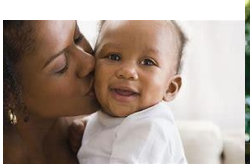
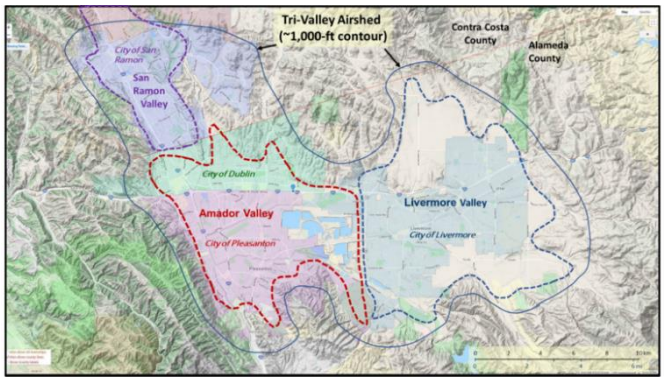
Ensuring Future Air Quality in the Tri-Valley
By the Tri-Valley Air Quality Community Alliance, the Bay Air Quality Management District, and the Alameda County Health Dept.
December 29, 2021

Summary

Surrounded by hills, the San Ramon, Amador, and Livermore Valleys form a basin which can trap and concentrate air pollutants. For decades, Livermore has recorded some of the highest ozone concentrations in the nine-county San Francisco Bay Area Air District. **While our air quality is generally good, one in five of the days each year the outdoor air is unhealthy for sensitive populations including asthmatics, elderly, children, and pregnant women.**


In early 2019, a group of citizens interested in improving our local air quality organized the **Tri-Valley Air Quality Community Alliance (TVAQCA)**. In March 2020, the Bay Air Quality Air Quality Management District (BAAQMD) funded the TVAQCA with a **Community Air Protection Program (Assembly Bill 617) grant** to reach out, strengthen partnerships with community and government agencies, and explore actions and strategies to improve air quality. In 2020-2021 TVAQCA worked with the BAAQMD to understand **what actions by residents, businesses, and local governments could do to ensure our future air quality**.



TVAQCA chose to define our community as a **local airshed** based on the 1,000-ft elevation contour that surrounds the cities of San Ramon, Dublin, Pleasanton, and Livermore. Our four cities have a combined 2020 US Census population over 326,000 comprised of 106,000 households averaging 3 residents each. In 2019, the Tri-Valley racial makeup was about 50% White, 35% Asian, 11% Latino, and 2% Black or African American. The general health of our population is good with most health-related indicators in the 25th percentile relative to the rest of California. However, African American/Black populations experience higher rates of cardiovascular disease and cancer. **With 12% over 65 years of age and 18% asthmatics, up to 100,000 living in the Tri-Valley may experience health effects on days with moderate or higher Air Quality Indexes (AQIs above 50).**

Our local weather determines our air quality. Specific weather conditions create the potential for pollutants to concentrate in our airshed. During summer westerly sea-breezes carry emissions from the inner Bay Area into our airshed and combine with local emissions to create days with high ozone. Freeway traffic on I-580 and I-680 add significantly to local concentrations, especially during heavy commute hours. The Tri-Valley has hundreds of small permitted stationary sources, but no major industrial facilities. That said, sensitive populations near the largest stationary sources or freeways likely experience health effects.

Smoke from California wildfires blankets the Bay Area on Sept. 9, 2020.

Due to controls on burning wood and other sources, local emissions rarely cause high PM2.5 concentrations. However, since 2017 **wildfire smoke** entering our airshed has contributed to episodes with extremely high PM2.5 values. Individual daily exposure depends on one's activities and location. **To reduce exposure especially during wildfire episodes, TVAQCA recommends households with sensitive populations install high-efficiency Heating-Ventilation Air Conditioning (HVAC) air filtration, and optionally indoor air purifier systems.**

One of our key health issues is cancer. While only a few percent of total emissions, **diesel trucks contribute over 85% of the cancer risk in the Tri-Valley.** Statewide controls coupled with BAAQMD's "Diesel Free by '33" program will reduce emissions, but local decisions, such as limited use of diesel generators, can help this significant problem.

CalEPA's CalEnviroScreen and SB 535 analyses did not identify **environmental justice** issues in the Tri-Valley. However, income disparities reveal different exposures. For example, those in low-income housing are likely to experience higher indoor PM2.5 concentrations given the likelihood that their HVAC systems have lower particulate collection efficiencies, or that they might not have air conditioning at all to reduce wildfire smoke indoors.

Our outreach was limited by COVID-19 epidemic restrictions. We were not able to have any Town Hall type of meetings in person, so we made virtual presentations to city governments and a variety of interested parties and organizations. In summer and fall of 2020, we surveyed the Tri-Valley community on air quality concerns. Results showed a **major concern was both noise and emissions from landscaping activities**.

The 2018 emissions inventory prepared by the Air District showed that uncontrolled emissions from landscaping operations are currently equivalent to those from auto traffic in the Tri-Valley. Consequently, an **effective way to reduce ozone is to replace gas-powered landscaping equipment with electric**. We reached out to our community, organized an online forum, launched an incentive program, and funded several landscapers' purchase of electric equipment, as well as reduce the direct exposure of the operators of the gas-powered lawn equipment.

In October 2021 the **state legislature passed AB 1346** which prevents sale of gas-powered landscaping equipment under 25 horsepower by 2024. We also recommend Tri-Valley cities consider implementing ordinances for electric equipment as well as encourage cities, businesses, and

residences to minimize areas with lawns. Reducing lawn area benefits both our response to drought and improves air quality. While the relative contributions local versus transported emissions on our air quality are not easily quantifiable, reductions in local emissions will directly reduce local concentrations.

In addition to causing health effects, air pollution also reduces visibility. For residences on the hillsides and those who hike our surrounding ridges, visibility is especially important. Visual range depends on many variables both natural and anthropogenic. Specifically, higher ozone concentrations result in whitish horizons, and particulates, especially those in the PM2.5 range, reduce visual range and cause red sunsets.

Haze on Sept. 30, 2020, a high ozone day Clear air on Dec. 23, 2020
Views across the Tri-Valley from Pleasanton Ridge to the northeast

The BAAQMD 2017 Spare the Air - Cool the Climate document identifies many actions to improve air quality while reducing climate change. Including air quality considerations with city AB 32 Climate Action Plans (CAPs) makes sense. Each city's General Plans include policies to mitigate air pollution effects from urban growth and increased transportation. However, there does not appear to be a regular venue for jointly addressing air quality issues in the Tri-Valley as an airshed. **We strongly encourage the four cities and associated county governments include discussion of air quality policies for the Tri-Valley Airshed in parallel with CAP development**.

Acknowledgements

We recognize the input many city and county officials provided as well as individuals from several stakeholder organizations over the last two years. Since our project began concurrent with the onset of COVID-19 restrictions, unfortunately almost all of our interactions were limited by online meetings.

Aneesh Rana is the BAAQMD point of contact for our AB 617 project. Alesia Hsiao provided technical support including sections on BAAQMD plans for improving regional air quality and the health risk assessment from local sources, as well as coordinating the Air District's review of this document. Daniel Alrick and Steven Reid commented on the *Understanding our Air Quality* section. Steven Reid provided a detailed emissions inventory for the Tri-Valley. We greatly appreciate the expertise from the Air District for their guidance for our understanding of our air quality issues. Sandi Gálvez, Director, Health Equity, Policy, & Planning of the Alameda County Health Department, provided recent analyses of health impacts from air pollution in the Tri-Valley included in Section 3.4.3.

Ron Baskett, Chair of the TVAQCA Science Committee, is the lead author of this document. Bruce Daggy, Chair of TVAQCA Oversight Committee, wrote much of Section 2. Laurene Green, Oversight and Science Committees, conducted the TVAQCA 2020 Air Quality Survey and analyzed the survey results. Both Bruce and Laurene thoroughly reviewed and commented earlier drafts.

Ensuring Future Air Quality in the Tri-Valley

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Aerial view of Tri-Valley taken in 2016 above Pleasanton Ridge looking north to Pleasanton, Dublin, and San Ramon with Livermore off to the east. Unincorporated Castlewood is in the lower left; Mt. Diablo is in the upper left. Source: (wikimedia.org)

1. Background

1.1 Background leading to Assembly Bill 617

The Clean Air Act (CAA) of 1970 directs the U.S. Environmental Protection Agency (EPA) to "protect the public health within a margin of safety." U.S. EPA established the National Ambient Air Quality Standards (NAAQS) for 6 major pollutants known to cause health effects: sulfur dioxide, nitrogen dioxide, particulate matter, carbon monoxide, ozone, and lead. Primary standards are set to protect public health with a margin of safety, including protecting sensitive populations such as asthmatics, pregnant women, children, and the elderly. Secondary standards safeguard public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The California State Implementation Plan (SIP) shows what reductions in emissions are needed to attain the federal standards. California has led the nation with stringent mobile source emissions regulations for both from automobiles and diesel vehicles. California has also implemented state standards, some of which are more stringent than federal standards. While California's air quality has continuously improved for over 60 years, several areas continue to experience problems attaining the standards. To engage communities in the process of improving their local air quality, in 2017 the state legislature passed Assembly Bill 617 (C. Garcia, Chapter 136, Statutes of 2017).

AB 617 directs local air districts engage with communities which still have not attained state and federal standards. AB 617 requires the California Air Resources Board (CARB), with input from community groups, air districts, and stakeholders, to select locations from around the state to prepare community-led plans to reduce emissions of criteria pollutants and toxic air contaminants from non-vehicular sources. The primary requirement for selecting a community is a demonstrated

high cumulative exposure burden. A key goal is to remedy elevated exposures affecting disadvantaged communities, see: Advancing Environmental Justice: A New State Regulatory Framework to Abate Community-Level Air Pollution Hotspots and Improve Health Outcomes.)

In 2018 BAAQMD published, San Francisco Bay Area Community Health Protection Program: Improving Neighborhood Air Quality (BAAQMD 2018a) and provide a Community Health Protection website: https://www.baaqmd.gov/community-health/community-health-protection-program.

1.2 Why was AB 617 funding available to the Tri-Valley?

Most of the time the Tri-Valley within the standards. However, in the past, the ozone (O_3) and Fine Particulate Matter (PM2.5) air quality standards have been exceeded at the District's Livermore Air Quality Monitoring Station. Consequently, starting in 2014, the BAAQMD CARE Program identified the **Tri-Valley as an Impacted Community (Figure 1-1).** This designation provided the pathway for the Tri-Valley to be considered for AB 617 funding (see BAAQMD 2018b Final Submittal: Public Process for Determination of Recommended Communities).

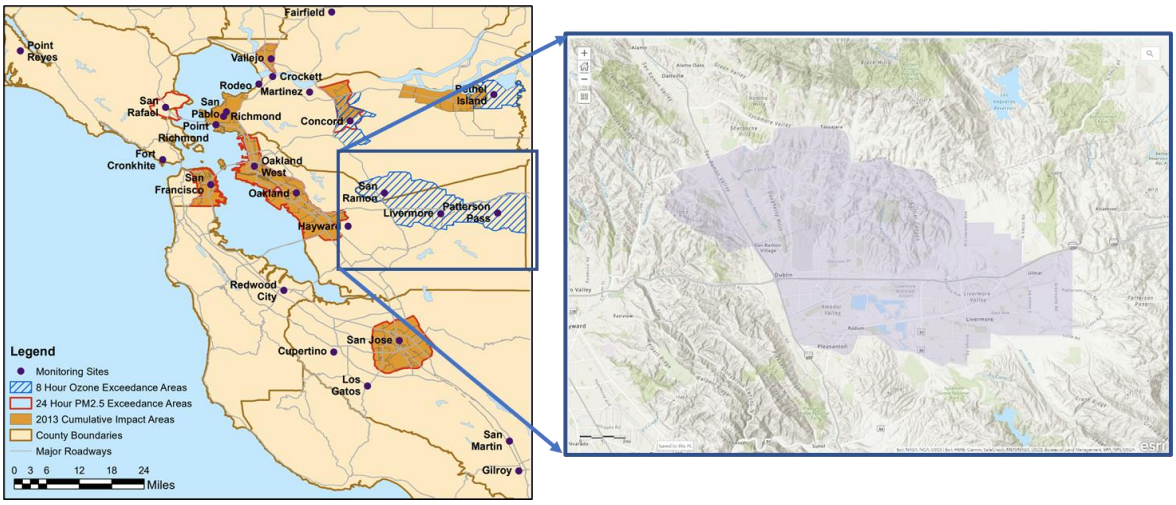


Figure 1-1. Map of CARE Impacted Communities (Source: BAAQMD CARE Program).

Ozone takes several hours to form from photochemical reactions with nitrogen dioxide and hydrocarbon emissions. Many of these precursor emissions, as well as ozone itself are transported into the Tri-Valley. Detailed photochemical modeling may or may not be able to quantify how much of our high ozone concentrations are due to emissions upwind versus locally generated, thus that effort was not planned for our project.

The BAAQMD (2018b) indicates that the Tri-Valley has "high health-burden neighborhoods with disproportionately high exposure to air pollution due to significant sources." However, the Tri-Valley does not have a major industrial source such as a refinery or power plant. Consequently, we look to the detailed emissions inventory to understand any local effects.

2. TVAQCA origin and organization

2.1 TVAQCA origin

With the goal of acquiring AB 617 funding, in 2019 a group of concerned citizens formed the Tri-Valley Air Quality Community Alliance (TVAQCA). **On April 25, 2019**, four members (Bruce Daggy, Van Rainey, Ann Brown, and Jennifer Yeamans) plus Trish Munro, a member of Livermore City Council, held our first meeting at Livermore City Hall to discuss developing an AB 617 grant proposal for the

Tri-Valley. Scott Haggerty, Alameda County Board of Supervisors, offered to identify and convene individuals in the community who would develop the grant proposal. Later Laurene Green and Ron Baskett joined the group. Pleasanton City Council members Karla Brown (subsequently Mayor) and Julie Testa (subsequently Vice Mayor), also participated in early discussions and offered support. Throughout 2019, the group continued to meet and work toward a grant submission. Under the direction of Kathy Young, The Tri-Valley Nonprofit Alliance (TVNPA) offered to act as the contracting agency and budget holder.

On January 31, 2020, TVAQCA applied for a grant and on **March 2, 2020,** BAAQMD funded TVAQCA GRANT NO. 2019.328 for $50,000. Bruce Daggy and Jennifer Yeamans spearheaded the development of our first year (March 2020-February 2021) Work Plan with review and input from the BAAQMD AB 617 Point of Contact, Aneesh Rana, and Michael Chao.

2.2 TVAQCA organization

The Community Air Protection Blueprint | California Air Resources Board (CARB 2018) States: "The **Community Steering Committee (CSC)** membership brings together an inclusive group of stakeholders with community knowledge, technical and scientific expertise, and the authority and responsibility for implementing effective solutions for cleaner air." TVAQCA chose to call our managing body an **Oversight Committee** so as not to be confused with other existing steering committees in the Tri-Valley. We set up an internal informal organizational structure shown in **Figure 2-1**. Bruce Daggy has served as Chair of the Oversight Committee from grant approval through 2021.

Ron Baskett led a **Science Committee** which gathered and analyzed data to create the scientific foundations of our air quality. Ann Brown led the Education Committee and coordinated outreach to the middle and high schools and associated school districts, as well as Las Positas College.

We formed an **Advisory Group** with representatives from city and county governments, schools and district offices, businesses, and health, environmental, civic, trade, faith, student, and senior organizations. We used these contacts to communicate our message and gather feedback.

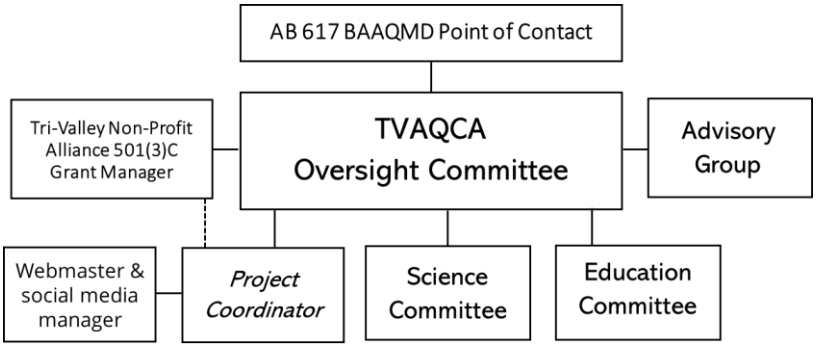


Figure 2-1. Organization of the Tri-Valley Air Quality Community Alliance (TVAQCA)

Initially, our Oversight Committee hired a paid consultant as a **Project Coordinator**. However, changes to the work plan due to the COVID-19 pandemic caused that individual to step down. Since then, the project has been an all-volunteer effort, except for an honorarium for Lauren Chang, a student who acts as webmaster and social media manager.

2.3 Definition of the Tri-Valley Community

TVAQCA chose to define our community as an airshed based on a 1,000 ft elevation contour that surrounds the BAAQMD CARE Program boundary. **Figure 2-2** shows the Tri-Valley Airshed—a topographically-confined area that can trap pollutants and result in high concentrations. 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. Appendix A discusses the Tri-Valley Airshed and the Zip Codes and Census Tracts within its boundary.

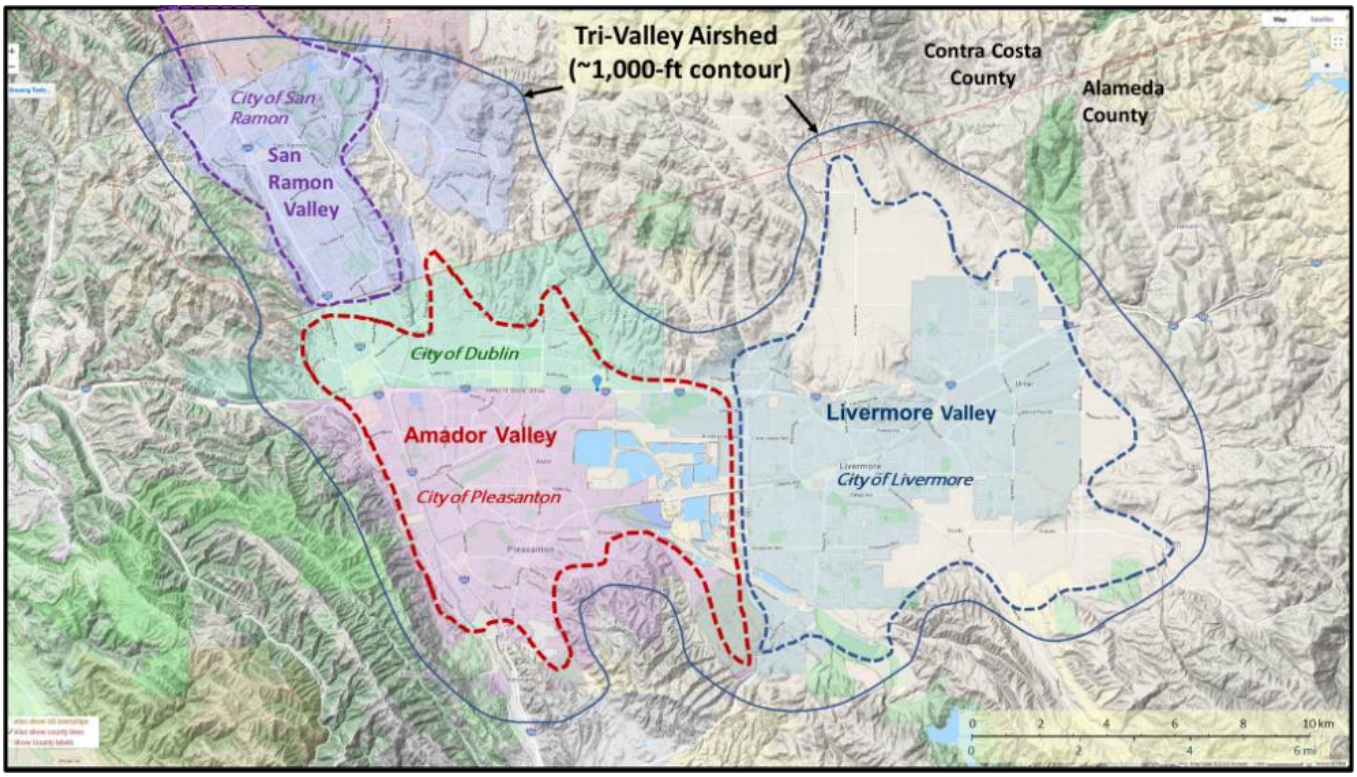


Figure 2-2. Tri-Valley Airshed defined by the 1,000-ft contour surrounding the San Ramon, Amador, and Livermore Valleys; valley floors are depicted by dashed lines. (Created from Google Maps base)

3. Tri-Valley: About the Community

3.1 Historical perspective

Once occupied by Native American Ohlone tribes, the Tri-Valley saw a transformation beginning with Spanish settlers arriving in the late 1700s, colonizing the valley, and initiating agriculture. During the 1800s and early 1900s infrastructure was developed, more vineyards planted, downtowns built, and housing expanded. From the mid-1900s to present, the suburban communities grew over 10% per year. Appendix B provides more detail of key historical events.

3.2 Land Use

Tables 3-1 and 3-2 summarize amount of land in each broad land use category for the Tri-Valley cities. **About half of each city is suburban neighborhoods**, almost 10% commercial and a third in parks, schools, and open space. Each Tri-Valley city has a town center, city government offices, schools, parks, golf courses, medical facilities, religious institutions, retail centers, commercial areas, and business parks. Sparce residences, regional parks, ranches, vineyards and open space surround the incorporated areas. Appendix C provides maps of each city's land use, zoning, and planning maps from city General Plans.

Table 3-1. Summary of Tri-Valley city land use in square miles.

Land Use Category	San Ramon	Dublin	Pleasanton	Livermore	Four-City Total
Residential	8.1	9.2	12.5	8.6	38.4
Commercial	0.6	1.9	2.3	2.8	7.6
Parks, Schools and Open Space	7.8	3.5	11.3	5.0	27.6
Other	1.6	0.3	0	8.8	10.7
Total City Area	18.1	14.9	26.1	25.2	82.3

Table 3-2. Summary of Tri-Valley city land use as percent of city area.

Land Use Category	San Ramon	Dublin	Pleasanton	Livermore	Four City Average
Residential	44.8	61.7	47.9	34.1	47.1
Commercial	3.3	12.8	8.8	11.1	9.0
Parks, Schools and Open Space	43.1	23.5	43.3	19.8	32.4
Other	8.8	2.0	0.0	34.9	11.4

Table notes:

- The land use categories are extracted from each city's General Plans.
- The "Other" category is the difference between the sum of the general categories and the total.
- The total area is inside each city limits according to the U. S. Census except for Pleasanton's 2025 General Plan includes 2 square miles greater than Census.

Figure 3-1 highlights key non-residential elements in the Tri-Valley including:

- Bishop Ranch Business Park in San Ramon
- Hacienda Business Park in north Pleasanton
- Bernal Corporate Park in south Pleasanton
- Stoneridge Mall on the northwest side of Pleasanton
- Alameda County Fairgrounds on the south side of Pleasanton
- San Francisco Premium Outlets, a large outdoor mall on east side of Pleasanton
- Camp Parks, Federal Correctional Institute, and Alameda County Jail on north side of Dublin
- Livermore Municipal Airport owned by the City of Livermore
- Elliott Quarry Sand and gravel operations and Shadow Cliffs Regional Park-center of Airshed
- Lakes including some used for drinking water from former gravel pits
- Las Positas College on the north side of I-580 at Hwy 84
- Livermore Industrial parks on the east side of the Airport and northeast side of the city
- Lawrence Livermore National Laboratory (LLNL) and Sandia National Laboratory (SNL) on the east side of Livermore
- Sycamore Grove Park on the south side of Livermore
- Vineyards and wineries in the south Livermore Valley (unincorporated area)
- Farm and cattle ranches in north Livermore Valley (unincorporated area)

Unique to the Tri-Valley are the **sand and gravel operations** along Stanley Road between Pleasanton and Livermore. The Alameda County Community Development Agency (CDA) Neighborhood

Preservation and Sustainability Department (NPS) administers permits for the surface mines on unincorporated county lands. In 1971, Kaiser Industries returned a 266-acre gravel quarry to East Bay Regional Park District. This is now the Shadow Cliffs Regional Recreation Area with an 80-acre lake. Since 1987, the county has been evolving a reclamation plan to restore the Chain of Lakes to provide groundwater recharge lakes and a regional recreational area. **Wineries** expanded from a few in the early 1900s to currently 55 with tasting rooms, see Livermore Valley Wine Trails and Visit Tri-Valley! Wineries, Restaurants, Breweries and More (visittrivalley.com). The Tri-Valley Conservation Agency coordinates maintenance of open space south of Livermore. Also significant with respect to air quality are the two **landfills** on the northeast side of the airshed.

For a business perspective, Snapshot of the Tri-Valley Region in California's San Francisco Bay Area (innovationtrivalley.org) addresses the need for greater transit connectivity, improved transportation infrastructure, a larger supply of housing for a range of income groups, preparedness for future innovations in mobility and the nature of work, and enhanced support for entrepreneurship and innovation in the Tri-Valley.

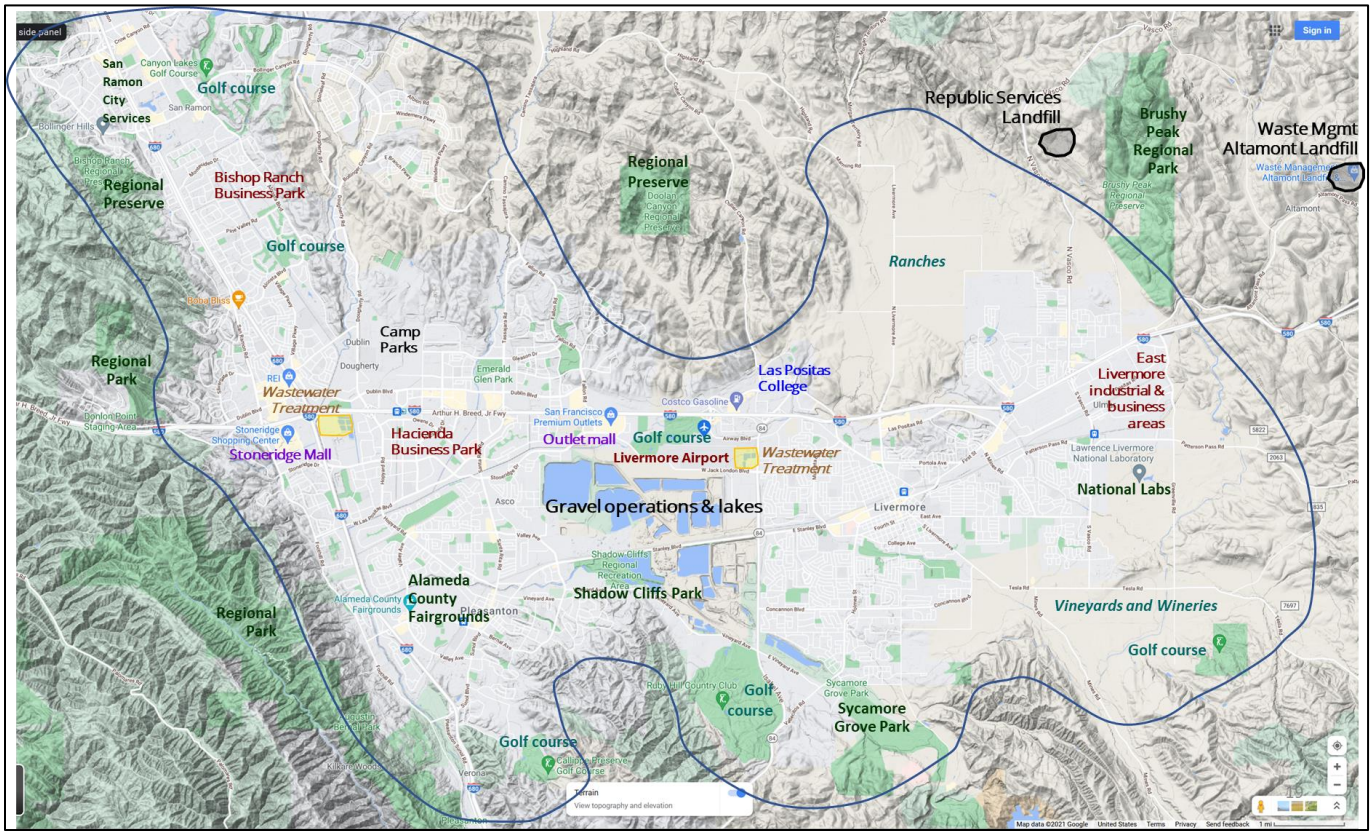
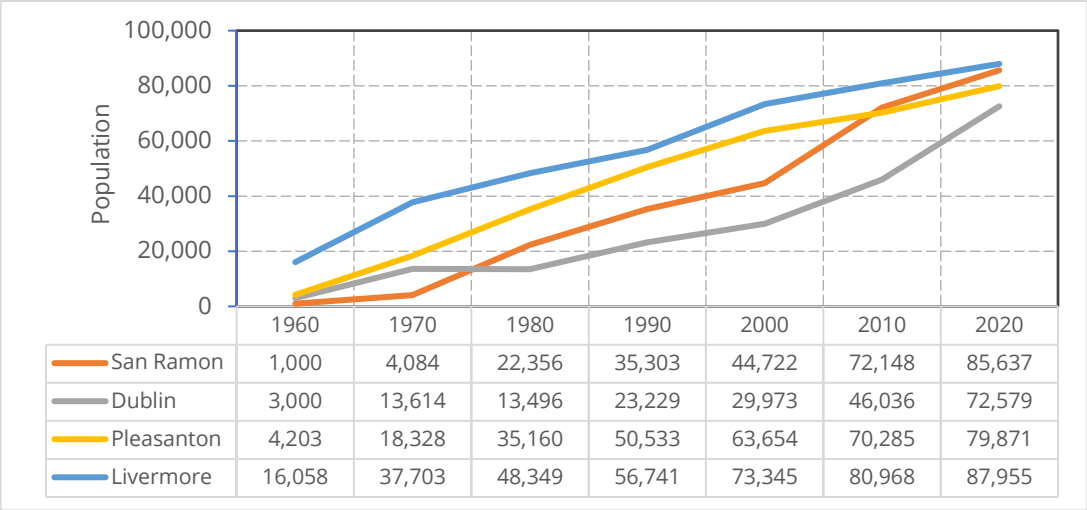


Figure 3-1. Key non-residential land use elements in the Tri-Valley Airshed (Created using Google Maps base).

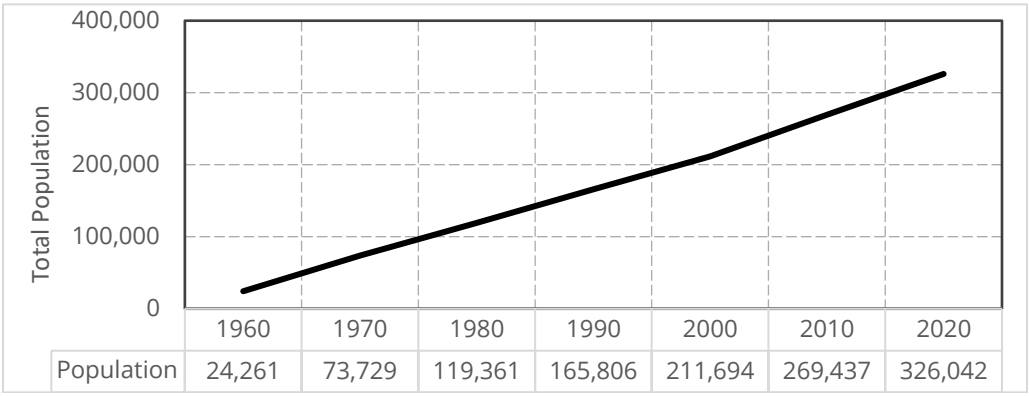
3.3 Population

Figures 3-2 and **3-3** show six decades of population growth in the Tri-Valley. Population of the unincorporated areas are not included in these data (Alameda and Contra Costa County's unincorporated areas represent about 5-6% of total county population). The total Tri-Valley urban population reveals a steady growth for the last 70 years. The 2020 Census showed San Ramon grew by 17%, Dublin by 58%, Pleasanton by 14%, Livermore by 9% from 2010 to 2020. The population is projected to grow by about 60,000 in the next 20 years (Source: Projections 2040 - Forecasts for Population Households and Jobs (planbayarea.org).)



	1960	1970	1980	1990	2000	2010	2020
San Ramon	1,000	4,084	22,356	35,303	44,722	72,148	85,637
Dublin	3,000	13,614	13,496	23,229	29,973	46,036	72,579
Pleasanton	4,203	18,328	35,160	50,533	63,654	70,285	79,871
Livermore	16,058	37,703	48,349	56,741	73,345	80,968	87,955

Figure 3-2. Population growth of the four Tri-Valley Cities from 1960-2020.



	1960	1970	1980	1990	2000	2010	2020
Population	24,261	73,729	119,361	165,806	211,694	269,437	326,042

Figure 3-3. Total population of the four Tri-Valley cities (Source: U.S. Census).

3.4 Demographics

We use several sources to describe our demographics:

- US Census as of July 1, 2019, for population makeup, housing, and economic characteristics.
- California EPA's Office of Environmental Health Hazard Assessment CalEnviroScreen for environmental and health-related factors.
- Alameda County for specific health-related demographics

Note: US Census data updated July 1, 2019 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. Quick Facts were not available for 2020 census as of November 11, 2021.

Appendix D provides the data.

3.4.1 US Census demographics

Figure 3-4 shows race varies among the 4 cities' populations with Livermore at 75% White and 16% Hispanic or Latino population. The Tri-Valley average racial makeup is 53% White, 35% Asian, and 11% Latino. About a third of the Tri-Valley residents were born in a foreign country and about 38% of our population speak a foreign language at home.

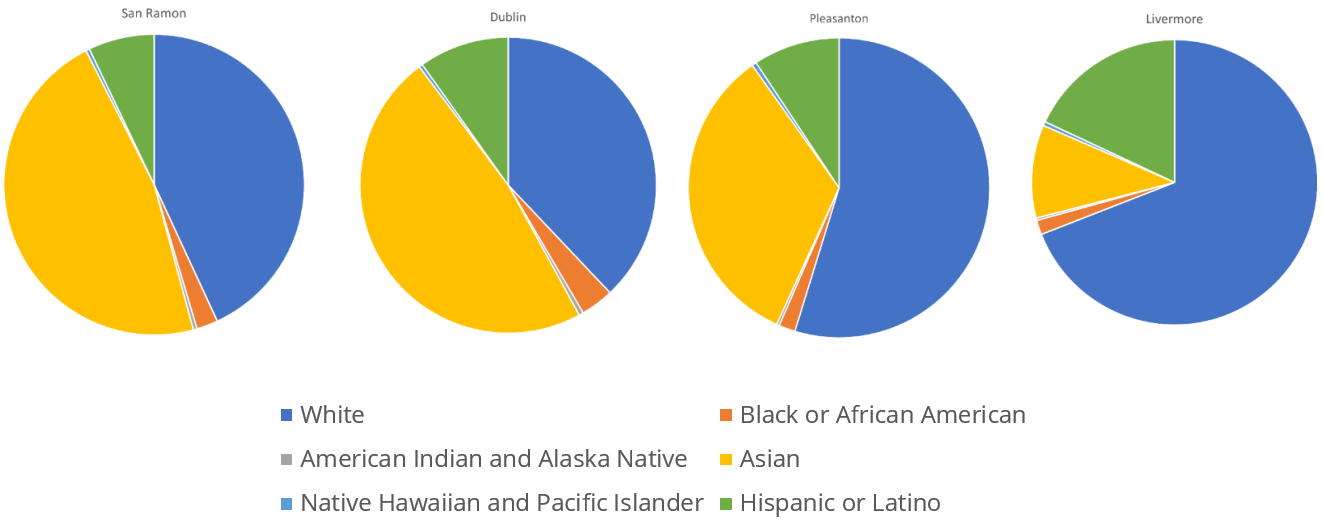


Figure 3-4. Racial makeup of the four Tri-Valley Cities from 2019 US Census data.

In 2019, about 12% of the Tri-Valley's population was 65 years and over. The four-city total of about 106K households are 70% owner-occupied averaging about 3 residents. About 70% are homeowners with a median home value of $900K. About 61% received a B.S. or higher degree and over 97% use computers at home most with Internet access.

About 70% are in the labor force and on the average take about 37 minutes to get to work. The median household income in 2019 was about $150,000 with about 4% living at the poverty level (the 2019 poverty level was below $13K per individual or $20K for a family of 3; see: How the Census Bureau Measures Poverty).

3.4.2 CalEPA pollution burden and population characteristics

CalEPA's **CalEnviroScreen** tool ranks pollution burden and population characteristics for each California census tract. The current Version4 employs 21 indicators:

- 13 indicators of pollution burden
  - 8 types of pollution exposure
  - 5 environment effects
- 8 indicators of population characteristics
  - 3 health-related factors of sensitive populations
  - 5 socioeconomic factors

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.

Appendix D provides detailed tables and maps of CES indicators for the census tracts in the Tri-Valley. Each census tract in California is ranked from 1 to 100 percentile with 100 being the largest effect. We discuss those pollution exposures relevant to air quality—Ozone, PM2.5, Diesel PM, Toxic Releases, and Traffic Density.

Traffic Density and Diesel PM emissions create our largest pollution exposure with 50-percentile rankings. While diesel emissions percentile went down by 10% between 2018 and 2020, traffic density is increased by 6%. Diesel exposure depends strongly on the proximity to dense freeway traffic. Traffic density runs in the 80th and 90th percentiles along I-580 than I-680. Consequently, as shown in **Figure 3-5,** census tracts along the freeways experience similar high percentiles of Diesel PM emissions.

Average Tri-Valley **ozone** exposure is in the 25th percentile range and shows 5% improvement in the last few years. Exposure to **toxic releases** in the Tri-Valley runs about 35th percentile with higher values on the east side of Livermore. **Pesticide use** is around the 20th percentile in all census tracts except south Livermore.

The overall CES4.0 Pollution Burden includes rankings from the 7 Exposures, 6 of which are related to air quality and 5 types of Environmental Effects, none appear directly related to air quality. **The Tri-Valley ranks in the 26th percentile for overall Pollution Burden compared with the rest of California**.

CalEnviroScreen **Population Characteristics include health-related and socioeconomic factors.** Health-related indicators focus on sensitive populations which include the infirmed, children, the elderly, and people sensitive to air pollutants. Examples of sensitive receptor locations are hospitals, childcare centers, schools, playgrounds, rehabilitation centers, residences, and senior housing, including assisted living and nursing homes.

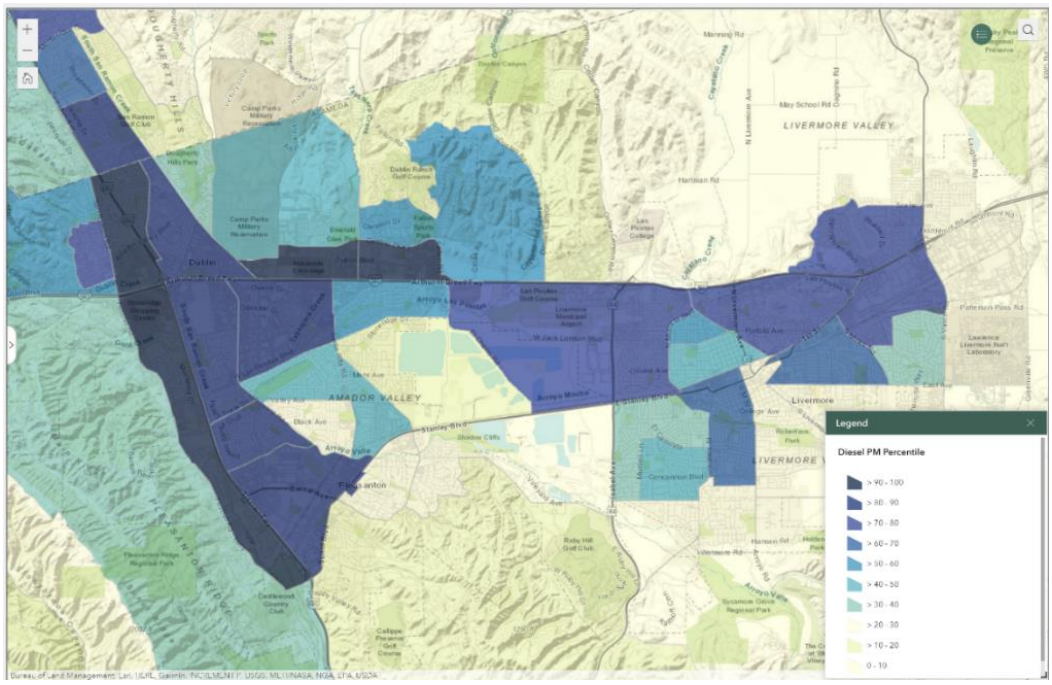


Figure 3-5. CalEnviroScreen 4.0 Diesel Particulate Matter rankings for Tri-Valley census tracts.

Key Health-Related Population Characteristics in the Tri-Valley:

- Asthma and Cardiovascular Risk are currently 22nd and 24th percentiles respectively due to 9% and 20% improvements between 2018 and 2020.
- Dublin and Pleasanton are in the 22nd percentile for **Asthma** rate of emergency department visits while San Ramon and Livermore are slightly higher at the 28th percentile. Cardiovascular disease expressed as age-adjusted rate of emergency department visits of heart attacks per 10,000 is highest in Livermore at the 62nd percentile with other cities in the 30th range.
- The health-related measure for pregnant women is **Low Birth Weight**—the Tri-Valley averages about 5% which ranks 50th percentile statewide.

Key Socioeconomic Factors Population Characteristics in the Tri-Valley:

- **Education** is 20th percentile measured by the percent over 25 without High School diploma.
- **Poverty** ranks 10th percentile with one census tract in east Livermore at 80th Percentile. **Housing Burden for low-income** averages 18th percentile but two census tracts in East Livermore and south Pleasanton report up to 70th.

The SB 535 analysis did not identify any Disadvantaged Communities in the Tri-Valley. While there are a few census tracts showing need within Livermore, **Environmental Justice from air pollution is not identified as an issue in the Tri-Valley.** That said, we are concerned about outdoor workers who may not live here, particularly those using gas-powered lawn equipment, or those living/working/going to school in buildings with inadequate air filtration during fire season.

3.4.3 Alameda County health impact estimates

Sandi Gálvez, Director, Health Equity, Policy, & Planning of the Alameda County Health Department, provided recent analyses of health impacts from air pollution in the Tri-Valley. The primary source of data is from the 2017-2019 Alameda County Public Health Department (ACPHD) Community Assessment, Planning, and Evaluation Unit (CAPE).

Conclusions including **race/ethnicity** comparisons are:

1. Life expectancy
    - Tri-Valley residents live 1-2 years longer than the county 82.3-year average.
    - On the average, African American/Black people will live 6 years less than those from other racial groups in the Tri-Valley.
2. Mortality rates
    - Livermore has the same cancer mortality rate as Alameda County average of 135 per 100,000 people; Pleasanton and Dublin are lower with 119 ad 117, respectively.
    - Similar to 116 per 100,000 people for Alameda County, Dublin has a heart disease mortality rate of 114, but Livermore with 109 and Pleasanton at 97 are lower.
    - African American/Black people have the highest cancer rates and significantly higher rate of heart disease (see **Figure 3-5**)
    - Hispanics have the lowest cancer rates while Asian people are lowest for heart disease.
    - For Chronic Lower Respiratory Disease (CLRD), Tri-Valley adult asthma rates are similar to the rest of the county, but asthma hospitalization for all ages in the Tri-Valley is half the county average.
3. **Low birth weight** (LBW or less than 2500 grams or 5.5 pounds)
    - The Tri-Valley has a few percent less LBW than the rest of the county for all racial groups except Asians who are similar to the county average.

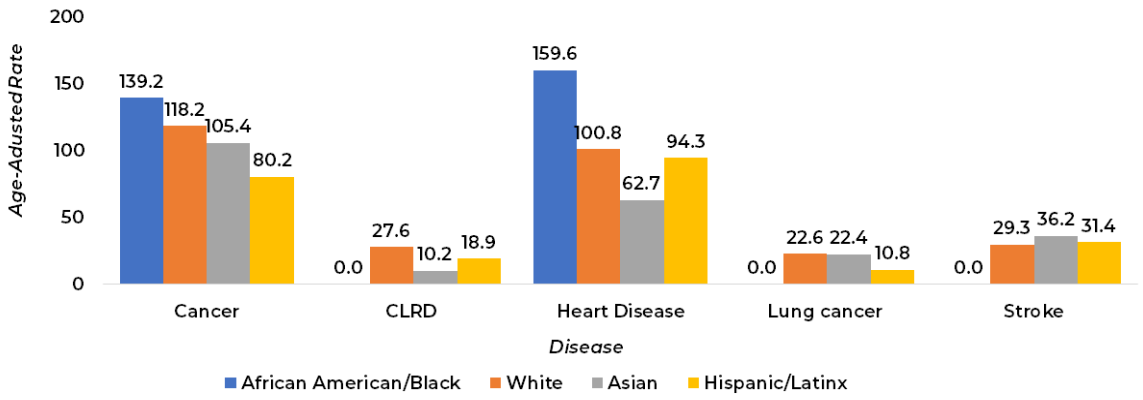


Figure 3-5. Tri-Valley mortality rates by disease and race. (Source: Alameda Co. Health Dept.)

Note: CLRD, Lung cancer and Stroke mortality rates for African-American/Black people are not reported due to low counts.

Appendix E provides the Alameda County Health Department Health PowerPoint slides.

4. Tri-Valley: Understanding Our Air Quality

4.1 Air quality history

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 delivers alerts to the public on methods to mitigate forecasted high ozone or particulates. That said, the standards are still occasionally exceeded resulting in negative health effects especially for sensitive populations.

Table 4-1 lists the three BAAQMD air monitoring stations in the Tri-Valley. Located centrally in our Airshed, the Livermore station provides a comprehensive 4-decade record. Appendix F discusses other data sources such as private Purple Air PM2.5 sensors. As these data are not quality assured, they are not used for our main analyses.

Table 4-1. BAAQMD air monitoring stations in the Tri-Valley.

(Source: BAAQMD 2020 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	O3, 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.		O3, NOx	

Note: The Livermore and San Ramon stations are also Air District Photochemical Assessment Monitoring Stations (PAMS) that measure speciated hydrocarbons hourly. We discuss the recently added Ultrafine Particles (UFP) in Appendix F.

For decades, Livermore has recorded some of the highest ozone concentrations in the 9-county San Francisco Bay Area (SFBA). **Figure 4-1** 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. As of this report date, the federal ozone standard has been exceeded on 9 days in 2021.

EPA currently designates the SFBA non-attainment for the federal 8-hour ozone standard and attainment for 24-hour and annual PM2.5 (Air Quality Design Values | US EPA). SFBA ozone non-attainment is due to exceedances at Livermore. (California also sets air quality standards, some of which are more stringent than federal; see BAAQMD Air Quality Standards and Attainment Status).

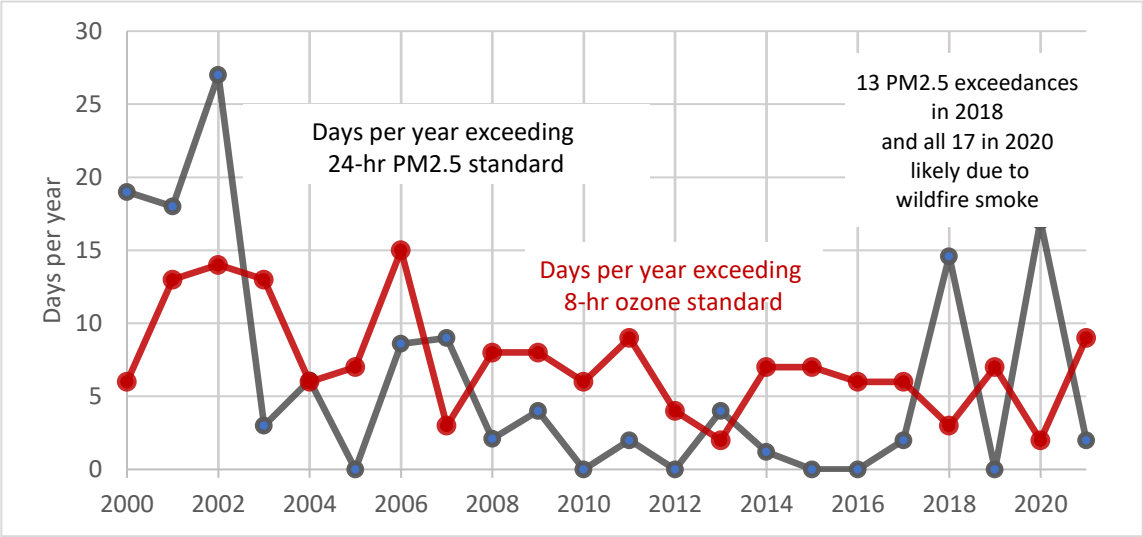


Figure 4-1. Number of days each year that the federal 8-hr ozone and 24-hr PM2.5 standards were exceeded at Livermore from January 1, 2000, to December 22, 2021. (Created from EPA AirData)

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 likely largely due to sources upwind from either the inner Bay Area cities or the Central Valley. The Air District addresses nitrogen oxide (NO_x) and reactive organic gases (ROG) controls on a regional basis (see Table 5-13 Control Measures in the 2017 Spare the Air – Cool the Climate Plan). Determining how much benefit reducing local NO_2 and ROG emissions would have on local ozone is a complex problem likely requiring a dispersion modeling study.

The effects of wildfires are quite significant since 2018. Our analysis from satellite plumes shows that wildfire smoke dominated when PM2.5 standard was exceeded on:

- 13 of the 15 exceedance days in 2018
- All 17 exceedance days in 2020
- Both 2 exceedance days in 2021

Also, both ozone exceedances in 2020 appear on the first day of wildfire smoke plume arrivals in our area. It is interesting that 2020 had only 2 exceedance days during COVID-19 while 2021 had 10 days after traffic may have picked up.

The number of daily exceedances tell part of the picture, but because small particles can accumulate in the lung the total annual exposure for PM2.5 is also important. **Figure 4-2** shows that the Livermore annual average is 9 ug/m^3 or 75% of the current federal standard of 12. Experts recently

reviewed the PM standards and 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).

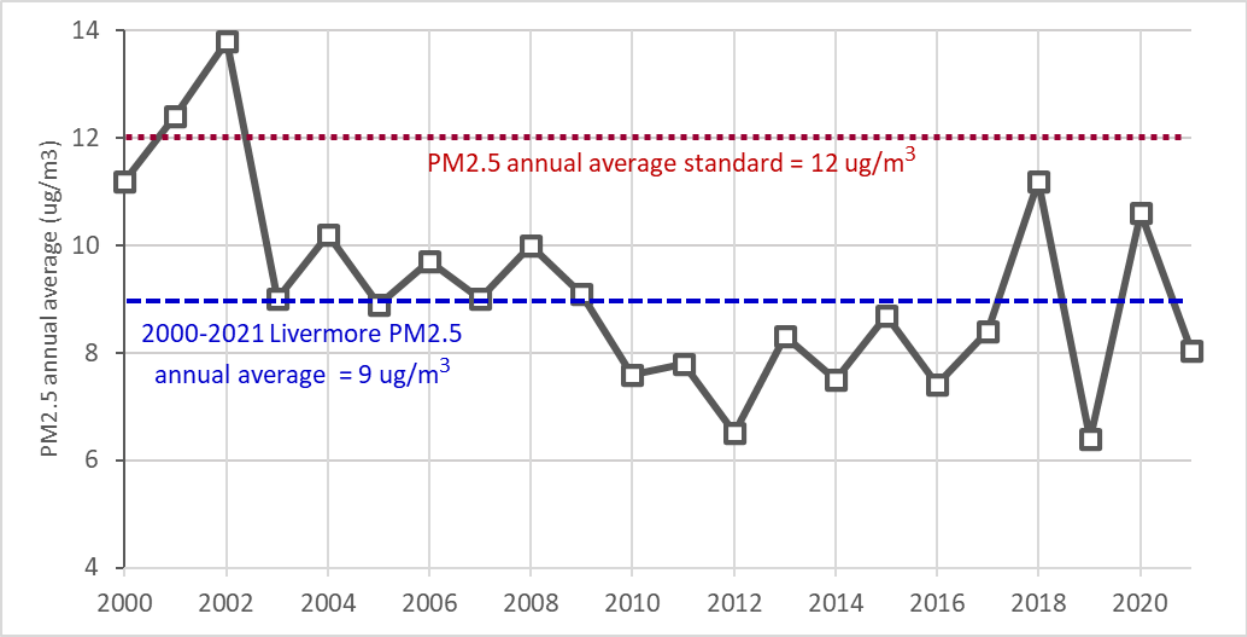


Figure 4-2. Annual average PM2.5 concentration at Livermore from January 1, 2000, to December 22, 2021. (Source: EPA AirData)

The Air Quality Index (AQI) provides a scale of daily health effects. The unitless scale ranges from 0 to 500 with 100 being the air quality standard. Air quality is considered good for an AQI from 0 to 50 The moderate category from 50 to 100 AQI represents **health risk to sensitive populations** and 100 to150 is unhealthy air for sensitive people.

Sensitive populations include asthmatics, pregnant mothers, babies, and elderly.

Figure 4-3 shows that **for the last decade one in five days the average AQI for ozone or PM2.5 has either been moderate (70 days/yr) or unhealthy (10 days/yr) for sensitive populations.** The average annual Livermore combined O_3 and PM2.5 AQI for the last decade is 34 with 2020 and 2021 being the highest two years at 37 and 36 respectively. Since 2018 the PM2.5 AQI at Pleasanton's Owens Court station near I-580 has averaged 4 higher than Livermore. On the average the San Ramon AQI for ozone is 4 lower than Livermore.

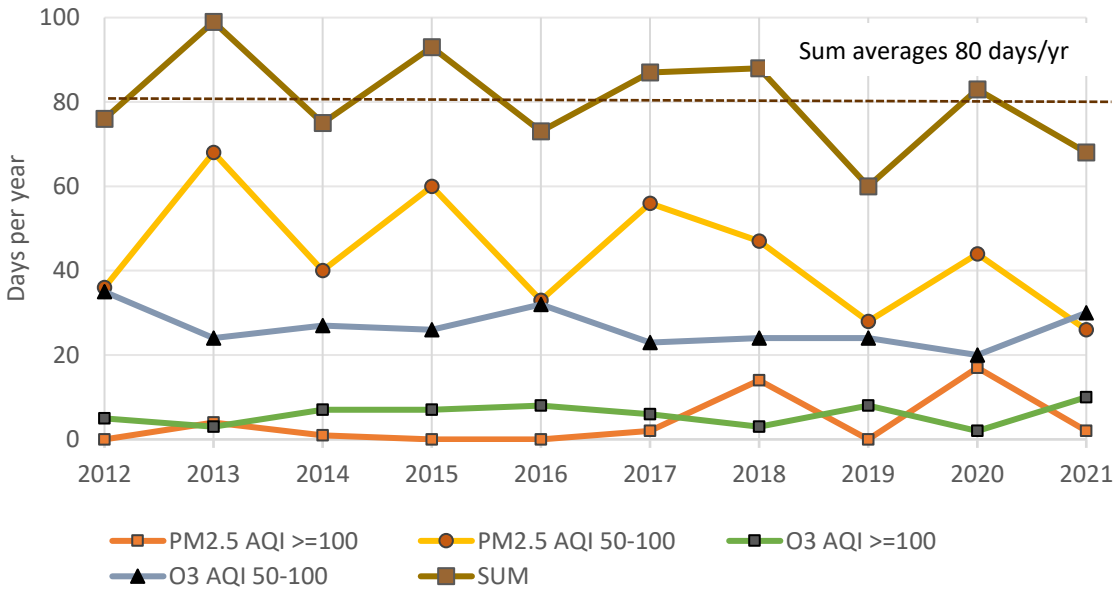


Figure 4-3 Days per year from 2012 to 2021 that Livermore PM2.5 and Ozone AQI was either moderate or unhealthy. For the sum, the higher AQI was used on duplicate days. (EPA AirData as of Nov. 22, 2021)

Figures 4-4 and 4-5 show the seasonality of the daily AQI for ozone and PM2.5 in Alameda County for 2010 through Nov. 11, 2021. While the highest ozone is mostly at Livermore, the highest PM2.5 varies around the county. Higher ozone occurs during May to October. Before 2017 most of the higher PM2.5 concentrations occurred in winter, likely associated with local wood burning. With greater controls and Spare the Air alerts, winter PM2.5 concentrations have fallen. However, since 2017 wildfires smoke transported into the Tri-Valley have caused the PM2.5 peak concentrations to occur in August to November.

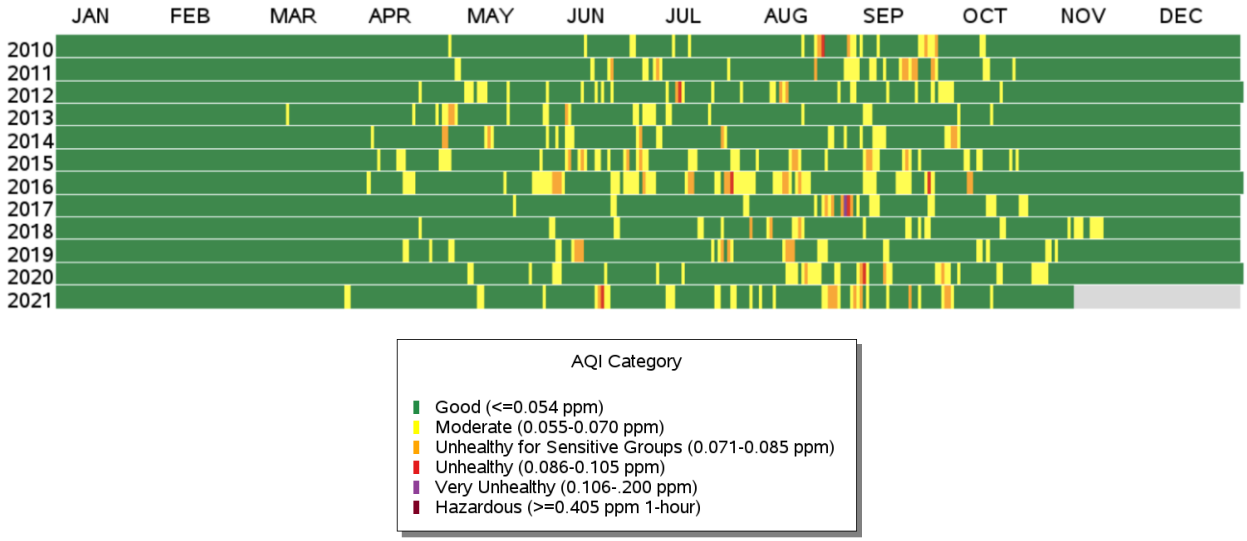


Figure 4-4. Daily ozone AQI in Alameda County for 2010-2020. (Source: Air Data - Multiyear Tile Plot | US EPA)

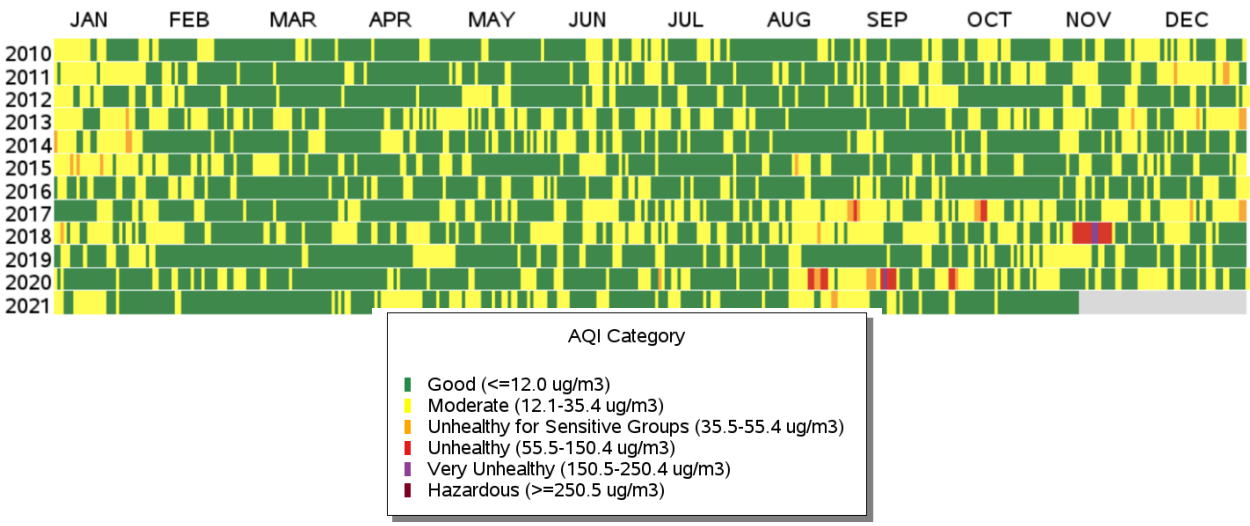


Figure 4-5. Daily PM2.5 AQI in Alameda County for 2010-2020. (Source: Air Data - Multiyear Tile Plot | US EPA)

4.2 Air pollution potential

Given that day-to-day emissions are relatively constant, **the weather is primarily responsible for determining air pollutant concentrations. The two key weather factors that determine the potential for air pollution are wind speed and mixing height.** The mixing height is the distance from the ground to the base of a temperature inversion. The combination of low wind speeds and low inversion heights cause the highest potential for pollution buildup. Appendix F describes air pollution potential in more detail.

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. **Figure 4-6** shows the frequency of wind directions from which the wind blows and associated wind speeds 10 m above ground at the Livermore Airport.

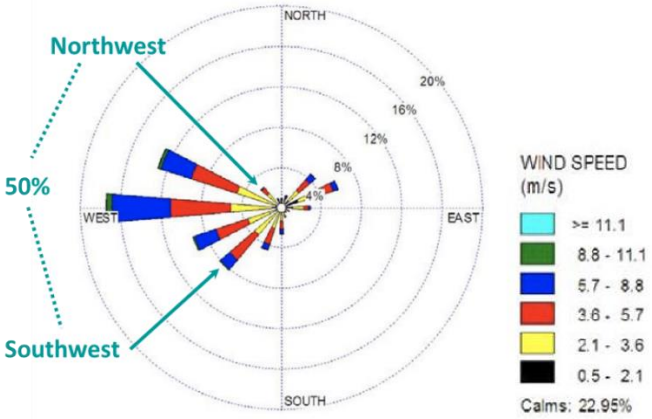


Figure 4-6. Annual wind rose at the Livermore Airport (Source: CARB APPENDIX F Wind Roses and Statistics for Surface Meteorological Stations).

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. After westerly winds enter the Tri-Valley, the flow tends to spread out and slow significantly resulting in calm conditions (less than 0.5 m/s or 1 mph). **Calms occur about 23% of the hours each year, mostly at night. During stagnant conditions local**

emissions accumulate within the airshed. Some nocturnal drainage flow will move the air toward lower elevations in the southwest corner of the Tri-Valley.

The unique combination of the topography and weather result in two seasons for higher air pollution in the Tri-Valley—summertime ozone and wintertime PM2.5. In recent years, wildfires have created a third air pollution season.

4.3 Summer ozone season

On the majority of the days from May through October, high-pressure system over the west coast creates a Mediterranean climate and an "air-conditioned Bay Area." **Figure 4-7** illustrates a typical summer afternoon sea breeze flow with winds entering our airshed from the west and exiting to the east.

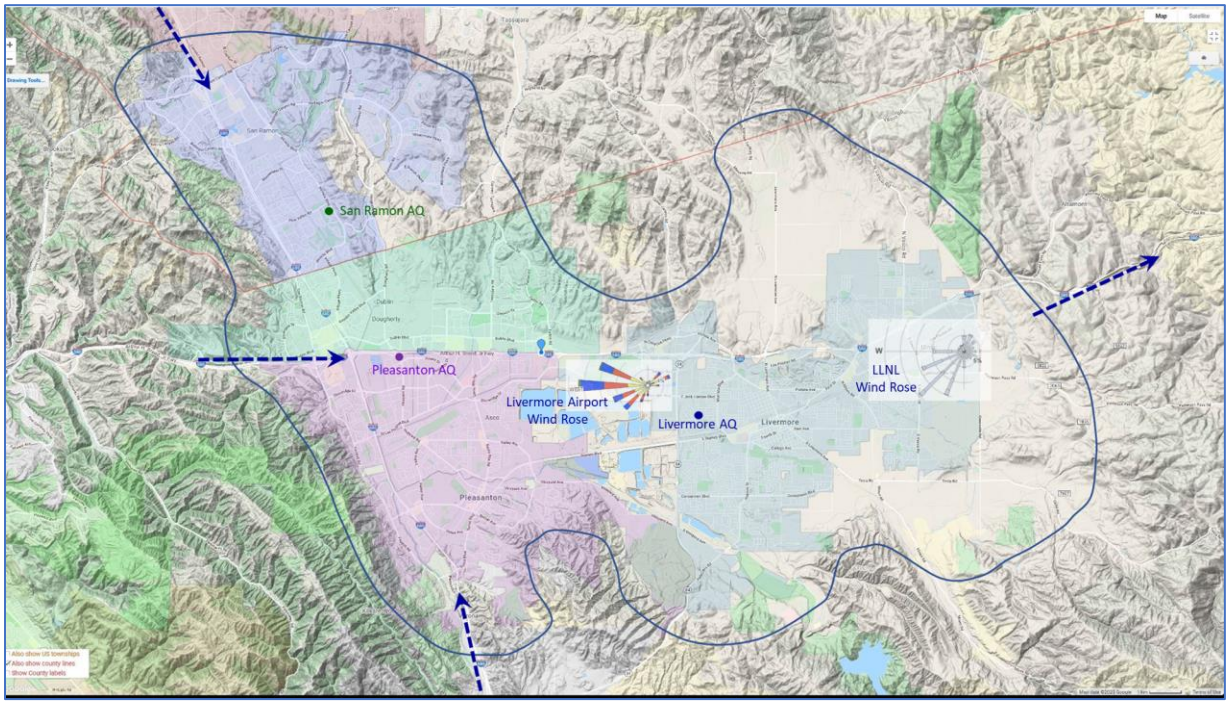


Figure 4-7. The Tri-Valley Airshed with wind inflow and outflow during onshore conditions. Noted are the three BAAQMD air quality monitoring stations and annual wind roses from the Livermore Airport and Lawrence Livermore National Laboratory (LLNL). (Created using a Google Map base)

Our ozone exceedances are due partly from transport from emissions upwind of our airshed. Summertime sea breezes pick up ozone and its precursors as they move across the inner San Francisco Bay cities and transport into the Tri-Valley. Locally generated nitrogen oxide (NO_x) and reactive organic gases (ROG) emissions are added to the air and transformed into ozone during the sunny summer days common to our airshed. Under high pressure, the temperature inversion traps pollutants and reduces mixing resulting in higher ozone levels at the ground.

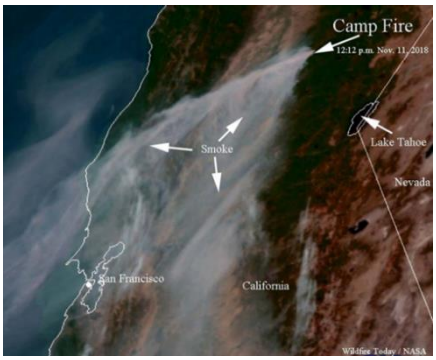
When a high-pressure system moves eastward toward Nevada, winds over the Tri-Valley switch and come from the northeast. These conditions typically occur less than 10% of days each year. Flows from the east can result in high ozone days with transport of precursors and ozone from the Central Valley. When the winds are strong the descending hot, dry offshore flow—also known as the "Diablo wind"—is conducive to high wildfire danger.

4.4 Winter PM2.5 season

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, at night under clear skies, strong cooling at the surface results in sinking wind flow off the surrounding hills, filling the valley with a cold, stable pool of air and a strong temperature inversion. In this case, local emissions of PM2.5 become trapped within our Airshed, resulting in high PM2.5 concentrations. Also, in winter periods of easterly flow can bring PM2.5 into the Bay Area from the San Joaquin Valley.

4.5 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).



From November 9-19, 2018, the Camp Fire plume was directed at the Bay Area causing some of the highest 24-hr PM2.5 air concentrations recorded in the Tri-Valley (up to 5 times the 35 ug/m^3 standard).

While wildfire smoke was much less prevalent and did not cause exceedances in the Tri-Valley in 2019, there was still some smoke around the Bay Area at times.

During August 15-October 15, 2020, California experienced three large wildfires ignited by lightning. For 17 days the 24-hr PM2.5 was exceeded in the Tri-Valley due to wildfire smoke—about 38% of the year's total PM2.5 outdoor exposure in less than 5% of the year. In addition, both of Livermore's ozone exceedances in 2020 were at beginning of wildfire smoke plume arrivals.

Appendix F offers details of these episodes.

A 2021 study conducted by Stanford University's Environmental Change and Human Outcomes Lab, Dangerous Air: As California Burns, America Breathes Toxic Smoke, shows that wildfire smoke exposure in Pleasanton and Dublin tripled from about 12 smoke days per year in 2009-2013 to 48 in 2016-2020; in Livermore the change was from 19 to 55 smoke days per year.

4.6 Visibility

For many residences on the hillsides and those hiking trails on ridges, visibility is important to the Tri-Valley. Visibility depends on many variables such as sun angle, and amount of moisture, gases, and particles in the air, both natural and anthropogenic. Higher ozone concentrations result in whitish horizons. Particulates, especially those in the PM2.5 range, reduce visual range and cause red sunsets.

Since visibility is necessary for aircraft flight operations at airports, the Federal Aviation Administration measures visual range: The distance to the farthest distinguishable object. For

Livermore Airport, the farthest horizon is 10 miles. Generally, the visibility in the Tri-Valley is good—the last two decades of data show the annual average visual range is consistently about 9 miles (Source: IEM :: Download ASOS/AWOS/METAR Data (iastate.edu).

However, many elevated views around the Tri-Valley exceed 10 miles. For example, one such view from Pleasanton Ridge looking northeast to Brushy Peak shown in **Figure 4-8** is about 24 km or 15 miles. As an illustration of the variation in visibility, **Figure 4-9** shows sample photos of this view taken on eight mornings in 2020. The three days when haze reduced the visibility had high AQIs for both ozone and PM2.5.

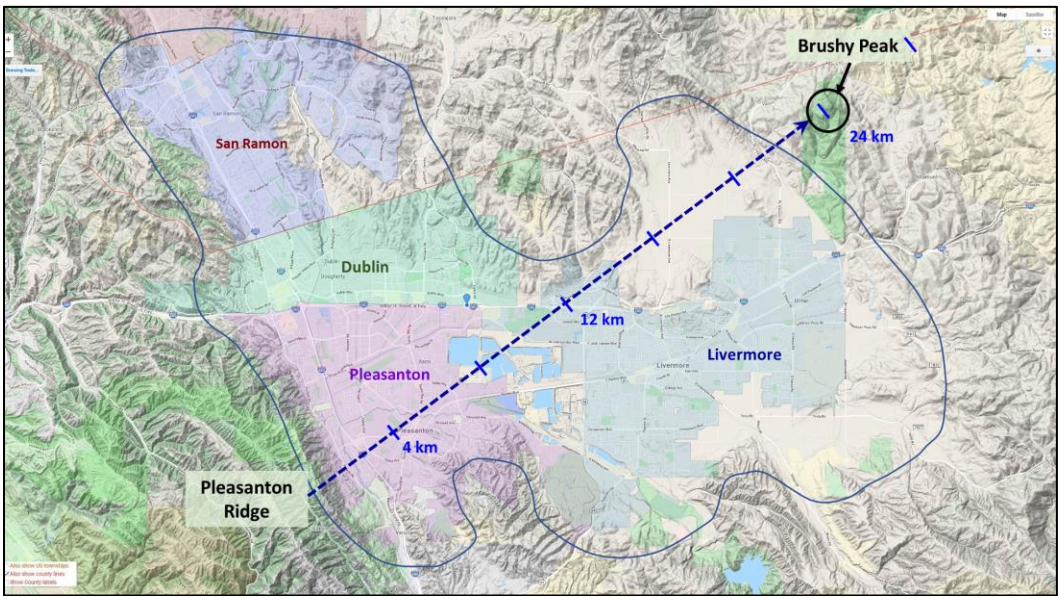


Figure 4-8. View from southern Pleasanton Ridge to Brushy Peak for visibility photos.

Jan 25 at 9 am—PM2.5=30; O_3=21, Some fog

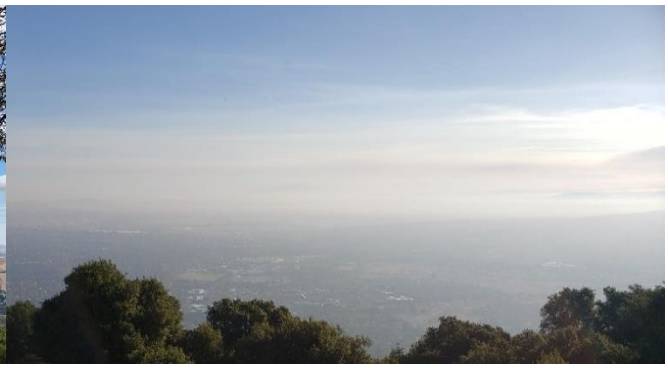
Jun 11 at 8:20 am—PM2.5=15, O_3=24; Cirrus aloft

Jun 20 at 9 am—PM2.5 & O_3=30; Thick altostratus

Sep 30—PM2.5=89; O_3=126; **Haze**

Oct 10 at 11 am—PM2.5 & O_3=20; Thin altostratus

Nov 1 at 8 am—PM2.5=79; O_3=71; **Haze + moisture**



Dec 9—PM2.5=64; O_3=39 **Haze**, moisture, altostratus

Dec 23 at 10 am—PM2.5 & O_3 =25; Dry, clear skies

Figure 4-9. Views from Pleasanton Ridge looking to the northeast across the Tri-Valley during mornings of 2020. PM2.5 and O_3 AQIs are noted as well as general weather conditions. (Photos taken by Ron Baskett)

4.7 Emissions Inventory

Annual emissions are listed for 6 **criteria pollutants** and 7 of the largest sources of **toxic chemicals** according to Criteria Pollutant and Toxics Emissions Reporting (CTR) | California Air Resources Board.

Example Tri-Valley sources in the two main types include:

- **Stationary sources**: Landfill waste facilities, wastewater treatment plants, Livermore Airport, research laboratories, quarry operations, as well as smaller facilities such as diesel generators, gasoline dispensing facilities (GDFs or gas stations), and boilers. Stationary sources also include "area" sources such as residential fireplaces that are small, dispersed, and not subject to District permit requirements.
- **Mobile sources**: On-Road from high-volume I-680 and I-580 freeways, trucks, transit buses, and Off-Road from construction, landscaping, and agricultural equipment

In March 2021, the Air District provided **2018 Preliminary Emissions Inventory** for sources in the Tri-Valley (BAAQMD 2021a and b). The inventory includes annual emissions for each stationary and mobile source for the Tri-Valley on a subgrid of the BAAQMD's Community Multiscale Air Quality (CMAQ) Modeling System (see **Appendix G** for details).

While CARB regulations control **mobile** sources statewide, the Air Districts oversee permits for **stationary** sources. **Table 4-2** summarizes the big picture—the total emissions for the Tri-Valley by the 4 source types. For PM2.5, stationary, area, and on-road sources contribute more than off-road. The Tri-Valley was designated an AB 617 project because of the exceedances of the federal ozone standard due to NOx and ROG emissions. While all source types generate similar amounts of ROGs, over 60% of NOx emissions in the Tri-Valley is due to vehicular traffic.

Table 4-2. Contributions by source type to annual emissions of NOx, ROG, and PM2.5. (Source: BAAQMD 2021a)

	Nitrogen Oxides (NOx)		Reactive Organic Gases (ROG)		Respirable Particulate Matter (PM2.5)	
SOURCE TYPE	tons/year	percent	tons/year	percent	tons/year	percent
Stationary	297.1	10%	1,005.8	31%	143.3	29%
Area	227.6	8%	1,025.1	31%	201.0	41%
Mobile On-Road	1,784.0	61%	709.6	22%	115.4	23%
Mobile Off-Road & Other Mobile	604.2	21%	529.8	16%	33.9	7%
Community Total	**2,912.8**		**3,270.3**		**493.5**	

The basic four source types are further broken down into 75 subcategories which are listed in Appendix G, Tri-Valley 2018 Emissions Inventory. **Figure 4-10** illustrates the source subcategories that contribute to the majority of NOx, ROG, and DPM emissions. Mobile diesel trucks are the largest source of NOx. Area source solvent evaporation dominates Tri-Valley ROG emissions. Mobile—OFF-ROAD EQUIPMENT contributes a substantial fraction of the Tri-Valley's NOx, ROG, and DPM emissions.

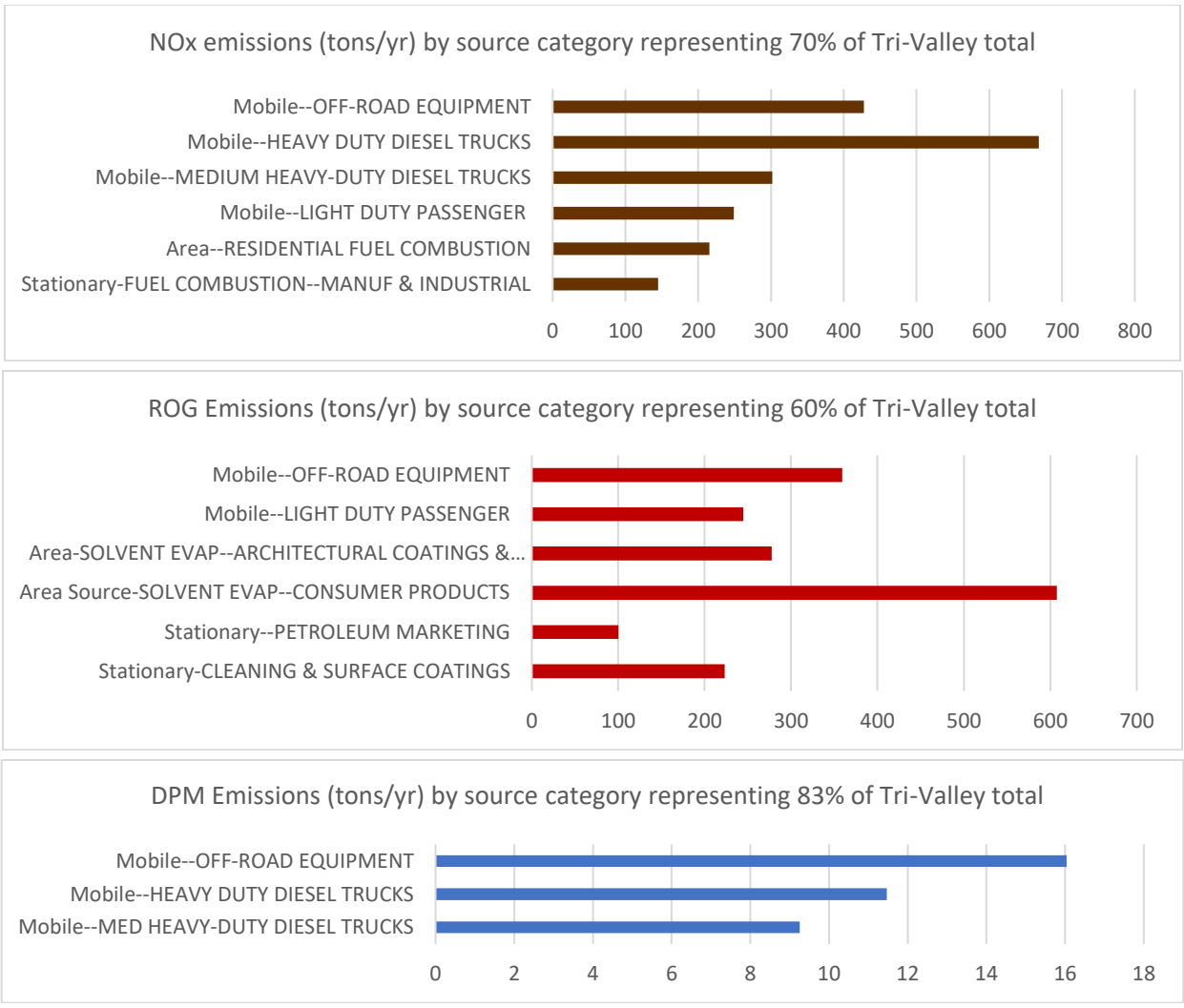


Figure 4-10. Preliminary Tri-Valley Community 2018 Emissions Inventory – Source categories which contribute the majority of NOx, ROG, and DPM emissions. (Source: BAAQMD 2021a. 2018_TriValley_Gridded_Inventory.)

4.7.1 Mobile on-road emissions

Figure 4-11 illustrates location of NOx mobile emissions for each of the 1 km CMAQ model grids. Red grids represent the highest emissions along the freeways. As illustrated in **Figure 4-10** diesel trucks are by far the largest contributors of NOx in the Tri-Valley.

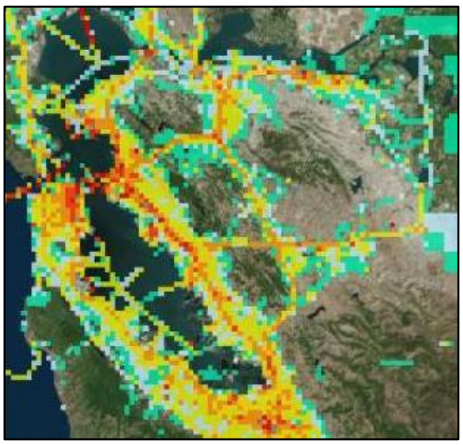


Figure 4-11 Relative NOx emissions on Bay Area CMAQ grid.

4.7.2 Mobile off-road and other mobile emissions

Gas-powered lawn and garden equipment

Years of study in California have shown that Small Off-Road Engines (SORE) produce substantial amounts of smog-forming emissions (See: Small Off-Road Engines (SORE) | California Air Resources Board). SORE includes lawn and garden equipment as well as other outdoor power equipment and specialty vehicles. SORE emissions are included in Mobile—OFF-ROAD EQUIPMENT category. **In the Tri-Valley, SORE emissions create the majority of mobile off-road and other mobile emissions.**

Figure 4-12 shows the equivalence of operating lawn and garden equipment to driving an automobile. CARB shows that in 2021 landscaping statewide emissions of ROG are equivalent to those from automobiles. **Table 4-3** shows that this is also true for annual ROG emissions in the Tri-Valley.

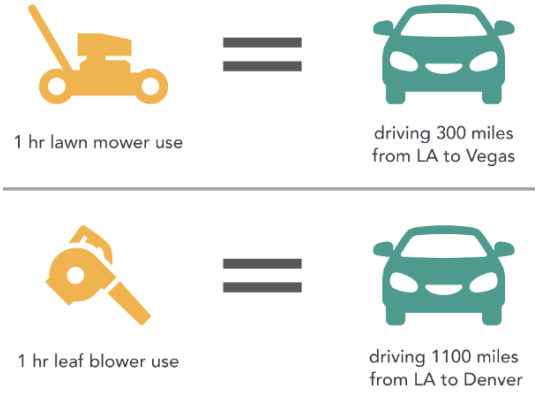


Figure 4-12. Emissions from lawn and leaf blower compared with driving an automobile. (Source: SORE - Small Engine Fact Sheet | California Air Resources Board)

Table 4-3. Emissions from gasoline-powered lawn and garden equipment compared with light duty passenger automobiles in the Tri-Valley. (Source: BAAQMD 2021a. 2018_TriValley_Gridded_Inventory.)

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 also that gasoline-powered land and garden equipment emit almost as much CO as light duty passenger automobiles in the Tri-Valley.

4.7.2 Stationary source emissions

Figure 4-13 illustrates the location of permitted **stationary sources** in the Tri-Valley.

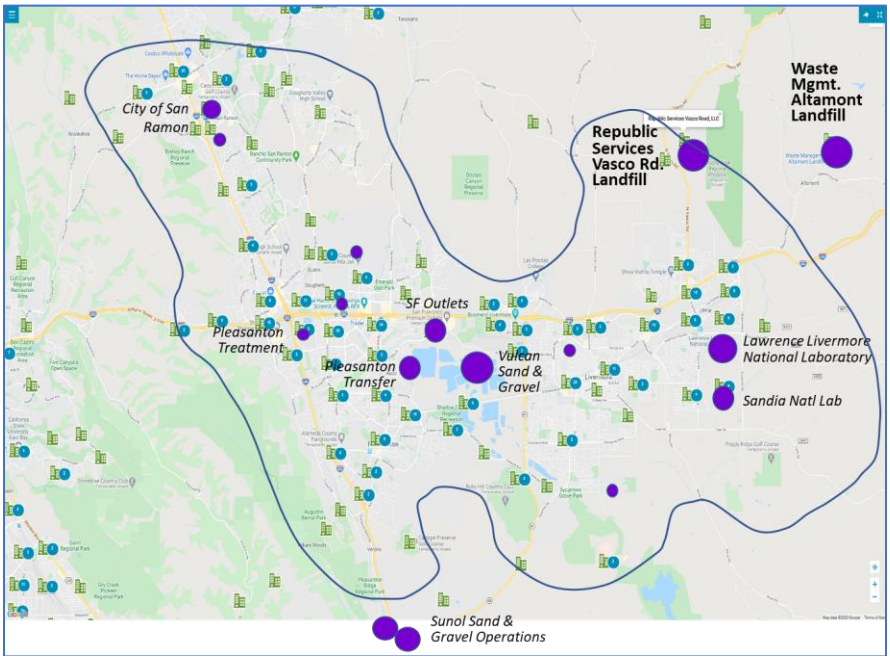


Figure 4-13. Map of permitted stationary sources in Tri-Valley. Green icons represent source locations; purple circles represent largest clusters of emissions. (Source: BAAQMD Interactive Data Maps)

Table 4-4 reveals that the 688 permitted stationary sources contribute a small fraction of the total Tri-Valley emissions. However, single sources have the potential of creating local "hotspots." The Air District's (BAAQMD 2018a) rule-of-thumb is that stationary sources emitting more than 50 tons/year could create a hotspot. **Table 4-5** shows that a few sources of NOx and ROG are near the 50 ton/yr hotspot guideline. The largest stationary source of NOx is Dublin-San Ramon Services District at 49 tons/yr; Gillig in Livermore total 59 tons/yr of ROG.

See **Section 4.9.2** for Air District estimates of health risk from stationary sources. Evaluating the nearby air concentrations may warrant further study.

Table 4-4. Summary of stationary source contributions to total emissions in the Tri-Valley

Emissions (tons/year)	NOx	ROG	DPM2.5	PM2.5
Total emissions from stationary sources in Tri-Valley	128	275	0.6	27
Total Tri-Valley emissions	2897	3249	41	489
Stationary source contribution to total emissions	4%	6%	1%	5%

Table 4-5. Largest stationary sources in the Tri-Valley

Plant Name	NOX (tons/yr)
Dublin San Ramon Services District - Was	48.84
Ameresco Vasco Road LLC	15.64
Lawrence Livermore National Laboratory	13.86
Granite Construction Co	3.88
Lawrence Livermore National Laboratory	2.90
Chevron Business and Real Estate Service	2.81
City of San Ramon	2.78
Vulcan Materials Western Division	2.26
Gillig LLC	2.04
Plant Name	**ROG (tons/yr)**
Gillig LLC	34.90
G S Cosmeceutical USA Inc	33.15
Gillig LLC	23.77
Ameresco Vasco Road LLC	21.50
Republic Services Vasco Road LLC	20.71
McGrath Rent Corporation	10.08
Plant Name	**DPM2.5 (tons/yr)**
Valley Memorial Hospital	0.251
City of San Ramon	0.078
Lawrence Livermore National Laboratory	0.041
Plant Name	**PM2.5 (tons/yr)**
Ameresco Vasco Road LLC	4.13
Republic Services Vasco Road LLC	3.57
Republic Services Vasco Road LLC	2.09
Vulcan Materials Western Division	1.82
CEMEX (Pleasanton)	1.79
CEMEX Construction Materials Pacific LLC	1.62
Granite Construction Co	1.45
Lawrence Livermore National Laboratory	1.45
RC Ready Mix Co	1.32
CEMEX Construction Materials Pacific LLC	1.01

4.7.3 Area source emissions

Area sources include emissions from solvents, pesticides, and asphalt paving and roofing, residential fuel combustion, farming operations, construction, paved and unpaved road dust, windblown dust, cooking, and managed burning. **Table 4-6** provides a summary for the Tri-Valley.

Table 4-6. Summary of area source contributions to total emissions in the Tri-Valley

Emissions (tons/year)	NOx	ROG	DPM2.5	PM2.5
Total area source emissions	228	1025	0	201
Total Tri-Valley emissions	2897	3249	41	489
Area source contribution to total	8%	32%	0%	41%

4.7.4 Toxic Air Contaminant emissions

EPA has designated about 650 chemicals as **Toxic Air Contaminants (TACs)**, also known as Hazardous Air Pollutants, to be harmful to human health at certain air concentrations. Long-term exposure to TACs may cause neurological damage, hormone disruption, developmental defects, and cancer (see: CARB Toxics Brochure).

Industrial operations like power plants and refineries are often the largest individual sources of TACs, but TACs also come from a range of other human sources including mobile (autos, trucks, etc), certain restaurants—basically any time we burn fuels—and also from evaporation of certain products like paint, solvents, and gasoline. Our major action for reducing local NOx and ROG emissions has been to fund the conversion of landscaper's gas-powered equipment to electric.

In the Bay Area each facility must report annual emissions above specified thresholds for TACs, see Toxic Air Contaminant List with Staff Reports/Executive Summaries | OEHHA. Also, AB2588 "Hot Spots" Inventory Guidelines lists about 800 chemicals in 8 categories:

1) Carcinogens
2) Developmental and Reproductive Toxicants
3) Pesticides
4) Metals
5) Other Inorganics
6) Pharmaceuticals
7) Neurotoxins
8) Other

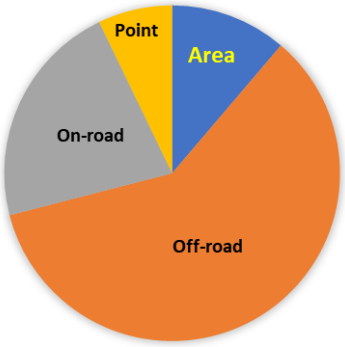


Figure 4-14. Tri-Valley Toxic Air Contaminant emissions by

BAAQMD Toxics Emission Inventory (BAAQMD 2021b) lists annual emission rates for 35,474 sources of 149 different chemicals in 4 categories in the Tri-Valley. **Figure 4-14** shows that about 80% of the sources are vehicular traffic—60% are off-road, 20% on-road. The remaining 20% are point and area sources. **Figure 4-15** shows the largest TAC emission rates from the stationary sources in the Tri-Valley from BAAQMD (2021b).

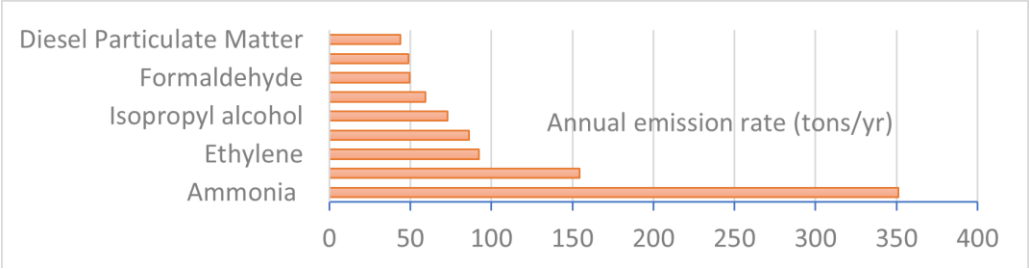


Figure 4-15. Largest Toxic Air Contaminants emissions in the Tri-Valley.

4.8 Health effects from local sources

4.8.1 Health risks from stationary sources

BAAQMD developed the Permitted Stationary Source Risk and Hazards Screening Tool Methodology (BAAQMD 2020) to show the relative contribution to cancer and non-cancer hazard risks from stationary sources. For each facility, local dispersion factors are calculated and used to estimate the local air concentration for each listed chemical. These concentrations are then multiplied by chemical-specific potency factors, followed by the application of conservative exposure assumptions to estimate risk. Emissions for each air toxic are multiplied by a cancer risk factor and other parameters to put them on an equal scale for comparison purposes. The tool also calculates the hazard associated with chronic exposures to non-carcinogenic compounds.

Figures 4-16 and 4-17 show the estimated cancer risk and hazard impacts from permitted stationary sources in the Tri-Valley region. The maps show one circle per permitted source (one facility). The larger the size of the circle, the larger the corresponding cancer, hazard, or PM2.5 risk. Superimposed are the locations of sensitive receptors from BAAQMD ArcGIS map, Also **Figure 4-18.** **Appendix H** provides higher resolution maps for individual cities.

TVAQCA recommends residences who are in sensitive populations in and around these areas minimize their potential exposure by installing high-efficiency HVAC air filtration and optionally indoor air purifier systems.

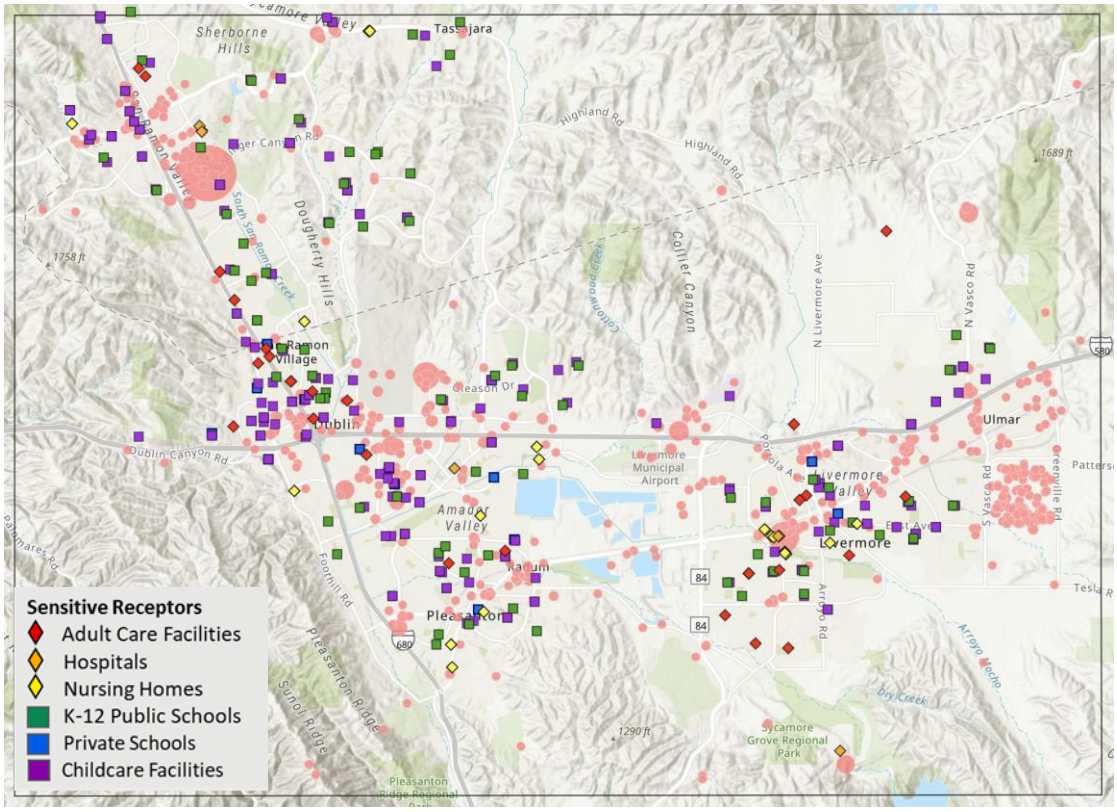


Figure 4-16. Cancer Risk from Permitted Sources in Tri-Valley (Source: BAAQMD ArcGIS)

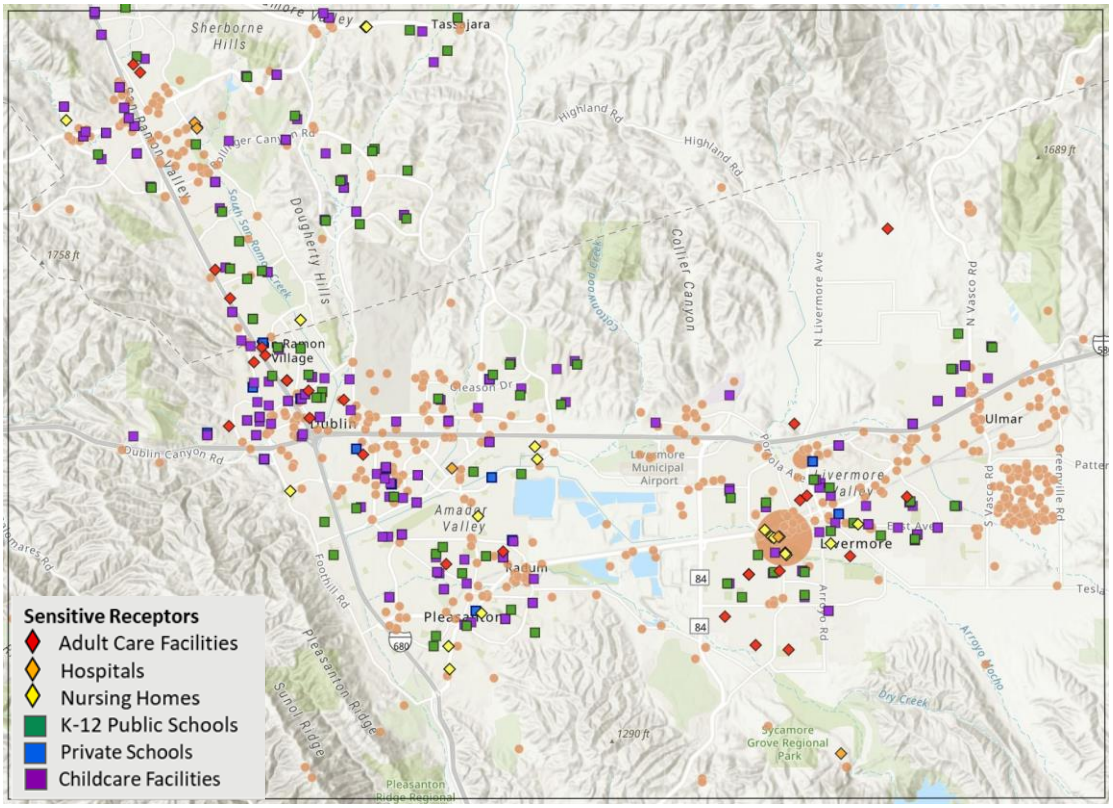


Figure 4-17. Hazard Risk by Permitted Sources in Tri-Valley (Source: BAAQMD ArcGIS)

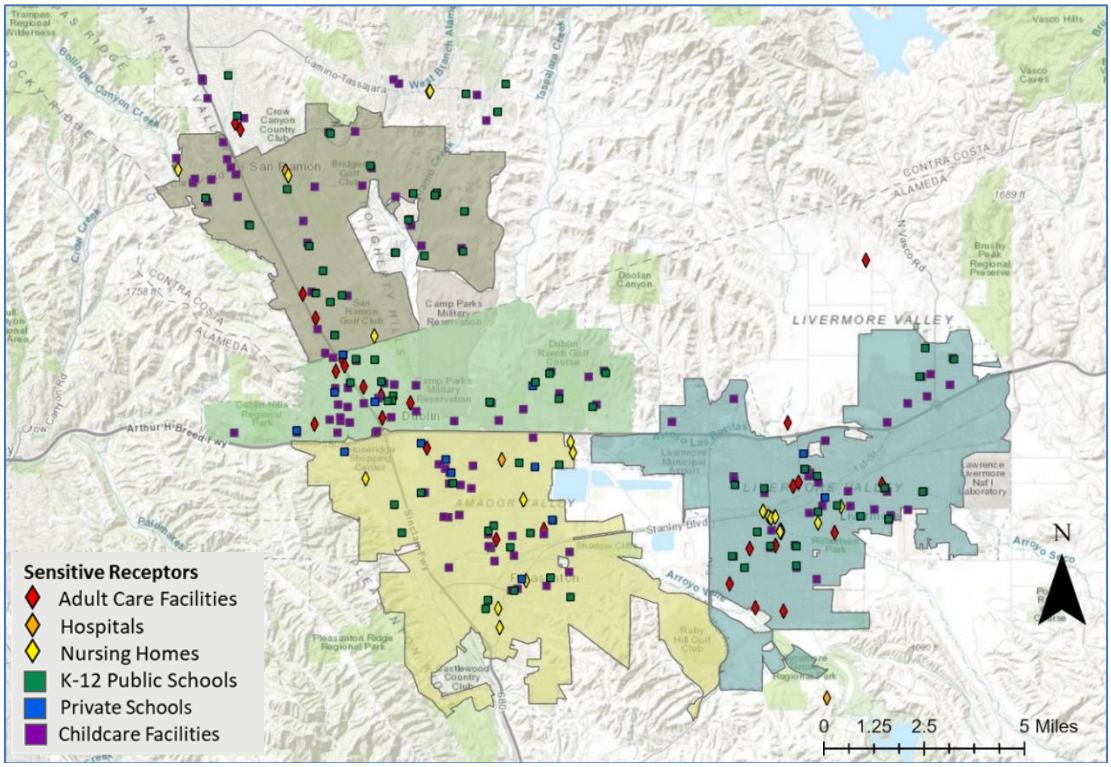


Figure 4-18. Location of Sensitive Receptors in Tri-Valley (Source: BAAQMD)

4.8.2 Health effects from toxic emissions

Figure 4-19 shows the relative health effects of key toxic emissions in the Tri-Valley. Diesel engine emissions are estimated to be responsible for the majority of cancer risk attributable to toxic air contaminants in the Tri-Valley, a conclusion consistent with studies statewide as well as in the Bay Area. BAAQMD's "Diesel Free by '33" program is designed to reduce DPM emissions to acceptable levels. Diesel engines emit a complex mixture of pollutants, including small carbon particles, or "soot" coated with numerous organic compounds, known as diesel particulate matter (DPM). Diesel exhaust also contains more than 40 cancer-causing substances, most of which are readily adsorbed onto the soot particles.

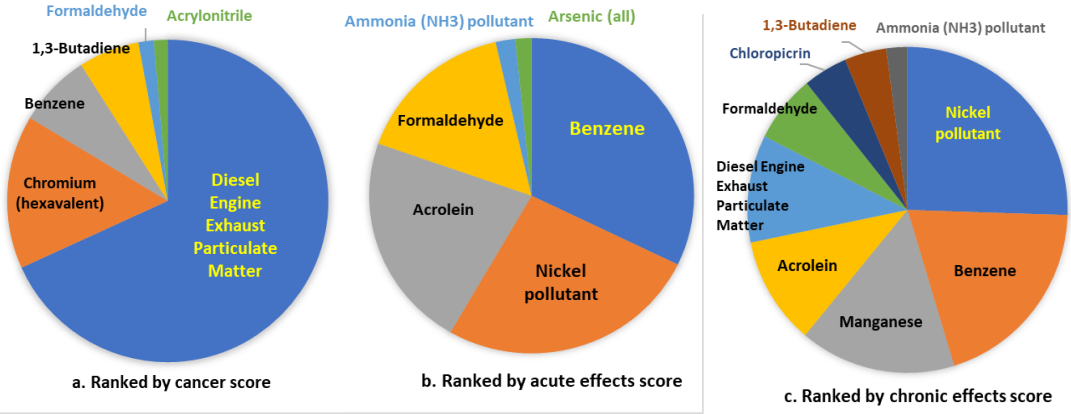


Figure 4-19. Ranking of health effects by toxic source type in the Tri-Valley. (Source: BAAQMD 2021b)

5. Efforts to Improve Air Quality

During the last five decades, federal, state, district, county, and city government efforts have resulted in major improvements in air quality. We review these plans as background for what additional **local efforts** could make a difference.

5.1 CARB statewide programs

California developed a State Implementation Plan (SIP) to schedule emission reductions to meet federal standards. CARB provides a mobile source program portal that includes statewide programs and strategies to reduce the emission of smog-forming pollutants and toxics by mobile sources.

5.2 BAAQMD plans for improving regional air quality

Since the 1960s the BAAQMD has extensively studied air quality and developed regional plans for improving the air quality in the Bay Area. The 2017 Spare the Air - Cool the Climate is a comprehensive plan to achieve both air quality standards and reduce greenhouse gas (GHG) emissions 40% below 1990 by 2050.

The May 2021 Draft Plan Bay Area 2050 | Plan Bay Area (MTC and ABAG 2021) 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. This plan references Spare the Air - Cool the Climate to reduce emissions and achieve climate goals. Given the largest health effect is from diesel emissions, BAAQMD's "Diesel Free by '33" program is designed to reduce DPM emissions to acceptable levels.

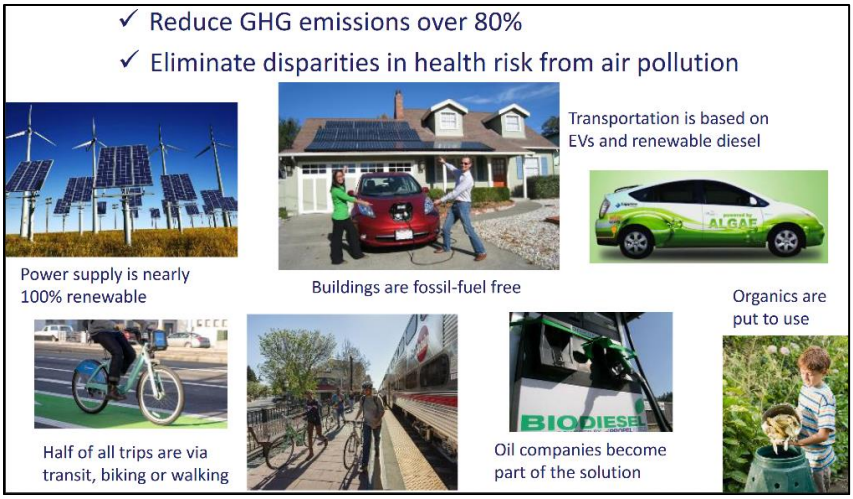


Figure 5-1. Example Actions from BAAQMD *2017 Spare the Air, Cool the Climate*

In addition, the BAAQMD funds specific programs for residents and businesses for improving regional air quality:

Residents:

- Clean Transportation for Low-income Households in Clean Cars for All – Low-income families can scrap an old vehicle and get a grant to reduce the cost of an electric vehicle, e-bike, or public transit.
- Passenger Car and Light-Duty Truck Retirement in the Vehicle Buy Back Program pays Bay Area residents $1,200 per vehicle to turn in their operable, registered, model year 1997 and older passenger car or light-duty truck for scrapping.
- Wood-Burning Stove Changeouts for Wood Smoke Reduction in the Wood Smoke Reduction Incentive Program will offer grants to low-income residents and residents in overburdened communities to replace qualifying woodburning devices with zero-emission heat pumps.

Businesses:

- Flex your Commute Pledge through the Bay Area Commuter Benefits Program funds Bay Area employers with 50 or more full-time employees with commuter benefit option(s) to their employees.
- Electric Vehicle Charging Stations through Charge! provides grants for the purchase and installation of publicly accessible electric vehicle charging stations.
- Greenhouse Gas Technologies in Climate Tech Finance provides loans or loan guarantees for Bay Area municipalities, schools, hospitals, and industrial facilities to adopt emerging technologies that reduce greenhouse gas emissions.
- Diesel Engine Replacements and Clean Tech Infrastructure through the Carl Moyer Program provides grants to upgrade or replace heavy-duty on-road vehicles, school buses, transit buses, off-road and agricultural equipment, marine equipment, and locomotives, and to install infrastructure that supports advanced clean vehicles and technology, throughout the Bay Area.
- Goods Movement Equipment Replacements and Fueling Infrastructure in the Goods Movement Program provides grants to replace freight movement equipment including trucks, locomotives, cargo-handling equipment, transportation refrigeration units, and insulated cold-storage. Also, berth electrification and emissions capture & control equipment at ports and fueling/charging infrastructure.

5.3 County plans for improving air quality

In 2003, **Alameda County** First District Supervisor Scott Haggerty commissioned a study for improving the air quality of the Tri-Valley cities of Dublin, Pleasanton, Livermore and Sunol. The ***2004 Clean Air Plan for the Tri-Valley Area*** (Garvey and Howekamp 2004) describes 55 voluntary measures to improve air quality in four categories: **Technology, Transportation, Land Use, and Public Education**.

Due to AB 32, both Alameda and Contra Costa counties have Climate Action Plans (Climate Action Plans - Sustainability - Alameda County (acgov.org); Sustainability | Contra Costa County, CA Official Website) in place which include reducing some air emissions, primarily from combustion sources.

While counties and cities have periodically met and documented air quality issues and policy, there does not appear to be an established forum which recognizes the commonality in the Tri-Valley Airshed. **TVAQCA recommends establishing a forum where air quality is addressed as the Tri-Valley Airshed by the four cities and counties.**

Tri-Valley cities have adopted many of these measures in their General Plans as well as their optional Air Quality Elements (summarized below). These plans provide measures for TVAQCA to consider during the current AB 617 process of reviewing effective strategies.

Planning Areas and Specific Plans discuss plans for expansion and changes. While adding housing and associated population does not produce "direct" sources of air pollution, increased traffic results in "indirect" emissions. Also increased residents and commercial activity inevitably increases indirect emissions. **Appendix I** provides additional details of the plans summarized in this section.

5.4 City General Plans

2019 City of San Ramon General Plan

Polices included in General Plan Chapter 12 Air Quality and Greenhouse Gas are:

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

12.4-I-3 Analyze the air quality and climate change impacts of discretionary projects using applicable regulatory guidance.

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.

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.

2016 City of Dublin General Plan

Policies from Chapter 7 Environmental Resources Management: Conservation Element Air Quality, 7.5.1, 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.

2019 Amended 2005 Pleasanton Plan 2025 and Climate Action Plan

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.

In addition, the Pleasanton Climate Action Plan ensures 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.

2004 City of Livermore General Plan 2003-2025

Livermore's land use and development policy for growth and resource conservation through 2025. One unique action is:

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.

Livermore's General Plan includes both North and South Livermore Urban Growth Boundaries as well as the 1,891-acre South Livermore Valley Specific Plan in collaboration with the Tri-Valley Conservation Agency to preserve the rural nature of the area.

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

5.5 Business Activities

Many Tri-Valley businesses follow the pollution prevention guidelines listed in California Green Business Network (greenbusinessca.org).

We applaud Wente Vineyards who partnered with Monarch Tractor to develop the world's first fully electric Artificial Intelligent tractor, a CARB FARMER program grant.

Karl Wente and Monarch Tractor team (Source: SFBT_Tri-Valley-2021_FNL.pdf (innovationtrivalley.org)

Another example of electrification is the local transport in Bishop Ranch, see: Autonomous vehicles to hit the road in Bishop Ranch | News | thepress.net.

5.7 TVACQA Activities

During 2020-21, TVACQA conducted several activities to inform the community and assist developing strategies to maintain our good air quality:

1. **We organized and built internal capacity**
   - **a.** We organized our committees and assign responsibilities.
   - **b.** We define our work processes.

   See Section 3 above and quarterly reports on our web page.

2. **We developed an understanding of air quality issues in the Tri-Valley**
   - a. We summarized existing data and studies on local meteorology, air quality, emissions, & health effects; we analyzed air quality exceedances.
   - b. We determine impacts of local Toxic Air Contaminants (TACs).
   - c. The Air District provided maps with sensitive receptor locations.
   - d. We determined reduction in which emissions may improve our air quality.
   - e. We addressed air quality issues that lower economic groups may experience or specific populations that are adversely affected.

   In early 2020 the Science Committee gathered data from Internet sources and in June 2020, produced An Initial Technical Assessment of the Air Quality in the Tri-Valley. After a review by BAAQMD Caroline Normile and Steven Reid, on January 5, 2021, we posted a updated version, An Understanding of the Air Quality in the Tri-Valley. In March 2021, Steven Reid provided a preliminary 2018 emissions inventory including criteria emissions from each 1 kilometer^2 model grid as well as the list of TAC sources in the Tri-Valley. This document is a synthesis of our understanding with BAAQMD input.

3. **We conducted outreach to the public**
   - **a. We created web and Facebook pages,** see Tri-Valley Air Quality Community Alliance.
   - **b. We developed a list of 57 stakeholder organizations** with email contacts including:

Alameda Co. Board of Supervisors, District 1
American Indian Center
American Lung Association
Axis Community Health
BAAQMD Spare the Air
Bishop Ranch (San Ramon)
CA Interfaith Power & Light
CA State Assembly 16th District
Citizens' Climate Education
City of Dublin
City of Dublin, Planning Dept.
City of Livermore
City of Livermore High School
City of Livermore Sanitation
City of Pleasanton
City of Pleasanton Energy & Environment Committee
City of San Ramon
Dublin USD
East Bay Regional Park District (EBRPD)
Eric Swalwell
Glide Finder
Go Green Initiative
Hacienda Business Park
Hispanic Heritage Center
Innovation TV
Interfaith Interconnect
JPA Landscape
Las Positas College
Lawrence Livermore National Lab (LLNL)
Livermore Area Recreation & Park District (LARPD)
Livermore Valley Chamber of Commerce
Livermore Indivisible
Livermore Rotary
Livermore Valley Joint USD
Livermore Valley Winegrowers Association
Local Leaders of the 21st Century
Ohlone Audubon
Pedego
Pleasanton Peddlers
Pleasanton Pedestrian/Bike/Trails Comm.
Pleasanton USD
Quest Science Center

Rebecca Bauer-Kahan
Livermore Rotary Club
Sierra Club, Tri-Valley Group
Sons in Retirement-Livermore, San Ramon
Students for Social Change
Sustainable Contra Costa
Tri-Valley CARES
Tri-Valley Chapter of Citizens Climate Lobby
Tri-Valley Conservancy
Tri-Valley Citizens' Climate Education
Tri-Valley Go
Tri-Valley Stargazers
Tri-Valley Women's Action Group
ValleyLink / Wheels
WorkDay

c. We engaged and informed our community with virtual presentations including:

1) Pleasanton City Council meeting (July 27, 2020)
2) Instagram interview with TVAQCA's Bruce Daggy, by Brittni Kiick, kiickitup (Aug. 5, 2020)
3) Tri-Valley Women's Action Group (TVWAG) (Sept 14, 2020)
4) Tri-Valley Sierra Club (Oct 7, 2020)
5) Livermore SIR (Sons in Retirement) Chapter 101 (Oct 27, 2020)
6) Livermore Chamber of Commerce (Nov 4, 2020)
7) Toastmasters, Speakeasies Club (Nov 17, 2020, and Oct 19, 2021)
8) Rotary Club of Livermore (Dec 9, 2020)
9) First Public Online Forum (Dec 14, 2020)
10) Virtual Forum: The Transition to Battery Electric Commercial Landscaping Equipment (Apr 13, 2021)
11) San Ramon SIR Chapter 128 (Aug 18, 2021)

d. We determined the air quality concerns of the community by conducting an online survey.

In July and August 2020 Laurene Green, TVAQCA Oversight Committee, developed drafts and finalized a set of survey questions. During September through November 2020, TVAQCA published online link on Tri-Valley Air Quality Community Alliance (tvaqca.org) to our Air Quality Survey. We notified our stakeholders list. By November 19, 2020, approximately **300 households** responded representing about 900 people. Most were residents but there were also a handful of workers that live outside of the Tri-Valley. There was only a single response to the Spanish version. **Appendix J** contains the full results of the survey

Major Findings from the 2020 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.
2) Air quality was a significant criterion in living-location and quality-of-life decisions for most respondents.
3) A majority responded that their household has one or more vulnerable population individual sensitive to air quality with the highest responses being **elderly and asthmatics**.
4) Respondents were largely not aware of **specific sources** except for wildfire smoke.
5) Regarding appliances which emit air pollution and significant noise outside revealed that hired gardeners use gas-powered equipment, whereas almost a third of the respondents who do their own landscaping work use electric equipment. Most use Gas or Propane BBQ grills.
6) Most of the submitted suggestions were consistent with solutions that the air quality community have been suggesting for some time.
7) Several respondents were concerned with Livermore Airport emissions and noise.
8) The two most significant highlights were:
    a. Near-unanimous agreement that the **air quality was unacceptable** during **wildfires**
    b. **Traffic and lawn/garden equipment** are the largest emitters of pollution and noise.

4. We took action

   a. **We met in virtual online meetings** at least monthly, see: Stay Updated—Tri-Valley Air Quality Community Alliance (tvaqca.org)
   b. **We made recommendations** to legislators and agencies such as letters supporting Assembly Bill 3211 (Bauer-Kahan) – Toxic Air Contaminants, a statewide zero-emission lawn & garden equipment incentive program, and Valley Link Rail. We also offered to assist Tri-Valley Climate Action Plans.
   c. **We developed and funded initiatives.** Our major action to reduce our NOx and ROG emissions involved funding landscapers to replace gas-powered equipment with electric. We offered incentives to local landscaping companies, cities, and school districts to purchase electric equipment. (The Air District has previously funded this incentive as Spare the Air - Cool the Climate Mobile Source Measure MSM-C2: Lawn and Garden Equipment. See: Landscaper Forum Resources—Tri-Valley Air Quality Community Alliance (tvaqca.org).)

      By project's end, we funded 5 proposals. Four were to commercial landscaping operations and one was municipal (City of Livermore). Four were for leaf blowing equipment and one for a rider mower. There were no applications from any school district, which was particularly disappointing given the pandemic requirement for open windows; schools were a place where less noise and cleaner air were especially important. One explanation for the lack of uptake by the schools was the failure of battery electric equipment purchased about 5 years ago to perform adequately.

      There remains a belief that the battery equipment is not good enough. On the other hand, we heard from two commercial operators that they were using their electric equipment to win new contracts. So, a key requirement for adoption of battery electric equipment is education.

      Three of the five grants were for the maximum $5,000 amount and covered less than half of the equipment cost (in the case of the rider mower, the grant covered about 13% of the cost). Going forward, we may also need to increase the maximum size of the grant to draw more interest.

   d. **We explored offering internships** for students through contacts at Las Positas College, high schools, and through the Quest Science Center. As of project end, we did not create an internship.

   e. **We did not propose formal monitoring or emissions reductions plans**.

      With sufficient monitoring data and emission available to define our air quality issues, we did not pursue either of AB 617 formal plans during our first two years:
      - Community Air Monitoring Plan (CAMP)
      - Community Emissions Reduction Program (CERP)

5. We documented our progress

   a. We delivered quarterly and final reports to the Air District.
   b. We prepared presentations and documents.
   c. We summarized our project in this report, "Ensuring Future Air Quality in the Tri-Valley" which includes the AB 617 Community Profile.

6. References

Note: Web links references were accessed from June to December 2021.

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