

# Pennsylvania's Odor Siting Index

R. Mikesell<sup>1</sup>, K. Dymond<sup>2</sup>

Penn State Department of Dairy and Animal Science<sup>1</sup>, Pennsylvania State Conservation Commission<sup>2</sup>

**Species:** Swine, Poultry, Dairy, Beef feedlot, Veal  
**Use Area:** Animal Housing and Manure Storage  
**Technology Category:** Facility Siting & Management  
**Air Mitigated Pollutants:** Odors

## Description:

The Pennsylvania Siting Index was developed in response to specific state legislation (PA Act 38 of 2005) in an effort to objectively evaluate locations for new or expanding regulated animal operations, then develop an Odor Management Plan to reduce the potential for community conflict from building and manure storage odors. The goal is to construct livestock operations where community odor conflict potential is minimized. Data from the site and site map are entered into the index and the resulting score indicates the complexity of Best Management Practices (BMPs) that must be adopted for a producer to develop the site. Scores of less than 50 index points do not require any BMPs. Scores from 50 to 99.9 index points require "Level 1" BMPs, which are generally standard, industry-accepted practices. Scores greater than 100 points require more costly and complicated "Level 2" BMPs. The index cannot be used to stop a proposed operation, nor is it used to mitigate specific air emissions.

## Mitigation Mechanism:

### The Odor Siting Index

The index evaluates odor generation potential, location of potential odor receptors, and designated land use, with a goal of encouraging producers to locate new or expanded facilities in locations where odor conflict will be minimized. If the index score indicates the proposed operation has a high probability of causing community odor conflict, the producer must implement one or more BMPs to either reduce odor generation at the site or reduce odor transfer from the site to the receptors. Alternately, the producer may choose a different location with a lower index score.

To begin indexing a site, an evaluation distance is established depending on the number of AEUs (Animal Equivalent Unit, 454 kg (1000 pounds) of animal body weight on an annualized basis) proposed. Evaluation distances for AEU categories are as follows:

<50 AEUs	366 m (1200 ft)
50-199 AEUs	549 m (1800 ft)
200-599 AEUs	732 m (2400 ft)
>600 AEUs	914 m (3000 ft)

A map of the site identifies the operation footprint, property lines, and location of all potential receptors (homes, businesses, etc.), and other animal operations within the evaluation distance. From the geographical center of the operation footprint, the surrounding area is divided into four 90-degree directional quadrants (North, South, East, and West) at 45, 135, 225, and 315 degrees from due North to establish the direction of receptors from the odor source. In addition, circles are drawn at 366 m (600 ft) intervals to the maximum evaluation distance for the site so that each receptor is located in a distance/direction subset. Based on the legislative language, the following factors were selected for inclusion in the index score.

1. Odor Source Factors (range of 14 to 47 index points):
  - Facility size (AEUs) of the regulated operation (range of 2 to 10 points)
  - History of livestock on the site (range of 0 to 12 points)
  - Species or type of livestock (range of 10 to 15 points)
  - Manure storage type (range of 2 to 10 points)
2. Site Land Use Factors (potential for 0 to 35 points deducted from the index score):
  - Is the land located in township's Agricultural Security Area? (5-point deduction)
  - Is the land zoned for agricultural production? (10-point deduction)
  - Has the land been permanently preserved for agricultural production? (20-point deduction)

3. Surrounding Land Use Factors (potential index points range from -5 to an unlimited value):
- Other livestock (>8 AEUs) within the evaluation distance (range of -5 to 5 points)
  - Distance from nearest corner or edge of footprint to property line (range of 0 to 10 points)
  - \*Number of non-public receptors (homes) within each distance/direction subset (range from 0 to unlimited points)
  - \*Number and location of public use facilities (limited to public schools, hospitals, elder care homes, and buildings with >4 living units) within each distance/direction subset (range from 0 to unlimited points)

\*Points assigned for these factors are adjusted for distance/direction subset (nearby receptors to the east and south are assessed more index points), and intervening topography and vegetation (index points for receptors shielded by topography or vegetation are adjusted downward).

Index scores of 27 existing and proposed swine, poultry, and dairy farms were calculated in a pilot exercise and ranged from -2 to 246 index points. Twenty of the 27 farms scored fewer than 50 index points. Five farms scored between 50 and 99.9 index points, and two farms scored more than 100 index points.

### **Best Management Practices**

Best Management Practices are described in two levels (Level I and Level II) based on expense and ease of implementation. Level I BMPs are proscribed based on species and production system. For example, Level I BMPs for confined poultry operations would include:

- Cuke out litter and till litter between flocks (floor birds only)
- Monitor water lines and drinkers for leaks
- Monitor for egg jams (layers only)
- High pressure wash or dry clean between flocks
- Minimize feed wastage
- Phase feed

If a site scores more than 100 index points, the planner, producer, and State Conservation Commission must agree on one or more appropriate Level II BMPs to address the major odor source. Potential Level II BMPs include:

- Aeration of manure storage
- Air scrubbers
- Anaerobic digestion
- Biofiltration
- Composting manure
- Special feed formulation
- Covering manure storages
- Manure pit additives
- Oil sprinkling
- Wind barriers, shelter belts

Regulations allow for BMP lists to be adjusted and updated as technology and efficacy data become available.

### **Odor Management Plan**

After the site has been indexed and BMPs selected (if required), an odor management plan must be developed and submitted to the Pennsylvania State Conservation Commission for approval. The plan must follow an approved format and contain the following sections:

1. Plan Summary Information
  - a. Operator Commitments and Responsibilities
  - b. Farm Identification
  - c. Operational Map Information
2. Plan Evaluation Information
  - a. Odor Site Index
3. Odor BMP Information
  - a. BMP Implementation, Operation & Maintenance Schedule
  - b. BMP Documentation

## Applicability:

In Pennsylvania, the index and associated Odor Management Plan (OMP) will be required for new or expanding operations that fall under the state's nutrient management regulations (>2000 pounds of annualized animals per acre of manure application area, Concentrated Animal Operation), or federal CAFO regulations. All applicable species and production systems are included. Non-regulated operations may develop an index score and OMP and receive limited liability protection from nuisance odor complaints.

## Limitations:

1. The index does not attempt to quantify odors or specific gasses, nor does it objectively measure the effectiveness of BMPs.
2. Assumptions made regarding index scores based on species and adjustments for shielding by topography and vegetations are based on limited data.
3. The potential for conflicts due to inversion odors is ignored in the index because of the difficulty in consistently predicting which neighbors would be affected.
4. Regulations indicate that a site must only be scored and a plan developed once unless the operation is substantially changed. Thus, encroaching development could create conflict where none existed at the time of construction.
5. The index value increases with an increasing number of homes within the evaluation distance. There may be circumstances in which the total number of homes is low, but those that exist are relatively close to the operation. The resulting index score in such an instance could be fewer than 50 points, which would require no BMPs.

## Cost:

Because the regulations are not yet finalized, no official plans have been developed to date. The Pennsylvania State Conservation Commission estimates the cost to producers for developing an index and associated odor management plan will be approximately \$1120 (16 hrs \* \$70/hr). BMP installation and maintenance costs would be variable, depending on BMP complexity. If producers choose a site with an index score of <50 points, BMPs would not be required thus erasing all BMP costs.

## Implementation:

Producers are required to obtain an approved odor management plan and written approval from the Pennsylvania State Conservation Commission prior to populating the regulated building or using the regulated manure storage structure. Producers are required to implement and document required BMPs according to the approved odor management plan's schedule and are subject to annual inspection by the State Conservation Commission. Implementation, operation and maintenance records will be reviewed during inspections.

## Technology Summary:

Pennsylvania's odor siting index is designed to urge producers to locate operations in locations where potential for community odor conflict is minimized. If producers choose to build animal facilities on a site with a high odor index score, state legislation requires implementation of BMPs to reduce odor generation and/or dispersion. An odor index and odor management plan are both required for operations regulated by state nutrient management laws (animal density-driven), or federal CAFO laws.

## Additional Resources:

Pennsylvania's Odor Management Program:

<http://www.agriculture.state.pa.us/agriculture/cwp/view.asp?a=3&Q=145162&PM=1>

## References:

ASABE Standard. 2007. Management of Manure Odors. ASAE EP379.4 St. Joseph, MI.

Mikesell, R.E. 2002. Odor remediation and siting considerations for Pennsylvania swine farms. PhD Thesis.

Department of Dairy and Animal Science. The Pennsylvania State University, University Park, PA.

Miner, J. R. 1995. An Executive Summary, A Review of the Literature on the Nature and Control of Odors from Pork Production Facilities, The Odor Subcommittee of The Environmental Committee of The National Pork Producers Council, Des Moines, IA.

### Point of Contact:

Robert E. Mikesell  
Penn State University  
324 Henning Building  
University Park, PA 16802  
USA  
814-865-2987  
rem9@psu.edu

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