Appendices to
Ensuring Future Air Quality in the Tri-Valley
By the Tri-Valley Air Quality Community Alliance,
the Bay Air Quality Management District, and the Alameda County Health Dept.
December 29, 2021

List of Appendices

Appendix A. Tri-Valley Community Definition—
Airshed boundary, Zip Codes and Census Tracts
An Appendix to: Ensuring Future Air Quality in the Tri-Valley
TVAQCA AB 617 Project
December 27, 2021

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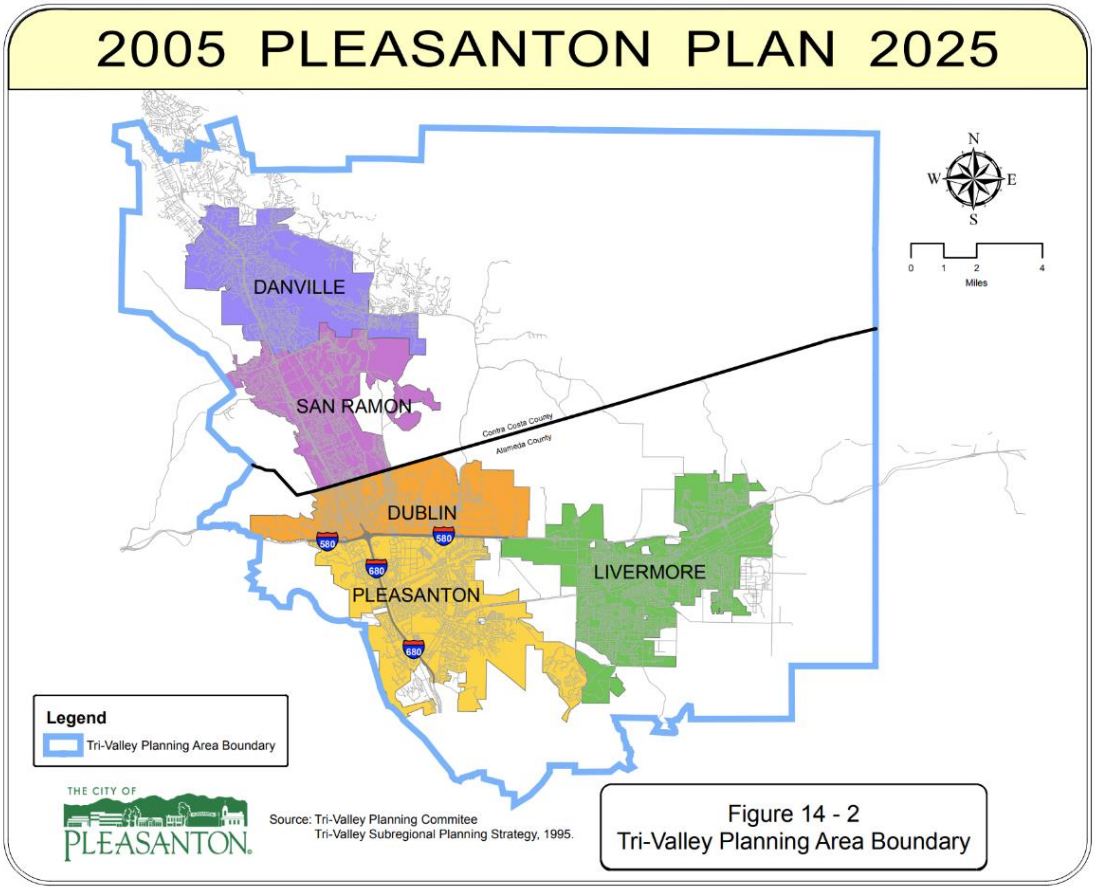
1. Previous Tri-Valley Planning Area

Cities and counties have conducted decades of regional planning in the Tri-Valley. For example, **Figure 1** shows the planning area that the Tri-Valley Planning Committee used in 1995.

Figure 1. Tri-Valley Planning Area Boundary from 1995 Tri-Valley Planning Committee



2. Tri-Valley Airshed

TVAQCA chose to define our community based on the BAAQMD CARE Program boundary (**Figure 2-1**) represented by the regions' ozone data from the Livermore Air Quality Monitoring station. The 1,000 to 2,500-foothills surrounding our three valleys create a topographically-confined area or local airshed. The Air District regional dispersion modeling analyses and field studies have shown that our topography can trap pollutants both transported into the area as well as local pollutants to cause high concentrations.

TVAQCA chose our community as the Tri-Valley Airshed as the natural topographic constraint at about 1,000 ft above sea level contour shown in **Figure 4**. The **Tri-Valley Airshed** encompasses about 133 square miles of which about 82 (or 62%) are within the city limits of San Ramon, Dublin, Pleasanton, and Livermore and the remaining 38% or 51 square miles are unincorporated areas in Alameda and Contra Costa Counties shown in **Figure 5**.

Mean city elevations (above mean sea level) are:

- 486 feet for San Ramon and Livermore
- 354 feet for Dublin
- 351 feet for Pleasanton

The highest side of the Airshed are the hills on the northern and western sides of the Airshed rising up to 2,500 feet. The Airshed's lowest elevation is the drainage exit of Amador Valley southwest of Pleasanton at 300 feet; beyond that is Sunol Valley.

Unincorporated areas in the Tri-Valley Airshed include:

- A several-block area on the north side of Vineyard Ave. in Pleasanton
- The gravel operations area on east side of Amador Valley
- North Livermore Valley
- South Livermore Valley
- A small area on the east side of Greenville Road
- The area on the perimeter of each which reaches up into the surrounding hills
- The area on the east side of Dougherty Road in Contra Costa County

Figure 4. Tri-Valley Airshed defined by the 1,000-ft contour surrounding the San Ramon, Amador, and Livermore Valleys. Approximate perimeters of the three valley's floor and city limits of San Ramon, Dublin, Pleasanton, and Livermore. (Google Map base)

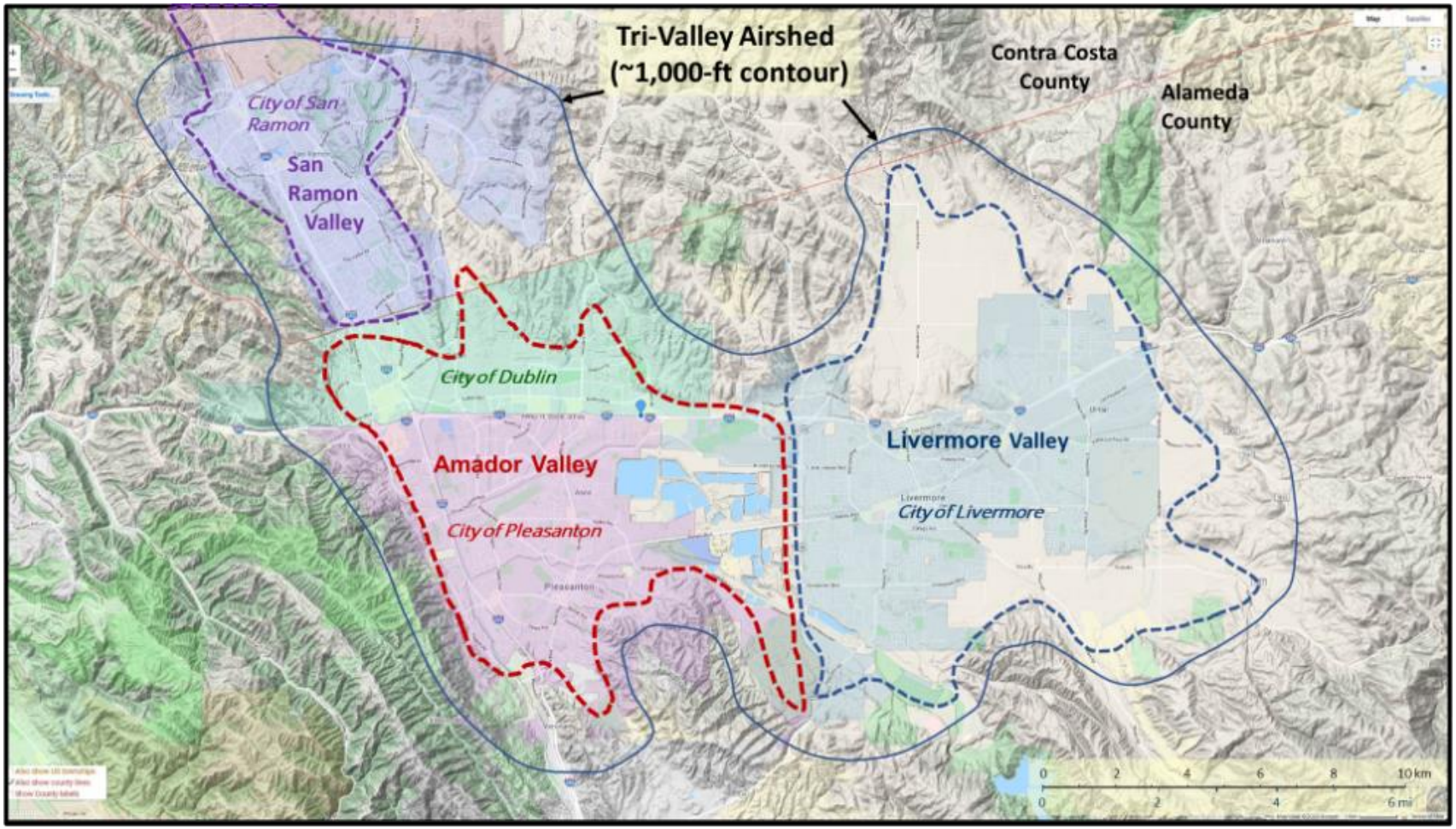
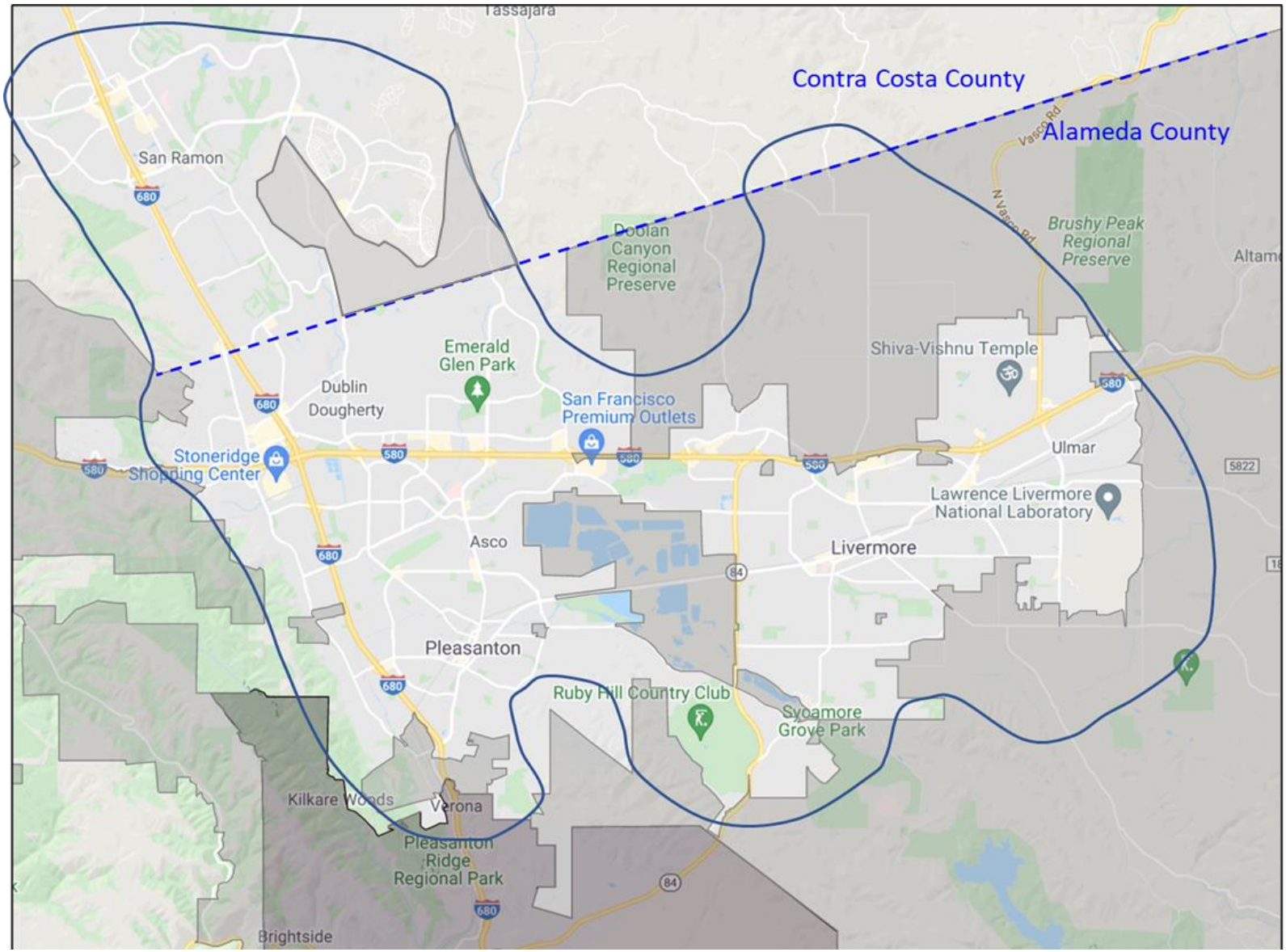


Figure 5. Unincorporated areas (shaded gray) in the Tri-Valley (Source: http://communitylocator.acgov.org/).



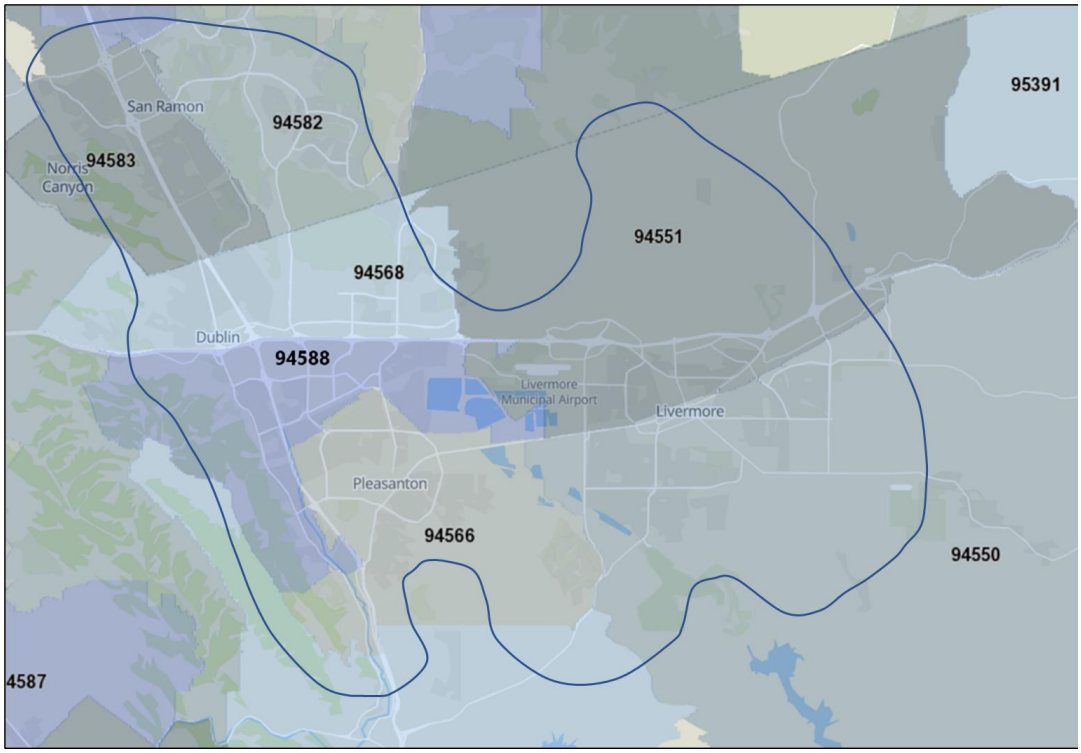
3. Tri-Valley Zip Codes

Most of the data sets are organized by either zip code or US Census Tract. **Table 1** and **Figure 6** show the 7 zip codes in the Tri-Valley. **Table 2** and **Figure 7** show the 55 US Census Tracts.

Table 1 Zip Codes in Tri-Valley Airshed

Zip Code	Primary City
94550	Livermore
94551	Livermore
94566	Pleasanton
94568	Dublin
94582	San Ramon
94583	San Ramon
94588	Pleasanton

Figure 6 Map of Zip Codes in the Tri-Valley Airshed.



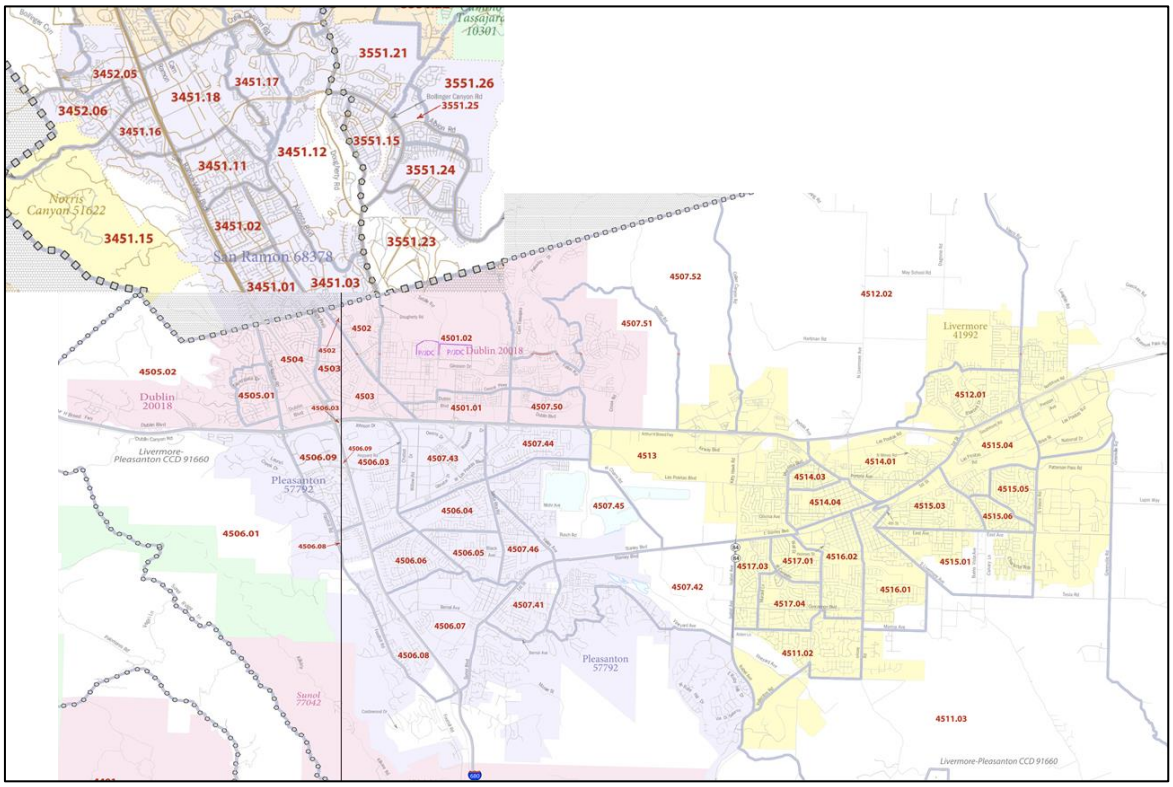
4. Tri-Valley Census Tracts

Table 2-2 List of 55 US Census Tracts in Tri-Valley Airshed.

Block 6013 San Ramon	Block 6003 Dublin	Block 6001 Pleasanton	Block 6001 Livermore
3451.11	4504.00	4506.01	**4511.01**
3451.01	4501.01	4506.02	**4511.02**
3451.02	4503.00	4506.03	4512.01
3451.03	4501.02	4506.04	**4512.02**
3451.08	4502.00	4506.05	4513.00
3451.12	4507.50	4506.06	4514.01
3451.15	4505.01	4506.07	4514.03
3451.16		4507.01	4514.04
3452.02		4507.41	4515.01
3551.14		4507.42	4515.03
3551.15		4507.43	4515.04
3551.16		4507.44	4515.05
3551.17		4507.45	4515.06
3551.23		4507.46	4516.01
		4507.51	4516.02
		4507.52	4517.01
			4517.03
			4517.04

Note: **Bolded tracts** are unincorporated County near designated city

Figure 7. Map of Census Tracts in the Tri-Valley Airshed. (Sources: 2020 Census - Census Tract Reference Map Alameda Co. and 2020 Census - Census Tract Reference Map Contra Costa Co.)



Appendix B. Historical Timelines of Tri-Valley
An Appendix to Ensuring Future Air Quality in the Tri-Valley
By Ron Baskett, TVAQCA AB 617 Project
December 27, 2021

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1. Brief history of the Tri-Valley

Below are key events showing Tri-Valley's transformation from agriculture to suburban communities.

Since the 16th century, the Native American Ohlone tribe lived in the Tri-Valley.

In the late 1700s, the first Spanish settlers arrived and in 1797 built nearby Mission San Jose. Spanish missionaries indoctrinated the Ohlone and took their land. The missionaries planted wine grapes in the Livermore Valley making it California's oldest wine region. After Mexico won independence from Spain in 1821, mission lands were split into ranchos.

1835: José María Amador, a Mexican soldier serving in the Mission, was granted 16,500 acres in what is now Amador Valley. See the 1,100-page History of Alameda County up to 1880s for details as well as Alameda County Historical Society (alamedacountyhistory.org).

1848: California becomes a state.

Throughout the **1800s:** Agriculture was the basis for the Tri-Valley's economy until the early 1900s when the infrastructure expanded, downtowns were built, and housing expanded. In 1858, the sons of Don Agustín Bernal constructed a horse racetrack in Pleasanton.

1869: The Transcontinental Railroad was built through the Tri-Valley and in 1891, the San Ramon Branch of the Southern Pacific Oakland-Stockton Line of the Railroad was completed. In 1986, this branch would become part of the Iron Horse Regional Trail.

Early 1900s: The Tri-Valley expands its agriculture base with Wente and Concannon Wineries, hop fields, horse breeding, cattle grazing, dairies. In 1912 Bernal's racetrack became part of the Alameda County Fairgrounds. New industries include Livermore's Beehive brick kiln and sand gravel operations in the center of the Tri-Valley. Livermore and Pleasanton add housing and expand downtowns.

1929: Livermore Airport was built.

World War II: The Navy builds Camp Parks to house 10,000 servicemen. Later Alameda County leases areas for Santa Rita Jail.

1942: Livermore Naval Air Station built for World War II Navy pilots training.

1952: Livermore Naval Air Station converted to Lawrence Livermore National Laboratory and subsequent expansion resulted in steady demand for housing.

Mid-1960s: Highway 50 expanded to I-580 and the newly I-680 open up arterial traffic to the Tri-Valley supporting development of the four cities, their businesses, and housing.

1960's to present: City governments develop General Plans, create their unique city characters, grow retail and business, set aside open space, build schools, hospitals, and business parks, and add subdivisions to accommodate a steady 11%/year increase in population.

1963: Las Positas College opens as an extension of Chabot College.

1980s: Stoneridge Mall as well as several business parks built.

1997: BART opens the Dublin/Pleasanton station.

Each of the items listed below timelines are events relevant to city character, growth, or planning involving air quality.

2. San Ramon Historical Timeline

- 1895: Attorney Thomas Bishop acquired a 3,000-acre ranch for hay, fruit crops, walnuts, cattle, and sheep.
- 1850: Leo and Mary Jane Norris purchased 4,450 acres from Amador.
- Amador named San Ramón (Spanish for 'Saint Raymond') not after a real saint but rather after a Native American vaquero who tended mission sheep on the land.
- **1983: San Ramon was incorporated.**
- 1999: Measure G passed to "Manage the City's growth in a way that balances existing and planned transportation facilities, protection of open space and ridgelines, provision of diverse housing options and job opportunities, and the preservation of high-quality community facilities and services."
- 2014: Civic Center approved including shops, restaurants, and a movie theater.
- 2002: San Ramon General Plan 2020 established the city's first Urban Growth Boundary to encourage smart growth by promoting infill development and discouraging urban sprawl. San Ramon acquired open space, created affordable housing, and provided opportunities for mixed use development.

Source: History of San Ramon - City of San Ramon (ca.gov)

3. Dublin Historical Timeline

- 1850: Irish settlers bought land from Amador and founded Dublin.
- **1982: Dublin was incorporated.** Dublin embraces and celebrates its Irish origins.
- 1991: Dublin annexed the west side; city at 8.46 square miles with 6,904 housing units and population of 19,755.
- 1995: Dublin started growing eastward with the annexation of 2.4 square miles. Over the next 15 years, Dublin grew to 14.62 square miles.

- 2000: The City Council established an Urban Limit Line within the Western Extended Planning Area to protect 4.14 acres from development for 30 years. The objective of the measure was to prevent the Dublin Hills from becoming overwhelmed with housing and that the housing would not be built on preserved open space.
- 2014: The City Council adopted the Dublin Open Space Initiative, removing the 30-year sunset clause for the Urban Limit Line in the Western Extended Planning Area, and establishing an additional Urban Limit Line along the eastern edge of the Eastern Extended Planning Area to protect the 3,828-acre Doolan-Collier Canyons from development.
- During World War II, the Navy commissioned Camp Parks to house 10,000 servicemen. Over the years, Camp Parks was leased to Alameda County for Santa Rita Jail, the Air Force for a basic training center and the United States Army. In 1986, Dublin annexed the 4.24 square mile Parks Reserve Forces Training Area (Camp Parks).

Sources: Dublin, California - Wikipedia and Development History in Dublin Dublin General Plan Section 1.3, page 3, Explore Dublin History | Dublin, CA - Official Website.

4. Pleasanton Historical Timeline

- 1826: Jose Amador brought the first settlement to the valley—a mercantile stopover for miners traveling from San Francisco to seek their fortune in the Mother Lode.
- 1851: John W. Kottinger named Pleasanton after a Civil War general, Alfred Pleasonton. However, a spelling error by a recording clerk in Washington, D.C. resulted in the more appropriate name.
- 1860s: Augustine Bernal help build the community including the racetrack that eventually became part of the Alameda County Fairgrounds.
- 1869: When the Transcontinental Railroad rolled into Pleasanton, the town was only 500. Ranchers and thoroughbred horse breeders were attracted to the favorable climate and abundance of water, and were soon followed by dairy farms, hop fields and vineyards.
- **1894: Pleasanton was incorporated**
- 1900s: Main Street Pleasanton developed into a center for banks, business offices, retail stores, restaurants, hotels, and community activity.
- 1930s: Henry J. Kaiser initiated gravel operations in the center of the valley.
- 1980: Stoneridge Mall opens.
- 1982: The 850-acre Hacienda Business Park was built on swampland that had previously been considered as a site for a large mobile home park.

Sources: History of Pleasanton - Pleasanton Chamber of Commerce, History of Pleasanton - Museum on Main.

5. Livermore Historical Timeline

- 1839: Robert Livermore and Jose Noriega secured a land grant for 48,000-acre Rancho Las Positas which encompasses most of today's Livermore. Livermore used his land for grazing cattle and horses, but he also developed California's first commercial vineyards, as well as orchards of pears and olives.
- 1850s: During the Gold Rush, Livermore's ranch became a popular "first day" stopping point for prospectors and businessmen leaving San Francisco or San Jose and headed to the Mother Lode.
- 1869: William Mendenhall platted and registered the town of Livermore. The Transcontinental Railroad brought rapid growth with new schools, churches, hotels, a bank, a library, a fire company, and a police department.
- **1876: Livermore was incorporated.**
- 1883: Carl Wente planted 48 acres founding Wente Vineyards and James Concannon plants 40 acres to start Concannon Winery.
- 1886: A telephone line came to the valley.
- 1889: Electric lights were introduced.
- 1901: A hand-blown light bulb from the Shelby Electric Company was installed at one of Livermore's firehouses and is still in use.
- 1911-17: Livermore Fire Brick Company operated Beehive kiln producing 30,000 bricks/day at Stanley Blvd. and Railroad Ave. using magnesite mined on Cedar Mountain 12 miles SE of Livermore.
- 1942: Livermore Naval Air Station was built for World War II Navy pilots training.
- 1952: Lawrence Livermore National Laboratory was established.
- 1956: Sandia National Laboratories was established.
- 1960s: Livermore's population grew from a few thousand to over 40,000
- 1960s: Wineries increased from a few to 50 with over 5,000 acres in vineyard given the microclimate for Sauvignon Blanc, Semillon and Cabernet grapes.
- 1993: The Tri-Valley Conservancy (TVC) was created to preserve agricultural, range and park lands for the benefit of current and future generations.
- 1997: TVC preserved 1,891 acres in the South Livermore Valley Area Plan (SLVAP).
- 2019: TVC added 178 acres of wildlife habitat at the mouth of Doolan Canyon between Livermore and Dublin bringing the total TVC land preserved to more than 4,500 acres.

Sources: History of Livermore, California (CA): Yesterday and Today (livermorechamber.org), eLivermore.com.

Appendix C. Land Use Maps for the Tri-Valley
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TVAQCA AB 617 Project
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1. San Ramon Land Use Maps

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- November 21, 2017: General Plan Land Use Map, Figure 1-1, page 19
- Planning Subareas, Figure 4-1, page 5
- Land Use Diagram, Figure 4-2, page 16

San Ramon has 9 planning subareas with 47% of the city area as residential as well as small retail and distributed centers with businesses and services. Most of San Ramon's commercial area is within Bishop Ranch Business Park, a campus-style series of office building clusters with over 600 businesses employing over 30,000.

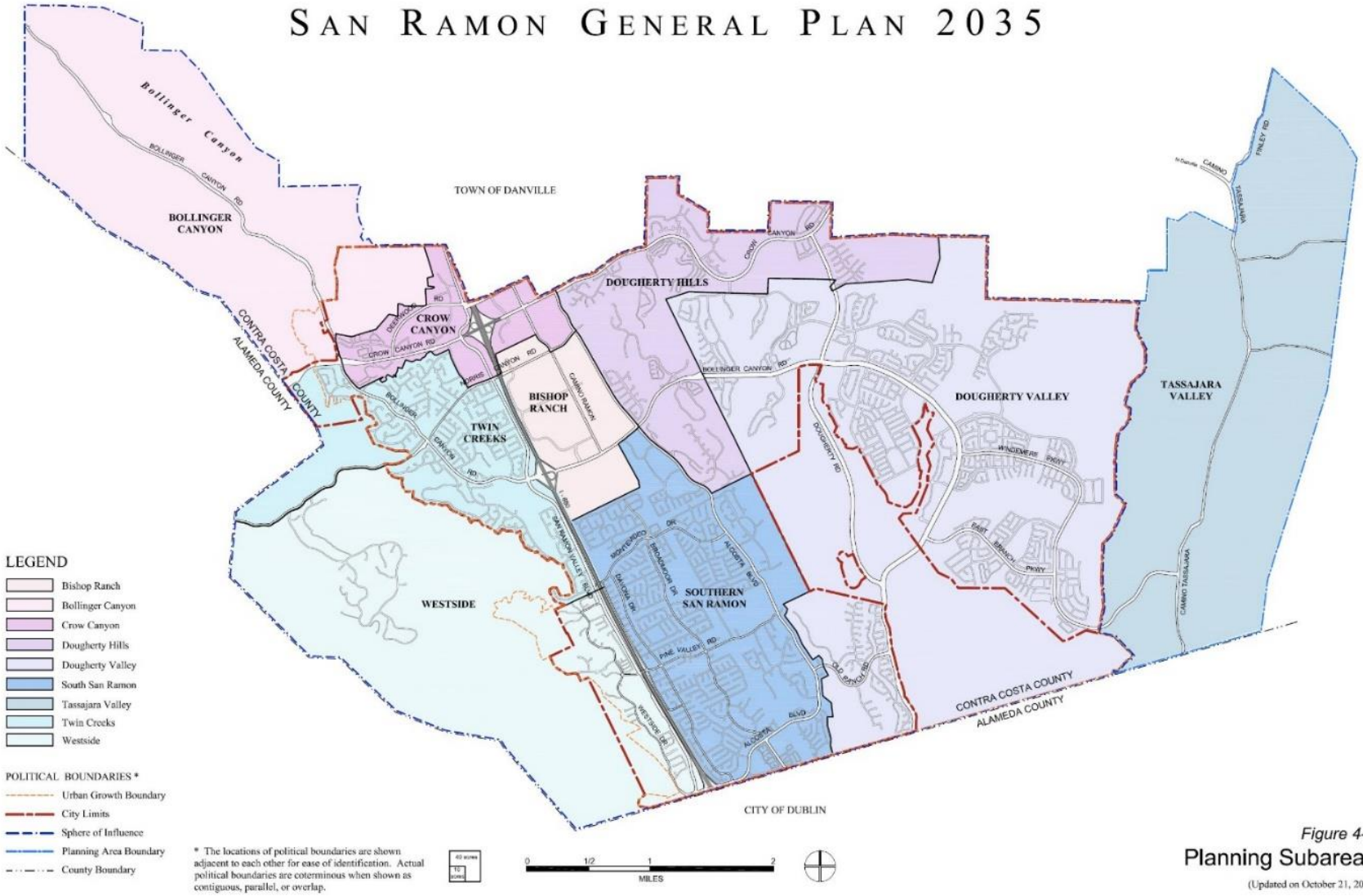


Figure 4-1

Planning Subareas

(Updated on October 21, 2019)

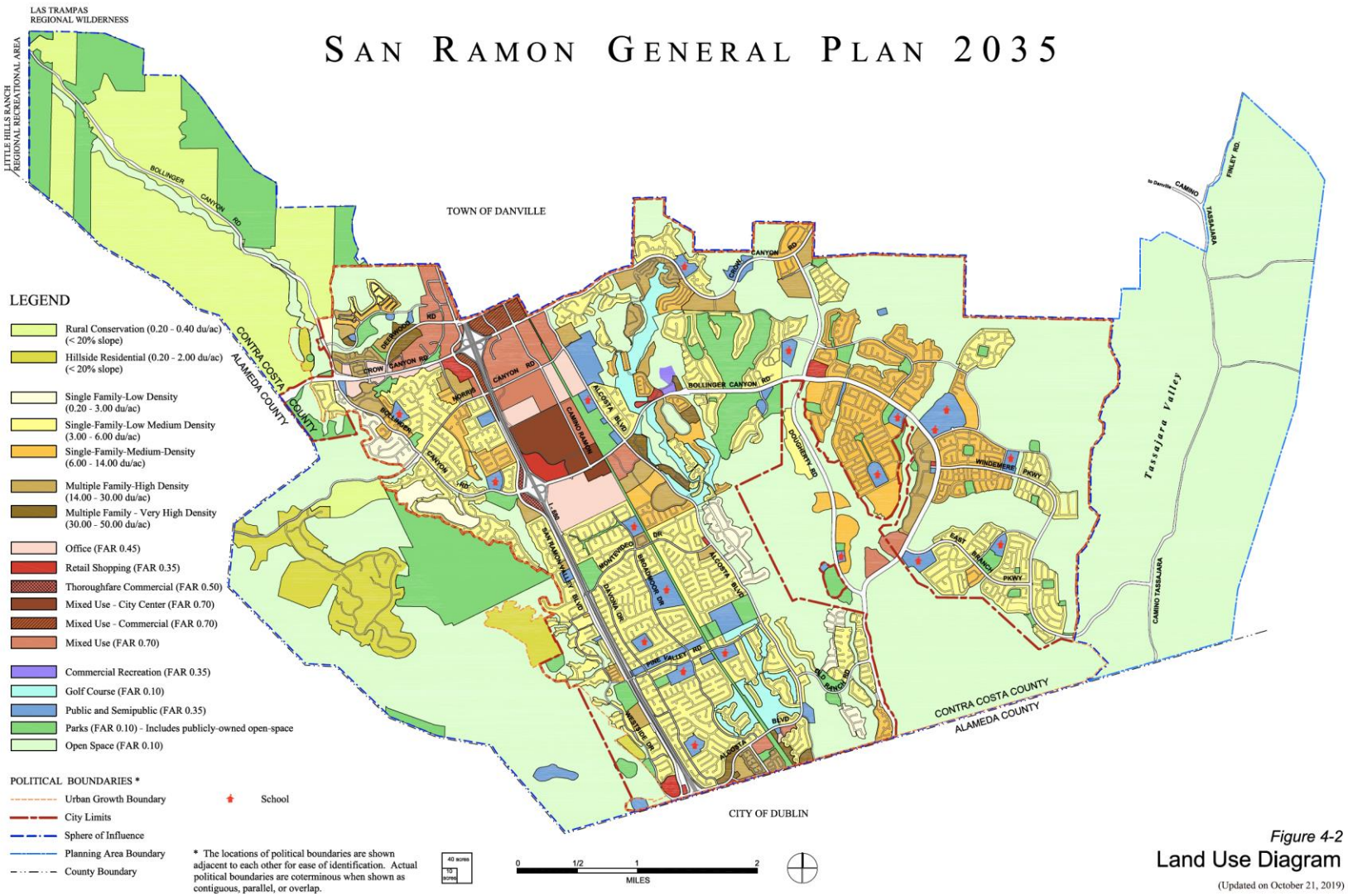
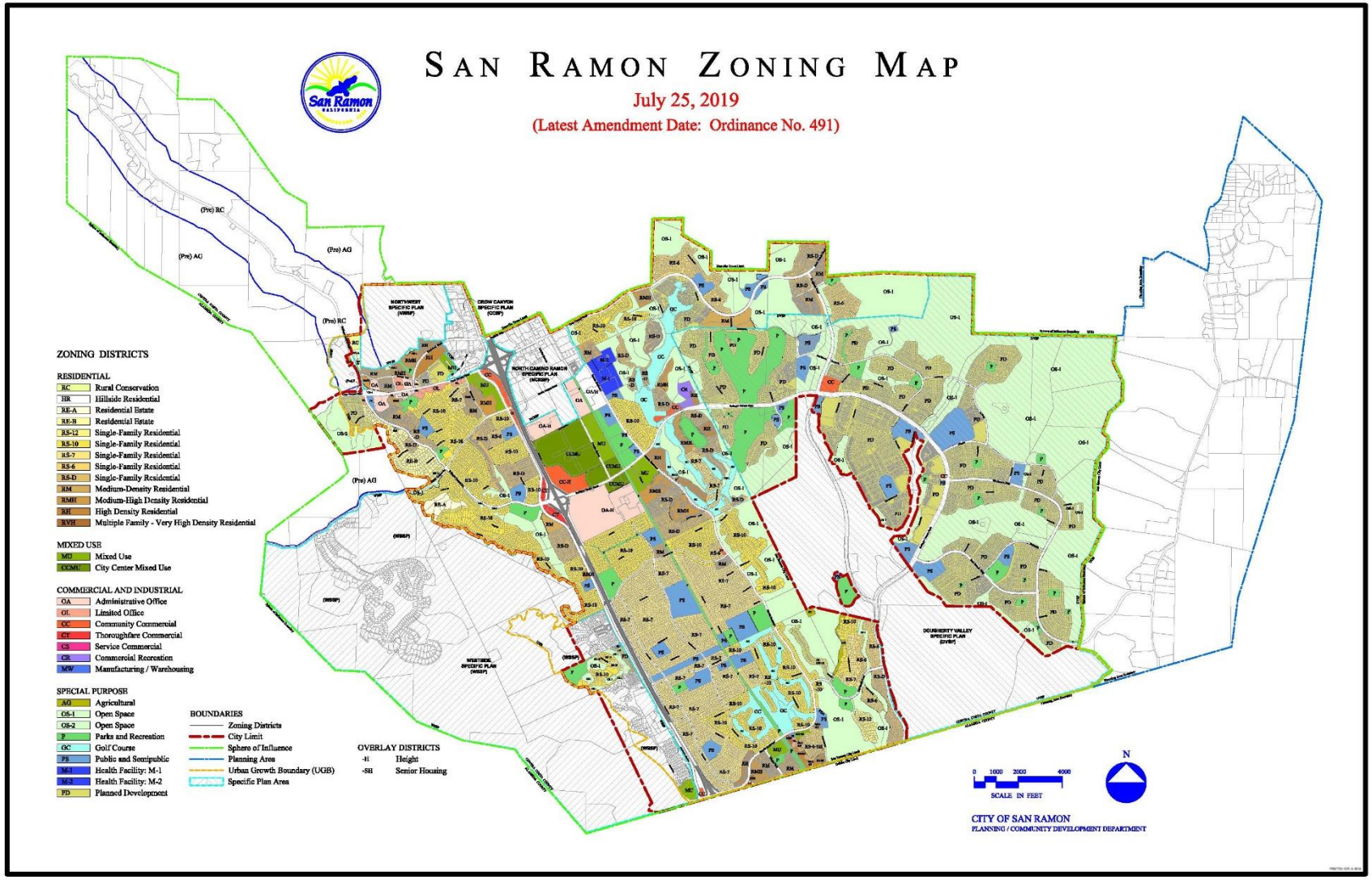


Figure 4-2

Land Use Diagram

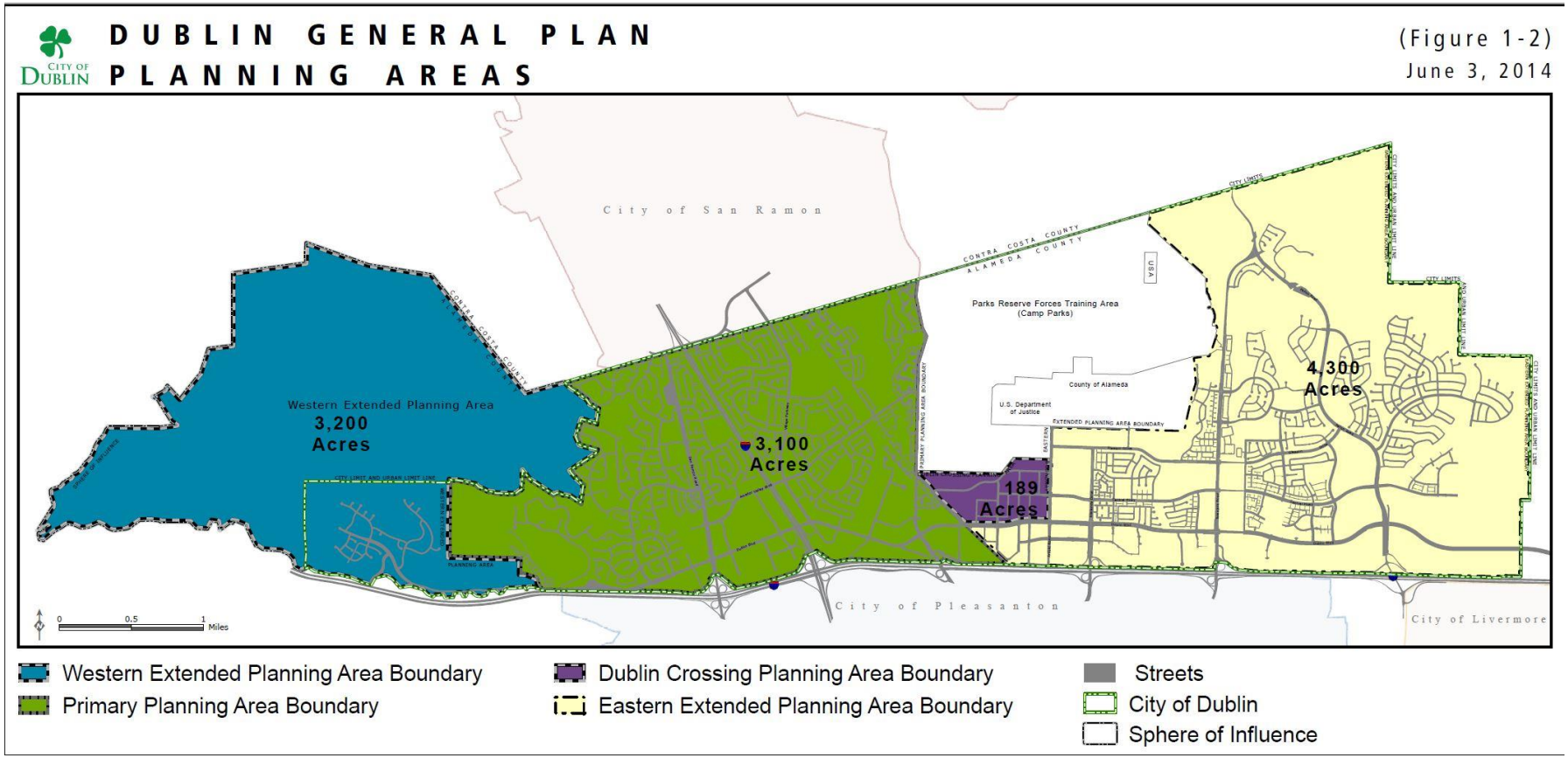
(Updated on October 21, 2019)


SAN RAMON ZONING MAP
July 25, 2019
(Latest Amendment Date: Ordinance No. 491)
ZONING DISTRICTS
RESIDENTIAL
RC Rural Conservation
HR Hillside Residential
RE-A Residential Estate
RE-B Residential Estate
RS-12 Single-Family Residential
RS-10 Single-Family Residential
RS-7 Single-Family Residential
RS-6 Single-Family Residential
RS-D Single-Family Residential
RM Medium-Density Residential
RMH Medium-High Density Residential
RH High Density Residential
RVH Multiple Family - Very High Density Residential
MIXED USE
MU Mixed Use
CCMU City Center Mixed Use
COMMERCIAL AND INDUSTRIAL
OA Administrative Office
OL Limited Office
CC Community Commercial
CT Thoroughfare Commercial
CS Service Commercial
CR Commercial Recreation
MW Manufacturing / Warehousing
SPECIAL PURPOSE
AG Agricultural
OS-1 Open Space
OS-2 Open Space
P Parks and Recreation
GC Golf Course
PS Public and Semipublic
M-1 Health Facility: M-1
M-2 Health Facility: M-2
PD Planned Development
BOUNDARIES
Zoning Districts
City Limit
Sphere of Influence
Planning Area
Urban Growth Boundary (UGB)
Specific Plan Area
OVERLAY DISTRICTS
-H Height
-SH Senior Housing
(Pre) RC
(Pre) AG
NORTHWEST SPECIFIC PLAN (NWSP)
CROW CANYON SPECIFIC PLAN (CCSP)
NORTH CAMINO RAMON SPECIFIC PLAN (NCRSP)
WESTRIDGE SPECIFIC PLAN (WRSP)
DOUGHERTY VALLEY SPECIFIC PLAN (DVSP)
0 1000 2000 4000
SCALE IN FEET
N
CITY OF SAN RAMON
PLANNING / COMMUNITY DEVELOPMENT DEPARTMENT

2. Dublin Land Use Maps

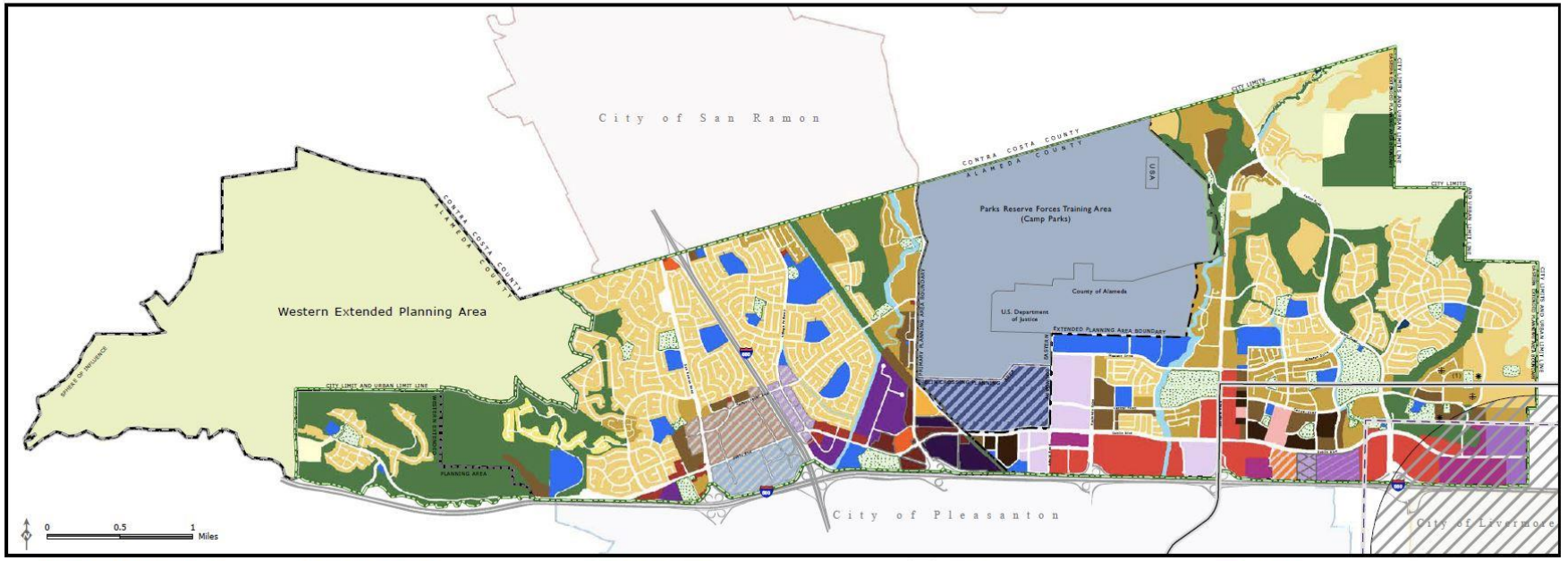
Dublin's General Plan includes 4 Planning Areas—Primary, Eastern Extended, Western Extended, and Dublin Crossing. About 62% of Dublin's land area is residential with a Civic Center and business area on either side of Dublin Blvd. within the Dublin Crossing Planning Area. Other shopping and retail areas are distributed along key thoroughfares. Reserve Forces Camp Parks, Alameda County, and Federal properties are Dublin's north side.

- June 3, 2014: Planning Areas Figure 1-2, page 21
- November 21, 2017: General Plan Land Use Map, Figure 1-1, page 19



DUBLIN GENERAL PLAN LAND USE

(Figure 1-1)
November 21, 2017



Public/Semi-Public/Open Space
- Regional Park
- Parks/ Public Recreation
- Open Space
- Stream Corridor
- Public Lands
- Public / Semi-Public
- Semi-Public

Commercial/Industrial
- General Commercial
- Retail/Office
- Retail/Office and Automotive
- Neighborhood Commercial
- General Commercial/Campus Office
- Campus Office
- Industrial Park
- Business Park/Industrial
- Business Park/Industrial and Outdoor Storage
- Medical Campus
- Medical Campus / Commercial
- Mixed Use
- Mixed Use 2/Campus Office
- Medium/High-Density Residential and Retail Office

Specific Plan Districts
- Downtown Dublin - Village Parkway District
- Downtown Dublin - Transit-Oriented District
- Downtown Dublin - Retail District
- Dublin Crossing

Residential
- Rural Residential/Agriculture (1 Unit per 100 Gross Residential Acres)
- Estate Residential (0.01 - 0.8 du/ac)
- Low-Density Single Family (0.5 - 3.8 du/ac)
- Single Family Residential (0.9 - 6.0 du/ac)
- Medium-Density Residential (6.1 - 14.0 du/ac)
- Medium/High-Density Residential (14.1 - 25.0 du/ac)
- High-Density Residential (25.1+ du/ac)

- Airport Influence Area (AIA)/Overlay Zoning District
- Airport Protection Area (APA)
- Airport Safety Zone 6
- Western Extended Planning Area Boundary
- Primary Planning Area Boundary
- Eastern Extended Planning Area Boundary
- Dublin Crossing Planning Area Boundary

- City of Dublin
- Sphere of Influence
- City of Livermore
- City of Pleasanton
- City of San Ramon

* The location of Semi-Public sites on the Chen and Croak properties of Fallon Village will be determined at the time of the Stage 2 Development Plan approval. The respective sizes of the sites will be 2.5 net acres, and 2.0 net acres on the Chen and Croak Properties.

** 50% of the units within the Medium Density land use designation on the Croak and Jordan properties shall have private, flat yards.

General Plan Land Use Map should be used in combination with the General Plan and applicable Specific Plans that contain policies and development standards for specific planning areas.

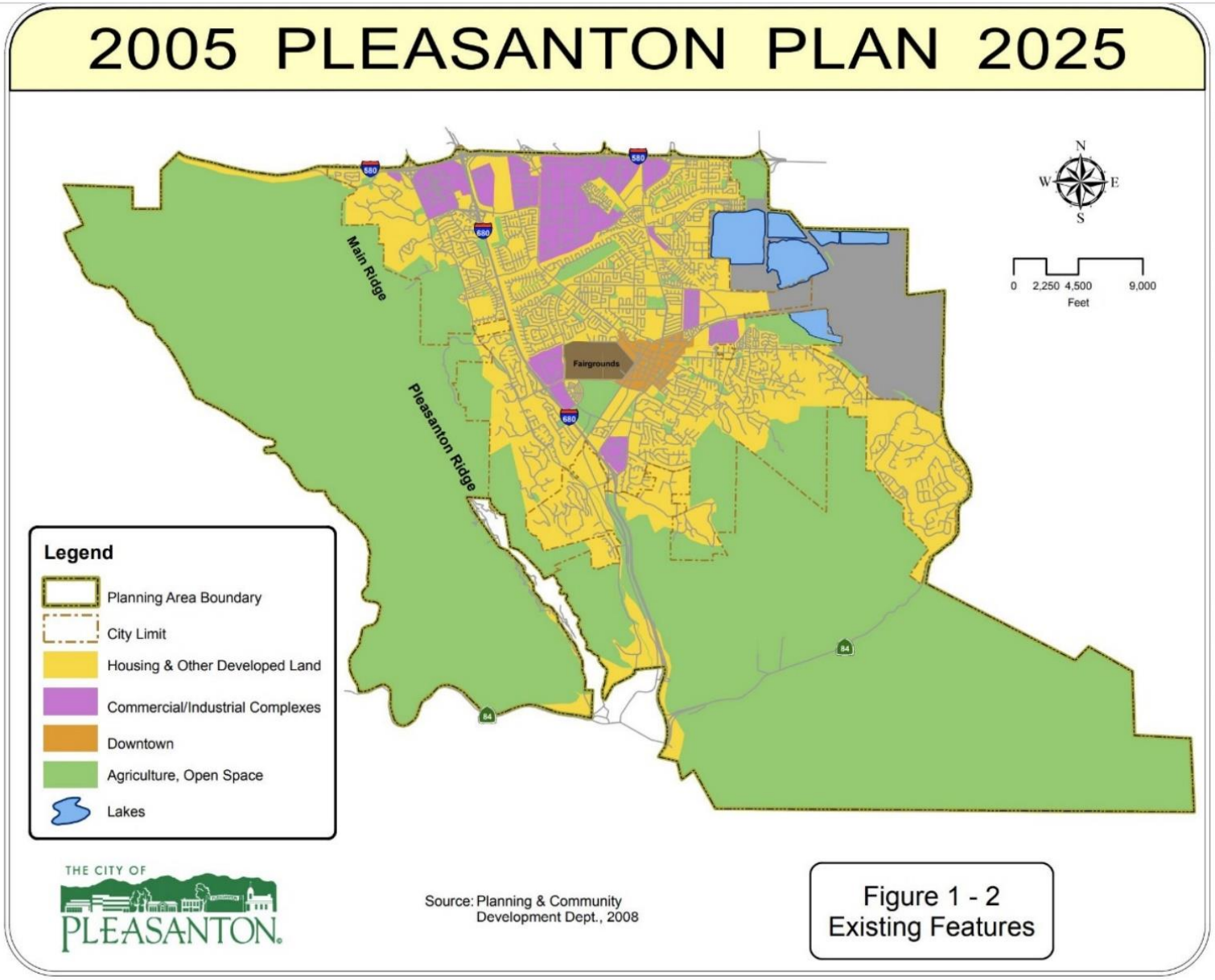
While the General Plan Land Use Map shows existing development and layout, only the land use designations for the land on which such development exists are part of the General Plan.

(1) Underlying Land Use – Public / Semi Public (ORD. 09-15 and RESO. 166-15)

3. *Pleasanton* Land Use Maps

The 2005 City of Pleasanton, CA - General Plan shows planning areas, some beyond the city limits. Pleasanton has several business parks, Hacienda being the largest on the north side. Stoneridge Mall is on the west side of I-680 and San Francisco Premium Outlets are along I-580. The Alameda Fairgrounds are south central side of town. The city has 8 Specific Plans with East Pleasanton being the largest future subdivision.

- City of Pleasanton General Plan Land Use Map 2005-2025
- City of Pleasanton Subregional Planning Element, Air Quality pages 17-18


2005 PLEASANTON PLAN 2025
Main Ridge
Pleasanton Ridge
Fairgrounds
580
680
84
N
W
E
S
0 2,250 4,500 9,000
Feet
Legend
Planning Area Boundary
City Limit
Housing & Other Developed Land
Commercial/Industrial Complexes
Downtown
Agriculture, Open Space
Lakes
THE CITY OF
PLEASANTON
Source: Planning & Community Development Dept., 2008
Figure 1 - 2
Existing Features

2005 PLEASANTON PLAN 2025

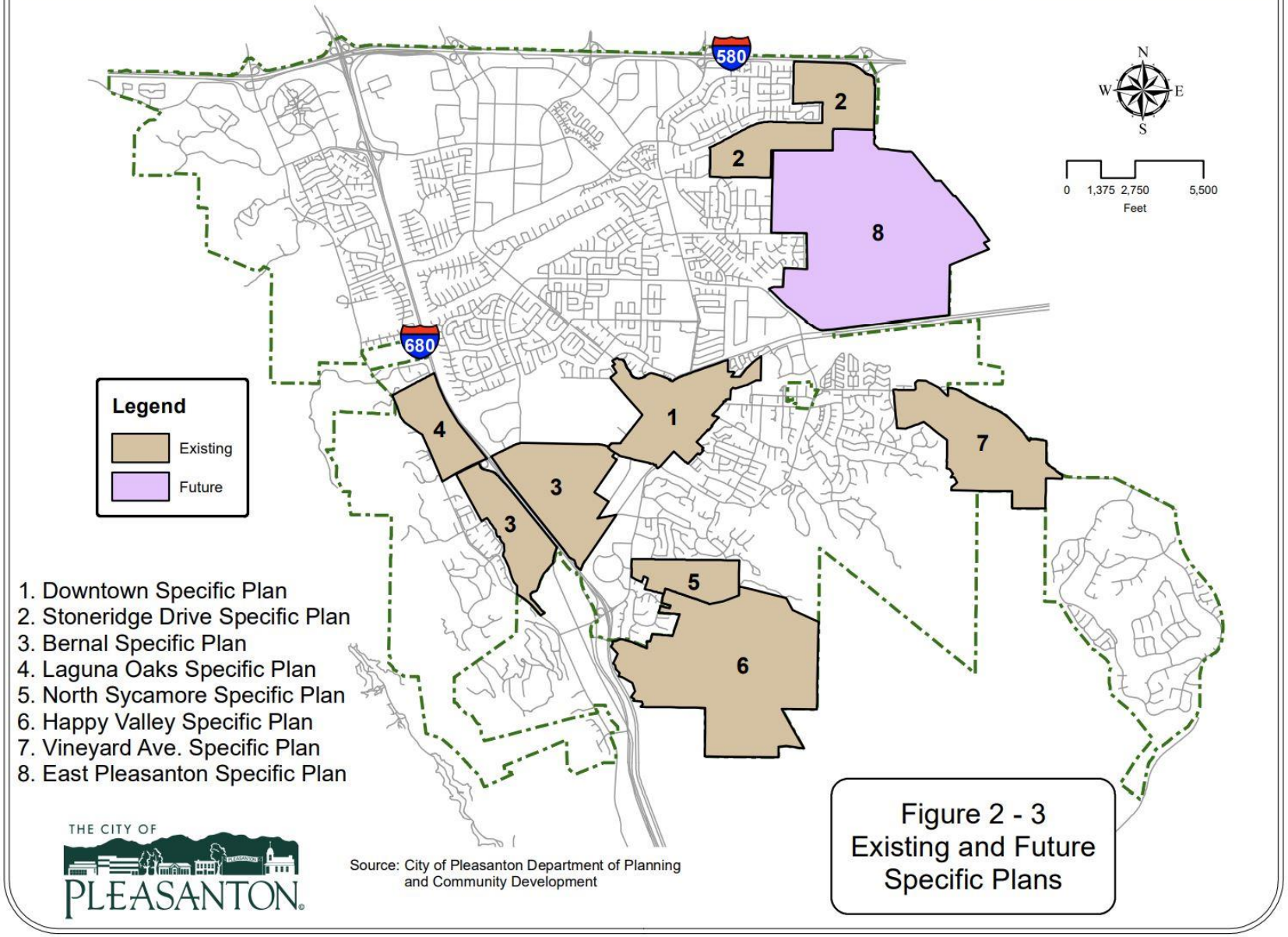
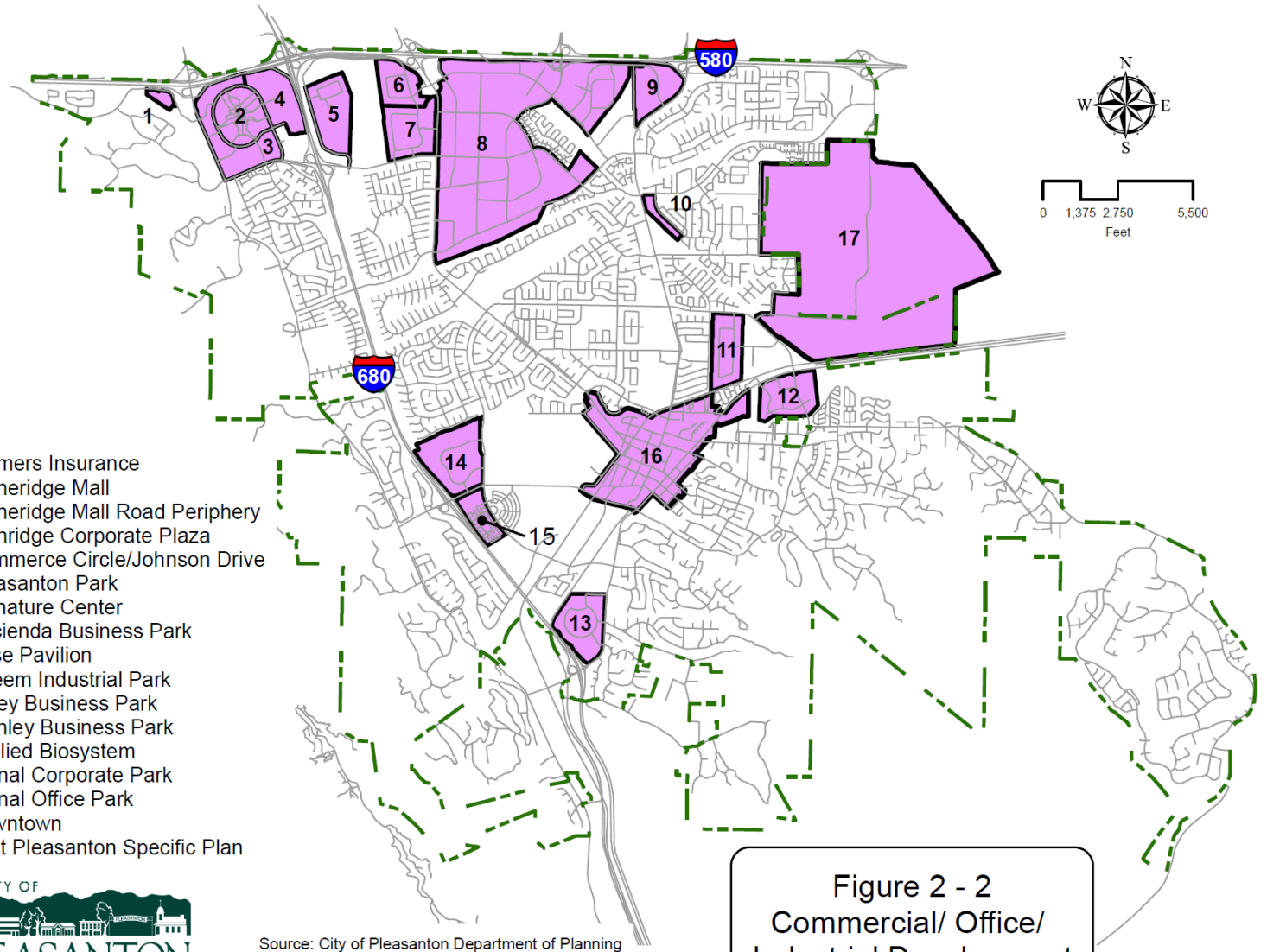


Figure 2 - 3
Existing and Future
Specific Plans

2005 PLEASANTON PLAN 2025

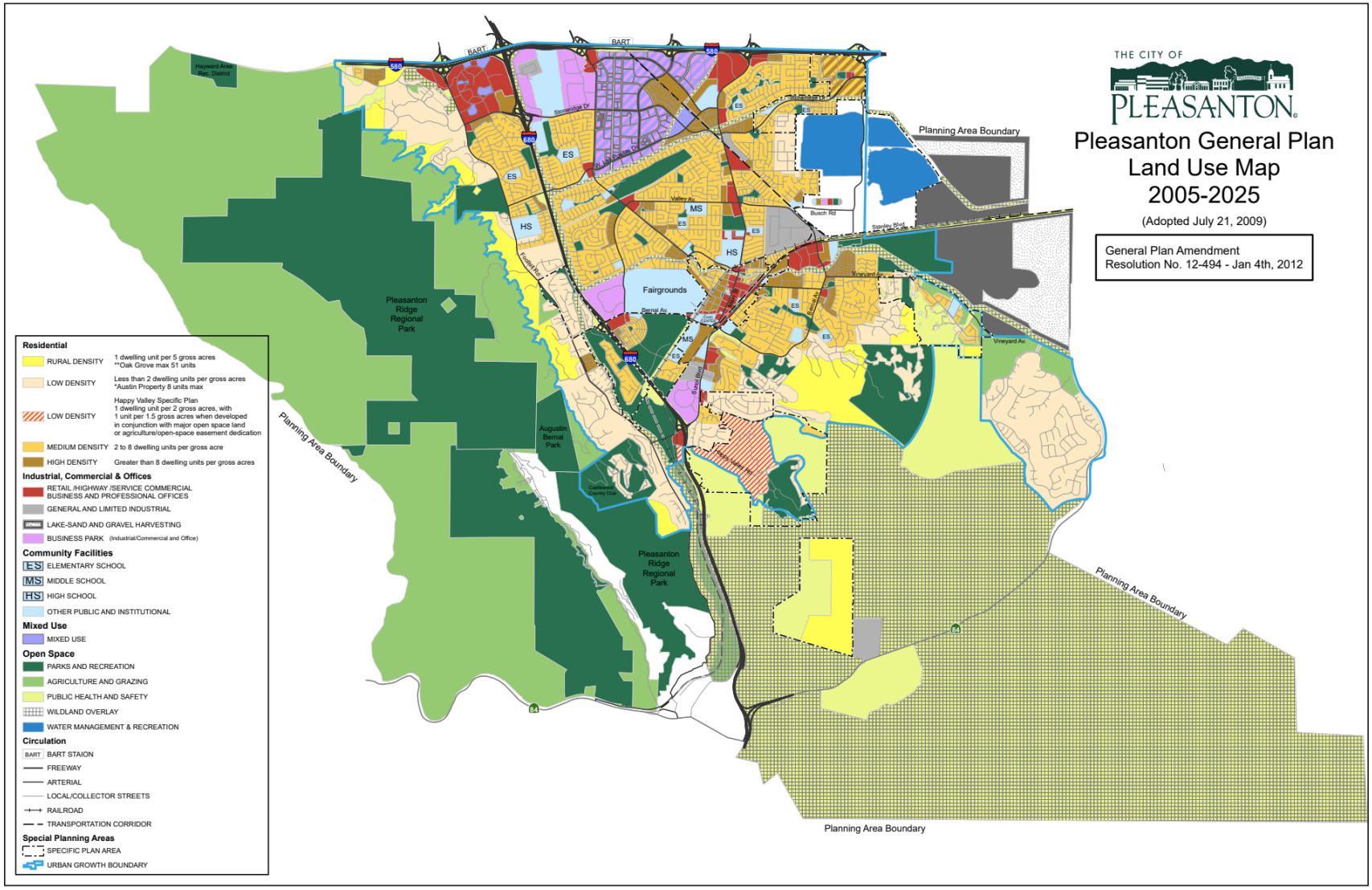


1. Farmers Insurance
2. Stoneridge Mall
3. Stoneridge Mall Road Periphery
4. Stonridge Corporate Plaza
5. Commerce Circle/Johnson Drive
6. Pleasanton Park
7. Signature Center
8. Hacienda Business Park
9. Rose Pavilion
10. Rheem Industrial Park
11. Valley Business Park
12. Stanley Business Park
13. Applied Biosystem
14. Bernal Corporate Park
15. Bernal Office Park
16. Downtown
17. East Pleasanton Specific Plan

THE CITY OF PLEASANTON

Source: City of Pleasanton Department of Planning and Community Development

Figure 2 - 2
Commercial/ Office/
Industrial Development


THE CITY OF
PLEASANTON
Pleasanton General Plan
Land Use Map
2005-2025
(Adopted July 21, 2009)
General Plan Amendment
Resolution No. 12-494 - Jan 4th, 2012
Planning Area Boundary
Planning Area Boundary
Planning Area Boundary
Planning Area Boundary
Pleasanton Ridge Regional Park
Pleasanton Ridge Regional Park
Augustin Bernal Park
Fairgrounds
Residential
RURAL DENSITY 1 dwelling unit per 5 gross acres **Oak Grove max 51 units
LOW DENSITY Less than 2 dwelling units per gross acres *Austin Property 8 units max
LOW DENSITY Happy Valley Specific Plan 1 dwelling unit per 2 gross acres, with 1 unit per 1.5 gross acres when developed in conjunction with major open space land or agriculture/open-space easement dedication
MEDIUM DENSITY 2 to 8 dwelling units per gross acre
HIGH DENSITY Greater than 8 dwelling units per gross acres
Industrial, Commercial & Offices
RETAIL /HIGHWAY /SERVICE COMMERCIAL BUSINESS AND PROFESSIONAL OFFICES
GENERAL AND LIMITED INDUSTRIAL
LAKE-SAND AND GRAVEL HARVESTING
BUSINESS PARK (Industrial/Commercial and Office)
Community Facilities
ES ELEMENTARY SCHOOL
MS MIDDLE SCHOOL
HS HIGH SCHOOL
OTHER PUBLIC AND INSTITUTIONAL
Mixed Use
MIXED USE
Open Space
PARKS AND RECREATION
AGRICULTURE AND GRAZING
PUBLIC HEALTH AND SAFETY
WILDLAND OVERLAY
WATER MANAGEMENT & RECREATION
Circulation
BART BART STAION
FREEWAY
ARTERIAL
LOCAL/COLLECTOR STREETS
RAILROAD
TRANSPORTATION CORRIDOR
Special Planning Areas
SPECIFIC PLAN AREA
URBAN GROWTH BOUNDARY

4. Livermore Land Use Maps

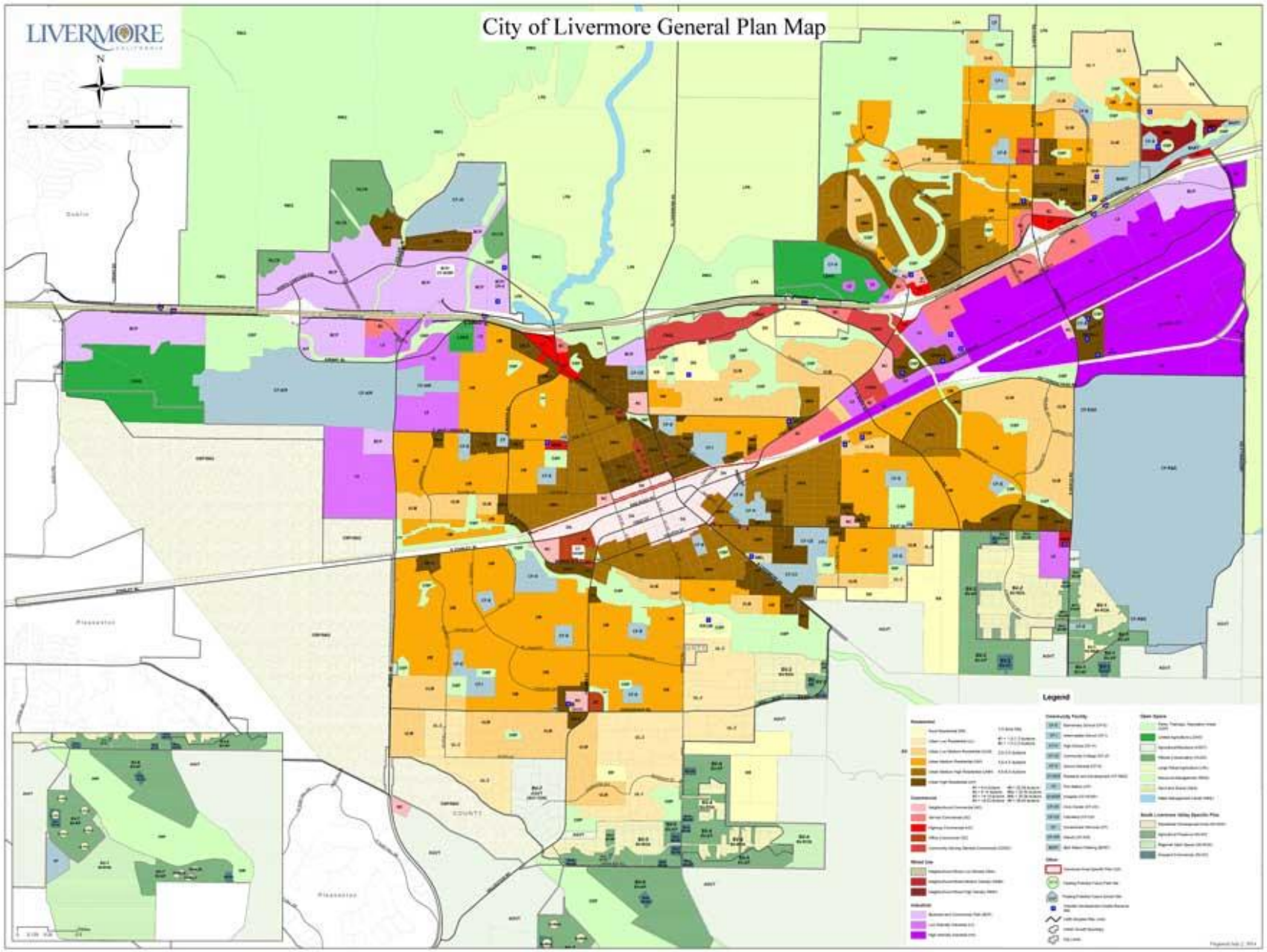
Livermore General Plan Map: https://www.cityoflivermore.net/civicax/filebank/documents/9961/

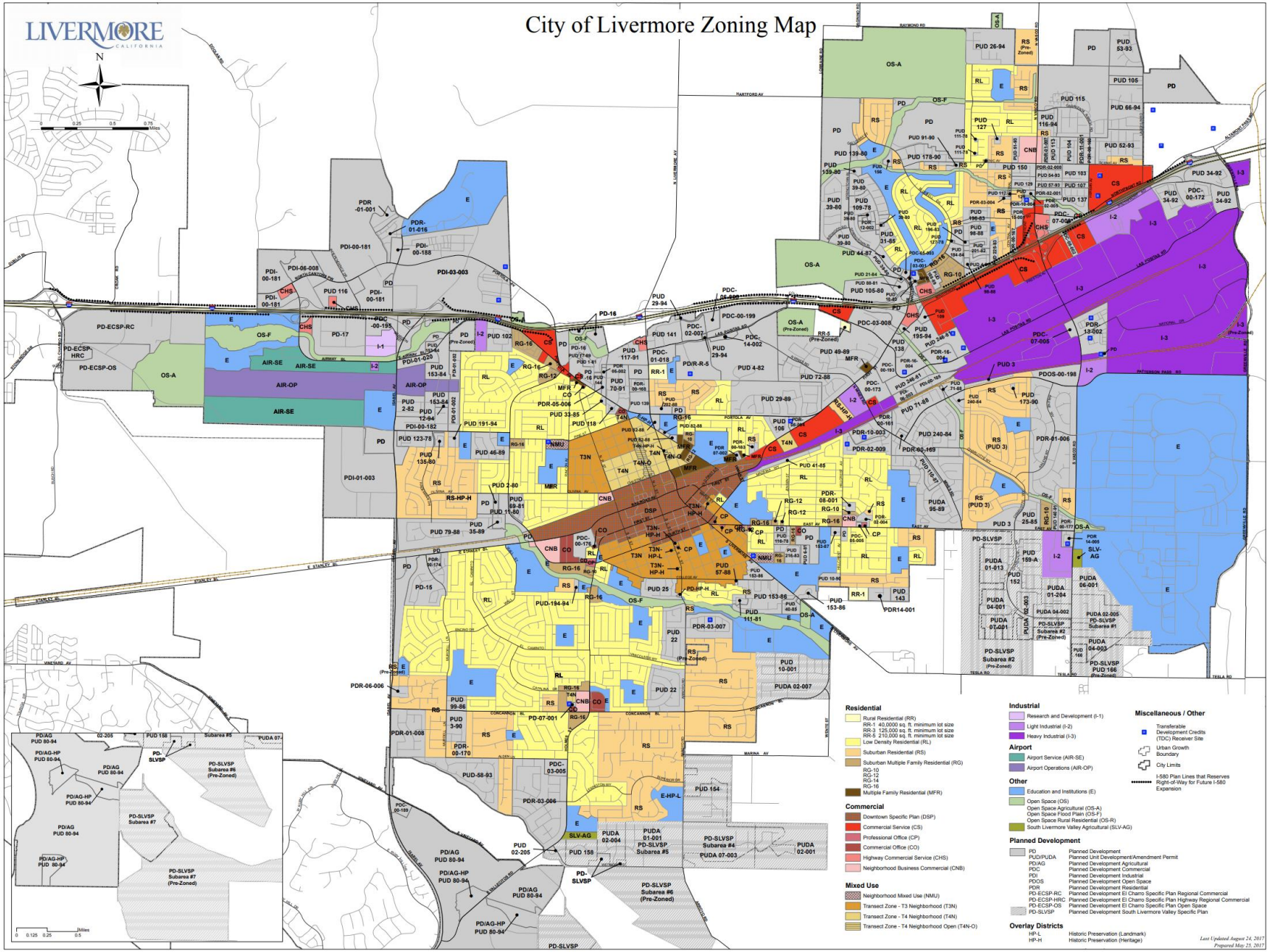
Livermore Zoning Map: https://www.cityoflivermore.net/civicax/filebank/documents/13792/

Existing Land Uses 2002

Livermore Land Use Element 3 – Livermore Airport Safety Compatibility Zones

South Livermore Area Plan


LIVERMORE
City of Livermore General Plan Map
Legend


LIVERMORE
CALIFORNIA
City of Livermore Zoning Map
N
Residential
Rural Residential (RR)
RR-1 40,0000 sq. ft. minimum lot size
RR-3 126,000 sq. ft. minimum lot size
RR-5 210,000 sq. ft. minimum lot size
Low Density Residential (RL)
Suburban Residential (RS)
Suburban Multiple Family Residential (RG)
RG-10
RG-12
RG-14
RG-16
Multiple Family Residential (MFR)
Commercial
Downtown Specific Plan (DSP)
Commercial Service (CS)
Professional Office (CP)
Commercial Office (CO)
Highway Commercial Service (CHS)
Neighborhood Business Commercial (CNB)
Mixed Use
Neighborhood Mixed Use (NMU)
Transect Zone - T3 Neighborhood (T3N)
Transect Zone - T4 Neighborhood (T4N)
Transect Zone - T4 Neighborhood Open (T4N-O)
Industrial
Research and Development (I-1)
Light Industrial (I-2)
Heavy Industrial (I-3)
Airport
Airport Service (AIR-SE)
Airport Operations (AIR-OP)
Other
Education and Institutions (E)
Open Space (OS)
Open Space Agricultural (OS-A)
Open Space Flood Plain (OS-F)
Open Space Rural Residential (OS-R)
South Livermore Valley Agricultural (SLV-AG)
Planned Development
PD Planned Development
PUD/PUDA Planned Unit Development/Amendment Permit
PD/AG Planned Development Agricultural
PDC Planned Development Commercial
PDI Planned Development Industrial
PDOS Planned Development Open Space
PDR Planned Development Residential
PD-ECSP-RC Planned Development El Charro Specific Plan Regional Commercial
PD-ECSP-HRC Planned Development El Charro Specific Plan Highway Regional Commercial
PD-ECSP-OS Planned Development El Charro Specific Plan Open Space
PD-SLVSP Planned Development South Livermore Valley Specific Plan
Overlay Districts
HP-L Historic Preservation (Landmark)
HP-H Historic Preservation (Heritage)
Miscellaneous / Other
Transferable Development Credits (TDC) Receiver Site
Urban Growth Boundary
City Limits
I-580 Plan Lines that Reserves Right-of-Way for Future I-580 Expansion
Last Updated August 24, 2017
Prepared May 25, 2017

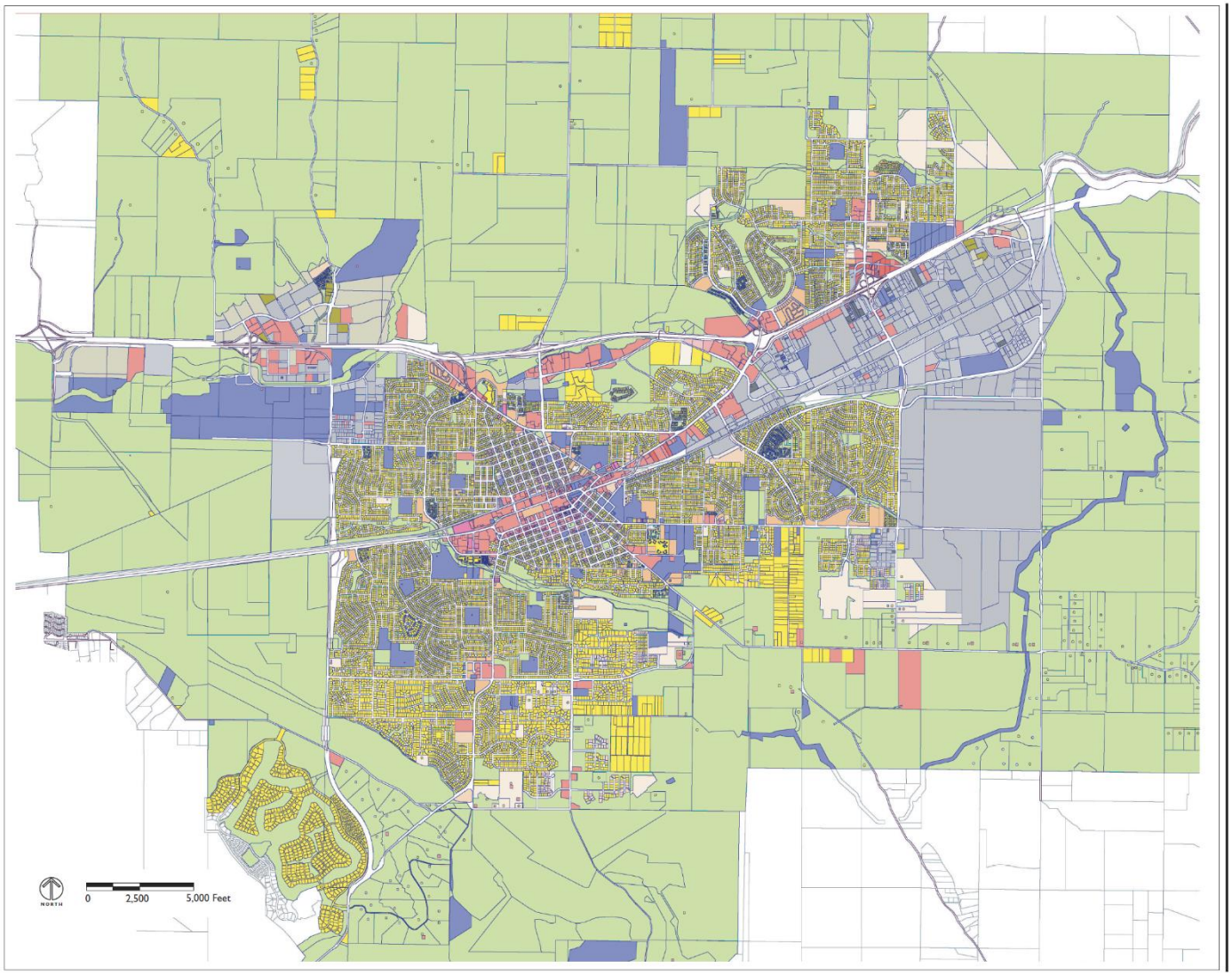


FIGURE 3 - 1

2002 EXISTING LAND USES

(FOR ILLUSTRATIVE PURPOSES ONLY)

- Vacant Industrial
- Underdeveoped Industrial
- Developed Industrial
- Vacant BCP
- Developed BCP
- Vacant Commercial
- Underdeveloped Commercial
- Developed Commercial
- Public Uses
- Vacant Public Uses
- Residential Care Facilities
- Open Space/Agriculture
- Vacant Residential
- Allocated Residential
- Developed Single Family Residential
- Developed Multi Family Residential

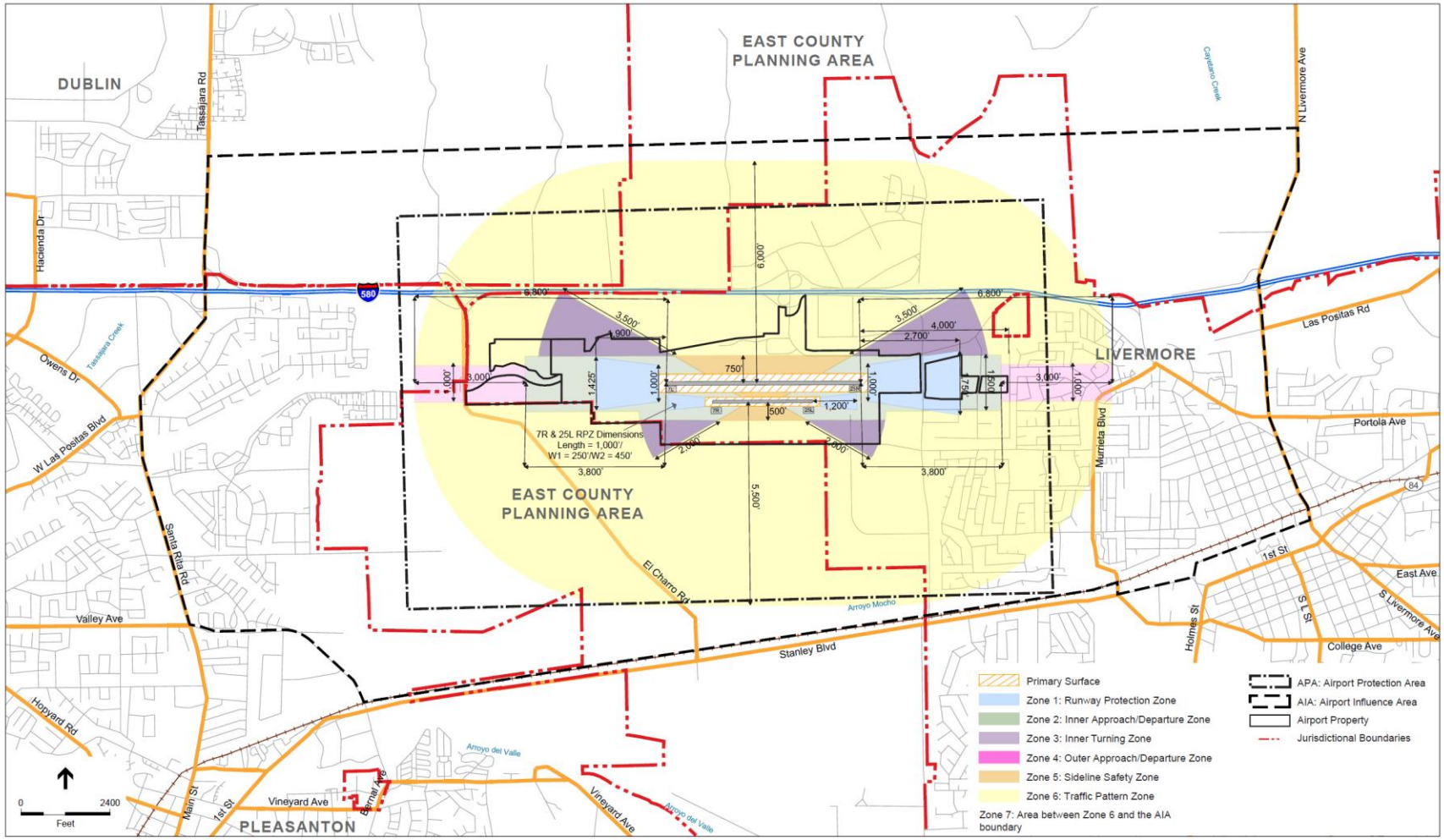
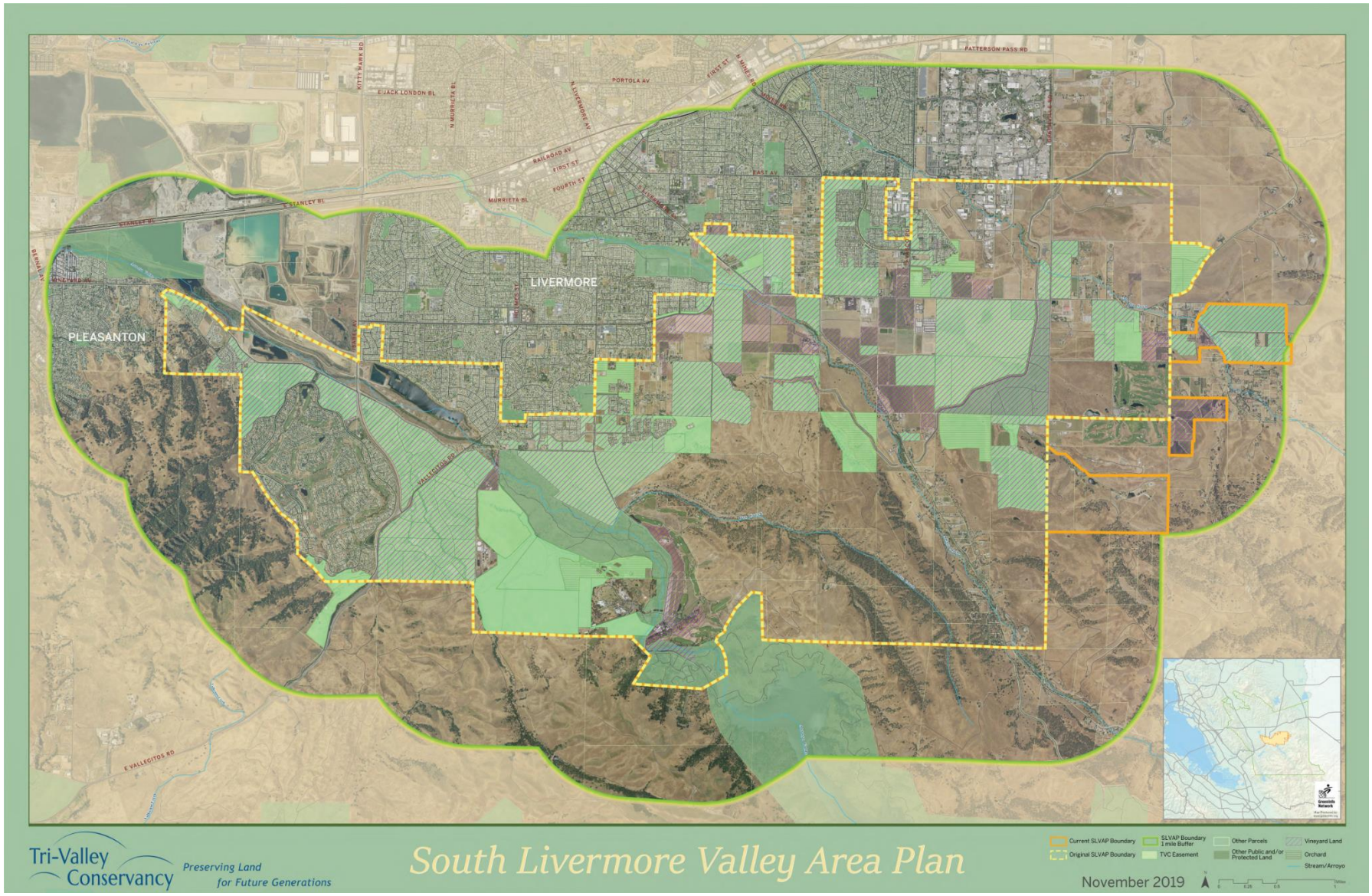


FIGURE 3-5.1

SOURCE: Alameda County ALUC: ESA Airports, ESRI, California Airport Land Use Planning Handbook (Caltrans, 2002)

SAFETY COMPATIBILITY ZONES AND AIRPORT INFLUENCE AREA

LIVERMORE GENERAL PLAN
September 2013


LIVERMORE
PLEASANTON
PATTERSON PASS RD
PORTOLA AV
E JACK LONDON BL
N MURRIETA BL
N LIVERMORE AV
RAILROAD AV
FIRST ST
FOURTH ST
EAST AV
E STANLEY BL
MURRIETA BL
VALLECITOS RD
E VALLECITOS RD
Tri-Valley Conservancy
Preserving Land for Future Generations
South Livermore Valley Area Plan
November 2019
Current SLVAP Boundary
Original SLVAP Boundary
SLVAP Boundary 1 mile Buffer
TVC Easement
Other Parcels
Other Public and/or Protected Land
Vineyard Land
Orchard
Stream/Arroyo

Appendix D. Demographic Data for Tri-Valley
An Appendix to: Ensuring Future Air Quality in the Tri-Valley
By Ron Baskett, TVAQCA AB 617 Project
December 27, 2021

Contents

1. US Census Bureau Demographic Data

Table 1. Demographic Data for Tri-Valley cities from US Census Bureau accessed June 2021

Population	San Ramon	Dublin	Pleasanton	Livermore	Tri-Valley
Population estimates, July 1, 2019, (V2019)	75,995	64,826	81,777	90,189	**312,787**
Population estimates base, April 1, 2010, (V2019)	71,412	46,036	70,280	81,426	**269,154**
Population, percent change – April 1, 2010 (estimates base) to July 1, 2019, (V2019)	6.40%	40.80%	16.40%	10.80%	**18.60%**
Population, Census, April 1, 2010	72,148	46,036	70,285	80,968	**269,437**
Age and Sex	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Persons under 5 years, percent	5.40%	7.40%	4.30%	7.20%	**6.08%**
Persons under 18 years, percent	28.30%	26.60%	24.40%	23.60%	**25.73%**
Persons 65 years and over, percent	10.50%	9.10%	14.70%	13.50%	**11.95%**
Female persons, percent	49.70%	50.70%	51.30%	51.20%	**50.73%**
Race and Hispanic Origin	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
White alone, percent	43.10%	38.90%	56.00%	75.90%	**53.48%**
Black or African American alone, percent(a)	2.30%	3.70%	1.80%	1.80%	**2.40%**
American Indian and Alaska Native alone, percent(a)	0.40%	0.50%	0.30%	0.30%	**0.38%**
Asian alone, percent(a)	46.70%	48.90%	34.20%	11.60%	**35.35%**
Native Hawaiian and Other Pacific Islander alone, percent(a)	0.40%	0.40%	0.50%	0.50%	**0.45%**
Two or More Races, percent	5.80%	5.80%	5.00%	6.40%	**5.75%**
Hispanic or Latino, percent(b)	7.10%	10.10%	9.50%	19.80%	**11.63%**
White alone, not Hispanic or Latino, percent	38.60%	32.40%	50.10%	61.90%	**45.75%**
Population Characteristics	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Veterans, 2015-2019	1,979	1,283	2,670	4,103	**10,035**
Foreign born persons, percent, 2015-2019	37.00%	39.00%	32.00%	15.70%	**30.93%**
Housing	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Housing units, July 1, 2019, (V2019)	X	X	X	X	
Owner-occupied housing unit rate, 2015-2019	72.40%	65.50%	69.90%	72.40%	**70.05%**

Median value of owner-occupied housing units, 2015-2019	$958,800	$882,200	$986,800	$744,200	**$893,000**
Median selected monthly owner costs -with a mortgage, 2015-2019	$3,849	$3,666	$3,554	$2,993	**$3,516**
Median selected monthly owner costs -without a mortgage, 2015-2019	$1,066	$959	$768	$652	**$861**
Median gross rent, 2015-2019	$2,391	$2,681	$2,396	$2,063	**$2,383**
Building permits, 2019	X	X	X	X	
Families & Living Arrangements	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Households, 2015-2019	25,535	20,235	29,011	31,747	**106,528**
Persons per household, 2015-2019	2.96	2.96	2.81	2.81	**2.89**
Living in same house 1 year ago, percent of persons age 1 year+, 2015-2019	86.40%	82.50%	87.50%	88.30%	**86.18%**
Language other than English spoken at home, percent of persons age 5 years+, 2015-2019	44.20%	48.40%	36.90%	20.80%	**37.58%**
Computer and Internet Use	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Households with a computer, percent, 2015-2019	98.30%	98.10%	97.50%	96.00%	**97.48%**
Households with a broadband Internet subscription, percent, 2015-2019	96.60%	95.70%	95.00%	93.00%	**95.08%**
Education	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
High school graduate or higher, percent of persons age 25 years+, 2015-2019	96.40%	94.90%	96.10%	93.70%	**95.28%**
Bachelor's degree or higher, percent of persons age 25 years+, 2015-2019	70.60%	66.30%	64.90%	44.00%	**61.45%**
Health	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
With a disability, under age 65 years, percent, 2015-2019	3.10%	3.40%	3.30%	4.90%	**3.68%**
Persons without health insurance, under age 65 years, percent	2.30%	2.50%	2.40%	3.30%	**2.63%**
Economy	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
In civilian labor force, total, percent of population age 16 years+, 2015-2019	68.80%	70.40%	66.00%	70.10%	**68.83%**
In civilian labor force, female, percent of population age 16 years+, 2015-2019	60.10%	59.70%	56.40%	64.10%	**60.08%**
Total accommodation and food services sales, 2012 ($1,000)©	159,782	181,412	247,683	153,709	**742,586**
Total health care and social assistance receipts/revenue, 2012 ($1,000)©	430,788	174,411	987,499	310,823	**1,903,521**
Total manufacturer's shipments, 2012 ($1,000)©	D	509,711	836,874	1,339,415	**2,686,000**
Total merchant wholesaler sales, 2012 ($1,000)©	2,125,573	222,608	2,651,340	2,192,912	**7,192,433**
Total retail sales, 2012 ($1,000)(c)	671,450	1,329,043	1,662,290	1,211,971	**4,874,754**
Total retail sales per capita, 2012(c)	$9,083	$27,248	$22,979	$14,506	**73,816**
Transportation	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Mean travel time to work (minutes), workers age 16 years+, 2015-2019	38.8	40.9	36.4	32.9	**37**
Income & Poverty	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Median household income (in 2019 dollars), 2015-2019	$160,783	$150,299	$156,400	$127,452	**$148,734**

Per capita income in past 12 months (in 2019 dollars), 2015-2019	$63,782	$61,503	$69,551	$54,813	**$62,412**
Persons in poverty, percent	3.70%	4.00%	4.30%	4.50%	**4.13%**
Businesses	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Total employer establishments, 2018	X	X	X	X	
Total employment, 2018	X	X	X	X	
Total annual payroll, 2018 ($1,000)	X	X	X	X	
Total employment, percent change, 2017-2018	X	X	X	X	
Total non-employer establishments, 2018	X	X	X	X	
All firms, 2012	7,423	4,695	7,637	7,387	**27,142**
Men-owned firms, 2012	3,450	2,242	3,872	3,283	**12,847**
Women-owned firms, 2012	2,742	1,742	2,362	2,679	**9,525**
Minority-owned firms, 2012	2,922	2,404	2,230	2,061	**9,617**
Nonminority-owned firms, 2012	4,079	1,952	4,775	4,697	**15,503**
Veteran-owned firms, 2012	519	300	612	470	**1,901**
Nonveteran-owned firms, 2012	6,522	4,015	6,434	6,340	**23,311**
Geography	**San Ramon**	**Dublin**	**Pleasanton**	**Livermore**	**Tri-Valley**
Population per square mile, 2010	3,994.70	3,088.00	2,914.80	3,216.50	**3,303.50**
Land area in square miles, 2010	18.06	14.91	24.11	25.17	**82.25**

Note: The column for the Tri-Valley is either the sum or average of the 4 cities

Source: Each column represents data were downloaded from the US Census Bureau Quick Facts web site by city, for example for San Ramon: U.S. Census Bureau QuickFacts: San Ramon city, California. Note that Quick Facts using 2020 Census were not available by end of 2021.

Definitions

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa. It includes people who indicate their race as "White" or report entries such as Irish, German, Italian, Lebanese, Arab, Moroccan, or Caucasian.

Black or African American. A person having origins in any of the Black racial groups of Africa. It includes people who indicate their race as "Black or African American," or report entries such as African American, Kenyan, Nigerian, or Haitian.

American Indian and Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment. This category includes people who indicate their race as "American Indian or Alaska Native" or report entries such as Navajo, Blackfeet, Inupiat, Yup'ik, or Central American Indian groups or South American Indian groups.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam. This includes people who reported detailed Asian responses such as: "Asian Indian," "Chinese," "Filipino," "Korean," "Japanese," "Vietnamese," and "Other Asian" or provide other detailed Asian responses.

Native Hawaiian and Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands. It includes people who reported their race as "Fijian," "Guamanian or Chamorro," "Marshallese," "Native Hawaiian," "Samoan," "Tongan," and "Other Pacific Islander" or provide other detailed Pacific Islander responses.

Two or more races. People may choose to provide two or more races either by checking two or more race response check boxes, by providing multiple responses, or by some combination of check boxes and other responses. For data product purposes, "Two or More Races" refers to combinations of two or more of the following race categories: "White," "Black or African American," American Indian or Alaska Native," "Asian," Native Hawaiian or Other Pacific Islander," or "Some Other Race"

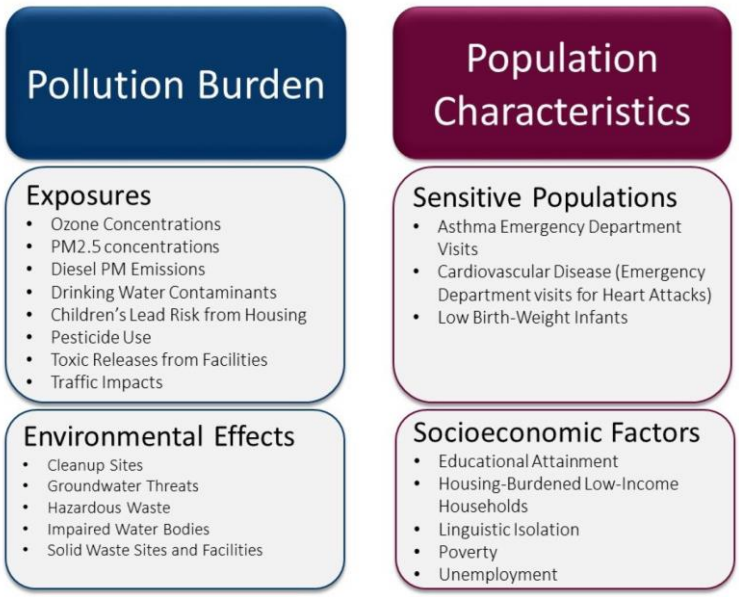
2. CalEnviroScreen Demographic Data

CalEnviroScreen is a tool that ranks each census tracts in California with 3 health-related factors of sensitive populations and 5 socioeconomic factors along with their pollution.

> Note: The California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) Version 3.0 of the California Communities Environmental Health Screening Tool (CalEnviroScreen3.0 or CES3.0) provides pollution and population indicators by census tract for June 2018 (CalEnviroScreen 3.0 | OEHHA). In September 2020, OEHHA released a draft CES4.0 with changes in methodology and a new indicator for Children's Lead Risk from Housing.

Each census tract is given a percentile ranking from 1 to 100 with 100 being the largest effect. CalEnviroScreen4.0 2020 uses the 21 indicators shown in Figure1.

Figure 1. CalEnviroScreen4.0 demographic indicators (Reference: OEHHA 2020)



Note that no Disadvantaged Communities have been identified by the SB 535 analysis. While there are some pocket areas of need within Livermore, Environmental Justice does not appear to be as significant an issue as in other areas of the Bay Area.

Figures 2 and 3 present 2018 CES3.0 and 2020 CES4.0 results on maps of the Tri-Valley census tracts. Figures 4 through 9 show additional selected maps for the Tri-Valley.

CES indicates the Tri-Valley has two KEY health issues—asthma and cardiovascular risk.

Table 2 lists selected CES3.0 indicators compiled for each of the 54 census tracts in the four Tri-Valley cities. These selected indicators include 5 Environmental Characteristic Indicators related to air quality, the overall Pollution Burden and 7 key Population indicators as well as the overall Population Characteristics Percentile. Table 3 shows average changes in the Tri-Valley between 2018 and 2020.

Table 2. Selected CalEnviroScreen4.0 rankings for Tri-Valley Cities

	San Ramon	Dublin	Pleasanton	Livermore	Tri-Valley
2020 Population	**85,309**	**37,866**	**90,757**	**99,258**	**313,190**
Selected Environmental Characteristics Indicators related to air quality (basis in parentheses)					
Ozone Percentile (Amount of daily maximum 10-hour Ozone concentration)	24	26	27	**36**	**29**
PM2.5 Percentile (annual mean PM 2.5 concentrations)	23	23	21	20	**21**
Diesel PM Percentile (diesel PM emissions from on-road and non-road sources)	35	**75**	50	42	**47**
Toxic Release Percentile (toxicity-weighted concentrations of modeled chemical releases to air from facility emissions & off-site incineration)	44	38	32	29	**35**
Traffic Percentile (traffic density in vehicle-kilometers per hour per road length within 150 m of the census tract boundary)	58	72	68	46	**59**
Pollution Burden Percentile (average of percentiles from Pollution Burden Indicators with a half-weighting for Environ. Effects indicators)	5	27	28	38	**26**
Key Population Characteristics Indicators (basis in parentheses)					
Asthma Percentile (age-adjusted rate of emergency dept visits for asthma)	14	25	23	24	**22**
Low Birth Rate (percent of births less than 5.5 pounds)	41	65	56	**33**	**45**
Cardiovascular Disease Percentile (age-adjusted rate of emergency dept visits of heart attacks per 10,000)	14	18	25	**32**	**24**
Education Percentile (percent of population over 25 with less than a high school education)	14	22	15	27	**20**
Linguistic Isolation Percentile (percent of limited English-speaking households)	38	56	42	27	**37**
Poverty Percentile (percent of population living below two times the federal poverty level)	5	8	8	14	**9**
Unemployment Percentile (percent of the population over the age of 16 that is unemployed and eligible for the labor force)	19	22	16	21	**19**
Housing Burden Percentile (percent housing burdened low-income households)	17	20	18	18	**18**
Population Characteristics Percentile (average of the Population Characteristics indicators)	10	21	18	15	**15**
CalEnviroScreen4.0 Overall Percentile	**4**	**20**	**18**	**19**	**15**

Table 3. Comparison of 2018 with 2020 CalEnviroScreen rankings for the Tri-Valley cities (Values are percentile ranking with higher values indicating more negative impact)

	CES3.0 2018	CES4.0 2020	Change CES3-CES4
Exposure			
1. Ozone concentrations	**24**	**29**	**-5**
2. PM2.5 concentrations	**29**	**21**	**8**
3. Diesel PM emissions	**57**	**47**	**10**
4. Drinking Water Contaminant	30	36	-6
5. Pesticide use	22	17	5
6. Toxic Releases	36	35	1
7. Traffic Density	**53**	**59**	**-6**
Environmental Effects			
8. Cleanup Sites	23	23	0
9. Groundwater Threats	**39**	**48**	**-9**
10. Hazardous Waste	33	31	2
11. Impaired Water Bodies	20	17	3
12. Solid Waste	14	13	1
Pollution Burden	**29**	**26**	3
Sensitive Populations			
13. Asthma Emergency Dept Visits	**31**	**22**	**9**
14. Low Birth Weight	**50**	**45**	**5**
15. Cardiovascular Disease	**44**	**24**	**20**
Socioeconomic Factors			
16. Education (% over 25 without HS diploma)	22	20	2
17. Linguistic Isolation	37	37	0
18. Poverty	12	9	3
19. Unemployment	16	19	-3
20. Housing Burden for low income	19	18	1
Population Characteristics	**22**	**15**	7
Overall Percentile	**21**	**15**	6

1. Each indicator represents the average percentile for the 54 census tracts in the four Tri-Valley cities.
2. Both CES3.0 and CES4.0 used the Tri-Valley four-city 2018 population of 277,514.
3. The new CES4.0 indicator for Children's Lead Risk from Housing is not included because it is not available for CES3.0.
4. **A positive value in change column represents improvement.**
5. Sources: CalEnviroScreen 3.0 | OEHHA and Draft CalEnviroScreen 4.0 | OEHHA.

3. CalEnviroScreen4.0 Maps by Census Tract

Source: CalEnviroScreen 4.0 Indicator Maps | CalEnviroScreen (arcgis.com)

Figure 2. CalEnviroScreen4.0 Results for the Tri-Valley

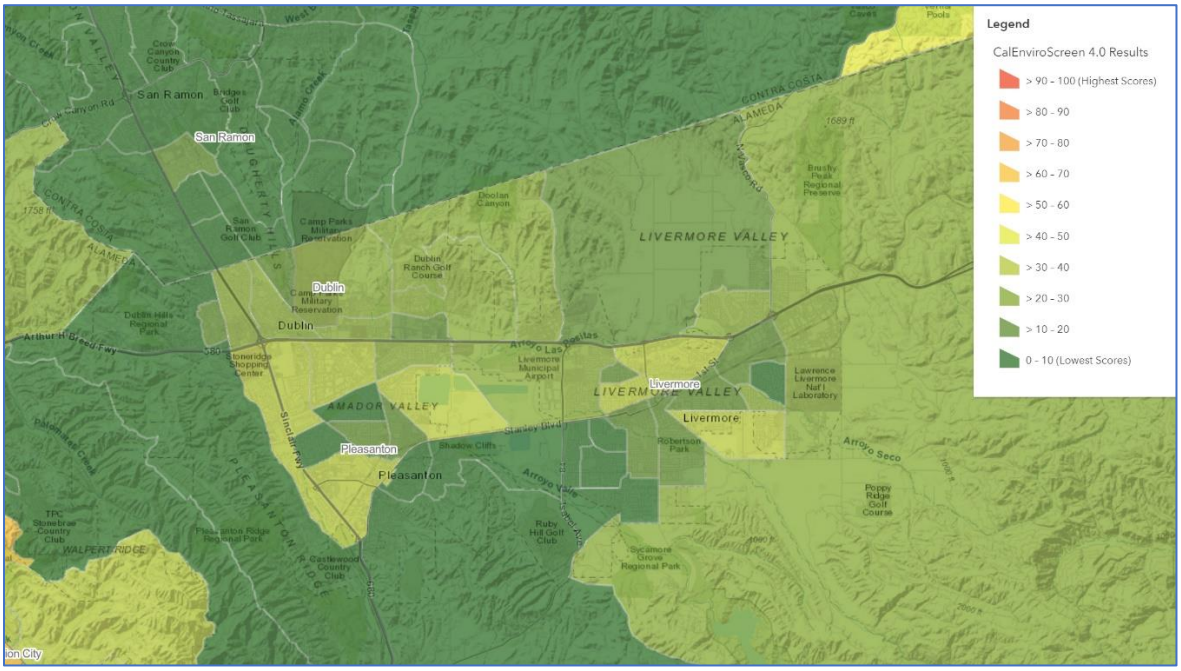


Figure 3. CalEnviroScreen4.0 Pollution Burden for the Tri-Valley

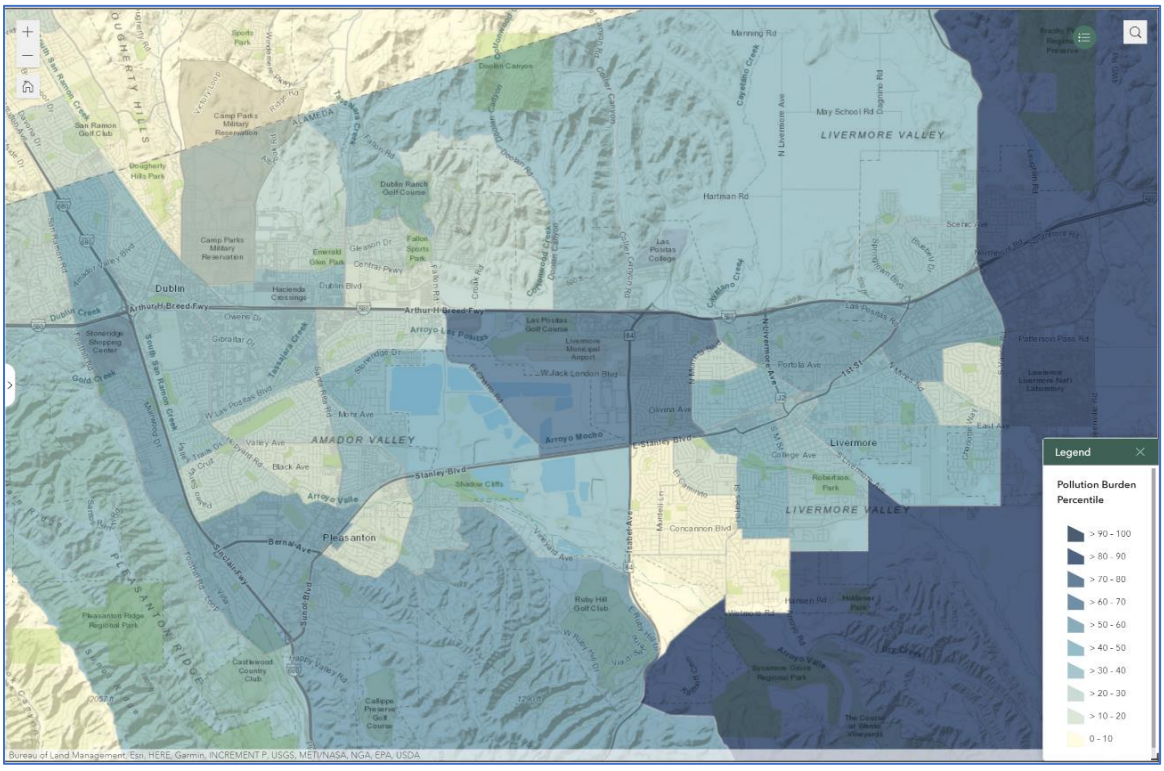


Figure 4. CalEnviroScreen4.0 Traffic Impacts for the Tri-Valley

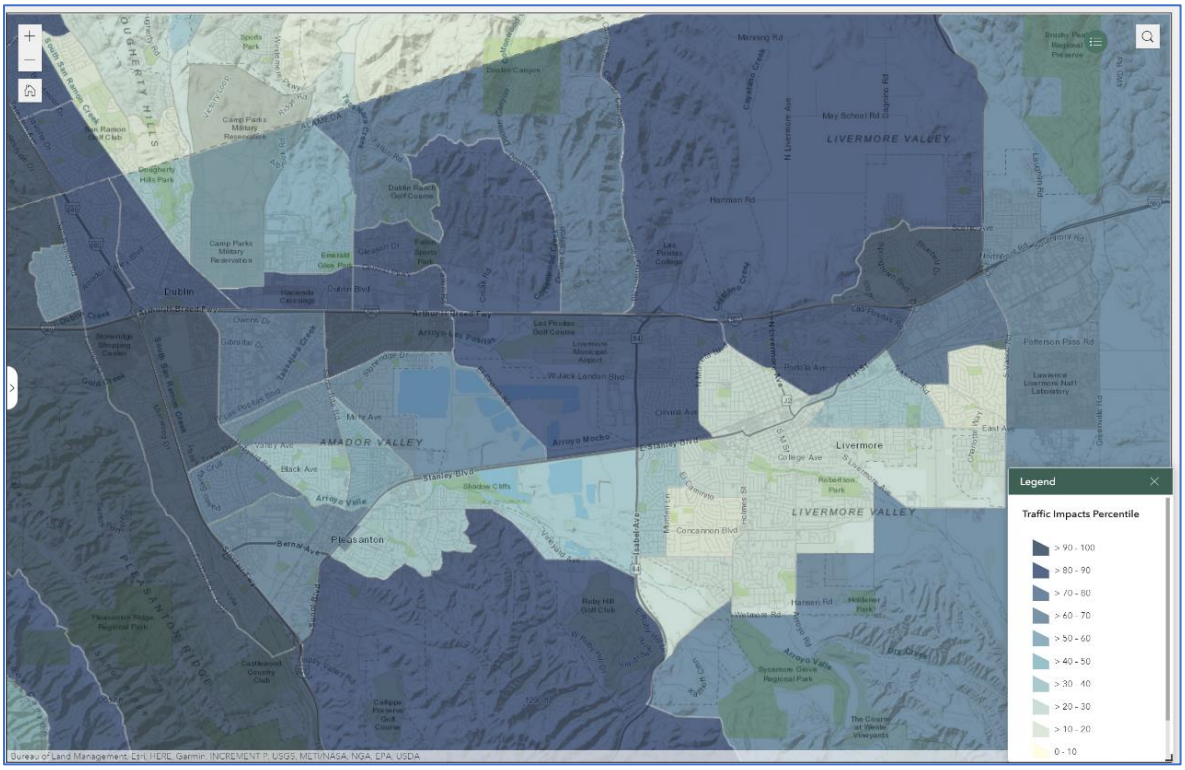


Figure 5. CalEnviroScreen4.0 Diesel PM for the Tri-Valley

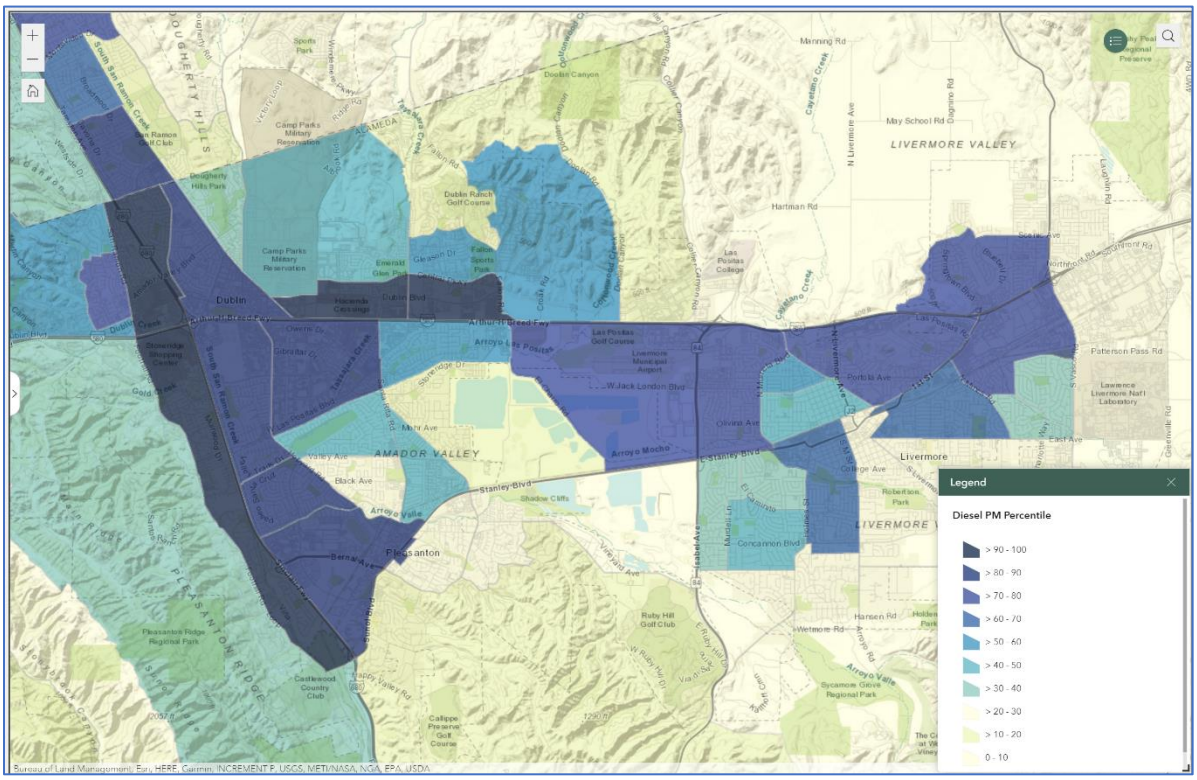


Figure 6. CalEnviroScreen4.0 Pesticide Use for the Tri-Valley

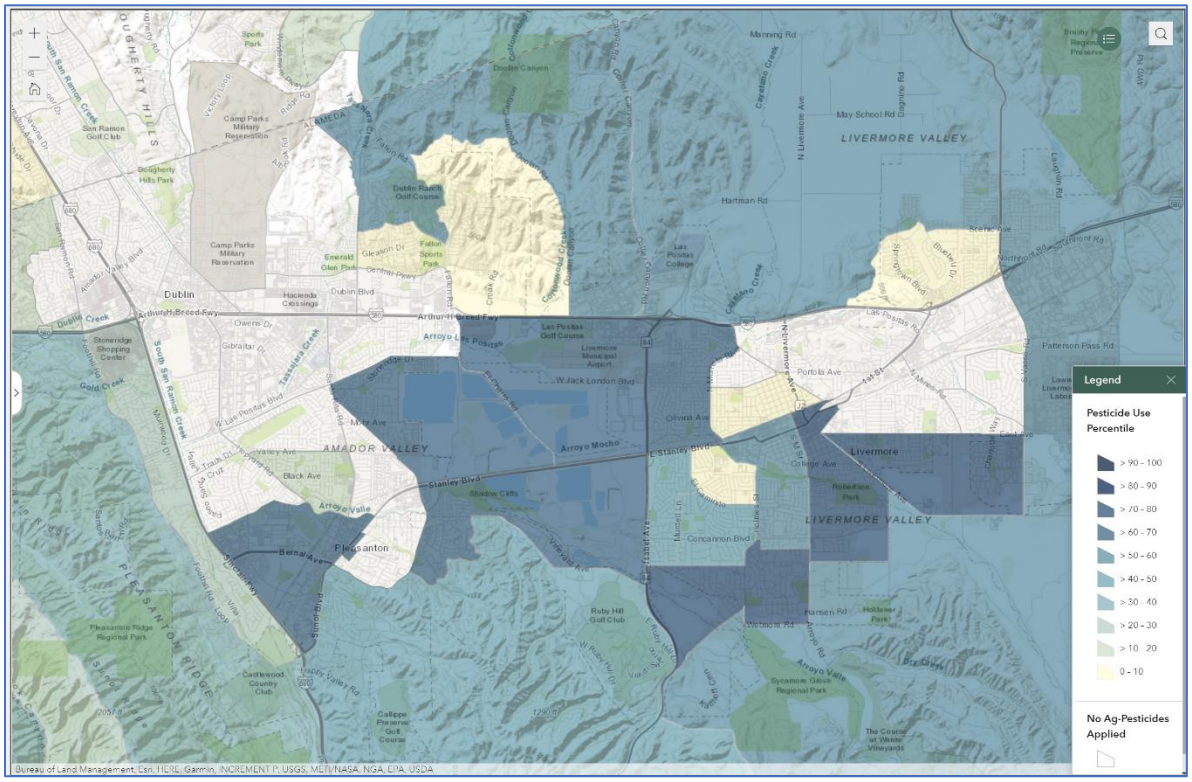


Figure 7. CalEnviroScreen4.0 Emergency Department Visits for Asthma in the Tri-Valley

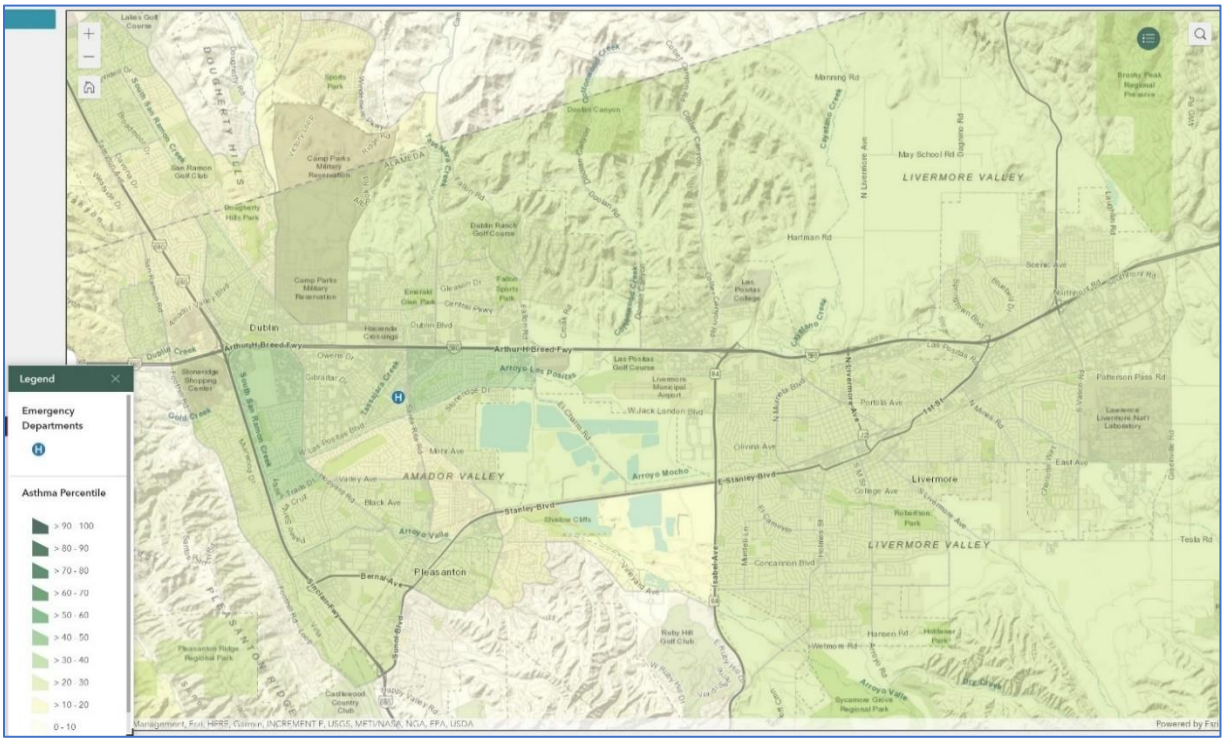


Figure 8. CalEnviroScreen4.0 0 Cardiovascular risk

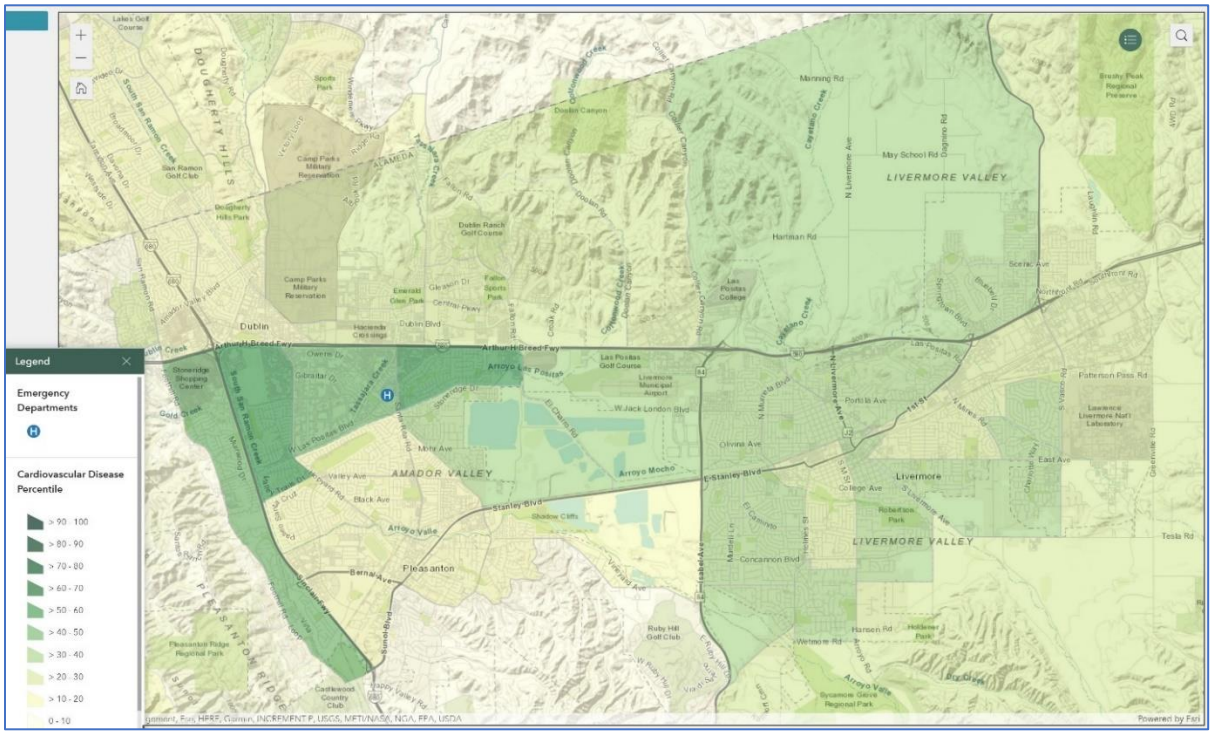
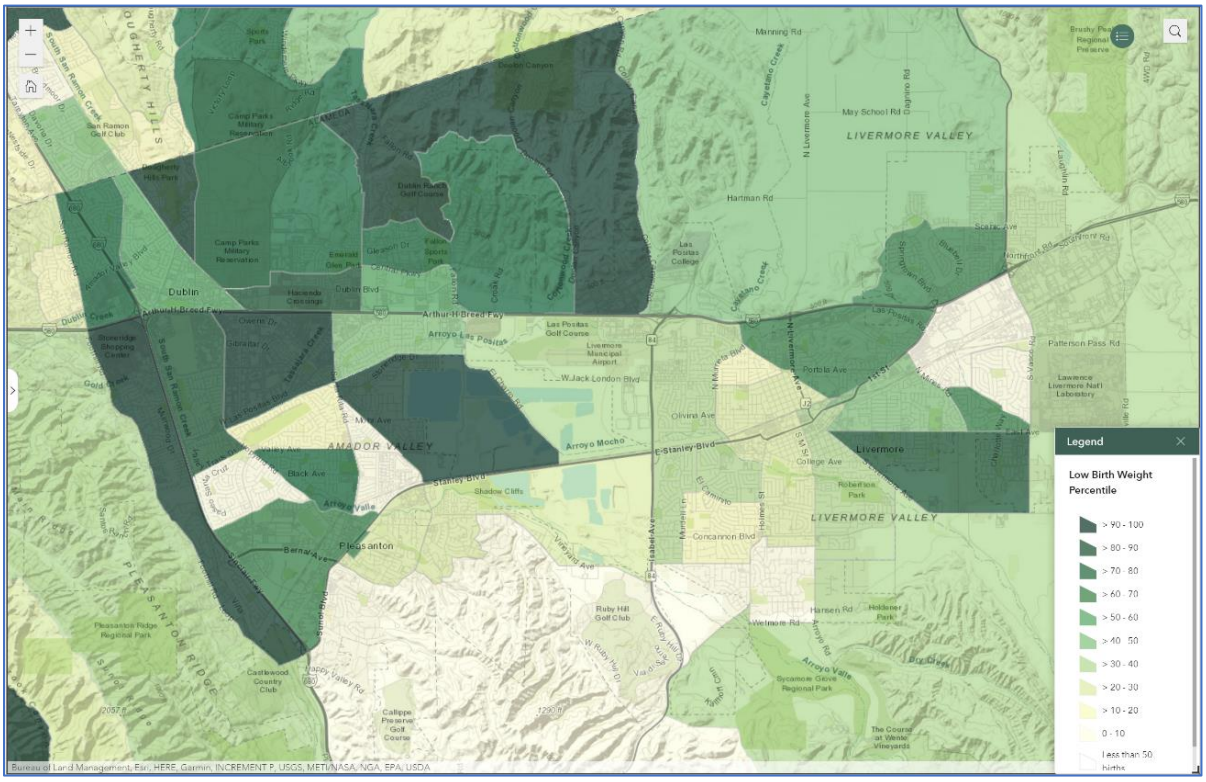


Figure 9. CalEnviroScreen4.0 Low Birth Rate for the Tri-Valley



Appendix E. Tri-Valley Health Demographics from Alameda County Health Dept.

PRESENTATION 1. TRI-VALLEY HEALTH OUTCOMES DISAGGREGATED BY RACE/ETHNICITY

By Sandi Gálvez, Director, Health Equity, Policy, & Planning, Alameda County Health Dept.

September 2021

Appendix E to "Ensuring Good Air Quality in the Tri-Valley"

Contents

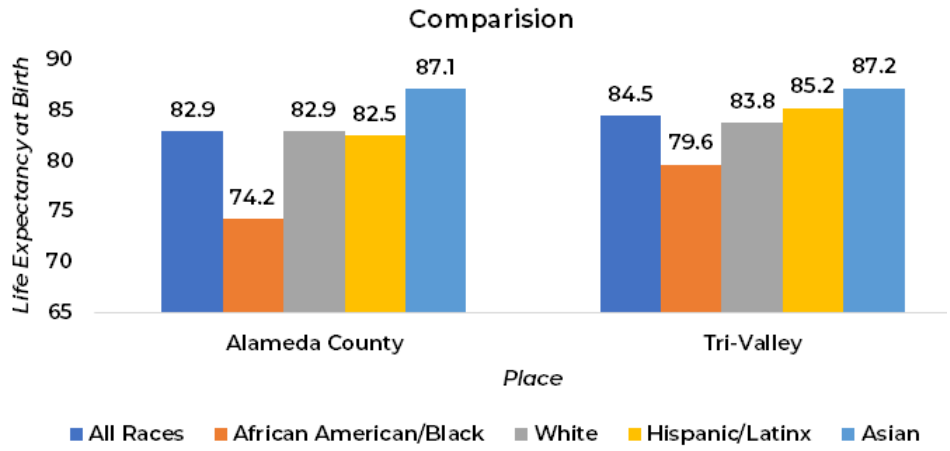
1. MAIN TAKEAWAYS

- Life expectancy in Tri-Valley is higher than in Alameda County.
    - Black people in Tri-Valley experience the lowest life expectancy, while Asian people experience the highest.
- Mortality rates in Tri-Valley are below or similar to those of Alameda County.
    - Black people in Tri-Valley experience the highest mortality rates.
- Heart disease and asthma emergency department visits and hospitalization rates in Tri-Valley are lower than in Alameda County.
    - The rate of asthma hospitalizations in Tri-Valley is similar to Alameda County for all races when data is reportable*. The rate of heart disease hospitalizations in Tri-Valley is highest for Black people and lowest for Asian people.
- Low birth weight percentages in Tri-Valley are lower than in Alameda County for all racial groups except Asians.
    - Low birth weight percentages in Tri-Valley are highest for Asian people and lowest for white people.
- Overall, where reportable, *African-American/Black people in Tri-Valley largely have the worst health outcomes*, i.e., highest mortality rates and lowest life expectancy, for all indicators shown herein.*

*Data cannot be reported when count is under 10. Mortality for African-American/Black people is unreportable for some diseases.

2. LIFE EXPECTANCY AT BIRTH BY RACE

People in Tri-Valley have a higher life expectancy than people in Alameda County. African American/Black people in Tri-Valley will live, on average, six years less than people from other racial groups in Tri-Valley.



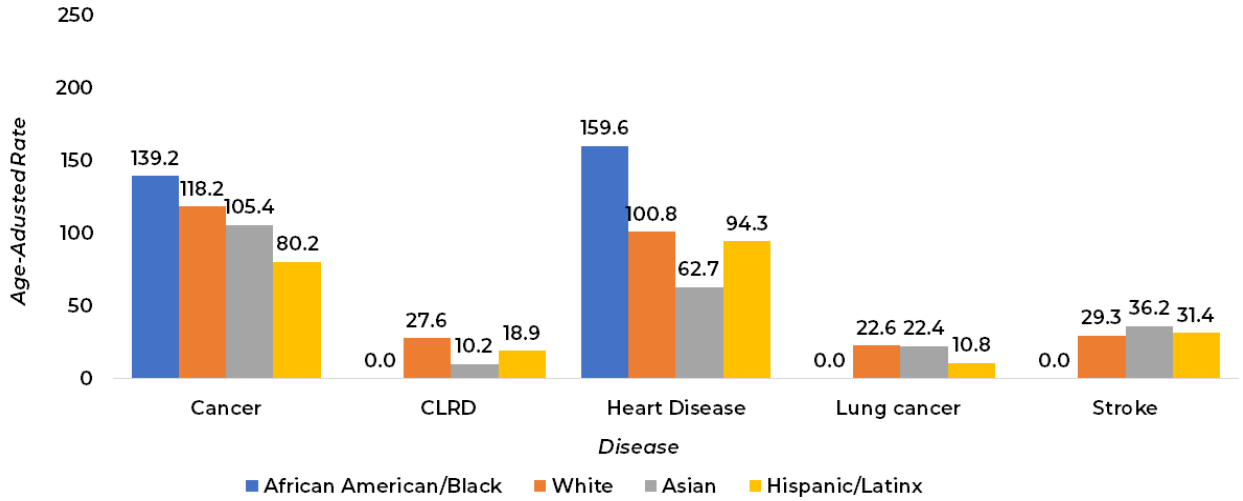
SOURCE: ACPHD Community Assessment, Planning and Evaluation (CAPE), with data from Alameda County vital statistics files, 2016-2020.

3. MORTALITY RATES BY RACE

Mortality Rates are reported here for diseases for which air pollution is a known risk factor.

NOTE: An age-adjusted mortality rate is a death rate that controls for the effects of differences in population age distributions. When comparing across geographic areas, some method of age-adjusting is typically used to control for the influence that different population age distributions might have on health event rates.

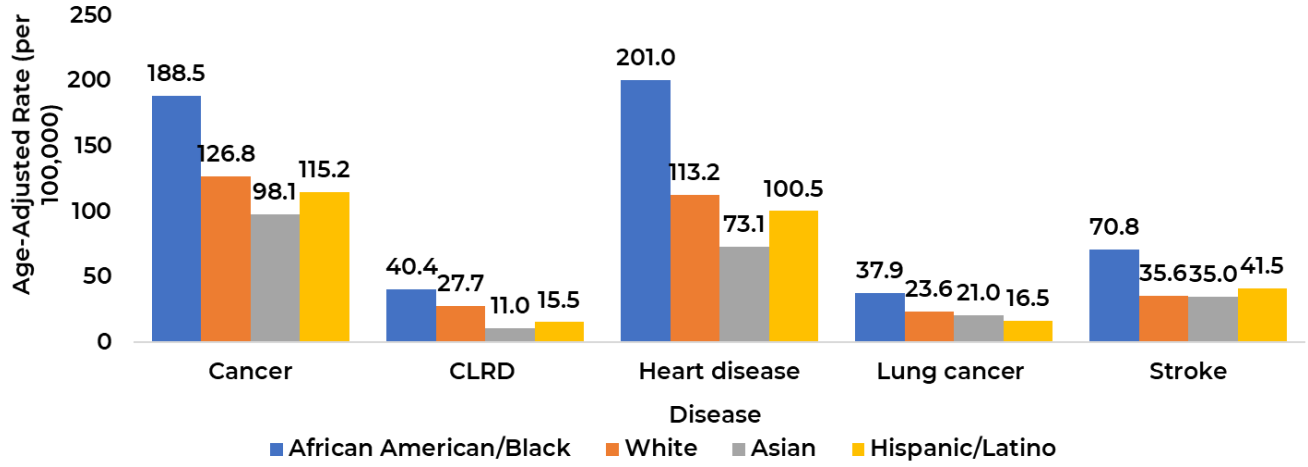
4. TRI-VALLEY MORTALITY RATES



SOURCE: ACPHD CAPE, with data from Alameda County vital statistics files, 2016-2020.

NOTE: Data cannot be reported when count is under 10. Mortality for Black people is unreportable for some diseases.

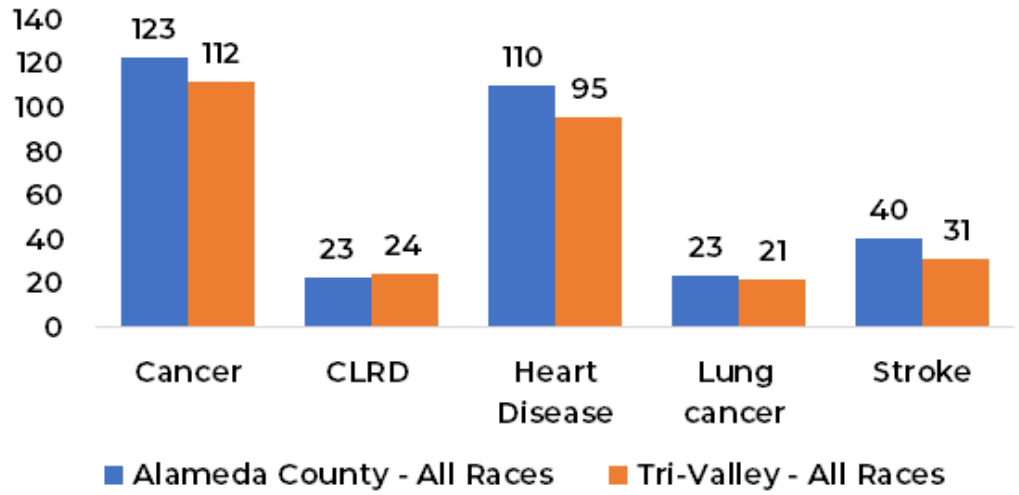
5. ALAMEDA COUNTY MORTALITY RATES



SOURCE: ACPHD CAPE with data from Alameda County vital statistics files, 2016-2020.

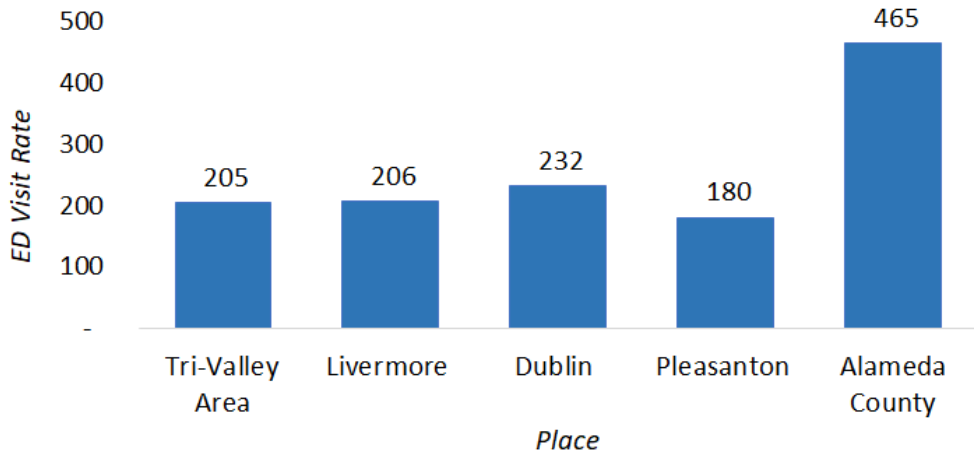
6. TRI-VALLEY MORTALITY RATES COMPARED

For all races, Tri-Valley mortality rates are below or similar to Alameda County mortality rates.



SOURCE: ACPHD CAPE with data from Alameda County vital statistics files, 2016-2020.

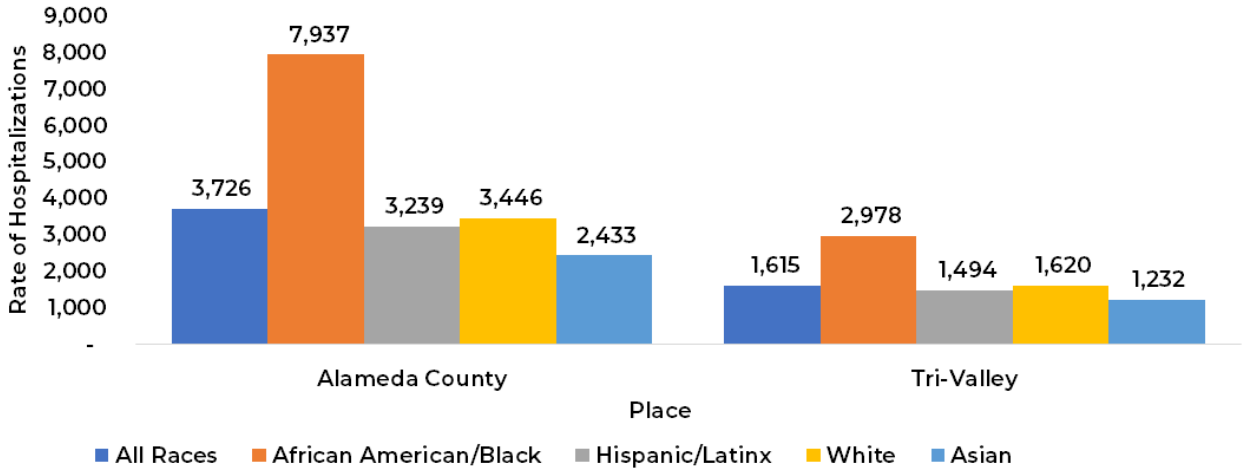
7. RATE OF ASTHMA EMERGENCY DEPARTMENT VISITS



SOURCE: ACPHD CAPE with data from Office of Statewide Health Planning & Development, 2017-2019.

8. RATE OF HEART DISEASE HOSPITALIZATIONS

People in Tri-Valley have a lower rate of asthma Hospitalizations than people in Alameda County. African American/Black people in Alameda County and Tri-Valley have much higher rates of heart disease hospitalizations. (Note: Rates are per 100,00 people.)



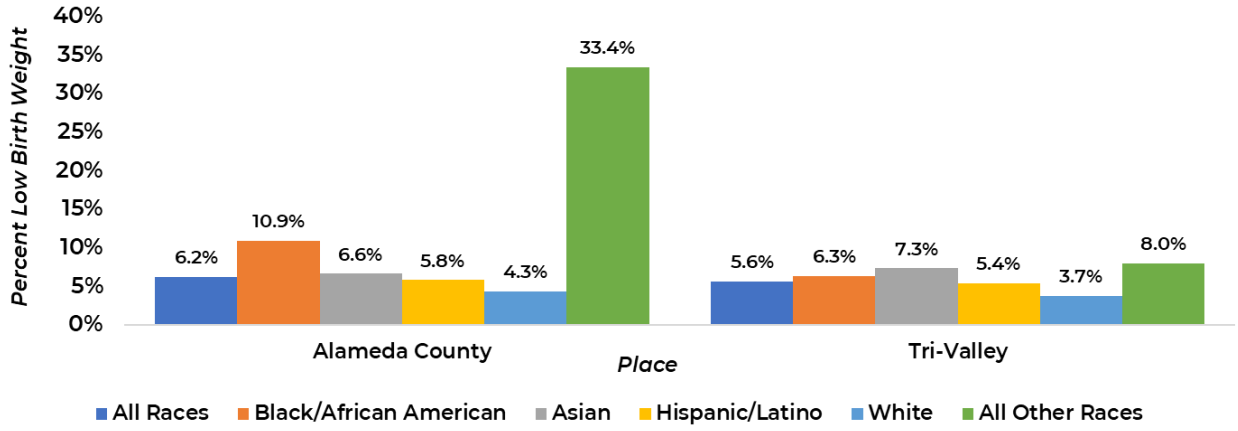
SOURCE: ACPHD CAPE with data from the Office of Statewide Health Planning and Development, 2016-2018. Tri-Valley data by zip code.

NOTE: Data cannot be reported when count is under 10. Hospitalizations for Black people is unreportable.

9. LOW BIRTH PERCENTAGE BY RACE

Low birth weight is less than 2500 grams. Births of only one child only shown.

All Tri-Valley racial groups, except Asians, have a lower percentage of babies born with low birth weight than people in Alameda County.



SOURCE: ACPHD CAPE with data from Alameda County vital statistics files, 2017-2019.

10. SOURCES

1. Alameda County Public Health Department Community Assessment, Planning and Evaluation (CAPE) vital statistics files, 2016-2019 & 2017-2019.
2. Office of Statewide Health Planning and Development, 2016-2018

PRESENTATION 2. AIR POLLUTION & HEALTH IMPACTS in the Tri-Valley

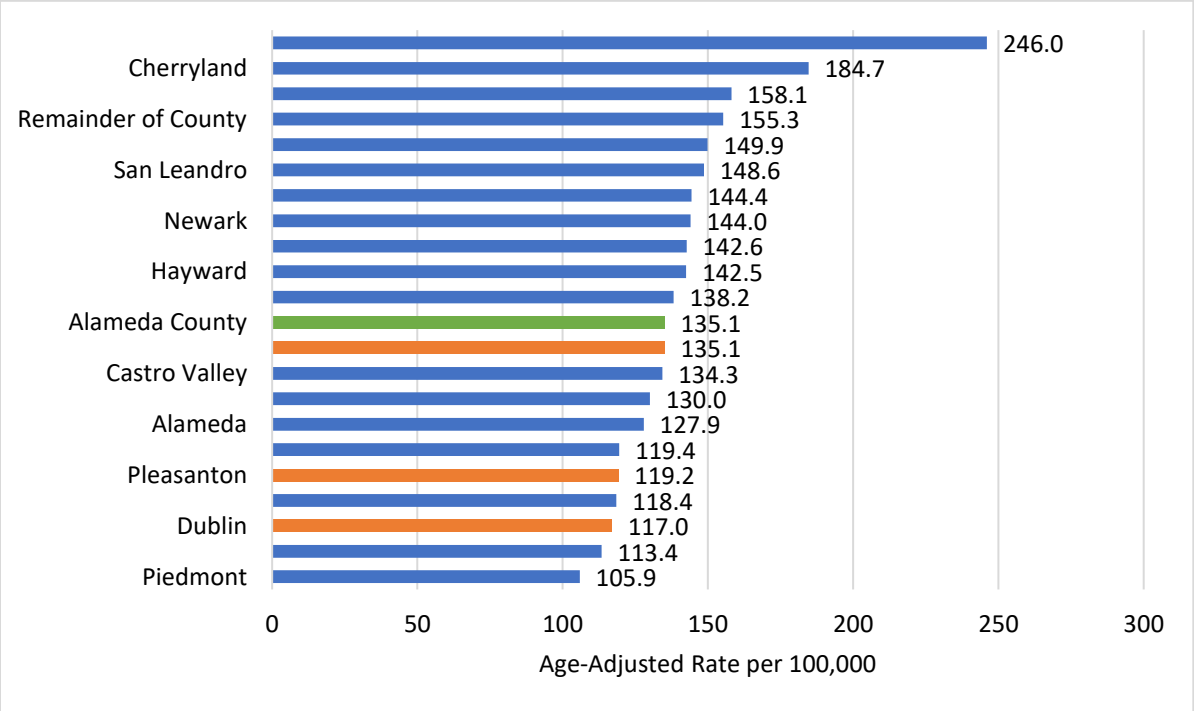
By Sandi Gálvez
Director, Health Equity, Policy, & Planning
Alameda County Health Department
April 2021

1. Cancer, heart disease, stroke and chronic lower respiratory disease are among top 5 leading causes of death in Tri-Valley.

Leading Causes of Death in Tri-Valley

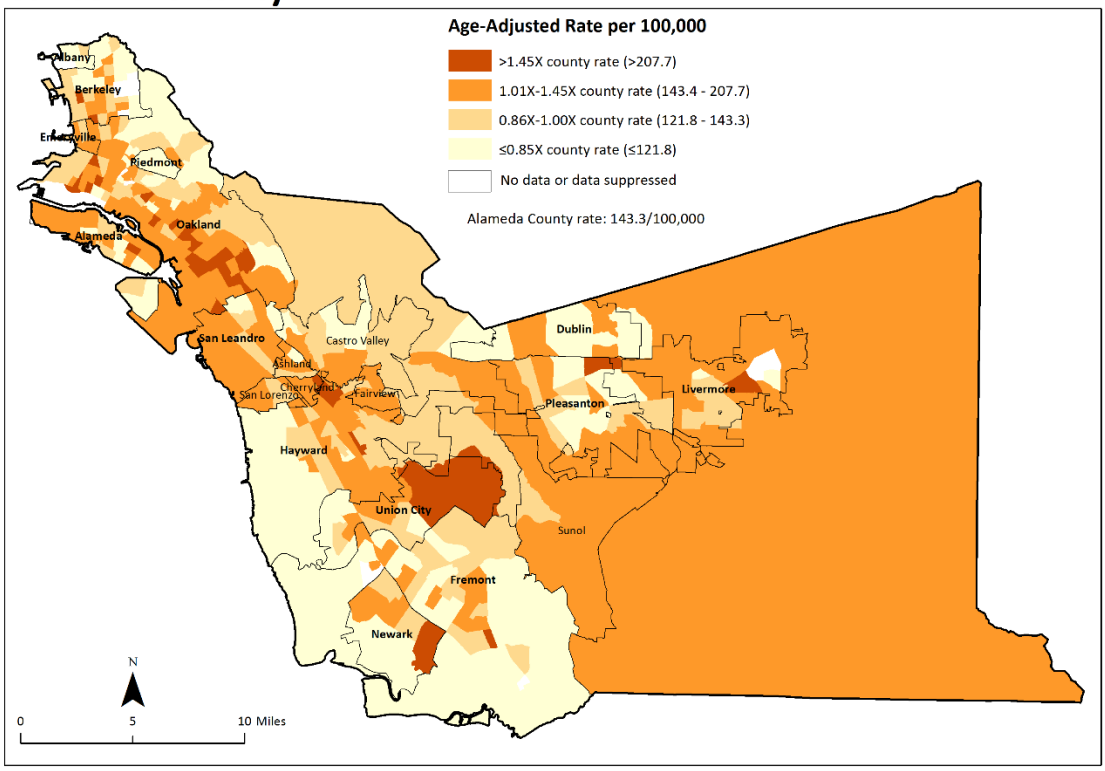
- Cancer
- Heart Disease
- Alzheimer's Disease
- Stroke
- Chronic Lower Respiratory Disease

2. Cancer Mortality Rates by City/Place



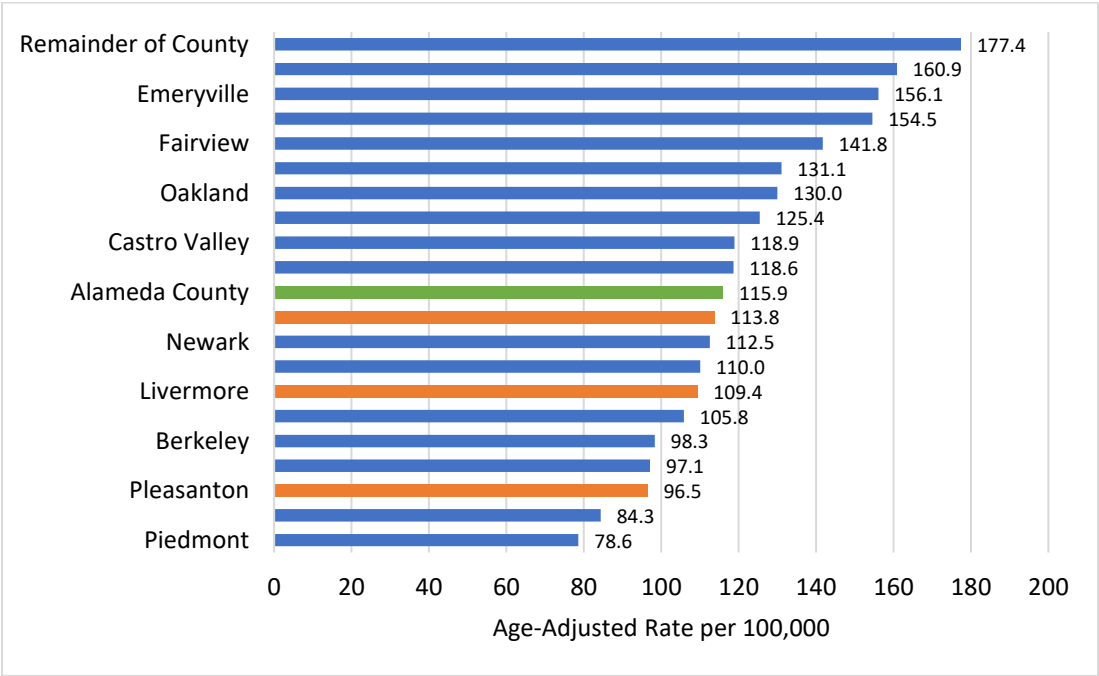
3. Cancer death rates are especially high in parts of Livermore and Dublin.

Cancer Mortality



Source: CAPE, with data from Alameda County vital statistics files, 2012-2016.

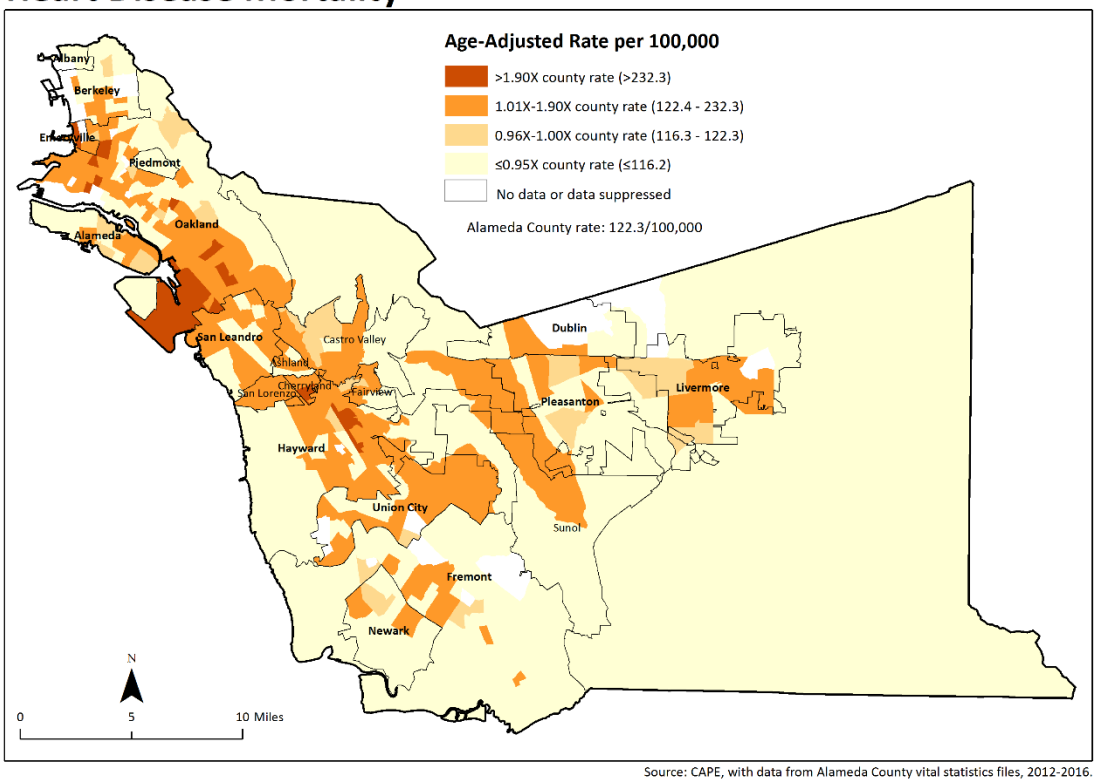
4. Heart Disease Mortality Rates by City/Place



Source: Alameda County vital statistics, 2014-2018

5. Heart disease death rates are notably high in part of Livermore.

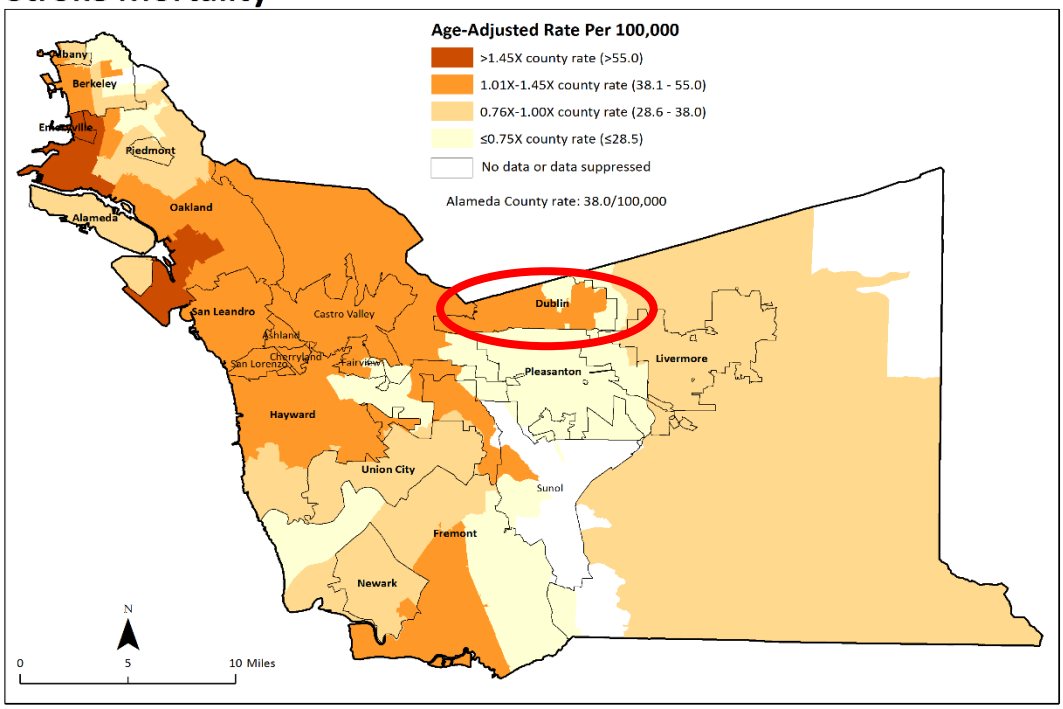
Heart Disease Mortality



Source: CAPE, with data from Alameda County vital statistics files, 2012-2016.

6. Within the Tri-Valley, stroke mortality is relatively high in Dublin.

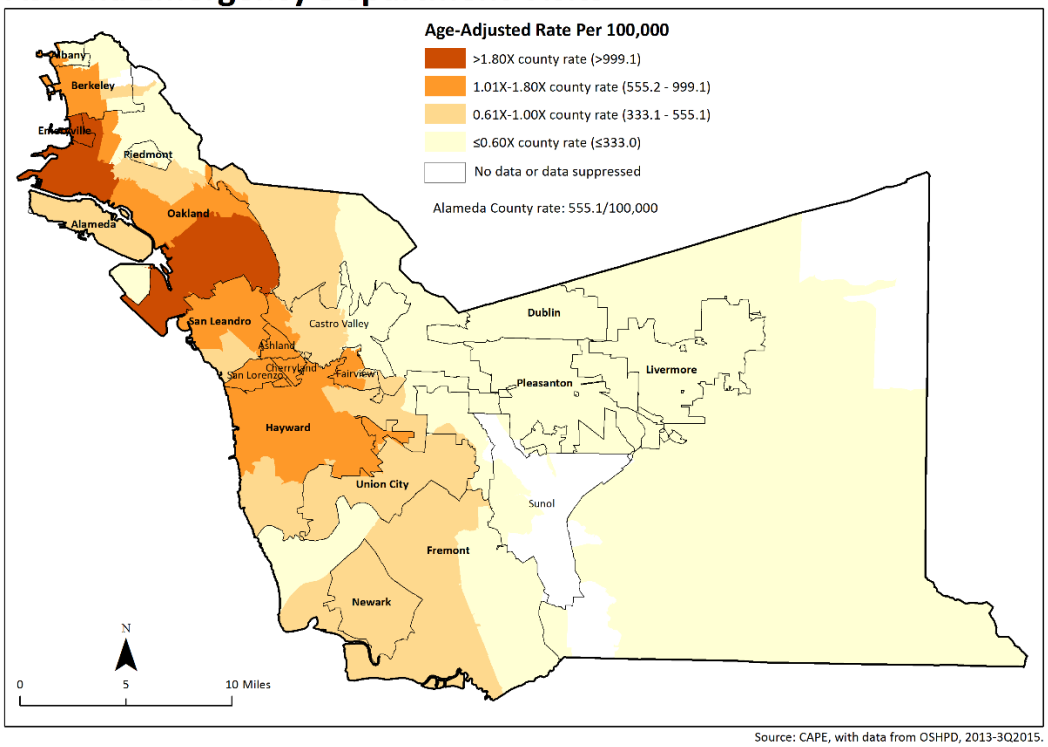
Stroke Mortality



Source: CAPE, with data from Alameda County vital statistics files, 2012-2016.

7. Rates of asthma emergency department visits are relatively low in the Tri-Valley.

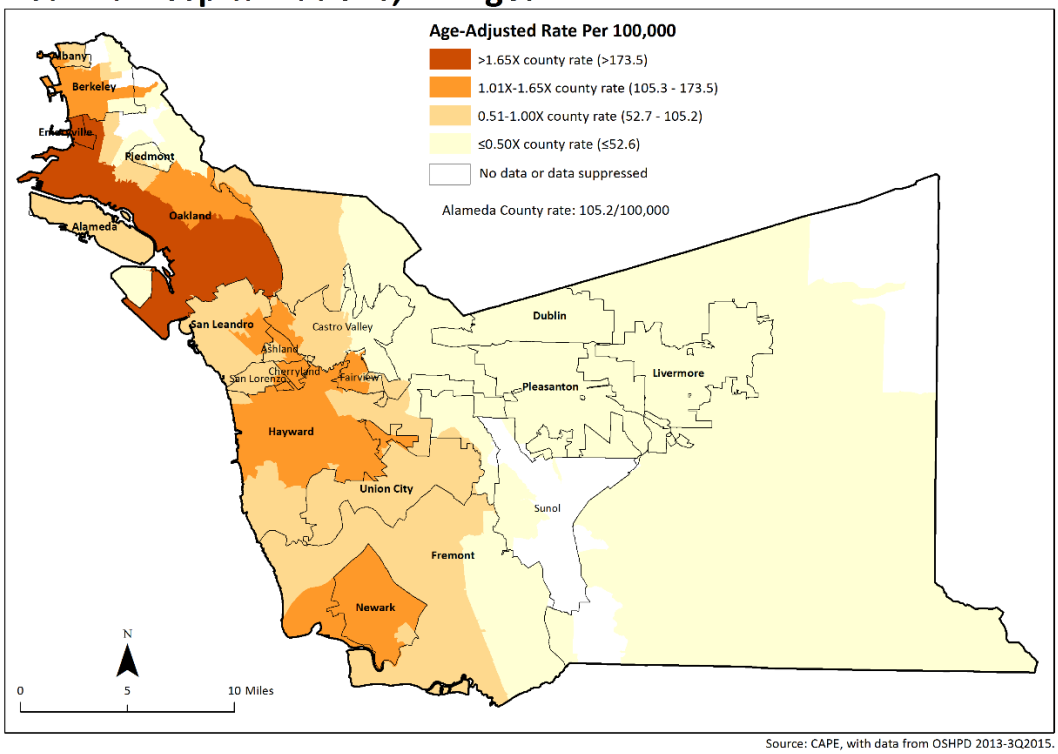
Asthma Emergency Department Visits



Source: CAPE, with data from OSHPD, 2013-3Q2015.

8. Asthma hospitalization rates are also relatively low.

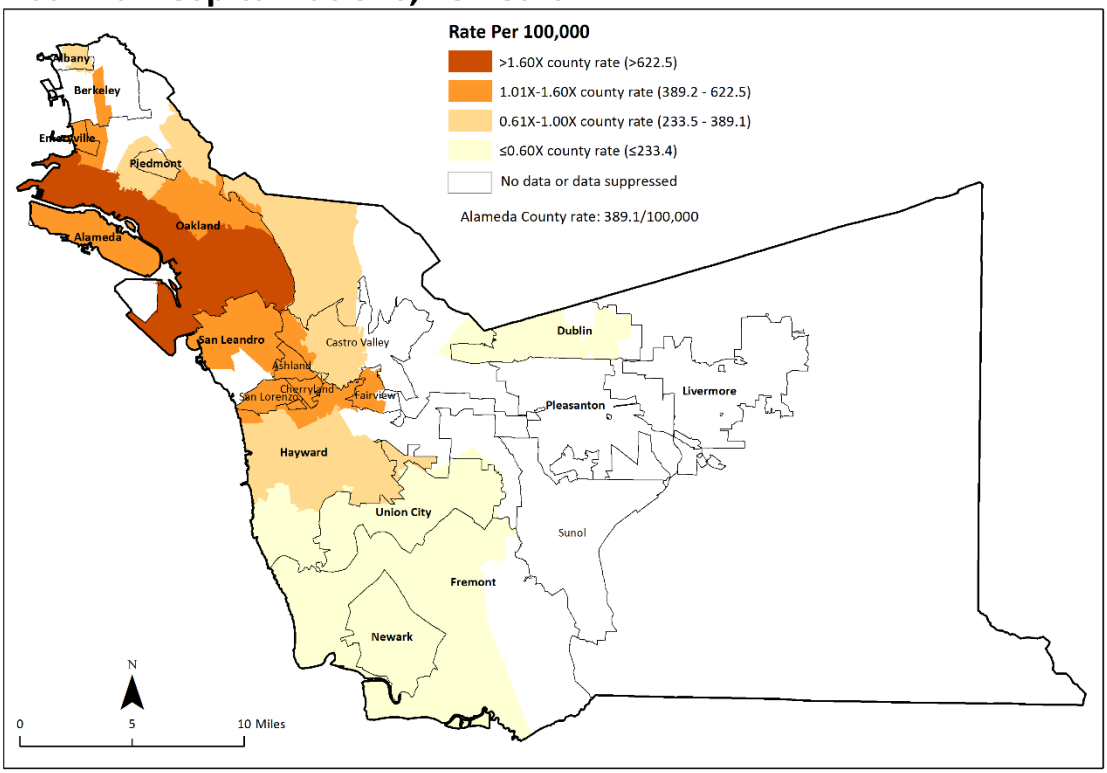
Asthma Hospitalizations, All Ages



Source: CAPE, with data from OSHPD 2013-3Q2015.

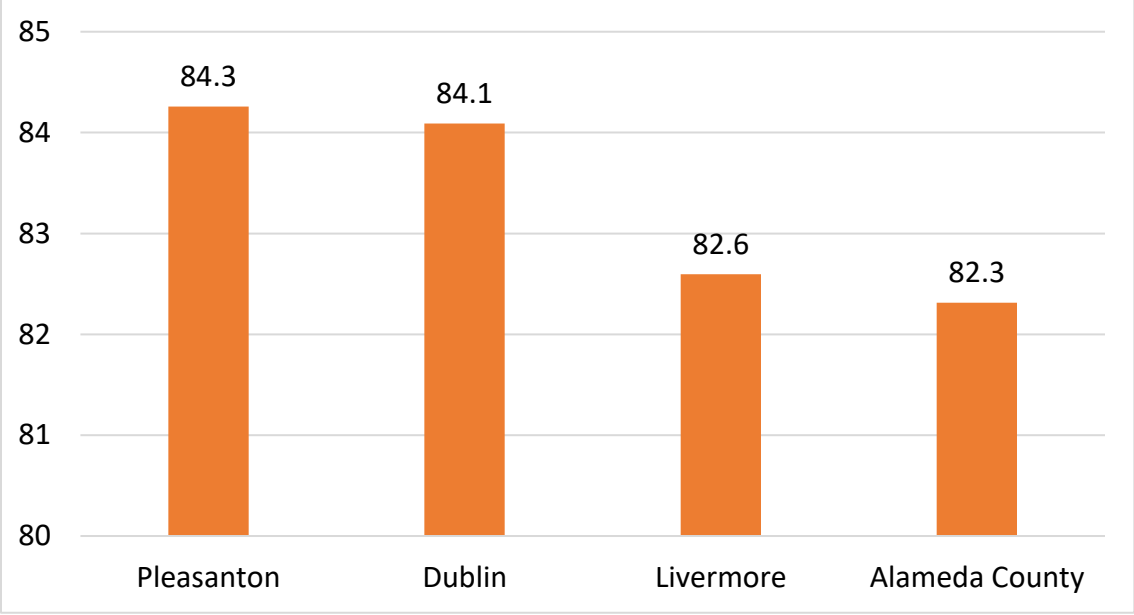
9. Child asthma hospitalization rates are low.

Asthma Hospitalizations, <5 Years



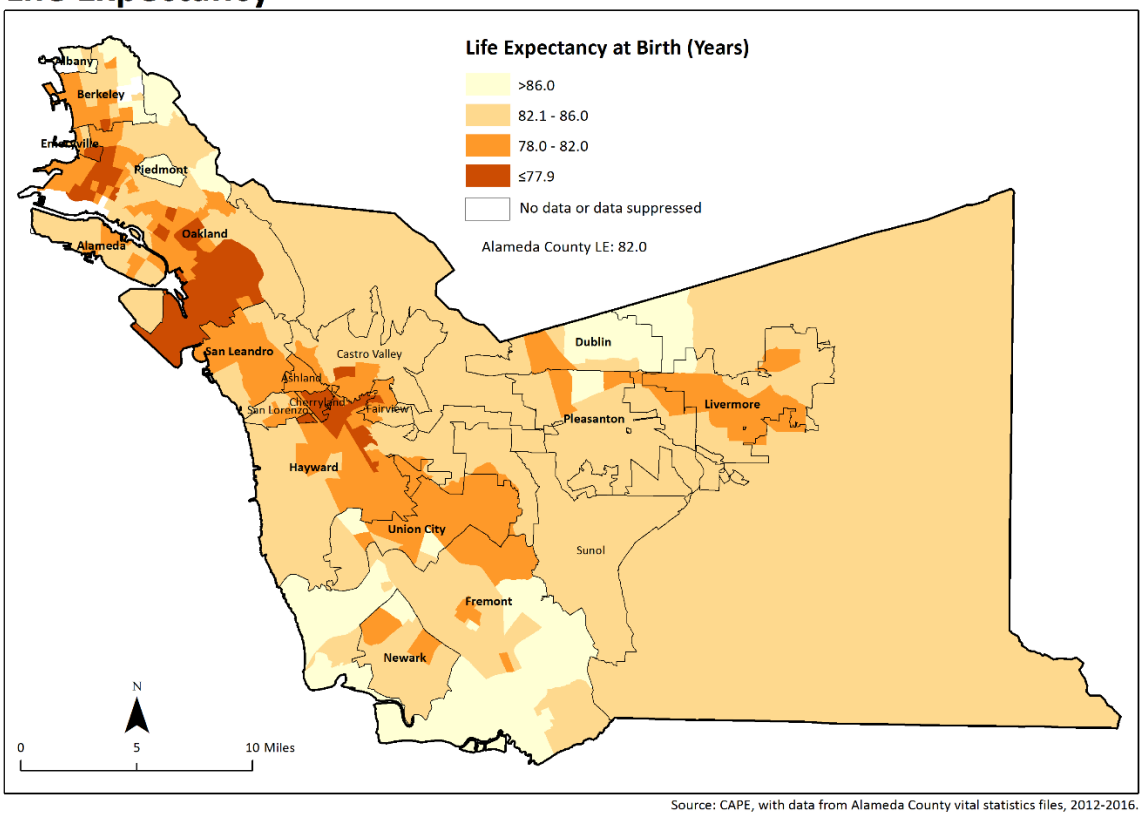
Source: CAPE, with data from OSHPD 2013-3Q2015.

10. Compared to the overall County, the Tri-Valley has relatively longer life expectancy.



11. Life expectancy within Alameda County.

Life Expectancy



Source: CAPE, with data from Alameda County vital statistics files, 2012-2016.

Appendix F. Analysis of Tri-Valley Air Quality
An Appendix to: Ensuring Future Air Quality in the Tri-Valley

By Ron Baskett, TVAQCA AB 617 Project

October 2021

Contents

1. Air Pollution Potential Explained

Two meteorological parameters determine the potential for air pollution – wind speed and mixing height:

$$\text{Air Pollution Potential} = \frac{1}{\text{Average wind speed x Mixing height}}$$

When winds are weak and mixing height low, pollution potential is high. If winds are stagnant, also known as "light and variable," e.g., less than 2 mph, air is confined in the mixed layer. Then only mixing height determines the pollution potential.

Mixing height is the height above the ground below which pollutants mix vertically. While surface wind speed can vary over an area such as an airshed, mixing height is generally uniform over large areas. Mixing height is determined from the weather balloon releases. For the SFBA, radiosondes are taken twice daily from Oakland International Airport at 0 and 12 UTC (4 am and 4 pm PST).

Figure 1-1 illustrates the diurnal variation of mixing height during fair weather at a coastal location such as the inner SFBA. The height and strength of the subsidence inversion is determined by the position and intensity of the high-pressure weather system. In the figure the red lines represent the vertical temperature structure. Typically, the atmosphere cools with height according to the adiabatic lapse rate of 5.5 deg F per 100 ft or 1 deg C/100. Inversions are an increase of temperature with height caused by sinking air under high-pressure systems. **Figure 1-2** shows a typical diurnal pattern for an inland location such as the Tri-Valley.

Figure 1-1. Diurnal variation of atmospheric boundary layer during fair weather at a coastal location (after Stull 1988)

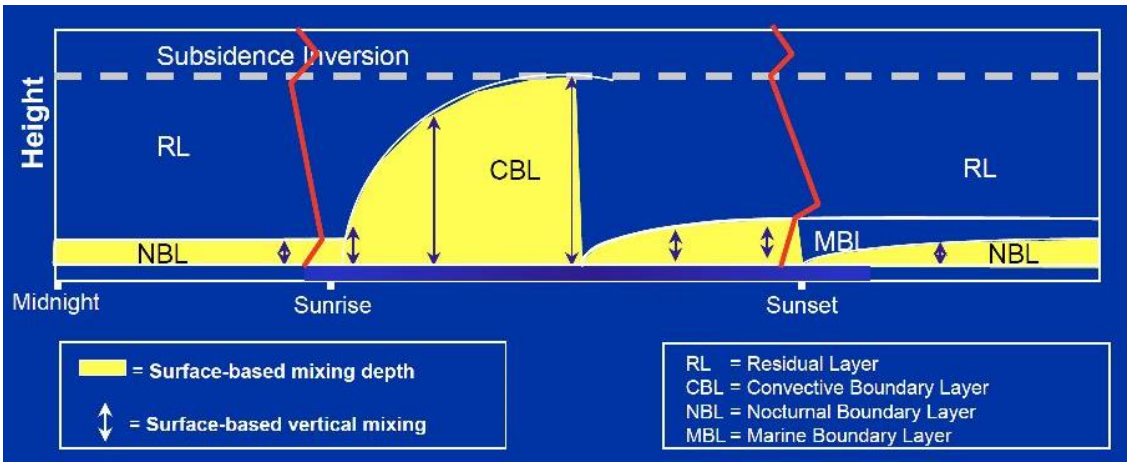


Figure 1-2. Diurnal variation of atmospheric boundary layer during fair weather at an inland location (Stull 1988)

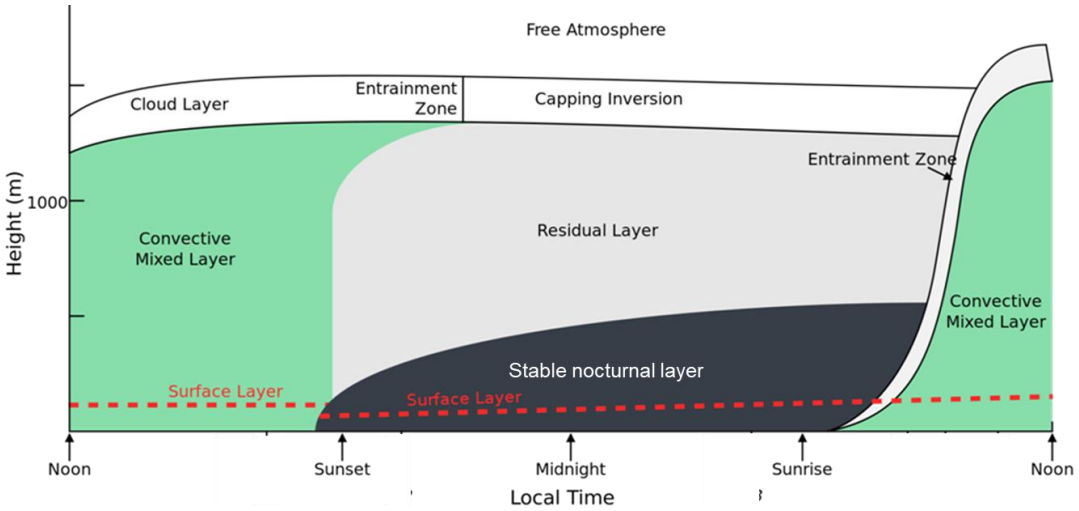
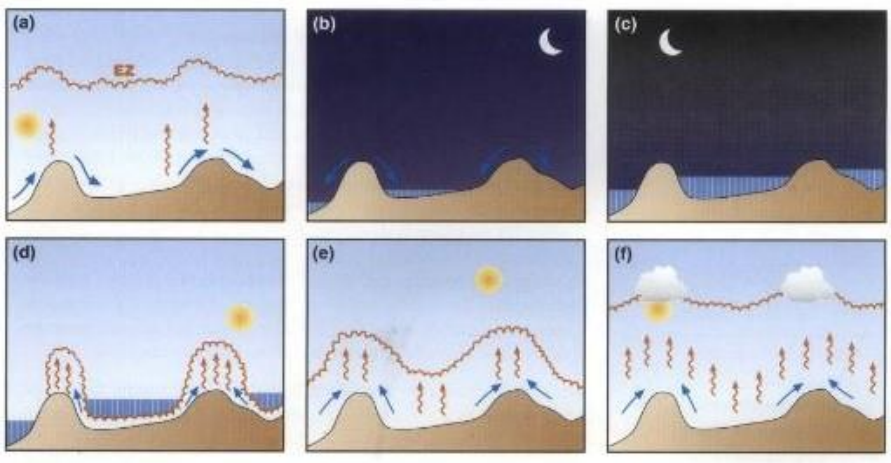


Figure 1-1 shows a shallow nocturnal boundary layer (NBL), the top of which is the mixing height. A convective boundary layer rises sharply after sunrise due to the sun heating the earth's surface resulting the mixing height reaching up to the subsidence inversion. If a sea breeze penetrates the coast in the afternoon, the mixing layer collapses to the height of the marine boundary layer. For the Tri-Valley, this collapse occurs late in the afternoon if at all. The valley setting of the Tri-Valley and the CBL is likely higher due to stronger convection with drier inland air. After sunset due to loss of heat to space and cooling of the air, the mixing layer is again reduced to a shallow stable nocturnal boundary layer near the ground. **Figure 1-3** illustrates six stages in the diurnal evolution of the boundary layer during fair weather at valley location. Figure A-4 is an example movie illustrating the onset of early morning convective heating on east-facing Pleasanton Ridge.

Figure 1-3. Cross-section view of the diurnal evolution of atmospheric boundary layer during fair weather at valley location. Frames a and b represent the evening transition where the CBL collapses and nocturnal drainage into the valley begins; Frame c is nighttime when the valley is filled with a cold stable air; Frame c shows morning transition with onset of convection; Frames c and d show midday and afternoon CBL developing (Whiteman 2000).



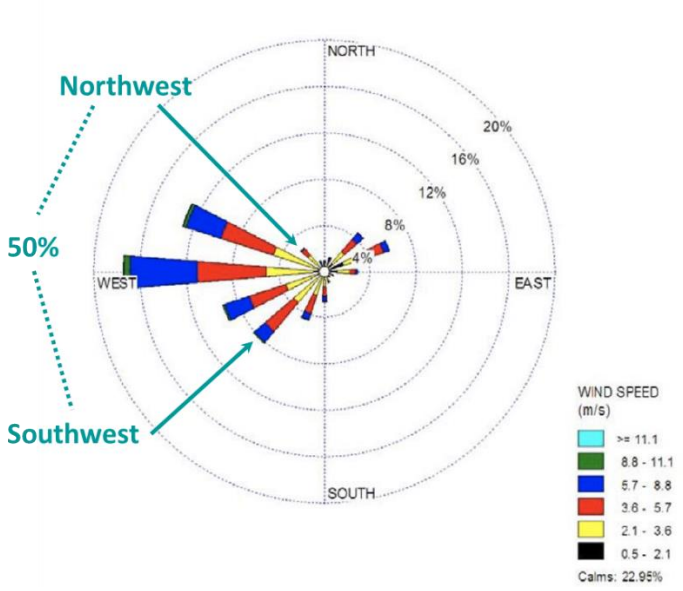
The wind at the middle of the mixing height layer would be the best to use in estimating pollution potential, but wind measurements are commonly taken at 10 m above ground.

Recommended study: Compute mixing heights and air pollution potential for the Tri-Valley.

2. Surface winds

The meteorological tower at the Livermore Airport located centrally in the Tri-Valley provides a long-term record of surface wind flows. **Figure 2-1** shows the climatological-average annual wind rose from the runway tower at 10 m above ground at the Livermore Airport. The figure shows the frequency of winds from each of 16 wind direction sectors with colors representing ranges of wind speeds.

Figure 2-1. Annual wind rose at the Livermore Airport (Source: CARB APPENDIX F Wind Roses and Statistics for Surface Meteorological Stations)



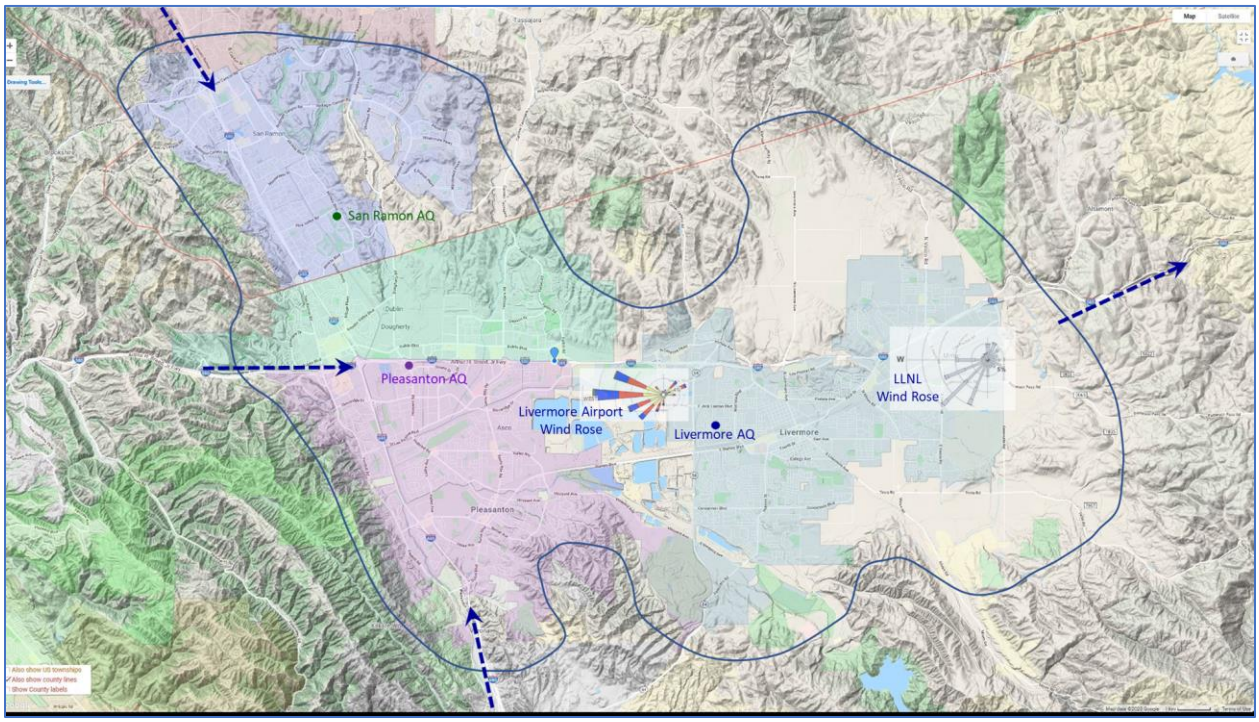
Annually winds from NW through SW sectors total about half the hours of the year, but during the ozone season, westerlies occur 75% of the time. When these winds enter the Tri-Valley, the flow spreads out at the surface and wind speeds can slow significantly resulting in calm conditions (less than 0.5 m/s or 1 mph). Annually calms occur about 23% of the hours each year, mostly at night.

Given that day-to-day emissions are relatively constant, weather is primarily responsible for determining concentrations of air pollutants.

3. Summer ozone season meteorology

On the majority of the days from May through October, a high-pressure system (the “semi-permanent Pacific High”) is located over the west coast creating a Mediterranean climate and an “air-conditioned Bay Area.” As illustrated in **Figure 3-1**, when centered west of San Francisco, the pressure from the Pacific High pushes cool afternoon onshore sea breezes into the Bay Area.

Figure 3-1. The Tri-Valley Airshed with wind inflow and outflow during onshore conditions. Noted are the 3 BAAQMD air quality monitoring stations and two annual wind roses from the Livermore Airport and Lawrence Livermore National Laboratory (LLNL). (Google Map base)



When the high moves directly over the Bay Area, a heat wave and stagnant air can occur. If the high moves eastward over the Sierra or Nevada, offshore northeasterlies can create the hottest and driest weather of the year.

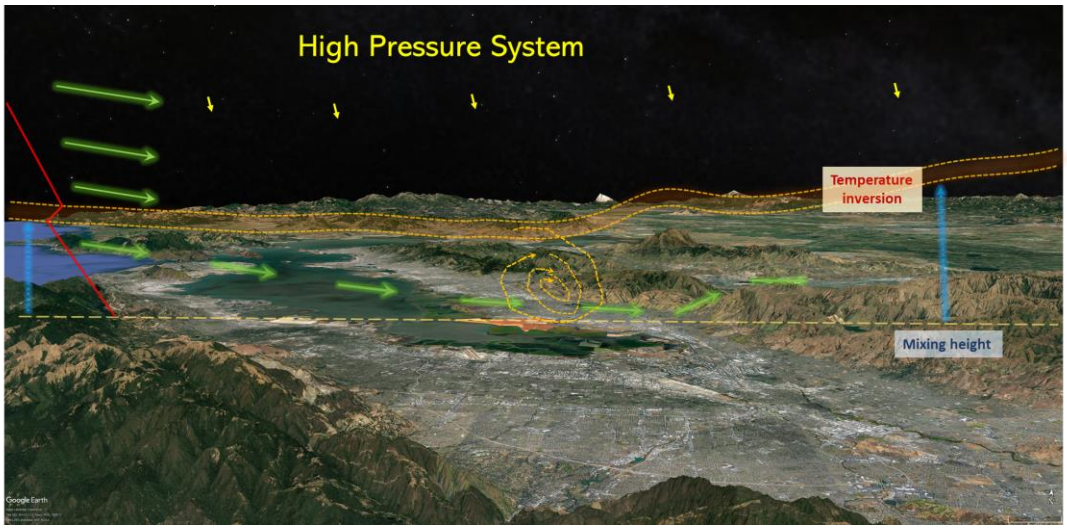
The position and strength of the Pacific High not only determines the wind pattern but also the height to which pollutants emitted near the ground will mix. This height, known as the mixing height, is created by the high pressure pushing down the air, warming as it sinks. Normally in the atmosphere temperature decreases with height, but the sinking air during high pressure systems creates a stable layer about 1,500 feet or more above ground where the air temperature increases with height. Being the inverse of the normal cooling with height, this layer is known as a temperature inversion.

The terrain which surrounds the Tri-Valley, the amount of incoming solar insolation, and large-scale weather circulations all influence the wind patterns and vertical mixing. Pollutants are trapped beneath the elevated temperature inversion layer. Sunny days heat the surface and create a well-mixed turbulent layer below the elevated inversion. During fair weather, elevated temperature inversions limit the vertical extent of turbulent mixing keeping pollutants near the ground.

The figures below show the typical summer afternoon onshore sea breeze wind flow pattern and the associated vertical cross-sections of winds and temperature.

Figure 3-2. Onshore afternoon sea breeze flow on summer afternoons in the San Francisco Bay Area associated with the Pacific high-pressure system is located offshore (Figure by Ron Baskett)

Figure 3-3. Vertical structure of winds and temperature during summertime onshore sea breeze flow in the San Francisco Bay Area (Figure by Ron Baskett)



Summertime onshore sea breezes are funneled through the gaps in in the East Bay hills. The largest gaps are San Pablo Bay to the northeast and Santa Clara Valley south of San Jose. To the east are Hayward-Dublin and Niles Canyon gaps which funnel winds along I-580 into the Tri-Valley. Northwesterly sea breezes can also bring polluted air into the Tri-Valley airshed from the north along the San Ramon Valley. Or if the Pacific High moves to the south of the Bay Area, southwesterly onshore flow can enter the Tri-Valley through the Sunol grade.

Figure 3-4. Fog trapped under summer temperature inversion in the Tri-Valley. (Photo by Ron Baskett on 2020-7-29 at 0917 am form Pleasanton Ridge looking east).

Summertime sea breezes pick up ozone and its precursors as they move across the inner San Francisco Bay cities and carry pollutants into the Tri-Valley. Locally generated NO_x and ROC emissions are added to these pollutants and transformed into ozone during the sunny summer days common to our Airshed. Under high pressure, the temperature inversion traps pollutants creating high ozone levels at the ground. Our ozone exceedances are due to this effective transport from sources upwind of our Airshed.

When a high-pressure system moves eastward toward Nevada, winds over the Tri-Valley can switch to hot, dry “Diablo winds” from the northeast. Easterly flows also can result in high ozone days with transport of precursors from the Central Valley. Also, this offshore flow is conducive to high wildfire danger. These occur less than 10% of days each year.

4. Winter PM2.5 season meteorology

When high-pressure, fair-weather systems occur during winter, wind speeds can be quite calm for days. This **stagnation causes local particulate emissions to accumulate within the confines of our local Airshed**. In addition, as **Figure 4-1**illustrates, at night under clear skies, strong cooling at the surface results in sinking wind flows off the surrounding hills, filling the valley with a cold, stable pool of air within a surface-based cool layer (**Figure 4-2**). In this case, emissions are trapped in our local Airshed. Under these conditions local PM2.5 emissions create our local air quality.

Figure 4-1. Typical nighttime drainage flows in the Tri-Valley airshed during high-pressure weather systems (Figure by Ron Baskett on a Google Map base)

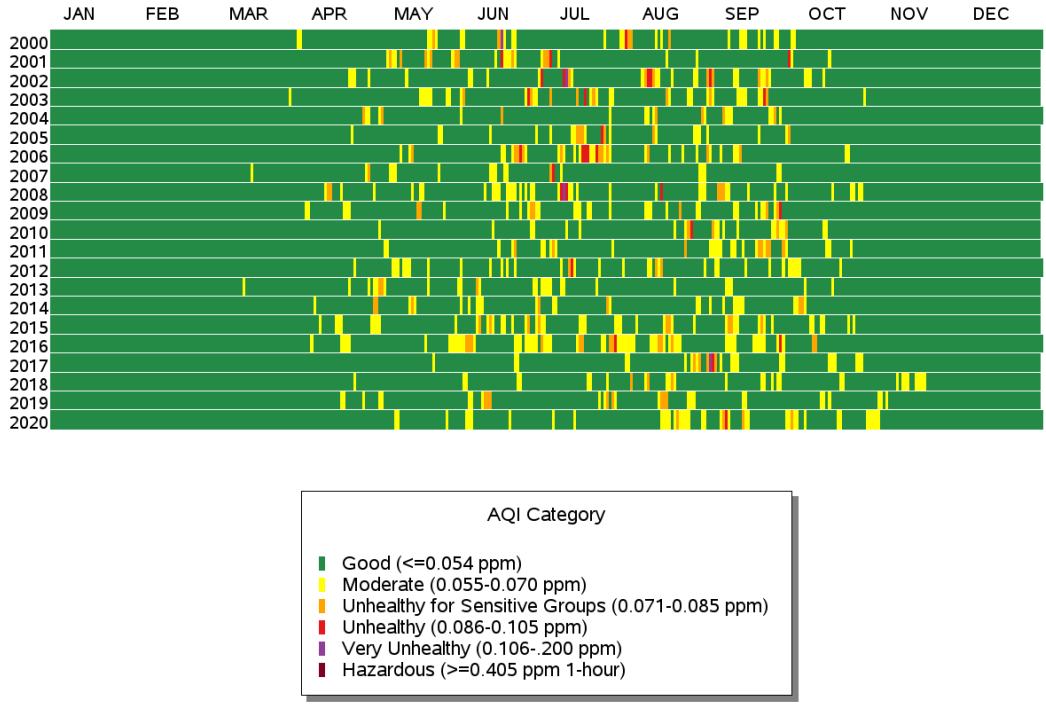
Figure 4-2. View from Dublin toward the west with moist layer indicating a 600-foot-deep mixing height at 9 am on December 21, 2020 (Photo by author)

5. History of air quality in Alameda County

The Air Quality Index (AQI) is a common way to show air quality. **Figures 5-1 and 5-2** show the highest daily AQI for ozone and PM2.5 in Alameda County. While the highest ozone is mostly from Livermore, the highest PM2.5 varies moves around the county.

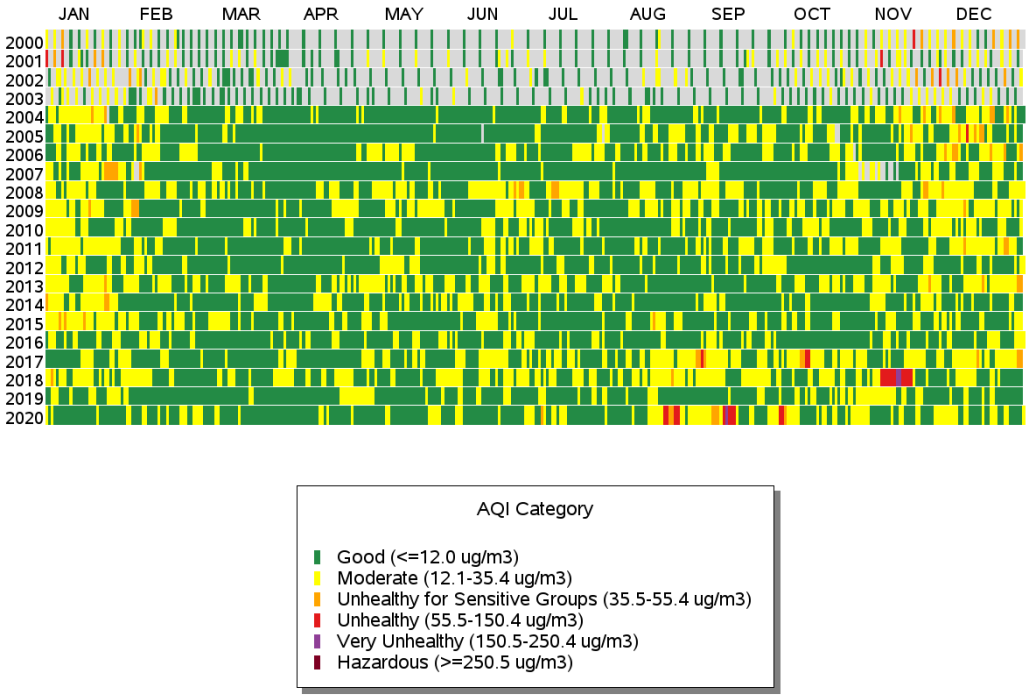
Ozone clearly peaks during May to October. The higher PM2.5 concentrations can occur throughout the year in the county but are more frequent higher in winter.

Figure 5-1. Highest daily ozone AQI in Alameda County for 2000-2020.



Source: U.S. EPA AirData <https://www.epa.gov/air-data>

Figure 5-2. Highest daily PM2.5 AQyI in Alameda County for 2000-2020.



Source: U.S. EPA AirData <https://www.epa.gov/air-data>

6. Air Quality Monitoring Stations in the Tri-Valley

BAAQMD air monitoring stations

Table 6-1 lists the three air monitoring stations that the Air District operates in the Tri-Valley. Located centrally to our Airshed, the Livermore station provides a 4-decade record.

Table 6-1. The BAAQMD air monitoring stations in the Tri-Valley. (Source: BAAQMD 2018 AIR MONITORING NETWORK PLAN)

Years of Operation	Station Name - Address	Meteorology	Air Pollutants	Greenhouse Gases
1981-2000 2000 to present	Livermore – 2614 First St. 739 Rincon Ave.	Wind speed Wind direction Temperature Relative humidity Precipitation Pressure	O_3, NOx, PM2.5 since 2000 Speciated PM2.5 since 2018 Toxics since 2000 Black Carbon (BC) since 2012 Ultrafine Particles (UFP)	CO2, CH4, CO, water vapor (H_2O)
2018 to present	Pleasanton – Owen's Court		NOx, CO, PM2.5, Toxics	
2012 to present	San Ramon – 9885 Alcosta Blvd.		O_3, NOx	

Note: The Livermore and San Ramon stations are also Air District Photochemical Assessment Monitoring Stations (PAMS) that measure speciated hydrocarbons hourly.

Purple Air sensor network

In the last decade, low-cost air quality sensors have become an attractive means for local environmental groups and individuals to independently evaluate air quality. EPA, state agencies and academic institutions have conducted studies to show their accuracy and practical use. Sensors may be placed either outdoors or indoor. The most common sensor measures PM2.5.

The Purple Air network was especially useful in quantifying the magnitude and spatial extent of the intrusion of the wildfire smoke plumes in 2020. **Figure 6-1** shows an example map for the Tri-Valley on August 20, 2020, and F **Figure 6-2** shows individual sampler data in Pleasanton.

Recommended study: Collect and quality assure a period of private air quality data (Purple Air) with a focus on episodes such as ozone, winter PM2.5 or wildfires. Include data correction factors.

Figure 6-1 Example Purple Air maps of the Tri-Valley showing 10-minute average PM2.5 midday on December 11, 2019 (top) and August 20, 2020 (bottom). Indoor stations have a solid circle around the data. (Source: PurpleAir | Real Time Air Quality Monitoring).

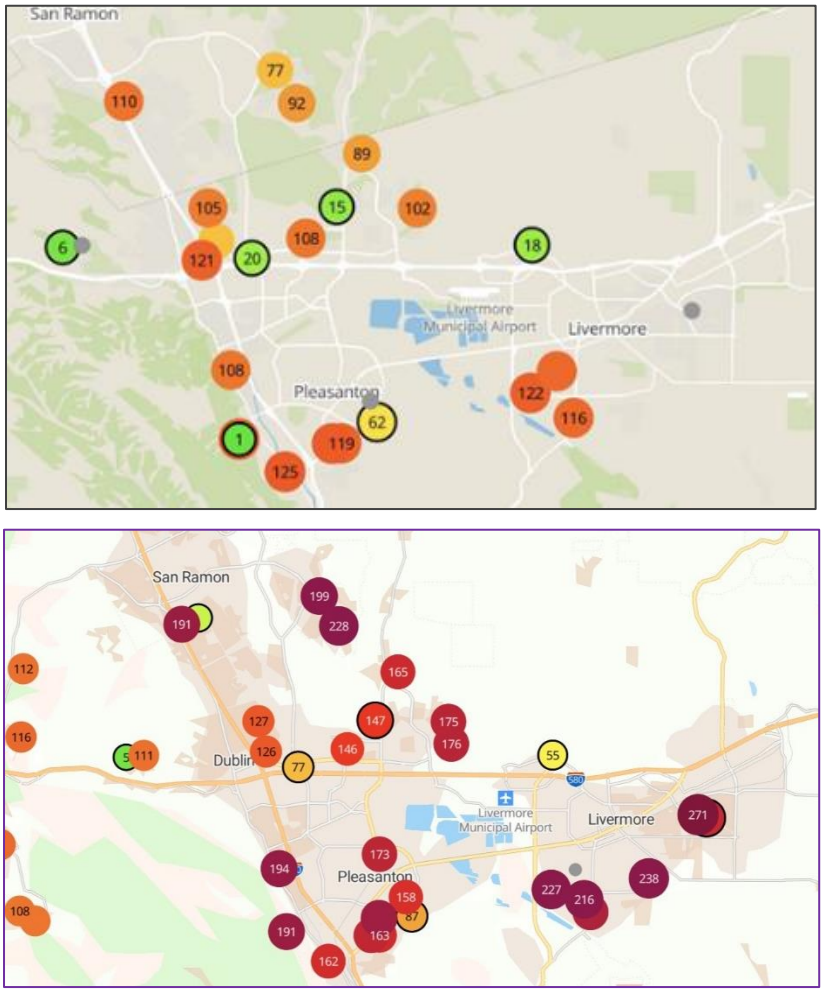
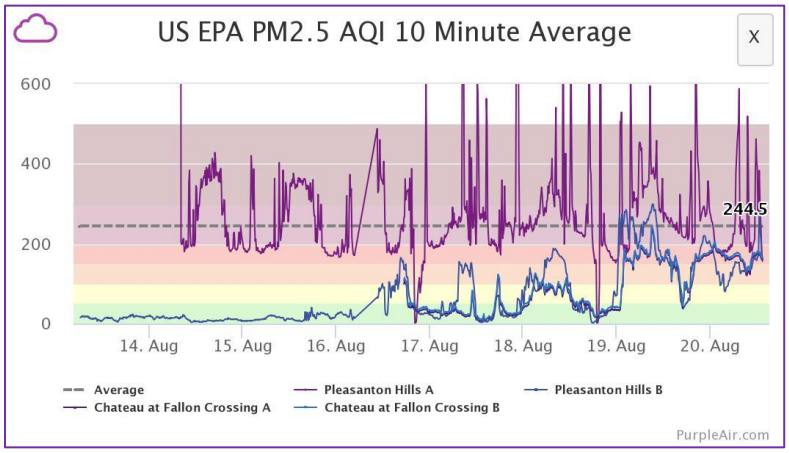
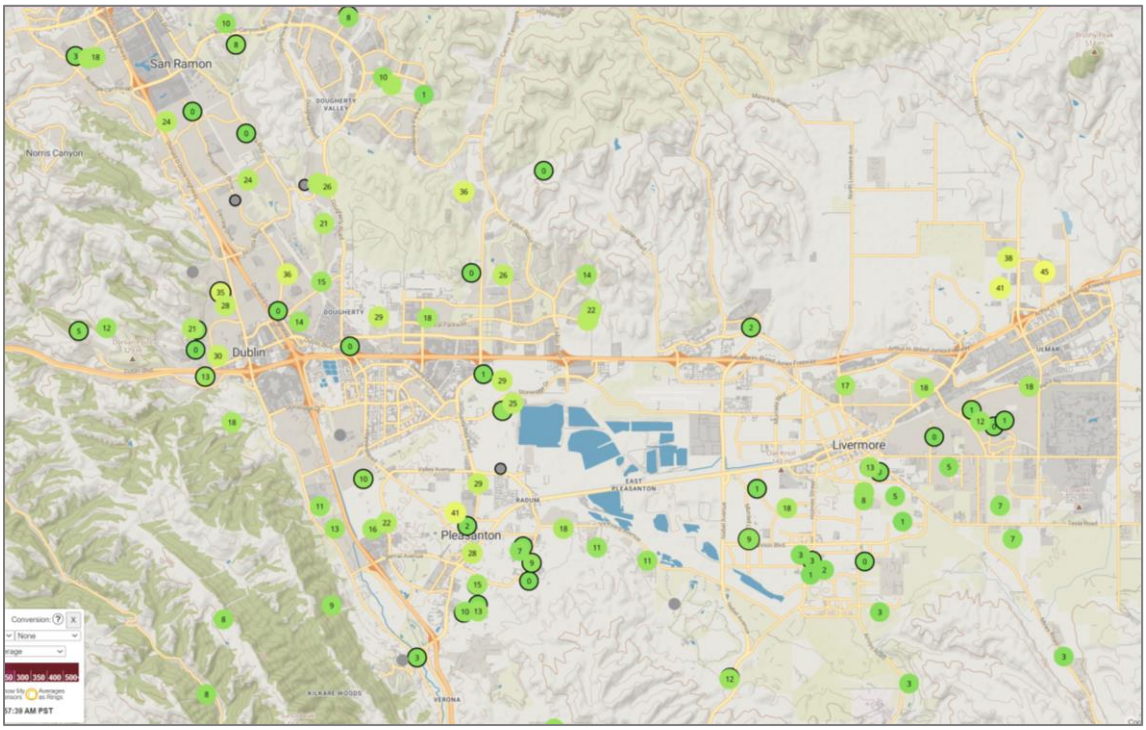


Figure 6-2. Example Purple Air 10-minute average PM2.5 data on August 14-20, 2020 for several stations in Pleasanton. (Source: PurpleAir | Real Time Air Quality Monitoring).



While the Air District stations showed an AQI of 150 on August 20, 2020, several outdoor Purple Air sensors showed values on the order of 200. Several studies have shown how the calibration of Purple Air sensors to the density of dust particles results in too high values for less dense smoke particles. Once the data have been corrected, the detailed temporal and spatial resolution of low-cost sensor networks have been successfully used to characterized details of local air quality and identify hot spots of higher concentrations. **Figure 6-3** shows that about 70 Purple Air sensors at the time of this report which is almost triple the number from the summer of 2020.

Figure 6-3. Example Purple Air map of the Tri-Valley showing 10-minute average PM2.5 at 5 am PST on January 5, 2021. (Source: PurpleAir | Real Time Air Quality Monitoring).



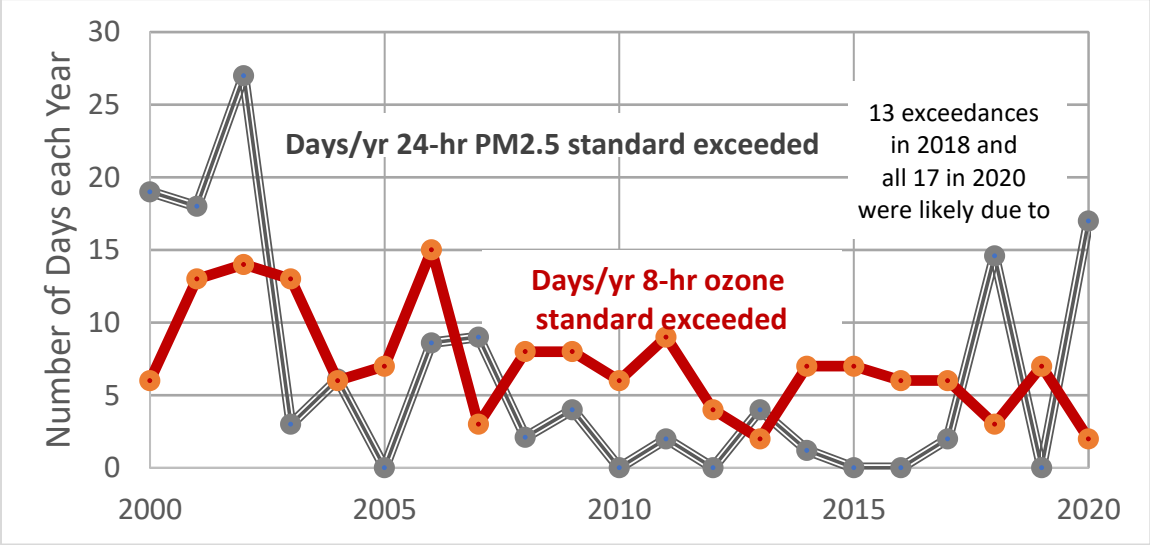
7. History of air quality in the Tri-Valley

In general, the air quality in the Tri-Valley airshed is good most of the year. The State vehicle emission controls coupled with Air District's regulatory control of stationary sources has resulted in five decades of steady improvement in our air quality. The District's Spare the Air program provides a daily means to alert the public on methods to mitigate either a forecasted high ozone or particulate day. That said, the standards are still occasionally exceeded resulting in negative health effects especially for sensitive populations.

For decades, Livermore has recorded some of the highest ozone concentrations in the 10-county Air District. **Figure 7-1** shows the number of days each of the last 20 years that the federal **8-hour ozone and 24-hour PM2.5 standards were exceeded at Livermore**. In the last decade, ozone exceedances occurred an average of 7 days/year.

NO_2 emissions, mostly generated by combustion processes, are photo-dissociated in the atmosphere by ultraviolet radiation from the sun resulting in NO plus the single molecule oxygen or O. With the enhancement of the Reactive Organic Compounds (ROCs) the O combines with natural oxygen, O_2, to form O_3. Depending on the intensity of the sunlight as well as the temperature, ozone production may take several hours. **Therefore, ozone concentrations in the Tri-Valley are primarily due to sources from the inner Bay Area cities or the Central Valley.** Consequently, the Air District addresses NO_x and ROG emissions on a regional basis rather than at the local level. Determining how much benefit that reducing local NO_2 and ROC emissions will have on reducing local ozone is a complex problem which would require detailed dispersion modeling calculations.

Figure 7-1. Number of days each year that the federal 8-hr ozone and 24-hr PM2.5 standards were exceeded at Livermore from 2000-2020. (Graphic created from CARB AQMIS2 and EPA AirData)



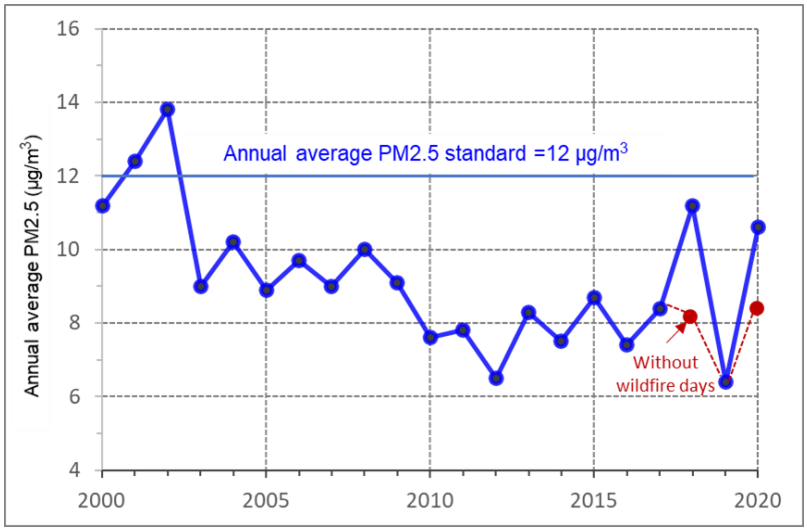
In contrast to ozone, PM2.5 and Toxic Air Concentrations (TACs) depend strongly on local emissions. In the Tri-Valley, the 24-hr PM2.5 standard is exceeded only a few days per year. However, based on satellite observations of active smoke plumes, wildfires contributed substantially to 13 of the exceedances in 2018 and all 17 days in 2020. Note that no exceedances occurred in 2019.

The Air District characterize each station's representativeness; Livermore is designated to represent the residential exposure. There may also be local hotspots of either PM2.5 or TACs from traffic or local sources worth investigating during our project. Regional analyses have shown that Diesel Particulate Matter (DPM) is overwhelmingly the air toxic of greatest concern in the Bay Area.

The number daily exceedances tell part of the picture, but because small particles can accumulate in the lung the total annual outdoor exposure for PM2.5 is important. (Note that we only address outdoor air quality while one's total exposure depends on location such as outdoors, transportation, home, work, and shopping or other indoors.)

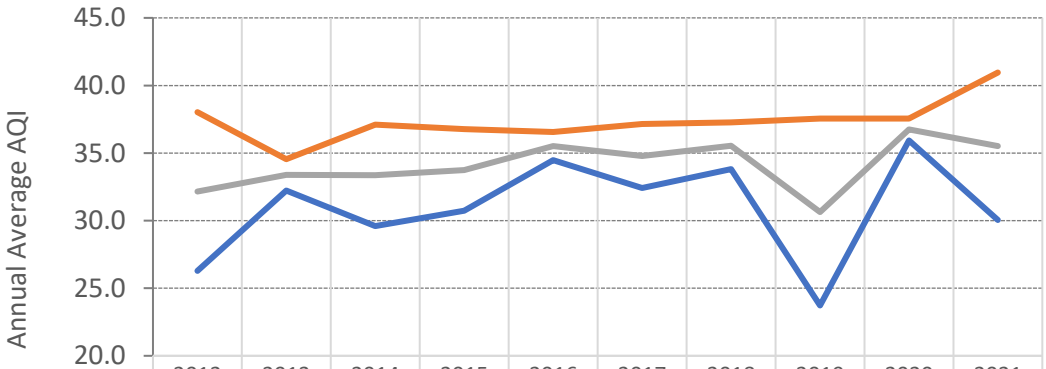
Figure 7-2 shows that the Livermore annual average is about 8 ug/m^3, well under the federal standard of 12. Removing the wildfire days in 2018 and 2020 results in annual averages of 8.2 and 8.7 ug/m^3, respectively. The scientific experts who recently reviewed the PM standards concluded that health effect evidence strengthens the concern that the current standard is not adequate and recommended lowering the annual standard to between 8 and 10 ug/m^3 (EPA 2019).

Figure 7-2. Annual average PM2.5 concentration at Livermore from 2000-2020. (Source: CARB AQMIS2 and EPA AirData)



Another way to present annual averages is with the AQIs for PM 2.5 and O_3. **Figure 7-3** provide the total air quality picture for each year as well as the trend in AQI for Livermore. This shows that both 2012 and 2019 had lower air pollution while 2020 and 2021 were the highest.

Figure 7-3. Annual average PM 2.5 and O_3 AQIs at Livermore from 2011-2020. (Source: CARB AQMIS2 and EPA AirData)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
PM2.5 AQI	26.3	32.2	29.6	30.7	34.5	32.4	33.8	23.7	35.9	30.1
O3 AQI	38.0	34.5	37.1	36.8	36.6	37.2	37.3	37.5	37.6	41.0
Average AQI	32.2	33.4	33.4	33.7	35.5	34.8	35.5	30.6	36.7	35.5

Table 7-1 lists the last 10-year's average ozone and PM2.5 AQI statistics for the 3 District stations in the Tri-Valley. Of those years, from 2013 through 2017 the station at San Ramon was operated only from April through October. Because both San Ramon and Pleasanton have operated year-round only since 2018, we use the last 4 years to compare with Livermore.

Table 7-1. Ozone and PM2.5 AQI statistics for District stations for 2012-2021

	Period	Average Ozone AQI	Average PM2.5 AQI
San Ramon 4-yr	2018-2021	38	-
Livermore 4-yr	2018-2021	42	32
Livermore 10-yr	2012-2021	37	32
Pleasanton 4-yr	2018-2021	-	36

Figures 7-4 and 7-5 show the Daily ozone AQI at Livermore and San Ramon averaged over the last 10 years each day from April 1 through October 31 (the "ozone season"). Based on the last 4 years, Livermore AQI averages 4 higher than San Ramon for ozone and 4 less than Pleasanton for PM2.5.

Figure 7-4. Average Daily Ozone AQI at Livermore from Apr-Oct for 2012-2021. (Data source: EPA AirData)

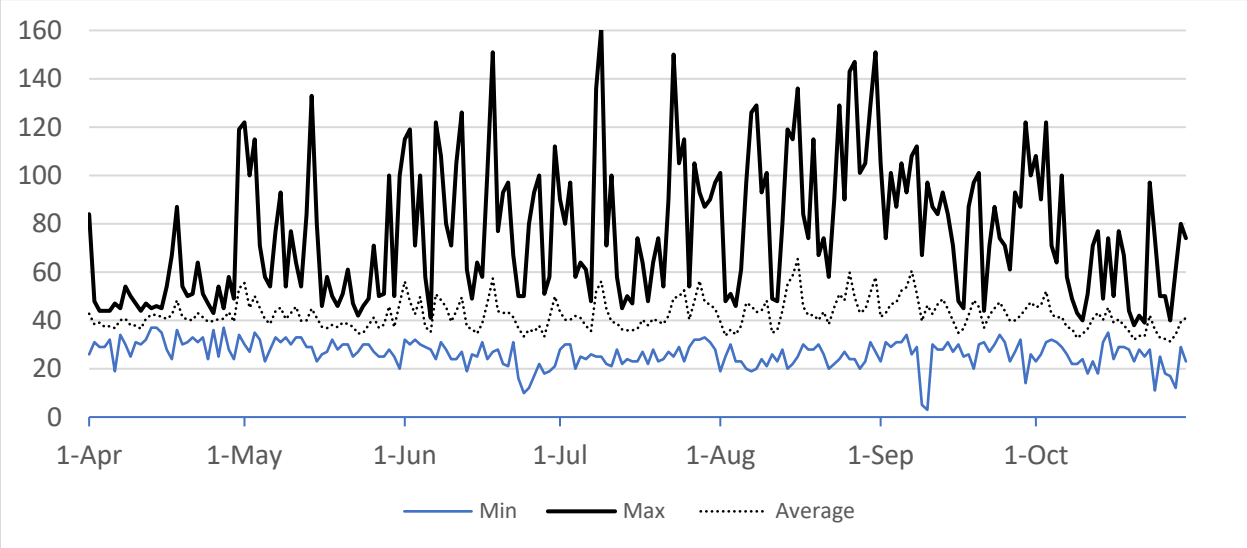
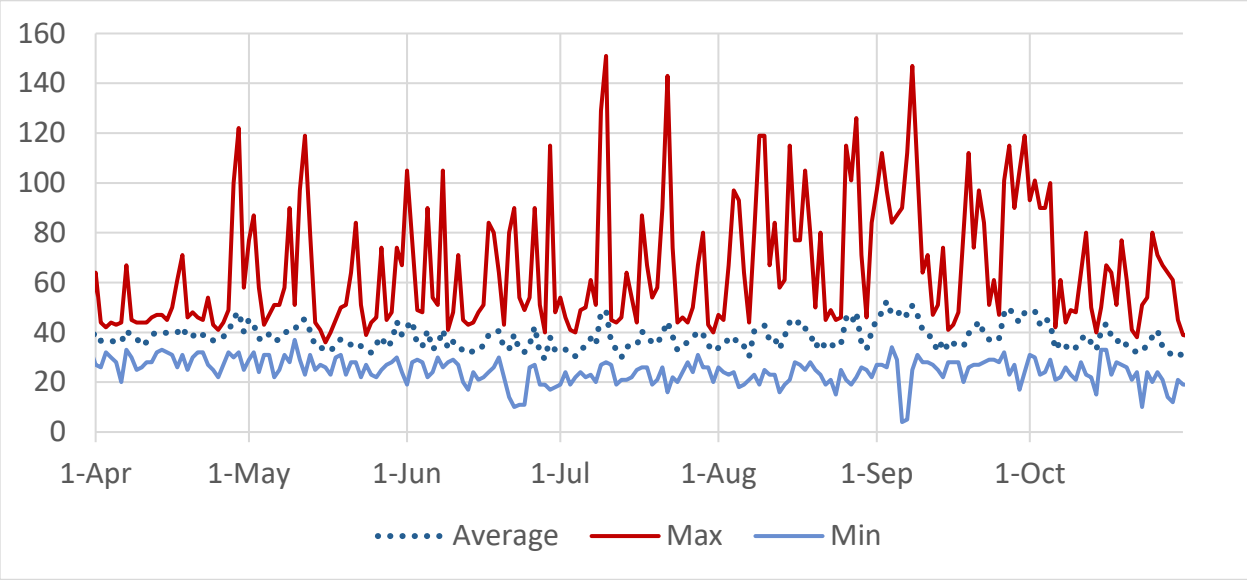


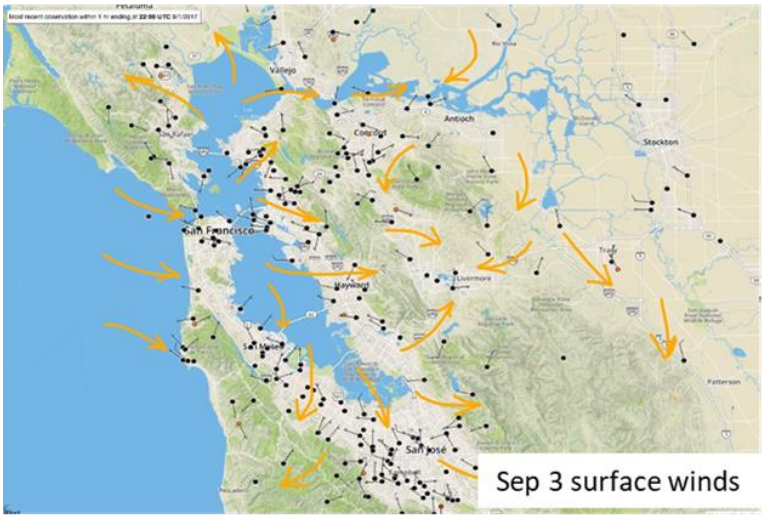
Figure 7-5. Average Daily Ozone AQI at San Ramon from Apr-Oct for 2012-2021. (Data source: EPA AirData)

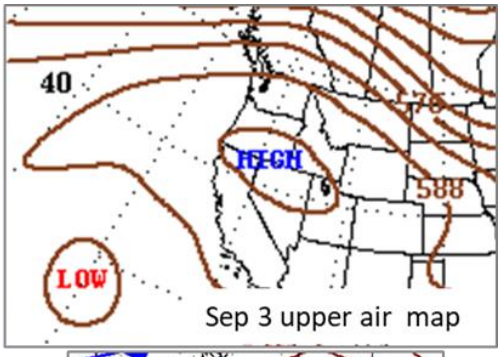


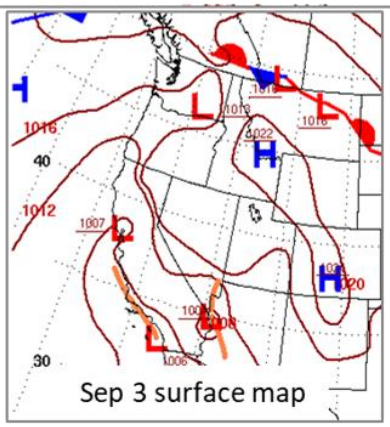
8. Example ozone episode

Figure 8-1 shows an example Bay Area ozone episode from Aug 31, 2017, to Sep 3, 2018, with exceedances at Livermore station. In this case the center of the high pressure moved onshore north of the Bay Area driving maximum temperatures over 100 deg F and relative humidities down to 10-20% during the day. Winds converged on the Tri-Valley from both east and west causing low winds in the Valley during much of the period.

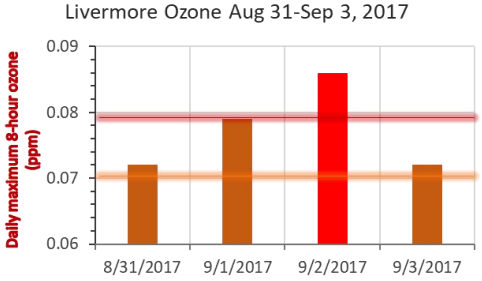
Figure 8-1. Example Bay Area ozone episode from Aug 31, 2017, to Sep 3, 2017, with exceedances at Livermore station







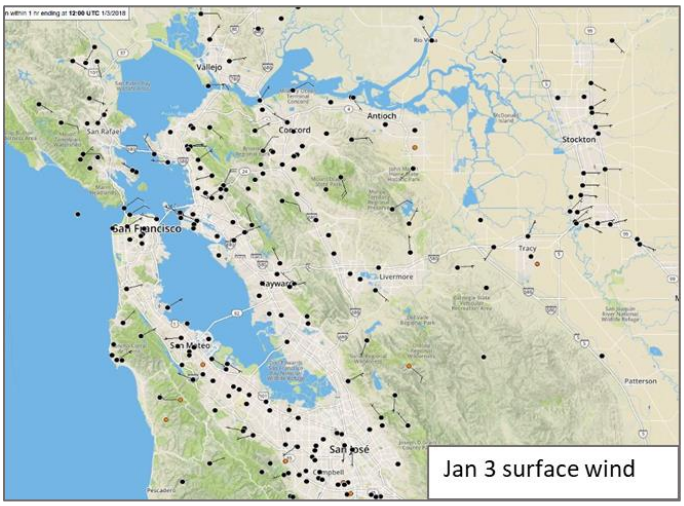
Hot, dry winds from the east created the conditions for ozone formation in the Tri-Valley.



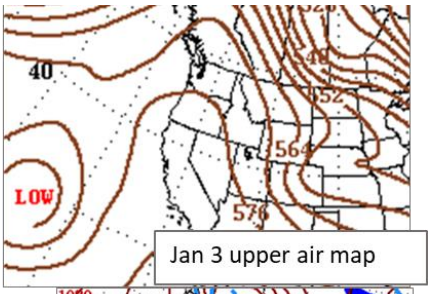
9. Example PM2.5 episode

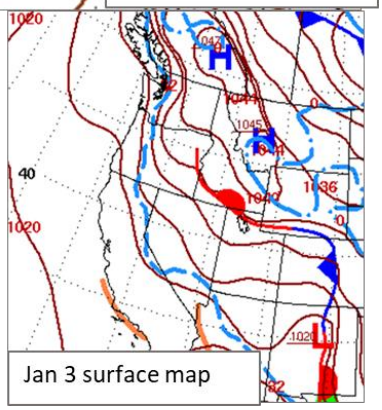
Figure 9-1 shows the conditions during a high PM2.5 period from Dec 31, 2017, to Jan 3, 2018. Maps of the surface winds show calm, stagnant conditions. Solid dots without a wind direction barb indicate that the wind was calm (below 1-2 mph). The weather maps at the surface and upper air for January 3, 2018, show a strong ridge over California when the 24-hour PM2.5 standard was last exceeded in Livermore.

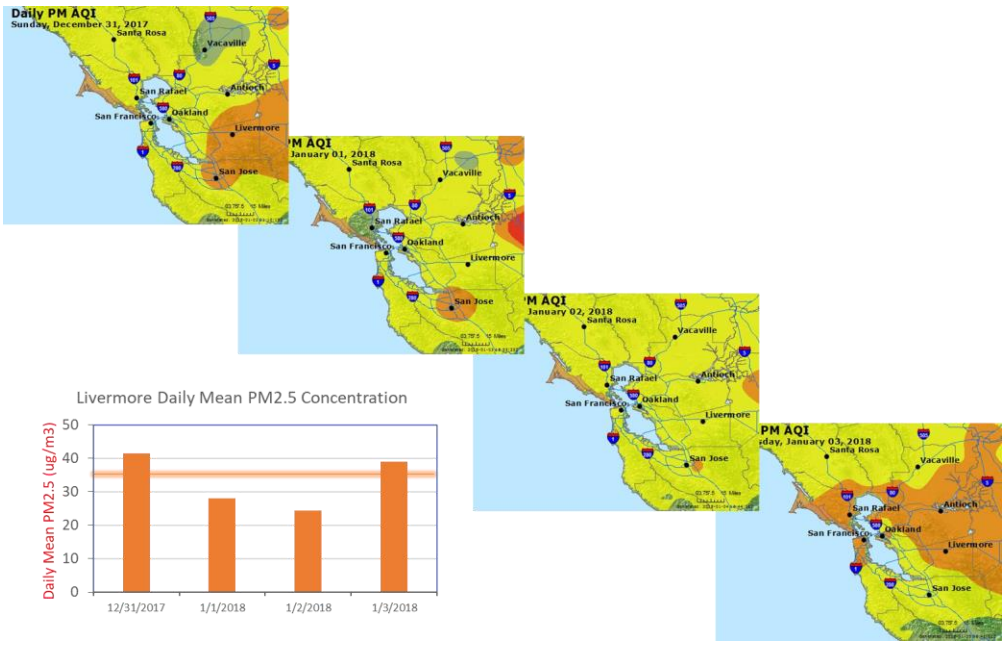
Figure 9-1. Example Bay Area PM2.5 episode from Dec 31, 2017, to Jan 3, 2018, with exceedances at Livermore station



Stagnant winds during light offshore flow created the conditions for high PM2.5 in the Tri-Valley







10. Wildfire episodes

Air pollution episodes due to wildfire smoke transported into the Bay Area cause significant health effects but are not within Air District control. The Air District responds to wildfires by issuing public Spare the Air alerts and smoke advisories to help people reduce their exposure (see: Wildfire Air Quality Response Program (baaqmd.gov).

In the past few years, the Bay Area experienced some of the worst PM2.5 concentrations on record. **Figure 10-1** shows a satellite view on November 11, 2018, when the Camp Fire plume was directed at the Bay Area during strong winds from the northeast also known as Diablo Winds. **Figure 10-2** shows the 24-hr PM2.5 air concentration reached 5 times the 35 ug/m^3 standard, some of the highest values ever recorded in the Tri-Valley's history.

Figure 10-1. Satellite view of Camp Fire smoke plume at noon on Nov. 11, 2018. Source: NASA GOES.

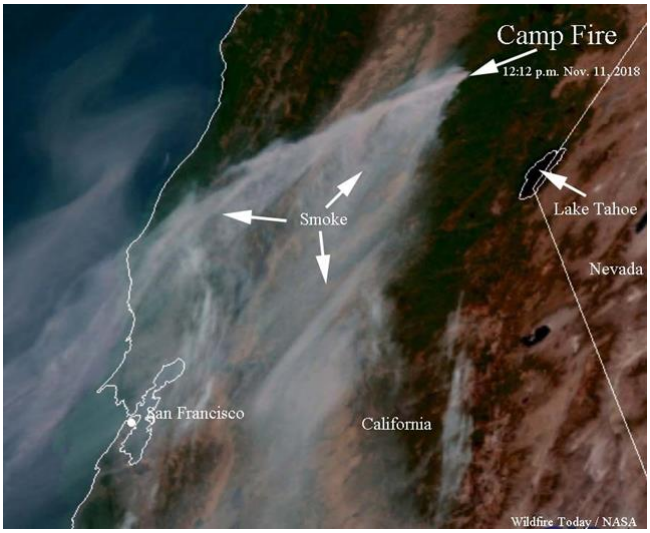
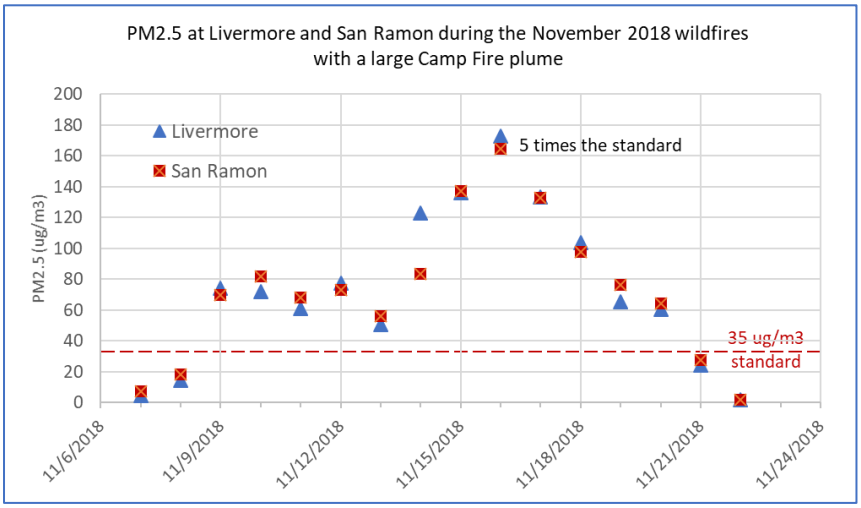


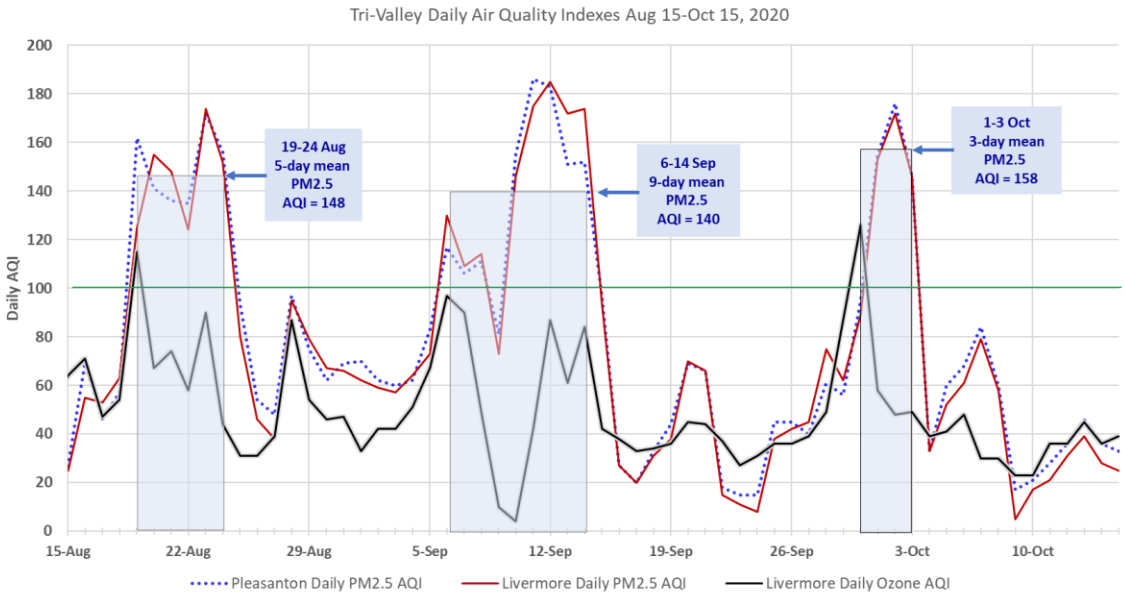
Figure 10-2. Tri-Valley 24-hr average PM2.5 concentrations reached record high values during the November 2018 wildfires. Source: EPA AirData.



While wildfire smoke did not enter the Bay Area in 2019, during August 15-October 15, 2020, California experienced the largest acreage of wildfires. Three wildfires ignited by lightning grew into some of the largest complexes in our history. **Figure 10-3** shows the satellite view on September 9, 2020, and **Figure 10-4** shows the Air Quality Index (AQI) values for ozone and PM2.5. All 17 24-hr PM2.5 exceedances in the Tri-Valley during 2020 were due to wildfire smoke—about 38% of the year's total PM2.5 outdoor exposure was due to these 17 days (<5% of the year). In addition, both of our 2 ozone exceedances this year were each at beginning of smoke plume arrivals.

Figure 10-3. Satellite photo of northern California wildfires on September 9, 2020. Source: NASA GOES.

Figure 10-4. Daily ozone and PM2.5 Air Quality Index values at Air District Pleasanton and Livermore stations. Source: EPA AirData.

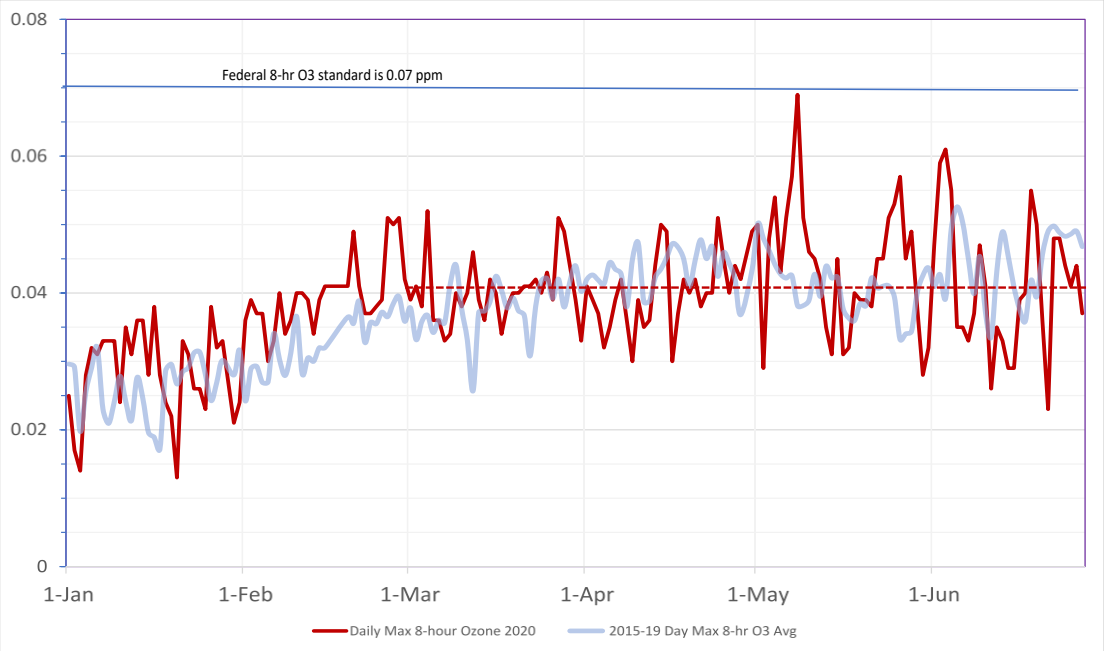


11. Was Tri-Valley air quality different during COVID-19?

Figures 11-1 and 11-2 show comparisons of Livermore's air quality during the first half of 2020 with previous 5-year averages. Specifically, we compare the Mar-Jun 2020 early COVID-19-19 period with previous 5-year daily 8-hr maximum ozone and 24-hr PM2.5 data for those same 4 months. For ozone, they are the same. Large variations in the weather (sun intensity, winds, and mixing height) are known to dominate the variation in ozone concentrations in the Tri-Valley. Variations in emissions have a smaller effect. Apparently, any reduction in traffic emissions that may have happened did not affect ozone during March-June 2020 COVID-19 period. However, apparently, reduction in local PM2.5 emissions during Mar-Jun 2020 may have caused the PM2.5 concentrations to be 35% lower than the 5-yr average during the Mar-Jun months. More detailed analysis with knowledge of emissions would assist in supporting any conclusions about the unique nature of our air quality during COVID-19-19.

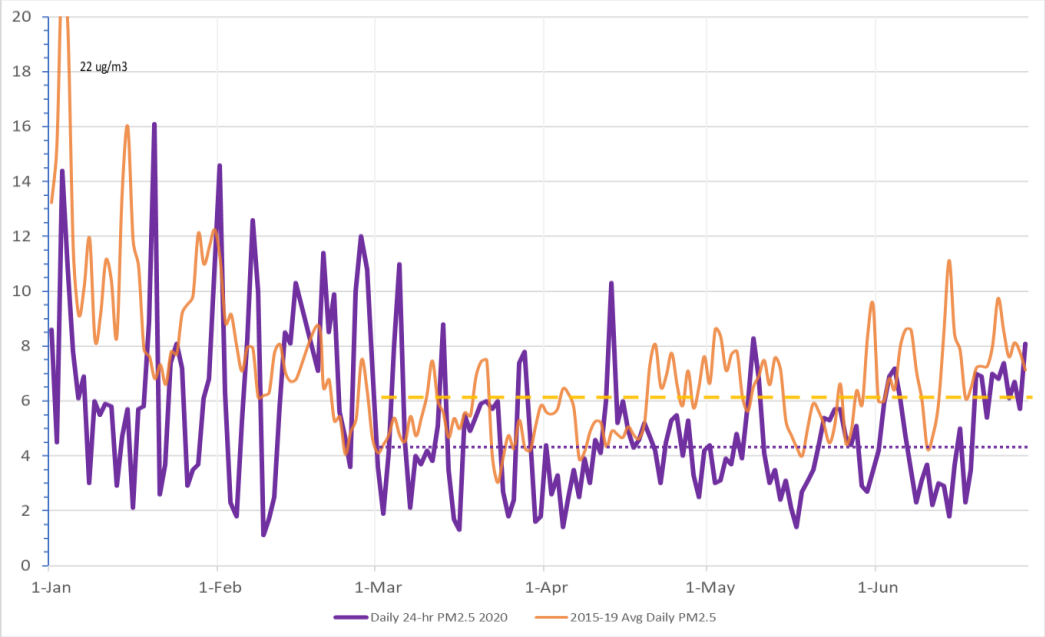
Recommended study: Analyze effects of COVID-19 reduced traffic on 2020 and 2021 air quality.

Figure 11-1. Livermore Daily Max 8-hr ozone (ppm) for Jan-Jun 2020 compared with 2015-19 average. Data source: EPA AirData.



The 4-month averages of the 8-hr daily maximum ozone for the early COVID-19-19 period from Mar-Jun 2002 and the 2015-2019 5-year average were the same at 0.041 ppm (dashed horizontal red line).

Figure 11-2. Livermore 24-hr PM 2.5 (ug/m3) for Jan-Jun 2020 compared with 2015-19 average. Data source: EPA AirData.



During the COVID-19 4-month period Mar-Jun 2020, the average PM2.5 was 4.5 ug/m3 (dotted purple line) versus 6.1 ug/m3 for the 2015-2019 5-year average (dashed horizontal orange line).

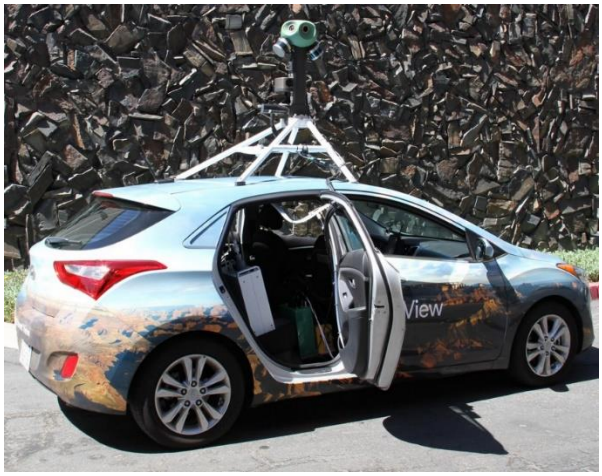
12. Google Street View-Aclima hyper-local air quality measurements

Beginning in 2015 Google Earth Outreach partnered with Environmental Defense Fund (EDF) and Aclima to equipped Google Street View cars with a set of professional-grade air pollution sensors—starting with measurements of the greenhouse gas methane and expanding to include the following air pollutants:

- ✓ Carbon dioxide (CO2)
- ✓ Carbon monoxide (CO)
- ✓ Nitrogen dioxide (NO2)
- ✓ Nitric oxide (NO),
- ✓ Ozone (O_3)
- ✓ Particulate matter (PM2.5)
- ✓ Black carbon (BC)

Black carbon, a byproduct of incomplete combustion from diesel engines, industrial processes, and carbonaceous fuel combustion (wood or coal), is a key contributor to PM2.5 in the Bay Area and as indicated above associated with significant potential detrimental health effects.

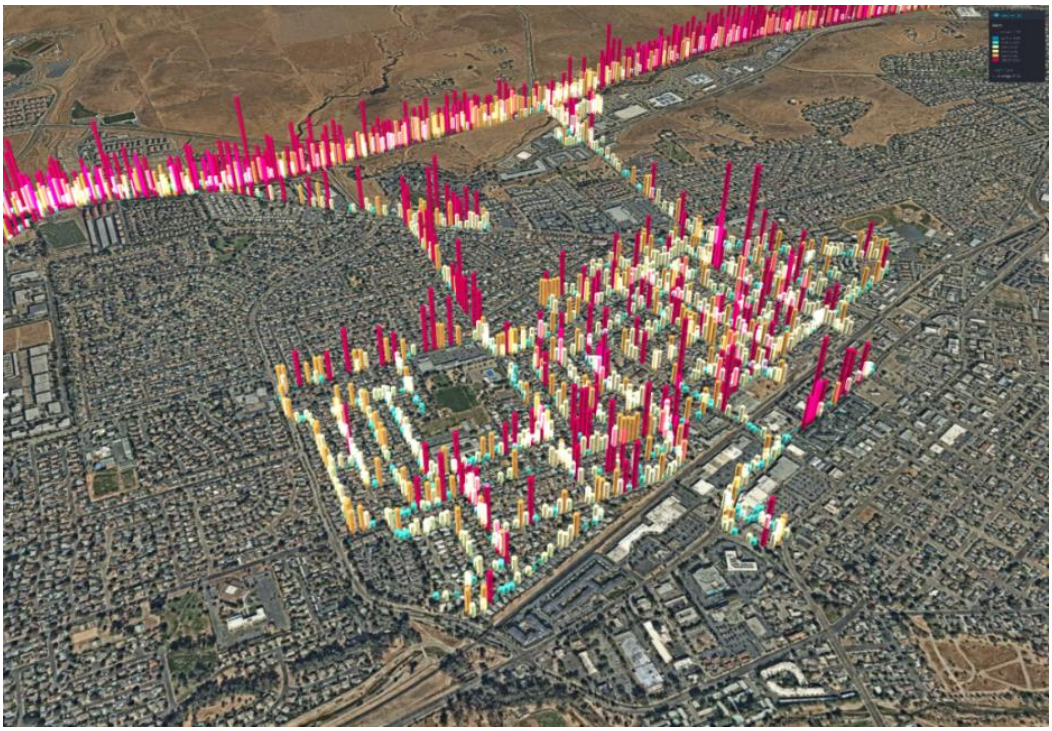
Figure 12-1. Google Street View cars equipped with Aclima air quality sensors.



Sensors collect pollutant concentrations at about 1 Hz (60 times per second) resulting in 10-30 m resolution depending on car speed (typical 10 m/s). Google gave TVAQCA access to a 2015-2019 data set that included some measurements in Livermore. **Figure 12-2** is an example display of the black carbon data for Dec 1, 2017. Higher BC concentrations associated with diesel traffic occur along I-580 while high concentrations appear to be rather random in town.

Figure 12-2. Black Carbon concentrations around Livermore on Dec 1, 2017.

Concentrations are proportional to color and element height: Higher concentrations are warmer colors, highest values ranging from 1.6 to 15 ug/m^3 are shown as dark pink columns. Source Google-Aclima California_Unified_2015_2019 data set graphed by Ron Baskett using https://kepler.gl/.

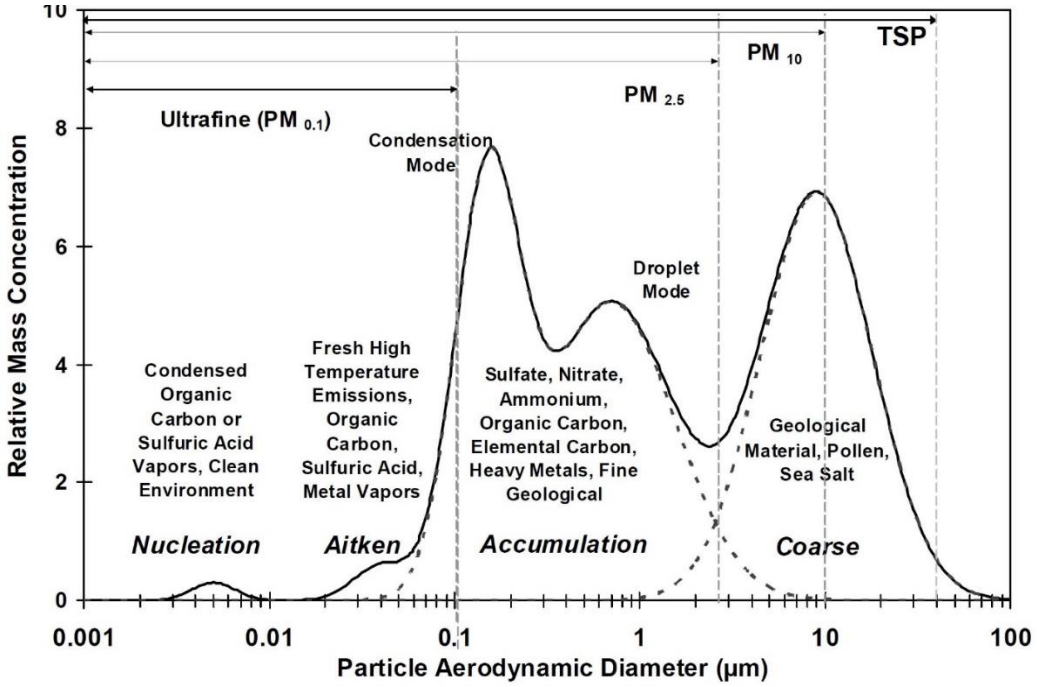


13. Ultrafine Particle (UFP) measurements at Air District's Livermore site

In recent years, the BAAQMD has taken Ultrafine Particle (UFP) measurements at the Livermore. For background, **Figure 13-1**shows the three major modes of particle size that occur in the ambient air. PM2.5 includes UFPs which are smaller than 0.1 µm diameter and have high deposition fractions in the inner sacs of the lung. Since there is no regulatory standard for UFPs, they are not usually included in AB617 projects. However, they do offer insights into health effects. Yu, et al., 2019 led a major analysis of UFPs for several California cities including Livermore. The dominant contributions to UFPs resolved by were traffic, urban background, secondary aerosol, wood burning, and natural gas nucleation sources.

A basic principle of aerosol physics is that gases condense to form nucleation aerosols with diameters < 0.1 µm that grow and agglomerate or stick with other particles to the Accumulation mode, the dominate mass of PM2.5. Condensation of particles in the Accumulation mode are also known as secondary aerosols.

Figure 13-1. Definitions of particle size modes (from Watson, et al. 2010, Measurement system evaluation for fugitive dust emissions detection and quantification, Prepared for South Coast Air Quality Management District.



Yu, et al. (2019) explain in their introduction: Numerous epidemiological studies have identified positive correlations between exposure to ambient particulate matter (PM) and increased risk of respiratory and cardiovascular diseases, premature mortality, and hospitalization … Most of these studies have not fully addressed Ultrafine Particles (UFPs with diameters < 0.1 µm) because these particles make a very small contribution to total ambient PM mass. Toxicity studies suggest that UFPs may be especially dangerous to human health since they have higher toxicity per unit mass and can penetrate the lungs and enter the bloodstream and secondary organs. These toxicology results are suggestive but more epidemiological evidence is required before the threat to public health from UFPs can be fully assessed.

Yu, et al. (2019) concluded: Combustion sources such as wood burning, food cooking, and mobile sources made stronger contributions to PM0.1 at heavily urbanized locations. Wood burning for home heating had strong seasonal patterns with peak concentrations in winter, while other sources contributed more consistently throughout the seasons. Nucleation made a negligible contribution to PM0.1 mass in the cities studied. Natural gas combustion is the largest primary source of nucleation particles (< 0.01 μm) in the city locations, whereas traffic sources dominated nucleation sources up to 300 m away from freeways. Combustion of natural gas dominates the generation of nucleation particles which in turn grow in size creating health implications that warrant further epidemiology study. Translating measured UFPs into population exposure estimates is difficult because UFP concentrations change more rapidly over shorter distances than PM2.5. **Figures 24-26,** below are copied from Yu, et al. (2019), show source contributions to UFPs.

Figure 24. Yu, et al. (2019) Figure 10 Seasonal variation of major source contributions to PM0.1 at Livermore in 2012.

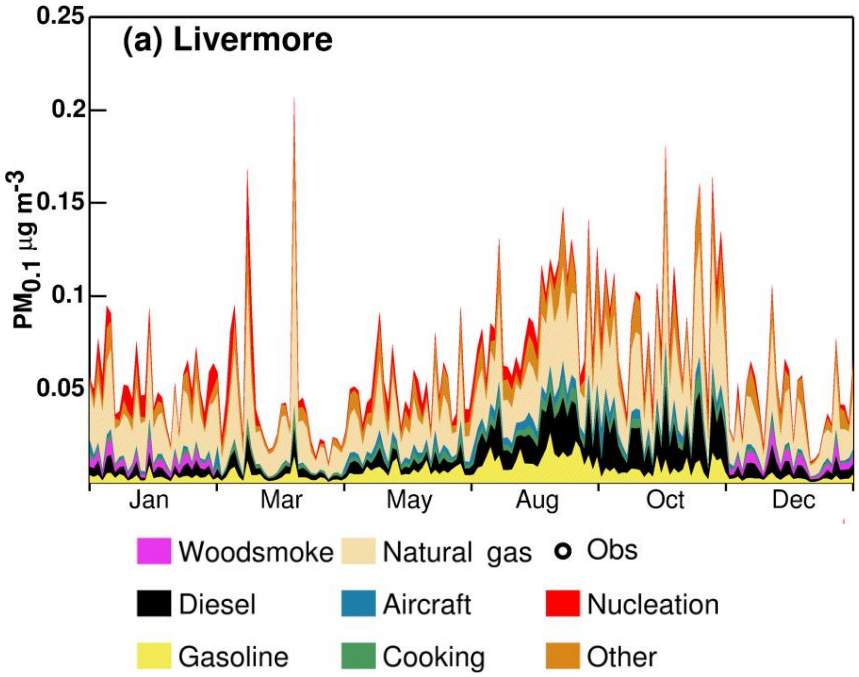


Figure 25. Yu, et al. (2019) Figure 13 The relative source contributions to PM0.01 at Livermore.

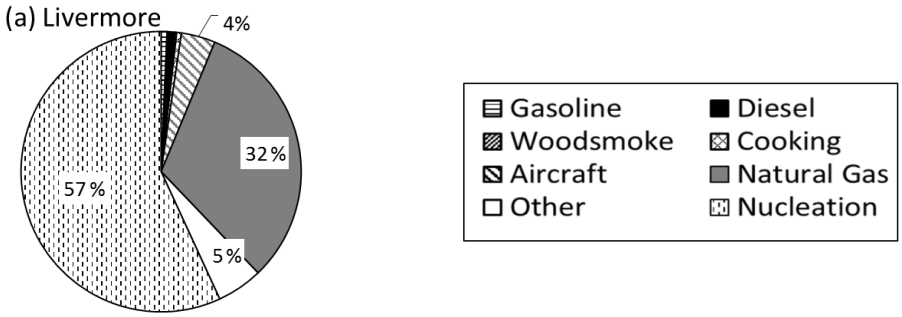
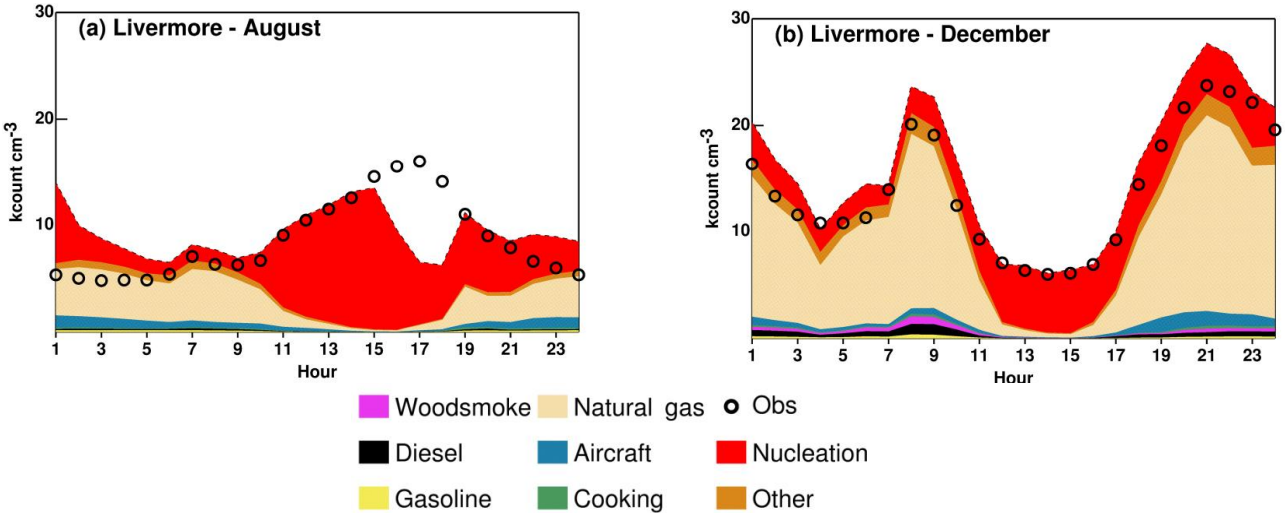


Figure 26. Yu, et al. (2019) Figure 15. Model predicted diurnal variations compared with observed PM0.01 particle count (also known as N10) averaged for August 2012 (a) and December 2012 (b) at Livermore.



The main afternoon peak appears to be related to nucleation particles (PM0.01), while the smaller early morning peak appears to be related to early morning human activity including natural gas combustion. Nucleation continues to play a role during winter but does not dominate to the point that it produces a midday peak in PM0.01 concentrations. Non-residential natural gas combustion is predicted to be the largest source of PM0.01 during morning and evening peaks. Industrial natural gas combustion emissions peak during the daytime, with lower values at night. Emissions from electricity generation powered by natural gas peak in the morning and evening.

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Appendix G. Summary of BAAQMD 2018 Emissions Inventory for the Tri-Valley

An Appendix to: Ensuring Future Air Quality in the Tri-Valley

By Steve Reid, BAAQMD and Ron Baskett, TVAQCA AB 617 Project

December 27, 2021

In March and May 2021, Steve Reid of the BAAQMD provided spreadsheets containing listings of the sources of air pollutants released in the Tri-Valley Airshed. Section 1 describes the inventory of gridded emissions and Section 2 discusses the sources of Toxic Air Contaminants.

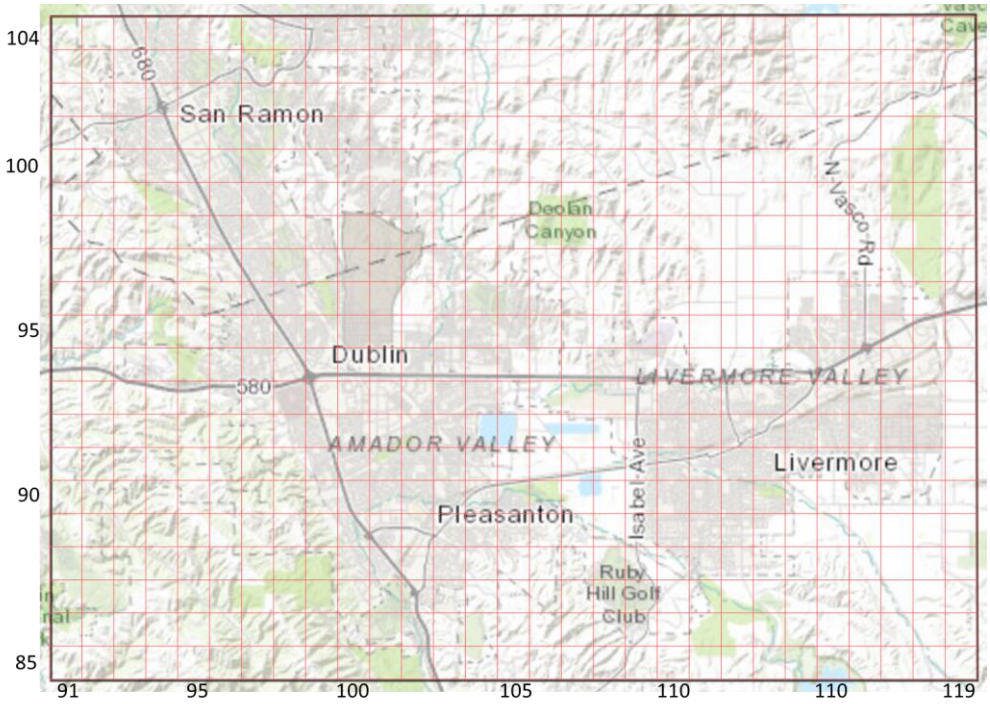
1. Gridded criteria and key toxic emissions

BAAQMD provided two files containing the emission data on their modeling grid:

- **2018_TriValley_Gridded_Inventory.xlsx** – a 67 MB Excel spreadsheet containing gridded emissions for the Tri-Valley Airshed.
- **eic_08122020.xlsx** – an Excel spreadsheet containing descriptions for CARB Emission Inventory Codes (EICs).

The 2018 gridded inventory for Tri-Valley is reported by grid cell and EIC. **Figure 1** shows the Tri-Valley 29 x 20 subset of 1-km grid cells from the BAAQMD Community Multiscale Air Quality (CMAQ) Modeling System consisting of 164 x 224 grid cells.

Figure 1. CMAQ Grid Subset for the Tri-Valley 2018 Emissions Inventory. Defined by lower left corner at 91, 85 and upper right corner at 119, 104.



BAAQMD used the Sparse Matrix Operator Kernel Emissions (SMOKE) model to produce annual emission rates for facility- and county-level sources on X, Y CMAQ grid coordinates.

A total of 529,896 individual sources are listed in the 67 MB Excel file. This Appendix includes Steve Reid's summary. **Sources** are grouped in 4 broad sectors:

1. Point: Facilities permitted by the Air District. Emissions are reported by grid cell, facility, and source (a single facility can have multiple emissions-producing sources/processes). Individual sources within a facility are identified using CARB's Emissions Inventory Code (EIC) system.

2. Area : Stationary sources that are not subject to permit requirements, usually because they are too small and dispersed to regulate individually. Examples include restaurants and residential sources. Area source emissions are reported by grid cell and EIC.

3. On-road: Mobile sources such as passenger cars and trucks that operate on roadways. Emissions are reported by grid cell and EIC.

4. Off-road: Mobile sources such as lawn mowers and construction equipment that operate in an offroad environment. Emissions are reported by grid cell and EIC.

Pollutants include the 8 criteria and 7 key toxic substances which are health risk drivers in the Bay Area:

Table 2. Pollutants included in the Tri-Valley 2018 Gridded Emissions Inventory

Criteria:	CO	Carbon monoxide
	NOX	Oxides of nitrogen
	TOG	Total organic gases
	ROG	Reactive organic gases
	NH3	Ammonia
	SOX	Oxides of sulfur
	PM10	Particulate matter with aerodynamic diameter 10 microns or less
	PM2.5	Particulate matter with aerodynamic diameter 2.5 microns or less
Toxics:	BENZ	Benzene
	CCHO	Acetaldehyde
	HCHO	Formaldehyde
	ACRO	Acrolein
	13BDE	1,3-Butadiene
	DPM10	Diesel PM with aerodynamic diameter 10 microns or less
	DPM2.5	Diesel PM with aerodynamic diameter 2.5 microns or less

Steve Reid developed Table 3 below which summarizes the total annual emissions data for the Tri-Valley by the major stationary and area source categories.

Table 3. Summary of the 2018 Draft Annual Emissions Inventory for the Tri-Valley AB 617 Community by Source Category
Annual Average Emissions in tons per year (Source: BAAQMD, March 2021)

SOURCES about 100 to 200 tons/yr are bold blue; SOURCES over 200 tons/yr are bold red

Summary Source Category Code (EIC3)

STATIONARY SOURCES		NOX	TOG	ROG	SOX	PM10	PM2_5	DPM
FUEL COMBUSTION		**263.87**	**358.17**	**56.61**	**12.21**	**35.10**	**34.75**	**1.54**
010	ELECTRIC UTILITIES	0.79	0.64	0.06	0.00	0.00	0.00	0.00
020	COGENERATION	0.88	21.33	1.99	0.02	0.22	0.22	0.00
030	OIL AND GAS PRODUCTION (COMBUSTION)	0.03	0.00	0.00	0.00	0.00	0.00	0.00
040	PETROLEUM REFINING (COMBUSTION)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
050	**MANUFACTURING AND INDUSTRIAL**	**144.93**	**298.50**	36.44	8.82	15.17	15.16	0.32
052	FOOD AND AGRICULTURAL PROCESSING	2.58	5.60	2.55	0.48	0.32	0.31	0.29
060	**SERVICE AND COMMERCIAL**	**93.43**	29.22	13.06	2.89	18.73	18.73	0.26
099	OTHER (FUEL COMBUSTION)	21.23	2.88	2.53	0.00	0.66	0.33	0.66
WASTE DISPOSAL		**3.91**	**3411.62**	**45.44**	**3.41**	**2.27**	**2.26**	**0.00**
110	SEWAGE TREATMENT	2.83	13.13	5.19	3.34	2.22	2.21	0.00
120	**LANDFILLS**	0.16	**3160.77**	20.86	0.00	0.00	0.00	0.00
130	INCINERATORS	0.93	0.15	0.07	0.07	0.02	0.02	0.00
140	SOIL REMEDIATION	0.00	0.46	0.35	0.00	0.03	0.03	0.00
199	**OTHER (WASTE DISPOSAL)**	0.00	**237.11**	18.97	0.00	0.00	0.00	0.00
CLEANING AND SURFACE COATINGS		**0.00**	**602.13**	**491.17**	**0.00**	**0.00**	**0.00**	**0.00**
210	LAUNDERING	0.00	10.46	10.14	0.00	0.00	0.00	0.00
220	**DEGREASING**	0.00	**146.22**	54.92	0.00	0.00	0.00	0.00
230	**COATINGS AND RELATED PROCESS SOLVENTS**	0.00	**229.46**	**223.11**	0.00	0.00	0.00	0.00
240	PRINTING	0.00	67.81	67.72	0.00	0.00	0.00	0.00
250	**ADHESIVES AND SEALANTS**	**0.00**	**132.81**	**119.90**	0.00	0.00	0.00	0.00
299	OTHER (CLEANING AND SURFACE COATINGS)	0.00	15.38	15.38	0.00	0.00	0.00	0.00

PETROLEUM PRODUCTION AND MARKETING		**0.00**	**1093.27**	**135.78**	**0.00**	**0.02**	**0.01**	**0.00**
310	*OIL AND GAS PRODUCTION*	*0.00*	*4.21*	*2.24*	*0.00*	*0.00*	*0.00*	*0.00*
320	*PETROLEUM REFINING*	*0.00*	*4.97*	*4.38*	*0.00*	*0.02*	*0.01*	*0.00*
330	***PETROLEUM MARKETING***	*0.00*	***1048.32***	***100.20***	*0.00*	*0.00*	*0.00*	*0.00*
399	*OTHER (PETROLEUM PRODUCTION AND MARKETING)*	*0.00*	*35.77*	*28.96*	*0.00*	*0.00*	*0.00*	*0.00*
INDUSTRIAL PROCESSES		**29.31**	**342.83**	**276.77**	**125.48**	**278.87**	**106.26**	**0.00**
410	***CHEMICAL***	*0.00*	***73.78***	***64.44***	*0.00*	*25.72*	*3.93*	*0.00*
420	*FOOD AND AGRICULTURE*	*0.00*	***126.08***	***93.45***	*0.00*	*4.91*	*1.28*	*0.00*
430	***MINERAL PROCESSES***	*26.99*	*20.45*	*17.24*	***125.46***	***211.43***	***78.90***	*0.00*
440	*METAL PROCESSES*	*2.32*	*0.61*	*0.47*	*0.01*	*36.13*	*21.69*	*0.00*
450	*WOOD AND PAPER*	*0.00*	*0.00*	*0.00*	*0.00*	*0.18*	*0.11*	*0.00*
470	*ELECTRONICS*	*0.00*	*1.63*	*1.60*	*0.00*	*0.00*	*0.00*	*0.00*
499	***OTHER (INDUSTRIAL PROCESSES)***	*0.00*	***120.28***	***99.57***	*0.00*	*0.52*	*0.36*	*0.00*
	Total Stationary Sources (tons/ year)	**297.1**	**5,808.0**	**1,005.8**	**141.1**	**316.3**	**143.3**	**1.5**

AREA SOURCES		**NOX**	**TOG**	**ROG**	**SOX**	**PM10**	**PM2_5**	**DPM**
SOLVENT EVAPORATION		**1.85**	**1004.98**	**912.57**	**0.02**	**0.00**	**0.00**	**0.00**
510	***CONSUMER PRODUCTS***	*0.00*	***679.54***	***607.59***	*0.00*	*0.00*	*0.00*	*0.00*
520	***ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS***	*0.00*	***295.61***	***277.49***	*0.00*	*0.00*	*0.00*	*0.00*
530	*PESTICIDES/FERTILIZERS*	*0.00*	*17.04*	*17.04*	*0.00*	*0.00*	*0.00*	*0.00*
540	*ASPHALT PAVING / ROOFING*	*1.85*	*12.78*	*10.45*	*0.02*	*0.00*	*0.00*	*0.00*
MISCELLANEOUS PROCESSES		**225.71**	**661.79**	**112.50**	**6.48**	**932.53**	**200.98**	**0.00**
610	***RESIDENTIAL FUEL COMBUSTION***	***215.40***	*29.65*	*13.16*	*4.22*	*20.45*	*20.45*	*0.00*
620	***FARMING OPERATIONS***	*0.00*	***533.71***	*42.70*	*0.00*	*16.71*	*2.50*	*0.00*
630	***CONSTRUCTION AND DEMOLITION***	*0.00*	*0.00*	*0.00*	*0.00*	***285.19***	*29.76*	*0.00*

640	PAVED ROAD DUST	0.00	0.00	0.00	0.00	423.56	63.56	0.00
645	UNPAVED ROAD DUST	0.00	0.00	0.00	0.00	12.59	1.26	0.00
650	FUGITIVE WINDBLOWN DUST	0.00	0.00	0.00	0.00	104.00	16.66	0.00
660	FIRES	1.04	3.65	2.32	0.00	3.04	2.85	0.00
670	MANAGED BURNING AND DISPOSAL	8.89	35.49	13.05	2.26	16.98	16.15	0.00
690	COOKING	0.00	3.72	2.47	0.00	44.45	44.45	0.00
699	OTHER (MISCELLANEOUS PROCESSES)	0.38	55.57	38.82	0.00	5.59	3.35	0.00
	Total Area Sources	**227.6**	**1,666.8**	**1,025.1**	**6.5**	**932.5**	**201.0**	**0.0**

ON-ROAD MOTOR VEHICLES		NOX	TOG	ROG	SOX	PM10	PM2_5	DPM
710	LIGHT DUTY PASSENGER (LDA)	248.82	300.03	244.78	7.12	115.79	48.39	0.38
722	LIGHT DUTY TRUCKS - 1 (LDT1)	51.59	71.72	57.89	0.83	11.71	5.01	0.02
723	LIGHT DUTY TRUCKS - 2 (LDT2)	142.04	139.85	113.88	3.16	38.95	16.22	0.03
724	MEDIUM DUTY TRUCKS (MDV)	117.55	112.07	91.74	2.33	23.95	10.05	0.06
732	LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDGT1)	30.41	38.36	30.48	0.61	5.10	2.18	0.00
733	LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDGT2)	4.26	4.88	3.87	0.10	0.81	0.35	0.00
734	MEDIUM HEAVY DUTY GAS TRUCKS (MHDGT)	8.72	4.87	3.77	0.14	1.11	0.47	0.00
736	HEAVY HEAVY DUTY GAS TRUCKS (HHDGT)	0.39	0.13	0.10	0.00	0.01	0.00	0.00
742	LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDDT1)	110.28	7.79	6.85	0.19	4.36	2.45	1.24
743	LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDDT2)	30.95	2.48	2.17	0.08	1.63	0.87	0.38
744	MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDDT)	301.69	25.67	22.55	0.70	18.53	12.71	9.26
746	HEAVY HEAVY DUTY DIESEL TRUCKS (HHDDT)	668.09	41.37	36.34	1.72	22.13	14.93	11.47
750	MOTORCYCLES (MCY)	30.04	106.84	89.09	0.05	0.44	0.20	0.00
760	HEAVY DUTY DIESEL URBAN BUSES (UBD)	10.97	3.88	3.41	0.07	0.53	0.22	0.03
762	HEAVY DUTY GAS URBAN BUSES (UBG)	0.01	0.00	0.00	0.00	0.01	0.01	0.00
771	SCHOOL BUSES - GAS (SBG)	0.05	0.05	0.04	0.00	0.08	0.04	0.00

772	*SCHOOL BUSES - DIESEL (SBD)*	*4.74*	*0.06*	*0.06*	*0.01*	*0.53*	*0.24*	*0.02*
776	*OTHER BUSES (OB)*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
777	*OTHER BUSES - GAS (OBG)*	*2.90*	*1.17*	*0.89*	*0.06*	*0.46*	*0.19*	*0.00*
778	*OTHER BUSES - MOTOR COACH - DIESEL (OBC)*	*5.80*	*0.36*	*0.32*	*0.01*	*0.26*	*0.18*	*0.14*
779	*ALL OTHER BUSES - DIESEL (OBD)*	*8.85*	*0.91*	*0.80*	*0.02*	*0.49*	*0.36*	*0.30*
780	*MOTOR HOMES (MH)*	*5.86*	*0.72*	*0.55*	*0.05*	*0.58*	*0.30*	*0.10*
	Total On-road Mobile Sources	**1,784.0**	**863.2**	**709.6**	**17.3**	**247.5**	**115.4**	**23.4**

OTHER MOBILE SOURCES		**NOX**	**TOG**	**ROG**	**SOX**	**PM10**	**PM2_5**	**DPM**
810	***AIRCRAFT***	***83.59***	*31.35*	*30.54*	*8.85*	*2.20*	*2.13*	*0.00*
820	*TRAINS*	*46.77*	*2.67*	*2.34*	*0.72*	*0.86*	*0.78*	*0.86*
833	*OCEAN GOING VESSELS*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
835	*COMMERCIAL HARBOR CRAFT*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
840	*RECREATIONAL BOATS*	*0.00*	*24.04*	*22.83*	*0.00*	*0.00*	*0.00*	*0.00*
850	*OFF-ROAD RECREATIONAL VEHICLES*	*7.52*	*76.60*	*71.62*	*0.06*	*1.11*	*0.80*	*0.00*
860	***OFF-ROAD EQUIPMENT***	***427.77***	***387.49***	***359.04***	*0.43*	*33.40*	*27.95*	***16.04***
870	*FARM EQUIPMENT*	*38.50*	*11.06*	*9.94*	*0.00*	*2.48*	*2.24*	*2.26*
890	*FUEL STORAGE AND HANDLING*	*0.00*	*33.52*	*33.52*	*0.00*	*0.00*	*0.00*	*0.00*
	Total Other Mobile Sources	**604.2**	**566.7**	**529.8**	**10.1**	**40.0**	**33.9**	**19.2**
	Total Community Emissions (tons per year)	**2,897.2**	**8,673.8**	**3,248.8**	**168.5**	**1,532.2**	**489.4**	**44.1**

Tables 4 to 7 list the 20 largest stationary sources representing the majority of emissions from the 688 total permitted point sources of NOx, ROG, DPM2.5, and PM2.5.

Table 4. Largest NOx stationary sources in the Tri-Valley

X cell	Y cell	EIC3	Plant ID	Plant Name	NOX (tons/yr)
99	92	050	1371	Dublin San Ramon Services District - Was	48.84
116	99	050	20432	Ameresco Vasco Road LLC	15.64
117	92	060	255	Lawrence Livermore National Laboratory	13.86
107	90	430	13443	Granite Construction Co	3.88
117	92	050	255	Lawrence Livermore National Laboratory	2.90
95	100	050	7237	Chevron Business and Real Estate Service	2.81
96	101	050	23612	City of San Ramon	2.78
107	90	430	705	Vulcan Materials Western Division	2.26
108	92	440	22428	Gillig LLC	2.04
116	99	110	5095	Republic Services Vasco Road LLC	1.97
102	87	060	19553	Thermo Fisher Scientific	1.97
117	91	060	290	DOE-KAO Sandia National Laboratories	1.95
107	90	540	705	Vulcan Materials Western Division	1.85
111	91	060	3335	Valley Memorial Hospital	1.82
111	91	060	3335	Valley Memorial Hospital	1.82
100	93	050	20072	Kaiser Permanente	1.28
107	90	060	705	Vulcan Materials Western Division	1.26
100	93	060	15225	Roche Molecular Systems Inc	1.05
95	101	060	21709	Sunset Development Company	1.02
				Total of largest NOx stationary sources	110.99
				Total of all NOx stationary sources	128.08
				Total Tri-Valley NOx Emissions	2,897.2

The 22 largest NOx stationary sources represent 87% of all NOx point source annual emissions and 4% of all NOx emissions in the Tri-Valley.

Table 5. Largest ROG stationary sources stationary sources in the Tri-Valley

X cell	Y cell	EIC3	Plant ID	Plant Name	ROG (tons/yr)
108	92	230	22428	Gillig LLC	34.90
116	94	410	17967	G S Cosmeceutical USA Inc	33.15
108	92	230	22428	Gillig LLC	23.77
116	99	050	20432	Ameresco Vasco Road LLC	21.50
116	99	120	5095	Republic Services Vasco Road LLC	20.71
115	93	230	13234	McGrath Rent Corporation	10.08
115	93	499	8481	Alameda County Household Hazardous Waste	7.62
118	95	230	23728	Advantage Metal Products	5.45
116	99	110	20432	Ameresco Vasco Road LLC	4.66
99	92	050	1371	Dublin San Ramon Services District - Was	4.12
108	92	250	22428	Gillig LLC	3.97
117	93	240	10321	Packaging Innovators Corporation	3.83
99	95	240	12383	AMP Printing Inc	3.40
117	95	220	14266	Form Factor	3.32
116	99	410	5095	Republic Services Vasco Road LLC	2.93
116	93	240	8885	Printegra	2.57
107	90	430	705	Vulcan Materials Western Division	2.56
118	92	320	8869	XL Operating Company	2.40
108	92	052	3169	City of Livermore Water Reclamation Plan	2.38
108	94	399	100088	Costco Wholesale #146	2.26
108	92	230	22428	Gillig LLC	2.19
117	92	220	255	Lawrence Livermore National Laboratory	2.03
				Total of largest ROG stationary sources	199.77
				Total of all ROG stationary sources	275.40
				Total Tri-Valley ROG Emissions	3,248.8

The 22 largest ROG stationary sources represent 73% of all ROG **point** source annual emissions and 6% of **all** ROG emissions in the Tri-Valley.

Table 6. Largest DPM2.5 stationary sources in the Tri-Valley

X cell	Y cell	Plant ID	Plant Name	DPM2.5 (tons/yr)
111	91	3335	Valley Memorial Hospital	0.251
96	101	23612	City of San Ramon	0.078
117	92	255	Lawrence Livermore National Laboratory	0.041
101	95	23535	Judicial Council of CA East County Hall	0.031
100	93	20072	Kaiser Permanente	0.017
101	92	14691	Verizon Wireless Pleasanton Switch	0.011
112	85	281	U S Veterans Administration Medical Cent	0.010
101	92	14839	AT&T	0.006
101	95	8996	Alameda County GSA	0.006
95	101	10477	Pacific Bell	0.006
108	93	19899	Pearl Investment Co., LLC	0.005
101	93	14075	S F Bay Area Rapid Transit District	0.005
116	99	5095	Republic Services Vasco Road LLC	0.004
95	100	7237	Chevron Business and Real Estate Service	0.004
100	93	21708	Clorox Services Company	0.003
100	95	14285	U S Army Garrison Camp Parks	0.003
111	91	3335	Valley Memorial Hospital	0.003
101	94	15352	SBC Advanced Solutions Inc	0.003
99	92	1371	Dublin San Ramon Services District - Was	0.003
99	92	1371	Dublin San Ramon Services District - Was	0.003
96	100	21793	Pacific Gas & Electric Company	0.003
			Total of largest stationary sources	0.495
			Total of all DPM2.5 stationary sources	0.572
			Total Tri-Valley DPM2.5 emissions	40.67

The 21 largest DPM2.5 stationary sources represent 88% of all DPM2.5 **point** source annual emissions and 1% of **all** DPM2.5 emissions in the Tri-Valley.

Table 7. Largest PM2.5 stationary sources in the Tri-Valley

X cell	Y cell	EIC3	Plant ID	Plant Name	PM2.5 (tons/yr)
116	99	050	20432	Ameresco Vasco Road LLC	4.13
116	99	410	5095	Republic Services Vasco Road LLC	3.57
116	99	110	5095	Republic Services Vasco Road LLC	2.09
107	90	430	705	Vulcan Materials Western Division	1.82
103	90	430	19391	CEMEX (Pleasanton)	1.79
103	90	430	3358	CEMEX Construction Materials Pacific LLC	1.62
107	90	430	13443	Granite Construction Co	1.45
117	92	060	255	Lawrence Livermore National Laboratory	1.45
118	93	430	9000	RC Ready Mix Co	1.32
103	90	430	3358	CEMEX Construction Materials Pacific LLC	1.01
104	90	430	3959	Pleasanton Ready Mix Concrete	0.93
107	91	430	8507	Vulcan Materials/Calmat Company	0.77
103	90	430	3358	CEMEX Construction Materials Pacific LLC	0.49
106	91	430	13166	Right Away Ready Mix Inc	0.45
101	89	430	3925	Oldcastle Infrastructure	0.27
118	94	410	21152	Pleasanton Trucking Inc	0.27
111	91	060	3335	Valley Memorial Hospital	0.25
111	91	060	3335	Valley Memorial Hospital	0.25
107	90	430	13443	Granite Construction Co	0.24
99	92	050	1371	Dublin San Ramon Services District - Was	0.23
99	92	020	1371	Dublin San Ramon Services District - Was	0.22
				Total of largest PM2.5 stationary sources	24.63
				Total of all PM2.5 stationary sources	27.39
				Total Tri-Valley PM2.5 Emissions	489.4

The 21 largest PM2.5 stationary sources represent 93% of all PM2.5 **point** source annual emissions and 5% of **all** PM2.5 emissions in the Tri-Valley.

Emissions of gasoline land and garden utility equipment

To explore the contribution from gasoline land and garden utility equipment, we select the three EICs listed in Table 8.

Table 8. EICs for gasoline land and garden equipment
Source: eic_08122020.xlsx from BAAQMD (2021)

EIC **Emission Inventory Code**	EICSUM **Summary Category Code**	EICSUMN **Summary Category Name**	EICMAT **Materials Description Code**	EICMATN **Emission Sub-category Code**	EICSOUN **Emission Sub-category Name**
860901XXXXXXXX	680	OFF-ROAD EQUIPMENT	1100	GASOLINE (UNSPECIFIED)	LAWN AND GARDEN (COMMERCIAL)
860902XXXXXXXX	680	OFF-ROAD EQUIPMENT	1100	GASOLINE (UNSPECIFIED)	LAWN AND GARDEN (RESIDENTIAL)
860903XXXXXXXX	680	OFF-ROAD EQUIPMENT	1100	GASOLINE (UNSPECIFIED)	LAWN AND GARDEN (OTHER)

Table 9. Emissions from gasoline-powered land and garden equipment compared with light duty passenger automobiles in the Tri-Valley

Annual Emission (tons/yr) >	CO	NOX	TOG	ROG	SOX	PM10	PM2_5	DPM10
Lawn & Garden (L+G)	2092.3	44.5	263.7	248.9	0.1	5.3	4.1	0.72
Light Duty Passenger (LDA)	2890.4	248.8	300.0	244.8	7.1	115.8	48.4	0.38
Ratio L+G to LDA	0.7	0.2	0.9	1.0	0.02	0.05	0.09	1.9

Note that gasoline-powered land and garden equipment emit a almost as much CO and about the same ROG as light duty passenger automobiles in total in the Tri-Valley.

2. Toxic Air Contaminant (TAC) emissions

BAAQMD provided the following files for TAC emissions:

> 2018_TriValley_Toxics_Inventory - air toxics emissions by source sector and source code (EIC). Toxic emissions have also been weighted by OEHHA health values for cancer risk and chronic/acute effects.

The inventory is summarized in Section 8 of the TVAQCA Community Profile.

> 2018_TV_all_toxics_weighted.zip - CSV file containing a gridded version of the toxics inventory. This file unzips to 1.1 GB.

> eic_08122020.xlsx - EIC definitions from CARB.

> OEHHA_HEALTH_VALUES_REFERENCE_TABLE_SEP2019.csv - health values used in the air toxics weighting process.

> CARB_Toxics_Methodology.docx - one-pager summarizing CARB's methodology for developing air toxics inventories, which was used to develop these inventories for Tri-Valley. The key steps are:

(1) applying speciation profiles to PM and TOG emissions estimates.
(2) selecting air toxics from among the speciated compounds.
(3) weighting air toxic emissions using OEHHA health values.

This file is copied below.

CARB Air Toxics Emissions Estimated Methodology

The on-road toxics emissions by EIC by grid cell are calculated using chemical speciation profiles for particulate matter (PM) and Total organic gases (TOG) species. These speciation profiles are developed, maintained and updated by CARB (https://www.arb.ca.gov/ei/speciate/speciate.htm), and essentially break down PM and TOG emissions into their individual constituents, including toxics, for each EIC. Then all the species which are listed in Appendix A-I of AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation are filtered out as toxics. The TOG based toxics (e.g., Formaldehyde, Benzene, Xylenes, Naphthalene, 1,3-Butadiene) are estimated using TOG speciation profiles and PM based toxics (metals like Lead, Chromium, Nickel, and Arsenic) are estimated using PM speciation profiles.

All the exhaust PM emissions from diesel internal combustion engines are considered Diesel particulate matter (DPM) and considered one of the most important on-road toxics due to its cancerous effects.

As Ammonia (NH3) is also one of the toxics and there are no speciation profiles for NH3, NH3 emissions are taken from the criteria emissions and converted to pounds per year from tons per day.

Current CARB speciation profiles don't speciate out hexavalent chromium (Cr (VI)) and is therefore augmented from the speciated Chromium (Cr) emissions. Cr (VI) emissions are estimated as 5% of the total Cr emissions[1].

[1] We assumed that 5% ratio of Cr (VI) to the total Cr, which is within the range ratios of 0.7% - 9% noted in CARB 1986 study, Kang et al, 2016, Rogula-Kozloska, 2018. We also acknowledge that this Cr (VI) ratio to total Cr could vary with different sources (e.g. soil, dust, combustion sources etc.) (Kitsa et al., 1992, Catrambone et al., 2013).

To compare the relative toxicity of TACs, Toxicity Weighted Emissions (TWE) are calculated for all TACs using health values[2] approved by Office of Environmental Health Hazard Assessment (OEHHA). It is important to note that TWEs are not risks, but weighted emissions useful to compare relative toxicity of TACs. TWEs are calculated by multiplying mass emissions of each TAC by the corresponding health values (e.g., cancer unit risk factor, non-cancer chronic, and acute reference exposure levels) as determined by OEHHA, molecular weight adjustment factors accounting for the molecular weight fraction of a compound associated with the specific health effects, maximum hours of emissions, and normalization factors as described in formulas below:

1) $Cancer\ TWE_{pol} = \sum EMS_{pol} \times CANURF_{pol} \times MWAF_{pol} \times 7700$

   Where,
   Cancer TWE_{pol} = Cancer risk-based s (TWE) for a pollutant
   $CANURF_{pol}$ = Cancer Inhalation Unit Risk Factor for a pollutant
   EMS_{pol} = Annual Emissions in lbs/yr for a pollutant
   $MWAF_{pol}$ = Molecular Weight Adjustment Fraction for a pollutant

2) $Chronic\ Non\ Cancer\ TWE_{pol} = \sum ((EMS_{pol} \div 8760) \div CHRONREL_{pol}) \times 150$

   Where,
   Chronic Non-Cancer TWE_{pol} = Chronic Non-Cancer risk-based (TWE) of a pollutant
   $CHRONREL_{pol}$ = Chronic Inhalation reference exposure level (REL) for a pollutant

3) $Acute\ Non\ Cancer\ TWE_{pol} = \sum ((EMS_{pol} \div 8760) \div ACUTEREL_{pol}) \times 1500$

   Where,
   Acute Non-Cancer TWE_{pol} = Acute Non-Cancer risk-based (TWE) of a pollutant
   $ACUTEREL_{pol}$ = Acute Inhalation reference exposure level (REL) for a pollutant

---

[2] OEHHA Approved health values - https://ww2.arb.ca.gov/sites/default/files/classic//toxics/healthval/contable.pdf.

NOTE: The Inhalation Cancer Unit Risk Factor and the Molecular Weight Adjustment Fraction (MWAF) should be obtained from the approved **"Consolidated Table" of health values** on the above-mentioned CARB website. The Chronic Inhalation REL and Acute Inhalation REL values (used below) are also available in the "Consolidated Table".

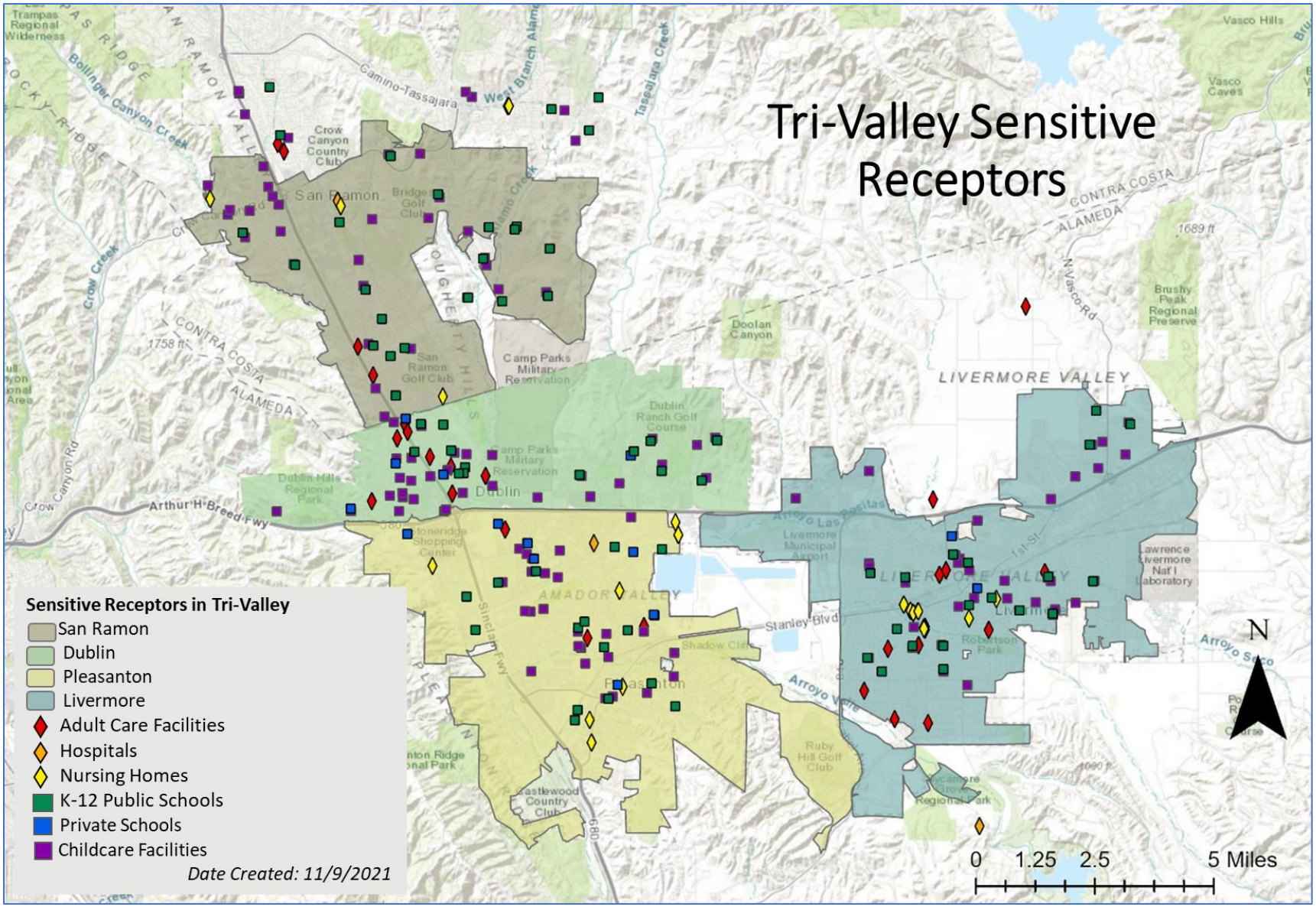
NOTE: The Molecular Weight Adjustment Fraction (MWAF) is used with Cancer score, for example to get the proportion of the weight of carcinogenic chromium in a compound like barium chromate. The latest OEHHA guidelines also allow the use of the MWAF for non-cancer (chronic and acute) score calculations.

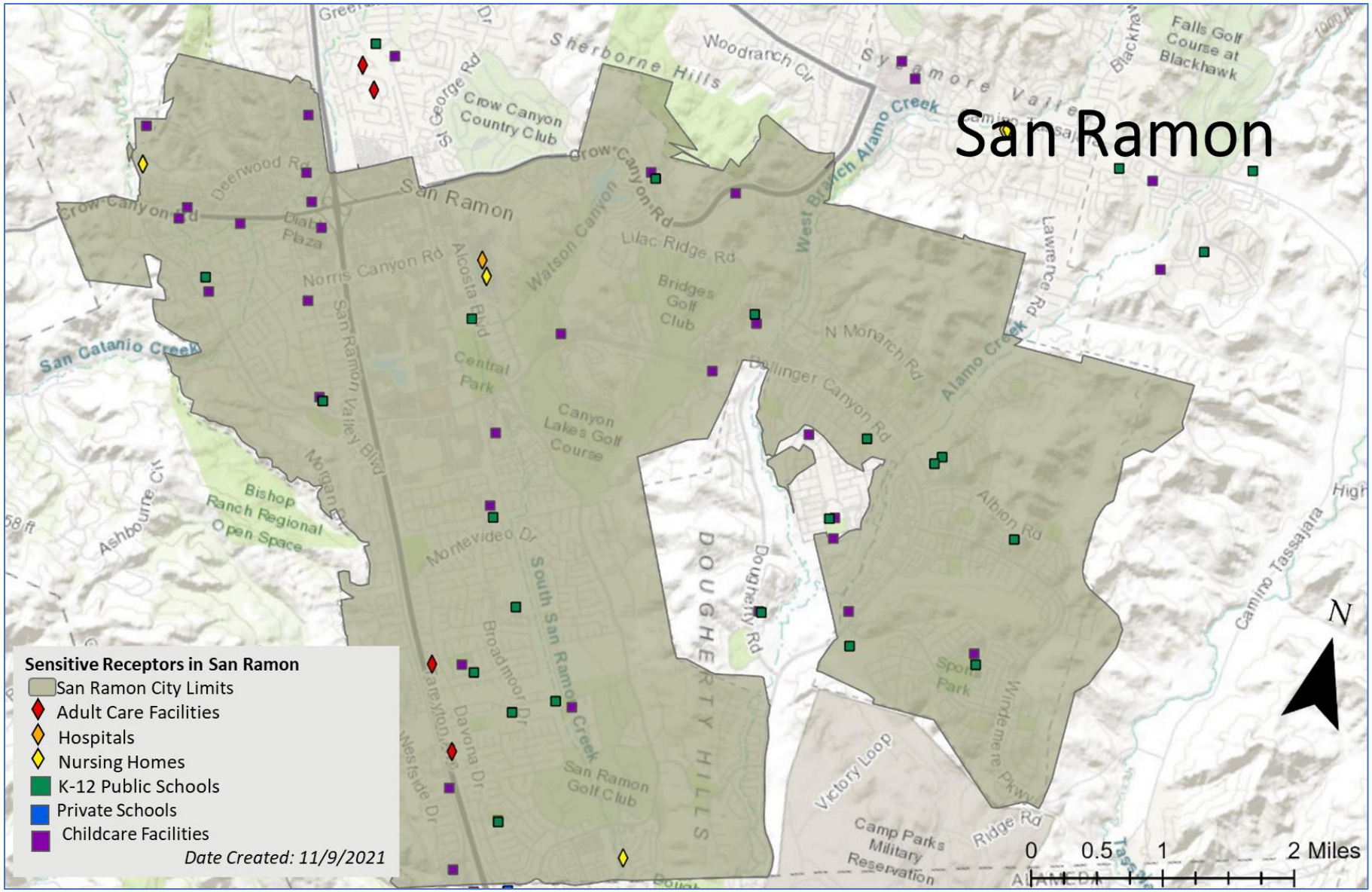
Appendix H. Maps of Sensitive Receptors in the Tri-Valley

Appendix to "Ensuring Future Air Quality in the Tri-Valley"

By Alesia Hsaio, BAAQMD

December 2, 2021


Tri-Valley Sensitive Receptors
Sensitive Receptors in Tri-Valley
San Ramon
Dublin
Pleasanton
Livermore
Adult Care Facilities
Hospitals
Nursing Homes
K-12 Public Schools
Private Schools
Childcare Facilities
Date Created: 11/9/2021
N
0 1.25 2.5 5 Miles
LIVERMORE VALLEY
AMADOR VALLEY
CONTRA COSTA
ALAMEDA
Arthur H Breed Fwy
Stanley Blvd
Crow Canyon Country Club
San Ramon Golf Club
Bridges Golf Club
Camp Parks Military Reservation
Dublin Ranch Golf Course
Dublin Hills Regional Park
Doolan Canyon
Brushy Peak Regional Preserve
Livermore Municipal Airport
Lawrence Livermore Nat'l Laboratory
Ruby Hill Golf Club
Castlewood Country Club
Shadow Cliffs
Robertson Park
Sycamore Grove Regional Park
Vasco Caves
Vasco Hills
Trampas Regional Wilderness
Bollinger Canyon Creek
Crow Creek
Tassajara Creek
Camino Tassajara
West Branch Alamo Creek
N Vasco Rd
Arroyo Las Positas
Arroyo Seco
Arroyo Valle
Sinclair Fwy
1689 ft
1758 ft
1090 ft


San Ramon
Sherborne Hills
Woodranch Cir
Crow Canyon Country Club
George Rd
Deerwood Rd
Crow Canyon Rd
Diablo Plaza
San Ramon
Watson Canyon
Lilac Ridge Rd
West Branch Alamo Creek
Sycamore Valley
Falls Golf Course at Blackhawk
Blackhawk
Lawrence Rd
Norris Canyon Rd
Alcosta Blvd
San Ramon Valley Blvd
Bridges Golf Club
N Monarch Rd
Bollinger Canyon Rd
Alamo Creek
San Catanio Creek
Central Park
Canyon Lakes Golf Course
Bishop Ranch Regional Open Space
Ashbourne Cir
Montevideo Dr
South San Ramon Creek
Broadmoor Dr
Davona Dr
Westside Dr
San Ramon Golf Club
DOUGHERTY HILLS
Dougherty Rd
Albion Rd
Camino Tassajara
Windemere Pkwy
Victory Loop
Camp Parks Military Reservation
Ridge Rd
ALAMEDA
Sensitive Receptors in San Ramon
San Ramon City Limits
Adult Care Facilities
Hospitals
Nursing Homes
K-12 Public Schools
Private Schools
Childcare Facilities
Date Created: 11/9/2021
N
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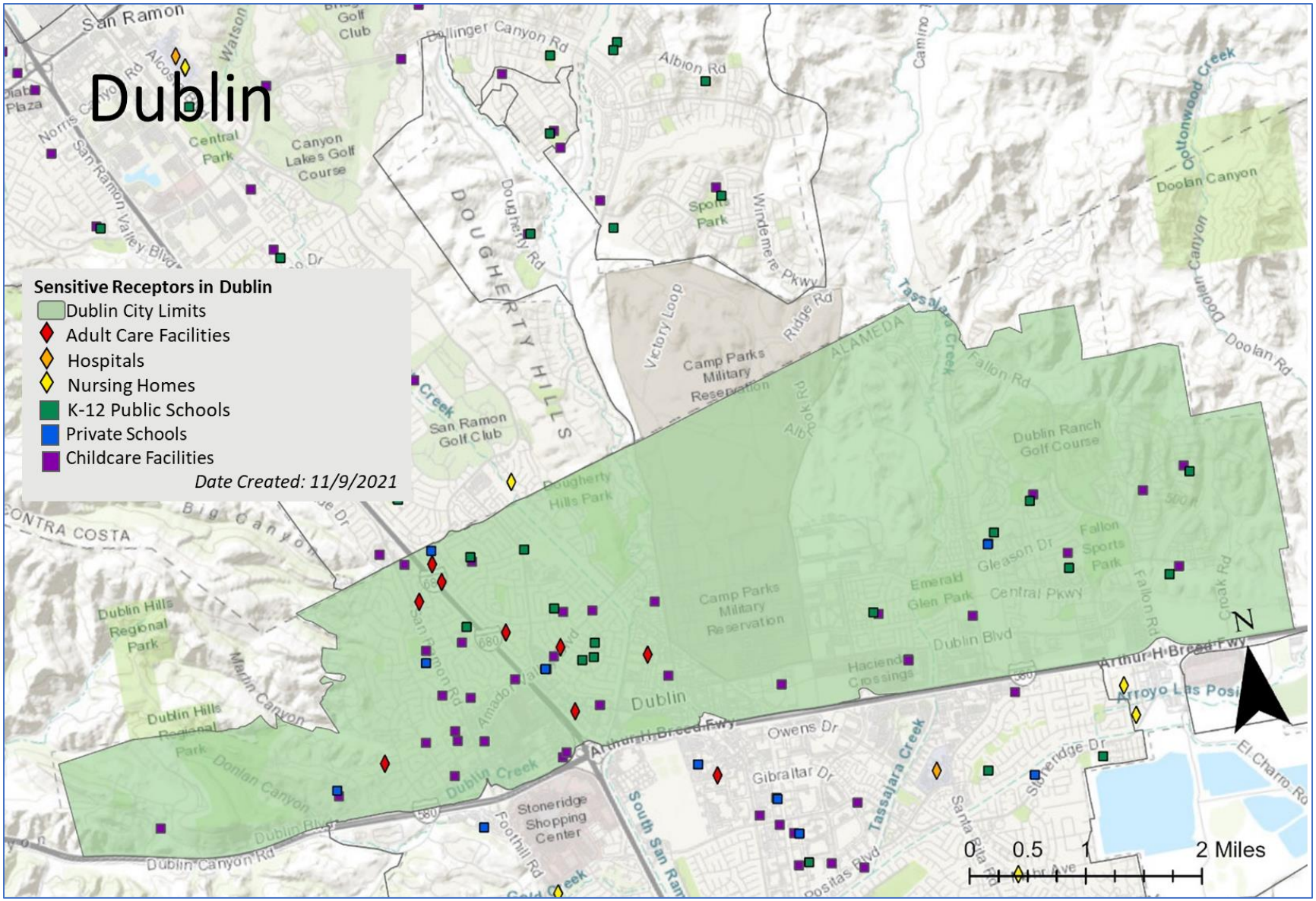
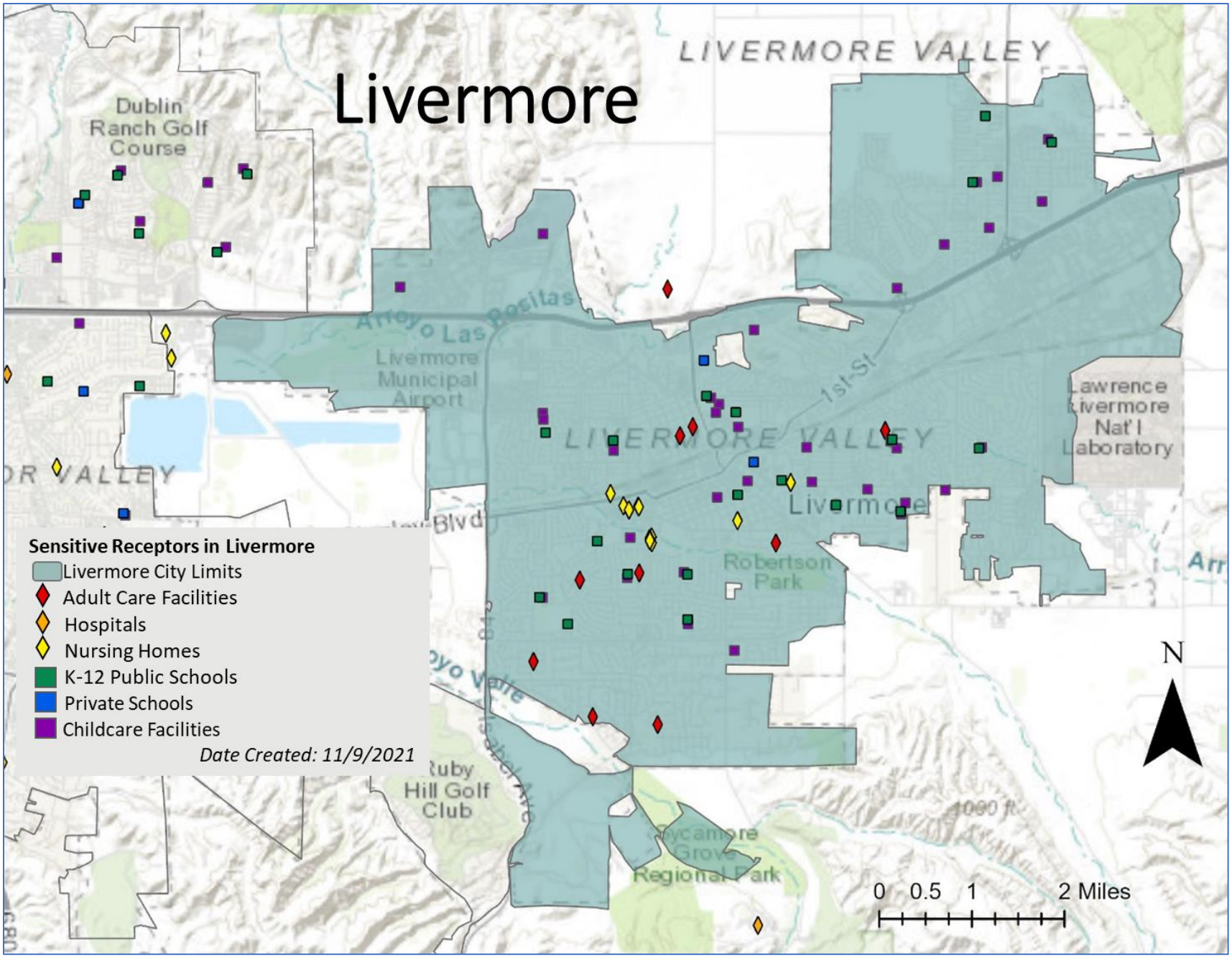
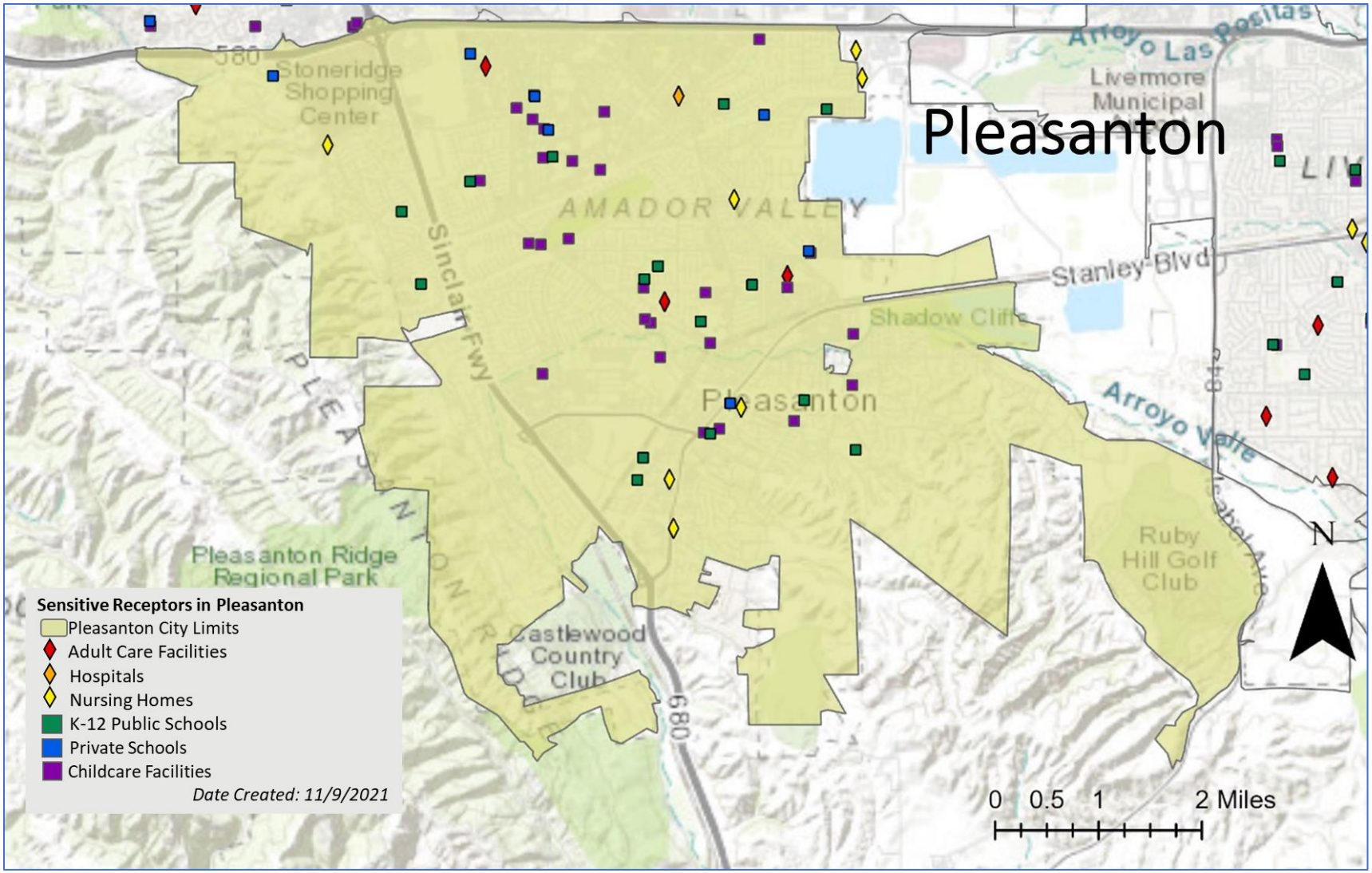
0.5
1
2 Miles


Dublin
Sensitive Receptors in Dublin
Dublin City Limits
Adult Care Facilities
Hospitals
Nursing Homes
K-12 Public Schools
Private Schools
Childcare Facilities
Date Created: 11/9/2021
San Ramon
Bollinger Canyon Rd
Albion Rd
Central Park
Canyon Lakes Golf Course
DOUGHERTY HILLS
Dougherty Rd
Windemere Pkwy
Victory Loop
Ridge Rd
Camp Parks Military Reservation
ALAMEDA
Tassajara Creek
Fallon Rd
Dublin Ranch Golf Course
Cottonwood Creek
Doolan Canyon
Doolan Rd
San Ramon Golf Club
Dougherty Hills Park
CONTRA COSTA
Dublin Hills Regional Park
Dublin
Dublin Blvd
Hacienda Crossings
Arthur H Breed Fwy
Owens Dr
Gibraltar Dr
Stoneridge Shopping Center
Foothill Rd
Dublin Canyon Rd
Dublin Creek
South San Ramon
Arroyo Las Positas
El Charro Rd
Fallon Sports Park
Emerald Glen Park
Central Pkwy
Gleason Dr
N
0 0.5 1 2 Miles


Livermore
LIVERMORE VALLEY
Dublin Ranch Golf Course
Arroyo Las Positas
Livermore Municipal Airport
1st St
Lawrence Livermore Nat'l Laboratory
Livermore
Robertson Park
Ruby Hill Golf Club
Sycamore Grove Regional Park
Sensitive Receptors in Livermore
Livermore City Limits
Adult Care Facilities
Hospitals
Nursing Homes
K-12 Public Schools
Private Schools
Childcare Facilities
Date Created: 11/9/2021
N
0 0.5 1 2 Miles


Pleasanton
580
Stoneridge Shopping Center
Arroyo Las Positas
Livermore Municipal
AMADOR VALLEY
Sinclair Fwy
Stanley Blvd
Shadow Cliffs
Pleasanton
Arroyo Valle
PLEASANTON RIDGE RD
Pleasanton Ridge Regional Park
Castlewood Country Club
Ruby Hill Golf Club
680
N
0 0.5 1 2 Miles
Sensitive Receptors in Pleasanton
Pleasanton City Limits
Adult Care Facilities
Hospitals
Nursing Homes
K-12 Public Schools
Private Schools
Childcare Facilities
Date Created: 11/9/2021

Sources of Sensitive Receptor Data

Sensitive Receptor Name	Description	Owner	URL	Last Data Updated Date	Audience	Attribution	Attribution Link	Documentation URL	NOTES
K-12 Schools	K-12 schools in California including both points and campus boundaries.	GreenInfo Network	http://californiaschoolcampusdatabase.org/#download	2021	Public	CSCD	https://www.californiaschoolcampusdatabase.org/	https://www.californiaschoolcampusdatabase.org/	Updated in 2020, further updates are grant-funding dependent.
Private School Universe	Private schools in the U.S. that meet the NCES definition (i.e., a private school is not supported primarily by public funds, provides classroom instruction for one or more of grades K-12 or comparable ungraded levels, and has one or more teachers. Organizations or institutions that provide support for home schooling without offering classroom instruction for students are not included.).	National Center for Educational Statistics	https://nces.ed.gov/surveys/pss/pssdata.asp	School Year 207-18	Public	NCES	https://nces.ed.gov/	https://nces.ed.gov/surveys/pss/index.asp	
California Healthcare Facility Locations	Includes California healthcare facilities that are operational and have a current license issued by the CDPH and/or a current U.S. Department of Health and Human Services' Centers for Medicare and Medicaid Services (CMS) certification.	California Health and Human Services	https://data.chhs.ca.gov/dataset/healthcare-facility-locations/resource/098bbc36-044d-441f-9442-1f4db4d8aaa0	15-Sep-21	Public	CHHS	https://data.chhs.ca.gov/dataset/healthcare-facility-locations/resource/098bbc36-044d-441f-9442-1f4db4d8aaa0	https://data.chhs.ca.gov/dataset/healthcare-facility-locations/resource/098bbc36-044d-441f-9442-1f4db4d8aaa0	

Sensitive Receptor Name	Description	Owner	URL	Last Data Updated Date	Audience	Attribution	Attribution Link	Documentation URL	NOTES
Child Care Centers (CA HHS)	Partial list of Child Care facility locations (830 Infant Center. 840 School Age Day Care Center/School Age CC Center, 845 Day Care Center - Ill Center/ CC Center -Ill, 850 Day Care Center/ Child Care Center)	California Health and Human Services	https://data.chhs.ca.gov/dataset/community-care-licensing-child-care-center-locations	Dec-20	Public	CHHS	https://data.chhs.ca.gov/dataset/community-care-licensing-child-care-center-locations	https://data.chhs.ca.gov/dataset/community-care-licensing-child-care-center-locations	Used instead of the Department of Homeland Security dataset because it is more recent]
Nursing Home/Assisted Care Facilities	The Nursing Home / Assisted Care feature class/shapefile contains facilities that house elderly adults. This feature class's/shapefile's attribution contains physical and demographic information for facilities in the continental United States and some of its territories.	Department of Homeland Security	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::nursing-homes/about	7-Jul-20	Public	HIFLD	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::nursing-homes/about	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::nursing-homes/about	Reliant on State reporting, provides geo-coding of information that appears to only be available from the State in Tabular/Address form
Hospitals	This feature class/shapefile contains locations of Hospitals for 50 US states, Washington D.C., US territories of Puerto Rico, Guam, American Samoa, Northern Mariana Islands, Palau, and Virgin Islands.	Department of Homeland Security	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::hospitals/about	7-Dec-20	Public	HIFLD	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::hospitals/about	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::hospitals/about	Reliant on State reporting, provides geo-coding of information that appears to only be available from the State in Tabular/Address form

Sensitive Receptor Name	Description	Owner	URL	Last Data Updated Date	Audience	Attribution	Attribution Link	Documentation URL	NOTES
Adult Residential Facilities (CA HHS)	The location of Adult Residential Facilities (734 Adult Residential Facility for Persons with Special Health Care Needs, 735 Adult Residential, 736 Residential Facility for the Chronically Ill, 772 Social Rehabilitation Facility, and 775 Adult Day Program).	California Health and Human Services	https://data.chhs.ca.gov/dataset/community-care-licensing-adult-residential-facility-locations	Dec-20	Public	CHHS	https://data.chhs.ca.gov/dataset/community-care-licensing-adult-residential-facility-locations	https://data.chhs.ca.gov/dataset/community-care-licensing-adult-residential-facility-locations	Clipped to BAAQMD Counties and geocoded using GEOCODIO
Elder Care Facility Locations (CA HHS)	This dataset contains a list of Residential Elder Care facilities (740 Residential Care Elderly and 741 Residential Care for the Elderly (RCFE) - Continuing Care Retirement Community).	California Health and Human Services	https://data.chhs.ca.gov/dataset/community-care-licensing-residential-elder-care-facility-locations	Dec-20	Public	CHHS	https://data.chhs.ca.gov/dataset/community-care-licensing-residential-elder-care-facility-locations	https://data.chhs.ca.gov/dataset/community-care-licensing-residential-elder-care-facility-locations	Clipped to BAAQMD Counties and geocoded using GEOCODIO

Alternatives Source (not used)

K-12 Schools Common Core of Data	Basic information on public elementary and secondary schools, local education agencies (LEAs), and state education agencies (SEAs) for each state, the District of Columbia, and the outlying territories with a U.S. relationship.	National Center for Educational Statistics	https://nces.ed.gov/ccd/files.asp#Fiscal:2,LevelId:7,SchoolYearId:35,Page:1	March 2021 (School Year 2019-20)	Public	NCES	https://nces.ed.gov/	https://nces.ed.gov/ccd/online_documentation.asp	National survey updated annually
Child Care Centers	Child care centers (does not include home or family-based child care)	Department of Homeland Security	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::child-care-centers/about	2-Jul-20	Public	HIFLD	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::child-care-centers/about	https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::child-care-centers/about	Reliant on State reporting, provides geo-coding of information that appears to only be available from the State in Tabular/Address form

Appendix I. Regional and Local Air Quality Planning in the Tri-Valley
An Appendix to: Ensuring Future Air Quality in the Tri-Valley
By Ron Baskett, TVAQCA AB 617 Project
December 27, 2021

Introduction

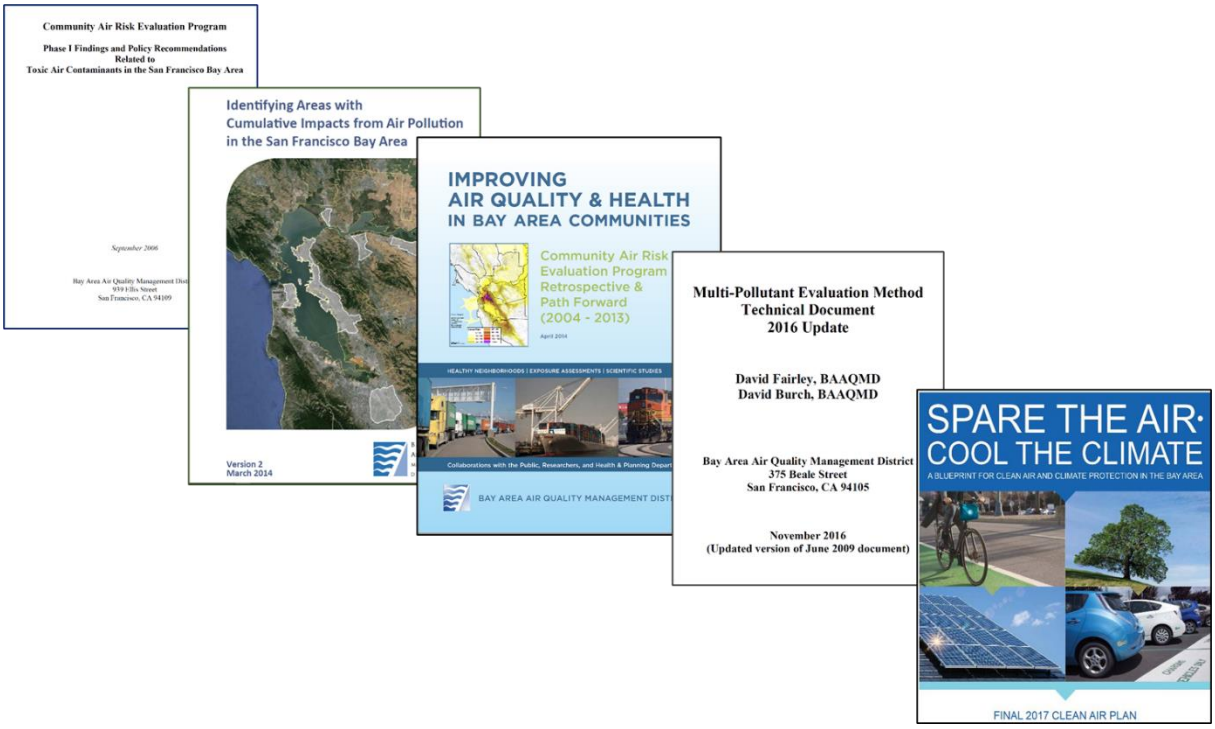
For decades, Bay Area, county, and city planning agencies have produced studies, strategies, policies, initiatives, and plans. Content relevant to Tri-Valley air quality have been extracted from these documents and discussed below.

Contents

1. Bay Area Air Quality Plans

Since the 1960s the BAAQMD has extensively studied air quality and developed regional plans for improving the air quality in the Bay Area. Figure 1 illustrates a progression of documents recently culminating in the comprehensive 2017 Spare the Air-Cool the Climate.

Figure 1. Progression of BAAQMD studies and plans.



2017: Clean Air Plan Spare the Air-Cool the Climate, **A blueprint for clean air and climate protection in the Bay Area.** This document is a comprehensive summary of the BAAQMD's plan to achieve both air quality standards and reduce greenhouse gas (GHG) emissions 40% below 1990 by 2050. Below are the plan's strategies for control measures for stationary sources, specifically refineries, building efficiency, electrical generation, electrification of and controls on transportation, controls on agriculture, waste management, and reduction of GHG emissions for city Climate Action Plans:

1. Limit Fossil Fuel Combustion: Develop a region-wide strategy to increase fossil fuel combustion efficiency at industrial facilities, beginning with the three largest sources of industrial emissions: oil refineries, power plants, and cement plants.
2. Stop Methane Leaks: Reduce methane emissions from landfills, and oil and natural gas production, storage and distribution.
3. Reduce Exposure to Toxics: Reduce emissions of toxic air contaminants by adopting more stringent limits and methods for evaluating toxic risks at existing and new facilities.
4. Put a Price on Driving: Implement pricing measures to reduce travel demand.

5. Advance Electric Vehicles: Accelerate the widespread adoption of electric vehicles.
6. Promote Clean Fuels: Promote the use of clean fuels and low or zero carbon technologies in trucks and heavy-duty vehicles.
7. Accelerate Low Carbon Buildings: Expand the production of low-carbon, renewable energy by promoting on-site technologies such as rooftop solar and ground-source heat pumps.
8. Support More Energy Choices: Support community choice energy programs throughout the Bay Area.
9. Make Buildings More Efficient: Promote energy efficiency in both new and existing buildings.
10. Make Space and Water Heating Cleaner: Promote the switch from natural gas to electricity for space and water heating in Bay Area buildings.

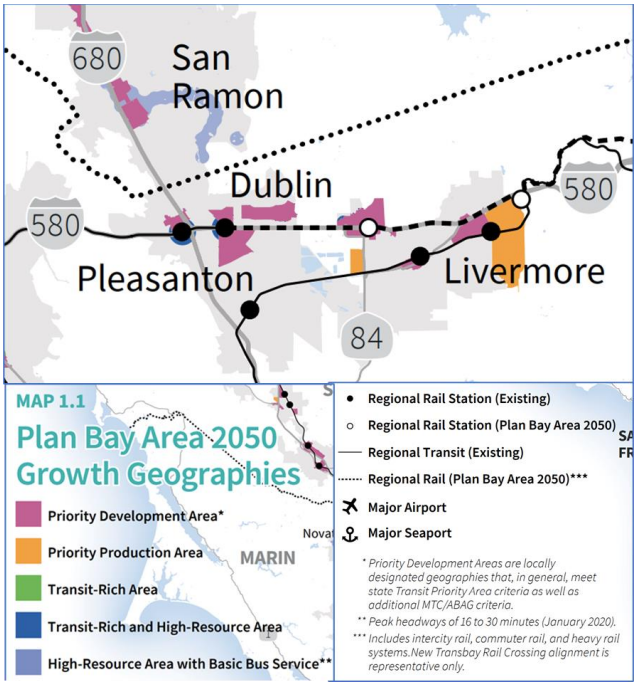
Source: https://www.baaqmd.gov/plans-and-climate/air-quality-plans/current-plans

Figure 2. Example Actions from BAAQMD *2017 Spare the Air, Cool the Climate*

May 2021: Draft Plan Bay Area 2050. This is the Bay Area's Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments' (ABAG) long-range strategic planning for regional housing, economy, transportation, and environment. In partnership with the BAAQMD and referring to the 2017 Spare the Air-Cool the Climate, they propose strategies to reduce emissions and achieve climate goals.

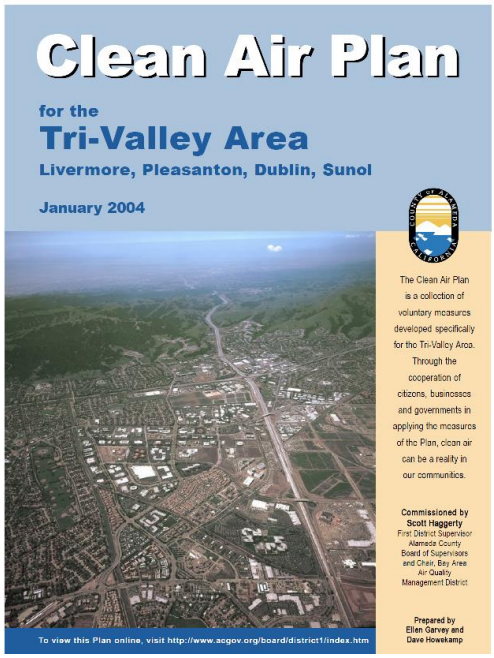
Figure 3 is the Tri-Valley portion copied from Map 1.1 of the Plan Bay Area 2050 Growth Geographies. Both Priority Development and Production Areas are planned for the Tri-Valley. In addition, two Regional Rail Stations are planned as extensions to the Dublin/Pleasanton BART station.

Figure 3. Tri-Valley portion of the Plan Bay Area 2050 Growth Geographies map.



2. Tri-Valley Air Quality Plan

January 2004: Clean Air Plan for the Tri-Valley Area



In 2003, Alameda County First District Supervisor Scott Haggerty commissioned a study for improving the air quality of the Tri-Valley. The 2004 Clean Air Plan for the Tri-Valley Area describes 55 voluntary measures to improve air quality in 4 categories:

Technology Measures

TECH 1. Purchase Low Emission Vehicles (SULEV or best available)
TECH 2. Lawnmower and Garden Equipment Trade-in Program
TECH 3. Purchase Alternative Fuel (CNG, LNG, LPG) or Electric Vehicles
TECH 4. Woodstove/Fireplace Replacement
TECH 5. Encourage Private Sector Fleets to Purchase Alternative Fuel Vehicles
TECH 6. Heavy Duty Diesel Retrofits
TECH 7. Exceptional Vehicle Maintenance
TECH 8. Establish Funding Incentive Program for Private On-Road Trucks (replace old diesel trucks)
TECH 9. Green Contracting Ordinance (cities and county procure and to operate alternative fuel of super ultra-low-emission gasoline vehicles)
TECH 10. Diesel Locomotive Retrofits
TECH 11. Establish Police Bicycle Patrols
TECH 12. Two-Stroke Small Engine Program (replace gas lawn and garden equipment with electric)
TECH 13. Gas Can Trade-in Program
TECH 15. Clean Air Consortium
TECH 16. Clean Construction Equipment
TECH 17. Good Fueling Practices

Transportation Measures

TRAN 1. Telework
TRAN 2. Compressed Work Week
TRAN 3. Carpool/Vanpool/Transit Promotion
TRAN 4. Transit Financial Incentives Program
TRAN 5. Bicycle & Pedestrian Infrastructure Improvements
TRAN 6. Car Sharing Programs
TRAN 7. Parking Incentives
TRAN 8. Trip-Appropriate Vehicles ("Right-Sizing")
TRAN 9. Congestion Relief Improvement Projects
TRAN 10. Increase Number of City Services Available by Phone or Electronic Media
TRAN 11. Dedicated Bus Lanes
TRAN 12. Neighborhood Electric Vehicles
TRAN 13. Reduce City-Owned Paid Parking and/or Raise Parking Fees
TRAN 14. Traffic Calming
TRAN 15. Expand Mass Transit
TRAN 17. Improve/Pave Road Shoulders
TRAN 18. Idling Restrictions for Large Vehicles and Off-Road Equipment
TRAN 19. Water Meter Reading Via Transponders
TRAN 20. Provide School Buses to Reduce School Congestion
TRAN 21. School Transit
TRAN 22. School Bus Idling Restrictions
TRAN 23. Best Workplaces for Commuters Program
TRAN 24. "Smart Drive" Policy
TRAN 25. Dynamic Ridesharing Program

Land Use Measures

LU 1. Smart Growth
LU 2. Urban Heat Island Mitigation
LU 3. “Green Buildings”
LU 4. Jobs Housing Balance
LU 5. Air Quality Element in General Plans

Public Education Measures

PE 1. Educate the Public to Promote Behavior Changes
PE 2. Air Quality Award for Tri-Valley Science Fair
PE 3. Public Education in Schools
PE 4. Education of Employers
PE.5. Education to Improve Fueling Practices
PE 6. Electronic Sign and Billboard Air Quality Messages
PE 7. Resource Teams
PE 8. Bay Area Green Business Program

Specifics for each measure include:

- Identification of the air pollutant(s) reduced by the measure.
- Identification of the entities likely to implement the measure.
- Possible funding sources for many of the measures.
- Websites containing more detailed information about each of the measures,

Cities incorporated several of these measures in their optional Air Quality Elements of their General Plans. Document accessed at About Scott Haggerty - District 1 - Board of Supervisors - Alameda County (acgov.org).

January 2018: The Tri-Valley Hazard Mitigation Plan addresses planning for hazards in Dublin, Livermore, and Pleasanton within Alameda County as well as the service area for the Dublin San Ramon Services District in Contra Costa County. The plan was based on the **Tri-Valley Planning Partnership Steering Committee's** extensive coordination between the three city's governments and community outreach in public forums and an online survey. Parties to the plan include:

- Cities of Pleasanton, Livermore, and Dublin
- Livermore-Pleasanton Fire Department
- Dublin San Ramon Services District
- Lawrence Livermore National Laboratory

The Plan provides a uniform hazard mitigation strategy for the Tri-Valley addressing a range of hazards. The following were conclusions of the severity of the including hazards considered:

- The earthquake hazard was ranked as high.
- The severe weather, wildfire, and landslide hazards were ranked as medium.
- The dam failure, flood and drought hazards were ranked as low.

On page 7-15 the report mentions the relationship between hazards of drought and air quality's impact on health, and on page 13-15 wildfire's effect on air quality.

3. San Ramon Air Quality Plans

August 2011: City of San Ramon Climate Action Plan ensures that the buildout of the General Plan 2030 will not conflict with the implementation of AB 32, which requires California to reduce statewide greenhouse gas emissions to 1990 levels by the year 2020. The San Ramon Climate Action Plan (CAP) is designed to reduce community related and City operations related greenhouse gas emissions to a degree that would not hinder or delay implementation of AB 32. The General Plan 2035 below supersedes this plan.

April 2015: San Ramon General Plan, 2035 Air Quality and Greenhouse Gas Element provides a platform within the General Plan for local action to address regional, State and federal air quality climate change concerns.

The proposed General Plan 2030 would create an Air Quality/Greenhouse Gas Emissions Element that addresses air emissions. The element would identify state (e.g., Assembly Bill 32 and Senate Bill 375) and local requirements and objectives for reducing criteria air pollutant and greenhouse gas emissions and set forth strategies to accomplish these goals.

October 2019: San Ramon General Plan

The General Plan - City of San Ramon (ca.gov) Chapter 12 - Air Quality and Greenhouse Gas Sections 12.4 and 12.5 are extracted below.

12.4 Regional Coordination, guiding and implementing policies, page 20

12.5 Air Quality, Land Use, and Transportation, guiding and implementing policies, page 22.

12.4 REGIONAL COORDINATION

Air quality is a truly regional concern. Air pollutants can travel long distances and do not recognize political boundaries. Regional travel is a substantial contributor to air quality impacts affecting the region and San Ramon. The City's participation in regional air quality and transportation programs and initiatives can help ensure consistency in implementation and best use of resources.

GUIDING POLICIES

12.4-G-1 Improve and protect San Ramon's air quality and promote improvements in subregional air quality.

IMPLEMENTING POLICIES

12.4-I-1 Cooperate with other local, regional, and state agencies to achieve and maintain air quality standards.

Effective governmental coordination and cooperation in on-going government programs requires proactive and sustained effort. The differing responsibilities and constituencies of cities and counties, along with those of state, federal and regional agencies, will require a commitment by all to reduce land use-based sources of air pollution that affect our public health and quality of life. Working together for a common interest can multiply the resources available to accomplish air quality goals.

12.4-I-3 **Analyze the air quality and climate change impacts of discretionary projects** using applicable regulatory guidance; for example, the BAAQMD's CEQA Air Quality Guidelines. Stationary and mobile TAC and/or PM2.5 emissions should be evaluated in the context of existing and planned sensitive receptors. Figure 12-1 identifies areas within the City, based on roadway traffic volumes may result in potential health concerns sensitive receptors absent project specific mitigation as a result of mobile TAC. New discretionary projects, classified as sensitive receptors, located within the established buffer zones should conduct additional air quality analysis and identify any necessary mitigation measures.

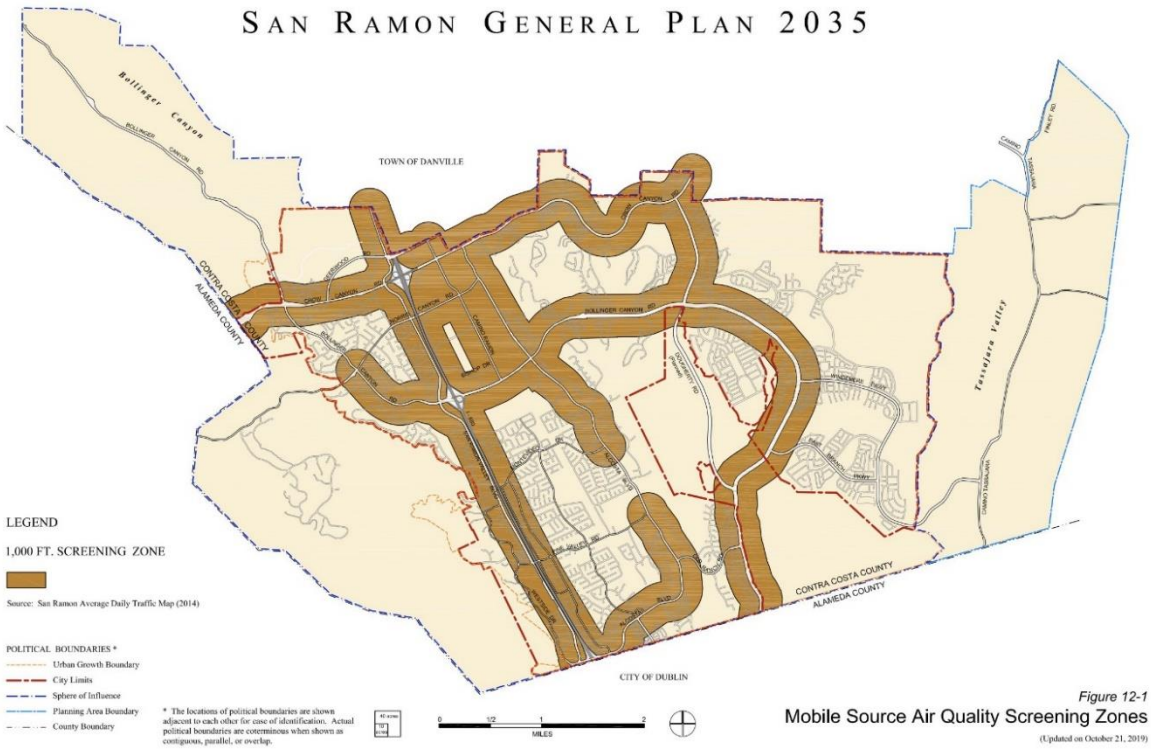


Figure 12-1
Mobile Source Air Quality Screening Zones
(Updated on October 21, 2019)

12.4-I-4 Use the City's environmental review process to **impose appropriate mitigation measures on new development to reduce air quality and greenhouse gas emissions** impacts. Mitigation measures appropriate for the type of project and its physical location can reduce air quality and greenhouse emissions impacts through reduced energy use and motor vehicle use. The adoption of SB 743 will likely change the way traffic impacts are mitigated based on a vehicle or trip standard as opposed to a delay and level of service standard.

12.4-I-5 Work with the Bay Area Air Quality Management District (BAAQMD), the Metropolitan Transportation Commission (MTC), and transit providers to implement the **regional Clean Air Plan**.

The regional Clean Air Plan includes transportation control measures that reduce vehicle emissions by increasing transit use, carpooling, bicycling, and walking. Many of these measures are reliant on local government action for implementation. The city works closely with the BAAQMD and the MTC to implement applicable measures in San Ramon.

12.4-I-6 Educate residents on the **linkage between land use, transportation, water and energy use and air pollution**. Efforts should include measures that can be taken and resources that are available to improve air quality and reduce potential climate change impacts. Without the understanding and support of the general public, local air quality and climate change prevention programs cannot be expected to achieve the desired results. Illustrating the livability and other benefits of land use and transportation measures such as increased density near transit or reduced street widths and traffic calming can increase support for these measures. Educating the public on air quality issues is a vital component of a successful air quality program. For example, the BAAQMD's Spare the Air Program includes measures that encourage the public to reduce polluting activities on bad air such as ridesharing, free transit passes, and fireplace use curtailment.

12.5 AIR QUALITY, LAND USE, AND TRANSPORTATION

GUIDING POLICIES

12.5-G-1 Improve air quality by integrating air quality, land use, and transportation planning that incorporates appropriate project location, design, and application of best available technologies.

IMPLEMENTING POLICIES

12.5-I-1 Minimize air quality and climate change impacts through project review, evaluation, and conditions of approval when planning the location and design of land use projects and transportation system projects needed to accommodate expected City population growth.

12.5-I-2 Support and encourage projects proposing infill, and mixed-use development that creates walkable neighborhoods and communities and increases access to transit. Strategies that reduce air quality impacts, such as mixed-use development, will encourage people to walk between home and business. Local emissions can also be reduced by incorporating such strategies as Complete Streets, trails and bicycle paths into site design, so that people will be able to use their cars less frequently.

The City encourages the use of best available technologies in terms of energy efficiency and air pollutant emissions that provide cost-effective emission reductions.

12.5-I-3 Work with regional and local transit agencies to assess development project impacts on long-range transit plans and transit facilities during the planning stages of land use projects and ensure that potential impacts are avoided.

Projects with higher density housing or employment centers that are close to high quality transit service contribute to the success of the transit system through increased ridership. Conversely, low-density development near transit stations can reduce the effectiveness of the transit system. The City can identify areas along transit corridors or near existing or proposed transit facilities where new growth areas can be planned to maximize their potential for transit service. The City can coordinate and consult with the regional transit agencies on large projects.

12.6 HAZARDOUS EMISSIONS AND PUBLIC HEALTH

GUIDING POLICIES

12.6-G-1 **Minimize exposure of the public to hazardous air pollutant emissions,** particulates, and noxious odors from freeways, major arterial roadways, commercial and industrial uses with substantial truck trips, and other uses that produce toxic emissions through the use and handling of fuels and solvents.

IMPLEMENTING POLICIES

12.6-I-1 Locate **sources of hazardous emissions** at appropriate distances from existing and planned sensitive land uses in order to minimize or avoid potential health risks to people that might result from hazardous air pollutant emissions. Locate residential development projects and projects categorized as sensitive receptors at adequate distances from existing and potential sources of hazardous emissions. Siting decisions for hazardous emission sources and sensitive receptors have the potential to create land use conflicts. Common hazardous emission sources include freeways and high traffic roads, distribution centers, dry cleaners, gasoline stations, diesel engines, and auto body shops. Providing appropriate locations and separation for incompatible land uses for all types of development can minimize conflicts and promote economic growth. The ARB's Air Quality and Land Use Handbook provides suggestions for

appropriate distances between sensitive uses and sources of hazardous emissions. The Handbook recognizes that local conditions should be considered in application of the guidelines. In addition, the City requires health risk assessments for projects with potential for exposure to significant amounts of toxic and hazardous emissions. Figure 12-1 establishes mobile source screening zones for which additional air quality analysis should be conducted when locating sensitive receptors within these areas. San Ramon General Plan 2035 12-24

12.6-I-2 **Evaluate potential handling, storage, and transport of hazardous materials** in new commercial and industrial developments to minimize public exposure to hazardous air pollutants. Development projects that will handle, store, and transport hazardous materials require special consideration and evaluation to ensure that potential accidental releases will not impact the public.

12.6-I-3 Require **construction and grading activities** to incorporate particulate emissions reduction measures. Particulate emissions are generated during construction activities from diesel engines used for most off-road equipment and from soil disturbance during site grading. This implementing policy supports the Bay Area Air Quality Management District's Clean Air Plan. Best management practices for construction and grading such as site watering and use of diesel particulate filters are often required as mitigation measures in environmental documents and as standard conditions for projects requiring a grading plan.

12.6-I-4 Require all **new wood-burning stoves and fireplaces** to comply with EPA- and BAAQMD-approved standards and provide informational handouts outlining low emission alternatives to wood-burning fireplaces. Many homes in San Ramon are equipped with fireplaces, which are an important source of localized air pollution. Wood smoke released from fireplaces and wood stoves contains carbon monoxide, nitrogen dioxide, volatile organic compounds, and inhalable particulate matter (PM10). Wood burning should be encouraged only in stoves and fireplaces designed to minimize air pollutants. The City promotes the BAAQMD's Winter Spare the Air Program that prohibits wood burning on days when air quality is unhealthful. The program also encourages residents to burn as cleanly as possible throughout the winter by using seasoned wood and cleaner burning alternatives such as natural gas fireplaces, EPA-certified wood heaters, and pellet stoves, and manufactured logs. Pacific Gas & Electric and the Hearth Products Association have offered incentives in the past in the form of cash rebates to encourage replacement of old wood-burning appliances with more efficient fireplaces and stoves.

4. Dublin Air Quality Plans

December 2013: Complete Streets Policy is designed to create and maintain a safe and efficient transportation system that promotes the health and mobility of the City of Dublin citizens and visitors, support better access to businesses and neighborhoods and foster new opportunities.

October 2014: Bicycle and Pedestrian Master Plan The Bicycle and Pedestrian Master Plan provides policies, network plans, prioritized project lists, support programs, and best practice design guidelines for bicycling and walking in Dublin.

December 2016: The Dublin General Plan is a guide for the development decisions that shape the social, economic, and environmental character of the City's Planning Area.

Chapter 7 Environmental Resources Management: Conservation Element

Extracted below from Chapter 7.5 Air Quality, 7.5.1, All Planning Areas, page 7:

A. Implementing Policies

1. Request that the Bay Area Air Quality Management District establish an air quality monitoring station in Dublin.

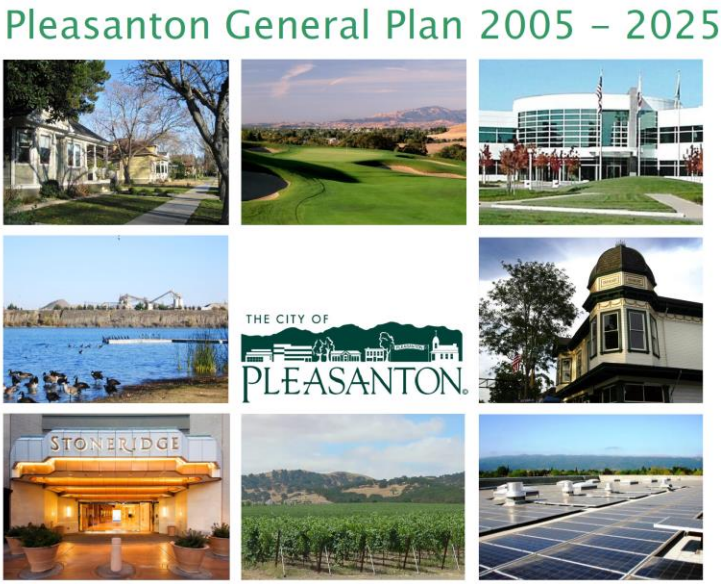
2. Require an air quality analysis for new development projects that could generate significant air emissions on a project and cumulative level. Air quality analyses shall include specific feasible measures to reduce anticipated air quality emissions to a less-than-significant California Environmental Quality Act (CEQA) level.

July 2020: The Downtown Dublin Specific Plan guides the creation of a vibrant and dynamic commercial and mixed-use center that provides a wide array of opportunities for shopping, services, dining, working, living, and entertainment in a pedestrian-friendly and aesthetically pleasing setting.

Residential Units Development Standards and Design Guidelines pages 67, 76, 85: Projects within 1,000 ft. of either Interstate 580 or 680 (or less per BAAQMD guidelines) shall incorporate standards to minimize potentially adverse air quality affects.

5. Pleasanton Air Quality Plans

August 2019 Amended 2005 Pleasanton Plan 2025



Amended August 20, 2019, The 2005 Pleasanton Plan 2025 includes land use, technology, and public awareness strategies from the 2004 Clean Air Plan for the Tri-Valley. Quoting Section 9 Air Quality and Climate Change Element:

The City of Pleasanton embraces the concept of sustainable development and planning. By far the largest change in subregional emissions related to 2025 buildout under the General Plan are from the 35% projected increase in automobile traffic. Below are the two basic goals:

Goal 1: Implement a proactive approach and use available technology to maintain and improve air quality within Pleasanton and the region to protect the public health, safety, and welfare.

Goal 2: Promote sustainable development and planning to minimize additional air emissions.

A key map relevant for developing strategies is to locate sensitive receptors. **The figure** and **Table below** are copied from 2005 Pleasanton Plan 2025 Air Quality Element: AQ Sensitive Receptors Locations, Table 9-2 pages 10-11.

Sensitive receptors include the infirm, children, the elderly, and people sensitive to air pollutants. Examples of land uses where sensitive receptors congregate are hospitals, childcare centers, schools, playgrounds, rehabilitation centers, residences, and senior housing, including assisted living and nursing homes.

To analyze the impact from sources on sensitive receptors, we need to develop maps of georeferenced locations on a Geographical Information System for all four cities.

Figure 6-3. Location of Air Quality Sensitive Receptors in Pleasanton from 2005 Pleasanton Plan 2025

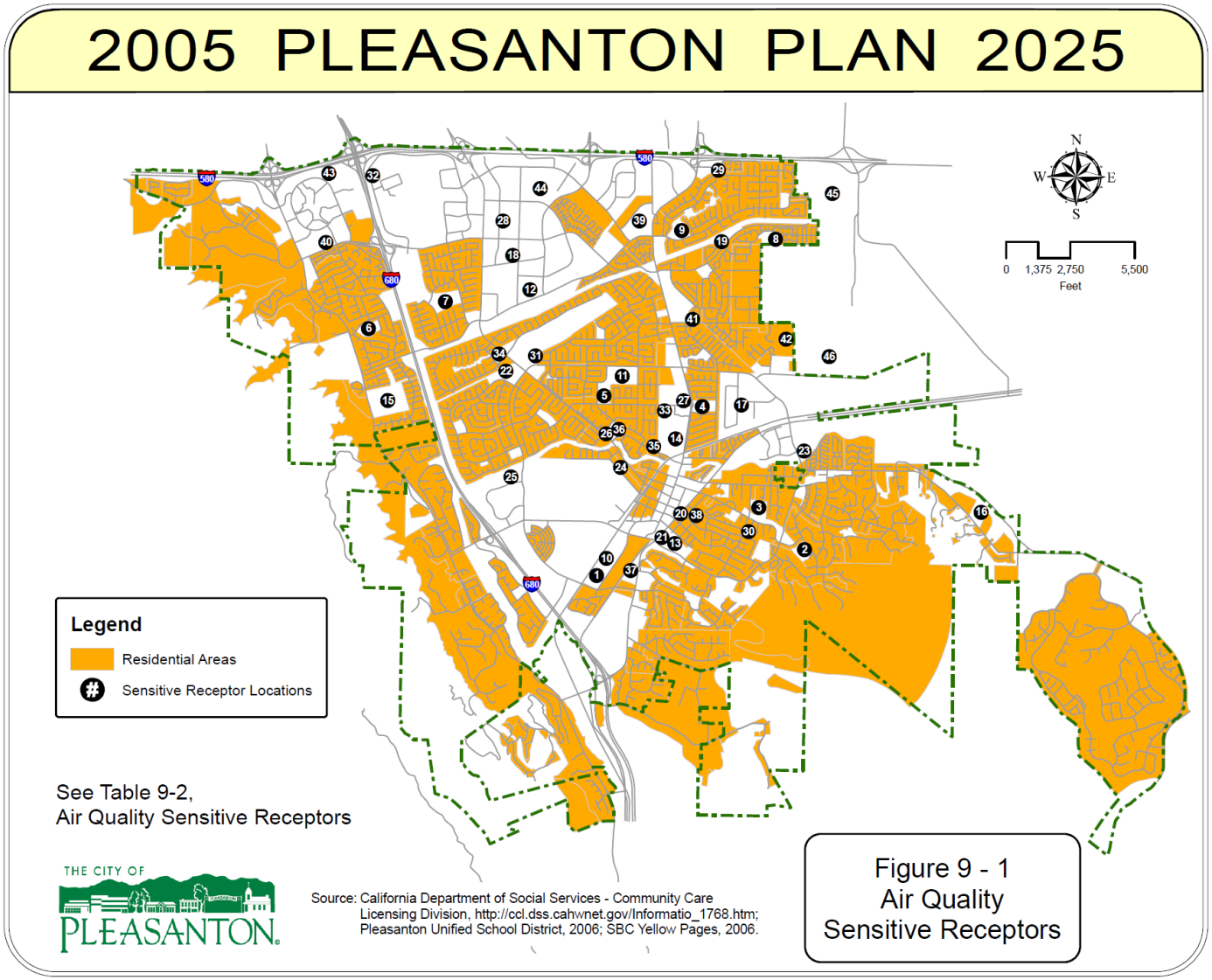


Figure 6-3. List of Air Quality Sensitive Receptor Locations in Pleasanton from 2005 Pleasanton Plan 2025

TABLE 9-2: AIR QUALITY SENSITIVE RECEPTOR LOCATIONS, 2005

Pleasanton Unified School District Schools

1. Phoebe Apperson Hearst Elementary School, 5301 Case Avenue
2. Vintage Hills Elementary School, 1125 Concord Street
3. Valley View Elementary School, 480 Adams Way
4. Alisal Elementary School, 1454 Santa Rita Road
5. Walnut Grove Elementary School, 1999 Harvest Road
6. George C. Lydicksen Elementary School, 7700 Highland Oaks Drive
7. Thomas H. Donlon Elementary School, 4150 Dorman Road
8. Henry P. Mohr Elementary School, 3300 Dennis Drive
9. Fairlands Elementary School, 4151 West Las Positas Boulevard
10. Pleasanton Middle School, 5001 Case Avenue
11. Harvest Park Middle School, 4900 Valley Avenue
12. Thomas S. Hart Middle School, 4433 Willow Road
13. Village and Horizon High Schools, 4645 Bernal Ave. & 245 Abbie Street
14. Amador Valley High School & Adult Education, 1155 Santa Rita Road
15. Foothill High School, 4375 Foothill Road
16. Potential Elementary School, Vineyard Avenue

Private Schools

17. Quarry Lane School, 3750 Boulder Street
18. Carden West School, 4576 Willow Road
19. Hacienda School, 3800 Stoneridge Drive
20. Lighthouse Baptist School, 118 Neal Street

Note: Family childcare and about 15 residential-care facilities for the elderly are provided in residential neighborhoods throughout Pleasanton. Because residents are also sensitive receptors, Figure 9-1 does not delineate childcare providers and elder residential care in these neighborhoods.

Childcare Centers Not in Schools or Residences

21. Adventure Time (former YMCA facility), 4667 Bernal Avenue
22. Adventures in Learning, 3200 Hopyard Road
23. Beth Emek Preschool, 3400 Nevada Street (at Bernal Avenue)
24. The Child Day School, 883 Rose Avenue
25. Children's World Learning Center, 7110 Koll Center Parkway
26. Early Years Children's Center, 1251 Hopyard Road
27. Gingerbread Preschool, 4333 Black Avenue
28. Hacienda Child Development Center, 4671 Chabot Drive
29. Kindercare Learning Center-Pleasanton, 3760 Brockton Drive
30. Kinderkirk Christian Preschool-Pleasanton, 4300 Mirador Drive
31. La Petite Academy, 5725 Valley Avenue
32. Love and Care Preschool, 7106 Johnson Drive
33. Quarry Lane School, 4444-A Black Avenue
34. Saint Clare's Day Care Center, 3350 Hopyard Road
35. Shining Light Preschool, 4455 Del Valle Parkway
36. Sonshine Enrichment Center, 1225 Hopyard Road

Facilities for the Medically Fragile and Elderly

37. Pleasanton Senior Center, 5353 Sunol Blvd.
38. Pleasanton Nursing and Rehabilitation Center, 300 Neal Street
39. Valley Care Medical Center, 5555 West Las Positas Boulevard
40. Kaiser Permanente Medical Center, 7601 Stoneridge Drive
41. Eden Villa Pleasanton Residential Care, 4115 Mohr Avenue

Potential Future Sensitive Receptors

42. Busch Road Senior Housing
43. West Pleasanton/Dublin BART Station residences
44. Hacienda – Housing locations are not yet specifically identified.
45. Staples Ranch Senior Continuing Care
46. East Pleasanton – Housing locations are not yet identified.

Sources: California Department of Social Services – Community Care Licensing Division, http://ccl.dss.cahwnet.gov/Informatio_1768.htm; Pleasanton Unified School District, 2006; SBC Yellow Pages, 2006; Pleasanton Planning and Community Development Department, 2006.

Many of the strategies from the ***2004 Clean Air Plan for the Tri-Valley*** are in the Pleasanton 2025 plan. Extracts from the 2005 Pleasanton Plan 2025 Amended August 20, 2019:

9. AIR QUALITY AND CLIMATE CHANGE ELEMENT FUTURE AIR QUALITY (page 9-17)

Buildout of the General Plan would replace currently vacant and underutilized land with mostly residential, commercial, and industrial uses. These urban uses are a source of pollutants from the combustion of fuel for space and water heating as well as from the use of consumer products. These urban uses also contribute to residential and commercial motor vehicle trips that use fuel. Pleasanton projects about 3,800 more housing units and about a 50 percent increase in commercial and industrial development from 2006 until General Plan buildout – from 21.0 million square feet in 2006 to about 32.8 million at buildout.[13] This substantial increase in development will lead to fuel-use and air-emission intensification related to vehicle use.

The General Plan also would allow for additional regulated point sources of pollutants and users of hazardous materials. Although the number and nature of future additional air pollutant point sources within Pleasanton are not known, BAAQMD requires that each individual source meet its rules and regulations. These regulations require that sources of hazardous materials or criteria pollutants above certain thresholds obtain permits prior to constructing or operating the facility. BAAQMD regulations may require use of Best Available Control Technology with emission reductions at other locations to offset proposed increases and may require detailed analysis and/or modeling of air pollution impacts prior to issuing a permit. In certain cases, BAAQMD may also require on-site monitoring prior to and after construction and may attach conditions that it believes are necessary to avoid public health hazards and community complaints.

By far the largest change in subregional emissions related to buildout under the General Plan would be related to automobile traffic. Table 9-5 shows total daily vehicle miles traveled (VMT) associated with county-wide vehicle use, the largest source of air emissions. Emissions generated by automobiles are estimated for 2005 and 2025. Note that all emissions, with the exception of carbon dioxide, would continue to drop and that countywide air quality would improve. This is due to improvements in the vehicle fleet: better controls on newer vehicles while older vehicles are removed from roadways. Carbon dioxide, the gas related to climate change, will continue to grow at about the same rate as future gasoline consumption. Thus, to lower greenhouse gas emissions would require consuming less gasoline. Although Pleasanton development contributes to vehicle miles traveled, commuting within the Tri-Valley is a regional problem.

TABLE 9-5: PROJECTED COUNTY-WIDE VEHICULAR EMISSIONS, 2005 AND 2025 (TONS/DAY)

	2005	2025	% Change
Vehicle Miles Traveled	36,218,000	48,872,000	35 %
Diesel Consumption (gallons)	409,030	481,420	18 %
Gasoline Consumption (gallons)	1,755,530	2,342,660	33 %
Pollutants (in Tons per Day)			
Reactive Organic Gases (ROG)	31.03	11.11	- 65 %
Nitrogen Oxides (NOX)	72.31	20.5	- 72 %
Sulfur Oxides (SOX)	0.57	0.27	- 53 %
Particulate Matter (PM_{10})	3.02	2.52	- 17 %
Carbon Monoxide (CO)	295.45	83.34	- 72 %
Carbon Dioxide (CO_2)	21.19	28.1	+ 33 %

Source: Illingworth & Rodkin, using Emfac2007 V2.3 Nov. 2006, 2007.

PURPOSE OF AIR QUALITY PLANNING

Air quality in the Tri-Valley area has continually improved over the past 30 years. However, the area continues to violate both federal and State ozone and particulate matter (PM_{10}) standards. Continued improvement of air quality is not assured given climatic warming coupled with continuing population and job growth in the Bay Area. Additional subregional public transit options would lead to decreased dependence on the single-occupant vehicle. Until the Tri-Valley as a whole becomes more sustainable and/or development ceases, air quality considerations will continue to be important in the planning process. The combined effects of future growth in population and traffic, along with expected deterioration in travel speed and congestion, may offset projected decreases in mobile and stationary-emission rates. Attainment and maintenance of the ozone standard in the future is not likely to occur without implementation of air-emission reduction programs.

The climatological setting of Pleasanton ensures that the potential for ozone and suspended particulate problems will continue to exist. An increase in future traffic volumes will have the potential to exacerbate these problems.

AIR QUALITY PLANNING (page 9-18)

The major reason for including an Air Quality and Climate Change Element in the General Plan is to coordinate the planning of land use, circulation, housing, energy, and other City policies with their potential effects on air quality. The City of Pleasanton is committed to incorporating air quality considerations into its plans, policies, and programs for future development.

Sustainable Development and Planning

The City of Pleasanton embraces the concept of sustainable development and planning. A sustainable city draws from the environment only those resources that are necessary and that can be used or recycled perpetually or returned to the environment in a form that nature can use to generate more resources. Relating the sustainability concept to air quality means reducing emissions related to buildings as well as reducing the frequency and distance of vehicle trips within Pleasanton. Trip reduction can be accomplished by:

(1) including housing opportunities for Pleasanton workers of all socioeconomic levels.

(2) providing local job opportunities to existing Pleasanton residents.

(3) providing neighborhood-serving retail and recreational uses that are readily accessible to residential neighborhoods.

(4) maximizing transit, bicycle, and walking opportunities to workers and residents,

(5) providing services such as childcare, restaurants, banks, and markets at major employment centers.

(6) alleviating the need for and/or number of work-related trips, and

(7) concentrating all new development within the Urban Growth Boundary with emphasis on development near transit nodes.

GOALS, POLICIES, AND PROGRAMS (page 9-22)

Goal 1: Implement a proactive approach and use available technology to maintain and improve air quality within Pleasanton and the region to protect the public health, safety, and welfare.

Goal 2: Promote sustainable development and planning to minimize additional air emissions.

Land Use

Policy 2: Support development plans that reduce mobile-source emissions by reducing vehicle trips and vehicle miles traveled.

Implement programs from the Land Use Element to provide mixed-use developments, locate high-density uses near transit

facilities, and provide neighborhood-serving retail uses convenient to residential neighborhoods. These programs would reduce vehicle trips and vehicle miles traveled, thus reducing air-pollutant emissions.

Policy 3: Separate air pollution sensitive land uses from sources of air pollution.

Program 3.1: Locate new air pollution point sources, such as manufacturing and extracting facilities, away from residential areas and other sensitive land uses following the California Air Resource Board's recommendations.

Program 3.2: Locate new sensitive receptors, such as residences (including residential care and assisted living facilities for the elderly), childcare centers, schools, playgrounds, and medical facilities away from point sources of air

pollution and busy traffic corridors following the California Air Resource Board's recommendations

Technology Measures

Policy 7: Provide leadership to Pleasanton residents and businesses by implementing all technology-based air-pollutant reduction programs that are reasonable and feasible.

Program 7.1: Adopt a City "Green Fleet" policy to guide the City in purchasing energy efficient and clean vehicles.

Program 7.2: Continue to properly maintain the City vehicle fleet to insure as-designed vehicle operation. Proper preventative maintenance includes regular tune-ups, filter replacements, and engine diagnosis.

Program 7.3: As resources allow, continue and increase police bicycle patrols.

Program 7.4: As the City replaces landscaping equipment, gas cans, street sweepers, and other electrical and mechanical equipment, consider purchasing the least polluting equipment available.

Program 7.5: Postpone activities that contribute to air emissions on Spare the Air Days. Activities include use of fossil fuel-powered landscaping equipment; surface coating and paint projects; and refueling vehicles.

Reschedule vehicle trips, if feasible, without impacting project deadlines.

Program 7.6: Adopt a measure requiring large vehicles (gross weight rating of greater than 14,000 pounds) and offroad equipment owned by the City and/or private contractors to restrict engine idling to less than 5 consecutive minutes and to prohibit engine idling in parking lots, where feasible.

Public Awareness

Policy 9: Strongly encourage citizen and business participation in reducing air pollution.

Program 9.1: Provide regional and local air-quality information on the City of Pleasanton's website, including links to the Bay Area Air Quality Management District, the California Air Resources Board, Alameda County Waste Management Authority Stop Waste.org, and other environmental-based internet sites.

Program 9.2: Establish an air quality public awareness program which includes changes that people can make to minimize air pollution. This program would educate the public and encourage people to choose the cleanest paints and consumer products, and to purchase the most energy-efficient appliances, landscaping equipment, and gas cans. This program would further encourage the public to purchase more energy-efficient vehicles and to properly maintain them.

Program 9.3: Develop incentives for the public to help reduce air pollution. This includes offering incentive programs for using non-motorized (i.e., pedestrian and bicycle) and low-polluting mobility alternatives.

Program 9.4: Develop a recognition and awards program for businesses that reduce air pollution.

Program 9.5: Provide information to the public regarding the importance of Spare the Air Days and how people can make a positive impact on the environment.

Program 9.6: When the School District replaces landscaping, cleaning, and other fuel-powered equipment, strongly encourage the District to purchase the least polluting equipment available that is feasible.

Sensitive receptors include the infirm, children, the elderly, and people sensitive to air pollutants. Examples of land uses where sensitive receptors congregate are hospitals, childcare centers, schools, playgrounds, rehabilitation centers, residences, and senior housing, including assisted living and nursing homes.

Pleasanton Climate Action Plan, serves to outline strategies, goals, and actions for reducing municipal and community-wide greenhouse gas (GHG) emissions. This Climate Action Plan has been structured to ensure that the City does its part to meet the mandates of 2006 AB 32, while taking into account the City's General Plan vision and its goal to become the "greenest" city in California.

6. City of Livermore Plans

February 2004: City of Livermore General Plan 2003-2025 provides city land use and development policy for growth and resource conservation through 2025 (Livermore Web - 2003-2025 General Plan (cityoflivermore.net). Specifics from Chapter 8 Open Space and Conservation Element Section IV. Air Quality, pages 32-36 are extracted below.

In response to Alameda County Measure D, 2000 Livermore developed urban growth plans

Alameda County Measure D Save Agriculture and Open Space Lands, see: 8742 (cityoflivermore.net)

North Livermore, 8740 (cityoflivermore.net) and South Livermore 8741 (cityoflivermore.net).

Goal OSC-6 Protect and improve Livermore's air quality

Objective OSC-6.1 Minimize air pollution emissions

Policies:

P1. The City shall require project developers to develop and implement a construction-period air pollution control plan, consistent with dust and emission abatement actions outlined in the CEQA handbook of the Bay Area Air Quality Management District.

P2. The City shall prohibit the location of sensitive receptors (e.g., residential uses, schools, hospitals) in the vicinity of industries that generate toxic emissions; conversely, prohibit the location of industries that generate toxic emissions in the vicinity of sensitive receptors.

P3. The City shall work with local and regional municipalities and agencies to reduce automobile-related vehicle emissions.

P4. All industrial uses within Livermore shall meet regional, State and federal air pollution standards.

P5. The City shall attempt to increase the employment to population ratio to reduce commuting rates and associated vehicle-related pollution emissions.

P6. The City shall monitor air quality and shall consider implementing a population cap if air quality declines.

P7. The City shall support programs to encourage the development and maximum use of regional and local mass transit systems. To this end, the City shall actively support:

(a) the funding and construction of a BART or light/commuter rail extension to Livermore,

(b) the designation of special lanes on I-580 for the exclusive use of commuter buses during peak traffic periods; and

(c) close coordination in the operations of local and regional transit systems in order to minimize the travel time between communities and major generating areas served by the regional system.

Actions

A1. Provide incentives to purchase vehicles that have alternative fuel systems with reduced emissions.

A2. Provide incentives to reduce vehicle trips and increase ridesharing so as to reduce pollutants generated by vehicular combustion engines.

A3. Seek means to meet State standards for emission of air pollutants so that vegetation (including crops), the visual environment, and public health will be protected.

A4. Study the implementation and feasibility of a population cap which would be implemented in the event of a decline in air quality over the next five to ten years.

A5. Coordinate with other local and regional agencies (e.g. LARPD, LVJUSD, Alameda County) to manage and control fugitive dust from sources including, but not limited to, quarries, ballfields, construction sites and landscaping and maintenance activities.

A6. Triennially, concurrent with the development of each three-year Housing Implementation Program, review, and report changes in local air quality levels, based on reports published by the Air Quality Management District, to the City Council to determine if consideration of a population cap is warranted.

November 2012: Livermore Climate Action Plan Livermore Climate Action Plan outlines strategies and activities the City and Community can take to do our fair share to reduce greenhouse gas (GHG) emission levels produced within the city.

Appendix J. Results from the 2020 TVAQCA Community Survey

An Appendix to: Ensuring Future Air Quality in the Tri-Valley

by Laurene Green, January 28, 2021

Contents

1. Summary

During the third quarter of 2020, TVAQCA released a survey (TVAQCA 3Q 2020 Survey) into the Tri-Valley Area as both an outreach effort and to gather information regarding residents' and workers' understanding and experiences with outdoor air quality. We emailed the link to the online survey to our stakeholder contacts in Dublin, Pleasanton, Livermore, and San Ramon and Danville. Our intention was to understand day-to-day experiences, however just as the survey was launched, the wildfires in northern California started raging air currents transported hazardous levels of smoke into the Tri-Valley for several weeks in August and September. This juxtaposition helped prompt more interest in the survey, but also required the addition of a question regarding air quality created by wildfires. Also, as TVAQCA was trying to understand typical experiences and behavior, the survey specified that responses should reflect pre- or non- pandemic times.

As the 3Q 2020 Survey was an inaugural effort, getting the word out required not only using all of the Advisory Committee contacts, social media discussions, and presentations to community groups, it was also decided to extend the open period of the survey until responses dwindled (the end of November 2020). Ultimately there were approximately 300 households that responded (approximately one survey per household); it is estimated that this represents approximately 900 people, mostly residents and a handful of workers that live outside of the Tri-Valley.

As an effort for full outreach and to possibly identify communities with environmental justice issues, a Spanish version of the essay was also created, and a link sent to a prominent organization that represents the Hispanic/Latinx community. Unfortunately, the current fears of ICE (U.S. Immigration and Customs Enforcement) surveillance were cited as a reason for lack of responses. It may also be that many Spanish-speaking households have at least one English speaking member that answered the survey. We will need to consider this for future surveys.

2. Major Findings from the Survey:

1) Residents appear generally aware of air quality, especially during wildfires, but only partially aware of the specifics of Ozone (O3) and Particulate Matter (PM2.5) compliance. Also, air quality was shown to be a significant criterion in living-location and quality-of-life decisions for most respondents.
2) It is hard to measure how successful the survey was in introducing the TVAQCA; however, assuming respondents read the introduction on the survey, they now know about TVAQCA. In our next annual survey, the question regarding TVAQCA awareness will be asked again to help measure this.
3) In answer to the question if there were *vulnerable-population individuals in their household, a* majority responded that their household has one or more vulnerable population individual (sensitive to air quality). Surprisingly, responses with pregnant women were the smallest number – perhaps a reflection of the pandemic. The highest responses were households with elderly and asthmatics. There was a significant number of "Other" responses. Responses to subsequent open-ended questions suggest this could be largely allergies. Allergies will be added as a possible response on the next survey.
4) The open-ended responses to Question 6 (explain bad air quality impacts) did not identify sources, except for wildfires, rather effects were mostly described, thus not helping to identify any impactful non-identified emission sources. Future questions will more specifically solicit the source as well as the effect.

5) A look at use of appliances which emit air pollution outside (e.g., leaf blower gas grill, etc.) revealed a strong response to the lawn/garden equipment question (Question 14) with 68% of respondents answering the question. Also, hired landscaper/gardener using (assumed) gas-powered equipment were cited almost half of the time, whereas almost a third of the respondents who do their own landscaping work have already converted to electric. Although there were responses in all categories for *Fire Appliances* (Question 13), by far the largest was *Gas or Propane BBQ/Grill* at 59% of the time.
6) Most of the submitted suggestions are consistent with solutions that the air quality community have been suggesting for some time.
7) Unfortunately, the response to the Spanish version of the survey was very poor (one response only, which was invoked to double-check that there weren't any technical problems). The current fears of ICE (U.S. Immigration and Customs Enforcement) surveillance were cited as a reason for lack of responses. It may also be that many Spanish-speaking households have at least one English speaking member that answered the survey. This will need to be considered for future surveys.
8) The percent of responders who fully completed the survey was very acceptable at 93%. Although there were 16 questions on the survey, the design did allow the average completion rate to be 8 minutes. Open-ended questions allowed for longer responses as desired.
9) Even though instructions were clear, and examples were given on how to respond to questions, there were many responses that had to be adjusted to reflect the true intent in the numerically proper format. It was easy to see the intention for many, others were harder and ultimately required some interpretation. Questions in future surveys will be simplified to help avoid this problem.
10) The two most significant highlights are the near-unanimous agreement that the air quality was unacceptable during wildfires, and that traffic and lawn/garden equipment are the largest emitters of pollution and noise. About half of respondents were using professional landscapers who (presumably) are using gas-powered equipment. Respondents would like to see these issues changed.

We plan to incorporate lessons learned into future annual surveys and repeat some questions to see if response changes through time.

3. Introduction to TVAQCA Survey

During the third quarter of 2020, TVAQCA released a survey (TVAQCA 3Q2020 Survey) into the Tri-Valley Area as both an outreach effort and to gather information regarding residents' and workers' understanding and experiences with outdoor air quality. This included Dublin, Pleasanton, Livermore, and San Ramon and Danville. On the outreach side, the survey included some text at the beginning introducing the respondent to TVAQCA and supplying a small write-up on Ozone and PM2.5 compliance issues in the Tri-Valley. On the information gathering side 16 questions were fashioned to understand the respondent's level-of-awareness on air quality issues, and how they experience air quality in their lives. This report describes the process of designing and deploying the survey, as well as an analysis of the responses received.

4. Survey Goals and Methods

TVAQCA set the following goals of the survey:

1) To get a sense of Tri-Valley residences' experience and knowledge about local air quality,
2) To introduce TVAQCA and Tri-Valley air quality compliance issues to those not yet familiar,
3) To identify populations sensitive to poor air quality (vulnerable populations),
4) To help identify any impactful, but yet-to-be-identified emission sources,
5) To understand household levels of emissions from transportation and outdoor appliances choices,
6) To solicit ideas how to improv local air quality
7) Try to reach communities with possible environmental justice issues, and
8) To limit the number of questions so as to not dissuade respondents from completing the survey, and not exceed 10 minutes to fill out the survey.

With these in mind, TVAQCA set about designing the first annual outreach survey, with some qualifiers to collect information for typical (pre-COVID-19) behavior.

SURVEY TOOL – An account with Survey Monkey was established and used to create the survey.

SURVEY DESIGN – The survey contained 15 questions plus a final request for the respondents Zip Code. Questions were designed to cover the 5 goals listed above. In particular, BETA-testing indicated that the test time would be within the 10-minute goal TVAQCA had set previously.

The intention of the survey was to understand day-to-day experiences, however just as the survey was launched, the wildfires in northern California started raging and air currents transported hazardous levels of smoke into the Tri-Valley for several weeks in August and September. This juxtaposition helped prompt more interest in the survey, but also required the addition of a question regarding air quality and wildfires. Also, as TVAQCA was trying to understand typical experiences and behavior, the survey specified at times that responses should reflect pre- or non- pandemic times.

REVIEW PROCESS – A set of questions were created and sent to BAAQMD July 6, 2020, then discussed during the July 8th Q2 review Zoom meeting, and suggestions were incorporated. In particular it was suggested to simplify the language. A draft or BETA version of the survey was tested amongst the TVAQCA Oversight and Science Committee Members and their families. The findings were incorporated, and a final version was produced.

SPANISH VERSION – A local Spanish teacher volunteered to translate the survey into a second Spanish version, which was later tested on a local individual who speaks English but has Spanish as her native language. When the survey was launched both versions were forwarded to the local group La Familia in an effort to reach Spanish-speaking households.

DISTRIBUTION AND PROMOTION – When the two versions were finalized, links to both versions were distributed via email. As the 3Q2020 Survey was an inaugural effort, getting the word out required not only using all of the Advisory Committee contacts, social media discussions, and presentations to community groups, it was also decided to extend the open period of the survey until responses dwindled at the end of November 2020.

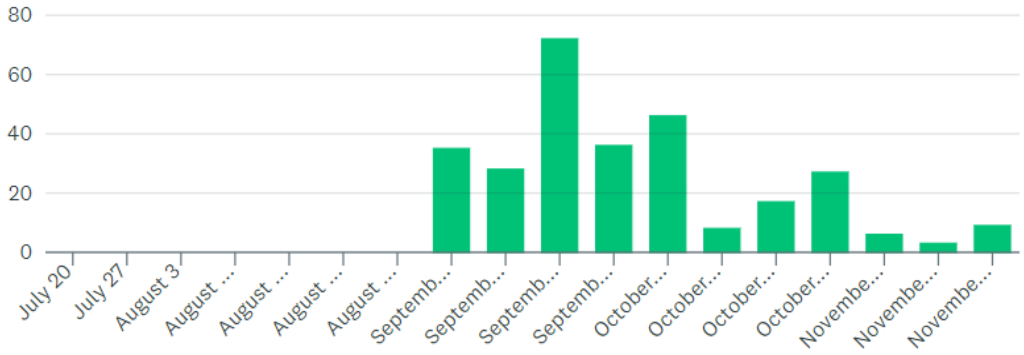
5. Organizations Participating in TVAQCA Survey

1. Bike Pleasanton
2. Citizens' Climate Education
3. Hacienda Business Park Newsletter
4. Interfaith Power and Light
5. La Familia
6. Lawrence Livermore National Laboratories (announced in *Newsline*)

7. Livermore Chamber of Commerce
8. Local Interfaith Council
9. Lots of Personal Outreach
10. Next Door – Pleasanton, Livermore
11. Office of Scott Haggerty's Newsletter
12. PeachJar
13. Tri-Valley Sons In Retirement
14. Spare the Air
15. Sustainable Contra Costa
16. Tri-Valley Non-Profit Alliance
17. Tri-Valley Women's Action Group
18. TVAQCA Advisory Group
19. TVAQCA Website and FB page
20. Unitarian Universalist Church Livermore
21. Tri-Valley Women's Action Group
22. Toastmasters Club, Speakeasies Pleasanton

6. Response Statistics

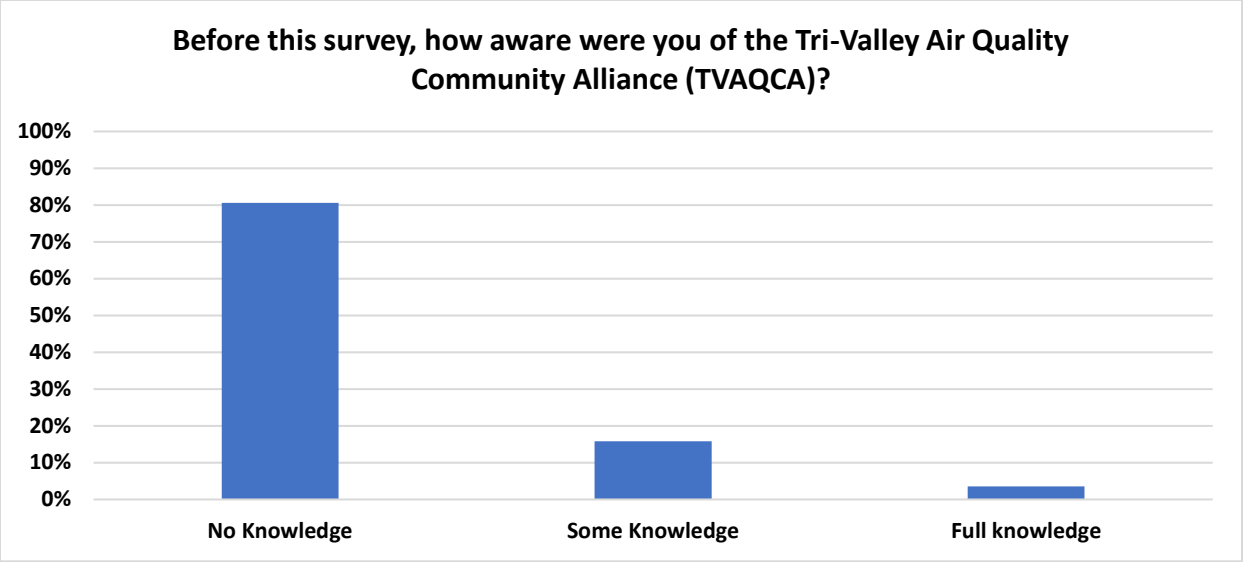
Ultimately, 287 people responded to the survey. As the survey was designed to encompass the household, this represents many more individuals; rounding up and assuming a conservative average of 3 persons per household, that is roughly 900 individuals captured in the responses. Below are the number of responses by week from July 20-November 16, 2020. The surges in late October and late November were in response to presentations given by TVAQCA.



7. Questions and Responses

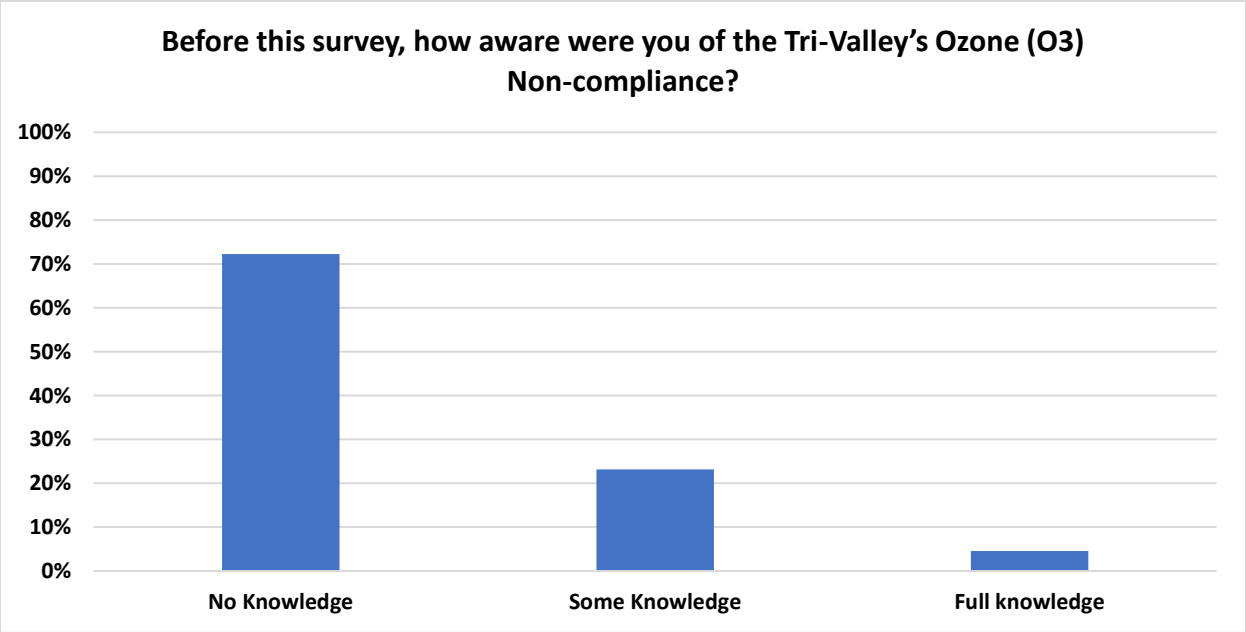
Question 1: Before this survey, how aware were you of the Tri-Valley Air Quality Community Alliance?

As expected, a majority of respondents (80%) had **No Knowledge** of the TVAQCA before taking the survey. 20% of respondents did have some or full knowledge, so TVAQCA has already made some inroads.



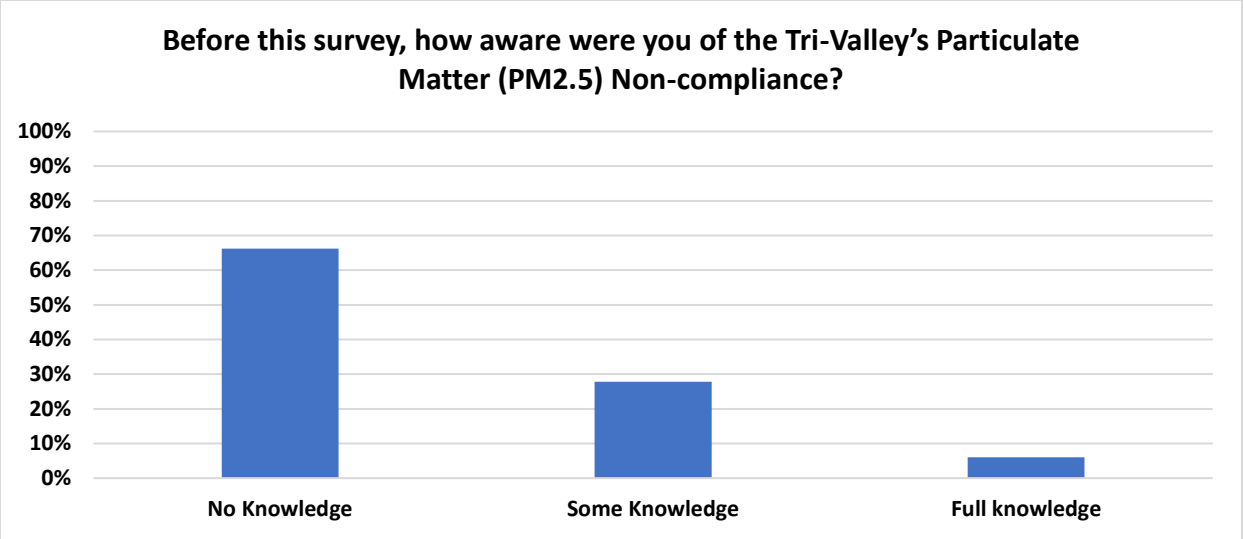
Question 2: Before this survey, how aware were you of the Tri-Valley's Ozone (O3) Non-compliance?

A majority of respondents (72%) had **No Knowledge** of the status of Ozone (O3) compliance in the Tri-Valley Area. 28% of respondents had some knowledge of Ozone (O3) compliance issues.



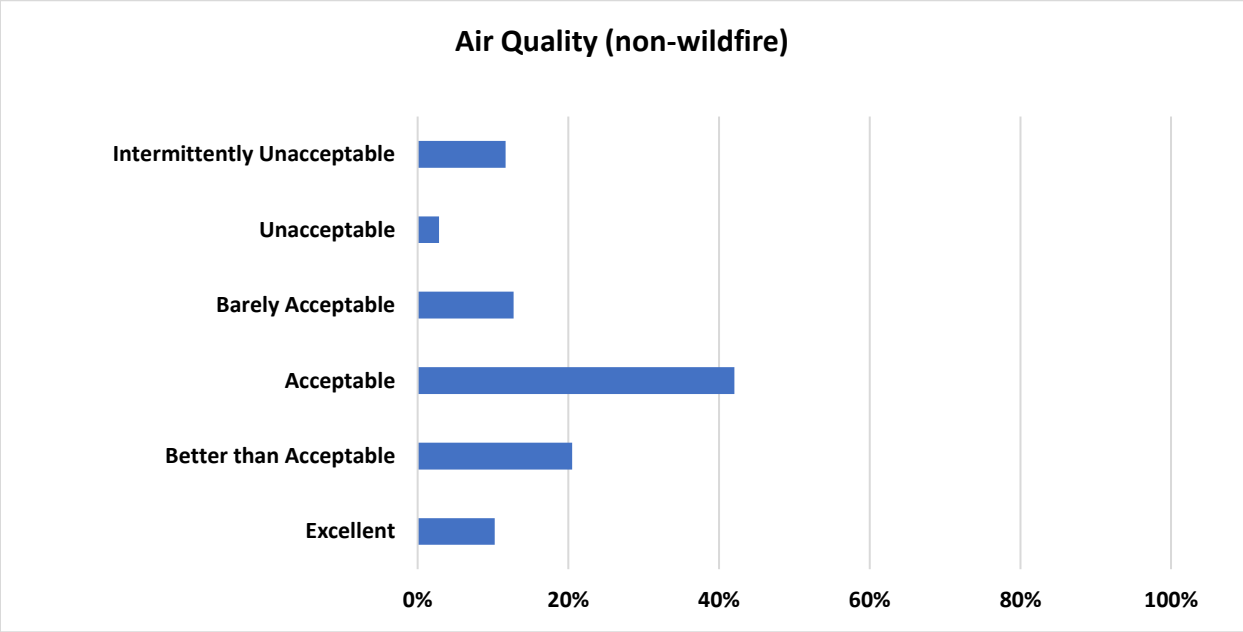
Question 3: Before this survey, how aware were you of the Tri-Valley's Particulate Matter (PM2.5) Non-compliance?

A majority of respondents (66%) had **No Knowledge** of the status of Particulate Matter (PM2.5) compliance in the Tri-Valley Area. 34% of respondents had some knowledge of Particulate Matter (PM2.5) compliance issues.



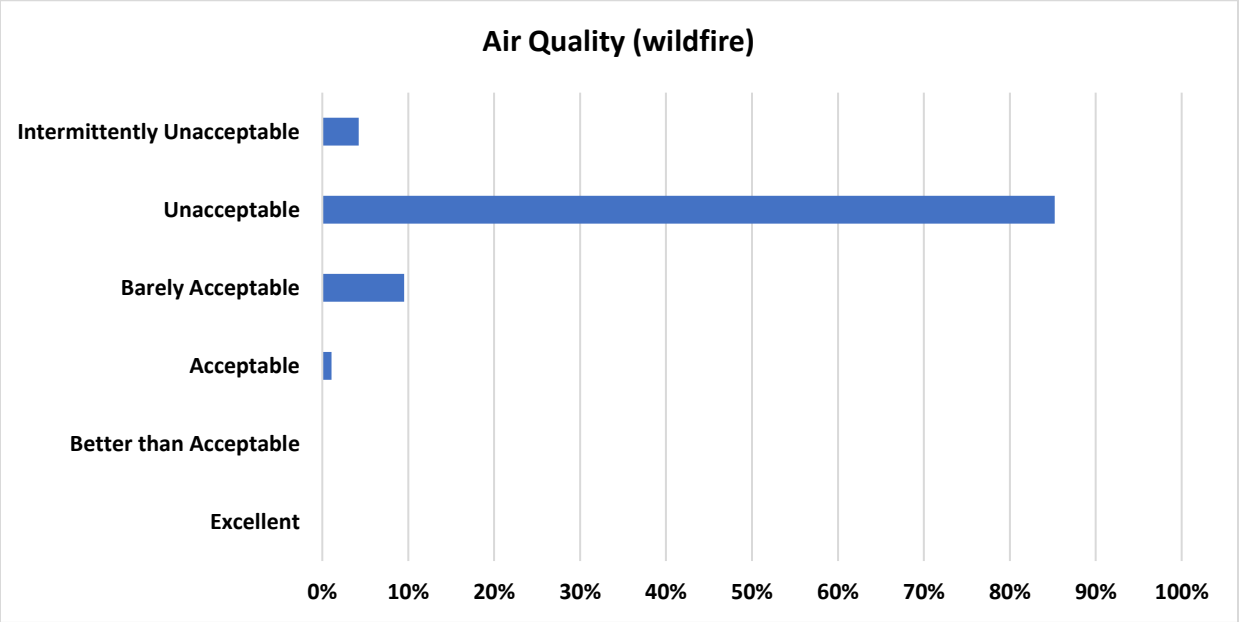
Question 4: How good/bad is the air quality in your specific neighborhood (don't include wildfire days)?

28% of respondents find the air quality to be problematic during non-wildfire times. That means that 72% of respondents are satisfied with the air quality in the Tri-Valley during non-wildfire times.



Question 5: How good/bad has the air quality been in your specific neighborhood particularly during recent wildfire events?

99% of respondents find the air quality to be problematic during wildfire times. That means only 1% of respondents are satisfied with the air quality in the Tri-Valley during the late 2020 wildfire season.



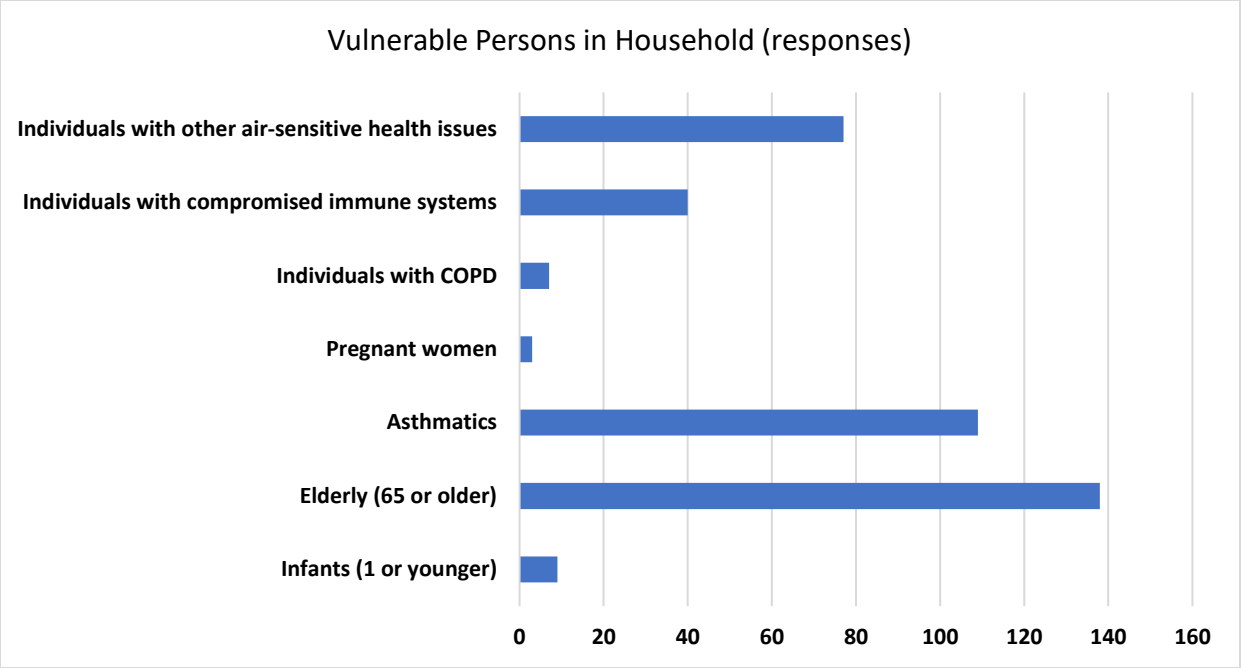
Question 6: Are you or a household member significantly impacted by bad air quality?

If yes please explain; if no, enter N/A.

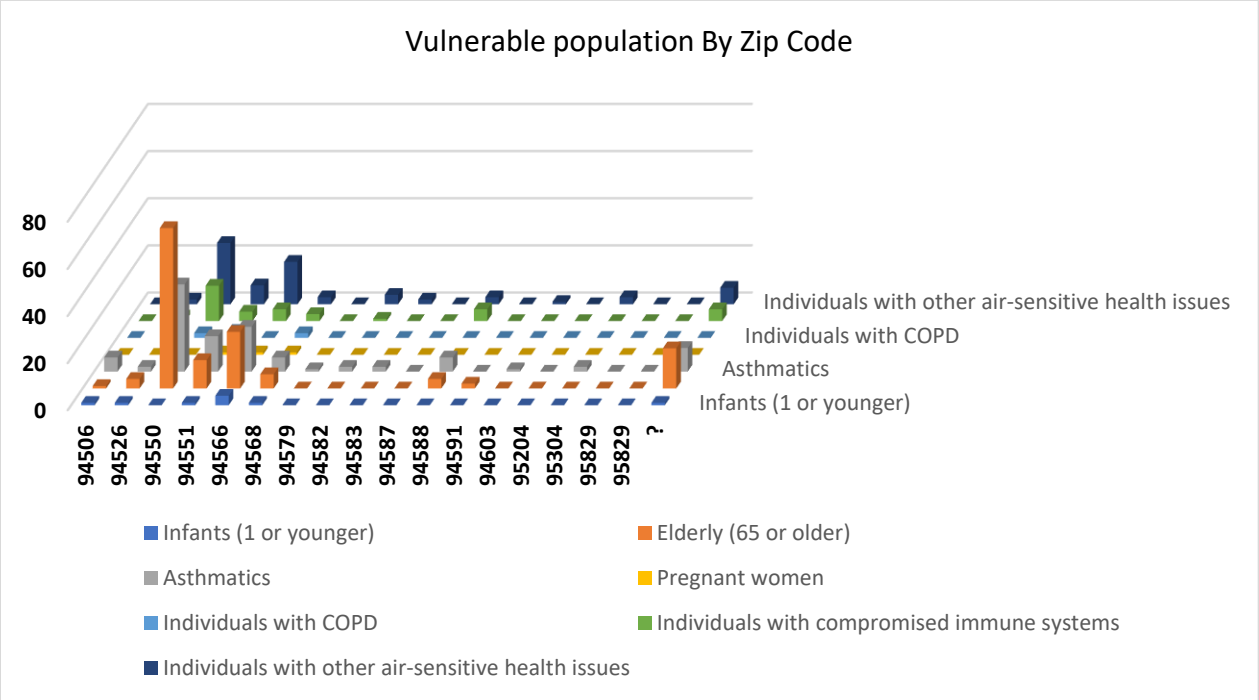
135 responded with impacts and 68 registering no impacts. The majority of responses expanded in detail on the same data collected in Question 7 (*Do you have vulnerable-population individuals in your household, and if so, how many?*). The majority of descriptions mention **asthma**. Headaches and irritated eyes were often cited. 19 respondents said that they and/or others in the household suffer from allergies, and air quality plays a role. Bad air quality was also cited several times for limiting the ability to exercise or play outside. Cabin fever effects were cited as spin-off problems from poor air quality, but it was hard to parse out the COVID-19 lockdown effect, as they were simultaneous. Heightened impacts from wildfires were often discussed.

Question 7: Do you have vulnerable-population individuals in your household, and if so, how many?
Fill out as many as apply (example, 2).

188 respondents have a total of 383 vulnerable persons in their households. "Other air-sensitive health issues" varied, but allergies are frequently seen in the descriptions and responses to other questions.



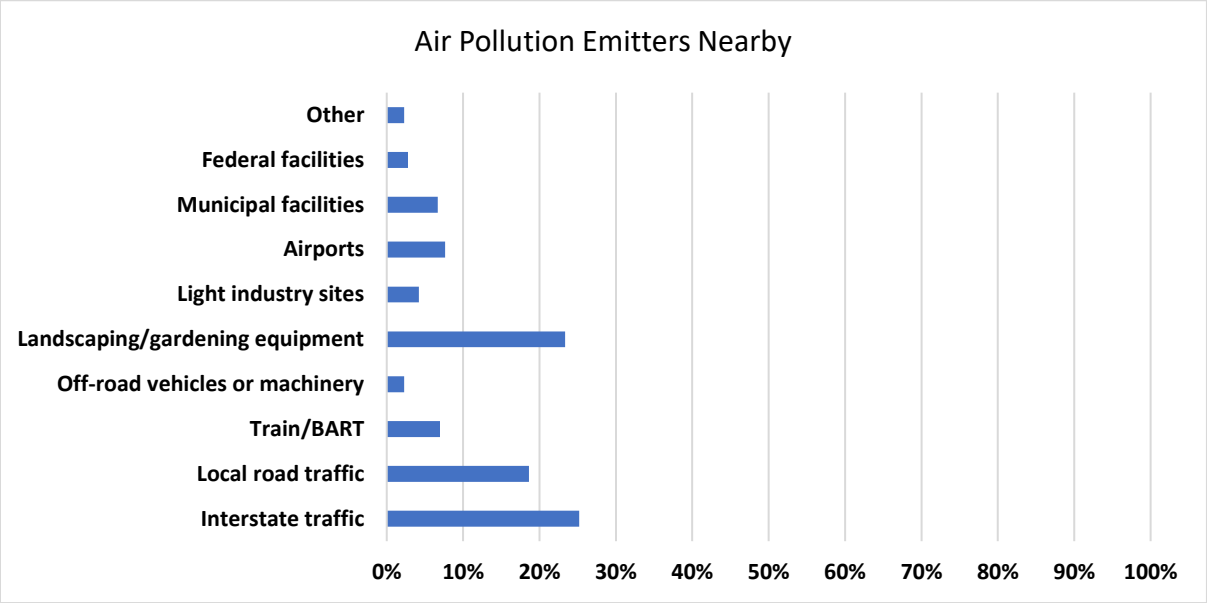
Below is a breakdown of answers to Question 7 by zip code. Livermore and Pleasanton responders were the largest number with an air-sensitive health issue.



Question 8: Do you have any significant air pollution producers near you?

Check as many as apply.

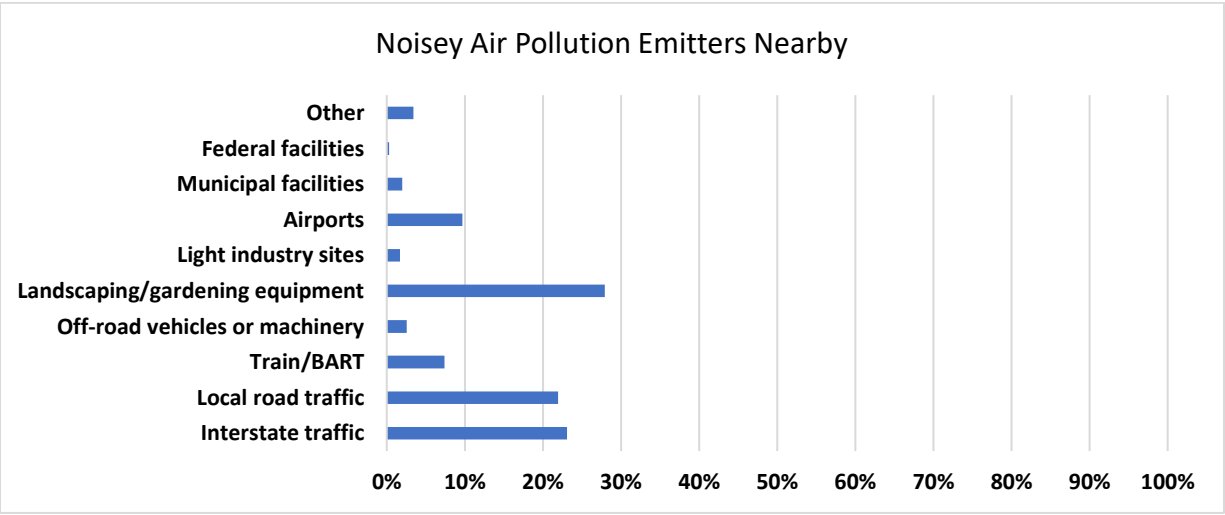
51% respondents have pollution emitters near them which include traffic (including Train/BART) and landscaping/gardening equipment.



Comments mention leaf blowers in particular as pollution emitters, which respondents would like to see either converted to electric or outlawed. Note, modern trains are considered to be lesser polluters, especially BART, but they are significant noise emitters and were included to couple with the next question.

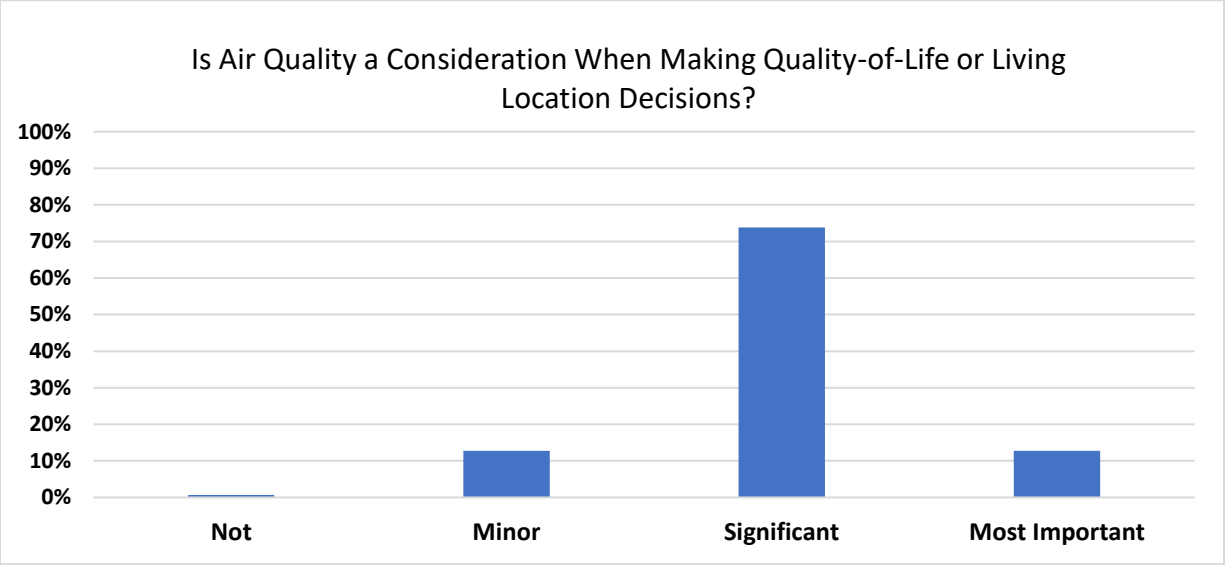
Question 9: Do you have any air pollution producers which are a significant noise problem for you?

52% respondents have pollution emitters near them which are traffic (including Train/BART) and have landscaping/gardening equipment. This pattern matches the responses from the previous question.



Question 10: What value do you place on good air quality?

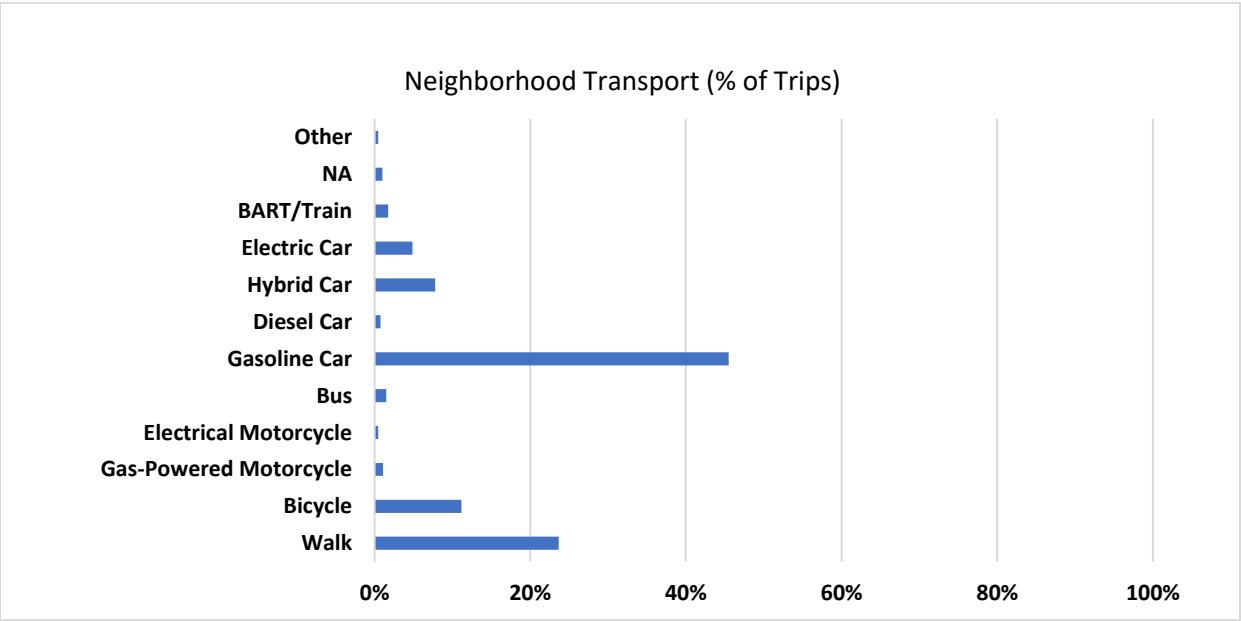
87% of respondents consider air quality as significant or the most important criteria when considering quality-of-life or living-location decisions. The response discussed above is important to keep in mind when making choices to keep the Tri-Valley a desirable place to live.



Question 11: What transportation option(s) do you and your household members mostly use when in your neighborhood/town (pre COVID-19), and how often (total for all members)?

Fill out as many as apply (example, to the store and back is 2 trips). For N/A enter 0 (zero).

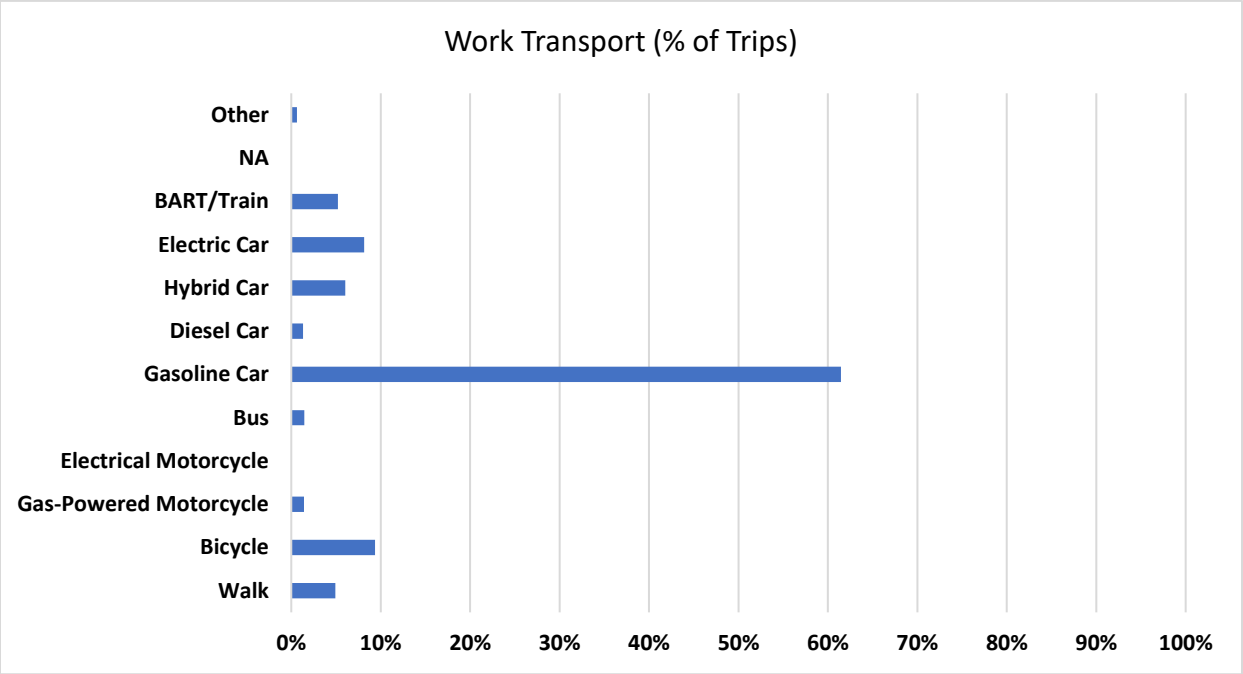
For travel in and around their neighborhoods, 47% of trips use gas or diesel-powered cars. An encouraging 35% of the trips are walking or bicycle.



Question 12: If you and any household members work outside of the home, what transportation option(s) do you use typically for your commute (pre-COVID-19), and how often (total for all members)?

Fill out as many as apply (example, to work and back is 2 trips). For N/A enter 0 (zero).

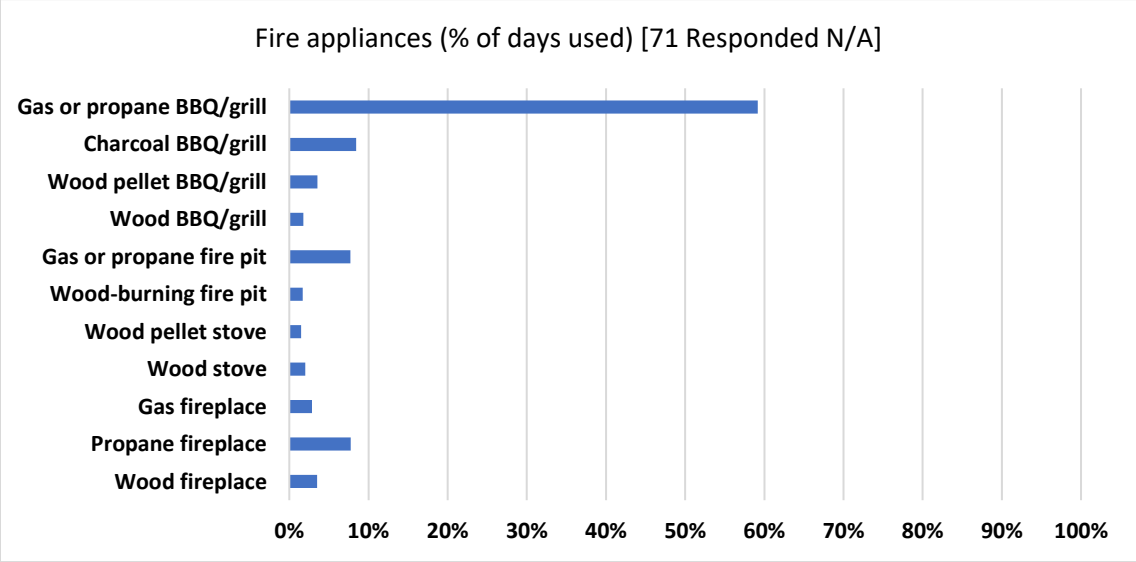
Gas or diesel-powered cars are used for 62% of travel to work trips. Only 14% of trips do people walk or use a bicycle.



Question 13: Do you have a working fire appliance?

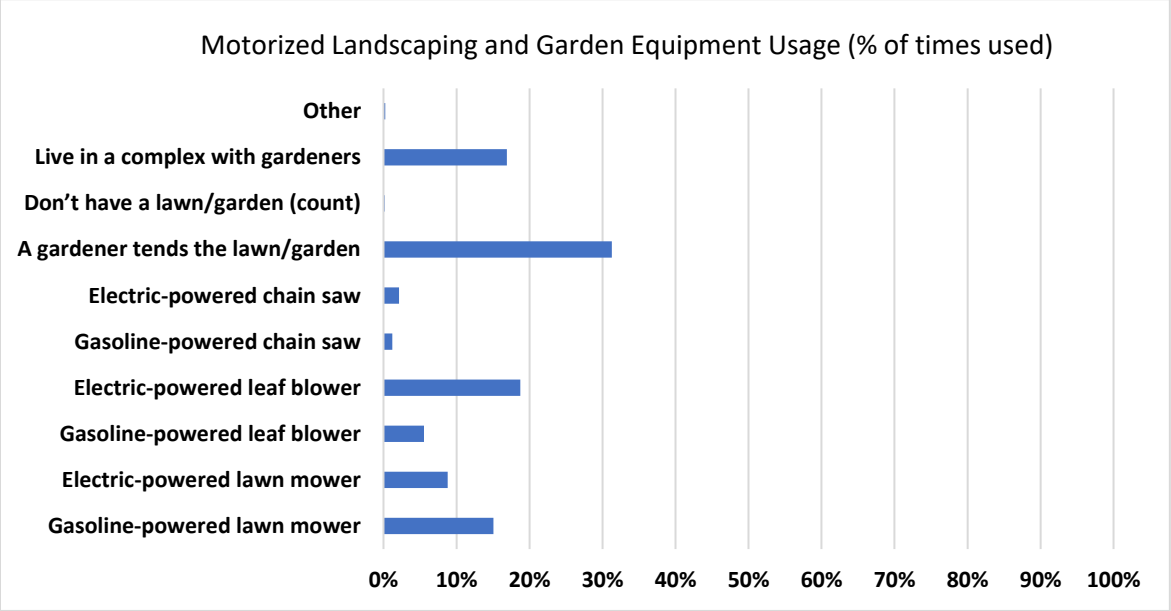
Please fill out all that apply (example, 60). For N /A enter 0 (zero).

59% of the times that outside fire appliances are used they are gas or propane BBQ/grills. 63% of respondents use some type of fire appliances.



Question 14: Please fill in if you have any of the following motorized landscaping/garden equipment, and describe how often you use them (example, 4,6).

48% of the time a hired landscaper/gardener is using motorized landscaping and gardening equipment. The working assumption is that most landscapers/gardeners still use gas-powered equipment, so the conversion of this industry to electric could significantly reduce local emissions. An encouraging 30% of the time electric equipment is used. It appears that residents are already converting to electric.



Question 15: Do you have any suggestions on ways to address air or noise pollution in the Tri-Valley, or more specifically near your neighborhood?

There were 117 suggestions.

Several responses mentioned converting gas equipment to electric, especially for leaf blowers and the like, also more e-charging stations and more solar power. Improving and incentivizing the use of public transportation as well as facilitating and incentivizing more work-at-home days was often discussed. Walls and bio-barriers (trees and bushes) were suggested to block fumes and noise from the freeways. Education of our air quality, what causes it and practical alternatives was mentioned several times. Some practical ordinances were mentioned like for limiting hours to minimize traffic (especial truck traffic during commute hours), fugitive dust (construction and gravel pit operations), and noise pollution. The less practical but novel included "Allow burning of trees and brush during the winter", "Spray. Environmentally friendly disinfectant to stop the spread of virus.", and "nuke San Francisco". Better forest management was cited several times to address wildfires.

Question 16: Please enter your ZIP CODE

254 respondents supplied their zip code. Below are the zip code responses are translated to cities. About 200 or ¾ were from either Pleasanton or Livermore.

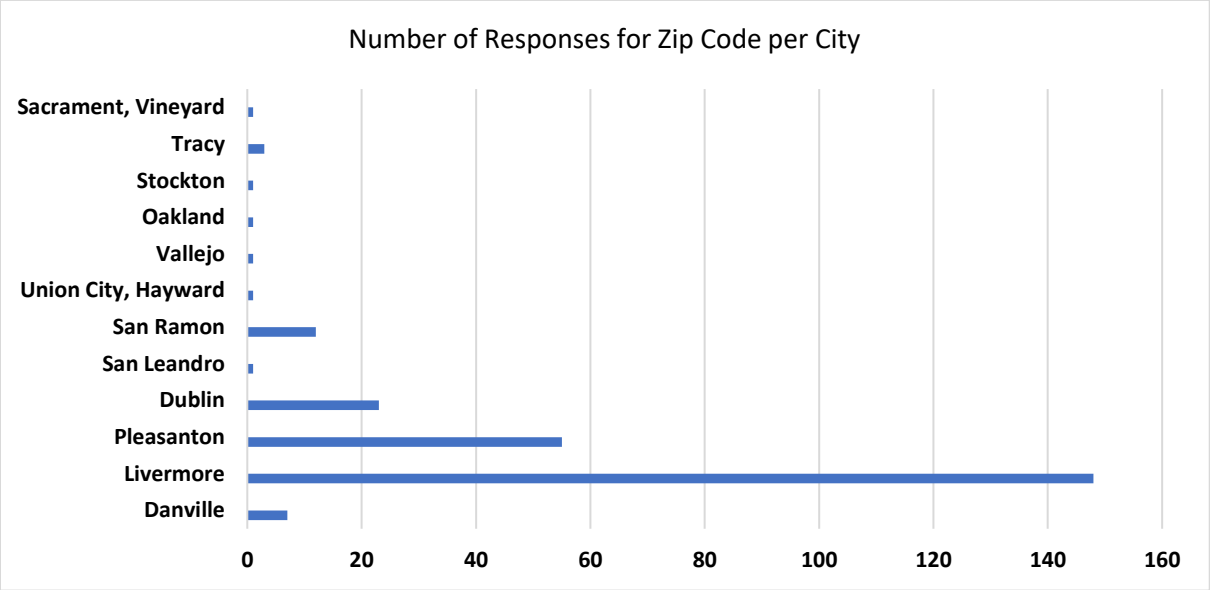
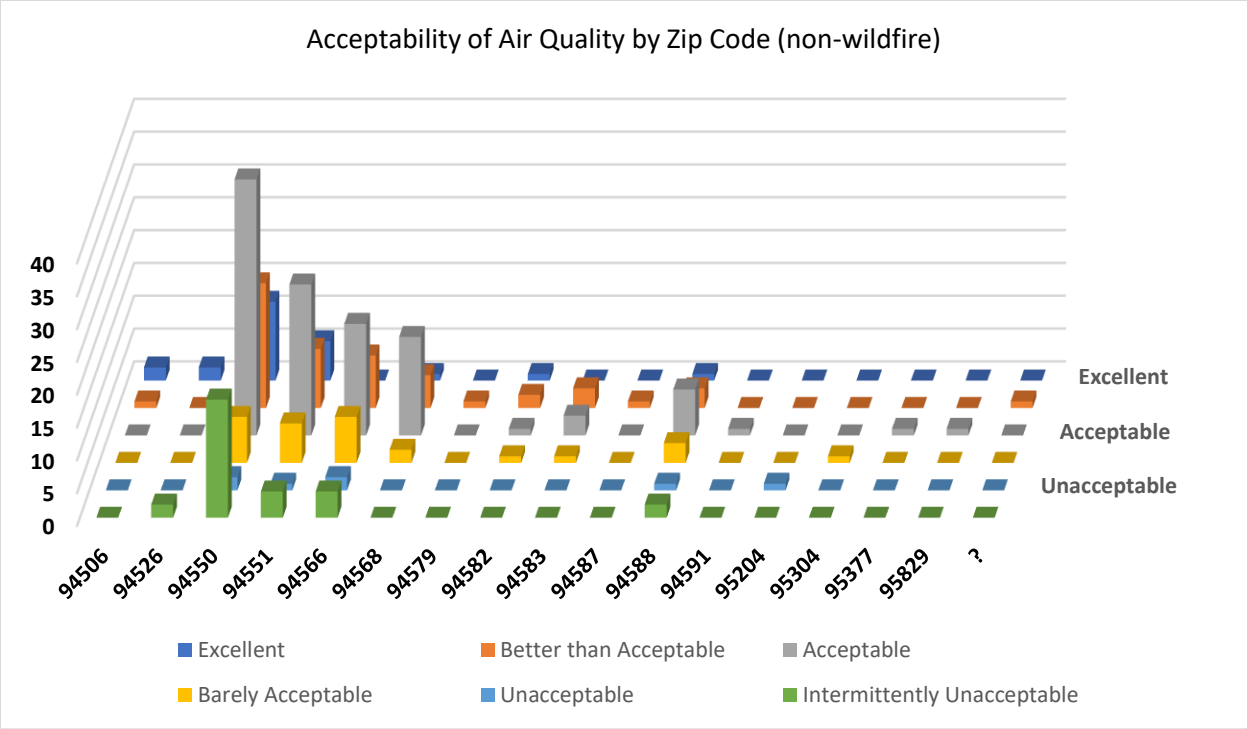


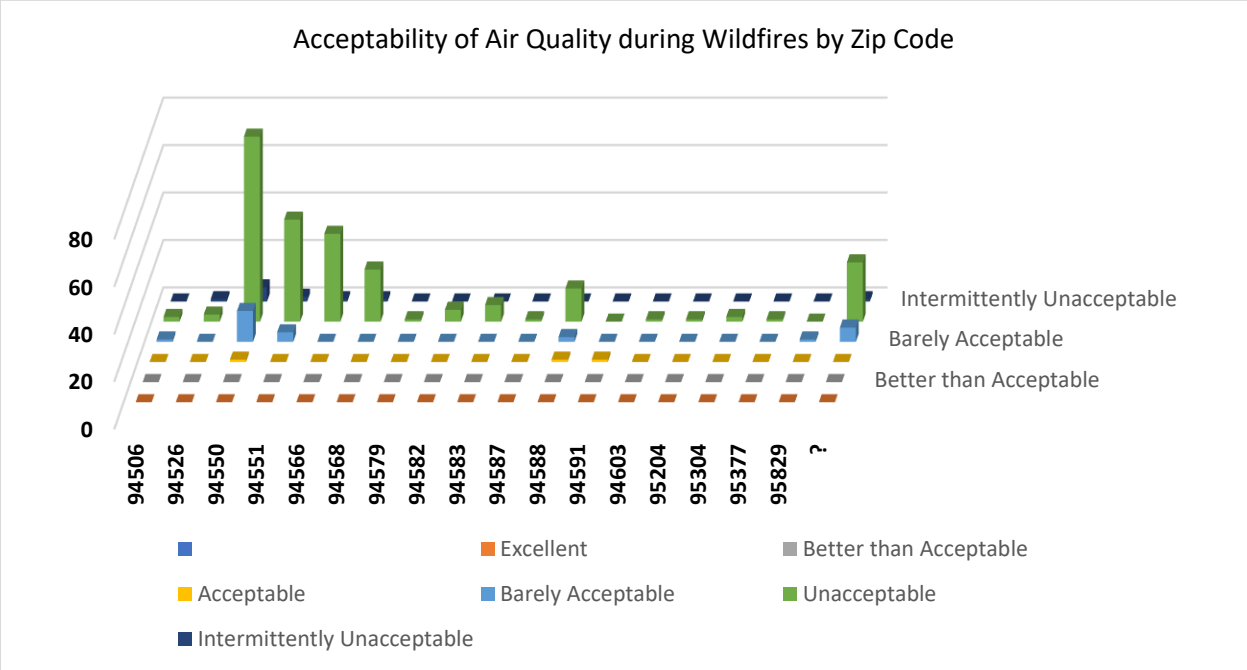
Table of respondent Zip Code and associated cities.

Zip Code	Associated Cities
94506	Danville
94526	Danville
94550	Livermore
94551	Livermore
94566	Pleasanton
94568	Dublin
94579	San Leandro
94582	San Ramon
94583	San Ramon
94587	Union City, Hayward
94588	Pleasanton
94591	Vallejo
94603	Oakland
95204	Stockton
95304	Tracy
95377	Tracy
95829	Sacramento, Vineyard

An example of how one can apply this information is in the following graphs displaying air quality by zip code. The gray, orange and blue columns show that the respondents from Livermore and Pleasanton Zip Codes (94550, 94551, and 94566, 94588) find their air quality to be acceptable to excellent.



Below is a breakdown by zip code for acceptability of the air quality during wildfires. Although 99% of the respondents felt the air quality was problematic, one can see the few respondents that thought air quality was acceptable during wildfires are from Livermore and Vallejo. Unfortunately, reviewing the open-ended question responses did not explain why these 3 respondents appear to experience the wildfires differently than the overwhelming majority. A clue may be that none of them had vulnerable population individuals in their households.



8. Future Surveys

It is expected that TVAQCA will conduct a similar survey on an annual basis. Lessons learned will be incorporated into future annual surveys, and some questions will be deliberately repeated to see response changes through time.

The following will be considered when designing the 3Q2021 Survey.

1) Several of the questions from this current survey will be used again to see how responses change with time.
2) Some questions will be reworded for better affect and to remove any unnecessary overlap (e.g., questions designed to solicit information on yet-to-be-identified emissions source).
3) Some questions will need to be simplified as two-part answers were often answered in the wrong format.
4) An attempt will be made to see if a Spanish version can be better deployed.
5) The ability to distinguish between Tri-Valley residents and non-resident Tri-Valley workers will be included in the next survey.
6) There will be presentations throughout the year on the results of the survey with a reminder that this is an annual event, in hopes of capturing the same respondents plus more, especially workers.
7) This survey focused on outdoor air pollution. Indoor air pollution may be considered in the next survey (e.g., gas hot-water heaters, stoves, smoking/vaping, etc.).

9. List of Survey Open-Ended Response Statements

(Note: The 25 responses related to **banning gas-powered landscaping equipment are bolded)**

1. Involve local officials.
2. Safe, clean, easy access to electric buses. Use of trolleys for inner town travel where I can hope on/off (Like the cable cars in San Francisco).
3. Reduce carbon footprint preferably by following non gasoline ways.
4. Incentivize residents to give up wood FPL, charcoal grills, etc. (as was done with old refrigerators by PG&E).
5. Spray environmentally friendly disinfectant to stop the spread of virus.
6. Bring back the 2-direction bus route #15 in Springtown so we don't have to loop throughout the entire eastern neighborhood just head south into downtown Livermore. Costs us over 30 minutes of bus time just to get to transfer station, making bus ride to BART over an hour+ just to go 10 miles. Forces me to drive to Bart because who has the time to an extra hour+ to their commute? Better yet, start a commuter express bus directly from Springtown straight to Bart in the morning and back in the evening.
7. Trees and sound walls next to 580.
8. Encourage use of **electric vehicles and equipment.**
9. Enforce current noise pollution laws.
10. Allow burning of trees and brush during the winter!! Narrow focused groups like this are a big reason why we have so many terrible wildfires!!!
11. Better mass transit to cut 580 & 84 traffic.
12. More incentives for **landscape maintenance workers to go electric.**
13. Reduce road pollution with clean burning vehicles.

14. Outlaw **gas-powered blowers**.
15. Expand access to car and bike share at walkable locations.
16. **Leaf blowers** are used to often just to blow dust around rather than actually collect leaves. Brooms should come back.
17. More **electric equipment** and cars
18. Yes, get cars off the freeways coming from the East doing the commute. Need the Valley Wheels connection since BART is not coming.
19. Finish working on the street improvements.
20. Reduce **gas-powered landscaping and all leaf blowing**. Leaf blowing is the biggest source of particulates in my neighborhood.
21. Buy a hybrid or electric vehicle.
22. Phase out old fireplaces and outlaw new fireplaces.
23. Better bus service, Allow electric golf cart type vehicles.
24. Make ValleyLink great, provide incentives for train shipping instead of truck.
25. Incentives for electric vehicles and solar power.
26. More measurement for awareness; there are portable meters for this; have safe places with HEPA-Charcoal filtered air.
27. Limit hours for construction at highway 84.
28. Limit the use of large pick-up trucks and SUVs. Many people who don't actually need such large vehicles seem to drive huge pick-ups just because they are "cool". It seems like a huge waste.
29. Plant more trees. Encourage more walking or biking as a way to commute. Better public transportation system.
30. Take care of the trees on time and move to electric cars.
31. Use push mowers, **sweep up the leaves**, encourage a culture of walking and biking for errands
32. Curb compact housing construction. Encourage solar panel installation for households, businesses. Support from local businesses for solar panels for schools.
33. Raise quality awareness, adding more Wi-Fi air quality sensors in the residential area
34. Find volunteer groups to plant more trees/plants in public streets/places. Encourage people/HOAs to sweep instead of using noisy **and gas-smelly leaf blowers.** Teach residents on growing their own food in yards.
35. Loud motorcycles and cars should not even be allowed. During inspections, revved vehicles over a certain decibel should not be allowed.
36. Noise significantly around South Vasco area increased from I-580 when sound wall was replaced on north side of I580. Need sound wall on south side too.
37. Extend BART and ACE train service, offer incentives to workplaces to continue to support employees to telecommute (even after COVID), make it safer to park bikes at the BART station (add lighting and security cameras to reduce Bike theft and so it is safer to commute by bike to/from BART after dark), increase incentives for electric trucks/cars
38. Better bicycle paths
39. Better sound walls on 680, stop reflection.
40. Stop building so many homes!
41. When train is passing by, perhaps they should blow their horn when they are way too far from crossing. Local cement facility sometimes works through night or early morning
42. I believe everybody knows the issue of air quality during recent wildfires. we need to leadership of government put it on priority and need to act on it rather than accept it as new normal.

43. Announce concerts at the fairgrounds that will run past 9 pm
44. According to the information you provided much of our pollution problem is coming from the inner bay area. Without legislation further limiting air pollution I'm not sure how the tri-valley alone can improve the air quality.
45. The public needs to be educated about air quality and what it does to our lungs and how it affects our health. Then people may be more concerned.
46. Legislation to support work from home.
47. Tighten diesel emissions standards to reduce PM2.5 pollution, close gravel mines
48. Planting trees, next to the highway would help in lowering air/sound pollution
49. More incentives on walking/biking.
50. **Ban leaf blowers.**
51. More bike lanes, more bike racks at stores, more bike paths,
52. Extend BART to Tracy. Create incentives to replace the highest emitting vehicles. Create more solar panel installations including the ones on the ballot this year for Livermore.
53. Stronger window/insulation.
54. Make alternative transportation safer and more prevalent, e.g., protected bike lanes to schools, downtown. Better access between neighborhoods for pedestrians. Require cities to use electric vehicles and make charging accessible downtown, at shopping centers and public venues.
55. Limit semi and large truck access on 580 during heavy commute times.
56. Improve public transportation (easier said than done).
57. I do not think the Tri-Valley itself can address this problem since the causes mostly stem from the outside of the community (Bay area and wildfires). I think the focus really needs to be on clearly identifying and trying to resolve the causes of the pollution which is frankly a state-wide issue (especially wildfires which have progressively gotten worse over the last 5 years).
58. I don’t feel like there’s much we can do locally without infringing on others
59. Reduce GHG emissions west of and in the Tri-Valley.
60. Forest management, performing construction during reasonable hours
61. Regulate maximum noise cars can make, mandate sales of EVs only. Provide incentives to trade in combustion cars.
62. Ban open ag. burning and wood-burning fireplaces year-round
63. work to implement strict emission control for diesel engines that includes on-road enforcement for those with modified emissions control systems that are only in effect during smog checks.
64. **Ban gas powered lawn equipment**. Make neighborhood/region more bike friendly.
65. Improve forest management to limit and slow down wildfires
66. Increase telecommuting so people don't have to drive to work as much
67. Raise inbound flight approach angle, shift inbound approach North, over 580
68. More public transit, better bike options
69. telecommuting
70. Higher fence requirements.
71. Prohibiting heavy equipment and 18-wheeler traffic from driving down fourth street. To limit noise pollution please place speed indicator signs or encourage the LPD to conduct a speed study on P street from Chestnut down to College. These are 25mph areas that, as a resident on the corner of 5th & P Street, I consistently witness vehicles drive in excess of 40 MPH or more daily.

72. Other than wildfires, it hasn't been a major concern for us.
73. No gas-powered **leaf blowers** or weed wackers
74. **Ban all gas-powered landscaping machines and tools.** Ban leaf blowers of any sort. Mandate landscaping tools be converted to non-gas power by 2025.
75. I honestly don't think it's that much of a problem.
76. Pedestrian-priority design for new neighborhoods, plant more trees, parking incentives for hybrid vehicles - not just electric, mandate dust- and smoke-generating businesses to have more controls in place, build-up a municipal N95 mask stockpile post-COVID, giant aerial fan in the sky to hasten air movement from Hayward to Tracy, noise dampers and electric-powered (rather than gas) construction machinery at construction sites, greater surveillance at public parks and trails to prevent illegal fireworks, public-education emails on the ineffectiveness of wood-burning stove for heating purposes, information resources on how to safely board-up un-used and outdated fireplaces, limit flights at Livermore airport, widen the space requirement between roads and sidewalks and buildings for new neighborhoods.
77. More electric vehicles, more bike lanes, **ban gas powered leaf blowers/lawn equipment**
78. Incentivize greener alternatives; do not subsidize oil/gas; force consumers to pay carbon tax; need a national campaign to say "we're going green" just like when JFK said "where going to the moon"...we need a leader.
79. Share burden of diesel truck traffic with other counties.
80. Ban diesel vehicles, enforce statutes on idling, **ban gas leaf blowers.**
81. Stop running empty ACE trains back and forth to Stockton to clean them for Covid. Figure out how to do this in San Jose.
82. Speed bumps in pass through streets in neighborhood
83. Offer rebates for electric/battery solutions.
84. Way too many people have modified exhausts on their cars. Car company's put a great deal of effort into optimizing exhaust noise and catalytic converter efficiency and people completely ruin that effort for their own amusement. We need better rules and better enforcement regarding this.
85. Make city to city dedicated bike trails. you can bike in cities where you live but biking outside of the city requires dangerous interaction between high car traffic & bikes.
86. **Convert landscaping 2-stroke engines to electric.** 2-stroke engines make a ton of noise and pollute far more than a modern automobile. Electric is quieter and can be sourced from renewable energy sources unlike fossil fuels.
87. Limit size of large private jets using the airport.
88. More city/regional programs to encourage EV use, like more charging stations
89. Better dust prevention at the gravel pits near Livermore.
90. More awareness on Spare the Air days. **Encourage electric landscaping.**
91. Provide clean, safe and reasonably prices public transportation. Public transportation should be able to quickly get you to your destination.
92. Publish the limits and the actuals weekly in the local paper (e.g. Pleasanton Weekly). Also, publish limits and actuals in neighborhood social media (e.g. NextDoor). Publish bullets about how best to reduce. (e.g., Limit wood fires, limit car travel, **use electric not 2-cycle lawn** equipment).
93. Noise from Small Airport is sparse and not unpleasant.
94. Backing up warning sound at gravel pit--any other safe way?

95. In my neighborhood, half the homes have gardeners. The all use noisy, polluting gas. These machines are used a lot. Regulations and grants to **encourage switching to quiet, clean electric** would be great!
96. Educate neighbors who pollute the air using their fireplaces.
97. Stop building new homes.
98. Reroute traffic on Stoneridge Drive, it's nonstop!
99. **Recommend electric leaf blowers** only if absolutely needed.
100. Work from home as much as possible. **Encourage electric leaf blowers.**
101. Continue to provide tax rebates for solar power installation and other rebate programs to reduce air or noise pollution.
102. Plant more trees and shrubs to reduce CO2 in the air, only allow loud machinery between 8am-9pm.
103. Enforcement of quiet time.
104. Lead blowers at lowered noise level.
105. MORE TREES/NOISE BARRIER FOR FREEWAYS.
106. Incentivize **electrification of transportation and landscaping;** use low-water landscaping; minimize commute by including low-cost housing in new developments.
107. More easy-to-understand info on what I can actually do to help.
108. Ban gas powered gardening equipment by offering incentive to **switch them to electric;** encourage low maintenance gardens/yards; ban train horns between 10pm-7am; install more free or low cost electric chargers for cars; provide incentive for home chargers; encourage conversion of gas stovetop to electric stovetop; encourage conversion of gas washer/dryer to electric; local incentive for solar; create microgrid for electric storage to help mitigate effects of PG&E power shutoffs.
109. Work with small landscaper/gardeners' businesses to educate them & incentivize them **to switch to electric tools;** ticket noisy custom mufflers.
110. Noise pollution not a real problem. A little annoying on weekends but usually a short time. As long as it continues this way, I would not have an issue. Air pollution is a much bigger issue. Transportation is the problem with congested highways. Maybe the work from home trend will continue long term and that would help. Finding a way to implement a low-cost public transportation system that works for commuters would be one solution. Current system is too fragmented and costly to be effective.
111. **Ban gas-powered landscaping blowers.**
112. Planting more trees and berm along the freeway. **Phase out gas powered lawn equipment**. Electrify homes.
113. a. More "work from home" and home offices; b. Get rid of airplanes and chem trail makers c. larger tax on Port of Oakland incoming crates ... as this causes major pollution (trucks, trains, ships) throughout the Bay Area.
114. More E-vehicle charging stations at Costco or other shopping centers, (perhaps the outlet mall), light pollution is also a problem, though not a health issue for most.
115. Increase awareness/offer trade in on gasoline articles for electric equivalents/ Train connection from Tracy etc to Pleasanton BART-ASAP.
116. **Prohibit gas powered gardening equipment.**
117. No. live 200' from the train (including ACE) tracks in Pleasanton.
118. Encourage solar and wind power generation to lower fossil fuel use.