Ambient Air Monitoring Plan
Former Champaign Manufactured Gas Plant
Interim Remedial Measures -
Source Removal

October 1, 1997

Prepared for:

ILLINOIS POWER COMPANY

Champaign, Illinois

Columbia, Illinois

PHILIP ENVIRONMENTAL

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PHILIP SERVICES CORPORATION
210 West Sand Bank Road
Post Office Box 230
Columbia, Illinois 62236-0230

Project 17246

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1 INTRODUCTION

1.1 Background/Overview

Illinois Power Company (IP) is conducting interim remedial measures at a former manufactured gas plant (MGP) site located in Champaign, Illinois. This remediation is to consist of dewatering GH-1, blending and disposal of coal tar within GH-1 and excavation of tar wells, a tar separator, and purifier wastes in the northwest section of the site. Figure 1 is a site map which shows the location of the proposed excavation.

To support the remediation, ambient air quality will be monitored around the site to evaluate the background quality of air at the site perimeter, and to prevent off-site areas from experiencing significant adverse impacts.

1.2 Air Monitoring Objectives

The overall objective of the proposed ambient air monitoring is to collect sufficient data to support a demonstration that the proposed remediation activities do not significantly impact human health or the environment in the area around the site. Specific objectives include:

- monitoring to document ambient air quality upwind and downwind of the site prior to remediation activities to provide a baseline for comparison;
- monitoring of ambient air quality upwind and downwind of the site during remediation activities to immediately identify emission occurrences and allow for prompt corrective measures of operations; and
- collection of sufficient ambient air quality and meteorological (MET) data that will be usable (following data validation) at a future time to perform an assessment of the air quality impact to the area surrounding the site from remediation activities. The intent is to demonstrate that the remediation activities on the site did not result in emissions that caused adverse human health or environmental impact.

2 AMBIENT AIR MONITORING

2.1 Ambient Air Sampling Parameters

Ambient air sampling will be conducted to monitor the concentrations of the following parameters:

- volatile organic compounds (VOCs);
- polycyclic aromatic hydrocarbons (PAHs);
- real-time particulates; and
- real-time VOCs.

These parameters were selected based on analytical data for soil from this site, as well as experience with other MGP sites.

2.2 Ambient Air Sampling Locations

Monitoring will be conducted by sampling predominantly at the site fenceline and at intermediate locations around the work area. Actual number of monitoring points and locations for stationary integrated sampling of VOCs and PAHs will be selected prior to each sampling event. Factors that influence the selection of monitoring points include:

- invasive or non-invasive remedial activities;
- location of activities occurring on the site;
- weather conditions, especially wind direction and speed;
- location of obstructions such as buildings in relation to wind direction;
- location of closest receptors, especially sensitive receptors; and
- any other pertinent conditions identified prior to the beginning of each sampling event.

Prevailing wind directions, based on historical MET data collected by the National Weather Service, along with the location of site activities and local conditions, will be used to conceptually locate the monitoring stations. For the months when this remediation is scheduled to occur (October through December), historical data indicate a predominant wind

direction from the southwest. A seasonal wind rose for the site is presented in Figure 2.

Several sensitive receptors are located near the site. A private child care center is located across the railroad tracks north of the site, a battered women's shelter (group home) is located across the alley from the southern boundary of the site, and a hospital is located southeast of the site. Figure 3 is a neighborhood map that identifies residential and other areas surrounding the site. Background sampling locations are also identified on Figure 3.

One building (approximately 20 feet tall) is located on the site (Figure 1). This building could significantly affect the dispersion of air-borne contaminants from the site; therefore, placement of the monitoring stations along the fenceline will take this into consideration.

It is recognized that actual locations may deviate from the "ideal" in that it may not be physically possible (or practical) to meet all of the desired sampling equipment siting criteria. Equipment siting criteria include:

- locate the monitor along the "fenceline" of the site (when possible);
- the monitor inlet should be placed approximately 2 meters above the ground surface level;
- the monitor inlet should be at least 20 meters away from the nearest street or trees;
- the monitor should be well-removed from obstacles (about two or more times the height of the obstruction);
- the immediate surroundings should have ground cover to prevent surface dust from affecting the measurements;
- the monitor should receive unrestricted airflow from at least three cardinal wind directions (270°), including the predominant wind direction;
- there should be no furnace or incinerator flues nearby;
- the station location must have suitable accessibility;
- the monitor must be placed on a flat surface;
- security, electrical power, and (if remotely operated or reporting) communication lines must be considered and provided; and

- if a roof-top location is considered, the monitor should be located at least 2 meters from walls, parapets, penthouses, etc.

Note: It is possible that meeting all of the above criteria may not be possible at any locations. Site-specific locations will be determined at the site by considering the above criteria.

Real-time VOC monitoring will be performed by use of portable hand-held equipment located and moved intermittently among fenceline locations and spots nearer to the work area as appropriate . Real-time dust (particulate) monitoring will be conducted by locating a real-time dust monitoring device in the downwind segment of the active work area. Real-time monitors will be relocated as needed based on wind conditions and site activities.

2.3 Ambient Air Sampling Methods and Equipment

Integrated sampling with stationary samplers will be conducted in accordance with Methods TO-13 (modified) and TO-14. These samples will be collected simultaneously over a 24-hour period. Sample media will be obtained from Zenon Laboratories, Inc. (Zenon) of Burlington, Ontario, Canada. Samples will be returned to Zenon for analysis to be performed in accordance with Methods TO-13 and TO-14 as described below. Table 1 lists the laboratory method detection limits for each method.

Real-time sampling of dust and VOCs will be conducted using portable instruments during the normal workday.

2.3.1 VOCs

USEPA Method TO-14 (USEPA, 1988) will be used for VOCs. For each VOC sample, air will be drawn into a SUMMA canister with subsequent analysis by gas chromatography/mass spectrometry (GC/MS) in accordance with this method.

For Method TO-14, a 1.7-liter sample will be collected. The laboratory will evacuate the SUMMA canisters to the prescribed negative pressure and the flow controller will be set for a 24-hour sampling period prior to shipping to the site. Standard temperature and pressure corrections for air density variations will be made from data collected at the site with an on-site MET station.

2.3.2 PAHs

USEPA Method TO-13 (USEPA, 1989) will be used for PAHs. Method TO-13 is for determination of benzo(a)pyrene and other PAHs in outdoor air. For each sample, air will be drawn through a combination quartz filter/adsorbent cartridge. Particulate-bound PAHs will be collected on the 4-inch-diameter acid-washed quartz-fiber filter and gaseous PAHs will be collected on the 2-inch-diameter by 3-inch-long PUF. Zenon will analyze the PUFs and fiber filters together (as one sample). Samples will be analyzed by GC/MS in accordance with this method.

Method TO-13 was modified to include the use of Gilian AirCon 2 programmable air sampling pumps, which have a lower flow rate. The lower flow rate results in higher detection limits; however, the detection limits have been judged acceptable for the purposes of this project. The AirCon 2 pumps operate on 110 volts AC and have an electronic monitor set to document the sampling duration and flow. The sampling flow rate will be 20 liters per minute for 24 hours. The samplers will be calibrated on-site using a Gilibrator primary standard calibration device immediately before and after the sampling period.

2.3.3 Real-Time Dust

Real-time monitoring of fugitive dust (particulates) will be conducted using a Laser Dust Monitor, which will be operated as necessary to monitor locations downwind from active remediation areas. Readings from the instrument will be observed and recorded either manually or by use of the datalogger.

Ambient air action levels for dust have been established based on the OSHA limit of 10 mg/m^3 over 8 hours. The real-time (instantaneous) action level for dust is 5 mg/m^3. The detection limit for the Laser Dust Monitor is 0.01 mg/m^3.

2.3.4 Real-Time VOCs

Real-time VOC monitoring will be conducted by use of a portable photoionization detector (PID) as a screening device to non-selectively monitor VOCs. More selective VOC monitoring will be performed via a portable GC.

The PID will be carried by field personnel along certain upwind and downwind locations from the active work areas to detect and

manually record VOCs. In the event of sustained VOC readings on the PID exceeding 2 parts per million (ppm), the portable GC will be used to determine the level of benzene present. Readings will be compared to the ambient air action levels presented in Section 2.5. The benzene detection limit for the portable GC is 0.001 ppm, which is less than the calculated action levels.

2.4 Ambient Air Sampling Duration and Frequency

Ambient air will be monitored in the three phases of activities described in the following subsections.

2.4.1 Background Ambient Air Sampling

Background ambient air will be characterized by collecting air samples for two consecutive 24-hour sampling events prior to site remediation activities. Each background sampling event will consist of a 24-hour sampling period, resulting in a 48-hour total sampling period. Five stationary locations along the fencelines will be sampled during the two events. One sampling station will have co-located samplers to collect duplicate samples. The location of the background monitoring points are shown on Figure 3, and marked with a "BL" prefix.

Real-time dust and VOC monitoring will be performed intermittently during each of the two background sampling events and the measurements recorded to identify and document potential VOC and dust sources prior to remediation activities.

Background monitoring will be performed on two consecutive workdays between Monday and Friday prior to start of remedial actions.

2.4.2 Ambient Air Sampling During Invasive Site Remediation

During "invasive" site remediation, stationary integrated ambient air sampling will be performed at least once every three days. Invasive remediation includes excavation, blending, or handling materials that are not yet acceptable to be transported off site. (Note: Sampling on a periodic basis during site remediation is consistent with USEPA requirements for ambient air sampling during remediation of Superfund sites.) Air sampling will occur on the first day of invasive remediation and an average of once every three days following that time for the entire period of invasive remediation.

Real-time monitoring for VOCs via the PID will be performed by taking instantaneous measurements of ambient air on at least one-hour intervals and during the start of a different activity. Real-time dust monitoring will be conducted at least once per day and more frequently if visible dust excursions are observed. Dust monitoring will be performed at the location specified by the qualified on-site air monitoring technician.

2.4.3 Ambient Air Sampling During Non-Invasive Site Remediation

After all materials are blended, removed from the gas holder and tar wells, and stockpiled (i.e., invasive site remediation is complete), these materials will be loaded and transported off site. Thus, loading, transporting, and possibly reblending (i.e. non-invasive activities) may extend several weeks beyond the invasive remediation. Sampling once every three days is proposed during the non-invasive activities. Real-time monitoring will continue during non-invasive activities, but will be performed less frequently.

2.5 Ambient Air Action Levels

The risk-based, site-specific ambient air action levels presented in the following list have been established so that unacceptable site-related airborne contaminant concentrations do not exit the site during the proposed IRMs.

The PID will be used as a screening device at the downwind fenceline location or other areas of potential VOCs. If sustained PID measurements exceed 2 ppm, the portable GC will be used to compare benzene measurements to the following action levels:

Monitoring Point along:	Acceptable Benzene Concentration at Monitoring Point			
	Stable Wind Speed (less than 10 mph)		*Average Wind Speed* (10 mph or greater in all directions)	
	mg/m^3	ppm_v	mg/m^3	ppm_v
North Fenceline	2.3	0.72	3.1	0.97
West Fenceline	0.7	0.22	0.8	0.25
South Fenceline	0.7	0.22	0.8	0.25
East Fenceline	1.4	0.44	1.6	0.50

If the portable GC indicates that these levels are exceeded as a result of remediation activities, ALL remediation activities shall cease until adequate control measures are implemented or site conditions change.

The process used to establish these ambient air action levels is described in Appendix A.

2.6 Analysis

Zenon will analyze the integrated ambient air samples collected for VOCs and PAHs (PUFs, fiber filters, and SUMMA canisters). Chain-of-custody forms will accompany all samples during shipment. The following is the laboratory contact for this project.

Mr. Rod Thompson
(905) 332-8788
Zenon Laboratories
5555 North Service Road
Burlington, Ontario L7L 5H7

3 METEOROLOGICAL MONITORING

MET monitoring will be accomplished by assembling a 3-meter tripod to support the MET sensors and a weather-tight enclosure to house the translators and the data acquisition system. The MET parameters measured will include: wind speed, wind direction, temperature, barometric pressure, date, and time. The general MET equipment that we propose to use for this project includes:

- tripod to support sensors;
- wind speed sensor;
- wind direction sensor;
- ambient dry bulb temperature sensor;
- barometric pressure sensor; and
- data acquisition/recording system.

The MET station will be placed in accordance with the following guidelines and field experience. The MET station will comply with the following criteria (when possible):

- sensors mounted at a height of approximately 3 meters above the ground;
- sensors placed such that the distance between the sensor and any obstruction (natural or man made) will be at least 10 times the height of the obstruction (when possible); and
- if mounted on a structure (stack or roof of a building), be mounted on a 10- to 15-foot mast placed on the side of the structure facing the prevailing wind direction.

The MET station will be set up as follows:

- locate MET station site;
- assemble and erect 3-meter MET sensor support tripod;
- locate 115 VAC, 20 amp electrical power source, if necessary, and have it connected to the station;
- install each sensor on the MET sensor support tripod and connect it to the respective indicator according to the manufacturer's instruction manual;
- verify wind speed, wind direction, ambient temperature, and barometric pressure sensors conforming to field experience and/or the supplier's instructions; and

- connect the indicators to the data recording device and compare the sensors with the output of the recorder.

The MET station will continuously record wind speed, wind direction, barometric pressure, and ambient temperature for each sampling period. The data collected will be used in the location of predominantly upwind and downwind air samples. Meteorological data will be tabulated for each sample period and included in the final report.

4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

4.1 Ambient Air Sampling

The QC procedures that will be followed for collection of ambient air quality samples include preventive maintenance and the collection of blanks and duplicates. The maintenance procedures specified by the manufacturer will be performed to keep the instruments from failing and to return failed instruments to service.

Calibrations will be performed in accordance with USEPA and manufacturer instructions. Routine self audits will be performed by either Philip Services Corp. or subcontractor personnel that are not involved with other operating aspects during the monitoring program. Auditing will be performed at the beginning and end of the monitoring program.

The QC samples will be collected as follows:

- one duplicate during background air sampling event (Method TO-13 and TO-14);
- one duplicate on the 1st day of invasive remediation, and every fifth sampling event thereafter, or a minimum of 20 percent of the sampling events (Method TO-13 and TO-14);
- one field spike during the background air sampling event (Method TO-13 only);
- one field spike on the 1st day of invasive remediation, and every fifth sampling event thereafter, or a minimum of 20 percent of the sampling events (Method TO-13 only);
- two trip blanks (one per sample shipment) during the background sampling event (Method TO-13 only); and
- one trip blank for every sampling event (Method TO-13 only).

Laboratory QC will be in accordance with the method requirements for Methods TO-13 and TO-14.

4.2 Meteorological Monitoring

QA/QC procedures will be applied to the installation and operation of the MET monitoring system. QA/QC will follow manufacturer specifications. Meteorological sensors will be installed per manufacturing specifications

and have documentation indicating that the sensor has been calibrated within the past year by qualified technicians. MET data collected during the monitoring program will be routinely screened for potential operational problems.

5 DATA REPORTING

Samples will be shipped to the laboratory with 24 hours of sample collection. Preliminary results will be reported to the site manager to assess potential air quality concerns due to site activities and whether action levels have been exceeded.

Real-time sampling results will be reported immediately to the site manager to allow prompt evaluation and response to potential emission problems.

A field logbook and/or field forms will be maintained throughout the sampling effort. Information to be recorded in the logbook or field forms will include:

- description of remediation activities conducted during sample collection;
- sample media receipt dates, conditions, and numbers;
- sampling equipment installation, operation and removal dates;
- sampling equipment calibration dates and results;
- sampling equipment maintenance dates and results;
- MET conditions on sampling days;
- any unusual situations which may affect samples or sampling;
- project number and location;
- unique sample (filter) numbers;
- sample dates;
- start and stop times;
- SUMMA canister serial numbers; and
- AirCon 2 pump serial numbers.

Data will be summarized in a section of the project completion report. The summary will include site conditions, sampling and analytical procedures and analytical results.

List of Tables

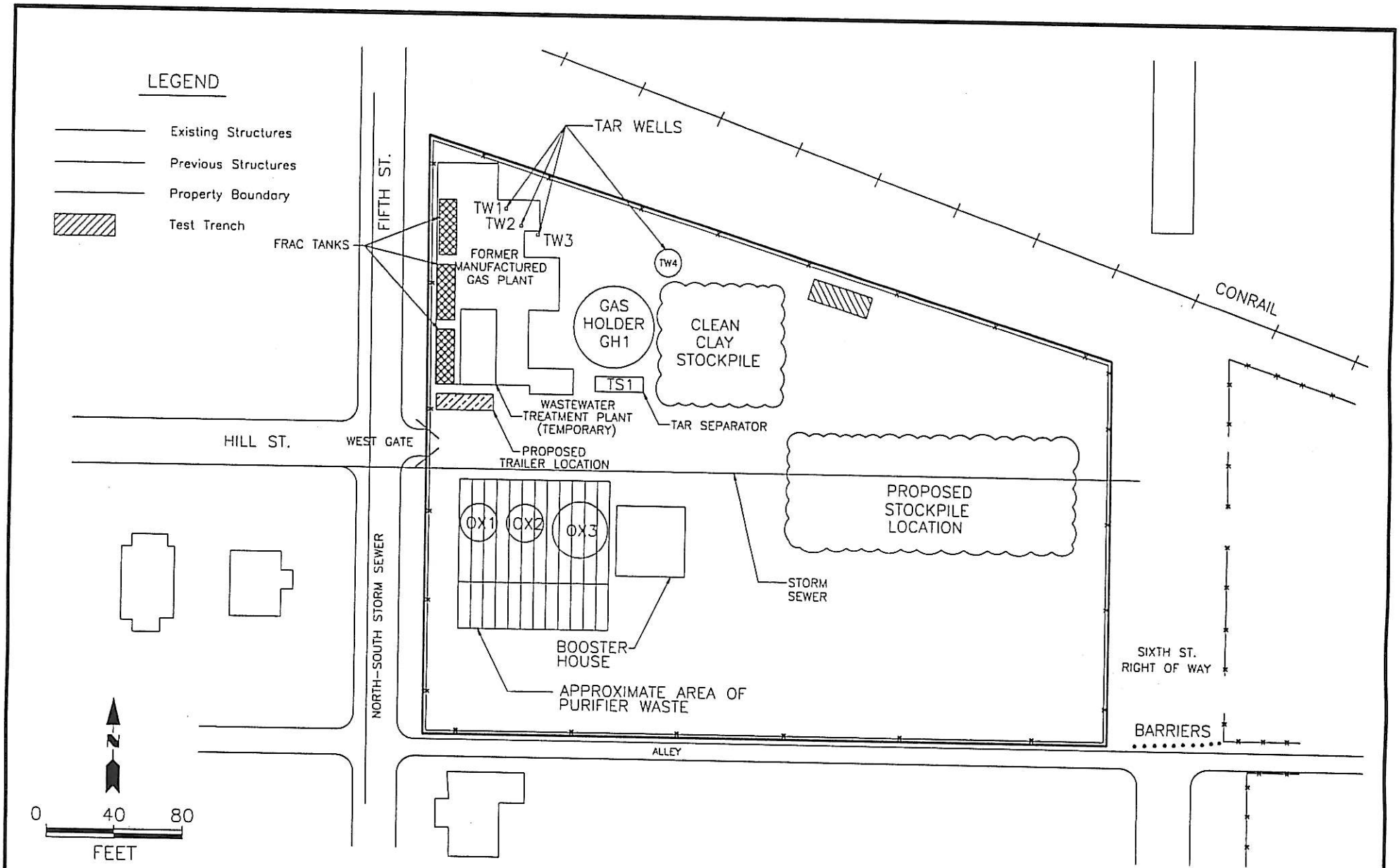
Table 1. Laboratory Method Detection Limits for Air Sampling Methods TO-13 and TO-14

Component	MDL	Units
TO-13 (PAHs)		
Naphthalene	1.9	ug
Acenaphthylene	1.6	ug
Acenaphthene	2.0	ug
Fluorene	1.3	ug
Phenanthrene	0.6	ug
Anthracene	1.1	ug
Fluoranthene	1.0	ug
Pyrene	0.5	ug
Benzo(a)anthracene	0.8	ug
Chrysene	0.5	ug
Benzo(b)fluoranthene	1.0	ug
Benzo(k)fluoranthene	1.1	ug
Benzo(a)pyrene	0.8	ug
Indeno(1,2,3-cd)pyrene	0.6	ug
Dibenzo(a,h)anthracene	1.0	ug
Benzo(ghi)perylene	0.7	ug

Component	MDL	Units
TO-14 (VOCs)		
Dichlorodifluoromethane	1.36	ppbv
Chloromethane	2.24	ppbv
Halocarbon 114	0.17	ppbv
Vinyl Chloride	1.22	ppbv
Chloroethane	0.11	ppbv
1,2-Dichloroethane	0.18	ppbv
Bromomethane	0.49	ppbv
Trichlorofluoromethane	0.17	ppbv
1,1-Dichloroethene	0.15	ppbv
cis-1,2-Dichloroethene	0.13	ppbv
1,1-Dichloroethane	0.20	ppbv
1,2-Dichloropropane	0.18	ppbv
Dichloromethane	0.30	ppbv
Chloroform	0.17	ppbv
1,1,2,2-Tetrachloroethane	0.56	ppbv
Halocarbon 113	0.15	ppbv
1,1,1-Trichloroethane	0.09	ppbv
1,1,2-Trichloroethane	0.22	ppbv
Toluene	0.21	ppbv
Benzene	0.12	ppbv
cis-1,3-Dichloropropene	0.15	ppbv
trans-1,3-Dichloropropene	0.20	ppbv
Trichloroethene	0.15	ppbv
Tetrachloroethene	0.24	ppbv
Carbon Tetrachloride	0.13	ppbv
Ethylene Dibromide	0.35	ppbv
Ethylbenzene	0.42	ppbv
m&p-Xylene	0.75	ppbv
o-Xylene	0.45	ppbv
1,3,5-Trimethylbenzene	1.10	ppbv
1,2,4-Trimethylbenzene	1.41	ppbv
1,3-Dichlorobenzene	1.34	ppbv
1,4-Dichlorobenzene	1.40	ppbv
1,2-Dichlorobenzene	1.74	ppbv
1,2,4-Trichlorobenzene	6.46	ppbv
Hexachloro-1,3-butadiene	6.10	ppbv

MDL - Method Detection Limit
PAHs- Polycyclic Aromatic Hydrocarbons
VOCs- Volatile Organic Compounds

List of Figures



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PHILIP ENVIRONMENTAL

TITLE:

SITE PLAN
INTERIM REMEDIAL MEASURES
SOURCE REMOVAL

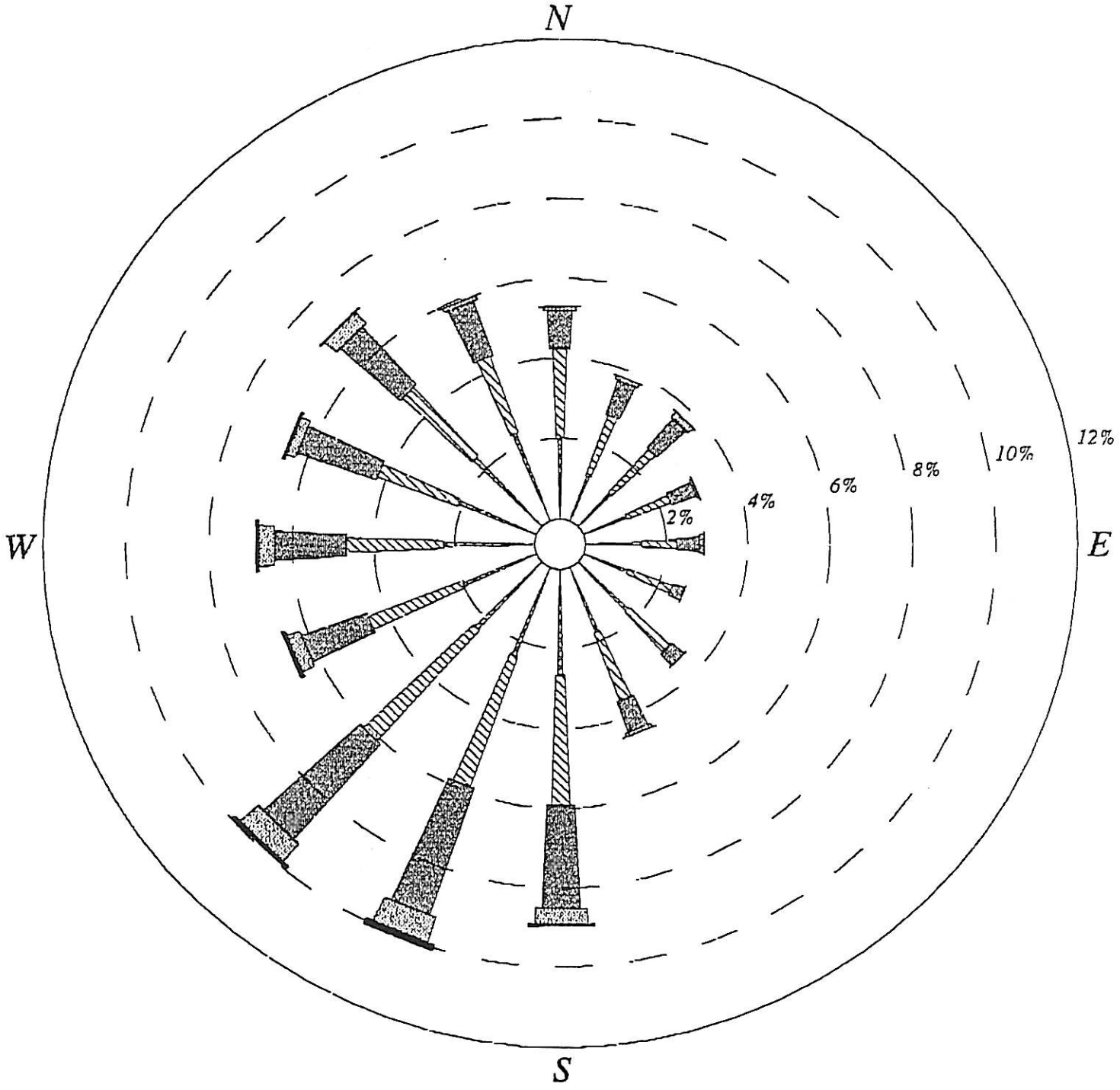
DWN:	DES.:
MRC	SJC
CHKD:	APPD:
DATE:	REV.:
09/16/97	A

PROJECT NO.: 17246
MGP SOURCE REMOVAL
CHAMPAIGN, ILLINOIS

FIGURE 1

Champaign

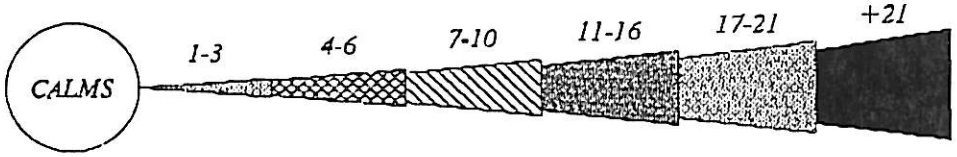
October 1-December 31; Midnight-11 PM

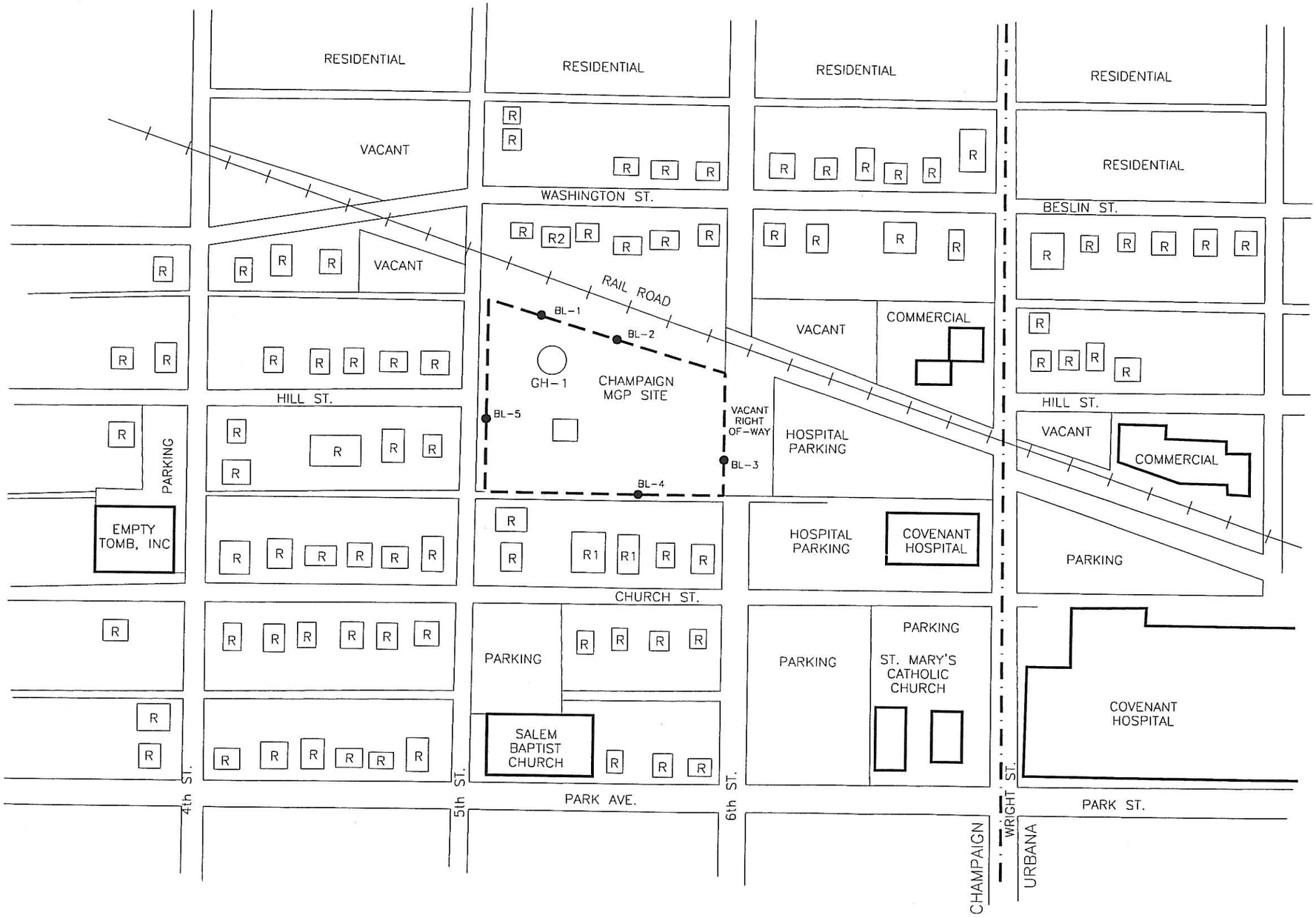


CALM WINDS 8.27%

NOTE: Frequencies indicate direction from which the wind is blowing.

WIND SPEED (KNOTS)





LEGEND

- R — RESIDENTIAL
- R1 — SOCIAL SERVICES (GROUP HOME)
- R2 — PRIVATE CHILD DAYCARE
- ● — BL— BASELINE AIR SAMPLE

0 200
FEET

N

PHILIP SERVICES CORP.

TITLE:
NEIGHBORHOOD MAP AND BASELINE AIR MONITORING LOCATIONS

DWN: TMM	DES: JW	PROJECT NO: 17246	
CHKD: JW	APPD: DEW	IP-CHAMPAIGN CHAMPAIGN, IL	
DATE: 9/4/97	REV: 0	FIGURE 3	

COL 17246A-001

References

U.S. Environmental Protection Agency (USEPA). 1989. EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. June (with applicable updates).

APPENDIX A

Calculation of Ambient Air Action Levels

PHILIP ENVIRONMENTAL
Columbia, Illinois
(618) 281-7173

Title: **Calculation of Risk-Based Ambient Air Action Levels for Soil Removal Activities**

Project Name: **IP Champaign**

Project No.: **17246**
File Name:
By: Dotti Ramey
Check by: Barrie Selcoe

Phase: **5002.77**
File No.:
Date: **9/15/97**
Date: 9/17/97

Selection of Benzene as Indicator Chemical

For this remediation project, action levels are needed for only the carcinogenic risk of benzene exposure because of benzene's high toxicity relative to other site-related contaminants. Based upon the experience of Philip and other firms at other MGP sites, concentrations of benzene will be high relative to those of other carcinogenic site-related contaminants.

Reference Exposure Level for Lifetime Benzene Exposure Limits

A 0.22 microgram per cubic meter ($\mu g/m^3$) average benzene concentration for residential exposure for 30 years represents a 10^{-6} cancer risk. (Reference: USEPA Region III Risk-Based Concentration Tables, January–June 1996.)

Modeled Equivalent Exposure Level for 2½-Month Project Duration

Since remediation activities are anticipated to require no more than 2½ months, a resident child would have to be exposed to an average benzene concentration of approximately 22 $\mu g/m^3$ to equal 10^{-6} cancer risk (Table 2: Cancer Risk Estimates for Benzene).

Adjustment for 10-Hour per Day Emission/Exposure Duration

The duration of potential exposure each day will be only 10 hours because remediation work at the site will last only 10 hours each day. The 22 $\mu g/m^3$ acceptable exposure concentration represents a 24-hour average concentration. Emissions will be unlikely during the non-work period because significant emissions occur only when the material is being disturbed. During non-work periods, the excavation and stockpiles will be covered. Therefore, the 24-hour acceptable exposure concentration should be adjusted to a 10-hour exposure concentration as follows:

$$\text{Real-Time Action Level (10-hour average)} = 22\ \mu g/m^3 \times \frac{24\ \text{hr / day}}{10\ \text{hr / day}} \cong 53\ \mu g/m^3$$

Adjustment for Variability in Wind Direction

The highest exposed receptor is likely to be downwind of the site no more than 25 percent of the 2½ -month project duration (a reasonable assumption based upon local historical wind direction data which indicates wind blows from any one 22.5-degree direction sector for less than 10 percent of the time during October through December in Champaign).

$$\text{Adjusted Real-Time Action Level (10-hour average)} = 53\ \mu g/m^3 \times \frac{1\ \text{day}}{0.25\ \text{day}} \cong 211\ \mu g/m^3$$

Therefore, 211 $\mu g/m^3$ represents the acceptable benzene concentration at the receptor for a 10-hour daily period of remediation.

Calculation of Measuring Point Action Level Equivalent to Receptor Action Level

Ambient air will be monitored at the fenceline; however, the nearest off-site receptors reasonably expected to have more than an instantaneous exposure are located further away from the source of benzene. Benzene originating from the site will disperse naturally as it moves away from the

site. Modeling was performed to estimate the dispersion between the fenceline and the receptors.

The Champaign site has a roughly rectangular shape as shown on the neighborhood map. The gasholder, where the remedial activities will be conducted, is located in the northwest section of the site. A child day care center is located directly north of the gas holder, 130 feet from the fenceline. A group home is located south of the site, and Covenant Hospital is located southeast of the site, more than 650 feet from the fenceline. Residences are located west of the site.

Each fenceline will have unique action levels dependent upon the modeled dispersion between the fenceline and the nearest receptor in that direction. The action levels will be protective of the most sensitive receptors closest to the site. Several monitoring points were modeled, as indicated on Tables 3 and 4. The table below identifies the modeling points (and corresponding fencelines) that were chosen for the air monitoring program based on worst-case conditions as determined by the modeling. The action levels calculated from each modeling point will be applicable to the entire corresponding fenceline since they are based on the modeled worst-case conditions.

Fenceline Monitored	Receptor	Modeling Point (Tables 3&4)
North	child care	M-7
West	residence	M-6
South	group home	M-3
East	hospital	M-2

The following subsections calculate the real-time action level for each of the fencelines.

North Fenceline (Modeling Point M-7)

Based upon the modeling results for stable and average wind speeds to the north, the concentrations at the north fenceline are, respectively, 4.4 and 5.9 times higher than at the nearest receptors during these conditions. Average wind speed is 10 miles per hour (mph). Stable wind speed action levels will apply to wind speeds less than 10 mph. Application of these dispersion factors to calculate the fenceline concentrations corresponding to the acceptable off-site receptor level yields the following:

Adjusted Real-Time Action Level (10-hour avg) for Stable Wind Speed = 211 $\mu g/m^3$ × 4.4 ≅ 928 $\mu g/m^3$ = 0.9 mg/m^3

Adjusted Real-Time Action Level (10-hour avg) for Avg Wind Speed = 211 $\mu g/m^3$ × 5.9 ≅ 1,245 $\mu g/m^3$ = 1.2 mg/m^3

West Fenceline (Modeling Point M-6)

Based upon the modeling results for stable and average wind speeds, the concentrations at the west fenceline are, respectively, 1.4 and 1.5 times higher than at the receptor during these conditions. Average wind speed is 10 mph. Stable wind speed action levels will apply to wind speeds less than 10 mph. Application of these dispersion factors to calculate the fenceline concentrations corresponding to the acceptable off-site receptor level yields the following:

Adjusted Real-Time Action Level (10-hour avg) for Stable Wind Speed = 211 $\mu g/m^3$ × 1.4 ≅ 295 $\mu g/m^3$ = 0.3 mg/m^3

Adjusted Real-Time Action Level (10-hour avg) for Avg Wind Speed = 211 $\mu g/m^3$ × 1.5 ≅ 317 $\mu g/m^3$ = 0.3 mg/m^3

South Fenceline (Modeling Point M-3)

Based upon the modeling results for stable and average wind speeds, the concentrations at the south fenceline are, respectively, 1.4 and 1.5 times higher than at the receptor during these conditions. Average wind speed is 10 mph. Stable wind speed action levels will apply to wind speeds less than 10 mph. Application of these dispersion factors to calculate the fenceline concentrations corresponding to the acceptable off-site receptor level yields the following:

Adjusted Real-Time Action Level (10-hour avg) for Stable Wind Speed = 211 $\mu g/m^3$ × 1.4 ≅ 295 $\mu g/m^3$ = 0.3 mg/m^3

Adjusted Real-Time Action Level (10-hour avg) for Avg Wind Speed = 211 $\mu g/m^3$ × 1.5 ≅ 317 $\mu g/m^3$ = 0.3 mg/m^3

East Fenceline (Modeling Point M-2)

Based upon the modeling results for stable and average wind speeds, the concentrations at the east fenceline are, respectively, 2.6 and 3.1 times higher than at the receptor during these conditions. Average wind speed is 10 mph. Stable wind speed action levels will apply to wind speeds less than 10 mph. Application of these dispersion factors to calculate the fenceline concentrations corresponding to the acceptable off-site receptor level yields the following:

Adjusted Real-Time Action Level (10-hour avg) for Stable Wind Speed = 211 $\mu g/m^3$ × 2.6 ≅ 549 $\mu g/m^3$ = 0.5 mg/m^3

Adjusted Real-Time Action Level (10-hour avg) for Avg Wind Speed = 211 $\mu g/m^3$ × 3.1 ≅ 654 $\mu g/m^3$ = 0.7 mg/m^3

Summary

Monitoring Point along:	Acceptable Benzene Concentration at Monitoring Point			
	Stable Wind Speed		*Average Wind Speed*	
	mg/m^3	ppm_v	mg/m^3	ppm_v
North Fenceline	0.9	0.28	1.2	0.38
West Fenceline	0.3	0.09	0.3	0.09
South Fenceline	0.3	0.09	0.3	0.09
East Fenceline	0.5	0.16	0.7	0.22

Conversion of mg/m^3 to ppm_v for benzene (molecular weight = 78):

$$ppm_v = (mg/m^3) \times 24.5 / 78$$

Table 1
Intakes from Air Exposures to Benzene

Illinois Power
Champaign, IL

CA	IR	FI	EF	ED	BW	AT	Intake
Test to evaluate 0.22 ug/m3 for residential							
0.00022	20	1	350	30	70	25550	2.58E-05
2.5-Month Residential - Adult							
0.00022	20	1	260	0.208	70	25550	1.33E-07
0.0022	20	1	260	0.208	70	25550	1.33E-06
0.022	20	1	260	0.208	70	25550	1.33E-05
0.05	20	1	260	0.208	70	25550	3.02E-05
1	20	1	260	0.208	70	25550	6.05E-04
5	20	1	260	0.208	70	25550	3.02E-03
2.5-Month Residential - Child							
0.00022	15	1	260	0.208	15	25550	4.66E-07
0.0022	15	1	260	0.208	15	25550	4.66E-06
0.022	15	1	260	0.208	15	25550	4.66E-05
0.05	15	1	260	0.208	15	25550	1.06E-04
1	15	1	260	0.208	15	25550	2.12E-03
5	15	1	260	0.208	15	25550	1.06E-02

CA = Chemical concentration in air (mg/m^3)
IR = Inhalation rate (m^3/day)
FI = Fraction inhaled from a potentially impacted source (unitless)
EF = Exposure frequency (days/year).
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (days)

Equation (USEPA, 1989):

$$\text{Intake (mg/kg-day)} = \frac{CA \times IR \times FI \times EF \times ED}{BW \times AT}$$

Table 2
Cancer Risk Estimates for Air Exposures to Benzene

Illinois Power Company
Champaign, IL

	CDI (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Risk
Test Residential			
0.00022	2.58E-05	2.9E-2	7E-7
2.5-Month Residential - Adult			
0.00022	1.33E-07	2.9E-2	4E-9
0.00220	1.33E-06	2.9E-2	4E-8
0.02200	1.33E-05	2.9E-2	4E-7
0.05	3.02E-05	2.9E-2	9E-7
1	6.05E-04	2.9E-2	2E-5
5	3.02E-03	2.9E-2	9E-5
2.5-Month Residential - Child			
0.00022	4.66E-07	2.9E-2	1E-8
0.0022	4.66E-06	2.9E-2	1E-7
0.022	4.66E-05	2.9E-2	1E-6
0.05	1.06E-04	2.9E-2	3E-6
1	2.12E-03	2.9E-2	6E-5
5	1.06E-02	2.9E-2	3E-4

Note; a risk of 1×10^{-6} is acceptable.

Air concentrations in mg/m^3.

CDI = Chronic Daily Intake for carcinogenic effects.

SF = Slope Factor.

Equation (USEPA, 1989):

$$Risk = CDI \times SF$$

Table 3
Worst-Case Condition (Stable Winds)
IP Champaign Site

Concentration in microgram/m^3		
	Fenceline	
Monitor	**Concentration**	**Receptor 1**
M1	2.61E+07	3.99E+06
M2	5.47E+06	2.16E+06
M3	8.02E+06	5.91E+06
M4	8.02E+06	6.99E+06
M5	1.65E+07	6.69E+06
M6	1.65E+07	1.19E+07
M7	3.84E+07	8.67E+06

Concentration in PPM[1]		
	Fenceline	
Direction	**Concentration**	**Receptor 1**
M1	8031.83	1230.66
M2	1685.57	665.11
M3	2472.42	1821.80
M4	2472.42	2153.43
M5	5088.47	2061.58
M6	5088.47	3655.31
M7	11847.41	2672.14

[1] Benzene used as reference molecular weight.

Concentration in PPM Scale[1]		
	Fenceline	
Direction	**Concentration**	**Receptor 1**
M1	1.00	0.15
M2	1.00	0.39
M3	1.00	0.74
M4	1.00	0.87
M5	1.00	0.41
M6	1.00	0.72
M7	1.00	0.23

[1] Benzene used as reference molecular weight.

Note : Emission Rate 1 g/s-m^2

Table 4
Actual-Case Conditions (Average Winds)
IP Champaign Site

Concentration in microgram/m^3		
	Fenceline	
Monitor	**Concentration**	**Receptor 1**
M1	5.30E+06	4.88E+05
M2	7.32E+05	2.32E+05
M3	1.22E+06	8.12E+05
M4	1.22E+06	1.02E+06
M5	3.09E+06	9.58E+05
M6	3.09E+06	2.04E+06
M7	8.26E+06	1.40E+06

Concentration in PPM[1]		
	Fenceline	
Direction	**Concentration**	**Receptor 1**
M1	1633.49	150.37
M2	225.73	71.57
M3	376.63	250.20
M4	376.63	312.83
M5	951.74	295.11
M6	951.74	629.97
M7	2546.70	430.56

[1] Benzene used as reference molecular weight.

Concentration in PPM Scale[1]		
	Fenceline	
Direction	**Concentration**	**Receptor 1**
M1	1.00	0.09
M2	1.00	0.32
M3	1.00	0.66
M4	1.00	0.83
M5	1.00	0.31
M6	1.00	0.66
M7	1.00	0.17

[1] Benzene used as reference molecular weight.

Note : Emission Rate 1 g/s-m^2
Average Wind Speed = 10 mph