

## ENVIRONMENT

**Title:** Air Emissions Monitoring Protocol, NPB Project #04-126

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### Abstract:

A research project was conducted from May 2004 through mid-September 2005 to investigate the concentration of hydrogen sulfide ( $H_2S$ ) at the perimeter of nine swine operations across the state of Iowa, and, to investigate the ammonia ( $NH_3$ ) and  $H_2S$  concentrations near and inside residences located in the community of swine operations and in one area of the state not associated with animal agriculture. The nine sources monitored ranged from sites that housed 1,200 to 4,800 finishing animals. The results indicated that at the perimeter of all nine sources monitored, the overall average  $H_2S$  concentration ranged from a low of  $1.9 \pm 2.7$  ppb to a high of  $26.3 \pm 32.3$  ppb. If a sampler was determined to be in the downwind plume, or the meteorological conditions were calm, the average measured results ranged from a low of  $7.4 \pm 6.9$  ppb to a high of  $45.8 \pm 31.8$  ppb. In both cases, the maximum  $H_2S$  concentration was recorded at a finishing site where an earthen basin and a concrete formed below-grade basin existed in close proximity to the livestock housing. As a frame of reference, the State of Iowa is currently considering a Health Effects Value (HEV) for  $H_2S$  of 30 ppb *at a residence located at or beyond the regulated separation distance*, not to be exceeded more than seven 1-hour averages per year (the Health Effects Standard, HES).

Measurements of  $H_2S$  and  $NH_3$  were also collected at five residences, four of which were located near four of the sites monitored for perimeter  $H_2S$  levels, with one located in an urban setting far removed from animal agriculture. The results, based on the daily averages, indicate that the overall average  $NH_3$  concentration measured inside the homes ranged from a low of  $28.6 \pm 12.8$  ppb to a high of  $94.7 \pm 28.1$  ppb. The overall average  $NH_3$  concentration measured in the ambient air outside the homes ranged from a low of  $11.7 \pm 5.3$  ppb to a high of  $55.1 \pm 20.6$  ppb. The  $NH_3$  concentration inside the homes were significantly higher than in the ambient air outside of the homes ( $p < 0.01$ ).  $H_2S$  concentration inside the homes ranged from a low of  $0.7 \pm 0.2$  ppb to a high of  $2.5 \pm 1.5$  ppb.  $H_2S$  concentration in the ambient air outside the home ranged from a low of  $0.4 \pm 0.2$  ppb to a high of  $2.4 \pm 2.4$  ppb. The highest ambient air average for  $H_2S$  ( $2.4 \pm 2.4$  ppb) and  $NH_3$  ( $55.1 \pm 20.6$  ppb) was recorded for a residence located 251 ft to the east of a 4,800-hd deep-pit finishing site and served as the home for the tenants of the farm. For the residence monitored in an urban setting far removed from animal agriculture, the overall average  $H_2S$  concentration outside the home was  $0.4 \pm 0.2$  ppb with the inside home averaging  $0.7 \pm 0.2$  ppb. The highest average inside home concentration for  $NH_3$  and  $H_2S$  was

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94.7±28.1 ppb and 2.5±1.5 ppb, respectively, both from a residence where the occupants smoked and in which cats were kept inside. The next highest inside home NH<sub>3</sub> concentration was 85.7±15.3 ppb. For this residence the occupants did not smoke but cats were kept inside. The two inside home NH<sub>3</sub> levels specified above are