

# CAMEO Refresher Exercise Set: June, 2010

## CAMEO and Google Earth

### CAMEO Chemicals

#### Exercise 1:

1. Find the following information from the CAMEO Chemicals software:

Chemical Name: \_\_\_\_\_ CAS # : 7664-41-7  
UN/NA #: \_\_\_\_\_ DOT Label: \_\_\_\_\_

NFPA Values

Flammability \_\_\_\_\_  
Health \_\_\_\_\_  
Reactivity \_\_\_\_\_  
Special \_\_\_\_\_

Regulatory Information

CAA Threshold Quantity \_\_\_\_\_  
CERCLA RQ \_\_\_\_\_  
ERCLA TPQ \_\_\_\_\_  
RCRA Chemical Code \_\_\_\_\_

ERG Initial Isolation Zone: \_\_\_\_\_

ERG Downwind Protection Distance: \_\_\_\_\_

General Description \_\_\_\_\_  
\_\_\_\_\_

Reactivity \_\_\_\_\_  
\_\_\_\_\_

First Aid \_\_\_\_\_  
\_\_\_\_\_

Reactive Hazards \_\_\_\_\_  
\_\_\_\_\_

Health Hazards \_\_\_\_\_  
\_\_\_\_\_

Fire Hazards & Firefighting \_\_\_\_\_  
\_\_\_\_\_

Chemical Properties:

AutoIgnition \_\_\_\_\_  
Flash Point \_\_\_\_\_  
Specific Gravity \_\_\_\_\_  
Molecular Weight \_\_\_\_\_  
Water Soluability \_\_\_\_\_  
Vapor Pressure \_\_\_\_\_  
Vapor Density \_\_\_\_\_

Action Levels:

LEL - UEL \_\_\_\_\_  
IDLH \_\_\_\_\_  
TLV \_\_\_\_\_  
TEEL-1 , 2, 3 \_\_\_\_\_  
ERPG-1, 2, 3 \_\_\_\_\_  
AEGL-1, 2, 3 \_\_\_\_\_

**Exercise 2:**

1. Find the following information from the CAMEO Chemicals software:

Chemical Name: \_\_\_\_\_ CAS # : 7664-41-7

UN/NA #: \_\_\_\_\_ DOT Label: \_\_\_\_\_

NFPA Values

Flammability \_\_\_\_\_  
Health \_\_\_\_\_  
Reactivity \_\_\_\_\_  
Special \_\_\_\_\_

Regulatory Information

CAA Threshold Quantity \_\_\_\_\_  
CERCLA RQ \_\_\_\_\_  
ERCLA TPQ \_\_\_\_\_  
RCRA Chemical Code \_\_\_\_\_

ERG Initial Isolation Zone: \_\_\_\_\_

ERG Downwind Protection Distance: \_\_\_\_\_

General Description \_\_\_\_\_  
\_\_\_\_\_

Reactivity \_\_\_\_\_  
\_\_\_\_\_

First Aid \_\_\_\_\_  
\_\_\_\_\_

Reactive Hazards \_\_\_\_\_  
\_\_\_\_\_

Health Hazards \_\_\_\_\_  
\_\_\_\_\_

Fire Hazards & Firefighting \_\_\_\_\_  
\_\_\_\_\_

Chemical Properties:

AutoIgnition \_\_\_\_\_  
Flash Point \_\_\_\_\_  
Specific Gravity \_\_\_\_\_  
Molecular Weight \_\_\_\_\_  
Water Soluability \_\_\_\_\_  
Vapor Pressure \_\_\_\_\_  
Vapor Density \_\_\_\_\_

Action Levels:

LEL - UEL \_\_\_\_\_  
IDLH \_\_\_\_\_  
TLV \_\_\_\_\_  
TEEL-1, 2, 3 \_\_\_\_\_  
ERPG-1, 2, 3 \_\_\_\_\_  
AEGL-1, 2, 3 \_\_\_\_\_

## **CAMEOfm EXERCISE:**

Displaying CAMEOfm Facilities on Google Earth.

*It is possible to display CAMEOfm Facility records on Google Earth. The process is as follows:*

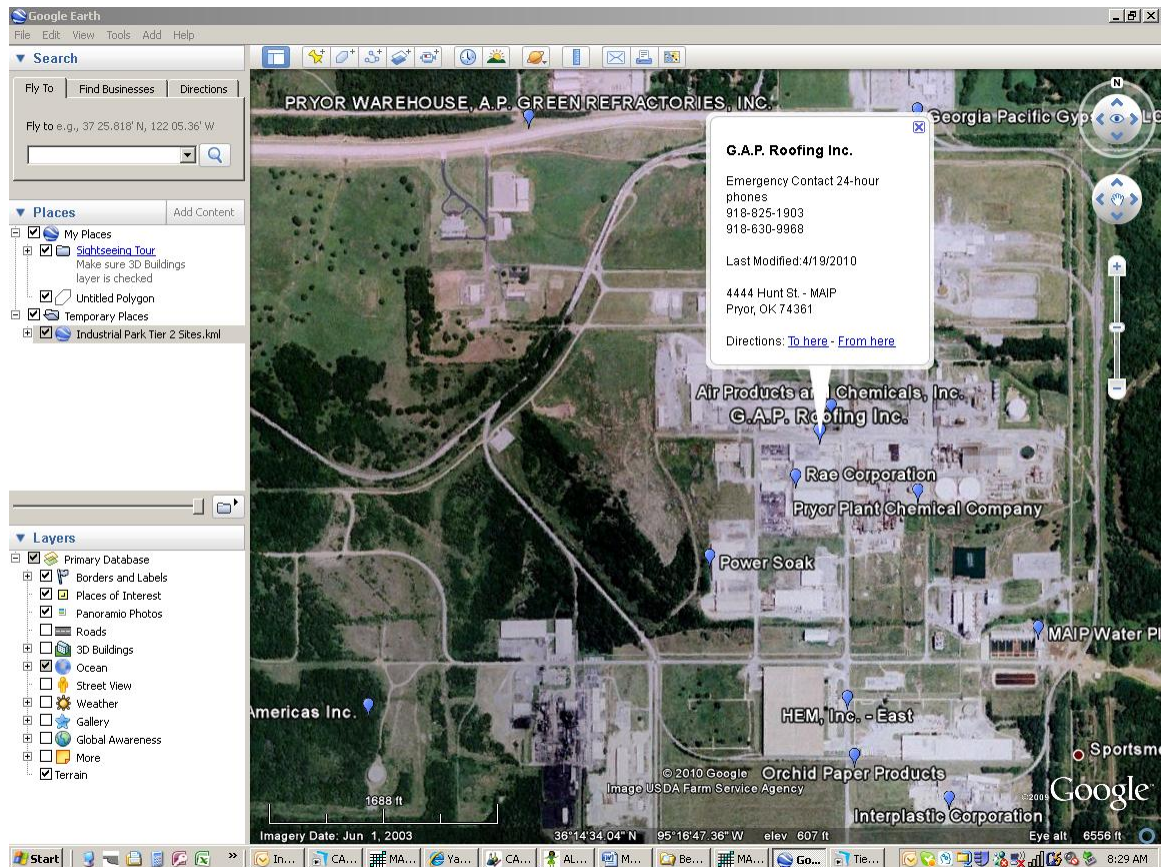
- 1. Open CAMEOfm; open the Facilities module*
- 2. Select a single facility record, or a group of facility records*
- 3. Select the “File / Make KML file” menu*
- 4. Choose “Current Record, Found Set, or All Records” from the Make KML File dialog box*
- 5. Select the “Open in Google Earth” box*
- 6. Select “Make KML File”*

*Your computer should launch Google Earth and zoom-in to the selected Facilities.*

1. Open CAMEOfm; open the Facilities module
2. Conduct a CAMEOfm Search to select a group of facility records
3. If your Facility records are linked to MARPLOT, select the Sharing / MARPLOT / Show All on Map menu
4. Return to the CAMEOfm Facilities module; the found set of records should still be active
5. Select the “File / Make KML file” menu
6. Choose “Current Record, Found Set, or All Records” from the Make KML File dialog box; Select the “Open in Google Earth” box
7. Select “Make KML File”; name and save the file

Your computer should launch Google Earth and display the selected facility sites.

Notice that by “clicking” on the map symbols, the computer will display the Facility Name, Contacts, Phone Numbers, and Lat Long. This information is taken from the CAMEOfm Facility record.



## **ALOHA EXERCISE:**

Plotting ALOHA Threat Zone on Google Earth.

*It is possible to display ALOHA Threat Zones on digital photos. The process is as follows:*

- 1. Create an ALOHA Threat Zone*
- 2. Display the Threat Zone on MARPLOT using the Sharing menu*
- 3. In MARPLOT, select the "ALOHA" button and select "Export ALOHA objects to KML"; save the .kml to your computer*
- 4. Launch Google Earth; use the File / Open menu to select the .kml file*

### **Step 1: Create an ALOHA Threat Zone**

Chemical:            Anhydrous Ammonia (chemical from above Exercise 1)

Atmospheric:      Wind Speed            16 mph  
                         Wind Direction        ESE  
                         Ground Roughness    Open County  
                         Cloud Cover            5  
                         Temperature          85  
                         Inversion              none  
                         Humidity               18%

Source:             Tank Type             Horizontal  
                         Diameter               5 feet  
                         Length                 12 feet  
                         Volume                 1763 gallons  
  
                         State of Chemical    Liquid  
                         Temperature         Ambient  
                         Volume in Tank      1,000 gallons  
                         Leaking Tank         Leaking Tank, chemical is not  
                                                     burning as it escapes into the  
                                                     atmosphere  
                         Area and Type of Leak   Circular  
                                                     2"  
                                                     Short Pipe  
                         Location of leak      0% of way to top of tank

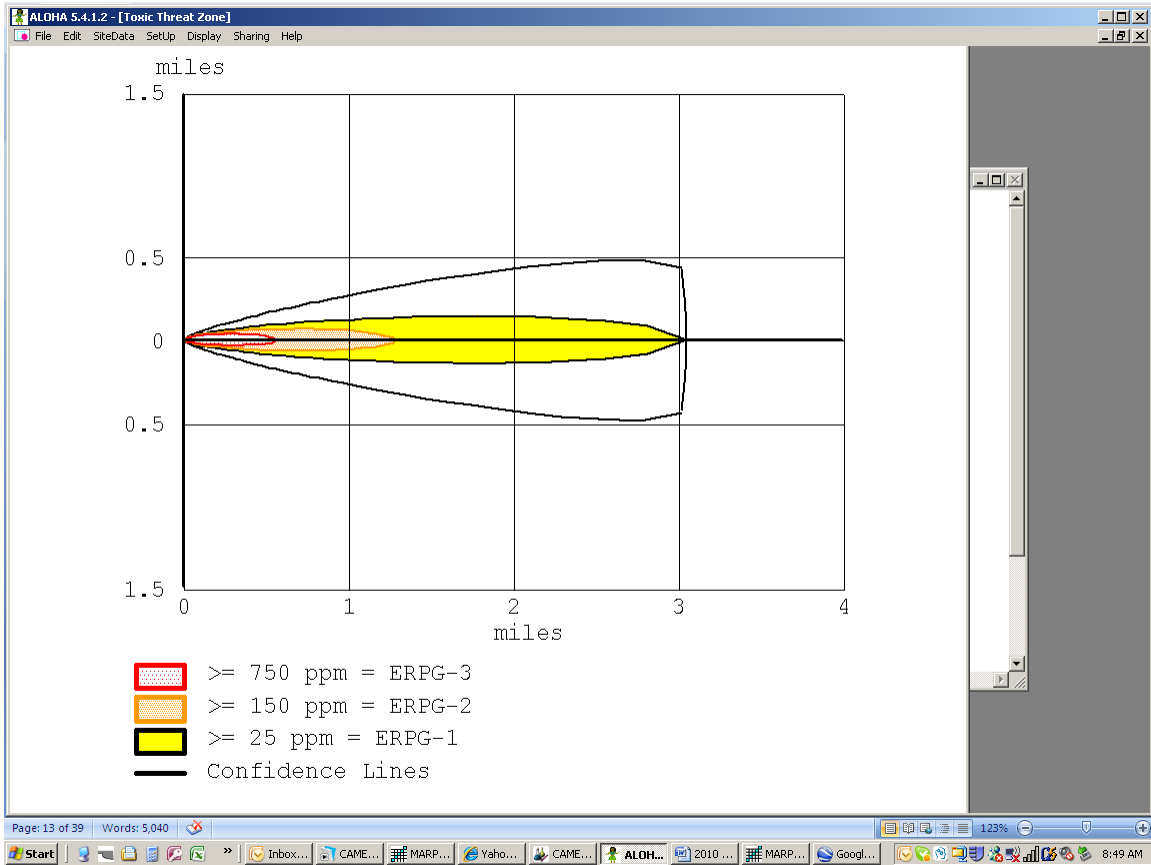
Display: Threat Zone: Toxic area of Vapor Cloud  
Toxic Level of Concern ERPG-1, -2, -3

**THREAT ZONE:**

Model Run: Gaussian

Red : 135 yards --- (500 ppm = ERPG-3)

Orange: 512 yards --- (50 ppm = ERPG-2)



SITE DATA:

Location: OKLAHOMA CITY, OKLAHOMA  
Building Air Exchanges Per Hour: 1.52 (unsheltered single storied)  
Time: May 28, 2010 0846 hours CDT (using computer's clock)

CHEMICAL DATA:

Chemical Name: AMMONIA                      Molecular Weight: 17.03 g/mol  
AEGL-1(60 min): 30 ppm   AEGL-2(60 min): 160 ppm   AEGL-3(60 min): 1100 ppm  
IDLH: 300 ppm   LEL: 160000 ppm   UEL: 250000 ppm  
Ambient Boiling Point: -29.7° F  
Vapor Pressure at Ambient Temperature: greater than 1 atm  
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 16 miles/hour from ese at 3 meters  
Ground Roughness: open country              Cloud Cover: 5 tenths  
Air Temperature: 85° F                      Stability Class: D  
No Inversion Height                      Relative Humidity: 18%

SOURCE STRENGTH:

Leak from short pipe or valve in horizontal cylindrical tank  
Flammable chemical escaping from tank (not burning)  
Tank Diameter: 5 feet                      Tank Length: 12 feet  
Tank Volume: 1,763 gallons  
Tank contains liquid                      Internal Temperature: 85° F  
Chemical Mass in Tank: 2.51 tons              Tank is 57% full  
Circular Opening Diameter: 2 inches  
Opening is 0 feet from tank bottom  
Release Duration: 3 minutes  
Max Average Sustained Release Rate: 2,020 pounds/min  
(averaged over a minute or more)  
Total Amount Released: 5,020 pounds  
Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).

THREAT ZONE:

Model Run: Heavy Gas  
Red : 975 yards --- (750 ppm = ERPG-3)  
Orange: 1.3 miles --- (150 ppm = ERPG-2)  
Yellow: 3.0 miles --- (25 ppm = ERPG-1)

**Note: your threat zone distances will differ from the above based on your selections for location and time of day.**

## **MARPLOT EXERCISE:**

Display an ALOHA Threat Zone on both MARPLOT and Google Earth.

Displaying Threat Zone on MARPLOT.

1. Activate MARPLOT
2. Navigate to your desired “release point”; *a location in Mayes County, Oklahoma is used for the example*
3. Select the Pointer Tool
4. Left-click on the map at your chosen “release point”
5. Select the ALOHA button; select “Set Source Point at Click Point”

Producing a Population Estimate for the ALOHA Threat Zone

1. In MARPLOT, right-click on one of the Threat Zone lines
2. From the right-click menu, select “Get Population within Selected Overlay Object(s)”

Plotting the ERG Initial Isolation Zone on MARPLOT

1. Determine the Initial Isolation Zone distance for Ammonia (see Exercise 1 for CAMEO Chemicals) Answer for Large Spill – Daytime = 100 feet
2. Since the distance will be relatively short (100 feet), you should zoom-in close to the release point
3. In MARPLOT, select the Circle drawing tool from the left-side



4. Select the “Window Width” drop down menu and choose “feet”
5. Left-click on the release point and drag to create a circle object
6. Select the “Position/Size” button from the Objects Settings dialog box
7. Set the Radius to “100” ft

**Circle Size/Position**

Perimeter: 628 ft  
Area: 31416 sq ft  
Radius:  ft

Center

Latitude:

Longitude:

degrees  
 degrees/minutes  
 degrees/minutes/seconds

8. Select the “OK” button
9. Name the object “ERG Initial Isolation Zone”; set the color to “Red” and the Line Style to the thickest choice

**Object Settings**

Name:  Modified: 5/28/10

Overlay: Temporary Overlay

Map: User's map

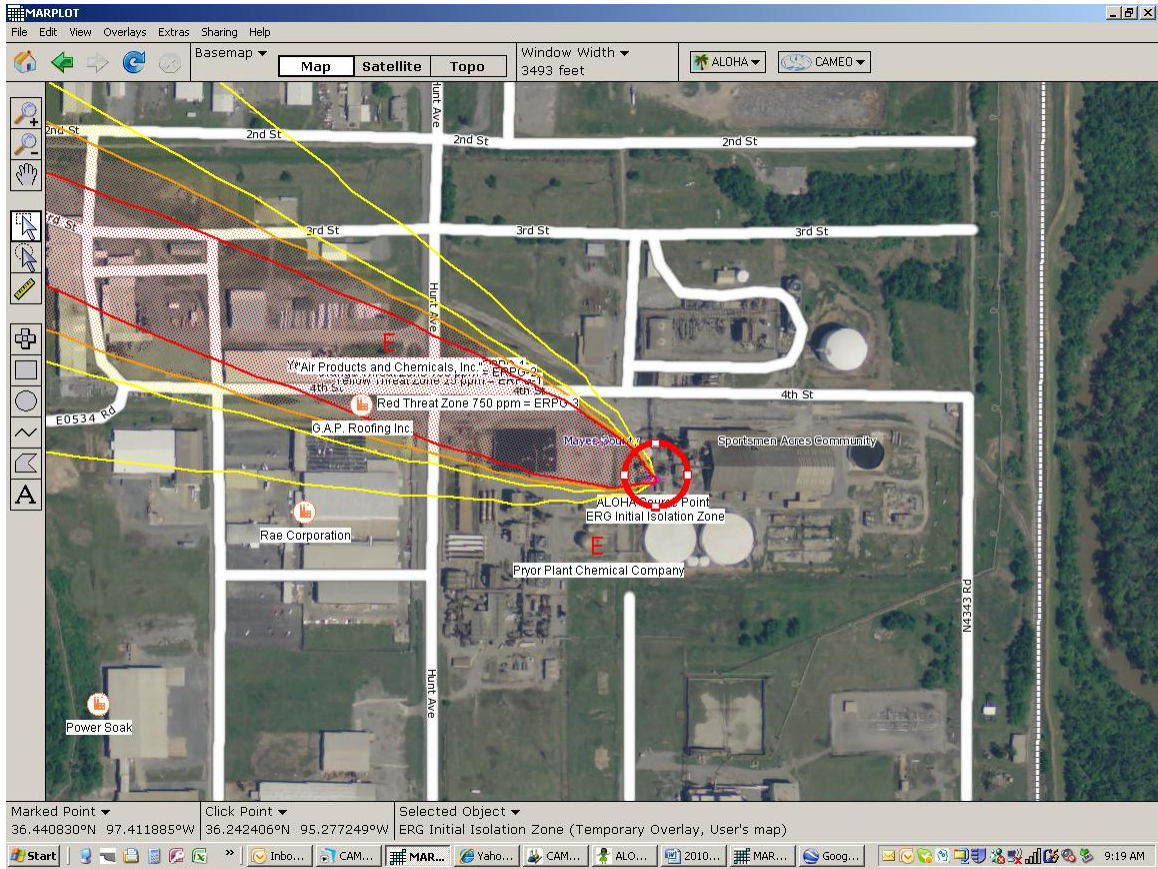
Type: Circle

Color:

Line Style:

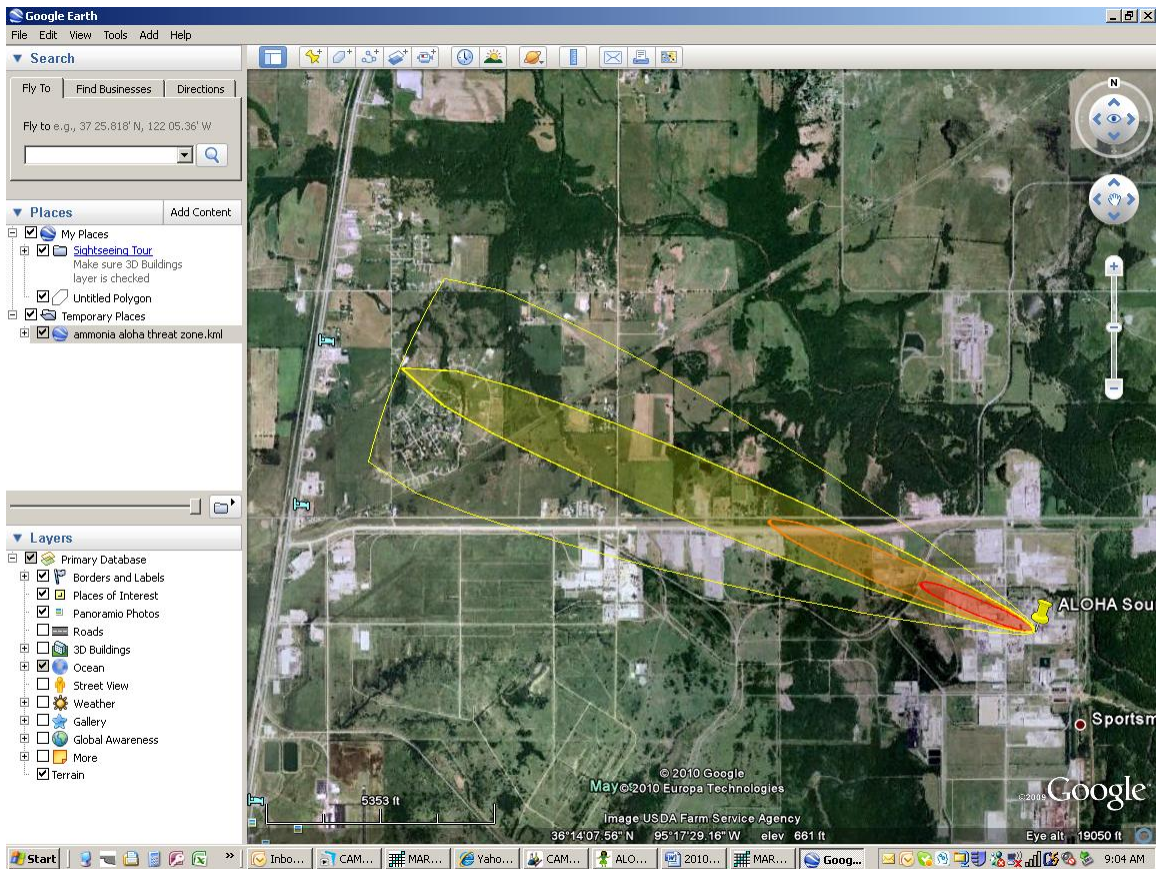
Fill Pattern:

# 10. Select the "OK" button



## Displaying Threat Zone on Google Earth.

1. In MARPLOT, Select the ALOHA button; select “Export ALOHA Objects to KML”
2. Name and save the .kml file
3. Launch Google Earth
4. Select the “File / Open” menu
5. Select the ALOHA kml file you just saved



# ANSWERS

## Exercise 1:

1. Find the following information from the CAMEO Chemicals software:

Chemical Name: AMMONIA CAS # : 7664-41-7  
 UN/NA #: 1005 DOT Label: NON-FLAMMABLE GAS  
 NFPA Values  
 Flammability 1  
 Health 3  
 Reactivity 0  
 Special 0

### Regulatory Information

**CAA RMP:** Regulated chemical with a Threshold Quantity of 10000 pounds.  
**CERCLA:** Regulated chemical with a Reportable Quantity of 100 pounds.  
**EHS (EPCRA 302):** Regulated chemical with a Reportable Quantity of 100 pounds and a Threshold Planning Quantity of 500 pounds.  
**TRI (EPCRA 313):** Regulated chemical.  
**RCRA Chemical Code:** none

ERG Initial Isolation Zone: \_\_\_\_\_

ERG Downwind Protection Distance: \_\_\_\_\_

## Initial Isolation and Protective Action Distances

Name of Material	Small Spills (From a small package or small leak)			Large Spills (From a large package or many small packages)		
	First Isolate in all Directions (Feet)	Then Protect persons Downwind during-		First Isolate in all Directions (Feet)	Then Protect persons Downwind during-	
		Day (Miles)	Night (Miles)		Day (Miles)	Night (Miles)
Ammonia, anhydrous	100	0.1	0.1	500	0.5	1.4
Anhydrous ammonia	100	0.1	0.1	500	0.5	1.4

General Description \_\_\_\_\_

### General Description

A clear colorless gas with a strong odor. Shipped as a liquid under its own vapor pressure. Density (liquid) 6 lb / gal. Contact with the unconfined liquid can cause frostbite. Gas generally regarded as nonflammable but does burn within certain vapor concentration limits and with strong ignition. Fire hazard increases in the presence of oil or other combustible materials. Although gas is lighter than air, vapors from a leak initially hug the ground. Prolonged exposure of containers to fire or heat may cause violent rupturing and rocketing. Long-term inhalation of low concentrations of the vapors or short-term inhalation of high concentrations has adverse health effects. Used as a fertilizer, as a refrigerant, and in the manufacture of other chemicals.

Rate of onset: Immediate

Persistence: Minutes

Odor threshold: 17 ppm

Source/use/other hazard: Explosives manufacture; pesticides; detergents industry.

Reactivity \_\_\_\_\_

### Reactivity Alerts

→ Water-Reactive

### Air & Water Reactions

Soluble in water with evolution of heat. The amount of heat generated may be large.

→ [Bases](#)

## Response

First Aid \_\_\_\_\_

### First Aid

Warning: Ammonia is extremely corrosive to the skin, eyes, and mucous membranes. Contact with the liquified gas may cause frostbite. Caution is advised.

Signs and Symptoms of Acute Ammonia Exposure: Inhalation of ammonia may cause irritation and burns of the respiratory tract, laryngitis, dyspnea (shortness of breath), stridor (high-pitched respirations), and chest pain. Pulmonary edema and pneumonia may also result from inhalation. A pink frothy sputum, convulsions, and coma are often seen following exposure to high concentrations. When ammonia is ingested, nausea and vomiting may result; oral, esophageal, and stomach burns are common. If ammonia has contacted the eyes, irritation, pain, conjunctivitis (red, inflamed eyes), lacrimation (tearing), and corneal erosion may occur. Loss of vision is possible. Dermal exposure may result in severe burns and pain.

Emergency Life-Support Procedures: Acute exposure to ammonia may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary.

#### Inhalation Exposure:

1. Move victims to fresh air. Emergency personnel should avoid self-exposure to ammonia.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
4. Transport to a health care facility.

#### Dermal/Eye Exposure:

1. Remove victims from exposure. Emergency personnel should avoid self-exposure to ammonia.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support. Warning: Do not attempt to neutralize with an acid wash; excessive liberation of heat may result.
3. If eye exposure has occurred, eyes must IMMEDIATELY be flushed with lukewarm water for at least 15 minutes.
4. Remove contaminated clothing as soon as possible.
5. Wash exposed skin areas THOROUGHLY with soap and water.
6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
7. Transport to a health care facility.

#### Ingestion Exposure:

1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
2. DO NOT induce vomiting or attempt to neutralize!
3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
4. Activated charcoal does not strongly bind ammonia, and therefore is of little or no value.
5. Give the victims water or milk: children up to 1 year old, 125 mL (4 oz or 1/2 cup); children 1 to 12 years old, 200 mL (6 oz or 3/4 cup); adults, 250 mL (8 oz or 1 cup). Water or milk should be given only if victims are



conscious and alert.

6. Transport to a health care facility. (EPA, 1998)

#### Reactive Hazards

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##### Reactivity Profile

AMMONIA is a base. Reacts exothermically with all acids. Violent reactions are possible. Readily combines with silver oxide or mercury to form compounds that explode on contact with halogens. When in contact with chlorates it forms explosive ammonium chlorate [Kirk-Othmer, 3rd ed., Vol. 2, 1978, p. 470]. Reacts violently or produces explosive products with fluorine, chlorine, bromine and iodine and some of the interhalogen compounds (bromine pentafluoride, chlorine trifluoride). Mixing of bleaching powder (hypochlorite solution) with ammonia solutions produces toxic/explosive ammonia trichloride vapors. Undergoes potentially violent or explosive reactions on contact with 1,2-dichloroethane (with liquid ammonia), boron halides, ethylene oxide (polymerization), perchlorates or strong oxidants (chromyl chloride, chromium trioxide, chromic acid, nitric acid, hydrogen peroxide, chlorates, fluorine, nitrogen oxide, liquid oxygen). Reacts with silver chloride, silver oxide, silver nitrate or silver azide to form the explosive silver nitride. May react with some heavy metal compounds (mercury, gold(III) chloride) to produce materials that may explode when dry. [Bretherick, 5th ed., 1995, p. 1553].

##### Belongs to the Following Reactive Group(s)

#### Health Hazards

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##### Health Hazard

Vapors cause irritation of eyes and respiratory tract. Liquid will burn skin and eyes. Poisonous; may be fatal if inhaled. Contact may cause burns to skin and eyes. Contact with liquid may cause frostbite. (EPA, 1998)

#### Fire Hazards & Firefighting

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##### Fire Hazard

Mixing of ammonia with several chemicals can cause severe fire hazards and/or explosions. Ammonia in container may explode in heat of fire. Incompatible with many materials including silver and gold salts, halogens, alkali metals, nitrogen trichloride, potassium chlorate, chromyl chloride, oxygen halides, acid vapors, azides, ethylene oxide, picric acid and many other chemicals. Mixing with other chemicals and water. Hazardous polymerization may not occur. (EPA, 1998)

##### Firefighting

Wear positive pressure breathing apparatus and full protective clothing.

Small fires: dry chemical or carbon dioxide. Large fires: water spray, fog or foam. Apply water gently to the surface. Do not get water inside container. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Cool containers that are exposed to flames with water from the side until well after fire is out. Isolate area until gas has dispersed. (EPA, 1998)

##### Molecular Formula:

3N

Flash Point: data unavailable

**Lower Explosive Limit:** 16.0 % (EPA, 1998)

**Upper Explosive Limit:** 25.0 % (EPA, 1998)

**Autoignition Temperature:** 1204.0 ° F (USCG, 1999)

**Melting Point:** -107.9 ° F (EPA, 1998)

**Vapor Pressure:** 400.0 mm Hg at -49.72 ° F (EPA, 1998)

**Vapor Density:** 0.6 (EPA, 1998)

**Specific Gravity:** 0.6818 at -28.03 ° F (EPA, 1998)

**Boiling Point:** -28.03 ° F at 760 mm Hg (EPA, 1998)

**Molecular Weight:** 17.03 (EPA, 1998)

Water Solubility: data unavailable

##### AEGL-1

30.0 ppm for 10 minutes

30.0 ppm for 30 minutes

30.0 ppm for 60 minutes

30.0 ppm for 4 hours

30.0 ppm for 8 hours

(AEGL, 2003)

##### ERPG-1

25.0 ppm

(AIHA, 2008)

TEEL: data unavailable

**IDLH:** 300.0 ppm (NIOSH, 2003)

##### AEGL-2

220.0 ppm for 10 minutes

220.0 ppm for 30 minutes

160.0 ppm for 60 minutes

110.0 ppm for 4 hours

110.0 ppm for 8 hours

##### ERPG-2

150.0 ppm

##### AEGL-3

2700.0 ppm for 10 minutes

1600.0 ppm for 30 minutes

1100.0 ppm for 60 minutes

550.0 ppm for 4 hours

390.0 ppm for 8 hours

##### ERPG-3

750.0 ppm

**Exercise 2:**

1. Find the following information from the CAMEO Chemicals software:

Chemical Name: Acrylonitrile, stabilized CAS # : 107-13-1



UN/NA #: 1093 DOT Label: FLAMMABLE LIQUID POISON

NFPA Values

Flammability	3
Health	4
Reactivity	2
Special	

Regulatory Information

**CAA RMP:** Regulated chemical with a Threshold Quantity of 20000 pounds.

**CERCLA:** Regulated chemical with a Reportable Quantity of 100 pounds.

**EHS (EPCRA 302):** Regulated chemical with a Reportable Quantity of 100 pounds and a Threshold Planning Quantity of 10000 pounds.

**TRI (EPCRA 313):** Regulated chemical.

**RCRA Chemical Code:** U009

ERG Initial Isolation Zone: • As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.

ERG Downwind Protection Distance: **S p i l l**  
• See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".  
**Fire**  
• If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

General Description \_\_\_\_\_

**General Description**

A clear colorless liquid with a strong pungent odor. Flash point 32°F. Prolonged exposure to the vapors or skin contact harmful. Density 6.7 lb / gal. Vapors heavier than air. Combustion produces toxic oxides of nitrogen. Requires storage and handling in closed systems. Used in insecticides and to make plastics, fibers and other chemicals.

Rate of onset: Immediate

Persistence: Minutes to hours

Odor threshold: 17 ppm

Source/use/other hazard: Plastics, coatings, adhesives industries; dyes; pharmaceuticals; flam gas.

Reactivity \_\_\_\_\_

**Reactivity Alerts**

Highly Flammable  
 Polymerizable

First Aid \_\_\_\_\_

**Fire Hazard**

Materials are too dangerous to health to expose fire fighters. A few whiffs of vapor could cause death or vapor or liquid could be fatal on penetrating the fire fighter's normal full protective clothing. The normal full protective

clothing and breathing apparatus available to the average fire department will not provide adequate protection against inhalation or skin contact with these materials. Explosion hazard is moderate. It is flammable and explosive at normal room temperatures. Can react violently with strong acids, amines, strong alkalis. Vapors may travel considerable distance to source of ignition and flash back. Dilute solutions are also hazardous (flash point of a solution of 2 percent in water is 70F). When heated or burned, toxic hydrogen cyanide gas and oxides of nitrogen are formed. Avoid strong acids, amines, alkalis. Incompatible with strong oxidizers (especially bromine) copper and copper alloys. Unstable, moderate hazard is possible when it is exposed to flames, strong acids, amines and alkalis. May polymerize spontaneously in the container, particularly in absence of oxygen or on exposure to visible light. If polymerization occurs in containers, there is a possibility of violent rupture. (EPA, 1998)

#### Reactive Hazards

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##### **Reactivity Profile**

ACRYLONITRILE produces poisonous hydrogen cyanide gas on contact with strong acids or when heated to decomposition. Reacts violently with strong oxidizing agents (dibenzoyl peroxide, di-tert-butylperoxide, bromine) [Sax, 9th ed., p. 61]. Rapidly ignites in air and forms explosive mixtures with air. Polymerizes violently in the presence of strong bases or acids. Underwent a runaway reaction culminating in an explosion on contact with a small amount of bromine or solid silver nitrate [Bretherick, 5th ed., 1995, p. 404].

**Belongs to the Following Reactive Group(s)**

[Nitriles](#)

[Hydrocarbons, Aliphatic Unsaturated](#)

#### *Response Recommendations*

#### Health Hazards

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##### **Health Hazard**

It is classified as very toxic. Probable oral lethal dose for human is 50-500 mg/kg (between 1 teaspoon and 1 oz.) for a 70 kg (150 lb.) person. Irritant skin dose -- 500 mg. Toxic concentrations have been reported at 16 ppm/20 min. Acute toxicity is similar to that due to cyanide poisoning, and the level of cyanide ion in blood is related to the level of poisoning. Inhalation or ingestion results in collapse and death due to tissue anoxia (lack of oxygen) and cardiac arrest (heart failure). (EPA, 1998)

#### Fire Hazards & Firefighting

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##### **Firefighting**

In advanced or massive fires, fire fighting should be done from a safe distance or a protected location. Isolate for 1/2 mile in all directions if tank car or truck is involved in fire.

Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam. Stay away from ends of tanks. Do not get water inside container. Cool containers that are exposed to flames with water from the side until well after fire is out. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire. (EPA, 1998)

##### **Fire Hazard**

Materials are too dangerous to health to expose fire fighters. A few whiffs of vapor could cause death or vapor or liquid could be fatal on penetrating the fire fighter's normal full protective clothing. The normal full protective clothing and breathing apparatus available to the average fire department will not provide adequate protection against inhalation or skin contact with these materials. Explosion hazard is moderate. It is flammable and explosive at normal room temperatures. Can react violently with strong acids, amines, strong alkalis. Vapors may travel considerable distance to source of ignition and flash back. Dilute solutions are also hazardous (flash point of a solution of 2 percent in water is 70F). When heated or burned, toxic hydrogen cyanide gas and oxides of nitrogen are formed. Avoid strong acids, amines, alkalis. Incompatible with strong oxidizers (especially bromine) copper and copper alloys. Unstable, moderate hazard is possible when it is exposed to flames, strong acids, amines and alkalis. May polymerize spontaneously in the container, particularly in absence of oxygen or on exposure to visible light. If polymerization occurs in containers, there is a possibility of violent rupture. (EPA, 1998)

#### Chemical Properties:

**Molecular Formula:** H<sub>2</sub>C  
CHCN

**Flash Point:** 32.0 ° F (EPA, 1998)

**Lower Explosive Limit:** 3.0 % (EPA, 1998)

**Upper Explosive Limit:** 17.0 % (EPA, 1998)

**Autoignition Temperature:** 898.0 ° F (USCG, 1999)



**Melting Point:** -116.0 ° F (EPA, 1998)  
**Vapor Pressure:** 100.0 mm Hg at 73.4 ° F (EPA, 1998)  
**Vapor Density:** 1.9 (EPA, 1998)  
**Specific Gravity:** 0.8004 at 77.0 ° F (EPA, 1998)  
**Boiling Point:** 171.0 ° F at 760 mm Hg (EPA, 1998)  
**Molecular Weight:** 53.6 (EPA, 1998)  
**Water Solubility:** 10-50 mg/mL at 70.9° F (NTP, 1992)

AEGL: data unavailable

**ERPG-1**

10.0 ppm  
(AIHA, 2008)

**ERPG-2**

35.0 ppm

**ERPG-3**

75.0 ppm

TEEL: data unavailable

**IDLH:** 85.0 ppm ; A potential human carcinogen. (NIOSH, 2003)