

**AMBIENT AIR QUALITY IMPACT AND WORKER EXPOSURE ASSESSMENT
CABOT CARBON LIFT STATION**

**Eastern Portion of the Cabot Carbon/ Koppers Superfund Site
Gainesville, Florida**

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TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
	ABSTRACT	1
1	INTRODUCTION	2
2	SAMPLING PROGRAM.....	4
2.1	Worker Exposure Assessment.....	4
2.2	Ambient Air Quality Impact Assessment	5
2.2.1	EPA Method TO-8 for the Determination of Phenol and Methylphenols (Cresols) in Ambient Air (Ref. 2)	6
2.2.2	EPA Method TO-13A for the Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air (Ref. 3)	7
2.2.3	EPA Method TO-14 for the Determination of Volatile Organic Compounds (VOCs) in Ambient Air (Ref. 4).....	8
3	QUALITY ASSURANCE AND QUALITY CONTROL.....	9
3.1	Field Blanks	9
3.2	Calibration.....	9
4	SAMPLING RESULTS	11
4.1	Worker Exposure Assessment.....	11
4.2	Ambient Air Quality Impact Assessment	11
5	CONCLUSIONS.....	13
5.1	Worker Exposure Assessment.....	13
5.2	Ambient Air Quality Impact Assessment	13
5.3	Odor Issue	13
5.4	FDEP Emissions Guidelines	14
	REFERENCES.....	15
	TABLES	16

TABLE OF CONTENTS (Continued)

LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
Table 1	Inside Lift Station Worker Exposure Assessment Results	16
Table 2	OSHA Permissible Exposure Limits and ACGIH Threshold Limit Values	17
Table 3	Ambient Air Quality Results Outside Lift Station	19
Table 4	Ambient Air Quality Results Compared to Ambient VOC Concentrations Reported in US Cities	21
Table 5	Hazardous Air Pollutant Emissions	22

LIST OF APPENDICES

APPENDIX A – Figures

APPENDIX B – NIOSH Analytical Methods

APPENDIX C – Sampling Photographs

APPENDIX D – Analytical Data

ABSTRACT

An indoor and outdoor air sampling and analysis program was undertaken in January 2005 at the Cabot Carbon groundwater lift station associated with the Cabot Carbon/Koppers Superfund Site in Gainesville, Florida (Site). Odors have been noted in the past near the lift station. Consequently, this study was undertaken to assess potential worker exposures inside the lift station and to assess the impact of the lift station operations on ambient air quality. Data gathered from this study was also used to determine emission levels from the lift station for comparison against Florida Department of Environmental Protection emission criteria for active remediation systems.

Only three compounds, ethyl benzene, toluene and naphthalene, were detected in indoor air within the lift station. The concentrations of these three compounds are orders of magnitude below acceptable occupational exposure thresholds. The three lift-station related compounds were also detected in ambient air outside the lift station at concentrations that are well below conservative USEPA risk-based screening levels. Therefore, operation of the lift station is not causing any adverse health effects to the workers or the general public.

Although odors have been noticed in the vicinity of the lift station, the presence of odors does not signify a human health concern. For instance, the presence of phenol (a site-related compound of concern) in the air is perceivable at a concentration of 0.184 mg/m^3 , whereas the OSHA Permissible Exposure Limit for phenol is 19.2 mg/m^3 and the USEPA Risk Based Concentration (RBC) is 1.095 mg/m^3 . Therefore, a compound such as phenol would result in a detectable odor at a concentration that is well below levels that would present a concern.

Total emissions from the lift station were calculated to be approximately 0.08 lbs/day, substantially below FDEP (FDEP) criteria of 5.5 lbs/day for any single Hazardous Air Pollutant (HAP) or 13.7 lbs/day for total HAPs.

SECTION 1

INTRODUCTION

The Cabot Carbon/Koppers NPL Site is located in Gainesville, Alachua County, Florida. The 190-acre Site consists of three sections. An active Koppers wood preservation facility is located on the western half of the site. Cabot Carbon operated a pine tar and charcoal production facility in the southeastern quadrant of the site from 1944 to 1966 on property that has since been redeveloped as a shopping center. The northeastern portion of the site has been developed and automobile dealerships and other small commercial businesses are now present. The western and eastern portions of the Site are two distinct areas. There are major differences in the operational histories, nature and extent of contamination, and investigation and remedial status of the western and eastern portions of the Site. (Appendix A-Figure 1). This remediation system has been in operation since 1995.

Constituents of Concern (COCs) at the Eastern Portion of the Site are well understood as a result of numerous studies that have been performed at the site including the Remedial Investigation and Feasibility Study completed in 1990 (Ref.1). COCs for the Eastern portion of the site are polynuclear aromatic hydrocarbons (PAHs), phenol and gasoline constituents—benzene, toluene, ethyl benzene and xylene. Remedial action for the Eastern portion of the site consists of a 2000 foot long buried groundwater interception trench located along North Main Street that captures contaminated groundwater from the Site. Groundwater captured by the trench flows to a lift station and is pumped to the Gainesville Regional Utility (GRU) wastewater treatment plant under a discharge permit with GRU.

The groundwater interception trench consist of two 8-inch diameter perforated PVC pipes surrounded by aggregate that collects and conveys captured groundwater. The trench is backfilled and covered by a concrete surface drainage swale; therefore, captured groundwater is not exposed to ambient air. The trench piping drains to the sump where collected groundwater is pumped by a lift station to the GRU's Privately Owned Treatment Works (POTW). The sump and lift station pumping equipment is housed within a secured building. Volatile components of the groundwater can volatilize from the sump and lift station into the air in the building due to

turbulence. Many of the compounds present in groundwater have low odor thresholds and there is a noticeable odor in the immediate vicinity of the lift station building. This odor has become more noticeable recently with the encroachment of commercial developments around the lift station building.

The lift station building was replaced in 2005 after it was severely damaged during a hurricane. The new lift station was designed to minimize and control the generation of odors from this operation. The new lift station building has been equipped with continuous running ventilation fans with a capacity to move 400 cubic feet per minute that will provide 12 air changes per hour within the building. This prevents the build-up of odors and also exhausts the vapors away from adjacent automobile dealership parking area.

This Ambient Air Quality and Worker Exposure Assessment was conducted from January 17th through January 20th, 2005 to assure that workers who enter the building for periods of time are protected, and to assess the ambient impact on air quality outside the building. Data generated from this study was further used to verify that emissions from the building are below Florida Department of Environmental Protection (FDER) criteria.

SECTION 2

SAMPLING PROGRAM

2.1 WORKER EXPOSURE ASSESSMENT

The lift station building houses the flow meters and controls for the pumping system and the sump that collects water from the interception trench. Submersible pumps lift the water to the Gainesville Regional Utility (GRU) POTW. Normal operation and maintenance (O&M) activities include bi-weekly visits to record flow meter readings, gauge rainfall amounts, and record pump run times. The exposure time for a worker during these routine visits is approximately 2 to 3 hours. For unusual maintenance activities such as pump replacement or meter repairs, the exposure time for a visit is typically 6-8 hours. There is also a water sampling event every four months that requires a sampling technician to collect a sample of the discharge water in accordance with a GRU discharge permit. This extends the routine visit by approximately one hour. There is only one technician responsible for the O&M activities. Access to the lift station building is restricted by an eight-foot high chain link fence with barbed wire and locked doorway. The O&M technician retains the only key to the lift station building doorway and locked fence gate. Workers allowed access to the lift station building are environmental contractors trained in appropriate health and safety procedures for working at hazardous waste sites.

In order to assess the exposure to workers who maintain the lift station, an air sample was collected from the breathing zone around the collection sump area of the lift station building. The sample was analyzed for the constituents of concern in the groundwater which include polycyclic aromatic hydrocarbons (PAH), select volatile organic compounds (VOC) and phenol.

The air sampling and analytical procedures used to assess worker exposure were performed in accordance with National Institute for Occupational Safety and Health (NIOSH) methods. NIOSH is in the U.S. Department of Health and Human Services and is an agency that provides research, information, and training in the field of occupational safety and health. The Occupational Safety and Health Administration (OSHA) is responsible for developing and enforcing workplace safety and health regulations. OSHA sets permissible exposure limits

(PELs) to protect workers against the health effects of exposure to hazardous substances. PELs are regulatory limits on the amount or concentration of a substance in the air. OSHA PELs are based on an 8-hour time weighted average (TWA) exposure. The levels detected in this assessment area also compared to the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). TLV's are guidelines prepared by the ACGIH to assist in making decisions regarding safe levels of exposure to various hazards found in the workplace. ACGIH is a private not-for-profit, non-governmental corporation whose members are industrial hygienists or other occupational health and safety professionals dedicated to promoting health and safety within the workplace. ACGIH is not a standards setting body. ACGIH publishes TLV's for use making decisions regarding safe levels of exposure to various chemical and physical agents found in the workplace.

The specific sampling and analytical methods chosen to assess the worker exposure were based on the constituents of concern at the site. These methods are the appropriate methods to assess occupational exposure for workers performing operation and maintenance activities at the lift station. The specific methods included the following:

- NIOSH Method 1501 – Hydrocarbons, Aromatic
- NIOSH Method 2546 – Phenol
- NIOSH Method 5506 – Polynuclear Aromatic Hydrocarbons

The air sampling methodology analytical procedures were conducted in strict accordance with the established procedures as described in the NIOSH Manual of Analytical Methods (NMAM, Fourth Edition). Copies of these methods are included in Appendix B.

2.2 AMBIENT AIR QUALITY IMPACT ASSESSMENT

Ambient air samples were collected for three consecutive days (January 18, 19, and 20, 2005). Each day one sample was collected twenty to fifty feet upwind of the lift station building and another twenty to thirty feet downwind of the lift station. Weather station data from the Gainesville Regional Airport was utilized to verify wind direction for proper placement of the upwind and downwind sample locations. Wind rose diagrams for the sampling days indicate very consistent wind direction for the sampling periods. Figures 2, 3, and 4 in Appendix A show

the locations of each sample point and the associated wind rose diagram for each day of sampling. Photographs of the sampling equipment and locations relative to the lift station building in Appendix C.

Two of the three ambient samples were collected over an 8-hour period from 8:00 am to 4:00 pm each day. This 8-hour period was selected to mirror normal business hours, which would be the time of greatest potential public exposure to COC's from the system.. The third sample was collected over a 3-hour period within the same 8-hour window (generally between 10:00 am to 1:00 pm).

The groundwater interceptor trench and lift station operates 24-hours per day on a fairly uniform extraction and pumping rate that varies only due to groundwater volume that is directly related to rainfall amount. During the three day ambient air sampling event, the discharge flow readings from the lift station were consistently recorded at approximately 45 gallons per minute (gpm) versus an average over the entire year of 50 gpm. The 8-hour time period also corresponds to the maximum level of community/commercial activity. Morning and lunch vehicular traffic, commercial and consumer activity from the adjacent automobile dealerships, etc. during the sampling period would also have contributed to non-site related contaminants. The lift station was running normally during the entire sampling effort. The average ambient temperature for all three days of sampling was 55 degrees Fahrenheit.

The sampling methodology analytical procedures were conducted in strict accordance with the established procedures as described in the methods for the determination of organic compounds in ambient air as specified by USEPA in its Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. The specific methods used and details of those methods are presented in the following subsections.

2.2.1 EPA Method TO-8 for the Determination of Phenol and Methylphenols (Cresols) in Ambient Air (Ref. 2)

EPA Method TO-8 was used to collect samples for Phenol analysis. The impingers were connected in series by means of rigid glass connectors. The first impinger contained 15 ml of 0.1 normal NaOH (sodium hydroxide) solution. The second impinger also contained 15 ml of 0.1

normal NaOH. The third impinger contained 300 grams of dry silica gel. All impingers were maintained in an ice bath for the duration of the sample. A control console with a leakless vacuum pump, a calibrated dry gas meter, a calibrated orifice, and inclined manometers was connected to the final impinger via a clean flexible latex sample line to complete the train. Sample glassware was rinsed thoroughly with methanol and oven-dried before use. Sampler flow rates were kept ~500 ml/min with total volumes at 80 L as per Method TO-8. Impinger samples were run for approximately 3 hours during the middle of the 8-hour sample program to avoid exceeding 80 L. The calibrated dry gas meter was used to document the total sample volume.

2.2.2 EPA Method TO-13A for the Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air (Ref. 3)

Samples for semi-volatiles were collected and analyzed according to EPA Method TO-13A. EPA Method TO-13A uses General Metal Works model PS-1 PUF samplers to collect ambient air samples for semi-volatile analysis. The sampler employs a two-stage sampling module. The first stage holds a 102mm micro quartz filter to collect the semi-volatiles bound to particulates. The second stage of the sampling module contains a glass cylinder holding a 1" PUF plug, 1" XAD-2 Resin, and 1" PUF plug in series to collect the gas phase semi-volatiles. The samplers were set to run at approximately 220 lpm (liters per minute) for a total volume of approximately 105 m³ over the 8-hour sampling period. The samplers were mounted at ground level, with sample inlets at four feet above ground level, near breathing height.

The PUF plug adsorbent that was used contained polyether type polyurethane foam similar to the foam used for furniture upholstery. The PUF plug and filter were initially cleaned in a Soxhlet apparatus. Filters and glassware containing the PUF media were cleaned in solvents and vacuum dried. After cleaning, the filters and PUF plugs were wrapped in aluminum foil to protect them from lights and sealed in a plastic bag. After sample collection, the media was shipped to the laboratory cooled (~4°C).

2.2.3 EPA Method TO-14 for the Determination of Volatile Organic Compounds (VOCs) in Ambient Air (Ref. 4)

EPA method TO-14 uses an evacuated chemically treated stainless steel 6-liter Summa® canister. The interior of the spherical canisters is specially polished and treated to prevent it from reacting with the gas collected. This interior finish makes it possible to collect a stable whole-air sample that is shipped to the laboratory for direct analysis without an intermediate medium. The canisters are initially evacuated, and will be equipped with critical orifice flow controllers. The fixed-rate critical orifice flow controllers, along with micron particulate filter was placed on the canister, after measurement of initial canister pressure (normally measured negative 30" Hg using a pressure gauge or about 2 atmospheres). The flow-controllers were pre-set to meter the flow of air into the canister at a relatively constant rate over the course of the 8-hour sampling period to fill approximately two thirds of the canister capacity. The flow controller and the filters were cleaned and supplied by the laboratory, and were dedicated for each sample.

Samples were collected from the breathing zone (3 to 5 feet above ground or floor level). Prior to opening the canisters for sampling, each connection was checked for leaks. At the end of the 8-hour sampling period, the final canister pressure was measured using a vacuum gauge. The target final pressure is between negative 4" and negative 12"Hg (mercury). The whole-air samples were sent directly to the laboratory for analysis by U.S. EPA Method TO-14.

SECTION 3

QUALITY ASSURANCE AND QUALITY CONTROL

Quality Assurance (QA) includes the planned and systematic actions necessary to provide adequate confidence that a measurement or process will satisfy a given requirement for accuracy. Quality Control (QC) is the operational techniques and activities that are used to fulfill requirements for quality. The QC procedures included calibrations and analysis of QC samples (field/trip blanks).

3.1 FIELD BLANKS

QC field blank samples were collected to measure for possible contamination introduced by field sampling procedures, sampling media, sampling equipment, or shipment of the samples. Field blanks were handled in the same manner as actual samples, undergoing the same preparation, installation in the samplers, and cleanup procedures.

One field blank for each pollutant type was collected on the second day of sampling (1/19/05). Each sample media for the field blanks was shipped to the field, prepared and handled as the other samples, and returned to the laboratory without drawing air through the sample media. Results of the field blank samples were non-detect for every constituent analyzed.

3.2 CALIBRATION

The calibration of the PUF samplers is a multi-point calibration of the flow indicator on the PUF sampler. A multi-point calibration is performed because the sampler is not equipped with a mass or volumetric flow controller. The calibration was performed at several flow rates to determine the actual airflow rates corresponding to readings on the flow indicator device (magnetic gauge) attached to the sampler venturi. An adapter plate, NIST-traceable orifice calibration unit, and a manometer were used to measure the pressure drop in inches of water across the calibration orifice. The pressure drop for a calibration orifice corresponds to a specific flow rate. The calibration results were used to determine the flow rate of the PUF sample.

No field flow calibration was necessary for the Summa Canisters. The flow controllers are critical orifices preset by the laboratory based on the sample period needed and the canister volume. The final pressures need only be less than -4" Hg to meet recommended QC guidelines.

Impinger sample volume calculations were determined from the dry gas meter calibration for each impinger sample. Each dry meter was calibrated in the WESTON equipment warehouse before leaving to the field with a National Institute of Standards Traceable Wet Test Meter.

SECTION 4

SAMPLING RESULTS

4.1 WORKER EXPOSURE ASSESSMENT

A summary of the results for samples collected inside the lift station building is presented in Table 1. These samples were collected and analyzed in accordance with NIOSH methods for the worker exposure assessment. The results are compared against OSHA PEL's and ACGIH TLV's. OSHA sets Permissible Exposure Levels (PELs) to protect workers against the health effects of exposure to hazardous substances. The PELs are regulatory limits enforced by OSHA and are time-weighted average concentrations that must not be exceeded during any 8-hour work shift of a 40-hour work week. ACGIH publishes guidelines known as TLV's for use in making decisions regarding safe levels of exposure to various chemical and physical agents found in the workplace. Only three compounds were detected in the air sample collected from inside the lift station building. These are naphthalene at 0.019 ppm, ethyl benzene at 0.172 ppm, and toluene at 0.350 ppm compared to their PEL's of 10 ppm, 100 ppm and 200 ppm, or their TLV's of 10 ppm 100 ppm and 100 ppm, respectively. The three compounds measured in indoor air were detected at levels at least two orders of magnitude less than their respective OSHA PEL's or ACGIH TLV's (Table 2).

4.2 AMBIENT AIR QUALITY IMPACT ASSESSMENT

A summary of the results for ambient air samples collected outside the lift station building is presented in Table 3. These samples were collected and analyzed in accordance with EPA methods for ambient air sampling. Three days of sampling occurred with samples collected both upwind and downwind of the lift station building. One sample, C-SW-011805, the downwind sample collected for PAHs on January 18, was broken in return shipment to the lab and was not analyzed.

Naphthalene, ethyl benzene and toluene, the only compounds detected in the lift station (but are also common urban pollutants) were detected at low concentrations in both the upwind and

downwind samples. Other PAHs and VOCs were detected in ambient air, but since they were not present in the air in the lift station, and since there are many urban sources of chemical emissions in the vicinity of the lift station (car dealership, a heavily trafficked road, *etc.*), it is concluded that those compounds are not due to the operation of the lift station. (Table 4) (Ref. 5)

The concentrations of the three lift station-related compounds detected during the ambient air sampling were compared to the United States Environmental Protection Agency (USEPA) Region 3 risk based concentrations (RBCs) and the USEPA Region 9 preliminary remediation goals (PRGs) to assess whether the levels detected in ambient air are protective of human health.

The concentrations in ambient air were well below both the RBCs and PRGs. The USEPA Region 3 provides a table of Risk-Based Concentrations for chemical screening during baseline risk assessment. (Ref. 6). These tables provide readily available “lookup values” against which data may be screened. USEPA Region 9 Preliminary Remediation Goals (PRGs) are also risk-based screening levels for evaluating and cleaning up contaminated sites (Ref. 7). The Region 9 PRG Table combines current human health toxicity values with standard exposure factors to estimate contaminant concentrations in environmental media (soil, air, and water) that are considered by the USEPA to be health protective of human exposures (including sensitive groups), over a lifetime. The ambient air PRG is applicable to both indoor and outdoors and is based on a residential exposure scenario using standard Superfund exposure assumptions.

Naphthalene was detected at a maximum concentration of 0.413 ug/m^3 , compared to an EPA RBC of 3.3 ug/m^3 and a PRG of 3.1 ug/m^3 . Ethyl benzene was detected at a maximum concentration of 1.5 ug/m^3 compared to an EPA RBC and PRG of 1100 ug/m^3 . Toluene was detected at a maximum concentration of 5.5 ug/m^3 compared to the EPA RBC of 420 ug/m^3 and PRG of 400 ug/m^3 .

Naphthalene, ethyl benzene and toluene are common urban air pollutants and were detected in both upwind and downwind samples. However, given that the maximum concentrations detected in ambient air during this study are insignificant, contribution apportionment between urban and site related sources is not necessary.

Copies of the complete laboratory analytical data packages are included in Appendix D.

SECTION 5

CONCLUSIONS

5.1 WORKER EXPOSURE ASSESSMENT

Only three compounds, naphthalene, ethylbenzene and toluene were detected within the lift station building above laboratory detection limits. The three compounds measured in indoor air were detected at levels at least two order of magnitude less than their respective OSHA PEL's or ACGIH TLV's. Therefore, the indoor air within the lift station poses insignificant health risk to workers. Note that the worker protection levels are indicated as safe for extended working periods; however, the engineers performing operation and maintenance at the Cabot lift station are typically within this environment for short durations only, further increasing the factor of safety for worker protection.

5.2 AMBIENT AIR QUALITY IMPACT ASSESSMENT

The concentrations of the three lift station-related compounds were compared to the United States Environmental Protection Agency (USEPA) Region 3 risk based concentrations (RBCs) and the USEPA Region 9 preliminary remediation goals (PRGs) to assess whether the levels detected in ambient air are protective of human health. The concentrations in ambient air were well below both the RBCs and PRGs. Therefore, the operation of the lift station is not adversely affecting ambient air quality or human health.

5.3 ODOR ISSUE

Although odors have been noticed in the vicinity of the lift station, the presence of odors does not trigger a human health risk. For instance, the presence of phenol (a site-related compound of concern) in the air is perceivable at a concentration of 0.184 mg/m^3 (Ref. 8), whereas the PEL for phenol is 19.2 mg/m^3 and the PRG and RBC for phenol is 1.095 mg/m^3 . Therefore, a compound such as phenol would result in a detectable odor at a concentration that is well below a risk-based threshold.

5.4 FDEP EMISSIONS GUIDELINES

Florida Department of Environmental Protection (FDEP) asked at a January 27, 2005 meeting that emissions from the list station be evaluated and compared to State Brownfield Cleanup requirements. State Brownfield Cleanup Criteria does not require an air permit if total air emissions from all on-site remediation equipment do not exceed 5.5 lbs/day for any single Hazardous Air Pollutant (HAP) or 13.7 lbs/day for total HAPs. *Florida Administrative Code (FAC) Chapter 62-785.700*. A comparison was performed with the assumption that the values for air analyzed inside the building will then be exhausted out of the ventilation fan vent openings at 400 cubic feet per minute (cfm).

As shown in Table 5, ethylbenzene, toluene, and naphthalene were the only compounds detected during the sampling inside the building. All three of these compounds are listed HAPs; however, based on the concentrations found within the building and exhausted at 400 cfm, the total emissions are 0.08 lbs/day, substantially below the 5.5 lbs/day for any single Hazardous Air Pollutant (HAP) or 13.7 lbs/day for total HAPs.

REFERENCES

- Ref. 1 Remedial Investigation/Feasibility Study at the Cabot Carbon/Koppers Site, Gainesville, Florida, Environmental Science and Engineering, Inc., May 9, 1990.
- Ref. 2 Method TO-8 – Method for the Determination of Phenol and Methylphenols (Cresols) in Ambient Air Using High Performance Liquid Chromatography, Revision 1, September 1988, Air Toxic Methods, U.S. Environmental Protection Agency.
- Ref.3 Compendium Method TO-13A – Determination of Polycyclic Aromatic Hydrocarbon (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS), January 1999; Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition; Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, OH 45268.
- Ref.4 Compendium Method TO-14A – Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters With Subsequent Analysis by Gas Chromatography, January 1999; Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition; Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, OH 45268.
- Ref. 5 Shah, Jitendra J., Sylvia A. Edgerton, Michael W. Holdren, and Deborah L. Smith; Inter-Urban Comparison of Ambient Volatile Organic Compound Concentrations in U.S. Cities; Journal of the Air Pollution Control Association, Vol. 39, No. 5, May 1989, p729-732.
- Ref. 6 EPA Region 3 Risk-Based Concentration Table: Technical Background Information, originally developed by Roy L. Smith, Ph.D., Toxicologist, revise 4/16/2003 by Jennifer Hubbard, Toxicologist. United States Environmental Protection Agency, Region 3, 1650 Arch Street, Philadelphia, Pennsylvania 19103
- Ref. 7 EPA Region 9 PRGs 2004 Table. Preliminary Remediation Goals for the Superfund/ RCRA programs. United States Environmental Protection Agency, Region 9, October 2004.
- Ref 8 Verschueren, K. September 2000. "Handbook of environmental data on organic chemicals, Fourth edition." John Wiley & Sons, Inc. (Somerset, NJ)

TABLES

Table 1

Inside Lift Station Worker Exposure Assessment Results

NIOSH Method	Analyte	Result (mg/m ³)	Reporting Limit (mg/m ³)
5506	Acenaphthene	ND	0.00208
	Acenaphthylene	ND	0.00260
	Anthracene	ND	0.000260
	Benzo(a)anthracene	ND	0.000260
	Benzo(a)pyrene	ND	0.000260
	Benzo(b)fluoranthene	ND	0.000521
	Benzo(g,h,i)perylene	ND	0.000521
	Benzo(k)fluoranthene	ND	0.000260
	Chrysene	ND	0.000261
	Dibenzo(a,h)anthracene	ND	0.000521
	Fluoranthene	ND	0.000521
	Fluorene	ND	0.000521
	Indeno(1,2,3-cd)pyrene	ND	0.000260
	Naphthalene	0.0843	0.0010
1501	Benzene	ND	0.365
	Ethylbenzene	0.749	0.365
	Xylene	ND	0.365
	Toluene	1.320	0.365
2546	Phenol	ND	0.194

ND: Not detected above method detection limits.

Table 2

OSHA Permissible Exposure Limits and ACGIH Threshold Limit Values

Parameters	Results		OSHA Permissible Exposure Limits (PELs)						ACGIH Threshold Limit Values (TLVs)			
			Z-1 Limits		Z-2 Limits							
	(mg/m³)	ppm	ppm	mg/m3	8hr TWA	Acceptable Ceiling	Acceptable Maximum Peak		TWA		STEL	
							Conc.	Duration				
Benzene	ND	ND	--	--	10	25	50	10 min	10	31.9	--	--
Ethylbenzene	0.749	0.172	100	434.2	--	--	--	--	100	434.2	125	542.8
Toluene	1.32	0.350	--	--	200	300	500	10 min	100	376.9	150	565.3
o-Xylene	ND	ND	--	--	--	--	--	--	--	--	--	--
Acenaphthene	ND	ND	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	ND	ND	--	--	--	--	--	--	--	--	--	--
Anthracene	ND	ND	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	ND	ND	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	ND	ND	--	--	*	--	--	--	--	--	--	--
Benzo(b)fluoranthene	ND	ND	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	ND	ND	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	ND	ND	--	--	--	--	--	--	--	--	--	--
Chrysene	ND	ND	--	--	*	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	ND	ND	--	--	--	--	--	--	--	--	--	--
Fluoranthene	ND	ND	--	--	--	--	--	--	--	--	--	--
Fluorene	ND	ND	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	ND	ND	--	--	--	--	--	--	--	--	--	--
Naphthalene	0.0843	0.016	10	52.4	--	--	--	--	10	52.4	15	78.6

Table 2 (Continued)

OSHA Permissible Exposure Limits and ACGIH Threshold Limit Values

Parameters	Results		· OSHA Permissible Exposure Limits (PELs)						ACGIH Threshold Limit Values (TLVs)					
			Z-1 Limits		Z-2 Limits									
	(mg/m³)	ppm	ppm	mg/m3	8hr TWA	Acceptable Ceiling	Acceptable Maximum Peak		TWA			STEL		
							Conc.	Duration						
Phenanthrene	ND	ND	--	--	*	--	--	--	--	--	--	--	--	--
Pyrene	ND	ND	--	--	*	--	--	--	--	--	--	--	--	--
Phenol	ND	ND	5	19.2	--	--	--	--	--	5	19.2	--	--	--
"Coal Tar Volatiles"	ND	ND	--	0.2	--	--	--	--	--	--	--	--	--	--
Total Xylenes	ND	ND	100	434.2	--	--	--	--	--	100	434.2	150	651.3	651.3

* Included in "Coal Tar Volatiles."

-- No PEL or TLV's established

1 ppm values for results are calculated using the following formula: $\text{ppm} = (\text{concentration in mg/m}^3)(24.45/(\text{gram molecular weight of substance}))$ where 24.45 is the molar volume of air in Liters at NPT conditions (25°C and 760 torr) (American Conference of Government Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices, 2004 p. 8).

2 When mg/m³ values are listed without ppm values, they are directly from the applicable regulatory table. When mg/m³ values are listed with a corresponding ppm value, they are calculated from the ppm values by the formula below. Note that these values may differ slightly from values commonly listed in published tables, however the published values are listed as approximate (see footnote b to both OSHA PEL and ACGIH TLV tables). $\text{mg/m}^3 = (\text{concentration in ppm})(\text{gram molecular weight}/24.45)$.

Table 3
Ambient Air Quality Results
Outside Lift Station

Sample ID: Analyte	011805 upwind (ug/m ³)	011805 downwind (ug/m ³)	011905 upwind (ug/m ³)	011905 downwind (ug/m ³)	012005 upwind (ug/m ³)	012005 downwind (ug/m ³)	Laboratory Reporting Limit (ug/m ³)*	EPA Region 3 RBC (ug/m ³)	EPA Region 9 PRG (ug/m ³)
TO-8 Analysis									
Phenol	ND	ND	ND	ND	ND	ND	19.3	1095.00	1095
TO-13 Analysis									
Acenaphthene	ND	NA	0.024 (J)	0.031 (J)	0.045 (J)	0.070	0.05	219.00	219
Acenaphthylene	ND	NA	ND	ND	ND	0.005 (J)	0.05	0.00	
Anthracene	ND	NA	ND	ND	ND	ND	0.05	1,095.00	1095
Benzo(a)anthracene	ND	NA	ND	ND	ND	ND	0.05	0.01	0.0092
Benzo(a)pyrene	ND	NA	ND	ND	ND	ND	0.05	0.002	0.00092
Benzo(b)fluoranthene	ND	NA	ND	ND	ND	ND	0.05	0.01	0.0092
Benzo(g,h,i)perylene	ND	NA	ND	ND	ND	ND	0.05	NL	NL
Benzo(k)fluoranthene	ND	NA	ND	ND	ND	ND	0.05	0.09	0.092
Chrysene	ND	NA	ND	ND	ND	ND	0.05	0.86	0.92
Dibenzo(a,h)anthracene	ND	NA	ND	ND	ND	ND	0.05	NL	0.00092
Fluoranthene	ND	NA	ND	ND	ND	0.007 (J)	0.05	146.00	146
Fluorene	ND	NA	0.015 (J)	0.015 (J)	0.023 (J)	0.033 (J)	0.05	146.00	146
Indeno(1,2,3-cd)pyrene	ND	NA	ND	ND	ND	ND	0.05	0.01	0.0092
Naphthalene	0.097	NA	0.165	0.413	0.136	0.515	0.10	3.29	3.1
Phenanthrene	0.010 (J)	NA	0.021 (J)	0.018 (J)	0.028 (J)	0.034 (J)	0.05	NL	NL
Pyrene	ND	NA	ND	ND	ND	ND	0.05	109.50	110
Total PAHs	0.107	NA	0.225	0.477	0.232	0.664			
TO-14 Analysis									
Benzene	1.1	1.3	0.97	1.2	0.98	1.1	0.98	0.23	0.25
Bromodichloromethane	ND	ND	ND	ND	ND	ND	2.1	0.10	0.11
Bromoform	ND	ND	ND	ND	ND	ND	3.1	1.61	1.7
Bromomethane	ND	ND	ND	ND	ND	ND	1.2	5.11	5.2
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	1.9	0.12	0.13
Chlorobenzene	ND	ND	ND	ND	ND	ND	1.4	62.05	62
Dibromochloromethane	ND	ND	ND	ND	ND	ND	2.6	0.07	0.080
Chloroethane	ND	ND	ND	ND	ND	ND	0.81	2.16	2.3
Chloroform	ND	ND	ND	ND	ND	ND	1.5	0.08	0.083
Chloromethane	1 (J)	0.91 (J)	1.2 (J)	0.99 (J)	1.1 (J)	1.2 (J)	1.2	94.90	95
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	1.8	146.00	209
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	1.8	10.95	110
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	1.8	0.28	0.31

Table 3 (Continued)

**Ambient Air Quality Results
Outside Lift Station**

Sample ID: Analyte	011805 upwind (ug/m ³)	011805 downwind (ug/m ³)	011905 upwind (ug/m ³)	011905 downwind (ug/m ³)	012005 upwind (ug/m ³)	012005 downwind (ug/m ³)	Laboratory Reporting Limit (ug/m ³)*	EPA Region 3 RBC (ug/m ³)	EPA Region 9 PRG (ug/m ³)
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	1.2	219.00	521
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	1.2	0.07	0.074
Trans-1,2- Dichloroethene	ND	ND	ND	ND	ND	ND	1.2	73.00	73
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	1.2	219.00	208
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	1.4	0.09	0.099
Cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	1.4	0.63	73
Trans-1,3- Dichloropropene	ND	ND	ND	ND	ND	ND	1.4	0.63	0.48
Ethylbenzene	ND	0.66 (J)	0.71 (J)	1.5	0.61 (J)	0.88 (J)	1.3	1,058.50	1059
Methylene chloride	ND	ND	ND	ND	ND	ND	2.7	3.79	4.1
1,2,2,2- Tetrachloroethane	ND	ND	ND	ND	ND	ND	2.1	0.03	0.033
Tetrachloroethene	ND	ND	ND	ND	ND	ND	2.1	0.31	0.32
Toluene	3.8	5.5	3	3.9	2.1	2.6	1.0	416.10	402
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	1.7	2,299.50	2300
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	1.7	0.11	0.12
Trichloroethene	ND	ND	ND	ND	ND	ND	1.6	0.02	0.017
Trichlorofluoromethane	1.2 (J)	1.3 (J)	1.2 (J)	1.2 (J)	1.4 (J)	1.3 (J)	1.5	730.00	730
Vinyl chloride	ND	ND	ND	ND	ND	ND	0.78	0.07	0.11
m-Xylene & p-Xylene	1.1 (J)	1.7	1.9	3	1.9	2.1	1.3	109.5**	106**
o-Xylene	ND	0.57 (J)	0.56 (J)	0.96 (J)	0.68 (J)	0.88 (J)	1.2	109.5**	106**

NA = Not analyzed due to sample breakage during shipment.

* Highest Reporting Limit of analyzed samples is listed.

** Value is for Total Xylenes, all isomers.

(J) Indicates an estimated value below the Laboratory Practical Quantitation Limit, but above the Method Detection Limit

Table 4

**Ambient Air Quality Results Compared to
Ambient VOC Concentrations Reported in US Cities**

Parameters	Jan 18th Downwind Sample (ug/m³)	Jan 19th Downwind Sample (ug/m³)	Jan 20th Downwind Sample (ug/m³)	Average of 9 Cities * (ug/m³)
Benzene	1.30	1.20	1.10	8.85
Carbon tetrachloride	ND	ND	ND	1.13
Ethylbenzene	0.66	1.50	0.88	4.08
Methylene chloride	ND	ND	ND	4.32
Toluene	5.50	3.90	2.60	22.44
1,1,1-Trichloroethane	ND	ND	ND	4.58
m-Xylene & p-Xylene	1.70	3.00	2.10	12.98
o-Xylene	0.57	0.96	0.88	5.73

* From Inter Urban Comparison of Ambient Volatile Organic Compound Concentrations in U.S. Cities; Shah, Jitendra J., Sylvia A. Edgerton, Michael W. Holdren, Deborah L. Smith; Air & Waste Management, vol 39, No. 5; May 1989.

median ppbv values originally reported

Table 5
Hazardous Air Pollutant Emissions

Hazardous Air Pollutant	Assuming Inside Air, Exhausted at 400 cfm mass per day @ 400cfm	
	ug/m³	lb/day
Benzene	ND	0
Ethylbenzene	749	0.027
Toluene	1320	0.047
o-Xylene	ND	0
Phenol	ND	0
Polycyclic Organic Matter ¹		
Acenaphthene	ND	0
Acenaphthylene	ND	0
Anthracene	ND	0
Benzo(a)anthracene	ND	0
Benzo(a)pyrene	ND	0
Benzo(b)fluoranthene	ND	0
Benzo(g,h,i)perylene	ND	0
Benzo(k)fluoranthene	ND	0
Chrysene	ND	0
Dibenzo(a,h)anthracene	ND	0
Fluoranthene	ND	0
Fluorene	ND	0
Indeno(1,2,3-cd)pyrene	ND	0
Naphthalene	84.3	0.003
Phenanthrene	ND	0
Pyrene	ND	0
SUM		0.077

¹ Polycyclic Organic Matter is a listed Hazardous Air Pollutants (HAP) under Florida regulations (FAC Chapter 62-210.200 (130)) and is defined as organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100 degrees C.