

# Southwest Indianapolis Community Scale Air Toxics Study

March 11, 2010

Indiana Department of  
Environmental Management



## Background of Study

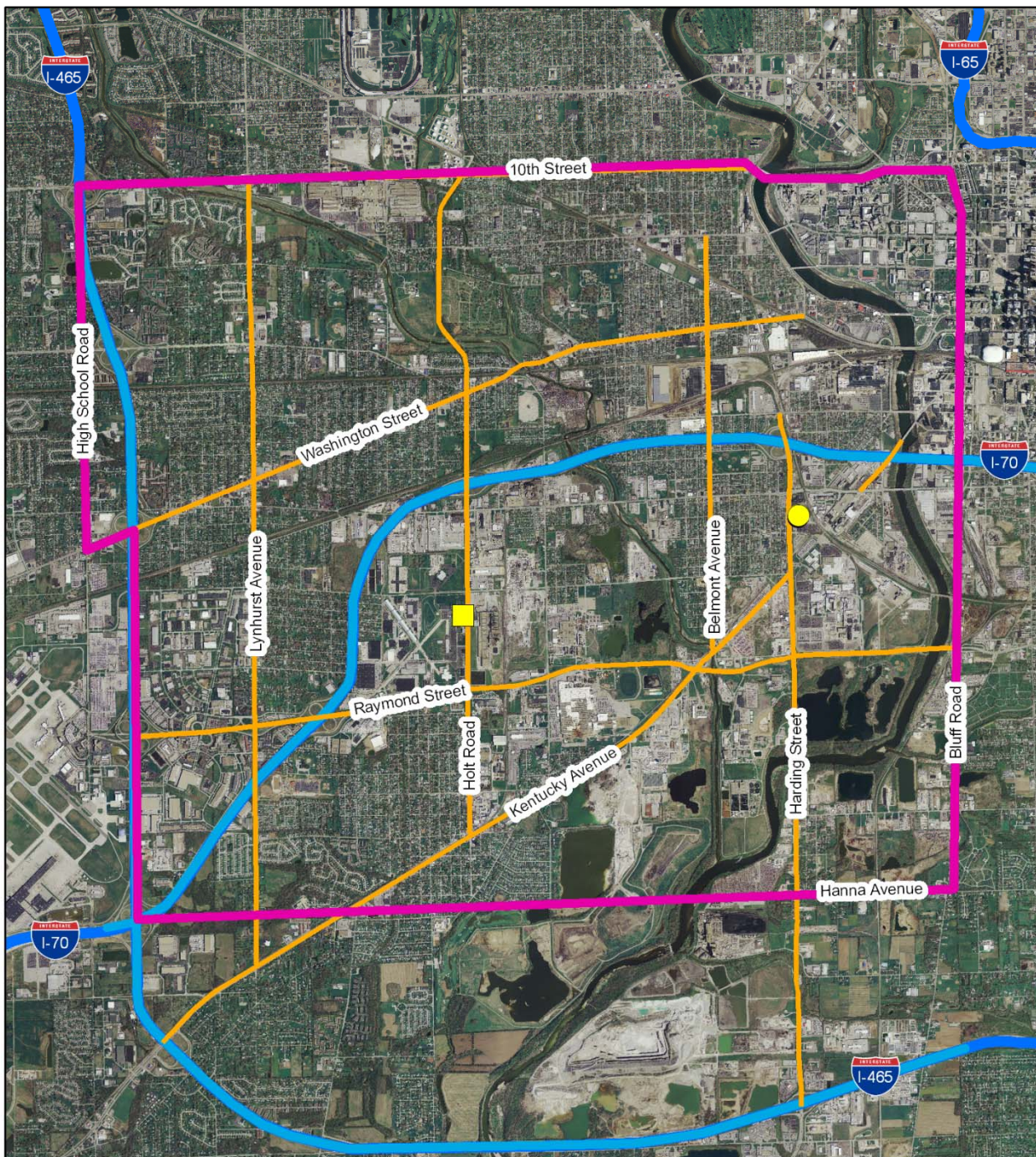
- Area highlighted in 1996 National Air Toxics Assessment (NATA) as high risk (released 2002)
  - National computer model that screens air toxics for the entire United States
  - Chromium VI main chemical of interest
- Identified through results of SEA 259 as being an area of interest for further study (released 2003)
- Highlighted again in 1999 NATA as area of high risk (released 2006)
  - Arsenic and acrolein main chemicals of interest
- Area featured in 2004 by local news as having poor air quality



## Background of Area

- Area has a large number of industries mixed within residential neighborhoods
- Indianapolis International Airport located next to study area
- Two major interstate highways run through the study area
- IDEM applied for and received a \$244,262 grant from U.S. EPA to study air toxics levels and health risk in cooperation with City of Indianapolis (third application accepted)
- Monitoring ran from October 2006 through October 2008





# Southwest Indianapolis Air Toxics Study



This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By: B. Callahan, Office of Air Quality  
 Date: 2/18/2010

**Sources:**  
 Non-Orthophotography Data - Obtained from the State of Indiana Geographical Information Office Library and CAQ  
 Orthophotography Data - Obtained from Indiana Map Framework Data ([www.indianamap.org](http://www.indianamap.org))

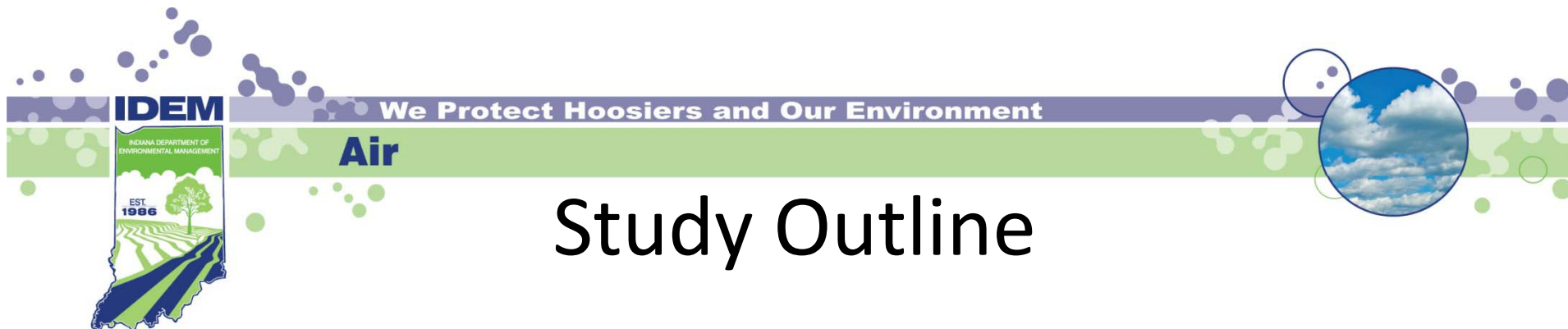
Map Projection: UTM Zone 16 N Map Datum: NAD83





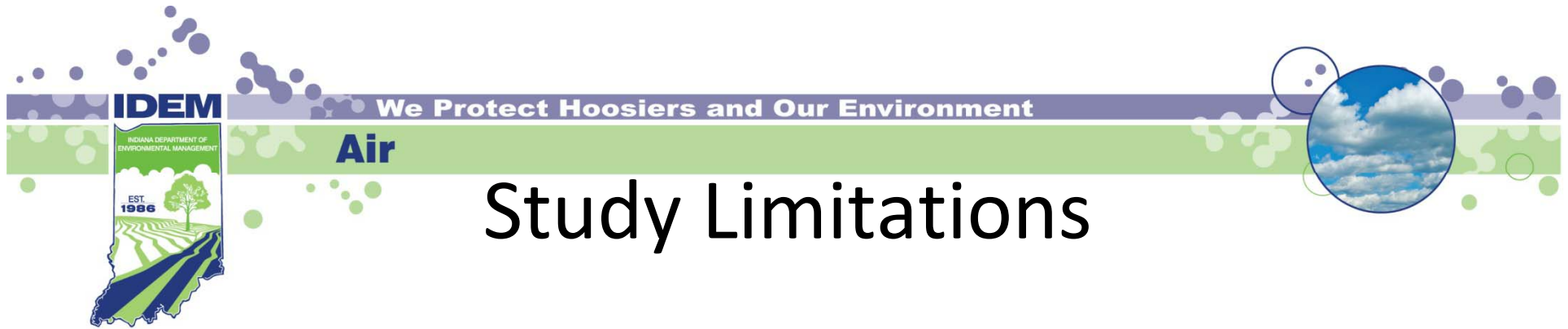
## Goals of the Study

- Collect air toxics monitoring data within the study area
- Develop a detailed emissions inventory of all industrial and business sources in the area
- Conduct community scale detailed air toxics modeling
- Assess and characterize potential health risks from air toxics to the community
- Look for opportunities to reduce risk from pollution sources
- Communicate results of the study



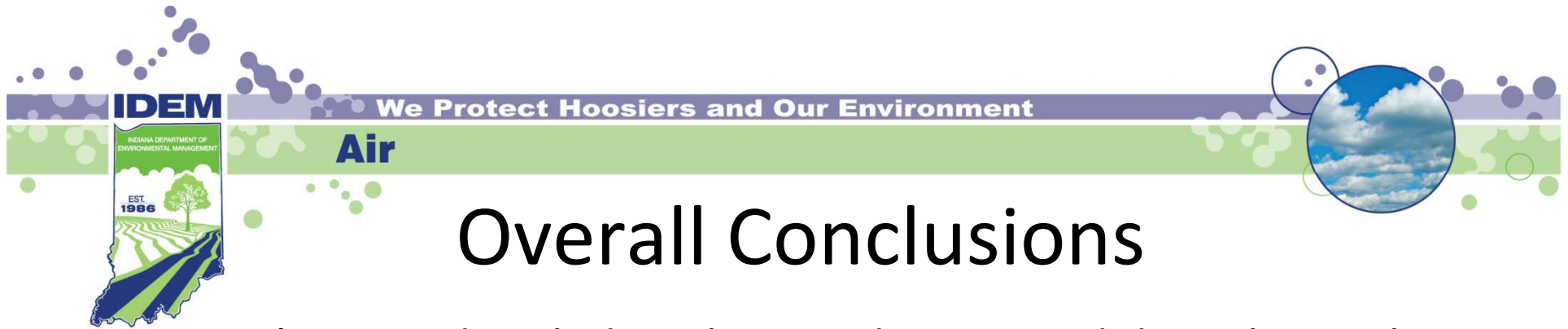
# Study Outline

- Air Monitoring
  - Two monitoring locations (Harding Street, Stout Field)
    - Metals (arsenic, manganese, nickel, etc.)
    - Carbonyls (formaldehyde, acetaldehyde, valeraldehyde, etc.)
    - Volatile Organic Compounds (VOC) (acrolein, benzene, toluene, etc.)
    - Chromium VI sampling for one year (Harding Street)
- Air Modeling component
  - Regional Air Impact Modeling Initiative (RAIMI)
- Community involvement
  - Public Advisory Group
  - Technical Advisory Group



# Study Limitations

- Thousands of pollutants are emitted
  - Modeled 168 pollutants, monitored 85 pollutants
  - Selected pollutants based on what industry emits and chemicals identified as the most toxic by NATA
- Ozone ( $O_3$ ) and Particulate Matter (PM) not evaluated as part of the study
  - IDEM evaluates  $O_3$  and PM as part of its core network for Indianapolis
  - Current monitoring levels are below health protective levels
- Uncertainty in toxicity data
  - Individual people react differently, have different exposure, genetic make up, etc.
  - IDEM uses reasonable “*worst case*” assumptions in evaluations



## Overall Conclusions

- IDEM's more detailed analysis and measured data shows that air toxics concentrations are lower than predicted by U.S. EPA's NATA screening tool
  - Monitored concentrations of chromium VI and arsenic were lower than predicted by NATA and below health protective levels
- No pollutants were observed at concentrations that warrant immediate or drastic action to protect human health
- Air toxics concentrations in Southwest Indianapolis are similar to concentrations observed throughout other Indiana and Midwestern cities
- Motor vehicles (cars, trucks, etc.) are the largest contributor of air toxics in the area, which is common in large urban areas





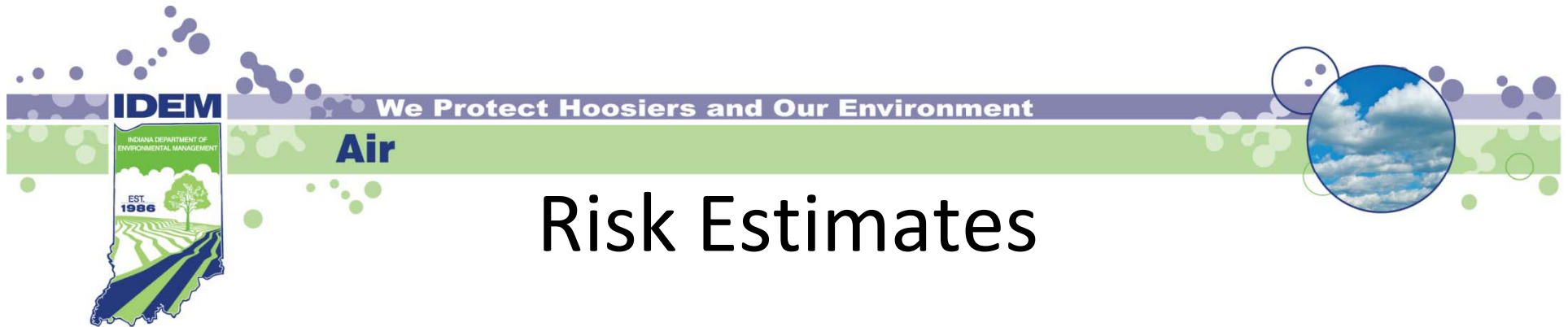
## Secondary Conclusions

- Both monitors measured similar results
- Acrolein is a pollutant of interest based on monitoring data collected
  - We believe that motor vehicles are primary contributor to air concentrations
  - Other pollutants “break down” into acrolein in air
  - Challenges with monitoring methodology and origin of pollutant
- Benzene is the carcinogen of greatest concern
  - Motor vehicles are primary contributor
  - Consistent with concentrations observed in other metropolitan areas
- No industry-caused hotspots were observed in residential areas of the study
- Air toxics concentrations in the area are as safe to breathe as other urban areas in Indiana and the Midwest



# Air Monitoring

- Monitoring Locations
  - Followed U.S. EPA guidance
  - Near residential areas but secure from tampering
- Monitoring Frequency
  - 24-hour samples
  - Sampled every 6 days
- Quality Assurance
  - U.S. EPA-approved Quality Assurance Project Plan (QAPP)



## Risk Estimates

- Examined both cancer and non-cancer health effects
- Exposure assumptions
  - Erred on the side of being health-protective
  - Continuous exposure (24 hours a day for 70 years)
- Toxicity information
  - Used toxics data from U.S. EPA and other health agencies (i.e., IRIS, ATSDR, CALEPA)

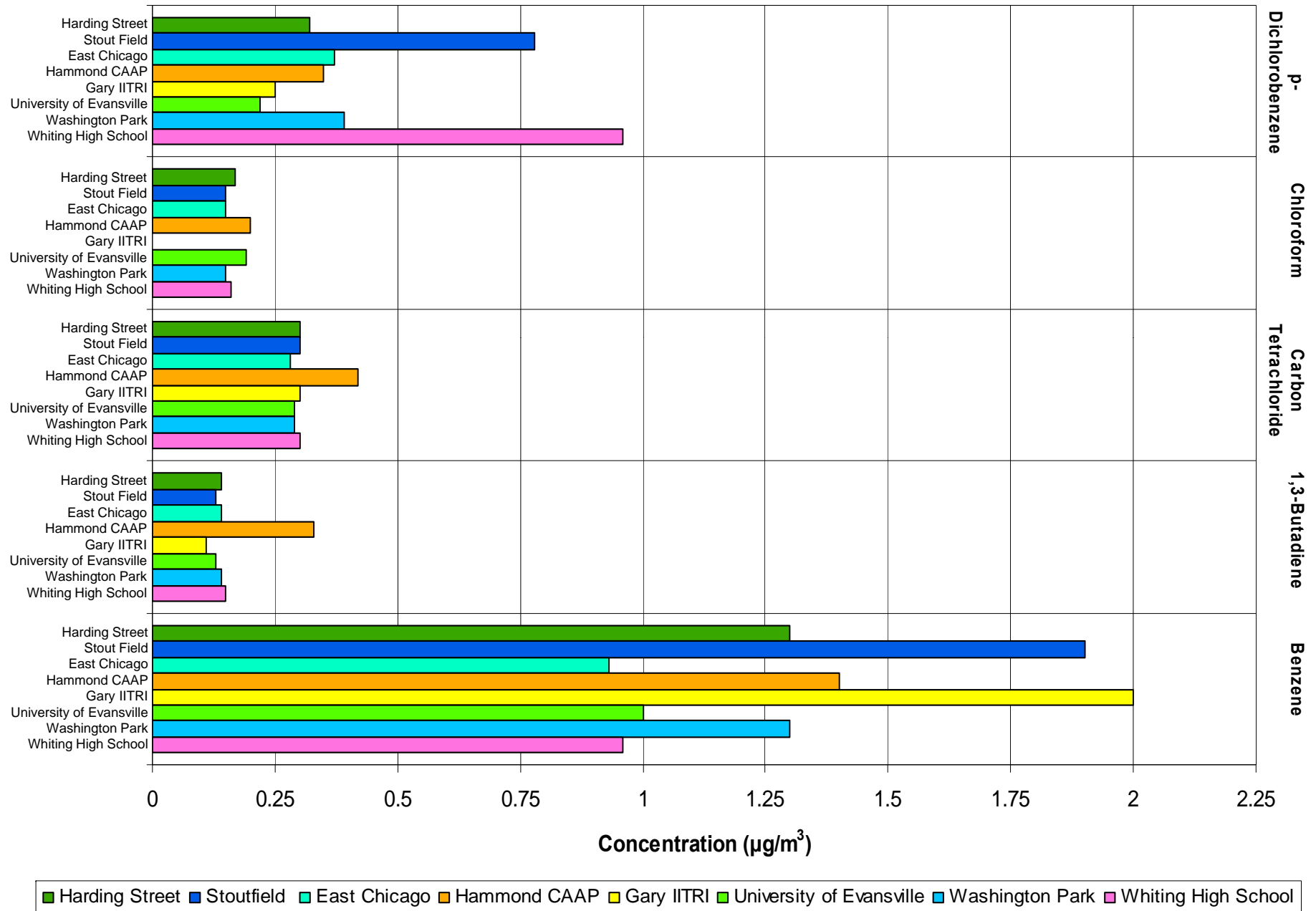


## Cancer Risk

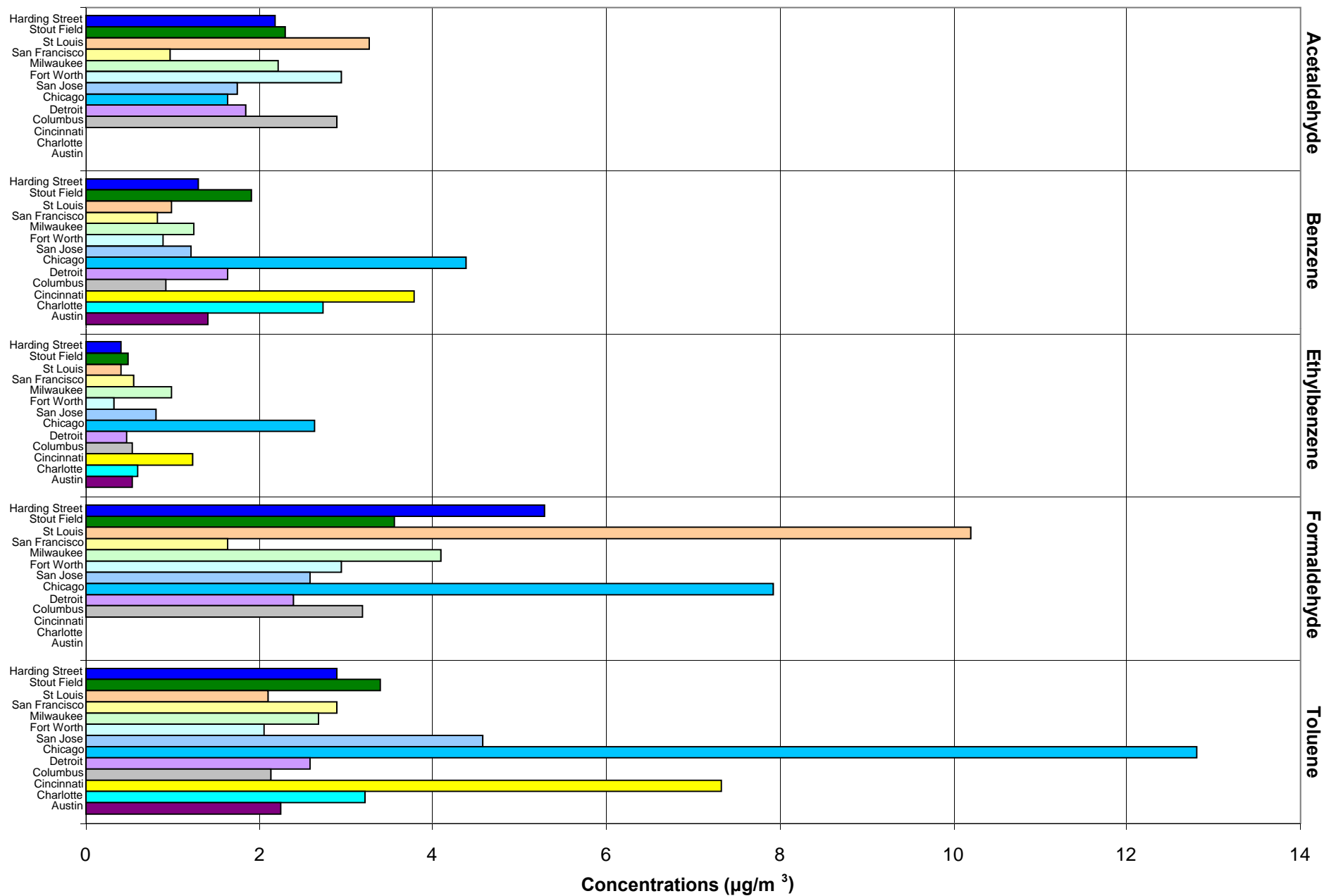
- Highest monitored cancer risk pollutant was benzene
  - Highest risk estimate was at Stout Field at 15 in a million
    - With population of 60,000, we would expect to see less than one additional cancer case in the study area over 70 years



# Carcinogenic Compound Concentrations Throughout Indiana



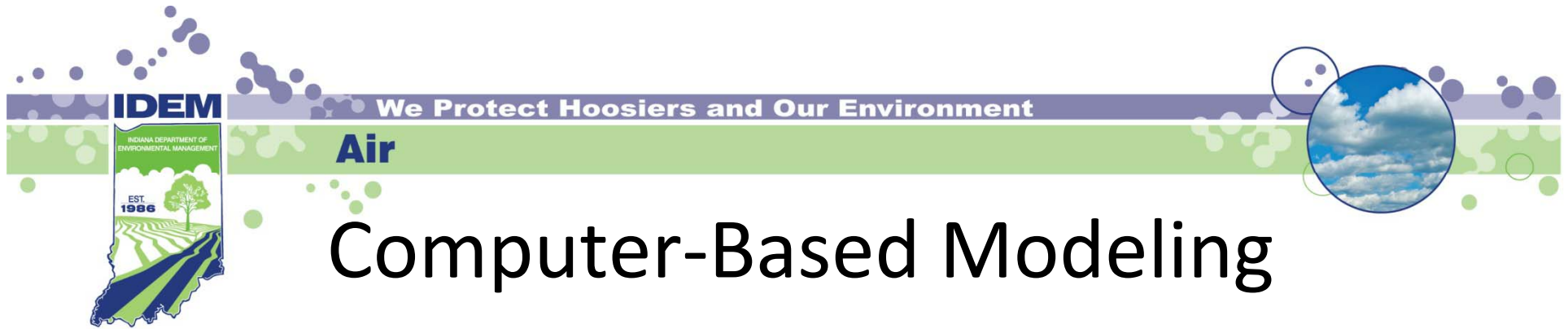
# U.S. City Mobile Source Pollutant Concentration Comparison





## Non-Cancer Hazard

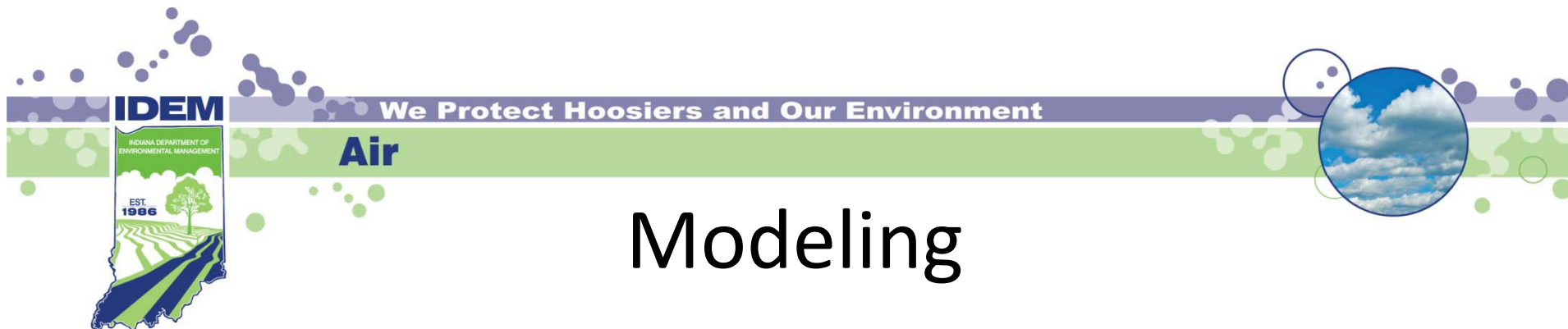
- Acrolein main contributor - 99% of total hazard in both locations
  - Many unknowns concerning monitoring of acrolein
    - No standard method nationally for monitoring
    - How much acrolein forms from breakdown of other pollutants
  - Acrolein identified as being of interest nationally
  - IDEM actively involved in addressing acrolein monitoring challenges with other agencies



# Computer-Based Modeling

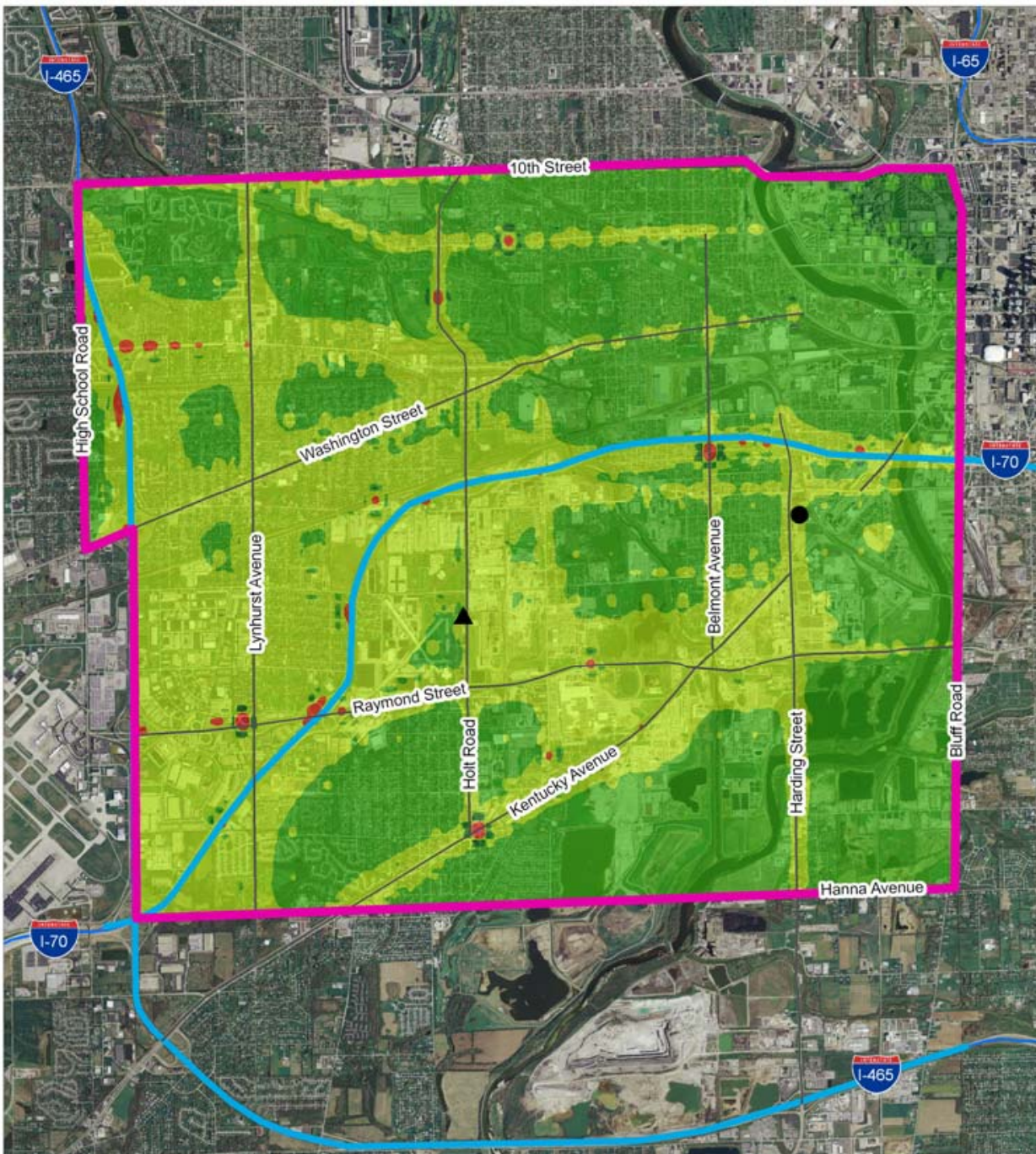
- Used Regional Air Impact Modeling Initiative (RAIMI) to evaluate emissions from:
  - Industries
  - Gas stations, small businesses, etc.
  - Cars and trucks (mobile sources)
- Designed by U.S. EPA specifically to evaluate communities with the size and complexity of Southwest Indianapolis
- Much more localized and detailed than U.S. EPA NATA





# Modeling

- 465 total sources
  - 315 Industrial sources
  - 71 Trucking sources
  - 49 Gas stations/truck stop sources
  - 19 Auto body sources
  - 10 Dry cleaning sources
  - Indianapolis International Airport
- 2 Interstates (I-70 and I-465)
- 13 major roadways (Holt Rd., Raymond St., Belmont Ave., etc.)
- 168 total pollutants
- Data from 54,195 nodes (locations/receptors)
- Sources included from areas outside of the study area to evaluate impact on area



# Total Modeled Estimated Cancer Risk

## Cancer Risk

- Cancer Risk < 1 in 1,000,000
- 1 in 1,000,000 < Cancer Risk < 10 in 1,000,000
- 10 in 1,000,000 < Cancer Risk < 100 in 1,000,000
- 100 in 1,000,000 < Cancer Risk < 1,000 in 1,000,000



## Legend

- Harding St. Monitor
- Stout Field Monitor
- SW Indianapolis Study Area



0 0.25 0.5 Mi  
0 0.25 0.5 Km

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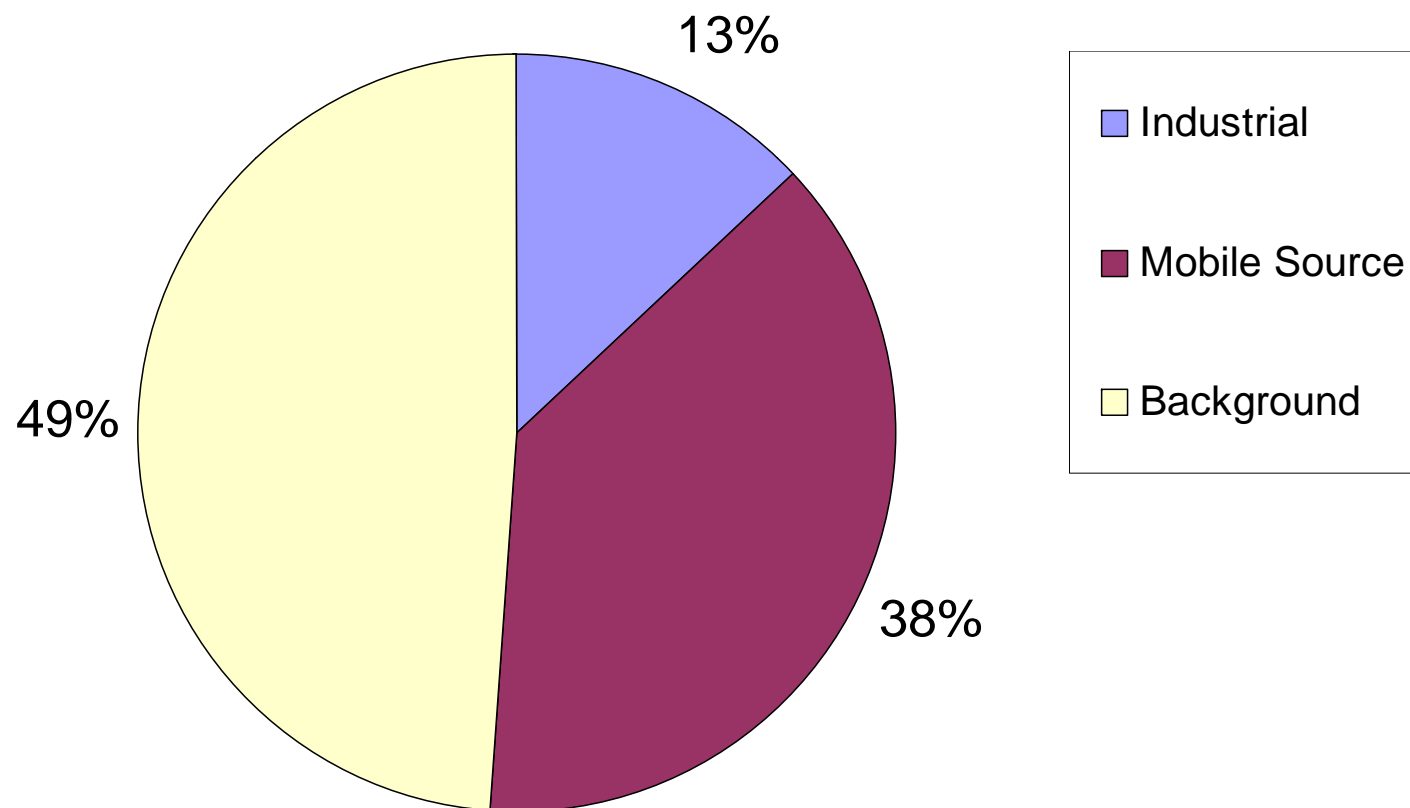
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## Contributions of Air Pollutant Risk for Southwest Indianapolis by Source Category





# Model to Monitor Comparison\*

## Harding Street Monitor

Pollutants	Modeling Concentration (including background)	Monitoring Concentration	Comparison (under 3 considered good agreement)
	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	
Acetaldehyde	1.8	0.67	2.7
Benzene	0.87	1.3	-1.5
Formaldehyde	2.7	3.5	-1.3
Toluene	1.9	2.9	-1.5
Nickel	0.0066	0.001	6.6

\* Necessary to put model performance into perspective.





**IDEM**

**We Protect Hoosiers and Our Environment**

**Air**



# Model to Monitor Comparison\*

## Stout Field Monitor

Pollutants	Modeling Concentration (including background)	Monitoring Concentration	Comparison (under 3 considered good agreement)
	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	
Acetaldehyde	1.8	0.70	2.6
Benzene	1.2	1.9	-1.6
Formaldehyde	2.8	2.4	1.2
Toluene	2.7	3.4	-1.3
Nickel	0.0075	0.002	3.8

- Necessary to put model performance into perspective.

# NATA vs. Harding Street Monitoring

Pollutant	1999 NATA Concentration	2002 NATA Concentration	Harding Street Monitor
	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Acetaldehyde	1.7	2.7	0.67
Arsenic	0.13	0.001	0.001
Benzene	1.9	1.6	1.3
Chromium VI	0.00064	N/A	0.00004
Formaldehyde	2.1	2.9	3.5
Toluene	4.1	3.8	2.9

# NATA vs. Stout Field Monitoring

Pollutant	1999 NATA Concentration	2002 NATA Concentration	Stout Field Monitor
	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Acetaldehyde	1.4	2.4	0.70
Arsenic	0.0011	0.001	0.001
Benzene	1.9	1.4	1.9
Chromium VI	0.00031	N/A	N/A
Formaldehyde	1.9	2.8	2.4
Toluene	3.4	3.4	3.4



# Outreach

- Technical Advisory Group
  - Served as forum to evaluate methods and make recommendations concerning specific technical matters
- Public Advisory Group
  - Helped IDEM understand community concerns
  - Helped develop communication plan to present results as clearly as possible
  - Provided community perspective
- Industry Cooperation
  - Helped with collection of emissions inventory information
  - 83% response rate to emission information request
  - Kept employees in area informed
- Web Page
  - [www.idem.IN.gov/programs/air/workgroups/swindyairtox](http://www.idem.IN.gov/programs/air/workgroups/swindyairtox)





# City of Indianapolis

- Project Partner
  - Helped maintain monitoring locations
  - Collected samples
  - Provided local industry information
  - Assisted with public outreach



## Overall Conclusions

- IDEM's more detailed analysis and measured data shows that air toxics concentrations are lower than predicted by U.S. EPA's NATA screening tool
  - Monitored concentrations of chromium VI and arsenic were well below levels assumed in NATA
- No pollutants were observed at concentrations that warrant immediate or drastic action to protect human health
- Air toxics concentrations in Southwest Indianapolis are similar to concentrations observed throughout other Indiana and Midwestern cities
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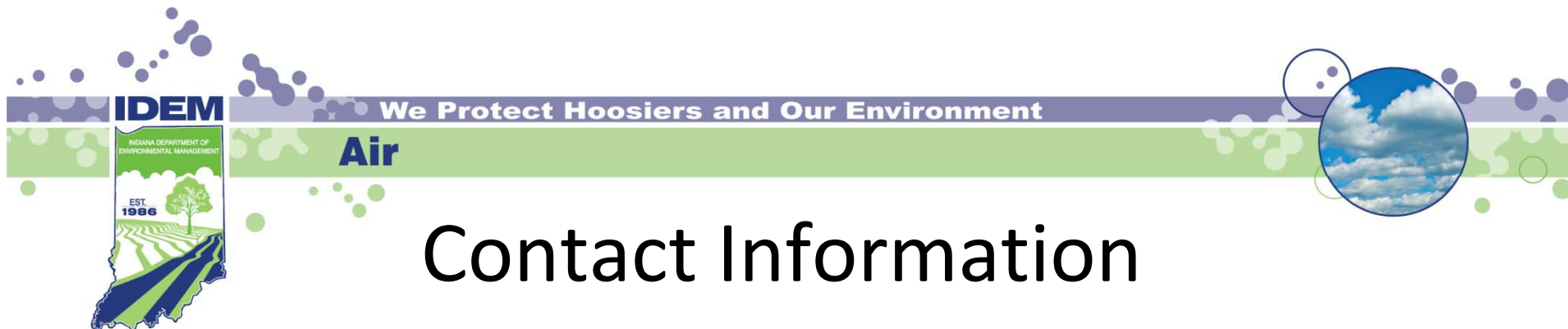
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## Next Steps

- U.S. EPA and IDEM Initiatives
  - Mobile Source Air Toxics rule implementation
  - Work to promote reduced car, truck, and bus idling
  - Diesel exhaust retrofits (DieselWise, retrofits, grants)
  - Continue to work with industry on creative pollution prevention opportunities
- City of Indianapolis
  - Central Indiana Clean Air Partnership (CICAP)
  - Knozone program
- Community
  - Reduce mobile emissions



# Contact Information

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# Comments & Questions?