

RELEASE MITIGATION FACTORS FOR RMP WORST CASE EVALUATIONS

Page 1 of 4

PROBLEM:

The worst case scenario of the Federal Risk Management Plan (RMP) permits the inclusion of a Mitigation Factor (MF) to reduce the rate of the release. For example, per the RMP Offsite Consequence Analysis Guidance (OCAG) in Section 3.1.2 - Release of Gas in Enclosed Space, a Mitigation Factor of 0.55 can be applied to a gas release that occurs within a ventilated enclosed space in a building, i.e., a room. Similarly, in Section 3.2.3 - Release of Liquid With Passive Mitigation, a Mitigation Factor of 0.1 can be applied to the evaporation release within a room. Only passive elements can be considered as mitigation devices in the worst case scenario.

The Total Containment Vessel (TGO Vessel) of TGO Technologies, Inc. for one ton containers, can be considered as a passive system. The TGO Vessel is a passive containment structure up to the location where the high pressure fitting connects the pigtail from the one ton container inside the TGO Vessel to the wall of the TGO Vessel. This fitting permits the passage of chlorine through the wall of the TGO Vessel to the exterior. All the devices external to the wall of the TGO Vessel are assumed to not function for the worst case scenario. The chlorine is assumed to be in the ambient surroundings once it is external to the wall of the TGO Vessel.

Mitigation Factors for the worst case scenario for the Federal EPA Risk Management Plan (RMP) are to be determined for the use of a TGO Vessel with a one ton container of chlorine sealed inside of it.

DISCUSSION:

The rate of release of Regulated Substance for the RMP worst case is given as:

$$RQ = (TQ/10)(MF)$$

Where:

RQ = Rate of Release of Quantity of Regulated Substance, lb/min
TQ = Total Quantity of Regulated Substance To Be Considered, lb
10 = 10 minutes
MF = Mitigation Factor

Mitigation Factors for the worst case scenario of the RMP can be determined for a considered case situation by iterating on the value of RQ until the distance to the end point for the worst case is equal to the end point determined for the considered case situation.

RELEASE MITIGATION FACTORS FOR RMP WORST CASE EVALUATIONS

Page 2 of 4

DISCUSSION (Continued):

Mitigation Factors for the worst case scenario of a TGO Vessel with a one ton container of chlorine sealed inside of it, will be determined based upon the results obtained from the consideration of the following case situations:

- The TGO Vessel has a 1/4 inch hole in the wall fitting with the contents of a one ton container inside the Vessel
- The TGO Vessel has a 1/8 inch hole in the wall fitting with the contents of a one ton container inside the Vessel

RESULTS:

CAMEO-ALOHA computer runs for these case situations and related case situations are provided in Appendix A. Each of these cases will be considered with the worst case climatological conditions in urban surroundings. The end point for each case is 3 ppm for chlorine. Computer runs are done for both gaussian and heavy gas models with the larger end-point distance used as a conservative value. The end point distance and the determined Mitigation Factors are given in the enclosed Table 1. The ventilated rooms are based on 0.5 air change per hour which OACG of the RMP states is typical of buildings which house toxic gases. The reductions in the affected surface areas, provided in Table 2, are related to the affected surface area for the unmitigated worst case using the end point distances given in Table 1.

RELEASE MITIGATION FACTORS FOR RMP WORST CASE EVALUATIONS

Page 3 of 4

SUMMARY:

The following conclusions are deduced from the results:

- The release of one ton of chlorine has an end-point distance of 3 miles for the unmitigated worst case.
- The release of one ton of chlorine in a ventilated room has a Mitigation Factor of 0.55. The end-point distance is 2.5 miles for this mitigated worst case which is a 31% reduction in the affected surface area from the unmitigated worst case.
- The TGO Vessel with a standard high pressure fitting of 1/4 inch id has an end point distance of 0.68 mile. By iteration on the worst case, a Mitigation Factor of 0.035 gives this end point distance.
- The TGO Vessel with a choked high pressure fitting of 1/8 inch id has an end point distance of 0.52 mile. By iteration on the worst case, a Mitigation Factor of 0.021 gives this end point distance.
- The release of chlorine gas from a TGO Vessel with a standard high pressure fitting of 1/4 inch id that has a Mitigation Factor of 0.035 into a ventilated room with a Mitigation Factor of 0.55 has a combined Mitigation Factor of 0.019. The end-point distance is 0.50 miles for this mitigated worst case which is a 97% reduction in the affected surface area from the unmitigated worst case.
- The release of chlorine gas from a TGO Vessel with a choked high pressure fitting of 1/8 inch id that has a Mitigation Factor of 0.021 into a ventilated room with a Mitigation Factor of 0.55 has a combined Mitigation Factor of 0.012. The end-point distance is 0.39 miles for this mitigated worst case which is a 98% reduction in the affected surface area from the unmitigated worst case.

Mitigation Factors have been determined for the TGO Vessel. The use of the TGO Vessel results in an end point distance and affected ground surface area for the worst case scenario for the RMP that are reduced significantly from the unmitigated worst case scenario.

In addition, the use of the TGO Vessel will reduce significantly the end point distance and affected ground surface area for the alternative release scenarios to be done for the RMP as well.

RELEASE MITIGATION FACTORS FOR RMP WORST CASE EVALUATIONS

Table 1 - Results of CAMEO-ALOHA Computer Runs

Release Case - Chlorine Liquefied Gas	Release in Air	End Point (mile)	Mitigation Factor
Worse Case - 2000 lb in 10 minutes	Gas	3.00 ⁽¹⁾	None
TGO Vessel - gas or liquid - 1/4 inch hole	Gas	0.68 ⁽¹⁾	0.035
TGO Vessel - gas or liquid - 1/8 inch hole	Gas	0.52 ⁽²⁾	0.021
Gas release in ventilated room (per OCA §3.1.2) ⁽³⁾	Gas	2.50 ⁽¹⁾	0.550
TGO Vessel - gas or liquid - 1/4 inch hole in ventilated room $(0.035)(0.55) = 0.019$	Gas	0.50 ⁽¹⁾	0.019
TGO Vessel - gas or liquid - 1/8 inch hole in ventilated room $(0.021)(0.55) = 0.012$	Gas	0.39 ⁽¹⁾	0.012

⁽¹⁾ The heavy gas model is the larger value of end point distance.

⁽²⁾ The gaussian model is the larger value of end point distance.

⁽³⁾ Ventilation at 0.5 air change per hour.

Table 2 - Affected Surface Area Reductions for Worse Case

Release Case - Chlorine Liquefied Gas	End Point (mile)	Affected Surface Area Reduction (percent)
Unmitigated Worse Case - 2000 lb in 10 minutes	3.00	0
Ventilated Room	2.50	31
Ventilated Room with Scrubber	2.50	31
TGO Vessel with 1/4 inch hole	0.68	95
TGO Vessel with 1/8 inch hole	0.52	97
TGO Vessel with 1/4 inch hole in ventilated room	0.50	97
TGO Vessel with 1/8 inch hole in ventilated room	0.39	98

Mitigation Factors have been determined for the TGO Vessel. The use of the TGO Vessel results in an end point distance and affected ground surface area for the worse case scenario for the RMP that are reduced significantly from the unmitigated worse case scenario.

In addition, the use of the TGO Vessel will reduce significantly the end point distance and affected ground surface area for the alternative release scenarios to be done for the RMP as well.

TGO TECHNOLOGIES
(800) 543-6603

APPENDIX A
COMPUTER OUTPUT DATA

Footprint Window

ALOHA 5.2

Time: February 11, 1997 0940 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

FOOTPRINT INFORMATION: (GAUSS SELECTED)

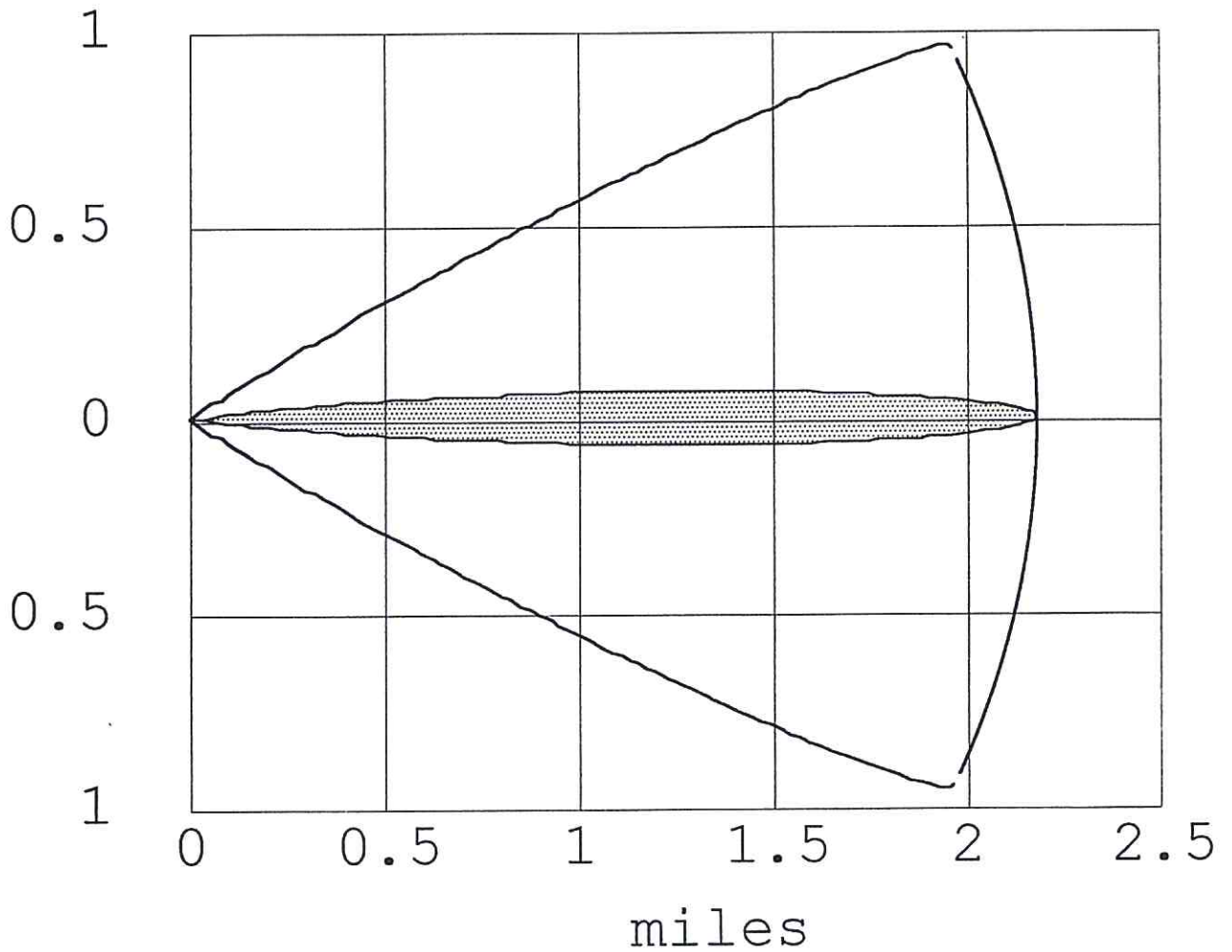
Dispersion Module: Gaussian

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 2.2 miles

Max Threat Zone for IDLH: 1.2 miles

miles



Source Strength (Release Rate)

ALOHA 5.2

Time: February 11, 1997 0940 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 110 pounds/min

Source Height: 0

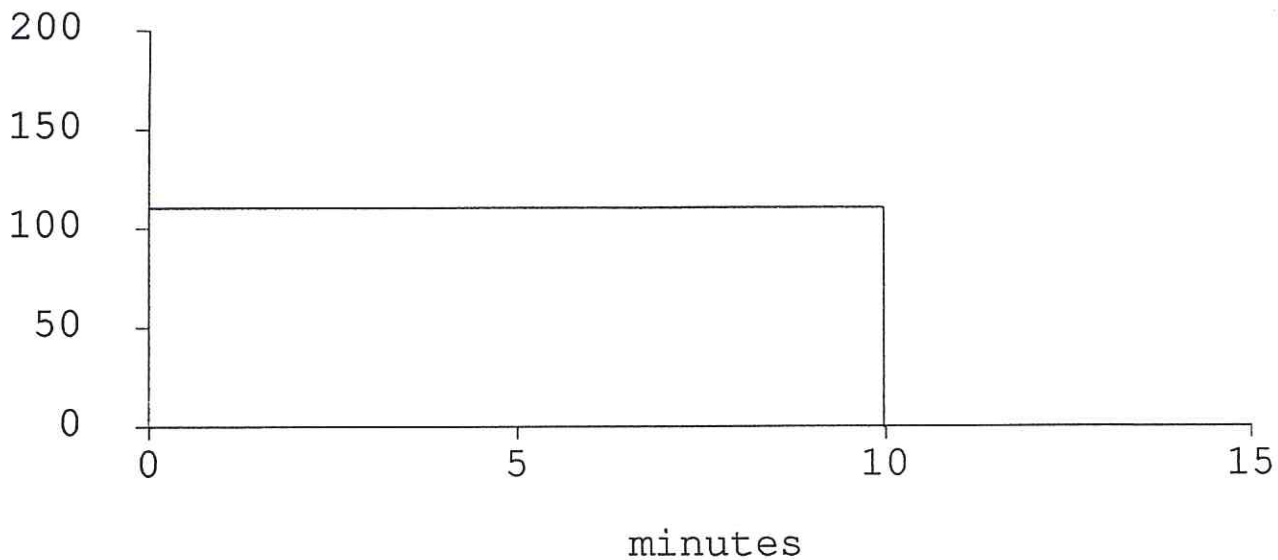
Release Duration: 10 minutes

Release Rate: 110 pounds/min

Total Amount Released: 1,100 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SACRAMENTO, CALIFORNIA
Building Air Exchanges Per Hour: 0.50 (Enclosed office)
Time: February 11, 1997 0940 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

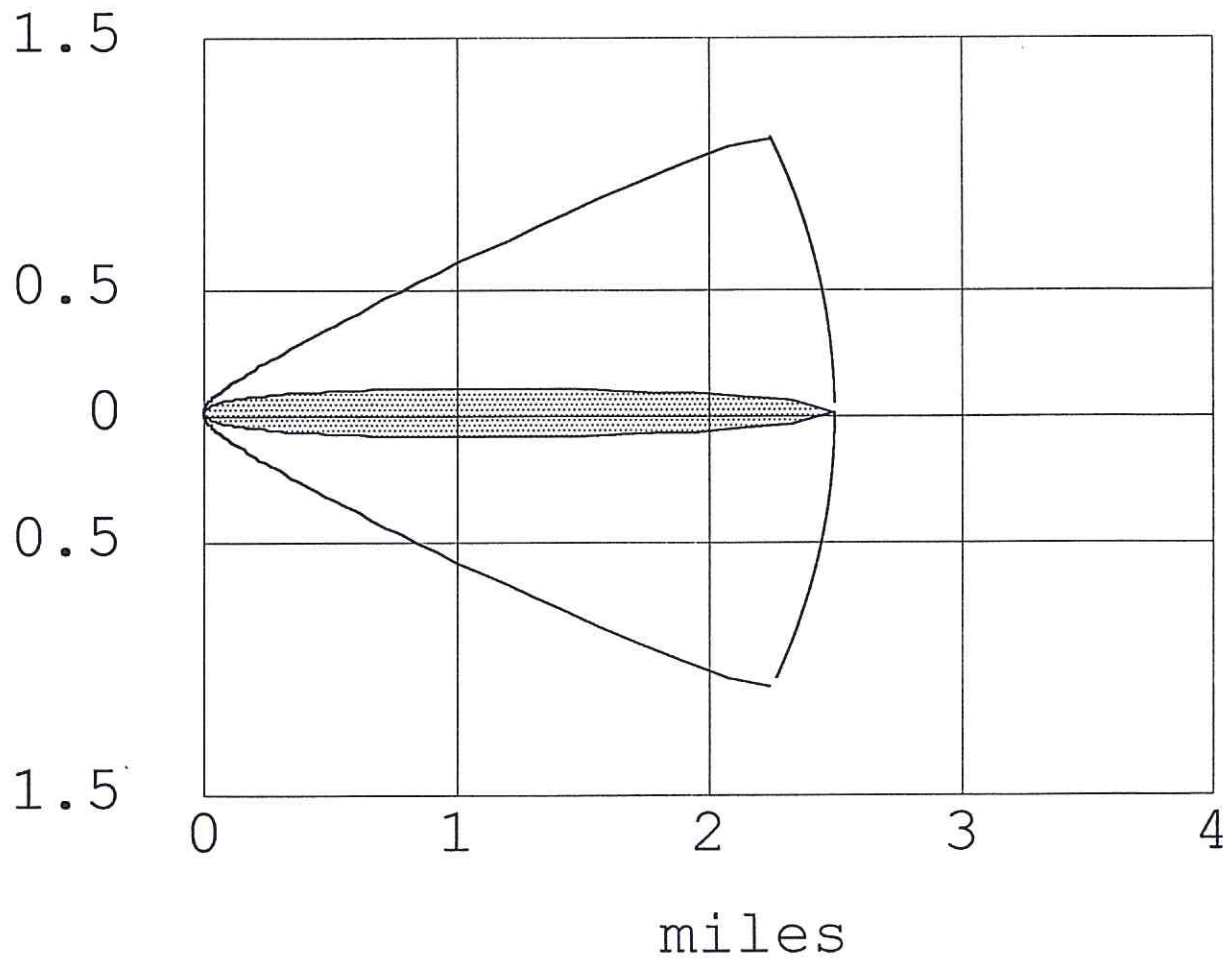
Direct Source: 110 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 110 pounds/min
Total Amount Released: 1,100 pounds
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 2.2 miles
Max Threat Zone for IDLH: 1.2 miles

Time: February 11, 1997 0940 hours PST (Using computer's clock)
Chemical Name: CHLORINE
Wind: 3.4 mph from 180° true at 3 meters
FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)
Model Run: Heavy Gas
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 2.5 miles

miles



Source Strength (Release Rate)

ALOHA 5.2

Time: February 11, 1997 0940 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 110 pounds/min

Source Height: 0

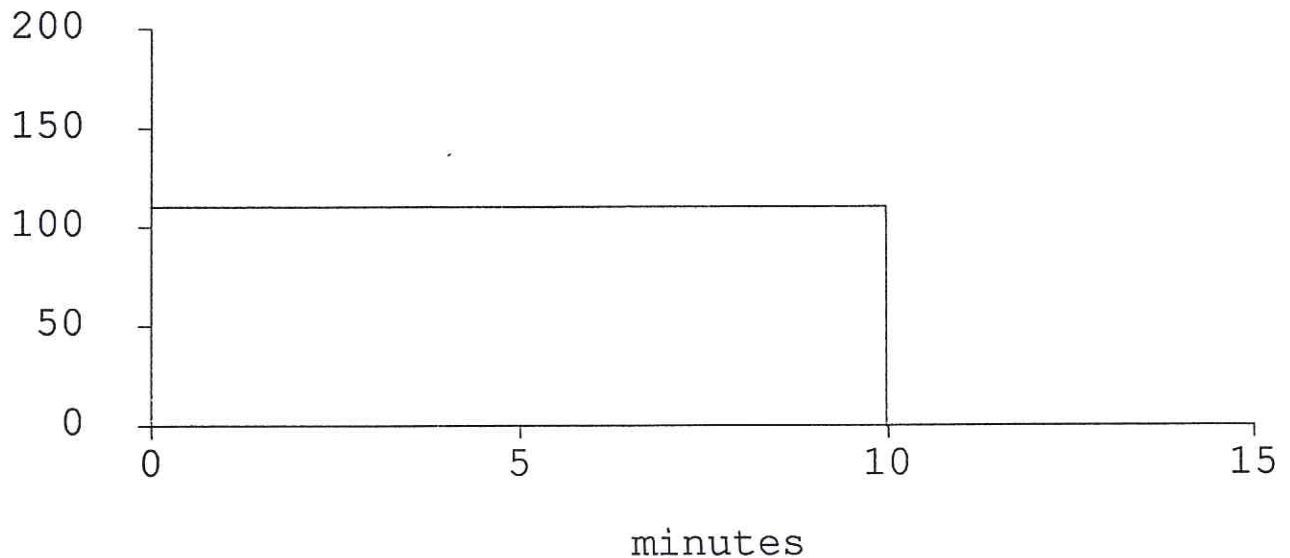
Release Duration: 10 minutes

Release Rate: 110 pounds/min

Total Amount Released: 1,100 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SACRAMENTO, CALIFORNIA
Building Air Exchanges Per Hour: 0.50 (Enclosed office)
Time: February 11, 1997 0940 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 110 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 110 pounds/min
Total Amount Released: 1,100 pounds
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 2.5 miles

APPENDIX A
COMPUTER OUTPUT DATA

Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

FOOTPRINT INFORMATION: (GAUSS SELECTED)

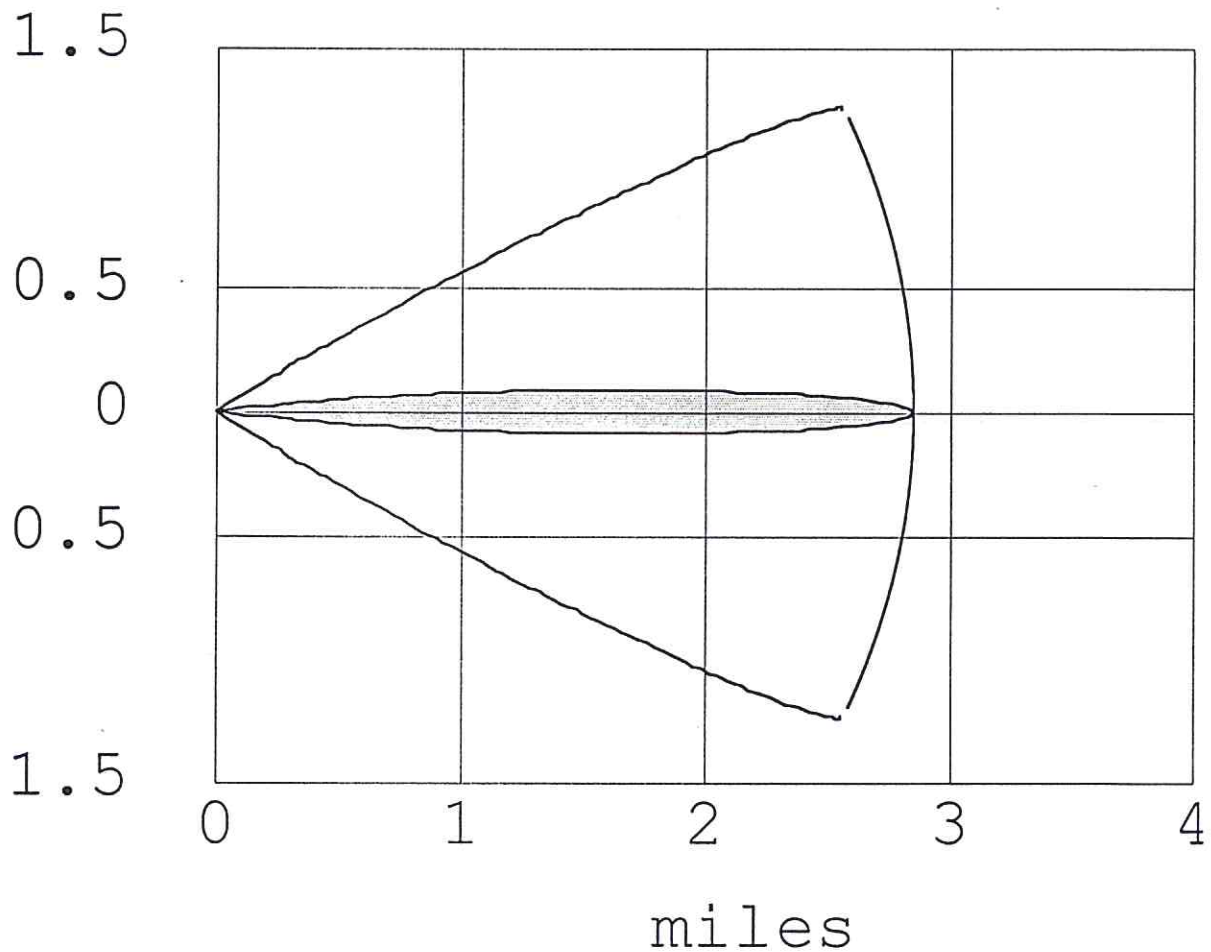
Dispersion Module: Gaussian

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 2.9 miles

Max Threat Zone for IDLH: 1.6 miles

miles



Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 200 pounds/min

Source Height: 0

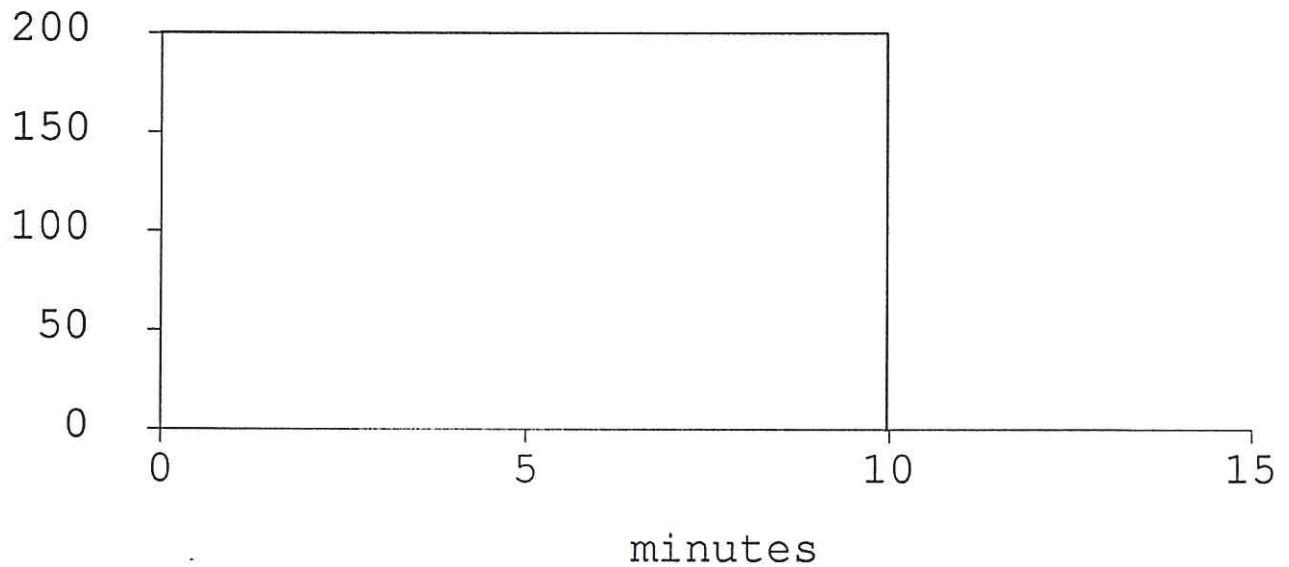
Release Duration: 10 minutes

Release Rate: 200 pounds/min

Total Amount Released: 2,000 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 7, 1997 1738 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 200 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 200 pounds/min
Total Amount Released: 2,000 pounds
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 2.9 miles
Max Threat Zone for IDLH: 1.6 miles

Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

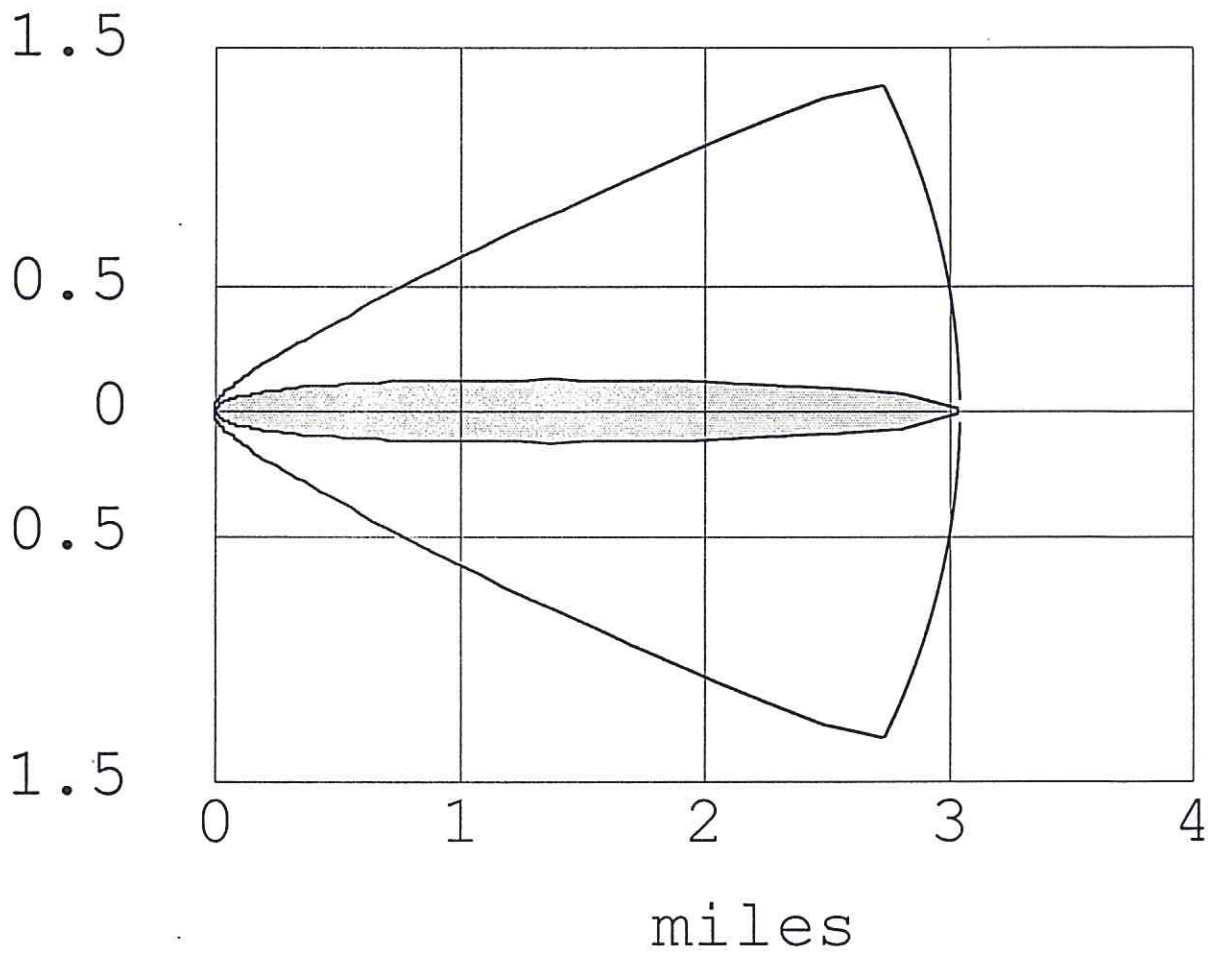
FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 3.0 miles

miles



Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 200 pounds/min

Source Height: 0

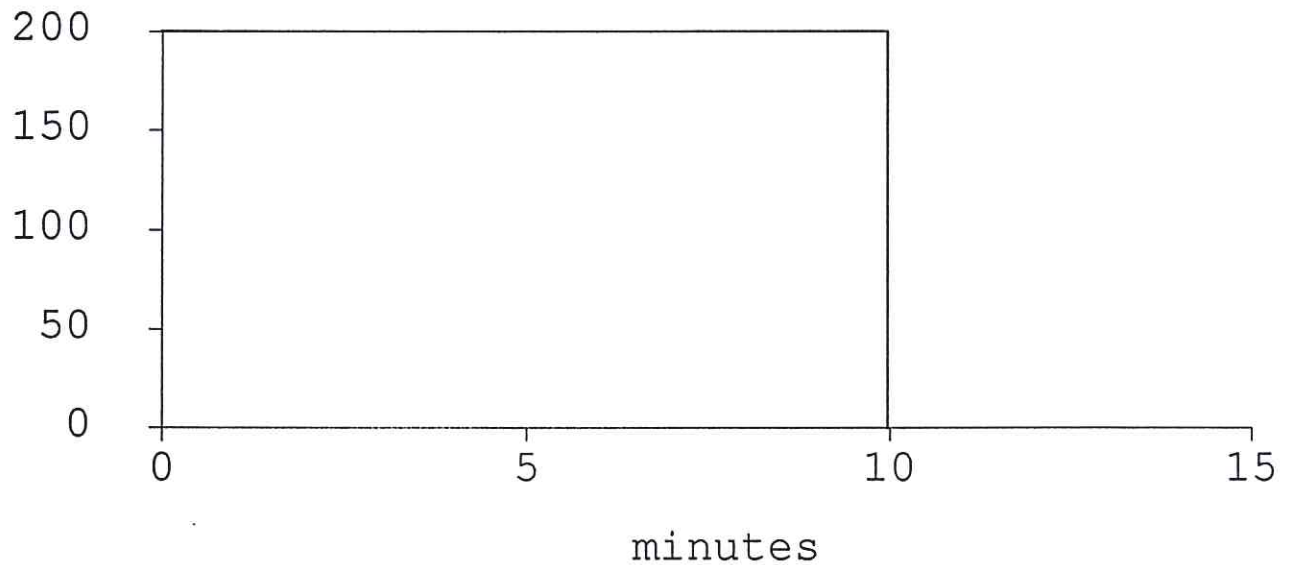
Release Duration: 10 minutes

Release Rate: 200 pounds/min

Total Amount Released: 2,000 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 7, 1997 1738 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

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TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 200 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 200 pounds/min
Total Amount Released: 2,000 pounds
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 3.0 miles

Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

FOOTPRINT INFORMATION: (GAUSS SELECTED)

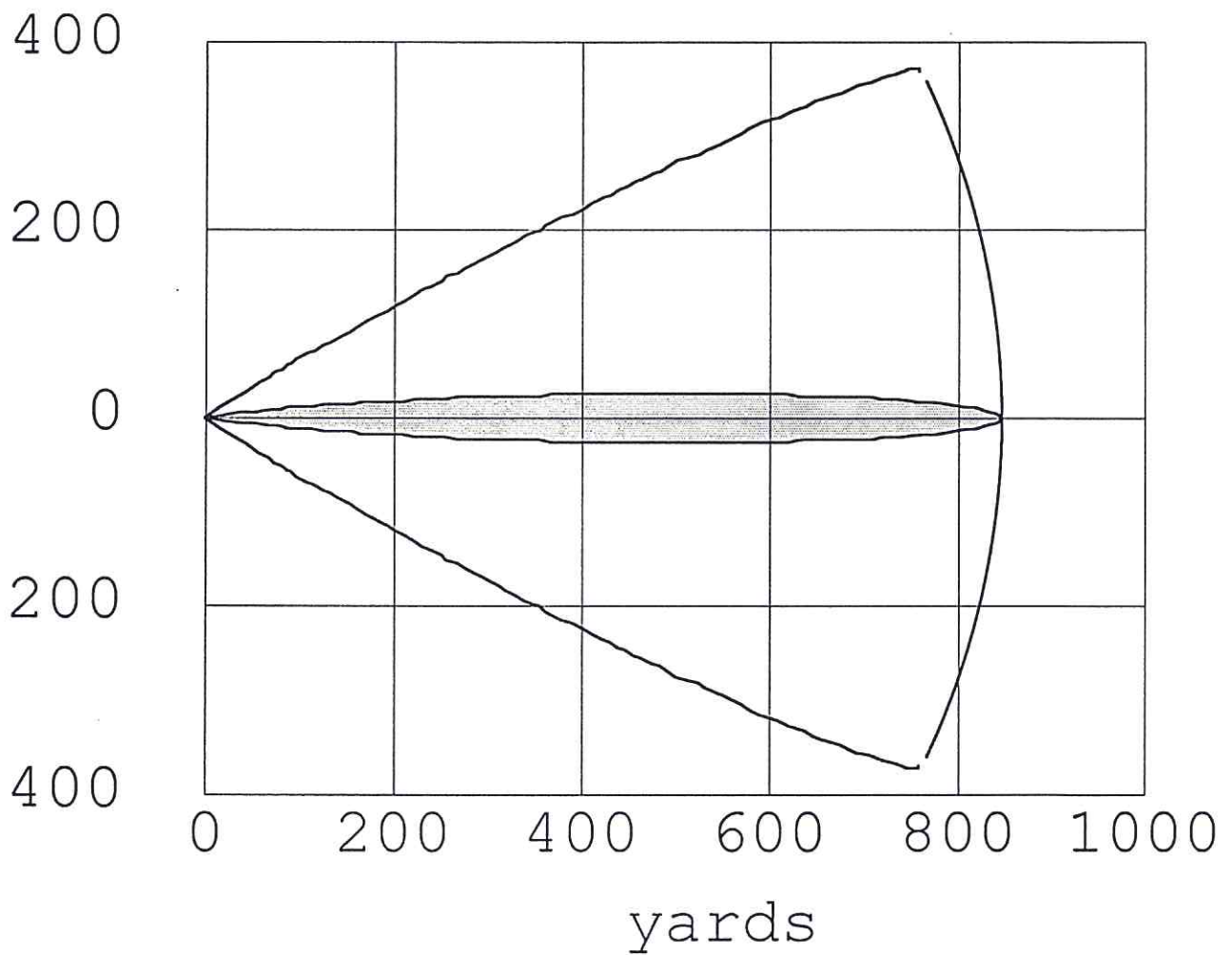
Dispersion Module: Gaussian

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 848 yards

Max Threat Zone for IDLH: 426 yards

yards



Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank

Tank Diameter: 3.167 feet Tank Length: 8 feet

Tank Volume: 63.0 cubic feet

Tank contains liquid

Internal Temperature: 77° F

Chemical Mass in Tank: 2000 pounds

Tank is 35% full

Circular Opening Diameter: 0.25 inches

Opening is 3.17 feet from tank bottom

Release Duration: ALOHA limited the duration to 1 hour

Max Computed Release Rate: 7.46 pounds/min

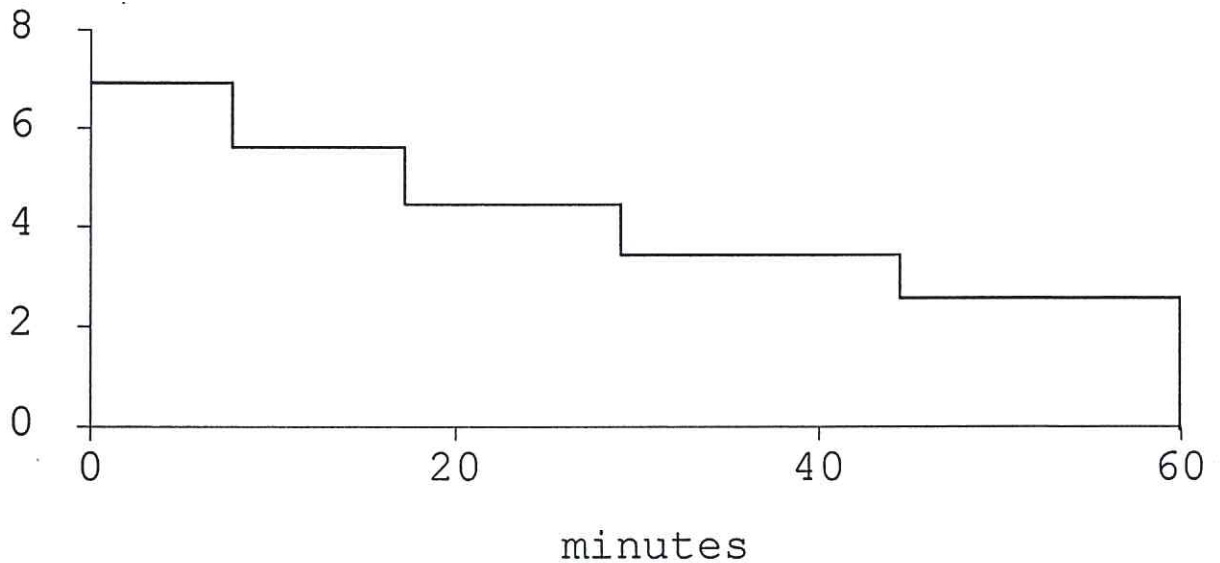
Max Average Sustained Release Rate: 6.92 pounds/min

(averaged over a minute or more)

Total Amount Released: 254 pounds

Note: The chemical escaped from the tank as a gas.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 7, 1997 1738 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank
Tank Diameter: 3.167 feet Tank Length: 8 feet
Tank Volume: 63.0 cubic feet
Tank contains liquid
Internal Temperature: 77° F
Chemical Mass in Tank: 2000 pounds
Tank is 35% full
Circular Opening Diameter: 0.25 inches
Opening is 3.17 feet from tank bottom
Release Duration: ALOHA limited the duration to 1 hour
Max Computed Release Rate: 7.46 pounds/min
Max Average Sustained Release Rate: 6.92 pounds/min
(averaged over a minute or more)
Total Amount Released: 254 pounds
Note: The chemical escaped from the tank as a gas.

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 848 yards
Max Threat Zone for IDLH: 426 yards

Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

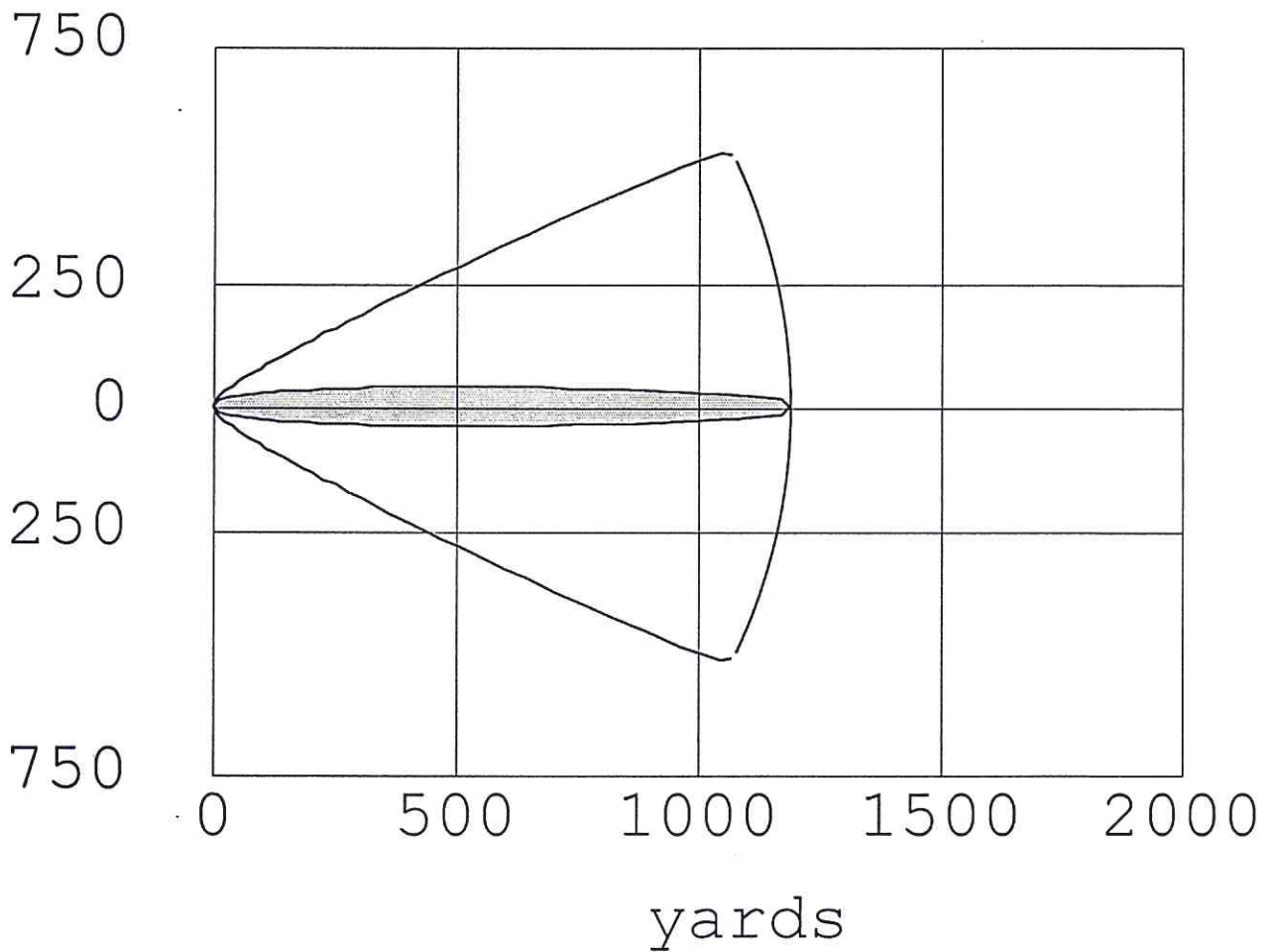
FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 1,193 yards

yards



Time: February 7, 1997 1738 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank

Tank Diameter: 3.167 feet Tank Length: 8 feet

Tank Volume: 63.0 cubic feet

Tank contains liquid

Internal Temperature: 77° F

Chemical Mass in Tank: 2000 pounds

Tank is 35% full

Circular Opening Diameter: 0.25 inches

Opening is 3.17 feet from tank bottom

Release Duration: ALOHA limited the duration to 1 hour

Max Computed Release Rate: 7.46 pounds/min

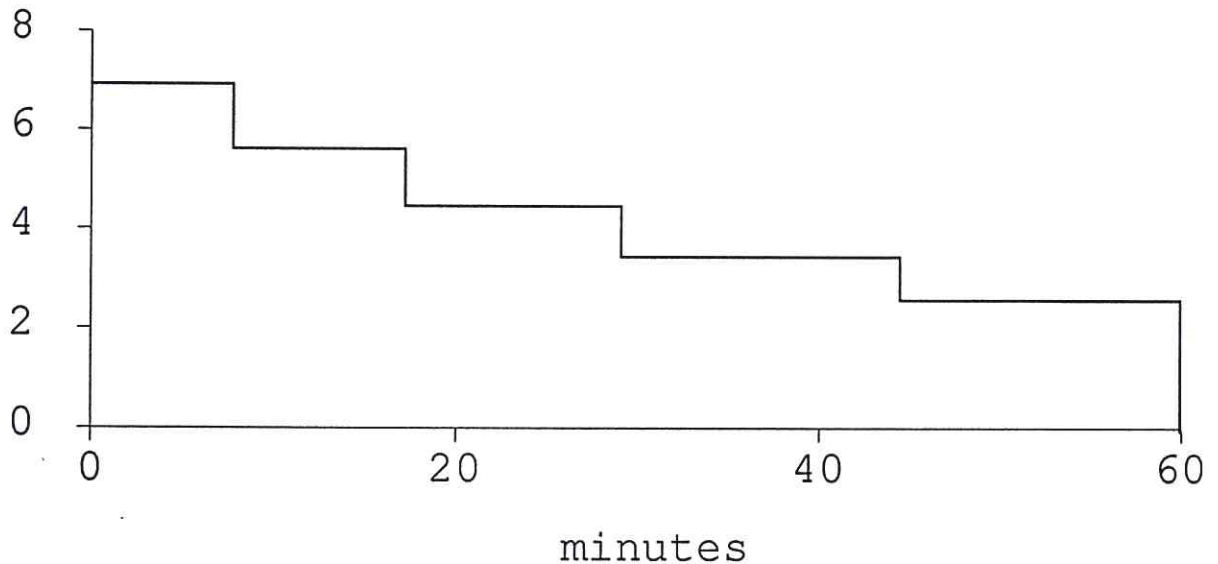
Max Average Sustained Release Rate: 6.92 pounds/min

(averaged over a minute or more)

Total Amount Released: 254 pounds

Note: The chemical escaped from the tank as a gas.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 7, 1997 1738 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank
Tank Diameter: 3.167 feet Tank Length: 8 feet
Tank Volume: 63.0 cubic feet
Tank contains liquid
Internal Temperature: 77° F
Chemical Mass in Tank: 2000 pounds
Tank is 35% full
Circular Opening Diameter: 0.25 inches
Opening is 3.17 feet from tank bottom
Release Duration: ALOHA limited the duration to 1 hour
Max Computed Release Rate: 7.46 pounds/min
Max Average Sustained Release Rate: 6.92 pounds/min
(averaged over a minute or more)
Total Amount Released: 254 pounds
Note: The chemical escaped from the tank as a gas.

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 1,193 yards

Time: February 8, 1997 1334 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

FOOTPRINT INFORMATION: (GAUSS SELECTED)

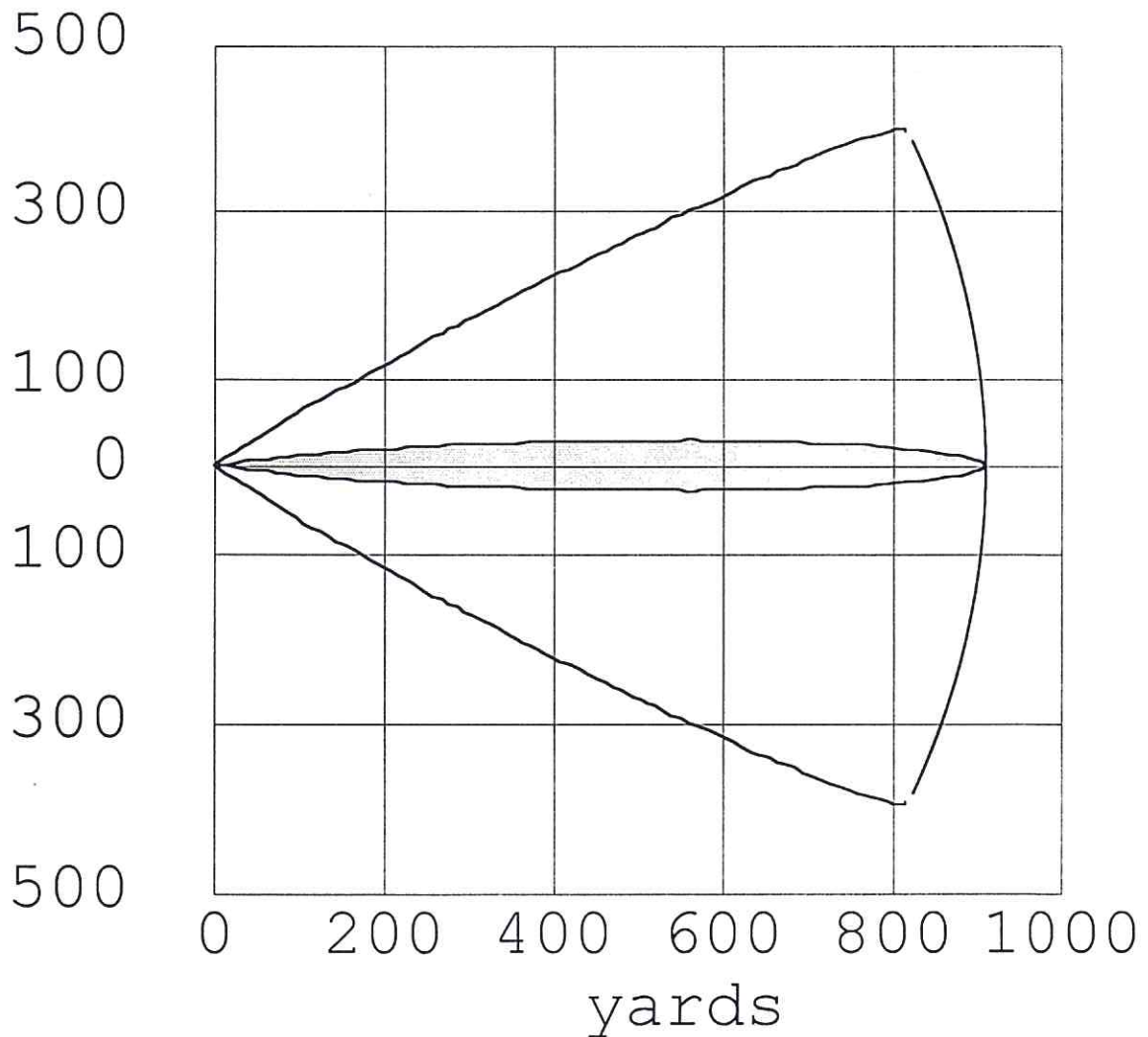
Dispersion Module: Gaussian

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 907 yards

Max Threat Zone for IDLH: 468 yards

yards



Time: February 8, 1997 1334 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank

Tank Diameter: 3.167 feet Tank Length: 8 feet

Tank Volume: 63.0 cubic feet

Tank contains liquid

Internal Temperature: 77° F

Chemical Mass in Tank: 2000 pounds

Tank is 35% full

Circular Opening Diameter: 0.125 inches

Opening is 3.17 feet from tank bottom

Release Duration: ALOHA limited the duration to 1 hour

Max Computed Release Rate: 1.86 pounds/min

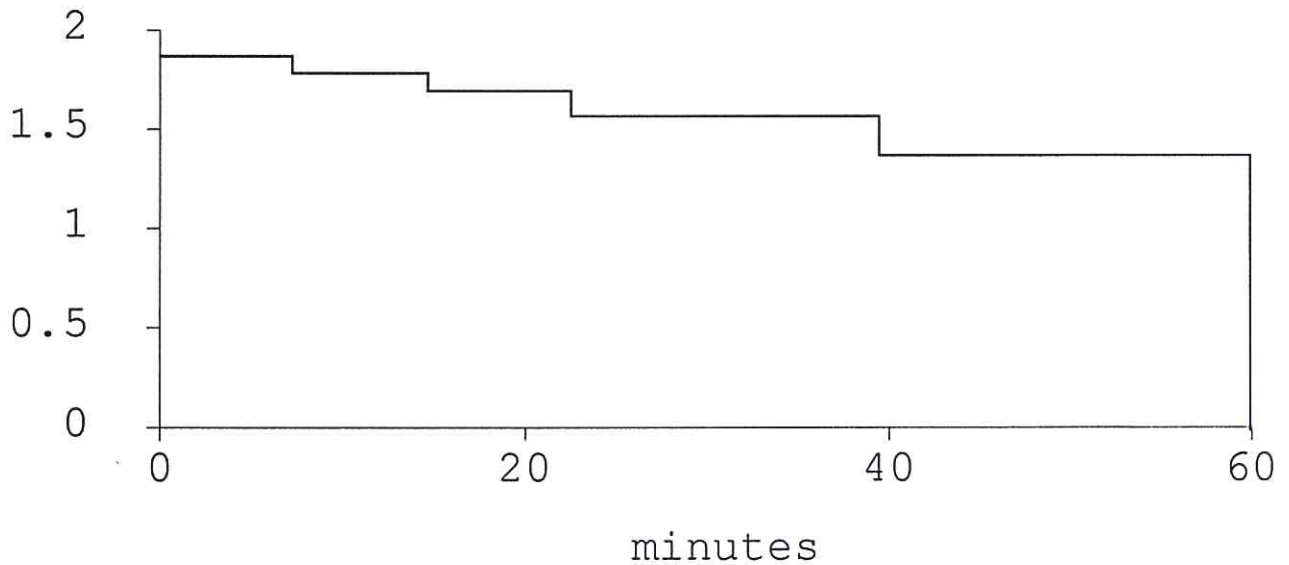
Max Average Sustained Release Rate: 1.86 pounds/min

(averaged over a minute or more)

Total Amount Released: 94.7 pounds

Note: The chemical escaped from the tank as a gas.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 8, 1997 1334 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Open country
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank
Tank Diameter: 3.167 feet Tank Length: 8 feet
Tank Volume: 63.0 cubic feet
Tank contains liquid
Internal Temperature: 77° F
Chemical Mass in Tank: 2000 pounds
Tank is 35% full
Circular Opening Diameter: 0.125 inches
Opening is 3.17 feet from tank bottom
Release Duration: ALOHA limited the duration to 1 hour
Max Computed Release Rate: 1.86 pounds/min
Max Average Sustained Release Rate: 1.86 pounds/min
(averaged over a minute or more)
Total Amount Released: 94.7 pounds
Note: The chemical escaped from the tank as a gas.

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 907 yards
Max Threat Zone for IDLH: 468 yards

Time: February 8, 1997 1334 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

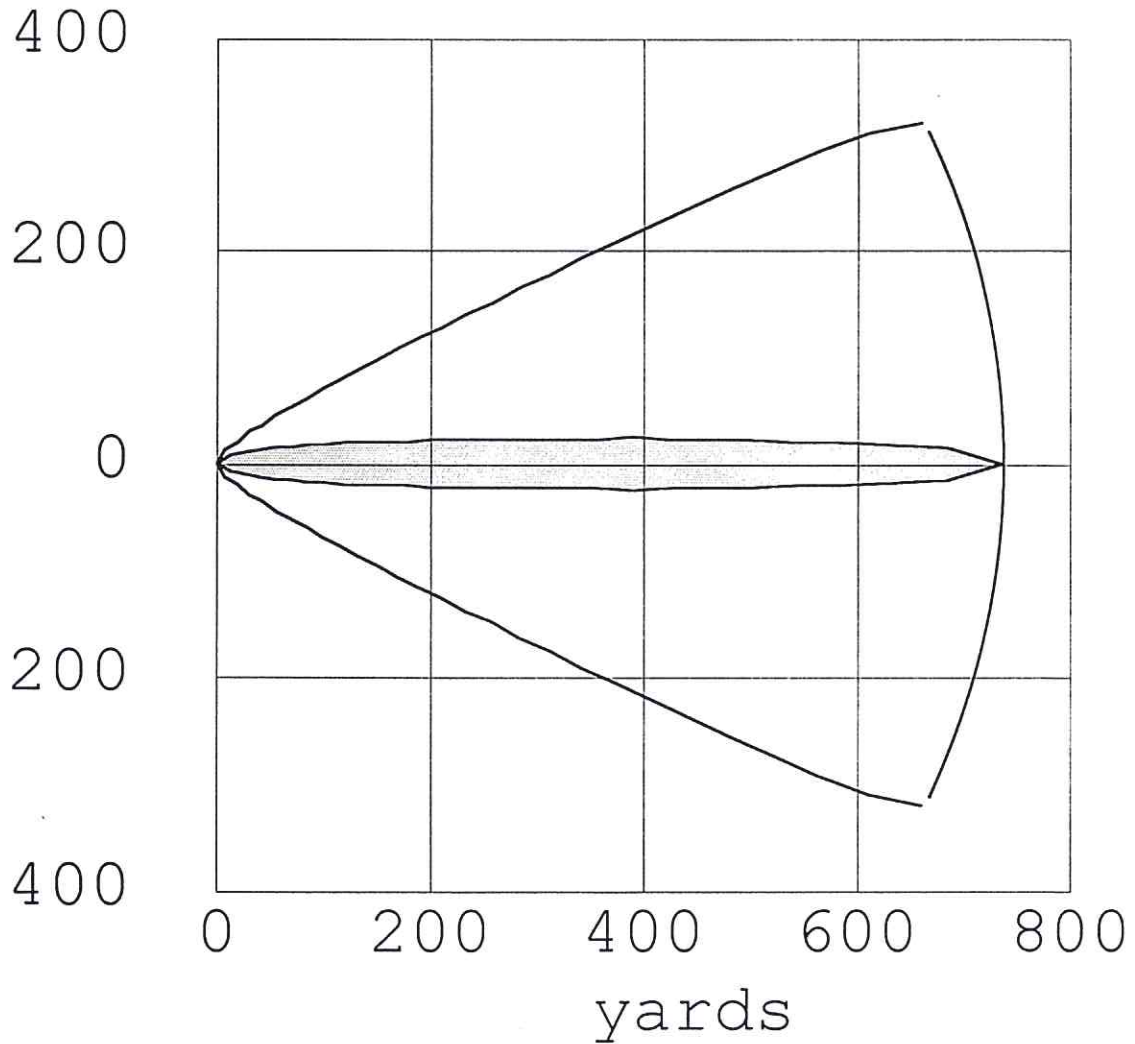
FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 734 yards

yards



Time: February 8, 1997 1334 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank

Tank Diameter: 3.167 feet Tank Length: 8 feet

Tank Volume: 63.0 cubic feet

Tank contains liquid

Internal Temperature: 77° F

Chemical Mass in Tank: 2000 pounds

Tank is 35% full

Circular Opening Diameter: 0.125 inches

Opening is 3.17 feet from tank bottom

Release Duration: ALOHA limited the duration to 1 hour

Max Computed Release Rate: 1.86 pounds/min

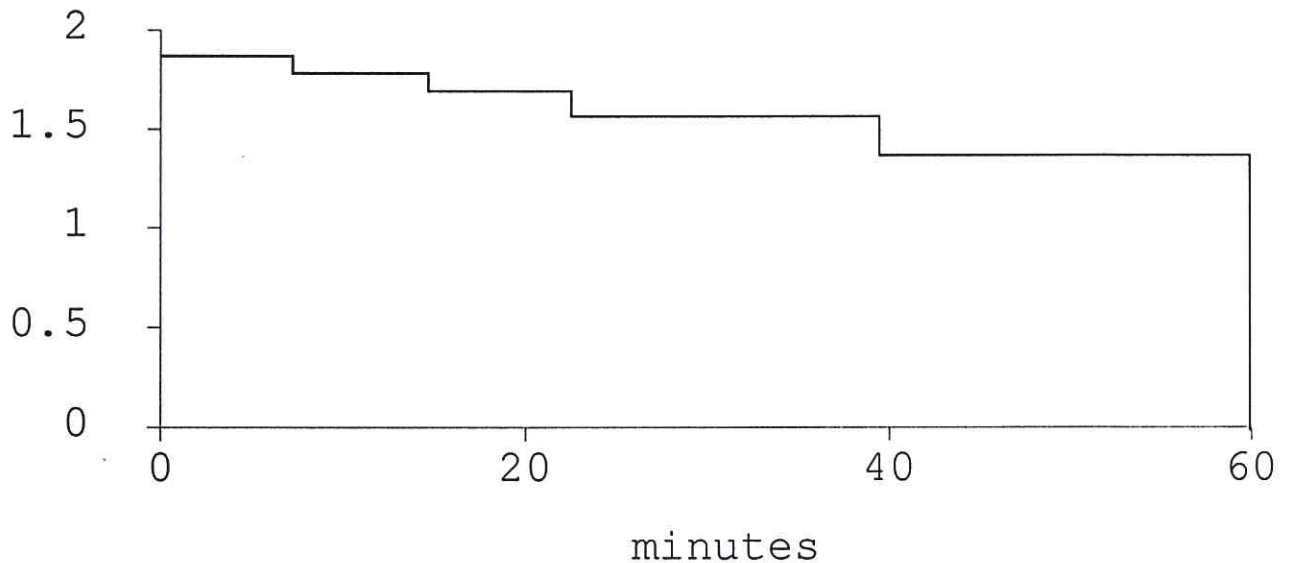
Max Average Sustained Release Rate: 1.86 pounds/min

(averaged over a minute or more)

Total Amount Released: 94.7 pounds

Note: The chemical escaped from the tank as a gas.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 8, 1997 1334 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Open country
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Leak from short pipe or valve in horizontal cylindrical tank
Tank Diameter: 3.167 feet Tank Length: 8 feet
Tank Volume: 63.0 cubic feet
Tank contains liquid
Internal Temperature: 77° F
Chemical Mass in Tank: 2000 pounds
Tank is 35% full
Circular Opening Diameter: 0.125 inches
Opening is 3.17 feet from tank bottom
Release Duration: ALOHA limited the duration to 1 hour
Max Computed Release Rate: 1.86 pounds/min
Max Average Sustained Release Rate: 1.86 pounds/min
(averaged over a minute or more)
Total Amount Released: 94.7 pounds
Note: The chemical escaped from the tank as a gas.

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 734 yards

Time: February 10, 1997 1240 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

FOOTPRINT INFORMATION: (GAUSS SELECTED)

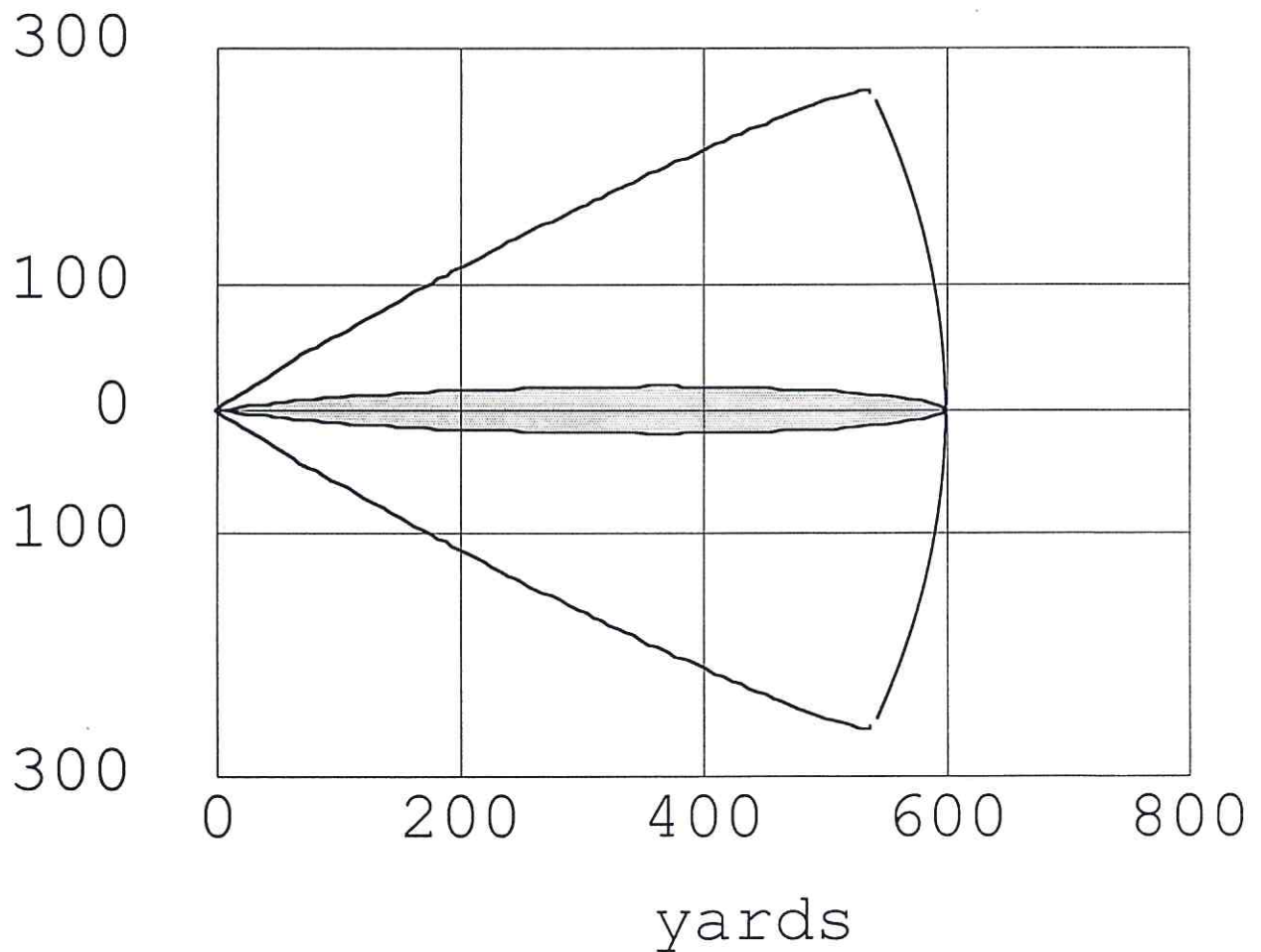
Dispersion Module: Gaussian

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 598 yards

Max Threat Zone for IDLH: 306 yards

yards



Time: February 10, 1997 1240 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 3.8 pounds/min

Source Height: 0

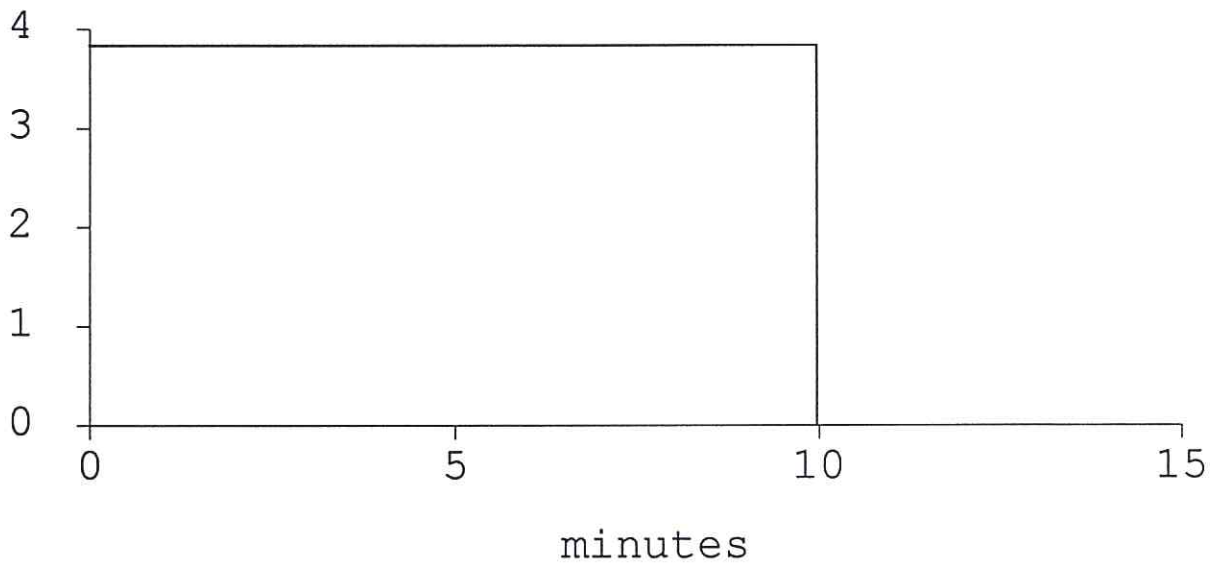
Release Duration: 10 minutes

Release Rate: 3.8 pounds/min

Total Amount Released: 38.0 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 10, 1997 1240 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 3.8 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 3.8 pounds/min
Total Amount Released: 38.0 pounds
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 598 yards
Max Threat Zone for IDLH: 306 yards

Time: February 9, 1997 1928 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

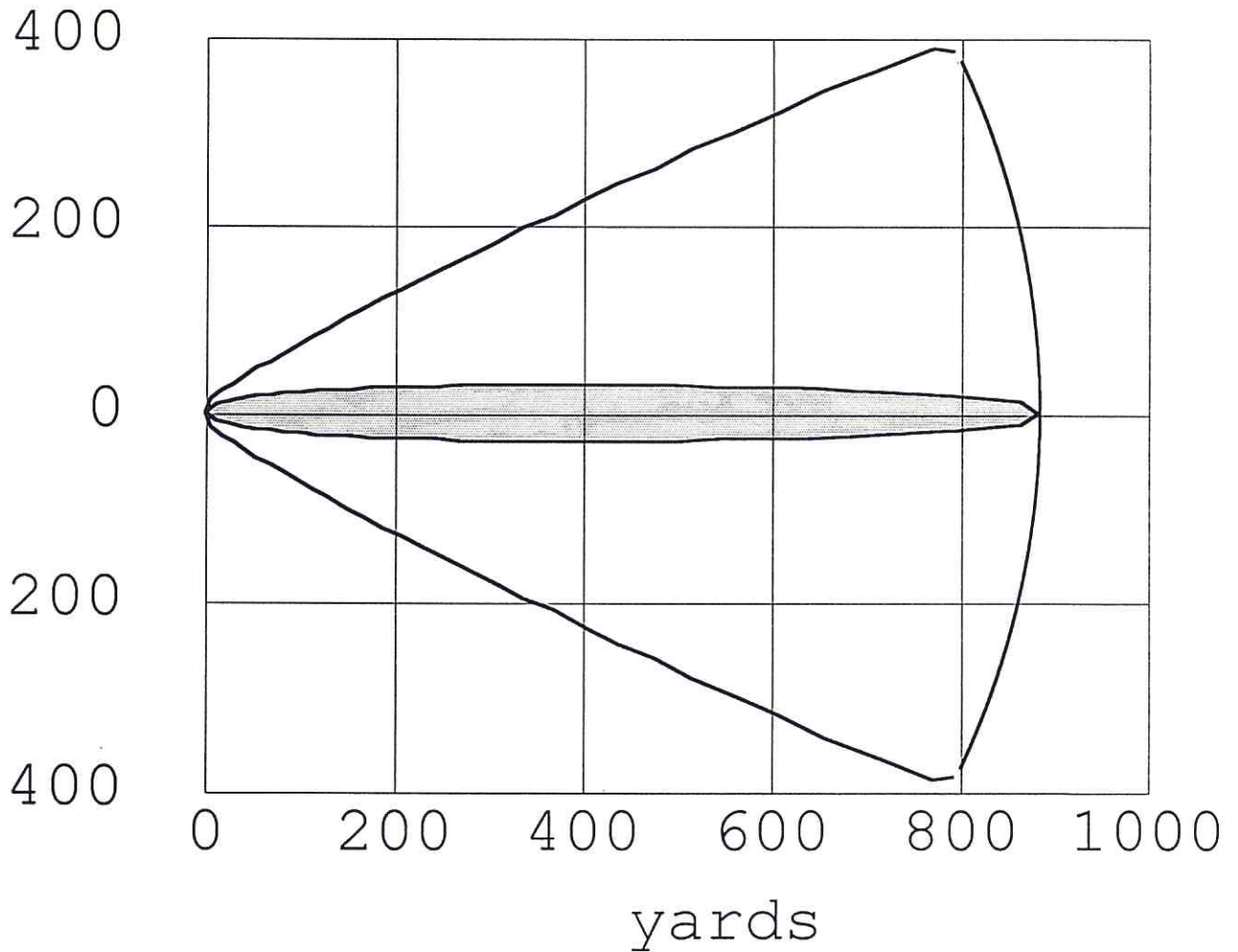
FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 883 yards

yards



Time: February 9, 1997 1928 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 3.8 pounds/min

Source Height: 0

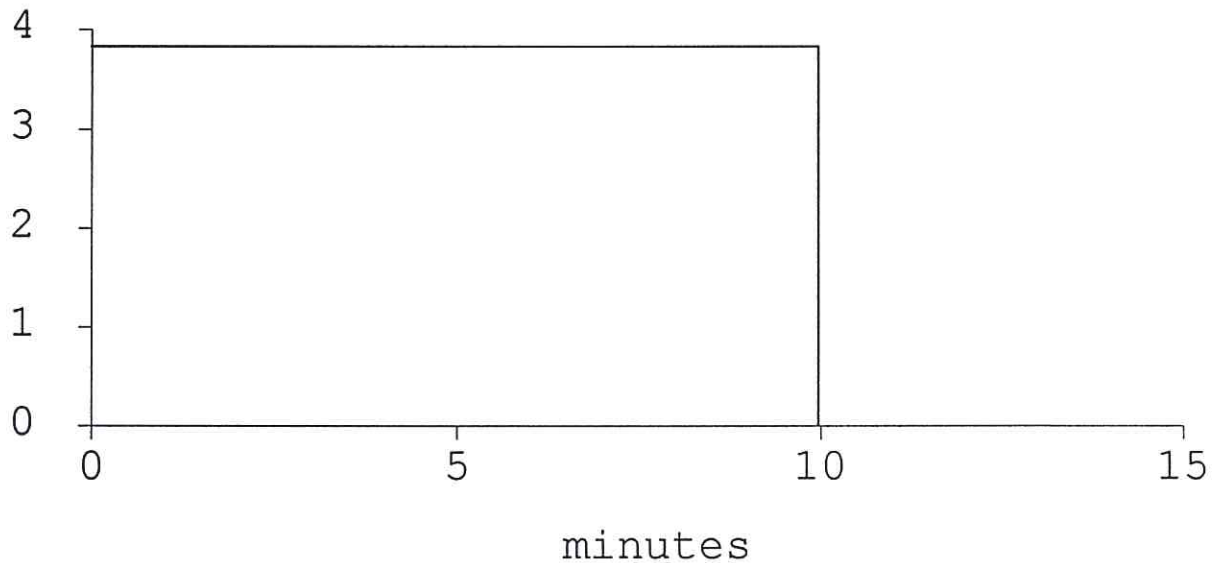
Release Duration: 10 minutes

Release Rate: 3.8 pounds/min

Total Amount Released: 38.0 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 9, 1997 1928 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 3.8 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 3.8 pounds/min
Total Amount Released: 38.0 pounds
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 883 yards

Time: February 10, 1997 1240 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

FOOTPRINT INFORMATION: (GAUSS SELECTED)

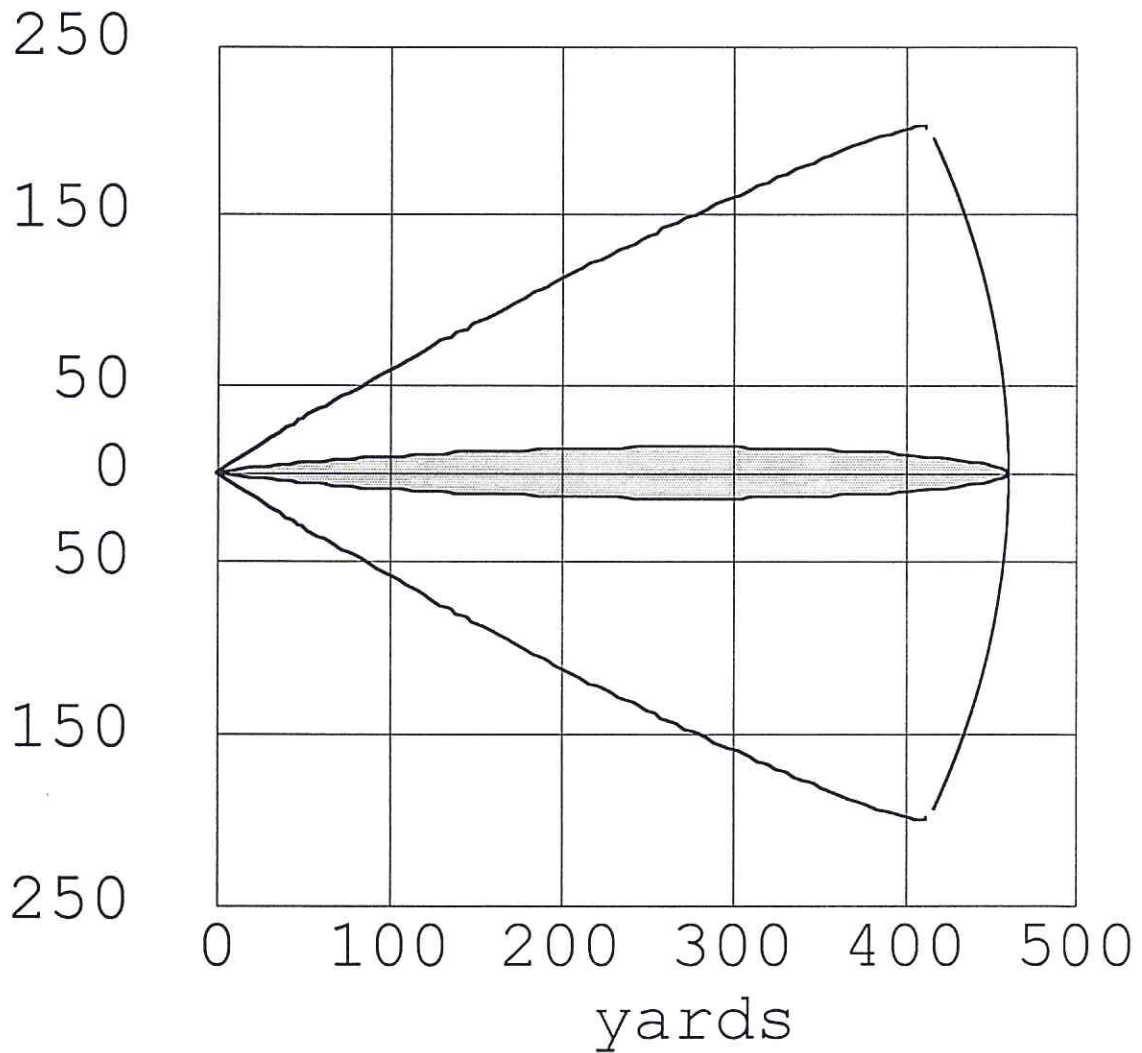
Dispersion Module: Gaussian

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 462 yards

Max Threat Zone for IDLH: 239 yards

yards



Time: February 10, 1997 1240 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 2.4 pounds/min

Source Height: 0

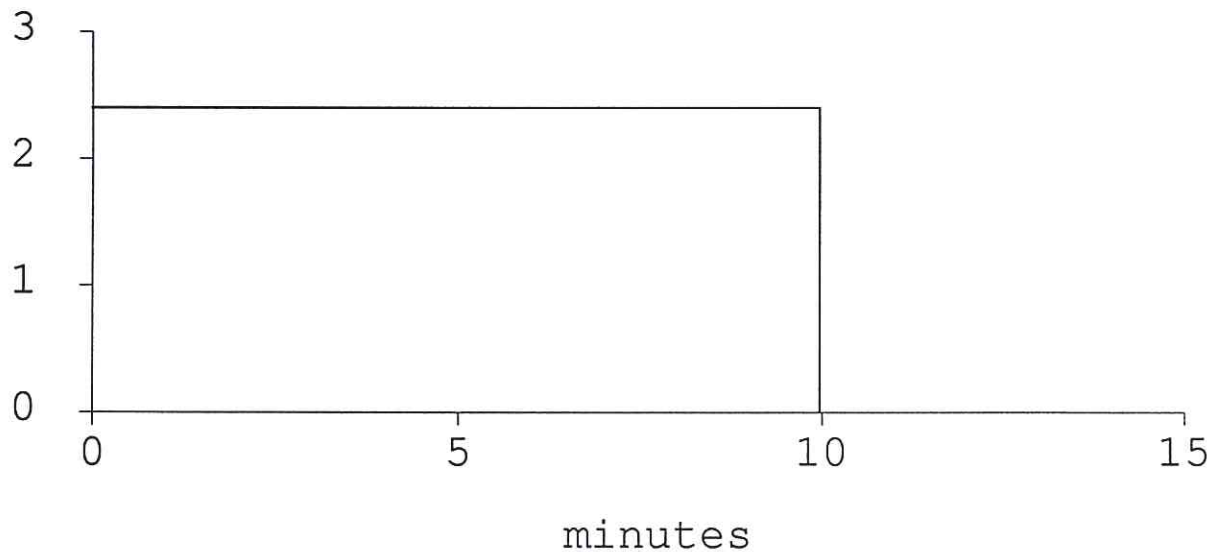
Release Duration: 10 minutes

Release Rate: 2.4 pounds/min

Total Amount Released: 24.0 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 10, 1997 1240 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 2.4 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 2.4 pounds/min
Total Amount Released: 24.0 pounds

Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (GAUSS SELECTED)

Dispersion Module: Gaussian
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 462 yards
Max Threat Zone for IDLH: 239 yards

Time: February 9, 1997 1928 hours PST (Using computer's clock)

Chemical Name: CHLORINE

Wind: 3.4 mph from 180° true at 3 meters

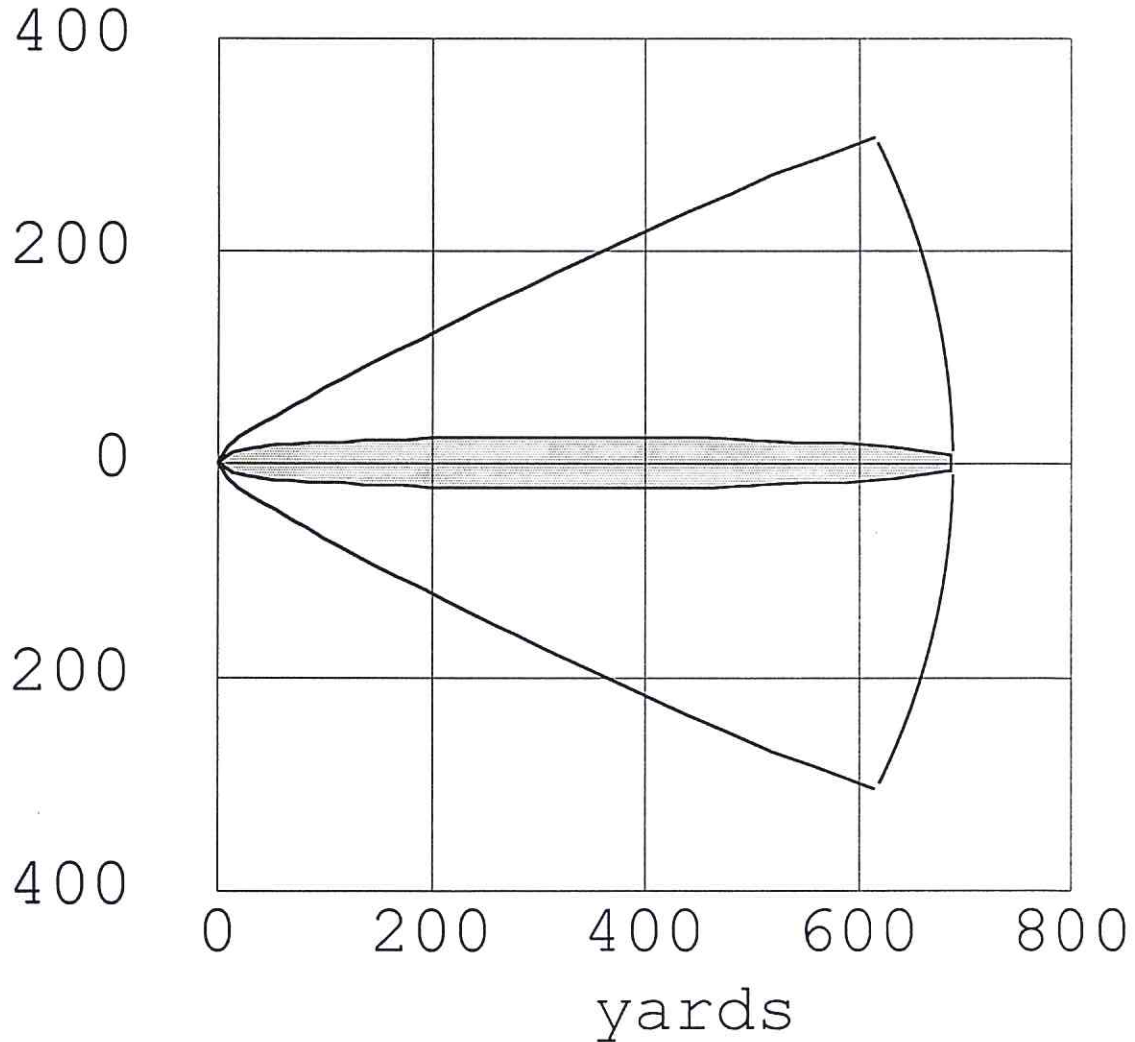
FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas

User-specified LOC: 3 ppm

Max Threat Zone for LOC: 686 yards

yards



Time: February 9, 1997 1928 hours PST (Using computer's clock)

Chemical Name: CHLORINE

SOURCE STRENGTH INFORMATION:

Direct Source: 2.4 pounds/min

Source Height: 0

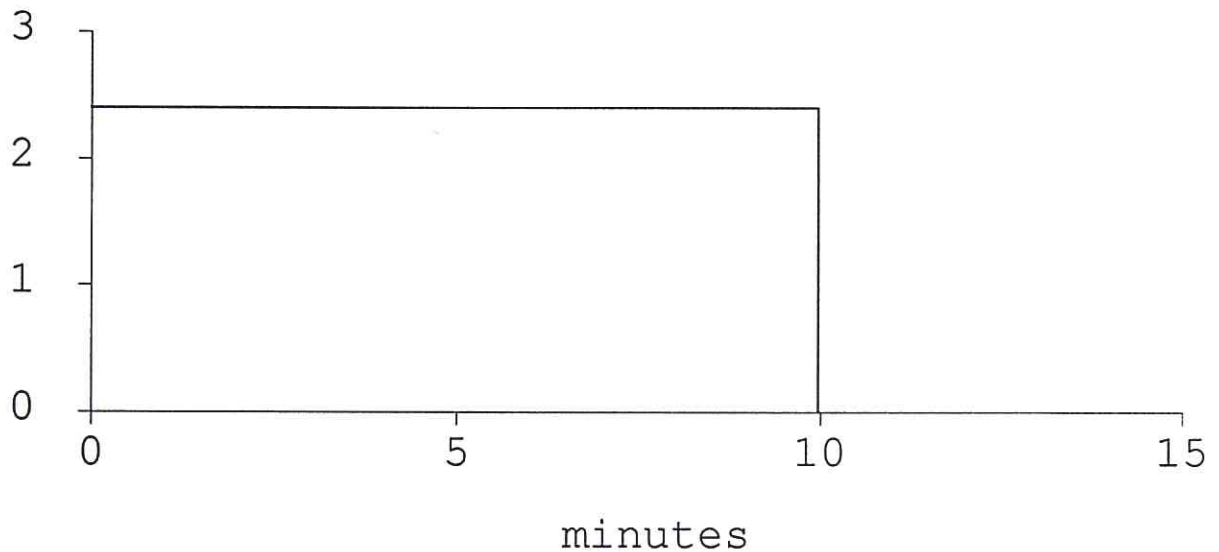
Release Duration: 10 minutes

Release Rate: 2.4 pounds/min

Total Amount Released: 24.0 pounds

Note: This chemical may flash boil and/or result in two phase flow.

pounds/minute



SITE DATA INFORMATION:

Location: SAN JOSE, CALIFORNIA
Building Air Exchanges Per Hour: 60 (User specified)
Time: February 9, 1997 1928 hours PST (Using computer's clock)

CHEMICAL INFORMATION:

Chemical Name: CHLORINE Molecular Weight: 70.91 kg/kmol
TLV-TWA: 0.5 ppm IDLH: 10 ppm
Footprint Level of Concern: 3 ppm
Boiling Point: -29.25° 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: 3.4 mph from 180° true at 3 meters
No Inversion Height
Stability Class: F (user override)
Air Temperature: 77° F
Relative Humidity: 50% Ground Roughness: Urban or forest
Cloud Cover: 2 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 2.4 pounds/min
Source Height: 0
Release Duration: 10 minutes
Release Rate: 2.4 pounds/min
Total Amount Released: 24.0 pounds
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION: (HEAVY GAS SELECTED)

Model Run: Heavy Gas
User-specified LOC: 3 ppm
Max Threat Zone for LOC: 686 yards