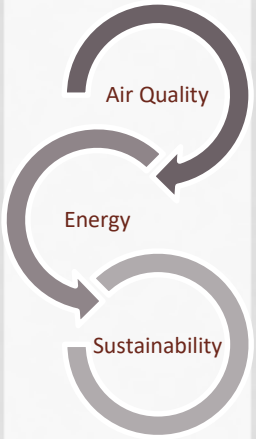
DIVISION OF AIR QUALITY

AIR QUALITY, ENERGY, AND SUSTAINABILITY

FUMIGATION AND ASSOCIATED EMERGING POLLUTANTS OF CONCERN

2020 NACAA JOINT PERMITTING AND ENFORCEMENT WORKSHOP
ST LOUIS, MISSOURI



Presented by Kenneth Ratzman

WHAT IS FUMIGATION?

- Fumigation is a process that attempts to kill pests by completely filling an enclosed area with gaseous chemicals (pesticides/fumigants)to suffocate or poison the pests within.

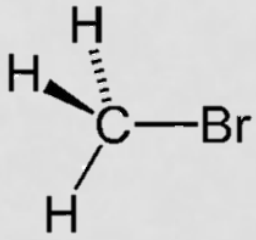
- Common Fumigation Operations include:
  - Buildings (structural) fumigation
  - Fumigation of agricultural commodities including farmers' fields (strawberries) and crop storage (grain silos)
  - **Quarantine and Pre-treatment of goods to be imported or exported to prevent transfer of exotic organisms**
    - **table grapes, lumber, kiwi fruit, etc.**

SHIPPING CONTAINER OF LOGS

WHY SHOULD WE BE CONCERNED?

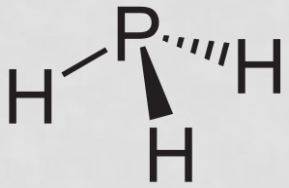
- Fumigants are toxic!
- News headlines
  - "Terminix Fined For Poisoning Virgin Island Family" - https://www.wccbcharlotte.com/2016/03/30/terminix-fined-for-poisoning-virgin-island-family/
  - "Orkin Held Responsible For 2 Fumigation Deaths" - https://www.washingtonpost.com/archive/local/1988/11/17/orkin-held-responsible-for-2-fumigation-deaths/34fd0939-f0c9-41fc-bb7e-b06dfae1af32/?noredirect=on&utm_term=.f408aebf252e
  - "Boy, 10, faces long recovery after pesticide poisoning" - https://www.cnn.com/2016/05/09/health/pesticide-poisoning-investigation/index.html
  - Fruit fly fumigation halted after Tasmanian biosecurity workers fall ill - https://www.abc.net.au/news/2018-02-18/fruit-fly-chemicals-blamed-for-sickness/9459634
  - "TERMINIX PAYS $80,000 SETTLEMENT FOR FUMIGATION SAFETY VIOLATIONS" - https://www.nj.gov/dep/newsrel/2006/06_0043.htm

TYPICAL FUMIGANTS & THEIR TOXICITY



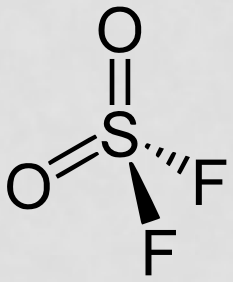
Methyl bromide

- HAP
- VOC
- Colorless and Odorless
- Ozone Depleting Substance
- High Toxicity
- Limiting Ban - 2005



Phosphine

- HAP
- NOT a VOC
- Colorless and Garlic/Fish like Odor
- High Toxicity



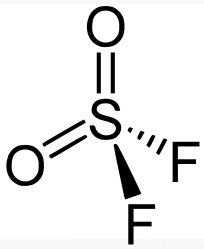
Sulfuryl fluoride

- NOT a HAP
- NOT a VOC
- Colorless and Odorless
- Greenhouse Gas
- High Toxicity
- EPA proposed to withdraw food residue tolerances in 2012 (not adopted)

TOXICITY VALUES

	Methyl bromide ($\mu g/m^3$)	Sulfuryl fluoride ($\mu g/m^3$)	Phosphine ($\mu g/m^3$)
RfC Long-Term	5 I	60 Cal	0.3 I
RfC Short-Term	3,900 *Cal	1,700 **Cal	70 **Cal

RfC = Reference Concentration
* Averaging time of 1 hour.
** Averaging time of 24 hours.
I = IRIS
Cal = California EPA

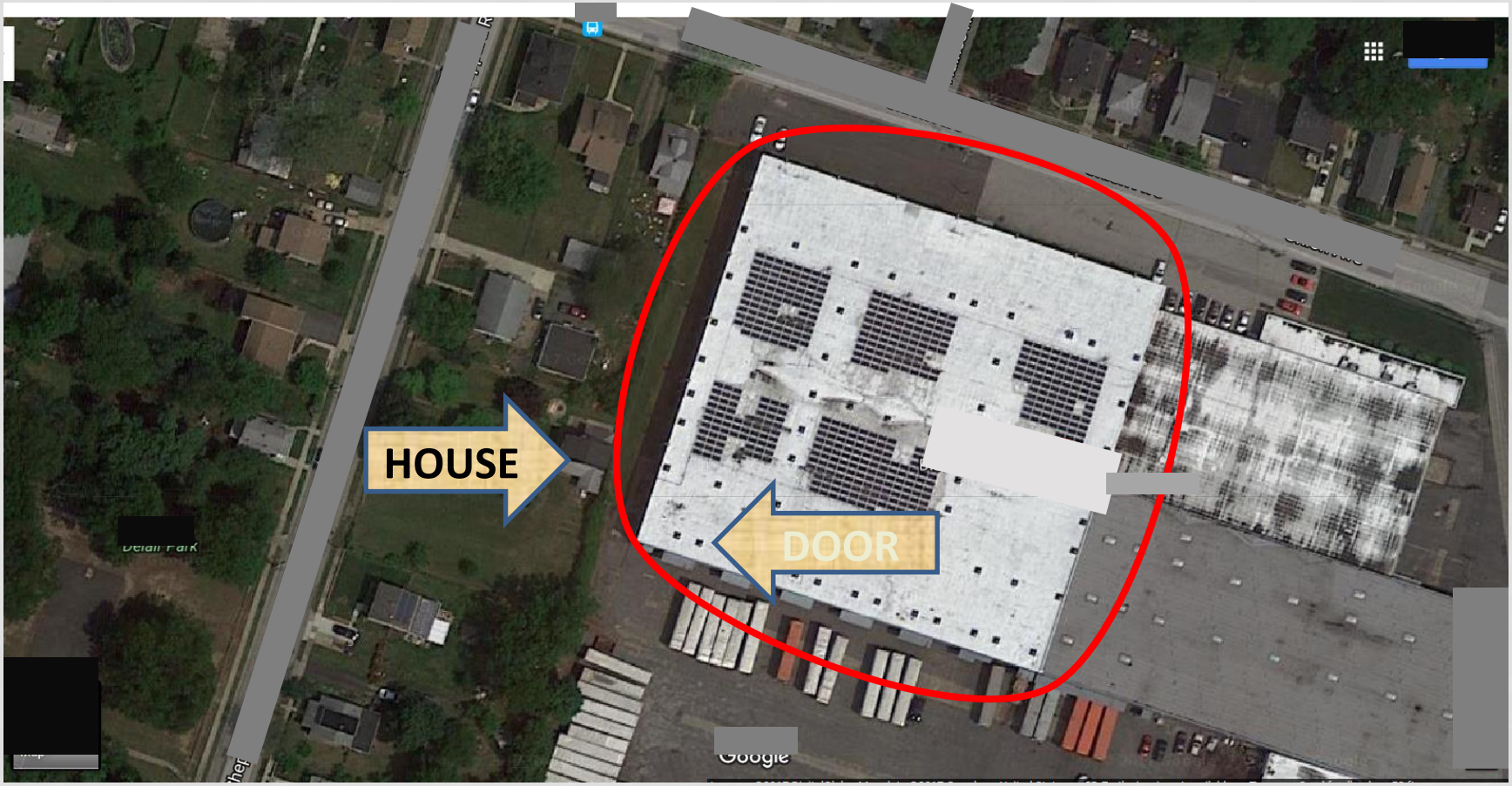


SULFURYL FLUORIDE (SF)

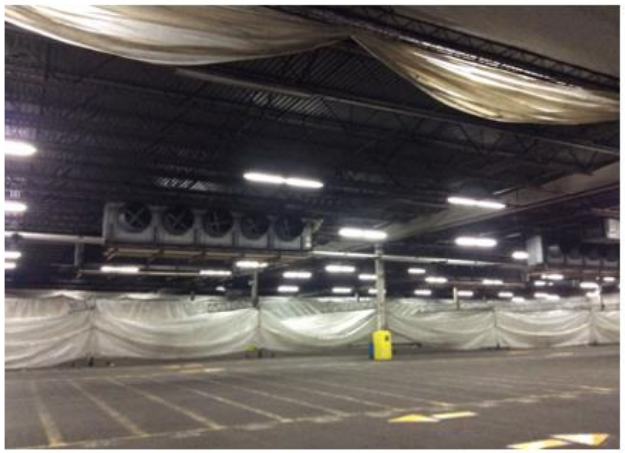
- Commercial names: Vikane® (+ chloropicrin, odor agent) and ProFume®
- Regulated by USDA (Agriculture) and US FDA
- Uses:
  - Insecticide and rodenticide fumigant
    - Residential structures
    - **Processed-food and pet food facilities**
    - **Warehouses**
    - **Shipping containers**
  - **Synthesis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

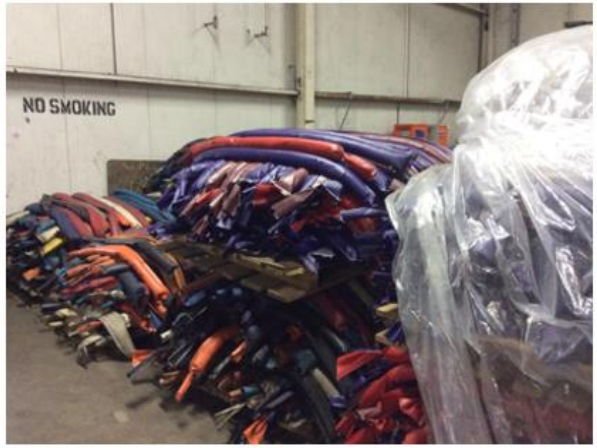
TARPAULIN CHAMBER

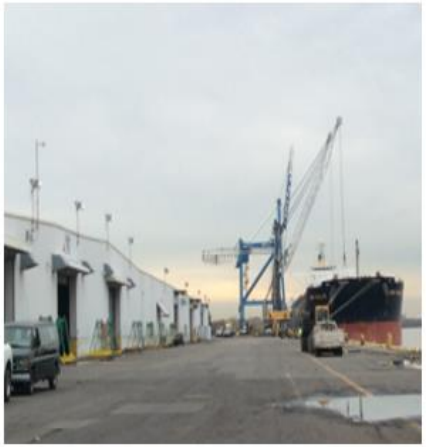
WHAT IS WRONG WITH THIS PICTURE?



FUMIGATION OPERATION

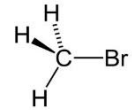






HEALTH RISKS BEFORE RISK MITIGATION

A Methyl Bromide example



Modeling Parameters

	Discharging [a] Height (ft)	Discharging Diameter (ft)	Discharging Direction	Discharging Temperature	Flow Rate (acfm)	MB Emission Rate (lbs/hr)	
						Hourly	Annual Average [b]
South Building	0	1.5	horizontal	Ambient	18,000	1,200	38.97
North Building	0	1.5	horizontal	ambient	18,000	800	9.74

a: Discharged at ground level

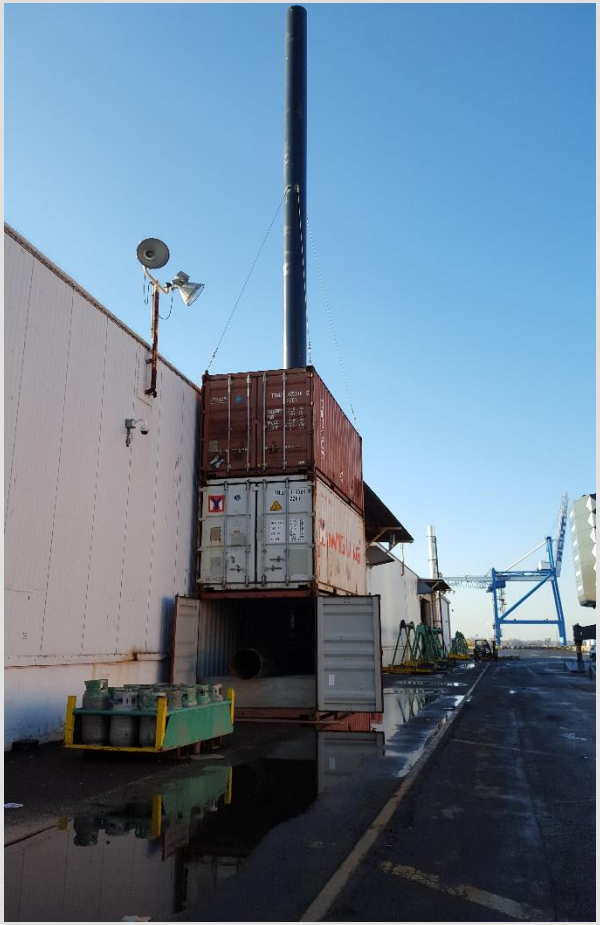
b: 80 tons/yr fumigants, 9 hrs/day fumigation, South Building 80%, North Building 20%

Health Risks

	Benchmark ($\mu g/m^3$)	Maximum Modeled Concentration ($\mu g/m^3$)	Health Impact (HQ) [c]
Short-Term (1-hr)	3,900 (1 ppm)	3,938,198	1,010
Long-Term (annual)	5 (1.3 ppb)	5,103.7	1,021

c: HQ ≤ 1.0: negligible risk

70 FT DISCHARGING STACK



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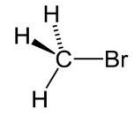

Modeling Parameters

	Discharging Height (ft) [a]	Discharging Diameter (ft)	Discharging Direction	Discharging Temperature	Flow Rate (acfm)	MB Emission Rate (lbs/hr)	
						Hourly	Annual Average
South Building	70	2	up	ambient	12,000	1,200	48.7 [b]
North Building	70	2	up	ambient	12,000	1,200	48.7 [b]
42A Building	70	2	up	ambient	12,000	400	16.2 [c]

a: Discharged at ground level
b: 80 tons/yr fumigants, 9 hrs/day fumigation
c: 27 tons/yr fumigants, 9 hrs/day fumigation

Health Risks

	Benchmark ($\mu g/m^3$)	Maximum Modeled Concentration ($\mu g/m^3$)	Health Impact (HQ) [d]
Short-Term (1-hr)	3,900 (1 ppm)	11,085	2.8
Long-Term (annual)	5 (1.3 ppb)	8.5	1.7

d: HQ ≤ 1.0: negligible risk

CHALLENGING INDUSTRY

- Variable Operations
  - Frequent relocations
  - Intermittent use (once every other year)

- New fumigants – some not specifically regulated
  - Not a HAP?
  - Not a VOC?

FINDING FUMIGATION FACILITIES

- Enforcement Advisory
- Identify Fumigation operators
- Information Inquiry
- Enforcement Action
- Permit Request Follow Up
- Clarity in Rule Making

NEW JERSEY'S EXPERIENCE IDENTIFYING FACILITIES

- How to identify sources with limited resources?
- New Jersey's Answer!!!!
  - Post enforcement advisory
  - Information request letters to fumigators to identify facilities where they fumigate
  - Enforcement actions requiring facilities to submit applications for unpermitted sources

FUMIGATION PERMITTING STATUS

- 14 facilities with pending applications
  - 3 use Methyl Bromide
  - 12 use Sulfuryl Fluoride
- 2 approved permits (1 being renewed)
- Commodities include:
  - Grapes
  - Cocoa Beans
  - Lumber
  - Fruits and Vegetables
  - Licorice Root

ADDITIONAL AIR TOXICS – RULEMAKING

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

SULFURYL FLUORIDE TOXICITY DEVELOPMENT RULE/PERMITTING APPLICATION

CAL EPA Toxic Air Contaminant (TAC)

RfCs

Residents/bystanders: Acute – **1,700 µg/m^3**, averaging time of 24 hours

Long-Term or Chronic – **60 µg/m^3**

These RfCs are currently being re-evaluated by CalEPA due to more recent studies.

- NJ Permitting Reporting Thresholds depend on these toxicity values
  - NJ Fumigation Rule will be proposing fumigation Reporting Thresholds
- NJ Proposed Risk Screening Worksheet includes these RfCs
  - If/when the CalEPA values change, the RSW will update accordingly

Questions?

Kenneth Ratzman, Assistant Director
NJDEP – Air Quality Regulation and Planning
609-292-0834