U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF INSPECTOR GENERAL

Improving air quality

EPA Needs to Improve Its Emergency Planning to Better Address Air Quality Concerns During Future Disasters

Report No. 20-P-0062 **December 16, 2019**

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Abbreviations

AEGL	Acute Exposure Guideline Level
AMCV	Air Monitoring Comparison Value
ASPECT	Airborne Spectral Photometric Environmental Collection Technology
CCP	Crisis Communication Plan
EPA	U.S. Environmental Protection Agency
ESF	Emergency Support Function
NAAQS	National Ambient Air Quality Standards
OIG	Office of Inspector General
ppm	Parts Per Million
SLAMS	State and Local Air Monitoring System
SSM	Startup, Shutdown, Malfunction
TAGA	Trace Atmospheric Gas Analyzer
TCEQ	Texas Commission on Environmental Quality

Cover Photo: Residential neighborhood in Houston, Texas, with industrial facilities in the background. (OIG photo)

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U.S. Environmental Protection Agency
Office of Inspector General

20-P-0062
December 16, 2019

At a Glance

Why We Did This Project

We conducted this audit to determine whether the air quality monitoring and related activities conducted in the greater Houston area by the U.S. Environmental Protection Agency (EPA) and the state of Texas:

- Addressed potential high-risk areas.
- Indicated any potential health concerns.
- Accurately communicated air monitoring results and potential health concerns to the public.

On August 25, 2017, Hurricane Harvey made landfall on the U.S. Gulf Coast as a Category 4 storm. Many of the Houston area's air monitors were shut down and secured prior to the storm's landfall to prevent damage. The EPA and state and local agencies subsequently conducted mobile monitoring to assess air quality conditions, including the levels of hazardous air pollutants, which are also called *air toxics.*

This report addresses the following:

- *Improving air quality.*

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EPA Needs to Improve Its Emergency Planning to Better Address Air Quality Concerns During Future Disasters

What We Found

Developing EPA guidance for collecting and communicating air quality data could improve public confidence in the agency during future disaster responses.

Most air toxic emission incidents during Hurricane Harvey occurred within a 5-day period of the storm's landfall. The majority of these emissions were due to industrial facilities shutting down and restarting operations in response to the storm and storage tank failures. However, state, local and EPA mobile air monitoring activities were not initiated in time to assess the impact of these emissions. Additionally, once started, monitoring efforts did not always generate data considered suitable for making health-based assessments, in part because there was no guidance outlining how to monitor air quality following an emergency.

The air monitoring data collected did not indicate that the levels of individual air toxics after Hurricane Harvey exceeded the health-based thresholds established by the state of Texas and the EPA. However, these thresholds do not consider the cumulative impact of exposure to multiple air pollutants at one time. Further, the EPA's thresholds are based on short-term exposure to a single air pollutant and do not consider lifetime exposures. Consequently, the thresholds may not be sufficiently protective of residents in communities that neighbor industrial facilities and experience repeated or ongoing exposures to air toxics.

We did not identify instances of inaccurate communication from the EPA to the public regarding air quality after Hurricane Harvey. However, public communication of air monitoring results was limited. As a result, communities were unaware of the agency's activities and data collection efforts. This lack of awareness can diminish public trust and confidence in the EPA.

Recommendations and Planned Agency Corrective Actions

We recommend that the Assistant Administrator for Land and Emergency Management develop guidance for emergency air monitoring in heavily industrialized areas, develop a plan to provide public access to air monitoring data, and assess the availability and use of remote and portable monitoring methods. We also recommend that the Region 6 Regional Administrator develop a plan to inform communities near industrial areas of adverse health risks and to limit exposure to air toxics in these communities, and conduct environmental justice training. We further recommend that the Associate Administrator for Public Affairs establish a process to communicate the resolution of public concerns. Two of our six recommendations are resolved with corrective actions pending. The remaining four recommendations, which we revised after we issued our draft report, are unresolved pending receipt of corrective action plans from the EPA.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

December 16, 2019

MEMORANDUM

SUBJECT: EPA Needs to Improve Its Emergency Planning to Better Address Air Quality Concerns During Future Disasters
Report No. 20-P-0062

FROM: Charles J. Sheehan, Acting Inspector General

TO: *See Attached List*

This is our report on the subject audit conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). The project number for this audit was OA&E-FY18-0266. This report contains findings that describe the problems the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG and does not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

The EPA provided acceptable corrective actions and milestone dates for two recommendations: Recommendation 5, which is addressed to the Associate Administrator of Public Affairs, and Recommendation 6, which is addressed to the Regional Administrator for Region 6. In accordance with EPA Manual 2750, both recommendations are resolved, and no further response to these recommendations is required.

Action Required

We consider four recommendations to be unresolved: Recommendations 1 through 3, which are addressed to the Assistant Administrator for Land and Emergency Management, and Recommendation 4, which is addressed to the Regional Administrator for Region 6. In accordance with EPA Manual 2750, you are required to provide a written response to this report within 60 calendar days. You should include planned corrective actions and completion dates for the four recommendations that need additional information for resolution. Your response will be posted on the OIG's website, along with our memorandum commenting on your response. Your response should be provided as an Adobe PDF file that complies with the accessibility requirements of Section 508 of the Rehabilitation Act of 1973, as amended. The final response should not contain data that you do not want to be released to the public; if your response contains such data, you should identify the data for redaction or removal along with corresponding justification.

We will post this report to our website at www.epa.gov/oig.

Addressees
Peter Wright, Assistant Administrator for Land and Emergency Management
Ken McQueen, Regional Administrator for Region 6
Corry Schiermeyer, Associate Administrator for Public Affairs

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Chapter 1
Introduction

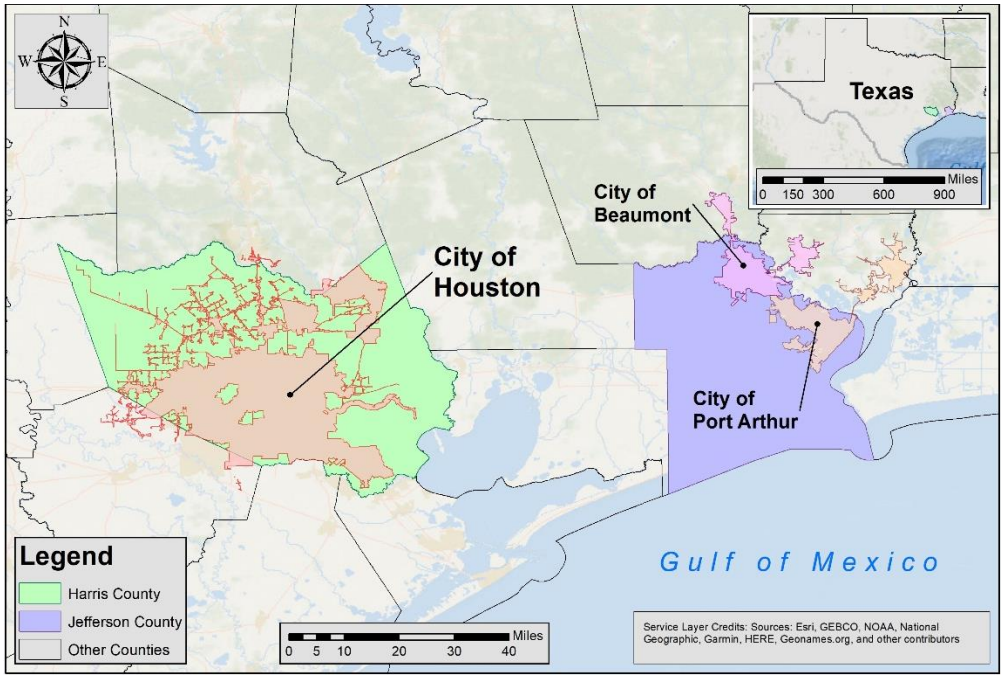
Purpose

The Office of Inspector General (OIG) for the U.S. Environmental Protection Agency (EPA) conducted this audit to determine whether the EPA's and the state of Texas' air quality monitoring and related activities after Hurricane Harvey (1) addressed potential high-risk areas, (2) indicated any potential health concerns, and (3) were accurately communicated to the public with respect to monitoring results and potential health concerns.

Background

On August 25, 2017, Hurricane Harvey made landfall on the U.S. Gulf Coast as a Category 4 storm, dropping over 19 trillion gallons of rain across the region (Figure 1). During this unprecedented weather event, the highest total rainfall in the nation's history—60.58 inches—was recorded near Nederland, Texas, about 90 miles east of Houston. According to state officials, more than 270,000 homes were impacted, with approximately 80,000 homes inundated with at least 18 inches of water. Hurricane Harvey was the most expensive natural disaster in more than a decade and the second costliest in U.S. history, causing an estimated $125 billion in damage.

Figure 1: Region impacted by Hurricane Harvey



Source: OIG analysis using Esri's ArcMap, a mapping and location analytics platform.

According to the United States Global Research Program's most recent climate assessment,[1] "heavy precipitation events in most parts of the United States have increased in both intensity and frequency since 1901 and are projected to continue to increase over this century." Further, "the heaviest rainfall amounts from intense storms, including hurricanes, have increased by 6% to 7%, on average, compared to what they would have been a century ago." Similarly, a study published in the *Proceedings of the National Academy of Sciences of the United States of America* indicates that the annual probability of rainfall in excess of 19 inches has increased sixfold since the late 20th century.[2] Thus, the likelihood that the EPA, states and local governments will have to continue to respond to disasters similar to Hurricane Harvey has also increased.

Air Quality Impacts of Hurricane Harvey

Before Hurricane Harvey made landfall, many industrial sources of air pollution—such as oil and gas production facilities—shut down their operations in anticipation of heavy rainfall and flooding. When industrial facilities shut down or restart their plant operations, significant spikes in air pollutants—including hazardous air pollutants, which are also referred to as *air toxics*—can result. These spikes are often referred to as startup, shutdown, malfunction (SSM) emissions.

Many industrial facilities affected by Hurricane Harvey were forced to make last-minute decisions regarding whether to shut down because of the uncertain course of the storm. Facilities in Corpus Christi, Texas, which is located southwest of Houston, were forecasted to be in the storm's path and were able to coordinate shutdown activities early, thus reducing SSM emissions. However, the hurricane's course toward Houston was not as clear. When the storm did make landfall, it stalled over southeastern Texas, leading to massive flooding. Many facilities in Houston, therefore, were shutting down within 24 hours of when the heavy rainfall began. After the storm passed and flooding subsided, all the facilities that shut down resumed normal operations.

According to excess emissions reports voluntarily submitted to the Texas Commission on Environmental Quality (TCEQ) by impacted facilities in Harris and Jefferson counties, Hurricane Harvey resulted in industrial facilities releasing an extra 340 tons of air toxics.[3] These emissions were from accidents, facility

[1] USGCRP, 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume I* [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6.
[2] Kerry Emanuel, "Assessing the present and future probability of Hurricane Harvey's rainfall," *Proceedings of the National Academy of Sciences of the United States of America* 114, no. 48 (November 28, 2017): 12681–84.
[3] Excess emissions are self-reported by facilities to the TCEQ. The reporting rule requiring these submissions was suspended during and for 7 months after Hurricane Harvey. Thus, the total emissions reported likely underrepresent the total excess emissions due to Hurricane Harvey. For example, only 13 of nearly 400 major industrial facilities operating in Harris and Jefferson counties reported excess emissions due to facility shutdowns or startups during the hurricane. Of these 13 facilities, six reported only emissions related to a shutdown event.

shutdowns during the hurricane and facility startups after the hurricane. For example:

- A gasoline spill at Magellan in the Galena Park Terminal released an estimated 282 tons of combined air toxics, including over 6 tons of benzene.
- A floating roof tank failure at Valero released an estimated 12.5 tons of combined air toxics.
- During a startup event, the Flint Hills Resources Port Arthur Facility released 0.89 tons of air toxics.
- During a shutdown event, the ExxonMobil Beaumont Refinery released 0.07 tons of air toxics.

The impact on air quality concerned community members and health officials. Short-term exposure to air toxics such as benzene can cause drowsiness; dizziness; headaches; irritation to eyes; skin and respiratory tract problems; and, at very high levels, unconsciousness and death. In addition, residents who live near Houston-area industrial facilities already experience chronic exposure to high levels of air pollution.

Health Impacts in Fenceline Communities

According to a study published in *Environmental Science and Technology*, the health impacts of direct and indirect particulate matter emissions from SSM events in Texas were estimated to cost $148 million in 2015.[4] An analysis of air pollution risks in the greater Houston area conducted for the Houston Mayor's Task Force on the Health Effects of Air Pollution reached the following conclusion:

> East Houston neighborhoods that face a number of vulnerabilities based on their marginal social and economic standing also carry a heavier burden of health risks from breathing pollutants in their air. They tend to be located closer to major point sources than most other neighborhoods in the Greater Houston area and to be nearer to major transportation corridors.

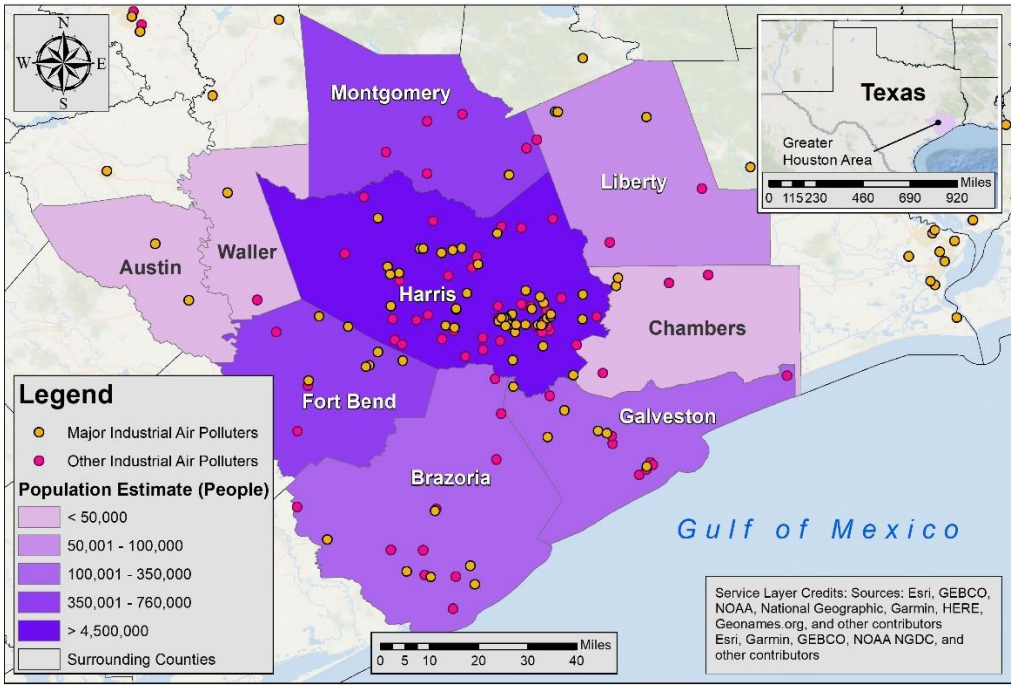
Air pollution can lead to health effects that often go unaddressed in communities where residents have limited financial and health care resources. Further, residents of fenceline communities—neighborhoods that are directly next to a facility and are directly impacted by the facility's operations, including air emissions—are often unable to relocate because of low home values. The lack of resources and the disproportionate layering of intersecting social factors create additional challenges in these communities when faced with a weather event like Hurricane Harvey.

[4] Zirogiannis, Nikolaos, Alex J. Hollingsworth and David M. Konisky, "Understanding Excess Emissions from Industrial Facilities: Evidence from Texas," *Environmental Science and Technology* 52, no. 5 (2018): 2482–90.

Industrial Makeup and Demographics of Greater Houston Area

The greater Houston area encompasses nine counties along the Gulf Coast in southeastern Texas and is the fifth-most populous metropolitan statistical area in the United States, with a population of over 6 million people as of 2014 (Figure 2). The Houston area is also a major industrial center and is home to hundreds of petrochemical facilities, including two of the four largest petroleum refineries in the United States. According to the Mayor's Task Force on Health Effects of Air Pollution, the massive petrochemical complex along the Houston Ship Channel is the largest in the country, and the Port of Houston is the sixth largest port in the world and is the second largest in the country in terms of total tonnage. These facilities release several types of air pollutants, including air toxics that can cause cancer or other serious health problems.

Figure 2: Houston population estimates and industrial air polluter locations (as of 2017 and 2019, respectively)



Source: OIG analysis using Esri's ArcMap.

Houston Ship Channel. (OIG video)

The National Air Toxics Assessment is the EPA's periodic estimate of the public's cancer and noncancer health risks from long-term exposure to air toxics in the United States. The most recent estimate of national average cancer risk—the 2014 National Air Toxics Assessment[5]—was estimated as 30 in 1 million. This estimate has not historically accounted for SSM emissions, however. As noted on the EPA's *National Air Toxics Assessment* website, the assessment "may not accurately capture sources that emit only at certain times (e.g., … startups, shutdowns, malfunctions and upsets)." Still, for 2014, this screening tool estimated elevated risk levels for *all* census tracts in the Houston area,[6] with a countywide average cancer risk of 45.89 in 1 million but with some cancer risks estimated as high as 348 in 1 million. Most of the Houston area's highest risk census tracts were in East and Southeast Houston.

Houston community center playground neighboring an industrial facility, with smokestacks in the background. (OIG video)

The Houston area is unusual in that—due to a lack of zoning requirements—many residential communities are located next to or near industrial sources of air pollution. The number and density of industrial sources and their proximity to residents contribute to the elevated health risks in the Houston area. The area's fenceline

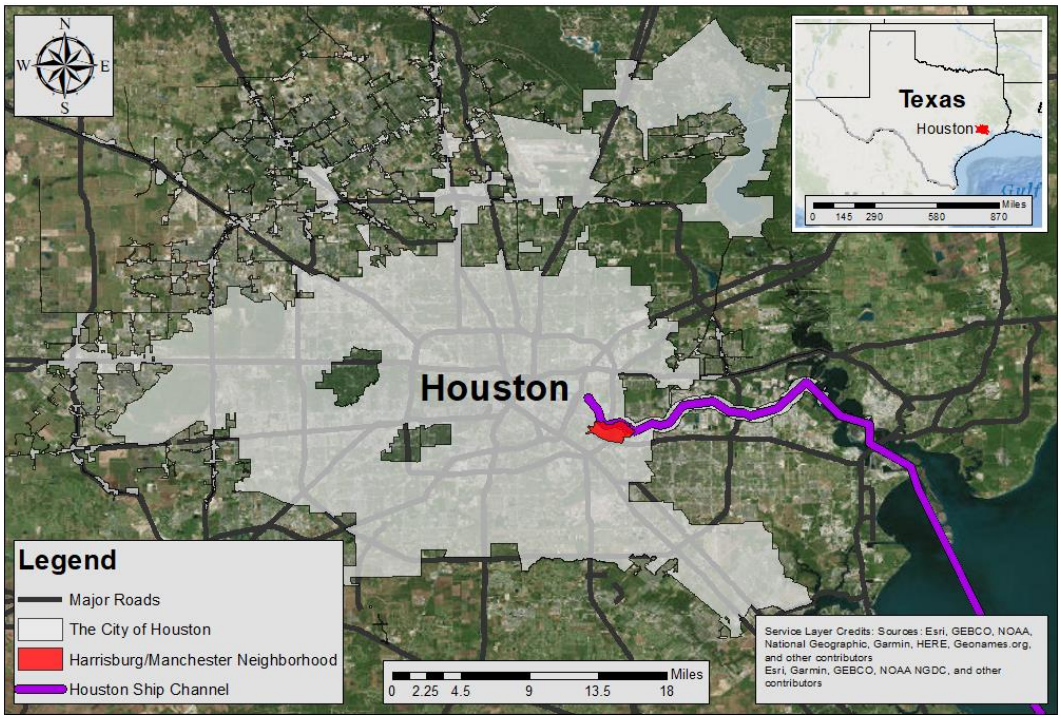
[5] The EPA released the 2014 National Toxics Assessment on August 22, 2018. The assessment is based on air toxics emissions for calendar year 2014.

[6] Per the U.S. Census Bureau, a *census tract* is a small, relatively permanent statistical subdivision of a county for the purpose of presenting data. Census tracts nest within counties, and their boundaries normally follow visible features but may follow legal geography boundaries and other nonvisible features in some instances. Census tracts ideally contain about 4,000 people and 1,600 housing units.

communities are also often *environmental justice communities*,[7] which are communities predominantly comprising minority and low-income residents.

For example, as shown in Figure 3 below, the Harrisburg/Manchester neighborhood in Harris County in East Houston sits along the Houston Ship Channel, home to several industrial emitters of wastewater, air contaminants and hazardous waste. According to the Mayor's Task Force on Health Effects of Air Pollution, this neighborhood routinely exceeded safe levels for seven of the 12 air pollutants that the task force deemed "definite risks." Furthermore, the Harrisburg/Manchester neighborhood is surrounded by major transportation corridors. Both the Sidney Sherman Bridge, which services Interstate 610 over the Houston Ship Channel, and multiple rail tracks run through the community.

Figure 3: Houston's Harrisburg/Manchester neighborhood



Source: OIG analysis using Esri's ArcMap.

Union Pacific rail tracks, Houston. (OIG photo)

[7] *Environmental justice* is defined by the EPA as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

Ship Channel Bridge, Houston. (OIG video)

In addition to the inherent vulnerability of the community's location, Harrisburg/Manchester residents face several socioeconomic challenges. According to the U.S. Census Bureau American Community Survey, 2013–2017, more than 25 percent of the neighborhood's residents live at or below the poverty line. Approximately 37 percent of Harrisburg/Manchester residents, ages 16 to 64, were either unemployed or worked less than 6 months in 2017. More than one-third (36 percent) of Harrisburg/Manchester residents ages 25 to 64 reported that they had not graduated from high school. Finally, in 2017, about 22.5 percent of the population age 5 and above speak English "not well" or "not at all."

EPA Assisted Texas' Response to Hurricane Harvey under the Stafford Act

On August 25, 2017, the President declared a major disaster in Texas at the request of the Texas Governor. This declaration allowed the federal government to assist local emergency responders under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act and under the direction of the U.S. Federal Emergency Management Agency. The federal government *supports* state and local entities during an emergency response, consequently, the TCEQ served as the lead agency for the Hurricane Harvey environmental response.

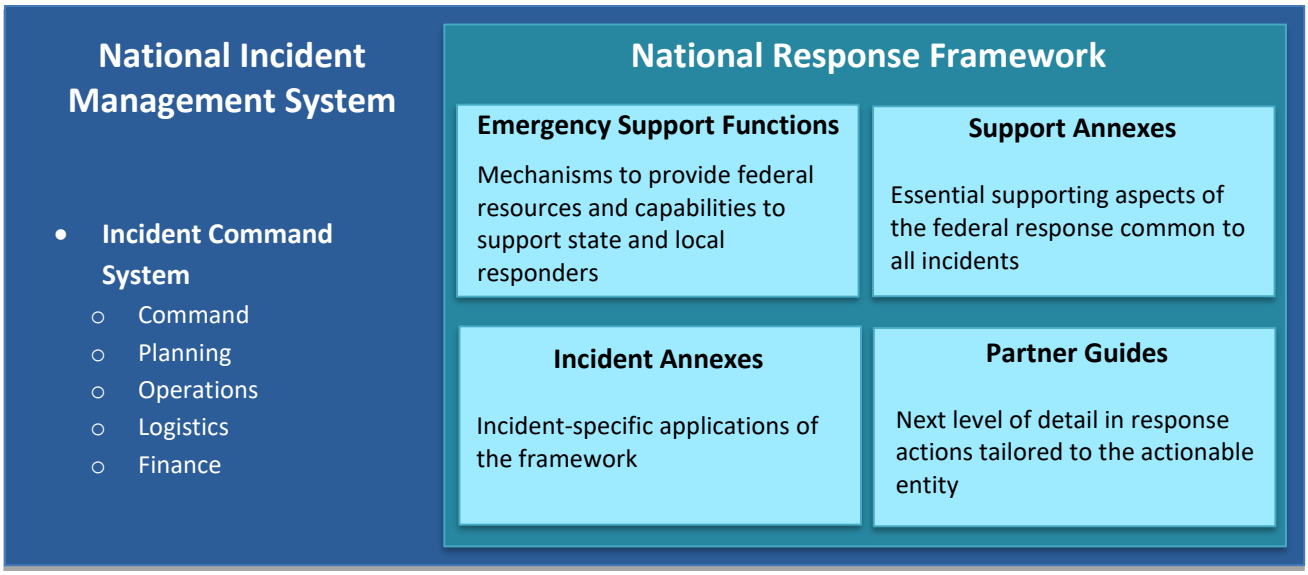
To coordinate Hurricane Harvey response activities, a unified command was established among the EPA, the TCEQ, the General Land Office of Texas and the U.S. Coast Guard to oversee the evaluation and cleanup of spills, releases and orphan containers. This command was supported by three operational branches in Corpus Christi, Houston and Port Arthur. In addition, the EPA's Emergency Operations Center serves as the agency's emergency response operational focal point for all its emergency response efforts, as well as a communication hub to increase data management and coordination capabilities. The EPA also staffed on-scene coordinators to monitor or direct responses to all oil spills and hazardous substance releases reported to the federal government. The on-scene coordinators

worked with, provided support to and disseminated information to local, state and regional response communities regarding all federal efforts.

National Incident Management System and Response Framework

The federal government's response to a national disaster is guided by the National Incident Management System and the National Response Framework, which work together to provide a comprehensive approach to domestic incidents (Figure 4). The National Incident Management System provides management and organizational structures—such as the Incident Command System—to assist operations across jurisdictions and disciplines. The Incident Command System is a management structure that assists in managing resources, making decisions and assigning responsibilities. It also establishes a chain of command detailing how authority and information flow during an incident. Under the Incident Command System, the Incident Commander has overall responsibility for the incident; for determining incident objectives; and for establishing priorities based on the nature of the incident, the resources available and agency policy.

Figure 4: National Incident Management System and National Response Framework



Source: EPA analysis of Federal Emergency Management Agency information.

The National Response Framework is composed of 15 Emergency Support Functions (ESFs) that detail how agencies implement their capabilities and coordinate the resources required in a national response. For Hurricane Harvey, the Federal Emergency Management Agency activated EPA Region 6 under ESF #10, Oil and Hazardous Materials Response, on August 28, 2017. ESF #10 "includes the appropriate actions to prepare for and respond to a threat to public health, welfare, or the environment caused by actual or potential oil and hazardous materials incidents."

Each ESF contains a range of possible mission assignments for federal agencies activated to respond to a national disaster. ESF #10 actions can include those to "prevent, minimize, or mitigate a release"; "detect and assess the extent of environmental contamination, including environmental monitoring"; and "stabilize the release and prevent the spread of contamination." Under EPA Order 2071, *National Approach to Response*, which documents agency policy for the National Incident Management System, the EPA's role under ESF #10 may include air quality sampling and monitoring.

In addition to EPA Order 2071, the EPA's response to national emergencies is governed by EPA Order 2010, *Crisis Communication Plan* (CCP). The CCP outlines the process for the EPA to coordinate and communicate environmental information to the public. The EPA initiated its CCP under ESF #15—External Affairs—on August 28, 2017, "to ensure rapid response to providing coordinated, accurate, up-to-date information regarding its field activities." Figure 5 shows the EPA's roles under the National Response Framework.

Figure 5: EPA's roles under the National Response Framework

NRF Emergency Support Functions	
#1	Transportation
#2	Communications
#3	Public Works and Engineering
#4	Firefighting
#5	Information and Planning
#6	Mass Care, Emergency Assistance, Temporary Housing, and Human Services
#7	Logistics
#8	Public Health and Medical Services
#9	Search and Rescue
#10	Oil and Hazardous Materials Response
#11	Agriculture and Natural Resources
#12	Energy
#13	Public Safety and Security
#14	Superseded
#15	External Affairs

The EPA's role under ESF #10 and EPA Order 2071 may include:
• Detect, identify, contain, clean up, or dispose of released oil or hazardous materials
• Removal of drums, barrels, tanks, or other bulk containers that contain oil or hazardous materials
• Household hazardous waste collection
• Monitoring of debris disposal
• Water quality monitoring and protection
• Air quality sampling and monitoring
• Protection of natural resources

Source: National Response Framework and EPA Order 2071.

Note: Yellow highlighted text indicates the EPA's roles.

Through ESF #15, the National Response Framework delivers "coordinated, prompt, reliable, and actionable information" on threats and hazards to the entire affected community to "expedite the delivery of emergency services and aid the public in taking protective actions." Per EPA Order 2071, the EPA's role under ESF #15 "integrates Public Affairs and the Joint Information Center, Congressional Affairs, Intergovernmental Affairs (state, local, tribal and territorial), Planning and Products and the Private Sector under the coordinating auspices of external affairs." The order also says that the Joint Information Center "ensures the coordinated release of information," while the "Planning and Products component of external affairs develops all external and internal communications strategies and products."

TCEQ air monitor in Houston. (OIG photo)

Air Monitoring Conducted after Hurricane Harvey

Managed by the TCEQ, the state and local air monitoring system (SLAMS) network in Texas collects data about six criteria air pollutants to determine whether air quality meets the National Ambient Air Quality Standards (NAAQS) established by the EPA.[8]

There are adverse health effects associated with each of the six criteria air pollutants. For example, short term exposure to ozone is associated with deaths from respiratory causes, while long-term exposure to ozone is linked to asthma aggravation and development, as well as permanent lung damage.

In addition to measuring criteria air pollutants, the TCEQ's SLAMS routinely collects data for over 100 different air toxics to determine whether their levels exceed Air Monitoring Comparison Value (AMCV) thresholds established by the TCEQ. If a TCEQ SLAMS monitor detects a chemical concentration that exceeds its associated AMCV threshold, adverse health effects in the public are not necessarily anticipated. However, the TCEQ considers these data during any future permitting process.

Starting on August 23, 2017, before Hurricane Harvey made landfall, the TCEQ began preparations to shut down its SLAMS sites and monitors in the Houston area to protect the network from storm damage. Once the storm was over, the TCEQ began taking steps to restore its air monitoring operations. By September 13, 2017, most of the air monitoring network in the Houston area was once again operational. By September 29, 2017, Houston's network was 100 percent operational.

Top to bottom: TAGA bus. ASPECT aircraft. (EPA photos)

[8] The Clean Air Act, as amended, requires the EPA to set NAAQS for pollutants considered harmful to public health and the environment. The EPA established NAAQS for six principal pollutants, which are called *criteria air pollutants*: carbon monoxide, lead, ground-level ozone, nitrogen dioxide, particulate matter and sulfur dioxide. Per the act, states are responsible for maintaining an air quality monitoring network to provide "timely air quality data upon which to base national assessments and policy decisions." The Clean Air Act also requires each state to have a state implementation plan to attain and maintain the NAAQS. Many of these state implementation plans (such as Texas') included provisions that govern SSM events and provided automatic exemptions from enforcement for facilities whose SSM emissions violate the Clean Air Act standards. In 2015, the EPA found that the SSM provisions included in the state implementation plans for Texas and 35 other states were "substantially inadequate" to meet Clean Air Act requirements (*State Implementation Plans: Response to Petition for Rulemaking*, 80 Fed. Reg. 33840, 33845 (June 12, 2015)). However, in April 2019, EPA Region 6 proposed to deviate from the agency's finding and allow Texas to maintain its existing SSM provisions. As of October 2019, the EPA was revising its SSM policy.

Although the SLAMS can provide useful air quality information during or after an emergency, these fixed, stationary networks were not specifically designed for that purpose and may not be able to withstand emergency conditions. An emergency response may therefore require portable, remote sensing or other monitoring techniques to obtain air quality data, especially for those locations and pollutants not regularly monitored by existing networks. Existing technologies—such as the EPA's Airborne Spectral Photometric Environmental Collection Technology (ASPECT) and the EPA's Trace Atmospheric Gas Analyzer (TAGA)—provide alternative solutions to this issue by either analyzing remote infrared and photographic imagery or by directly collecting pollutant concentrations using gas chromatography.

After Hurricane Harvey, the EPA and the city of Houston used a variety of temporary monitoring methods to capture conditions around industrial sites. These efforts included monitoring conditions next to industrial fencelines with handheld instruments, such as toxic vapor analyzers, summa canisters, optical gas imaging cameras and portable multi-gas monitors. In addition, from August 31 through September 11, 2017, the EPA conducted flyovers of facilities with the ASPECT plane, screening pollutant plumes for potential hazardous emissions near high priority industrial targets. The agency also drove a TAGA bus throughout the impacted region from September 6 through 20, 2017. Additional air monitoring was conducted using portable instruments by a firm under contract to the Environmental Defense Fund, which is a nongovernmental organization. Although this private monitoring was not conducted at the request of the EPA or state and local agencies, the results were made available to the EPA and the TCEQ.

Top: Valero facility fencing displaying community banner. *Bottom:* Community park and housing adjacent to Valero facility in the background. (OIG photos)

In a September 8, 2017, press release, the EPA and the TCEQ informed Houston communities that available data collected around the Valero facility indicated that local residents should not be concerned about air quality issues related to the effects of the storm. The EPA issued six press releases related to fuel waivers, four related to water or Superfund issues, and six that specifically addressed air toxic exposure concerns related to an explosion and fires at the Arkema plant in

Crosby, Texas.[9] The six press releases related to Arkema, some of which were issued jointly with the TCEQ, informed members of the public about the fire and chemical release; assured them that the TCEQ and the EPA were monitoring the smoke and air quality; and advised them to limit their exposure by staying indoors, keeping their doors and windows closed, and continually running their air conditioners. On September 1, 2017, an EPA press release stated that neither aerial surveillance nor ground-level air quality monitoring "found toxic concentration levels in areas away from the evacuated facility."

Responsible Offices

The EPA's Office of Emergency Management, within the Office of Land and Emergency Management, develops and implements regulations related to emergency management and is central to the EPA's emergency preparedness and response efforts. The Office of Emergency Management also maintains valuable air quality assets that can be used during emergencies.

EPA Region 6 worked directly with the TCEQ and other government and nongovernmental stakeholders in the overall emergency response effort and, specifically, the air monitoring response effort.

The EPA's Office of Public Affairs within the Office of the Administrator is responsible for coordinating the agency's external message for emergency response activities.

Scope and Methodology

We conducted our audit from August 2018 through July 2019. We conducted this audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our objectives.

We encountered an impediment to obtaining all the desired information to complete our audit, as described below. We were still able to obtain enough information to answer our objectives, although this impediment impacted our

[9] The Arkema plant manufactures organic peroxides. Due to extensive flooding from Hurricane Harvey, the plant lost power, backup power and critical organic peroxide refrigeration systems. On August 31, 2017, organic peroxide products stored inside a refrigerated trailer decomposed, causing the peroxides and the trailer to burn. After the vapor from the decomposing products traveled across a public highway adjacent to the plant, 21 people sought medical attention from exposure to the fumes. Over the next several days, a second fire and a controlled burn consumed eight more trailers holding Arkema's remaining organic peroxide products. During these three fires, over 350,000 pounds of organic peroxide combusted, and more than 200 residents living within 1.5 miles of the facility evacuated the area and could not return home for a week. A U.S. Chemical Safety and Hazard Investigation Board report (No. 2017-08-I-TX), issued May 2018, provides more details on the Arkema explosion and fires.

ability to analyze all air quality data and to definitively determine the rationale for certain decisions. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

To understand the EPA's responsibilities during emergency situations, we reviewed the following statutes, policies, guidance and documents:

- The Clean Air Act, as amended.
- The Stafford Act.
- The Emergency Planning and Community Right-to-Know Act.
- The National Response Framework.
- The National Incident Management System.
- EPA Order 2071, *National Approach to Response*.
- EPA Order 2010, *Crisis Communication Plan*.
- EPA press releases.
- EPA internal documents related to emergency response.

We also conducted interviews with staff from EPA Region 6, the Office of Land and Emergency Management, the Office of Air and Radiation, and the Office of Research and Development. We discussed emergency response activities at the county and city levels with officials representing Harris County and the city of Houston. Finally, we discussed the EPA, state and local emergency responses with nongovernmental organizations and community members.

To understand how and when air monitoring occurred, we collected and analyzed air toxic data from several sources, including the EPA's Air Quality System, TAGA bus and ASPECT aircraft; the TCEQ's Air Emission Event Report database; the city of Houston; and Entanglement Technologies, a private company under contract with the Environmental Defense Fund. We compared these data to the TCEQ's short-term AMCVs and the EPA's Acute Exposure Guideline Levels (AEGLs) to identify any potential health impacts of Harvey-related air emissions.[10] We also compared the location, timing and duration of the monitoring with reported excess emissions incidents to identify any potential data gaps in areas of elevated air emissions.

After the hurricane, the EPA's Office of Emergency Management and Region 6 developed after-action reports based on online surveys, written questionnaires and interviews with EPA response personnel. These reports identified areas of strength, lessons learned and recommendations to be used in future EPA responses. We reviewed these documents and developed an OIG survey to assess

[10] The TCEQ maintains two sets of AMCVs: short-term comparison values and long-term comparison values. Short-term AMCVs are based on acute (short-term) health effects data and are used to evaluate air quality averaged over short time frames (e.g., 30 minutes to 1 hour), while long-term AMCVs are based on chronic health effects data and are used to evaluate air quality averaged over a year or more. The EPA's AEGLs describe the human health effects from once-in-a-lifetime, or rare, exposure to airborne chemicals. The AEGLs are generally used by emergency responders when dealing with chemical spills or other catastrophic exposures.

the effectiveness of the EPA's communications regarding air quality in response to Hurricane Harvey. This survey was designed to determine whether the EPA's on-the-ground response and Harvey-related EPA communications were effective. We distributed the survey to 59 EPA staff who served as community liaisons during the response. We received 44 responses and analyzed the data.

Impediment to Obtaining Information

TCEQ staff, managers and officials declined to meet with us to discuss their response to the hurricane and their reasoning for various decisions or actions described in this report. We provided the TCEQ with an initial list of questions before scheduling a meeting at TCEQ offices in September 2018. The TCEQ cancelled the meeting the day before we were scheduled to meet due to an impending tropical storm. Also, the TCEQ declined to meet with us during a subsequent week when we visited the Houston area to meet with city officials and community representatives from impacted areas. Further, despite several conversations to arrange for written answers to our initial list of questions, we never received a response from the TCEQ. Subsequent to our unsuccessful attempts to arrange meetings and obtain information from the TCEQ, we learned that the TCEQ collected air monitoring data from helicopter flyovers following Hurricane Harvey. We were unable to review those data as a part of this audit. However, we believe that the evidence we obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Prior OIG Reports

EPA OIG Report No. 2006-P-00033, *Lessons Learned: EPA's Response to Hurricane Katrina*, issued September 14, 2006, identified deficiencies in the EPA's coordination with state and local officials, as well as in the EPA's use of its floodwater database. The OIG recommended, among other things, interagency meetings and training for EPA Region 6 and state staff on the Incident Command System and the ESFs. The agency agreed with the OIG's recommendations and implemented appropriate corrective actions.

EPA OIG Report No. 19-P-0236, *Region 6 Quickly Assessed Water Infrastructure after Hurricane Harvey but Can Improve Emergency Outreach to Disadvantaged Communities*, issued July 16, 2019, found that EPA Region 6 conducted extensive preparation activities and forged close working relationships with state emergency response partners well before Hurricane Harvey made landfall. This preparation enabled Region 6 to protect human health and water sector resources as part of its Hurricane Harvey mission assignment. The OIG identified one area for improvement—staff outreach to residents of vulnerable communities—that would further enhance the region's emergency response capabilities. The OIG recommended, among other things, that the EPA Region 6 Regional Administrator include environmental justice outreach in planning and pre-landfall preparation exercises by gathering data to determine the population, unique needs and

challenges of vulnerable communities. The agency agreed with the OIG's recommendations and, as of October 2019, was in the process of implementing appropriate corrective actions.

EPA OIG Report No. 20-P-0010, *EPA Adequately Managed Hurricane Harvey Funding Received from FEMA*, issued on October 23, 2019, found that the EPA effectively managed its Hurricane Harvey Disaster Relief Funding. The OIG did not identify any significant issues in the EPA's contracting, logistics or resource acquisition processes. The OIG noted that the agency had already identified strengths and areas for improvement and had implemented corrective actions in response to the OIG's recommendations in its 2006, 2008 and 2014 reports regarding its emergency responses. The OIG made no recommendations to the agency in this audit.

Chapter 2
Better Planning Was Needed to Coordinate Air Quality Monitoring Efforts

The EPA, the state of Texas and the city of Houston lacked guidance and procedures for conducting air quality monitoring in response to an emergency. As a result, their ability to assess and communicate air quality-related health risks to the public during and after the Hurricane Harvey emergency response was limited. The nature of an emergency response requires flexibility and cannot be predetermined. However, EPA guidance would help future efforts address when, where and how long to monitor air quality; the minimum quality assurance needed to obtain data that can be used to assess health risks; and other issues related to air monitoring. Although the data from Hurricane Harvey monitoring efforts did not exceed the health-based thresholds used during the response (e.g., the TCEQ's AMCVs), pre-emergency planning and coordination by the EPA and the TCEQ could lead to more effective monitoring and communication during future emergency responses.

Monitoring Not Conducted During Most Air Toxic Emission Incidents

In response to the Hurricane Harvey disaster, a nongovernmental organization, local governmental entities and the EPA collected air monitoring data with four distinct mobile monitoring efforts over a span of 21 days (August 31–September 20, 2017). Despite the broad range of monitoring efforts, this monitoring:

- Did not coincide with most industry-reported air toxic emission incidents occurring during the disaster.

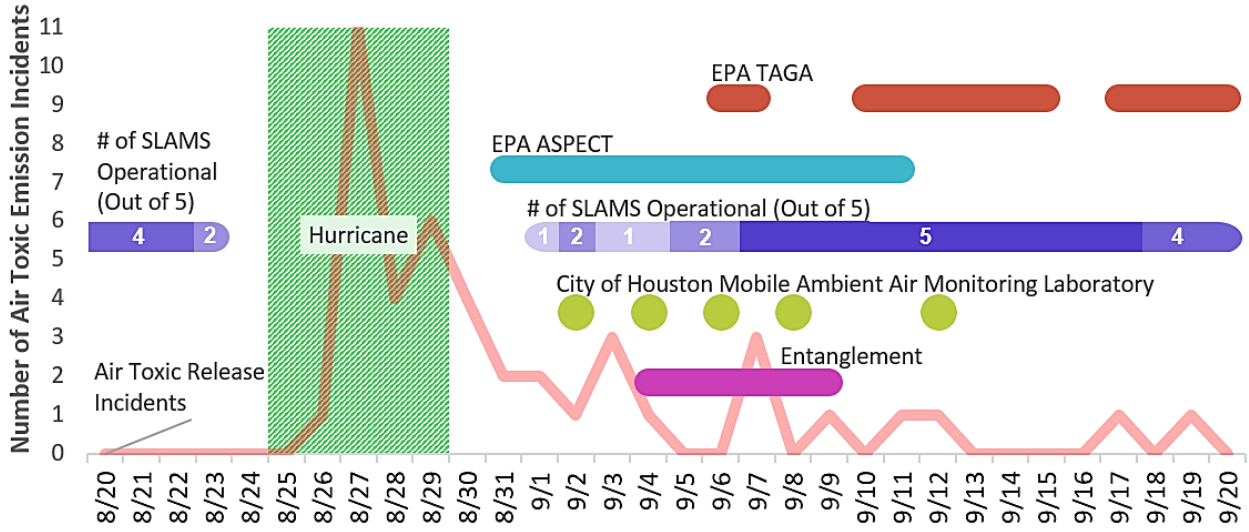
- Sometimes used ineffective techniques to collect data. For example, a nongovernmental organization collected samples over a duration too short to analyze whether the concentrations were harmful to human health.

Video showing air toxic releases and monitoring methods used over time. (OIG video)

Over half of all known air toxic emission incidents began when no monitors were operating. Companies in the Houston area reported over 319 tons of air toxic emissions due to Harvey-related SSM activities. However, when these facilities were shutting down and when the first malfunctions and air toxic emissions occurred, most of the TCEQ's monitors in Houston's air monitoring network had been turned off and secured to protect them from storm damage.

Figure 6 illustrates the different air monitoring efforts during the Hurricane Harvey emergency response,[11] as well as the asset owner/operator. Our comparison of these monitoring timelines to the TCEQ's repository of self-reported SSM emission data revealed that most air toxic emission incidents occurred from August 26 through 31, 2017—after the TCEQ disabled its SLAMS in the Houston area and before the EPA began collecting data with its ASPECT flight response. Many of the air toxic emissions during the peak incident period were from storage tank leaks due to excessive rainfall. However, since these reported emissions occurred before temporary monitoring had begun or the SLAMS was redeployed, we were unable to assess their impact on air quality.

Figure 6: Monitoring efforts and air toxic emission incidents during the Hurricane Harvey response



Source: OIG analysis.

Notes: This chart includes only SLAMS monitors capable of detecting air toxics, not NAAQS monitors. ASPECT operation dates are based on actual data submitted to the OIG.

An example of an air toxic emission incident during the peak incident period was Valero Partners' roof tank failure. This incident—which released an estimated 12.5 tons of air toxics, including benzene, hexane and toluene—began on August 27, 2017, when all SLAMS monitors were offline and before emergency monitoring had begun. The Arkema Crosby Plant explosion, another widely publicized event, occurred on August 31, 2017, before the EPA's TAGA bus or the city of Houston's Mobile Ambient Air Monitoring Laboratory had been deployed. At the time of the explosion, only the ASPECT was operational.

[11] Although NAAQS monitors were also offline during this time, given our audit focus on air toxics, we did not extensively assess criteria air pollutants. However, according to an Environmental Integrity Project report, based on self-reported data in the State of Texas Environmental Electronic Reporting System, ozone precursor emissions were high along the Gulf Coast following Hurricane Harvey. Per the report, from August 23 through September 1, 2017, approximately 3.9 million pounds of volatile organic compounds were released into the Houston region by surrounding industries, and "[n]itrogen oxides totaled about 154,000 pounds during the same period in the Houston region."

As demonstrated in Table 1, communities located close to industries faced an increased likelihood of exposure to SSM emissions during the emergency response period. For example, 38 percent of all known air toxic emission incidents due to Hurricane Harvey that were reported by Houston-area industries occurred fewer than 4 miles from the Harrisburg/Manchester neighborhood in East Houston. These incidents accounted for over 93 percent (a total of nearly 300 tons) of all known air toxic emissions occurring in Harris County during the disaster, despite this geographical region accounting for only 4.5 percent of the county.

Table 1: Proximity of air toxic emissions to Harrisburg/Manchester, August 20–September 20, 2017

Category	Value
Tons released in a 4-mile radius of Harrisburg/Manchester	298.71
Total tons released in Harris County	319.97
Percent of Harris County emissions released in a 4-mile radius of Harrisburg/Manchester	93%

Source: OIG analysis of industry data reported to TCEQ.

In 2018, the EPA's Office of Air and Radiation amended the National Emission Standard for Hazardous Air Pollutants for petroleum refineries to require that, starting in January 2019, these facilities report their monitoring data for benzene concentrations at the perimeters of their facilities.[12] The monitoring and reporting requirements were not yet in place when Hurricane Harvey hit Houston. However, the monitors used to collect the benzene data could provide useful information for assessing air quality impacts related to future emergency responses in the Houston area and other industrialized locations. These monitors are also relatively cost-effective and replaceable if damaged, unlike the TCEQ's SLAMS monitors. These low-cost sensors could therefore be used in fenceline communities during emergency situations.

Some Data Considered Unusable for Health Assessments Due to Monitoring Duration

Governmental and nongovernmental organizations collected data to evaluate the region's air quality after the hurricane by comparing these data to existing health-based air quality thresholds. The results of these comparisons were used to assess whether the air quality was likely to result in adverse human health effects. However, due to quality control-related reasons, the TCEQ did not use much of the data collected to make health-based assessments. Table 2 shows which data collected could not be used to make health assessments related to local air quality.

[12] 83 Fed. Reg. 60696, November 26, 2018.

Table 2: Usability of data collected during Hurricane Harvey for health-based assessments

Monitoring asset	Asset owner	Monitoring type	Data usable?
TAGA	EPA	Temporary mobile monitor	No
ASPECT	EPA	Temporary mobile monitor	No
SLAMS	TCEQ	Permanent stationary monitors	Yes
Mobile Ambient Air Monitoring Laboratory	City of Houston	Temporary mobile monitor	No [a]
Portable monitoring	Entanglement Technologies	Temporary mobile monitor	No [b]

Source: OIG analysis.

Note: The colors differentiating the assets in this table correlate with the colors used in Figure 6, which illustrates when the monitoring efforts using these assets were conducted.

[a] The laboratory's monitoring time frames were sufficiently long enough to produce data useable for health-based assessments; however, the TCEQ disqualified the data because the onboard global positioning system failed.

[b] Some monitoring time frames were sufficiently long enough to produce data useable for health-based assessments; however, the TCEQ determined that most time frames were too short. The monitor must be active for at least 30 minutes to 1 hour to be usable for health-based assessments.

Although the EPA's TAGA operation was primarily intended to screen for elevated air toxic concentrations, the data collected by this method were also compared against the TCEQ's short-term AMCV thresholds (described in Chapter 1) to make health-based assessments. Although the EPA, the TCEQ and the city of Houston assessed that the data indicated there was no concern—and subsequently issued a press release communicating this assessment to the public—we found that the TAGA's sampling time frame was too short to generate data that could accurately assess airborne toxin concentrations for making health-based assessments.[13] In addition, we found that the data collected by the TAGA operation were not timely. Before the TAGA buses were activated by the EPA's Emergency Operations Center for Hurricane Harvey, they were parked in Las Vegas, Nevada, and Research Triangle Park, North Carolina. Their transit to the Houston area after they were activated impaired the timeliness of the data collection.

Entanglement Technologies supported the assessment of air quality following Hurricane Harvey's landfall by using a portable monitor from September 4 through 9, 2017. These data were submitted to the TCEQ and the city of Houston for review. However, the TCEQ concluded that the data were unsuitable for making health-based assessments because most air samples were collected over a period lasting fewer than 5 minutes. The EPA also conducted handheld monitoring in Manchester from September 3 through 8, 2017. However, this handheld monitoring collected data on only one air toxic (benzene), and no readings exceeded the method detection limit (effectively 0 parts per million [ppm]).

ASPECT data are intended only for screening purposes, as this monitoring method (i.e., remote sensing) does not provide sufficiently reliable data for health-

[13] Short-term AMCVs require monitoring data to be averaged for a 30-minute to 1-hour period prior to comparing the data to the air quality thresholds. The TAGA monitoring method averages data for only 1–2 seconds.

based assessments. As a part of this screening process, the EPA dispatched follow-up ground monitoring units and established evacuation zones as necessary to protect human health when elevated pollutant concentrations were detected. This follow-up occurred, for example, on September 2, 2017, when the ASPECT detected benzoyl peroxide concentrations above the ASPECT's method detection limit.

EPA Lacked Guidance for Emergency Air Quality Monitoring Efforts

Emergency air monitoring efforts were initiated without a plan to help guide and coordinate governmental and nongovernmental efforts, including the minimum level of quality assurance needed to obtain data suitable for health-based assessments and how to effectively share data among all interested parties.

While many entities collected air monitoring data in the weeks following Hurricane Harvey's landfall, the data acquisition itself was not performed in a manner that would provide a holistic picture of air quality in the Houston region:

1. Despite efforts by Entanglement Technologies and the city of Houston to share information with the TCEQ, the TCEQ did not forward these raw datasets to the EPA. We also found no evidence that the EPA requested access to these data or that these data were shared with the public.

2. The raw data collected by the EPA via the TAGA were stored in the agency's Environmental Response Team Information Management System, a data repository that can only be accessed by the EPA team members.

3. The EPA's ASPECT flight data were retained in the Environmental Unit of the EPA's Office of Emergency Management, with the air toxic concentration values stripped from the dataset.

4. Although the EPA presented via press releases that some preliminary analyses of data were received, the raw data were never publicly distributed.

Ultimately, this isolation of raw data limited analysts' and the public's ability to perform monitoring data comparisons and make informed and comprehensive conclusions regarding the region's overall air quality.

Even if these monitoring datasets were housed in a central database that was accessible to all interested parties, the unique formatting of each dataset would have presented substantial challenges in terms of data interpretation. For example, the ASPECT's concentration values were split into 97 separate Excel spreadsheets. Furthermore, we found that concentration values were

inconsistently expressed using a range of units, such as parts per million, parts per billion, milligrams per cubic meter and micrograms per cubic meter.

Although EPA Region 6 and the TCEQ collaborate annually to plan and train for hurricanes, the EPA lacked both internal and external guidance on how to appropriately collaborate with others to collect, assess and store air quality data during extreme weather events or other emergency situations. A focus on air quality monitoring when planning for disasters in industrial cities like Houston would facilitate the timely, proper and collaborative use of alternative monitoring devices.

Conclusion

Overall, the EPA's lack of monitoring guidance and various technological limitations prevented nongovernmental organizations, local governmental entities and the EPA itself from monitoring air quality during the peak period of excess emissions due to Hurricane Harvey. Further, the monitoring data that were collected were not always useful for assessing potential impacts on human health. Additionally, inconsistent formatting and isolated storage of air monitoring data prevented the EPA, the public and other stakeholders from gaining a holistic understanding of air quality.

The EPA could better plan and coordinate future emergency response efforts with governmental and nongovernmental organizations to help ensure that the air quality in potentially high-risk areas is monitored during periods of elevated air toxic emissions. During the Hurricane Harvey response, high-risk areas were predominantly located adjacent to or near large industrial facilities. Increased planning and coordination could provide these communities with timely information about their air quality during an emergency, enabling them to take precautions to reduce their exposure to air toxics.

Recommendations

We recommend that the Assistant Administrator for Land and Emergency Management:

1. Develop general guidance to help state and local agencies and external stakeholders develop air monitoring plans for emergency situations in heavily industrialized areas so that usable data are collected in targeted areas of concern.

2. Develop, in coordination with the Associate Administrator for Public Affairs, a plan for providing public access to air monitoring data collected during an emergency response.

3. Coordinate with the Office of Research and Development and the Office of Air Quality Planning and Standards within the Office of Air to assess the availability and use of remote and portable monitoring methods to monitor air toxics when stationary monitoring methods are not available.

Agency Response and OIG Evaluation

The agency disagreed with our draft report recommendations for this chapter. The agency noted that each emergency is unique and that developing guidance that would cover all scenarios would be challenging. Further, per the agency's response, state and local governments are primarily responsible for emergency response efforts, with the EPA regions assisting when requested. The agency said that the EPA has developed a variety of tools and procedures for emergency assistance.

Based on discussions with the agency and its response to our draft report, we revised our recommendations for the final report to better clarify the recommendations. Recommendations 1 through 3 are unresolved pending the OIG's receipt of acceptable corrective action plans and proposed completion dates from the EPA in response to the final report.

The agency's response to our draft report and our additional comments are in Appendix A. The agency provided specific suggestions for our consideration, and we revised the report as appropriate.

Chapter 3
Data Did Not Indicate That Air Toxic Levels Were Exceeded, but Health Risks to Fenceline Communities from Emission Spikes Are Unknown

Although available monitoring data did not indicate that the levels of air toxics in the Houston area during the Hurricane Harvey disaster exceeded Texas' short-term AMCVs or the EPA's AEGLs,[14] these thresholds do not consider the cumulative impact of being exposed to multiple pollutants. Instead, the thresholds are based on an individual exposed to one specific pollutant (e.g., benzene). Further, the EPA's thresholds do not consider chronic exposure that some populations, such as those residing near industrial facilities, may have already experienced. Consequently, emergency exposure thresholds may not be sufficiently protective of populations already experiencing chronic exposure to multiple air toxics.

EPA Used State Thresholds to Assess Houston's Air Quality

According to EPA staff, the agency coordinates with the relevant state when an incident occurs to determine which health-based thresholds to use when analyzing air monitoring results. A review of internal agency documents from September 5 and 6, 2017, showed that there was confusion among EPA staff regarding whether to use the TCEQ's short-term AMCVs or other TCEQ thresholds. Ultimately, the TCEQ decided that the EPA should use the AMCVs after discussing the issue with the federal agency. The TCEQ and the EPA subsequently compared air monitoring data collected from various handheld monitors, summa canisters, ASPECT and the TAGA bus to the AMCVs. The TCEQ also compared data collected by the city of Houston to the AMCVs. None of the data were found to exceed the AMCVs.

Relative to the EPA's Level 2 and Level 3 AEGLs,[15] the EPA's Level 1 AEGL thresholds most closely match the short-term AMCV thresholds, although the differences between these threshold categories are substantial and their underlying purposes are different. Short-term AMCVs were developed by the TCEQ to

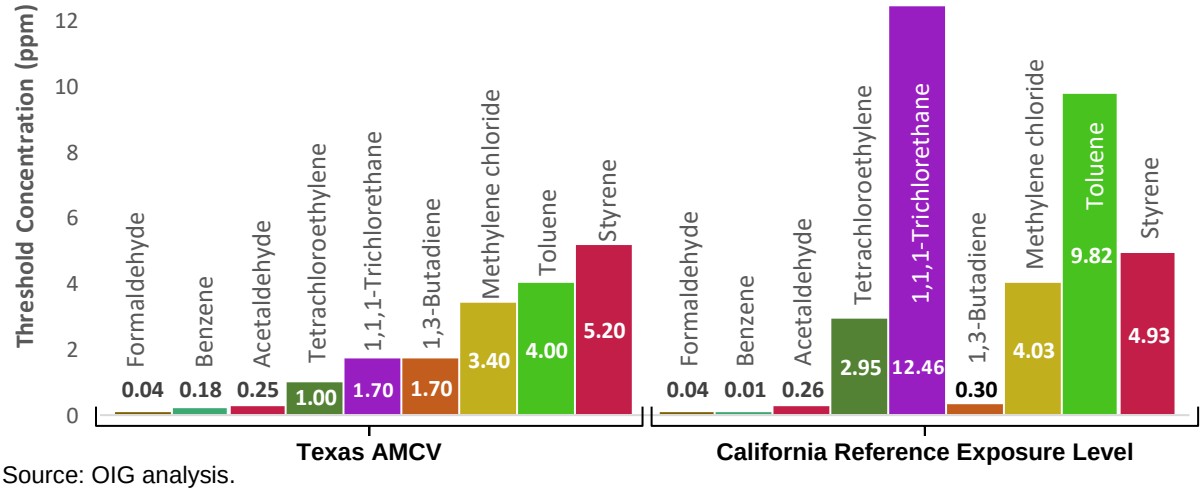
[14] As described earlier in the "Scope and Methodology" section, the TCEQ's short-term AMCVs are used to evaluate air quality averaged over short time frames (e.g., 30 minutes to 1 hour). The EPA's AEGLs describe the human health effects from rare exposure to airborne chemicals and are generally used by emergency responders when dealing with chemical spills or other catastrophic exposures.

[15] AEGLs, which address the acute (or short-term) effects of air toxics, are established at three levels, with each level representing the severity of health impacts. Level 1 is the lowest impact level and represents the airborne concentration above which notable discomfort or irritation could be experienced, but the effects are not disabling and are reversible once exposure stops. Level 2 is the middle impact level and represents the exposure level at which irreversible harm; other serious, long-lasting adverse health effects; or an impaired ability to escape are caused. Finally, a Level 3 exposure causes life-threatening health effects or death.

screen air quality in more general, day-to-day situations, while AEGLs were developed by the EPA to screen situations involving a once-in-a-lifetime, accidental exposure. As an example of the difference between these thresholds, the AEGL Level 1 short-term (30 minutes and 60 minutes) thresholds for 1,3-butadiene is 670 ppm versus the short-term AMCV threshold of 1.7 ppm. Thus, the use of short-term AMCVs as health-based thresholds for assessing air quality data after Harvey was more conservative—in other words, protective of health—than if AEGLs were used.

However, the use of state thresholds to assess adequate margins of safety could lead the EPA to endorse different conclusions regarding public safety when air quality conditions are similar. For example, Figure 7 shows the differences in common air quality thresholds issued by Texas and California.

Figure 7: Comparison of Texas and California air quality threshold levels



Source: OIG analysis.

This lack of standardization in state air toxic thresholds could cause the EPA to provide inconsistent advice as it supports local entities in disasters. For example, using California's air quality thresholds, the EPA could advise local governments in that state to issue a shelter-in-place order if monitoring results showed a benzene concentration of 0.1 ppm. That same concentration, however, would not have triggered any health advisories during the Hurricane Harvey response, since the Texas' short-term AMCVs have a higher threshold for benzene.

Monitoring Thresholds Do Not Consider Exposure to Multiple Pollutants

Studies have shown that fenceline communities are exposed to a heavy daily load of multiple pollutants beyond SSM emissions. For example, the Houston Mayor's Task Force on Health Effects of Air Pollution found that the communities in East Houston, which includes the Harrisburg/Manchester neighborhood, are exposed to more high-risk pollutants than other Houston communities. In East Houston,

90 percent of the census tracts face four or more "definite-risk" pollutants,[16] while one tract in the Harrisburg/Manchester neighborhood faces seven definite-risk pollutants. Of the greater Houston census tracts exposed to six or more definite-risk pollutants, half of them are in East Houston. These figures suggest that these communities—given their cumulative exposure to multiple definite-risk pollutants—face a higher lifetime risk of cancer and chronic disease than other Houston communities exposed to only one or two definite-risk pollutants.

During Hurricane Harvey, these East Houston communities faced exposures to many pollutants at one time. Within a 3-hour period, the city of Houston's Mobile Ambient Air Monitoring Laboratory identified 46 pollutant concentrations greater than 0 ppm occuring in Manchester Park on September 4, 2017, including benzene (0.008 ppm), n-hexane (0.096 ppm) and n-heptane (0.072 ppm). While none of these concentrations exceeded their respective short-term AMCVs, this example illustrates the large number of distinct pollutants in the air at that time.

Houston's Mobile Ambient Air Monitoring Laboratory. (City of Houston photo)

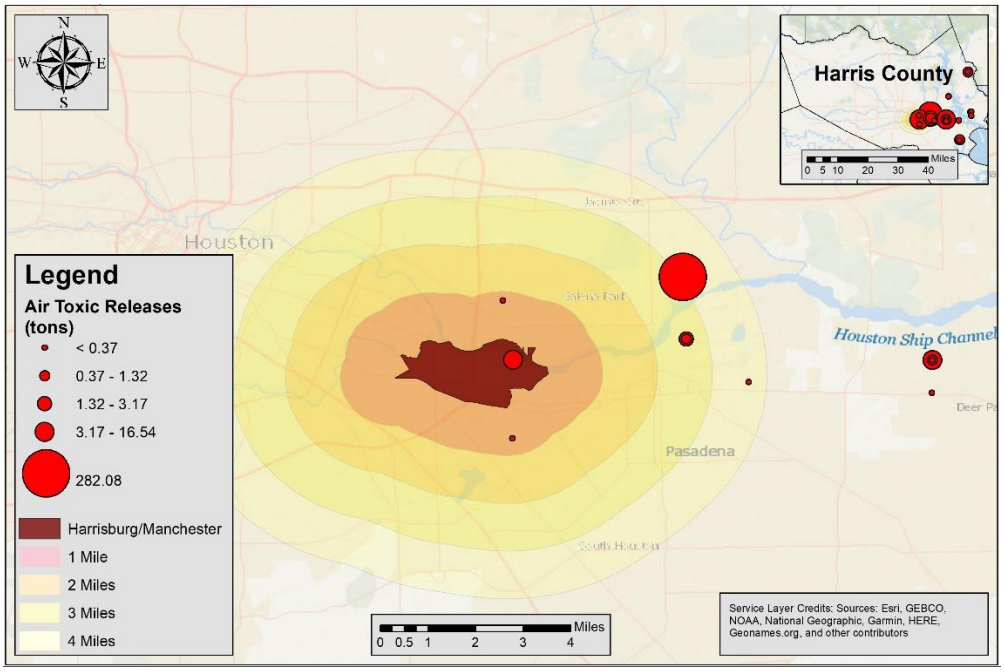
One limitation to using the AMCVs or AEGLs to assess health risks during an emergency response is that neither one accounts for the following situations that could potentially impact health:

- Concurrent exposure to multiple air pollutants (i.e., *cumulative* exposure).
- Accumulation of consecutive distinct exposures to a pollutant over time (i.e., *aggregated* exposure).

As Figure 8 shows, when compared to the rest of Harris County, a disproportionate amount of air toxic emissions reported for Hurricane Harvey were within 4 miles of the Harrisburg/Manchester neighborhood. These residents were potentially exposed to a variety of air toxics, such as xylene, toluene, hexane and ethylbenzene. However, the TCEQ only tracks these incidents and assesses the air toxics' health effects at certain exposure levels on a pollutant-by-pollutant basis; there is no way of quantifying potential effects across the AMCV or AEGL standards.

[16] The task force defined *definite-risk pollutants* as "those substances for which there was compelling and convincing evidence of significant risk to the general population or vulnerable subgroups at current ambient concentrations." The following 12 air pollutants were classified as definite risks: ozone; fine particulate matter (PM 2.5); diesel particular matter; 1,3-butadiene; chromium VI; benzene; ethylene dibromide; acrylonitrile; formaldehyde; acrolein; chlorine; and hexamethylene diisocyanate.

Figure 8: Known emissions near Harrisburg/Manchester during Hurricane Harvey



Source: OIG analysis using Esri's ArcMap.

The EPA's guidance on the development of AEGLs only relies on multiple exposure studies when single exposure data are lacking. AEGLs may therefore not be protective enough of disproportionately burdened communities like Harrisburg/Manchester, given their proximity to large industrial facilities and the number of air toxics they could be exposed to during large-scale SSM incidents before, during and after an emergency or disaster situation. Although AEGLs were not used to make public health assessments after Hurricane Harvey, with the exception of California, no other states have developed acute air toxic thresholds like Texas. The other states may therefore opt to use AEGLs to assess air quality.

Based on a review of TCEQ guidance, we determined that cumulative risks from multiple pollutant exposures are not addressed in AMCVs. While short-term AMCVs are more protective of health than AEGLS when assessing exposure to a single air toxic, whether these values were sufficiently protective of health is unknown, considering the multiple pollutant exposures experienced after Hurricane Harvey.

Conclusion

The available monitoring data did not indicate that air toxic levels during the Hurricane Harvey disaster exceeded Texas or EPA thresholds. It is unclear, however, whether or how SSM emissions compound the health risks of residents in fenceline communities. Short-term AMCVs and other risk-based thresholds used by the EPA and the TCEQ to assess the risk of emissions during Hurricane Harvey

do not account for communities that are exposed—daily and/or over the long-term—to multiple pollutants and chronic daily exposures in addition to spikes from large-scale SSM events.

Recommendation

We recommend that the Region 6 Regional Administrator:

4. Develop and implement, in coordination with the states, a plan to inform residents in fenceline and nearby communities about adverse health risks resulting from multiple facility startups and shutdowns during emergencies and to limit these residents' exposure to air toxics.

Agency Response and OIG Evaluation

In this chapter in our draft report, we included one recommendation addressing the use of acute exposure thresholds to assess air quality during an emergency. The agency disagreed with this recommendation and noted that there are existing air quality standards that the EPA uses to estimate the risks to communities for criteria air pollutants. The agency further explained that the EPA uses its AEGLs to assess public risk from air toxics exposure.

Our draft report also included two additional recommendations in this chapter addressing how to limit the potential health impact of multiple shutdowns and startups on nearby residents during an emergency. The agency noted that neither the EPA nor the states have authority over facilities' SSM schedules. The agency stated that the EPA coordinates with local officials, states and tribes regarding shelter in place, evacuations or other protective measures for fenceline and nearby communities.

Based on discussions with the agency, its response to our draft report, and internal management discussions, we developed one recommendation for this chapter in our final report (Recommendation 4).

Recommendation 4 is unresolved pending the OIG's receipt of an acceptable corrective action plan and proposed completion date from the agency in response to our final report. The agency's response to our draft report and our additional comments are in Appendix A. The agency provided specific suggestions for our consideration, and we revised the report as appropriate.

Chapter 4
Lack of Communication Left Communities Unaware of Risks

We did not identify any instances of inaccurate communication regarding air quality during the Hurricane Harvey response effort. However, we found that official communication from the EPA regarding air quality was limited. For example, a lack of guidance regarding how the EPA should disseminate air quality data meant air monitoring results and air quality risks did not always reach residents of impacted communities. In addition, the lack of a feedback mechanism meant field staff did not communicate how the EPA resolved residents' concerns. As a result, some communities were left unaware of important issues, which can lead to a lack of trust and confidence in the EPA's actions and findings.

Guidance Outlines Community Engagement During an Incident

Pursuant to EPA Order 2010, *Crisis Communication Plan* (CCP), the agency's Public Information Officers must consider five factors when communicating with the public during an emergency:

1. Community engagement.
2. Language access.
3. Environmental justice.
4. Environmental data.
5. EPA authority.

In addition, the EPA's CCP states that information provided to the public during an incident must be understandable, timely, accurate and consistent. Further, the CCP stresses the following points:

- The agency will widely disseminate information concerning EPA activities to the public.
- Information should be developed in languages other than English under the Commitment to Language Access Obligations in Executive Order 13166.
- The agency will develop information to address environmental justice as prescribed by EPA Memorandum, *Incorporating Environmental Justice Considerations into EPA Disaster Preparedness and Response Procedures*, issued November 2, 2006.

Some EPA offices have incorporated environmental justice into their office-specific guidance about risk communication, which the EPA defines as the

"process of informing people about potential hazards to their person, property, or community." For example, the EPA's Office of Research and Development produced the *Risk Communication Workbook,* which explains that risk communication must "transcend barriers of literacy, language, and ethnicity to ensure acceptance or understanding." An Office of Research and Development document regarding risk communication during water security emergencies warns that poor risk communication "can … undermine public trust and confidence" and that the goal should be to "enhance knowledge and understanding [and] build trust and credibility." The EPA Superfund program's risk communication guidance emphasizes that individuals perceive risk differently depending on different factors of the risk,[17] including voluntariness, controllability, familiarity, fairness, catastrophic potential, reversibility, equity and effects on children.

EPA Deployed Community Liaisons

EPA Region 6 deployed more than 80 community liaisons to the region impacted by Hurricane Harvey—the first instance in which so many liaisons were used by the agency to respond to a disaster, according to an EPA staff person. These liaisons, who were coordinated by three leaders, provided information to the public regarding how to best protect themselves from environmental risks, collected citizen concerns, and forwarded these concerns to EPA management. The liaisons were not tasked with resolving environmental issues.

EPA community liaison providing information in Houston. (EPA photo)

During the Hurricane Harvey response effort, the EPA's community liaisons communicated with the public by distributing preapproved flyers, which were available in English, Spanish and Vietnamese. The community liaisons held daily meetings with the community liaison lead[18] and maintained a dedicated environmental justice email address that the community could use. During our audit, we received feedback from the community that the liaisons in the Port Arthur/Beaumont area were present and played an active role.

[17] The EPA's Superfund program addresses the nation's most contaminated sites and responds to environmental emergencies and natural disasters.
[18] This individual was located in the Region 6 office in Dallas and provided updates to senior management regarding the work of the liaisons on the ground.

From left: English, Spanish and Vietnamese versions of EPA flyers regarding debris management. (EPA photo)

Residents Were Not Informed How EPA Resolved Their Concerns

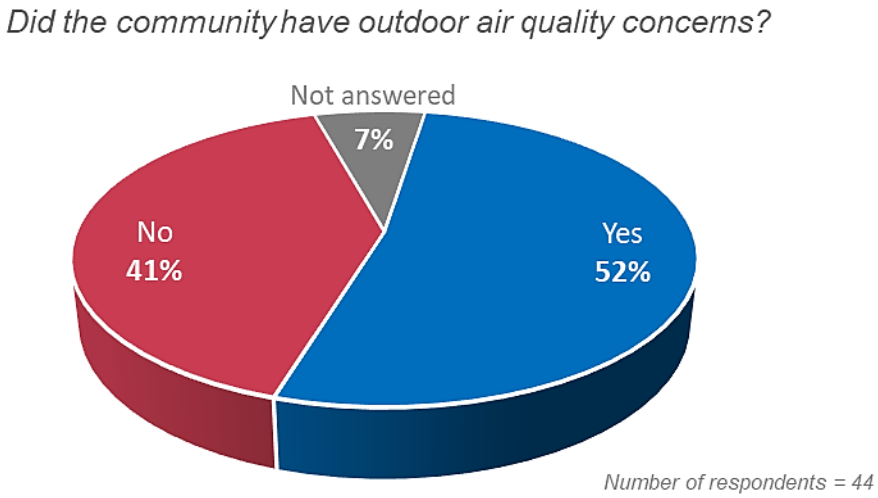
Despite concerns about air quality and other issues in the Houston area after Hurricane Harvey, the EPA did not adequately communicate important information so that all impacted communities received it. A lack of information hindered residents' ability to make informed and independent decisions to protect their health.

Residents Expressed Concerns about Health Impacts of Hurricane Harvey

The public expressed concern about the health effects related to the hurricane's impact on the community, including drinking water quality and air quality issues. As shown in Figure 9, over half of the 59 EPA staff who served as community liaisons and responded to an OIG survey stated that outdoor air quality was a concern to the community. These staff cited odors, safety, fires or hazardous air emissions from facilities as community concerns.

An aerial view of the flooding caused by Hurricane Harvey in Houston on August 31, 2017. (U.S. Department of Defense photo)

Figure 9: Community liaison survey results—outdoor air quality concerns*



Source: OIG survey analysis.

* This chart is based on the perspectives of EPA's community liaisons.

The city of Houston also received public expressions of outdoor air quality concerns after Hurricane Harvey via the city's 311 hotline. For example, the city received 33 odor complaints from August 27 through September 17, 2017. Many of these complaints pertained specifically to odors emanating from refineries in the Ship Channel area.

In addition, a few nongovernmental organizations requested air quality data from the EPA. One of these nongovernmental organizations had contacts living in affected communities who could reach the impacted constituency. However, the EPA was not responsive to requests from nongovernmental organizations for air quality data.

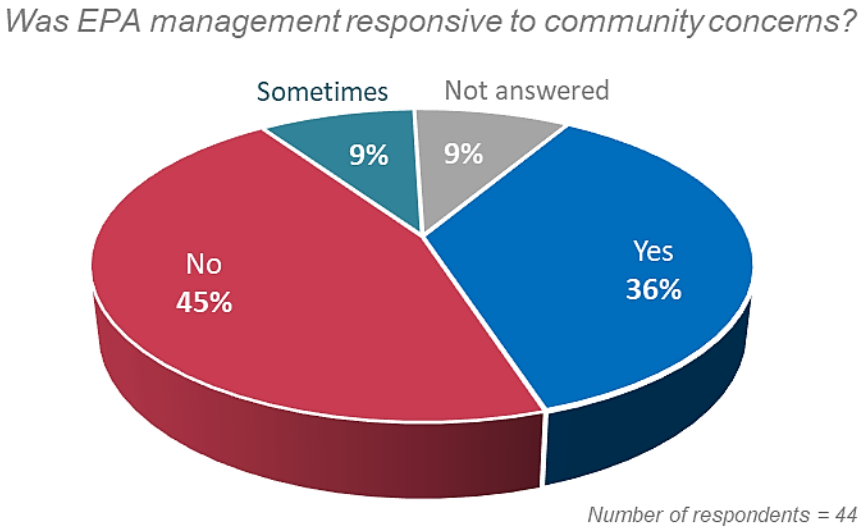
Resolution of Concerns Not Communicated to Affected Residents

The EPA lacked a process for providing feedback to the community after residents' concerns were considered resolved or addressed. While response activities were communicated daily to EPA headquarters via written reports, community liaisons and field staff reported in the EPA's post-hurricane surveys that this information was not being relayed to field teams and that they were not informed whether problems were resolved. For example, one community liaison who communicated an incident at a local refinery up the established chain of command subsequently asked about the health risks from that incident and about the resolution status. That community liaison told the OIG that the only response received from the chain of command was that the TCEQ was taking care of the situation. The community liaison expressed concern about the community and whether it was exposed to health risks from the incident.

Over half of the community liaisons who responded to our survey reported hearing about air quality concerns in communities, but about half also said that

the EPA did not address or only sometimes addressed the concerns they submitted in their daily reports (Figure 10).

Figure 10: Community liaison survey results—EPA management responsiveness*



Source: OIG survey analysis.

* This chart is based on the perspectives of EPA's community liaisons. Numbers do not add to 100 percent due to rounding.

According to the survey respondents and EPA staff we interviewed, community concerns were passed up the EPA's chain of command and were then forwarded to the governmental party responsible for resolving the issue (e.g., air quality concerns were forwarded to the TCEQ). Once the relevant party was notified, the EPA considered the matter "closed." Region 6 staff from the Office of Environmental Justice and Tribal Affairs did conduct outreach with local government officials and community organizations;[19] however, some community liaisons reported that information about how issues were resolved was lacking. In addition, after the EPA referred an issue, the EPA's process did not include following up to confirm resolution of the issue and communicating that resolution to the concerned party.

Environmental Justice Not Adequately Addressed in Emergency Response Implementation

According to the Office of Emergency Management's *2017 Hurricane and Wildfire Response After-Action Report*, environmental justice considerations were not adequately integrated into the Incident Command System structure. The report recommended integrating environmental justice considerations, "such as through coordination with nongovernmental organizations to maintain awareness of their concerns," into the CCP.

[19] In the March 2019 Region 6 realignment, this office became the Office of Communities, Tribes and Environmental Assessment.

EPA-conducted questionnaires, our survey and our interviews with community members indicated a lack of knowledge on behalf of the EPA about the needs of the Houston region's various communities and how best to reach them. This knowledge is especially critical for community liaisons to effectively communicate with environmental justice communities. For example, community liaisons should have experience with these communities so that the liaisons can address the cultural differences, communication barriers and geographical challenges that make some of these communities hard to reach. Knowing when and where communities gather is also important to effectively communicate and distribute essential information.

We also identified some concern among regional staff and managers that information did not reach all environmental justice communities. Some residents were not aware of the EPA's presence in these communities. Although community liaisons were deployed into affected communities, we confirmed with some community members that they never saw a community liaison in their neighborhoods after Hurricane Harvey. In addition, many community liaisons and organizations expressed concern about the lack of printed materials in languages other than English that are spoken prevalently in the Houston area.

Conclusion

Based on the results of our review, some residents impacted by Hurricane Harvey were unaware of air monitoring results and air quality risks during and immediately after the hurricane. The EPA has limited guidance on how to disseminate air quality data and lacks a feedback mechanism allowing EPA field staff to communicate the status of concerns to affected communities.

These challenges led to limited public awareness of potential air quality issues, which in turn could reduce public trust and confidence in the government's actions in response to an emergency. Given the number of impacts of the hurricane—including flooding, loss of power and the fear naturally instigated by a natural disaster—unaddressed concerns regarding air quality likely compounded the public perception of risks.

Recommendations

We recommend that the Associate Administrator for Public Affairs:

5. Revise the EPA's *Crisis Communication Plan* to include a communication process to inform affected communities about the resolution of community concerns raised during an emergency.

We recommend that the Region 6 Regional Administrator:

6. Conduct environmental justice training for community liaisons and Incident Command System staff, thereby fulfilling that element of the EPA's *Crisis Communication Plan*.

Agency Response and OIG Evaluation

The agency concurred with Recommendations 5 and 6 and provided acceptable planned corrective actions and completion dates. To address Recommendation 5 (Recommendation 7 in our draft report), the EPA's Office of Public Affairs plans to update the agency's CCP. In an email to the OIG dated December 3, 2019, the agency clarified that its update to the CCP will include a communication process to inform affected communities about the resolution of community concerns raised during an emergency. To address Recommendation 6 (Recommendation 9 in our draft report), Region 6 will provide annual environmental justice training to all EPA Region 6 employees, including emergency response personnel. The EPA will also provide training to community involvement core team, Incident Command staff and other appropriate community liaisons consistent with the EPA's CCP. Recommendations 5 and 6 are considered resolved with corrective actions pending.

The agency's response to our draft report and our additional comments are in Appendix A. The agency provided specific suggestions for our consideration, and we revised the report as appropriate.

Status of Recommendations and Potential Monetary Benefits

RECOMMENDATIONS						
Rec. No.	**Page No.**	**Subject**	**Status[1]**	**Action Official**	**Planned Completion Date**	**Potential Monetary Benefits (in $000s)**
1	21	Develop general guidance to help state and local agencies and external stakeholders develop air monitoring plans for emergency situations in heavily industrialized areas so that usable data are collected in targeted areas of concern.	U	Assistant Administrator for Land and Emergency Management		
2	21	Develop, in coordination with the Associate Administrator for Public Affairs, a plan for providing public access to air monitoring data collected during an emergency response.	U	Assistant Administrator for Land and Emergency Management		
3	22	Coordinate with the Office of Research and Development and the Office of Air Quality Planning and Standards within the Office of Air to assess the availability and use of remote and portable monitoring methods to monitor air toxics when stationary monitoring methods are not available.	U	Assistant Administrator for Land and Emergency Management		
4	27	Develop and implement, in coordination with the states, a plan to inform residents in fenceline and nearby communities about adverse health risks resulting from multiple facility startups and shutdowns during emergencies and to limit these residents' exposure to air toxics.	U	Region 6 Regional Administrator		
5	33	Revise the EPA's *Crisis Communication Plan* to include a communication process to inform affected communities about the resolution of community concerns raised during an emergency.	R	Associate Administrator for Public Affairs	12/30/20	
6	34	Conduct environmental justice training for community liaisons and Incident Command System staff, thereby fulfilling that element of the EPA's *Crisis Communication Plan*.	R	Region 6 Regional Administrator	9/20/20 and annually thereafter	

1 C = Corrective action completed.
R = Recommendation resolved with corrective action pending.
U = Recommendation unresolved with resolution efforts in progress.

Agency Response to Draft Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 6 2019

OFFICE OF
LAND AND EMERGENCY
MANAGEMENT

MEMORANDUM

SUBJECT: Response to Office of Inspector General Draft Report No. OA&E FY18 0266 "EPA Needs to Improve Its Emergency Planning to Better Address Air Quality Concerns During Future Disasters," dated June 25, 2019

FROM: Peter C. Wright
Assistant Administrator

TO: Charles J. Sheehan, Acting Inspector General
Office of Inspector General

Thank you for the opportunity to respond to the issues and recommendations in the subject audit report. Following is a summary of the agency's overall position, along with its position on each of the report recommendations. For those report recommendations with which the agency agrees, we have provided high-level intended corrective actions and estimated completion dates to the extent we can. For those report recommendations with which the agency does not agree, we have explained our position, provided the legal basis, and proposed alternatives to recommendations. For your consideration, we have included a Technical Comments attachment to supplement this response.

AGENCY'S OVERALL POSITION

The report seems to make broad conclusions applicable to the Agency and several national programs based on the limited review of one event in which flooding was the primary focus of the response. Instead, a review of the Region 9 response to the Kilauea volcanic activity in Hawaii, as an extended response intensively focused on air monitoring, would provide a better overall picture of EPA's existing processes, capabilities, and thorough coordination with state and local agencies.

In general, the Agency does not agree with nor advise developing overarching monitoring guidance for emergency responses - beyond what already exists. First, states and local governments are responsible for their emergency response efforts. If federal assistance is requested, or EPA receives a mission assignment from FEMA, the response is handled by the particular EPA Region. Each emergency is unique, as are the associated responses. Overarching

guidance for monitoring that would encompass the myriad emergency scenarios that could possibly occur would be challenging. Decisions regarding monitoring are made based on an evaluation of the specific incident. Further, in Region 6, all states have State Implementation Plans (SIP)-approved authority to permit planned startup, shutdown and maintenance (SSM) emissions for most facilities. EPA only approves state permitting regulations. EPA can, and does, also enforce these permits, SIP required conditions, and National Emission Standards for Hazardous Air Pollutants. Current regulations do not allow the state or EPA to dictate SSM schedules.

We understand from our discussions that we can propose alternatives for the draft recommendations, and we have provided suggestions in the "Disagreements" table below. In general, we propose to:

1. remove the Office of Air and Radiation as an action official from the recommendations,
2. combine recommendations 2 and 8,
3. combine recommendations 5 and 6,
4. exclude the term "implement" in the revised recommendations,
5. assume that "develop guidance" includes the option to incorporate the requested provisions into existing guidance or other appropriate document(s), and
6. focus the revisions on monitoring related to permitted and non-permitted air toxic releases during an emergency event rather than hazardous air pollutants covered by SIPs.

This response and these revisions have been coordinated with the Office of Air and Radiation, the Office of Public Affairs, and EPA Region 6.

AGENCY'S RESPONSE TO REPORT RECOMMENDATIONS

Agreements

No.	Recommendation	High-Level Intended Corrective Action(s)	Estimated Completion by Quarter and FY
7	(OPA) Revise the EPA's Crisis Communication Plan to include a communication process to inform affected communities about the resolution of community concerns raised during an emergency.	7.1 Update Crisis Communications Plan	1st Quarter FY 2020, December 30
OIG Response #1: The agency concurred with the recommendation and provided a planned corrective action and completion date. In an email to the OIG dated December 3, 2019, the agency clarified that its update to the CCP will include a communication process to inform affected communities about the resolution of community concerns raised during an emergency. We consider this recommendation—which is Recommendation 5 in the final report—resolved with corrective actions pending.			
9	(Region 6) Conduct environmental justice training for community liaisons and Incident Command System staff, thereby fulfilling that element of the EPA's Crisis Communication Plan.	9.1 Continue to provide annual EJ training to all EPA Region 6 employees including emergency response personnel. EPA will consider adding a module to emphasize environmental justice communications during emergency response.	4th Quarter FY 2020 September 30, and annually thereafter
		9.2 Provide training to community involvement core team, Incident Command staff, and other appropriate community liaisons consistent with EPA's Crisis Communication Plan.	3rd Quarter FY 2020, June 30
OIG Response #2: The agency concurred with the recommendation and provided planned corrective actions and completion dates. Specifically, the agency's corrective action number 9.2 addresses the recommendation. This recommendation, which is Recommendation 6 in the final report, is resolved with corrective actions pending.			

Disagreements

No.	Recommendation	Agency Explanation/Response	Proposed Alternative
1	(OLEM) Develop and implement ambient air quality monitoring guidance for emergency responses	Air monitoring during a response is individualized and highly dependent upon the unique characteristics of the incident. Overarching guidance for monitoring encompassing the myriad emergency	(OLEM) In order to collect useable data and target concerns during an emergency response develop guidance (e.g, job

	in heavily industrialized areas. This guidance should address, at a minimum, how to select monitoring locations, duration, timing and methods depending on the intended use of the data.	scenarios that could possible occur is not feasible. Decisions regarding monitoring are made based on an evaluation of the specific incident. For example, circumstances such as flooded streets, power outages, accessibility to facilitate/sites, or personnel safety, would dictate what could/could not be done.	aid) to assist state, local and tribal agencies; industry; and the affected public in developing air monitoring plans in heavily industrialized areas during an emergency.
OIG Response #3: Our report recognizes the individual nature of each emergency response. Our intent was not to recommend that the EPA develop prescriptive guidance to cover all potential situations; rather, our intent was to recommend that the EPA develop general guidance to help state and local agencies, as well as nongovernmental organizations, develop their emergency monitoring plans. In discussions with the agency, we agreed on alternative language for Recommendation 1 and revised it for the final report. This recommendation is unresolved pending receipt of a correction action plan and proposed completion date from the EPA.			
2	(OLEM) Develop and implement a method for storing and providing public access to ambient air monitoring data collected during an emergency response.	EPA has several existing tools and procedures such as SCRIBE, Viper, Common operation Picture, and story maps. Emergency Response Team Sampling guidelines can be found at: https://nepis.epa.gov/Exe/ZyPDF.cgi/2000FZYG.PDF?Dockey=2000FZYG.PDF	(OLEM/OPA) Develop a method for storing and providing public access to air monitoring data during an emergency response.
OIG Response #4: Viper, a wireless network-based communications system, was not used to distribute raw air monitoring data to the public during the agency's response to Hurricane Harvey and still has not been used to retroactively provide this information. This tool also lacks user-friendly features that would allow members of the public to easily identify and extract information relevant to their exposures or interest level. The remaining tools that the EPA mentions in its response also do not adequately address our concerns or resolve our recommendation, because the tools only provide summary-level information or require the installation of complex software onto the user's computer. Based on discussions with the agency, we developed alternative language for Recommendation 2 and revised the recommendation for the final report. This recommendation is unresolved pending receipt of a correction action plan and proposed completion date from the EPA.			
3	(OLEM) Test and evaluate the use of low-cost air monitors throughout fenceline communities to monitor air toxics and other air pollutants during emergency situations when state and local air	If pre-event monitoring systems are rendered non-operational by an emergency conditions, EPA uses screening level tools (TAGA, ASPECT) to pinpoint areas of concern for further, targeted air monitoring.	(OLEM) To improve the availability of air monitoring immediately post-event, incorporate into existing procedures coordination with ORD and OAQPS to assess the availability and use of remote and portable monitoring methods to

	monitoring systems and networks are not operational.		monitor air toxic when stationary methods are not available.
OIG Response #5: The screening-level tools cited by the agency are all described in our report. In discussions with the agency, we came to an agreement on alternative language for Recommendation 3 and revised the recommendation for the final report. This recommendation is unresolved pending receipt of a corrective action plan and proposed completion date from the EPA.			
4	(OLEM/OAR) Identify and standardize the use of appropriate health-based ambient air quality thresholds in communities during emergency responses.	There are already existing air quality standards [National Ambient Air Quality Standards (NAAQS)]. They do not change during emergency responses. During a response, if we detect a specific contaminant of concern, we go to the existing acute values for that chemical in order to estimate risk to communities. These values already exist (e.g., AEGLs) and indicate the concentrations at which public health impacts may occur for a particular chemical hazard. In the rare instance that there is no established value for a particular substance, one is developed based on existing data or by using existing tools to estimate toxicity. This is done in coordination with entities such as EPA's ORD, ATSDR, and other experts in toxicology and risk assessment. AEGLS are expressed as specific concentrations of airborne chemicals at which health effects may occur. They are designed to protect the elderly and children, and other susceptible populations.	Remove OAR and revise recommendation to read: (OLEM) In the absence of federal acute exposure thresholds (AEGL standards) for air toxics and to avoid delays in assessing the potential health impacts of concentrations detected during an emergency, incorporate into existing preparedness guidance the requirement for Regions to coordinate with states to identify the air pollutant standards for making decisions about public health impacts from potential toxic air emissions.
OIG Response #6: We recognize that there are existing air quality standards for criteria air pollutants, but there are no federal air quality standards for air toxics. We also acknowledge that the EPA developed the AEGLs for assessing public health risk from exposure to air toxics during an emergency. However, the AEGLs do not account for cumulative or aggregated exposures to airborne chemicals, meaning the AEGLs may not be sufficiently protective of sensitive communities. Additionally, Texas developed its own acute exposure thresholds, and a key decision during the Hurricane Harvey response was whether to use the state or EPA thresholds as action levels. Our report does not question the selection of the thresholds used for the response. After further discussions with the agency and among OIG management, we have withdrawn this recommendation.			
5	(Region 6) Assess the potential for adverse health risks to residents living near industrial areas from	Current regulations do not allow the state or EPA to dictate SSM schedules. Public health evaluations are the responsibility of department of Health and Human Services, not EPA. EPA can provide air	(Region 6) SSMs are governed by state and federal regulations which are already designed to limit emissions including

	increased [startup, shutdown and maintenance] SSM emissions during emergencies	monitoring data to support HHS analysis, as needed. EPA's emergency responses are undertaken to protect human health and the environment from immediate threats posed by discharges and hazardous substance releases resulting from a natural disaster. These responses follow statutes, regulations, policy, guidance, which provide for coordination with other federal agencies and state, tribal and local response agencies. For fenceline and nearby communities, EPA coordinates with local officials, states and tribes regarding shelter in place, evacuations, or other protective measures.	during emergencies. During an emergency, air quality concerns are addressed through monitoring using established acute values (e.g. AEGLs) for the chemicals of concern, in order to estimate risk to communities. EPA's enforcement program also evaluates facility operations and takes enforcement actions as needed when violations occur.
OIG Response #7: We understand that the EPA cannot dictate when a facility should shut down or start up in response to an emergency and that characterizing the risk from these exposures is difficult. However, a public health concern during the Hurricane Harvey response was the potential health impact of residents' exposure to air toxics from multiple facility SSMs during a condensed time period. We therefore believe that Region 6 should develop a strategy, in coordination with its states, to limit fenceline communities' exposures in heavily industrialized areas during future emergencies. Based on discussions with the agency, we revised and combined two draft report recommendations (Recommendations 5 and 6) into one final recommendation (Recommendation 4). The final report recommendation is unresolved pending receipt of a corrective action plan and proposed completion date from the EPA.			
6	(Region 6) Develop and implement a plan for limiting air toxic exposures in fenceline and other nearby communities from startup, shutdown and malfunction emissions during a large-scale emergency.		Delete this recommendation and combine with #5.
OIG Response #8: See OIG Response #7.			

8	Develop and implement a strategy for public dissemination of air quality data.	See OLEM response to recommendation #2.	Delete this recommendation and incorporate into #2
OIG Response #9: Based on our discussions with the agency, we agreed that Recommendations 2 and 8 in the draft report were similar and could be combined into one recommendation. We therefore deleted draft Recommendation 8 and made minor revisions to Recommendation 2 for the final report. See OIG Response #4.			

CONTACT INFORMATION

If you have any questions regarding this response, please contact Reggie Cheatham, Director, of the Office of Emergency Management at Cheatham.Reggie@epa.gov or (202) 564-8003 or Becki Clark, Deputy Director, of the Office of Emergency Management at Clark.Becki@epa.gov or (202) 564-3818.

Attachment - Technical Comments

cc: Anne Idsal, OAR
Nancy Grantham, OPA
Ken McQueen, Region 6
Reggie Cheatham, OEM
Kevin Christensen, OIG
James Hatfield, OIG
Gabrielle Fekete, OIG

Appendix B

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