



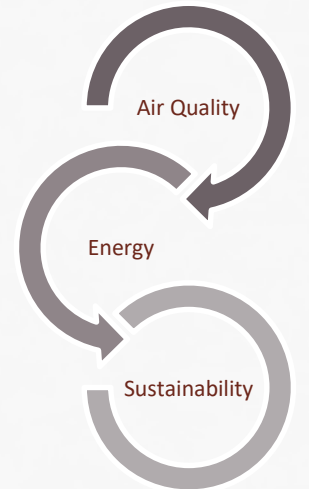
STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION



DIVISION OF AIR QUALITY AIR QUALITY, ENERGY, AND SUSTAINABILITY

FUMIGATION AND AIR TOXICS STAKEHOLDER MEETING

JANUARY 17, 2019



Presented by Anjuli Ramos

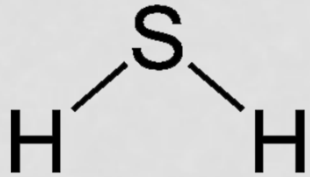
ADDITIONAL AIR TOXICS WILL BE ADDED TO SUB. 17

- Hydrogen Sulfide – Landfill and Waste Water Treatment Plants
- n-Propyl Bromide – Dry Cleaners and Degreasers
- Sulfuryl Fluoride – Fumigation activities

APPROACH

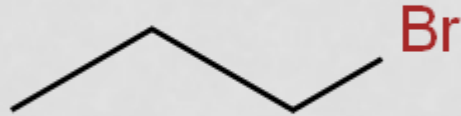
- N.J.A.C. 7:27-17.9(b) Table 1 and 2 list all Air Toxics and Hazardous Air Pollutants (HAPs) currently regulated in NJ
- Some chemicals of concern already go through the Risk Assessment process due to health/odor impacts, e.g. hydrogen sulfide and sulfuryl fluoride
- Given the potential significant health impacts associated with these air toxics, the Department is adding these to the list of regulated Air Toxics/HAPs

TOXICS



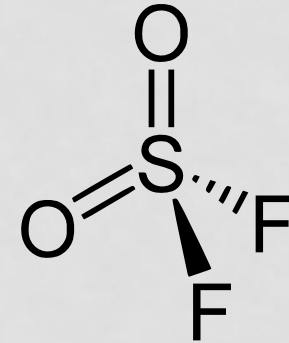
Hydrogen Sulfide

- NOT a HAP
- NOT a VOC
- Colorless and Rotten Egg Smell
- High Toxicity
- Occupational Regulation



n-Propyl Bromide

- NOT a HAP (pending)
- VOC
- Colorless and Sweet Odor
- High Toxicity
- Challenging Evaluation by USEPA



Sulfuryl fluoride

- NOT a HAP
- NOT a VOC
- Colorless and Odorless
- Greenhouse Gas
- High Toxicity
- Proposed to be banned in 2014 – never finalized

HYDROGEN SULFIDE (H₂S)

- Extremely Hazardous (Flammable)
- Occurs naturally in crude petroleum and natural gas
- Can be produced by the breakdown of organic matter and human/animal wastes (e.g., sewage)
- It is heavier than air and can collect in enclosed, poorly ventilated areas such as basements, etc.
- Odor/Smell Issue
 - Can be smelled at low levels, but with continuous low-level exposure or at higher concentrations you lose your ability to smell the gas even though it is still present
 - At high concentrations – your ability to smell the gas can be lost instantly

H₂S – HEALTH IMPACTS/TOXICITY

- Non-carcinogen
- Chronic and Acute non-cancer toxicity
 - **Low concentrations** – irritation of eyes, nose, throat, or respiratory system; effects can be delayed
 - **Moderate concentrations** – more severe eye and respiratory effects, headache, dizziness, nausea, coughing, vomiting and difficulty breathing
 - **High concentrations** – shock, convulsions, unable to breathe, coma, death; effects can be extremely rapid (within a few breaths)

LEGACY LANDFILL RULE

- Statute issued by legislature, N.J.S.A. 13:1E-125.1 et. seq., which:
 - Passed to address H₂S concerns
 - Several landfills had significant H₂S emissions because placement of construction fines
 - Hurricane Sandy resulted in a great amount of construction debris that had to be disposed of
 - Wall boards: Gypsum wallboard has 17 – 19% Sulfur compounds by wt. (anaerobic microbe sulfur reduction)
- NJDEP adopted 7:27-7.3 “Discharge of hydrogen sulfide from a sanitary landfill”
 - Sanitary landfill, legacy landfill or closed sanitary landfill
 - 30 ppb by volume averaged over any 30-minute period at or beyond property line
- Legislative action demonstrates the potential health impact of hydrogen sulfide emissions

LANDFILLS IN NJ

Typical average landfill emissions

□ CH₄ - 50% - 55% ¹

□ CO₂ - 40% - 45% ¹

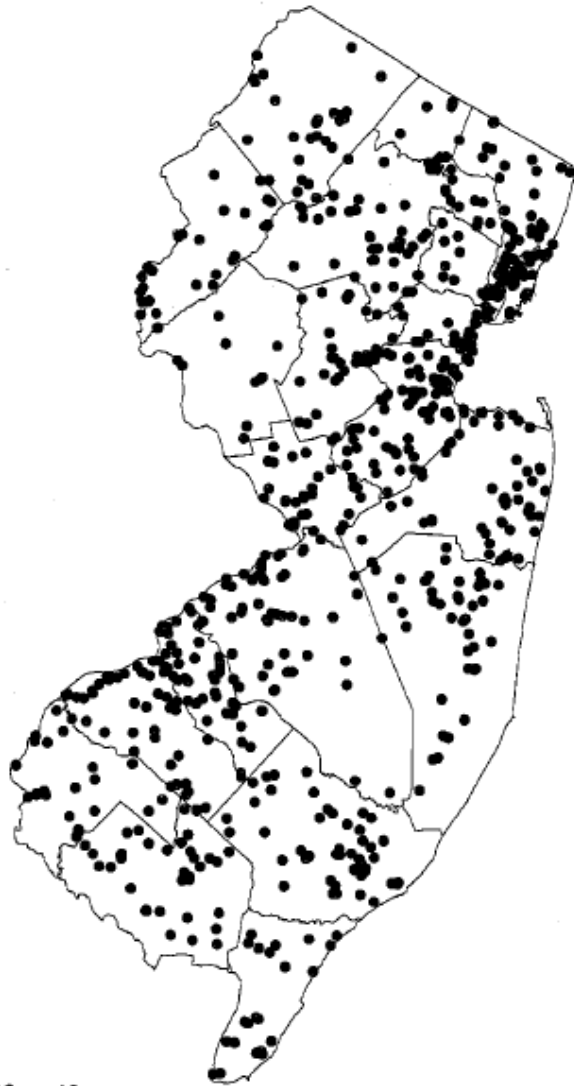
□ Nitrogen - 5% ¹

□ Complex organics not degraded by microbes
0.2%-0.5% ¹

□ H₂S - 0.0035% (**35 parts per million by volume**) ²

¹ Based on nationwide average, January 2000 USEPA FACT Sheet about Landfills

² Based on October 2008 AP-42 Emission Factor, Rating B



0 5 10 20 30 40
Miles

Imagery and Data by NJDEP Hazardous Waste

H₂S - HEALTH IMPACT THRESHOLDS

Impact	ppbv and time of exposure	Observed health impacts	Reference
Odor	< 1 to 10 ppb instantaneous	Discomfort	N.J.A.C.7:27-5 (Prohibition of Air Pollution)
Acute public health value	30 ppb 30 minutes (NJ)	Central Nervous system, including headache and nausea	N.J.A.C.7:27-7
OSHA workplace permissible exposure limit	20,000 ppb 8 hours	Possible fatigue, loss of appetite, headache, irritability, poor memory, dizziness	Occupational Safety and Health Administration
Immediately Dangerous to Life and Health	100,000 ppb instantaneous	Serious Eye Damage	NIOSH – National Institute for Occupational Safety and Health

n-PROPYL BROMIDE (nPB)

- Uses:
 - vapor degreaser for optics electronics, plastics, and metals
 - aerosol solvent in cleaning products
 - spray fixative in arts and crafts
 - spot cleaner in various industrial/commercial/consumer sectors (DRY CLEANING)
- nPB use increases as an alternative for other solvents that have become more strictly regulated, such as:
 - methylene chloride – NJ Air Toxic and HAP
 - perchloroethylene (Perc) – NJ Air Toxic
 - trichloroethylene (TCE) – NJ Air Toxic and HAP

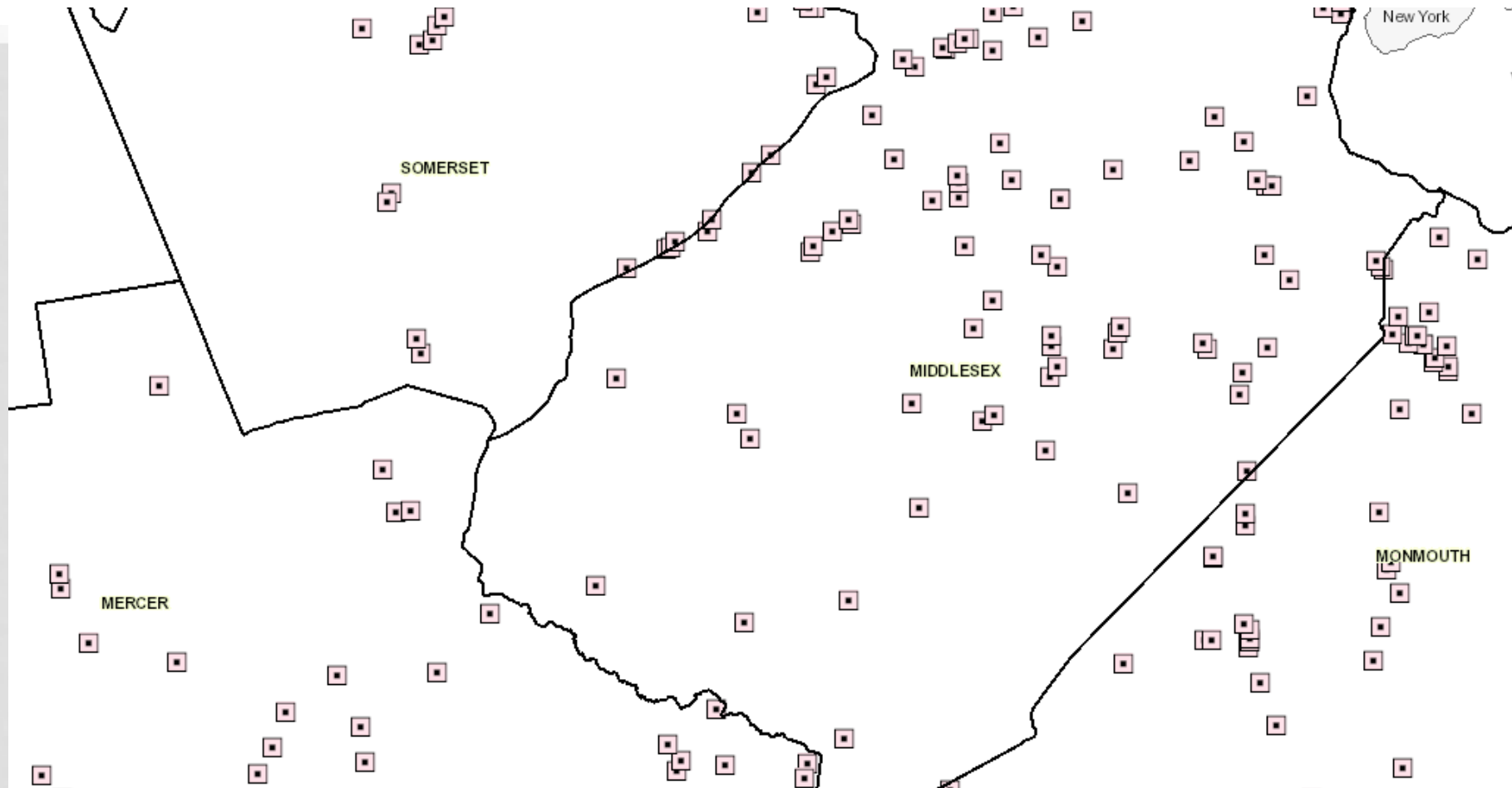
nPB – HEALTH IMPACTS/TOXICITY

- Carcinogen – lung
- Chronic and Acute non-cancer toxicity
 - Endpoints → reproductive developmental, kidney and liver
 - Potential effects on:
 - the developing fetus
 - adults (including pregnant women) in commercial uses
 - children (as bystanders)
 - adults of all ages (including pregnant women) for consumer uses
 - Can cause irritation of eyes, mucous membranes, upper airways and skin and can damage the nervous system
 - Neurologic effects can appear as headaches, dizziness, loss of consciousness, slurred speech, confusion, difficulty walking, muscle twitching, and/or loss of feeling in arms and legs

nPB - INHALATION TOXICITY FACTORS

- URFs
 - DRAFT TSCA Work Plan, Chemical Risk Assessment Peer Reviewed Draft Document
 $7.0 \text{ E-7 } (\mu\text{g}/\text{m}^3)^{-1}$
 - NY DEC – $2.33 \text{ E-6 } (\mu\text{g}/\text{m}^3)^{-1}$
- RfCs – ATSDR 2017
 - Chronic - $1.0\text{E}+02 \mu\text{g}/\text{m}^3$
 - Acute - $5.3 \text{ E}+3 \mu\text{g}/\text{m}^3$ is a (24-hour average)

Dry Cleaners



Imagery and Data by NJDEP GeoWeb

Who else is concerned?

- National Toxicology Program (NTP) – Department of Health and Human Services
 - 2014 → listed nPB as “Reasonably Anticipated to be a Human Carcinogen”
- MA DEP
 - 2009 → nPB was added to the list of Toxic or Hazardous Substances subject to regulations under the Massachusetts Toxics Use Reduction Act (TURA)
 - 2016 → nPB is designated as a Higher Hazard Substance under TURA, which lowers the reporting threshold to 1,000 lb/yr
- NYDEC
 - 2013 → adopts an annual guideline concentration of $4.3 \text{ E-1 } \mu\text{g}/\text{m}^3$
- PA lists nPB on its hazardous substances list
- CA EPA
 - 2004 and 2016 → regulates n-propyl bromide under the Safe Drinking Water and Toxics Enforcement Act (Proposition 65) as a “developmental and reproductive” (2004) and “cancer causing” (2016) toxic

SULFURYL FLUORIDE (SF)

- Commercial names: Vikane® (+ chloropicrin, odor agent) and ProFume®
- Use is regulated by USDA (Agriculture) and US FDA
- Uses:
 - Insecticide and rodenticide fumigant
 - Residential structures
 - **Processed-food and pet food facilities**
 - **Warehouses**
 - **Shipping containers**
 - **Synthesis of organic drugs and dyes**
- Registered in the US as a pesticide since 1959
- Sold/used as a liquefied gas in pressurized steel cylinders

SF - TOXICITY

- Categorized as “not likely to be carcinogenic to humans” by USEPA
- Toxicology factors like AEGLs 1 and RfCs are difficult to determine due to its steep concentration-response curve (a.k.a. highly toxic)

SF	30 min ppm	60 min ppm	4 hr ppm	8 hr ppm
AEGL 1	NR	NR	NR	NR
AEGL 2	27	21	13	6.7
AEGL 3	81	64	40	20

Termites

Inhibits lipase and other enzymes in the glycolysis cycle

Increases oxygen uptake

Death occurs when proteins and amino acids, as energy sources, are depleted



Humans

Acute exposure
to high
concentrations

Respiratory irritation, pulmonary edema, nausea, abdominal pain, central nervous system depression, numbness in the extremities, muscle twitching, seizures and death.

The fluoride ion may affect muscle activity by binding to calcium. Other effects may be attributed to its binding to potassium and magnesium ions.

Direct contact to concentrated SF as a liquid causes tissue damage to eyes, mucous membranes, or skin.

Humans

At lethal
concentrations

SF would be expected to disrupt carbohydrate and lipid metabolism similar to its actions in termites.

SF – TOXICOLOGY FACTORS & AIR REGULATION

- Currently not regulated by USEPA
- States
 - MD Toxic Air Pollutant (TAP)
 - CAL EPA Toxic Air Contaminant (TAC)
 - Acute - 1,700 $\mu\text{g}/\text{m}^3$, 24-hour averaging time *
 - Chronic - 60 $\mu\text{g}/\text{m}^3$ *

* Further re-evaluation by CalEPA due to more recent studies.

SUMMARY

- H₂S, nPB and SF will be listed in N.J.A.C. 7:27-17.9(b) as Air Toxics
- Will be subject to reporting thresholds and therefore Risk Assessment
- Through Risk Assessment, the Department can understand the potential risk to the surrounding communities
- Given the potential significant health impacts associated with these air toxics, the Department feels confident in adding these to the list of regulated Air Toxics

Questions?
Suggestions?