

TOLUENE (C₇H₈)

Chemical Abstracts Service (CAS) Number: 108-88-3

General Information

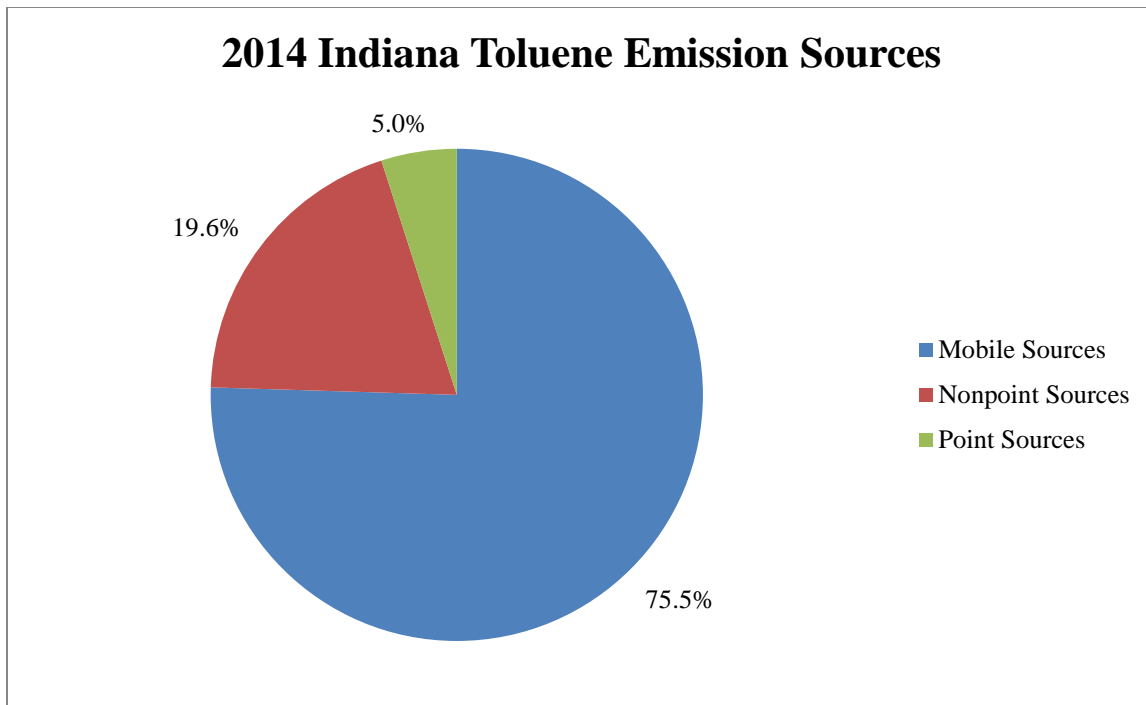
Toluene is a colorless, flammable, refractive liquid that is slightly soluble in water. Acute (short-term) exposure of humans to low or moderate levels of toluene can cause central nervous system dysfunction with symptoms that include fatigue, sleepiness, headaches, and nausea. Central nervous system depression and death have occurred at higher levels of exposure. Chronic (long-term) inhalation exposure to toluene causes irritation of the upper respiratory tract and eyes, sore throat, dizziness, headache, and difficulty with sleep. U.S. EPA has concluded that there is inadequate information to assess the carcinogenic potential of toluene.

Sources

- The major use of toluene is as a mixture added to gasoline to improve octane ratings.
- Toluene is used to produce benzene and as a solvent in paints, coatings, synthetic fragrances, adhesives, inks, and cleaning agents.
- Toluene is also used in the production of polymers used to make nylon, plastic soda bottles, and polyurethanes and for pharmaceuticals, dyes, cosmetic nail products, and the synthesis of organic chemicals.
- Automobile emissions are the principal source of toluene to the ambient air. Toluene may also be released to the ambient air during the production, use, and disposal of industrial and consumer products that contain toluene.

Indiana Emissions

IDEM collects HAP emissions information for the categories of point sources (large stationary sources like power plants and factories), nonpoint sources (aka area sources - smaller stationary sources like gas stations and dry cleaners), and mobile sources (vehicles, airplanes, marine vessels, etc.).* Estimated statewide emissions of toluene totaled 11,316.22 tons in the 2014 calendar year. Of this total, 75.5% was attributed to mobile sources, 19.6% to nonpoint sources, and approximately 5.0% to point sources.



* For additional examples of types of emission sources, please visit IDEM's Hazardous Air Pollutants page at: <http://www.in.gov/idem/toxic/pages/hap/index.html>. For specific details on industrial sources of air toxics, please visit U.S. EPA's Toxics Release Inventory (TRI) page at: <https://www.epa.gov/toxics-release-inventory-tri-program>.

Measured Concentration Trends

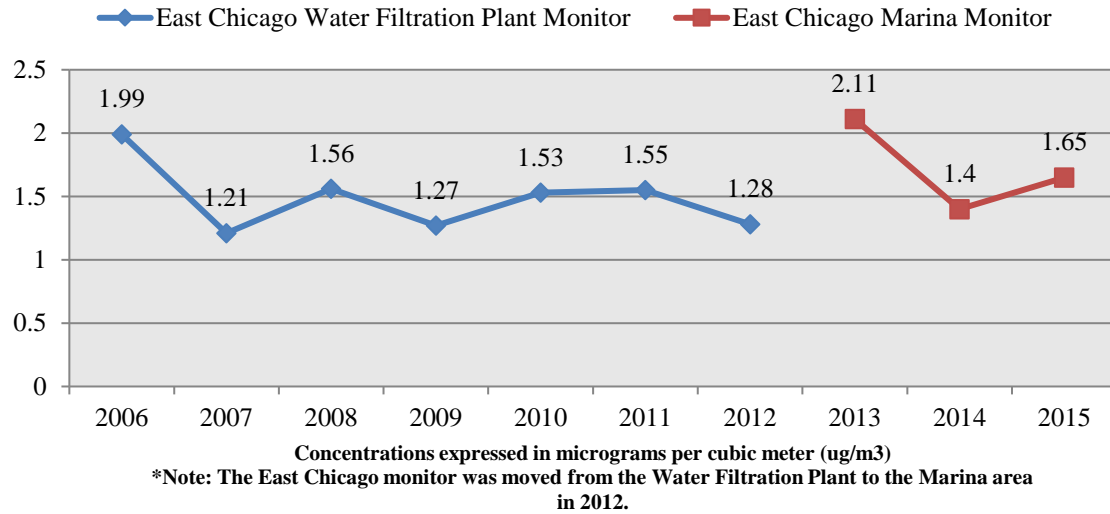
Ambient air monitoring data most accurately represents a limited area near the monitor location. All monitors for air toxics sample every sixth day. The monitoring locations by themselves are not sufficient to accurately characterize air toxic concentrations throughout the entire state, however, results from the monitors will provide exposure concentrations with a great deal of confidence at the monitoring locations.

The ambient air monitoring results were analyzed using U.S. EPA recommended statistical methods. IDEM evaluated the data so that a 95% upper confidence limit of the mean (UCL) could be determined. A 95% UCL represents a value which one can be 95% confident that the true mean of the population is below that value.

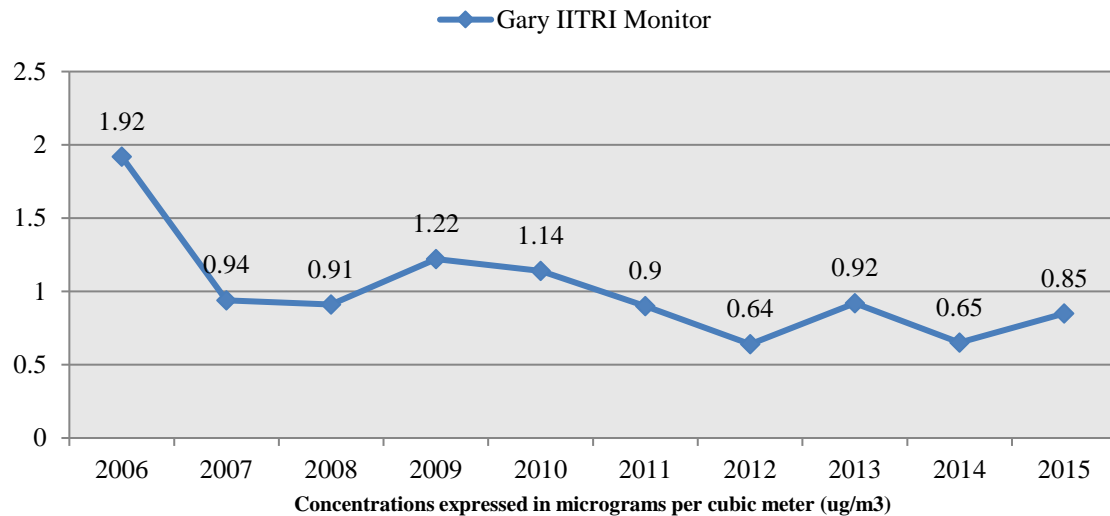
To learn more about the current monitoring locations, please visit IDEM's Air Toxics Monitor Siting webpage at: <http://www.in.gov/idem/toxic/2337.htm>

Data analysis was performed for each monitor that operated for a significant portion of the analysis period. This analysis determined the detection rate, which is defined as the percentage of valid samples taken statewide that had a quantifiable concentration of the pollutant. The statewide detection rate of toluene for the monitors analyzed from 2006-2015 was 97.1%. Trend graphs for each of these monitors are provided below.

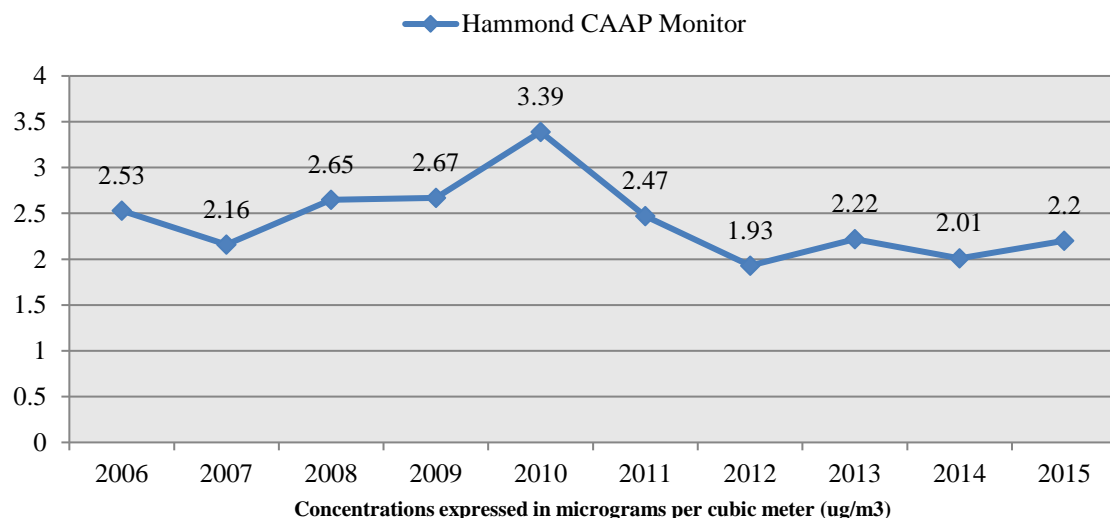
95% UCL Toluene Concentrations at East Chicago (2006-2015)



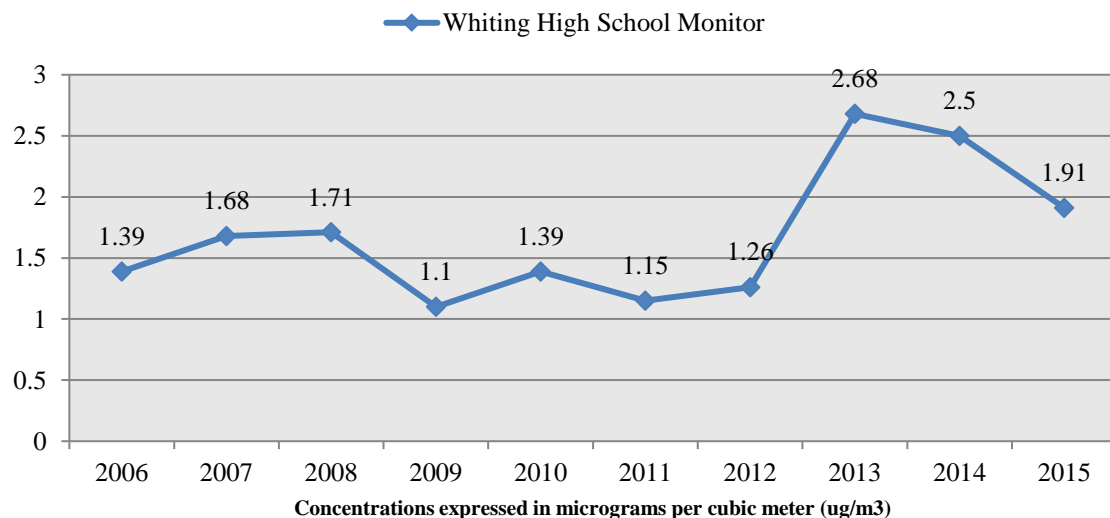
95% UCL Toluene Concentrations at Gary (2006-2015)



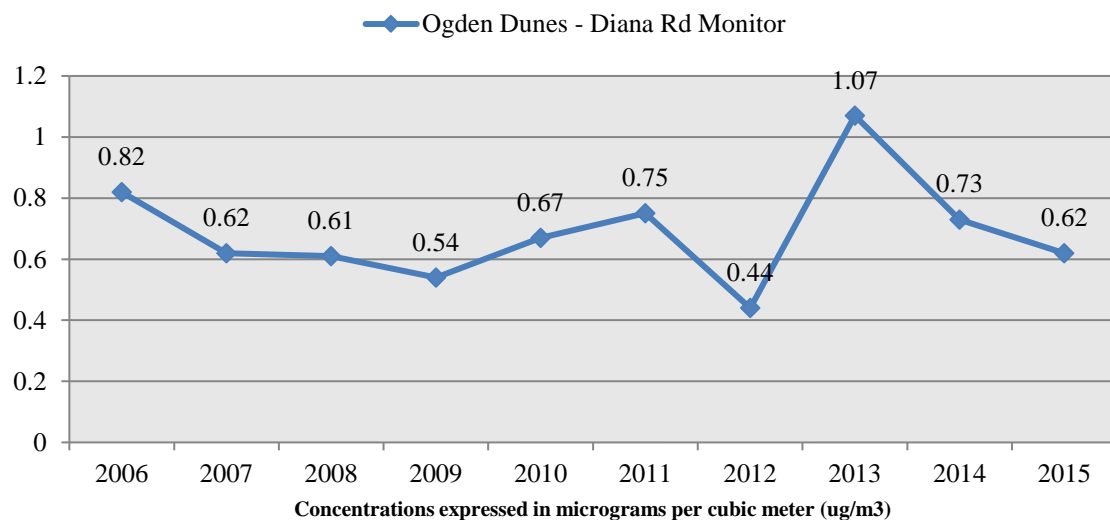
95% UCL Toluene Concentrations at Hammond (2006-2015)



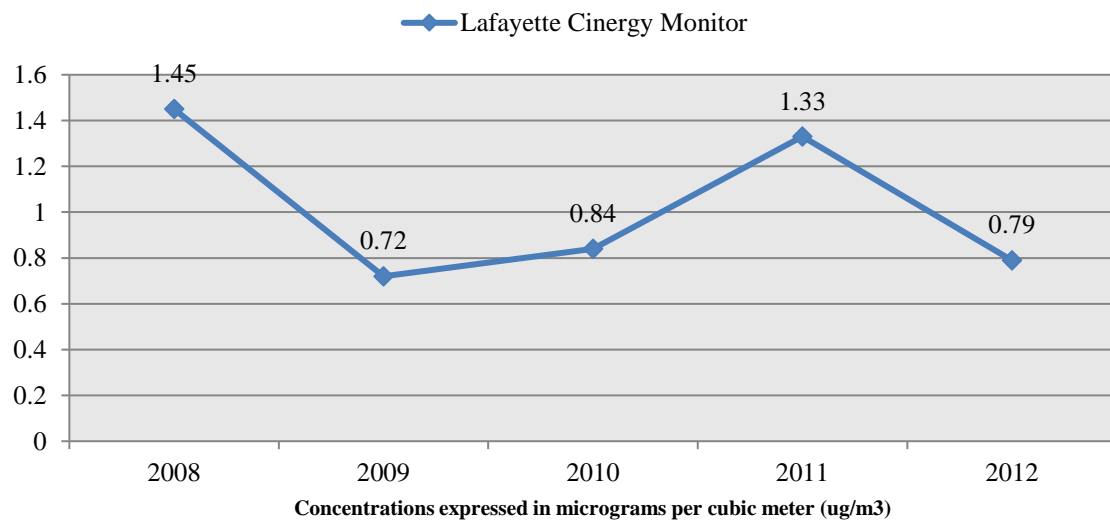
95% UCL Toluene Concentrations at Whiting (2006-2015)



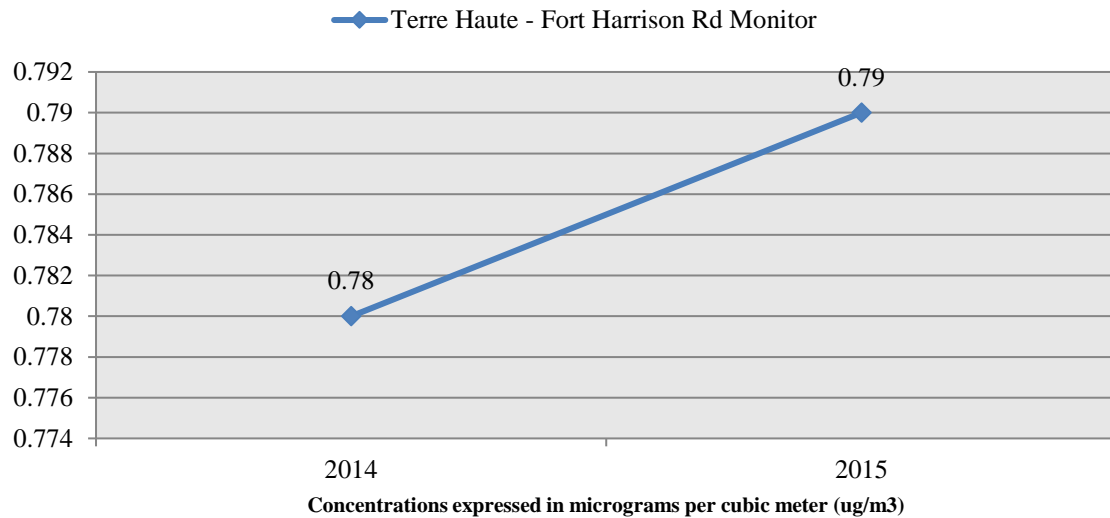
95% UCL Toluene Concentrations at Ogden Dunes (2006-2015)



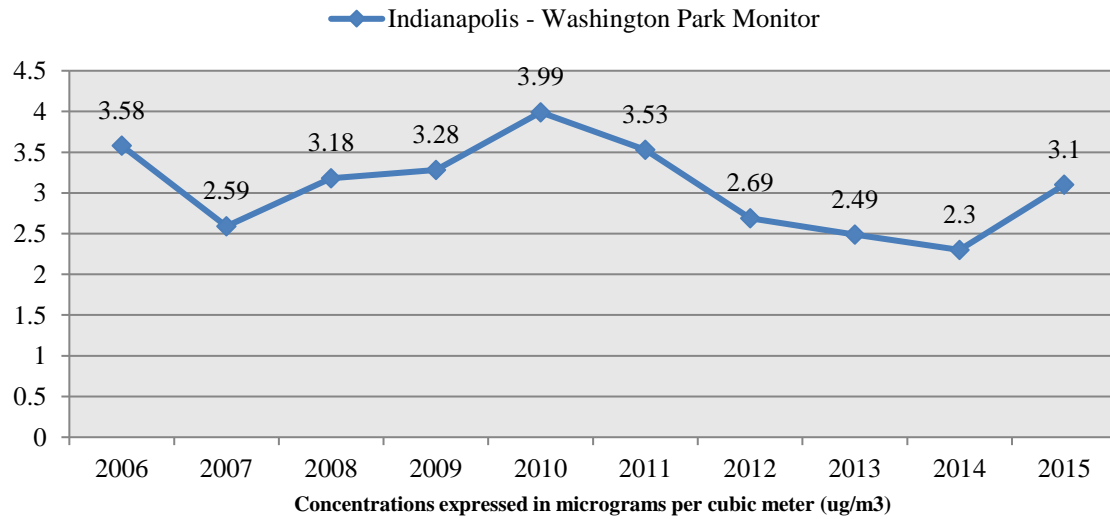
95% UCL Toluene Concentrations at Lafayette (2008-2012)



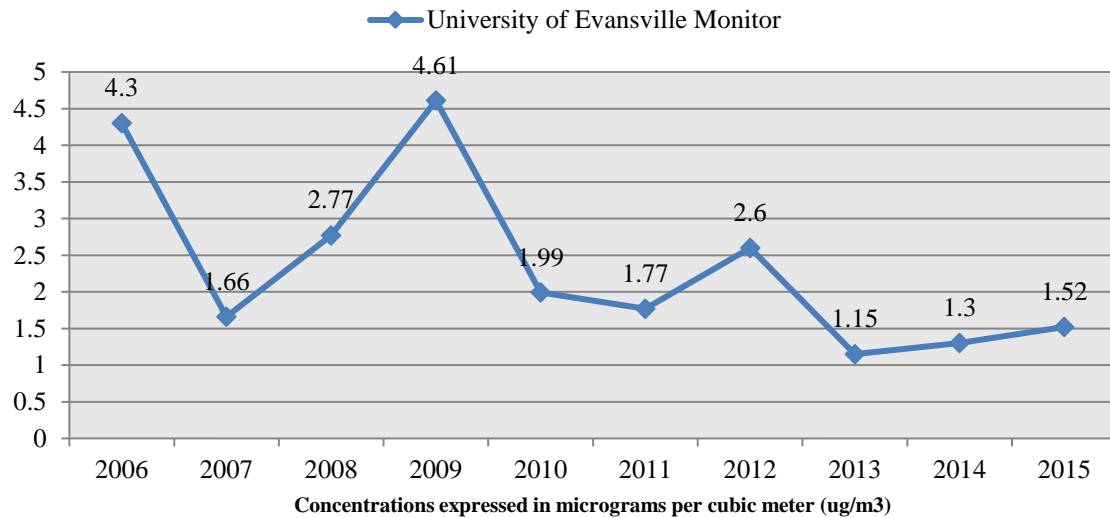
95% UCL Toluene Concentrations at Terre Haute (2014-2015)



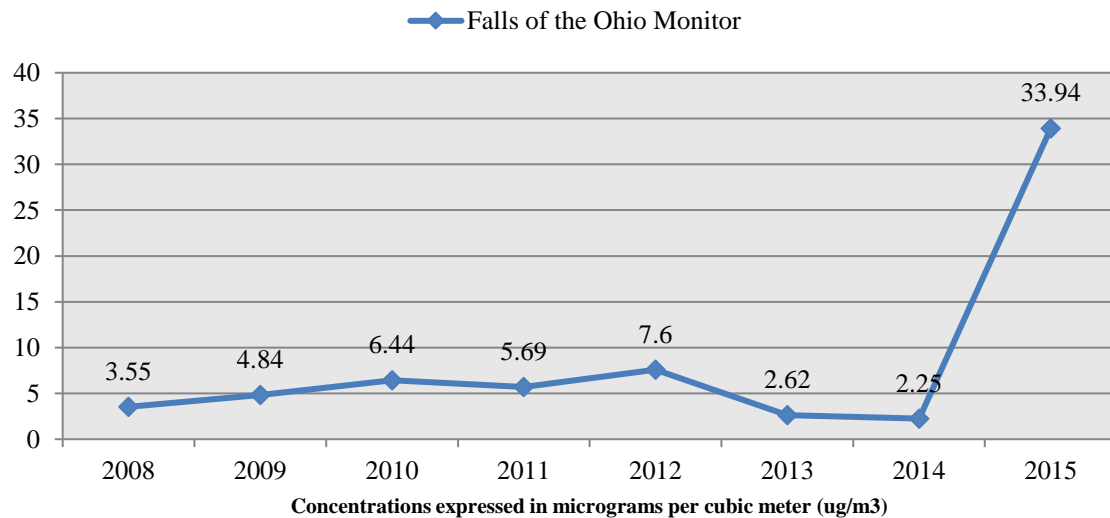
95% UCL Toluene Concentrations at Indianapolis (2006-2015)



95% UCL Toluene Concentrations at Evansville (2006-2015)



95% UCL Toluene Concentrations at Clarksville (2008-2015)



The analysis of monitoring data from 2006 to 2015 indicates that concentration patterns of propene have remained relatively steady at most monitors around the state. Readings from multiple monitors in northwest Indiana show a spike in readings during 2013 followed by a decline in the following years. The most notable spike in readings occurred in Clarksville during 2015. The calculated 95% UCL value for Clarksville in 2015 was heavily influenced by a string of unusually high readings during the months of February and March. The single highest reading

in this study was 152.38 ug/m³ recorded in Gary on 2/22/2015. This reading is well below the reference concentration for toluene. More information about the reference concentration can be found in the hazard quotient section below.

Hazard Quotient

IDEM evaluates chronic (lifetime) non-cancer hazard assuming a threshold for each pollutant at which a health effect can be observed. That is, it assumes safe exposure to the pollutant up to a certain level before it is possible to experience a health effect from breathing the pollutant. IDEM uses health protective assumptions by taking into account people who might be more sensitive to the pollutants. The hazard quotient is a ratio that divides the measured concentration of a pollutant by the reference concentration (RfC). A hazard quotient under 1.0 is commonly recognized to be below the health-protective level. Hazard quotients over 1.0 indicate that further investigation may be necessary and does not necessarily mean that health effects are expected. Given the many health-protective assumptions used in the evaluation, most non-cancer hazards over 1.0 are still unlikely to be associated with observable adverse health effects.

The average concentration of toluene was evaluated for each air pollutant monitor over the span of this study. The results for each monitor are displayed in the table below. The calculated hazard quotient is below 1.0 at all monitors, which indicates that the measured concentrations of toluene do not present a risk for non-cancer health effects.

Table 1. Toluene Hazard Quotients (concentrations expressed in micrograms per cubic meter)

Monitor	Years	Average Concentration	Reference Concentration (RfC)*	Hazard Quotient
East Chicago Water Filtration Plant	2006-2012	1.33	5000.00	0.0003
East Chicago Marina	2013-2015	1.61	5000.00	0.0003
Gary IITRI	2006-2015	0.90	5000.00	0.0002
Hammond CAAP	2006-2015	2.16	5000.00	0.0004
Whiting High School	2006-2015	1.48	5000.00	0.0003
Ogden Dunes – Diana Rd	2006-2015	0.61	5000.00	0.0001
Lafayette Cinergy	2008-2012	0.92	5000.00	0.0002
Terre Haute – Fort Harrison Rd	2014-2015	0.75	5000.00	0.0002
Indianapolis – Washington Park	2006-2015	2.67	5000.00	0.0005

University of Evansville	2006-2015	1.92	5000.00	0.0004
Clarksville – Falls of the Ohio	2008-2015	7.24	5000.00	0.0014

* Reference Concentration Source: Integrated Risk Information Service (IRIS)

Cancer Risk

Toluene is not classifiable as to its potential to cause cancer.