UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

DATE: September 5, 2008

SUBJECT: **Iodomethane, PC Code 000011, DP Barcode 347811**; Health Effects Division (HED) Human Health Risk Assessment Based On Emissions Data Collected Under Experimental Use Permit (66330-EUP-37)

PC Code: 000011	**DP Barcode:** D347811
Decision No.: 386968	**Registration No.:** varied (66330-44 technical)
Petition No.: N/A	**Regulatory Action:** Experimental Use Permit
Risk Assessment Type: EUP Data Analysis	**Case No.:** N/A
TXR No.: N/A	**CAS No.:** 74-88-4
MRID Nos.: 472952-01, -02, -03, -04	**40 CFR: N/A**

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This document serves as the human health risk assessment based on the three field scale emissions studies that were completed under the experimental use permit issued for iodomethane that quantified flux after applications of the Midas 50/50 formulation. These three studies were completed in Georgia, Florida, and Michigan. In each study, both iodomethane and chloropicrin emissions were quantified. This risk analysis used PERFUM buffer outputs in a similar manner to the previous iodomethane risk assessment (Mendez & Dawson, D339055). It also includes an emissions factors analysis using CHAIN2D based on these data. In these emissions studies, metalized and VIF films were used in the application process along with reduced application rates and a proprietary programmable controller system named Symmetry™ which was developed by the registrant, Arysta Life Science. Results indicate that given the locations of the treated fields, soil conditions and the parameters of the given applications, overall emissions were significantly reduced compared to typical practices which were quantified in previous iodomethane emissions studies. PERFUM-predicted buffer distances mirrored this in that results indicated target air concentrations were achieved at very small distances (i.e., 0 meters in most cases and only a few were 5 meters even at high percentiles of exposure) for many field situations including large fields at high application rates. CHAIN2D analyses indicate certain factors such as bulk density, soil type, and soil moisture can significantly impact emissions. [Note: The chloropicrin elements of the referenced studies are addressed in D348674 completed 6/18/08 (Author: Smith) available at www.regulations.gov EPA-HQ-OPP-2007-0350-0171. The DERs for the iodomethane studies are included in D356082 and all were found acceptable for use in the risk assessment process.]

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1. Introduction

This document serves as the human health risk assessment for iodomethane which is based on the results of the recent emissions studies completed under Experimental Use Permit (66330-EUP-37). In this document, flux calculations are provided based on those emissions studies (Section 2) as well as risk estimates based on PERFUM modeling and the monitoring data (Section 3). CHAIN2D analyses have also been completed to evaluate the impact of changing soil conditions and tarps using the emissions data which are included in Section 4. A summary of this analysis is included in Section 5.

The studies/analyses which were submitted under the EUP which are referenced below and used to develop subsequent risk estimates can be identified by the following [Note: See the data evaluation record (DER) for the flux studies (MRID 472952-02, -03, and -04) in D356082 for more information, Author; Dawson 9/5/08.]:

- MRID 472952-01; ***A Review of the Flux Rate Data Collected For Iodomethane and Midas 50:50***; Authors: Reiss and Griffin; 11/30/07; Exponent, 1800 Diagonal Rd., Suite 500, Arlington VA 22314 (EXPO1207); Sponsor: Arysta LifeScience North American Corporation, 15401 Weston Parkway, Suite 150, Cary, NC 27513.

- MRID 472952-02; ***Direct and Indirect Flux Determination of Iodomethane and Chloropicrin Under Field Conditions Following Tarped/Raised Bed/Shallow Shank Injection Application of Midas 50:50 in Dover FL***; Authors: Baker and Arndt; 11/19/07; PTRL West, Inc., 625-B Alfred Nobel Drive, Hercules CA 94547 (PTRL 1595W, Volumes 1-3); Sponsor: Arysta LifeScience North American Corporation, 15401 Weston Parkway, Suite 150 Cary, NC 27513.

- MRID 472952-03; ***Direct and Indirect Flux Determination of Iodomethane and Chloropicrin Under Field Conditions Following Tarped/Raised Bed/Shallow Shank Injection Application of Midas 50:50 in Bainbridge GA***; Authors: Baker and Arndt; 2/23/07; PTRL West, Inc., 625-B Alfred Nobel Drive, Hercules CA 94547 (PTRL 1619W, Volumes 1-2); Sponsor: Arysta LifeScience North American Corporation, 15401 Weston Parkway, Suite 150, Cary, NC 27513.

- MRID 472952-04; ***Direct and Indirect Flux Determination of Iodomethane and Chloropicrin Under Field Conditions Following Tarped/Raised Bed/Shallow Shank Injection Application of Midas 50:50 in Hart MI***; Authors: Baker and Arndt; 11/21/07; PTRL West, Inc., 625-B Alfred Nobel Drive, Hercules, CA 94547 (PTRL 1646W, Volumes 1-2); Sponsor: Arysta LifeScience North American Corporation, 15401 Weston Parkway, Suite 150, Cary, NC 27513.

2.0 Flux Calculations

In EPA MRID 472952-01, the registrants used the data from the three emissions studies completed under the iodomethane EUP to calculate flux rates using the aerodynamic method of Majewski and also the indirect method developed by the California Department of Pesticide Regulation. These calculations were completed for both iodomethane and chloropicrin since they were both applied in these studies based on the use of the Midas 50:50 formulation at all sites. A comparison of the results of the recent EUP studies described below and the previously completed emissions data for iodomethane with typical HDPE or LDPE tarps, higher application rates, and common application systems was also included. Finally, a comparison of emissions to ambient temperature and also methyl bromide emissions rates were completed. The investigators drew several conclusions based on the analysis presented in this document. Essentially, the Agency concurs with these conclusions. The conclusions pertinent to the interpretation of the EUP studies and how they are used are summarized below:

- The indirect flux method consistently provided higher flux rates than the direct method. In a previous study using more typical practices (Manteca flat fume) the results based on the two methods were more consistent.
- The flux rates were higher for iodomethane than chloropicrin in the EUP studies where each was applied concurrently at the same application rate with the same equipment.
- Using the indirect method, the comparison between the measured and modeled air concentration values was very good. About 50 percent of the correlation coefficient values between measured and modeled values were above 0.90 or better.
- An analysis was attempted to elicit the impact of temperature and soil type on emissions. It appeared to have little influence but the investigators acknowledged a limited dataset for this analysis. [Note: See Agency conclusions on factors impacting emissions in separate document D306857 completed June 9, 2008, Authors: Dawson and Smith.]

Based on the results of the reviews of the emissions studies (i.e., residue values were corrected for recovery by the Agency and not by the investigators) and to verify the flux calculations, the Agency calculated flux from the studies using the same approaches which are widely recognized as viable methods for flux determinations. The flux estimates calculated by the investigators and also by the Agency are presented below in Tables 2-1 through 2-3. The results are very similar in most cases. The Agency used the flux rates calculated by Versar, which made corrections based on recovery results, rather than those of the investigators, which did not make recovery corrections, in its risk calculations (Appendix A). The investigators also calculated mass loss estimates for iodomethane and chloropicrin and found that the mass losses over 24-hour periods were significantly lower than previous studies with standard tarps and application equipment (i.e., around 5% or so compared with around 50% or so) as well as over the entire monitoring period (i.e., around 19% or so on average compared with approximately 50 to 100% or so emitted). Chloropicrin mass loss values were also comparatively low with 24-hour values less than 1.7 percent and total values over the entire monitoring period less than 4 percent. The Agency essentially agrees with these mass loss values calculated by the investigators. [Note: The flux rates below reflect the application rates used in the studies and not label maximum application rates. PERFUM analyses were completed using these and maximum rates.]

Table 2-1: Flux Rates Dover, FL Study						
Period	Date/Time	Flux Estimation Technique				
		Indirect			Aerodynamic	
		Flux (µg/m2-s)		Reasoning	Flux (µg/m2-s)	
		Reg.[1]	Est.[2]	Est.	Reg.	Est.
Iodomethane						
1	Day 0 11:00-14:00	11.68	14.47	Slope	1.37	1.18
2	Day 0 14:00-17:00	9.47	10.06	Slope, no intercept	5.24	6.95
3	Day 0 17:00-19:00	6.62	5.18	Slope, no intercept	5.60	7.59
4	Day 0 19:00-7:00	2.69	4.00	Slope, no intercept	1.57	2.14
5	Day 1 7:00-19:00	2.99	3.98	Slope	1.52	1.99
6	Day 1 19:00-7:00	1.49	2.25	Slope	1.11	1.49
7	Day 2 7:00-19:00	1.10	1.13	Slope	0.66	0.80
8	Day 2 19:00-7:00	0.44	0.66	Slope, no intercept	0.46	0.62
9	Day 3 7:00-19:00	1.03	3.52	Slope, no intercept	0.37	1.12
10	Day 3 19:00-7:00[3]	0.97	1.80	Slope	0.43	-1.88
11	Day 4 7:00-19:00[3]	3.81	142.49	Ratio of averages	0.56	12.2
12	Day 4 19:00-7:00	1.19	9.41	Ratio of averages	0.37	0.68

1. Reg. – Registrant estimated flux rates.
2. Est. – Versar estimated flux rates.
3. Significant breakthrough of iodomethane into back-end section of sample tubes. Registrant did not use data from back-end section, indicating that "Since it was clear from laboratory and field validation studies that breakthrough into back-end sections did not occur to a significant extent then only front-end section extracts were the focus of the current study." Additionally, the registrant cited possible contamination during storage.

Table 2-2: Flux Rates Bainbridge, GA Study						
Period	Date/Time	Flux Estimation Technique				
		Indirect			Aerodynamic	
		Flux (µg/m2-s)		Reasoning	Flux (µg/m2-s)	
		Reg.[1]	Est.[2]	Est.	Reg.	Est.
Iodomethane						
1	Day 0 10:00-14:00	2.49	3.99	Slope, no intercept	2.89	4.31
2	Day 0 14:00-17:00	5.44	7.39	Slope	7.63	11.40
3	Day 0 17:00-20:00	3.47	3.37	Slope	4.20	6.28
4	Day 0 20:00-8:00	2.48	3.96	Slope	1.32	1.85
5	Day 1 8:00-20:00	3.83	5.13	Slope	2.60	3.88
6	Day 1 20:00-8:00	2.14	3.25	Slope, no intercept	0.82	1.11
7	Day 2 8:00-20:00	1.46	7.06	Slope, no intercept	1.77	4.21
8	Day 2 20:00-8:00[3]	1.26	5.44	Slope, no intercept	0.45	-0.24
9	Day 3 8:00-20:00	0.93	3.28	Slope	0.84	1.93
10	Day 3 20:00-8:00	0.83	1.17	Slope, no intercept	0.04	0.29
11	Day 4 8:00-20:00	0.42	0.50	Slope	0.44	2.16
12	Day 4 20:00-8:00	0.34	0.54	Slope	0.15	0.46

1. Reg. – Registrant estimated flux rates.
2. Est. – Versar estimated flux rates.
3. Significant breakthrough of iodomethane into back-end section of sample tubes 12 and 13.

Table 2-3: Flux Rates Hart, MI Study						
Period	Date/Time	Flux Estimation Technique				
		Indirect			Aerodynamic	
		Flux (µg/m2-s)		Reasoning	Flux (µg/m2-s)	
		Reg.[1]	Est.[2]	Est.	Reg.	Est.
Iodomethane						
1	Day 0 11:00-13:00	3.68	6.83	Slope, no intercept	1.19	1.82
2	Day 0 13:00-16:00	1.90	1.76	Slope	0.39	0.64
3	Day 0 16:00-19:00	3.28	2.55	Slope, no intercept	1.53	1.97
4	Day 0 19:00-7:00	1.80	2.79	Slope, no intercept	2.31	2.93
5	Day 1 7:00-19:00	2.00	3.28	Slope, no intercept	1.61	2.40
6	Day 1 19:00-7:00	4.09	4.45	Slope	2.26	2.54
7	Day 2 7:00-19:00	1.30	2.67	Slope	2.24	3.59
8	Day 2 19:00-7:00	4.25	6.40	Slope, no intercept	2.25	2.70
9	Day 3 7:00-19:00	2.94	4.96	Slope	2.26	3.66
10	Day 3 19:00-7:00	1.64	2.15	Slope	1.62	3.38
11	Day 4 7:00-19:00	0.79	1.41	Slope, no intercept	1.16	1.68
12	Day 4 19:00-7:00	0.83	1.91	Slope	1.04	1.21

1. Reg. – Registrant estimated flux rates.
2. Est. – Versar estimated flux rates.

3.0 Risk Estimates Based On EUP Emissions Data

In the 2007 iodomethane risk assessment, a series of calculations were completed based on empirical monitoring data and also using the PERFUM model to quantify the potential risks for bystanders as a result of iodmethane use (see D339055, authors: Mendez and Dawson, 6/18/07). The outputs presented in D339055 are buffer distances as defined by the PERFUM model which is described in that assessment. The risk analysis at that time was based on emissions data reflecting conventional fumigant application methods and a variety of weather stations.

In this assessment, a similar approach has been used to estimate buffer distances using the PERFUM model and similar weather data but the new iodomethane flux data collected under the EUP. These data differ from those in D339055 in that they reflect reduced application rates (75 pounds active ingredient/treated acre), the use of higher barrier films, application of a Midas 50:50 combination product that also contains chloropicrin, and the use of the Symmetry™ application system. Two studies were also conducted in different geographical areas from previous studies (Michigan and Georgia). The third was conducted in the same county of Florida as the previous tarped raised bed emissions study in Plant City. Soil conditions generally were sand or sandy loam, applications were made at culturally appropriate times of the year, and other ambient conditions were reflective of typical fumigant use patterns.

The same HECs (Human Equivalent Concentrations) as were used in D339055 have been used in the current calculations to develop risk estimates. The effects upon which the assessment is based include nasal irritation, developmental/fetal loss, and neurotoxicity and the HECs are: 4.5 ppm for nasal lesions; HEC = 7.4 ppm for fetal loss; and HEC = 10 ppm for neurotoxicity. In all cases the target uncertainty factor is 30 which was derived based on the guidance contained in the Agency's RfC methodology described in D339055. The duration over which time-weighted average air concentrations were amortized was 24 hours for the nasal lesion and developmental/fetal loss effects and 8 hours for the neurotoxicity effect as described in D339055.

As described in Section 2 above, flux rates were calculated based on the study conditions and these are summarized in Tables 2-1 through 2-3 above. The study conditions included in-field application rates of 75 pounds iodomethane per treated acre. However, the label prescribed maximum application rate is 175 pounds iodomethane per treated acre so for the purposes of completing PERFUM analyses the flux rates were scaled up to the maximum application rate to evaluate risks from situations where such high rates could be used under metalized or VIF type tarps. This approach in the analysis should be considered as a rangefinder because it is unlikely that in most situations such high rates would be used in conjunction with these types of tarps since they appear to retain higher levels of iodomethane in soil over longer periods of time than standard types of tarps which allows for the possible use of lower rates to achieve similar efficacy. It is also not clear if such an extrapolation is linear as completed so this step may add some uncertainty in the results. However; as a reminder, PERFUM provides information for several application rates in each output file so the study rate of 75 pounds iodomethane per treated acre is also included in output files. Additionally, PERFUM itself was modified to allow for analyses of field sizes up to 120 acres as opposed to the maximum of 40 acres considered in the 2007 assessment. This is also reflected in the current analyses. It should also be noted that results were similar regardless of the type of flux inputs used for each study (i.e., indirect or direct flux estimates as described above).

In this analysis, PERFUM predicted buffer distances (i.e., both whole field and maximum values) were all (0) meters for all combinations of emissions and weather data considered (e.g., Dover FL flux and Bradenton, FL weather) based on the application rate of 75 pounds iodomethane applied per treated acre used in the studies described above even in fields as large as 120 acres. Results were similar even when the maximum application rate of 175 pounds iodomethane per treated acre in 120 acre fields was also considered even though this far exceeded the application conditions evaluated in the emissions studies upon which the PERFUM analysis was based. The only exception noted was that in some of these maximum rate analyses 5 meter buffers were predicted at the upper percentiles of exposure (e.g., 99, 99.9 and 99.99th percentiles).

PERFUM outputs now also include air concentrations that are reported as distributions in 30 rings around the perimeter of a treated field spaced at different distances from 5 meters to 1440 meters away from the field perimeter. Using this information, risks were calculated and found not to be of concern even for 120 acre fields, 5 meters from the perimeter at the maximum application rate of 175 lb iodomethane/treated acre at the 99.9th percentile air concentration. These results are presented in Table 6-1 for all durations (i.e., 8 or 24 hour time-weighted averages) and endpoints considered (i.e., nasal lesions, developmental, neurotoxicity). Risks are presented in Table 3-1 as *Margins of Exposure* (MOEs) and MOEs <30 are of concern to the Agency.

Table 3-1: Iodomethane MOEs Based On PERFUM Air Concentrations (120A/150 lb ai/A)

Weather Source	Nasal (24hr TWA)		Fetal Loss (24hr TWA)		Neurotox (8 hr TWA)	
	Direct	Indirect	Direct	Indirect	Direct	Indirect
Bakersfield CA	126	78	197	129	142	96
Bradenton FL	74	46	129	76	110	73
Flint MI	126	68	197	110	175	96
Tallahassee FL	108	62	174	102	157	96
Ventura CA	94	51	156	85	119	63
Yakimah WA	116	62	197	102	142	73

Along with using PERFUM to estimate risks, the monitoring data were also used to calculate risks (i.e., MOEs) for each of the three endpoints described above (i.e., nasal lesions, developmental effects and neurotoxicity). In the monitoring studies, sampling devices were spaced evenly around the perimeter of the treated fields, 60 feet from the perimeter and the 2.5 acre fields were treated at an application rate of 75 pounds iodomethane per treated acre. The risk estimates (i.e., MOEs) which were calculated based on the monitoring data are included in Appendix B for all monitoring masts up to 4 days after application at all sites. A summary of the risks are presented below for all 3 emissions studies for each endpoint (Table 3-2). Risks were not of concern for any of the endpoints, at any study location, at any sampling period (i.e., MOEs>30 are not of concern). In fact, if a linear relationship is considered as a crude approach for extrapolating air concentration based on application rate, then risks even at the maximum application rate of 175 lb iodomethane per treated acre are not of concern (i.e., worst MOE~45 where the level of concern is anything below 30).

Table 3-2: MOEs Calculated Based On Time Weighted Average Air Concentrations From Iodomethane Monitoring Data

Air Concentration Descriptor	MOEs For Different Endpoints		
	Nasal Lesions	**Developmental (Fetal Loss)**	**Neurotoxicity**
Min	544250	894979	1184755
Max	107	176	121
Mean	20967	34478	38726

Air concentrations upon which MOEs were calculated are time weighted averages based on either 8 or 24 hours. Results from all sampling masts from all sites were considered in this summary. In most cases the MOEs based on neurotoxicity are based on 12 hour sampling periods because the concentrations were highest for that timeframe.

4.0 CHAIN2D Analysis Of Emissions Data

In this analysis, CHAIN2D was used to evaluate the impact of altering basic conditions in the subsurface soil after iodomethane application on emissions. The impact of altering agricultural films was also considered. This analysis used the same approaches and techniques as described in the recently completed document:

> *Factors Which Impact Soil Fumigant Emissions - Evaluation For Use In Soil Fumigant Buffer Zone Credit Factor Approach D306857, Authors: Dawson & Smith, 6/9/08*

The Agency's sensitivity analysis focused on the following factors, including:

- Injection depth (from study ± 10% and 25%),
- Soil moisture (from study ± 10% and 25%),
- Organic matter via K_d value (from study ± 10% and 25%),
- Soil type (from study ± 10% and 25%),
- Bulk density (from study ± 10% and 25%),
- Percent tarp coverage to evaluate possible breaches in the higher barrier films used in the studies (from study -10% and -25%), and
- Tarp type via mass transfer coefficient (from study ± 10% and 25%).
- [Note: Evaluating changes in soil temperature is not applicable because soil temperatures are incorporated on an hourly basis from the empirical data and also the boundary layer mass transfer coefficient is temperature dependent.]

In order to perform the sensitivity analysis, the Agency needed to calibrate CHAIN2D using actual iodomethane field volatility studies as well as a number of chemical and environmental fate properties. This calibration process included extracting soil and meteorological parameters from the field volatility studies. The results of all of the CHAIN2D analyses which have been completed are provided in graphical form in Appendix C. An example calibration result for the Dover, Florida data is provided in Figure 4-1. Examples of factors which appear to have the greatest impact upon emissions if they are altered are provided in Figures 4-2 through 4-4.

Generally the trends in the results of this analysis were consistent with the analysis included in the factors analysis completed by the Agency (D306857). Additionally, the results appear supportive of the factors which were believed to impact emission levels. It is also clear that soil type and the level of compaction can significantly impact results and in a manner anticipated prior to this analysis. For example, more clay in the soil leads to lower emissions likely because it is harder for fumigants to be mobile in clay soils. Additionally, higher levels of compaction reduce emissions probably for similar reasons. A couple of factors (i.e., soil temperature and MTC changes) which intuitively have impacts were hard to evaluate in a systematic manner. Soil temperature changes can be evaluated by considering hour by hour model outputs where soil temperatures change but it should also be realized that since this type of review would be empirical that other field factors would be changing as well. For MTC changes, it is likely that other subsurface phenomena would also be impacted which were difficult to quantify. Techniques for further assessment of these factors are being considered.

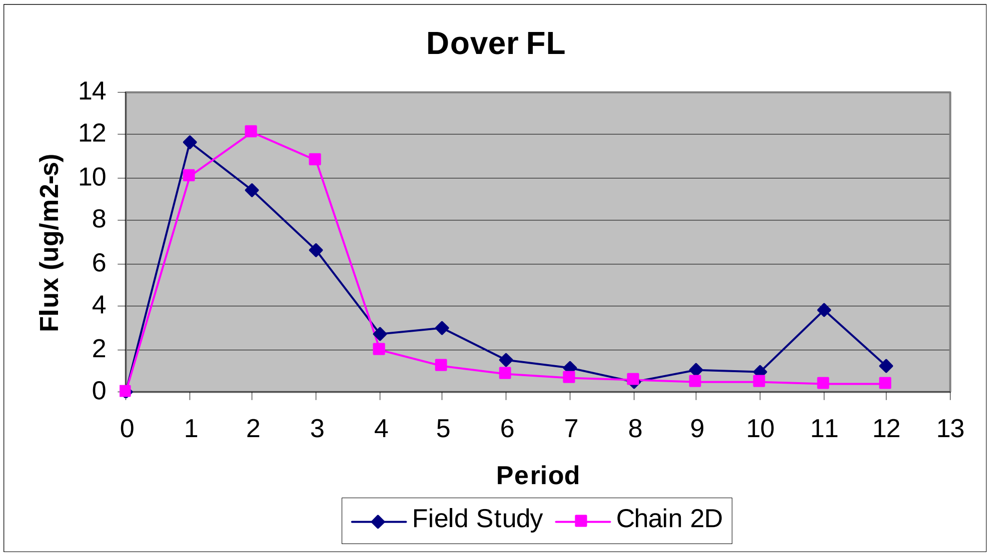


Figure 4-1: CHAIN2D Calibration Result For Dover FL Iodomethane Emissions Study

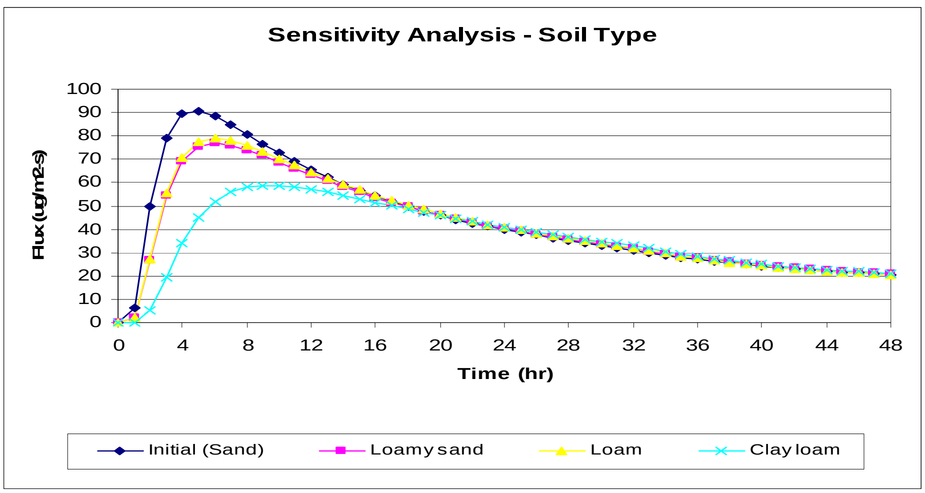


Figure 4-2: Impact of Altering Soil Type On Iodomethane Emissions From Dover FL

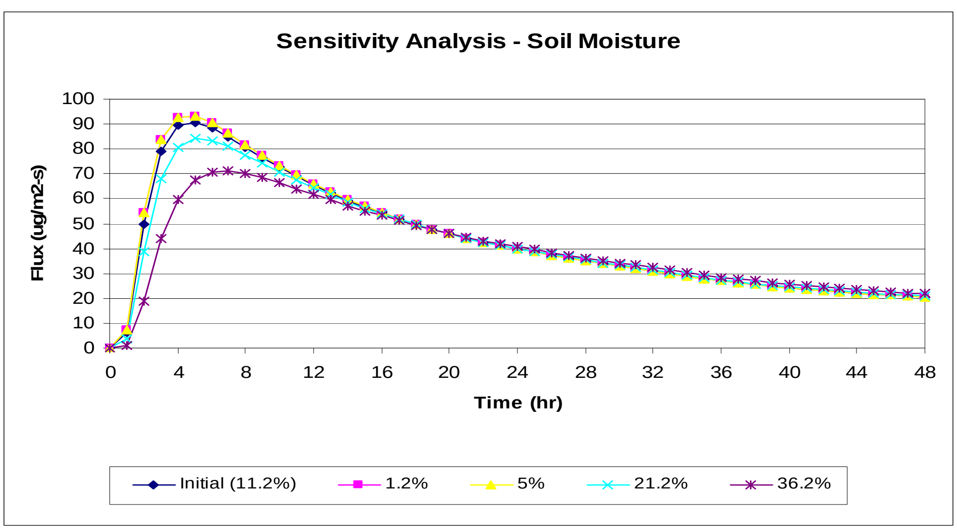


Figure 4-3: Impact of Altering Soil Type On Iodomethane Emissions From Dover FL

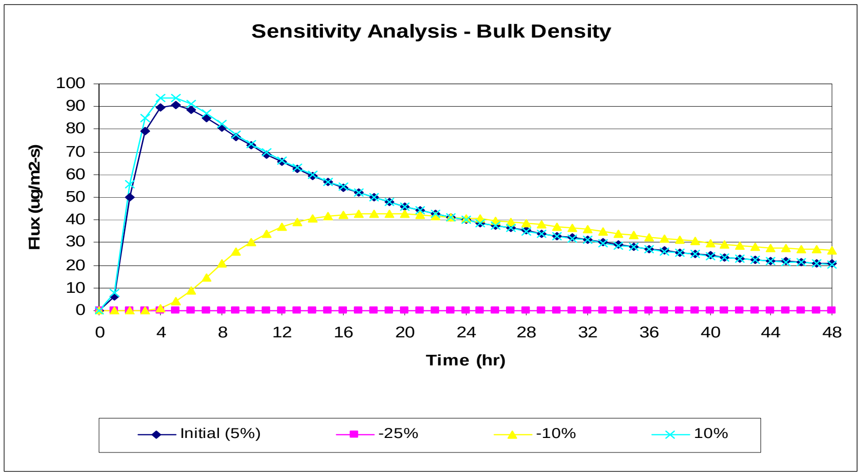


Figure 4-4: Impact of Altering Bulk Density On Iodomethane Emissions From Dover FL

5.0 Summary

The recent emissions data which were completed under the requirements of the EUP (Experimental Use Permit) for iodomethane have been reviewed from a technical perspective and each has been found to be acceptable for use in the risk assessment process as described in D356082 (Author Dawson, 9/5/08). These data reflect emissions based on the use of either metalized or high barrier VIF-type films coupled with the Symmetry™ application system and reduced application rates of 75 pounds iodomethane per treated acre in raised beds. The studies were conducted in Dover, Florida, Bainbridge, Georgia, and Hart, Michigan which are typical areas where key crops are produced where iodomethane could be used (e.g., tomatoes and strawberries). The only items of note identified in the reviews of the study were that some low level contamination during freezer storage was observed in certain samples but the overall impact was minimal on the results. Also, the investigators in the studies did not correct for recovery values in some cases. The Agency corrected the appropriate results for recovery and used the revised values in all of its calculations. The Agency also verified the approaches used by the investigators to calculate emission flux estimates. All flux estimates used in the risk assessment included in this document are based on the Agency-calculated flux estimates because they are based on the results which have been corrected for recovery.

The results indicate that overall emissions were greatly reduced at each site given the conditions of each application. Additionally, PERFUM predicted buffer zones were essentially (0) meters in all cases regardless of the size of the treated fields, application rate, or source of emissions data. In fact, this is true even if fields of 120 acres are treated at the maximum allowable application rate of 175 pounds iodomethane per treated acre. This was considered by extrapolating the results of the 3 field studies, based on differences in application rate, from the actual application rate of 75 lb/treated acre. Air concentration data from PERFUM were also considered and the risks calculated based on this information were also not of concern even 5 meters from the field at the highest levels of exposure (e.g., 99.9th percentile). Finally, the CHAIN2D analysis, based on the monitoring data, indicates similar results to that observed in the recent Agency factors document (D306857). In essence, higher levels of organic matter, clay content, moisture levels, and soil compaction have significant impact on emissions.

Appendix A: Versar Flux Calculations And Comparison With Flux Estimates Presented In MRID 472952-01

Iodomethane and Chloropicrin (MIDAS) Flux Rate Estimation Techniques

Two techniques were employed in estimating flux rates from fields treated with Midas50:50: the aerodynamic flux method and the indirect method, commonly referred to as the "back calculation" method.

In the aerodynamic method, a mast is erected in the middle of the treated field and concentration samples are collected at five different heights; 15, 33, 55, 90, and 150 cm. Likewise, temperature and wind speed samples are collected at 33, 55, 90, and 150 cm. A log-linear regression is performed relating the logarithm of the sample height to the concentration, temperature, and wind speed. These relationships are then incorporated into an equation to estimate flux. The equations used are presented at the end of Attachment C.

In the indirect method, samples are collected at various locations outside the boundaries of a treated field. Meteorological conditions, including air temperature, wind speed, wind direction, and atmospheric stability are also collected for the duration of the sampling event. The dimensions and orientation of the treated field, the location of the samplers, and the meteorological information is used in combination with the air model ISC and a unit flux rate of 0.01 g/m^2-s to estimate concentrations at the sampler locations. Because the ISC model assumes a linear relationship between flux and the concentration at a given location, the results from the ISC model runs are compared to those concentrations actually measured and a regression is performed, using the modeled values along the x-axis and the measured values along the y-axis. If the linear regression does not result in a good fit (e.g., a poor r-squared value), the regression may be rerun forcing the intercept through the origin, or the data may be resorted, removing the spatial relationship of the concentrations, and a regression performed. Further discussion of the hierarchy used in estimating flux rates from these regressions is provided in Attachment A.

MIDAS Field Studies

Three field volatility studies, with shank injection applications, were conducted in estimating flux rates for iodomethane and chloropicrin (Midas 50:50). The following sections discuss the field volatility studies and the flux rates that were developed.

Direct and Indirect flux determination of Iodomethane and Chloropicrin under Field Conditions Following Tarped/Raised Bed/ Shallow Shank Injection Application of MIDAS 50:50 in Dover, FL (MRID 472952-02)

MIDAS 50:50 was applied via a tarped, shank injection to a field measuring 330 feet (101 meters) by 330 feet (101 meters) at a rate of 144.8 pounds ai per treated acre in January 31, 2007. The field was oriented in a north-south direction. A 0.0013 inch thick metalized white tarpaulin (Canslit Inc.) was placed over the application plot. Application began at 11:24 am and was completed by 3:01 pm. Eight samplers were placed evenly around the field at a distance of 60 feet, as depicted in Figure 1, to measure the amount of MIDAS 50:50 in the air around the field. Samplers were placed at a height 5 feet above the ground. Additionally, a sample mast was placed in the center of the field and samples collected at five different heights. Meteorological measurements were also made onsite.

Onsite concentration and meteorological measurements and flux calculations are presented in Attachment B. Estimated flux rates for the first 5 days are provided in Table 1.

Direct and Indirect Flux Determination of Iodomethane and Chloropicrin under Field Conditions Following Tarped/Raised Bed/Shallow Shank Injection Application of MIDAS 50:50 in Bainbridge, GA **(MRID# 472952-03)**

MIDAS 50:50 was applied via a tarped, shank injection to a field measuring 330 feet (101 meters) by 330 feet (101 meters) at a rate of 154.8 pounds ai per treated acre on March 21, 2007. The field was oriented to the northeast. A 0.00125 inch thick tarpaulin, Hytiblock 7 black film (Polygrow Inc.) was placed over the application plot. Application began at 09:46 am and was completed by 12:46 pm. Eight samplers were placed evenly around the field at a distance of 60 feet, as depicted in Figure 2, to measure the amount of MIDAS 50:50 in the air around the field. Samplers were placed at a height 5 feet above the ground. Additionally, a sample mast was placed in the center of the field and samples collected at five different heights. Meteorological measurements were also made onsite.

Onsite concentration measurements, meteorological data, and flux calculations are presented in Attachment C. Estimated flux rates for the first 5 days are provided in Table 2.

Direct and Indirect Flux Determination of Iodomethane and Chloropicrin under Field Conditions Following Tarped/Raised Bed/Shallow Shank Injection Application of MIDAS 50:50 in Hart, MI **(MRID# 472952-04)**

MIDAS 50:50 was applied via a tarped, shank injection to a field measuring 330 feet (101 meters) by 330 feet (101 meters) at a rate of 159.7 pounds ai per treated acre on May 17, 2007. The field was oriented in a north-south direction. A 0.00125 inch thick XL Black Blockade (Pliant Corp.) was placed over the application plot. Application began at 10:07 am and was completed by 1:14 pm. Eight samplers were placed evenly around the field at a distance of 60 feet, as depicted in Figure 3, to measure the amount of MIDAS 50:50 in the air around the field. Samplers were placed at a height 5 feet above the ground. Additionally, a sample mast was placed in the center of the field and samples collected at five different heights. Meteorological measurements were also made onsite.

Onsite concentration measurements, meteorological data, and flux calculations are presented in Attachment D. Estimated flux rates for the first 5 days for iodomethane and the first 3 days for chloropicrin are provided in Table 3.

Table 1. Flux Rates Dover, FL Study

Period	Date/Time	Flux Estimation Technique				
		Indirect			Aerodynamic	
		Flux (µg/m2-s)		Reasoning	Flux (µg/m2-s)	
		Reg.[1]	Est.[2]	Est.	Reg.	Est.
Iodomethane						
1	Day 0 11:00-14:00	11.68	14.47	Slope	1.37	1.18
2	Day 0 14:00-17:00	9.47	10.06	Slope, no intercept	5.24	6.95
3	Day 0 17:00-19:00	6.62	5.18	Slope, no intercept	5.60	7.59
4	Day 0 19:00-7:00	2.69	4.00	Slope, no intercept	1.57	2.14
5	Day 1 7:00-19:00	2.99	3.98	Slope	1.52	1.99
6	Day 1 19:00-7:00	1.49	2.25	Slope	1.11	1.49
7	Day 2 7:00-19:00	1.10	1.13	Slope	0.66	0.80
8	Day 2 19:00-7:00	0.44	0.66	Slope, no intercept	0.46	0.62
9	Day 3 7:00-19:00	1.03	3.52	Slope, no intercept	0.37	1.12
10	Day 3 19:00-7:00[3]	0.97	1.80	Slope	0.43	-1.88
11	Day 4 7:00-19:00[3]	3.81	142.49	Ratio of averages	0.56	12.2
12	Day 4 19:00-7:00	1.19	9.41	Ratio of averages	0.37	0.68
Chloropicrin						
1	Day 0 11:00-14:00	11.70	13.57	Slope, no intercept	1.24	1.63
2	Day 0 14:00-17:00	6.76	4.65	Slope, no intercept	0.30	0.37
3	Day 0 17:00-19:00	6.37	3.25	Slope, no intercept	0.22	0.29
4	Day 0 19:00-7:00	0.78	1.09	Slope, no intercept	0.64	0.78
5	Day 1 7:00-19:00	1.22	1.35	Slope	0.60	0.67
6	Day 1 19:00-7:00	2.87	1.96	Slope, no intercept	0.47	0.55
7	Day 2 7:00-19:00	0.81	0.57	Slope	0.33	0.39
8	Day 2 19:00-7:00	0.27	0.38	Slope, no intercept	0.18	0.23
9	Day 3 7:00-19:00	0.35	0.48	Slope	0.10	0.12
10	Day 3 19:00-7:00	0.28	0.33	Slope	0.04	0.06
11	Day 4 7:00-19:00	0.37	0.45	Slope	0.05	0.07
12	Day 4 19:00-7:00	0.19	0.22	Slope	0.05	0.06

1. Reg. – Registrant estimated flux rates.
2. Est. – Versar estimated flux rates.
3. Significant breakthrough of iodomethane into back–end section of sample tubes. Registrant did not use data from back-end section, indicating that "Since it was clear from laboratory and field validation studies that breakthrough into back-end sections did not occur to a significant extent then only front-end section extracts were the focus of the current study." Additionally, the registrant cited possible contamination during storage.

Table 2. Flux Rates Bainbridge, GA Study

Period	Date/Time	Flux Estimation Technique				
		Indirect			Aerodynamic	
		Flux (µg/m2-s)		Reasoning	Flux (µg/m2-s)	
		Reg.[1]	Est.[2]	Est.	Reg.	Est.
Iodomethane						
1	Day 0 10:00-14:00	2.49	3.99	Slope, no intercept	2.89	4.31
2	Day 0 14:00-17:00	5.44	7.39	Slope	7.63	11.40
3	Day 0 17:00-20:00	3.47	3.37	Slope	4.20	6.28
4	Day 0 20:00-8:00	2.48	3.96	Slope	1.32	1.85
5	Day 1 8:00-20:00	3.83	5.13	Slope	2.60	3.88
6	Day 1 20:00-8:00	2.14	3.25	Slope, no intercept	0.82	1.11
7	Day 2 8:00-20:00	1.46	7.06	Slope, no intercept	1.77	4.21
8	Day 2 20:00-8:00[3]	1.26	5.44	Slope, no intercept	0.45	-0.24
9	Day 3 8:00-20:00	0.93	3.28	Slope	0.84	1.93
10	Day 3 20:00-8:00	0.83	1.17	Slope, no intercept	0.04	0.29
11	Day 4 8:00-20:00	0.42	0.50	Slope	0.44	2.16
12	Day 4 20:00-8:00	0.34	0.54	Slope	0.15	0.46
Chloropicrin						
1	Day 0 10:00-14:00[4]	0.422	0.940	Ratio of averages	0.054	-0.003
2	Day 0 14:00-17:00	0.323	0.175	Slope, no intercept	0.347	0.373
3	Day 0 17:00-20:00	0.322	0.238	Slope	0.370	0.370
4	Day 0 20:00-8:00	0.272	0.292	Slope	0.189	0.190
5	Day 1 8:00-20:00	0.516	0.465	Slope, no intercept	0.354	0.354
6	Day 1 20:00-8:00	0.101	0.068	Slope	0.042	0.042
7	Day 2 8:00-20:00	0.096	0.070	Slope, no intercept	0.096	0.096
8	Day 2 20:00-8:00	0.022	0.023	Slope, no intercept	0.008	0.010
9	Day 3 8:00-20:00	0.030	0.246	Slope	0.018	0.011
10	Day 3 20:00-8:00	0.015	0.012	Slope, no intercept	0.002	0.001
11	Day 4 8:00-20:00	0.017	0.020	Slope, no intercept	0.008	0.065
12	Day 4 20:00-8:00	0.062	0.077	Ratio of averages	0.003	0.002

1. Reg. – Registrant estimated flux rates.
2. Est. – Versar estimated flux rates.
3. Significant breakthrough of iodomethane into back–end section of sample tubes 12 and 13.
4. All on-site samplers below LOQ.

Table 3. Flux Rates Hart, MI Study

Period	Date/Time	Flux Estimation Technique				
		Indirect			Aerodynamic	
		Flux (µg/m2-s)		Reasoning	Flux (µg/m2-s)	
		Reg.[1]	Est.[2]	Est.	Reg.	Est.
Iodomethane						
1	Day 0 11:00-13:00	3.68	6.83	Slope, no intercept	1.19	1.82
2	Day 0 13:00-16:00	1.90	1.76	Slope	0.39	0.64
3	Day 0 16:00-19:00	3.28	2.55	Slope, no intercept	1.53	1.97
4	Day 0 19:00-7:00	1.80	2.79	Slope, no intercept	2.31	2.93
5	Day 1 7:00-19:00	2.00	3.28	Slope, no intercept	1.61	2.40
6	Day 1 19:00-7:00	4.09	4.45	Slope	2.26	2.54
7	Day 2 7:00-19:00	1.30	2.67	Slope	2.24	3.59
8	Day 2 19:00-7:00	4.25	6.40	Slope, no intercept	2.25	2.70
9	Day 3 7:00-19:00	2.94	4.96	Slope	2.26	3.66
10	Day 3 19:00-7:00	1.64	2.15	Slope	1.62	3.38
11	Day 4 7:00-19:00	0.79	1.41	Slope, no intercept	1.16	1.68
12	Day 4 19:00-7:00	0.83	1.91	Slope	1.04	1.21
Chloropicrin						
1	Day 0 11:00-13:00	0.885	0.96	Slope, no intercept	0.117	0.115
2	Day 0 13:00-16:00	0.291	0.12	Slope, no intercept	0.03	0.02
3	Day 0 16:00-19:00	NA	NA	NA	NA	NA
4	Day 0 19:00-7:00	0.008	0.006	Slope	0.009	0.009
5	Day 1 7:00-19:00	0.022	0.026	Slope, no intercept	0.025	0.026
6	Day 1 19:00-7:00	0.025	0.034	Slope, no intercept	0.009	0.007
7	Day 2 7:00-19:00	0.009	0.017	Slope, no intercept	0.014	0.013
8	Day 2 19:00-7:00	0.017	0.008	Slope	0.002	0.002

1. Reg. – Registrant estimated flux rates.
2. Est. – Versar estimated flux rates.
NA = not assessed. Insufficient data were available to estimate flux rates for these periods.

Figure 1. Dover, FL Field Layout (obtained from study)

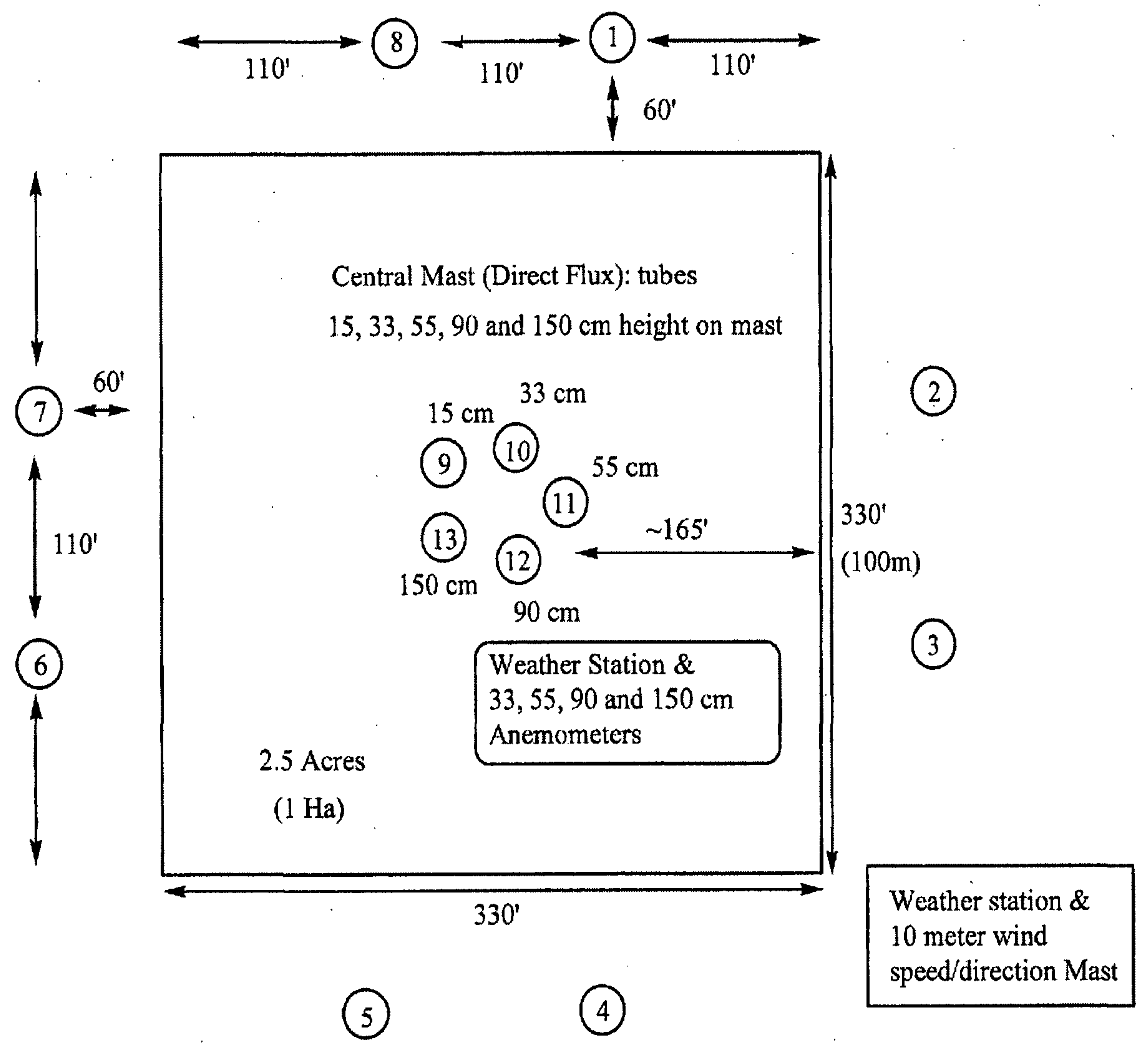


Figure 2. Bainbridge, GA Field Layout (obtained from study)

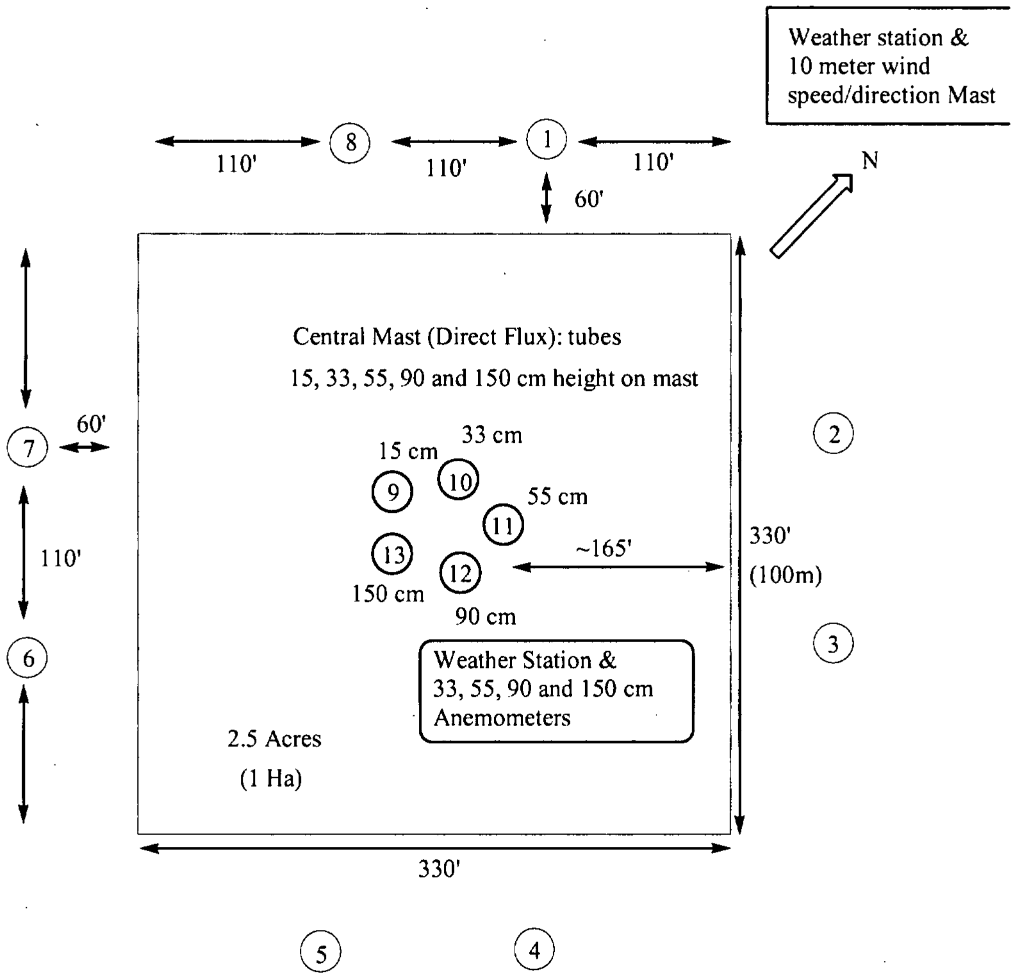
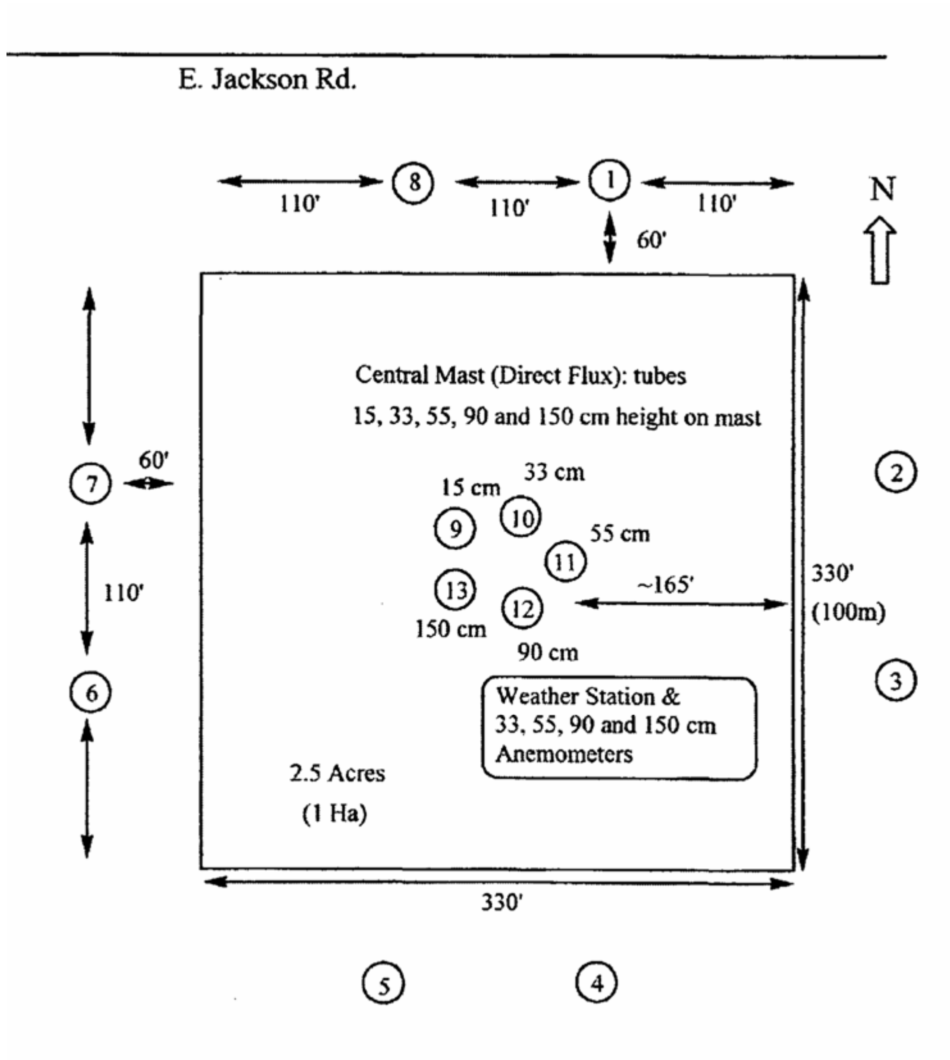


Figure 3. Hart, MI Field Layout (obtained from study)



US EPA ARCHIVE DOCUMENT

Attachment A
Indirect Flux Rate Process

Source: User's Manual for Fumigant Emissions Modeling System v 5.0, dated November 1, 2006, Sullivan Environmental Consulting

5.1 - Attachment A — Determination of Emission Rates

Before a FEMS simulation begins, emission rates for a fumigant are produced based on four days of off gassing that represent 24, four-hour periods of measured air quality data, which is within several hundred meters from a field for the chemical being modeled.[1] A dispersion modeling routine is needed to determine the emission rates based on a statistical analysis of the measured air quality data and modeled predicted concentrations. The following method was developed in consultation with the California Department of Pesticide Regulation (DPR). The method employs best-fit procedures to calculate emission rates as shown below. It is assumed the user has access to air quality and meteorological data from on-site monitors at a field study and has the ability to run air dispersion models based on the field source size, locations of the air quality monitors, and on-site hourly meteorological data. Sullivan Environmental Consulting, Inc. can be contacted for assistance in preparing the emissions files. The following only describes how emissions are calculated from a dataset of already produced, measured, and modeled data.

It is important to note that emission fitting needs to be done specifically for all models and all fumigant/application scenarios to be run. For example, if CALPUFF 6 will be used for a drip irrigation application for a particular fumigant, the emission files needed to run CALPUFF 6 for this scenario need to be computed based on: (1) field data specific to that fumigant and application method, and (2) using CALPIIFF 6 to compute the normalized modeling.

1. All measured and modeled data are used to calculate emission rates using linear regression.

2. If there are fewer than three pairs of measured and modeled values greater than 0.1 μ/m^3 for both terms, there are not enough data pairs to estimate emission rates for the period. The emission rate for the period in question is defaulted by weighted interpolation of the preceding and following non-defaulted periods of the preceding and followed non-defaulted periods or conservative diurnal matching. In addition, the standard error for defaulted periods (used to compute distributions) is computed by multiplying the emission rate by a conservative default coefficient of variance of 0.3.[2]

3. If there are at least three pairs of measured and modeled concentrations greater than 0.1 μ/m^3 for both terms, linear regression (including both slope and intercept terms) is used to estimate emission rates by the best-fit line for the data. The slope of the linear regression line and the intercept term are checked for significance at the 95 percent confidence level.

- 3a. If the linear regression slope is significantly greater than zero at the 95 percent confidence level (range of emission rates in the 95 confidence interval does not include zero) and the intercept is not significantly different from zero at the 95 percent confidence level, the regression slope is used as the emission rate and the standard error of the slope is used as the standard error term for calculating the distribution of emission rates.
- 3b. If the linear regression slope is significant, but the intercept is significantly different from zero at the 95 percent confidence level, then the intercept term must be compared with the 25 percentile of all of the measured data. If the

intercept is less than the 25 percentile of the measured data, the slope is used as the emission rate and the standard error of the s1o is used as the standard error term. If the intercept is greater than the 25 percentile of the measured data, linear regression without an intercept term is used and the slope computed on that basis is checked for significance.

- If the least squares slope without an intercept is not significant at the 95 percent confidence level, then the measured mean divided by the mean modeled method is used to calculate the emission rate for this period. The standard error is set to the emission rate multiplied by the default coefficient of variance (0.3).
- If the least squares slope without an intercept is significant, then the least squares slope without an intercept is used as the emission rate for this period and the standard error of the slope is used as the standard error term for calculating the distribution of emission rates.

3c. If the linear regression slope is not significant, the slope term cannot be used. The least squares regression method (linear regression without an intercept term) is used and the slope checked for significance.

- If the least squares slope without an intercept is not significant at the 95 percent confidence level, then the measured mean divided by the mean modeled method is used to calculate the emission rate for this period.[3] The standard error is set to the emission rate multiplied by the default coefficient of variance (0.3).
- If the least squares slope without an intercept is significant, then the least squares slope is used as the emission rate for this period and the standard error of the slope is used as the standard error term for calculating the distribution of emission rates.

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1. In some cases, the measured ambient air quality data may have been collected using a different averaging time than the standard 4-hour treatment in FEMS. It is recommended that the available data be processed to best represent the 4-hour time steps. For example, if 8-hour sampling is used, it would be assumed that two, 4-hour time blocks had the same emissions rates. Discussion with the appropriate regulatory agency still is recommended.

2. A coefficient of variance of 0.3 is used as a conservative default consistent with Cullen & Frey, Probabilistic Techniques in Exposure Assessment, Plenum Press, New York, 1999, pp. 66-67.

3. Depending on the circumstances, in some cases sorted regression could be used as a default procedure. As discussed during the SAP deliberation on FEMS in August of 2004, if in the judgment of the analyst the lack of significance in the fit is caused by the model being offset on the peak, sorted regression may be appropriate and useflul. Sorted regression should be used with caution, and based on careful consideration of site-specific factors.

Attachment B
Flux Rate Analysis for Dover, FL Study

Table B-1. Uncorrected Iodomethane Air Concentrations at Samplers Around Field (µg/m³) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	1/31/07 11:00 - 14:00	1/31/07 14:00 - 17:00	1/31/07 17:00 - 19:00	1/31/07 19:00 - 07:00	2/01/07 07:00 - 19:00	2/01/07 19:00 - 07:00	2/02/07 07:00 - 19:00	2/02/07 19:00 - 07:00	2/03/07 07:00 - 19:00	2/03/07 19:00 - 07:00	2/04/07 07:00 - 19:00	2/04/07 19:00 - 07:00
Sampler												
1	3.971	4.222	5.035	9.532	14.706	7.086	6.803	0.588	0.300	0.016	5.278	5.833
2	4.604	5.011	10.204	1.833	0.408	2.151	5.000	1.861	0.556	0.000	12.222	0.517
3	1.844	0.631	3.758	0.944	0.069	0.639	3.611	4.085	0.472	0.417	8.877	1.111
4	3.110	29.834	8.739	2.288	0.000	0.000	2.114	10.204	9.444	4.729	13.002	8.403
5	53.966	25.698	23.333	3.530	0.007	0.003	2.420	9.179	10.000	6.803	10.502	11.438
6	24.221	59.286	73.333	40.793	0.553	0.150	0.357	0.779	1.639	3.060	10.431	3.056
7	16.279	43.333	57.190	32.544	2.716	0.014	0.215	0.545	1.221	0.834	7.106	1.988
8	1.486	11.111	33.733	14.404	19.221	6.925	4.859	0.583	0.247	0.454	14.485	0.333

Table B-2. Uncorrected Chloropicrin Air Concentrations at Samplers Around Field (µg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	1/31/07 11:00 - 14:00	1/31/07 14:00 - 17:00	1/31/07 17:00 - 19:00	1/31/07 19:00 - 07:00	2/01/07 07:00 - 19:00	2/01/07 19:00 - 07:00	2/02/07 07:00 - 19:00	2/02/07 19:00 - 07:00	2/03/07 07:00 - 19:00	2/03/07 19:00 - 07:00	2/04/07 07:00 - 19:00	2/04/07 19:00 - 07:00
Sampler												
1	19.7964	36.6667	15.1361	4.4444	5.3419	4.5351	4.1667	1.1944	0.0000	0.0000	0.0000	0.0000
2	10.9353	9.4444	22.8758	2.1514	0.8715	7.7778	4.1667	1.9444	0.0000	0.0000	0.0000	0.0000
3	9.0780	36.0807	8.3333	1.1983	0.9804	2.9380	4.1667	3.0556	0.0667	0.0000	0.0000	0.0000
4	28.9655	20.9945	16.4772	1.3333	1.2500	16.3172	2.6147	5.5556	3.0556	1.5895	1.6677	1.7246
5	23.1696	8.8929	26.6667	3.0471	1.3056	6.6425	2.5591	4.4506	3.3333	2.0408	1.6463	1.9722
6	35.2941	33.5196	65.0000	12.2053	1.7740	4.2458	1.5107	1.3057	0.3401	0.3406	0.2197	0.3056
7	10.3488	18.8889	28.3333	9.0435	3.3241	1.1650	1.2867	1.0218	0.2038	0.2725	0.1309	0.1889
8	8.9011	23.3333	60.7185	3.8781	7.9145	5.0879	2.6296	1.1389	0.0000	0.0000	0.0000	0.0000

Table B-3. Corrected Iodomethane Air Concentrations at Samplers Around Field (μg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	1/31/07 11:00 - 14:00	1/31/07 14:00 - 17:00	1/31/07 17:00 - 19:00	1/31/07 19:00 - 07:00	2/01/07 07:00 - 19:00	2/01/07 19:00 - 07:00	2/02/07 07:00 - 19:00	2/02/07 19:00 - 07:00	2/03/07 07:00 - 19:00	2/03/07 19:00 - 07:00	2/04/07 07:00 - 19:00	2/04/07 19:00 - 07:00
Sampler												
1	6.50	6.53	13.32	13.41	19.46	10.23	9.23	0.78	11.04	8.20	252.53	22.41
2	13.32	7.55	25.65	3.20	0.23	2.92	6.85	2.46	9.55	7.05	177.31	12.22
3	2.41	1.92	6.36	3.05	0.07	0.91	5.01	5.41	48.00	7.58	130.33	16.90
4	7.69	44.14	26.46	5.87	0.07	0.07	2.79	13.49	23.52	9.00	204.47	19.17
5	75.35	34.94	35.05	5.57	0.07	0.07	3.27	12.13	23.52	22.86	45.47	22.71
6	35.70	83.56	101.19	54.15	0.80	0.30	0.25	1.03	46.26	8.82	67.48	11.39
7	25.07	59.96	88.40	44.16	3.59	0.14	0.24	0.72	5.64	1.95	480.26	8.04
8	3.69	17.49	48.63	19.12	25.41	10.00	6.67	0.77	15.30	5.88	39.79	107.66

Table B-4. Corrected Chloropicrin Air Concentrations at Samplers Around Field (µg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	1/31/07 11:00 - 14:00	1/31/07 14:00 - 17:00	1/31/07 17:00 - 19:00	1/31/07 19:00 - 07:00	2/01/07 07:00 - 19:00	2/01/07 19:00 - 07:00	2/02/07 07:00 - 19:00	2/02/07 19:00 - 07:00	2/03/07 07:00 - 19:00	2/03/07 19:00 - 07:00	2/04/07 07:00 - 19:00	2/04/07 19:00 - 07:00
Sampler												
1	25.07	46.41	19.16	5.63	7.24	6.23	5.77	2.01	0.15	0.16	0.16	0.15
2	13.84	11.95	28.96	2.72	0.95	11.43	5.77	2.96	0.15	0.15	0.15	0.15
3	11.49	45.67	10.55	1.52	2.59	4.19	5.77	4.37	0.15	0.15	0.15	0.16
4	36.67	26.58	20.85	1.69	2.07	21.11	3.81	7.53	3.87	2.01	2.11	2.18
5	29.34	11.26	33.76	3.86	2.14	8.94	3.73	6.13	4.22	2.58	2.09	2.50
6	44.68	42.43	82.28	15.43	3.73	7.35	2.42	2.17	0.50	0.50	0.15	0.15
7	13.10	23.91	35.86	11.45	4.69	3.68	2.13	1.81	0.16	0.16	0.15	0.15
8	11.27	29.54	76.85	4.91	11.91	6.93	3.84	1.94	0.15	0.16	0.14	0.15

Table B-5. Meteorological Data for First Four Days

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
1/31/2007	11	208	4.1155	287	3
1/31/2007	12	216	3.6011	289.3	2
1/31/2007	13	227	2.5722	290.9	2
1/31/2007	14	254	3.0866	292	2
1/31/2007	15	269	2.5722	293.2	3
1/31/2007	16	256	2.5722	293.7	3
1/31/2007	17	258	2.5722	293.2	4
1/31/2007	18	259	2.0578	291.5	4
1/31/2007	19	256	1.0000	289.8	5
1/31/2007	20	269	1.0000	288.2	6
1/31/2007	21	271	2.0578	288.7	6
1/31/2007	22	288	3.6011	288.2	5
1/31/2007	23	276	3.0866	287.6	6
2/1/2007	24	283	2.5722	287	6
2/1/2007	1	283	3.0866	286.5	6
2/1/2007	2	278	3.0866	286.5	6
2/1/2007	3	287	3.0866	285.9	6
2/1/2007	4	289	2.0578	286.5	6
2/1/2007	5	287	1.5433	286.5	7
2/1/2007	6	296	1.5433	287	6
2/1/2007	7	309	2.0578	288.7	6
2/1/2007	8	316	2.0578	289.3	5
2/1/2007	9	310	2.5722	290.9	4
2/1/2007	10	334	3.6011	293.7	4
2/1/2007	11	336	3.6011	295.9	3
2/1/2007	12	346	4.1155	297	3
2/1/2007	13	4	4.1155	298.2	3
2/1/2007	14	9	4.1155	299.3	3
2/1/2007	15	6	4.6300	298.2	4
2/1/2007	16	6	2.0578	295.9	4
2/1/2007	17	8	3.6011	297	4
2/1/2007	18	12	3.0866	296.5	4
2/1/2007	19	6	3.6011	296.5	5
2/1/2007	20	9	4.1155	295.9	5
2/1/2007	21	25	4.1155	295.9	5
2/1/2007	22	12	4.1155	295.9	5
2/1/2007	23	21	4.1155	295.9	4
2/2/2007	24	22	4.1155	296.5	4
2/2/2007	1	22	4.6300	297	4

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
2/2/2007	2	35	5.6588	297.6	4
2/2/2007	3	33	5.6588	297.6	4
2/2/2007	4	35	5.1444	297.6	5
2/2/2007	5	39	6.1733	297.6	4
2/2/2007	6	43	5.1444	297	5
2/2/2007	7	46	4.1155	295.9	5
2/2/2007	8	56	2.5722	294.8	4
2/2/2007	9	35	2.0578	294.3	4
2/2/2007	10	36	2.0578	294.8	4
2/2/2007	11	31	2.0578	294.8	4
2/2/2007	12	36	2.5722	295.4	4
2/2/2007	13	53	2.5722	294.8	4
2/2/2007	14	66	2.5722	294.8	4
2/2/2007	15	52	3.0866	294.3	4
2/2/2007	16	70	2.0578	293.7	4
2/2/2007	17	108	2.5722	294.3	4
2/2/2007	18	144	1.5433	293.2	3
2/2/2007	19	148	0.0000	292	4
2/2/2007	20	137	1.0000	291.5	5
2/2/2007	21	153	1.0000	290.9	6
2/2/2007	22	130	1.0289	290.4	6
2/2/2007	23	119	1.0000	289.8	6
2/3/2007	24	153	1.0000	288.7	6
2/3/2007	1	151	1.0000	288.2	6
2/3/2007	2	145	1.0000	288.2	6
2/3/2007	3	146	1.5433	288.2	6
2/3/2007	4	158	1.0289	288.2	6
2/3/2007	5	166	1.5433	288.2	6
2/3/2007	6	176	1.5433	287.6	6
2/3/2007	7	190	1.5433	287.6	6
2/3/2007	8	192	1.5433	287.6	5
2/3/2007	9	194	2.5722	287.6	4
2/3/2007	10	173	2.0578	288.2	4
2/3/2007	11	205	2.0578	288.2	3
2/3/2007	12	230	1.5433	288.7	2
2/3/2007	13	228	2.5722	289.3	3
2/3/2007	14	228	2.5722	288.7	4
2/3/2007	15	182	2.0578	289.3	4
2/3/2007	16	177	2.5722	288.7	4
2/3/2007	17	197	2.5722	288.7	4
2/3/2007	18	205	2.5722	288.2	4

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
2/3/2007	19	206	2.5722	288.2	5
2/3/2007	20	202	3.0866	287.6	5
2/3/2007	21	213	3.6011	286.5	4
2/3/2007	22	208	3.6011	285.9	4
2/3/2007	23	233	3.0866	285.4	5
2/3/2007	24	235	3.6011	284.8	4

Table B-6. Regression Statistics and Flux Rate Estimates for Iodomethane

Period	1		2		3		4		5		6	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	0.000	6.50	0.000	6.53	0.000	13.32	149.771	13.41	5149.017	19.46	4969.897	10.23
2	0.000	13.32	0.000	7.55	0.000	25.65	0.000	3.20	34.338	0.23	1934.905	2.92
3	0.000	2.41	0.000	1.92	0.000	6.36	0.000	3.05	0.065	0.07	424.922	0.91
4	1055.218	7.69	3.098	44.14	0.013	26.46	0.000	5.87	0.000	0.07	0.000	0.07
5	2254.567	75.35	256.393	34.94	591.934	35.05	0.000	5.57	0.000	0.07	0.000	0.07
6	3154.016	35.70	7323.289	83.56	18687.261	101.19	11294.128	54.15	552.446	0.80	0.000	0.30
7	1965.751	25.07	7098.286	59.96	18151.950	88.40	13346.470	44.16	1672.860	3.59	0.000	0.14
8	0.161	3.69	2.245	17.49	0.000	48.63	1738.423	19.12	6257.986	25.41	3321.560	10.00
Slope	0.014472		0.007476		0.003774		0.003369		0.003979		0.002249	
Intercept	5.967061		18.28983		25.47218		7.395726		-0.584343		0.086547	
Standard error	0.005401		0.001886		0.00062		0.000434		0.000191		0.000248	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Is intercept significant?	No		Yes		Yes		Yes		Yes		No	
Is intercept < 25th %?	No		No		No		No		Yes		Yes	
Slope, no intercept	0.016986		0.010057		0.005178		0.004004		0.003863		0.002272	
Standard error	0.003877		0.002232		0.001027		0.00051		0.000156		0.000185	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	14.47		10.06		5.18		4.00		3.98		2.25	
Flux Basis	Slope		Slope, no intercept		Slope, no intercept		Slope, no intercept		Slope		Slope	

Table B-6. Regression Statistics and Flux Rate Estimates for Iodomethane (continued)

Period	7		8		9		10		11		12	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	4829.808	9.23	0.000	0.78	0.000	11.04	0.000	8.20	0.000	252.53	0.000	22.41
2	6235.423	6.85	2552.970	2.46	0.000	9.55	0.000	7.05	0.000	177.31	0.000	12.22
3	3858.988	5.01	11456.779	5.41	3.307	48.00	0.000	7.58	0.000	130.33	0.087	16.90
4	891.918	2.79	22448.899	13.49	7352.697	23.52	3282.046	9.00	2842.440	204.47	5961.549	19.17
5	430.623	3.27	11959.644	12.13	9069.739	23.52	6243.159	22.86	4664.873	45.47	10325.569	22.71
6	0.000	0.25	0.894	1.03	2401.988	46.26	4476.443	8.82	1976.832	67.48	5637.919	11.39
7	0.000	0.24	0.000	0.72	762.239	5.64	1631.554	1.95	324.898	480.26	1517.976	8.04
8	1968.387	6.67	0.000	0.77	0.000	15.30	0.000	5.88	0.000	39.79	0.000	107.66
Slope	0.001125		0.000597		0.000571		0.001802		-0.02891		-0.00205	
Intercept	1.72704		0.9858		21.4568		5.396727		210.1509		33.58409	
Standard error	0.000301		8.79E-05		0.00179		0.000696		0.03156		0.003311	
Is slope significant?	Yes		Yes		No		Yes		No		No	
Is intercept significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Is intercept < 25th %?	Yes		No		No		Yes		No		No	
Slope, no intercept	0.001509		0.000658		0.003517		0.002966		0.031983		0.002412	
Standard error	0.000242		7.1E-05		0.002066		0.000711		0.03888		0.003193	
Is slope significant?	Yes		Yes		Yes		Yes		No		No	
Flux (µg/m2-s)	1.13		0.66		3.52		1.80		142.49		9.41	
Flux Basis	Slope		Slope, no intercept		Slope, no intercept		Slope		Ratio of averages		Ratio of averages	

Table B-7. Regression Statistics and Flux Rate Estimates for Chloropicrin

Period	1		2		3		4		5		6	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	0	25.07	0	46.41	0	19.16	149.7715	5.63	5149.017	7.24	4969.897	6.23
2	0	13.84	0	11.95	0	28.96	0	2.72	34.33845	0.95	1934.905	11.43
3	0	11.49	0	45.67	0	10.55	0	1.52	0.065073	2.59	424.922	4.19
4	1055.218	36.67	3.097747	26.58	0.013235	20.85	0	1.69	0	2.07	0	21.11
5	2254.567	29.34	256.3929	11.26	591.9343	33.76	0	3.86	0	2.14	0	8.94
6	3154.016	44.68	7323.289	42.43	18687.26	82.28	11294.13	15.43	552.4461	3.73	0	7.35
7	1965.751	13.10	7098.286	23.91	18151.95	35.86	13346.47	11.45	1672.86	4.69	0	3.68
8	0.161087	11.27	2.244857	29.54	0	76.85	1738.423	4.91	6257.986	11.91	3321.56	6.93
Slope	0.006839		0.000611		0.001521		0.000815		0.001351		-0.00059	
Intercept	15.97441		28.59674		31.41848		3.197473		2.10498		9.524944	
Standard error	0.003078		0.001718		0.001122		0.000143		0.000168		0.00117	
Is slope significant?	Yes		No		Yes		Yes		Yes		No	
Is intercept significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Is intercept < 25th %?	No		No		No		No		Yes		No	
Slope, no intercept	0.013569		0.004645		0.003252		0.00109		0.00177		0.001964	
Standard error	0.003552		0.00292		0.001426		0.000199		0.000254		0.00156	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	13.57		4.65		3.25		1.09		1.35		1.96	
Flux Basis	Slope, no intercept		Slope, no intercept		Slope, no intercept		Slope, no intercept		Slope		Slope, no intercept	

Table B-7. Regression Statistics and Flux Rate Estimates for Chloropicrin (continued)

Period	7		8		9		10		11		12	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	4829.808	5.77	0	2.01	0	0.15	0	0.16	0	0.16	0	0.15
2	6235.423	5.77	2552.97	2.96	0	0.15	0	0.15	0	0.15	0	0.15
3	3858.988	5.77	11456.78	4.37	3.307453	0.15	0	0.15	0	0.15	0.087321	0.16
4	891.9179	3.81	22448.9	7.53	7352.697	3.87	3282.046	2.01	2842.44	2.11	5961.549	2.18
5	430.6228	3.73	11959.64	6.13	9069.739	4.22	6243.159	2.58	4664.873	2.09	10325.57	2.50
6	0	2.42	0.894256	2.17	2401.988	0.50	4476.443	0.50	1976.832	0.15	5637.919	0.15
7	0	2.13	0	1.81	762.2393	0.16	1631.554	0.16	324.8982	0.15	1517.976	0.15
8	1968.387	3.84	0	1.94	0	0.15	0	0.16	0	0.14	0	0.15
Slope	0.000569		0.000254		0.000476		0.000328		0.00045		0.000218	
Intercept	2.862698		2.075819		0.001991		0.093714		0.086882		0.0595	
Standard error	9.68E-05		2.35E-05		3.51E-05		9.52E-05		9.83E-05		5.69E-05	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Is intercept significant?	Yes		Yes		No		No		No		No	
Is intercept < 25th %?	Yes		No		Yes		Yes		Yes		Yes	
Slope, no intercept	0.001205		0.000382		0.000477		0.000348		0.000475		0.000226	
Standard error	0.000246		6.5E-05		2.65E-05		6.76E-05		7.42E-05		4.13E-05	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	0.57		0.38		0.48		0.33		0.45		0.22	
Flux Basis	Slope		Slope, no intercept		Slope		Slope		Slope		Slope	

Table B-8. Concentration Profile Used to Develop Flux Estimates for Iodomethane, Aerodynamic Method

Period	Day/ Hour	Conc @ 15 cm	Conc @ 33 cm	Conc @ 55 cm	Conc @ 90 cm	Conc @ 150 cm	a	b	r^2
1	1/31, 11:00 - 14:00	115.12	89.09	149.49	96.82	88.68	-7.72	138.29	0.07
2	1/31, 14:00 - 17:00	196.80	147.71	121.46	102.58	77.24	-51.14	330.87	0.99
3	1/31, 17:00 - 19:00	412.94	319.33	269.40	224.43	159.15	-107.71	701.92	1.00
4	1/31, 19:00 - 07:00	135.72	100.53	72.38	78.19	52.65	-34.21	222.82	0.92
5	2/1, 07:00 - 19:00	67.45	51.44	40.42	25.72	12.13	-24.13	134.60	0.99
6	2/1, 19:00 - 07:00	45.85	34.38	23.42	14.70	5.65	-17.75	94.82	1.00
7	2/2, 07:00 - 19:00	49.80	41.44	31.22	15.68	13.06	-17.47	99.17	0.96
8	2/2, 19:00 - 07:00	49.77	40.65	30.20	23.06	20.25	-13.67	86.71	0.98
9	2/3, 07:00 - 19:00	49.97	34.91	23.88	14.33	16.98	-15.69	89.89	0.91
10	2/3, 19:00 - 07:00	109.19	208.04	135.26	1989.07	1062.68	29.03	52.01	0.14
11	2/4, 07:00 - 19:00	328.86	219.39	20.94	23.15	25.35	-145.88	698.98	0.83
12	2/4, 19:00 - 07:00	36.38	31.23	21.68	19.86	12.13	-10.59	66.01	0.97

Concentrations reported as μg/m^3.
Log-linear regression.

Table B-9. Concentration Profile Used to Develop Flux Estimates for Chloropicrin, Aerodynamic Method

Period	Day/ Hour	Conc @ 15 cm	Conc @ 33 cm	Conc @ 55 cm	Conc @ 90 cm	Conc @ 150 cm	a	b	r^2
1	1/31, 11:00 - 14:00	53.64	29.78	36.69	48.98	15.33	-10.64	78.84	0.38
2	1/31, 14:00 - 17:00	33.76	26.72	23.91	40.57	19.69	-2.73	39.70	0.09
3	1/31, 17:00 - 19:00	86.87	0.92	92.83	66.94	48.52	-4.11	75.44	0.01
4	1/31, 19:00 - 07:00	67.69	40.61	30.46	26.06	43.08	-12.45	90.69	0.47
5	2/1, 07:00 - 19:00	31.08	24.27	18.76	15.07	13.19	-8.08	52.35	0.98
6	2/1, 19:00 - 07:00	24.05	19.06	13.58	12.23	9.10	-6.58	41.57	0.98
7	2/2, 07:00 - 19:00	30.52	23.77	19.05	15.33	10.94	-8.50	53.44	1.00
8	2/2, 19:00 - 07:00	18.08	13.86	11.53	7.88	6.66	-5.15	31.90	0.99
9	2/3, 07:00 - 19:00	5.27	3.52	2.92	2.11	1.30	-1.68	9.67	0.99
10	2/3, 19:00 - 07:00	2.37	1.79	0.49	0.49	0.49	-0.92	4.74	0.83
11	2/4, 07:00 - 19:00	2.00	1.38	0.48	0.49	0.15	-0.83	4.16	0.93
12	2/4, 19:00 - 07:00	2.55	1.97	1.27	0.49	0.49	-1.00	5.29	0.95

Concentrations reported as $\mu g/m^3$.
Log-linear regression.

Table B-10. Temperature Profile Used to Develop Flux Estimates, Aerodynamic Method

Period	Day/ Hour	Temp @ 33 cm	Temp @ 55 cm	Temp @ 90 cm	Temp @ 150 cm	a	b	r^2
1	1/31, 11:00 - 14:00	19.795	19.04	19.15	18.665	-0.653537	21.942366	0.8169111
2	1/31, 14:00 - 17:00	20.78667	20.44667	20.4	19.98333	-0.488866	22.483592	0.931442
3	1/31, 17:00 - 19:00	17.54	17.495	17.45	17.41	-0.086386	17.841198	0.9989874
4	1/31, 19:00 - 07:00	14.17917	14.1675	14.155	14.14167	-0.024826	14.266431	0.9990588
5	2/1, 07:00 - 19:00	22.71917	22.69167	22.67583	22.65333	-0.042396	22.865332	0.9911577
6	2/1, 19:00 - 07:00	23.27083	23.32583	23.36667	23.39917	0.084581	22.980854	0.9861952
7	2/2, 07:00 - 19:00	21.04833	21.04917	21.03667	21.00083	-0.030798	21.164752	0.7795296
8	2/2, 19:00 - 07:00	15.745	15.7425	15.6925	15.66833	-0.055503	15.94817	0.9067844
9	2/3, 07:00 - 19:00	15.5175	15.44667	15.39583	15.30583	-0.136295	15.9962	0.9899711
10	2/3, 19:00 - 07:00	11.50667	11.46667	11.42	11.38333	-0.082728	11.796055	0.9974488
11	2/4, 07:00 - 19:00	14.965	14.86917	14.825	14.70417	-0.164366	15.539974	0.9742758
12	2/4, 19:00 - 07:00	12.1125	12.0725	12.0275	11.98667	-0.083897	12.406654	0.9991409

Temperatures reported as ^{o}C.
Log linear regression used to fit the data.

Table B-11. Wind Speed Profile Used to Develop Flux Estimates, Aerodynamic Method

Period	Day/ Hour	WS @ 33 cm	WS @ 55 cm	WS @ 90 cm	WS @ 150 cm	a	b	r^2
1	1/31, 11:00 - 14:00	1.398	1.6145	1.7285	1.94	0.3458617	0.1991024	0.988522
2	1/31, 14:00 - 17:00	1.46	1.725	1.887333	2.041	0.3785443	0.1681683	0.981521
3	1/31, 17:00 - 19:00	0.226	0.4645	0.5295	0.6605	0.2721373	-0.68743	0.944435
4	1/31, 19:00 - 07:00	1.202417	1.356333	1.53625	1.63075	0.2907781	0.1945922	0.985038
5	2/1, 07:00 - 19:00	3.4735	3.605917	3.902417	4.0205	0.3843008	2.1159323	0.966893
6	2/1, 19:00 - 07:00	3.854917	4.033833	4.351667	4.549083	0.4763421	2.1712198	0.986564
7	2/2, 07:00 - 19:00	1.229667	1.277417	1.447167	1.489167	0.1879654	0.56133	0.931334
8	2/2, 19:00 - 07:00	0.268667	0.343583	0.397417	0.442833	0.1144809	-0.123827	0.986863
9	2/3, 07:00 - 19:00	1.2355	1.289917	1.3985	1.491167	0.1737935	0.6145277	0.983101
10	2/3, 19:00 - 07:00	1.7445	1.79125	2.023583	2.0605	0.2338682	0.9101831	0.901051
11	2/4, 07:00 - 19:00	2.461	2.599083	2.80225	2.846417	0.2696622	1.5301602	0.949107
12	2/4, 19:00 - 07:00	1.255333	1.358417	1.48075	1.5935	0.2257387	0.4618042	0.998574

Wind speed (WS) reported as m/s.
Log linear regression used to fit the data.

Table B-12. Aerodynamic Flux Estimates for Iodomethane

Period	Day/Hour	Conc @ 33 cm	Conc @ 90 cm	WS @ 33 cm	WS @ 90 cm	Temp @ 33 cm	Temp @ 90 cm	Ri	Θ_m	Θ_c	Flux (µg/m^2-s)
1	1/31, 11:00 - 14:00	111.30	103.55	1.4084	1.7554	19.6573	19.0016	-0.104	0.724	0.550	1.18
2	1/31, 14:00 - 17:00	152.06	100.76	1.4918	1.8715	20.7743	20.2838	-0.065	0.791	0.621	6.95
3	1/31, 17:00 - 19:00	325.30	217.23	0.2641	0.5371	17.5392	17.4525	-0.022	0.904	0.754	7.59
4	1/31, 19:00 - 07:00	103.22	68.90	1.2113	1.5030	14.1796	14.1547	-0.006	0.972	0.844	2.14
5	2/1, 07:00 - 19:00	50.24	26.03	3.4596	3.8452	22.7171	22.6746	-0.005	0.973	0.846	1.99
6	2/1, 19:00 - 07:00	32.75	14.94	3.8368	4.3147	23.2766	23.3615	0.007	1.036	0.964	1.49
7	2/2, 07:00 - 19:00	38.07	20.54	1.2186	1.4071	21.0571	21.0262	-0.017	0.926	0.782	0.80
8	2/2, 19:00 - 07:00	38.91	25.19	0.2765	0.3913	15.7541	15.6984	-0.082	0.759	0.586	0.62
9	2/3, 07:00 - 19:00	35.04	19.30	1.2222	1.3966	15.5196	15.3829	-0.087	0.750	0.577	1.12
10	2/3, 19:00 - 07:00	153.52	182.65	1.7279	1.9625	11.5068	11.4238	-0.030	0.880	0.724	-1.88
11	2/4, 07:00 - 19:00	188.89	42.52	2.4730	2.7436	14.9653	14.8004	-0.044	0.839	0.676	12.2
12	2/4, 19:00 - 07:00	29.00	18.38	1.2511	1.4776	12.1133	12.0291	-0.032	0.872	0.714	0.68

Flux is estimated using the following equations

$$Flux = \frac{-(0.42^2)(c_{80} - c_{30})(WS_{80} - WS_{30})}{\theta_m \theta_c \ln(80/30)^2}$$

$$Ri = \frac{(9.8)(0.8 - 0.3)(T_{80} - T_{30})}{\left(\left[T_{80} + T_{30}\right]/2 + 273.16\right)(WS_{80} - WS_{30})^2}$$

where

if Ri > 0, $\theta_m = (1 + 16Ri)^{0.333}$ and $\theta_c = 0.885(1 + 34Ri)^{0.4}$

if Ri < 0, $\theta_m = (1 - 16Ri)^{-0.333}$ and $\theta_c = 0.885(1 - 22Ri)^{-0.4}$

Table B-13. Aerodynamic Flux Estimates for Chloropicrin

Period	Day/Hour	Conc @ 33 cm	Conc @ 90 cm	WS @ 33 cm	WS @ 90 cm	Temp @ 33 cm	Temp @ 90 cm	Ri	Θ_m	Θ_c	Flux ($\mu g/m^2$-s)
1	1/31, 11:00 - 14:00	41.648	30.977	1.4084	1.7554	19.6573	19.0016	-0.104	0.724	0.550	1.63
2	1/31, 14:00 - 17:00	30.153	27.414	1.4918	1.8715	20.7743	20.2838	-0.065	0.791	0.621	0.37
3	1/31, 17:00 - 19:00	61.058	56.932	0.2641	0.5371	17.5392	17.4525	-0.022	0.904	0.754	0.29
4	1/31, 19:00 - 07:00	47.158	34.667	1.2113	1.5030	14.1796	14.1547	-0.006	0.972	0.844	0.78
5	2/1, 07:00 - 19:00	24.092	15.984	3.4596	3.8452	22.7171	22.6746	-0.005	0.973	0.846	0.67
6	2/1, 19:00 - 07:00	18.554	11.950	3.8368	4.3147	23.2766	23.3615	0.007	1.036	0.964	0.55
7	2/2, 07:00 - 19:00	23.729	15.204	1.2186	1.4071	21.0571	21.0262	-0.017	0.926	0.782	0.39
8	2/2, 19:00 - 07:00	13.909	8.745	0.2765	0.3913	15.7541	15.6984	-0.082	0.759	0.586	0.23
9	2/3, 07:00 - 19:00	3.779	2.088	1.2222	1.3966	15.5196	15.3829	-0.087	0.750	0.577	0.12
10	2/3, 19:00 - 07:00	1.534	0.615	1.7279	1.9625	11.5068	11.4238	-0.030	0.880	0.724	0.06
11	2/4, 07:00 - 19:00	1.269	0.439	2.4730	2.7436	14.9653	14.8004	-0.044	0.839	0.676	0.07
12	2/4, 19:00 - 07:00	1.799	0.798	1.2511	1.4776	12.1133	12.0291	-0.032	0.872	0.714	0.06

Flux is estimated using the following equations

$$Flux = \frac{-(0.42^2)(c_{80} - c_{30})(WS_{80} - WS_{30})}{\theta_m \theta_c \ln(80/30)^2}$$

$$Ri = \frac{(9.8)(0.8-0.3)(T_{80} - T_{30})}{\left(\left[T_{80} + T_{30}\right]/2 + 273.16\right)(WS_{80} - WS_{30})^2}$$

where

if Ri > 0, $\theta_m = (1+16Ri)^{0.333}$ and $\theta_c = 0.885(1+34Ri)^{0.4}$

if Ri < 0, $\theta_m = (1-16Ri)^{-0.333}$ and $\theta_c = 0.885(1-22Ri)^{-0.4}$

Attachment C
Flux Rate Analysis for Bainbridge, GA Study

Table C-1. Uncorrected Iodomethane Air Concentrations at Samplers Around Field (µg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	3/19/07 10:00 - 14:00	3/19/07 14:00 - 17:00	3/19/07 17:00 - 20:00	3/19/07 20:00 - 08:00	3/20/07 08:00 - 20:00	3/20/07 19:00 - 07:00	3/21/07 08:00 - 20:00	3/21/07 19:00 - 07:00	3/22/07 08:00 - 20:00	3/22/07 19:00 - 07:00	3/23/07 08:00 - 20:00	3/23/07 19:00 - 07:00
Sampler												
1	14.1	13.3	7.71	0.00	6.13	15.5	5.28	15.6	1.95	9.44	1.33	5.83
2	5.86	0.68	0.82	0.00	0.25	8.81	0.56	3.20	0.28	8.33	0.83	1.94
3	5.75	0.23	0.87	0.00	0.16	6.39	0.47	2.08	0.21	3.21	0.56	1.36
4	0.00	0.03	0.57	0.19	0.11	3.33	0.21	3.61	0.24	2.53	0.89	0.36
5	0.00	0.04	0.77	0.68	0.11	4.17	0.28	7.50	0.53	4.44	0.83	0.47
6	4.28	12.3	0.73	22.5	11.7	16.1	5.56	8.61	4.44	7.35	1.64	1.01
7	8.35	24.7	59.9	27.8	17.2	19.1	8.77	6.95	6.11	5.17	3.61	1.53
8	14.3	29.7	18.9	14.7	11.4	23.3	6.67	16.7	2.45	6.39	2.47	6.54

Table C-2. Uncorrected Chloropicrin Air Concentrations at Samplers Around Field (µg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	3/19/07 10:00 - 14:00	3/19/07 14:00 - 17:00	3/19/07 17:00 - 20:00	3/19/07 20:00 - 08:00	3/20/07 08:00 - 20:00	3/20/07 19:00 - 07:00	3/21/07 08:00 - 20:00	3/21/07 19:00 - 07:00	3/22/07 08:00 - 20:00	3/22/07 19:00 - 07:00	3/23/07 08:00 - 20:00	3/23/07 19:00 - 07:00
Sampler												
1	1.67	0.18	0.82	0.50	1.04	0.71	0.33	0.31	0.04	0.02	0.05	0.00
2	2.43	0.00	0.04	0.04	0.00	0.40	0.05	0.10	0.03	0.08	0.04	0.02
3	1.54	0.00	0.00	0.17	0.07	0.26	0.02	0.06	0.04	0.15	0.03	1.28
4	0.00	0.00	0.00	0.13	0.00	0.05	0.00	0.11	0.00	0.00	0.00	0.28
5	0.00	0.00	0.00	0.16	0.00	0.15	0.00	0.10	0.11	0.02	0.02	0.42
6	2.34	1.45	4.22	2.51	1.50	0.89	0.36	0.27	0.10	0.20	0.08	0.27
7	2.28	1.35	4.67	3.27	1.94	1.01	0.53	0.16	0.16	0.00	0.14	0.11
8	1.76	0.82	2.33	1.59	2.02	0.94	0.48	0.07	0.06	0.12	0.21	0.00

Table C-3. Corrected Iodomethane Air Concentrations at Samplers Around Field ($\mu g/m^3$) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	3/19/07 10:00 - 14:00	3/19/07 14:00 - 17:00	3/19/07 17:00 - 20:00	3/19/07 20:00 - 08:00	3/20/07 08:00 - 20:00	3/20/07 19:00 - 07:00	3/21/07 08:00 - 20:00	3/21/07 19:00 - 07:00	3/22/07 08:00 - 20:00	3/22/07 19:00 - 07:00	3/23/07 08:00 - 20:00	3/23/07 19:00 - 07:00
Sampler												
1	21.03	19.90	11.54	0.08	9.18	23.24	24.12	136.43	15.82	14.14	2.00	8.73
2	8.77	0.34	1.14	0.08	1.18	13.19	12.37	29.55	11.12	12.48	1.25	2.91
3	8.60	0.33	1.14	0.08	0.08	9.56	17.34	14.35	8.19	4.80	0.29	2.04
4	0.26	0.33	0.33	0.29	0.08	4.99	20.25	13.72	18.17	3.78	1.33	0.29
5	0.25	0.33	1.17	1.02	0.08	6.24	46.03	19.13	6.95	6.65	1.25	0.29
6	6.41	18.40	1.17	33.68	17.47	25.28	54.06	28.28	43.25	11.01	2.45	1.51
7	12.49	37.00	89.69	41.64	25.75	28.58	39.83	11.81	18.71	7.75	5.41	2.29
8	21.34	44.52	28.28	22.07	17.10	34.93	27.86	34.51	12.41	9.56	3.70	9.78

Table C-4. Corrected Chloropicrin Air Concentrations at Samplers Around Field (µg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	3/19/07 10:00 - 14:00	3/19/07 14:00 - 17:00	3/19/07 17:00 - 20:00	3/19/07 20:00 - 08:00	3/20/07 08:00 - 20:00	3/20/07 19:00 - 07:00	3/21/07 08:00 - 20:00	3/21/07 19:00 - 07:00	3/22/07 08:00 - 20:00	3/22/07 19:00 - 07:00	3/23/07 08:00 - 20:00	3/23/07 19:00 - 07:00
Sampler												
1	0.94	0.45	0.44	0.36	1.04	0.35	0.35	0.36	0.11	0.11	0.11	0.11
2	2.43	0.44	0.44	0.11	0.11	0.37	0.11	0.11	0.11	0.13	0.10	0.11
3	1.11	0.44	0.44	0.11	0.11	0.36	0.11	0.11	0.11	0.11	0.11	1.28
4	0.33	0.44	0.44	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.36
5	0.33	0.44	0.44	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.36
6	2.34	1.45	4.22	2.50	1.50	0.89	0.36	0.35	1.94	0.11	0.11	0.35
7	2.28	1.46	4.67	3.27	1.94	1.01	0.36	0.11	0.94	0.11	0.11	0.11
8	0.96	0.45	1.44	1.59	2.02	0.94	0.35	0.12	0.96	0.11	0.11	0.11

Table C-5. Meteorological Data for First Four Days

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
3/19/2007	9	297	2.5722	279.3	4
3/19/2007	10	312	3.0866	284.3	3
3/19/2007	11	322	3.6011	288.2	2
3/19/2007	12	329	3.6011	290.9	2
3/19/2007	13	324	4.1155	292.6	3
3/19/2007	14	320	3.0866	294.3	2
3/19/2007	15	338	3.6011	294.8	2
3/19/2007	16	323	3.0866	295.4	3
3/19/2007	17	332	2.5722	295.9	3
3/19/2007	18	331	2.5722	295.9	4
3/19/2007	19	324	2.0578	295.4	5
3/19/2007	20	313	1.0000	292.6	6
3/19/2007	21	88	0.0000	288.7	7
3/19/2007	22	341	0.0000	286.5	7
3/19/2007	23	291	0.0000	285.4	7
3/19/2007	24	268	0.0000	284.8	7
3/20/2007	1	224	1.0000	283.7	7
3/20/2007	2	258	1.5433	284.8	7
3/20/2007	3	282	2.0578	285.4	6
3/20/2007	4	301	2.0578	283.7	6
3/20/2007	5	313	1.5433	282	7
3/20/2007	6	307	1.5433	280.9	7
3/20/2007	7	315	1.5433	280.4	6
3/20/2007	8	302	2.0578	280.9	5
3/20/2007	9	296	2.0578	283.2	4
3/20/2007	10	324	2.5722	287	3
3/20/2007	11	308	2.5722	290.9	2
3/20/2007	12	336	2.0578	294.3	2
3/20/2007	13	307	2.0578	295.9	2
3/20/2007	14	284	2.5722	297	2
3/20/2007	15	289	2.5722	298.2	2
3/20/2007	16	266	2.5722	298.7	3
3/20/2007	17	308	2.0578	298.7	3
3/20/2007	18	279	1.5433	298.7	3
3/20/2007	19	266	1.5433	298.2	4
3/20/2007	20	229	1.0289	295.4	5
3/20/2007	21	241	1.5433	293.7	6
3/20/2007	22	248	2.0578	293.2	6
3/20/2007	23	246	2.5722	292.6	6

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
3/20/2007	24	313	1.0289	288.7	7
3/21/2007	1	303	1.0289	288.2	7
3/21/2007	2	298	1.5433	287.6	7
3/21/2007	3	287	1.5433	285.9	7
3/21/2007	4	289	2.0578	286.5	6
3/21/2007	5	287	2.0578	285.9	6
3/21/2007	6	286	2.0578	285.4	6
3/21/2007	7	289	2.0578	284.8	5
3/21/2007	8	286	2.5722	284.8	4
3/21/2007	9	290	2.5722	285.9	3
3/21/2007	10	304	3.0866	289.3	2
3/21/2007	11	306	3.0866	292.6	3
3/21/2007	12	326	3.0866	294.3	4
3/21/2007	13	304	3.6011	295.4	4
3/21/2007	14	289	4.6300	296.5	4
3/21/2007	15	296	3.6011	297.6	3
3/21/2007	16	276	3.6011	297.6	4
3/21/2007	17	278	2.5722	297	4
3/21/2007	18	272	2.0578	297	4
3/21/2007	19	266	1.0289	296.5	5
3/21/2007	20	239	1.0000	295.4	6
3/21/2007	21	255	1.5433	294.3	6
3/21/2007	22	272	1.0289	293.7	6
3/21/2007	23	271	2.5722	293.2	6
3/21/2007	24	282	3.6011	292	5
3/22/2007	1	292	3.6011	290.9	5
3/22/2007	2	295	3.0866	289.8	6
3/22/2007	3	283	2.5722	288.7	6
3/22/2007	4	275	2.0578	288.2	6
3/22/2007	5	259	1.5433	287	7
3/22/2007	6	233	2.0578	287	6
3/22/2007	7	206	2.5722	286.5	5
3/22/2007	8	216	2.0578	285.9	4
3/22/2007	9	235	2.0578	287	3
3/22/2007	10	256	2.5722	289.8	2
3/22/2007	11	281	3.0866	293.2	2
3/22/2007	12	286	4.1155	295.4	3
3/22/2007	13	283	4.1155	296.5	3
3/22/2007	14	286	4.6300	298.2	3
3/22/2007	15	302	4.6300	298.7	4
3/22/2007	16	300	3.6011	299.3	4

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
3/22/2007	17	258	3.6011	299.3	3
3/22/2007	18	284	3.0866	299.3	4
3/22/2007	19	248	2.5722	298.7	5
3/22/2007	20	237	1.5433	297.6	6
3/22/2007	21	233	1.5433	293.7	7
3/22/2007	22	230	2.0578	293.7	6
3/22/2007	23	239	1.5433	293.2	7
3/22/2007	24	283	2.0578	292.6	6

Table C-6. Regression Statistics and Flux Rate Estimates for Iodomethane

Period	1		2		3		4		5		6	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	5223.142	21.03	3439.87	19.90	2953.718	11.54	2884.149	0.08	2118.6934	9.18	4938.311	23.24
2	24.17903	8.77	0	0.34	0	1.14	0	0.08	0	1.18	0	13.19
3	0.002272	8.60	0	0.33	0	1.14	0	0.08	0	0.08	0	9.56
4	0	0.26	0	0.33	0	0.33	0.061793	0.29	0	0.08	0	4.99
5	0	0.25	0	0.33	0	1.17	164.4896	1.02	0.0080233	0.08	0	6.24
6	26.43337	6.41	895.5237	18.40	13004.56	1.17	4979.571	33.68	3420.1121	17.47	5225.167	25.28
7	490.5142	12.49	3357.911	37.00	18942.81	89.69	9949.984	41.64	4761.2968	25.75	10429.66	28.58
8	5631.516	21.34	5980.475	44.52	8597.614	28.28	7831.63	22.07	3405.1385	17.10	11381.91	34.93
Slope	0.002879		0.007392		0.003369		0.003957		0.005135		0.002212	
Intercept	5.79235		2.51002		-1.51026		-0.39757		0.06897		9.409132	
Standard error	0.000642		0.001109		0.00105		0.000785		0.000194		0.000298	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Is intercept significant?	Yes		No		No		No		No		Yes	
Is intercept < 25th %?	No		No		Yes		Yes		Yes		No	
Slope, no intercept	0.003993		0.007967		0.003261		0.003904		0.005153		0.00325	
Standard error	0.000852		0.000845		0.000763		0.000549		0.000132		0.000488	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	3.99		7.39		3.37		3.96		5.13		3.25	
Flux Basis	Slope, no intercept		Slope		Slope		Slope		Slope		Slope, no intercept	

Table C-6. Regression Statistics and Flux Rate Estimates for Iodomethane (continued)

Period	7		8		9		10		11		12	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	2657.8	24.12	8903.681	136.43	2533.111	15.82	9241.69	14.14	4855.169	2.00	11596.39	8.73
2	0.046217	12.37	0	29.55	26.12452	11.12	0	12.48	1150.461	1.25	0.025633	2.91
3	0	17.34	0	14.35	1.625075	8.19	0	4.80	366.0633	0.29	0	2.04
4	0	20.25	0	13.72	0.486883	18.17	260.4081	3.78	0.000613	1.33	0	0.29
5	0	46.03	0	19.13	110.3379	6.95	2730.916	6.65	0.346308	1.25	0	0.29
6	2890.708	54.06	7746.475	28.28	4791.257	43.25	9721.151	11.01	3534.5	2.45	1551.883	1.51
7	6416.713	39.83	9706.299	11.81	5389.295	18.71	7425.549	7.75	6720.694	5.41	6472.188	2.29
8	5812.169	27.86	10985.02	34.51	3146.096	12.41	10663.06	9.56	6617.05	3.70	16493.32	9.78
Slope	0.001974		0.003248		0.003276		0.000418		0.000498		0.000536	
Intercept	25.84614		20.80893		10.27579		6.679481		0.761493		1.062742	
Standard error	0.002095		0.003063		0.001572		0.000268		0.000109		8.63E-05	
Is slope significant?	No		Yes		Yes		Yes		Yes		Yes	
Is intercept significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Is intercept < 25th %?	No		No		Yes		No		Yes		Yes	
Slope, no intercept	0.007058		0.005442		0.005682		0.001169		0.000638		0.000621	
Standard error	0.002621		0.00219		0.001437		0.000299		8.48E-05		7.68E-05	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	7.06		5.44		3.28		1.17		0.50		0.54	
Flux Basis	Slope, no intercept		Slope, no intercept		Slope		Slope, no intercept		Slope		Slope	

Table C-7. Regression Statistics and Flux Rate Estimates for Chloropicrin

Period	1		2		3		4		5		6	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	5223.1417	0.94	3439.8700	0.45	2953.7181	0.44	2884.1489	0.36	2118.6934	1.04	4938.3109	0.35
2	24.1790	2.43	0	0.44	0	0.44	0	0.11	0	0.11	0	0.37
3	0.0023	1.11	0	0.44	0	0.44	0.0000	0.11	0	0.11	0	0.36
4	0	0.33	0	0.44	0	0.44	0.0618	0.11	0	0.11	0	0.11
5	0	0.33	0	0.44	0	0.44	164.4896	0.11	0.0080	0.11	0	0.11
6	26.4334	2.34	895.5237	1.45	13004.557	4.22	4979.5713	2.50	3420.1121	1.50	5225.1668	0.89
7	490.5142	2.28	3357.9108	1.46	18942.813	4.67	9949.9841	3.27	4761.2968	1.94	10429.656	1.01
8	5631.5155	0.96	5980.4748	0.45	8597.6143	1.44	7831.6300	1.59	3405.1385	2.02	11381.908	0.94
Slope	-8.66E-05		2.5E-05		0.0002376		0.0002919		0.0004294		6.8E-05	
Intercept	1.46282		0.655104		0.2755691		0.0779772		0.1322817		0.244924	
Standard error	0.000141		8.33E-05		2.911E-05		5.421E-05		3.954E-05		1.47E-05	
Is slope significant?	No		No		Yes		Yes		Yes		Yes	
Is intercept significant?	Yes		Yes		Yes		No		Yes		Yes	
Is intercept < 25th %?	No		No		Yes		Yes		No		Yes	
Slope, no intercept	0.000195		0.000175		0.0002572		0.0003023		0.0004653		9.5E-05	
Standard error	0.000206		9.29E-05		2.307E-05		3.815E-05		3.047E-05		1.54E-05	
Is slope significant?	No		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	0.94		0.18		0.24		0.29		0.47		0.07	
Flux Basis	Ratio of averages		Slope, no intercept		Slope		Slope		Slope, no intercept		Slope	

Table C-7. Regression Statistics and Flux Rate Estimates for Chloropicrin (continued)

Period	7		8		9		10		11		12	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	2657.8001	0.35	8903.6811	0.36	2533.1110	0.11	9241.6895	0.11	4855.1690	0.11	11596.388	0.11
2	0.0462	0.11	0	0.11	26.1245	0.11	0	0.13	1150.4611	0.10	0.0256	0.11
3	0	0.11	0	0.11	1.6251	0.11	0	0.11	366.0633	0.11	0	1.28
4	0	0.11	0	0.11	0.4869	0.11	260.4081	0.11	0.0006	0.11	0	0.36
5	0	0.11	0	0.11	110.3379	0.11	2730.9157	0.11	0.3463	0.11	0	0.36
6	2890.7084	0.36	7746.4751	0.35	4791.2575	1.94	9721.1514	0.11	3534.5005	0.11	1551.8827	0.35
7	6416.7134	0.36	9706.2987	0.11	5389.2952	0.94	7425.5495	0.11	6720.6945	0.11	6472.1875	0.11
8	5812.1690	0.35	10985.018	0.12	3146.0963	0.96	10663.058	0.11	6617.0500	0.11	16493.322	0.11
Slope	4.27E-05		1.03E-05		0.000246		-6.5E-07		2.18E-07		-2.9E-05	
Intercept	0.138311		0.125081		0.059383		0.116909		0.109164		0.478222	
Standard error	9.51E-06		8.16E-06		6.93E-05		4.79E-07		2.94E-07		2.23E-05	
Is slope significant?	Yes		Yes		Yes		Yes		No		Yes	
Is intercept significant?	Yes		Yes		No		Yes		Yes		Yes	
Is intercept < 25th %?	No		No		Yes		No		No		No	
Slope, no intercept	6.99E-05		2.35E-05		0.000259		1.25E-05		2.03E-05		9.68E-06	
Standard error	1.34E-05		7.39E-06		4.71E-05		4.39E-06		7.09E-06		2.53E-05	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		No	
Flux (µg/m2-s)	0.07		0.02		0.25		0.01		0.02		0.08	
Flux Basis	Slope, no intercept		Slope, no intercept		Slope		Slope, no intercept		Slope, no intercept		Ratio of averages	

Table C-8. Concentration Profile Used to Develop Flux Estimates for Iodomethane, Aerodynamic Method

Period	Day/ Hour	Conc @ 15 cm	Conc @ 33 cm	Conc @ 55 cm	Conc @ 90 cm	Conc @ 150 cm	a	b	r^2
1	3/19, 10:00 - 14:00	86.83	60.76	43.15	33.29	24.91	-27.31	157.52	0.98
2	3/19, 14:00 - 17:00	216.23	148.04	100.49	59.88	39.92	-79.14	425.07	0.99
3	3/19, 17:00 - 20:00	266.13	199.60	134.73	103.70	64.33	-89.29	505.92	0.99
4	3/19, 20:00 - 08:00	110.92	83.17	65.23	36.23	18.41	-41.07	224.80	0.99
5	3/20, 08:00 - 20:00	79.01	58.22	41.58	27.86	16.71	-27.64	153.71	1.00
6	3/20, 20:00 - 08:00	137.70	113.14	87.97	59.98	37.66	-44.66	263.44	0.99
7	3/21, 08:00 - 20:00	80.26	74.43	35.64	30.77	19.52	-29.08	162.83	0.90
8	3/21, 20:00 - 08:00	111.99	95.96	75.68	133.07	135.67	13.17	58.53	0.21
9	3/22, 08:00 - 20:00	41.15	23.29	17.25	14.14	8.73	-13.55	74.35	0.94
10	3/22, 20:00 - 08:00	76.37	41.58	34.10	29.59	24.39	-33.52	164.79	0.95
11	3/23, 08:00 - 20:00	44.24	12.89	10.83	9.98	5.82	-15.11	76.37	0.75
12	3/23, 20:00 - 08:00	57.28	23.70	19.54	14.79	11.23	-18.88	99.79	0.83

Concentrations reported as $\mu g/m^3$.
Log-linear regression.

Table C-9. Concentration Profile Used to Develop Flux Estimates for Chloropicrin, Aerodynamic Method

Period	Day/ Hour	Conc @ 15 cm	Conc @ 33 cm	Conc @ 55 cm	Conc @ 90 cm	Conc @ 150 cm	a	b	r^2
1	3/19, 10:00 - 14:00	1.45	1.45	1.41	1.55	1.45	0.02	1.39	0.10
2	3/19, 14:00 - 17:00	6.22	4.17	1.39	1.39	0.44	-2.59	12.94	0.92
3	3/19, 17:00 - 20:00	14.44	12.82	7.97	5.36	3.19	-5.26	29.51	0.96
4	3/19, 20:00 - 08:00	10.95	7.39	4.77	2.62	1.61	-4.21	22.07	0.98
5	3/20, 08:00 - 20:00	7.37	4.90	3.54	2.42	1.61	-2.53	13.93	0.98
6	3/20, 20:00 - 08:00	5.17	3.67	2.59	1.95	1.36	-1.68	9.58	0.99
7	3/21, 08:00 - 20:00	2.28	1.75	1.36	0.97	0.81	-0.66	4.05	0.99
8	3/21, 20:00 - 08:00	1.58	1.23	0.98	0.82	0.33	-0.51	3.01	0.97
9	3/22, 08:00 - 20:00	0.36	0.35	0.37	0.38	0.12	-0.08	0.62	0.39
10	3/22, 20:00 - 08:00	0.36	0.35	0.11	0.11	0.11	-0.13	0.73	0.75
11	3/23, 08:00 - 20:00	1.28	0.11	0.11	0.11	0.11	-0.45	2.13	0.60
12	3/23, 20:00 - 08:00	0.37	0.11	0.11	0.11	0.11	-0.10	0.56	0.60

Concentrations reported as $\mu g/m^3$.
Log-linear regression.

Table C-10. Temperature Profile Used to Develop Flux Estimates, Aerodynamic Method

Period	Day/ Hour	Temp @ 33 cm	Temp @ 55 cm	Temp @ 90 cm	Temp @ 150 cm	a	b	r^2
1	3/19, 10:00 - 14:00	23.1667	22.7900	22.5067	22.1200	-0.6802	25.5390	0.9974
2	3/19, 14:00 - 17:00	24.9500	24.6300	24.3867	24.0633	-0.5768	26.9611	0.9978
3	3/19, 17:00 - 20:00	22.9733	22.9033	22.8367	22.7833	-0.1264	23.4119	0.9961
4	3/19, 20:00 - 08:00	16.5250	16.5692	16.6025	16.6492	0.0806	16.2435	0.9971
5	3/20, 08:00 - 20:00	23.5842	23.2408	23.0408	22.7400	-0.5430	25.4613	0.9921
6	3/20, 20:00 - 08:00	16.4150	16.4625	16.5150	16.6200	0.1326	15.9389	0.9605
7	3/21, 08:00 - 20:00	24.9392	24.5433	24.3725	24.0033	-0.5921	26.9832	0.9818
8	3/21, 20:00 - 08:00	17.0675	17.0808	17.1100	17.1725	0.0684	16.8169	0.9059
9	3/22, 08:00 - 20:00	26.2508	25.8792	25.6767	25.3608	-0.5709	28.2202	0.9899
10	3/22, 20:00 - 08:00	16.4450	16.4692	16.5042	16.6042	0.1019	16.0723	0.8937
11	3/23, 08:00 - 20:00	27.3533	26.9658	26.8450	26.4667	-0.5530	29.2601	0.9682
12	3/23, 20:00 - 08:00	19.5683	19.5633	19.5800	19.6017	0.0231	19.4799	0.7786

Temperatures reported as ^{o}C.
Log linear regression used to fit the data.

Table C-11. Wind Speed Profile Used to Develop Flux Estimates, Aerodynamic Method

Period	Day/ Hour	WS @ 33 cm	WS @ 55 cm	WS @ 90 cm	WS @ 150 cm	a	b	r^2
1	3/19, 10:00 - 14:00	2.3063	2.5107	2.7033	2.9380	0.4147	0.8506	0.9986
2	3/19, 14:00 - 17:00	1.8683	2.0377	2.2177	2.4170	0.3627	0.5925	0.9986
3	3/19, 17:00 - 20:00	0.6913	0.7223	0.8860	0.9910	0.2108	-0.0739	0.9438
4	3/19, 20:00 - 08:00	1.2393	1.4288	1.5452	1.6976	0.2963	0.2173	0.9927
5	3/20, 08:00 - 20:00	2.1116	2.3372	2.4633	2.6688	0.3573	0.8753	0.9910
6	3/20, 20:00 - 08:00	0.5278	0.6824	0.7599	0.8803	0.2255	-0.2467	0.9860
7	3/21, 08:00 - 20:00	1.6601	1.8718	1.9642	2.1273	0.2970	0.6424	0.9808
8	3/21, 20:00 - 08:00	0.1791	0.2983	0.3308	0.4455	0.1654	-0.3902	0.9630
9	3/22, 08:00 - 20:00	1.6728	1.8550	1.9550	2.0900	0.2686	0.7505	0.9877
10	3/22, 20:00 - 08:00	0.3002	0.3637	0.4298	0.4854	0.1235	-0.1305	0.9984
11	3/23, 08:00 - 20:00	1.2853	1.4311	1.5155	1.6270	0.2205	0.5267	0.9901
12	3/23, 20:00 - 08:00	0.2548	0.3745	0.4061	0.5132	0.1605	-0.2955	0.9621

Wind speed (WS) reported as m/s.
Log linear regression used to fit the data.

Table C-12. Aerodynamic Flux Estimates for Iodomethane

Period	Day/Hour	Conc @ 33 cm	Conc @ 90 cm	WS @ 33 cm	WS @ 90 cm	Temp @ 33 cm	Temp @ 90 cm	Ri	Θ_m	Θ_c	Flux (µg/m^2-s)
1	3/19, 10:00 - 14:00	62.022	34.620	2.3006	2.7167	23.1608	22.4783	-0.074	0.772	0.600	4.31
2	3/19, 14:00 - 17:00	148.364	68.964	1.8606	2.2245	24.9442	24.3655	-0.082	0.758	0.586	11.40
3	3/19, 17:00 - 20:00	193.700	104.112	0.6631	0.8746	22.9699	22.8430	-0.054	0.815	0.648	6.28
4	3/19, 20:00 - 08:00	81.191	39.983	1.2534	1.5507	16.5254	16.6063	0.018	1.086	1.068	1.85
5	3/20, 08:00 - 20:00	57.059	29.326	2.1247	2.4832	23.5626	23.0177	-0.080	0.762	0.590	3.88
6	3/20, 20:00 - 08:00	107.292	62.487	0.5419	0.7681	16.4027	16.5358	0.050	1.215	1.318	1.11
7	3/21, 08:00 - 20:00	61.152	31.975	1.6810	1.9790	24.9129	24.3188	-0.126	0.695	0.521	4.21
8	3/21, 20:00 - 08:00	104.575	117.787	0.1882	0.3542	17.0559	17.1245	0.048	1.207	1.303	-0.24
9	3/22, 08:00 - 20:00	26.981	13.388	1.6898	1.9593	26.2241	25.6513	-0.147	0.670	0.496	1.93
10	3/22, 20:00 - 08:00	47.582	13.950	0.3013	0.4252	16.4285	16.5307	0.129	1.446	1.733	0.29
11	3/23, 08:00 - 20:00	23.523	8.358	1.2978	1.5190	27.3264	26.7715	-0.211	0.614	0.443	2.16
12	3/23, 20:00 - 08:00	33.768	14.822	0.2656	0.4266	19.5608	19.5840	0.017	1.083	1.063	0.46

Flux is estimated using the following equations

$$Flux = \frac{-(0.42^2)(c_{80} - c_{30})(WS_{80} - WS_{30})}{\theta_m \theta_c \ln(80/30)^2}$$

$$Ri = \frac{(9.8)(0.8 - 0.3)(T_{80} - T_{30})}{\left([T_{80} + T_{30}]/2 + 273.16\right)(WS_{80} - WS_{30})^2}$$

where

if Ri > 0, $\theta_m = (1 + 16Ri)^{0.333}$ and $\theta_c = 0.885(1 + 34Ri)^{0.4}$

if Ri < 0, $\theta_m = (1 - 16Ri)^{-0.333}$ and $\theta_c = 0.885(1 - 22Ri)^{-0.4}$

Table C-13. Aerodynamic Flux Estimates for Chloropicrin

Period	Day/Hour	Conc @ 33 cm	Conc @ 90 cm	WS @ 33 cm	WS @ 90 cm	Temp @ 33 cm	Temp @ 90 cm	Ri	Θ_m	Θ_c	Flux ($\mu g/m^2$-s)
1	3/19, 10:00 - 14:00	1.455	1.474	2.3006	2.7167	23.1608	22.4783	-0.074	0.772	0.600	-0.003
2	3/19, 14:00 - 17:00	3.881	1.281	1.8606	2.2245	24.9442	24.3655	-0.082	0.758	0.586	0.373
3	3/19, 17:00 - 20:00	11.114	5.835	0.6631	0.8746	22.9699	22.8430	-0.054	0.815	0.648	0.370
4	3/19, 20:00 - 08:00	7.354	3.131	1.2534	1.5507	16.5254	16.6063	0.018	1.086	1.068	0.190
5	3/20, 08:00 - 20:00	5.101	2.566	2.1247	2.4832	23.5626	23.0177	-0.080	0.762	0.590	0.354
6	3/20, 20:00 - 08:00	3.702	2.016	0.5419	0.7681	16.4027	16.5358	0.050	1.215	1.318	0.042
7	3/21, 08:00 - 20:00	1.732	1.067	1.6810	1.9790	24.9129	24.3188	-0.126	0.695	0.521	0.096
8	3/21, 20:00 - 08:00	1.218	0.703	0.1882	0.3542	17.0559	17.1245	0.048	1.207	1.303	0.010
9	3/22, 08:00 - 20:00	0.350	0.271	1.6898	1.9593	26.2241	25.6513	-0.147	0.670	0.496	0.011
10	3/22, 20:00 - 08:00	0.268	0.136	0.3013	0.4252	16.4285	16.5307	0.129	1.446	1.733	0.001
11	3/23, 08:00 - 20:00	0.547	0.092	1.2978	1.5190	27.3264	26.7715	-0.211	0.614	0.443	0.065
12	3/23, 20:00 - 08:00	0.207	0.107	0.2656	0.4266	19.5608	19.5840	0.017	1.083	1.063	0.002

Flux is estimated using the following equations

$$Flux = \frac{-(0.42^2)(c_{80} - c_{30})(WS_{80} - WS_{30})}{\theta_m \theta_c \ln(80/30)^2}$$

$$Ri = \frac{(9.8)(0.8 - 0.3)(T_{80} - T_{30})}{\left(\left[T_{80} + T_{30}\right]/2 + 273.16\right)(WS_{80} - WS_{30})^2}$$

where

if Ri > 0, $\theta_m = (1 + 16Ri)^{0.333}$ and $\theta_c = 0.885(1 + 34Ri)^{0.4}$

if Ri < 0, $\theta_m = (1 - 16Ri)^{-0.333}$ and $\theta_c = 0.885(1 - 22Ri)^{-0.4}$

Attachment D
Flux Rate Analysis for Hart, MI Study

Table D-1. Uncorrected Iodomethane Air Concentrations at Samplers Around Field (µg/m³) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	5/16/07 11:00 - 13:00	5/16/07 13:00 - 16:00	5/16/07 16:00 - 19:00	5/16/07 19:00 - 07:00	5/17/07 07:00 - 19:00	5/17/07 19:00 - 07:00	5/18/07 07:00 - 19:00	5/18/07 19:00 - 07:00	5/19/07 07:00 - 19:00	5/19/07 19:00 - 07:00	5/20/07 07:00 - 19:00	5/20/07 19:00 - 07:00
Sample r												
1	4.00	0.03	2.35	0.27	0.24	23.33	8.89	38.89	15.00	1.31	0.13	5.28
2	0.00	0.80	1.34	2.31	4.25	19.50	9.17	3.90	10.28	10.56	3.40	3.33
3	6.93	7.60	5.22	7.78	7.37	21.67	5.99	3.61	4.72	12.81	2.26	3.81
4	19.23	4.11	8.56	24.44	10.48	16.43	0.44	0.59	0.00	10.83	5.00	0.27
5	15.09	2.51	5.08	20.00	5.83	18.33	0.19	0.42	0.00	7.22	4.63	0.05
6	0.00	0.00	1.53	1.39	0.22	32.70	0.23	1.06	0.00	0.22	1.00	2.08
7	0.00	0.04	2.11	0.39	0.10	38.89	0.61	6.11	0.08	0.02	0.48	5.00
8	0.00	0.06	18.99	0.33	0.19	24.52	6.94	41.67	6.94	0.30	0.10	7.50

Table D-2. Uncorrected Chloropicrin Air Concentrations at Samplers Around Field (µg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	5/16/07 11:00 - 13:00	5/16/07 13:00 - 16:00	5/16/07 16:00 - 19:00	5/16/07 19:00 - 07:00	5/17/07 07:00 - 19:00	5/17/07 19:00 - 07:00	5/18/07 07:00 - 19:00	5/18/07 19:00 - 07:00	5/19/07 07:00 - 19:00	5/19/07 19:00 - 07:00	5/20/07 07:00 - 19:00	5/20/07 19:00 - 07:00
Sampler												
1	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.13	0.01	NA	NA	NA
2	0.64	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	NA	NA	NA
3	3.08	1.56	0.00	0.00	0.12	0.10	0.00	0.00	0.00	NA	NA	NA
4	3.08	0.19	0.00	0.08	0.14	0.07	0.00	0.00	0.00	NA	NA	NA
5	4.28	0.12	0.00	0.11	0.07	0.08	0.00	0.00	0.00	NA	NA	NA
6	0.00	0.00	0.00	0.01	0.00	0.19	0.00	0.00	0.00	NA	NA	NA
7	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	NA	NA	NA
8	0.00	0.00	0.00	0.00	0.00	0.11	0.04	0.18	0.00	NA	NA	NA

Table D-3. Corrected Iodomethane Air Concentrations at Samplers Around Field (μg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	5/16/07 11:00 - 13:00	5/16/07 13:00 - 16:00	5/16/07 16:00 - 19:00	5/16/07 19:00 - 07:00	5/17/07 07:00 - 19:00	5/17/07 19:00 - 07:00	5/18/07 07:00 - 19:00	5/18/07 19:00 - 07:00	5/19/07 07:00 - 19:00	5/19/07 19:00 - 07:00	5/20/07 07:00 - 19:00	5/20/07 19:00 - 07:00
Sample r												
1	6.22	0.19	3.64	0.63	1.15	34.72	13.23	57.87	22.32	2.03	0.15	8.20
2	0.19	0.62	9.20	4.18	6.60	29.53	13.64	6.06	15.29	15.71	5.28	5.18
3	10.76	11.80	8.11	12.08	12.14	32.24	9.31	5.61	7.33	19.06	3.51	5.92
4	29.86	6.38	16.91	36.94	15.60	24.45	0.69	0.92	0.05	16.12	7.76	0.15
5	23.44	3.90	7.90	29.76	9.06	27.28	0.15	0.66	0.05	11.21	7.19	0.05
6	0.25	0.20	4.75	2.88	0.15	48.66	0.15	1.65	0.05	0.15	1.55	3.23
7	0.21	0.19	6.04	0.60	0.05	57.87	0.95	9.49	0.05	0.05	0.75	7.76
8	0.20	0.20	32.27	0.52	0.16	36.49	10.78	62.00	10.78	0.15	0.05	11.65

Table D-4. Corrected Chloropicrin Air Concentrations at Samplers Around Field (µg/m^3) for First Four Days

Sample Periods	1	2	3	4	5	6	7	8	9	10	11	12
Hours	0-4	4-8	8-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24	0-12	12-24
DTG	5/16/07 11:00 - 13:00	5/16/07 13:00 - 16:00	5/16/07 16:00 - 19:00	5/16/07 19:00 - 07:00	5/17/07 07:00 - 19:00	5/17/07 19:00 - 07:00	5/18/07 07:00 - 19:00	5/18/07 19:00 - 07:00	5/19/07 07:00 - 19:00	5/19/07 19:00 - 07:00	5/20/07 07:00 - 19:00	5/20/07 19:00 - 07:00
Sampler												
1	0.11	0.11	0.11	0.03	0.03	0.10	0.10	0.10	0.03	NA	NA	NA
2	0.38	0.11	0.11	0.03	0.03	0.10	0.10	0.03	0.03	NA	NA	NA
3	3.08	1.56	0.11	0.03	0.10	0.10	0.03	0.03	0.03	NA	NA	NA
4	3.08	0.11	0.11	0.10	0.10	0.10	0.03	0.03	0.03	NA	NA	NA
5	4.28	0.11	0.11	0.10	0.10	0.10	0.03	0.03	0.03	NA	NA	NA
6	0.12	0.11	0.11	0.03	0.03	0.10	0.03	0.03	0.03	NA	NA	NA
7	0.11	0.11	0.11	0.03	0.03	0.40	0.03	0.03	0.03	NA	NA	NA
8	0.11	0.12	0.11	0.03	0.03	0.10	0.03	0.10	0.03	NA	NA	NA

Table D-5. Meteorological Data for First Four Days

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
5/16/2007	12	164	5.1444	281.5	4
5/16/2007	13	149	5.1444	281.5	4
5/16/2007	14	146	4.63	282	3
5/16/2007	15	157	4.63	282.6	3
5/16/2007	16	158	5.6588	283.2	4
5/16/2007	17	172	5.1444	284.8	4
5/16/2007	18	167	4.63	285.4	4
5/16/2007	19	167	4.1155	284.8	4
5/16/2007	20	169	4.1155	284.3	4
5/16/2007	21	136	2.5722	282	5
5/16/2007	22	165	3.0866	280.9	6
5/16/2007	23	155	1.5433	279.3	7
5/16/2007	24	161	1.0289	278.7	7
5/17/2007	1	165	2.5722	279.3	6
5/17/2007	2	159	2.0578	279.3	6
5/17/2007	3	160	1.5433	279.3	6
5/17/2007	4	171	1.5433	279.3	6
5/17/2007	5	176	2.0578	278.7	5
5/17/2007	6	205	3.6011	278.7	4
5/17/2007	7	201	2.0578	278.2	4
5/17/2007	8	199	2.0578	279.3	4
5/17/2007	9	177	2.5722	281.5	3
5/17/2007	10	180	3.6011	283.2	3
5/17/2007	11	161	3.0866	284.3	3
5/17/2007	12	142	3.6011	285.9	3
5/17/2007	13	164	3.6011	288.2	2
5/17/2007	14	149	4.63	288.7	2
5/17/2007	15	153	5.1444	289.8	3
5/17/2007	16	155	5.6588	290.4	3
5/17/2007	17	148	6.1733	290.4	4
5/17/2007	18	154	5.1444	289.8	4
5/17/2007	19	150	5.1444	289.3	4
5/17/2007	20	147	3.6011	288.7	4
5/17/2007	21	165	2.0578	287	5
5/17/2007	22	174	0	282	6
5/17/2007	23	317	0	278.7	7
5/17/2007	24	301	1.0289	277.6	7
5/18/2007	1	346	1	276.5	7
5/18/2007	2	213	1	275.4	7

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
5/18/2007	3	314	0	275.4	7
5/18/2007	4	12	0	274.3	7
5/18/2007	5	117	1	273.7	7
5/18/2007	6	256	1.0289	273.7	7
5/18/2007	7	343	1.0289	273.7	6
5/18/2007	8	338	1	275.9	5
5/18/2007	9	343	1.5433	283.2	4
5/18/2007	10	25	1.5433	287.6	3
5/18/2007	11	61	2.0578	289.3	2
5/18/2007	12	71	2.5722	290.9	2
5/18/2007	13	98	3.6011	291.5	2
5/18/2007	14	92	4.1155	292	2
5/18/2007	15	65	4.63	292.6	2
5/18/2007	16	55	5.1444	292.6	3
5/18/2007	17	54	5.6588	292	3
5/18/2007	18	37	5.6588	292	4
5/18/2007	19	31	5.1444	291.5	4
5/18/2007	20	23	4.63	290.9	4
5/18/2007	21	1	3.0866	289.3	4
5/18/2007	22	346	3.6011	288.2	5
5/18/2007	23	356	3.0866	287.6	6
5/18/2007	24	14	2.0578	286.5	5
5/19/2007	1	9	1.5433	285.9	6
5/19/2007	2	339	2.5722	284.8	5
5/19/2007	3	354	2.5722	284.8	5
5/19/2007	4	1	2.0578	285.4	5
5/19/2007	5	19	2.5722	286.5	5
5/19/2007	6	32	3.6011	286.5	4
5/19/2007	7	23	2.5722	286.5	4
5/19/2007	8	22	2.5722	287	4
5/19/2007	9	6	2.0578	287.6	4
5/19/2007	10	52	2.0578	288.7	3
5/19/2007	11	55	4.1155	289.8	3
5/19/2007	12	37	4.1155	290.4	3
5/19/2007	13	28	4.1155	292.6	3
5/19/2007	14	31	4.63	294.3	2
5/19/2007	15	38	5.1444	294.8	3
5/19/2007	16	34	5.6588	295.4	4
5/19/2007	17	48	5.6588	295.9	3
5/19/2007	18	42	5.1444	295.9	4
5/19/2007	19	35	4.63	294.8	3

Date	Hour	Wind Direction (degrees)	Wind Speed (m/s)	Temperature (K)	Stability
5/19/2007	20	60	3.6011	293.2	4
5/19/2007	21	102	2.5722	290.4	4
5/19/2007	22	95	1.5433	287.6	5
5/19/2007	23	148	2.5722	285.9	6
5/19/2007	24	165	2.0578	284.3	5

Table D-6. Regression Statistics and Flux Rate Estimates for Iodomethane

Period	**1**		**2**		**3**		**4**		**5**		**6**	
Sampler	**Model**	**Measured**	**Model**	**Measured**	**Model**	**Measured**	**Model**	**Measured**	**Model**	**Measured**	**Model**	**Measured**
1	0	6.22	0	0.19	0	3.64	0	0.63	0	1.15	4483.502	34.72
2	95.349	0.19	178.793	0.62	0.061	9.20	208.667	4.18	174.831	6.60	1271.957	29.53
3	1026.116	10.76	1212.539	11.80	141.825	8.11	2120.753	12.08	1034.863	12.14	2881.965	32.24
4	4478.253	29.86	3696.246	6.38	4992.317	16.91	13242.39	36.94	4571.29	15.60	3369.286	24.45
5	3454.94	23.44	2592.72	3.90	4868.909	7.90	11161.46	29.76	3790.571	9.06	3703.08	27.28
6	0	0.25	0	0.20	0	4.75	356.277	2.88	143.302	0.15	4444.505	48.66
7	0	0.21	0	0.19	0	6.04	9.411	0.60	0.9	0.05	5067.462	57.87
8	0	0.20	0	0.20	0	32.27	0	0.52	0	0.16	5774.326	36.49
Slope	0.0063702		0.0017625		0.0003584		0.0025947		0.0026372		0.0044548	
Intercept	1.6794474		1.2440613		10.653352		2.1578869		2.4099639		19.146189	
Standard error	0.0005274		0.0009681		0.0016931		0.0001565		0.0008008		0.0027637	
Is slope significant?	Yes		Yes		No		Yes		Yes		Yes	
Is intercept significant?	Yes		No		Yes		Yes		Yes		Yes	
Is intercept < 25th %?	No		No		No		No		No		Yes	
Slope, no intercept	0.0068302		0.0021991		0.0025489		0.0027866		0.0032807		0.0088880	
Standard error	0.0004814		0.0007657		0.0019509		0.0001639		0.0007033		0.0009977	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	6.83		1.76		2.55		2.79		3.28		4.45	
Flux Basis	Slope, no intercept		Slope		Slope, no intercept		Slope, no intercept		Slope, no intercept		Slope	

Table D-6. Regression Statistics and Flux Rate Estimates for Iodomethane (continued)

Period	7		8		9		10		11		12	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	4937.414	13.23	9624.276	57.87	4346.712	22.32	228.5975	2.03	0.0000	0.15	4665.414	8.20
2	2710.940	13.64	718.716	6.06	2384.455	15.29	2799.141	15.71	749.3965	5.28	3232.862	5.18
3	1716.754	9.31	47.681	5.61	872.1785	7.33	4687.865	19.06	1036.759	3.51	2447.968	5.92
4	21.355	0.69	0.000	0.92	0.0000	0.05	8453.315	16.12	5545.079	7.76	37.4184	0.15
5	1.055	0.15	0.000	0.66	0.0000	0.05	5597.331	11.21	5805.198	7.19	0.2327	0.05
6	2.637	0.15	0.436	1.65	0.0000	0.05	41.4695	0.15	568.7565	1.55	887.0081	3.23
7	659.187	0.95	202.665	9.49	0.0000	0.05	0.0033	0.05	43.5782	0.75	2206.151	7.76
8	4647.580	10.78	9112.531	62.00	2789.725	10.78	27.3384	0.15	0.0000	0.05	5086.129	11.65
Slope	0.0026654		0.0060554		0.0049599		0.0021468		0.0011268		0.00191	
Intercept	1.2160307		3.1164353		0.5470962		2.2005316		1.3449331		0.8356750	
Standard error	0.0005575		0.0003076		0.0004928		0.0005718		0.0002397		0.0003182	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Is intercept significant?	No		Yes		No		No		Yes		No	
Is intercept < 25th %?	No		No		No		No		No		Yes	
Slope, no intercept	0.0029806		0.0064039		0.0051315		0.0025090		0.0014052		0.0021325	
Standard error	0.0003939		0.0003231		0.0003597		0.0004211		0.0002276		0.0001938	
Is slope significant?	Yes		Yes		Yes		Yes		Yes		Yes	
Flux (µg/m2-s)	2.67		6.40		4.96		2.15		1.41		1.91	
Flux Basis	Slope		Slope, no intercept		Slope		Slope		Slope, no intercept		Slope	

Table D-7. Regression Statistics and Flux Rate Estimates for Chloropicrin

Period	1		2		3		4		5		6	
Sampler	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured	Model	Measured
1	0.00	0.11	0.00	0.11	0.00		0.00	0.03	0.00	0.03	4483.50	0.10
2	95.35	0.38	178.79	0.11	0.06		208.67	0.03	174.83	0.03	1271.96	0.10
3	1026.12	3.08	1212.54	1.56	141.83		2120.75	0.03	1034.86	0.10	2881.96	0.10
4	4478.25	3.08	3696.25	0.11	4992.32		13242.39	0.10	4571.29	0.10	3369.29	0.10
5	3454.94	4.28	2592.72	0.11	4868.91		11161.46	0.10	3790.57	0.10	3703.08	0.10
6	0.00	0.12	0.00	0.11	0.00		356.28	0.03	143.30	0.03	4444.51	0.10
7	0.00	0.11	0.00	0.11	0.00		9.41	0.03	0.90	0.03	5067.46	0.40
8	0.00	0.11	0.00	0.12	0.00		0.00	0.03	0.00	0.03	5774.33	0.10
Slope	0.0008328		2.443E-05				5.764E-06		1.639E-05		2.597E-05	
Intercept	0.4661358		0.2689187				0.0255307		0.0343098		0.0343059	
Standard error	0.0002046		0.0001444				3.842E-07		4.150E-06		2.889E-05	
Is slope significant?	Yes		No				Yes		Yes		No	
Is intercept significant?	Yes		Yes				Yes		Yes		No	
Is intercept < 25th %?	No		No				Yes		No		Yes	
Slope, no intercept	0.0009605		0.0001188				8.035E-06		2.555E-05		3.391E-05	
Standard error	0.000173		0.0001198				1.341E-06		5.912E-06		8.640E-06	
Is slope significant?	Yes		Yes				Yes		Yes		Yes	
Flux (µg/m2-s)	0.96		0.12		NA		0.01		0.03		0.03	
Flux Basis	Slope, no intercept		Slope, no intercept				Slope		Slope, no intercept		Slope, no intercept	

Table D-7. Regression Statistics and Flux Rate Estimates for Chloropicrin (continued)

Period	7		8	
Sampler	Model	Measured	Model	Measured
1	4937.414	0.10	9624.276	0.10
2	2710.940	0.10	718.716	0.03
3	1716.754	0.03	47.681	0.03
4	21.355	0.03	0.000	0.03
5	1.055	0.03	0.000	0.03
6	2.637	0.03	0.436	0.03
7	659.187	0.03	202.665	0.03
8	4647.580	0.03	9112.531	0.10
Slope	9.551E-06		7.739E-06	
Intercept	0.0275017		0.0265165	
Standard error	5.202E-06		1.862E-07	
Is slope significant?	Yes		Yes	
Is intercept significant?	Yes		Yes	
Is intercept < 25th %?	No		Yes	
Slope, no intercept	1.668E-05		1.070E-05	
Standard error	4.487E-06		1.824E-06	
Is slope significant?	Yes		Yes	
Flux (µg/m2-s)	0.02		0.01	
Flux Basis	Slope, no intercept		Slope	

Table D-8. Concentration Profile Used to Develop Flux Estimates for Iodomethane, Aerodynamic Method

Period	Day/ Hour	Conc @ 15 cm	Conc @ 33 cm	Conc @ 55 cm	Conc @ 90 cm	Conc @ 150 cm	a	b	r^2
1	5/16, 11:00 - 13:00	69.95	61.55	61.00	52.22	49.04	-9.11	94.67	0.96
2	5/16, 13:00 - 16:00	13.66	10.06	8.45	8.27	5.39	-3.31	22.23	0.95
3	5/16, 16:00 - 19:00	38.73	36.08	25.71	17.08	18.98	-10.29	67.91	0.88
4	5/16, 19:00 - 07:00	119.87	87.32	74.40	62.52	37.81	-33.86	209.95	0.99
5	5/17, 07:00 - 19:00	49.60	38.96	30.18	26.04	19.01	-13.26	85.07	0.99
6	5/17, 19:00 - 07:00	227.07	202.74	169.48	140.54	105.42	-53.63	380.59	0.98
7	5/18, 07:00 - 19:00	57.87	46.37	30.59	18.19	13.23	-20.83	115.40	0.98
8	5/18, 19:00 - 07:00	140.54	99.21	82.67	62.00	35.55	-44.26	258.58	0.99
9	5/19, 07:00 - 19:00	64.88	49.60	31.42	22.71	15.29	-22.51	125.56	0.98
10	5/19, 19:00 - 07:00	89.60	66.14	40.51	32.24	22.32	-37.10	191.69	0.98
11	5/20, 07:00 - 19:00	35.96	29.76	22.73	17.36	12.94	-10.36	64.62	0.99
12	5/20, 19:00 - 07:00	49.60	32.24	25.63	21.91	15.29	-14.37	85.64	0.96

Concentrations reported as $\mu g/m^3$.
Log-linear regression.

Table D-9. Concentration Profile Used to Develop Flux Estimates for Chloropicrin, Aerodynamic Method

Period	Day/ Hour	Conc @ 15 cm	Conc @ 33 cm	Conc @ 55 cm	Conc @ 90 cm	Conc @ 150 cm	a	b	r^2
1	5/16, 11:00 - 13:00	4.32	4.60	4.11	4.07	2.86	-0.58	6.27	0.60
2	5/16, 13:00 - 16:00	0.39	0.39	0.39	0.39	0.12	-0.09	0.70	0.45
3	5/16, 16:00 - 19:00	NA	NA	NA	NA	NA	NA	NA	NA
4	5/16, 19:00 - 07:00	0.36	0.28	0.31	0.20	0.10	-0.11	0.67	0.85
5	5/17, 07:00 - 19:00	0.58	0.50	0.44	0.35	0.25	-0.14	0.99	0.97
6	5/17, 19:00 - 07:00	0.75	0.69	0.56	0.57	0.41	-0.14	1.15	0.90
7	5/18, 07:00 - 19:00	0.20	0.09	0.09	0.03	0.03	-0.08	0.39	0.90
8	5/18, 19:00 - 07:00	0.10	0.10	0.03	0.03	0.03	-0.04	0.20	0.75

Concentrations reported as $\mu g/m^3$.
Log-linear regression.

Table D-10. Temperature Profile Used to Develop Flux Estimates, Aerodynamic Method

Period	Day/ Hour	Temp @ 33 cm	Temp @ 55 cm	Temp @ 90 cm	Temp @ 150 cm	a	b	r^2
1	5/16, 11:00 - 13:00	9.4350	9.0450	8.7000	8.3300	-0.7270	11.9698	0.9997
2	5/16, 13:00 - 16:00	10.4867	10.1000	9.7667	9.3800	-0.7257	13.0203	0.9995
3	5/16, 16:00 - 19:00	12.8633	12.4533	12.1833	11.7467	-0.7194	15.3717	0.9938
4	5/16, 19:00 - 07:00	6.8189	6.7671	6.7306	6.6791	-0.0906	7.1343	0.9965
5	5/17, 07:00 - 19:00	14.8841	14.4796	14.0712	13.6484	-0.8174	17.7475	0.9999
6	5/17, 19:00 - 07:00	5.6247	5.5660	5.5458	5.5349	-0.0575	5.8126	0.8734
7	5/18, 07:00 - 19:00	17.4818	17.1403	16.6336	16.3023	-0.8029	20.3049	0.9917
8	5/18, 19:00 - 07:00	13.6892	13.6658	13.6658	13.6550	-0.0204	13.7558	0.8476
9	5/19, 07:00 - 19:00	20.2625	19.8492	19.5250	19.1333	-0.7374	22.8290	0.9986
10	5/19, 19:00 - 07:00	11.3512	11.2645	11.1701	11.0998	-0.1685	11.9379	0.9961
11	5/20, 07:00 - 19:00	12.4266	12.0975	11.6990	11.3592	-0.7149	14.9366	0.9981
12	5/20, 19:00 - 07:00	10.9150	10.8208	10.7333	10.6592	-0.1698	11.5043	0.9970

Temperatures reported as ^oC.
Log linear regression used to fit the data.

Table D-11. Wind Speed Profile Used to Develop Flux Estimates, Aerodynamic Method

Period	Day/ Hour	WS @ 33 cm	WS @ 55 cm	WS @ 90 cm	WS @ 150 cm	a	b	r^2
1	5/16, 11:00 - 13:00	4.0230	4.4485	4.6980	5.1905	0.7458	1.4178	0.9877
2	5/16, 13:00 - 16:00	4.1217	4.5237	4.7187	5.2273	0.6983	1.6778	0.9762
3	5/16, 16:00 - 19:00	3.8380	4.2527	4.4127	4.9507	0.6956	1.4046	0.9650
4	5/16, 19:00 - 07:00	1.5575	1.8173	1.8989	2.1473	0.3681	0.2893	0.9689
5	5/17, 07:00 - 19:00	3.2936	3.6230	3.7873	4.1348	0.5344	1.4367	0.9851
6	5/17, 19:00 - 07:00	0.5803	0.6590	0.7208	0.7672	0.1237	0.1559	0.9866
7	5/18, 07:00 - 19:00	2.7150	2.8097	3.0438	3.1442	0.3018	1.6444	0.9661
8	5/18, 19:00 - 07:00	1.4861	1.5128	1.7916	1.8753	0.2866	0.4473	0.9021
9	5/19, 07:00 - 19:00	3.0137	3.1261	3.4033	3.5321	0.3635	1.7227	0.9687
10	5/19, 19:00 - 07:00	1.7902	2.0003	2.1206	2.2940	0.3243	0.6718	0.9911
11	5/20, 07:00 - 19:00	2.1990	2.4122	2.5344	2.7238	0.3372	1.0332	0.9917
12	5/20, 19:00 - 07:00	2.1050	2.2283	2.3999	2.4847	0.2601	1.1982	0.9837

Wind speed (WS) reported as m/s.
Log linear regression used to fit the data.

Table D-12. Aerodynamic Flux Estimates for Iodomethane

Period	Day/Hour	Conc @ 33 cm	Conc @ 90 cm	WS @ 33 cm	WS @ 90 cm	Temp @ 33 cm	Temp @ 90 cm	Ri	Θ_m	Θ_c	Flux ($\mu g/m^2$-s)
1	5/16, 11:00 - 13:00	62.830	53.694	4.0254	4.7736	9.4279	8.6985	-0.026	0.892	0.739	1.82
2	5/16, 13:00 - 16:00	10.649	7.327	4.1192	4.8198	10.4828	9.7546	-0.029	0.881	0.725	0.64
3	5/16, 16:00 - 19:00	31.925	21.599	3.8369	4.5348	12.8563	12.1345	-0.029	0.882	0.726	1.97
4	5/16, 19:00 - 07:00	91.554	57.582	1.5765	1.9459	6.8175	6.7266	-0.013	0.938	0.799	2.93
5	5/17, 07:00 - 19:00	38.700	25.394	3.3051	3.8413	14.8896	14.0695	-0.055	0.811	0.643	2.40
6	5/17, 19:00 - 07:00	193.074	139.266	0.5882	0.7123	5.6114	5.5537	-0.075	0.770	0.599	2.54
7	5/18, 07:00 - 19:00	42.579	21.683	2.6997	3.0025	17.4974	16.6918	-0.169	0.649	0.476	3.59
8	5/18, 19:00 - 07:00	103.821	59.415	1.4494	1.7370	13.6844	13.6639	-0.005	0.976	0.850	2.70
9	5/19, 07:00 - 19:00	46.862	24.279	2.9936	3.3583	20.2507	19.5109	-0.106	0.721	0.547	3.66
10	5/19, 19:00 - 07:00	61.982	24.762	1.8057	2.1311	11.3489	11.1799	-0.031	0.874	0.717	3.38
11	5/20, 07:00 - 19:00	28.393	17.999	2.2121	2.5504	12.4368	11.7195	-0.123	0.699	0.524	1.68
12	5/20, 19:00 - 07:00	35.374	20.952	2.1076	2.3685	10.9106	10.7403	-0.049	0.825	0.660	1.21

Flux is estimated using the following equations:

$$Flux = \frac{-(0.42^2)(c_{80} - c_{30})(WS_{80} - WS_{30})}{\theta_m \theta_c \ln(80/30)^2}$$

$$Ri = \frac{(9.8)(0.8-0.3)(T_{80} - T_{30})}{\left(\left[T_{80} + T_{30}\right]/2 + 273.16\right)(WS_{80} - WS_{30})^2}$$

where

if Ri > 0, $\theta_m = (1+16Ri)^{0.333}$ and $\theta_c = 0.885(1+34Ri)^{0.4}$

if Ri < 0, $\theta_m = (1-16Ri)^{-0.333}$ and $\theta_c = 0.885(1-22Ri)^{-0.4}$

Table D-13. Aerodynamic Flux Estimates for Chloropicrin

Period	Day/Hour	Conc @ 33 cm	Conc @ 90 cm	WS @ 33 cm	WS @ 90 cm	Temp @ 33 cm	Temp @ 90 cm	Ri	Θ_m	Θ_c	Flux (µg/m^2-s)
1	5/16, 11:00 - 13:00	4.251	3.671	4.0254	4.7736	9.4279	8.6985	-0.026	0.892	0.739	0.115
2	5/16, 13:00 - 16:00	0.375	0.283	4.1192	4.8198	10.4828	9.7546	-0.029	0.881	0.725	0.018
3	5/16, 16:00 - 19:00	NA	NA	3.8369	4.5348	12.8563	12.1345	NA	NA	NA	NA
4	5/16, 19:00 - 07:00	0.296	0.189	1.5765	1.9459	6.8175	6.7266	-0.013	0.938	0.799	0.009
5	5/17, 07:00 - 19:00	0.490	0.347	3.3051	3.8413	14.8896	14.0695	-0.055	0.811	0.643	0.026
6	5/17, 19:00 - 07:00	0.660	0.518	0.5882	0.7123	5.6114	5.5537	-0.075	0.770	0.599	0.007
7	5/18, 07:00 - 19:00	0.122	0.046	2.6997	3.0025	17.4974	16.6918	-0.169	0.649	0.476	0.013
8	5/18, 19:00 - 07:00	0.072	0.035	1.4494	1.7370	13.6844	13.6639	-0.005	0.976	0.850	0.002

Flux is estimated using the following equations:

$$Flux = \frac{-(0.42^2)(c_{80} - c_{30})(WS_{80} - WS_{30})}{\theta_m \theta_c \ln(80/30)^2}$$

$$Ri = \frac{(9.8)(0.8 - 0.3)(T_{80} - T_{30})}{\left(\left[T_{80} + T_{30}\right]/2 + 273.16\right)(WS_{80} - WS_{30})^2}$$

where

if Ri > 0, $\theta_m = (1 + 16Ri)^{0.333}$ and $\theta_c = 0.885(1 + 34Ri)^{0.4}$

if Ri < 0, $\theta_m = (1 - 16Ri)^{-0.333}$ and $\theta_c = 0.885(1 - 22Ri)^{-0.4}$

Appendix B: Risk Estimates Calculated Based On Iodomethane Monitoring Data

Appendix B/Table 1: Summary of Iodomethane MOEs Based On Nasal Lesions

Dover FL

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	2271.7	3525.5	8319.7	1839.7	1150.8	430.4	542.0	1332.9
1	1753.3	16639.5	53314.3	373200.0	373200.0	47498.2	13970.1	1475.9
2	5214.4	5606.0	5014.2	3209.3	3392.7	40818.8	54425.0	7041.5
3	2715.6	3147.5	939.7	1602.7	1126.0	946.5	6874.7	2464.5
4	190.7	275.6	354.5	233.3	766.1	663.0	107.1	354.5

Bainbridge GA

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	3080.7	12743.4	14513.3	90082.8	32655.0	1181.5	627.5	1016.1
1	1611.6	3633.4	5419.9	10285.0	8267.1	1222.5	961.9	1004.4
2	325.5	1245.8	1649.2	1537.6	801.8	634.5	1011.0	837.6
3	1743.9	2213.9	4019.1	2379.2	3841.8	962.9	1974.6	2377.1

Hart MI

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	14433.1	6911.1	2311.9	910.2	1187.5	10750.6	20570.1	5309.8
1	1459.4	1443.3	1176.8	1306.2	1435.4	1070.7	900.8	1427.5
2	735.9	2652.2	3501.9	32371.7	64344.8	29026.7	5004.6	717.7
3	2141.3	1685.4	1979.1	3233.2	4640.1	258653.5	544250.0	4775.9
4	6264.7	4995.0	5534.7	6597.0	7216.6	10930.5	6132.4	4465.6

Max	544250.0
Min	107.1
Mean	20966.6

Appendix B/Table 2: Summary of Iodomethane MOEs Based On Developmental Effects

Dover FL

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	3735.6	5797.4	13681.2	3025.3	1892.5	707.7	891.3	2191.8
1	2883.2	27362.4	87671.4	613700.0	613700.0	78107.3	22972.7	2427.1
2	8574.7	9218.7	8245.5	5277.5	5579.1	67123.4	89497.9	11579.2
3	4465.6	5175.8	1545.3	2635.5	1851.7	1556.5	11305.0	4052.7
4	313.6	453.2	582.9	383.6	1259.8	1090.3	176.1	582.9

Bainbridge GA

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	5065.9	20955.6	23866.1	148134.5	53698.8	1943.0	1031.9	1670.9
1	2650.2	5974.8	8912.7	16913.0	13594.6	2010.2	1581.7	1651.6
2	535.2	2048.6	2712.1	2528.5	1318.6	1043.5	1662.5	1377.3
3	2867.8	3640.6	6609.1	3912.5	6317.5	1583.5	3247.1	3908.9

Hart MI

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	23734.3	11364.8	3801.7	1496.8	1952.7	17678.6	33826.0	8731.5
1	2399.9	2373.4	1935.1	2148.0	2360.4	1760.6	1481.3	2347.5
2	1210.1	4361.3	5758.6	53233.0	105810.3	47732.2	8229.7	1180.2
3	3521.2	2771.5	3254.5	5316.7	7630.4	425336.6	894979.2	7853.6
4	10301.9	8214.0	9101.5	10848.2	11867.1	17974.5	10084.3	7343.4

Max	894979.2
Min	176.1
Mean	34478.1

Appendix B/Table 3: Summary of Iodomethane MOEs Based On Neurotoxicity

Dover FL

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	4332.3	3925.2	15690.0	1564.8	1071.1	969.2	813.8	1928.7
1	2977.1	19881.2	63445.9	802946.1	819957.6	194157.2	16170.8	2285.6
2	6289.6	8474.9	10730.7	4300.2	4797.8	37943.1	80517.3	8703.6
3	5277.5	6078.8	1209.4	2470.3	2470.3	1253.8	10293.1	3794.3
4	229.5	328.0	446.6	284.6	1275.9	860.0	120.9	537.5

Bainbridge GA

Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	2831.9	10555.1	11518.5	174333.3	56914.7	1723.7	914.2	1594.9
1	2502.3	4398.0	6072.5	11633.9	9303.4	2294.6	2029.8	1663.4
2	426.9	1967.9	3355.7	2859.8	1262.0	1073.1	1458.6	1682.7
3	3674.2	4644.2	7088.3	3189.7	8352.9	1343.8	3104.4	4681.7
4	6649.8	19949.5	28457.4	43648.9	46442.4	23695.1	10730.7	5935.9

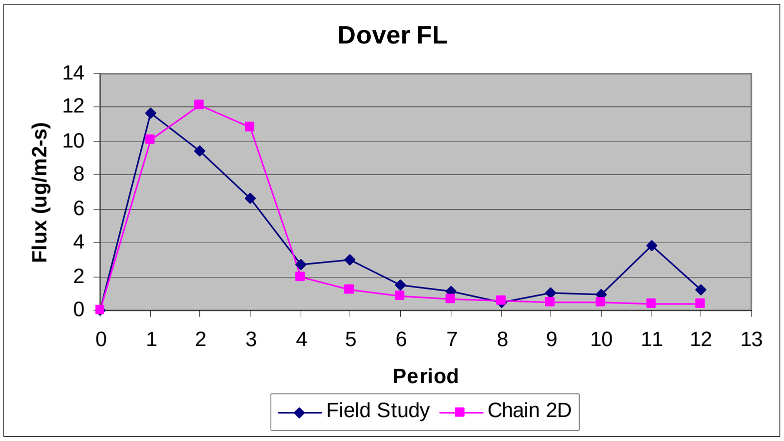
Hart MI

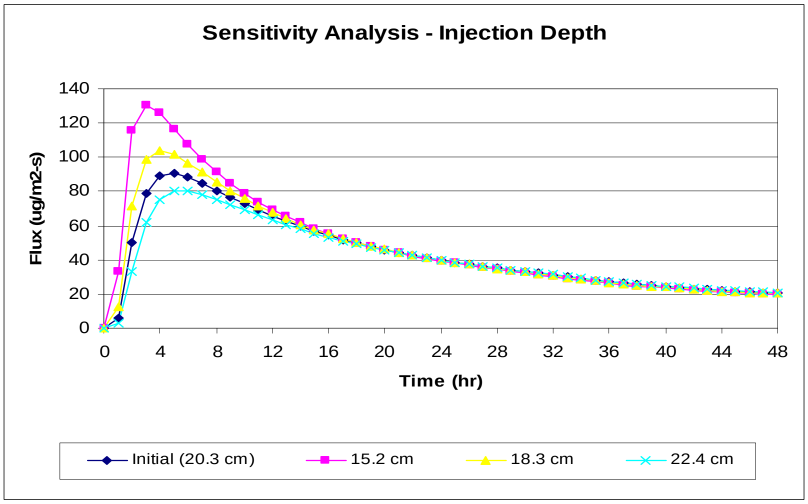
Study Day	Mast 1	Mast 2	Mast 3	Mast 4	Mast 5	Mast 6	Mast 7	Mast 8
0	17917.6	11871.8	4797.8	1573.3	1948.1	20157.3	18726.8	3572.5
1	1673.0	1967.9	1802.9	2369.5	2126.5	1192.1	1002.6	1590.5
2	1002.6	4268.6	6235.6	62827.9	87959.1	35183.6	6117.3	936.3
3	2603.3	3697.6	3039.4	3605.8	5183.3	379431.4	1184755.1	5375.3
4	7079.6	10994.9	9806.3	7481.1	8074.1	17973.1	7481.1	5004.6

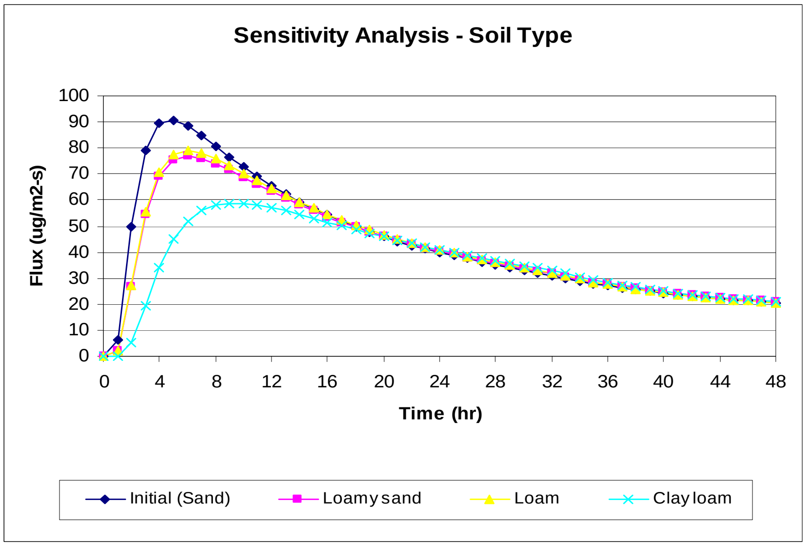
Max	1184755.1
Min	120.9
Mean	38726.4

Appendix C: CHAIN 2D Outputs Based On Iodomethane Monitoring Data

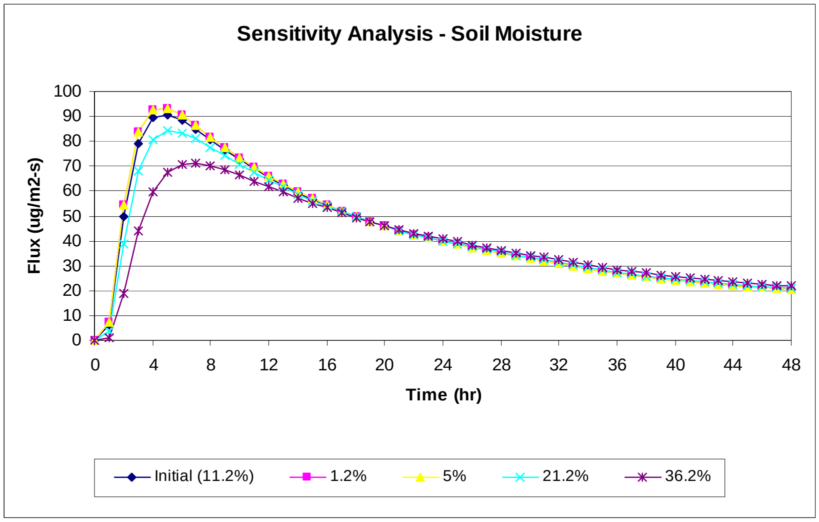
Outputs From Analysis of Dover Florida Emissions Data (Canslit Metalized Film)

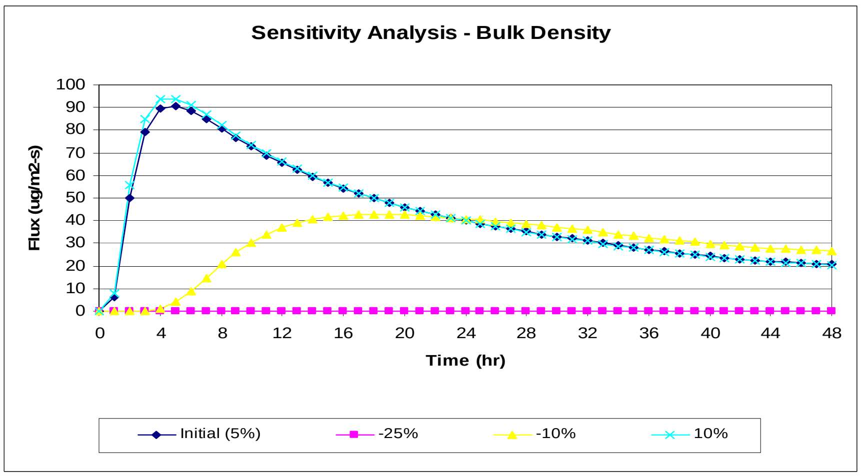


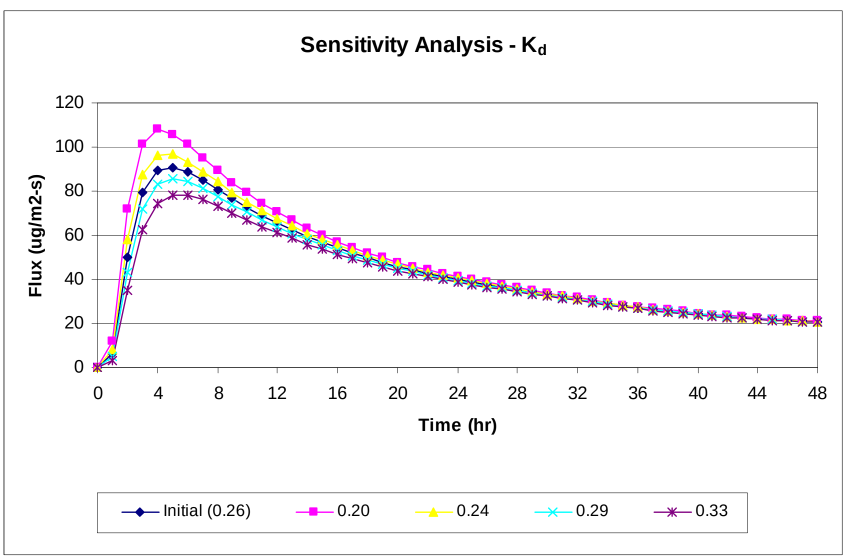




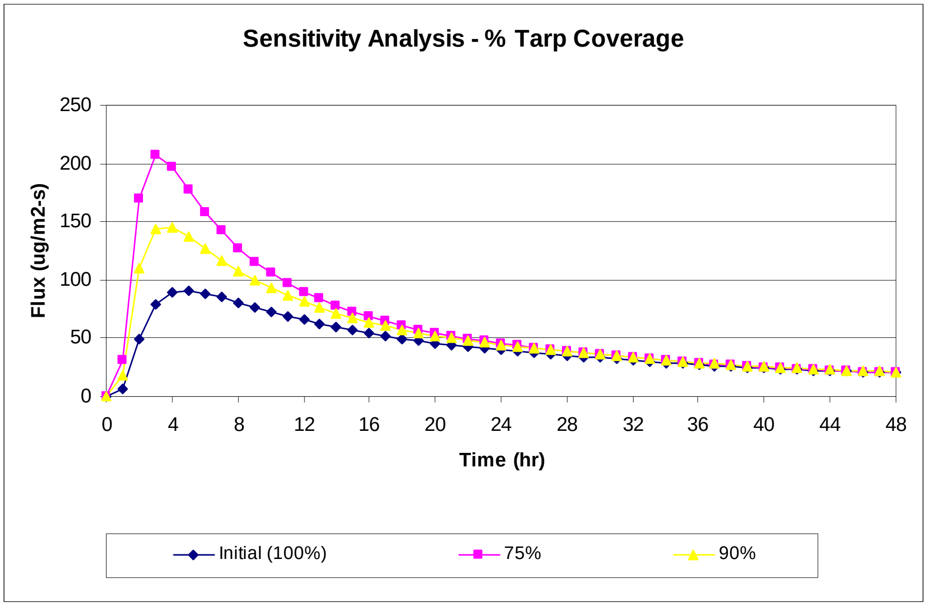
Outputs From Analysis of Dover Florida Emissions Data (Canslit Metalized Film)

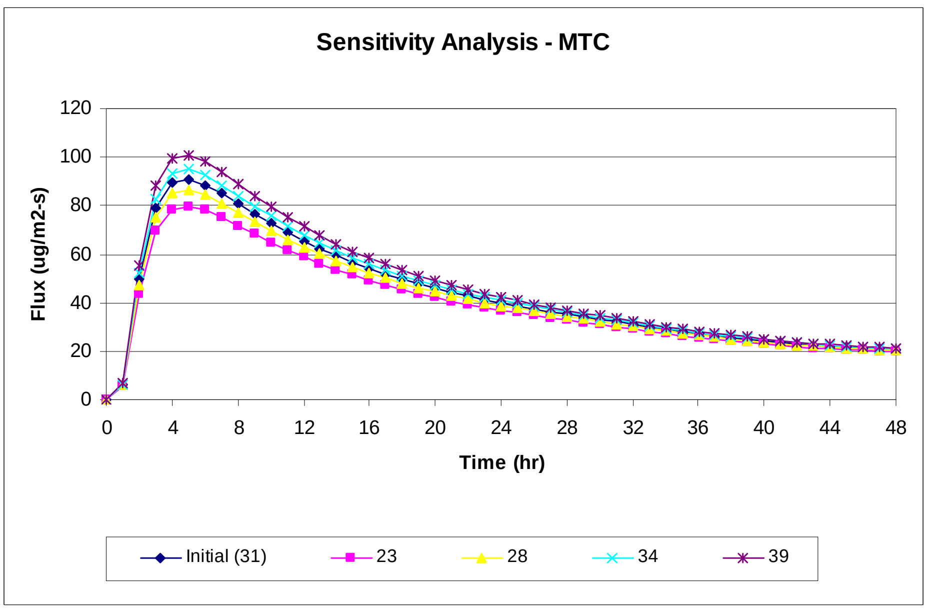




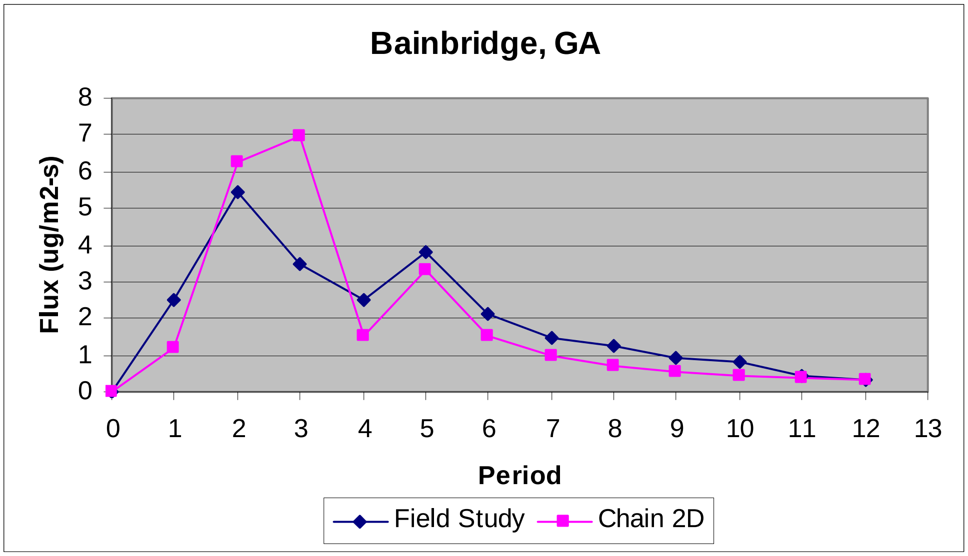


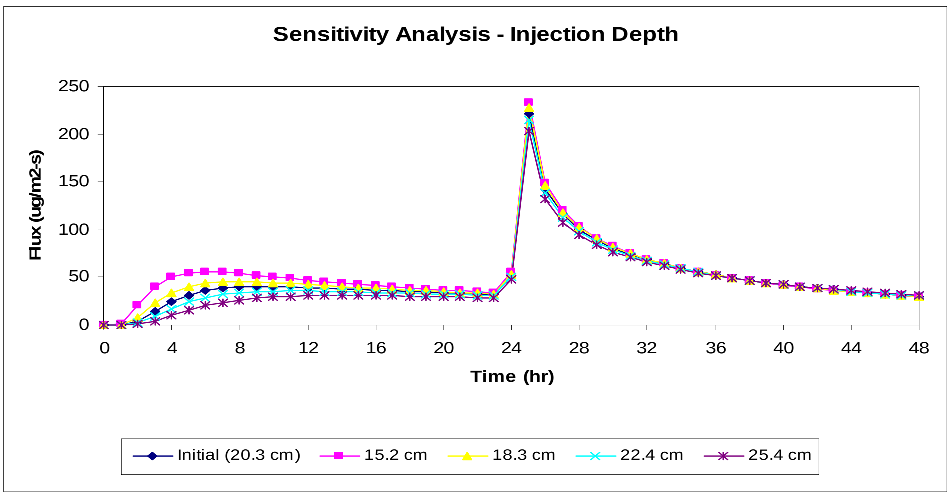
Outputs From Analysis of Dover Florida Emissions Data (Canslit Metalized Film)

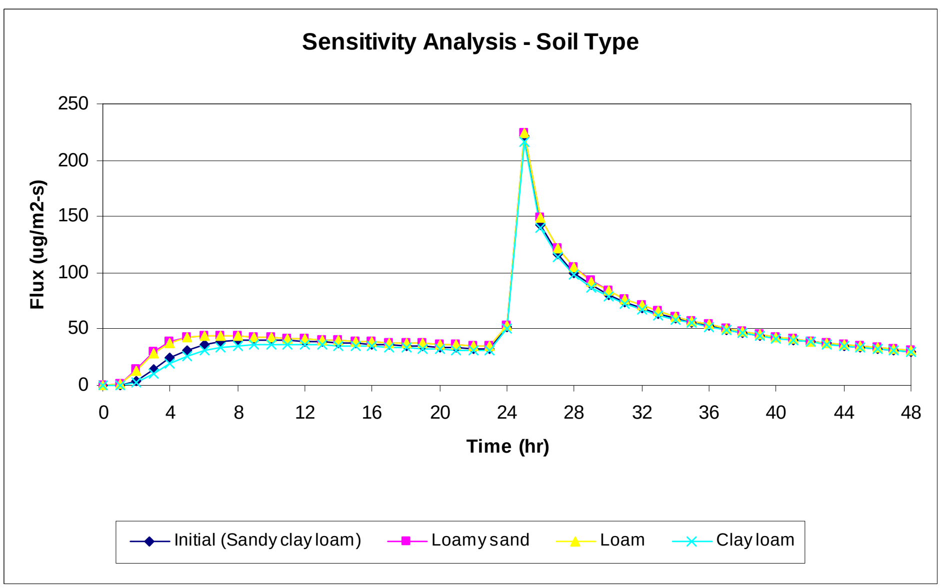




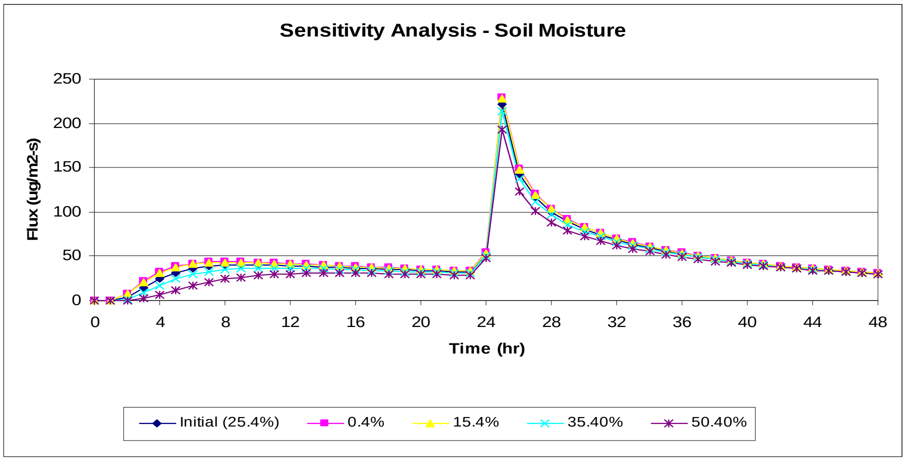
Outputs From Analysis of Bainbridge Georgia Emissions Data (Hytiblock VIF Film)

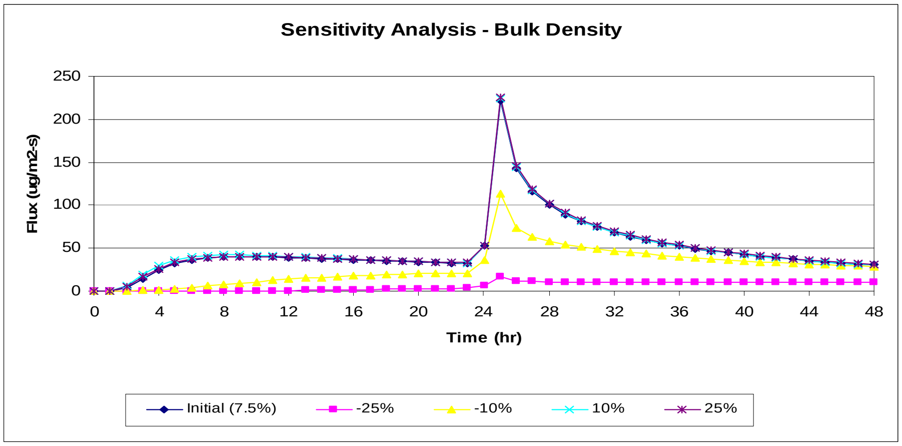


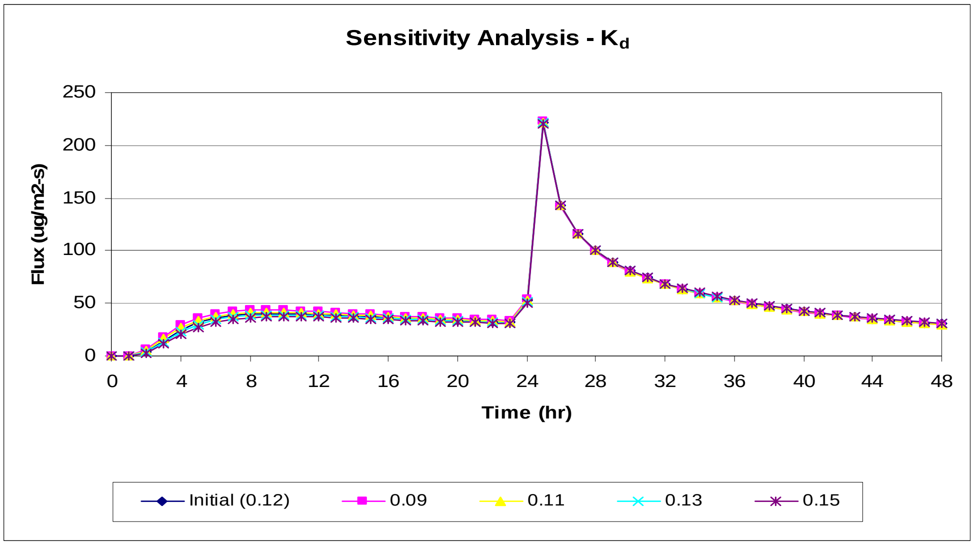




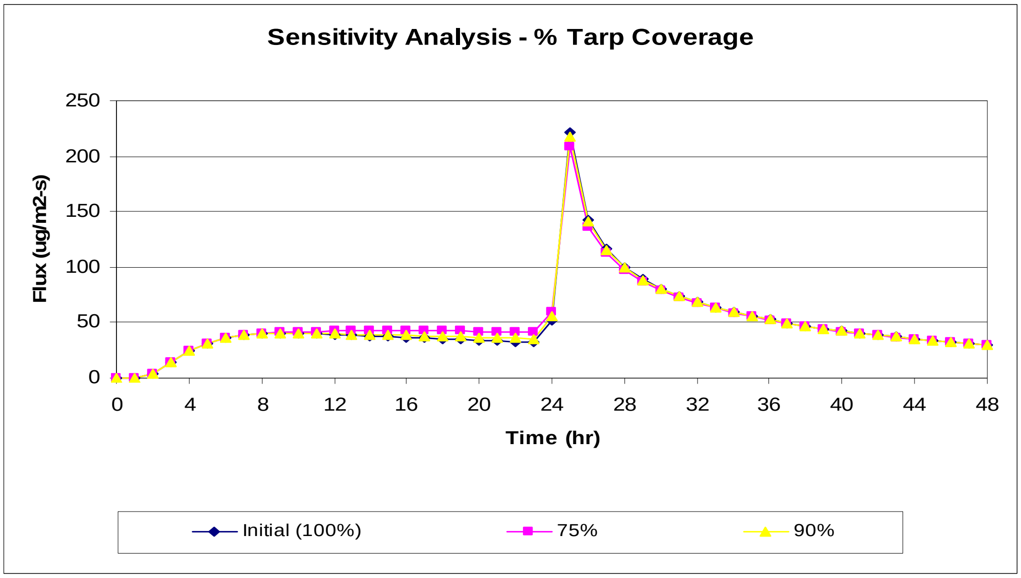
Outputs From Analysis of Bainbridge Georgia Emissions Data (Hytiblock VIF Film)

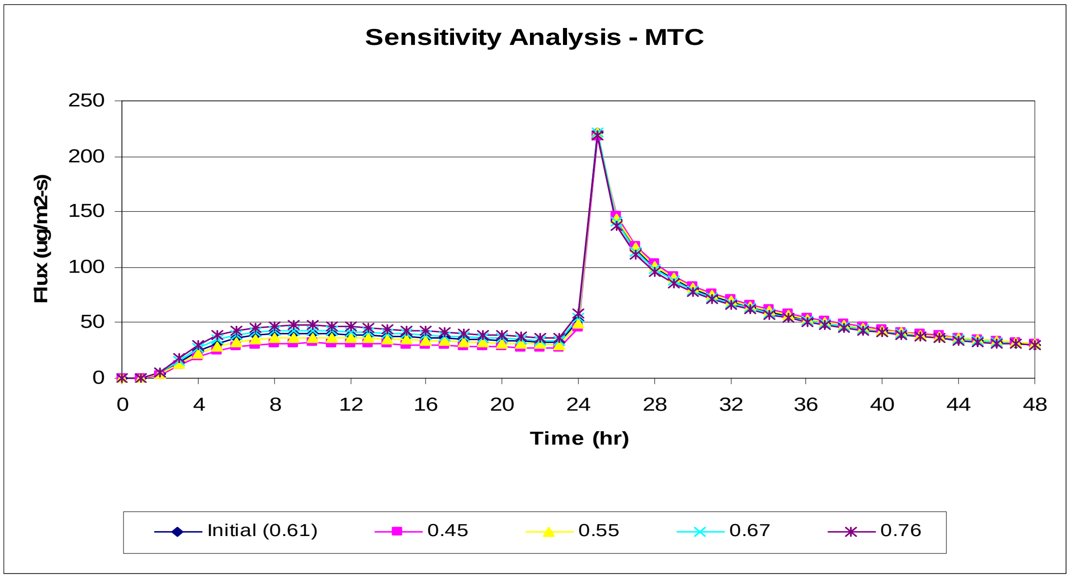




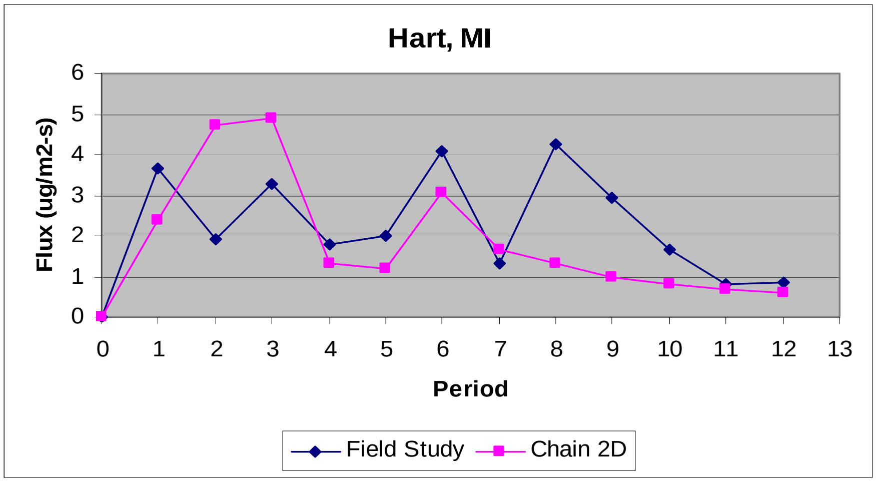


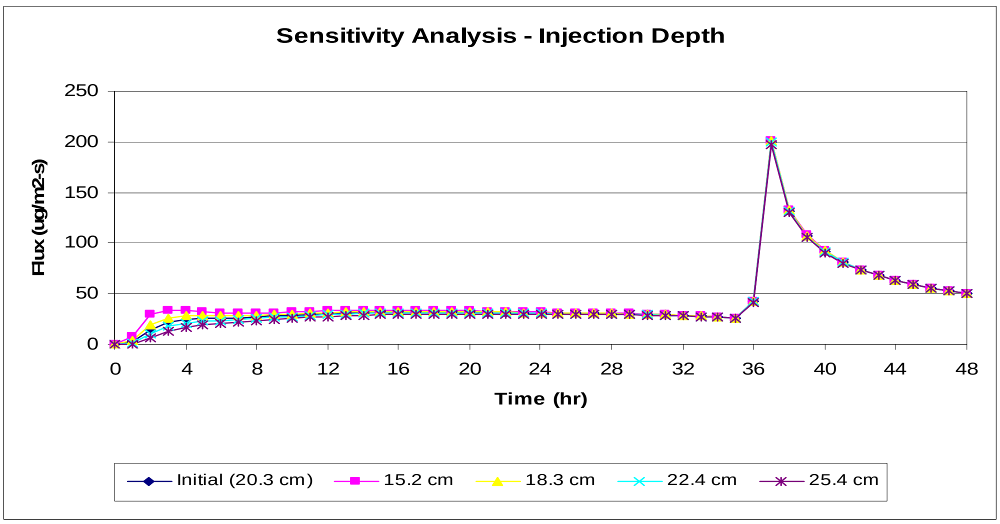
Outputs From Analysis of Bainbridge Georgia Emissions Data (Hytiblock VIF Film)

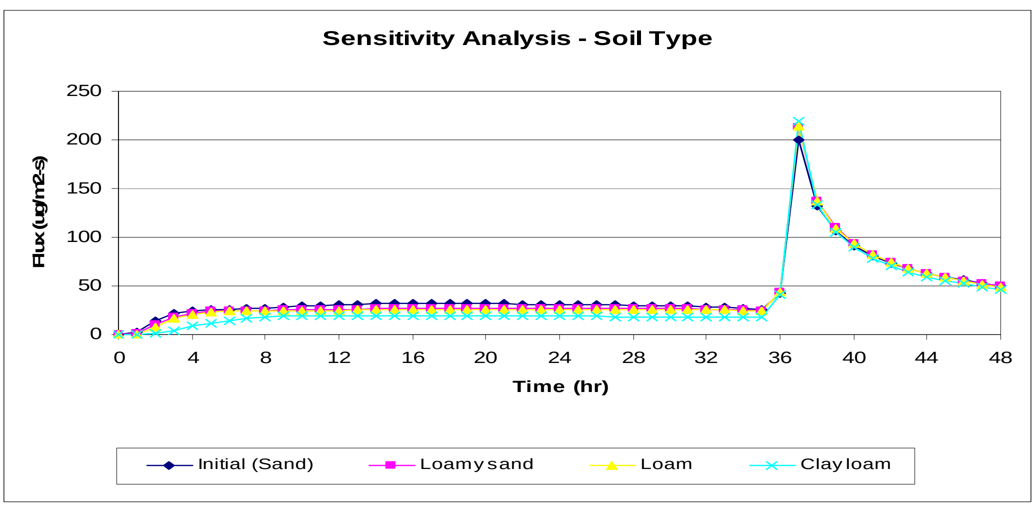




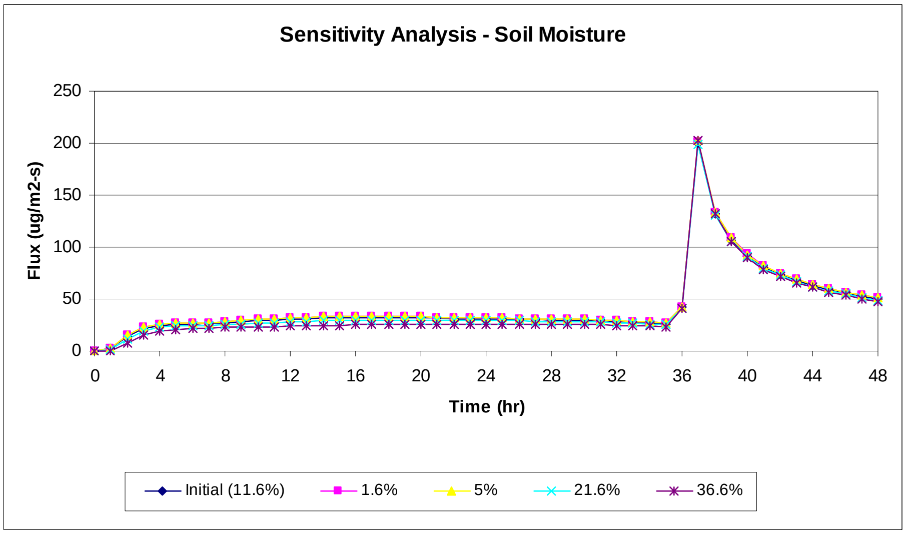
Outputs From Analysis of Hart Michigan Emissions Data (Blockade VIF Film)

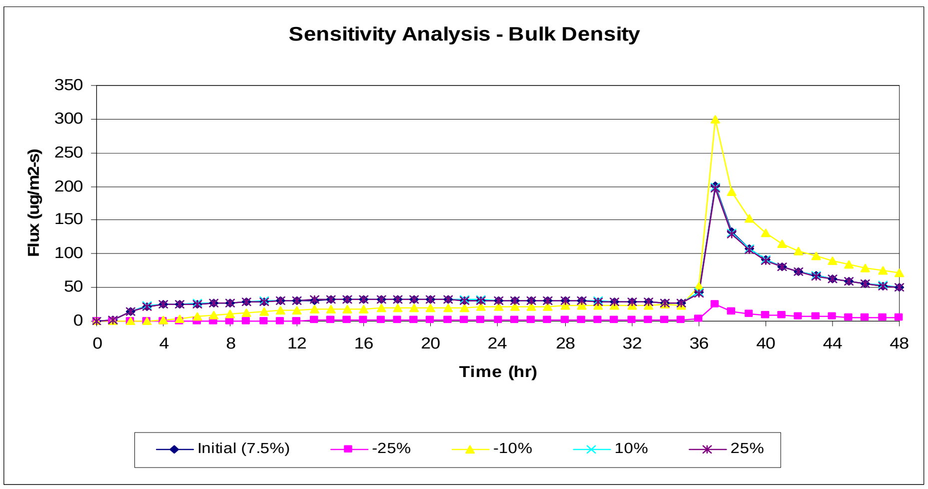


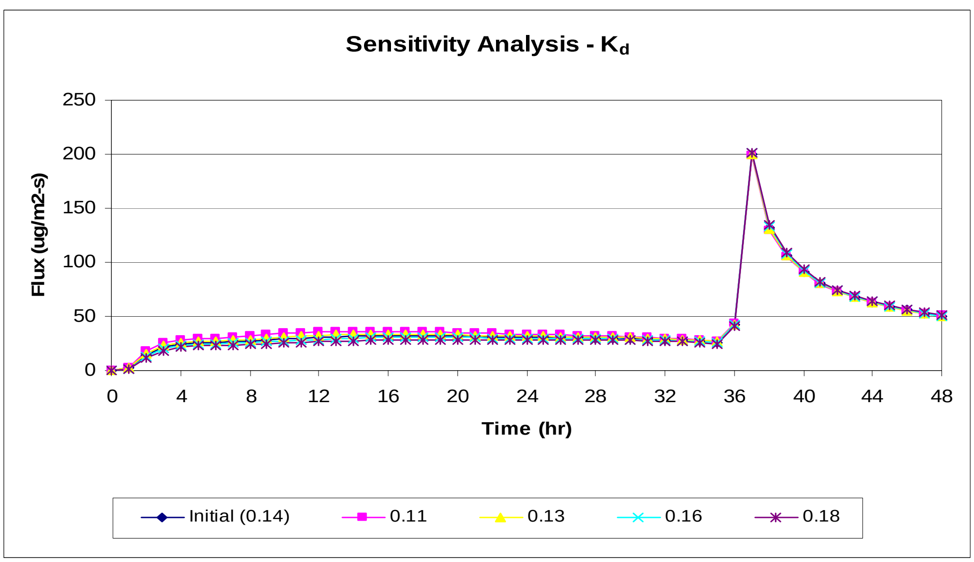




Outputs From Analysis of Hart Michigan Emissions Data (Blockade VIF Film)







Outputs From Analysis of Hart Michigan Emissions Data (Blockade VIF Film)