

ALOHA Plume Projection – Chlorine Release

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This drill requires hazmat responders to use the ALOHA air model to estimate the size of the area potentially threatened by a chlorine release.

Cost of Drill: \$0.00

Time required: 60 minutes

Teaching Points

1. Identify factors present in an incident that will affect the accuracy of plume projections from the ALOHA air model.
2. Predict concentrations of hazardous vapors/gases in the endangered area.
3. Provided recommendations for implementing protection actions.

Note

1. There is no “school solution” and there are no right answers (but there may be a few wrong ones).
2. If you want more information, ask for it (you may not get it but you can still ask!).

Materials List

1. ALOHA air model software
2. Projector, screen and laptop to display simulated incident scene (optional)
3. Standard classroom and furniture (tables, chairs, etc.)
4. Appropriate number of laptop computers for exercise participants to use.

Setup Directions

Arrange the exercise room as desired. Take precautions to minimize safety issues generated by the number of power strips and extension cords needed.

Initiating the Drill

Give the drill participants the initial narrative (see below):

Initial Narrative

On the morning of August 14, a railroad tank car unloading operation at Acme Enterprises has gone awry. Acme Enterprises is a facility that repackages bulk dry liquid chlorine into 1-ton containers and 150-pound cylinders for commercial, industrial, and municipal use in the nearby metropolitan area.

Around 9:20 AM on Wednesday, August 14, a chlorine transfer hose used in a railroad tank car unloading operation catastrophically ruptured. The hose is 11 feet long and has a 1-inch inside diameter. Plant personnel activated the emergency shutdown system before evacuating but several critical valves failed to close, which allow the release to continue unabated. According to the employees, the tank car contains 48,000 pounds of liquid chlorine.

About 1,500 people live and work within a 1-mile radius of Acme Enterprises. About 200 people live adjacent to Acme Enterprises in a mobile home park. The mobile home park, consisting of about 100 luxury mobile homes, is directly adjacent to the southwest side of Acme Enterprises. A construction company and a tire retreading company are located about 100 feet to the east, separated from Acme Enterprises by Highway 61. Each business has about 18 full-time employees. A farm is located just to the north, separated from the Acme Enterprises site by railroad tracks.

Weather: 78° F and 85% humidity at the time of the accident. The forecast high for the day is 87° F. Winds are from the west to northwest at 3 to 5 mph. Skies are partly cloudy.

Use the ALOHA air model to predict how far the chlorine plume will spread. Are the businesses on the other side of Highway 61 in danger? Is there a threat to the trailer park? Provide recommendations for protective actions for the businesses and the trailer park. Should we close the interstate freeway (I-55)?

Photo of rail car offloading station



Diagram of Acme Enterprises facility

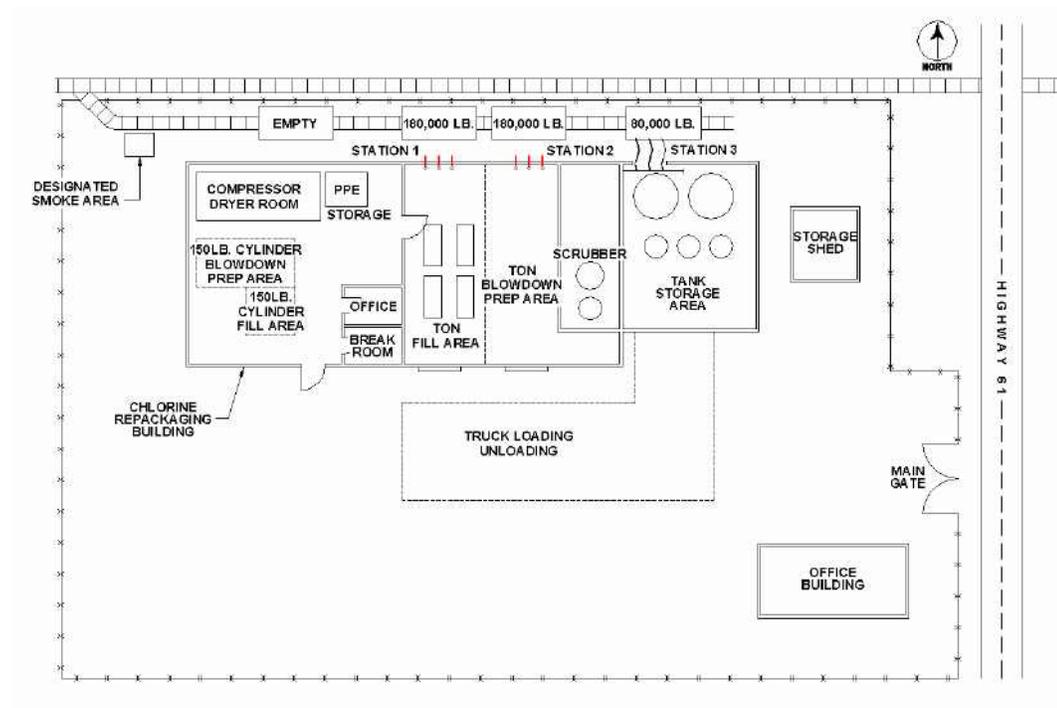
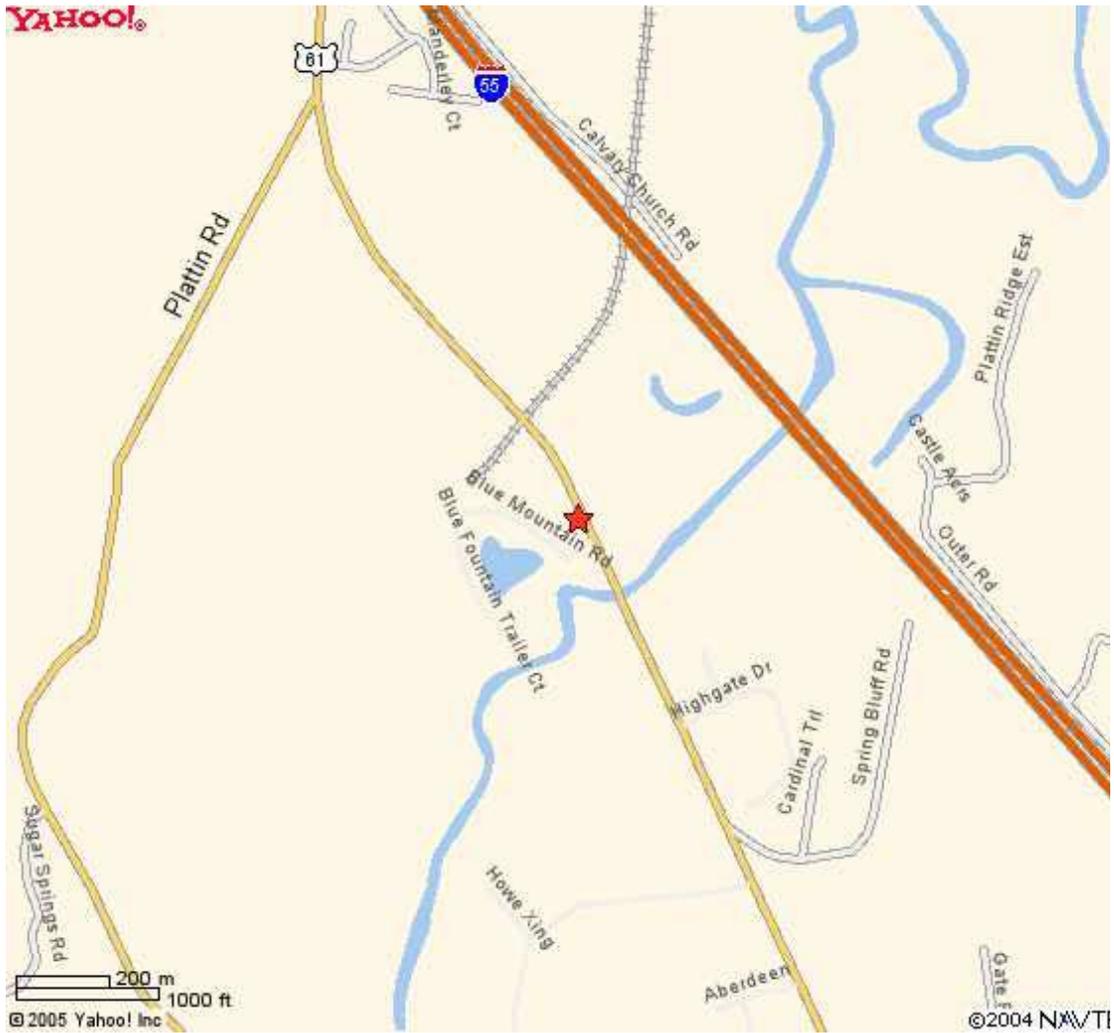


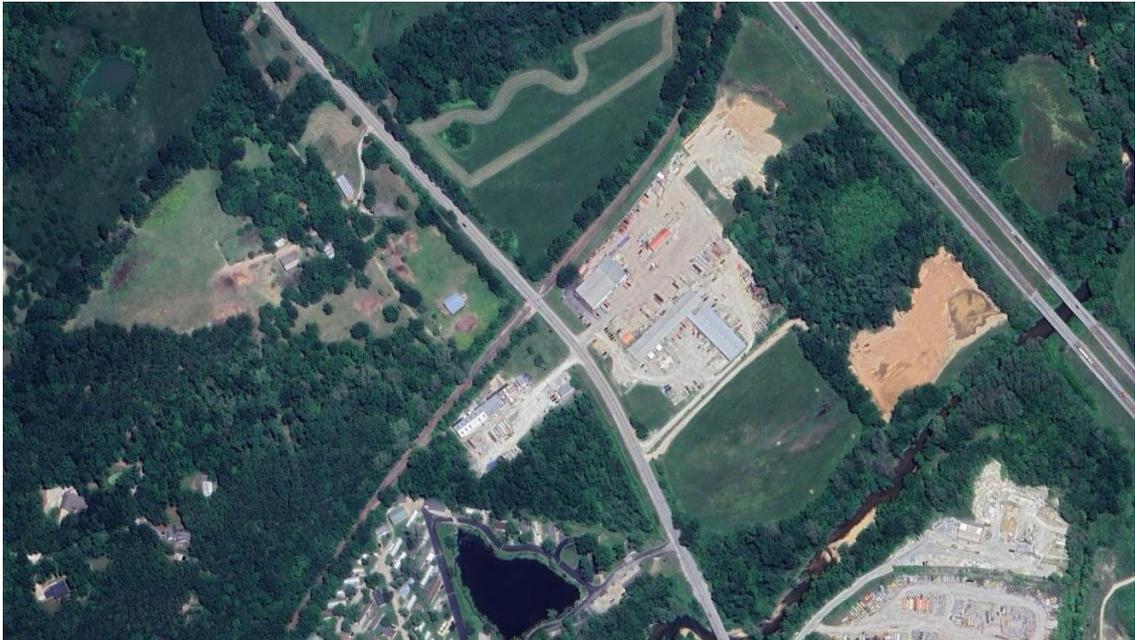
Photo of release from ruptured hose



Map of area



Overhead view of the area



Overhead view of the chlorine release



Suggested Findings

Identify factors present in an incident that will affect the accuracy of plume projections from the ALOHA air model.

The main factor that will give an inaccurate picture of the movement of contaminants is what is called terrain steering effect. The ALOHA air model doesn't take this into account.

The rail line and adjacent trees will direct the chlorine vapor to spread in a northeasterly direction. The ALOHA air model will predict that the plume will travel in an easterly direction. The ALOHA air model has no provision for inputs regarding terrain, buildings or vegetation.

Should responders close the Interstate?

This is a judgement call. The plume projection will vary according to the level of concern selected. Any recommendation should take into account the low odor threshold of chlorine. The public may smell it even though the concentration is below a harmful level. The ALOHA air model may provide some hard numbers to use but public perceptions may trump this.

Background Information

According to the official reports from this incident, the hazmat team involved was brand new and this was their first call.



Lesson Learned – Training

Hazmat Technician training programs assume that leaks from railcars will come from the dome. They will train responders to act accordingly. The photo above shows the responders climbing onto the top of the car. Only one problem, the leak was coming from a loading hose that was near ground level.

The photo below shows there is nothing coming from the dome. The chlorine is leaking from below the railcar.

