

OFFSITE CONSEQUENCES ANALYSIS AND HAZARDS BUFFER REPORT FOR TRICAL, INC.

JULY 9, 2020

PREPARED FOR
County of San Benito

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TABLE OF ABBREVIATIONS AND ACRONYMS

Federal Agencies

ATF – Bureau of Alcohol, Tobacco,
Firearms, and Explosives

ATSDR – Agency for Toxic Substances and
Disease Registry

CSB – Chemical Safety and Hazard
Investigation Board

DOT – Department of Transportation

EPA – Environmental Protection Agency

OSHA – Occupational Health and Safety
Administration

NOAA – National Oceanic and
Atmospheric Administration

NTSB – National Transportation Safety
Board

State Agencies

CUPA – Certified Unified Program Agency

DPR – California’s Department of Pesticide
Regulation

SWRCB – State Water Resources Control
Board

Exposure Limits

AEGLs – Acute Exposure Guideline Levels

ERPGs – Emergency Response Planning
Guidelines

IDLHs – Immediately Dangerous to Life or
Health concentrations

PACs – Protective Action Criteria

PELs – Permissible Exposure Limits

TEELs – Temporary Emergency Exposure
Limits

TLVs – Threshold Limit Values

Programs

CalARP – California’s Accidental Release
Prevention Regulations

HMBP – California’s Hazardous Materials
Business Plan

NPIRS – National Pesticide Information
Retrieval System

SMARTS – California’s Storm Water
Multiple Application and
Report Tracking System

SWPPP – Storm Water Pollution Prevention
Plan

TRI – EPA’s Toxics Release Inventory

Federal Statutes

CAA – Clean Air Act

EPCRA – Emergency Planning and
Community Right-to-Know
Act of 1986

FIFRA – Federal Insecticide, Fungicide, and
Rodenticide Act

Documents, Reports and Plans

CUP – Conditional Use Permit

RMP – Risk Management Plan

Other

BLEVE – Boiling Liquid Expanding Vapor
Explosion

VCE – Vapor Cloud Explosion

Chemicals

1,3-DCP – 1,3-Dichloropropene

MITC – Methyl Isothiocyanate

Modeling Programs

ALOHA – Areal Locations Of Hazardous
Atmospheres

BIA – BREEZE Incident Analyst

CAMEO – Computer-Aided Management
of Emergency Operations

DEGADIS – Dense Gas Dispersion model

Executive Summary

Report Purpose. San Benito County's (County) 2035 General Plan includes health and safety policies designed to protect residents, workers, visitors and properties from unreasonable risks associated with potential hazards. The General Plan's Health and Safety Policy (Policy HS 6.9) applies to new sensitive land uses near industrial facilities that handle industrial or agricultural chemicals. That policy provides that a "buffer shall be maintained between new sensitive land uses" and certain facilities that can handle or receive "chemicals regulated as potentially hazardous." Policy HS 6.9 also provides that "the appropriate buffer zone shall be established on a case-by-case basis," depending on, among other factors, the degree of hazard associated with existing industrial facilities.

This report contains the findings and conclusions of an offsite consequences analysis, which was prompted by a new development (Strada Verde) next to Trical, Inc.'s (Trical) chemical storage and blending facility on Highway 25.¹ The Strada Verde project is proposed to be built by Bristol SB LLC on the Floriani Ranch immediately adjacent to the Trical facility. An offsite consequences analysis is used to evaluate potential harm to human life and property in areas adjacent to industrial facilities due to chemical releases, fires or explosions. This report evaluates the potential harm to human life and property associated with approval of the Strada Verde project.

The purpose of this report is to assist the County with making an informed determination regarding the establishment of a prudent and appropriate buffer zone between Trical and the Strada Verde project. In furtherance of that purpose, this report evaluates the hazards presented by the Trical facility to the surrounding area resulting from Trical's handling and storage of large quantities of toxic, flammable and explosive chemicals. While no analysis can address every conceivable hazard from a given facility, this report evaluates a set of reasonable worst-case chemical release scenarios and their consequences in recommending a prudent and appropriate buffer zone around Trical.

¹ See Strada Verde Project Application (May 19, 2019); Strada Verde Innovation Park Voter Initiative (May 26, 2020).

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Chemical accidents and releases—often with serious negative consequences for surrounding communities—can and do occur for multiple reasons.² Many unexpected chemical releases result from unintentional acts like system failures, human errors (including inadequate employee training) or accidents. Intentional acts, such as vandalism or terrorism, also can cause releases by design. And acts of God (e.g., floods, earthquakes, lightning strikes, severe storms) also can cause the unexpected release of toxic, flammable and explosive chemicals. This report uses industry-standard methods to analyze the adverse consequences to people and property that would result from reasonable worst-case chemical release scenarios that might occur at Trical.

The Strada Verde Project. The Strada Verde project is a mixed-use development proposing more than 6.4 million square feet of commercial space comprised of an automotive research and testing facility, a 20-acre town center, retail shops, office space, hotels, a museum and other uses that are designed to draw a significant number of people to the area, including 5,500 employees. The proposed project would be developed on a 2,777-acre site on the County’s northwestern boundary, southeast of the Pajaro River and southwest of Highway 25 and the Union Pacific rail line.

The Strada Verde Innovation Park Voter Initiative of May 2020 indicates that a variety of additional land uses would be permitted “by right” if the project is approved, including:

Farmer’s market or a neighborhood center	Outpatient or urgent care medical clinics
College or other learning centers	Public event venues
Religious or charitable institutions	Wedding venues
Spas	Children’s daycare facility

Trical Site. The proposed Strada Verde project location is immediately adjacent to and generally south of Trical’s chemical facility. Trical is located at 8770 Bolsa Road (CA Highway 25) in the northwest corner of the County. The locations of Trical and the proposed Strada Verde project are shown in the map below:

² For example, in January 2020, an explosion and fire occurred at an industrial facility in Houston, Texas that killed three people and damaged 200 nearby homes and businesses. Appendix 8 summarizes numerous chemical incidents as reported by the U.S. Chemical Safety and Hazard Investigation Board and the National Transportation Safety Board.



Toxic Chemicals. The Trical facility is authorized to receive, handle and blend a range of regulated agricultural fumigants, including chloropicrin, 1,3-dichloropropene³ (1,3-DCP) and methyl bromide. These fumigants are important tools for controlling pests but also pose inherent and serious human health and safety risks. For example, chloropicrin was used as a chemical-warfare agent in World War I, and exposure to high concentrations of chloropicrin can lead to death.

Trical receives or can receive substantial quantities of all three of these fumigants via railcars or tanker trucks (and sometimes trucks containing cylinders or other smaller containers) and stores them on its relatively compact site in either railcars (up to 175,000 pounds) themselves or in multiple large aboveground storage tanks (10,000 to 32,000 gallons in capacity), as well as in hundreds of smaller-sized containers.

³ Also commonly referred to as Telone or Telone II. National Center for Biotechnology Information, Compound Summary: 1,3-Dichloropropene, https://pubchem.ncbi.nlm.nih.gov/compound/1_3-Dichloropropene.

Hazard Zone Modeling. An offsite consequences analysis requires the characterization of specific release scenarios, including which chemical is released and how that chemical might be released. While many different types of chemicals can be handled at Trical, this report analyzes three chemicals: chloropicrin, 1,3-DCP and methyl bromide, as well as a by-product from the chemical degradation of chloropicrin which can form a highly toxic gas (phosgene) and an acid gas which is a combustion product of 1,3-DCP (hydrogen chloride). This report selects 15 release scenarios for analysis, each involving a large, unexpected direct release of these chemicals, as well as resulting fires and explosions. Release air dispersion models approved by federal and state agencies were then used to assess adverse impacts due to each release scenario. For example, the report uses ALOHA (Areal Locations Of Hazardous Atmospheres), which is a model developed by the U.S. Environmental Protection Agency (EPA) and the U.S. National Oceanic and Atmospheric Administration (NOAA). As described in Section 7 of the report, other models are also used.

The release dispersion models estimate downwind concentrations of airborne toxic chemicals after specified release scenarios. As a result, the models can identify the specific distances at which particular toxic concentrations can occur depending on the chemical and release conditions. For fires and explosions, the models predict the intensity of heat flux from fires (e.g., lethal heat) and over-pressure waves due to explosions, each of which can cause extensive damage to the surrounding area.

Airborne Toxics Endpoints. The release models use health-based endpoint concentrations to identify hazard zones that may result from chemical releases, as well as resulting fires and explosions. For exposures to airborne toxic chemicals, these health-based endpoints are often referred to as Protective Action Criteria (PACs).

PACs are levels or concentrations of airborne chemicals that threaten public safety and are intended to provide guidance to public agencies on the need to ensure that appropriate protective measures, such as avoidance through careful land use planning, are instituted. PACs are used for emergency planning scenarios by first responders and local, state and federal agencies to determine the protective actions needed to address unexpected release events. There are three levels of PAC values (one to three) that represent increasingly severe effects resulting from progressively higher concentrations of exposures:

Table ES-1. Airborne Toxics Endpoints

Level One		Mild, transient health effects
Level Two		Irreversible or other serious health effects that could impair the ability to take protective action
Level Three		Serious, life-threatening health effects or death

PACs are guidelines designed for public exposure as distinct from other guidelines designed solely for occupational exposures. For example, the EPA develops Acute Exposure Guideline Levels (AEGLs), a PAC, through a rigorous process which requires that all underlying toxicological data be peer-reviewed. This report uses AEGLs thresholds (as described further in Section 5), when available, as the PAC in order to identify the toxic hazard zones surrounding the Trical facility.

For a specific chemical, the Level Three (AEGL-3) and Level Two (AEGL-2) concentration levels are generally dependent on exposure duration. This report has selected a 60-minute exposure duration (see Section 5). Because AEGL-3 and AEGL-2 concentration levels may be lower than odor thresholds, it is possible that members of the public could be exposed to Level Three or Level Two concentrations for periods longer than 60 minutes. Such longer duration exposures could increase the severity of adverse consequences.

Fires and Explosions Endpoints. Some chemicals can burn or explode and cause serious adverse health impacts from the resulting intense heat or over-pressures. Over-pressures can be caused due to vapor cloud explosions (VCEs). Intense heat can be caused by pool fires and/or boiling liquid expanding vapor explosions (BLEVEs).

For scenarios involving fire, this report evaluates the fire's heat or thermal radiation flux (expressed in kilowatts per square meters, kW/m²) based on two thresholds: Level One: five kW/m² (which can cause second-degree burns within 60 seconds), and Level Two: 10 kW/m² (which can cause lethal heat within 60 seconds).

For scenarios involving explosions, this report evaluates the distance to which a blast or over-pressure wave would propagate from the explosion and cause potential damage, depending on the strength of the over-pressure. There are two over-pressure thresholds considered in this report: Level One: 3.5 pounds per square inch (psi) (which can cause damage such as the rupture of storage tanks or serious injuries), and Level Two: 8 psi (which can destroy buildings, overturn loaded railcars and cause severe impairment or death).

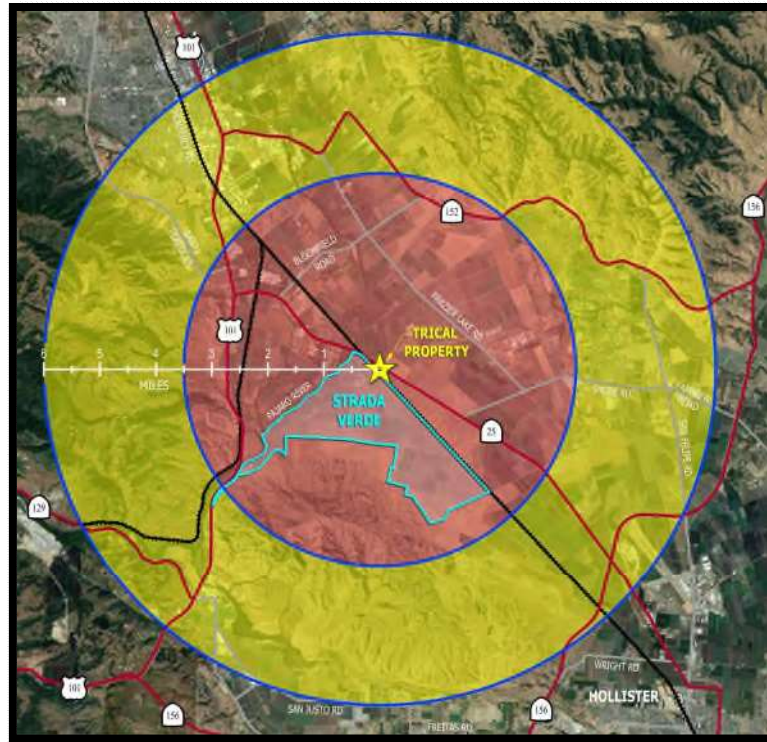
Table ES-2. Fires and Explosions Endpoints

Fires		
Level One	5 kW/m ²	Second-degree burns within 60 seconds
Level Two	10 kW/m ²	Lethal heat within 60 seconds
Explosions		
Level One	3.5 psi	Rupture of storage tanks, serious injuries
Level Two	8 psi	Buildings destroyed, loaded railcars overturned, severe impairment or death

This report analyzes 15 selected toxic chemical releases, fires and explosions that might occur assuming reasonable worst-case scenarios. For each scenario, an associated map has been prepared to show the results depicted as the range of applicable hazard zones with Trical at the center. A few examples are discussed next.

Chloropicrin Aboveground Tank Release. One scenario that was modeled involved the unexpected release of 137,000 pounds of chloropicrin, the contents of a single, 10,000-gallon horizontal aboveground storage tank. For context, approximately 80,000 pounds of toxic chemicals were released in 1984 from the Union Carbide pesticide facility in Bhopal, India, which is widely considered to be among the world's worst industrial disasters, resulting in massive loss of human life.⁴ Also for context, there are 10 such chloropicrin tanks onsite immediately adjacent to one another, each with the same 10,000-gallon (137,000-pound) capacity. In this scenario, the chemical release is assumed to result in the formation of a 500 square meter (m²) area evaporating pool of chloropicrin. Within 60 minutes, the pool is assumed to evaporate into the atmosphere, dispersing high concentrations of chloropicrin gas around the surrounding area as shown below:

⁴ That horrific accident gave rise to the industrial chemical safety statutory and regulatory programs that currently exists in the United States today, which aim to protect life and property from inherent and dangerous chemical risks associated with industrial facilities. Despite the implementation of regulations informed by the tragedy in India, accidents involving chemicals at industrial facilities still occur today in California, the United States, and elsewhere.

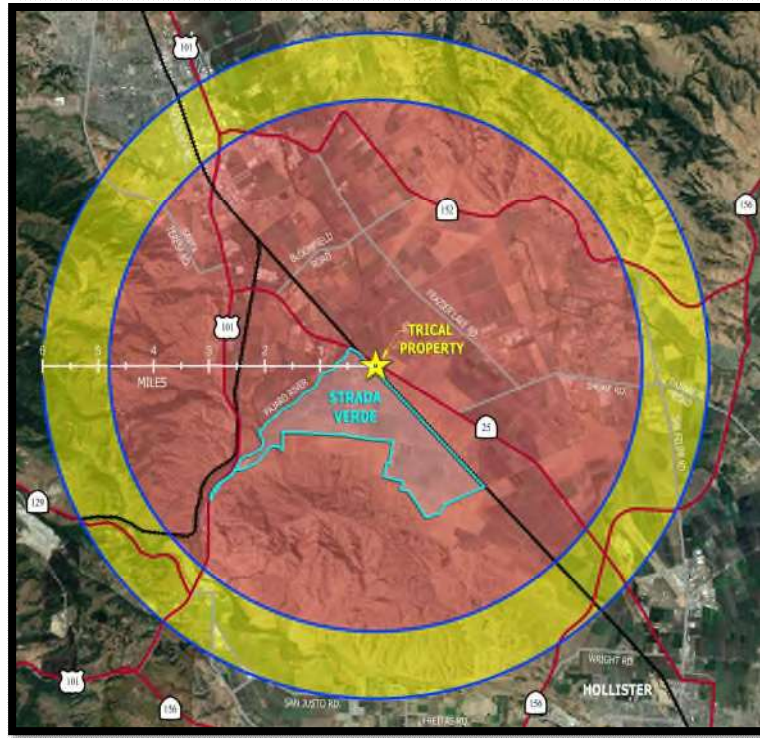


The red hazard zone in the map above covers areas subject to Level Three (AEGL-3) concentrations of chloropicrin—i.e., high danger areas with an immediate risk of life-threatening effects or death. The yellow hazard zone identifies Level Two (AEGL-2) danger areas presenting the risk of irreversible and serious negative health effects. This scenario shows that a Level Three hazard zone extends 3.5 miles in radius and that the Level Two hazard zone extends greater than 6 miles in radius from the Trical facility.⁵

Chloropicrin Railcar Release. The report also analyzes a scenario involving the rupture of a single railcar that releases 175,000 pounds of chloropicrin to form a liquid evaporating pool of 1,000 square meters.⁶ Within 60 minutes, such a pool would evaporate into the atmosphere, dispersing high concentrations of chloropicrin gas around the surrounding area as shown below:

⁵ Regardless of the models used, for making comparisons consistent, the hazard zones shown on the maps in this report are limited to a radius of six miles, which is approximately the maximum distance provided by the ALOHA model.

⁶ During in-person site visits, multiple railcars containing chloropicrin were observed onsite, consistent with typical facility operations.

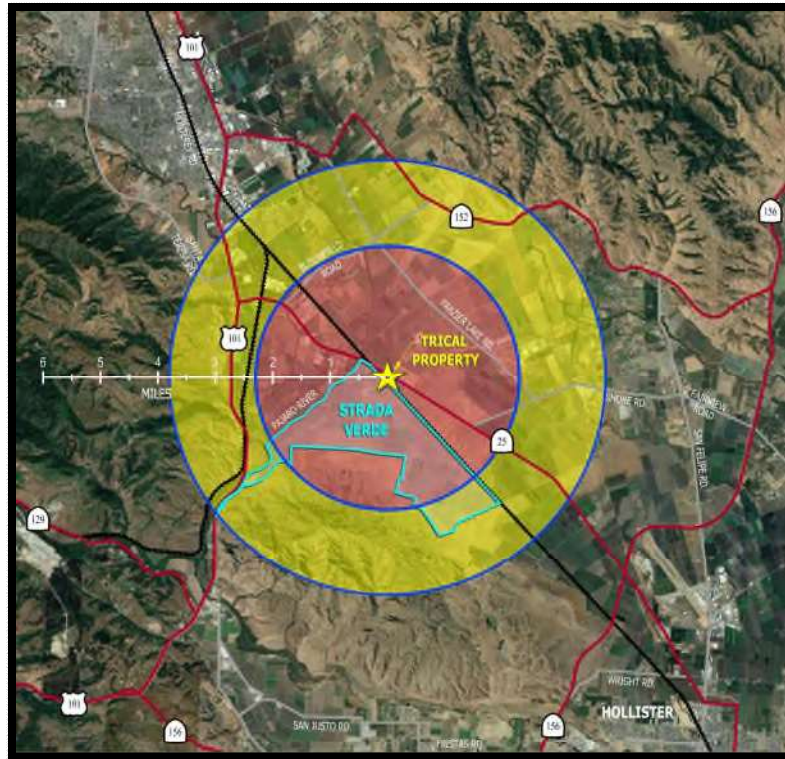


The scenario above shows that the Level Three hazard zone extends 4.8 miles in radius and that the Level Two hazard zone extends greater than 6 miles in radius from the Trical facility.

Methyl Bromide Railcar Release. Another scenario that was modeled involved the release of 175,000 pounds of methyl bromide from a single pressurized railcar.⁷ The quantity of methyl bromide handled and stored by Trical has declined over time due to regulatory restrictions and concerns over the ozone-depleting effects associated with methyl bromide's use as a soil fumigant. For those reasons, Trical has transitioned to handling and storing greater quantities of chloropicrin and 1,3-DCP. However, Trical is still authorized to handle and store methyl bromide and continues to do so. Since methyl bromide is stored as a liquid under pressure in the railcar, and due to its relatively low boiling point, upon release it can quickly become a vapor which then disperses in the atmosphere under most ambient conditions. The following diagram depicts the spread or dispersion of methyl bromide after such a release:

⁷ Trical itself has modeled this release scenario and submitted the results to San Benito County as part of its Risk Management Plan (RMP) obligations.

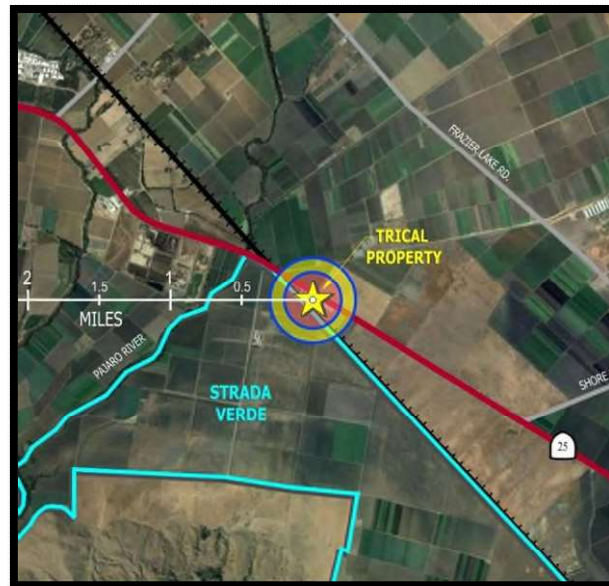
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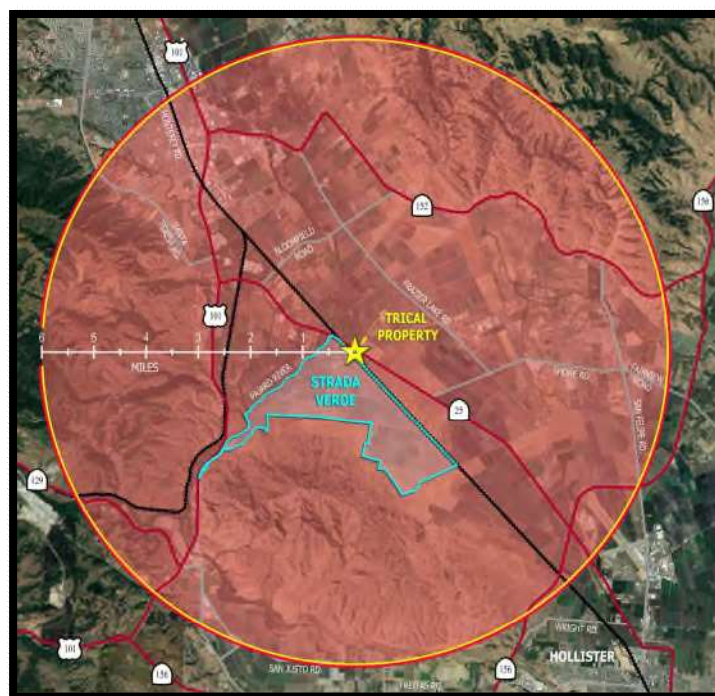
The scenario above shows that a Level Three hazard zone extends 2.3 miles in radius and that the Level Two hazard zone extends 3.8 miles in radius from Trical.

Fires and Explosions. As noted above, Trical stores 1,3-DCP in three vertical 32,000-gallon (326,400-pound) aboveground storage tanks and one horizontal 10,000-gallon (101,000-pound) aboveground tank. 1,3-DCP is a flammable liquid. A chemical spill or release could occur if any of the 1,3-DCP tanks is breached due to a number of potential causes, including a truck accident, terrorism, vandalism or material failure. Once discharged, 1,3-DCP could ignite and catch fire due to the presence of a number of potential ignition sources at Trical. Such a fire could then create a boiling liquid expanding vapor explosion (BLEVE), creating a zone with very high temperatures due to intense radiation from the fire and BLEVE. This radiation will then cause damage to additional tanks, resulting in cascading, compound failures. Alternatively, the discharge of 1,3-DCP could result in vapor concentrations that can exceed the Lower Explosive Limit for 1,3-DCP in air, causing a massive vapor cloud explosion (VCE) with resulting over-pressure waves. Both scenarios are evaluated in this report. Below is a diagram that shows the Level One and Level Two over-pressure endpoints associated with a VCE:

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The Level Two hazard zone shown above in red would destroy most of the Trical facility. The high temperatures associated with the combustion of 1,3-DCP coupled with potential loss of containment of chloropicrin (which is stored immediately adjacent to 1,3-DCP), due to over-pressure or blast events, would also cause the degradation of chloropicrin to phosgene, a highly toxic chemical. This report has conservatively assumed that only 1% of the contents of one chloropicrin tank degrades to phosgene, resulting in a Level Three hazard zone extending beyond six miles, as depicted in the following diagram:



These examples and the other modeling results described in this report show that multiple and distinct reasonable worst-case scenarios would culminate in extremely dangerous and lethal levels of toxic chemicals and their by-products surrounding the Trical facility. Like most industrial facilities, Trical is required to have certain mitigation measures and the capability to address small spills of the chemicals it handles. However, a large unexpected chemical release would easily overwhelm Trical's mitigation and emergency response capabilities. This inability to handle large, unexpected release scenarios is not unique to Trical and there are numerous examples of even the most responsible industrial facilities easily becoming overwhelmed by large, unexpected chemical releases, fires and explosions.

CONCLUSION

As noted above, Policy HS 6.9 of the County's General Plan requires that an appropriate buffer be established on a case-by-case basis for new sensitive land uses adjacent to industrial facilities that handle agricultural fumigants, such as the Trical facility. The purpose of the buffer is to protect human health and property from adverse consequences in the event of a large, unexpected chemical release.

The Trical facility is currently operating with a conditional use permit in an area zoned "Agricultural" in the County. If approved, the Strada Verde proposal would rezone approximately 2,777 acres of land immediately adjacent to Trical from Agricultural to a custom zoning district allowing a wide range of sensitive land uses including hotels, colleges, daycare facilities, event centers, medical facilities as well as automobile-related employment uses. If ultimately developed, the Strada Verde project would bring thousands of workers and hundreds of visitors on a daily basis in close proximity to Trical, which handles large quantities of many hazardous chemicals.

As set forth in Section 8 of this report (Table 8-1), multiple release scenarios could result in Level Three (serious, life-threatening health effects or death) hazard zones ranging from 2.3 miles to greater than 6 miles in radius from the Trical site. In addition, those same scenarios could result in Level Two (irreversible or other serious health effects) hazard zones ranging from 3.8 miles to more than 6 miles from the site. And prolonged exposures to Level Two chemical concentrations also could lead to even more serious adverse consequences consistent with Level Three impacts.

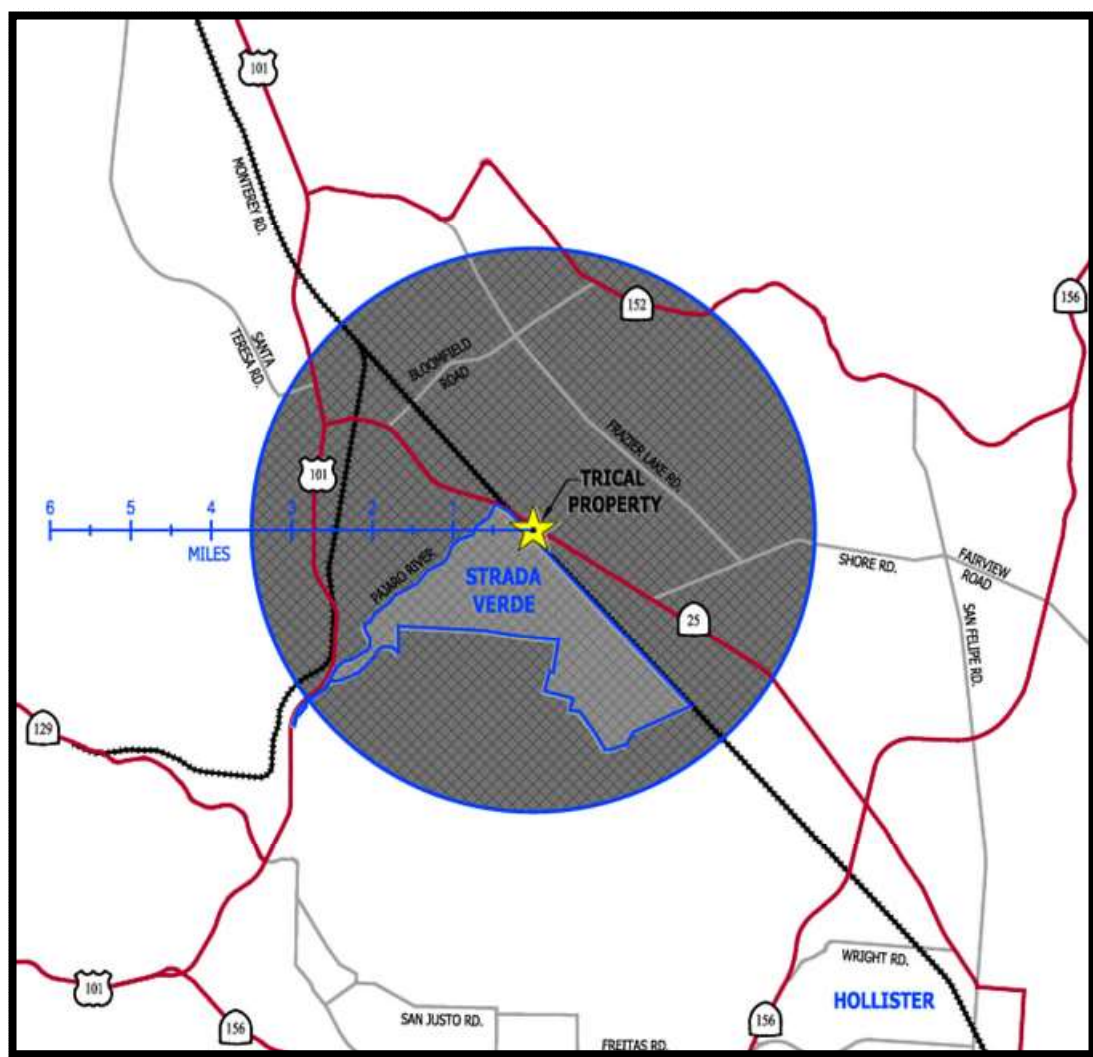
Thus, based on the findings of this report, the land uses that would be allowed if the Strada Verde proposal were approved should maintain a minimum buffer of 3.5 miles from the Trical facility. Any buffer zone less than 3.5 miles would place human life in jeopardy because multiple release scenarios result in unacceptably high concentrations of hazardous

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chemicals within 3.5 miles of the Trical site. Maps of a few scenarios illustrating this point are attached to this Executive Summary.

Below is a map showing that the Strada Verde project lies entirely within the 3.5-mile recommended minimum buffer zone. Given the findings of this report and degree of hazard at the Trical facility, the land uses that would be allowed under the Strada Verde proposal are not appropriate within this minimum buffer zone and should not be approved.

Below is a diagram showing the recommended 3.5-mile buffer zone and its relation to the Strada Verde project:



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TABLE AND MAPS BELOW

Executive Summary

The table below and the following maps show the results of six of the 15 release scenarios discussed in the report. The results and associated maps for all release scenarios analyzed are provided in Section 8 of this report. Appendix 5 is the Trinity Modeling Summary Report of Trinity Consultants, Inc., which was prepared by Dr. Qiguo Jing. That report describes in detail the parameters used and the modeling results (along with associated output files) for all scenarios.

Table ES-3. Description of Maps Showing Release Scenarios

Scenarios	Maps	Descriptions	Models Used
Chloropicrin Tank Release	Map One	Sudden rupture of one horizontal storage tank (10,000 gallons) releasing chloropicrin to form a liquid evaporating pool (500 m ²)	ALOHA, BREEZE INCIDENT ANALYST (BIA)
Chloropicrin Railcar Release	Map Two	Sudden rupture of one railcar (12,774 gallons) releasing chloropicrin to form a liquid evaporating pool (1,000 m ²)	ALOHA, BIA
Chloropicrin to Phosgene Degradation	Map Three	Phosgene, released by the degradation (1%) of chloropicrin due to adjacent fires	BREEZE AERSCREEN
1,3-DCP BLEVE	Map Four	Thermal radiation due to a 1,3-DCP BLEVE from one vertical storage tank (32,000 gallons)	ALOHA, BIA
1,3-DCP VCE	Map Five	Over-pressure wave due to a 1,3-DCP VCE from one vertical storage tank (32,000 gallons)	ALOHA, BIA
Methyl Bromide Railcar Release	Map Six	Sudden rupture of one railcar (175,000 pounds)	ALOHA, BIA