Waybill #16584588053
June 14, 2006

Ms. Almerinda Silva
United States Environmental Protection Agency
Region I
1 Congress Street
Suite 1100 (HBT)
Boston, MA 02114-2023

RE: **Risk Assessment for Gas Vent VOC Data – Revision 1.1**
Old Southington Landfill Superfund Project
Kleinfelder Project Number 0060201EA, Task 3.0

Dear Ms. Silva:

During a fall 2005 meeting, the Environmental Protection Agency (EPA) and the Connecticut Department of Environmental Protection (CT DEP) noted that emissions from the gas vent system for the cap on the Old Southington Landfill needed to be evaluated to further confirm that these emissions do not produce an unacceptable health risk. The Performing Settling Defendants (PSDs) conducted an assessment of the gas vent data, presented in the Gas Vent Sampling Data Report – Round 3 – September 2002, dated December 27, 2002 (Data Report), as required by the EPA and CT DEP pursuant to the Operations and Maintenance Plan.

A Risk Assessment for Gas Vent Volatile Organic Compound (VOC) Data was submitted to EPA and CT DEP on December 1, 2005. The Risk Assessment results showed no unacceptable residential risk at the ten residences located closest to the Landfill. After review of the December Risk Assessment, EPA requested that another modeling exercise be conducted using a Cartesian grid and that an assessment also be completed for an on-site worker on the Landfill. This Risk Assessment for Gas Vent VOC Data – Revision 1.1 presents the results of the risks to residential and on-site worker, using a Cartesian grid.

Presented in this letter are: 1) a summary of the previous data assessment; 2) the application of the EPA-accepted ISCST3 air dispersion model to predict the downwind concentrations Cartesian grid locations; and 3) an assessment of the estimated potential risks resulting from the modeled concentrations. As summarized in this letter, the maximum theoretical risks calculated utilizing this model and EPA-accepted risk calculation methods are generally orders of magnitude below the EPA acceptable risk range of 10^{-4} to 10^{-6}. The maximum risk associated with Trichloroethylene (TCE) (3.14×10^{-6}) occurs for the residential scenario at a grid point on the Landfill (563818, 272083; Figure 1), several hundred feet from the closest residential receptor.

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Previous Regulatory Assessment

As an initial matter, summary of previous assessment of the data from the gas vent sampling program, conducted by the PSDs pursuant to the Work Plan (Operations and Maintenance Plan, Appendices B and E) is appropriate. The Work Plan, Section 2 sets forth the regulatory analysis required to assess the need for active gas collection. The various criteria are outlined below, with the assessment based on the data collected during all sampling rounds. The regulatory assessment used the highest concentration for any round, for each compound detected in any round. Likewise the highest flow rate for each gas vent, from any round, was used. Therefore, using the highest concentration and the highest flow rate, results in a cumulative and very conservative assessment. Further, by using the highest concentration for each compound, regardless of which sampling round it was measured, the result of the total mass calculations are very conservative, since the highest concentration of the compound did not necessarily occur in the same round as the highest concentrations of other compounds. This is the same data set used for the modeling discussed in the next section and shown on Table 1.

Clean Air Act

Title I
The Old Southington Landfill site is located in the Ozone Transport Region where the threshold for volatile organic compounds (VOCs) is 50 tons per year (TPY). Total VOC sample results (0.25 TPY) are over two orders of magnitude below 50 TPY at the site.

Title III
Municipal landfills are potentially subject to Title III of the Clean Air Act, however, the regulation applies only to sources which have the potential to emit 10 TPY of any individual Hazardous Air Pollutant (HAP) or 25 TPY of total HAPs. Air sampling results are well below the 10 TPY for individual pollutants. TCE, the VOC at highest concentration (0.17 TPY), is over an order of magnitude below the 10 TPY. Other individual VOC concentrations are 3 or more orders of magnitude below the 10 TPY. Likewise, total VOC sample results (0.25 TPY) are two orders of magnitude below the 25 TPY.

Title V
A federal operating permit is required for stationary sources of air pollutants if the potential to emit a particular air pollutant is above specific major source thresholds for the source area. The air sampling results at Old Southington Landfill for total VOC (0.25 TPY) are over two orders of magnitude below the applicable major source threshold of 50 TPY for total VOCs.

State Regulations

§ 22a-174-3
Regulations of Connecticut State Agencies (RCSA) § 22a-174-3 was repealed in March 2002 and replaced by RCSA § 22a-174-3a: Permit to Construct and Operate Stationary Sources. Section 22a-174-3a(a)(1) sets forth the applicability of the section to air emission sources. Only (A) New major stationary source or (D) New emission unit with potential emissions of fifteen (15) tons or more of any individual air pollutant, might apply to this Site.

A "major stationary source" is defined, at RCSA § 22a-174-1(57), as it is defined in 40 CFR 51.165(a)(1)(iv), provided that it includes a stationary source that has potential to emit 25 TPY of VOC in any severe ozone nonattainment area or a stationary source that has potential to emit 50 TPY of VOC in

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any serious ozone nonattainment area. 40 CFR 51.165(a)(1)(iv) defines a major stationary source as having the potential to emit 100 TPY of any pollutant subject to the Act.
Therefore, the lowest regulatory criteria for applicability of RCSA § 22a-174-3a is the 15 TPY of any individual pollutant [(RCSA § 22a-174-3a(a)(1)(D)]. As indicated on Table 6, air sampling results are well below the 15 TPY for individual pollutants. TCE, the VOC at highest concentration (0.17 TPY), is almost two orders of magnitude below the 15 TPY. Other individual VOC concentrations are 3 or more orders of magnitude below the 15 TPY. Based on the low concentrations of air pollutants being emitted from the gas vents, RCSA § 22a-174-3a does not apply.

§ 22a-174-23

Odor in ambient air is considered a nuisance if any substance exceeds an off-site concentration in excess of the odor thresholds listed in Table 23-1 of RCSA § 22a-174-23. Air dispersion modeling is generally performed on hydrogen sulfide and methyl mercaptan which have the lowest odor threshold limits and the lowest regulated limits, and therefore, the highest potential for off-site odor impacts due to gas vent emissions. No hydrogen sulfide or methyl mercaptan was measured in any of the samples for any round in any of the samples.

§ 22a-174-24

Due to the low annual mass of VOC being emitted from the Landfill gas vents, as indicated in the above analyses, RCSA § 22a-174-24 is not applicable to the landfill. In particular, RCSA § 22a-174-24(b) provides the following:

> "no person shall operate a source, which has a significant impact on air quality as defined in subsection 22a-174-3(c), in such a manner as to cause or contribute to a violation of an ambient air quality standard listed in section 22a-174-24."

Based upon this language, in order to be subject to the modeling requirements of R.C.S.A. § 22a-174-3(c), the Landfill must have a significant impact as defined in R.C.S.A. § 22a-174-3(c) (which subsequently has been revised and is now located in R.C.S.A. § 22a-174-3a(i)). R.C.S.A. §§ 22a-174-3(c) and 22a-174-3a(i) are not applicable to a source unless the source is obligated to obtain an air quality permit. The VOC threshold for Connecticut's air quality permit program now is 15 TPY (TPY).

The annual VOC emissions from the Landfill, from all the gas vents combined, using this cumulative and very conservative assessment, are less than 1 TPY. Hence, the Landfill is not obligated to obtain a permit under Connecticut's air quality permit program. As a result, RCSA § 22a-174-24 does not apply to the Landfill.

§ 22a-174-29

This section is designed to control the emissions of HAPs from stationary sources. Maximum allowable stack concentrations (MASC) are determined using a dispersion equation based on exhaust gas flow rate, height above grade of the vent, the specific Hazard Limiting Value (HLV) for the HAP, and the distance from the vent to the nearest property line. MASC was calculated for each gas vent based on the flow and concentrations of each VOC. The actual concentrations measured are far below the MASC for every compound at every gas vent.

The Data Report concluded that the data showed there are no health risks to on-site workers or visitors. Based on the requirements set forth in the Work Plan, the regulatory requirements are all met by a significant margin and, therefore, there are no regulatory permits required for the Landfill gas vents. Likewise, the emissions of gases from the Landfill gas vents are of such de minimis concentrations as to

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be adequately managed using the current passive collection system. No data were generated during the three rounds of gas vent sampling that indicate a need to replace the passive system with an active system. Therefore, further consideration of an active system is not necessary.

Application of EPA-Accepted ISCST3 Model

EPA's ISC3 dispersion model was used to determine the maximum total VOC concentration of the VOC emissions from the landfill. This analysis considered 13 vents (GV-00 through GV-12) each with a 4 inch inside diameter. Available data for emissions from the vents include the maximum measured concentrations for 24 analytes with varying emission rates, volumetric flow rates ranging from 3.58 ft^3/min to 16.1 ft^3/min, and residential receptors at various locations surrounding the landfill. Six of the 24 analytes are classified as carcinogens by EPA and make up 75.2% of the total emission rate. Of the carcinogens, TCE is the main risk driver based on two key factors: total emissions (69%) and cancer potency.

ISC3 is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex. The modeling for the landfill was performed with the short-term ISCST3 model for two different averaging periods: 1-hour and annual. The latest version of the ISCST3 model (02035) was downloaded from EPA's SCRAM website for use in the modeling.

The ISCST3 modeling was performed with 5 consecutive years of National Weather Service (NWS) meteorological data per EPA modeling guidelines. NWS data for the years 1987-1991 for Hartford, CT were used as surface data and the same years for Albany, New York were used as upper air data. The models were run using the regulatory default option and a rural environment.

Each vent from the landfill was input into the model as an X-Y coordinate in space, using actual Universal Transverse Mercator (UTM) coordinate. The associated actual elevation was also input for each of these vents. Each vent is modeled by inputting its emission rate, vent height above grade, vent diameter, vent exhaust flowrate, and exhaust temperature into the model. Input parameters are shown on Table 2.

The concentration data used by the PSDs to model Landfill gases are shown on Table 1. To develop a conservative risk assessment, these data are the highest concentration measured in any of the three sampling events for each compound and for each vent. In addition, the flow rates shown on Table 1 for each gas vent are the highest flows measured, either before or after sampling, for any sampling event.

The concentrations to be output by the ISCST3 model are defined as the highest concentration predicted at any receptor for each averaging period for the modeled pollutants. The receptors chosen for the model output concentrations consisted of a Cartesian receptor grid spaced at 100 meter intervals. The area where these receptors are located is a 600-by-600 meter area surrounding the landfill, which includes residences in several areas near the landfill. Both a 1-hour maximum and an annual maximum concentration were predicted for each receptor. The grid boundaries are shown on Figure 1.

Table 3 shows the modeled maximum concentrations for the six carcinogens, for the 1-hour and annual averaging periods, for each of the five years, and the coordinates of the maximum location. The actual concentrations at each grid point for TCE and vinyl chloride are provided in Attachment C.

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Estimated Potential Risk Based on Modeled Concentrations

Residential Receptors

It is assumed residential receptors are present at the location for 24 hours/day, 350 days a year, for 30 years (child/adult). As a conservative residential screening evaluation, the maximum concentration was assumed for each carcinogenic VOC and the estimated potential risk is based on EPA's Region 9 PRGs for ambient air using the following equation:

Risk Estimate = (Total Maximum VOC Emission (0.8821 ug/m^3)/ Constituent-Specific 10^{-6} Risk-Based Concentration) x 10^{-6}

Table 4 provides the screening risk estimates for the maximum concentrations for each of the carcinogens, for the annual concentration, and the location at which that maximum concentration occurred. As can be seen on Table 4, the maximum theoretical risks calculated utilizing this model and conservative EPA-accepted risk calculation methods are generally orders of magnitude below the EPA acceptable risk range of 10^{-4} to 10^{-6}. The maximum risk associated with TCE (3.14 x 10^{-6}) occurs, for the residential scenario, at a grid point on the Landfill (563818, 272083; Figure 1), several hundred feet from the closest residential receptor

On-Site Worker

The only routine activity on the Landfill is mowing. Mowing is conducted twice a month from approximately mid-May to mid-September and takes about 2 hours. As shown on Table 5, inhalation exposure parameters were developed for an on-site worker mowing. Based on those parameters, receptor-specific exposure factors were developed, also shown on Table 5.

Table 6 shows the average daily doses and risk estimates calculated for an on-site worker using the maximum 1-hour concentrations generated from the model. These risks are also summarized on Table 4 with the corresponding location of each maximum concentration. All of the calculated risks to an on-site worker are orders of magnitude below the EPA acceptable risk range of 10^{-4} to 10^{-6}. The highest risk to an on-site worker is 1.40 x 10^{-8} for TCE at Grid Location 563818, 272083 (Figure 1).

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Summary

In conclusion, the PSDs' analysis of risk issues associated with Landfill gas vents at Old Southington Landfill employed the use of EPA's accepted ISCST3 model using very conservative data inputs. The resultant risk assessment using the modeled concentrations generally yielded predicted potential risks less than 10^{-8} range, two to four orders of magnitude below the EPA-accepted risk range of 10^{-4} to 10^{-6}. Only the maximum risk associated with TCE (3.14×10^{-6}), for the residential scenario at a grid point on the Landfill several hundred feet from the closest residential receptor, was greater than 10^{-8}.

I trust this letter report is responsive to your request. If you have questions or need further information, please contact me. Thank you.

Respectfully submitted,
Kleinfelder, Inc.

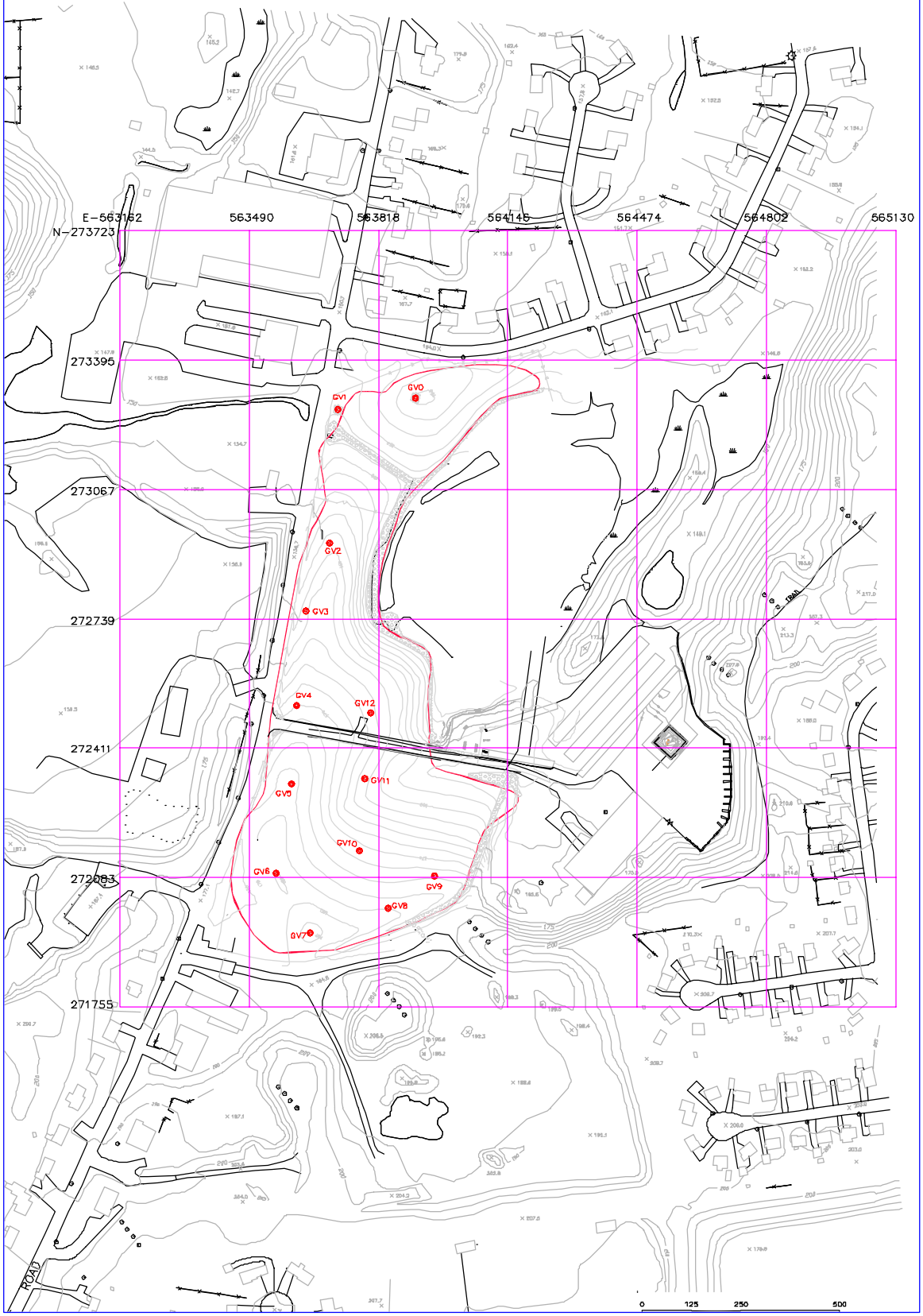
W. Gary Wilson, Esq.
Principal Professional

Attachments: Attachment A – Figure
Attachment B – Tables
Attachment C – TCE and VC Modeling Results

cc: Lew Horzempa, TtFWI, 133 Federal Street, 6th Floor, Boston, MA 02210
Mary Jane Dapkus, CT DEP, 79 Elm Street, Hartford, CT 06106-5127
Meg Harvey, CT DH, 410 Capital Avenue, M/S 11CHA, Hartford, CT 06134-0308
Martin Booher, LLG&M, Goodwin Square, 225 Asylum Street, Hartford, CT 06103
David Platt, Murtha Cullina LLP, City Place I, 185 Asylum Street, Hartford, CT 06103-3469
David Montany, P&W, 400 Main Street, M/S 132-12, East Hartford, CT 06108
Jeff Loureiro, LEA, 100 Northwest Drive, Plainville, CT 06062

GSC KLEINFELDER 30 Porter Road, Littleton, MA 01460 (800) 522-8740 toll free (978) 486-0060 phone (978) 486-0630 fax

ATTACHMENT A
Figure



LEGEND:

EXTENT OF STUDY SITE

GV10 GAS VENT LOCATION

CARTESIAN GRID

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FIGURE 1

GRID BOUNDARY, GAS VENT LOCATIONS AND MAXIMUM CONCENTRATION LOCATIONS
OLD SOUTHINGTON LANDFILL SUPERFUND PROJECT
SOUTHINGTON, CONNECICUT
SUPPLEMENTAL GROUNDWATER INVESTIGATION

GSC REF.: 060201.02GAS	CHECKED BY:
DRAFTED BY: ANG	DATE: 4/24/06
REVISED BY:	DATE:
SOURCE: MACTEC FILE# 719-75614	

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ATTACHMENT B
Tables

TABLE 1
SUMMARY DATABASE USED FOR MODELING ANALYSIS AND RISK ASSESSMENT
GAS VENT SAMPLING
Old Southington Landfill Superfund Site
Southington, CT

Location	GV-00	GV-01	GV-02	GV-03	GV-04	GV-05	GV-06	GV-07	GV-08	GV-09	GV-10	GV-11	GV-12
Flow, cu.ft./min.	5.4	0.088	4.01	3.58	8.65	9.6	16.1	4.71	9.6	12.9	9.5	8.61	15.2
Analytes	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day	lbs./day
benzene	0.0000102	0.0000000	0.0000061	0.0000000	0.0000000	0.0000672	0.0000333	0.0000000	0.0000000	0.0000000	0.0000427	0.0000055	0.0000000
chlorobenzene	0.0000000	0.0000000	0.0000097	0.0000000	0.0000000	0.0001121	0.0000824	0.0000151	0.0000077	0.0000974	0.0003583	0.0000270	0.0000000
chloroethane	0.0000184	0.0000000	0.0003486	0.0000084	0.0000115	0.0000948	0.0000983	0.0000257	0.0000000	0.0000000	0.0000000	0.0000052	0.0000000
chloroform	0.0000000	0.0000000	0.0000075	0.0000000	0.0000078	0.0000509	0.0000246	0.0000000	0.0000070	0.0000000	0.0000367	0.0000077	0.0000059
1,1-dichloroethane	0.0000291	0.0000000	0.0000208	0.0000013	0.0000944	0.0000000	0.0000217	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
1,1-dichloroethene	0.0000082	0.0000000	0.0000047	0.0001191	0.0000047	0.0000000	0.0000000	0.0000000	0.0000056	0.0000209	0.0000070	0.0000000	0.0000000
cis -1,2-dichloroethene	0.0002571	0.0000000	0.0003342	0.0070812	0.0005397	0.0000603	0.0005785	0.0040717	0.0001324	0.0056821	0.0001621	0.0002009	0.0009695
ethylbenzene	0.0000097	0.0000000	0.0000162	0.0000000	0.0000030	0.0002155	0.0003471	0.0000480	0.0000077	0.0000429	0.0000657	0.0000255	0.0000000
methylene chloride	0.0000015	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000095	0.0035139	0.0000031	0.0000053	0.0000000	0.0000000	0.0000000
tetrachloroethene	0.0000000	0.0000000	0.0000126	0.0000998	0.0000121	0.0000655	0.0000333	0.0016175	0.0000975	0.0001739	0.0000563	0.0000201	0.0000259
toluene	0.0000776	0.0000000	0.0000431	0.0000021	0.0000169	0.0000621	0.0000665	0.0000212	0.0000000	0.0000052	0.0000171	0.0000077	0.0000122
1,1,1-trichloroethane	0.0000049	0.0000000	0.0000097	0.0000000	0.0000944	0.0000215	0.0000362	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
trichloroethene	0.0001698	0.0000000	0.0005750	0.0128749	0.0002091	0.0002931	0.0008822	0.0780869	0.0015326	0.0080014	0.0010238	0.0003091	0.0001639
vinyl chloride	0.0001358	0.0000000	0.0001545	0.0001802	0.0000472	0.0000629	0.0005785	0.0008366	0.0000251	0.0003711	0.0000367	0.0000270	0.0000246
xylenes (total)	0.0000073	0.0000002	0.0000614	0.0000000	0.0000051	0.0002603	0.0013088	0.0002326	0.0000115	0.0001461	0.0001348	0.0000665	0.0000000
Freon 12	0.0000155	0.0000000	0.0000683	0.0000027	0.0000155	0.0077580	0.0004049	0.0001004	0.0001045	0.0002435	0.0000845	0.0000255	0.0000355
Freon 114	0.0000184	0.0000000	0.0000862	0.0000000	0.0000148	0.0005086	0.0008677	0.0002175	0.0001324	0.0001623	0.0004778	0.0002241	0.0000792
Freon 11	0.0000000	0.0000000	0.0000000	0.0000000	0.0000132	0.0004913	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000325	0.0000000
Trichlorotrifluoroethane (Freon 113)	0.0000000	0.0000000	0.0000057	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
4-ethyltoluene	0.0000000	0.0000000	0.0000108	0.0000000	0.0000000	0.0000448	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
1,2,4-trimethylbenzene	0.0000000	0.0000000	0.0000050	0.0000000	0.0000000	0.0001034	0.0001244	0.0000178	0.0000000	0.0000255	0.0000256	0.0000085	0.0000000
1,3,5-trimethylbenzene	0.0000000	0.0000000	0.0000115	0.0000000	0.0000000	0.0002241	0.0001200	0.0000145	0.0000067	0.0000186	0.0000427	0.0000124	0.0000000
1,3-dichlorobenzene	0.0000000	0.0000000	0.0000097	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
1,4-dichlorobenzene	0.0000000	0.0000000	0.0000158	0.0000000	0.0000000	0.0002414	0.0002603	0.0000301	0.0000125	0.0000103	0.0000938	0.0000448	0.0000150

TABLE 2
VENT STACK PARAMETERS AND ANALYTE MASS
GAS VENT SAMPLING
Old Southington Landfill Superfund Site
Southington, CT

Location	GV-00	GV-01	GV-02	GV-03	GV-04	GV-05	GV-06	GV-07	GV-08	GV-09	GV-10	GV-11	GV-12
UTM East (m)	563911.88	563716.22	563695.20	563633.76	563609.50	563597.59	563558.78	563646.09	563843.37	563961.41	563770.60	563785.16	563798.69
UTM North (m)	273298.59	273267.89	272930.48	272759.16	272519.96	272319.40	272094.74	271942.82	272005.85	272088.28	272151.31	272333.94	272500.57
Elevation (m)	83297.35	83287.99	83185.15	83132.94	83060.03	82998.90	82930.43	82884.13	82903.34	82928.46	82947.67	83003.33	83054.12
Vent Height (m)	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Vent Diameter (m)	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Velocity (m/s)	0.315	0.005	0.234	0.209	0.504	0.559	0.938	0.274	0.559	0.751	0.553	0.501	0.885
Temperature (K)	298	298	298	298	298	298	298	298	298	298	298	298	298
Analytes	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**	**gram/sec**
benzene	5.35E-08	0.00E+00	3.21E-08	0.00E+00	0.00E+00	3.53E-07	1.75E-07	0.00E+00	0.00E+00	0.00E+00	2.24E-07	2.88E-08	0.00E+00
chloroform	0.00E+00	0.00E+00	3.96E-08	0.00E+00	4.07E-08	2.67E-07	1.29E-07	0.00E+00	3.66E-08	0.00E+00	1.93E-07	4.06E-08	3.08E-08
methylene chloride	7.64E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.01E-08	1.84E-05	1.61E-08	2.80E-08	0.00E+00	0.00E+00	0.00E+00
tetrachloroethene	0.00E+00	0.00E+00	6.60E-08	5.24E-07	6.38E-08	3.44E-07	1.75E-07	8.49E-06	5.12E-07	9.13E-07	2.96E-07	1.05E-07	1.36E-07
trichloroethene	8.91E-07	0.00E+00	3.02E-06	6.76E-05	1.10E-06	1.54E-06	4.63E-06	4.10E-04	8.05E-06	4.20E-05	5.38E-06	1.62E-06	8.60E-07
vinyl chloride	7.13E-07	0.00E+00	8.11E-07	9.46E-07	2.48E-07	3.30E-07	3.04E-06	4.39E-06	1.32E-07	1.95E-06	1.93E-07	1.42E-07	1.29E-07

TABLE 3
MAXIMUM CONCENTRATIONS and GRID LOCATIONS
Old Southington Landfill Superfund Project
Southington, CT

ug/M^3

Benzene

Year	1-Hr Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing	Ann Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing
1987	0.00515	563818	272083	**0.00006**	563818	272411
1988	0.0058	563818	272083	**0.00006**	563818	272411
1989	0.0078	563818	272083	0.00005	563818	272411
1990	**0.00966**	563818	272083	**0.00006**	563818	272411
1991	0.0066	563818	272083	**0.00006**	563818	272411

Tetrachloroethene

Year	1-Hr Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing	Ann Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing
1987	**0.21804**	563818	272083	0.00109	563818	272083
1988	0.08277	563818	272083	0.00092	563818	272083
1989	0.12122	563818	272083	0.0011	563818	271755
1990	0.14233	563818	272083	0.00098	563818	272083
1991	0.14107	563818	272083	**0.00114**	563818	272083

Chloroform

Year	1-Hr Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing	Ann Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing
1987	0.00435	563818	272411	**0.00008**	563818	272411
1988	0.00527	563818	272411	0.00007	563818	272411
1989	0.0059	563818	272083	0.00007	563818	272411
1990	**0.0073**	563818	272083	**0.00008**	563818	272411
1991	0.00499	563818	272083	**0.00008**	563818	272411

Trichloroethene

Year	1-Hr Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing	Ann Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing
1987	**10.53**	563818	272083	0.05017	563818	272083
1988	4	563818	272083	0.04195	563818	272083
1989	5.85	563818	272083	0.0479	563818	272083
1990	6.87	563818	272083	0.04531	563818	272083
1991	6.81	563818	272083	**0.05339**	563818	272083

Methylene Chloride

Year	1-Hr Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing	Ann Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing
1987	**0.47255**	563818	272083	0.00216	563818	272083
1988	0.17938	563818	272083	0.0018	563818	272083
1989	0.26271	563818	272083	0.00205	563818	272083
1990	0.30846	563818	272083	0.00195	563818	272083
1991	0.30573	563818	272083	**0.00232**	563818	272083

Vinyl Chloride

Year	1-Hr Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing	Ann Conc (g/m^3)	Location of Receptor Easting	Location of Receptor Northing
1987	**0.11274**	563818	272083	0.00086	563818	272083
1988	0.05179	563818	272083	0.00079	563818	272083
1989	0.06268	563818	272083	**0.00091**	563818	271755
1990	0.0736	563818	272083	0.0008	563818	272083
1991	0.07294	563818	272083	**0.00091**	563818	272083

TABLE 4
SUMMARY OF CALCULATED AND SCREENING RISKS
ON-SITE WORKER and RESIDENTIAL RECEPTOR
Old Southington Landfill Superfund Project

	On-Site Worker Receptor				Residential Receptor				
Compond	Max. 1-Hr Conc g/M^3	Calculated Risk[1]	Location of Receptor Easting (m)	Location of Receptor Northing (m)	Region 9 PRG g/M^3	Max. Annual Conc g/M^3	Screening Risk[2]	Location of Receptor Easting (m)	Location of Receptor Northing (m)
Benzene	0.00966	**5.90E-11**	563818	272083	0.25	0.00006	**2.40E-10**	563818	272411
Chloroform	0.0073	**1.26E-10**	563818	272083	0.08	0.00008	**1.00E-09**	563818	271411
Methylene Chloride	0.47255	**1.74E-10**	563818	272083	4	0.00232	**5.80E-10**	563818	272083
Tetrachloroethene	0.21804	**9.39E-09**	563818	272083	0.32	0.00114	**3.56E-09**	563818	272083
Trichloroethene	10.53	**1.40E-08**	563818	272083	0.96	0.05339	**5.56E-08**	563818	272083
					0.017	0.05339	**3.14E-06**	563818	272083
Vinyl Chloride	0.11274	**7.77E-10**	563818	272083	0.11	0.00091	**8.27E-09**	563818	272083

Note 1: Risk calculated using exposure scenario described in the report for an intermittent on-site worker.
Note 2: Risk calculated using Region 9 PRGs for residential screnario for air inhalation.

TABLE 5
EXPOSURE ASSUMPTIONS and CALCULATION OF RECEPTOR-SPECIFIC EXPOSURE FACTORS
ON-SITE WORKER
Old Southington Landfill Suprefund Project

Exposure Pathway	Exposure Parameters (1)					
	Chemical-specific Variables					
	EPC (2)	EF (3)	ED (4)	EP (5)	AP (6) noncancer	AP (6) cancer
Inhalation of Ambient Air	Maximum One-Hour Concentration	8 events/ 1 year	2 hours/ event	30 years	30 years	70 years

Notes:

1. Code for Exposure Parameters: EPC = Exposure Point Concentration; EF = Exposure Frequency; ED = Exposure Duration; EP = Exposure Period; AP = Averaging Period.
2. Maximum one-hour averaged concentrations of each compound detected in ambient air at each gas vent were used to represent exposure point concentrations (EPCs) for ambient air exposure to on-site workers.
3. Frequency of exposure describes how often the exposure event occurs over a given period of time. It was assumed that workers would be exposed to ambient air during grounds maintenance (mowing, cap monitoring activities) twice a month during a 4-month period annually.
4. The duration of exposure describes how long each individual exposure event might last. For inhalation of ambient air, the exposure duration was assumed to be 2 hours per maintenance event.
5. The duration of the exposure period describes the length of time over which the receptor comes into contact with ambient air compounds. The on-site worker was assumed to have a 30-year tenure.
6. The averaging period is equal to the exposure period for non-cancer effects, and is equal to a lifetime (i.e., 70 years) when estimating cancer risks.

Receptor-Specific Exposure Factors

Inhalation of Vapors in Ambient Air (Chronic effects)

Average Daily Exposure (ug/m³) = EPC (ug/m³) * EF (events/years) * ED (hours/event) * EP (years) * 1/AP (1/years) * 1 day/24 hours*1year/365 days

Average Daily Exposure (ug/m³) = EPC (ug/m³) * Receptor-Specific Exposure Factor (unitless)

Receptor-Specific Exposure Factor (noncarcinogenic effects) =

Inhalation of Vapors in Ambient Air (Carcinogenic effects)

Average Daily Exposure (ug/m³) = EPC (ug/m³) * EF (events/year) * ED (hours/event) * EP (years) * 1/AP (1/years) * 1 day/24 hours * 1 year/365 days

Average Daily Exposure (ug/m³) = EPC (ug/m³) * Receptor-Specific Exposure Factor (unitless)

Receptor-Specific Exposure Factor (carcinogenic effects) =

Notes:

1. Code for Exposure Parameters: EPC = Exposure Point Concentration;
EF = Exposure Frequency; ED = Exposure Duration; EP = Exposure Period; AP = Averaging Period.

TABLE 6
CALCULATION OF AVERAGE DAILY DOSES and RISK ESTIMATES
INHALATION OF AMBIENT AIR BY ON-SITE WORKER
Old Southington Landfill Superfund Site

Constituents	Maximum 1-Hour Concentration (ug/m^3)	x	Receptor-Specific Exposure Factor (unitless)	=	Lifetime Average Daily Dose (ug/m^3)	x	Inhalation Unit Risk $(ug/m^3)^{-1}$	=	Excess Lifetime Cancer Risk Estimate
Benzene	9.66E-03		7.83E-04		7.56E-06		7.8E-06		5.90E-11
Chloroform	7.30E-03		7.83E-04		5.71E-06		2.2E-05		1.26E-10
Methylene Chloride	4.73E-01		7.83E-04		3.70E-04		4.7E-07		1.74E-10
Tetrachloroethylene	2.18E-01		7.83E-04		1.71E-04		5.5E-05		9.39E-09
Trichloroethylene	1.05E+01		7.83E-04		8.24E-03		1.7E-06		1.40E-08
Vinyl Chloride	1.13E-01		7.83E-04		8.83E-05		8.8E-06		7.77E-10
							TOTAL:		**2.5E-08**

ATTACHMENT C
TCE and VC Modeling Results

1-HOUR AVERAGING
TRICHLOROETHENE

1987

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	2.6659	0.3205	0.6012	0.2912	0.3963	0.5205	0.2448
563490	2.6848	0.5430	0.3668	0.2891	1.0599	0.6429	0.4966
563818	3.0301	**10.5297**	0.8028	0.4700	0.7386	0.7624	0.6449
564146	1.6551	4.7745	0.9685	0.3071	0.6860	0.6736	0.3877
564474	0.2216	1.5536	0.4398	0.3134	0.5040	0.4763	0.3348
564802	0.1584	0.1525	0.2650	0.6933	0.4886	0.5016	0.4928
565130	0.1222	0.1155	0.2055	0.1955	0.1004	0.3810	0.3098

1988

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	2.95973	0.32048	0.58145	0.19439	0.47095	0.49414	0.18306
563490	2.76436	0.47727	0.45099	0.30732	1.13592	0.57069	0.46178
563818	2.0458	**3.99698**	0.87486	0.45207	0.55954	0.5747	0.36347
564146	1.28577	0.98792	0.88743	0.30009	0.47702	0.50342	0.3987
564474	0.22158	1.56773	0.50545	0.36051	0.35634	0.34958	0.36257
564802	0.15806	0.16073	0.1392	0.64045	0.43208	0.37416	0.24913
565130	0.1218	0.12398	0.10009	0.10724	0.09169	0.3451	0.41647

1989

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	2.78049	0.3706	0.62647	0.19503	0.53135	0.44794	0.22838
563490	3.39359	0.75658	0.38121	0.37828	1.09608	0.64626	0.50106
563818	2.65071	**5.8539**	0.88575	0.60775	0.87568	0.60334	0.4389
564146	1.39466	0.24689	0.91856	0.32411	0.46142	0.37629	0.38329
564474	0.25068	1.2131	0.48585	0.29532	0.38649	0.43502	0.29514
564802	0.18835	0.15849	0.11947	0.12944	0.47934	0.32229	0.37135
565130	0.16748	0.12327	0.11947	0.10765	0.08893	0.38421	0.28227

1990

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	2.78717	0.90223	0.59841	0.21427	0.45986	0.28088	0.20355
563490	2.74841	0.50858	0.35726	0.42396	1.27311	0.63047	0.605
563818	2.67116	**6.87337**	1.61396	1.44241	0.66099	0.40212	0.32333
564146	1.57592	2.37689	1.27224	0.29249	0.85389	0.82366	0.95228
564474	0.18717	1.64073	0.69147	0.36407	0.38586	0.32772	0.58283
564802	0.13881	0.46506	0.15207	0.11902	0.71848	0.5094	0.24978
565130	0.12094	0.36427	0.35261	0.10763	0.10058	0.57618	0.41037

1991

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	1.99069	0.47436	0.32637	0.19439	0.42656	0.3497	0.22361
563490	3.99079	0.53555	0.56121	0.34865	1.5008	0.57805	0.43479
563818	3.03469	**6.81255**	1.06707	0.91682	1.23141	0.53722	0.44815
564146	1.57592	2.35936	0.69406	0.36795	0.59584	0.46327	0.32034
564474	0.84466	2.41559	0.60562	0.36401	0.42034	0.44297	0.33167
564802	0.63466	0.16134	0.15256	1.07668	0.67865	0.3516	0.37697
565130	0.56433	0.57516	0.11887	0.10771	0.10086	0.51532	0.23453

ANNUAL AVERAGING
TRICHLOROETHENE

1987

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00543	0.00212	0.00316	0.00157	0.00227	0.0017	0.00142
563490	0.03552	0.00573	0.00811	0.00413	0.00737	0.0046	0.00386
563818	0.04362	**0.05017**	0.0208	0.01059	0.01193	0.00721	0.00529
564146	0.01677	0.00481	0.01084	0.00613	0.00559	0.00439	0.00375
564474	0.00363	0.00384	0.00504	0.00389	0.00382	0.0032	0.00256
564802	0.00276	0.00261	0.00244	0.00247	0.00275	0.00231	0.002
565130	0.00199	0.00205	0.00188	0.00182	0.00168	0.00184	0.00152

1988

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00436	0.00183	0.00374	0.00199	0.00362	0.00335	0.00267
563490	0.02672	0.00449	0.00875	0.00609	0.01367	0.00758	0.00629
563818	0.04062	**0.04195**	0.01971	0.01089	0.01099	0.00754	0.00586
564146	0.01592	0.00401	0.00988	0.00528	0.00473	0.00357	0.00318
564474	0.00385	0.00454	0.00505	0.00393	0.00325	0.00236	0.00207
564802	0.003	0.00277	0.00259	0.0025	0.00248	0.00199	0.0014
565130	0.0023	0.00224	0.00201	0.00188	0.00164	0.00164	0.00132

1989

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00633	0.0021	0.00379	0.00207	0.00377	0.00308	0.00258
563490	0.03351	0.00583	0.01093	0.00629	0.01328	0.00681	0.0056
563818	0.0478	**0.0479**	0.01997	0.01039	0.01082	0.00695	0.00534
564146	0.01807	0.00377	0.00949	0.00521	0.00436	0.00348	0.00307
564474	0.00415	0.00406	0.00523	0.00358	0.00353	0.0025	0.00192
564802	0.00317	0.00267	0.00248	0.00224	0.00235	0.00211	0.00163
565130	0.00232	0.00219	0.00198	0.00187	0.00163	0.00153	0.00141

1990

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00646	0.00228	0.00322	0.002	0.00325	0.00289	0.00252
563490	0.02789	0.00513	0.01012	0.00635	0.01186	0.007	0.00581
563818	0.04029	**0.04531**	0.02075	0.01127	0.01144	0.00708	0.00542
564146	0.01693	0.00447	0.01043	0.00558	0.00529	0.0041	0.00361
564474	0.0038	0.00372	0.00467	0.00381	0.00342	0.00291	0.00257
564802	0.00293	0.00259	0.00226	0.00222	0.00267	0.00198	0.00172
565130	0.00214	0.00208	0.00188	0.00168	0.00155	0.00174	0.00133

1991

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00438	0.00208	0.00307	0.00162	0.00295	0.00247	0.00202
563490	0.02817	0.00515	0.00925	0.00506	0.0105	0.00573	0.00473
563818	0.04336	**0.05339**	0.02095	0.01089	0.01086	0.00613	0.00482
564146	0.01651	0.00427	0.01015	0.00591	0.00541	0.00399	0.0032
564474	0.00415	0.00393	0.00515	0.0037	0.00347	0.00296	0.00242
564802	0.00316	0.00259	0.00239	0.00255	0.00226	0.002	0.0019
565130	0.00249	0.00213	0.0018	0.00189	0.00162	0.00148	0.0013

1-HOUR AVERAGING
VINYL CHLORIDE

1987

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.03426	0.00521	0.00841	0.00562	0.00567	0.00882	0.00495
563490	0.02885	0.00765	0.00939	0.00449	0.03722	0.01045	0.00765
563818	0.04012	**0.11274**	0.01663	0.0083	0.03316	0.00922	0.00874
564146	0.0291	0.05112	0.01369	0.00609	0.00797	0.00815	0.00702
564474	0.00462	0.01717	0.00748	0.00427	0.00633	0.0055	0.00622
564802	0.00334	0.00331	0.00565	0.00861	0.00586	0.00588	0.00657
565130	0.00267	0.00245	0.00306	0.00432	0.0022	0.00481	0.00488

1988

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.03662	0.00437	0.00763	0.00378	0.00659	0.00899	0.00401
563490	0.02967	0.00719	0.012	0.00454	0.02647	0.01023	0.00731
563818	0.02821	**0.05179**	0.01946	0.00633	0.02059	0.00897	0.00612
564146	0.01726	0.01797	0.01021	0.0042	0.00668	0.00596	0.00495
564474	0.00462	0.01731	0.00797	0.00427	0.004	0.00489	0.00487
564802	0.00333	0.00344	0.003	0.00927	0.00566	0.00465	0.00355
565130	0.00261	0.00269	0.00211	0.00227	0.00179	0.00442	0.00583

1989

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.0333	0.00485	0.01047	0.00379	0.00834	0.00716	0.00448
563490	0.03651	0.01075	0.01058	0.00638	0.03113	0.01033	0.00786
563818	0.0374	**0.06268**	0.01412	0.0085	0.03472	0.00866	0.00639
564146	0.01846	0.01643	0.01166	0.0044	0.00684	0.00453	0.00513
564474	0.00317	0.01352	0.00946	0.0032	0.00478	0.00532	0.00629
564802	0.00325	0.00327	0.00243	0.00907	0.00558	0.0039	0.00614
565130	0.00347	0.00258	0.00308	0.00237	0.00179	0.00502	0.00396

1990

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.03281	0.00974	0.00858	0.00415	0.00678	0.00682	0.00364
563490	0.02949	0.00738	0.00949	0.00797	0.02818	0.01484	0.01104
563818	0.04031	**0.0736**	0.01885	0.02121	0.03419	0.01343	0.00763
564146	0.02851	0.02545	0.01362	0.01059	0.00996	0.01156	0.01703
564474	0.00245	0.01804	0.01109	0.00414	0.00628	0.00501	0.00719
564802	0.00253	0.00972	0.00332	0.00338	0.00836	0.00593	0.00413
565130	0.0025	0.00762	0.00774	0.0024	0.00228	0.00753	0.00553

1991

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.02559	0.00699	0.00577	0.00378	0.00986	0.00745	0.00376
563490	0.04289	0.01013	0.01428	0.00524	0.03171	0.00995	0.00729
563818	0.04176	**0.07294**	0.01493	0.01283	0.02147	0.0092	0.00608
564146	0.02017	0.02746	0.01797	0.00523	0.00802	0.0056	0.005
564474	0.00904	0.02658	0.0099	0.00435	0.00628	0.00546	0.00439
564802	0.01094	0.0096	0.00332	0.01271	0.00862	0.00444	0.00613
565130	0.01168	0.01275	0.00554	0.00235	0.00229	0.00656	0.00421

ANNUAL AVERAGING
VINYL CHLORIDE

1987

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00016	0.00006	0.00009	0.00004	0.00005	0.00004	0.00004
563490	0.00079	0.00015	0.0002	0.00015	0.00023	0.00012	0.0001
563818	0.00083	**0.00086**	0.00058	0.00037	0.00054	0.00017	0.00014
564146	0.00043	0.00011	0.00031	0.00019	0.00016	0.00012	0.0001
564474	0.0001	0.00009	0.00014	0.00012	0.00011	0.00009	0.00007
564802	0.00007	0.00007	0.00006	0.00006	0.00007	0.00006	0.00005
565130	0.00005	0.00005	0.00005	0.00005	0.00004	0.00005	0.00004

1988

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00014	0.00005	0.00009	0.00005	0.00009	0.00008	0.00007
563490	0.00056	0.00011	0.00021	0.00018	0.00034	0.00019	0.00016
563818	0.00075	**0.00079**	0.00056	0.00036	0.00046	0.00018	0.00015
564146	0.00042	0.00011	0.00028	0.00018	0.00013	0.0001	0.00008
564474	0.0001	0.00011	0.00015	0.00012	0.0001	0.00008	0.00005
564802	0.00007	0.00007	0.00007	0.00007	0.00006	0.00005	0.00004
565130	0.00006	0.00006	0.00005	0.00005	0.00004	0.00004	0.00003

1989

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00016	0.00006	0.00009	0.00005	0.00009	0.00008	0.00007
563490	0.00076	0.00015	0.00026	0.00019	0.00033	0.00017	0.00014
563818	**0.00091**	0.00083	0.00058	0.00038	0.00052	0.00016	0.00014
564146	0.00047	0.0001	0.00028	0.00018	0.00013	0.00009	0.00008
564474	0.00011	0.0001	0.00015	0.00012	0.00011	0.00008	0.00005
564802	0.00008	0.00007	0.00006	0.00006	0.00006	0.00005	0.00004
565130	0.00006	0.00006	0.00005	0.00005	0.00004	0.00004	0.00004

1990

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00016	0.00006	0.00008	0.00005	0.00008	0.00007	0.00007
563490	0.00064	0.00013	0.00024	0.00019	0.00031	0.00017	0.00015
563818	0.00077	**0.0008**	0.00056	0.00037	0.00051	0.00017	0.00014
564146	0.00044	0.0001	0.00029	0.00019	0.00014	0.00011	0.00009
564474	0.0001	0.00009	0.00013	0.00012	0.00011	0.00009	0.00007
564802	0.00007	0.00007	0.00006	0.00006	0.00007	0.00005	0.00005
565130	0.00005	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004

1991

CT State Plane	271755	272083	272411	272739	273067	273395	273723
563162	0.00013	0.00006	0.00008	0.00004	0.00007	0.00006	0.00005
563490	0.00066	0.00013	0.00022	0.00017	0.00026	0.00015	0.00012
563818	0.00082	**0.00091**	0.00058	0.00037	0.0005	0.00015	0.00013
564146	0.00045	0.00011	0.0003	0.00019	0.00014	0.0001	0.00009
564474	0.00011	0.0001	0.00015	0.00012	0.00011	0.00009	0.00006
564802	0.00008	0.00007	0.00006	0.00006	0.00006	0.00005	0.00005
565130	0.00006	0.00006	0.00005	0.00005	0.00004	0.00004	0.00003