Air Pollutants around an Animal Feed Processing Facility in Nacogdoches, TX: A Study on Their Effect on Local Outdoor Air Quality

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Abstract

In this exploratory study, different odorous compounds were measured near TFP Nutrition to better understand the impact of odor on local outdoor air quality. TFP Nutrition produces pet feed, livestock feed, and agricultural fertilizer for local brand Lone Star Feeds. It is known in the Nacogdoches area for producing powerful odors near its facilities. It is in the downtown area of the city and in proximity to an elementary school, recreational softball fields, and residential homes. Odors can be connected to the presence of air pollutants. This study on air quality was performed to quantify this data on odors for public education, health purposes, and further research if necessary. Two Nasal Ranger® Field Olfactometers (St. Croix Sensory) were used simultaneously: one evaluated general odor while the other evaluated ammonia (NH_3) odors. In addition, weather conditions, which included temperature, wind direction, and wind speed, were collected using two pocket weather trackers (Model 4500, Kestrel). Sampling occurred twice per week at five different locations near the plant. Notable findings included dilution-to-threshold (D/T) ratios at the highest possible value of 60 at certain locations on different days. Overall, the highest D/T ratios for both categories of odors (general and ammonia) were found at location 4 southwest of the facility. Wind direction seemed to make a large impact as the highest D/T ratios were detected at times the wind traveled in a direction from the facility toward the sample locations. An important discovery was that each time a D/T ratio greater than 2 was detected on the Nasal Ranger evaluating general odor, a D/T ratio of equal or lesser value was also detected on the Nasal Ranger evaluating ammonia odor, making the connection that much of the odor from this facility may be related to ammonia.

Objectives

The overall objective was to measure odorous compounds near TFP Nutrition to determine the effect on air quality.

Specific objectives included:

• To use the applicable tools in order to quantify odor-related data in the form of dilution-to-threshold ratios; and

• To synthesize and analyze the collected data to apply knowledge as to how local air quality may be affected by odorous compounds overall.

Using the Nasal Rangers

The group at Location 2

TFP Nutrition

The group gathering data

Setting up equipment

Turning Nasal Ranger dials

Methods

- *Equipment:* project notebook, two Nasal Ranger® Field Olfactometers (one to measure general odor and one to measure ammonia odor), and two pocket weather trackers (Model 4500, Kestrel) for monitoring weather conditions.
- Data were collected at 5 different points: at the fence line (Location 1), and in reference to the fence line and the proximity to the other sample locations, Location 2 was 496.73 ft. northeast, Location 3 was 820.97 ft. northeast, Location 4 was 552.05 ft. southwest, and Location 5 was 1,181 ft. southwest.
- Data were collected on the following dates: Sept. 26, Sept. 30, Oct. 3, Oct. 8, Oct. 10, Oct. 13, Oct. 17, Oct. 21, Oct. 25, and Oct. 30.
- A team of at least four were present for each sampling period (total of 100 samples). One team member took photos of the experiment and filled the project notebook while the others collected the data by utilizing the two nasal rangers and two Kestrel Pocket Weather Trackers.

Discussion

In Figure 1, the highest levels of general odor were noted on Sept. 30 at Locations 2 and 3 and on Oct. 10 at Location 4. All locations exhibited general odor at 60 D/T, which is the highest possible value for the Nasal Rangers used. On Oct. 8, general odor was measured at 15 D/T at Location 5. On Oct. 21 and Oct. 25, Location 1 on both days was measured at 30 D/T. General odor was also measured on Oct. 21 at Locations 2 and 3, both measuring at 15 D/T. In Figure 2, the highest levels of ammonia odor were noted on Sept. 30 and Oct. 10. Location 4 on both dates measured levels at 60 D/T. Ammonia odor was also measured on Sept. 30 at Location 2 with a level of 7 D/T. On Oct. 21, ammonia odor was measured at 15 D/T at Locations 1 and 3. On Oct. 21 and Oct. 25, Location 1 on both days measured at 30 D/T for general odor. Overall, highest D/T ratios were detected at Location 4 for both general odor and ammonia odor.

Acknowledgements

Many thanks to Dr. Jerez for providing the equipment used in this project and the continued guidance throughout. We thank TFP Nutrition for allowing us to take measurements near the fence line of their property.

Results

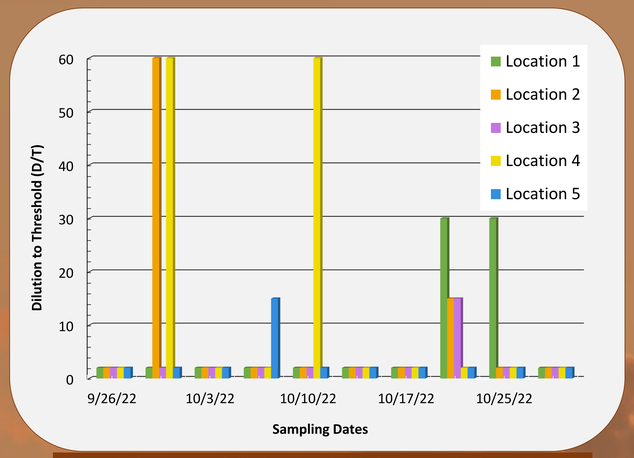


Figure 1. Summary of dilution thresholds for general odor at 5 sampling locations near TFP Nutrition over a period of two months.

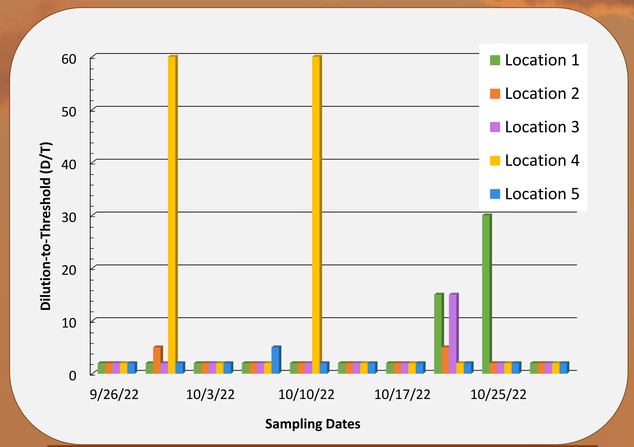
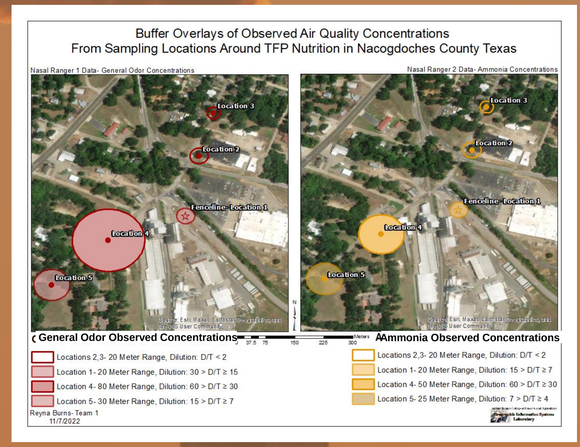


Figure 2. Summary of dilution thresholds for ammonia (NH_3) odor at 5 sampling locations near TFP Nutrition over a period of two months.



Conclusions

When considering all the data collected from this exploratory study, including weather data and Nasal Ranger data, a few conclusions can be drawn, but further study would aid to the completeness and accuracy of this analysis. First, wind direction seemed to play the largest role in producing greater D/T ratios at different locations. Second, because general odor and ammonia (NH_3) odor were always detected together, it can be understood that much of the odor associated with this facility could have been associated with ammonia.

Overall, because high D/T ratios were detected multiple times throughout this study, it could be seen as a red flag for pollutants being released into the ambient air. Air quality is impacted, to an extent, around this facility, as demonstrated by the results of this study. Because of this, it may be important to caution immuno-compromised individuals or those with sensitive respiratory systems should approach the nearby vicinity of the facility with caution in the case odors are strong at the time. Because overall data did not provide high D/T ratios very often, long-term exposure may or may not be a concern. A more in-depth study including additional sampling dates, times, and knowledge of the plant operational schedule would provide for a more complete portrait on how local air quality is affected on different days of the week, times of the day seasons, and more.