

Appendix F

Air Quality Model Background Information on REEDM and ALOHA and Raw Data for ALOHA Model

Background on REEDM

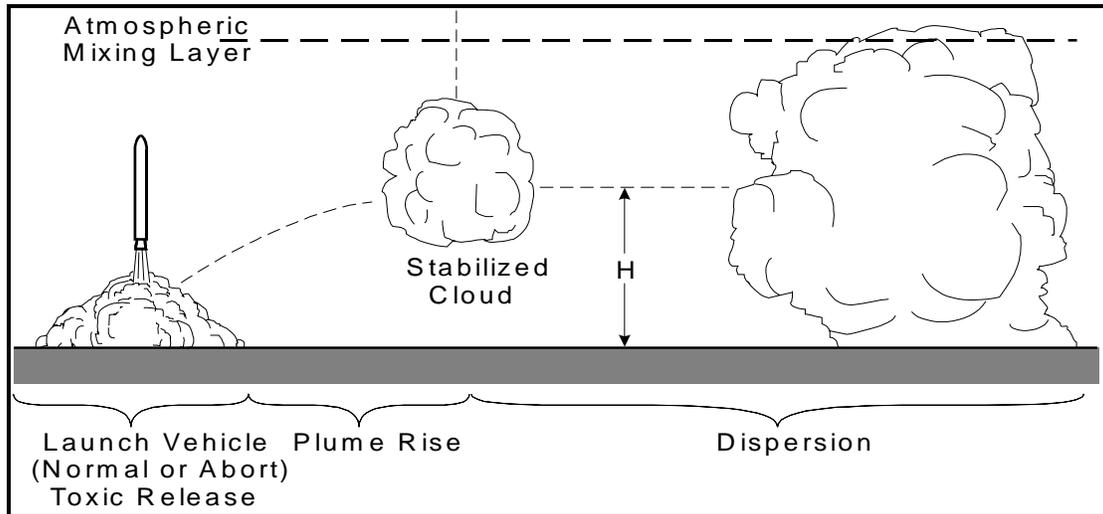
The REEDM model is a toxic dispersion model specifically tailored to address the large buoyant source clouds generated by rocket launches, test firings, and catastrophic launch vehicle explosions. REEDM falls in the category of “Gaussian puff” atmospheric dispersion models in that the initial mass distribution of toxic materials within the cloud at the time the cloud reaches thermal stabilization height in the atmosphere is assumed to be normally distributed. By making the Gaussian mass distribution assumption, the differential equation defining mass diffusion can be solved in closed form using exponential functions and may be readily implemented in a fast running computer program.

REEDM processes an emission event in the following sequence:

1. Process vehicle related data
2. Process meteorological data
3. Define the initial size, shape, location, and heat content of the exhaust cloud
4. Calculate the buoyant cloud rise rate and cloud growth rate to estimate the cloud stabilization height above ground, size, and downwind position
5. Determine whether or not part of the stabilized cloud is above a capping atmospheric temperature inversion
6. Transport the cloud disks downwind and grow the disk size using climatologic model estimates of atmospheric turbulence intensity
7. Calculate concentrations at ground receptor points and determine the peak concentration as a function of downwind distance
8. Report concentration as a function of distance from the source origin (e.g., launch pad)

REEDM was designed to primarily predict hazard conditions downwind from the stabilized exhaust cloud. REEDM does not directly calculate or report cloud concentrations during the buoyant cloud rise phase; however, advanced model users can manually extract sufficient pertinent cloud data from internal calculations to derive concentration estimates during the cloud rise phase. One assumption that REEDM makes about the nature and behavior of a rocket exhaust cloud is that it can be initially defined as a single cloud entity that grows and moves, but remains as a single cloud during the formation and cloud rise phases. A consequence of this assumption is that once the cloud lifts off the ground during the buoyant cloud rise phase, there will be no predicted cloud chemical concentration on the ground immediately below the cloud. Ground level concentrations will be predicted to remain at zero ppm until the some of the elevated cloud material is eventually brought back down to ground level by mixing due to atmospheric turbulence. This concept is illustrated in Figure F-1.

Figure F-1. Conceptual Illustration of Rocket Exhaust Source Cloud Formation, Cloud Rise, and Cloud Atmospheric Dispersion (NASA, 2009).

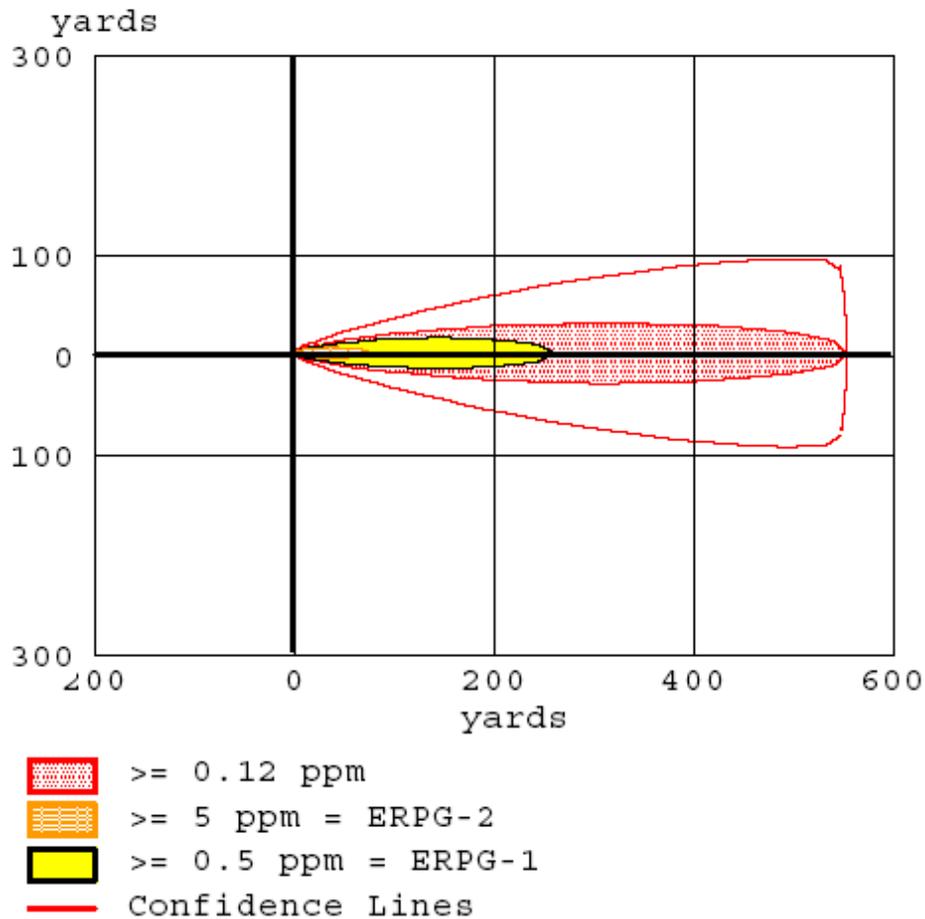
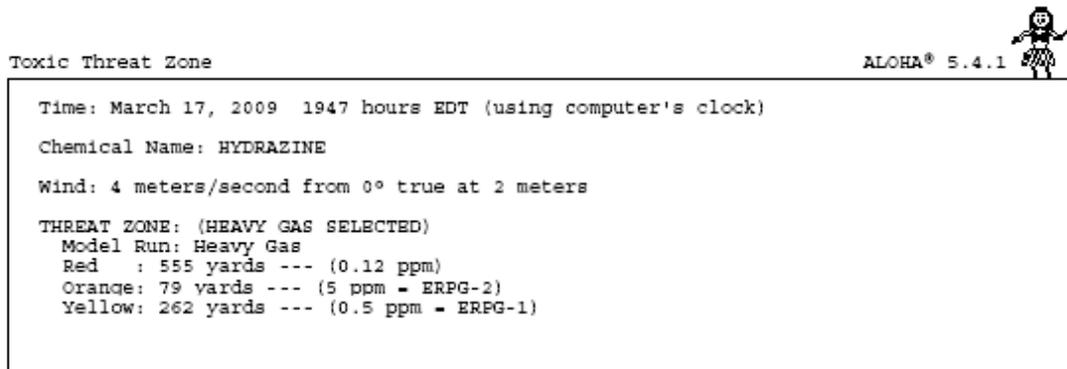


Background on ALOHA

The ALOHA model was designed with first emergency responders in mind. In particular, its air dispersion model is intended to be used to estimate the areas of impact near a short-duration chemical release where key hazards—toxicity, flammability, thermal radiation, or overpressure—may exceed user-specified Levels of Concern (LOCs).

ALOHA can model the dispersion of a cloud of pollutant gas in the atmosphere and display a diagram (i.e., a threat zone plot) that shows an overhead view of the regions, or threat zones, in which it predicts that key LOCs will be exceeded. To obtain a threat zone estimate, at least one LOC must be chosen. ALOHA will suggest default LOCs, and the user may keep those or choose up to three other LOCs. For toxic gas dispersion scenarios, an LOC is a threshold concentration of the gas at ground level—usually the concentration above which a hazard is believed to exist. The type of LOC will depend on the scenario. For each LOC chosen, ALOHA estimates a threat zone where the hazard is predicted to exceed that LOC at some time after a release begins. These zones are displayed on a single threat zone plot. If three LOCs are chosen, then ALOHA will display the threat zones in red, orange, and yellow. When ALOHA's default LOCs are selected, the red zone represents the worst hazard. Figure F-2 presents an example run from ALOHA indicating various threat zones.

Figure F-2: Example Threat Zone Plot in ALOHA Model



LOCs are usually based on one of the following parameters:

- Acute Exposure Guideline Levels (AEGs) developed by the National Research Council's Advisory Committee.
- Emergency Response Planning Guidelines (ERPGs) developed by the ERPG committee of the American Industrial Hygiene Association. These were developed as planning guidelines to anticipate human adverse health effects caused by exposure to toxic chemicals.
- Temporary Emergency Exposure Limits (TEELs) are temporary toxic LOCs similar to ERPGs and are defined by the U.S. Department of Energy for use when ERPGs are not available.
- The Immediately Dangerous to Life or Health level is a limit established for selecting respirators for use in workplaces by the National Institute for Occupational Safety and Health (NIOSH). Immediately Dangerous to Life or Health is an estimate of the maximum concentration in the air to which a healthy worker could be exposed to without suffering permanent or escape-impairing health effects.

There are two separate dispersion models in ALOHA: Gaussian and heavy gas. ALOHA uses the Gaussian model to predict how gases that have a buoyancy equivalent to air will disperse in the atmosphere. The heavy gas dispersion calculations that are used in ALOHA are based on those used in the DEGADIS model, one of several well-known heavy gas models.

Like any model, ALOHA cannot be more accurate than the information entered during the modeling analysis. Therefore, it is important to enter the most accurate information. The modeler must choose a value that would give the worst-case scenario, or run multiple scenarios and compare the results. Additionally, ALOHA's models use atmospheric information to estimate the spread of the chemical release. If any of the atmospheric conditions (e.g., wind speed) change substantially during a response, it is recommended to correct the inputs and create a new threat zone plot, as the old plot may no longer be accurate.

Examples of conditions that can produce unreliable results during modeling runs using ALOHA include:

- Very low wind speeds;
- Very stable atmospheric conditions;
- Wind shifts and terrain steering effects; or
- Concentration patchiness, particularly near the release source.



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.73 (sheltered single storied)
Time: February 4, 2009 2100 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: HYDRAZINE Molecular Weight: 32.05 g/mol
ERPG-3: 30 ppm ERPG-2: 5 ppm ERPG-1: 0.5 ppm
IDLH: 50 ppm
Carcinogenic risk - see CAMEO
Normal Boiling Point: 236.3° F Ambient Boiling Point: 236.3° F
Vapor Pressure at Ambient Temperature: 0.0050 atm
Ambient Saturation Concentration: 4,971 ppm or 0.50%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
Inversion Height: 1000 feet
Stability Class: E (user override) Air Temperature: 40° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 900 square feet Puddle Mass: 504.7 kilograms
Soil Type: Default Ground Temperature: 40° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 0.657 pounds/min
(averaged over a minute or more)
Total Amount Released: 37.6 pounds

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
Red LOC (0.12 ppm) Max Threat Zone: 1536 yards



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.71 (sheltered single storied)
Time: February 4, 2009 2100 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: HYDRAZINE Molecular Weight: 32.05 g/mol
ERPG-3: 30 ppm ERPG-2: 5 ppm ERPG-1: 0.5 ppm
IDLH: 50 ppm
Carcinogenic risk - see CAMEO
Normal Boiling Point: 236.3° F Ambient Boiling Point: 236.3° F
Vapor Pressure at Ambient Temperature: 0.029 atm
Ambient Saturation Concentration: 28,929 ppm or 2.89%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 90° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Diameter: 7.2 feet Puddle Volume: 5 gallons
Soil Type: Default Ground Temperature: 90° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 0.172 pounds/min
(averaged over a minute or more)
Total Amount Released: 9.13 pounds

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
Red LOC (0.12 ppm) Max Threat Zone: 584 yards



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.71 (sheltered single storied)
Time: February 4, 2009 0700 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: HYDRAZINE Molecular Weight: 32.05 g/mol
ERPG-3: 30 ppm ERPG-2: 5 ppm ERPG-1: 0.5 ppm
IDLH: 50 ppm
Carcinogenic risk - see CAMEO
Normal Boiling Point: 236.3° F Ambient Boiling Point: 236.3° F
Vapor Pressure at Ambient Temperature: 0.029 atm
Ambient Saturation Concentration: 28,929 ppm or 2.89%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 90° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 900 square feet Puddle Mass: 504.7 kilograms
Soil Type: Default Ground Temperature: 90° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 3.22 pounds/min
(averaged over a minute or more)
Total Amount Released: 174 pounds

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
Red LOC (0.12 ppm) Max Threat Zone: 1.5 miles



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.63 (sheltered single storied)
Time: February 4, 2009 0700 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: HYDRAZINE Molecular Weight: 32.05 g/mol
ERPG-3: 30 ppm ERPG-2: 5 ppm ERPG-1: 0.5 ppm
IDLH: 50 ppm
Carcinogenic risk - see CAMEO
Normal Boiling Point: 236.3° F Ambient Boiling Point: 236.3° F
Vapor Pressure at Ambient Temperature: 0.015 atm
Ambient Saturation Concentration: 14,958 ppm or 1.50%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 70° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Diameter: 7.2 feet Puddle Volume: 5 gallons
Soil Type: Default Ground Temperature: 70° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 0.0941 pounds/min
(averaged over a minute or more)
Total Amount Released: 5.23 pounds

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
Red LOC (0.12 ppm) Max Threat Zone: 417 yards



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.62 (sheltered single storied)
Time: February 4, 2009 2100 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: NITROGEN TETROXIDE Molecular Weight: 92.01 g/mol
Normal Boiling Point: 70.1° F Ambient Boiling Point: 70.1° F
Vapor Pressure at Ambient Temperature: 0.99 atm
Ambient Saturation Concentration: 996,775 ppm or 99.7%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
Inversion Height: 1000 feet
Stability Class: E (user override) Air Temperature: 70° F
Relative Humidity: 30% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Diameter: 7.2 feet Puddle Volume: 5 gallons
Soil Type: Default Ground Temperature: 70° F
Initial Puddle Temperature: Ground temperature
Release Duration: 9 minutes
Max Average Sustained Release Rate: 13.5 pounds/min
(averaged over a minute or more)
Total Amount Released: 60.2 pounds

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
Red LOC (1.0 ppm) Max Threat Zone: 1,181 yards



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.73 (sheltered single storied)
Time: February 4, 2009 2100 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: NITROGEN TETROXIDE Molecular Weight: 92.01 g/mol
Normal Boiling Point: 70.1° F Ambient Boiling Point: 70.1° F
Vapor Pressure at Ambient Temperature: 0.44 atm
Ambient Saturation Concentration: 438,008 ppm or 43.8%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
Inversion Height: 1000 feet
Stability Class: E (user override) Air Temperature: 40° F
Relative Humidity: 30% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 472 square feet Puddle Mass: 321.7 kilograms
Soil Type: Default Ground Temperature: 40° F
Initial Puddle Temperature: Ground temperature
Release Duration: 16 minutes
Max Average Sustained Release Rate: 69.6 pounds/min
(averaged over a minute or more)
Total Amount Released: 709 pounds

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
Red LOC (1.0 ppm) Max Threat Zone: 1.8 miles



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.73 (sheltered single storied)
Time: February 4, 2009 0700 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: NITROGEN TETROXIDE Molecular Weight: 92.01 g/mol
Normal Boiling Point: 70.1° F Ambient Boiling Point: 70.1° F
Vapor Pressure at Ambient Temperature: 0.44 atm
Ambient Saturation Concentration: 438,008 ppm or 43.8%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
Inversion Height: 1000 feet
Stability Class: E (user override) Air Temperature: 40° F
Relative Humidity: 30% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 472 square feet Puddle Mass: 321.7 kilograms
Soil Type: Default Ground Temperature: 40° F
Initial Puddle Temperature: Ground temperature
Release Duration: 16 minutes
Max Average Sustained Release Rate: 69.6 pounds/min
(averaged over a minute or more)
Total Amount Released: 709 pounds

FOOTPRINT INFORMATION:

Dispersion Module: Gaussian
Red LOC (1.0 ppm) Max Threat Zone: 1.8 miles



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.71 (sheltered single storied)
Time: February 4, 2009 2100 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: NITROGEN TETROXIDE Molecular Weight: 92.01 g/mol
Normal Boiling Point: 70.1° F Ambient Boiling Point: 70.1° F
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 90° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 472 square feet Puddle Mass: 321.7 kilograms
Soil Type: Default Ground Temperature: 90° F
Initial Puddle Temperature: 70.1° F
Release Duration: 7 minutes
Max Average Sustained Release Rate: 185 pounds/min
(averaged over a minute or more)
Total Amount Released: 709 pounds

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
Red LOC (1.0 ppm) Max Threat Zone: 1.9 miles



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.73 (sheltered single storied)
Time: February 4, 2009 0700 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: NITROGEN TETROXIDE Molecular Weight: 92.01 g/mol
Normal Boiling Point: 70.1° F Ambient Boiling Point: 70.1° F
Vapor Pressure at Ambient Temperature: 0.44 atm
Ambient Saturation Concentration: 438,008 ppm or 43.8%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 40° F
Relative Humidity: 30% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Diameter: 7.2 feet Puddle Volume: 5 gallons
Soil Type: Default Ground Temperature: 40° F
Initial Puddle Temperature: Ground temperature
Release Duration: 15 minutes
Max Average Sustained Release Rate: 6.33 pounds/min
(averaged over a minute or more)
Total Amount Released: 61.2 pounds

FOOTPRINT INFORMATION:

Dispersion Module: Gaussian
Red LOC (1.0 ppm) Max Threat Zone: 564 yards



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.73 (sheltered single storied)
Time: February 5, 2009 2107 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: MON-3 Molecular Weight: 90.14 g/mol
Default LOC-3: 30 ppm Default LOC-2: 20 ppm Default LOC-1: 10 ppm
IDLH: 50 ppm
Normal Boiling Point: 49.4° F Ambient Boiling Point: 49.3° F
Vapor Pressure at Ambient Temperature: 0.74 atm
Ambient Saturation Concentration: 743,692 ppm or 74.4%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 40° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 149 square feet Puddle Mass: 268.8 kilograms
Soil Type: Default Ground Temperature: 40° F
Initial Puddle Temperature: Ground temperature
Release Duration: 52 minutes
Max Average Sustained Release Rate: 41.4 pounds/min
(averaged over a minute or more)
Total Amount Released: 593 pounds

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
Red LOC (1 ppm) Max Threat Zone: 1,645 yards



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.71 (sheltered single storied)
Time: February 24, 2009 1200 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: METHYLHYDRAZINE Molecular Weight: 46.07 g/mol
AEGL-3: 16 ppm AEGL-2: 5.3 ppm
TEEL-3: 20 ppm TEEL-2: 0.5 ppm TEEL-1: 0.2 ppm
IDLH: 20 ppm
Carcinogenic risk - see CAMEO
Normal Boiling Point: 190.0° F Ambient Boiling Point: 189.9° F
Vapor Pressure at Ambient Temperature: 0.087 atm
Ambient Saturation Concentration: 87,286 ppm or 8.73%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 90° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 833 square feet Puddle Mass: 357.95 kilograms
Soil Type: Default Ground Temperature: 90° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 12.3 pounds/min
(averaged over a minute or more)
Total Amount Released: 658 pounds

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
Red LOC (0.24 ppm) Max Threat Zone: 1.8 miles



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.62 (sheltered single storied)
Time: February 24, 2009 0700 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: METHYLHYDRAZINE Molecular Weight: 46.07 g/mol
AEGL-3: 16 ppm AEGL-2: 5.3 ppm
TEEL-3: 20 ppm TEEL-2: 0.5 ppm TEEL-1: 0.2 ppm
IDLH: 20 ppm
Carcinogenic risk - see CAMEO
Normal Boiling Point: 190.0° F Ambient Boiling Point: 189.9° F
Vapor Pressure at Ambient Temperature: 0.047 atm
Ambient Saturation Concentration: 46,839 ppm or 4.68%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
Inversion Height: 1000 feet
Stability Class: E (user override) Air Temperature: 70° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Area: 803 square feet Puddle Mass: 357.95 kilograms
Soil Type: Default Ground Temperature: 70° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 6.65 pounds/min
(averaged over a minute or more)
Total Amount Released: 351 pounds

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
Red LOC (0.24 ppm) Max Threat Zone: 2.1 miles



SITE DATA INFORMATION:

Location: WALLOPS FLIGHT FACILITY, VIRGINIA
Building Air Exchanges Per Hour: 0.73 (sheltered single storied)
Time: February 24, 2009 0700 hours EST (user specified)

CHEMICAL INFORMATION:

Chemical Name: METHYLHYDRAZINE Molecular Weight: 46.07 g/mol
AEGL-3: 16 ppm AEGL-2: 5.3 ppm
TEEL-3: 20 ppm TEEL-2: 0.5 ppm TEEL-1: 0.2 ppm
IDLH: 20 ppm
Carcinogenic risk - see CAMEO
Normal Boiling Point: 190.0° F Ambient Boiling Point: 189.9° F
Vapor Pressure at Ambient Temperature: 0.016 atm
Ambient Saturation Concentration: 16,474 ppm or 1.65%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true at 3 meters
No Inversion Height
Stability Class: D Air Temperature: 40° F
Relative Humidity: 50% Ground Roughness: 10.0 centimeters
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:

Puddle Diameter: 7.2 feet Puddle Volume: 5 gallons
Soil Type: Default Ground Temperature: 40° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 0.146 pounds/min
(averaged over a minute or more)
Total Amount Released: 8.25 pounds

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
Red LOC (0.24 ppm) Max Threat Zone: 293 yards