

Near-Source Characterization of High Risk Formaldehyde, Precursors and other HAPs Posing Significant Risk in Houston to Inform Evaluation of Emission Reduction Measures

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Background: NATA 2014

- NATA indicated high cancer risk from formaldehyde in certain census tracts
- Five of the top ten census tracts for cancer risks in Houston are contiguous
- These census tracts also fall between the 6th and 12th rank for non-cancer respiratory hazards
 - Harrisburg, Manchester, Meadowbrook, Allendale, Northshore and Galena Park, all in the Houston Ship Channel
- NATA estimates of cancer risk and formaldehyde concentrations are high in surrounding neighborhoods as well

Background: Why do we care?

- One of the 12 “definite risk pollutants” posing unacceptable increased air pollution cancer risk in Houston in 2006 according to a Mayor’s Task Force
- Long-term exposure to formaldehyde increases the risk of lung, respiratory and other cancers
- Precursor to ozone formation, another “definite risk pollutant,” linked to reduced lung function, harm of lung tissue, worsening of bronchitis, emphysema, asthma, and increased likelihood of cardiac arrest

Background: Formaldehyde

Difficult to regulate and control in Houston because:

- Vast majority (95%) is secondarily formed,
- Largely from non-hazardous pollutants (e.g., ethylene, isoprene, propylene)

Background: Summary

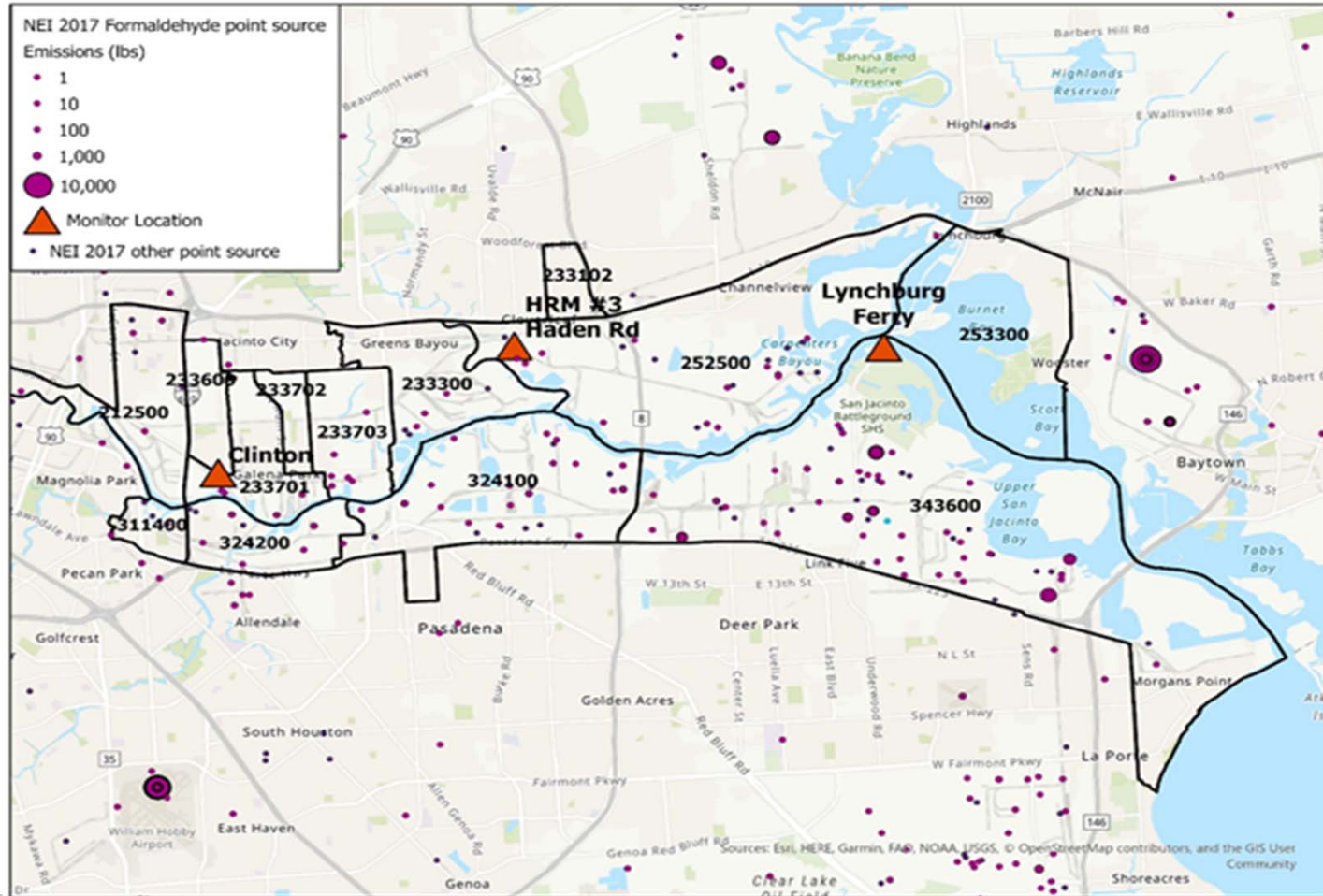
- NATA modeling indicated we might have elevated formaldehyde
- Formaldehyde needs to be controlled because it is a carcinogen
- It is also a precursor to ozone which has its own set of health effects
 - without controlling for formaldehyde our efforts to control ozone are less effective
- Formaldehyde is tricky to control because in Houston most of it is formed from precursors that are not hazardous and wouldn't necessarily need control

EPA Grant Project

Awarded an EPA Community Air Toxics Monitoring Grant to investigate formaldehyde.

The objective of the work was to provide additional and updated information for regulators so that they may enhance controls, regulations, or permits with this new knowledge. Thereby they are better able to protect communities.

Project Area



Project Area Existing Data

Project Area Existing Data

TCEQ available formaldehyde sampling locations by duration and year as of 9/30/2020

Type	8-hr			24-hr		
	2018	2019	2020	2018	2019	2020
Samples	91	90	0	86	52	10
Sites	1	1	0	2	2	2

A statistical comparison of 24-hour samples between 2019 (n=51) and 2020 (n=10) show a statistically significant increase in HCHO concentration from 2019. **TCEQ fixed site formaldehyde data indicate that HCHO concentrations are slightly statistically increasing in Houston, and sampling frequency is decreasing.**

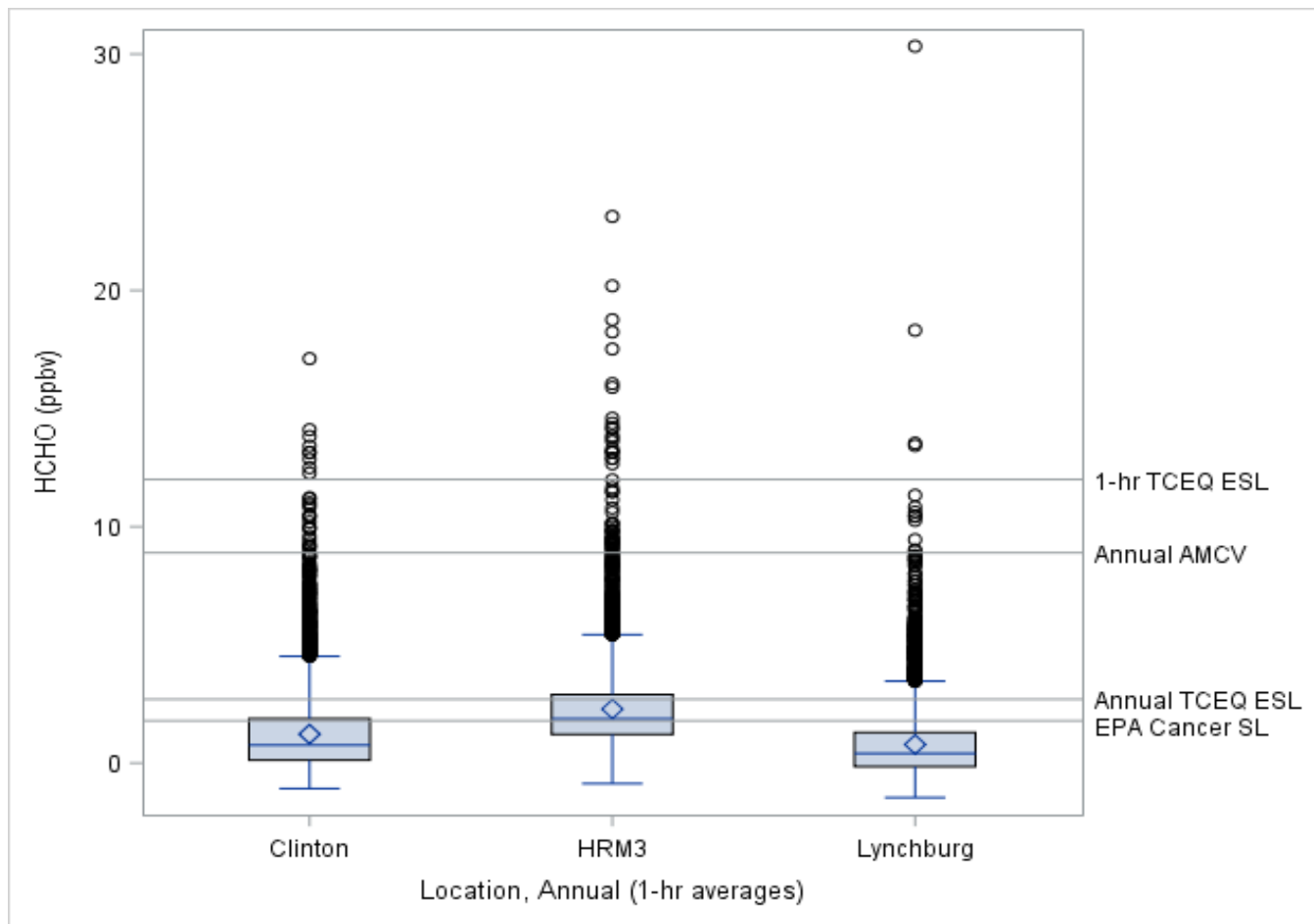
Project Monitoring

Project formaldehyde monitor instruments and their co-location at a fixed site address for the entire sampling period.

Date	08/01/2019- 08/20/2019	08/20/2019- 09/25/2019	09/25/2019- 09/27/2019	09/27/2019- 05/29/2020	05/29/2020- 07/28/2020	07/28/2020- 09/04/2020	09/04/2020- Present
HRM3	Aero-Laser Picarro 2 Picarro 3	Aero-Laser	Aero-Laser	Aero-Laser			Picarro 2
Lynchburg Ferry			Picarro 2	Picarro 2	Picarro 2		
Clinton				Picarro 3	Picarro 3	Picarro 3	Picarro 3

Formaldehyde measurements were made continuously at each site over a year, providing formaldehyde readings more than once a second.

Results: Measured Formaldehyde



Results

TCEQ formaldehyde concentrations at all three sites statistically exceed the EPA chronic screening level for 1 increased cancer case in one million (last TCEQ sample was April 27, 2020).

Study measurements indicate that concentrations measured at HRM3 also exceed the EPA chronic screening level for 10 in one million increased cancer risk.

Measured concentrations at HRM3 exceed the 2014 NATA modeled concentration.

Findings

- Verify for regulators that ***we do have a formaldehyde problem.***
- Contributes to the understanding of these critical air pollutants, allowing for improved modelling and regulation efforts by the Texas Commission on Environmental Quality and EPA.
- Data collected by this study add to the understanding of formaldehyde and its formation in Houston.

Findings

- Need for enhanced regulatory oversight,
 - similar to the study leading to TCEQ's adoption of its Highly Reactive VOC program more than a decade ago.
- Stricter limits and control of the gases that form into formaldehyde could benefit public health in multiple ways
 - Reduce carcinogens and an ozone-forming pollutant.
- Increased formaldehyde monitoring to better understand
 - public health risks and inform regulators and legislators effectiveness of controls

Not just a Houston problem

- Last NATA indicates formaldehyde was responsible for more than half of all the outdoor air pollution cancer risk in the United States.
- Any place with a concentration of industrial emissions would likely also see this secondary formation of formaldehyde.

Coverage in the Media

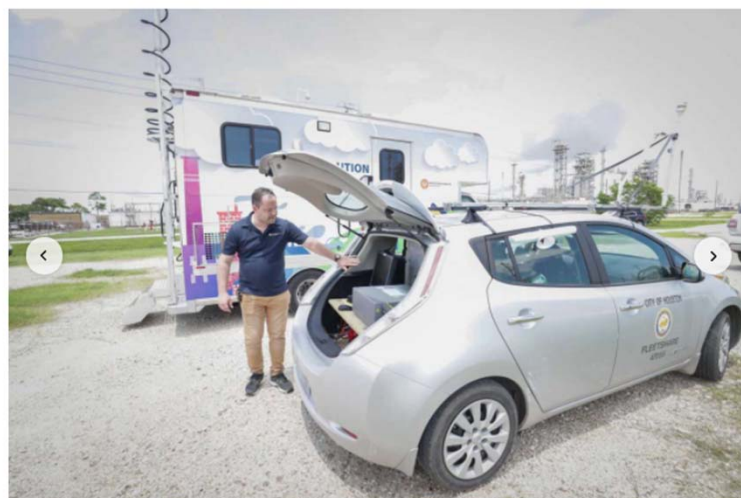
- HOUSTON CHRONICLE, 7/1/21
 - **Excessive formaldehyde levels put Ship Channel communities at higher risk of cancer, air study finds**

Houston urges TCEQ to tighten emissions rules following study of formaldehyde in city's air



Jasper Scherer, Staff writer

July 1, 2021 | Updated: July 2, 2021 9:03 a.m.



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John Pederson, an air quality analyst with the city of Houston's health department, discusses a new report about how much formaldehyde is in the city's air along the ship channel. The city has been studying formaldehyde with environmental groups. Steve Gonzales, Houston Chronicle / Staff photographer

Coverage in the Media

- HOUSTON CHRONICLE, 7/1/21
 - Excessive formaldehyde levels put Ship Channel communities at higher risk of cancer, air study finds
- HOUSTON PUBLIC MEDIA, 7/1/21
 - Report: Cancer-Causing Formaldehyde Found Near Houston Ship Channel Communities
- RUETERS, 7/1/21
 - High levels of cancer-causing chemical found in parts of Houston -report
- TEXAS PUBLIC RADIO, 7/1/21
 - Report: Cancer-Causing Formaldehyde Found Near Houston Ship Channel Communities
- KPRC-TV NBC-2 in Houston, 7/1/21
 - Toxic formaldehyde levels found in the air in neighborhoods near Houston Ship Channel
- FOX-26 TV in Houston, 7/2/21
 - Report says plumes of carcinogenic formaldehyde found in neighborhoods along Houston's ship channel
- INSIDE EPA, 7/2/21
 - Environmentalists Urge EPA To Tighten Formaldehyde Air Toxics Rules
- KAISER HEALTH NEWS, 7/2/21
 - Cancer-Causing Formaldehyde Found In Houston Air
- UNIVISION-TV in Houston, 7/2/21
 - Investigadores encuentran altas cantidades de un químico cancerígeno en áreas cercanas al canal de Houston

References

1. United States Environmental Protection Agency. National Air Toxics Assessment 2014 (09/27/2020).
2. United States Environmental Protection Agency. National Emissions Inventory 2017. (09/27/2020).
3. Parrish DD, Ryerson TB, Mellqvist J, Johansson J, Fried A, Richter D, Walega JG, Washenfelder RA, de Gouw JA, Peischl J, Aikin KC, McKeen SA, Frost GJ, Fehsenfeld FC, Herndon SC. Primary and secondary sources of formaldehyde in urban atmospheres: Houston Texas region. Atmos. Chem. Phys. 2012;12:3273-3288. <http://www.atmos-chem-phys.net/12/3273/2012/acp-12-3273-2012.pdf>
4. United States Environmental Protection Agency. [Regional Screening Levels for Chemical Contaminants at Superfund Sites](#). (09/27/2020).
5. Texas Commission on Environmental Quality. Effect Screening Levels. (9/27/2020).

<https://environmentalintegrity.org/reports/formaldehyde-air-pollution-in-houston/>