HARC

# Impacts on Air Quality

## COVID-19 Research: NOx

### INTRODUCTION

This analysis examines changes in local air quality observed in Harris County, Texas during the COVID-19 pandemic. Nitrogen oxides (NOx) are a group of highly reactive and harmful air pollutants comprised of nitric oxide (NO) and nitrogen dioxide ($NO_2$), a regulated criteria pollutant. NOx is primarily produced during fuel combustion processes, mainly those associated with motor vehicles, traditional fossil-fuel based power generation, and industrial processes.

Although emissions of NOx from transportation sources may change as fewer cars are on the road, local weather patterns and air chemistry are important drivers of air quality. NOx is removed from the air when it reacts to form acid deposition, particulate matter, undergoes complex chemical reactions with volatile organic compounds (VOCs) to form ground-level ozone in the presence of sunlight, or is simply broken down to form other compounds. NOx concentrations can change daily due to variability of several meteorological factors including solar radiation, wind speed and direction, surface temperature, precipitation, relative humidity, and barometric pressure.

### COVID-19: Average Daily Harris County NOx Levels (January – April 2020)

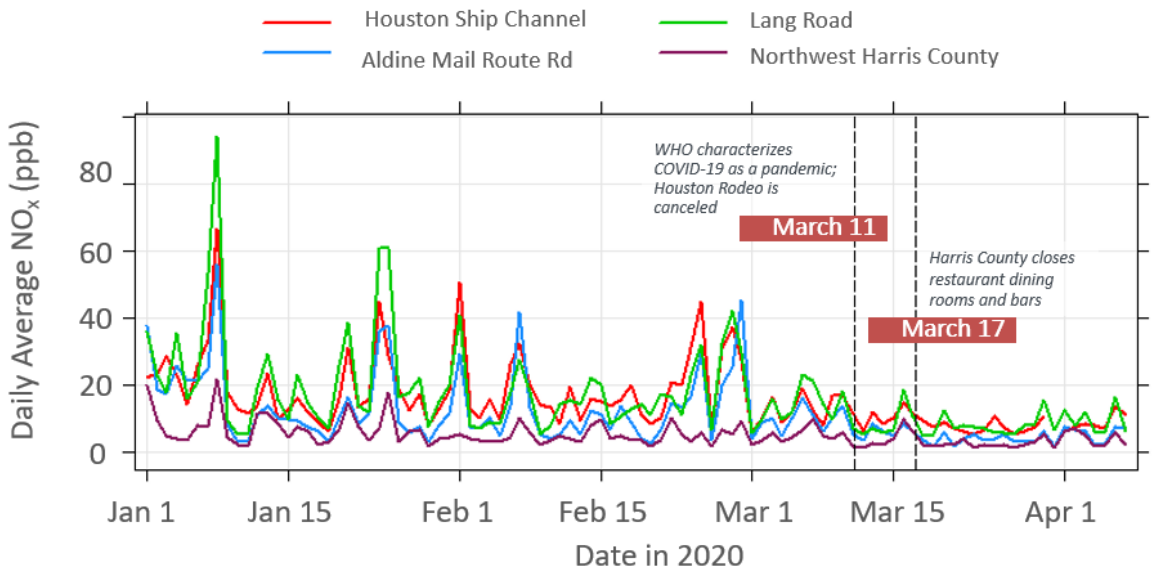


*Figure 1. Average daily NOx concentrations monitored at Lang Road (green), Aldine Mail Route Road (blue), and Houston Ship Channel (red) stations show similar trends because they are all located near local emissions sources (major roads and industries). The Northwest Harris County station (purple) is located in a park away from any highways or major industries and serves as a "background" station. Located near US Route 290, Lang Road station often shows the highest NOx concentrations.*

## HEALTH IMPACTS OF NOx POLLUTION

From a human health perspective, elevated levels of NOx can contribute and lead to human respiratory system irritation, the development of asthma, and even respiratory infections. NOx is one of the primary precursors of ozone and certain types of particulate matter, some of which can lead to haze and limit visibility. When exposed to water and other chemicals in the atmosphere, NOx can contribute to acid deposition formation (generally known as acid rain). Through air deposition, NOx may alter nutrient regimes in coastal waters and large river basins.

## IN-DEPTH ANALYSIS

During the COVID-19 pandemic, average daily NOx concentrations decreased at each station. In particular, as time progressed NOx concentrations at stations located near major roads and industries more closely resembled the background station, meaning that any new sources of NOx emissions had likely been reduced. Furthermore, because the variability of the concentrations decreased at each station, it is likely that the same phenomena (meteorology and source reduction) occured throughout the county.

## METHODOLOGY

Hourly NOx concentration data were collected by the Texas Commission on Environmental Quality (TCEQ) Continuous Ambient Monitoring Station (CAMS) network for the year 2020 (January 1 to April 7, 2020). Data were collected for six stations around the Houston Ship Channel area and three additional stations across Harris County. NOx concentrations were averaged daily to compare the NOx level immediately before and during COVID-19 period. NOx concentrations for the six Houston Ship Channel stations were aggregated because the daily trends of the individual stations were similar during the study period.

**COVID-19: Locations of Air Quality Monitoring Stations Used in Analysis**

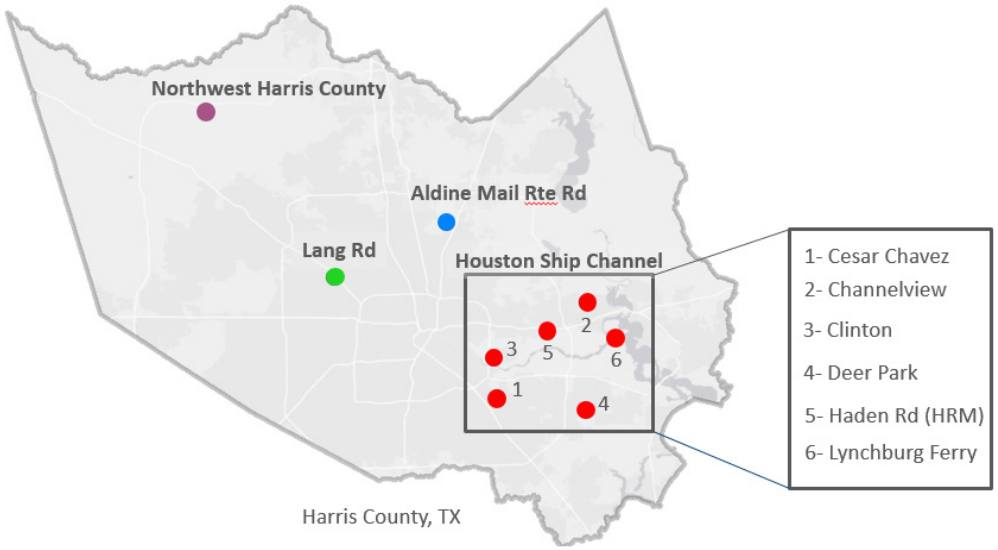


*Figure 2. Map of TCEQ monitoring stations used in Harris County NOx analysis.*

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**Learn more about HARC and review the ongoing COVID-19 research at HARCresearch.org/work/covid19.**

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