

## ENVIRONMENT

**Title:** Laying the Groundwork for Odor Control and Setback Estimation in Nebraska – NPB #04-180

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### Abstract:

The goal of this field research study was to validate use of the Odor Footprint Tool (OFT) with livestock building sources in rural communities. The primary objective was to evaluate the accuracy of predictions of annoyance potential (as projected by odor concentration output data from AERMOD<sup>®</sup> - the OFT's underlying dispersion model) when compared to measures of annoyance potential made in the field.

Odor assessors were trained to monitor odors around a 4,800-head finishing site in eastern Nebraska. During the summer of 2005, mobile odor assessors monitored odor levels at downwind locations. During the spring and summer of 2006, another set of mobile odor assessors monitored odor levels at downwind locations, while neighbors of the operation monitored odors at their residences. Modeling was performed for coinciding time periods using data from an on-site weather station and a 'blue book' OFT odor emission rate.

Mobile odor assessor data identified 22 instances out of 216 off-site downwind assessments where the state of odor was annoying based upon the odor concentration (group geometric mean) being 7 dilutions to threshold or greater. Similarly, in 20 off-site assessments, assessors rated the state of odor to be consequentially annoying, out of 192 instances where such ratings were provided. When modeling was performed for all coinciding time periods at off-site locations, predicted odor concentrations exceeded the threshold value 20 and 18 times, compared to 22 and 20 times when annoying states of odor existed based upon the measured concentration and rated annoyance potential, respectively. In each case, there was at least 90% agreement in the frequency of annoyance.

Five area residents evaluated the state of odor during three periods each day: daylight, nighttime, and twilight hours. Based upon an evaluation of composite data from these residents, livestock odor was detected and rated as being at an annoying state in 9.1% and 4.2%, respectively, of 1,007 total readings, for a composite odor annoyance-free frequency of roughly 96%. Given the locations of the residences with respect to the three swine production facilities in the area, predicted individual odor annoyance-free frequencies using the Odor Footprint Tool ranged from 90 to 99%. Annoyance frequencies for individual residents ranged from 0 to 11.4% and showed considerable variation due to individual biases (some residents were for and some against having the swine facilities in the area), senses of smell, data collection times, etc. The composite annoyance-free frequency based upon information supplied by area residents was comfortably within the predicted range.

*These research results were submitted in fulfillment of checkoff funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer reviewed*

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Additional objectives of this project involved pilot-testing the Odor Footprint Tool within a rural community for a proposed pork production facility; and installing a biofilter on a pork production facility to demonstrate this technology and the potential for reducing odor impacts on rural communities. The Odor Footprint Tool was used during planning and zoning commission consideration of an application for construction of a new swine finishing facility, and was successful in focusing discussion of odor on objective matters. At the very end of the project, a collaborator agreed to construct a biofilter to treat exhaust air from the facility to reduce the impact on some nearby neighbors.

Via this project, rural residents have seen how the Odor Footprint Tool can be used to evaluate the odor impact of a livestock operation and have been provided information that enhances confidence in the planning and screening tool.