Florida

Compound	Averaging Time	Maximum ISCST2 Ground Level Concentration ($\mu g/m^3$)	FDEP ARC ($\mu g/m^3$)
Methylene Chloride	8-hour	1,538.9	1,740
	24-hour	250.8	414
	Annual	2.73	2.0
Toluene Diisocyanate	8-hour	0.3	0.4
	24-hour	0.05	0.09
1,1,1-Trichloroethane	8-hour	10.1	19,000
	24-hour	6.7	4,524

Harding Lawson Associates

May 29, 1996

26005.F21.816

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MAY 30 1996
BUREAU OF
AIR REGULATION

Mr. Williard Hanks
Division of Air Resource Management
Florida Department of Environmental Protection
111 South Magnolia Drive, Suite 4
Tallahassee, Florida 32301

Foamex L.P.
FDEP Permit No. AC48-214902A

Dear Mr. Hanks:

On behalf of our client, Foamex, L.P., please find enclosed your copy of the "Proof of Publication" on the subject source.

Should you have any questions or comments, please do not hesitate to call.

Yours very truly,

HARDING LAWSON ASSOCIATES

Patricia Kay Rykowski

Patricia Kay Rykowski
Senior Engineer

PKR/slw/FOAMEX596.ltr

Enclosures

cc: Alan Zahm - FDEP Central Florida District
Dennis Nester-Orange County EPD
Jack Wanat-Foamex L.P., Orlando, FL
Tom Burghardt-Foamex, L.P., Linwood, PA

The Orlando Sentinel

Published Daily
$218.09

State of Florida } S.S.
COUNTY OF ORANGE

Before the undersigned authority personally appeared SHERI L. MILLER, who on oath says that he/she is the Legal Advertising Representative of The Orlando Sentinel, a daily newspaper published at ORLANDO in ORANGE County, Florida; that the attached copy of advertisement, being a INTENT TO ISSUE ST in the matter of AC 48-214902A

in the ORANGE Court, was published in said newspaper in the issue; of 05/21/96

Affiant further says that the said Orlando Sentinel is a newspaper published at ORLANDO, in said ORANGE County, Florida, and that the said newspaper has heretofore been continuously published in said ORANGE County, Florida, each Week Day and has been entered as second-class mail matter at the post office in ORLANDO in said ORANGE County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he/she has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Sheri L. Miller

The foregoing instrument was acknowledged before me this 23 day of MAY, 1996, by SHERI L. MILLER, who is personally known to me and who did take an oath.

Juanita Rosado

(SEAL)

JUANITA ROSADO
My Comm Exp 7/13/98
Bonded By Service Ins
No. CC392006

[ ] Personally Known [ ] Other I. D.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF INTENT TO ISSUE PERMIT
AC 48-214902A

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit to Foamex L.P., 1351 Gemini Blvd., Orlando, Orange County, Florida 32821. The modifications are to reconfigure the foam fabrication operation to reduce the number of fans needed to ventilate this process, to allow a 19.1 tons per year increase in methylene chloride emissions, and to extend the expiration date of the existing construction permit to May 15, 1997. These modifications do not require a Best Available Control (BACT) determination. Air dispersion modeling shows that ground-level concentrations of methylene chloride will not exceed the Florida Administration Reference Concentration.

The department has assigned File Number 175533 to the project.

A person whose substantial interests are affected by the department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Blvd., MS 35, Tallahassee, Florida 32399-3000, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) pursuant to Section 120.57, F.S.

The petition shall contain the following information: (a) The name, address and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application/request have the right to petition to become a

Department/request have the application/request have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207 Florida Administrative Code.

The application/request is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday except legal holidays, at:

Department of Environmental Protection
Bureau of Air Regulation
111 S. Magnolia Drive, Suite 4
Tallahassee, Florida 32301

Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Orange County Environmental Protection Department
2002 East Michigan Street
Orlando, Florida 32806

Any person may send written comments on the proposed action to the Administrator, New Source Review Section, at the Department's Tallahassee address. All comments received within 14 days of the publication of this notice will be considered in the Department's final determination.

COR949019 MAY.21,1996