

May 10, 2013

Ms. Tara Capobianco
Air Pollutant Watch List Coordinator
Texas Commission on Environmental Quality
Air Permits Division
MC-163
P.O. Box 13087
Austin, Texas 78711-3087

Re: Proposed Removal of Benzene and Hydrogen Sulfide from Texas City Air Pollutant Watch List Area

Dear Ms. Capobianco:

Air Alliance Houston and Environmental Defense Fund respectfully submit these comments on the proposed removal of benzene and hydrogen sulfide from the Texas City Air Pollutant Watch List (APWL) Area. Our comments were prepared with the assistance of an expert, Dr. Ram Hashmonay of Airmeasure Solutions.

We appreciate the opportunity to comment and participate in the Air Pollutant Watch List process. As one of us stated during the public hearing, we support the APWL program and the Texas Commission on Environmental Quality's (TCEQ) efforts to protect air quality in Texas City. We hope that the APWL continues to be administered efficiently and effectively.

I. AREA LISTING AND DELISTING

A. Benzene and Hydrogen Sulfide in Texas City APWL 1202

TCEQ first added Texas City to the Air Pollutant Watch List in 2001 because of elevated concentrations of propionaldehyde. Benzene was added in 2003 because annual average benzene concentrations at the Ball Park Monitor exceeded the long-term health-based Air Monitoring Comparison Value (AMCV) of 1.0 ppb.¹ Hydrogen sulfide was added in 2004 based on mobile monitoring data showing exceedances of the 0.08 parts per million (ppm) standard and stationary monitoring data from the Ball Park monitor showing 69 exceedances of 0.08 ppm.²

The Ball Park monitor is one of two canister-based monitoring stations operated by TCEQ in Texas City. The other, the Nessler Pool Monitor, was located at 17th and 5th Avenue North and operated from January 1, 1979 to July 30, 2007.

¹ The long-term AMCV for benzene has since been made less health protective, with a revised AMCV of 1.4 ppb.

² "Air Pollutant Watch List Proposed Change: Removal of Texas City, Hydrogen Sulfide," Texas Commission on Environmental Quality, Air Permits Division (Mar. 11, 2013) ("Hydrogen Sulfide Proposal") at p. 11.

For reasons explained below, we believe that only data from TCEQ canister based monitoring stations, such as Ball Park, are appropriate for calculation of representative annual average concentration and have any evidentiary weight in a benzene delisting proposal. Benzene was listed because of exceedances measured at the Ball Park Monitor. This monitor is properly located to evaluate emission variations for the eastern area of the BP facility (the largest emitter of benzene in the Texas City area) considering the predominant wind direction about 170°-180°. Our analysis of recent data (beginning in 2010) from the two auto GC monitoring stations at the northern side of BP's fence line—31st Street and Logan Street-- indicates that the current primary benzene sources are in the western area of the BP facility. There is a residential community downwind of these "newly found" major benzene sources, but there are no official TCEQ canister-based monitoring stations situated within this downwind community to intercept benzene plumes.

Our analysis shows that these western sources have actually contributed to an *increase* in benzene concentrations between 2010/11 and 2012. We believe that communities downwind from the northwestern side of the BP facility experience annual concentrations higher than the 1.4 ppb long-term AMCV. We have identified an upward trend in benzene emissions from this area over the last three years. BP has not reported emission events of benzene from the western portions of its facility. For this reason, we must insist that only canister measurements taken in this community May be supported by auto GC and open path monitoring for a period of several years can prove that benzene concentrations are below the AMCV and justify delisting.

B. Benzene and Hydrogen Sulfide are Proposed for Delisting

The TCEQ has proposed to delist Texas City for benzene and hydrogen sulfide. TCEQ protocol dictates how to proceed with a delisting, but no criteria are given for choosing areas to propose for delisting.³ We believe that the current proposal to delist Texas City from the APWL is based on inadequate monitoring data. As we will show below, the data available are incomplete, inadequate, and misleading. In addition, we are concerned that TCEQ treats data from several different types of monitors on equal footing. The delisting proposal includes no discussion of the relative weight to be given with respect to differences in data collected from different types of monitors. The comparison of annual averages from each monitor to the long-term AMCV without robust analysis is simplistic and misleading.

TCEQ has made no attempt to correlate monitor values with wind data. In addition, there has been no attempt to pinpoint emissions sources, even though TCEQ acknowledges that upwind and downwind monitors—both of which are present in Texas City—are useful for pinpointing.

C. Our Analysis Suggests this Area Should not be Delisted

An analysis of hourly data from the Logan Street and 31st Street Auto GCs, in conjunction with wind direction, allowed us to pinpoint the major sources of benzene emissions within the BP facility. We were

³ "Protocol for Notification and Work Group Functions for Evaluating Potential and Active Air Pollutant Watch List (APWL) Areas," Texas Commission on Environmental Quality (Feb. 2012) *available at* <http://www.tceq.state.tx.us/assets/public/implementation/tox/apwl/protocol2012.pdf>.

also able to estimate annual benzene concentrations in communities downwind of these sources through examination of wind direction frequencies. Our analysis determined that there are residences in the APWL area that may experience annual benzene levels greater than the long-term AMCV. Only focused monitoring of benzene in the areas downwind of major sources of benzene emissions that demonstrates that concentrations are below the AMCV for several years can justify delisting.

II. LARGEST SOURCE OF BENZENE EMISSIONS WITHIN BP CAN BE PINPOINTED

Texas City, APWL 1202 is a “highly industrialized” area containing some 19 industrial complexes. Twelve of these 19 facilities have benzene emissions in their emissions inventories. However, there is one facility that is far and away the largest contributor of benzene to the area: BP.⁴ Our comments focus on this facility and on pinpointed emissions sources within it.

The Benzene Proposal states that “[h]aving an upwind and a downwind monitor is extremely useful in better understanding an individual company’s contribution of an air toxic to the ambient air, and is also helpful in better pinpointing sources of emissions.”⁵ The Proposal identifies the BP on-site monitor as upwind from BP’s benzene sources and the Ball Park, Logan Street, 31st street, and 11th Street monitors as downwind. TCEQ’s analysis also found that “auto GC data at the 31st Street Monitor indicated that higher benzene concentrations were associated with winds blowing from the direction of BP.”⁶

TCEQ’s presentation of its analysis does not adequately explain the relationship between monitored concentrations and wind direction and frequency. We have performed a detailed analysis of monitored concentrations and wind direction. Our analysis allows us to pinpoint BP’s benzene emissions as originating from the west/northwest portion of the facility.

We correlated hourly monitored benzene concentrations with wind direction and found very close correlations with specific wind directions. In short, when prevailing winds place the Logan and 31st Street monitors downwind of a certain group of tanks within BP’s facility, monitored concentrations of benzene spike.

B. Pinpointing Emissions

1. Benzene Concentrations vs. Wind Direction

We have plotted hourly benzene concentrations against wind direction for 2010 (beginning May 2010 when Logan St. station came on-line) and 2011. This revealed a major peak for both the Logan and 31st street monitoring stations, at around 190°-220° wind direction for Logan and 140°-170° wind direction

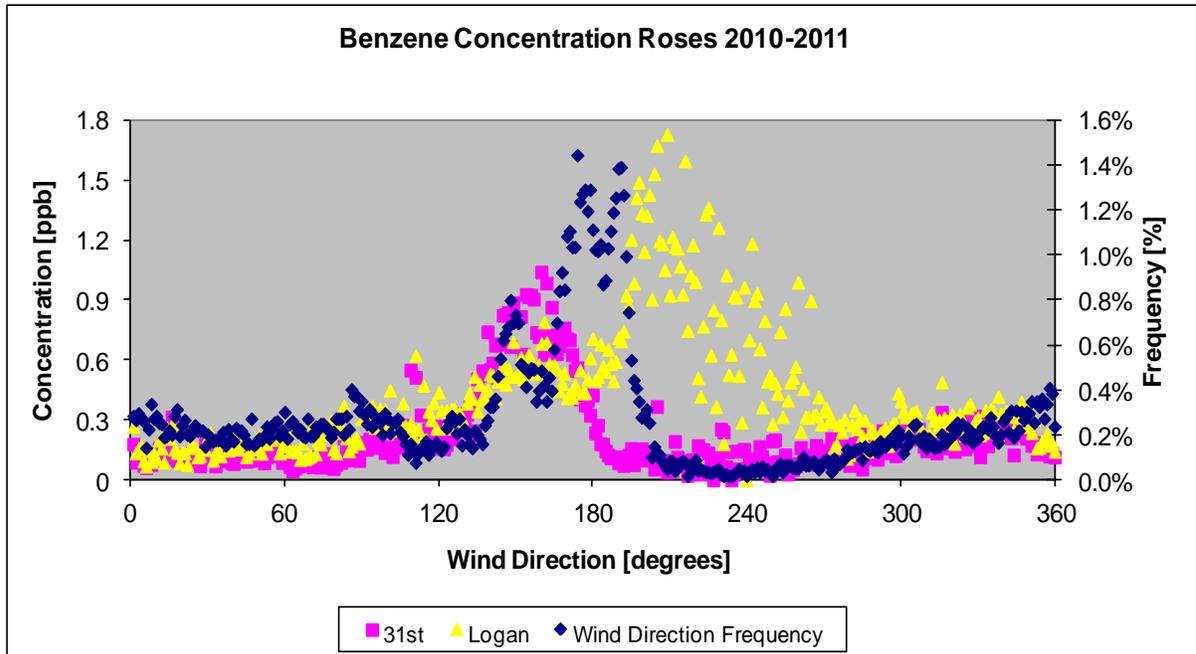
⁴ “Air Pollutant Watch List Proposed Change: Removal of Texas City, Benzene,” Texas Commission on Environmental Quality, Air Permits Division (Mar. 11, 2013) (“Benzene Proposal”) at p. 7.

⁵ Benzene Proposal at p. 10-11, fn. 3.

⁶ Benzene Proposal at p. 11.

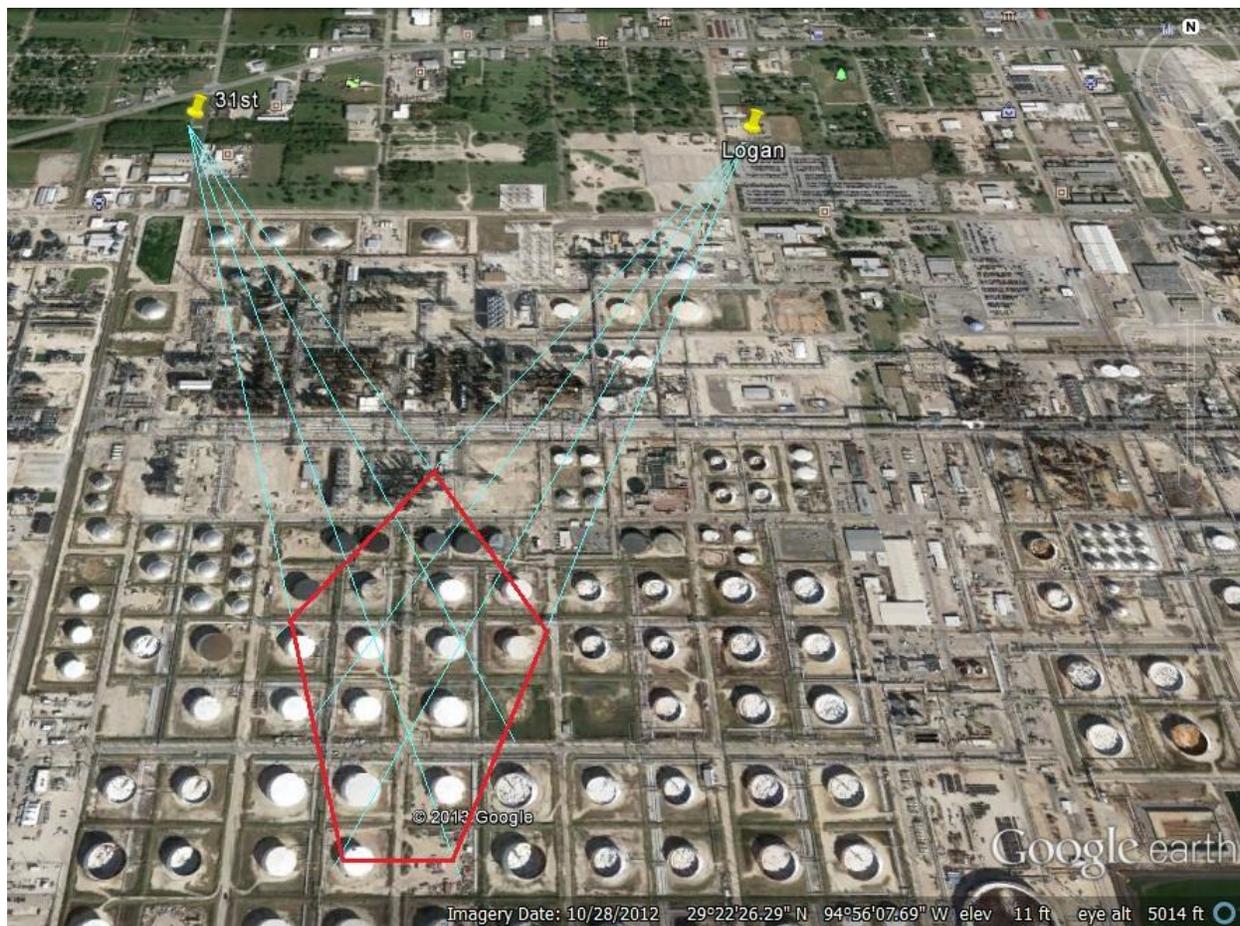
for 31st. The predominant wind direction frequency is at around 170°-190°, with a smaller peak at 150°. This places prevailing winds exactly between existing monitors.

Figure 1. Benzene Concentration Roses and Wind Direction Frequency



Using the data analysis above, we can pinpoint benzene emissions within the BP facility. Using the wind directions, we have identified the highest monitored concentrations at both the 31st and Logan Street monitors. We have illustrated this information below using lines drawn from the monitors to the BP facility at the appropriate directions.

Figure 2. Pinpointed emission source for 2010-2012



The area of overlap in the wind directions correlated with the highest monitored concentrations pinpoints the major benzene emissions area within the BP facility. A tank farm in the western half of BP's facility is the source of most benzene emissions.⁷

2. Analysis of 2012 Data Confirmed the Pinpointing Results and Discovered an Additional Benzene Source

In the next set of graphs, benzene hourly concentrations for 2012 are plotted against wind direction, along with wind direction frequencies. For comparison, the 2010/11 time interval is also illustrated, first

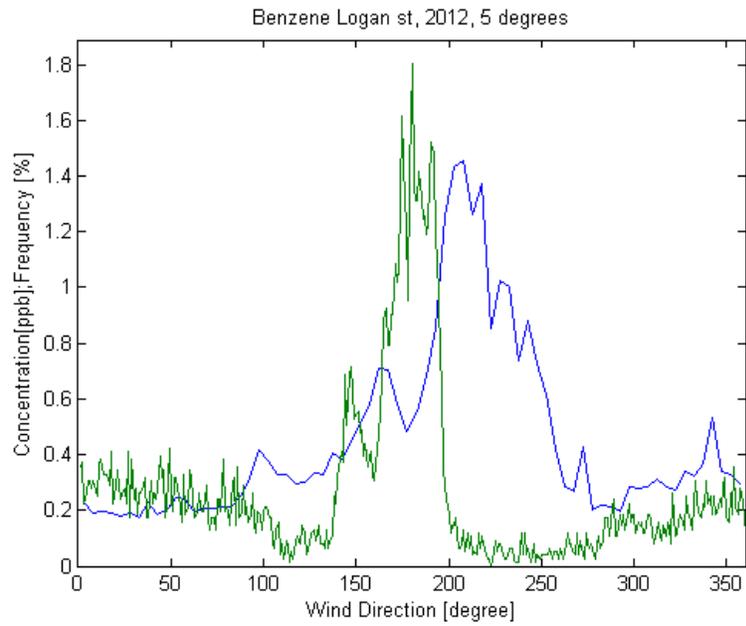
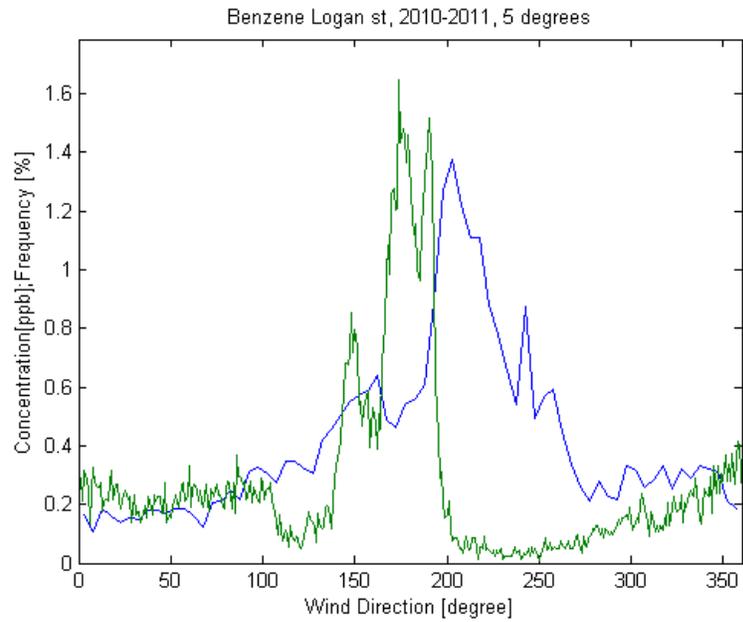
⁷ We have compared similar data for other volatile organic compounds (VOCs) such as hexane, pentane, and toluene. Our analysis demonstrates the same effect. Although other VOC emissions are beyond the scope of these comments, it should be pointed out that their analysis strengthened our results.

for the Logan St. monitor and then for 31st. In these graphs, the blue line illustrates the relationship between benzene concentrations and wind direction explained above. The green line shows the frequency at which the wind blows from any given direction. This relationship has been plotted at increments of five degrees.

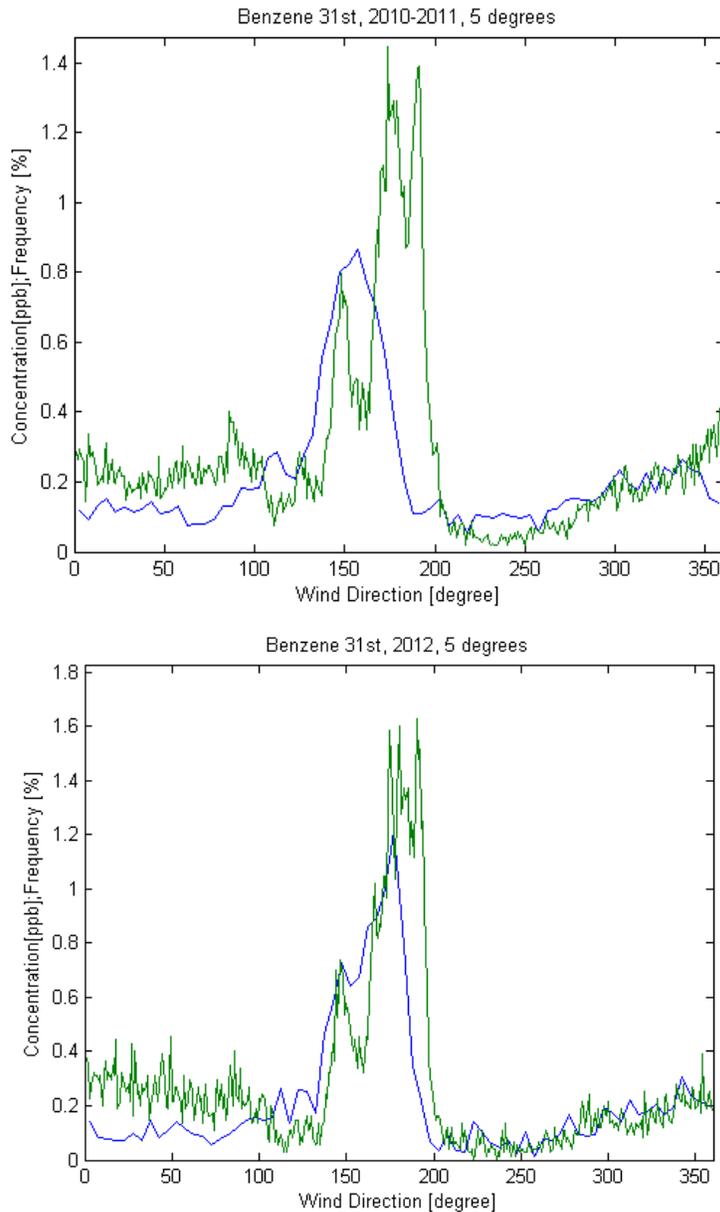
These graphs demonstrate that prevailing wind frequencies did not significantly change between the two time periods. Also, the main peaks on both stations remained at similar levels and wind directions. This indicates that the pinpointed group of tanks continued to emit benzene at a similar rate in 2012. Additional peaks are shown in the 2012 graphs, pinpointing an additional secondary source of benzene close to ground level at the northwest corner of the BP facility.

These graphs for Logan demonstrate that (1) as shown above, monitored benzene concentrations peak at Logan Street when the wind blows from the south, at about 200°-220°, and (2) the wind blows most frequently from about 170°-190°.

Figures 3a and 3b. Logan Street: Benzene concentrations (blue) and wind direction & frequency (green):



Figures 4a and 4b. 31st Street: Benzene concentrations (blue) and wind direction & frequency (green):



These graphs demonstrate that monitors are not ideally located to capture benzene that is emitted from the major sources within BP's facility. The 31st and Logan Street monitors are actually on either side of the most frequent and significant plumes of benzene emissions. This fact is illustrated in Figure 5 below.

C. Available Monitoring Data is Insufficient to Justify Delisting

The TCEQ only maintains one monitor in Texas City: the Ball Park Monitor (AQS Number 481670005). This monitor is a 24-hour canister sampler; it takes a 24 hour sample once every six days. It is the only monitor in Texas City that provides such data, and it is the only monitor that is designed for calculation annual average concentrations. Texas City was listed because annual average concentrations at the Ball

Park monitor exceeded the long-term AMCV. Only a monitor that is designed to monitor for annual average concentrations can provide meaningful data for comparison to a long-term AMCV. This means that Ball Park is the only monitor providing data with real evidentiary value.

The 31st and Logan Street monitors are Auto GCs. Their data have not been validated. The EPA has a set of standardized, peer reviewed methods for the determination of volatile, semi-volatile, and selected toxic organic pollutants in the air.⁸ Canister sampling is listed as Toxic Organic method 15 (TO-15). There is no TO method for Auto GC data. Auto GC data is collected continuously and, unless each monitor is calibrated to TO-13 for each compound, it is not suitable for calculation of annual concentrations or comparison to a long-term AMCV. But in its delisting proposal, TCEQ has compared both canister and Auto GC data to the long-term AMCV.⁹ TCEQ's proposed delisting does not include any discussion of cross-calibration between canisters and Auto GCs. The proposal also does not discuss the significance of different data collection methods. The TCEQ has not demonstrated that evidence collected with these different methods is equivalent. Yet the TCEQ seems to give these data equal weight, and even plots different types of data on a single chart as if it were the same.¹⁰ This data was also presented at a public hearing in Texas City on April 11, 2013 with no discussion of the significance of different data collection methods. This is misleading and represents a serious scientific flaw in the way that TCEQ communicates information to the public.

Our analysis of data from Auto GC monitors at 31st and Logan Streets is useful only to the extent that it allowed us to pinpoint emissions. As explained above, this dataset has not been validated for absolute concentrations, is not appropriate for calculation of annual averages or comparison to a long-term AMCV, and should not be given evidentiary weight in the proposed delisting. Only the Ball Park Monitor provides data that should be meaningfully considered as part of a delisting assessment.

It is troubling that there is only one valid community monitoring station in Texas City. The Ball Park monitor is located downwind from the eastern part the BP facility, an area historically considered to be the major source of emissions from the facility. But we have pinpointed a previously unrecognized source of benzene emissions: a collection of tanks in the western portion of the BP facility. This source is consistent with several recent DIAL¹¹ and U.S. EPA Other Test Method-10¹² studies that report that tanks are major VOC, including benzene, emission sources in refineries.

⁸ See US EPA, "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air," Second Edition (Jan. 1999) *available at* <http://www.epa.gov/ttnamti1/files/ambient/airtox/tocomp99.pdf>.

⁹ Benzene Proposal at p. 10.

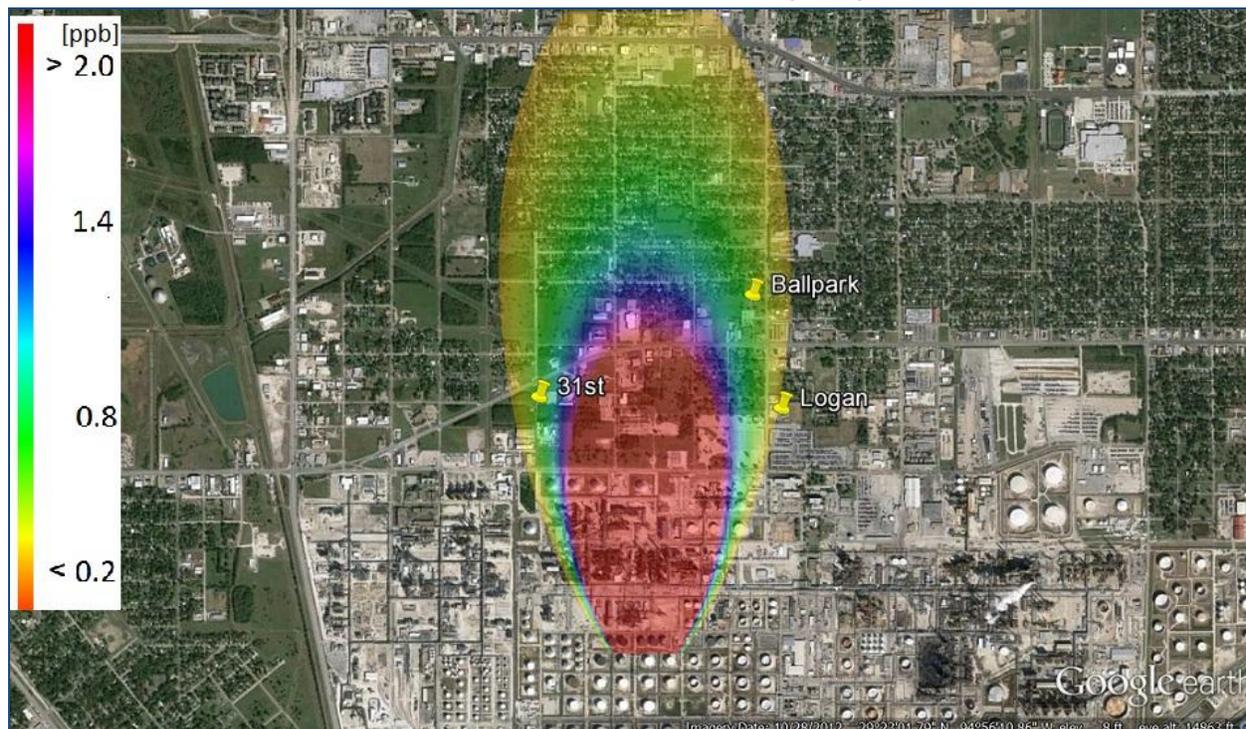
¹⁰ Benzene Proposal at p. 17, Fig. 4.

¹¹ See, e.g., Chambers et. al., "Direct Measurement of Fugitive Emissions of Hydrocarbons from a Refinery," J. Air & Waste Manage. Assoc. 58: 1047-1056 (Aug. 2008), *available at* https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CD0QFjAB&url=http%3A%2F%2Fwww.researchgate.net%2Fpublication%2F23187614_Direct_measurement_of_fugitive_emissions_of_hydrocarbons_from_a_refinery%2Ffile%2Fd912f50f81fa712137.pdf&ei=2N6LUZv6MaSJ0QHJoH4BQ&usg=AFQjCNGJ2eEqeYej3E4WT5AYFAD_t7t-Hg&bvm=bv.46340616,d.dmQ.

¹² *Available at* <http://www.epa.gov/ttn/emc/prelim/otm10.pdf>.

We have developed a map that estimates the distribution of benzene annual concentrations downwind of this pinpointed source within the BP facility.¹³ The map illustrates three things. First, the Ball Park monitor is not located in an area expected to capture the highest benzene concentrations. Second, there is strong evidence that annual benzene concentrations exceed the long-term AMCV of 1.4 ppb at locations—including residences—downwind of the BP facility. Third, only a monitor placed in the direct path of emissions could demonstrate that no Texas City residents are exposed to concentrations above the long-term benzene AMCV. Such a monitor is needed before a reasonable assessment or recommendation can be made with regard to the APWL listing status.

Figure 5. Estimated Distribution of Benzene Annual Concentration, Based on Retrieved Primary Source Location and Wind Direction Frequency



D. A New Monitor is Needed

The current monitoring scheme in Texas City is ineffective. Monitors must be placed so that they capture the highest concentrations to which the public are exposed. The TCEQ must place a point monitor such as a TO-16 open path monitor, between the 31st Street and Logan Street monitors. If well sited TO-15 monitors do not exceed the long-term AMCV, and well sited and cross-calibrated auto GCs or TO-16 monitors do not exceed the short-term AMCV, for several years, then the TCEQ may reconsider.

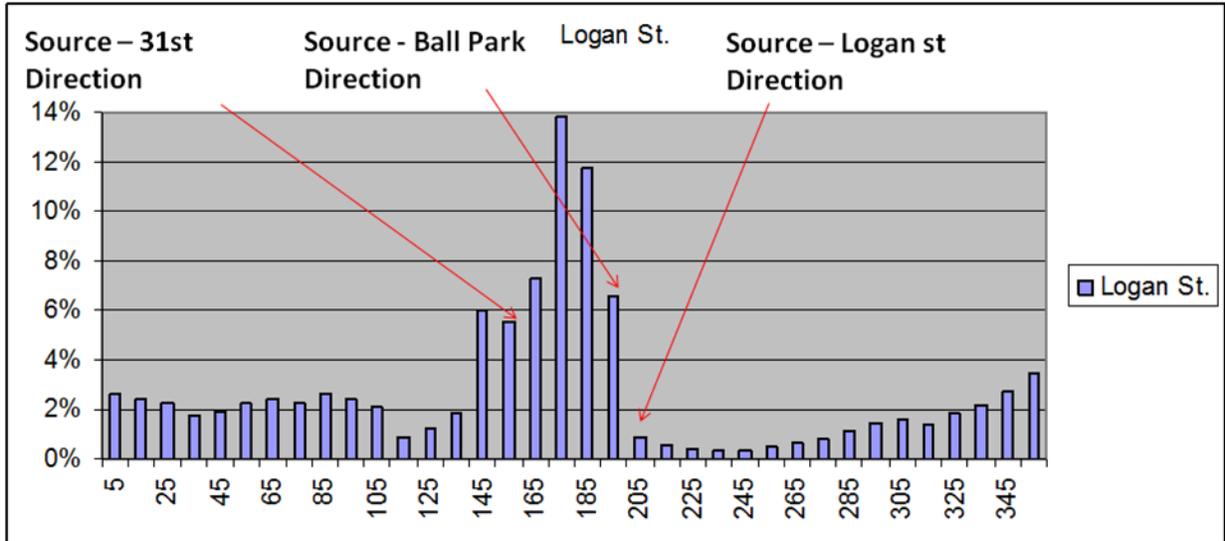
III. MONITORS ARE IMPROPERLY SITED

¹³ Figure 5, below.

A. Prevailing Winds Blow Emissions Between Exiting Monitors

We have pinpointed a group of tanks within BP’s facility as the major source of VOC emissions, including benzene. This allows us to identify several siting issues with existing monitors. This chart of wind direction frequency shows that wind blows most frequently from about 175°, and very infrequently from 200° and further west.

Figure 6. Wind Direction Frequency



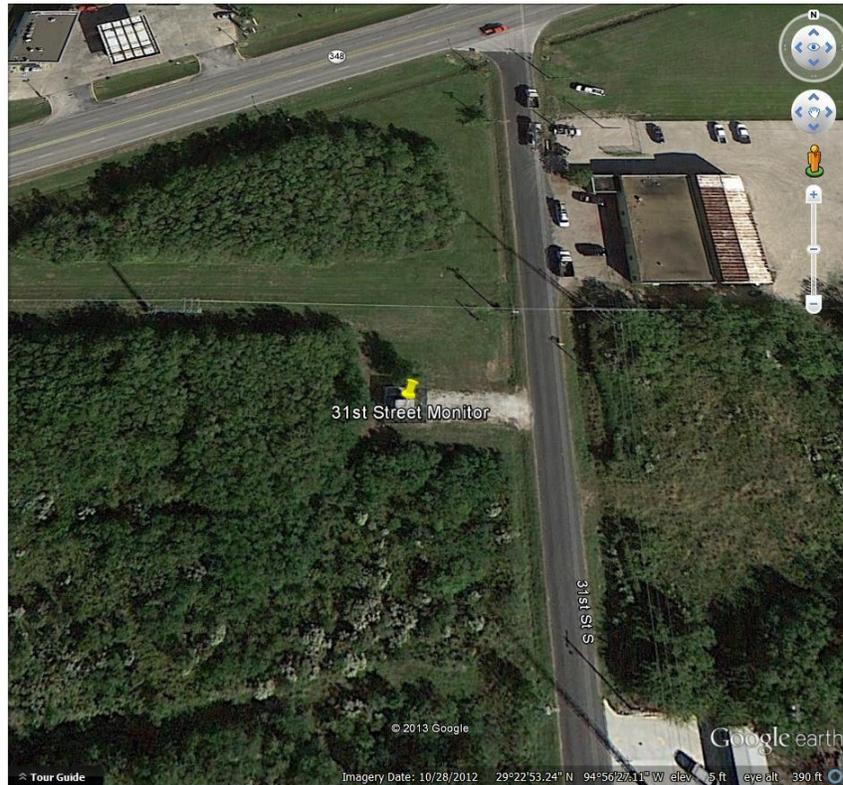
This means that prevailing winds often blow emissions from the primary source of benzene—the previously identified tanks—to the west of the Logan Street monitor. In order to properly monitor the highest annual concentrations of benzene, a TO-15 monitor should be located at 175° from the pinpointed source of benzene emissions—approximately between these two monitors.

Without a properly sited monitor, the annual average benzene concentration is artificially low. Days on which prevailing winds put the existing monitors directly downwind of the pinpointed site are diluted by days in which the wind blows emissions away from the monitors. If a monitor were located so that the most frequent winds placed it downwind of the pinpointed source, it may have measured benzene concentrations of three to five times the current Ball Park monitor.

B. The 31st Street Monitor is Surrounded by Trees

The 31st Street monitor is surrounded by trees that could affect its accuracy. The following image shows the location of the monitor and the trees that surround it.

Figure 7. Location of 31st Street Monitor



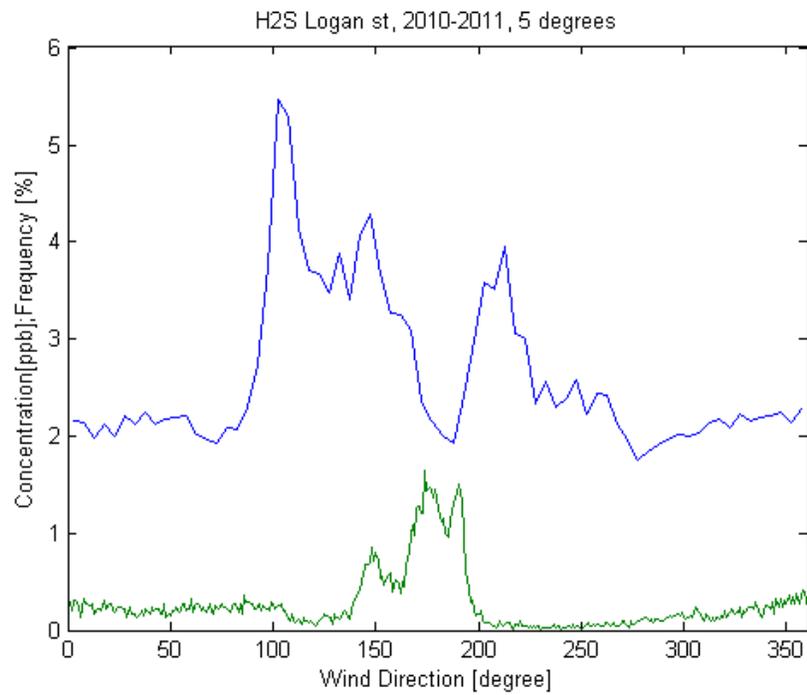
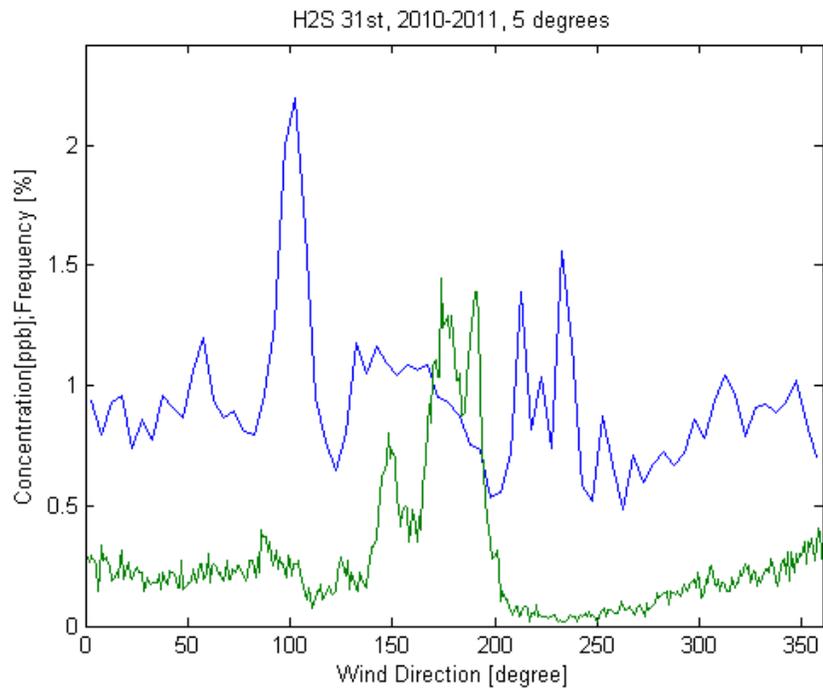
This monitor is north of the primary source of emissions within the western half of BP’s facility. It is surrounded by trees to the south, directly in the path of the facility. This monitor, which is a similar distance from the pinpointed source of benzene as the Logan street monitor, shows much lower benzene concentrations than that monitor.¹⁴ This poor siting impacts the data collected at that monitor. Although it is our contention that this monitor should not be used to monitor compliance with the long-term AMCV, its poor placement is indicative of poor planning and execution of the monitoring plan in Texas City.

IV. HYDROGEN SULFIDE ALSO SHOULD NOT BE DELISTED

Our analysis and comments have focused on benzene, but we have similar concerns about hydrogen sulfide. In Part II.B.2 above, we presented plots of wind direction frequency against benzene hourly concentrations. These plots demonstrated that monitors were not ideally located downwind of the major sources of benzene emissions. We have conducted a similar analysis of hydrogen sulfide and found similar results.

¹⁴ Our analysis of monitored toluene concentrations shows similar discrepancies.

Figure 8a and 8b. 31st Street and Logan Street: Hydrogen Sulfide concentrations (blue) and wind direction & frequency (green):



We see one major and quite narrow peak of hydrogen sulfide concentrations at 31st Street when the wind is blowing at 100°. This indicates a nearby H₂S source to the east of the 31st Street monitor and probably very near to the fenceline. The wind blows most frequently at about 160°-190°.

The situation is similar at Logan Street. Hydrogen sulfide concentrations peak when the wind blows at 100°, 140°, and 220°. The 220 spike, along with the 100 spike at 31st allows us to triangulate a major source near the fenceline and between the two monitoring stations. An H₂S monitor downwind from this source may frequently monitor concentrations that exceed the 0.08 ppm ambient regulatory standard for residential, business, or commercial properties.

We have identified considerable siting and data analysis issues throughout these comments. Given that our analysis shows similar issues with hydrogen sulfide, we have concluded that its delisting is also inappropriate and premature. We recommend several years of canister, auto GC, and open path monitors in the area we have identified as downwind of the pinpointed sources in the western portion of the BP facility.

V. BP, THE LARGEST EMITTER OF BENZENE IN TEXAS CITY, HAS A LONG HISTORY OF POOR ENVIRONMENTAL AND SAFETY MANAGEMENT

In addition to the air monitoring issues described above, BP, the largest emitter of benzene in the Texas City, has a history of poor environmental compliance and is the site of some of the most deadly industrial accidents in the state's history. On March 23, 2005, an explosion killed 15 employees and injured 170 as a result of workers re-starting a unit at the BP refinery that had been closed for repairs. The problem started when workers filled a tank with 138 feet of flammable liquid, when it should have only been filled with 6.5 feet of liquid. Upon further investigation, it was discovered that BP had cut costs, resulting in risky working conditions, which were likely the cause of the catastrophic event. An investigation by the Chemical Safety Board found numerous problems including out of date equipment, corroded pipes, and faulty safety alarms. This explosion has been characterized as the worst workplace incident in the U.S. from 1989 up until 2005.¹⁵

More recently, in November 2011, there were reports of gas leaks at the BP Texas City refinery. A caller initially reported a sulfur dioxide leak to the National Response Center. BP confirmed an ongoing leak of methyl mercaptan; the odor was bad enough that 30 workers from a neighboring plant downwind were taken to the hospital.

This poor record of environmental and safety management should give pause to anyone proposing delisting in Texas City. The Air Pollutant Watch List program has historically been an effective use of limited state resources. TCEQ should not propose delistings lightly nor proceed with them hastily.

¹⁵ See, e.g., Daniel Schorn, "The Explosion at Texas City," (Feb. 11, 2009) available at http://www.cbsnews.com/2100-18560_162-2126509.html?tag=contentMain;contentBody.

VI. CONCLUSION

It is the express opinion of the commenters that Texas City should not be removed from the APWL for benzene or hydrogen sulfide. We recommend placing canister, auto GC, and open path monitors in the area we have identified—downwind of the pinpointed source of emissions in the western portion of BP's facility for several years. Only properly sited monitors with validated data can justify a delisting. Without proper data collection and analysis, the TCEQ cannot ensure that it is maintaining the Air Pollutant Watch List in a manner that protects public health.

These comments represent a summary of our extensive analysis. We would be happy to meet in person to discuss our work and conclusions further. If you have question about these comments, or wish to discuss this matter, please contact Dr. Elena Craft, 512-691-3452, ecraft@edf.org; Dr. Ram Hashmonay, 919-616-6336, airmeasure@gmail.com; or Adrian Shelley, 713-528-3779, adrian@airalliancehouston.org.

Respectfully Submitted,

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