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Database of Emission Rate Measurement Projects

Technical Note

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Database of Emission Rate Measurement Projects

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SECTION 1
INTRODUCTION

1.1 BACKGROUND

The U.S. Environmental Protection Agency (EPA) Air Program Office (Office of Air Quality Planning and Standards) and the Regional Air Offices have been given the responsibility to evaluate air impacts from Superfund sites and to advise Superfund Regional Offices on appropriate clean-up actions. The Air/Superfund Coordination Program, under the direction of the EPA Air Program Office, was begun to facilitate this effort. One part of this program is the analysis of baseline air emissions from various types of sites, including uncontrolled landfills, lagoons, and sites with abandoned drums.

Work to estimate baseline emissions from Superfund sites has already been done under the Air/Superfund Coordination Program, including a manual summarizing estimation techniques for emissions at abandoned hazardous waste sites - Volume II of the National Technical Guidance Series (NTGS). This manual (1) generally provides sampling and modeling approaches for measuring emissions at specific sites. Only very limited data is provided in Volume II on the typical levels of emissions encountered at hazardous waste sites.

The U.S. EPA recognizes the need for a compilation of emission rate data and sponsored the study described in this document under Work Assignment 64 of EPA Contract No. 68-02-4392.

1.2 PROJECT (TASK) OBJECTIVES

Compilation and evaluation of Volatile Organic Compound (VOC) emission rate data was performed. The three primary objectives were to:

- Determine typical averages and ranges of emissions for various types of sources (e.g. surface impoundments, landfarms, wastewater treatment lagoons);

- Determine the degree of correlation between emission rate results from different sampling methods; and

- Perform a sensitivity analysis to examine the effects of different variables on measured emission rates or fluxes.

1.3 APPROACH

The study was limited to emission rate studies already in Radian's files. A list of applicable studies was developed and final reports for each study were obtained. Each report was examined for information pertaining to the following categories:

- Site Type;
- Site Characteristics;
- Waste Characteristics;
- Meteorological Conditions;
- Sampling Methods; and
- Sampling Technique Parameters.

Total non-methane hydrocarbon (TNMHC) and benzene emission rate or flux data were copied from each report along with any source concentration data (e.g. benzene concentration in soil or wastewater). In most of the reports, emission data were reported for a project-specific list of target compounds. For such cases, emission and source concentration data for three organic compounds (other than benzene) were selected for inclusion in the database. The compounds selected were those having the highest average emission rates or fluxes. These compounds were identified in the database as Compound 2, Compound 3, and Compound 4 in descending order of emissions and their identities were recorded.

In any report, a single source might have been divided into many grids for purposes of making a series of emission flux measurements. The selection of

Compounds 2, 3, and 4 remained the same across all the grids of that single source (i.e. the selection criteria was based on the average emission rate for the entire source and not the emission flux at any singe measurement point). For sites where emission rates were measured using multiple sampling techniques (e.g. transect method and flux chamber method for the same source), the same Compounds 2, 3, and 4 were used for each method when entering emission data and point source concentrations into the database. This enabled a broader base for comparison of two different measurement techniques.

Conversions of reported data were necessary in some cases to get all emission rate/flux data in the same units. These calculations were recorded in a project notebook along with comments and other points of clarification. The project notebook also was used to record information regarding when and where averages of data points were used, how point source concentration data were matched to emission data, and in some instances the rationale for not including certain data points in the database.

To supplement the comments in the project notebook, pertinent pages of actual reports were photocopied, labeled with the project number and name, and highlighted to show information utilized in the database. These packets were kept as an additional reference for the database.

1.4 ORGANIZATION OF TECHNICAL NOTE

The remainder of this technical note is divided into four sections. Section 2 presents a description of the database. Tabulated emission rates are contained in Section 3. A brief comparison of emission rate measurement methods and the results of a sensitivity analysis to look at the effect of key variables on emission fluxes are given in Section 4. References are given in Section 5. A hardcopy of the complete database is included as an appendix to this document.

SECTION 2
DATABASE STRUCTURE AND CONTENT

This section presents descriptions of the database format, the different types of emission sources, and the various sampling approaches used for measuring emission rates.

2.1 DESCRIPTION OF DATABASE

Data from each report was entered into a seperate spreadsheet using Lotus123 software. The spreadsheets had the general headings shown in Figure 2-1.

The "Source Type" column shown in Figure 2-1 utilizes a numerical code to define the nature of the waste/site generating the emissions. Thirteen different source types were distinguished based on identifying physical or operating characteristics. The source types are further defined in Section 2.2.

The "Sample Technique" column describes the method used to obtain the emission data. Abbreviations were used to identify the various measurement techniques:

Abbreviation	Sampling Technique
F/C	Emission isolation flux chamber
DH F/C	Downhole emission flux chamber
Transect	Transect technique
Vent	Vent sampling technique
C-P	Concentration-profile technique
Impinger	Collection medium for the F/C
PUF Plug	Collection medium for the F/C

These techniques are described in Section 2.3.

PROJECT # TITLE OF PROJECT

Month-Year of sampling

Sampling Technique Used (i.e. Flux Chamber)

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min)					SAMPLE PT. SOURCE CONC. (ug/g or mg/L)				
				TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4

MET & PROCESS VARIABLES													
TEMPERATURES (C)				WS	Clouds	Sweep Air	Emitting Area	Waste Volume	Soil/Pond Depth	Soil Type	Bulk Density	Particle Density	Soil Moisture	Specific Gravity	Retention Time
Amb.Air	F/C Air	Bulk	Surface	(mph)	(%)	(L/min)	(m2)	(m3)	(m)		(g/cm3)	(g/cm3)	(Wt.%)	(g/cm3)	(hours)

Figure 2-1. Database Format.

The "Sample Area" section contains a very brief, shorthand descriptor of the location where the emission measurement was performed. They may refer to a specific source at a given site (e.g. lagoon #4) or to a specific portion of a given source (e.g. cell #2 of landfill). These descriptors were included to assist in identification of the table or text in the original report that contains the pertinent emission data.

The "Sample Point" column generally provides a means for distinguishing different sampling locations within a given sampling area. In some cases for flux chamber data, the sample point refers to the chronological order in which a large series of replicate measurements were made at a single point. For transect data, the sample point typically refers to the location of the sampler within the transect array for a given sampling episode. The numbering system for sample point allows for ease of data manipulation when comparing different measurement techniques within one waste site.

The "Emission Rates" columns contain emission rates for total non-methane hydrocarbons (TNMHC), benzene and the additional organic species designated Compound 2, Compound 3, and Compound 4. In reports where the measurement technique was the emission isolation flux chamber, the emission rate would be more accurately called a flux measurement. A flux is defined as the mass of emissions per area per time while a rate is defined as the mass of emissions per time. In the database, a value with emission rate units (mass/time) generally represents emissions from the entire source, while a value with emission flux units (mass/area-time) represents emissions from a specified area that is usually limited to the specific area being sampled (e.g. the 0.13 m^2 enclosed by the flux chamber). Flux data was always reported in units of ug/m^2-min. For transect and vent sampling measurements, the emission rates were reported in units of ug/min, which can be converted to flux units by dividing the emission rate by the emitting area (m^2).

Point source concentrations are given in the next set of columns for TNMHC, benzene and Compounds 2, 3, and 4. Concentrations are given as either ppmw liquid (mg/L) or ppmw solids (ug/g).

The remaining columns in the spreadsheet contain meteorological and process data. Meteorological conditions during testing of interest are ambient air temperature (C), wind speed or WS (mph), and percent cloud coverage during measurement activities. Process data relating specifically to emission isolation flux chamber usage include the temperature of the flux chamber sweep air (F/C Air) in degrees Celsius and the flow rate of the sweep air within the chamber (L/min). Parameters describing the waste site itself include bulk and surface temperatures, the area, volume and depth of contaminated material, soil type, bulk density, soil density, soil moisture (weight percent), specific gravity, and retention time of the waste at the site.

2.2 DESCRIPTION OF SOURCE TYPES

Thirteen distinct source types were used to categorize the emission rate data. The defining characteristics of each of the source types are briefly described below. The code number for each source type is also shown.

1 - Surface Impoundment

A contained, defined pond or lagoon where liquid waste is placed for storage. The liquid surface is exposed to the atmosphere and no mechanical or chemical treatment of the waste occurs.

2 - Spill Site

An area of land where an uncontrolled, unanticipated release of liquid hazardous substances or hazardous waste has occured and the surface layers of soil are contamianted. The site typically has undergone some type of clean-up of the material that was spilled soon after the release.

3 - Controlled Landfill

A designated area in a RCRA-permitted transfer, storage, and disposal facility (TSDF) into which known quantities of defined substances have been placed for disposal. The quantity and types of wastes accepted are known. Wastes are typically segregated by type and placed in lifts (layers) in lined and bermed areas. Soil or fill layers are typically placed over each successive lift to further isolate the waste.

4 - Uncontrolled Landfill

An area of land where organic wastes have been placed for disposal. These are not RCRA-permitted facilities and the quantity and types of wastes placed in the landfill are not documented or regulated. The design and operation of the landfill may not follow any accepted engineering practices.

5 - Test Soil Pile

Piles or layers of soil spiked with known quatities of organic compounds (e.g. gasoline) and used in a controlled experimental setting. The volume of the piles and the test conditions are defined by the parameters of the experiment.

6 - Aerobic Wastewater Treatment Systems

Surface impoundments or tanks where wastewater is temporarily stored to allow oxygen-using microbes to degrade the organic components of the wastewater. Oxygen is typically added to the systems to promote degradation. The oxygen may be transferred to the system via surface, mechanical mixers or by introducing compressed air through a subsurface network of pipes and openings.

7 - Anaerobic Wastewater Treatment Lagoons

Surface impoundments in which liquid waste is temporarily stored to allow non-oxygen-using microbes to degrade the organic components of the wastewater. Volatilization is a competing pathway for VOCs in such systems, and may be responsible for a large fraction of the VOC losses from the wastewater.

8 - Subsurface Leaks

An area of land where the subsurface soil and/or groundwater is contaminated by leaks from underground storage tanks or pipelines.

9 - Covered Landfill

A controlled landfill (see #3) that has been filled to capacity with waste and has been covered by a polymer liner and/or compacted soil. Emission measurements may have been performed from the surface of the covered landfill or from standpipes present in the landfill to vent carbon dioxide and methane generated by decomposition of the waste.

10 - Chemical Production Unit

Any type of chemical production or manufacturing process unit operating under defined process parameters. Typically input and output materials of the process can be defined and quantified to help predict emissions.

11 - Drum Storage Area

An area designated for the storage of 55-gallon drums used as containment units for solvents or organic wastes. The drum storage area can be indoors or out (i.e. exposed to varying degrees of temperature change, sun exposure). The one indoor drum storage area included in the database had emissions from the drums exhausted from the building through a fan/vent system.

12 - Landfarm

An area of land where liquid refinery wastes are applied to the land surface and periodically tilled. The intent of the treatment is for the organic constituents of the waste to be ultimately degraded by biological and chemical processes or attenuated by the soil matrix. Volatilization is a competing pathway for VOCs and some semi-volatile compounds. The tilling of the landfarm or landtreatment unit typically enhances the volatilization rate of the volatile components present in the waste.

13 - Mining Operation

An area of land where mining activities such as crushing, conveying, excavation, and storage of mined materials takes place. The one mining operation site included in the database handled material (e.g. sand, shale) containing large amounts of organic compounds.

Significant overlap between certain source types was noted when compiling the database. Surface impoundments and anaeorbic wastewater treatment systems (source types 1 and 7) were difficult to distinguish, as were spill sites and subsurface leaks (source types 2 and 8). The data for these source type pairs were lumped together.

2.3 EMISSION RATE MEASUREMENT APPROACHES

The database contains emission rate data obtained from both direct and indirect methods of measurement. More detailed discussions of each sampling method are given in Volume II (1) along with schematic diagrams and primary references for the development and evaluation of each method.

2.3.1 Emission Isolation Flux Chamber

The emission isolation flux chamber (flux chamber) is an enclosure used to make direct emission flux measurements. The flux chamber isolates a defined area of the emitting surface (either liquid or solid) and captures any gas emissions. The typical flux chamber used has an internal volume of 0.030 m^3 (30 l) and isolates an area of 0.13 m^2. Clean, dry sweep air is introduced into the flux chamber at a controlled rate. The shape and size of the chamber as well as the rate of sweep air flow determines the residence time of gases within the flux chamber. The ratio of volume and flow rate (V/Q) is the theoretical residence time. Typically three to five residence times are required to establish steady state conditions in the chamber before sampling should begin. The standard flow rate of sweep air is 5 L/min, so steady state conditions can be achieved in

18 to 30 minutes. The sweep air flow rate through the chamber is recorded during sampling and the concentration of species present is measured at the outlet of the flux chamber.

Air samples are typically collected in one of three ways. One, a portable hydrocarbon analyzer with an internal pump can be used. Two, gas-tight syringes can be used to collect samples for on-site analysis. Three, evacuated canisters can be used to collect samples for off-site analysis. Alternate sample collection media can be attached to the flux chamber manifold. An impinger train such as one containing 0.1 N sulfuric acid solution can be attached for the collection of amine samples. A PUF (polyurethane foam) sampler can also be attached to collect semi-volatile organic samples.

The emission flux is calculated using the following equation:

$$EF_i = \frac{C_i * Q}{A}$$

where:
- EF_i = emission flux of species i (ug/m^2-min);
- C_i = measured concentration of species i (ug/m^3);
- Q = sweep air flow rate (m^3/min); and
- A = exposed surface area (m^2).

A series of emission flux measurements can be used to derive an overall emission rate for a given source.

2.3.2 Downhole Emissions Isolation Flux Chamber

The downhole emissions isolation flux chamber (downhole flux chamber) is used to directly measure volatile emissions from subsurface soils. The downhole flux chamber is similar to the flux chamber described above except that it is designed to be used in the annular space of a hollow-stem auger during drilling activities. Emissions are collected from an area of soil defined by the volume of the hollow-stem auger at a

selected depth below the surface. The emissions enter the chamber from the exposed soil and are mixed with the clean, dry sweep air being added to the chamber at a measured rate. The vapor/air mixture is then drawn through the exit port on the chamber for either sampling or measurement of vapor concentration. The emission flux is calculated using the same equation provided for the emission isolation flux chamber, but the effective surface area of emitting material can not be determined. The method is typically used to estimate air emissions from the subsurface if it were to be excavated and exposed to the atmosphere.

2.3.3 Vent Sampling

Vent sampling is a measurement method that can be applied for sites with stacks or vents. It requires values for the emission concentration and the volumetric flow rate. The volumetric flow rate can be calculated from measurements of the exhaust velocity and cross-sectional area of the vent. The Code of Federal Regulations (CFR) Title 40 Part 60 provides a procedure for obtaining flow rates for vents and ducts by outlining appropriate sampling locations and methods for determining exhaust velocity.

The emission rate for a vent is calculated using the following equation:

$$ER_i = (C_i)(U)(A)$$

where:
- ER_i = emission rate of species i (ug/sec);
- C_i = concentration of species i (ug/m3);
- U = gas velocity through vent (m/sec); and
- A = cross-sectional area of vent (m2).

2.3.4 Concentration Profile

The concentration-profile (C-P) method is an indirect measurement method where ambient air samples are collected under specified meteorological conditions and a

dispersion model is used to fit the data and derive an emission rate for the emission source of interest. The C-P method has been tested under field site conditions and has been demonstrated to generate valid results. The concentration of the species of interest is measured at logarithmically spaced heights at a downwind position on the anticipated centerline of the emission plume. Measurements of wind velocity, volatiles concentration and temperature profiles above the waste source are used to estimate the vertical flux of the emitted species. The C-P technique requires that wind speed and direction match the conditions preselected for the sampling location. The equation used to calculate an emission rate for this method is relatively complex (2), and certain terms in the equation (e.g., atmospheric stability correction factor) must be estimated.

2.3.5 Transect Technique

The transect technique employs vertical and horizontal arrangements of samplers set up within the effective cross-section of the emission plume to measure the concentrations of species present. This data is combined with a dispersion model to derive an emission rate for the emission source of interest. The modeling approach used is a basic gaussian plume model equation for a ground-level, non-buoyant point source. The cross-sectional area of the plume is determined from σ_y and σ_z and multiplied by the wind speed to determine the mass of contaminants moving through a given cross-section of the plume over time, i.e. the emission rate at the source. The equation used to calculate an emission rate for this method is relatively complex (2). The accuracy of this approach is limited by the accuracy of the measurement data and the validity of the assumption that the downwind concentrations of each compound vary according to a Gaussian distribution.

SECTION 3
MEASURED EMISSION RATE DATA

This section presents summary tables of the emission rate/flux data compiled in this study.

3.1 LIST OF STUDIES

Over 50 projects were identified as studies likely to have applicable emission rate data and included in a preliminary list of studies. Each study was assigned a sequential integer for identification purposes. After examination of the reported data, a subset of these studies were found to have data that met the objectives of this study. A listing of the 33 studies included in the database is given in Table 3-1. The specific names and locations are not given for the sites to avoid violating confidentiality agreements. Note that the study numbers are not consecutive.

The list of studies is not intended to be all inclusive. No systematic literature search was included in this study.

3.2 SUMMARY OF EMISSION RATE DATA

As previously noted, a spreadsheet was prepared for each site following the format shown in Figure 2-1. These spreadsheets may be found in Appendix A. The identities of Compounds 2, 3, and 4 for each study are given in Table 3-2.

TABLE 3-1. STUDIES CONTAINED IN THE EMISSION RATE DATABASE

Study Number	Project ID	Client	Site Name/ID	Date of Sampling	Geographical Location	Type of Waste Site
1	242-079-01-01	*****	*****	2/90	Gulf Coast	Surface Impoundment
2	203-080-64	EPA	Site B	10/89	Barstow, CA	Spill Site
3	207-092-04	EPA	Annex	8-9/89	San Pedro, CA	Spill Site/Terminal Uncontrolled Landfill
4	203-080-64	EPA	Site A	8/89	Midwest	Uncontrolled Landfill
5	256-042-04	USAF	Hill AFB	5/89	Utah	Spill/Leak Site
7	204-145	*****	Test Cells	1-3/89	Radian-Austin	Test Soil Pile
8	203-070-15	*****	*****	10/87	Gulf Coast	Chemical Production Unit
9	203-068-119	EPA	Plant A3	4/88	Eastern U.S.	Aerobic Wastewater Treatment System
10	274-003	*****	*****	6/87	Gulf Coast	Surface Impoundment
11	203-023-73	EPA	Plant A1	9/86	Eastern U.S.	Aerobic Wastewater Treatment System
13	203-024-42	EPA	*****	11/85	Gulf Coast	Surface Impoundment
14	203-024-42	EPA	Test Cell	11/85	Radian-Austin	Surface Impoundment
15	203-024-18	EPA	Test Cell	9/85	Radian-Austin	Test Soil Pile
16	203-001-63	EPA	*****	9-11/84	West Coast	Landtreatment Area
17	244-035-15	*****	*****	7/83	West Coast	Uncontrolled Landfill
18	???	CA DHS	Purity	6-9/84	Fresno, CA	Uncontrolled Landfill
19	222-078-17	EPA	Site 9??	6/84	West Coast	Controlled Landfill, Surface Impoundment
20	240-016-32	EPA	*****	4/84	West Coast	Spill Site
21	240-016-32	EPA	*****	1/84	Gulf Coast	Spill Site
23	203-001-63	EPA	Site 2	11/83	Gulf Coast	Landfarm, Controlled Landfill
24	203-001-63	EPA	Site 4	11/83	Eastern U.S.	Controlled Landfill, Covered Landfill
25	203-001-63	EPA	Site 5	9-11/83	Eastern U.S.	Surface Impoundment, Controlled Landfill, Covered Landfill, Drum Storage
26	203-001-63	EPA	Site 6	10/83	Eastern U.S.	Surface Impoundment
27	211-062-07	*****	*****	3-10/82	West Coast	Uncontrolled Landfill
28	242-068-06-01	*****	*****	4/89	Gulf Coast	Surface Impoundment
29	259-059-05-01	*****	*****	11/88	Rockies	Surface Impoundment, Uncontrolled Landfill
33	293-037-00	*****	*****	12/89	West Coast	Uncontrolled Landfill
36	239-024	*****	*****	7/89	West Coast	Refinery Unit
37	239-025	*****	*****	7-8/89	West Coast	Aerobic Wastewater Treatment System
45	243-050-04-01	*****	*****	11/87	West Coast	Mining Operation
45A	243-050-04-01	*****	*****	11/87	West Coast	Mining Operation
49	239-029-03-01	*****	*****	8/89	West Coast	Controlled Landfill
51	211-036-04-25	EPA	FB and TB	4/82	Gulf Coast	Aerobic & Anaerobic Wastewater Treatment System

TABLE 3-2. KEY TO COMPOUNDS 2, 3, AND 4 FOR EACH STUDY IN DATABASE

Site No.	Sample Location	Compound #2	Compound #3	Compound #4
1	Lagoon 4	methanol	toluene	styrene
	Lagoon 5	methanol	toluene	acetone
2	Transect Run 2	N-propylbenzene	O-xylene	
	Transect Run 3	trichlorofluoromethane	1,1,1-trichloroethane	O-xylene
	Transect Run 4	trichlorofluoromethane	O-xylene	M-,P-xylenes
	Transect Run 5	M-,P-xylenes	O-xylene	
3		chlorobenzene	trichloroethylene	tetrachloroethylene
4	Transect Run 1	total xylenes	ethylbenzene	
	Transect Run 2	total xylenes	ethylbenzene	
	Transect Run 4	total xylenes	ethylbenzene	
5		trichloroethylene	toluene	tetrachloroethylene
7		toluene	total xylenes	ethylbenzene
8		methylene chloride	chlorobenzene	
9		N-nonane	N-decane	N-octane
10		methylene chloride	chloroethane	vinyl chloride
11		acetaldehyde	toluene	C-2 VOC
13		toluene	chloromethane	N-hexane
14		toluene		
15		toluene	hexane	
16		toluene	M,-P-xylenes	methylcyclohexane
17		SO2		
18		toluene	ethylbenzene	trichloroethylene
19	Inact. Landf.	methylene chloride	1,1,1-trichloroethane	tetrachloroethylene
	Active area 1	1,1,1-trichloroethane	tetrachloroethylene	M-,P-xylenes
	Active area 2	1,1,1-trichloroethane	tetrachloroethylene	methylene chloride
	Surf. Imp. R1	1,1,1-trichloroethane	methylene chloride	tetrachloroethylene
	Surf. Imp. R2	1,1,1-trichloroethane	methylene chloride	toluene
23	Landtreatment	toluene	methylcyclohexane	M-,P-xylenes
	Landfarm	toluene	M-,P-xylenes	N-decane
	Active Landf.	N-decane	B-pinene	N-nonane
	Landf./transect	total halogenated HC	paraffins	acrylonitrile

(Continued)

TABLE 3-2. (Continued)

Site No.	Sample Location	Compound #2	Compound #3	Compound #4
24		paraffins	olefins	
25	Red. Lagoon 1	paraffins	olefins	
	Oxid. Lagoon 2	paraffins		
	Hold Pond 6/CP	toluene	M-,P-xylenes	trichloroethylene & bromodichloromethane
	Drum Storage	paraffins	olefins	
	Landf. 10/flam.	toluene	M-,P-xylenes	ethylbenzene
	Landf. 10/tox.	toluene	trichloroethylene & bromodichloromethane	M-,P-xylenes
	Hold Pond 6/FC	toluene	M-,P-xylenes	trichloroethylene & bromodichloromethane
	Landf. 10/org.	paraffins	olefins	
	Landf. 10/flam.	paraffins	olefins	
	Vent Sampling	paraffins	olefins	
26		paraffins	toluene	1,1,1-trichloroethane
27		SO2		
28		ammonia	C9 alkene	acetone
29	Amine Results	ammonia	ethylamine	methylamine
	Pufplug Results	1-chloro-4-thiobenzene	aldrin	1,1-oxybisbenzene
	Pond A	C11 H22	perfluoroheptene	hexachlorobicycloheptadiene
	North Area	hexachlorobutadiene	dimethyldisulfide	C10 H22 bicyclo HC
	South Area	hexachlorobutadiene	toluene	dimethyldisulfide
33		ethylbenzene	total xylenes	toluene
51	FB Site	diethyl ether	indene	styrene
	TB Site	acetone	cyclohexane	

In most of the studies examined, the flux chamber method was the only method used to obtain emission rate or flux data. Typically, a series of emission flux (mass/area-time) measurements were made at various locations on a given source and these values were then used to derive an overall emission rate (mass/time) for the source. The flux chamber data is summarized in two tables in this section, while emission data obtained using other sampling approaches are presented in Section 4.

The flux chamber data are summarized in Table 3-3 with the data grouped by source type (source types 1 and 8 are combined since surface impoundments and anaerobic wastewater treatment lagoons were found to be equivalent). The table shows the number of observations, the size of the emitting area, and the average emission flux for each major compound of interest for each emission source. In all cases, the fluxes shown in Table 3-3 are mean values. An overall emission rate (in units of ug/min) can be determined for any source by multiplying the mean flux shown by the emitting area. For some sites, a given emission source has multiple zones of equivalent emissions. In such cases, data for each zone are shown in Table 3-3.

Certain source types are better represented in Table 3-3 than others (i.e. have more data points). Surface impoundments, spill sites, controlled (RCRA) landfills and uncontrolled landfills (source types 1,2,3,4) have more data available for comparison than do test soil piles, aerobic wastewater treatment systems, landtreatment units, or mining operations (souces types 5,6,12,13).

Within any one source type, wide ranges of emission fluxes between the highest and lowest reported values can be seen, particularly for TNMHC emissions. Emission fluxes for compounds #2, #3, and #4 cannot be compared since the identity of each compound differed among the various source types and studies.

For comparison to the emission fluxes shown in Table 3-3, the concentrations of the species of interest in the soil or liquid are shown in Table 3-4.

TABLE 3-3. SUMMARY OF FLUX CHAMBER DATA

Study Number	Source Type	Maximum Number of Observations[a]	Size of Emitting Area (m^2)	Emission Flux ($\mu g/m^2$-min) TNMHC	Benzene	Compound # 2	Compound # 3	Compound # 4
1	8	9	15,100	235,000	118,000	26,500	16,600	6,650
1	8	8	121,000	15,500	8,130	2,440	1,100	313
10	1	5	21,100	2,620,000	.	1,210,000	771,000	469,000
13	1	9	3,750	5,950	3,840	1,420	60.5	50.0
14	1	30	2.30	.	.	22,900	.	.
19	1	2	6,270	11,200	7.15	2,160	1,400	399
25	8	4	1,130	346	.	39.6	3.96	.
25	8	2	4,910	31.8	.	4.46	9.87	2.04
28	8	3	258,000	0.20	0.01	483	0.01	0.01
29	1	1	17,200	.	.	240	120	25.0
5	2	12	.	24.9	.	19.3	1.04	2.74
5	2	4	.	45.2	.	1.21	3.11	.
5	2	1	.	9.80	.	0.27	0.46	.
5	2	1	.	74.5	.	0.06	5.03	.
20	2	1	4,180	1.10	.	.	.	.
20	2	12	4,180	2.08	.	.	.	.
20	2	52	13.4	744	.	.	.	.
20	2	1	4,180	0.44	.	.	.	.
21	2	11	29.7	4.43	.	.	.	.
19	3	1	2,370	45.1	0.15	8.30	4.30	2.10
19	3	2	1,490	2,420	0.75	1,050	404	300
23	3	2	186	9.35	0.64	0.12	0.04	0.03
24	3	1	3,900	47.0	.	11.30	7.63	.
25	3	1	2,090	54.3	.	7.19	2.84	.
25	3	2	4,180	707	.	31.8	9.58	.
49	3	30	0.13	40,000	.	.	.	.

(Continued)

Source Types:
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TABLE 3-3. (Continued)

Study Number	Source Type	Maximum Number of Observations	Size of Emitting Area (m^2)	Emission Rate ($\mu g/m^2$-min) TNMHC	Benzene	Compound # 2	Compound # 3	Compound # 4
3	4	10	1,460	2,150	2.26	2,090	548	335
17	4	9	0.13	25.7	57.0	0.75	.	.
18	4	6	.	107,000	.	94,400	.	.
18	4	6	.	739	.	48.0	.	.
18	4	3	.	25,100	.	97,600	.	.
27	4	20	182	205	.	181	.	.
29	4	1	.	.	0.63	410	32.0	30.0
29	4	2	.	.	36.0	4,800	113	95.0
33	4	8	.	1,370	1.00	36.4	15.9	0.47
2	5	2	15	255	.	3.2	0.16	0.39
4	5	2	8.4	2,210	.	618	110	.
7	5	9	8.0	56.8	2,600	9,940	6,560	1,680
7	5	14	8.0	245	9,630	37,500	21,900	5,990
7	5	9	8.0	32.8	1,160	6,770	5,440	1,350
15	5	64	2.30	.	.	71,600	339,000	.
9	6	18	1,050	2,120	3.34	123	105	94.5
11	6	1	161	138	.	66.0	34.7	12.7
37	6	5	9,870	2,550	.	.	.	.
16	12	25	421	2.330	.	122	98.9	82.6
16	12	23	421	316	.	2.47	3.66	2.50
16	12	25	421	2,710	.	189	146	122
23	12	3	557	2,990	99.5	234	175	107
45	13	45	.	16,700	.	.	.	.
45A	13	18	.	3.52 E10	.	.	.	.
45A	13	28	.	7.48 E9	.	.	.	.

[a] The number of observations per compound may vary, since each compound was not necessarily detected during sampling event.

Source Types:
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TABLE 3-4. SUMMARY OF SOURCE CONCENTRATION DATA

Study Number	Source Type	Maximum Number of Observations[a]	Size of Emitting Area (m^2)	Average Concentration (µg/g or mg/L)				
				TNMHC	Benzene	Compound # 2	Compound # 3	Compound # 4
1	8	10	15,100	.	60,000	.	10,000	8,100
1	8	9	121,000	.	4,100	.	720	2,500
10	1	0	21,100	.	.	.	.	.
13	1	5	3,750	75.4	17.0	2.63	0.030	.
14	1	1	2.3	.	.	88	.	.
19	1	2	6,270	278	0.29	26.0	11	5.3
25	8	2	1,130	0.397	.	0.0203	0.0125	.
25	8	2	4,910	0.176	.	0.030	0.031	0.028
28	8	3	258,000	0.319	0.0176	313	0.0140	0.0121
29	1	1	17,200	.	.	1.2	0.23	0.065
5	2	12	.	.	.	.	.	.
5	2	4	.	.	.	.	.	.
5	2	1	.	.	.	.	.	.
5	2	1	.	.	.	.	.	.
20	2	0	4,180	.	.	.	.	.
20	2	0	4,180	.	.	.	.	.
20	2	0	13.4	.	.	.	.	.
20	2	0	4,180	.	.	.	.	.
21	2	2	29.7	7.7	.	.	.	.
19	3	1	2,370	1,480	.	.	.	.
19	3	2	1,490	21,800	13.7	2,550	0.68	.
23	3	1	186	2.07	0.028	0.065	0.003	0.045
24	3	0	3,900	.	.	.	.	.
25	3	1	2,090	29.1	.	2.38	15.84	.
25	3	2	4,180	118	.	19.4	41.1	.
49	3	0	0.13	.	.	.	.	.

(Continued)

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8 = Subsurface Leak
9 = Covered Landfill
10 = Chemical Production Unit
11 = Drum Storage Area
12 = Landtreatment Unit
13 = Mining Operation

TABLE 3-4. (Continued)

Study Number	Source Type	Maximum Number of Observations	Size of Emitting Area (m^2)	Average Concentration µg/g or mg/L)				
				TNMHC	Benzene	Compound # 2	Compound # 3	Compound # 4
3	4	9	1,460	.	.	231	164	204
17	4	0	.	.	.	.	.	.
18	4	4	.	.	0.35	5.2	3.4	2.8
18	4	4	.	.	0.38	7.0	5.9	9.0
18	4	2	.	.	0.36	4.3	2.5	1.7
27	4	4	182	.	.	8,100	.	.
29	4	1	.	.	0.006	0.68	0.25	0.17
29	4	2	.	.	0.36	8.2	1.1	0.56
33	4	0	.	.	.	.	.	.
2	5	2	15	.	.	0.158	.	.
4	5	2	8.4	.	.	8.3	2.0	.
7	5	9	8.0	.	39	400	802	160
7	5	10	8.0	.	341	301	647	122
7	5	9	8.0	.	42.2	425	901	172
15	5	2	2.3	.	.	91.3	754	.
9	6	1	1,050	5,710	450	130	130	73
11	6	1	161	138	.	66.0	34.7	12.7
37	6	0	9,870	.	.	.	.	.
16	12	1	421	5,980	97.8	138	200	71.7
16	12	0	421	.	.	.	.	.
16	12	0	421	.	.	.	.	.
23	12	1	557	13.1	0.05	0.15	0.55	0.26
45	13	0	.	.	.	.	.	.
45A	13	0	.	.	.	.	.	.
45A	13	0	.	.	.	.	.	.

[a] The number of observations per compound may vary, since each compound was not necessarily detected during sampling event.

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The Total Non-Methane Hydrocarbon (TNMHC) flux data for each site was examined to determine the variability in the emission flux within a given source. These data are summarized in Table 3-5. The mean, minimum, and maximum emission flux values for each source are shown along with the standard deviation and spatial variability for the TNMHC emission flux. Precision data are shown that are based on replicate measurements made at a single location, with the second measurement being performed immediately after the first. Temporal variability data are also shown that are based on replicate measurements made at a single location over the duration of the measurements at that source (usually 1-2 days).

In comparing the flux chamber variability data for TNMHC emission fluxes, very few temporal variability values are available. Spatial variability is shown to be large (large coefficient of variability) for all types of sources, even between sites within the same study. Among the studies included in the database, the spill sites (source type 2) and the test soil piles (source type 5) exhibited the smallest average standard deviations. Uncontrolled landfills and mining operations show exceptionally poor average standard deviation values, indicating that these sources were highly non-homogenous. No overall relationship between the number of observations and average standard deviation among the source types examined is seen.

TABLE 3-5. SUMMARY OF FLUX CHAMBER TNMHC STATISTICS AND VARIABILITY

Study Number	Source Type	No. of Observations	TNMHC Emission Flux (ug/m²-min)				Precision		Temporal Variability		Spatial Variability	
			Mean	Minimum	Maximum	Std. Dev.	No. of Obs.	C.V. (%)	No. of Obs.	C.V. (%)	No. of Obs.	C.V. (%)
1	8	9	235,000	184,000	315,000	35,700	2	9.66	2	28.0	9	15.2
1	8	8	15,500	8,440	27,000	4,860	2	11.3	2	14.3	8	31.4
13	1	9	5,950	944	19,200	5,380	.	.	.	.	5	91.2
14	1	0	.	.	.	.	.	.	.	.	.	.
19	1	2	11,200	4,740	17,700	9,180	.	.	.	.	2	81.7
20	1	5	2,620,000	237,000	7,110,000	2,890,000	2	10.9	.	.	5	110
25	8	4	346	91.5	600	264	.	.	.	.	4	76.5
25	8	2	31.8	26.4	37.2	7.64	.	.	.	.	2	24.0
28	8	3	0.20	0.06	0.28	0.12	.	.	.	.	3	59.4
29	1	0	.	.	.	.	.	.	.	.	.	.
20	2	1	1.10	1.10	1.10	.	.	.	.	.	.	.
20	2	12	2.08	1.10	6.39	1.31	6	62.3	.	.	12	62.8
20	2	52	744	151	6100	970	.	.	.	.	52	130
20	2	1	0.44	0.44	0.44	.	.	.	.	.	.	.
21	2	11	4.43	0.90	15.7	5.30	3	104	3	103	11	135
5	2	12	24.9	3.97	109	26.4	2	30.8	.	.	12	106
5	2	4	45.2	6.88	149	69.3	2	11.5	.	.	4	153
5	2	1	9.80	9.80	9.80	.	.	.	.	.	.	.
5	2	1	74.5	74.5	74.5	.	.	.	.	.	.	.
19	3	1	45.1	45.1	45.1	.	.	.	.	.	.	.
19	3	2	2,420	846	3,990	2,220	.	.	.	.	2	91.9
23	3	2	9.35	7.69	11.0	2.34	.	.	.	.	2	25.0
24	3	1	47.0	47.0	47.0	.	.	.	.	.	.	.
25	3	1	54.3	54.3	54.3	.	.	.	.	.	.	.
25	3	2	707	154	1,260	782	.	.	.	.	2	111
49	3	30	40,000	520	169,000	45,300	.	.	.	.	30	114
3	4	10	2,150	5.61	13,100	3,160	6	106	.	.	10	147
17	4	9	25.7	1.80	120	37.9	.	.	.	.	9	147
18	4	6	107,000	1,240	471,000	1,180,000	.	.	.	.	6	169

(Continued)

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TABLE 3-5. (Continued)

Study Number	Source Type	No. of Observations	TNMHC Emission Flux (ug/m²-min)				Precision		Temporal Variability		Spatial Variability	
			Mean	Minimum	Maximum	Std. Dev.	No. of Obs.	C.V. (%)	No. of Obs.	C.V. (%)	No. of Obs.	C.V. (%)
18	4	6	740	131	1,800	0.25	.	.	.	.	6	91.2
18	4	3	25,100	2,9000	62,800	32,800	.	.	.	.	3	130
27	4	19	206	20.0	2,400	535	.	.	.	.	19	260
29	4	0	.	.	.	.	.	.	.	.	.	.
33	4	8	1,370	1.80	4,000	1,560	.	.	.	.	8	114
2	5	2	255	140	370	162	.	.	2	63.8	.	.
4	5	2	2,210	920	3,500	1,820	.	.	2	82.4	.	.
7	5	9	56.8	0.60	230	75.6	.	.	9	133	.	.
7	5	14	245	3.29	922	307	.	.	14	125	.	.
7	5	9	32.8	0.06	169	55.5	.	.	9	169	.	.
15	5	0	.	.	.	.	.	.	.	.	.	.
9	6	18	2120	606	5,570	1,250	8	19.7	3	33.0	18	58.8
11	6	1	138	138	138	.	.	.	.	.	.	.
37	6	5	2550	746	5,090	1,800	.	.	.	.	5	70.8
16	12	25	2330	74.4	14,900	3,520	8	16.3	25	151	7	43.8
16	12	23	316	69.6	1,480	316	.	.	23	100	4	82.2
16	12	25	2710	117	17,700	4,040	6	9.44	25	149	8	88.2
23	12	3	2990	608	7,250	3,690	.	.	3	123	.	.
45	13	45	16,700	15.8	103,000	27,300	.	.	.	.	45	164
45A	13	18	3.52 E10	1.83 E10	4.46 E10	7.43 E9	.	.	26	14.1	18	21.1
45A	13	28	7.48 E9	1.33 E10	1.33 E10	3.37 E9	.	.	.	.	28	45.1

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SECTION 4
METHODS COMPARISON AND EVALUATION

This section presents data comparing emission fluxes for given sites determined using multiple sampling methods, e.g. flux chamber versus transect. Also included in this section is the results of a sensitivity analysis performed to evaluate the effects of various parameters on the measurement data.

4.1 METHODS COMPARISON

As expected, very little comparative data was found. The only studies found with comparative data were Nos. 23, 24, 25, and 26 in the database. These were all part of an overall EPA study (2,3). The comparative data for TNMHC emission fluxes from that study are shown in Table 4-1.

4.2 RESULTS OF SENSITIVITY ANALYSIS

A sensitivity analysis was performed by pooling together all the flux chamber data and attempting to correlate emission rate and concentration data with site, operating, and meteorological parameters. As many as 268 observations, or data pairs, were available in the database. The results of this analysis is shown in Table 4-2. Correlation coefficients and p-values for each correlation attempt are shown.

The correlation coefficients show the degree of agreement between the data pairs and a straight line function. A correlation coefficient has a range of -1 to +1. A -1 or +1 value indicates a perfect correlation between two parameters of interest while a zero (0) correlation indicates no relationship. A positive correlation coefficient means that there is a direct relationship between two parameters. A negative correlation coefficient means that there is an inverse relationship between two parameters. In other words, as one of the two parameters increases in magnitude, the other parameter is decreasing in

TABLE 4-1. COMPARISON OF DATA FOR VARIOUS EMISSION MEASUREMENT METHODS

Emission Source Type	Measurement Method	TNMHC Emission Flux (μg-C/m^2-min)[a]
Active Landfill	Flux Chamber	260 - 640
	Transect	310 - 900
Surface Impoundment	Flux Chamber	190
	Concentration-Profile	56
Landtreatment (1 day after application)	Flux Chamber	43,500
	Concentration-Profile	75,000
Landtreatment (2 days after application)	Flux Chamber	3,700
	Concentration-Profile	57,700

[a]μg-C equals micrograms of carbon.

magnitude. A correlation coefficient equal to or greater than 0.7 is considered to be good.

A p-value is the smallest value of a significance level (α) for which a hypothesis test result becomes statistically significant. A hypothesis test is performed to determine if the correlation coefficient is equal to zero. The alternative to this hypothesis then would be that the correlation coefficient is different than zero (not equal to zero). Choosing a significance level of 0.05 and comparing it to a p-value (from Table 4-2), it can be determined whether the correlation coefficient is significantly different than zero. If the p-value is less or equal to the significance level, then it can be concluded that the correlation coefficient is not equal to zero. For p-values greater than the significance level, then the conclusion is that the correlation coefficient is not significantly different than zero. For example, the correlation of benzene emission rate with the concentration of benzene in the source (soil or water) in Table 4-2 shows a correlation coefficient of 0.98 and a p-value of 0.0001 for 84 observations. The correlation coefficients for the two variables are shown to be strongly related, while the p-value of less than 0.05 indicates that the correlation coefficient is significantly different from zero. Therefore, the emission rate of benzene is dependent on the concentration of benzene in the source. Statistically significant correlations in Table 4-2 are marked with a "*".

The evaluation of correlation coefficients indicates that the emission rate of TNMHC is strongly correlated to the emission rate benzene and the concentrations of benzene, compound #3, and compound #4 (all components that contribute to TNMHC emissions). The emission rate of benzene is strongly linked to the concentration of benzene in the source (bulk soil or liquid). The correlation coefficient and p-values, however, also indicate the emission rate of benzene is linked to the concentrations of compounds #3 and #4, indicating that the concentrations of the various compounds in the emission source tend to vary uniformly. The emission rates for compounds #2, #3, and #4 would be expected to be related to the concentrations of these same components in the source, but these relationships were not found in the data.

TABLE 4-2. CORRELATIONS FOR FLUX CHAMBER DATA IN ($\mu g/m^2$-min)

Correlation of:	Correlated to:	Correlation Coefficient	p-value	No. of Obs.
Emission Flux TNMHC	*Emission Flux Benzene	0.98	0.0001	100
	Emission Flux Compound 2	0.11	0.1026	227
	Emission Flux Compound 3	0.33	0.0001	188
	Emission Flux Compound 4	0.47	0.0001	169
	Concentration TNMHC	0.03	0.7956	86
	*Concentration Benzene	0.99	0.0001	115
	Concentration Compound 2	0.10	0.2567	139
	*Concentration Compound 3	0.97	0.0001	134
	*Concentration Compound 4	0.96	0.0001	123
	Temperature Ambient Air	0.31	0.0001	224
	Temperature F/C Air	-0.14	0.0872	159
	Temperature Bulk	0.05	0.8161	22
	Temperature Surface	-0.22	0.0027	180
	Wind Speed	0.11	0.3536	71
	Clouds	0.56	0.0002	39
Emission Flux Benzene	Emission Flux Compound 2	0.40	0.0001	101
	Emission Flux Compound 3	0.43	0.0001	94
	Emission Flux Compound 4	0.57	0.0001	92
	Concentration TNMHC	0.27	0.1135	34
	*Concentration Benzene	0.98	0.0001	84
	Concentration Compound 2	0.20	0.0891	70
	*Concentration Compound 3	0.98	0.0001	87
	*Concentration Compound 4	0.95	0.0001	82
	Temperature Ambient Air	0.24	0.2360	25
	Temperature F/C Air	-0.65	0.0018	20
	*Temperature Bulk	0.70	0.0016	17
	Temperature Surface	0.39	0.1817	13
	Wind Speed	-0.58	0.0121	18
	Clouds	0.64	0.0023	20
Emission Flux for Compound 2	*Emission Flux Compound 3	0.98	0.0001	186
	*Emission Flux Compound 4	0.94	0.0001	169
	Concentration TNMHC	-0.09	0.4402	70
	Concentration Benzene	0.05	0.5875	118
	Concentration Compound 2	-0.07	0.2474	235
	Concentration Compound 3	0.07	0.3946	135
	Concentration Compound 4	0.04	0.6342	124
	Temperature Ambient Air	-0.06	0.3694	185
	Temperature F/C Air	-0.13	0.1029	164
	Temperature Bulk	0.28	0.0021	116
	Temperature Surface	0.00	0.9790	187
	Wind Speed	-0.16	0.1058	102
	Clouds	0.50	0.0010	40

(Continued)

TABLE 4-2. (Continued)

Correlation of:	Correlated to:	Correlation Coefficient	p-value	No. of Obs.
Emission Flux for Compound 3	*Emission Flux Compound 4	0.96	0.0001	171
	Concentration TNMHC	0.04	0.7706	68
	Concentration Benzene	0.29	0.0018	111
	Concentration Compound 2	0.33	0.0004	112
	Concentration Compound 3	-0.01	0.9365	146
	Concentration Compound 4	0.29	0.0016	117
	Temperature Ambient Air	0.55	0.0001	102
	Temperature F/C Air	0.64	0.0001	89
	Temperature Bulk	0.62	0.0001	41
	*Temperature Surface	0.77	0.0001	90
	Wind Speed	-0.57	0.0002	38
	Clouds	0.63	0.0030	20
Emission Flux for Compound 4	Concentration TNMHC	0.18	0.1485	63
	Concentration Benzene	0.41	0.0001	110
	Concentration Compound 2	0.31	0.0010	108
	Concentration Compound 3	0.49	0.0001	122
	Concentration Compound 4	0.40	0.0001	117
	Temperature Ambient Air	-0.19	0.0984	76
	Temperature F/C Air	-0.24	0.0513	69
	Temperature Bulk	-0.18	0.4724	18
	Temperature Surface	0.12	0.3239	65
	Wind Speed	-0.39	0.1200	17
	Clouds	0.62	0.0043	19
Concentration TNMHC	Concentration Benzene	0.28	0.0298	59
	*Concentration Compound 2	0.76	0.0001	68
	Concentration Compound 3	0.57	0.0001	66
	*Concentration Compound 4	1.00	0.0001	56
	Temperature Ambient Air	0.51	0.0001	50
	Temperature F/C Air	-0.24	0.2488	25
	Temperature Bulk	-0.79	0.4228	3
	Temperature Surface	0.39	0.0035	55
	Wind Speed	-0.83	0.1645	4
	Clouds	0.08	0.9506	3
Concentration Benzene	Concentration Compound 2	-0.05	0.6202	101
	*Concentration Compound 3	0.99	0.0001	118
	*Concentration Compound 4	0.98	0.0001	113
	Temperature Ambient Air	-0.23	0.1079	51
	Temperature F/C Air	-0.47	0.0020	41
	*Temperature Bulk	0.73	0.0008	17
	Temperature Surface	-0.35	0.0459	32
	Wind Speed	-0.45	0.0326	23
	Clouds	0.64	0.0025	20

(Continued)

TABLE 4-2. (Continued)

Correlation of:	Correlated to:	Correlation Coefficient	p-value	No. of Obs.
Concentration of Compound 2	Concentration Compound 3	0.60	0.0001	121
	* Concentration Compound 4	0.73	0.0001	110
	Temperature Ambient Air	0.32	0.0001	139
	Temperature F/C Air	-0.05	0.5546	120
	Temperature Bulk	-0.01	0.9144	99
	Temperature Surface	-0.06	0.4287	156
	Wind Speed	-0.10	0.3350	85
	Clouds	0.47	0.0259	22
Concentration of Compound 3	*Concentration Compound 4	0.96	0.0001	126
	Temperature Ambient Air	-0.15	0.2000	77
	Temperature F/C Air	-0.33	0.0106	60
	Temperature Bulk	-0.33	0.0384	39
	Temperature Surface	0.69	0.0001	58
	Wind Speed	NS	0.8531	42
	Clouds	0.62	0.0032	20
Concentration of Compound 4	Temperature Ambient Air	-0.22	0.1105	54
	Temperature F/C Air	-0.42	0.0066	41
	*Temperature Bulk	0.75	0.0005	17
	Temperature Surface	-0.19	0.2977	33
	Wind Speed	-0.23	0.2786	24
	Clouds	0.60	0.0047	20
Temperature Ambient Air	*Temperature F/C Air	0.82	0.0001	226
	Temperature Bulk	0.59	0.0001	134
	*Temperature Surface	0.77	0.0001	268
	Wind Speed	0.14	0.0783	165
	Clouds	-0.33	0.1507	20
Temperature F/C Air	Temperature Bulk	0.67	0.0001	132
	*Temperature Surface	0.82	0.0001	210
	Wind Speed	NS	0.1650	127
	Clouds	-0.50	0.0264	20
Temperature Bulk	Temperature Surface	0.67	0.0001	118
	Wind Speed	-0.30	0.0017	110
	Clouds	0.63	0.0071	17
Temperature Surface	Wind Speed	0.19	0.0459	113
	Clouds	-0.61	0.0015	24
Wind Speed	Clouds	-0.50	0.0325	18

* denotes a statistically significant correlation
ND denotes "No Data."

Meteorological factors demonstrate certain strong relationships in the database. For example, cloud cover is related to all emission rates (TNMHC, benzene, compounds #2, #3, and #4) based on the p-values. Cloud cover was also found to be related to the concentrations of benzene and compounds #2, #3, and #4. The statistical relationship of such obviously unrelated parameters points up the limitations of such evaluations. Not surprisingly, bulk and surface temperatures were found to be related to cloud cover based on the p-values. In general, temperature measurements of the bulk material, the emitting surface, and the air inside the flux chamber were all found to be strongly correlated to one another.

In addition, sensitivity analyses performed on past studies were identified during the compilation of the database. Study #20 of the database was a test program in the development of the flux chamber method (4). The total variability in emission rate was found to consist of the following components:

Flux chamber air temperature	26.3%
Sampling location (spatial variability)	17.2%
Temporal variability	24.0%
Sampling + analytical variability	44.1%
	100.0%

A similar analysis was performed as part of a landtreatment study (5). The temporal variability accounted for 81.8% of the total variability. This is not unexpected, since VOC emissions from landtreatment facilities decrease rapidly with time after application. The remaining variability (total - temporal) was found to consist of the following components:

Flux chamber air temperature	44.1%
Sampling location (spatial variability)	50.4%
Surface shading	1.5%
Sampling + analytical variability	3.9%
	100.0%

SECTION 5
REFERENCES

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3. Balfour and Schmidt. Sampling Approaches for Measuring Emission Rates From Hazardous Waste Disposal Facilities. Presented at 77th Annual APCA Meeting - Paper 84-3.3. San Francisco, June 24-29, 1984.

4. Radian Corporation. Soil Gas Sampling Techniques of Chemicals for Exposure Assessment, Tustin Spill Site Data Volume. EPA Contract No. 68-02-3513, Work Assignment 32. July 27, 1984.

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APPENDIX A

DATABASE OF EMISSION FLUX AND EMISSION RATE MEASUREMENT DATA

PROJECT 1

February 1990

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min)					SAMPLE PT. SOURCE CONC. (ug/g or ng/L)					TEMPERATURES (C)		
				TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk Surface
1	F/C	Lagoon 5	8	12587	6759	2460	1099	211	4300		940	2400		25	30	19
1	F/C	Lagoon 5	7	15911	9972	2305	1230	226	4600		740	2300		24	31	19.4
1	F/C	Lagoon 5	3	8443	5097	1822	448	209	4200		680	2400		25	35	19.6
1	F/C	Lagoon 5	4	14936	4077	1494	474	130	3600		650	2700		23	39	19.9
1	F/C	Lagoon 5	6a	23046	10725	3058	1740	445	4300		760	2100		25	27	20.2
1	F/C	Lagoon 5	6b	27035	9241	3701	1252	501	4300		730	1900		25	25	21.4
1	F/C	Lagoon 5	5	18437	9795	2770	1398	439	4100		730	2200		23	31	20.8
1	F/C	Lagoon 5	1	16310	9418	2814	1323	290	3900		700	2800		22	45	21
1	F/C	Lagoon 5	2	13739	8532	1866	1044	408	3900		690	2900		25	30	21.8
1	F/C	Lagoon 5	4	12188	6825	2681	971	372	3700		640	2500		24	29	21.5
1	F/C	Lagoon 4	1	275327	134835	27344	19047	7977	62000		9700	8100		21	22	21.4
1	F/C	Lagoon 4	8	213095	110508	20744	14332	5205	58000		10000	7900		22	23	21.2
1	F/C	Lagoon 4	6	250811	119183	29607	17990	8241	62000		11000	8500		24	27	22.5
1	F/C	Lagoon 4	2	314929	152561	25270	25081	14445	62000		11000	8700		24	31	21.5
1	F/C	Lagoon 4	9	226296	111639	27910	15464	7355	62000		11000	8100		24	25	21.2
1	F/C	Lagoon 4	5a	250811	125406	30361	18122	7769	59000		10000	8200		24	23	21.8
1	F/C	Lagoon 4	5b	218753	101645	33190	15935	7355	58000		10000	8100		27	27	22.1
1	F/C	Lagoon 4	7	247040	129366	39602	18292		60000		11000	8200		25	27	22.4
1	F/C	Lagoon 4	3	205552	104662	24138	14238	1961	62000		11000	8300		24	25	22.9
1	F/C	Lagoon 4	4	190466	101645	14389	11994	3300	59000		10000	7700		24	24	22.4
1	F/C	Lagoon 4	1	184431	95610	22064	10296	2244	60000		10000	7800		22	22	22.2

PROJECT 1 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
18	10	5	120770	219530	1.8						1776
13	15	5	120770	219530	1.8						1776
18	20	5	120770	219530	1.8						1776
18	30	5	120770	219530	1.8						1776
16	90	5	120770	219530	1.8						1776
12	95	5	120770	219530	1.8						1776
9	90	5	120770	219530	1.8						1776
18	70	5	120770	219530	1.8						1776
16	50	5	120770	219530	1.8						1776
17	10	5	120770	219530	1.8						1776
1	100	5	15050	45420	3						360
4	100	5	15050	45420	3						360
	90	5	15050	45420	3						360
7	100	5	15050	45420	3						360
11	100	5	15050	45420	3						360
		5	15050	45420	3						360
	95	5	15050	45420	3						360
3	60	5	15050	45420	3						360
7	60	5	15050	45420	3						360
9	95	5	15050	45420	3						360
4	100	5	15050	45420	3						360

PROJECT 2

February 1990

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
2	Transect	run 2	1	20400000		144000	372000					0.6		21.1			
2	Transect	run 3	2	24000000	10800	2700000	28800	96000			0.006	0.003	0.132	26.9			
2	Transect	run 4	3	12000000		468000	116400				0.012	0.177		22.5			
2	Transect	run 5	4	20400000		138000					0.615			24.9			

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
5	F/C	Test Pile	1	370		6	0.31	0	0.217					35	43	32	29
5	F/C	Test Pile	2	140		0.46	0.01	0.77	0.0993					39	54	49	28

PROJECT 2 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
5.6			17.8	14		Sand	1.5	2.58	10		
6.2			17.8	12		Sand	1.44	2.6	5.2		
5.2			17.8	13		Sand	1.5	2.61	8.1		
4.8			200			Sand	1.5	2.58	10		

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	15	14	0.93	Sand	1.2	2.58	6.1		
		5	15	14	0.93	Sand	1.35	2.56	3.8		

PROJECT 3

August-September 1989

Source Type	Sample Tech	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
4	F/C	Area A	1	5.61		0.85	0.322	1.93			314	148	78				
4	F/C	Area A	2	11.8			3.55	19.7			444	217	733				
4	F/C	Area A	3	25	0.089	12.4	1.04	0.668			292	90	34				
4	F/C	Area A	4	44.7		9.2	1.15	1.96			483	567	167				
4	F/C	Area A	5	42.4							483	567	167				
4	F/C	Area A	6	327				112			444	217	733				
4	F/C	Area A	7a	474		254	71.2	23.1			19	2.5	4.4				
4	F/C	Area A	7b	8932	6.01	5082	716	384			19	2.5	4.4				
4	F/C	Area A	8	5390	0.67	4235	1224	947			1.9	3.2	6.7				
4	F/C	Area A	9a	3554		3015	1109	335			23	6.2	33				
4	F/C	Area A	9b	363		250	147	64.7			23	6.2	33				
4	F/C	Area A	10a	13052		9202	3927	2834			58	222	50				
4	F/C	Area A	10b	4928		2945	330	226			58	222	50				

PROJECT 3 (continued)

NET & PROCESS VARIABLES										
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		3.5	1456	2220	1.5	Sand	1.52		28.6	2.59	
		5	1456	2220	1.5	Sand	1.48		33.2	2.55	
		3.5	1456	2220	1.5	Sand	1.54		27.9	2.59	
		5	1456	2220	1.5	Sand	1.47		35.5	2.48	
		5	1456	2220	1.5	Sand	1.47		35.5	2.48	
		5	1456	2220	1.5	Sand	1.48		33.2	2.55	
		5	1456	2220	1.5	Sand	1.56		23.9	2.71	
		5	1456	2220	1.5	Sand	1.56		23.9	2.71	
		5	1456	2220	1.5	Sand	1.58		29.2	2.63	
		5	1456	2220	1.5	Sand	1.67		29.4	2.72	
		5	1456	2220	1.5	Sand	1.67		29.4	2.72	
		5	1456	2220	1.5	Sand	1.43		29.3	2.77	
		5	1456	2220	1.5	Sand	1.43		29.3	2.77	

PROJECT 4

August-October 1989

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
4	Transect	run 1	1			1200000	336000				33.9	2.1		16.6			
4	Transect	run 2	2			1320000	420000				33.9	2.1		17.1			
4	Transect	run 4	3			4200000	720000				0.47	0.046		24.3			

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
4	F/C	Test Pile	1	3500		1010	190				16	4		17	19		21
4	F/C	Test Pile	2	920		227	37				0.63	0.065		26	38		20

PROJECT 4 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
3.9			20	18.3		sand/clay	1.4	2.65	7.79		
4			20	16.8		sand/clay	1.4	2.65	7.79		
4.5			200	0		sand/clay	1.49	2.72	6.33		

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
1		5	8.4	2.3	0.3	sand/clay	1.76	2.74	3.1		
1	0	5	8.4	2.3	0.3	sand/clay					

PROJECT 5

May 1989

Source Type	Sample Tech	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
2	F/C	Zone 1	1	37.4		8.65	2.63	0.21									
2	F/C	Zone 1	2	3.97		0.12	0.08										
2	F/C	Zone 1	3	9.15			0.24										
2	F/C	Zone 1	4	11.3		0.52	0.53										
2	F/C	Zone 1	5	38.9		13.5	1.13	3.35									
2	F/C	Zone 1	6	10.2		7.12	0.11	2.34									
2	F/C	Zone 1	7a	109		284	1.11	8.79									
2	F/C	Zone 1	7b	70		7.26	4.46										
2	F/C	Zone 1	8	15.1		6.96	0.85	1.02									
2	F/C	Zone 1	9	7.4		0.81	0.28										
2	F/C	Zone 1	10	7.99		10.6	0.1										
2	F/C	Zone 1	11	58.3		0.44	3.66										
2	F/C	Zone 1	12	9.47		17.8	0.14	0.74									
2	F/C	Zone 2	13a	6.88			0.4										
2	F/C	Zone 2	13b	8.1		1.02	0.44										
2	F/C	Zone 2	14	9.02			0.72										
2	F/C	Zone 2	15	15.3			0.81										
2	F/C	Zone 4	16	74.5		0.06	5.03										
2	F/C	Zone 3	17	9.8		0.27	0.46										

PROJECT 5 (continued)

MET & PROCESS VARIABLES											
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)

PROJECT 6

April 1988

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m3) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
10	Transect	465' dnwd	1	131		14.8	32.7	7.2						20.38			
10	Transect	205' dnwd	2	209		12.7	21.1	10.2						20.43			
10	Transect	1415' dnwd	3a	157		44.9	23.5	16.1						20.22			
10	Transect	1415' dnwd	3b	162		43.5	24.3	15.5						20.22			
10	Transect	1265' dnwd	4	142		78.1	10.9	10.2						20.29			
10	Transect	1265' dnwd	5	805		73.2	8.4	11.3						20.26			
10	Transect	upwind	6	82.9		3.9	42.6	8.3						20.15			

PROJECT 6 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retentio Time (hours)
7.6			N/A								
7.6			N/A								
7.4			N/A								
7.4			N/A								
7.5			N/A								
7.5			N/A								
7.3			N/A								

January-March 1989
Flux Chamber

PROJECT 7

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
5	F/C	Control	1	230.25	7270	39400	30100	7590	55	515	1010	190					
5	F/C	Control	2	59.55	2730	10300	6370	1680	110	880	1620	310					
5	F/C	Control	3	71.03	2760	14800	10400	2640	98	780	1410	270					
5	F/C	Control	4	111.75	9000	17300	6530	1700	15	250	730	130					
5	F/C	Control	5	25.35	910	4910	4220	1080	39	290	670	130					
5	F/C	Control	6	8.1	400	1340	830	250	13	190	440	110					
5	F/C	Control	7	3.94	290	830	590	180	24	390	510	130					
5	F/C	Control	8	0.89	0	340	0	0	0	56	202	35					
5	F/C	Control	9	0.6	0	260	0	0	0	220	630	120					
5	F/C	Mixed Pile	10	855	30100	112000	48200	16900	91.75	617.5	1067.5	213.75					
5	F/C	Mixed Pile	11	202.5	7970	31400	21800	6130	91.75	617.5	1067.5	213.75					
5	F/C	Mixed Pile	12	301.5	12000	38600	21600	5560	33	360	830	150					
5	F/C	Mixed Pile	13	81	2810	14400	13900	3280	88	660	1260	250					
5	F/C	Mixed Pile	14	534	26400	101000	58200	15100	88	660	1260	250					
5	F/C	Mixed Pile	15	106.5	4230	20500	13900	3610	79	590	1070	210					
5	F/C	Mixed Pile	16	55.8	2370	9410	6210	1730	22.5	280	710	125					
5	F/C	Mixed Pile	17	922.5	34800	130000	69000	17500	22.5	280	710	125					
5	F/C	Mixed Pile	18	152.25	7010	25900	14600	3870	8.2	210	640	110					
5	F/C	Mixed Pile	19	72.68	2710	12600	13100	3300	15	200	530	97					
5	F/C	Mixed Pile	20	123	4140	25400	21300	5620	15	200	530	97					
5	F/C	Mixed Pile	21	9.08	0	2270	3030	740	4	87	333	59					
5	F/C	Mixed Pile	22	9	270	900	1700	460	0	0.55	25.1	4.3					
5	F/C	Mixed Pile	23	3.29	0	90	370	90	0	0	4.11	0.62					
5	F/C	Vent Pile	24	168.75	7640	33700	22500	5570	111.67	953.33	1790	346.67					
5	F/C	Vent Pile	25	62.48	1450	14500	12600	3110	110	850	1590	300					
5	F/C	Vent Pile	26	41.4	940	8000	8580	2270	78	670	1250	240					
5	F/C	Vent Pile	27	7.37	390	2040	1750	440	65	770	1730	330					
5	F/C	Vent Pile	28	13.65	0	2130	3500	790	11	270	610	110					
5	F/C	Vent Pile	29	1.02	0	440	0	0	3.8	150	364	87					
5	F/C	Vent Pile	30	0.15	0	80	0	0	0	51	182	38					
5	F/C	Vent Pile	31	0.14	0	0	0	0	0	36	253	40					
5	F/C	Vent Pile	32	0.06	0	0	0	0	0	72	342	54					

PROJECT 7 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		
		5	8	3.06	0.91	loamy sand			10		

PROJECT 8

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m3)					SAMPLE PT. SOURCE CONC. (ug/g or mg/L)					TEMPERATURES (C)			
				TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk	Surface
10	Transect	run 4	1			52200000	66000000								9.8		

PROJECT 8 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
2.4			N/A								

PROJECT 9

April 1988
Flux Chamber

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
6	F/C	GP 2	1	943	2.41	50.2	44.6	29.9	5714	449.88	134.44	128.4	72.66				
6	F/C	4	2	2130		125	119	94.6	5714	449.88	134.44	128.4	72.66				
6	F/C	4	3	1310	1.75	80.8	74	67.5	5714	449.88	134.44	128.4	72.66				
6	F/C	5	4	1960	4.72	116	132	83.6	5714	449.88	134.44	128.4	72.66				
6	F/C	7	5a	4970	4.5	325	328	224	5714	449.88	134.44	128.4	72.66				
6	F/C	7d	5b	5570	5.79	367	375	269	5714	449.88	134.44	128.4	72.66				
6	F/C	7	6	5080		297	289	228	5714	449.88	134.44	128.4	72.66				
6	F/C	9	7	994	0	65	54	42	5714	449.88	134.44	128.4	72.66				
6	F/C	8	8	4025	0	68.6	52	45.5	5714	449.88	134.44	128.4	72.66				
6	F/C	2	9	1900	11.3	88.2	81	67.6	5714	449.88	134.44	128.4	72.66				
6	F/C	6	10	2622	0	150.8	146.4	111.6	5714	449.88	134.44	128.4	72.66				
6	F/C	3	11	2300	6.35	117	113	88.6	5714	449.88	134.44	128.4	72.66				
6	F/C	4	12	2160	0	138	125	108	5714	449.88	134.44	128.4	72.66				
6	F/C	10	13	3930	1.45	354	201	317	5714	449.88	134.44	128.4	72.66				
6	F/C	2	14a	1190	15.1	82.1	35.9	73.1	5714	449.88	134.44	128.4	72.66				
6	F/C	2d	14b	1235	14.3	90.9	43.4	74.1	5714	449.88	134.44	128.4	72.66				
6	F/C	2	15	1930	13.9	103	94.1	75.1	5714	449.88	134.44	128.4	72.66				
6	F/C	14	16	606	0	39.9	32.8	26.7	5714	449.88	134.44	128.4	72.66				
6	F/C	12	17	1190	0	96.4	48.8	80.1	5714	449.88	134.44	128.4	72.66				
6	F/C	13	18	882	1.58	49.9	44.3	34.5	5714	449.88	134.44	128.4	72.66				
6	F/C	13	19	1017	0	55.8	48	40.2	5714	449.88	134.44	128.4	72.66				

PROJECT 9 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		25.9	1052.09	5155.24	4.9						10
		31.8	1052.09	5155.24	4.9						10
		31.8	1052.09	5155.24	4.9						10
		31.8	1052.09	5155.24	4.9						10
		55.4	1052.09	5155.24	4.9						10
		55.4	1052.09	5155.24	4.9						10
		55.4	1052.09	5155.24	4.9						10
		37.7	1052.09	5155.24	4.9						10
		18.2	1052.09	5155.24	4.9						10
		57.3	1052.09	5155.24	4.9						10
		37.7	1052.09	5155.24	4.9						10
		55.4	1052.09	5155.24	4.9						10
		29.8	1052.09	5155.24	4.9						10
		30.8	1052.09	5155.24	4.9						10
		30.8	1052.09	5155.24	4.9						10
		30.8	1052.09	5155.24	4.9						10
		30.8	1052.09	5155.24	4.9						10
		25.9	1052.09	5155.24	4.9						10
		18.2	1052.09	5155.24	4.9						10
		35.7	1052.09	5155.24	4.9						10
		35.7	1052.09	5155.24	4.9						10

PROJECT 10

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min)					SAMPLE PT. SOURCE CONC. (ug/g or ng/L)					TEMPERATURES (C)			
				TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk	Surface
1	Model					449	364	293			1	1	1	20		20	

PROJECT 10 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
7.6			21100	25320	1.2		1				

September 1986
Flux Chamber

PROJECT 11

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
6	F/C	tank	1	138.28		65.96	34.66	12.69									

PROJECT 11 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
			160.7								

Novenber 1985
Flux Chanber

PROJECT 13

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/a2-min.) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ag/L) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	TEMPERATURES (C) Anb.Air	F/C Air	Bulk	Surface
1	F/C	Grid A	1	2783.33					101								
1	F/C	Grid B	2	5266.67					61.8								
1	F/C	Grid E	3	3950					71.55								
1	F/C	Grid F	4	3250					52.55								
1	F/C	Grid A	5	19166.67	6541.67	3569.44	234.72	0	101	20.2	2.45	0.0035					
1	F/C	Grid B	6	8055.56	4645.83	1993.06	3.33	0	61.8	14.2	1.875	0.02675					
1	F/C	Grid E	7	3715.28	2680.56	590.97	18.82	250	71.55	14.05	2.29	0.03815	0				
1	F/C	Grid F	8	6423.61	4805.56	777.78	20.14	0	52.55	13.25	2.045	0.07265					
1	F/C	SW Corner	9	944.44	526.39	186.81	25.62	0	89.9	23.35	4.49	0.00715					

Sample points 1 - 4 and 5 - 8 represent the same sampling events. Sample points 1 through 4 were analyzed by on-site GC and sample points 5 through 9 were analyzed by off-site GC.

PROJECT 13 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	3749.9								
		5	3749.9								
		5	3749.9								
		5	3749.9								
		5	3749.9								
		5	3749.9								
		5	3749.9								
		5	3749.9								
		5	3749.9								

PROJECT 14

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
1	F/C	Test Tank	1	7710					88					32	31	20	20
1	F/C	Test Tank	2	9050					88					30	30	21	21
1	F/C	Test Tank	3	7520					88					27	27	18	19
1	F/C	Test Tank	4	8240					88					30	29	21	21
1	F/C	Test Tank	5	8240					88					30	30	20	21
1	F/C	Test Tank	6	8250					88					28	28	22	23
1	F/C	Test Tank	7	14800					88					28	24	21	21
1	F/C	Test Tank	8	9690					88					32	31	23	24
1	F/C	Test Tank	9	12000					88					23	30	23	24
1	F/C	Test Tank	10	8670					88					32	32	23	24
1	F/C	Test Tank	11	8670					88					32	32	23	24
1	F/C	Test Tank	12	8880					88					28	26	21	22
1	F/C	Test Tank	13	4500					88					30	30	22	24
1	F/C	Test Tank	14	13200					88					28	26	21	23
1	F/C	Test Tank	15	7530					88					32	31	23	24
1	F/C	Test Tank	16	10800					88					31	29	23	24
1	F/C	Test Tank	17	9380					88					32	31	23	24
1	F/C	Test Tank	18	13200					88					32	32	23	25
1	F/C	Test Tank	19	14000					88					26	26	21	22
1	F/C	Test Tank	20	19400					88					26	24	23	23
1	F/C	Test Tank	21	18300					88					24	24	23	23
1	F/C	Test Tank	22	14000					88					25	24	23	23
1	F/C	Test Tank	23	18800					88						24	23	23
1	F/C	Test Tank	24	14200					88					25	24	23	23
1	F/C	Test Tank	25	10100					88					22	22	20	20
1	F/C	Test Tank	26	72200					88					23	23	21	20
1	F/C	Test Tank	27	88500					88					24	24	21	21
1	F/C	Test Tank	28	94100					88					24	25	21	21
1	F/C	Test Tank	29	76800					88					23	24	21	21
1	F/C	Test Tank	30	76100					88					22	23	21	20

PROJECT 14 (continued)

MET & PROCESS VARIABLES												
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
2.5		5	2.3		0.46						
2.4		5	2.3		0.46						
2.3		5	2.3		0.46						
2.7		5	2.3		0.46						
2.5		5	2.3		0.46						
2		5	2.3		0.46						
1.7		5	2.3		0.46						
2.1		5	2.3		0.46						
2.6		5	2.3		0.46						
2.1		5	2.3		0.46						
2.1		5	2.3		0.46						
2.1		5	2.3		0.46						
2.2		5	2.3		0.46						
1.7		1.4	2.3		0.46						
2.1		4.8	2.3		0.46						
2.6		4.8	2.3		0.46						
2.1		4.8	2.3		0.46						
2.1		9.8	2.3		0.46						
2.1		15	2.3		0.46						
2		21.2	2.3		0.46						
1.8		5	2.3		0.46						
1.9		5	2.3		0.46						
2		5	2.3		0.46						
2		5	2.3		0.46						
1.9		5	2.3		0.46						
1.4		5	2.3		0.46						
1.7		5	2.3		0.46						
1.5		5	2.3		0.46						
1.7		5	2.3		0.46						
1.5		5	2.3		0.46						

PROJECT 15

April - September 1985

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4
5	F/C	Cell 1	1			62200					104.2		
5	F/C	Cell 1	2a			10700					104.2		
5	F/C	Cell 1	2b			88200					104.2		
5	F/C	Cell 1	3			60200					104.2		
5	F/C	Cell 1	4			31500					104.2		
5	F/C	Cell 1	5			20200					104.2		
5	F/C	Cell 1	6			17700					104.2		
5	F/C	Cell 1	7			14200					104.2		
5	F/C	Cell 1	8			31500					104.2		
5	F/C	Cell 1	9a			56100					104.2		
5	F/C	Cell 1	9b			50900					104.2		
5	F/C	Cell 1	10			72200					104.2		
5	F/C	Cell 1	11			76400					104.2		
5	F/C	Cell 2	12			53700					78.4		
5	F/C	Cell 2	13a			37100					78.4		
5	F/C	Cell 2	13b			39700					78.4		
5	F/C	Cell 2	14			42300					78.4		
5	F/C	Cell 2	15			59600					78.4		
5	F/C	Cell 2	16			59500					78.4		
5	F/C	Cell 2	17			41700					78.4		
5	F/C	Cell 2	18a			48000					78.4		
5	F/C	Cell 2	18b			45400					78.4		
5	F/C	Cell 2	19			53000					78.4		
5	F/C	Cell 2	20a			48900					78.4		
5	F/C	Cell 2	20b			43400					78.4		
5	F/C	Cell 2	21			86600					78.4		
5	F/C	Cell 1	22			76900					104.2		
5	F/C	Cell 1	23			99600					104.2		
5	F/C	Cell 1	24			10700					104.2		
5	F/C	Cell 1	25			88500					104.2		
5	F/C	Cell 1	26			57200					104.2		
5	F/C	Cell 1	27			40000					104.2		
5	F/C	Cell 1	28			9350					104.2		
5	F/C	Cell 1	29			18400					104.2		
5	F/C	Cell 1	30			5040					104.2		
5	F/C	Cell 1	31			4160					104.2		
5	F/C	Cell 2	32			38700					78.4		
5	F/C	Cell 2	33			21400					78.4		
5	F/C	Cell 2	34			21700					78.4		
5	F/C	Cell 2	35a			21000					78.4		
5	F/C	Cell 2	35b			16800					78.4		
5	F/C	Cell 2	36			33100					78.4		
5	F/C	Cell 2	37			17000					78.4		
5	F/C	Cell 2	38a			17600					78.4		
5	F/C	Cell 2	38b			19800					78.4		

PROJECT 15 (continued)

TEMPERATURES (C)				MET & PROCESS VARIABLES										
Amb.Air	F/C Air	Bulk	Surface	WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)
18	22	25	18	2.9		4.71	2.3	0.57	0.6	sand	1.45	2.65		
21	27	26	21	2.4		1.77	2.3	0.57	0.6	sand	1.45	2.65		
21	27	6	21	2.4		1.77	2.3	0.57	0.6	sand	1.45	2.65		
24	27	25	26	2.7		6.73	2.3	0.57	0.6	sand	1.45	2.65		
24	25	25	26	2.7		11.99	2.3	0.57	0.6	sand	1.45	2.65		
25	25	25	25	2.7		11.99	2.3	0.57	0.6	sand	1.45	2.65		
24	25	25	25	2.6		16.13	2.3	0.57	0.6	sand	1.45	2.65		
24	25	25	25	2.6		16.13	2.3	0.57	0.6	sand	1.45	2.65		
18	32	25	29	2.9		4.16	2.3	0.57	0.6	sand	1.45	2.65		
23	40	25	37	2.7		0.401	2.3	0.57	0.6	sand	1.45	2.65		
23	40	25	37	2.7		0.401	2.3	0.57	0.6	sand	1.45	2.65		
25	30	26	30	2.7		3.54	2.3	0.57	0.6	sand	1.45	2.65		
25	30	26	30	2.7		3.54	2.3	0.57	0.6	sand	1.45	2.65		
28	33	25.9	30	2.9		4.28	2.3	0.57	0.6	sand	1.3	2.68		
32	40	27	35	2.4		1.35	2.3	0.57	0.6	sand	1.3	2.68		
32	40	27	35	2.4		1.35	2.3	0.57	0.6	sand	1.3	2.68		
34	41	27	38	2.7		5.52	2.3	0.57	0.6	sand	1.3	2.68		
27	29	26	29	2.7		6.32	2.3	0.57	0.6	sand	1.3	2.68		
28	29	26	29	2.7		6.32	2.3	0.57	0.6	sand	1.3	2.68		
28	28	26	28	2.6		20.57	2.3	0.57	0.6	sand	1.3	2.68		
28	28	26	28	2.6		20.57	2.3	0.57	0.6	sand	1.3	2.68		
28	28	26	28	2.6		20.57	2.3	0.57	0.6	sand	1.3	2.68		
28	33	25.9	30	2.9		3.75	2.3	0.57	0.6	sand	1.3	2.68		
33	44	26	40	2.7		0.488	2.3	0.57	0.6	sand	1.3	2.68		
33	44	26	40	2.7		0.488	2.3	0.57	0.6	sand	1.3	2.68		
28	31	26	32	2.7		3.52	2.3	0.57	0.6	sand	1.3	2.68		
15	20	25	17	4.6		4.71	2.3	0.57	0.6	sand	1.45	2.65		
17	23	25.4	20			3.18	2.3	0.57	0.6	sand	1.45	2.65		
16	24	25	20			3.18	2.3	0.57	0.6	sand	1.45	2.65		
19	26	25	22			4.99	2.3	0.57	0.6	sand	1.45	2.65		
19	25	26	22			10.96	2.3	0.57	0.6	sand	1.45	2.65		
19	26	26	24			10.96	2.3	0.57	0.6	sand	1.45	2.65		
20	28	25	22			20	2.3	0.57	0.6	sand	1.45	2.65		
21	28	25	23			26.09	2.3	0.57	0.6	sand	1.45	2.65		
20	33	26	33			26.09	2.3	0.57	0.6	sand	1.45	2.65		
21	32	26	34			12.25	2.3	0.57	0.6	sand	1.45	2.65		
25	30	26	28	4.6		5.94	2.3	0.57	0.6	sand	1.3	2.68		
25	29	26	28	3.8		30	2.3	0.57	0.6	sand	1.3	2.68		
26	30	26	28			26.09	2.3	0.57	0.6	sand	1.3	2.68		
26	30	26.3	29			26.09	2.3	0.57	0.6	sand	1.3	2.68		
17	23	25.4	20			26.09	2.3	0.57	0.6	sand	1.3	2.68		
27	32	26	30			20.57	2.3	0.57	0.6	sand	1.3	2.68		
27	33	26	30			15	2.3	0.57	0.6	sand	1.3	2.68		
28	34	26	31			15	2.3	0.57	0.6	sand	1.3	2.68		
28	34	26	31			15	2.3	0.57	0.6	sand	1.3	2.68		

PROJECT 15 (continued)

PROJECT 913

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4
5	F/C	Cell 2	39			25200					78.4		
5	F/C	Cell 2	40			38100					78.4		
5	F/C	Cell 2	41a			12700					78.4		
5	F/C	Cell 2	41b			10500					78.4		
5	F/C	Cell 2	42			15700					78.4		
5	F/C	Cell 2	43a			14800					78.4		
5	F/C	Cell 2	43b			9650					78.4		
5	F/C	Cell 2	44			54200					78.4		
5	F/C	Cell 2	45			43700					78.4		
5	F/C	Cell 2	46a			60700					78.4		
5	F/C	Cell 2	46b			63300					78.4		
5	F/C	Cell 2	47a			71000					78.4		
5	F/C	Cell 2	47b			62800					78.4		
5	F/C	Cell 2	48a			35200					78.4		
5	F/C	Cell 2	48b			48800					78.4		
5	F/C	Cell 1	49a			97000					104.2		
5	F/C	Cell 1	49b			75800					104.2		
5	F/C	Cell 1	50			40900					104.2		
5	F/C	Cell 1	51a			42600					104.2		
5	F/C	Cell 1	51b			43000					104.2		
5	F/C	Cell 2	52				430000					754.2	
5	F/C	Cell 2	53a				327000					754.2	
5	F/C	Cell 2	53b				324000					754.2	
5	F/C	Cell 2	53c				322000					754.2	
5	F/C	Cell 2	54a				511000					754.2	
5	F/C	Cell 2	54b				496000					754.2	
5	F/C	Cell 2	55a				53800					754.2	
5	F/C	Cell 2	55b				54500					754.2	
5	F/C	Cell 2	56a				601000					754.2	
5	F/C	Cell 2	56b				612000					754.2	
5	F/C	Cell 2	57a				293000					754.2	
5	F/C	Cell 2	57b				328000					754.2	
5	F/C	Cell 2	58a				272000					754.2	
5	F/C	Cell 2	58b				382000					754.2	
5	F/C	Cell 2	59a				104000					754.2	
5	F/C	Cell 2	59b				113000					754.2	
5	F/C	Cell 2	60a				416000					754.2	
5	F/C	Cell 2	60b				424000					754.2	
5	F/C	Cell 2	61a				601000					754.2	
5	F/C	Cell 2	61b				585000					754.2	
5	F/C	Cell 2	62a				592000					754.2	
5	F/C	Cell 2	62b				602000					754.2	
5	F/C	Cell 2	63a				698000					754.2	
5	F/C	Cell 2	63b				64600					754.2	

PROJECT 15 (continued)

TEMPERATURES (C)														
Amb.Air	F/C Air	Bulk	Surface	WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)
27	35	27	32			9.84	2.3	0.57	0.6	sand	1.3	2.68		
30	37	26.5	33			5.94	2.3	0.57	0.6	sand	1.3	2.68		
28	36	26.5	34			0.375	2.3	0.57	0.6	sand	1.3	2.68		
28	36	26.5	34			0.375	2.3	0.57	0.6	sand	1.3	2.68		
28	38	26.1	35			0.375	2.3	0.57	0.6	sand	1.3	2.68		
28	39	26.3	36	3.2		0.375	2.3	0.57	0.6	sand	1.3	2.68		
28	39	26.3	36	3.2		0.375	2.3	0.57	0.6	sand	1.3	2.68		
30	38	26.3	35	3.4		3.13	2.3	0.57	0.6	sand	1.3	2.68		
30	38	26.3	35	3.4		3.13	2.3	0.57	0.6	sand	1.3	2.68		
30	38	26	34	2.7		4.88	2.3	0.57	0.6	sand	1.3	2.68		
30	38	26	34	2.7		4.88	2.3	0.57	0.6	sand	1.3	2.68		
30	37	26	33	2.7		7.07	2.3	0.57	0.6	sand	1.3	2.68		
30	37	26	33	2.7		7.07	2.3	0.57	0.6	sand	1.3	2.68		
29	36	26	34	2.5		8.85	2.3	0.57	0.6	sand	1.3	2.68		
29	36	26	34	2.5		8.85	2.3	0.57	0.6	sand	1.3	2.68		
30	38	29	41	3.4		1.77	2.3	0.57	0.6	sand	1.45	2.65		
30	38	29	41	3.4		1.77	2.3	0.57	0.6	sand	1.45	2.65		
39	56	31	53	2.9		9.84	2.3	0.57	0.6	sand	1.45	2.65		
37	55	30	51	4.8		5.94	2.3	0.57	0.6	sand	1.45	2.65		
37	55	30	51	4.8		5.94	2.3	0.57	0.6	sand	1.45	2.65		
32	45	37	43	3		5	2.3	0.57	0.6	sand	1.3	2.68		
38	60	26	49	2.8		2.5	2.3	0.57	0.6	sand	1.3	2.68		
38	60	26	49	2.8		2.5	2.3	0.57	0.6	sand	1.3	2.68		
38	60	26	49	2.8		2.5	2.3	0.57	0.6	sand	1.3	2.68		
38	56	35	49	3.1		5	2.3	0.57	0.6	sand	1.3	2.68		
38	56	35	49	3.1		5	2.3	0.57	0.6	sand	1.3	2.68		
35	50	36	53	3.2		15.3	2.3	0.57	0.6	sand	1.3	2.68		
35	50	36	53	3.2		15.3	2.3	0.57	0.6	sand	1.3	2.68		
43	58	36	60.8	2.9		5	2.3	0.57	0.6	sand	1.3	2.68		
43	58	36	60.8	2.9		5	2.3	0.57	0.6	sand	1.3	2.68		
41	55	36	48	2.9		9.9	2.3	0.57	0.6	sand	1.3	2.68		
41	55	36	48	2.1		9.9	2.3	0.57	0.6	sand	1.3	2.68		
32	47	37	43	3		4.88	2.3	0.57	0.6	sand	1.3	2.68		
32	47	37	43	3		4.88	2.3	0.57	0.6	sand	1.3	2.68		
37	54	35	50.2	3		9.84	2.3	0.57	0.6	sand	1.3	2.68		
37	54	35	50.2	3		9.84	2.3	0.57	0.6	sand	1.3	2.68		
34	61	36	58.8	2.8		4.88	2.3	0.57	0.6	sand	1.3	2.68		
34	61	36	58.8	2.8		4.88	2.3	0.57	0.6	sand	1.3	2.68		
38	63	35	66.3	3.1		2.4	2.3	0.57	0.6	sand	1.3	2.68		
38	63	35	66.3	3.1		2.4	2.3	0.57	0.6	sand	1.3	2.68		
42	61	36	59.1	3.2		4.88	2.3	0.57	0.6	sand	1.3	2.68		
42	61	36	59.1	3.2		4.88	2.3	0.57	0.6	sand	1.3	2.68		
42	52	36	56.2	2.9		15	2.3	0.57	0.6	sand	1.3	2.68		
42	52	36	56.2	2.9		15	2.3	0.57	0.6	sand	1.3	2.68		

PROJECT 15 (continued)

PROJECT #15

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4
5	F/C	Cell 1	64			1117000					104.2		
5	F/C	Cell 1	65a			187000					104.2		
5	F/C	Cell 1	65b			168000					104.2		
5	F/C	Cell 1	66a			149000					104.2		
5	F/C	Cell 1	66b			168000					104.2		
5	F/C	Cell 1	67a			142000					104.2		
5	F/C	Cell 1	67b			126000					104.2		
5	F/C	Cell 1	68a			181000					104.2		
5	F/C	Cell 1	68b			179000					104.2		
5	F/C	Cell 1	69a			176000					104.2		
5	F/C	Cell 1	69b			165000					104.2		
5	F/C	Cell 1	70a			232000					104.2		
5	F/C	Cell 1	70b			223000					104.2		
5	F/C	Cell 2	71				268000					754.2	
5	F/C	Cell 2	72a				32300					754.2	
5	F/C	Cell 2	72b				26700					754.2	
5	F/C	Cell 2	73a				318000					754.2	
5	F/C	Cell 2	73b				327000					754.2	
5	F/C	Cell 2	74a				519000					754.2	
5	F/C	Cell 2	74b				350000					754.2	
5	F/C	Cell 2	74c				350000					754.2	
5	F/C	Cell 2	75a				337000					754.2	
5	F/C	Cell 2	75b				386000					754.2	
5	F/C	Cell 2	76				14800					754.2	
5	F/C	Cell 2	77a				392000					754.2	
5	F/C	Cell 2	77b				382000					754.2	
5	F/C	Cell 1	78a			37400					104.2		
5	F/C	Cell 1	78b			37200					104.2		
5	F/C	Cell 1	79a			47000					104.2		
5	F/C	Cell 1	79b			42300					104.2		
5	F/C	Cell 1	80a			50600					104.2		
5	F/C	Cell 1	80b			50300					104.2		
5	F/C	Cell 1	81a			49700					104.2		
5	F/C	Cell 1	81b			54900					104.2		
5	F/C	Cell 1	82a			45500					104.2		
5	F/C	Cell 1	82b			46200					104.2		
5	F/C	Cell 1	83a			48800					104.2		
5	F/C	Cell 1	83b			50400					104.2		

PROJECT 15 (continued)

TEMPERATURES (C)				MET & PROCESS VARIABLES										
Amb.Air	F/C Air	Bulk	Surface	WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific R Gravity (g/cm3)
24	23	30	25	1.2		5	2.3	0.57	0.6	sand	1.45	2.65		
25	28	30	29	1.1		2.5	2.3	0.57	0.6	sand	1.45	2.65		
25	28	30	29	1.1		2.5	2.3	0.57	0.6	sand	1.45	2.65		
26	28	30	29	1.8		5	2.3	0.57	0.6	sand	1.45	2.65		
26	28	30	29	1.8		5	2.3	0.57	0.6	sand	1.45	2.65		
26	30	30	15	1.8		15.3	2.3	0.57	0.6	sand	1.45	2.65		
26	30	30	15	1.8		15.3	2.3	0.57	0.6	sand	1.45	2.65		
27	29	33	12.4	2		5	2.3	0.57	0.6	sand	1.45	2.65		
27	29	33	12.4	2		5	2.3	0.57	0.6	sand	1.45	2.65		
27	29	33	31	2.2		9.9	2.3	0.57	0.6	sand	1.45	2.65		
27	29	33	31	2.2		9.9	2.3	0.57	0.6	sand	1.45	2.65		
26	28	33	31	2.2		5	2.3	0.57	0.6	sand	1.45	2.65		
26	28	33	31	2.2		5	2.3	0.57	0.6	sand	1.45	2.65		
24	24	29	24	1.2		4.88	2.3	0.57	0.6	sand	1.3	2.68		
24	25	29	25	1.2		9.84	2.3	0.57	0.6	sand	1.3	2.68		
24	25	29	25	1.2		9.84	2.3	0.57	0.6	sand	1.3	2.68		
25	29	29	27.05	1.1		4.88	2.3	0.57	0.6	sand	1.3	2.68		
25	29	29	27.05	1.1		4.88	2.3	0.57	0.6	sand	1.3	2.68		
27	31	29	30	2		2.2	2.3	0.57	0.6	sand	1.3	2.68		
27	31	29	30	2		2.2	2.3	0.57	0.6	sand	1.3	2.68		
27	31	29	30	2		2.2	2.3	0.57	0.6	sand	1.3	2.68		
27	32	29	31.8	2		4.88	2.3	0.57	0.6	sand	1.3	2.68		
27	32	29	31.8	2		4.88	2.3	0.57	0.6	sand	1.3	2.68		
27	30	29	30	2.2		12.5	2.3	0.57	0.6	sand	1.3	2.68		
26	30	29	30	2.2		4.88	2.3	0.57	0.6	sand	1.3	2.68		
26	30	29	30	2.2		4.88	2.3	0.57	0.6	sand	1.3	2.68		
23	24	25	23	3		5	2.3	0.57	0.6	sand	1.45	2.65		
23	24	25	23	3		5	2.3	0.57	0.6	sand	1.45	2.65		
26	29	25	26	4.1		5	2.3	0.57	0.6	sand	1.45	2.65		
26	29	25	26	4.1		5	2.3	0.57	0.6	sand	1.45	2.65		
26	29	25	27	4.2		5	2.3	0.57	0.6	sand	1.45	2.65		
26	29	25	27	4.2		5	2.3	0.57	0.6	sand	1.45	2.65		
27	31	25	29	4.1		5	2.3	0.57	0.6	sand	1.45	2.65		
27	31	25	29	4.1		5	2.3	0.57	0.6	sand	1.45	2.65		
28	35	25.9	31	3.4		5	2.3	0.57	0.6	sand	1.45	2.65		
28	35	25.9	31	3.4		5	2.3	0.57	0.6	sand	1.45	2.65		
29	34	25	32	3.1		5	2.3	0.57	0.6	sand	1.45	2.65		
29	34	25	32	3.1		5	2.3	0.57	0.6	sand	1.45	2.65		

PROJECT 16

October-November 1984
Flux Chamber

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4
12 ↓	F/C	A	1	112.8		1.35	1.43	3.1	5976.2	97.8	138.5	200.1	71.7
	F/C	A	2	14946		1439.1	914.55	591.14	5976.2	97.8	138.5	200.1	71.7
	F/C	A	3	8538		531.1	344.99	354.55	5976.2	97.8	138.5	200.1	71.7
	F/C	A	4	1348.2		69.41	46.69	55.78	5976.2	97.8	138.5	200.1	71.7
	F/C	A	5	1954.8		127.28	95.28	98.91	5976.2	97.8	138.5	200.1	71.7
	F/C	A	6	2889		165.97	195.11	170.14	5976.2	97.8	138.5	200.1	71.7
	F/C	A	7	8787.6		403.78	395.69	327.18	5976.2	97.8	138.5	200.1	71.7
	F/C	A	8	2004		46.02	82.15	71.49	5976.2	97.8	138.5	200.1	71.7
	F/C	A	9	2779.8		96.16	97.72	82.3	5976.2	97.8	138.5	200.1	71.7
	F/C	A	10	997.8		14.57	31.42	20.27	5976.2	97.8	138.5	200.1	71.7
	F/C	A	11	898.8		3.4	5.23	4.27	5976.2	97.8	138.5	200.1	71.7
	F/C	A	12	482.4		4.67	5.48	6.67	5976.2	97.8	138.5	200.1	71.7
	F/C	A	13	2943.6		34.34	45.41	56.02	5976.2	97.8	138.5	200.1	71.7
	F/C	A	14	384.6		10.66	12.06	16.46	5976.2	97.8	138.5	200.1	71.7
	F/C	A	15	811.2		9.85	16.85	21.69	5976.2	97.8	138.5	200.1	71.7
	F/C	A	16	1311		19.8	34.17	32.66	5976.2	97.8	138.5	200.1	71.7
	F/C	A	17	4267.8		52.54	94.05	98.08	5976.2	97.8	138.5	200.1	71.7
	F/C	A	18	153.6		1.04	8.87	0.96	5976.2	97.8	138.5	200.1	71.7
	F/C	A	19	435		2.28	5.63	5.3	5976.2	97.8	138.5	200.1	71.7
	F/C	A	20	74.4		0.96	1.5	0.88	5976.2	97.8	138.5	200.1	71.7
	F/C	A	21	740.4		5.69	11.9	16.46	5976.2	97.8	138.5	200.1	71.7
	F/C	A	22	149.4		2.09	3.29	2.3	5976.2	97.8	138.5	200.1	71.7
	F/C	A	23	384		3.7	5.85	8.01	5976.2	97.8	138.5	200.1	71.7
	F/C	A	24	178.2		1.8	3.62	1.97	5976.2	97.8	138.5	200.1	71.7
	F/C	A	25	627.6		6.81	12.25	19.26	5976.2	97.8	138.5	200.1	71.7
	F/C	B	26	107.4		0.17	0.32	1.13					
	F/C	B	27	69.6									
	F/C	B	28	1482									
	F/C	B	29	603									
	F/C	B	30	245.4									
	F/C	B	31	306.6									
	F/C	B	32	245.4									
	F/C	B	33	595.8		5.95	5.5	6.3					
	F/C	B	34	490.8									

PROJECT 16 (continued)

TEMPERATURES (C)				MET & PROCESS VARIABLES										
Amb.Air	F/C Air	Bulk	Surface	WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Ret T (h
30	36.5		29.75			5	421	90.5		Clay					
31.1	33		28.4			5	421	90.5		Clay	1.01	2.29	5.73		
31.1	33		28.4			5	421	90.5		Clay	1.01	2.29	5.73		
23.2	21.5		24.1			5	421	90.5		Clay	0.8	2.3	6.7		
23.2	21.5		24.1			5	421	90.5		Clay	0.8	2.3	6.7		
31.9	37.1		22.9			5	421	90.5		Clay	1.3	2.65	10.53		
31.9	37.1		22.9			5	421	90.5		Clay	1.3	2.65	10.53		
30.3	35		29			5	421	90.5		Clay	1.09	2.44	6.07		
30.3	35		29			5	421	90.5		Clay	1.09	2.44	6.07		
26.3	20.6		25.4			5	421	90.5		Clay	1.39	2.53	7.34		
26.3	20.6		25.4			5	421	90.5		Clay	1.39	2.53	7.34		
						5	421	90.5		Clay					
						5	421	90.5		Clay					
						5	421	90.5		Clay					
						5	421	90.5		Clay					
30.6	35.5		30.6			5	421	90.5		Clay					
30.6	35.5		30.6			5	421	90.5		Clay					
27	32.1		26.8			5	421	90.5		Clay					
27	32.1		26.8			5	421	90.5		Clay					
28.5	31.9		24			5	421	90.5		Clay					
28.5	31.9		24			3	421	90.5		Clay					
25.5	35		30.3			3	421	90.5		Clay					
25.5	35		30.3			5	421	90.5		Clay					
20.1	27.1		19.9			5	421	90.5		Clay					
20.1	27.1		19.9			5	421	90.5		Clay					
30	36.5		29.75			5	421								
				7		5	421			Clay					
						5	421			Clay					
						5	421			Clay					
						5	421			Clay					
						5	421			Clay					
						5	421			Clay					
31.9	37.1		22.9			5	421			Clay					
						5	421			Clay					

PROJECT 16 (continued)

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4
12	F/C	B	35	531.6		3.5	5.19	1.93					
↓	F/C	B	36	162.6		1.12	1.97	1.14					
	F/C	B	37	367.8									
	F/C	B	38	163.8									
	F/C	B	39	600.6		7.63	12.58	7.45					
	F/C	B	40	122.4									
	F/C	B	41	348									
	F/C	B	42	79.2		2.14	1.98	1.22					
	F/C	B	43	155.4		0.71	1.75	1.07					
	F/C	B	44	73.2		0.88	1.59	0.88					
	F/C	B	45	83.4		0.74	1.58	0.46					
	F/C	B	46	85.8									
	F/C	B	47	71.4									
	F/C	B	48	265.2		1.9	4.12	3.43					
	F/C	C	49	117				2.43					
	F/C	C	50	10554		888.57	576.34	397.88					
	F/C	C	51	3165		298.93	171.22	165.61					
	F/C	C	52	828		50.21	35.73	32.06					
	F/C	C	53	1591.2		100.52	67.67	65.17					
	F/C	C	54	7174.8		752.73	658.02	520.63					
	F/C	C	55	17705.4		1316.3	887.51	834.91					
	F/C	C	56	4273.8		448.93	383.19	328.7					
	F/C	C	57	4042.8		229.78	164.05	182.86					
	F/C	C	58	743.4		16.01	24.04	22.82					
	F/C	C	59	907.8		5.12	9.41	8.32					
	F/C	C	60	604.8		16.53	26.56	2.87					
	F/C	C	61	5477.4		184.39	173.48	192.44					
	F/C	C	62	723.6		21.61	19.67	29.15					
	F/C	C	63	1317.6		24.53	35.75	36.3					
	F/C	C	64	778.8		14.01	23.65	21.23					
	F/C	C	65	3560.4		117.25	144.85	112.13					
	F/C	C	66	175.8		1.51	3.32	1.97					
	F/C	C	67	345.6		3.97	7.13	5.86					
	F/C	C	68	236.4		2.3	4.35	3.49					
	F/C	C	69	969.6		13.97	23.92	20.78					
	F/C	C	70	688.8		11.21	22.91	18.68					
	F/C	C	71	427.8		6.85	12.04	16.01					
	F/C	C	72	243.6		2.86	4.31	3.34					
	F/C	C	73	972.6		13.7	22.16	23.24					
12	T-H Model Tilled		1	5244.6		213.1	170.3		1036.9		40.5	36.6	
12	M/O Till		2	4033.2		214.8	99.5		1036.9		40.5	36.6	

PROJECT 16 (continued)

TEMPERATURES (C)				MET & PROCESS VARIABLES										
Amb.Air	F/C Air	Bulk	Surface	WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Re
30.3	35		29			5	421			Clay					
26.3	20.6		25.4			5	421			Clay					
						5	421			Clay					
						5	421			Clay					
						5	421			Clay					
						5	421			Clay					
						5	421			Clay					
30.6	35.5		30.6			5	421			Clay					
27	32.1		26.8			5	421			Clay					
28.5	31.9		24			5	421			Clay					
25.5	35		30.3			3	421			Clay					
						3	421			Clay					
						5	421			Clay					
20.1	27.1		19.9			5	421			Clay					
						5	421	90.5		Clay					
28.6	31.3		28.3			5	421	90.5		Clay	1.29	2.53	9.16		
28.6	31.3		28.3			5	421	90.5		Clay	1.29	2.53	9.16		
23	23.3		22.1			5	421	90.5		Clay	1.43	2.64	8.19		
23	23.3		22.1			5	421	90.5		Clay	1.43	2.64	8.19		
						5	421	90.5		Clay	1.4	2.57	5.84		
						5	421	90.5		Clay	1.4	2.57	5.84		
26.9	23.4		28.6			5	421	90.5		Clay	1.35	2.54	6.99		
26.9	23.4		28.6			5	421	90.5		Clay	1.35	2.54	6.99		
						5	421	90.5		Clay	1.45	2.55	8.44		
						5	421	90.5		Clay	1.45	2.55	8.44		
31.8	35.1		26.4			5	421	90.5		Clay					
31.8	35.1		26.4			5	421	90.5		Clay					
21	23		21.8			5	421	90.5		Clay					
21	23		21.8			5	421	90.5		Clay					
						5	421	90.5		Clay					
				7		5	421	90.5		Clay					
25.3	32.3		29			5	421	90.5		Clay					
25.3	32.3		29			5	421	90.5		Clay					
24.8	31.3		27.5			5	421	90.5		Clay					
24.8	31.3		27.5			5	421	90.5		Clay					
28.3	37.7		30.7			3	421	90.5		Clay					
28.3	37.7		30.7			3	421	90.5		Clay					
22.1	29.8		23.8			5	421	90.5		Clay					
22.1	29.8		23.8			5	421	90.5		Clay					

PROJECT 17

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
4	F/C	100'-60'	1	1.8	4.7	0.14											
4	F/C	100-61	2	44	1.8	0.14											
4	F/C	200'-30	3	120	470	0.14											
4	F/C	200'-90'	4	7.3	4.3	0.14											
4	F/C	Bkgd	5	7.3	7.2	0.14											
4	F/C	800'-90'	6	7.3	7.2	0.14											
4	F/C	500'-60'	7	7.3	3.6	0.14											
4	F/C	650-10'	8	29	3.6	0.14											
4	F/C	100'-60'	9	7.3	11	5.6											
4	DH F/C	S1-5'	1	38		7200				2.1							
4	DH F/C	S1-7.5'	2	6800		3800				0.14							
4	DH F/C	S1-15'	3	68													
4	DH F/C	S2-2.5'	4	38		5400				2.9							
4	DH F/C	S2-4.5'	5	38		1900				0.3							
4	DH F/C	S2-15'	6	95		1700				0.4							
4	DH F/C	S2-20'	7	38000													
4	DH F/C	S2-20'	8	380		2900											
4	DH F/C	S3-5'	9	76		160				0.8							
4	DH F/C	S3-10'	10			460				1.7							
4	DH F/C	S3-15'	11	7600		460				0.1							
4	DH F/C	S3-20'	12	230		160				0.1							
4	DH F/C	S3-30'	13	600		160											
4	DH F/C	N1-5'	14	380		160				2.5							
4	DH F/C	N1-10'	15	880		1700											
4	DH F/C	N1-15'	16	200		760											
4	DH F/C	N1-25'	17	290		760											
4	DH F/C	N2-10'	18	5600		1300				1.2							
4	DH F/C	N2-20'	19	260		680				1							

PROJECT 17 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.13	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						
			0.00318	8496	1.8						

PROJECT 18

June-September 1984
F/C

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) THC	benzene	SO2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) THC	benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
4	F/C	Pit6, E11	1	1800		43				0.165	2.3	0.865	0.48	20.7			
4	F/C	Pit4, F8	2	1200		22				0.42	6.33	4.19	2.99	20.7			
4	F/C	Pit3,B6	3	261		144					1.7		0.5	20.7			
4	F/C	grid G2	4	174		14											
4	F/C	Pit2, F3	5	131		22											
4	F/C	Pit5, C7	6	871		43				0.55	17.6	12.5	5	20.7			
4	F/C	trnch1,p6	7	2900		255000				0.165	2.3	0.865	0.48				
4	F/C	trnch2,p4	8	9700		13060				0.42	6.33	4.19	2.99				
4	F/C	trnch3,p7	9	62800		24700											
4	F/C	Bore B-1	10	79333		0					0.016	0.012					
4	F/C	Bore B-2	11	27240		3000				0.55	17.6	12.5	5	20.7			
4	F/C	Bore B-3	12	18260		1036											
4	F/C	Bore B-4	13	1242.5		0					0.2	0.16					
4	F/C	Bore B-5	14	42800		560740				0.15	3	1	0.51	22.2			
4	F/C	Bore B-6	15	471280		1890								20.7			

PROJECT 18 (continued)

MET & PROCESS VARIABLES											
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
8.4				8257.7							
8.4				4870.5							
8.4											
8.4				3991.2							
				5665.7							
8.4				3991.2							
				4251.2							
				1292.2							
7.7				8257.7							
8.4				328.8							

June 1984
Flux Chamber

PROJECT 19

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.)					SAMPLE PT. SOURCE CONC. (ug/g or ug/L)					TEMPERATURES (C)			
				TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	TNMHC	Benzene	Capnd 2	Capnd 3	Capnd 4	Amb.Air	F/C Air	Bulk	Surface
3	F/C	B-6	1	45.1	0.15	8.3	4.3	2.1	1480								35
3	F/C	B-9	2	845.6	0.98	157.9	38.9	32.8	24700	13.7	2550	0.68					30
3	F/C	B-9	3	3986.7	0.52	1941.4	768.3	567.9	18800								30
1	F/C	P-19	1	4739.7	2.9	1495	743.1	190.5	293	0.474	28.2	17	2.15				30
1	F/C	P-19	2	17718.4	11.4	2823.9	2048.7	606.8	262	0.1	23.9	5.22	8.47				30

PROJECT 19 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	2369				1.62		6.9	2.53	
		5	1486.4				1.4		19.8	2.38	
		5	1038.2				1.4		19.8	2.38	
		5	6270.8	11082.6							
		5	6270.8	11082.6							

April 1984
Flux Chamber

PROJECT 20

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
2	F/C	01	1a	4.18													
2	F/C	01	1b	2.2													
2	F/C	04	2	1.1													
2	F/C	06	3	4.84													
2	F/C	11	4	1.1													
2	F/C	13	5	2.86													
2	F/C	15	6	2.2													
2	F/C	17	7a	1.1													
2	F/C	17	7b	1.76													
2	F/C	background	8	1.1													
2	F/C	Well #3	9	0.44													
2	F/C	06-6" below	10	1.1													
2	F/C	11-6" below	11	1.1													
2	F/C	13-6" below	12	1.1													
2	F/C	15-6" below	13	1.1													
2	F/C	17-6" below	14a	1.32													
2	F/C	17-6" below	14b	6.39													
2	F/C	3b	15	340													
2	F/C	1A	16	328.1											31		
2	F/C	2A	17	403											44		
2	F/C	2B	18	3220													
2	F/C	3A	19	153.3											40.5		
2	F/C	4A	20	381											38		
2	F/C	5A	21	462.4											32		
2	F/C	6A	22	486.7											36.5		
2	F/C	6B	23	1800													
2	F/C	4A	24	731.1											40		
2	F/C	4B	25	365.6											40		
2	F/C	4B	26	226.8											38		
2	F/C	5B	27	370											30		
2	F/C	6B	28	286.3											35		

PROJECT 20 (continued)

MET & PROCESS VARIABLES											
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
	7	3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	4180.5								
		3.2	13.4								
		3.2	2								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	8.9								
		3.2	8.9								
		3.2	8.9								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	8.9								
		3.2	8.9								

PROJECT 20 (continued)

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
2	F/C	1B	29	2960													
2	F/C	1B	30	579.2											42		
2	F/C	2B	31	166											30		
2	F/C	3B	32	339.1											40		
2	F/C	4B	33	1610													
2	F/C	4A	34	563.7											43		
2	F/C	5B	35	792.8											49		
2	F/C	6B	36	493.3											39		
2	F/C	1B	37	733.3											37		
2	F/C	2B	38	581.4											41		
2	F/C	3B	39	308.3											37		
2	F/C	5A	40	6100													
2	F/C	5A	41	548.3											45		
2	F/C	5A	42	546.1											46		
2	F/C	5B	43	317.1											46		
2	F/C	5B	44	205											42		
2	F/C	6A	45	495.5											47		
2	F/C	6A	46	228.8											50		
2	F/C	6B	47	400.8											48		
2	F/C	6B	48	550.5											50		
2	F/C	6B	49	162.6											45		
2	F/C	4A	50	1558													
2	F/C	4A	51	731.1											40		
2	F/C	4A	52	311.3											42		
2	F/C	4B	53	365.6											40		
2	F/C	4B	54	151.1											42		
2	F/C	1A	55	920.5											32		
2	F/C	1A	56	715.7											42		
2	F/C	2A	57	306.1											30		
2	F/C	2A	58	433.8											44		
2	F/C	3A	59	409.6											40.5		
2	F/C	3A	60	356.7											54		
2	F/C	4B	61	290.7											41		
2	F/C	4B	62	444.8											53		
2	F/C	5A	63	856.6											41		
2	F/C	5A	64	1090.1											46		
2	F/C	6A	65	691.5											39		
2	F/C	6A	66	832.4											47		

PROJECT 20 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		3.2	2								
		3.2	2								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	8.9								
		3.2	8.9								
		3.2	2								
		3.2	13.4								
		3.2	13.4								
		3.2	8.9								
		3.2	8.9								
		1.1	8.9								
		3.2	8.9								
		1.1	8.9								
		3.2	8.9								
		1.1	8.9								
		3.2	8.9								
		3.2	8.9								
		1.1	8.9								
		3.2	13.4								
		3.2	13.4								
		1.1	13.4								
		3.2	13.4								
		1.1	13.4								
		3.2	2								
		3.2	2								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	13.4								
		3.2	8.9								
		3.2	8.9								
		3.2	8.9								
		3.2	8.9								

January 1984
Flux Chamber

PROJECT 21

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
2	F/C	Grid 04	1	0.9					7.2					8.33			8.33
2	F/C	Grid 06	2	~~12.2~~ 215					7.2					19.44			10.56
2	F/C	Grid 06	3	~~0.8~~					7.2					19.44			10.56
2	F/C	Grid 08	4	~~6.9~~ 38					7.2					5.56			6.11
2	F/C	Grid 08	5	~~1.7~~ 19					7.2					8.89			7.78
2	F/C	Grid 08	6	~~0.9~~ <10					7.2					11.11			8.33
2	F/C	Grid 14	7	~~0.9~~ <10					7.2					7.22			8.33
2	F/C	Grid 15	8	~~0.9~~ <10					7.2					10.56			11.11
2	F/C	Grid 19	9	~~0.9~~ <10					8.26					10.56			10
2	F/C	Grid 23	10	~~0.9~~ <10					8.26					10			8.89
2	F/C	Grid 25	11	~~15.7~~ 88					8.26					11.67			9.44

PROJECT 21 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retent Time (hour
		2.6	29.73			sand					
		2.6	29.73			pine needles/decay					
		2.6	29.73			pine needles/decay					
		5	27.73			moist sand					
		4.86	27.73			sand					
		2.6	27.73			moist sand					
		2.6	27.73			moist sandy soil					
		2.6	27.73			moist sand					
		2.6	27.73			pine needles					
		2.6	27.73			sand					
		2.6	27.73			moist sand					

PROJECT 23

November 1983

Flux Chamber, Conc.-Profile, Transect

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
12	F/C	2 hr.	1	7248	278.7	636.3	452.8	263.8	13.1	0.05	0.15	0.55	0.26	21.6			25.6
12	F/C	50 hr.	2	607.7	8.49	24.5	29.7	20.5	13.1	0.05	0.15	0.55	0.26	21.6			25.6
12	F/C	70 hr.	3	1123	11.3	40.4	42.3	36.2	13.1	0.05	0.15	0.55	0.26	21.6			25.6
3	F/C	Point 2	4	7.69	0.92	0.146	0.043	0.041	2.07	0.028	0.065	0.003	0.045	24.8			27
3	F/C	Point 10	5	11	0.36	0.097	0.032	0.024	2.07	0.028	0.065	0.003	0.045	24.8			27
12	C/P	Run 1	1	12510	136.7	604.9	430.05	277.26	13.1	0.05	0.15	0.26	0.21	18.9			
12	C/P	Run 2	2	9628	116.2	456.1	352.05	221.76	13.1	0.05	0.15	0.26	0.21	18.9			
12	C/P	Run 3	3	10010	58.1	270.5	286.35	255.9	13.1	0.05	0.15	0.26	0.21	18.9			
3	Transect	R1/Meth1	1					73.6					0.51	24.6			
3	Transect	R2/Meth1	2					42.9					0.51	24.6			
3	Transect	R3/Meth1	3			14.78	277.8	63			0.015	0.625	0.51	24.6			
3	Transect	R1/Meth2	4					74.3					0.51	24.6			
3	Transect	R2/Meth2	5					30.14					0.51	24.6			
3	Transect	R3/Meth2	6			9.16	58.64	49.42			0.015	0.625	0.51				
12	TH Model	2 hr.	1	474000	5820	2752.5	1267.5	994.3	40129.51	323.78	494.51	105.96	97.53				
12	TH Model	25 hr.	2	134000	1650	780	358.5	282.8									
12	TH Model	26.5 hr.	3	130000	1600	757.5	348	275.1									
12	TH Model	44 hr.	4	101000	1240	588	270	213.4									
12	TH Model	50 hr.	5	94800	1160	551.3	253.5	199.7									
12	TH Model	70 hr.	6	80100	983	466.5	214.5	168.8									

PROJECT 23(continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		4.86	557.4				1.43		30.77		
		4.86	557.4				1.43		30.77		
		4.86	557.4				1.43		30.77		
		4.86	185.8								
		4.86	185.8								
9.8			557.4				1.43		30.77		
7			557.4				1.43		30.77		
6.5			557.4				1.43		30.77		
15.17	7		185.8								
15.17			185.8								
15.17			185.8								
15.17			185.8								
15.17			185.8								
			520	101.92	0.196						
			520	101.92	0.196						
			520	101.92	0.196						
			520	101.92	0.196						
			520	101.92	0.196						
			520	101.92	0.196						

PROJECT 24

October 1983
Flux Chamber, Vent Sampling

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
9	Vent	Vent 2	1	244		4								18.3			
9	Vent	StndPipe1	2	409000		40700	7100							18.3			

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
3	F/C	act.landf	1	47		11.3	7.63							22.8			18

PROJECT 24 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
			20235								
			20235								

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
15		2.734	3900	410640	8.5						

September-October 1983
Transect, Flux Chamber, Vent Sampling

PROJECT 25

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
1	F/C	Lag 1/Pt 2	1	91.5		9.94	3.06		0.413		0.0196	0.0154		22			22
1	F/C	Lag 1/Pt 8	2	145		14.1	4.86		0.381		0.021	0.0096		22			22
1	F/C	Lag 2/Pt 1	3	600		67.2			168.08		23.4			22.5			23
1	F/C	Lag 2/Pt 7	4	546		67.3			49.99		31.04			22.5			23
1	F/C	Pond 6/R2	5	26.4		4.64	9.05	1.78	0.166		0.029	0.012	0.046	21.8			22.5
1	F/C	Pond 6/R3	6	37.2		4.29	10.68	2.3	0.186		0.03	0.05	0.011	21.8			22.5
3	F/C	Org. Cell	7	154		55.1	17.8		105.3		24.83	4.53		16.2		15.8	15
3	F/C	Org. Cell	8	1260		8.44	1.36		231		14.03	77.6		16.2		15.8	15
3	F/C	Flam Cell	9	54.33		7.19	2.84		29.08		2.38	15.83		18.6		16.3	18
1	C/P	Pond 6/R1	1	1.82		0.798	0.177	0.256	0.159		0.026	0.01	0.072	21			22.3
1	C/P	Pond 6/R2	2	20.98		0.875	0.471	0.269	0.166		0.029	0.012	0.046	21			22.3
1	C/P	Pond 6/R3	3	5.58		0.806	0.202	0.242	0.186		0.03	0.011	0.05	21			22.3
3	Transect	Flam/Meth1	1	43.6		16.88	3.01	4.913						17.5		16.3	
3	Transect	Flam/Meth2	2	62.2		23.57	4.93	1.28						17.5		16.3	
3	Transect	Tox/Meth1	3	107		15.6	43.8	7.14						12.2			
3	Transect	Tox/Meth2	4	147		21.4	63.3	9.6						12.2			
1	TPH Model	Lag 1/Pt 2	1	354		5.66	14.5		0.413		0.0196	0.0154					
1	TPH Model	Lag 1/Pt 4	2	488		9.85	11.9		0.615		0.042	0.033					
1	TPH Model	Lag 1/Pt 8	3	327		7.35	3.84		0.381		0.0213	0.0096					
1	T Model	Lag 2/Pt 1	1	170000		20800	13200		168.08		23.4	11.89		25.5			23
1	T Model	Lag 2/Pt 7	2	50800		27600	758		49.99		31.04	0.679		25.5			23
1	T Model	Pond 6/R1	1	52.2		8.33	25.85	2.84	0.159		0.026	0.072	0.01	21.8			22.5
1	T Model	Pond 6/R2	2	52.4		8.91	15.9	3.21	0.166		0.029	0.046	0.012	21.8			22.5
1	T Model	Pond 6/R3	3	2.68		0.43	0.82	0.16	0.186		0.03	0.05	0.011	21.8			22.5
11	Vent	Drums	1	33400		6190	346										
9	Vent	land7,v2A	2	1460		836	81.1							15		12.5	16
9	Vent	land7,v3-2	3	13		7.96	1.95							15		12.5	16

PROJECT 25 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		2.734	1133.4								
		2.734	1133.4								
		2.734	1040.5								
		2.734	1040.5								
		3.54	4905								
		3.54	4905								
		2.734	4180.5								
		2.734	4180.5								
		2.734	2090.3								
5.7			4905								
5.7			4905								
5.7			4905								
6.6											
6.6											
7.3											
7.3											
			1040.5								
			1040.5								
			4905								
			4905								
			4905								
			25919	370471.6							
			25919	370471.6							

October 1983

Transect

PROJECT 26

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
1	Transect	R1/Meth 1	1	551		181	126		1.4		0.092	0.15	0.84	13.9			
1	Transect	R1/Meth 2	2	621		213	157.7		1.4		0.092	0.15	0.84	13.9			
1	Transect	R2/Meth 1	3	417				226	1.4		0.092	0.15	0.84	13.9			
1	Transect	R2/Meth 2	4	601				306	1.4		0.092	0.15	0.84	13.9			
1	TPH Model	R1 Model	1	1965		1002	171.4	125	1.4		0.092	0.15	0.84	13.9			
1	TPH Model	R2 Model	2	1965		994	168.8	125	1.4		0.092	0.15	0.84	13.9			

PROJECT 26 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
4.7			451.5	481.7	1.07						
4.7			451.5	481.7	1.07						
3.5			451.5	481.7	1.07						
3.5			451.5	481.7	1.07						
4.7			451.5	481.7	1.07						
3.5			451.5	481.7	1.07						

PROJECT 27

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
4	F/C	R5C15	1			3.6			20000								20
4	F/C	R5C15	2	27		13			20000								26
4	F/C	R5C15	3	160		71			20000								26
4	F/C	R5C15	4	150		41			20000								26
4	F/C	Bkgd	5	97		1.9			350								17
4	F/C	Upper-W	6	110		64			1200								33
4	F/C	Upper-W	7	110		86			1200								33
4	F/C	Upper-W	8	120		140			1200								33
4	F/C	Upper-W	9	240		150			1200								32
4	F/C	R5C18	10	20		31			20000								20
4	F/C	R5C15	11	38		7.9			20000								21
4	F/C	R5C15	12	45		15			20000								24
4	F/C	R5C15	13						20000								25
4	F/C	R5C15	14	46		16			20000								24
4	F/C	R5C15	15	46		12			20000								23
4	F/C	Upper-E	16	23		31											20
4	F/C	Upper-W	17	160		620			1200								23
4	F/C	R5C06	18	2400		2300											33
4	F/C	R4C06	19	22		0.31			11000								42
4	F/C	LC #1	20	70		9			19000								33
4	F/C	LC #2	21	25		0.31			870								31

PROJECT 27 (continued)

MET & PROCESS VARIABLES										
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
	75		182.1			sand	1.6		6.7		
	25		182.1			sand	1.6		6.7		
	75		182.1			sand	1.6		6.7		
	75		182.1			sand	1.6		6.7		
	25		182.1			sand	1.4		3		
	0		182.1			sand	1.4		3		
	0		182.1			sand	1.4		3		
	0		182.1			sand	1.4		3		
	0		182.1			sand	1.4		3		
	75		182.1			sand	1.6		6.7		
	100		182.1			sand	1.6		6.7		
	10		182.1			sand	1.6		6.7		
	10		182.1			sand	1.6		6.7		
	50		182.1			sand	1.6		6.7		
	90		182.1			sand	1.6		6.7		
	90		182.1								
	25		182.1			sand	1.4		3		
	25		182.1								
	0		182.1			sand	1.4		12		2.6
	0		0.13								
	0		0.13								

PROJECT 28

April 1989
Flux Chamber

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/a2-min.)					SAMPLE PT. SOURCE CONC. (ug/g or ag/L)					TEMPERATURES (C)			
				TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk	Surface
1	F/C	Zone 1	1	0.0634	0.006	406	0	0.0033	0.101	0.0096	340	0	0.0053	31	30.7		31.8
1	F/C	Zone 2	2	0.2816	0.0083	627	0.0027	0.0043	0.459	0.0135	340	0.0044	0.007	35	36		30.7
1	F/C	Zone 3	3	0.2427	0.0181	417	0.0229	0.0158	0.398	0.0297	260	0.0376	0.0259	37	37.6		34

PROJECT 28 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
5	50	5	128992								
5	80	5	128992								
8	10	5	257984								

PROJECT 29

November 1988
Flux Chamber

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or ng/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
1	F/C	Pond A	1			240	120	25			1.2	0.23	0.065				
4	F/C	North	2		0.63	410	32	30		0.006	0.68	0.25	0.17				
4	F/C	South	3		36	5000	55	50		0.36	8.6	0.77	0.43				
4	F/C	South	4		36	4600	170	140		0.36	7.9	1.4	0.68				
1	Impinger	Pond A	1			130	2.95	2.05									
4	Impinger	North	2			1590	5.9	4.1									
4	Impinger	South	3			46200	295	205									
4	Impinger	South	4			89300	735	510									
1	Puf Plug	Pond A	1			0	0.4	0									
4	Puf Plug	North	2			16	4.2	2.2									
4	Puf Plug	South	3			32.1	13.5	3.2									
4	Puf Plug	South	4			32.1	11.2	0									

PROJECT 29 (continued)

MET & PROCESS VARIABLES											
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	17168	18925							
		5				Dry					
		5				Moist					
		5				Moist					
			17168	18925							
			17168	18925							

PROJECT 33

December 1989
Flux Chamber

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
4	F/C	PGE53	1	1.8													
4	F/C	PGE52	2	4.1	0.31		0.067										
4	F/C	PGE51	3	4000		86	45										
4	F/C	PGE56	4	.6.3	0.16	0.1	0.1	0.12									
4	F/C	PGE55	5	2000		39	25	0.81									
4	F/C	PGE60	6	2500	1.3	32	29	1									
4	F/C	PGE57	7	2400	3.2	25	12	0.27									
4	F/C	PGE59	8	9.2	0.036		0.26	0.14									

PROJECT 33 (continued)

MET & PROCESS VARIABLES											
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5									
		5									
		5									
		5									
		5									
		5									
		5									
		5									

PROJECT 36

July 1989
Flux Chamber

(ug/min)

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES FROM SEAMS AND PORTS					SAMPLE PT. SOURCE CONC. (ug/g or mg/L)					TEMPERATURES (C)			
				TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk	Surface
10	F/C	Seam #3	1	930.11													
10	F/C	Seam #6	2	16.54													
10	F/C	Seam #11	3	81.64													
10	F/C	Seam #18	4	103.35													
10	F/C	Seam #27	5	16.54													
10	F/C	Seam #28J	6	19635.79													
10	F/C	Seam #29	7	1550.19													
10	F/C	Seam #45	8	10.33													
10	F/C	Seam #50	9	1550.19													
10	F/C	Seam #53	10	29.97													
10	F/C	Seam #58	11	56840.44													
10	F/C	Port #2	12	21420													
10	F/C	Port #3	13														
10	F/C	Port # 6	14	15435													
10	F/C	#6 uncon.	15	31500													
10	F/C	#6 modif.	16	5985													

PROJECT 36 (continued)

MET & PROCESS VARIABLES											
WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
	7	5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								

PROJECT 37

July-August 1989
Flux Chamber

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
6	F/C	inlet o/w	1	5086.11													
6	F/C	inlet/oil	2	3729.82													
6	F/C	inlet/aqu	3	1831													
6	F/C	non-mixed	4	1356.3													
6	F/C	non-mixed	5	745.96													

PROJECT 37 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	23.23								
		5	92.9								
		5	283.35								
		5	9865.98								
		5	185.8								

November 1987
Flux Chamber

PROJECT 45

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4
13	F/C	R3,crush1	1	60600				
13	F/C	R3,convey	2	51600				
13	F/C	R3,crsh#2	3	103000				
13	F/C	vnt stor 1	4	15070				
13	F/C	vnt stor 4	5	3014				
13	F/C	non-vent 1	6	1830				
13	F/C	non-vent 4	7	1292				
13	F/C	surf.rip 1	8	70900				
13	F/C	surf.rip 2	9	51800				
13	F/C	surf.rip 4	10	90900				
13	F/C	surf.rip 4	11	64800				
13	F/C	site #2	12	308				
13	F/C	site #3	13	360				
13	F/C	site #1	14	2190				
13	F/C	site#4	15	328				
13	F/C	site #5	16	153				
13	F/C	site #6	17	29.4				
13	F/C	site #13	18	19300				
13	F/C	site #7	19	268				
13	F/C	site #9	20	3670				
13	F/C	site #8	21	15.8				
13	F/C	site #10	22	823				
13	F/C	site #11	23	341				
13	F/C	fresh rip	24	75500				
13	F/C	#16,25 min	25	8620				
13	F/C	#16,4.61hr	26	5580				
13	F/C	#4,56 min	27	25100				
13	F/C	#5,30 min	28	22500				
13	F/C	#5,5.1hr	29	7150				
13	F/C	#5,2 days	30	2440				
13	F/C	#5,@5 days	31	1440				
13	F/C	fresh rip	32	13300				
13	F/C	aft. 25min	33	7730				
13	F/C	1 hr 32min	34	5300				
13	F/C	2 hr 6 min	35	4610				
13	F/C	2 hr 40min	36	6920				
13	F/C	3 hr 6 min	37	5420				
13	F/C	3 hr 38min	38	6110				
13	F/C	4 hr 37min	39	2880				
13	F/C	site7,pit2	40	305				
13	F/C	site9,pit2	41	2670				
13	F/C	site8,pit2	42	1830				
13	F/C	site10pit2	43	671				
13	F/C	site11pit1	44	483				
13	F/C	site #12	45	159				

PROJECT 45 (continued)

SAMPLE PT. SOURCE CONC. (ug/g or mg/L)					TEMPERATURES (C)			
TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk	Surface
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
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					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
					10.4			
6263					12	13		13
					15	17		17
					17	20		18
					15	16		16
					12	15		16
					12	15		16
					15	15		15
					12	14		16
					20	33		31
					15	19		15
					22	33		21
					15	20		20
					13	14		14
					11	9		8

PROJECT 45 (Continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
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1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									
1.7		5									

PROJECT 45A

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4
13	F/C	rip aft1d	1	1.83E+10				
13	F/C	rip aft1d	2	2.20E+10				
13	F/C	rip aft1d	3	2.39E+10				
13	F/C	rip aft1d	4	2.61E+10				
13	F/C	rip aft1d	5	2.82E+10				
13	F/C	rip aft1d	6	2.92E+10				
13	F/C	rip aft1d	7	3.02E+10				
13	F/C	rip aft1d	8	3.15E+10				
13	F/C	rip aft1d	9	3.29E+10				
13	F/C	rip aft1d	10	3.39E+10				
13	F/C	rip aft1d	11	3.55E+10				
13	F/C	rip aft1d	12	3.73E+10				
13	F/C	rip aft1d	13	3.82E+10				
13	F/C	rip aft1d	14	3.97E+10				
13	F/C	rip aft1d	15	4.07E+10				
13	F/C	rip aft1d	16	4.14E+10				
13	F/C	rip aft1d	17	4.27E+10				
13	F/C	rip aft1d	18	4.43E+10				
13	F/C	rip aft1d	1	1.83E+10				
13	F/C	rip aft1d	2	1.88E+10				
13	F/C	rip aft1d	3	3.09E+10				
13	F/C	rip aft1d	4	3.29E+10				
13	F/C	rip aft1d	5	3.45E+10				
13	F/C	rip aft1d	6	3.66E+10				
13	F/C	rip aft1d	7	3.82E+10				
13	F/C	rip aft1d	8	4.00E+10				
13	F/C	rip aft1d	9	4.10E+10				
13	F/C	rip aft1d	10	4.18E+10				
13	F/C	rip aft1d	11	4.24E+10				
13	F/C	rip aft1d	12	4.37E+10				
13	F/C	rip aft1d	13	4.46E+10				
13	F/C	scrape2d	1	1.78E+09				
13	F/C	scrape2d	2	2.29E+09				
13	F/C	scrape2d	3	2.67E+09				
13	F/C	scrape2d	4	2.93E+09				
13	F/C	scrape2d	5	3.18E+09				
13	F/C	scrape2d	6	3.44E+09				
13	F/C	scrape2d	7	3.56E+09				
13	F/C	scrape2d	8	3.56E+09				
13	F/C	scrape2d	9	3.69E+09				
13	F/C	scrape2d	10	4.01E+09				
13	F/C	scrape2d	11	4.33E+09				
13	F/C	scrape2d	12	4.75E+09				
13	F/C	scrape2d	13	5.09E+09				
13	F/C	scrape2d	14	5.34E+09				

PROJECT 45A(continued)

SAMPLE PT. SOURCE CONC. (ug/g or mg/L)					TEMPERATURES (C)			
TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk	Surface
					11			
					17			
					20			
					22			
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			
					38			
								10
								11
								13
								14
								15
								16
								17
								18
								19
								20
								21
								22
								23
					10			
					16			
					18			
					21			
					22			
					23			
					24			
					25			
					26			
					27			
					28			
					29			
					30			
					31			

PROJECT 45A (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)

PROJECT 45A (continued)

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4
13	F/C	scrape2d	15	6.11E+09				
13	F/C	scrape2d	16	6.62E+09				
13	F/C	scrape2d	17	7.12E+09				
13	F/C	scrape2d	18	7.63E+09				
13	F/C	scrape2d	19	7.63E+09				
13	F/C	scrape2d	20	8.02E+09				
13	F/C	scrape2d	21	8.78E+09				
13	F/C	scrape2d	22	9.29E+09				
13	F/C	scrape2d	23	1.01E+10				
13	F/C	scrape2d	24	1.07E+10				
13	F/C	scrape2d	25	1.12E+10				
13	F/C	scrape2d	26	1.23E+10				
13	F/C	scrape2d	27	1.31E+10				
13	F/C	scrape2d	28	1.33E+10				
13	F/C	scrape2d	1	1.78E+09				
13	F/C	scrape2d	2	3.18E+09				
13	F/C	scrape2d	3	3.52E+09				
13	F/C	scrape2d	4	3.73E+09				
13	F/C	scrape2d	5	4.33E+09				
13	F/C	scrape2d	6	4.84E+09				
13	F/C	scrape2d	7	5.09E+09				
13	F/C	scrape2d	8	5.34E+09				
13	F/C	scrape2d	9	6.11E+09				
13	F/C	scrape2d	10	6.62E+09				
13	F/C	scrape2d	11	7.38E+09				
13	F/C	scrape2d	12	7.83E+09				
13	F/C	scrape2d	13	8.21E+09				
13	F/C	scrape2d	14	8.86E+09				
13	F/C	scrape2d	15	9.92E+09				
13	F/C	scrape2d	16	1.07E+10				
13	F/C	scrape2d	17	1.12E+10				
13	F/C	scrape2d	18	1.23E+10				
13	F/C	scrape2d	19	1.33E+10				
13	F/C	scrape2d	20	1.35E+10				

PROJECT 45A (continued)

SAMPLE PT. SOURCE CONC. (ug/g or mg/L)					TEMPERATURES (C)			
TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	Amb.Air	F/C Air	Bulk	Surface
					33			
					34			
					36			
					37			
					38			
					39			
					41			
					42			
					43			
					44			
					45			
					46			
					47			
					48			
								10
								16
								17
								18
								19
								20
								21
								22
								23
								24
								25
								26
								27
								28
								29
								30
								31
								32
								33
								34

PROJECT 45A (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)

August 1989
Flux Chamber

PROJECT 49

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (ug/g or mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
3	F/C	gas/43aft	1	169283.5										35.6	46		34
3	F/C	gas/101	2	113354.6										34.4	45.7		34
3	F/C	gas/233	3	18715.5										28.4	27.9		29.3
3	F/C	gas/1290	4	6237										29.3	45.3		25
3	F/C	dies/60	5	84188.2										31.9	48.3		28.1
3	F/C	dies/115	6	98884.8										33.5	48		30.3
3	F/C	dies/400	7	30989.9										31.4	35.8		34.7
3	F/C	dies/1450	8	11648.4										28.5	53.9		30.6
3	F/C	gas/79	9	11417.1										36.3	45.8		34.3
3	F/C	gas/112	10	44756.7										36.9	45.9		40.6
3	F/C	gas/317	11	21065.2										28.9	27.5		27.9
3	F/C	gas/1380	12	4227.1										31.8	50.5		38.4
3	F/C	gas/35	13	25719.1										28.9	41.7		25.4
3	F/C	gas/120	14	657.7										29.6	42.5		26.6
3	F/C	gas/328	15	1594.8										26.8	26.5		28
3	F/C	sump/58	16	120612.2										32	38.1		24.3
3	F/C	sump/116	17	74390.4										29.5	32.4		26.3
3	F/C	sump/169	18	48807.4										25.4	23.5		25.1
3	F/C	sump/1291	19	41186.9										30.3	46.3		30.9
3	F/C	crud/51	20	18221.1										33.3	44.7		32.2
3	F/C	crud/117	21	18107.7										33.7	47.8		32.4
3	F/C	crud/292	22	16275.2										31.6	40.1		33.2
3	F/C	crud/1380	23	7076.2										32.5	55.9		30.4
3	F/C	gas/64	24	110633										33.4	42.6		30.4
3	F/C	gas/133	25	82827.4										33.4	40.8		32
3	F/C	gas/283	26	12659.9										25.2	24.2		29.1
3	F/C	gas/1337	27	2509.3										33.6	53.1		31.3
3	F/C	gas/82	28	1106.8										32.4	48.7		27.3
3	F/C	gas/161	29	836.4										32	51.3		31.7
3	F/C	gas/233	30	519.8										34.8	48.1		29.2

PROJECT 49 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
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		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								
		5	0.13								

PROJECT 51

March 1982
Concentration-Profile

Source Type	Sample Tech.	Sample Area	Sample Point	EMISSION RATES (ug/m2-min.) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	SAMPLE PT. SOURCE CONC. (mg/L) TNMHC	Benzene	Cmpnd 2	Cmpnd 3	Cmpnd 4	TEMPERATURES (C) Amb.Air	F/C Air	Bulk	Surface
6	C-P	FB	1		5.92	11.27	1.74	7.56	0.0074	0.0014	0.0009	0.0006	0.0004	22.6		25	
7	C-P	TB	2	—	0.38	6.26	0.65		0.0659	0.0024	0.0068	0.0024		23.8		21.7	
6	T/H Model	FB	1		20.8												
7	T/H Model	TB	2		3.94												

PROJECT 51 (continued)

MET & PROCESS VARIABLES

WS (mph)	Clouds (%)	Sweep Air (L/min)	Emitting Area (m2)	Waste Volume (m3)	Soil/Pond Depth (m)	Soil Type	Bulk Density (g/cm3)	Particle Density (g/cm3)	Soil Moisture (Wt.%)	Specific Gravity (g/cm3)	Retention Time (hours)
9.2			64752	236992.3	3.66						
16.7			113316	172240.3	1.52						