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ONE HUNDRED TENTH CONGRESS

**U.S. House of Representatives**  
**Committee on Energy and Commerce**  
**Washington, DC 20515-6115**

JOHN D. DINGELL, MICHIGAN  
CHAIRMAN

March 18, 2008

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The Honorable Stephen L. Johnson  
Administrator  
Environmental Protection Agency  
1200 Pennsylvania Avenue, N.W.  
Washington, D.C. 20036

Dear Administrator Johnson:

On December 28, 2007, the Environmental Protection Agency (EPA) issued a notice of proposed rulemaking and requested comments on a proposed reporting exemption for air releases of hazardous substances from animal waste under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the Emergency Planning and Community Right-to-Know Act (EPCRA). According to the December 28, 2007, Federal Register Notice, the EPA had received a petition from the National Chicken Council, National Turkey Federation, and U.S. Poultry and Egg Association in 2005 seeking an exemption from CERCLA and EPCRA reporting requirements for ammonia emissions from poultry operations.

As a major part of its justification for the proposed exemption, EPA points to 26 comment letters from State and/or local emergency response agencies that supported granting the poultry petition – that is, exempting poultry operations from CERCLA and EPCRA reporting requirements for ammonia emissions. The Congressional Research Service (CRS), however, has found that of the 26 comments, 17 from the local emergency planning commissions (LEPCs) and one from a State emergency response commission (SERCs) were essentially identical in text. Two other comments provided general information about responses to release notifications from poultry operations but did not specifically take a position on the poultry petition and one other comment asked for more information.

Overall, according to the CRS “the 26 represent only a small fraction of the 4,491 LEPCs and SERCs that are included in EPA’s database.” In fact, the 26 represent only .6 percent of the total LEPCs and SERCs.

Curiously, the EPA continues to ignore the opposition of State and local air pollution control agencies to the proposed exemption for Animal Feeding Operations (AFO) (attached

letter dated March 20, 2007, from Executive Director S. William Becker to Representative Dingell). The March 20, 2007, letter from Mr. Becker on behalf of these agencies stated:

We do not believe a blanket exemption is warranted given the demonstrated health effects associated with ammonia and hydrogen sulfide, the amounts of manure produced by AFOs and the usefulness of the data contained in CERCLA and EPCRA reports to State and local air agencies and the people living near these facilities.

In proposing this exemption for ammonia and hydrogen sulfide, the EPA is turning a blind eye to the very real health effects that can be caused by air releases of these two hazardous substances.

On October 17 and 18, 2007, the EPA issued a press release in two separate cases where penalties were assessed for failure to report a release of ammonia that exceeded the reportable quantity of 100 pounds. In the press release the EPA described the health consequences as follows:

Exposure to high concentrations of ammonia can cause severe burns on the skin, eyes, throat and lungs. Breathing low levels of ammonia can cause coughing, as well as nose and throat irritation. Ammonia also plays a role in the formation of particulate air pollution, which has been linked to numerous health problems, including chronic bronchitis and lung disease.

Some animal feeding operations have reported ammonia emissions at levels that far exceed the reporting threshold of 100 pounds/day such as 15,500 pounds (Three Mile Canyon Farms), 710 pounds/day (Desert Rose Dairy), 250 pounds/day (Seaboard Farms, Dorman Dow facility), 5,700 pounds/day (Premium Standard Farms Somerset Facility).

EPA scientists have also examined potential acute health effects from hydrogen sulfide emissions from feedlot wastewater lagoons. In 2004, EPA scientists reported that the assumed 100 pounds/day hydrogen sulfide emission rate appears likely to create downwind concentrations that substantially exceed the threshold for mild adverse effects. The EPA analysis indicated that acute respiratory irritation and effects to the central nervous system could be caused in downwind receptor populations to a distance of 0.6 to 1.8 kilometers. (See attached Memorandum from Roy L. Smith dated February 19, 2004.)

On February 29, 2008, a panel of experts from the Pew Commission on Industrial Farm Animal Production informed Congress that “the vast amounts of animal waste and byproducts from such facilities pose significant risks to human health and the environment, requiring greater – not lesser – scrutiny.” The expert panel stated that “the toxics gas emissions can be harmful – and even fatal – to farm workers and surrounding communities.” According to the panel, “studies of residents living near industrial food animal productions facilities have documented

increased rates of neurobehavioral and neuropsychiatric abnormalities.” The two year investigation of AFOs led the panel to conclude as follows:

Monitoring is a basic component of strategies to protect the public from harmful effects resulting from contamination or disease yet monitoring systems in industrial food animal production are inadequate – a situation that makes mandatory reporting of toxic emissions even more important.

The reporting requirements of CERCLA and EPCRA are the only source of information providing emissions data for significant releases of ammonia and hydrogen sulfide. There are no specific Federal regulations under the Clean Air Act (CAA) that limit or control emissions of hydrogen sulfide from AFOs; and ammonia is not a regulated pollutant. There are no nationally applicable Federal regulations restricting emissions of ammonia from AFOs.

We also note that in 2006, EPA entered into the Animal Feeding Operations Air Compliance Agreement with approximately 13,900 farms in 42 States. This Air Compliance Agreement was challenged in the case of *Association of Irrigated Residents, et al vs. Environmental Protection Agency*, 494 F. 3d 1027 (U.S. Court of Appeals for the District of Columbia, July 17, 2007.) In its brief to the Court of Appeals, EPA stated that the consent agreements provide that the AFO will determine their emissions using the appropriate methodology and come into compliance with all applicable CAA, CERCLA, and EPCRA requirements once EPA publishes emissions methodologies. The agreements granted participating AFOs a covenant not to sue and release from liability for certain potential past and ongoing CAA, CERCLA, and EPCRA violations. EPA further assured the Court of Appeals that “the release and covenant are contingent on the participating AFOs full compliance with the consent agreement, including undertaking whatever actions may be required to come into compliance with any applicable statutory requirements.”

Now, EPA is proposing to eliminate the statutory reporting requirements under EPCRA and CERCLA. This raises extremely disturbing questions about whether the agency gave these animal feeding operations immunity from enforcement to allow time for the agency to move forward with a blanket exemption from the very reporting requirements under CERCLA and EPCRA that were the subject of the Animal Feeding Operation Air Compliance Agreement.

For all of the above reasons, the proposed reporting exemption for air releases from farms appears ill-considered and contrary to the public interest. To assist us in better understanding the basis for the proposed rule, we request responses pursuant to Rules X and XI of the Rules of the House of Representatives to the following questions by close of business March 27, 2008.

1. The original 2005 petition submitted by the National Chicken Council, National Turkey Federal, and U.S. Poultry and Egg Association sought an exemption only for ammonia emission reporting. It did not include hydrogen sulfide.

Has EPA received any petitions from other persons, companies or industries seeking a reporting exemption for hydrogen sulfide air releases from farms? If so, please provide any such petition or communication. If not, please explain the basis upon which EPA expanded the scope of the original petition to propose an expanded exemption that includes hydrogen sulfide and other hazardous substances.

2. On December 27, 2005, EPA acknowledged receipt of the petition from the National Chicken Council, et al, and requested public comment. Has the EPA ever requested public comment prior to issuing the proposed exemption on the merits of exempting hydrogen sulfide and other hazardous substances from the CERCLA and EPCRA reporting requirements? If so, explain when and how this was done and provide the comments received.
3. If the EPA finalizes exemptions from CERCLA and EPCRA reporting requirements, what prevents an AFO, or all the participating AFOs, from opting out of the agreement?
4. In reference to ammonia and hydrogen sulfide and other pollutants emanating from AFOs, the Court of Appeals for the District of Columbia has stated that “generally, an AFO emits these pollutants in proportion to its size; the more animals it houses, the more it pollutes.”

If burden reduction was a factor in EPA’s proposed rule, why didn’t EPA consider limiting the exemption to small family farms rather than providing an exemption for large corporate concentrated animal feeding operations?

5. Is EPA aware of any small farm operations, as opposed to large-scale industrial AFOs, that have triggered the reporting requirements for ammonia and hydrogen sulfide? If so, please provide a description of the reported emissions.
6. Does an episodic release notification for ammonia or hydrogen sulfide require anything other than a telephone call to the National Response Center? If so, please explain what else is required?
7. Are the emissions of hydrogen sulfide and ammonia from farms, and particularly large concentrated animal feeding operations, within the range of typical background concentrations in the air? If so, please explain in detail how you arrive at this conclusion.
8. Can EPA estimate how many animals would produce emissions of hydrogen sulfide and ammonia that would be expected to exceed the reporting requirement of 100 pounds/day?




9. Has any EPA employee or contractor hired by EPA conducted any analysis of the health effects from ammonia and hydrogen sulfide emissions from AFOs subsequent to the analysis conducted by Dr. Roy L. Smith of EPA's Office of Air Quality Planning and Standards on February 19, 2004? If so, please provide any such analysis, review, or report.
10. By what date does EPA expect to publish its methodologies for estimating emissions from AFOs that are being developed pursuant to the Air Compliance Agreement?
11. Has the EPA investigated the circumstances under which six local jurisdictions and/or local emergency response authorities (Luray, Virginia; Clinton, NC; Leesport, PA; Elizabethtown, NC; Dover, DE; Washington, AR) in five different States filed the identical comments under the name of six different officials? If not, please indicate whether EPA intends to investigate the circumstances of the identical nature of these comments in determining how much weight is given to each individual comment.
12. Until the EPA publishes the methodologies for estimating emissions, how is it able to determine whether there would be a significant number of notifications from the animal feeding operation sector? If EPA is able to currently make such a determination please provide the detailed basis for such determination for poultry, pork, and cattle livestock.
13. Did the Kentucky District Court in *Sierra Club Inc. vs. Tyson Foods*, 299 F. Supp. 2d.693 (W.D.Ky. 2003) hold that larger companies that contract with bird growers for bird production may be liable for compliance with CERCLA and EPCRA reporting requirements at contract grower facilities?
14. How many poultry farmers participated in the Air Compliance Agreement? Of the total numbers of participating poultry farmers how many are small family-owned farms and how many are larger companies?
15. Under the terms of the Air Compliance Agreement, participating AFOs agreed to pay a civil penalty, to be responsible for the payment of funds to the national air emissions monitoring study, and make certain farms available for monitoring.

Did every participating AFO make a payment to support the national air emissions monitoring study? If so, what was the average payment and the total collected?

The Honorable Stephen L. Johnson  
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Should you have any questions regarding this letter, please contact us or have your staff contact Richard A. Frandsen with the Committee on Energy and Commerce staff at (202) 225-2927.

Sincerely,

		
John D. Dingell Chairman	Albert R. Wynn Chairman Subcommittee on Environment and Hazardous Materials	Hilda L. Solis Vice Chair Subcommittee on Environment and Hazardous Materials

cc: The Honorable Joe Barton, Ranking Member  
Committee on Energy and Commerce

The Honorable John B. Shadegg, Ranking Member  
Subcommittee on Environment and Hazardous Materials

March 20, 2007

The Honorable John D. Dingell  
Chairman  
Committee on Energy and Commerce  
2125 Rayburn House Office Building  
Washington, DC 20515

Dear Representative Dingell:

We are writing in response to recent testimony provided by EPA Administrator Stephen Johnson before the House Energy and Commerce Committee regarding EPA's plan to exempt emissions of air pollutants from manure from reporting requirements under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Emergency Planning and Community Right to Know Act (EPCRA). Administrator Johnson indicated at a hearing held on March 8, 2007, that state and local officials implementing Title III of the Superfund Amendments and Reauthorization Act consulted by EPA did not object to eliminating the CERCLA and EPCRA reporting requirements for ammonia and hydrogen sulfide emissions from manure.

However, what Mr. Johnson failed to mention is that EPA staff also sought the input of state and local air pollution control agencies, who voiced a different view. During a conference call EPA's Office of Solid Waste and Emergency Response held with the National Association of Clean Air Agencies (NACAA) on November 9, 2006, we expressed several concerns to EPA about exempting from EPCRA and CERCLA the reporting of emissions of ammonia and hydrogen sulfide from manure, which we discuss below:

- Ammonia and hydrogen sulfide are air pollutants with demonstrated health effects. Human exposure to ammonia triggers respiratory problems, causes nasal and eye irritation and in large enough amounts can be fatal.<sup>1</sup> It also contributes directly to the formation of fine particulate matter (PM<sub>2.5</sub>), which causes severe health effects in people, including death, heart attacks and increased severity of asthma attacks, as well as visibility impairment.<sup>2</sup> Hydrogen sulfide is a toxic air

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<sup>1</sup> Schiffman, S.S., et al., *Health Effects of Aerial Emissions from Animal Production and Waste Management Systems*, available at [http://www.cals.ncsu.edu/waste\\_mgmt/natlcenter/summary.pdf](http://www.cals.ncsu.edu/waste_mgmt/natlcenter/summary.pdf) and Agency for Toxic Substances and Disease Registry, "Public Health Statement for Ammonia" (September 2004), available at <http://www.atsdr.cdc.gov/toxprofiles/phs126.html#bookmark05>.

<sup>2</sup> EPA, "Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information," (OAQPS Staff Paper) (December 2005), available at [http://www.epa.gov/ttn/naaqs/standards/pm/data/pmstaffpaper\\_20051221.pdf](http://www.epa.gov/ttn/naaqs/standards/pm/data/pmstaffpaper_20051221.pdf).

pollutant that can cause severe health effects, even death, at high concentrations of exposure.<sup>3</sup> As reported in the *Dayton Daily News*, “At least 24 people in the Midwest have died from inhaling hydrogen sulfide and methane from manure since the 1970s, including fifth-generation Michigan dairy farmer Carl Theuerkauf and four members of his family, who collapsed one by one in 1989 after breathing methane gas from a manure pit.”<sup>4</sup>

- Air emissions from animal farming operations (AFOs) are not trivial. AFO ammonia emissions represent *half* the U.S. ammonia emissions inventory.<sup>5</sup> Monitoring conducted of Premium Standard Farms (PSF) by EPA (under a settlement agreement) in 2004 shows that PSF releases 3 million pounds of ammonia annually from barns and lagoons at its Somerset facility, making it the fifth largest industrial emitter of ammonia in the country.<sup>6</sup> In Iowa, the greatest number of air complaints the state air agency receives concern emissions from manure storage pits. Iowa monitored ten homes for ammonia and hydrogen sulfide emissions and recorded high ammonia emissions on a regular basis and high hydrogen sulfide emissions periodically.<sup>7</sup>
- AFOs produce millions of tons of manure each year. According to EPA, AFOs generate approximately 500 million tons of waste each year, three times more raw waste than is generated yearly by people in the U.S.<sup>8</sup> Thus, manure is not a minor source of air emissions.
- Given the paucity of monitors in rural states, CERCLA and EPCRA reports may be the only source of information to people affected by excessive air emissions from AFOs.
- EPA is currently conducting a monitoring study to collect information about the air emissions from AFOs and to determine whether air emissions from AFOs, including emissions from manure, warrant regulation. EPA should not consider a blanket exemption from reporting requirements for air pollutant emissions from manure while data on this very subject is being collected. (Farms participating in this monitoring study have already received a waiver from enforcement of

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<sup>3</sup> Agency for Toxic Substances and Disease Registry, “Public Health Statement for Hydrogen Sulfide” (July 2006), available at <http://www.atsdr.cdc.gov/toxprofiles/phs114.html>.

<sup>4</sup> Wagner and Sutherly, “The supersizing of America’s livestock farms,” *Dayton Daily News* (December 1, 2002).

<sup>5</sup> National Research Council, “Air Emissions from Animal Feeding Operations: Current Knowledge, Future Needs” (pre-publication copy released Dec. 12, 2002), at p. 42

<sup>6</sup> Premium Standard Farms, *Air Emissions Monitoring Completion Report* (Nov. 17, 2004) and EPA, “Toxics Release Inventory” (2004), available at <http://www.epa.gov/triexplorer>.

<sup>7</sup> Iowa Department of Natural Resources Ambient Air Monitoring Group, “Results of the Iowa DNR Animal Feeding Odor Study” (January 2006).

<sup>8</sup> 68 *Federal Register* at pp. 7179-80.



CERCLA and EPCRA reporting provisions for air emissions of hydrogen sulfide and ammonia.)<sup>9</sup>

- We are also concerned about the precedent this action will set with respect to application of the Clean Air Act to air emissions from manure.

In our discussions with EPA, we suggested other means for reducing the perceived regulatory burden and uncertainty with respect to CERCLA and EPCRA: EPA could determine a size threshold for farms, based on animal units, below which a farm might reasonably assume its air emissions of ammonia and hydrogen sulfide were below CERCLA and EPCRA reporting thresholds. We do not believe a blanket exemption is warranted given the demonstrated health effects associated with ammonia and hydrogen sulfide, the amounts of manure produced by AFOs and the usefulness of the data contained in CERCLA and EPCRA reports to state and local air agencies and the people living near these facilities.

On a related issue, we understand that legislation has been introduced to exempt from CERCLA and EPCRA reporting of all air pollutant emissions from manure. We would oppose such a statutory exemption for the same reasons cited above. A legislative exemption is even more problematic because such an exemption would require legislative action to be reversed, as opposed to an EPA interpretation that could be changed administratively.

Please feel free to contact me at 202-624-7864 if you have any questions.

Sincerely,

A handwritten signature in black ink, consisting of a stylized initial 'S' followed by a long horizontal line extending to the right.

S. William Becker  
Executive Director

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<sup>9</sup> 70 *Federal Register* at p. 4963. Specifically, EPA covenants not to sue participating AFOs – whether or not they are actually monitored – for “civil violations of CERCLA section 103 or EPCRA section 304 from air emissions of Hydrogen Sulfide (H<sub>2</sub>S) or Ammonia (NH<sub>3</sub>) that are not singular unexpected or accidental releases such as those caused by an explosion, fire or other abnormal occurrence.”



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
OFFICE OF AIR QUALITY PLANNING AND STANDARDS  
EMISSION STANDARDS DIVISION  
RESEARCH TRIANGLE PARK, NC 27711

February 19, 2004

**SUBJECT:** Update of my memo of June 3, 2003 ("Screening-level Acute Risk Estimates for Emissions of Hydrogen Sulfide and Ammonia from Hypothetical Feedlot Wastewater Treatment Lagoons") to reflect the revision of the acute exposure guideline level for hydrogen sulfide

**FROM:** Roy L. Smith, Ph.D.  
Risk and Exposure Assessment Group (C404-01)

**THRU:** Dave Guinnup, Leader  
Risk and Exposure Assessment Group (C404-01)

**TO:** Sally L. Shaver, Director  
Emission Standards Division (C504-03)

### **Preface**

As you requested, I have updated the following analysis of feedlot wastewater treatment lagoons to reflect the development of a new, less stringent AEGL for hydrogen sulfide. I've edited only the text relating to that standard, plus minor clarifying changes to reflect the elapsed time.

### **Introduction**

In response to your request of 1 April 2003, this memo examines potential acute health effects from ammonia and hydrogen sulfide emissions from feedlot wastewater lagoons.

The analysis estimated acute inhalation exposure and risk, assuming lagoon emissions of 100 pounds per day of each compound. The procedure used the SCREEN3 air dispersion model to estimate concentrations of ammonia and hydrogen sulfide downwind from hypothetical wastewater lagoons of 1 and 2 acres. These estimated concentrations were then compared with appropriate acute dose-response assessment benchmarks associated either with no adverse effects, or with mild reversible respiratory irritation. The release parameters used as inputs to the dispersion model were generally conservative, and it was assumed that a person could be exposed for one hour at the downwind point of highest concentration.

The results of the analysis suggest that daily emission of 100 lb. of ammonia would produce downwind concentrations that slightly exceed no-effect levels but would not reach levels associated with respiratory irritation, even near a lagoon. In contrast, daily emission of 100 lb. of hydrogen sulfide would produce concentrations substantially exceeding both no-effect and mild-effect thresholds for about a mile downwind.

## Methods

### 1. Dispersion Modeling

The SCREEN3 model is EPA's recommended single source Gaussian plume model, which provides maximum ground-level concentrations for point, area, flare, and volume sources. The model requires inputs for emission rate, source release height, source type (point, area, or volume), receptor height, and land use (urban or rural). SCREEN3 modeling runs were made for 1-acre (64 m by 64 m) and 2-acre lagoons (90 m by 90 m), sizes typical of such impoundments. The release height was set at zero (because lagoons are at ground level) and the receptor height was also assumed to be zero. The modeled emission rate was 100 pounds per day, equal to the RQ. The modeling results (which apply both to ammonia and hydrogen sulfide) are shown in Table 1.

Table 1. Modeled concentrations of ammonia or hydrogen sulfide downwind of typical feedlot wastewater lagoons.

Downwind Distance (m)	Ambient Concentration ( $\mu\text{g}/\text{m}^3$ )	
	1-Acre	2-Acre
100	3980	3067
200	2014	1502
300	1347	1021
400	992.2	770.3
500	767.6	612.1
600	612.7	501.9
700	501.2	421.1
800	422.5	362.5
900	361.7	316.1
1000	313.5	278.4
1100	275.8	248.1
1200	245	222.8
1300	219.2	201.2
1400	197.5	182.8
1500	179.2	166.8
1600	163.3	153
1700	149.7	140.9
1800	137.8	130.2
1900	127.3	120.8
2000	118.2	112.5
2100	110.4	105.4
2200	103.5	99.11
2300	97.27	93.36
2400	91.67	88.14
2500	86.59	83.43
2600	81.94	79.1
2700	77.7	75.1
2800	73.81	71.46
2900	70.25	68.1

Downwind Distance (m)	Ambient Concentration ( $\mu\text{g}/\text{m}^3$ )	
	1-Acre	2-Acre
3000	66.98	65.01
3500	54.5	53.12
4000	45.55	44.53
4500	38.87	38.08
5000	33.72	33.09

## 2. Acute Dose-Response Assessments

To determine whether these estimated ambient concentrations could cause adverse acute health effects in humans, I compared them to acute dose-response assessment values from the following four sources, summarized in Table 2.

- US Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR, which is part of the US Department of Health and Human Services, develops and publishes Minimum Risk Levels (MRLs) for toxic substances. The MRL is defined as an estimate of daily human exposure to a substance that is likely to be without an appreciable risk of adverse effects (other than cancer) over a specified duration of exposure. Exposures above an MRL do not necessarily represent a threat, and MRLs are therefore not intended for use as predictors of adverse health effects or for setting cleanup levels. MRLs are published as part of pollutant-specific toxicological profile documents, and also in a table of "comparison values" that ATSDR regularly updates and distributes (available on-line at <http://www.atsdr.cdc.gov/mrls.html> ).
- California Environmental Protection Agency (CalEPA). The CalEPA Air Resources Board has developed dose-response assessments for many substances, including reference exposure levels (RELs) for acute inhalation exposure. CalEPA defines the REL as a concentration level at (or below) which no health effects are anticipated, a concept that is substantially similar to that of ATSDR's MRLs. CalEPA's acute RELs are available on-line at: [http://www.oehha.ca.gov/air/acute\\_rels/index.html](http://www.oehha.ca.gov/air/acute_rels/index.html).
- National Advisory Committee for Acute Exposure Guideline Levels (NAC). EPA's Office of Prevention, Pesticides and Toxic Substances established the NAC in 1995 to develop Acute Exposure Guideline Levels (AEGLs) and supplementary information on hazardous substances for federal, state, and local agencies and organizations in the private sector concerned with emergency planning, prevention, and response. The NAC is a discretionary Federal advisory committee that combines the efforts of stakeholders from the public and private sectors to promote efficiency and utilize sound science. AEGLs for a substance take the form of a matrix, with separate ambient levels for mild (AEGL-1), moderate (AEGL-2), and severe (AEGL-3) effects. Each of the effect levels are provided for as many as four different exposure periods, typically 0.5, 1, 4, and 8 hours. Table 2 provides only the 1-hour AEGL-1s for ammonia and hydrogen sulfide. The NAC formally proposed AEGL for ammonia in January, 2001, and published the AEGL for hydrogen sulfide as an interim value (i.e., after public review and revision) in July, 2003.

- American Industrial Hygiene Association (AIHA). AIHA has developed emergency response planning guidelines (ERPGs) for acute exposures at three different levels of severity of health effects. These guidelines (available on-line through the US Department of Energy at <http://www.bnl.gov/scapa/scapawl.htm>) are conceptually similar to AEGLs in that they represent concentrations for exposure of the general population for up to 1 hour associated with effects expected to be mild or transient (ERPG-1), irreversible or serious (ERPG-2), and potentially life-threatening or lethal (ERPG-3). Table 2 below includes only ERPG-1 values.

While dose-response assessments from any of these sources may reasonably be used as benchmarks in acute health risk assessments, readers should note that these assessments represent two different types of endpoint. The ATSDR MRL and Cal EPA REL concentrations are ambient levels at which *no adverse effects* are expected, whereas the AIHA ERPG-1 and NAC/AEGL-1 are levels at which *mild, reversible effects* may occur. Therefore, the ERPG-1 and AEGL-1 values will generally be higher than REL or MRL values, and the threshold for mild effects will probably occur somewhere between the two sets of values.

Table 2. Acute dose-response assessments for ammonia and hydrogen sulfide.

Acute Benchmark	H <sub>2</sub> S (µg/m <sup>3</sup> )	NH <sub>3</sub> (µg/m <sup>3</sup> )	Source	Definition
REL	42	3,200	California Environmental Protection Agency	A concentration or dose at (or below) which no health effects are anticipated.
MRL	98	1,184	Agency for Toxic Substances and Disease	An estimate of daily human exposure to a substance that is likely to be without appreciable risk of adverse effects over a duration ranging from 24 hours to two weeks.
ERPG-1	139	17,413	American Industrial Hygiene Association	The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.
AEGL-1	710	17,413	National Advisory Committee for Acute Exposure Guideline Levels	The 1-h airborne concentration of a substance at or above which it is predicted that the general population could experience mild odor, taste, or other sensory irritations.

The endpoint for the four ammonia assessments was irritation of the respiratory tract, eyes, and mucus membranes. This irritation, if not severe enough to cause burns, usually disappears in a few hours to a few days after exposure ceases. The endpoint for the hydrogen sulfide assessments was similar respiratory and mucus membrane irritation, but the effects may persist longer and be accompanied by additional effects to the central nervous system (e.g., memory problems, headaches, and dizziness).

## Results and Discussion

The SCREEN3 modeling results (Table 1) showed that the 1-acre lagoon would produce higher concentrations than the 2-acre lagoon at all downwind locations, assuming the same

emission rate from each. The discussion below therefore focuses on the 1-acre lagoon.

For ammonia, the modeled concentrations exceeded the REL at 100 m, and exceeded the MRL at locations less than 400 m. The ERPG-1 and AEGL-1 levels were not exceeded. For hydrogen sulfide, all four acute benchmarks were exceeded downwind to a distance of 600 m (where the ambient level dropped below the AEGL-1). The ERPG-1 was exceeded to 1800 m, the MRL to 2300 m, and the REL to 4500 m.

Because the MRL and REL are no-effect levels, and slight exceedances do not necessarily indicate a likelihood of adverse effects, the results for ammonia suggest that acute respiratory irritation to a downwind receptor would be either mild or nonexistent, even close to the lagoon. Therefore, the assumed 100 lb/d emissions from a 1-acre lagoon should not create adverse acute health effects to offsite receptors.

The modeled concentrations for hydrogen sulfide exceeded 1-h no-effect benchmarks by one to two orders of magnitude within 1000 m of the lagoon, and did not descend below the mild-effect AEGL-1 until 600 m downwind. Given this degree and geographic scope of exceedance, it is likely that emission of 100 lb/d of hydrogen sulfide from a 1-acre lagoon could cause acute respiratory irritation and effects to the central nervous system in downwind receptor populations to a distance of 0.6 to 1.8 kilometers.

In summary, it appears that the assumed ammonia emission rate would result in ambient air concentrations at nearby downwind locations that approach, but do not exceed, the threshold for acute respiratory irritation. The 100-lb/d ammonia emission rate therefore appears to be appropriately protective, though not overprotective. The assumed 100 lb/d hydrogen sulfide emission rate appears likely to create downwind concentrations that substantially exceed the threshold for mild adverse effects.

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