

Conditional Use Permit - Risk Assessment

**Tulip Kids, Inc.
1271 Lawrence Station Road
Sunnyvale, CA 94089**

**Project Number: PR-000583
Document Number: Draft A**

Date Prepared: June 1, 2016

Prepared by:



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Section One

Overview

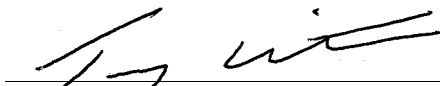
This is an engineering report of the Otis Institute Inc.'s opinions and conclusions regarding the potential exposure to hazardous materials which may occur at the Tulip Kids Preschool Center due to its location in an industrial zone. Based on:

- The Industrial Activity Screening in the Area (2500 feet radius),
- The Hazardous Material Inventory Statement provided by the Sunnyvale Department of Public Health on May 26, 2016,
- The Worst-Case Gas Release Modeling,
- The Planner's Guidelines for Preparation of Risk Assessments,

no chemicals were identified as potential chemicals of concern (COC) during a worst case release scenario that may have negative environmental impacts at the 1271 Lawrence Station Road project site.

The risk assessment concludes that the Tulip Kids Preschool Center is not within 1/10th IDLH level (Immediately Dangerous to Life and Health) of a COC, and that mitigation measures are not required. However, recommendations for the emergency action plan and parental disclosure are listed on the next page and will provide added safeguards to reduce the potential impact of a toxic chemical release in the area.

This report and its documented results were produced by Troy Christensen, PE and Emilie Cherre, EHS Consultant.


(Signature)

Troy Christensen, PE 06/01/2016
(Name) - (Date)

California - C64870 Expires - 06/30/2017
(State of Registration) - (Registration Number)



Recommended Conditions of Approval

The following is recommended to reduce the potential impact of a toxic chemical release in the area:

1. Implementing an Emergency Action Plan (EAP) with Evacuation and Shelter in Place procedures. The EAP shall include training of employees and drills to verify the emergency systems described below are well understood. A test shall be administered to verify the competence of employees.
2. Installing a wind directional sock on the building for assessing wind direction and weather conditions.
3. Implementing an in-place communication system for notifying occupants via a prerecorded message in the event of an incident, and directing them regarding emergency procedures to follow.
4. Verifying locations and existence of all manual shutoff controls for the building ventilation system.
5. Implementing a parental notification process including a description of how each parent will be notified of the nature of hazards in the area. This shall include at minimum:
 - a. A notification that includes the emergency procedures in place to protect their children, and what procedures the parents need to follow in the event of each type of anticipated emergency.
 - b. Notification records are to be maintained, signed by parents, stating that they understand and accept the emergency procedures that are in place.

Limitations

This Risk Assessment Report has been prepared by Otis Institute's consultants who have over 20 years of chemical release risk assessment experience. They are knowledgeable about industrial manufacturing processes, including the types of hazardous materials used in the processes that were evaluated in this assessment. This report has been prepared based on information provided by the Sunnyvale Department of Public Health and the Tulip Kids Preschool Center in May 2016.

No modeling assessment can wholly eliminate uncertainty regarding the impact to the site from accidental and catastrophic releases of hazardous materials. This threat zone modeling is intended to reduce, but not eliminate, uncertainty regarding the potential for impacts to the site from such catastrophic releases. The primary uncertainties associated with this appraisal included the selection of facilities and chemicals for evaluation, the size of each release, assumptions concerning release location, vapor pressures of released liquids, assumed area of liquid spills, and atmospheric conditions during the release.

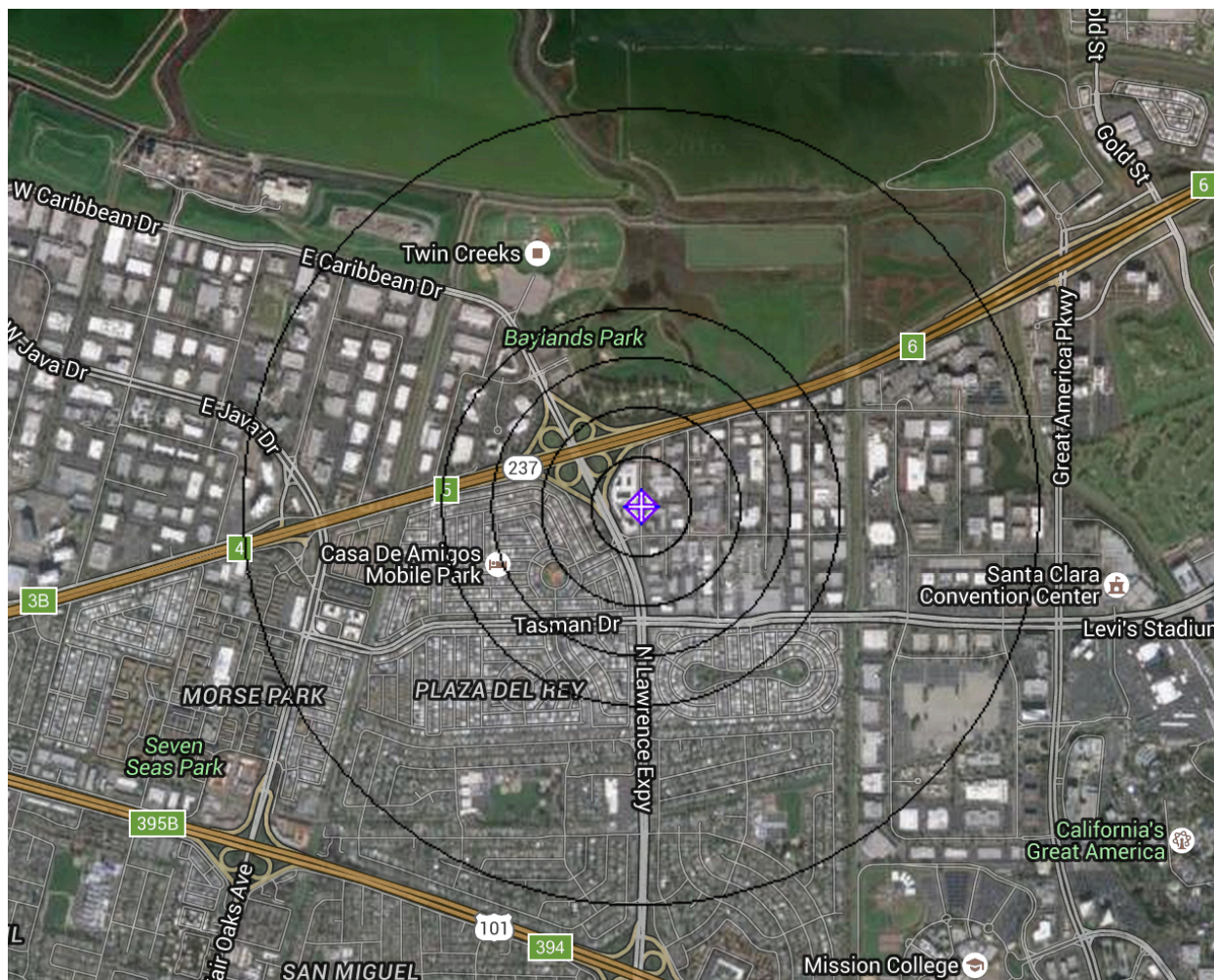
No warranty, expressed or implied, is made. In the event that changes in the nature, use, or layout of the facility, or in the chemical usage of the facilities around 1271 Lawrence Station Road be valid. This evaluation is valid for one year.

Section Two

Project Overview

Tulip Kids, Inc. plans to open a Preschool Center serving children aged two to five years on the lower floor of an existing mixed-use building located at 1271 Lawrence Station Road in Sunnyvale, California. The Childcare Center would operate from 8:00 am to 6:00 pm with a capacity of 85 children and 11 teachers and supporting staff members.

Figure 1: Tulip Kids Preschool Center - Circles at 2500 feet



Section Three

Primary Land Use

Industrial activities in the neighborhood

Within a 2,500 feet radius (0.5 miles), the Otis Institute investigated businesses in the area of the 1271 Lawrence Station Road location, to determine a list of companies in the area who might use toxic and corrosive gases in the proposed preschool neighborhood. To screen all industrial activities, the Otis Institute used:

1. Envirostor, which provides a list of tiered permit sites - <http://www.envirostor.dtsc.ca.gov/public/>
2. Hazardous Waste Tracking System Reports, which provide a list of hazardous waste generators - http://hwts.dtsc.ca.gov/report_search.cfm?id=5
3. Google Map Search with key words such as: Semiconductor, Electronics, Manufacturing, Chemical, Plating, Waste, etc.

The Otis Institute submitted the list to the Sunnyvale Department of Public Health on Thursday May 26, 2016. The CUPA technical assistant searched for each address to determine whether or not the company had an active CERS Inventory. The Otis Institute was provided with Hazardous Material Inventory Statements on that same day.

Potential Chemicals of Concern Inventory

From a risk assessment perspective, the primary emphasis is to identify chemicals that are likely to have significant off-property consequences if catastrophically released. Generally, chemicals that are acutely toxic, exist in a form that readily allows off-property transport (after release), and are used/stored in sufficient quantities are assumed to represent potential Chemicals of Concern (COCs).

This evaluation determined that the following organizations had chemicals that may environmentally impact the 1271 Lawrence Station Road proposed site:

1. LABPRO - 1290 Anvilwood Court
2. WESTAK/QUALITEK, INC. - 1274/1276 Forgewood Avenue
3. UPS - 1245 Hammerwood Avenue
4. SUNNYVALE AUTO BODY - 1281/1288 Forgewood Avenue
5. KRYTAR - 1288 Anvilwood Avenue
6. CHEVRON STATION - 1265 Lawrence Station Road
7. CYTYC CORP - 1240 Elko Drive
8. ERC CONCEPTS CO - 1255 Birchwood Drive
9. ARVI MANUFACTURING CO - 1256 Birchwood Drive

Attachment One contains a spreadsheet documenting the results of the HMIS review, chemicals of concern, distance to the 1271 Lawrence Station Road location, maximum amount of the chemical onsite, units of measure, and largest container of chemical onsite.

Section Four

Review of Historical Hazmat Incidents

The Otis Institute completed a review of historical incidents involving chemicals of concern listed in Attachment One, and most particularly Acetylene or Gasoline. This determination including incident reviews documented by the:

- US Chemical Safety Board (CSB)
- San Jose Mercury Archives
- Google Search
- City of Sunnyvale Website

Reviews went back to 2006-2016, depending on the source searched, and no incidents had been documented in any of the City of Sunnyvale public records available from these sources.

Furthermore, no incident has been recorded in nearby communities with potential for off site consequences.

Section Five

Risk Evaluation: Release Scenarios and Discussions

Pure Substances

The largest container of each chemical of concern was evaluated to determine the possible off-site consequence during a catastrophic release, and if the release could have a potential negative environmental impact at the 1271 Lawrence Station Road site. Each release was evaluated as to whether a release would produce concentrations of the chemical at the project site at 1/10th of the established 'Immediately Dangerous to Life and Health' (IDLH) level, with no engineering controls in place.

This off-site consequence determination was modeled using a software program: ALOHA (Areal Locations of Hazardous Atmospheres) Version 5.4.6, to determine potential worst-case release scenarios and distances. ALOHA is a modeling program provided by the USEPA, which estimates threat zones associated with hazardous chemical releases, including toxic gas clouds, fires, and explosions. A threat zone is an area where a hazard (such as toxicity, flammability, thermal radiation, or damaging overpressure) has exceeded a user-specified Level of Concern (LOC).

The worst-case release scenarios used the requirements listed in the California Accidental Release Prevention (CalARP) guidance and EPA Risk Management Program guidance documentation.

Based on ALOHA dispersion modeling and assumptions, only one scenario was retained:

Acetylene Cylinder rupture

Note that five sites out of the nine selected have acetylene cylinders used for welding, cutting and similar processes on their property. Thus, the threat zone for acetylene release was modeled for ERC CONCEPTS CO, which is the closest business (1100 feet), with the largest container (200 Cu. Feet) on site. Below is shown the list of businesses storing and using acetylene.

Facility Name	Distance to Site	Max. Quantity	Larger Container	Unit
WESTAK/QUALITEK, INC.	1400 ft	400	200	Cu. Feet
UPS	1750 ft	500	125	Cu. Feet
SUNNYVALE AUTO BODY	1450 ft	385	130	Cu. Feet
KRYTAR	1100 ft	35	35	Cu. Feet
ERC CONCEPTS CO	1100 ft	200	200	Cu. Feet
ARVI MANUFACTURING CO	1350 ft	114	115	Cu. Feet

Tulip Kids, Inc. - Conditional Use Permit - Risk Assessment**Project Number: PR-000583****Release Type:** Instantaneous - occurs when the chemical escapes into the atmosphere within a minute**Release Duration:** 1 minute**Amount of Chemical Entering Atmosphere:** 200 Cu. Feet**Source Height:** 0 – Ground level**Volume Input:** Chemical stored as a gas, Temperature: 70 degrees Fahrenheit, Pressure: 250 psia**Wind Speed:** 1.5 meters per second**Topography:** Urban**Atmospheric Stability Class:** F (stable conditions)

The ALOHA results of catastrophic acetylene releases are documented below and ALOHA printouts are shown in Attachment Two.

Chemical Name	Larger Container (Cu. Feet)	IDLH (ppm)	1/10 IDLH (ppm)	Distance to IDLH (Feet)	Distance 1/10 IDLH (Feet)	Distance to School (Feet)
Acetylene	200	2500 ppm	250 ppm	711 feet	2046 feet	1100 feet

However, given the wide explosive limit of acetylene, an instantaneous release of the entire content of the cylinder within a minute will not lead to a toxic gas release as modeled above: Instead, most likely a torch fire will result of the escaping gas, if not an explosion.

Both flammable and overpressure (blast force) threat zone are shown in Attachment Two. None of these zones do reach the proposed site.

Discussion and conclusion:

The probability for the acetylene tank failure is 1×10^{-6} per year, based on the catastrophic failure rate of acetylene stored in a gas cylinder resulting in an instantaneous release of the entire contents of the tank and thereby having the total vapor mass involved in the explosion (Purple Book, 2005). Then, in case of a tank failure with complete mixing at Upper Flammability Limit (UFL) upon release, an instantaneous release of the entire content of the cylinder will not lead to a toxic gas release but to a flammable torch or explosion, whose consequences will not have a potential negative environmental impact at the 1271 Lawrence Station Road site.

Tulip Kids, Inc. - Conditional Use Permit - Risk Assessment**Project Number: PR-000583****Mixtures****Gasoline Spill**

Located approximately 300 feet from the site, the most significant hazardous material reported at the CHEVRON facility is a 10,000 gallon underground storage tank of gasoline.

The worst-case release from this facility hypothetically would assume that 5,000 gallons of gasoline is released during a tank refill, and the evaporating pool would generate flammable vapors for approximately 30 minutes (assuming emergency response within 30 minutes).

This release is unique in that gasoline formulations are composed of hundreds of different hydrocarbon compounds, and the assumed volume of spilled material is great. ALOHA can model pure substances and has limited capabilities with respect to large volumes released. Therefore, this release was modeled in two ways. First, the Automated Resource for Chemical Hazard Incident Evaluation (ARCHIE) was used to estimate the release rate from an evaporating pool and the potential consequences of a vapor cloud explosion. However, since ARCHIE does not offer a choice for either urban or rural dispersion conditions, U.S. EPA SCREEN3 was also used to estimate off-site consequences for an area source using urban dispersion conditions.

These dispersion models determined that the proposed preschool would be within the toxic threat zone in the eventuality that the spill is fully vaporized and does not ignite.

If the gasoline has completely vaporized and vapors did not disperse before finding an ignition source, the unconfined vapor cloud explosion effects would be:

- Range serious/slight injuries from flying glass/object.
- Partial collapse of home walls/roofs.

ARCHIE and SCREEN3 printouts are shown in Attachment Three.

Discussion and conclusion:

In our opinion, this release scenario is highly unlikely. The most common spills occur at the fill pipe when the delivery hose is disconnected. These spills tend to be small (the typical delivery hose can hold approximately 14 gallons of fuel) and easily prevented. In addition, Underground Storage Tanks are designed with catchment basins to contain such spills. Fuel deliverers are trained to follow the industry standard practices for tank filling (API Recommended Practice 1007, "Loading and Unloading of MC306 DOT 406 Cargo Tank Motor Vehicles" and NFPA 385 "Standard for Tank Vehicles for Flammable and Combustible Fuels"). Based on the large number of daily fuel deliveries throughout the Bay Area, the lack of readily available information of such catastrophic releases (5,000 gallons) of this nature actually occurring during filling operations, and the high level of training and procedural requirements for gasoline deliveries, Otis Institute did not retained this scenario.

Conclusion

The nine facilities identified as facilities of potential concern (Attachment One) do not appear to pose unacceptable risks to the proposed use of the Site, in our opinion.

Tulip Kids, Inc. - Conditional Use Permit - Risk Assessment
Project Number: PR-000583

Attachment One

Sites with potential Chemicals of Concern

Tulip Kids, Inc. - Conditional Use Permit - Risk Assessment

Project Number: PR-000583

No	Facility Name	Type of Industrial Activity	Address	Distance to Site	Chemicals	State	Max. Quantity	Larger Container	Unit	Fire Haz. Class	IDLH
1	LABPRO	Distributor of laboratory products, chemicals, microscopes and imaging equipment	1290 Anvilwood Court	1250 ft	Tetrahydrofuran	Liquid	20	5	Gallons	Flammable, Irritant, Sensitizer	2000 ppm
					Acetone	Liquid	120	1	Gallons	Flammable, Irritant	20,000 ppm
					Chloroform	Liquid	50	8	Pounds	Carcinogen, Irritant, Other Health Hazard	500 ppm
					Hydrofluoric Acid 49%	Liquid	600	10	Pounds	Toxic, Corrosive	30 ppm
					Hydrogen Peroxide	Liquid	80	1	Gallons	Flammable, Irritant, Other Health Hazard	75 ppm
					Isopropanol	Liquid	200	1	Gallons	Flammable	2000 ppm
					Nitric Acid	Liquid	470	7	Pounds	Corrosive, Oxidizing	25 ppm
2	WESTAK/ QUALITEK, INC.	Printed and Etched Circuits Manufacturer	1274/1276 Forgewood Avenue	1400 ft	Acetylene	Gas	400	200	Cu. Feet	Unstable, Flammable	2500 ppm
					Hydrochloric Acid	Liquid	30	1	Gallons	Corrosive, Other Health Hazard	50 ppm
					Hydrogen Peroxide 30-50%	Liquid	150	50	Gallons	Corrosive, Oxidizing, Unstable	75 ppm
3	UPS	Printing and Delivery Services	1245 Hammerwood Avenue	1750 ft	Acetylene	Gas	500	125	Cu. Feet	Unstable, Flammable	2500 ppm
					Diesel	Liquid	18,000	10,000	Gallons	Flammable	-
					Gasoline	Liquid	9,000	10,000	Gallons	Flammable	-
4	SUNNYVALE AUTO BODY	Auto Body Repair	1281/1288 Forgewood Avenue	1450 ft	Acetylene	Gas	385	130	Cu. Feet	Unstable, Flammable	2500 ppm
5	KRYTAR	Microwave Components	1288 Anvilwood Avenue	1100 ft	Acetylene	Gas	35	35	Cu. Feet	Unstable, Flammable	2500 ppm
6	CHEVRON STATION	Gas Station	1265 Lawrence Station Road	300 ft	Gasoline	Gas	20,000	10,000	Gallons	Flammable	-
7	CYTYC CORP	Medical Device Manufacturer	1240 Elko Drive	2000 ft	Diesel Fuel	Liquid	180	180	Gallons	Flammable	-
8	ERC CONCEPTS CO	Machine shop	1255 Birchwood Drive	1100 ft	Acetylene	Gas	200	200	Cu. Feet	Unstable, Flammable	2500 ppm
9	ARVI MANUFACTURING CO	Roofing Siding and Sheet Metal Work	1256 Birchwood Drive	1350 ft	Acetylene	Gas	114	115	Cu. Feet	Unstable, Flammable	2500 ppm

Tulip Kids, Inc. - Conditional Use Permit - Risk Assessment
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Attachment Two

ALOHA Printouts

Toxic Threat Zone

Time: May 27, 2016 & 1655 hours PDT (using computer's clock)

Chemical Name: ACETYLENE

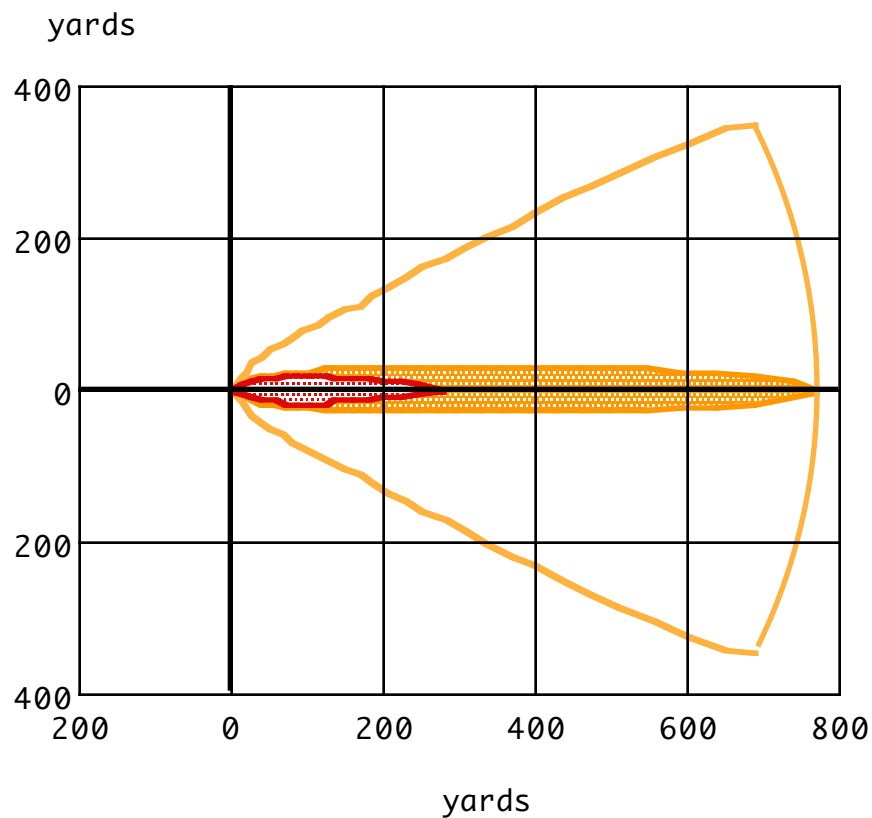
Wind: 1.5 meters/second from s at 3 meters

THREAT ZONE:

Model Run: Heavy Gas

Red : 275 yards --- (2500 ppm)

Orange: 774 yards --- (250 ppm)



greater than 2500 ppm



greater than 250 ppm



wind direction confidence lines

Text Summary**SITE DATA:**

Location: SUNNYVALE, CALIFORNIA
Building Air Exchanges Per Hour: 0.31 (unsheltered single storied)
Time: May 27, 2016 & 1655 hours PDT (using computer's clock)

CHEMICAL DATA:

Chemical Name: ACETYLENE
CAS Number: 74-86-2 Molecular Weight: 26.04 g/mol
PAC-1: 65000 ppm PAC-2: 230000 ppm PAC-3: 400000 ppm
LEL: 25000 ppm UEL: 800000 ppm
Ambient Boiling Point: -119.1° 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: 1.5 meters/second from s at 3 meters
Ground Roughness: urban or forest Cloud Cover: 5 tenths
Air Temperature: 70° F
Stability Class: F (user override)
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:

Direct Source: 200 cubic feet Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: 250 psia
Release Duration: 1 minute
Release Rate: 4.32 pounds/sec
Total Amount Released: 259 pounds

THREAT ZONE:

Model Run: Heavy Gas
Red : 275 yards --- (2500 ppm)
Orange: 774 yards --- (250 ppm)

Flammable Threat Zone

Time: May 31, 2016 & 1644 hours PDT (using computer's clock)

Chemical Name: ACETYLENE

Wind: 1.5 meters/second from s at 3 meters

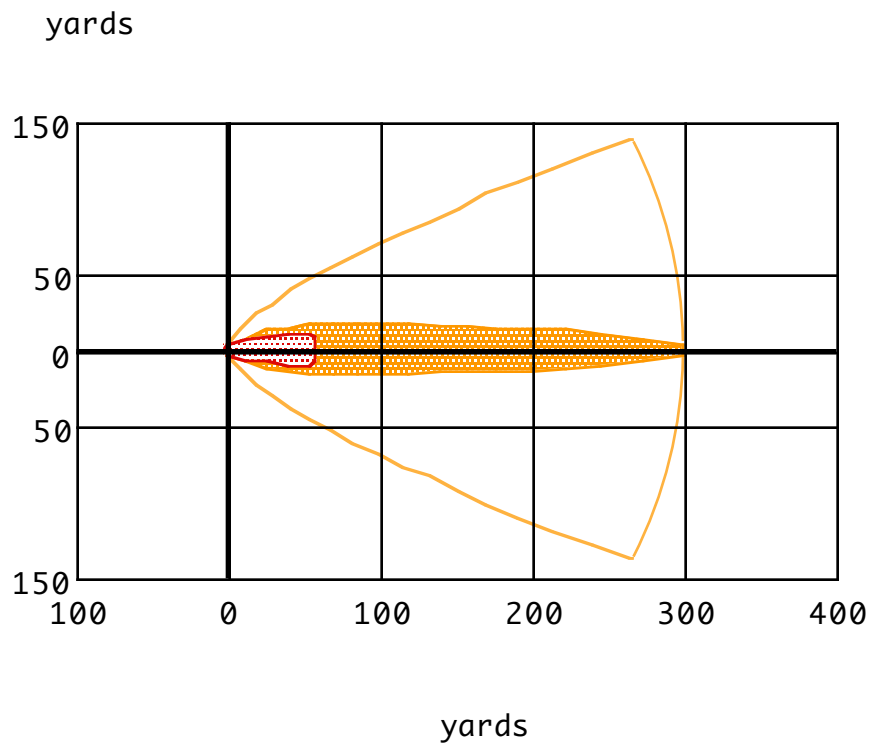
THREAT ZONE:

Threat Modeled: Flammable Area of Vapor Cloud

Model Run: Heavy Gas

Red : 57 yards --- (25000 ppm = LEL)

Orange: 300 yards --- (2500 ppm = 10% LEL)



greater than 25000 ppm (LEL)



greater than 2500 ppm (10% LEL)



wind direction confidence lines

Text Summary**SITE DATA:**

Location: SUNNYVALE, CALIFORNIA
Building Air Exchanges Per Hour: 0.31 (unsheltered single storied)
Time: May 31, 2016 & 1644 hours PDT (using computer's clock)

CHEMICAL DATA:

Chemical Name: ACETYLENE
CAS Number: 74-86-2 Molecular Weight: 26.04 g/mol
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LEL: 25000 ppm UEL: 800000 ppm
Ambient Boiling Point: -119.1° 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: 1.5 meters/second from s at 3 meters
Ground Roughness: urban or forest Cloud Cover: 5 tenths
Air Temperature: 70° F
Stability Class: F (user override)
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:

Direct Source: 200 cubic feet Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: 250 psia
Release Duration: 1 minute
Release Rate: 4.32 pounds/sec
Total Amount Released: 259 pounds

THREAT ZONE:

Threat Modeled: Flammable Area of Vapor Cloud
Model Run: Heavy Gas
Red : 57 yards --- (25000 ppm = LEL)
Orange: 300 yards --- (2500 ppm = 10% LEL)

Overpressure (Blast Force) Threat Zone

Time: May 31, 2016 & 1644 hours PDT (using computer's clock)

Chemical Name: ACETYLENE

Wind: 1.5 meters/second from s at 3 meters

THREAT ZONE:

Threat Modeled: Overpressure (blast force) from vapor cloud explosion

Type of Ignition: ignited by spark or flame

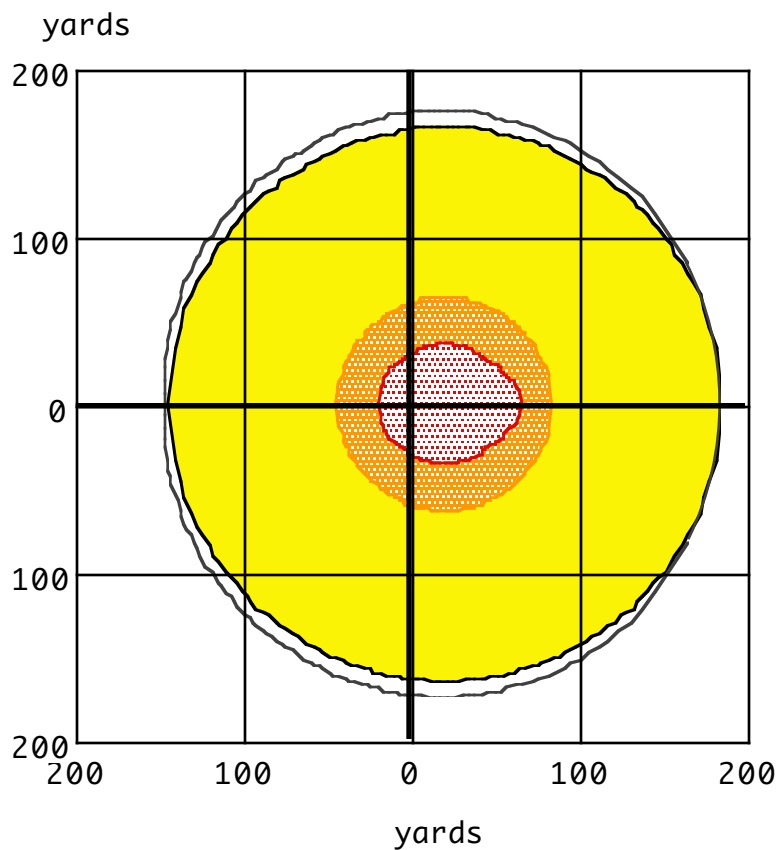
Level of Congestion: congested

Model Run: Heavy Gas

Red : 66 yards --- (8.0 psi = destruction of buildings)

Orange: 84 yards --- (3.5 psi = serious injury likely)

Yellow: 185 yards --- (1.0 psi = shatters glass)



-  greater than 8.0 psi (destruction of buildings)
-  greater than 3.5 psi (serious injury likely)
-  greater than 1.0 psi (shatters glass)
-  wind direction confidence lines

Text Summary**SITE DATA:**

Location: SUNNYVALE, CALIFORNIA
Building Air Exchanges Per Hour: 0.31 (unsheltered single storied)
Time: May 31, 2016 & 1644 hours PDT (using computer's clock)

CHEMICAL DATA:

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Ambient Boiling Point: -119.1° 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: 1.5 meters/second from s at 3 meters
Ground Roughness: urban or forest Cloud Cover: 5 tenths
Air Temperature: 70° F
Stability Class: F (user override)
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:

Direct Source: 200 cubic feet Source Height: 0
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Type of Ignition: ignited by spark or flame
Level of Congestion: congested
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Attachment Three

ARCHIE and SCREEN3 Printouts

ARCHIE

INPUT PARAMETER SUMMARY

PHYSIOCHEMICAL PROPERTIES OF MATERIAL

NORMAL BOILING POINT	=	130	degrees F
MOLECULAR WEIGHT	=	100	
LIQUID SPECIFIC GRAVITY	=	.75	
VAPOR PRES AT AMBIENT TEMP	=	5.01	psia
	=	258.7	mm Hg
LOWER FLAMMABLE LIMIT (LFL)	=	1.3	vol%
LOWER HEAT OF COMBUSTION	=	19000	Btu/lb
GAS EXPLOSION YIELD FACTOR	=	.03	
TOXIC VAPOR LIMIT	=	300	ppm

CONTAINER CHARACTERISTICS

TEMP OF CONTAINER CONTENTS	=	70	degrees F
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ENVIRONMENTAL/LOCATION CHARACTERISTICS

AMBIENT TEMPERATURE	=	80	degrees F
WIND VELOCITY	=	3.4	mph
ATMOSPHERIC STABILITY CLASS	=	F	
LIQUID CONFINEMENT AREA	=	NONE	
VAPOR/GAS DISCHARGE HEIGHT	=	0	feet

KEY RESULTS PROVIDED BY USER INSTEAD OF BY EVALUATION METHODS

DISCHARGE RATE	=	3335	lb/min
DURATION DISCHARGE	=	10	minutes
AMOUNT DISCHARGED	=	33350	lbs

KEY RESULTS OVERRIDDEN BY USER AT SOME POINT AFTER COMPUTATION
NONE OBSERVED

***** LIQUID POOL SIZE ESTIMATES

Evaporating pool area	=	30949	ft2
Burning pool area	=	3077	ft2

Note: Pool is assumed to ignite immediately upon initiation of discharge.

***** LIQUID POOL EVAPORATION RATE/DURATION ESTIMATES

Vapor evolution rate	=	2054.6	lbs/min
Evolution duration	=	16.3	minutes

***** TOXIC VAPOR DISPERSION ANALYSIS RESULTS

Downwind distance to concentration of 300 ppm		
-- at groundlevel	=	25953 feet

Note: Minimum computable answer is 33 feet!
Actual hazard distance may be less.

See attached table(s) for further details.

***** FLAMMABLE VAPOR CLOUD HAZARD RESULTS

For concentration of	1/2 LFL	LFL	
	-----	-----	
Downwind hazard distance =	1066	733	feet
Max hazard zone width =	959	660	feet
Max weight explosive gas =	7314	5031	lbs
Relative gas/air density =	1.84	1.84	initially
Model used in analysis =	Heavy gas		

***** EXPLOSION HAZARDS: See attached table(s)

UNCONFINED VAPOR CLOUD EXPLOSION EFFECTS

DISTANCE FROM EXPLOSION (feet)			EXPECTED DAMAGE
	8941		Occasional breakage of large windows under stress.
	1260		Some damage to home ceilings; 10% window breakage.
471	-	816	Windows usually shattered; some frame damage.
	471		Partial demolition of homes; made uninhabitable.
121	-	471	Range serious/slight injuries from flying glass/object.
	284		Partial collapse of home walls/roofs.
217	-	284	Non-reinforced concrete/cinder block walls shattered.
97	-	251	Range 90-1% eardrum rupture among exposed population.
	244		50% destruction of home brickwork.
181	-	217	Frameless steel panel buildings ruined.
	158		Wooden utility poles snapped.
130	-	158	Nearly complete destruction of houses.
	107		Probable total building destruction.
64	-	89	Range for 99-1% fatalities among exposed populations due to direct blast effects.

Note: The center of an unconfined gas/vapor explosion can be anywhere within the ground area passed over by the cloud or plume. See results of the vapor cloud fire hazard analysis for the maximum downwind distance and maximum width of this area. Explosion is assumed to take place on or near the ground.

SCREEN

08/16/07
15:56:43

*** SCREEN3 MODEL RUN ***
 *** VERSION DATED 96043 ***

Gasoline Release

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = AREA
 EMISSION RATE (G/(S-M**2)) = 5.40000
 SOURCE HEIGHT (M) = .0000
 LENGTH OF LARGER SIDE (M) = 53.6000
 LENGTH OF SMALLER SIDE (M) = 53.6000
 RECEPTOR HEIGHT (M) = 2.0000
 URBAN/RURAL OPTION = URBAN

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .000 M**4/S**2.

*** STABILITY CLASS 6 ONLY ***
 *** ANEMOMETER HEIGHT WIND SPEED OF 1.50 M/S ONLY ***

 *** SCREEN DISCRETE DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
100.	.2292E+08	6	1.5	1.5	10000.0	.00	45.
200.	.8891E+07	6	1.5	1.5	10000.0	.00	45.
300.	.4734E+07	6	1.5	1.5	10000.0	.00	45.
400.	.2975E+07	6	1.5	1.5	10000.0	.00	45.
500.	.2070E+07	6	1.5	1.5	10000.0	.00	35.
750.	.1080E+07	6	1.5	1.5	10000.0	.00	26.
1000.	.6898E+06	6	1.5	1.5	10000.0	.00	1.
440.	.2547E+07	6	1.5	1.5	10000.0	.00	37.

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	.2292E+08	100.	0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
