3760 & 3790 HOPYARD ROAD SHELL FUEL STATION – HEALTH RISK ASSESSMENT

Pleasanton, California

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Introduction

This report presents the results of community health risk assessment completed for a Shell Gas Station located on the southwest corner of Hopyard Road and Las Positas Boulevard at 3790 Hopyard Road in the City of Pleasanton. The Fuel Center will provide multi-product fuel categories at each of 12 fuel positions (6 dispensers – two fuel positions per dispenser) and will replace the current single-story commercial land uses at the project site. This health risk assessment was conducted to address localized impacts to sensitive receptors near the project. Sensitive receptors include residences south and northwest of the project site. The Church of Pleasanton which is just south of the project site was evaluated as well as nearby residences. This analysis addresses emissions of toxic air contaminants (TACs) from the primary sources of air pollutant emissions emitted by the project:

- Construction period emissions;
- Tailpipe and evaporative emissions from new vehicle trips generated by the project;
- Tailpipe and evaporative emissions from vehicles idling in queues waiting to access pumps and starting after fueling;
- Truck delivery emissions; and
- Evaporative emissions from the transfer and storage of gasoline (i.e., underground tank filling, tank breathing and vehicle fueling and spillage).

We understand that the current Shell station has a gasoline throughput of 100,000 gallons per month. The projected volume with the project would be up to 130,000 gallons per month. In addition, diesel fuel would be sold that is projected to be on the order of 6,000 to 7,000 gallons per month. The project effect is to essentially demolish and construct a new facility that is projected to increase gasoline sales by 30 percent and add new diesel fuel sales. This assessment evaluates the impacts from the station in entirety (both existing and future project).

Where applicable, procedures recommended by the Bay Area Air Quality Management District (BAAQMD) were used. The BAAQMD has published CEQA Air Quality Guidelines that are used in this assessment to evaluate air quality impacts of projects[1].

Discussion of TACs

Toxic Air Contaminants (TACs) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer or serious illness) and include, but are not limited to, criteria air pollutants. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter near a highway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, state, and federal level. The identification, regulation, and monitoring of TACs is relatively new compared to that for criteria air pollutants that have established ambient air quality standards. TACs are regulated or evaluated on the basis of risk to human health rather than comparison to an ambient air quality standard or emission-based threshold.

[1] Bay Area Air Quality Management District. 2011. BAAQMD CEQA Air Quality Guidelines. May.

Diesel Particulate Matter

Diesel exhaust, in the form of diesel particulate matter (DPM), is the predominant TAC in urban air with the potential to cause cancer. It is estimated to represent about two-thirds of the cancer risk from TACs (based on the statewide average). According to the California Air Resource Board (CARB), diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB, and are listed as carcinogens either under the State's Proposition 65 or under the federal Hazardous Air Pollutants programs. California has adopted a comprehensive diesel risk reduction program. The U.S. Environmental Protection Agency (EPA) and the CARB have adopted low-sulfur diesel fuel standards in 2006 designed to reduce diesel particulate matter substantially. The CARB recently adopted new regulations requiring the retrofit and/or replacement of construction equipment, on-highway diesel trucks, and diesel buses in order to lower fine particulate matter ($PM_{2.5}$) emissions and reduce statewide cancer risk from diesel exhaust.

Non-Diesel Total Organic Gases

Gasoline-powered vehicles, particularly light-duty autos and trucks emit TACs mostly in the form of total organic gases (TOG). TOG emissions associated with these types of vehicles occur primarily in two forms: running exhaust and evaporative running losses. Additional TOG emissions occur when starting a vehicle, especially cold vehicles. Mobile source TOG includes TACs such as benzene, 1,3-Butadiene and formaldehyde. Emissions of these TACs are controlled through requirements of motor vehicle exhaust systems and the formulation of gasoline by the U.S. EPA and CARB

Benzene

Benzene is a fundamental component of gasoline and diesel fuel as well as vehicle exhaust. Benzene is emitted through the evaporation of gasoline vapors. Since it is known to cause cancer in humans, benzene was classified as a TAC in 1984 by CARB. Benzene emissions from fuel use are regulated in numerous ways that include standards for the formulation of gasoline, vehicle emission standards, and vapor control systems for storage, fuel dispensing facilities and vehicle on-board fuel systems.

Fine Particulate Matter ($PM_{2.5}$)

Particulate matter in excess of state and federal standards represents another challenge for the Bay Area. Elevated concentrations of $PM_{2.5}$ are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Health Risk Assessment

Emissions of toxic pollutants potentially associated with the Project are estimated using various emissions models. Concentrations of these pollutants in the ambient air are estimated using the

U.S. EPA AERMOD dispersion model. The AERMOD dispersion model is a BAAQMD-recommended model for use in modeling analysis of these types of emission sources and activities for CEQA projects.[2] Modeling allows the estimation of both short-term and long-term average concentrations in air for use in a health risk assessment, accounting for site-specific meteorological conditions. Health risks potentially associated with the estimated concentrations of pollutants in the air are characterized in terms of excess lifetime cancer risks (for carcinogenic substances), or comparison with reference exposure levels (RELs) for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the maximum impact sensitive receptor (sensitive receptors are described below). The hypothetical MEI is an individual assumed to be located where the highest concentrations of air pollutants associated with Project emissions are predicted to occur, based on the air dispersion modeling. Health risks were evaluated at existing locations of nearby sensitive receptors (residences, schools, etc.). Health risks potentially associated with concentrations of carcinogenic air pollutants were calculated as estimated excess lifetime excess cancer risks. The excess lifetime cancer risk for a pollutant is estimated as the product of a lifetime exposure dose and a cancer potency factor; in other words, it represents the increased cancer risk associated with continuous exposure to concentration of toxic air contaminants in the air over a 30-year period.

The analysis was directed to address impacts to the nearby Church of Pleasanton. The types of exposures associated with this receptor is not known, since the church is presumably not continuously occupied by sensitive receptors.

Cancer risks are also evaluated for off-site worker exposures and school exposure periods, i.e., 9 year periods for children. For the short-term exposures associated with construction, it is more health protective to use a one year exposure and higher exposure factors (i.e., age sensitivity factors and breathing rate for infants or children) and in this case is the basis for the risk calculation. BAAQMD-recommended exposure parameters were used for the cancer risk and non-cancer health effects calculations, as described in *Attachment 1*.

Sensitive Receptors

There are groups of people more affected by air pollution than others. CARB has identified the following persons who are most likely to be affected by air pollution: children under 16, the elderly over 65, athletes, and people with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive receptors. Locations that may contain a high concentration of these sensitive population groups include residential areas, hospitals, daycare facilities, elder care facilities, elementary schools, and parks. For cancer risk assessments, children are the most sensitive receptors, since they are more susceptible to cancer causing TACs. Residential locations are assumed to include infants and small children. Sensitive receptors in the vicinity of the project include residences northwest and south of the project site. Additionally, the building with The Church of Pleasanton is adjacent to the southern project boundary. Churches are not normally considered sensitive receptors unless they include a daycare or school. Otherwise, routine users of the church are considered workers and patrons do not occupy the site for extended durations

[2] Bay Area Air Quality Management District (BAAQMD), 2012, *Recommended Methods for Screening and Modeling Local Risks and Hazards, Version 3.0.* May.

where chronic health impacts (i.e., cancer risk or exposure to annual PM2.5 concentrations) could occur. To conservatively address impacts to the church, this health risk assessment included evaluation of off-site workers and children who may be at this site.

BAAQMD Rules and Regulations

BAAQMD regulates the emissions of organic compounds (i.e., ROG) from gasoline dispensing stations through Regulation 8, Rule 7. This rule requires the facility to install enhanced vapor recovery (EVR systems. Since the facility would emit more than 10 pounds of ROG (i.e., volatile organic compounds or VOCs) in a single day, the Best Available Control Technology (BACT) requirement of Regulation 2-2-301 would be triggered. BACT for Gasoline Dispensing Facilities is considered the use of CARB-certified Phase-I and Phase-II vapor recovery equipment. A Health Risk Assessment (HRA) would be required by BAAQMD since the annual benzene emissions, a TAC, exceed the toxic air contaminant risk triggering level specified in Regulation 2-5.

Community Risk Thresholds of Significance

The Bay Area Air Quality Management District (BAAQMD) identified significance thresholds for exposure to TACs and $PM_{2.5}$ as part of its May 2011 *CEQA Air Quality Guidelines*[3]. This report uses the thresholds and methodologies from BAAQMD's May 2011 *CEQA Air Quality Guidelines* to determine whether there would be any project health risk impacts. This report addresses single-source (construction and operational) impacts to nearby off-site receptors. The following are the significance criteria that are used to judge this project's impacts:

Single Source Thresholds

If emissions of TACs or $PM_{2.5}$ exceed any of the thresholds of significance listed below, the proposed project would result in a significant impact and mitigation would be required.

- An excess cancer risk level of more than 10 in 1 million, or a non-cancer (chronic or acute) hazard index greater than 1.0.
- An incremental increase of more than 0.3 micrograms per cubic meter ($\mu g/m^3$) annual average $PM_{2.5}$.
- An incremental risk in the Hazard Index of more than 1.0.

Cumulative Source Thresholds

A project would have a cumulatively considerable impact if the aggregate total of all past, present, and foreseeable future sources within a 1,000-foot radius of the fence line of a source or from the location of a receptor, plus the contribution from the project, exceeds the following thresholds.

- An excess cancer risk levels of more than 100 in one million or a chronic non-cancer hazard index (from all local sources) greater than 10.0.
- An incremental increase of more than 0.8 $\mu g/m^3$ annual average $PM_{2.5}$.
- An incremental risk in the Hazard Index of more than 10.0.

[3] BAAQMD, 2011. *BAAQMD CEQA Air Quality Guidelines*. May. These guidelines were updated in May 2017 to reflect recent litigation that does not affect the thresholds used for this project. See http://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines accessed on February 28, 2019.

Construction Community Risk Impacts

Construction activity is anticipated to include demolition, minor grading, building construction, paving and some application of architectural coatings. Construction equipment and associated heavy-duty truck traffic generates diesel exhaust, which is a TAC. This health risk assessment focused on modeling on-site construction activity using construction fleet information included in the project design. Construction period emissions were modeled using the California Emissions Estimator Model, Version 2016.3.2 (CalEEMod) along with projected construction activity. The number and types of construction equipment and diesel vehicles, along with the anticipated length of their use for different phases of construction were based on the default schedule assumed by the model. Construction of the project is expected to occur over about a 7-month period assumed to occur in 2019. While construction may begin later, the use of the earliest construction start date would result in higher emissions, reflective of slightly older construction equipment that would have higher emissions rates. Default construction assumptions assigned by CalEEMod were used.

Construction Emissions

The CalEEMod model provided unmitigated total annual PM_{10} (assumed to be diesel particulate matter) and $PM_{2.5}$ exhaust emissions for the off-road construction equipment and for exhaust emissions from on-road vehicles (haul trucks, vendor trucks, and worker vehicles), with total DPM exhaust emissions of 0.0351 tons (70 pounds) in 2019. The construction DPM emissions include on-road emissions resulting from haul truck travel during grading activities, worker travel, and vendor deliveries during building construction, with overall trip lengths of 1.0 mile to simulate travel on and near the site. Fugitive $PM_{2.5}$ dust emissions were calculated by CalEEMod as 2.2 pounds for the overall construction period. The CalEEMod model output with emission calculations are provided in *Attachment 2*.

Dispersion Modeling

The U.S. EPA AERMOD dispersion model was used to predict concentrations of DPM and $PM_{2.5}$ at existing sensitive receptors in the vicinity of the project site. The AERMOD modeling utilized two area sources to represent the on-site construction emissions, one for DPM exhaust emissions and one for fugitive $PM_{2.5}$ dust emissions. The AERMOD modeling utilized area sources to represent the locations of on-site construction activities. Emissions were distributed evenly across the areas sources. To represent the construction equipment exhaust emissions, an emission release height of 6 meters (20 feet) was used for the area sources. The elevated source height reflects the height of the equipment exhaust pipes and buoyancy of the exhaust plume. For modeling fugitive $PM_{2.5}$ emissions, a near ground level release height of 2 meters (6 feet) was used for the area sources. Emissions from on-road truck travel were included in the area sources. Emissions were modeled as occurring daily between 7 am - 4 pm, when the majority of construction activity would occur. Figure 1 shows the project site and nearby sensitive receptor locations where health impacts were evaluated.

The model used a 5-year data set (2009-2013) of hourly meteorological data from Livermore Municipal Airport prepared for use with the AERMOD model by the CARB. Annual DPM concentrations from construction activities were predicted for 2019, with the annual average concentrations based on the 5-year average concentrations from modeling 5 years of meteorological data. DPM concentrations were calculated at nearby residential receptors and The Church of Pleasanton using receptor heights of 1.5 meters (5 feet).

Construction Cancer Risk and Hazards

The maximum-modeled unmitigated (uncontrolled) annual DPM concentration occurred at a residential receptor southeast of the project site. The location where the maximum impact occurred is identified on Figure 2. Increased cancer risks were calculated using the modeled annual concentrations and BAAQMD recommended risk assessment methods for infant and adult exposures for residential receptors, and for off-site worker exposure (25 years) and child exposure (9 years) at The Church of Pleasanton. Table 2 reports the community risk impacts associated with construction activities at the various sensitive receptor types near the project. Results of this assessment indicate that, with project construction, the incremental infant cancer risk at the maximally exposed residential individual location would be 2.1 in one million, the maximum residential adult incremental cancer risk would be 0.04 in one million. At The Church of Pleasanton, the maximum off-site worker cancer risk would be 0.1 in one million and the maximum off-site child cancer risk would be 1.1 in one million. The predicted excess cancer risks are below the BAAQMD significance threshold of 10 in one million and are not considered a significant impact.

The modeled maximum annual $PM_{2.5}$ concentration was 0.04 micrograms per cubic meter ($\mu g/m^3$), occurring at the The Church of Pleasanton south of the construction area. The maximum modeled residential $PM_{2.5}$ concentration was 0.01 $\mu g/m^3$ occurring where the maximum residential cancer risk would occur. These $PM_{2.5}$ concentrations are below the BAAQMD threshold of 0.3 $\mu g/m^3$ used to judge the significance of impacts for $PM_{2.5}$.

Potential non-cancer health effects due to chronic exposure to DPM were also evaluated. The chronic inhalation reference exposure level (REL) for DPM is 5 $\mu g/m^3$. The Hazard Index (HI), which is the ratio of the annual DPM concentration to the REL, is less than 0.01 at all receptor locations. This HI is much lower than the BAAQMD significance criterion of a HI greater than 1.0.

The project would have *a less-than-significant* impact with respect to community risk caused by construction activities. *Attachment 2* includes the emission calculations used for the area source modeling, dispersion modeling inputs, and the health risk calculations.

Table 1. Construction Period Community Risk Impacts

	Community Risk Impact		
Receptor	**Excess Cancer Risk (per million)**	**Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)**	**Hazard Index**
Residential – infant	2.1	0.01	<0.01
Residential - adult	<0.1	0.01	<0.01
Off-Site Worker	0.1	0.04	<0.01
Off-Site child (non-residential)	1.1	0.04	<0.01
BAAQMD Threshold	*>10.0*	*>0.3*	<1.0
Significant	*No*	*No*	*No*

Figure 1 – Project Site and Sensitive Receptor Locations

Operational Community Risk Impacts

Local traffic generated by the project along with evaporative emissions from gasoline fueling could lead to operational community risk impacts. Specific sources of emissions include traffic traveling to and from the project, traffic idling at the project, truck traffic accessing the site (importing fuel) and evaporative emissions of fuel from transfer and storage of gasoline (i.e., underground tank filling, tank breathing and vehicle fueling and spillage). Impacts from each of these sources are addressed. These sources are assumed to be operational well into the future (i.e., 30 years). The year 2020 was assumed to be the first full year of operation and was used as the year of analysis for generating emission rates. Emission rates are anticipated to decrease in the future due to improvements in exhaust systems and turnover of the fleet from older, more polluting vehicles, to newer cleaner vehicles.

Prediction of Traffic-Related Emissions

Project Traffic

Daily traffic generation was predicted using the CalEEMod model default assumptions for a fueling station with 12 pumps. The CalEEMod model predicts that the project would generate about 2,023 vehicle trips per day. The model estimates that about 59 percent of these trips would be passby trips. This means the vehicles are traveling by or near the project site. However, to be conservative, this analysis assumes these trips are all new to the project site. Note that the station currently operates, so, these emissions are not entirely new. Since the distribution of local vehicle trips to the fueling station was not available, it was assumed that all vehicles would enter the gas station from W. Los Positas Boulevard, travel through the gas station to the pump area, and then exit the station via the southern driveway onto Hopyard Road. The number of fuel delivery trucks visiting that station were estimated as 183 trucks per year based on a total station fuel use of 1,644,000 gallons per year. These trucks were assumed to arrive at the station via W. Los Positas Boulevard, travel to the underground fuel tank storage area, unload their fuel, then depart the station via the northern driveway on Hopyard Road. Both the customer vehicles and fuel delivery trucks were assumed to travel at a speed of 5 mph while at the station site.

The primary TACs of concern from project traffic are non-diesel mobile source air toxics found in total organic gases (TOG). This includes 14 different toxic components of TOG running exhaust emissions and five different toxic components of TOG evaporative emissions from gasoline vehicles.[4] The EMFAC2014 emission factor model provided emission rates of TOG for exhaust emissions (including starting emissions) and evaporative loss emissions. Starting emissions were assumed to occur once per vehicle visit to the station and all those emissions were conservatively assumed to occur at the station, near the fueling area. All vehicles using the fueling station were assumed to be light-duty autos (LDA), light-duty trucks (LDT) or medium-duty trucks (MDT). The percentage breakdown was based on the Alameda County fleet average as reported by EMFAC2014. BAAQMD has developed weighted toxicity values for tailpipe and evaporative losses that incorporates the individual toxicity of each compound that make up TOG.[5] The summation of all of the individual weighted toxicity values developed by BAAQMD is then cumulatively weighted and applied in the risk and hazard calculations. TOG emission rates used in the analysis are provided in *Attachment 3*.

All trucks delivering fuel to the station were assumed to be heavy heavy-duty diesel trucks (HHDT). The TAC of concern from these trucks is DPM. The EMFAC2014 model was used to calculate DPM exhaust emissions from the fuel delivery trucks at a speed of 5 mph.

Idling Emissions - Customer Vehicles and Fuel Delivery Trucks

Idling emissions due to customer vehicles queuing and fuel delivery trucks idling were computed using the EMFAC2014 motor vehicle emission factor model. Idle emissions were computed by converting 5 mile-per hour emissions rates into hourly emissions, TOG and $PM_{2.5}$ for customer vehicles and DPM and $PM_{2.5}$ for the delivery trucks. All customer vehicles were conservatively assumed to idle for 5 minutes during each visit to the station, while the fuel delivery trucks were assumed to idle for a total of 10 minutes while at the station. Annual emissions assumed similar

[4] BAAQMD. 2012. Recommended Methods for Screening and Modeling Local Risks and Hazard. May.
[5] BAAQMD. 2012. Recommended Methods for Screening and Modeling Local Risks and Hazard. May.

operating conditions 365 days per year. The analysis of idling emissions is provided in *Attachment 3*.

Fueling Emissions

The transfer and storage of gasoline results in emissions of TOG compounds. Emissions of TOG and benzene, which is a TAC, computed based on projected annual throughput of gasoline (i.e., 1.56 million gallons) using emission factors developed by CARB.[6] The emission factors are based on annual gasoline throughput and account for emissions from fuel storage tank loading and pressure driven (breathing) losses, motor vehicle refueling, spillage while refueling, and minor emissions from vapor permeation through gasoline dispensing hoses. The fueling emission factors take into account the effects of vehicles equipped with onboard refueling vapor recovery (ORVR) systems. ORVR systems were phased in beginning with 1998 model year passenger vehicles, and are now installed on all passenger, light-duty, and medium-duty vehicles manufactured since the 2006 model year. Emissions of benzene were computed assuming that benzene makes up 0.3% of gasoline vapor and 1% of liquid gasoline.[7] A*ttachment 3* includes emissions calculation of TOG and benzene emissions from gasoline fueling, storage, and transfer.

Dispersion Modeling

The US EPA AERMOD dispersion model was used to predict DPM and other TAC concentrations at existing sensitive receptors (residences) in the vicinity of the project site. The modeling used the same (2009-2013) meteorological data from the Livermore Municipal Airport as previously discussed for the construction health risk modeling. TAC concentrations from on-site emission sources were calculated at nearby sensitive receptors using receptor heights of 1.5 meters (4.9 feet). Since the receptors being modeled are close to the emission area, and there is negligible elevation difference between the source and receptors, flat terrain was used for the modeling.

Truck and customer vehicle travel emissions were modeled as line sources (a series of volume sources along a line) representing travel routes depicted in the site circulation plans. Truck emission release heights were assumed to be 3.4 meters (11 feet), while customer vehicles were assumed to have a release height of 0.5 meters (1.6 feet). Emissions of TOG and $PM_{2.5}$ from idling customer vehicles were modeled using six volume sources, two for TOG exhaust emissions, two for TOG evaporative emissions, and two for $PM_{2.5}$ emissions. The volume sources were placed in the fuel dispensing area. All of these volume sources were modeled using a release height of 0.5 meters (1.6 feet). The modeling assumed the fuel station would operate 24 hours per day. Truck idle emissions were modeled as a point source (truck exhaust stack) in the vicinity of the fuel storage tanks. The locations of these emission sources are shown in Figure 2.

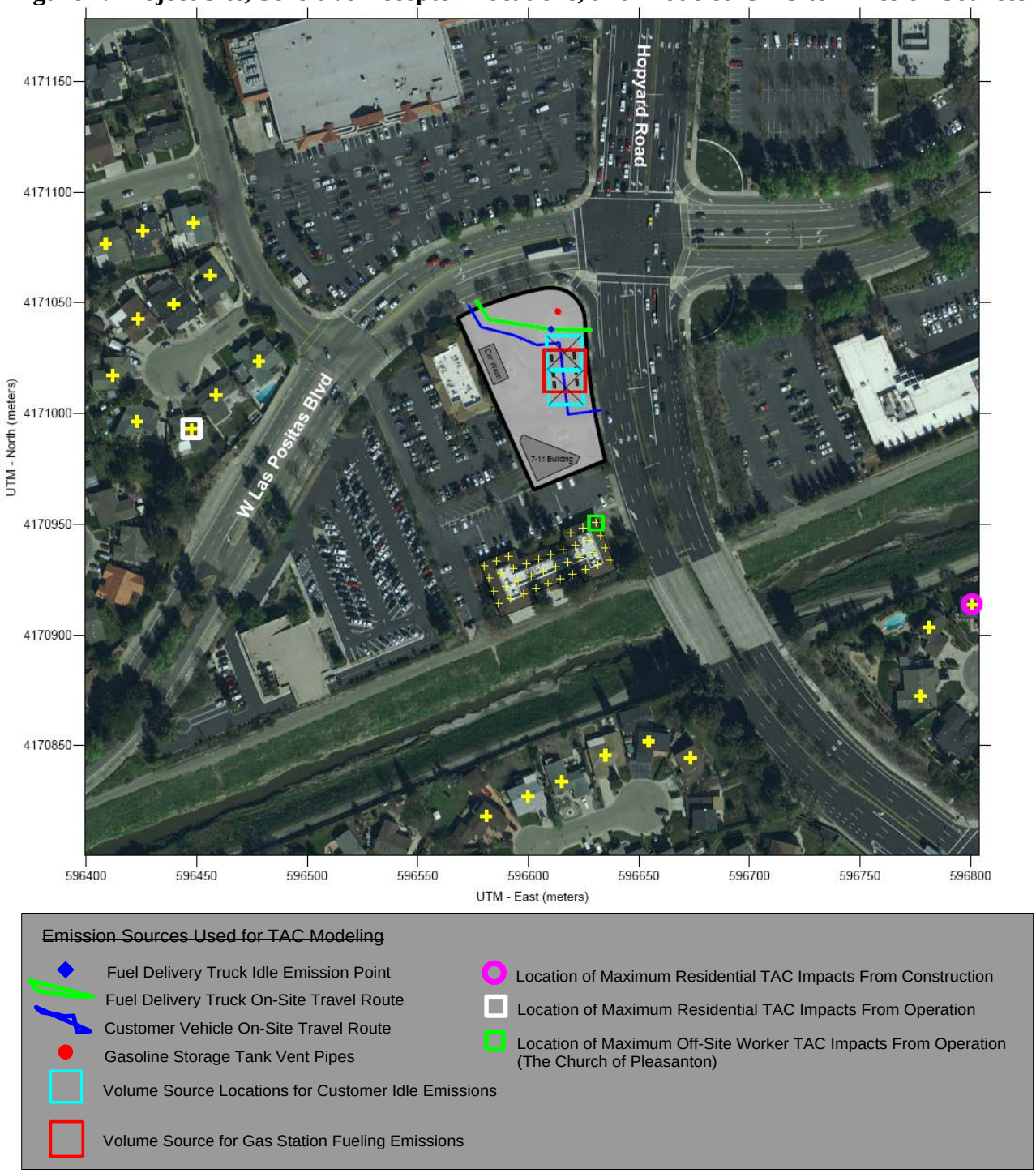
Benzene emissions from the fuel station were modeled using volume sources as recommended by CAPCOA. Two volume sources with side lengths of 18.7 meters (61 feet) and a 4-meter (13-foot) height were used. One of the volume sources were used to represent vehicle fueling emissions with a release height of 1 meter and the other volume sources represented the emission from fuel spillage with a release height of 0 meters. Benzene emissions from storage tank loading and breathing losses are discharged from vent pipes located in near the underground storage tank area

[6] CARB. 2013. *Revised Emissions Factors for Gasoline Marketing Operations at California Gasoline Dispensing Facilities*. December 23, 2013.
[7] CAPCOA. 1997. *Air Toxics "Hot Spots" Program, Gasoline Service Station Industrywide Risk Assessment Guidelines*, November 1997

and were modeled as a single point source. Details on the emission calculations and dispersion modeling information for these sources are provided in *Attachment 3*.

TOG, DPM, $PM_{2.5}$, and benzene concentrations were calculated at residential receptors near the project site and at The Church of Pleasanton using receptor heights of 1.5 meters (5 feet).

Figure 2. Project Site, Sensitive Receptor Locations, and Modeled On-Site Emission Sources



Cancer Risk, $PM_{2.5}$ and Hazards

Using the maximum modeled DPM, TOG and benzene concentrations, individual cancer risks were computed using the most recent methods recommended by BAAQMD and OEHHA that include nearly continuous exposures with adjustments for infants and children. Based on modeled TOG and DPM concentrations, cancer risks were calculated for 30-year residential exposures, 25-year exposures for an off-site worker exposure, and 9-year exposures for off-site non-residential children at The Church of Pleasanton assuming constant emissions at 2020 levels.

Table 2 shows the excess cancer risk, annual $PM_{2.5}$ concentration and acute or chronic hazards associated with the project operation at the locations of residential, off-site worker, and off-site child exposures. In addition, the contribution of other substantial sources of TACs located within 1,000 feet of the project site are included and combined with construction impacts. The combination of construction activity and operation impacts are shown in Table 4. The maximum excess cancer risk associated with project construction and operation would be 4.2 chances per million. The maximum annual $PM_{2.5}$ concentration would 0.05 $\mu g/m^3$, which does not exceed the significance threshold of 0.3 $\mu g/m^3$. The predicted Hazard Index is well below the significance threshold.

Table 2. Project Operation Maximum Community Risk Impacts

	Community Risk Impact		
Receptor	**Excess Cancer Risk (per million)**	**Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)**	**Total Hazard Index**
Residential	2.09	0.006	<0.01
Off-Site Worker	0.27	0.010	0.02
Off-Site child (non-residential)	0.25	0.010	0.02
BAAQMD Threshold	*>10.0*	*>0.3*	>1.0
Significant	*No*	*No*	*No*

Existing Fuel Station - Operational Community Risk Impacts

Health impacts from operation of the existing fuel station were also calculated in order to evaluate increased impacts from the proposed project. Emissions from the existing fuel station were calculated in the same manner as described above for the proposed project, but using the existing gasoline volume of 100,000 gallons per month and no diesel fuel sales. These emissions were then modeled using the AERMOD model in a similar manner as described above for the proposed project. The locations of the emission sources use for modeling the existing fuel station emissions are shown in Figure 3.

Table 3 shows the excess cancer risk, annual $PM_{2.5}$ concentration and acute or chronic hazards associated with the existing fuel station operation at the locations of residential, off-site worker, and off-site child exposures.

Project Impacts

To predict project impacts, the community risk impacts from existing operations, shown in Table 3, are subtracted from those caused by the proposed project, contained in Table 1 (for construction) and Table 2 (for operational impacts). These results are reported in Table 4.

Figure 3. Existing Fuel Station, Sensitive Receptors, and Modeled On-Site Emission Sources

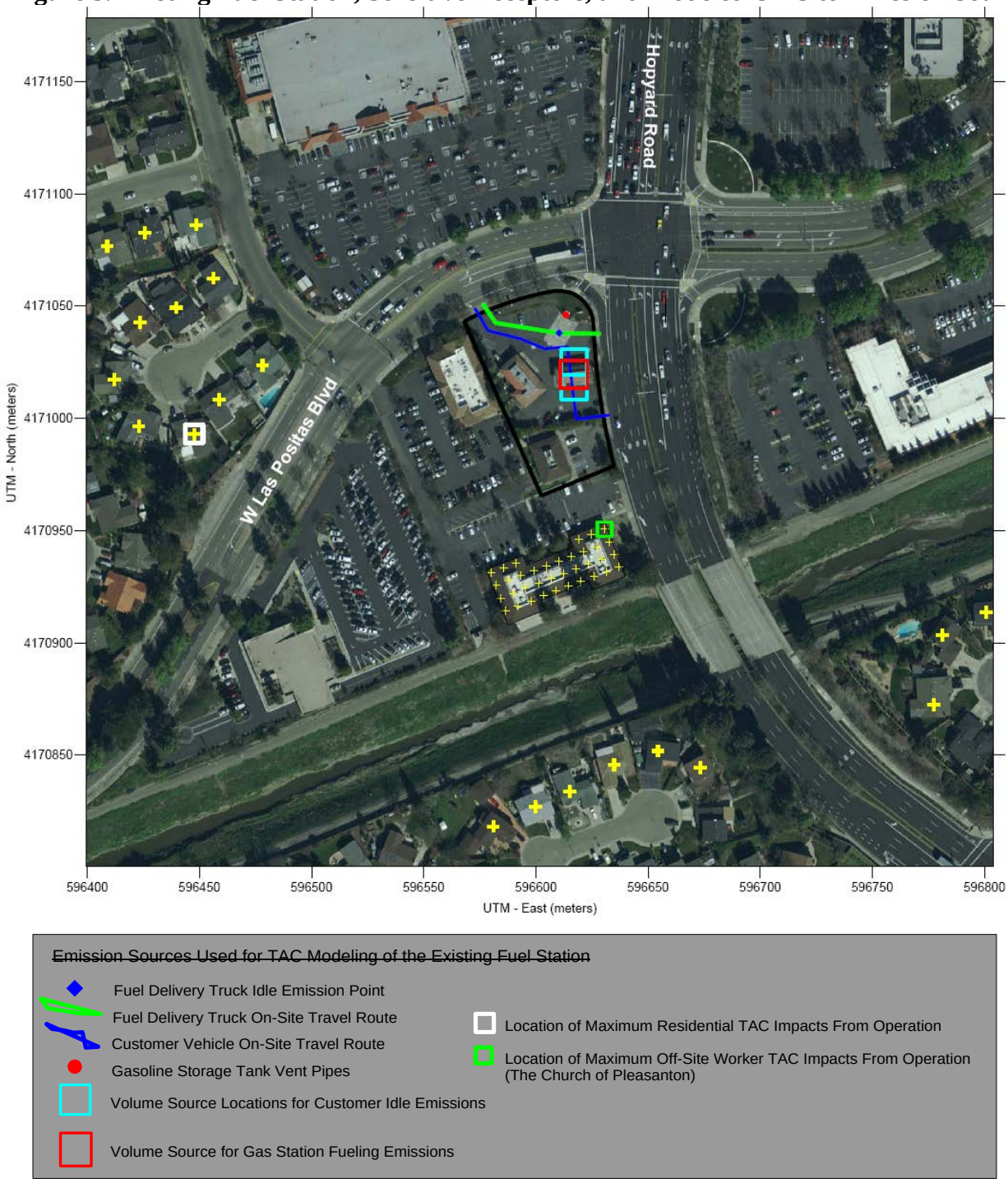


Table 3. Existing Fuel Station – Operation Maximum Community Risk Impacts

Receptor	Community Risk Impact		
	Excess Cancer Risk (per million)	**Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)**	**Total Hazard Index**
Residential	0.9	0.004	<0.01
Off-Site Worker	0.1	0.006	<0.01
Off-Site child (non-residential)	0.1	0.006	<0.01
BAAQMD Threshold	*>10.0*	*>0.3*	>1.0
Significant	*No*	*No*	*No*

Cumulative Community Risk Impacts

The only other sources of TACs or PM2.5 near the project are traffic on Hopyard Road and W. Las Positas. The effect of these sources was computed using BAAQMD's Roadway Screening Calculator along with traffic volumes published in the Pleasanton General Plan for 2025 conditions (see Attachment 4). These effects are included in Table 3 and the combined impact is compared to BAAQMD threshold for cumulative sources. When combined with project impacts, the community risk impacts are below the significance thresholds that are cancer risk of 100 chances per million, PM2.5 concentrations of 0.8 $\mu g/m^3$ and an HI less than 100.

Summary of Impacts

This analysis found that the combination of TAC emissions from construction and operation would not exceed the thresholds of significance for community risk impacts in terms of excess lifetime cancer risk, annual $PM_{2.5}$ concentrations and Hazard Index. Both single-source and cumulative source thresholds for community risk would not be exceeded. As a result, the project would have a less than significant impact in terms of exposing sensitive receptors to substantial air pollutant concentrations.

Note that the assessment used assumptions that are likely to overpredict the level of impacts. This includes assumptions that 3rd-trimester fetus, infants, children and adults would almost continuously occupy residential locations for 30 years, resulting in the maximum possible exposure scenario that could occur. Non-residential uses at the neighboring church were assumed to include children with exposure similar to a school child exposure, as recommended by BAAQMD. Even with these conservative exposure assumptions, community risk impacts are predicted to be well below thresholds recommended by BAAQMD and used by the City of Pleasanton to judge the significance of air quality community risk impacts. With inclusion of cumulative sources, the risks would be well below cumulative thresholds also recommended by BAAQMD.

Table 4. Pleasanton Fuel Station Cumulative Community Risk Impacts

Receptor/Source	Community Risk Impact		
	Excess Cancer Risk (per million)	**Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)**	**Hazard Index (highest of Acute or Chronic)**
Residential (30-year exposure)			
Proposed Project			
-Construction Impacts (2019)	2.07	0.013	0.003
-Vehicles (Fuel Truck & Customer)	1.92	0.006	0.003
-Benzene (from storage & fueling)	0.17	0.000	0.004
Proposed Project Total	***4.16***	***0.019***	***0.010***
Existing Fuel Station			
-Vehicles (Fuel Truck & Customer)	0.75	0.004	0.003
-Benzene (from storage & fueling)	0.16	0.000	0.004
Existing Fuel Station Total	***0.91***	***0.004***	***0.007***
Net Project Increase	**3.3**	**0.02**	**0.003**
Off-Site Child (9-year exposure)			
Proposed Project			
-Construction Impacts (2019)	1.07	0.039	0.007
-Vehicles (Fuel Truck & Customer)	0.23	0.010	0.008
-Benzene (from storage & fueling)	0.02	0.000	0.009
Proposed Project Total	***1.32***	***0.049***	***0.024***
Existing Fuel Station			
-Vehicles (Fuel Truck & Customer)	0.09	0.006	0.006
-Benzene (from storage & fueling)	0.01	0.000	0.007
Existing Fuel Station Total	***0.10***	***0.006***	***0.013***
Net Project Increase	**1.2**	**0.04**	**0.011**
Significance Threshold (Project)	*10*	*0.3*	*1.0*
Cumulative Sources at Residential			
Project	4.2	0.02	0.01
W. Las Positas traffic at 40 feet[2]	13.1	0.38	<0.01
Hopyard traffic at 470 feet[3]	3.1	0.08	<0.01
Maximum Cumulative including Project	**20.4**	**0.48**	**<0.03**
Cumulative Sources at School			
Project	1.3	0.05	0.02
W. Las Positas traffic at 220 feet[2]	1.5	0.08	<0.01
Hopyard traffic at 50 feet[3]	8.1	0.41	<0.01
Maximum Cumulative including Project	**10.9**	**0.54**	**<0.04**
Significance Threshold (Cumulative)	*100*	*0.8*	*10.0*

[1] Note that maximum year for $PM_{2.5}$ exposure would have 6 months of construction and only one-half year of operation.
[2] Based on BAAQMD Roadway Screening Calculator for East-West Roadway with 25,000 ADT per General Plan.
[3] Based on BAAQMD Roadway Screening Calculator for North-South Roadway with 50,000 ADT per General Plan.. Adjusted for number of school days (180)

Attachment 1 Health Risk Calculation Methodology

A health risk assessment (HRA) for exposure to Toxic Air Contaminates (TACs) requires the application of a risk characterization model to the results from the air dispersion model to estimate potential health risk at each sensitive receptor location. The State of California Office of Environmental Health Hazard Assessment (OEHHA) and California Air Resources Board (CARB) develop recommended methods for conducting health risk assessments. The most recent OEHHA risk assessment guidelines were published in February of 2015.[8] These guidelines incorporate substantial changes designed to provide for enhanced protection of children, as required by State law, compared to previous published risk assessment guidelines. CARB has provided additional guidance on implementing OEHHA's recommended methods.[9] This HRA used the recent 2015 OEHHA risk assessment guidelines and CARB guidance. The BAAQMD has adopted recommended procedures for applying the newest OEHHA guidelines as part of Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.[10] Exposure parameters from the OEHHA guidelines and the recent BAAQMD HRA Guidelines were used in this evaluation.

Cancer Risk

Potential increased cancer risk from inhalation of TACs are calculated based on the TAC concentration over the period of exposure, inhalation dose, the TAC cancer potency factor, and an age sensitivity factor to reflect the greater sensitivity of infants and children to cancer causing TACs. The inhalation dose depends on a person's breathing rate, exposure time and frequency of exposure, and the exposure duration. These parameters vary depending on the age, or age range, of the persons being exposed and whether the exposure is considered to occur at a residential location or other sensitive receptor location.

The current OEHHA guidance recommends that cancer risk be calculated by age groups to account for different breathing rates and sensitivity to TACs. Specifically, they recommend evaluating risks for the third trimester of pregnancy to age zero, ages zero to less than two (infant exposure), ages two to less than 16 (child exposure), and ages 16 to 70 (adult exposure). Age sensitivity factors (ASFs) associated with the different types of exposure are an ASF of 10 for the third trimester and infant exposures, an ASF of 3 for a child exposure, and an ASF of 1 for an adult exposure. Also associated with each exposure type are different breathing rates, expressed as liters per kilogram of body weight per day (L/kg-day). As recommended by the BAAQMD, 95th percentile breathing rates are used for the third trimester and infant exposures, and 80th percentile breathing rates for child and adult exposures. Additionally, CARB and the BAAQMD recommend the use of a residential exposure duration of 30 years in calculating a 70-year lifetime cancer risk for sources with long-term emissions. For workers, assumed to be adults, a 25-year exposure period is recommended by the BAAQMD.

Under previous OEHHA and BAAQMD HRA guidance, residential receptors are assumed to be at their home 24 hours a day, or 100 percent of the time. In the 2015 Risk Assessment Guidance,

[8] OEHHA, 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. Office of Environmental Health Hazard Assessment. February.
[9] CARB, 2015. *Risk Management Guidance for Stationary Sources of Air Toxics*. July 23.
[10] BAAQMD, 2016. *BAAQMD Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines*. December 2016.

OEHHA includes adjustments to exposure duration to account for the fraction of time at home (FAH), which can be less than 100 percent of the time, based on updated population and activity statistics. The FAH factors are age-specific and are: 0.85 for third trimester of pregnancy to less than 2 years old, 0.72 for ages 2 to less than 16 years, and 0.73 for ages 16 to 70 years. Use of the FAH factors is allowed by the BAAQMD if there are no schools in the project vicinity that would have a cancer risk of one in a million or greater assuming 100 percent exposure (FAH = 1.0).

Functionally, cancer risk is calculated using the following parameters and formulas:

Cancer Risk (per million) = $CPF \times Inhalation\ Dose \times ASF \times ED/AT \times FAH \times 10^6$

Where:

CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = $C_{air} \times DBR \times A \times (EF/365) \times 10^{-6}$

Where:

C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

The health risk parameters used in this evaluation are summarized as follows:

Parameter	*Exposure Type* →	Infant		Child		Adult	Worker
	Age Range →	3rd Trimester	0<2	2 < 9	2 < 16	16 - 30	> 16
Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$							
DPM		1.1E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00	1.1E+00
Benzene		1.0E-01	1.0E-01	1.0E-01	1.0E-01	1.0E-01	1.0E-01
Naphthalene		1.2E-01	1.2E-01	1.2E-01	1.2E-01	1.2E-01	1.2E-01
Polycyclic aromatic hydrocarbons (PAH)		3.9E+00	3.9E+00	3.9E+00	3.9E+00	3.9E+00	3.9E+00
Daily Breathing Rate (L/kg-day)[a]		361	1,090	631	572	261	690[b]
Inhalation Absorption Factor		1	1	1	1	1	1
Averaging Time (years)		70	70	70	70	70	70
Exposure Duration (years)		0.25	2	14	14	14	25
Exposure Frequency (days/year)		350	350	350	350	350	250
Age Sensitivity Factor		10	10	3	3	1	1
Fraction of Time at Home		0.85-1.0	0.85-1.0	0.72-1.0	0.72-1.0	0.73	-

[a] 95th percentile breathing rates for 3rd trimester and infants and 80th percentile for children and adults
[b] Daily equivalent breathing rate of worker 8-hr breathing rate of 230 L/kg-8hr.

Non-Cancer Hazards

Potential non-cancer health hazards from TAC exposure are expressed in terms of a hazard index (HI), which is the ratio of the TAC concentration to a reference exposure level (REL). OEHHA has defined acceptable concentration levels for contaminants that pose non-cancer health hazards. TAC concentrations below the REL are not expected to cause adverse health impacts, even for sensitive individuals. The total HI is calculated as the sum of the HIs for each TAC evaluated and the total HI is compared to the BAAQMD significance thresholds to determine whether a significant non-cancer health impact from a project would occur.

Typically, for projects involving construction or for residential projects locating near roadways with substantial TAC emissions, the primary TAC of concern with non-cancer health effects is DPM. For other emission sources, such as gasoline stations, benzene, toluene, and xylenes (organic TACs) are of concern with respect acute and chronic non-cancer health effects.

Annual $PM_{2.5}$ Concentrations

While not a TAC, fine particulate matter ($PM_{2.5}$) has been identified by the BAAQMD as a pollutant with potential non-cancer health effects that should be included when evaluating potential community health impacts under the California Environmental Quality Act (CEQA). The thresholds of significance for $PM_{2.5}$ (project level and cumulative) are in terms of an increase in the annual average concentration. When considering $PM_{2.5}$ impacts, the contribution from all sources of $PM_{2.5}$ emissions should be included. For projects with potential impacts from nearby local roadways, the $PM_{2.5}$ impacts should include those from vehicle exhaust emissions, $PM_{2.5}$ generated from vehicle tire and brake wear, and fugitive emissions from re-suspended dust on the roads

Attachment 2: Construction Modeling Information

Construction Health Risk Information

Pleasanton Fuel Station - 3720 Hopyard Rd

DPM Emissions and Modeling Emission Rates

Construction Year	Activity	DPM (ton/year)	Area Source	DPM Emissions (lb/yr)	DPM Emissions (lb/hr)	DPM Emissions (g/s)	Modeled Area (m^2)	DPM Emission Rate ($g/s/m^2$)
2019	Construction	0.0351	CON_DPM	70.2	0.02137	2.69E-03	3,753	7.17E-07

Construction Hours

hr/day =	9	(7am - 4pm)
days/yr =	365	
hours/year =	3285	

PM2.5 Fugitive Dust Emissions for Modeling

Construction Year	Activity	Area Source	PM2.5 Emissions (ton/year)	PM2.5 Emissions (lb/yr)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (g/s)	Modeled Area (m^2)	PM2.5 Emission Rate $g/s/m^2$
2019	Construction	CON_FUG	0.00110	2.2	0.00067	8.44E-05	3,753	2.25E-08

Construction Hours

hr/day =	9	(7am - 4pm)
days/yr =	365	
hours/year =	3285	

Pleasanton Fuel Station - 3720 Hopyard Rd - Construction Health Impact Summary

Maximum Impacts at Residential MEI Location

Emissions Year	Maximum Concentrations: Exhaust PM10/DPM ($\mu g/m^3$)	Maximum Concentrations: Fugitive PM2.5 ($\mu g/m^3$)	Cancer Risk (per million): Infant/Child	Cancer Risk (per million): Adult	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2019	0.0126	0.0004	**2.1**	**0.04**	**0.003**	**0.01**

Maximum Impacts at Maximum Worker Location (The Church in Pleasanton)

Emissions Year	Maximum Concentrations: Exhaust PM10/DPM ($\mu g/m^3$)	Maximum Concentrations: Fugitive PM2.5 ($\mu g/m^3$)	Worker Cancer Risk (per million)	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2019	0.0371	0.0019	**0.09**	**0.007**	**0.04**

Maximum Impacts for Off-Site Child Exposure (The Church in Pleasanton)

	Unmitigated Emissions				
	Maximum Concentrations				
Construction Year	Exhaust PM2.5/DPM ($\mu g/m^3$)	Fugitive PM2.5 ($\mu g/m^3$)	Child Cancer Risk (per million)	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2019	0.0371	0.0019	**1.07**	**0.007**	**0.04**

Pleasanton Fuel Station - 3720 Hopyard Rd - Construction Impacts
Maximum Residential DPM Cancer Risk and PM2.5 Calculations From Construction Impacts at Off-Site Residential MEI Location - 1.5 meter receptor height

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child				Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 9**	**2 - 16**	**16 - 30**
Parameter					
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	640	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	1.00	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

		Infant/Child - Exposure Information			Infant/Child	Adult - Exposure Information			Adult	Maximum	
						Modeled					
Exposure	Exposure Duration	DPM Conc (ug/m3)		Age Sensitivity	Cancer Risk	DPM Conc (ug/m3)		Age Sensitivity	Cancer Risk	Fugitive	Total
Year	(years)	Year	Annual	Factor	(per million)	Year	Annual	Factor	(per million)	PM2.5	PM2.5
1	1	2019	0.0126	10	2.1	2019	0.0126	1	0.04	0.0004	0.013

Pleasanton Fuel Station - 3720 Hopyard Rd - Construction Impacts
Maximum DPM Cancer Risk and PM2.5 Calculations From Construction
Impacts at Off-Site Maximum Worker Location - 1.5 meter receptor height

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child				Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 9**	**2 - 16**	**16 - 30**
Parameter					**(Worker)**
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR =	361	1090	640	572	230
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	1.00	1.00	1.00	1.00	0.73

* 95th percentile worker breathing rate (L/kg-8 hours)

Construction Cancer Risk by Year - Maximum Impact Receptor Location

		Adult Worker - Exposure Information				Maximum	
		Modeled					
		DPM Conc (ug/m3)		Age	Worker		
Exposure Year	**Exposure Duration (years)**	**Year**	**Annual**	**Sensitivity Factor**	**Cancer Risk (per million)**	**Fugitive PM2.5**	**Total PM2.5**
1	1	2019	0.0371	1	0.09	0.0019	0.039

Pleasanton Fuel Station - 3720 Hopyard Rd - Construction Impacts
Maximum DPM Cancer Risk Calculations From Construction
Off-Site Child Exposure

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child				Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 9**	**2 - 16**	**16 - 30**
Parameter					
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	640	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	1.00	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

		Child - Exposure Information				Maximum	
Exposure Year	**Exposure Duration (years)**	**DPM Conc (ug/m3) Year**	**Annual**	**Age* Sensitivity Factor**	**Child Cancer Risk (per million)**	**Fugitive PM2.5**	**Total PM2.5**
1	1	2019	0.0371	3	1.1	0.0019	0.039

* Students assumed to be from 2 to 9 years of age

Attachment 3: Operational Emissions Modeling, Dispersion Modeling Information, and Health Risk Calculations

Proposed Project

Pleasanton Fuel Station - TOG and TAC Emissions

Gas Station with Phase 2 & EVR Controls

Estimated Annual Gasoline Throughput = 1,560,000 gallons/year

TOG Emission Factors and Annual Emissions per GDF

Emission Source	TOG[1] Emission Factor (lb/10^3 gallon)	TOG Annual Emissions (lb/year)
Fueling[2]		
Non-ORVR Vehicles	0.42	86.5
ORVR Vehicles	0.021	28.5
Bulk Transfer Losses	0.15	234.0
Pressure Driven Losses	0.024	37.4
Fueling - Spillage	0.24	374.4
Gasoline Hose Losses	0.009	14.0
Total	**0.532**	**774.9**

TOG = total organic gas

ORVR = onboard refueling vapor recovery

1. Emission factors from CARB "Revised Emissions Factors for Gasoline Marketing Operations at California Gasoline Dispensing Facilities". December 23, 2013 (CARB, 2013). Assumes use of enhanced vapor recovery systems.
2. Fueling emissions based on CARB data for 2020 of 87% of vehicles use ORVR (CARB, 2013).

Benzene Emissions

Emission Source	Annual TOG Emissions (lb/year)	Operation[2] Schedule (hrs/day)	Percent[1] Benzene of TOG (%)	TAC Emissions	
				Annual Average (lb/year)	Average Hourly (lb/hr)
Refueling and Hose Losses	129	24	0.3%	0.39	0.00004
Spillage Losses (liquid)	374	24	1.0%	3.74	0.00043
Tank Transfer Losses	234	24	0.3%	0.70	0.00008
Tank Pressure Losses	37	24	0.3%	0.11	0.00001
Total	774.9			4.95	0.00056

Notes:

1. CAPCOA Air Toxics "Hot Spots" Program, Gasoline Service Station Industrywide Risk Assessment Guidelines, November 1997.
2. Gas station assumed to be open 24 hours per day, 365 days per year

Gas Station Modeling - Volume Source Parameters

Emission Source	Number of Volume Sources	Volume Source Dimensions (meters)			Volume Source Release Height (meters)
		Length	Width	Height	
Refueling and Hose Losses	1	18.7	18.7	4	1
Spillage Losses	1	18.7	18.7	4	0

Gas Station Modeling - Point Source Parameters

Emission Source	Number of Sources	Height (meters)	Diameter (meters)	Temperature (^oK)	Velocity (meters/sec)
Tank Transfer Losses	1	3.66	0.0508	291	0.0010
Tank Pressure Losses	1	3.66	0.0508	288.7	0.00016

Gas Station Modeling - TAC Emissions per Source

TAC	Emissions (lb/hr)			
	Refueling and Hose Losses	Spillage Losses	Tank Loading Losses	Tank Breathing Losses
% of Total Benzene Emissions	17%	48%	30%	5%
Benzene	4.42E-05	4.27E-04	8.01E-05	1.28E-05

Pleasanton Fuel Station - 3790 Hopyard Rd
2020 Project Truck Travel and Idle Emissions

Truck Exhaust Emissions

Road Segment	Truck Trip Length (ft)	Truck Trip Length (mi)	Modeled Road Width (ft)	Release Height (m)	No. of Annual Deliveries	Travel Speed (mph)	DPM Emission Factor (g/mi)	Truck Travel DPM Emissions Total Daily (lb/day)	Truck Travel DPM Emissions Total Hourly (lb/hr)	Truck Travel DPM Emissions Total Annual (lb/year)
On-Site Gas Truck	185	0.04	12	3.4	183	5	0.0436	1.69E-06	7.03E-08	6.16E-04

On-Site Diesel Truck Idle Emissions

Location	Stack[a] Height (m)	Stack[a] Diameter (m)	Stack[a] Velocity (m/s)	Stack[a] Temp (^oK)	No. of Annual Deliveries	No. of Modeled Emission Points	Idle Emissions Factor (g/hr)	Idle Emissions per Delivery (g/vehicle)	Total Idle Emissions Daily (lb/day)	Total Idle Emissions Hourly (lb/hr)	Total Idle Emissions Annual (lb/year)
Tank Loading Area	3.84	0.1	51.71	366	183	1	0.218	0.03635	4.01E-05	1.67E-06	0.0146

[a] Point source parameters from SJVAPCD *Guidance for Air Dispersion Modeling* .

Trip Information and DPM/PM2.5 Emission Factors

Daily Truck Deliveries =	183
Operation Days/year =	365
Delivery Truck Hours (hrs/day) =	24
Truck Speed (mph) =	5
Emission Factor for HHDT @ travel speed (g/mi) =	0.04362

Trucks assumed to be heavy duty diesel (HHDT)
Truck emissions based on EMFAC2014 for 2020 with default fleet mix for BAAQMD.
Truck emissions (lb/hr) = EF (g/mi) * Road Length (mi) * No. Trips / Hours per day * conversion factors

Idle DPM Emission Information (2020)

Emission Factor for HHDT @ 5 mph (g/mi) =	0.04362
HHDT Idle Emission Rate (g/hr) =	0.22
Idle Time per Delivery (min)	10

Idle emission factor (g/hr) = EF @5 mph (g/mi) * 5 mph

Monthly Gas Gallons =	130,000
Monthly Diesel Gallons =	7,000
Total Annual Fuel (gal) =	1,644,000
Annual Fuel Deliveries* =	183

* Assumes 9,000 gal fuel truck

Pleasanton Fuel Station - 3790 Hopyard Rd - Operational Emissions - Customer Vehicle Travel
Diesel Vehicles - At Station

Route	Emission Type	Vehicle Type[1]	Annual Number On-Site Vehicles	Travel Speed (mph)	DPM Emission Factor (g/VMT)	Operation[4] Schedule (hrs/day)	On-Site Travel Distance (feet)	On-Site Travel Distance (miles)	Annual DPM Emissions (lb/year)	Average Hourly DPM Emissoins (lb/hr)[4]
Gas Station	Travel	Diesel	37,728	5	0.0638	24	314	0.06	0.32	3.60E-05

[1] Default EMFAC2014 vehicle mix for LDA, LDT, and MDT

[2] Diesel vehicles traveling through station

[3] Emission factors developed from EMFAC2014 for Alameda County

[4] Station operation assumed operate 24 hours per day, 365 days per year

Total Daily Vehicles =	2,023
Days Annual Operation =	365
Total Annual Vehicles =	738,395
Monthly Gas Gallons =	130,000
Monthly Diesel Gallons =	7,000
% Gas Vehicles =	94.9%
% Diesel Vehicles =	5.1%
Annual Gas Vehicles =	700,667
Annual Diesel Vehicles =	37,728

Pleasanton Fuel Station - 3790 Hopyard Rd - Operational Emissions - Customer Vehicle Travel
Gasoline Vehicles - At Station

Route	Emission Type	Vehicle Type[1]	Annual Number On-Site Vehicles	Emissions Factors[3] Total PM2.5 (g/VMT)	TOG Exhaust (g/VMT)	TOG Start Exhaust (g/trip)	TOG Run Loss (g/VMT)	Operation[4] Schedule (hrs/day)	On-Site Travel Distance (feet)	On-Site Travel Distance (miles)	Annual Emissions (lb/year) Total PM2.5	TOG Exhaust	TOG[5] Starting Exhaust	TOG Running Loss	Average Hourly Emissions (lb/hr)[4] Total PM2.5	TOG Exhaust	TOG Starting Exhaust	TOG Running Loss	Total TOG
Gas Station	Travel	Gas	700,667	0.0289	0.1776	0.1762	0.0724	24	314	0.06	2.6	16.3	272.2	6.7	3.03E-04	1.86E-03	3.11E-02	7.59E-04	3.37E-02

[1] Default EMFAC2014 vehicle mix for LDA, LDT, and MDT

[2] Gas vehicles traveling through station

[3] Emission factors developed from EMFAC2014 for Alameda County

[4] Station operation assumed operate 24 hours per day, 365 days per year

[5] Starting emissions occur at gas station, assumed to occur once per visit

Total Daily Vehicles =	2,023
Days Annual Operation =	365
Total Annual Vehicles =	738,395
Monthly Gas Gallons =	130,000
Monthly Diesel Gallons =	7,000
% Gas Vehicles =	94.9%
% Diesel Vehicles =	5.1%
Annual Gas Vehicles =	700,667
Annual Diesel Vehicles =	37,728

Pleasanton Fuel Station - 3790 Hopyard Rd
2020 Customer Vehicle Idle Emissions

On-Site Vehicle Idle Emissions - DPM

Vehicle Type	No. of Annual Vehicles	Operation[1] Schedule (hrs/day)	Idle Emission Factor (g/hr)	Idle Emissions per Vehicle (g/vehicle)	Total Idle Emissions		
					Daily (lb/day)	Hourly (lb/hr)	Annual (lb/year)
Customer - Diesel	37,728	24	0.3189	0.0266	6.06E-03	2.52E-04	2.21

[1] Station operation assumed operate 24 hours per day, 365 days per year

On-Site Vehicle Idle Emissions - Gas PM2.5

Vehicle Type	No. of Annual Vehicles	Operation[1] Schedule (hrs/day)	Idle Emission Factor (g/hr)	Idle Emissions per Vehicle (g/vehicle)	Total Idle Emissions		
					Daily (lb/day)	Hourly (lb/hr)	Annual (lb/year)
Customer - Gas	700,667	24	0.0532	0.0044	1.88E-02	7.82E-04	6.85

[1] Station operation assumed operate 24 hours per day, 365 days per year

On-Site Vehicle Idle Emissions - Gas TOG

Vehicle Type	No. of Annual Vehicles	Operation[1] Schedule (hrs/day)	Idle Emission Factor (g/hr)	Idle Emissions per Vehicle (g/vehicle)	Total Idle Emissions		
					Daily (lb/day)	Hourly (lb/hr)	Annual (lb/year)
Customer - Gas	700,667	24	1.25	0.1042	4.41E-01	1.84E-02	160.95

[1] Station operation assumed operate 24 hours per day, 365 days per year

Idle Emisison Modeling - Source Parameters

Number of Volume Sources	Volume Source Dimensions (meters)			Volume Source Release Height (meters)
	Length	Width	Height	
2	15.5	15.5	4	0.5

Idle - Diesel Emission Information (2020)	**DPM**	**PM2.5**
Diesel Vehicle Emission Factor @ 5 mph (g/mi) =	0.0638	0.06377
Diesel Vehicle Idle Emission Rate (g/hr) =	0.319	0.319
Idle Time per Vehicle (min)	5	5

Idle - Gasoline Emission Information (2020)	**PM2.5**	**TOG**
Gas Vehicle Emission Factor @ 5 mph (g/mi) =	0.01064	0.25006
Gas Vehicle Idle Emission Rate (g/hr) =	0.053	1.25
Idle Time per Vehicle (min)	5	5

Total Daily Vehicles =	2,023
Days Annual Operation =	365
Total Annual Vehicles =	738,395
Monthly Gas Gallons =	130,000
Monthly Diesel Gallons =	7,000
Total Annual Fuel (gal) =	1,644,000
% Gas Vehicles =	94.9%
% Diesel Vehicles =	5.1%
Annual Gas Vehicles =	700,667
Annual Diesel Vehicles =	37,728

Pleasanton Fuel Station - 3790 Hopyard Rd
Health Risk Impact Summary - Project Operation

Maximum Cancer Risks

	Maximum Cancer Risks (per million)			
Sensitive Receptor Type	**DPM Vehicles**	**Benzene GDF**	**TOG Total**	**Total Operational Cancer Risk**
Off-Site Residential (30-year exposure)	0.96	0.17	0.96	2.1
Off-Site Child (9-year child exposure)	0.11	0.02	0.11	0.2
Off-Site Worker (25-year exposure)	0.13	0.02	0.13	0.3

Maximum Non-Cancer Health Effects

	Maximum Chronic Hazard Index			
Sensitive Receptor Type	**DPM Vehicles**	**Benzene GDF**	**TOG Total**	**Total Hazard Index**
Off-Site Residential (30-year exposure)	2.58E-04	0.001	0.001	0.002
Off-Site Child (9-year child exposure)	4.08E-04	0.001	0.001	0.003
Off-Site Worker (25-year exposure)	4.08E-04	0.001	0.001	0.003
	Maximum Acute Hazard Index			
Sensitive Receptor Type	**DPM Vehicles**	**Benzene GDF**	**TOG Total**	**Total Hazard Index**
Off-Site Residential (30-year exposure)	-	0.004	0.003	0.008
Off-Site Child (9-year child exposure)	-	0.009	0.008	0.016
Off-Site Worker (25-year exposure)	-	0.009	0.008	0.016
	Maximum Annual PM2.5 (µg/m^3)			
Sensitive Receptor Type	**PM2.5 Trucks**	**PM2.5 Customer Travel and Idling**		**Total PM2.5**
Off-Site Residential (30-year exposure)	0.00129	0.005		0.006
Off-Site Child (9-year child exposure)	0.00204	0.008		0.010
Off-Site Worker (25-year exposure)	0.00204	0.008		0.010

Pleasanton Fuel Station - 3790 Hopyard Rd
AERMOD Risk Modeling Parameters and Maximum TAC Concentrations
Off-Site Residential Receptors
at Location of Maximum Cancer Risk from Project Operation

Receptor Information

Number of Receptors	56
Receptor Height =	1.5 meters
Receptor distances =	variable - at nearby sensitive receptors

Meteorological Conditions

Livermore Muni Airport Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

Operation MEI Maximum Concentrations

TAC	Concentration (µg/m^3) Project Operation	
	Max Period Average	Max 1-hour Average
DPM	0.00129	-
Vehicle TOG Exhaust	0.22645	10.21
Vehicle TOG Evaporative	0.00381	0.13
Benzene	0.00251	0.12
PM2.5		
Delivery Trucks	0.00129	-
Customer Vehicles	0.0050	-
PM2.5 Total	0.0063	

Non-Cancer Health Effects

TAC	Project Operation Hazard Index	
	Acute	Chronic
DPM	-	2.58E-04
Vehicle TOG Exhaust	3.11E-03	7.97E-04
Vehicle TOG Evaporative	1.77E-04	3.18E-05
Benzene	4.35E-03	8.37E-04
Total	**0.008**	**0.0019**

Pleasanton Fuel Station - 3790 Hopyard Rd
Maximum Cancer & Non-Cancer Health Impacts
at Location of Maximum Cancer Risk from Project Operation
30-Year Residential Exposure

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child			Adult
Age -->	**3rd Trimester**	**0 - <2**	**2 - <16**	**16 - 70**
Parameter				
ASF	10	10	3	1
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Cancer Potency Factors and Reference Exposure Levels (REL)

		REL $(\mu g/m^3)$	
TAC	**CPF $(mg/kg\text{-}day)^{-1}$**	**Acute (1-hour)**	**Chronic (ann ave)**
DPM	1.10E+00	-	5
Vehicle TOG Exhaust	6.28E-03	3283	284
Vehicle TOG Evaporative	3.70E-04	762	120
Benzene	1.00E-01	27	3

Project Operation Cancer Risk - Maximum Project Operation Impact Residential Receptor Location

					Maximum - Exposure Information Annual Conc (ug/m3)				Cancer Risk (per million)				
Exposure Year	**Year**	**Exposure Duration (years)**	**Age**	**Age Sensitivity Factor**	**DPM**	**Exhaust TOG**	**Evaporative TOG**	**Benzene**	**DPM**	**Exhaust TOG**	**Evaporative TOG**	**Benzene**	**Total**
0	2019	0.25	-0.25 - 0*	10	0.00129	0.226450	0.00381	0.00251	0.0175	0.0176	0.0000	0.0031	0.04
1	2019	1	1	10	0.00129	0.226450	0.00381	0.00251	0.2119	0.2124	0.0002	0.0375	0.46
2	2020	1	2	10	0.00129	0.226450	0.00381	0.00251	0.2119	0.2124	0.0002	0.0375	0.46
3	2021	1	3	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
4	2022	1	4	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
5	2023	1	5	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
6	2024	1	6	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
7	2025	1	7	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
8	2026	1	8	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
9	2027	1	9	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
10	2028	1	10	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
11	2029	1	11	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
12	2030	1	12	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
13	2031	1	13	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
14	2032	1	14	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
15	2033	1	15	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
16	2034	1	16	3	0.00129	0.226450	0.00381	0.00251	0.0334	0.0334	0.0000	0.0059	0.07
17	2035	1	17	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
18	2036	1	18	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
19	2037	1	19	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
20	2038	1	20	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
21	2039	1	21	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
22	2040	1	22	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
23	2041	1	23	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
24	2042	1	24	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
25	2043	1	25	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
26	2044	1	26	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
27	2045	1	27	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
28	2046	1	28	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
29	2047	1	29	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
30	2048	1	30	1	0.00129	0.226450	0.00381	0.00251	0.0037	0.0037	0.0000	0.0007	0.01
Total Increased Cancer Risk									**0.96**	**0.96**	**0.001**	**0.17**	**2.09**

* Third trimester of pregnancy

Pleasanton Fuel Station - 3790 Hopyard Rd
AERMOD Risk Modeling Parameters and Maximum TAC Concentrations
9-Year Off-Sirte Child Exposure
at Location of Maximum Off-Site Cancer Risk from Project Operation

Receptor Information

Number of Receptors	56
Receptor Height =	1.5 meters
Receptor distances =	variable - at nearby sensitive receptors

Meteorological Conditions

Livermore Muni Airport Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

Maximum Concentrations

TAC	Concentration ($\mu g/m^3$) Project Operation	
	Max Period Average	**Max 1-hour Average**
DPM	0.00204	-
Vehicle TOG Exhaust	0.36051	23.75
Vehicle TOG Evaporative	0.00563	0.26
Benzene	0.00359	0.23
PM2.5		
Delivery Trucks	0.00204	-
Customer Vehicles	0.00774	-
PM2.5 Total	0.00978	

Non-Cancer Health Effects

TAC	Project Operation Hazard Index	
	Acute	**Chronic**
DPM	-	4.08E-04
Vehicle TOG Exhaust	7.24E-03	1.27E-03
Vehicle TOG Evaporative	3.39E-04	4.69E-05
Benzene	8.56E-03	1.20E-03
Total	**0.016**	**0.003**

Pleasanton Fuel Station - 3790 Hopyard Rd
Maximum Cancer & Non-Cancer Health Impacts
at Location of Maximum Off-Site Cancer Risk from Project Operation
9-Year Off-Sirte Child Exposure

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EFH/24) x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EFH = Daily exposure (hours/day)
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child			Adult
Age -->	**3rd Trimester**	**0 - <2**	**2 - <16**	**16 - 70**
Parameter			**(school child)**	
ASF	10	10	3	1
DBR* =	361	1090	640	261
A =	1	1	1	1
EF =	350	350	180	350
EFH =	24	24	10	24
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Cancer Potency Factors and Reference Exposure Levels (REL)

		REL $(\mu g/m^3)$	
TAC	**CPF $(mg/kg\text{-}day)^{-1}$**	**Acute (1-hour)**	**Chronic (ann ave)**
DPM	1.10E+00	-	5
Vehicle TOG Exhaust	6.28E-03	3283	284
Vehicle TOG Evaporative	3.70E-04	762	120
Benzene	1.00E-01	27	3

Exposure Year	Year	Exposure Duration (years)	Age	Age Sensitivity Factor	Maximum - Exposure Information Annual Conc (ug/m3)				Cancer Risk (per million)				
					DPM	Exhaust TOG	Evaporative TOG	Benzene	DPM	Exhaust TOG	Evaporative TOG	Benzene	Total
1	2020	1	2	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
2	2021	1	3	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
3	2022	1	4	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
4	2023	1	5	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
5	2024	1	6	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
6	2025	1	7	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
7	2026	1	8	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
8	2027	1	9	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
9	2028	1	10	3	0.00204	0.360510	0.00563	0.00359	0.0126	0.0128	0.0000	0.0020	0.03
Total Increased Cancer Risk									**0.11**	**0.11**	**0.0001**	**0.018**	**0.25**

Pleasanton Fuel Station - 3790 Hopyard Rd
AERMOD Risk Modeling Parameters and Maximum TAC Concentrations
25-Year Worker Exposure
at Location of Maximum Off-Site Cancer Risk from Project Operation

Receptor Information

Number of Receptors	56
Receptor Height =	1.5 meters
Receptor distances =	variable - at nearby sensitive receptors

Meteorological Conditions

Livermore Muni Airport Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

Maximum Concentrations

TAC	Concentration ($\mu g/m^3$) Project Operation	
	Max Period Average	**Max 1-hour Average**
DPM	0.00204	-
Vehicle TOG Exhaust	0.36051	23.75
Vehicle TOG Evaporative	0.00563	0.26
Benzene	0.00359	0.23
PM2.5		
Delivery Trucks	0.00204	-
Customer Vehicles	0.00774	-
PM2.5 Total	0.00978	

Non-Cancer Health Effects

TAC	Project Operation Hazard Index	
	Acute	**Chronic**
DPM	-	4.08E-04
Vehicle TOG Exhaust	7.24E-03	1.27E-03
Vehicle TOG Evaporative	3.39E-04	4.69E-05
Benzene	8.56E-03	1.20E-03
Total	**0.016**	**0.003**

Pleasanton Fuel Station - 3790 Hopyard Rd
Maximum Cancer & Non-Cancer Health Impacts
at Location of Maximum Off-Site Cancer Risk from Project Operation
25-Year Worker Exposure

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

Age --> / Parameter	Adult 16 - 70 (Worker)
ASF	1
DBR* =	230
A =	1
EF =	250
ED =	25
AT =	70
FAH =	-

* 95th percentile worker breathing rate (L/kg-8 hours)

Cancer Potency Factors and Reference Exposure Levels (REL)

TAC	CPF $(mg/kg\text{-}day)^{-1}$	REL $(\mu g/m^3)$ Acute (1-hour)	REL $(\mu g/m^3)$ Chronic (ann ave)
DPM	1.10E+00	-	5
Vehicle TOG Exhaust	6.28E-03	3283	284
Vehicle TOG Evaporative	3.70E-04	762	120
Benzene	1.00E-01	27	3

Exposure Year Age	Initial Exposure Year	Exposure Duration (years)	Age Sensitivity Factor	Maximum - Exposure Information Annual Conc (ug/m3) DPM	Exhaust TOG	Evaporative TOG	Benzene	Cancer Risk (per million) DPM	Exhaust TOG	Evaporative TOG	Benzene	Total
>16	2019	25	1	0.00204	0.360510	0.00563	0.00359	0.1263	0.1274	0.0001	0.0202	0.27
Total Increased Cancer Risk								**0.13**	**0.13**	**0.0001**	**0.020**	**0.27**

Existing Fuel Station

Existing - Pleasanton Fuel Station - TOG and TAC Emissions

Gas Station with Phase 2 & EVR Controls

Estimated Annual Gasoline Throughput = 1,200,000 gallons/year

TOG Emission Factors and Annual Emissions per GDF

Emission Source	TOG[1] Emission Factor (lb/10^3 gallon)	TOG Annual Emissions (lb/year)
Fueling[2]		
Non-ORVR Vehicles	0.42	66.5
ORVR Vehicles	0.021	21.9
Bulk Transfer Losses	0.15	180.0
Pressure Driven Losses	0.024	28.8
Fueling - Spillage	0.24	288.0
Gasoline Hose Losses	0.009	10.8
Total	**0.532**	**596.1**

TOG = total organic gas

ORVR = onboard refueling vapor recovery

1. Emission factors from CARB "Revised Emissions Factors for Gasoline Marketing Operations at California Gasoline Dispensing Facilities". December 23, 2013 (CARB, 2013). Assumes use of enhanced vapor recovery systems.
2. Fueling emissions based on CARB data for 2020 of 87% of vehicles use ORVR (CARB, 2013).

Benzene Emissions

Emission Source	Annual TOG Emissions (lb/year)	Operation[2] Schedule (hrs/day)	Percent[1] Benzene of TOG (%)	TAC Emissions	
				Annual Average (lb/year)	Average Hourly (lb/hr)
Refueling and Hose Losses	99	24	0.3%	0.30	0.00003
Spillage Losses (liquid)	288	24	1.0%	2.88	0.00033
Tank Transfer Losses	180	24	0.3%	0.54	0.00006
Tank Pressure Losses	29	24	0.3%	0.09	0.00001
Total	596.1			3.80	0.00043

Notes:

1. CAPCOA Air Toxics "Hot Spots" Program, Gasoline Service Station Industrywide Risk Assessment Guidelines, November 1997.
2. Gas station assumed to be open 24 hours per day, 365 days per year

Gas Station Modeling - Volume Source Parameters

Emission Source	Number of Volume Sources	Volume Source Dimensions (meters)			Volume Source Release Height (meters)
		Length	Width	Height	
Refueling and Hose Losses	1	12.3	12.3	4	1
Spillage Losses	1	12.3	12.3	4	0

Gas Station Modeling - Point Source Parameters

Emission Source	Number of Sources	Height (meters)	Diameter (meters)	Temperature (^oK)	Velocity (meters/sec)
Tank Transfer Losses	1	3.66	0.0508	291	0.0008
Tank Pressure Losses	1	3.66	0.0508	288.7	0.00012

Gas Station Modeling - TAC Emissions per Source

TAC	Emissions (lb/hr)			
	Refueling and Hose Losses	Spillage Losses	Tank Loading Losses	Tank Breathing Losses
% of Total Benzene Emissions	17%	48%	30%	5%
Benzene	3.40E-05	3.29E-04	6.16E-05	9.86E-06

Existing - Pleasanton Fuel Station - 3790 Hopyard Rd
2020 Existing Truck Travel and Idle Emissions

Truck Exhaust Emissions

Road Segment	Truck Trip Length (ft)	Truck Trip Length (mi)	Modeled Road Width (ft)	Release Height (m)	No. of Annual Deliveries	Travel Speed (mph)	DPM Emission Factor (g/mi)	Truck Travel DPM Emissions Total Daily (lb/day)	Truck Travel DPM Emissions Total Hourly (lb/hr)	Truck Travel DPM Emissions Total Annual (lb/year)
On-Site Gas Truck	185	0.04	12	3.4	133	5	0.0436	1.23E-06	5.13E-08	4.49E-04

On-Site Diesel Truck Idle Emissions

Location	Stack[a] Height (m)	Stack[a] Diameter (m)	Stack[a] Velocity (m/s)	Stack[a] Temp (^{a}K)	No. of Annual Deliveries	No. of Modeled Emission Points	Idle Emissions Factor (g/hr)	Idle Emissions per Delivery (g/vehicle)	Total Idle Emissions Daily (lb/day)	Total Idle Emissions Hourly (lb/hr)	Total Idle Emissions Annual (lb/year)
Tank Loading Area	3.84	0.1	51.71	366	133	1	0.218	0.03635	2.93E-05	1.22E-06	0.0107

[a] Point source parameters from SJVAPCD *Guidance for Air Dispersion Modeling* .

Trip Information and DPM/PM2.5 Emission Factors

Daily Truck Deliveries = 133
Operation Days/year = 365
Delivery Truck Hours (hrs/day) = 24
Truck Speed (mph) = 5
Emission Factor for HHDT @ travel speed (g/mi) = 0.04362
Trucks assumed to be heavy duty diesel (HHDT)
Truck emissions based on EMFAC2014 for 2020 with default fleet mix for BAAQMD.
Truck emissions (lb/hr) = EF (g/mi) * Road Length (mi) * No. Trips / Hours per day * conversion factors

Idle DPM Emission Information (2020)

Emission Factor for HHDT @ 5 mph (g/mi) = 0.04362
HHDT Idle Emission Rate (g/hr) = 0.22
Idle Time per Delivery (min) 10
Idle emission factor (g/hr) = EF @5 mph (g/mi) * 5 mph

Monthly Gas Gallons = 100,000
Monthly Diesel Gallons = 0
Total Annual Fuel (gal) = 1,200,000
Annual Fuel Deliveries* = 133
* Assumes 9,000 gal fuel truck

Existing - Pleasanton Fuel Station - 3790 Hopyard Rd
2020 Existing - Customer Vehicle Idle Emissions

On-Site Vehicle Idle Emissions - DPM

Vehicle Type	No. of Annual Vehicles	Operation[1] Schedule (hrs/day)	Idle Emission Factor (g/hr)	Idle Emissions per Vehicle (g/vehicle)	Total Idle Emissions		
					Daily (lb/day)	Hourly (lb/hr)	Annual (lb/year)
Customer - Diesel	0	24	0.3189	0.0266	0.00E+00	0.00E+00	0.00

[1] Station operation assumed operate 24 hours per day, 365 days per year

On-Site Vehicle Idle Emissions - Gas PM2.5

Vehicle Type	No. of Annual Vehicles	Operation[1] Schedule (hrs/day)	Idle Emission Factor (g/hr)	Idle Emissions per Vehicle (g/vehicle)	Total Idle Emissions		
					Daily (lb/day)	Hourly (lb/hr)	Annual (lb/year)
Customer - Gas	539,105	24	0.0532	0.0044	1.44E-02	6.01E-04	5.27

[1] Station operation assumed operate 24 hours per day, 365 days per year

On-Site Vehicle Idle Emissions - Gas TOG

Vehicle Type	No. of Annual Vehicles	Operation[1] Schedule (hrs/day)	Idle Emission Factor (g/hr)	Idle Emissions per Vehicle (g/vehicle)	Total Idle Emissions		
					Daily (lb/day)	Hourly (lb/hr)	Annual (lb/year)
Customer - Gas	539,105	24	1.25	0.1042	3.39E-01	1.41E-02	123.83

[1] Station operation assumed operate 24 hours per day, 365 days per year

Idle Emisison Modeling - Source Parameters

Number of Volume Sources	Volume Source Dimensions (meters)			Volume Source Release Height (meters)
	Length	Width	Height	
2	15.5	15.5	4	0.5

Idle - Diesel Emission Information (2020)	**DPM**	**PM2.5**
Diesel Vehicle Emission Factor @ 5 mph (g/mi) =	0.0638	0.06377
Diesel Vehicle Idle Emission Rate (g/hr) =	0.319	0.319
Idle Time per Vehicle (min)	5	5

Idle - Gasoline Emission Information (2020)	**PM2.5**	**TOG**
Gas Vehicle Emission Factor @ 5 mph (g/mi) =	0.01064	0.25006
Gas Vehicle Idle Emission Rate (g/hr) =	0.053	1.25
Idle Time per Vehicle (min)	5	5

Total Daily Vehicles =	1,477
Days Annual Operation =	365
Total Annual Vehicles =	539,105
Monthly Gas Gallons =	100,000
Monthly Diesel Gallons =	0
Total Annual Fuel (gal) =	1,200,000
% Gas Vehicles =	100.0%
% Diesel Vehicles =	0.0%
Annual Gas Vehicles =	539,105
Annual Diesel Vehicles =	0

Existing - Pleasanton Fuel Station - 3790 Hopyard Rd - Operational Emissions - Customer Vehicle Travel
Gasoline Vehicles - At Station

Route	Emission Type	Vehicle Type[1]	Annual Number On-Site Vehicles	Emissions Factors[3] Total PM2.5 (g/VMT)	TOG Exhaust (g/VMT)	TOG Start Exhaust (g/trip)	TOG Run Loss (g/VMT)	Operation[4] Schedule (hrs/day)	On-Site Travel Distance (feet)	(miles)	Annual Emissions (lb/year) Total PM2.5	TOG Exhaust	TOG[5] Starting Exhaust	TOG Running Loss	Average Hourly Emissions (lb/hr)[4] Total PM2.5	TOG Exhaust	TOG Starting Exhaust	TOG Running Loss	Total TOG
Gas Station	Travel	Gas	539,105	0.0289	0.1776	0.1762	0.0724	24	314	0.06	2.0	12.5	209.4	5.1	2.33E-04	1.43E-03	2.39E-02	5.84E-04	2.59E-02

[1] Default EMFAC2014 vehicle mix for LDA, LDT, and MDT
[2] Gas vehicles traveling through station
[3] Emission factors developed from EMFAC2014 for Alameda County
[4] Station operation assumed operate 24 hours per day, 365 days per year
[5] Starting emissions occur at gas station, assumed to occur once per visit

Total Daily Vehicles =	1,477
Days Annual Operation =	365
Total Annual Vehicles =	539,105
Monthly Gas Gallons =	100,000
Monthly Diesel Gallons =	0
% Gas Vehicles =	100.0%
% Diesel Vehicles =	0.0%
Annual Gas Vehicles =	539,105
Annual Diesel Vehicles =	0

Existing Fuel Station - 3790 Hopyard Rd
Health Risk Impact Summary - Existing Operation

Maximum Cancer Risks

Sensitive Receptor Type	Maximum Cancer Risks (per million) DPM Vehicles	Benzene GDF	TOG Total	Total Operational Cancer Risk
Off-Site Residential (30-year exposure)	0.00	0.16	0.75	0.9
Off-Site Child (9-year child exposure)	0.00	0.02	0.09	0.1
Off-Site Worker (25-year exposure)	0.00	0.02	0.10	0.1

Maximum Non-Cancer Health Effects

Sensitive Receptor Type	Maximum Chronic Hazard Index DPM Vehicles	Benzene GDF	TOG Total	Total Hazard Index
Off-Site Residential (30-year exposure)	5.84E-07	0.001	0.001	0.001
Off-Site Child (9-year child exposure)	4.32E-07	0.001	0.001	0.002
Off-Site Worker (25-year exposure)	4.32E-07	0.001	0.001	0.002

Sensitive Receptor Type	Maximum Acute Hazard Index DPM Vehicles	Benzene GDF	TOG Total	Total Hazard Index
Off-Site Residential (30-year exposure)	-	0.004	0.003	0.006
Off-Site Child (9-year child exposure)	-	0.007	0.006	0.013
Off-Site Worker (25-year exposure)	-	0.007	0.006	0.013

Sensitive Receptor Type	Maximum Annual PM2.5 (µg/m^3) PM2.5 Trucks	PM2.5 Customer Travel and Idling	Total PM2.5
Off-Site Residential (30-year exposure)	0.00000	0.004	0.004
Off-Site Child (9-year child exposure)	0.00000	0.006	0.006
Off-Site Worker (25-year exposure)	0.00000216	0.006	0.006

Existing Fuel Station - 3790 Hopyard Rd
AERMOD Risk Modeling Parameters and Maximum TAC Concentrations
Off-Site Residential Receptors
at Location of Maximum Cancer Risk from Project Operation

Receptor Information

Number of Receptors	56
Receptor Height =	1.5 meters
Receptor distances =	variable - at nearby sensitive receptors

Meteorological Conditions

Livermore Muni Airport Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

Operation MEI Maximum Concentrations

TAC	Concentration (µg/m^3) Project Operation	
	Max Period Average	**Max 1-hour Average**
DPM	2.92E-06	-
Vehicle TOG Exhaust	0.17550	8.58
Vehicle TOG Evaporative	0.00360	0.10
Benzene	0.00240	0.10
PM2.5		
Delivery Trucks	2.92E-06	-
Customer Vehicles	0.0038	-
PM2.5 Total	0.0038	

Non-Cancer Health Effects

TAC	Project Operation Hazard Index	
	Acute	**Chronic**
DPM	-	5.84E-07
Vehicle TOG Exhaust	2.61E-03	6.18E-04
Vehicle TOG Evaporative	1.36E-04	3.00E-05
Benzene	3.67E-03	8.00E-04
Total	**0.006**	**0.0014**

Existing Fuel Station - 3790 Hopyard Rd
Maximum Cancer & Non-Cancer Health Impacts
at Location of Maximum Cancer Risk from Project Operation
30-Year Residential Exposure

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child			Adult
Age -->	**3rd Trimester**	**0 - <2**	**2 - <16**	**16 - 70**
Parameter				
ASF	10	10	3	1
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Cancer Potency Factors and Reference Exposure Levels (REL)

		REL $(\mu g/m^3)$	
TAC	**CPF $(mg/kg\text{-}day)^{-1}$**	**Acute (1-hour)**	**Chronic (ann ave)**
DPM	1.10E+00	-	5
Vehicle TOG Exhaust	6.28E-03	3283	284
Vehicle TOG Evaporative	3.70E-04	762	120
Benzene	1.00E-01	27	3

Project Operation Cancer Risk - Maximum Project Operation Impact Residential Receptor Location

					Maximum - Exposure Information Annual Conc (ug/m3)				Cancer Risk (per million)				
Exposure Year	**Year**	**Exposure Duration (years)**	**Age**	**Age Sensitivity Factor**	**DPM**	**Exhaust TOG**	**Evaporative TOG**	**Benzene**	**DPM**	**Exhaust TOG**	**Evaporative TOG**	**Benzene**	**Total**
0	2019	0.25	-0.25 - 0*	10	0.00000	0.175500	0.00360	0.00240	0.0000	0.0136	0.0000	0.0030	0.02
1	2019	1	1	10	0.00000	0.175500	0.00360	0.00240	0.0005	0.1646	0.0002	0.0358	0.20
2	2020	1	2	10	0.00000	0.175500	0.00360	0.00240	0.0005	0.1646	0.0002	0.0358	0.20
3	2021	1	3	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
4	2022	1	4	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
5	2023	1	5	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
6	2024	1	6	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
7	2025	1	7	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
8	2026	1	8	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
9	2027	1	9	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
10	2028	1	10	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
11	2029	1	11	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
12	2030	1	12	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
13	2031	1	13	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
14	2032	1	14	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
15	2033	1	15	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
16	2034	1	16	3	0.00000	0.175500	0.00360	0.00240	0.0001	0.0259	0.0000	0.0056	0.03
17	2035	1	17	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
18	2036	1	18	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
19	2037	1	19	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
20	2038	1	20	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
21	2039	1	21	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
22	2040	1	22	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
23	2041	1	23	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
24	2042	1	24	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
25	2043	1	25	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
26	2044	1	26	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
27	2045	1	27	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
28	2046	1	28	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
29	2047	1	29	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
30	2048	1	30	1	0.00000	0.175500	0.00360	0.00240	0.0000	0.0029	0.0000	0.0006	0.00
Total Increased Cancer Risk									**0.00**	**0.75**	**0.001**	**0.16**	**0.9**

* Third trimester of pregnancy

Existing Fuel Station - 3790 Hopyard Rd
AERMOD Risk Modeling Parameters and Maximum TAC Concentrations
9-Year Off-Sirte Child Exposure
at Location of Maximum Off-Site Cancer Risk from Project Operation

Receptor Information

Number of Receptors	56
Receptor Height =	1.5 meters
Receptor distances =	variable - at nearby sensitive receptors

Meteorological Conditions

Livermore Muni Airport Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

Maximum Concentrations

TAC	Concentration (µg/m^3) Project Operation	
	Max Period Average	**Max 1-hour Average**
DPM	2.16E-06	-
Vehicle TOG Exhaust	0.27080	18.76
Vehicle TOG Evaporative	0.00430	0.20
Benzene	0.00308	0.20
PM2.5		
Delivery Trucks	2.16E-06	-
Customer Vehicles	0.00585	-
PM2.5 Total	0.00585	

Non-Cancer Health Effects

TAC	Project Operation Hazard Index	
	Acute	**Chronic**
DPM	-	4.32E-07
Vehicle TOG Exhaust	5.71E-03	9.54E-04
Vehicle TOG Evaporative	2.61E-04	3.58E-05
Benzene	7.49E-03	1.03E-03
Total	**0.013**	**0.002**

Existing Fuel Station - 3790 Hopyard Rd
Maximum Cancer & Non-Cancer Health Impacts
at Location of Maximum Off-Site Cancer Risk from Project Operation
9-Year Off-Sirte Child Exposure

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EFH/24) x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EFH = Daily exposure (hours/day)
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child			Adult
Age --> **Parameter**	**3rd Trimester**	**0 - <2**	**2 - <16 (school child)**	**16 - 70**
ASF	10	10	3	1
DBR* =	361	1090	640	261
A =	1	1	1	1
EF =	350	350	180	350
EFH =	24	24	10	24
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Cancer Potency Factors and Reference Exposure Levels (REL)

		REL $(\mu g/m^3)$	
TAC	**CPF $(mg/kg\text{-}day)^{-1}$**	**Acute (1-hour)**	**Chronic (ann ave)**
DPM	1.10E+00	-	5
Vehicle TOG Exhaust	6.28E-03	3283	284
Vehicle TOG Evaporative	3.70E-04	762	120
Benzene	1.00E-01	27	3

Exposure Year	Year	Exposure Duration (years)	Age	Age Sensitivity Factor	Maximum - Exposure Information Annual Conc (ug/m3)				Cancer Risk (per million)				
					DPM	Exhaust TOG	Evaporative TOG	Benzene	DPM	Exhaust TOG	Evaporative TOG	Benzene	Total
1	2020	1	2	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
2	2021	1	3	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
3	2022	1	4	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
4	2023	1	5	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
5	2024	1	6	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
6	2025	1	7	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
7	2026	1	8	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
8	2027	1	9	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
9	2028	1	10	3	0.00000	0.270800	0.00430	0.00308	0.0000	0.0096	0.0000	0.0017	0.01
Total Increased Cancer Risk									**0.00**	**0.086**	**0.0001**	**0.016**	**0.1**

Existing Fuel Station - 3790 Hopyard Rd
AERMOD Risk Modeling Parameters and Maximum TAC Concentrations
25-Year Worker Exposure
at Location of Maximum Off-Site Cancer Risk from Project Operation

Receptor Information

Number of Receptors	56
Receptor Height =	1.5 meters
Receptor distances =	variable - at nearby sensitive receptors

Meteorological Conditions

Livermore Muni Airport Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

Maximum Concentrations

TAC	Concentration ($\mu g/m^3$) Project Operation	
	Max Period Average	**Max 1-hour Average**
DPM	2.16E-06	-
Vehicle TOG Exhaust	0.27080	18.76
Vehicle TOG Evaporative	0.00430	0.20
Benzene	0.00308	0.20
PM2.5		
Delivery Trucks	2.16E-06	-
Customer Vehicles	0.00585	-
PM2.5 Total	0.00585	

Non-Cancer Health Effects

TAC	Project Operation Hazard Index	
	Acute	**Chronic**
DPM	-	4.32E-07
Vehicle TOG Exhaust	5.71E-03	9.54E-04
Vehicle TOG Evaporative	2.61E-04	3.58E-05
Benzene	7.49E-03	1.03E-03
Total	**0.013**	**0.002**

Existing Fuel Station - 3790 Hopyard Rd
Maximum Cancer & Non-Cancer Health Impacts
at Location of Maximum Off-Site Cancer Risk from Project Operation
25-Year Worker Exposure

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

Age --> / **Parameter**	**Adult 16 - 70 (Worker)**
ASF	1
DBR* =	230
A =	1
EF =	250
ED =	25
AT =	70
FAH =	-

* 95th percentile worker breathing rate (L/kg-8 hours)

Cancer Potency Factors and Reference Exposure Levels (REL)

TAC	**CPF $(mg/kg\text{-}day)^{-1}$**	**REL $(\mu g/m^3)$ Acute (1-hour)**	**REL $(\mu g/m^3)$ Chronic (ann ave)**
DPM	1.10E+00	-	5
Vehicle TOG Exhaust	6.28E-03	3283	284
Vehicle TOG Evaporative	3.70E-04	762	120
Benzene	1.00E-01	27	3

Exposure Year Age	**Initial Exposure Year**	**Exposure Duration (years)**	**Age Sensitivity Factor**	**Maximum - Exposure Information Annual Conc (ug/m3)**				**Cancer Risk (per million)**				
				DPM	**Exhaust TOG**	**Evaporative TOG**	**Benzene**	**DPM**	**Exhaust TOG**	**Evaporative TOG**	**Benzene**	**Total**
>16	2019	25	1	0.00000	0.270800	0.00430	0.00308	0.0001	0.0957	0.0001	0.0173	0.11
Total Increased Cancer Risk								**0.00**	**0.10**	**0.0001**	**0.017**	**0.1**

Attachment 4 Roadway Screening Calculations – Cumulative Sources

Bay Area Air Quality Management District

Roadway Screening Analysis Calculator

County specific tables containing estimates of risk and hazard impacts from roadways in the Bay Area.

INSTRUCTIONS:

Input the site-specific characteristics of your project by using the drop down menu in the "Search Parameter" box. We recommend that this analysis be used for roadways with 10,000 AADT and above.

• County: Select the County where the project is located. The calculator is only applicable for projects within the nine Bay Area counties.

• Roadway Direction: Select the orientation that best matches the roadway. If the roadway orientation is neither clearly north-south nor east-west, use the highest values predicted from either orientation.

• Side of the Roadway: Identify on which side of the roadway the project is located.

• Distance from Roadway: Enter the distance in feet from the nearest edge of the roadway to the project site. The calculator estimates values for distances greater than 10 feet and less than 1000 feet. For distances greater than 1000 feet, the user can choose to extrapolate values using a distribution curve or apply 1000 feet values for greater distances.

• Annual Average Daily Traffic (ADT): Enter the annual average daily traffic on the roadway. These data may be collected from the city or the county (if the area is unincorporated).

When the user has completed the data entries, the screening level PM2.5 annual average concentration and the cancer risk results will appear in the Results Box on the right. Please note that the roadway tool is not applicable for California State Highways and the District refers the user to the Highway Screening Analysis Tool at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

Notes and References listed below the Search Boxes

Search Parameters

County	Alameda
Roadway Direction	East-West
Side of the Roadway	South
Distance from Roadway	220 feet
Annual Average Daily Traffic (ADT)	25,000

Results

Alameda County

EAST-WEST DIRECTIONAL ROADWAY

PM2.5 annual average

0.078 ($\mu g/m^3$)

Cancer Risk

4.28 (per million)

W Las Positas

Data for Alameda County based on meteorological data collected from Pleasanton in 2005

Adjusted for 2015 OEHHA and EMFAC2014 for 2018

2.94 (per million)

adjusted to 180 days

1.51

Note that EMFAC2014 predicts DSL PM2.5 aggragate rates in 2018 that are 46% of EMFAC2011 for 2014. TOG gasoline rates are 56% of EMFAC2011 year 2014 rates. This is for light- and medium-duty vehciles traveling at 30 mph for Bay Area

Notes and References:

1. Emissions were developed using EMFAC2011 for fleet mix in 2014 assuming 10,000 AADT and includes impacts from diesel and gasoline vehicle exhaust, brake and tire wear, and resuspended dust.
2. Roadways were modeled using ~~CALINE4~~ Cal3qhcr air dispersion model assuming a source length of one kilometer. Meteorological data used to estimate the screening values are noted at the bottom of the "Results" box.
3. Cancer risks were estimated for 70 year lifetime exposure starting in 2014 that includes sensitivity values for early life exposures and OEHHA toxicity values adopted in 2013.

Bay Area Air Quality Management District

Roadway Screening Analysis Calculator

County specific tables containing estimates of risk and hazard impacts from roadways in the Bay Area.

INSTRUCTIONS:

Input the site-specific characteristics of your project by using the drop down menu in the "Search Parameter" box. We recommend that this analysis be used for roadways with 10,000 AADT and above.

• County: Select the County where the project is located. The calculator is only applicable for projects within the nine Bay Area counties.

• Roadway Direction: Select the orientation that best matches the roadway. If the roadway orientation is neither clearly north-south nor east-west, use the highest values predicted from either orientation.

• Side of the Roadway: Identify on which side of the roadway the project is located.

• Distance from Roadway: Enter the distance in feet from the nearest edge of the roadway to the project site. The calculator estimates values for distances greater than 10 feet and less than 1000 feet. For distances greater than 1000 feet, the user can choose to extrapolate values using a distribution curve or apply 1000 feet values for greater distances.

• Annual Average Daily Traffic (ADT): Enter the annual average daily traffic on the roadway. These data may be collected from the city or the county (if the area is unincorporated).

When the user has completed the data entries, the screening level PM2.5 annual average concentration and the cancer risk results will appear in the Results Box on the right. Please note that the roadway tool is not applicable for California State Highways and the District refers the user to the Highway Screening Analysis Tool at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

Notes and References listed below the Search Boxes

Search Parameters

County	Alameda
Roadway Direction	East-West
Side of the Roadway	North
Distance from Roadway	40 feet
Annual Average Daily Traffic (ADT)	25,000

Results

Alameda County

EAST-WEST DIRECTIONAL ROADWAY

PM2.5 annual average

0.375 ($\mu g/m^3$)

Cancer Risk

19.12 (per million)

W Las Positas

Data for Alameda County based on meteorological data collected from Pleasanton in 2005

Adjusted for 2015 OEHHA and EMFAC2014 for 2018

13.14 (per million)

Note that EMFAC2014 predicts DSL PM2.5 aggragate rates in 2018 that are 46% of EMFAC2011 for 2014. TOG gasoline rates are 56% of EMFAC2011 year 2014 rates. This is for light- and medium-duty vehciles traveling at 30 mph for Bay Area

Notes and References:

1. Emissions were developed using EMFAC2011 for fleet mix in 2014 assuming 10,000 AADT and includes impacts from diesel and gasoline vehicle exhaust, brake and tire wear, and resuspended dust.
2. Roadways were modeled using ~~CALINE4~~ Cal3qhcr air dispersion model assuming a source length of one kilometer. Meteorological data used to estimate the screening values are noted at the bottom of the "Results" box.
3. Cancer risks were estimated for 70 year lifetime exposure starting in 2014 that includes sensitivity values for early life exposures and OEHHA toxicity values adopted in 2013.

Bay Area Air Quality Management District

Roadway Screening Analysis Calculator

County specific tables containing estimates of risk and hazard impacts from roadways in the Bay Area.

INSTRUCTIONS:

Input the site-specific characteristics of your project by using the drop down menu in the "Search Parameter" box. We recommend that this analysis be used for roadways with 10,000 AADT and above.

• County: Select the County where the project is located. The calculator is only applicable for projects within the nine Bay Area counties.

• Roadway Direction: Select the orientation that best matches the roadway. If the roadway orientation is neither clearly north-south nor east-west, use the highest values predicted from either orientation.

• Side of the Roadway: Identify on which side of the roadway the project is located.

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• Annual Average Daily Traffic (ADT): Enter the annual average daily traffic on the roadway. These data may be collected from the city or the county (if the area is unincorporated).

When the user has completed the data entries, the screening level PM2.5 annual average concentration and the cancer risk results will appear in the Results Box on the right. Please note that the roadway tool is not applicable for California State Highways and the District refers the user to the Highway Screening Analysis Tool at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

Notes and References listed below the Search Boxes

Search Parameters

County	Alameda
Roadway Direction	North-South
Side of the Roadway	West
Distance from Roadway	50 feet
Annual Average Daily Traffic (ADT)	50,000

Results

Alameda County

NORTH-SOUTH DIRECTIONAL ROADWAY

PM2.5 annual average

0.409 ($\mu g/m^3$)

Cancer Risk

23.03 (per million)

Hopyard

Data for Alameda County based on meteorological data collected from Pleasanton in 2005

Adjusted for 2015 OEHHA and EMFAC2014 for 2018

15.82 (per million)

adjusted to 180 days

8.14

Note that EMFAC2014 predicts DSL PM2.5 aggragate rates in 2018 that are 46% of EMFAC2011 for 2014. TOG gasoline rates are 56% of EMFAC2011 year 2014 rates. This is for light- and medium-duty vehciles traveling at 30 mph for Bay Area

Notes and References:

1. Emissions were developed using EMFAC2011 for fleet mix in 2014 assuming 10,000 AADT and includes impacts from diesel and gasoline vehicle exhaust, brake and tire wear, and resuspended dust.
2. Roadways were modeled using ~~CALINE4~~ Cal3qhcr air dispersion model assuming a source length of one kilometer. Meteorological data used to estimate the screening values are noted at the bottom of the "Results" box.
3. Cancer risks were estimated for 70 year lifetime exposure starting in 2014 that includes sensitivity values for early life exposures and OEHHA toxicity values adopted in 2013.

Bay Area Air Quality Management District

Roadway Screening Analysis Calculator

County specific tables containing estimates of risk and hazard impacts from roadways in the Bay Area.

INSTRUCTIONS:

Input the site-specific characteristics of your project by using the drop down menu in the "Search Parameter" box. We recommend that this analysis be used for roadways with 10,000 AADT and above.

• County: Select the County where the project is located. The calculator is only applicable for projects within the nine Bay Area counties.

• Roadway Direction: Select the orientation that best matches the roadway. If the roadway orientation is neither clearly north-south nor east-west, use the highest values predicted from either orientation.

• Side of the Roadway: Identify on which side of the roadway the project is located.

• Distance from Roadway: Enter the distance in feet from the nearest edge of the roadway to the project site. The calculator estimates values for distances greater than 10 feet and less than 1000 feet. For distances greater than 1000 feet, the user can choose to extrapolate values using a distribution curve or apply 1000 feet values for greater distances.

• Annual Average Daily Traffic (ADT): Enter the annual average daily traffic on the roadway. These data may be collected from the city or the county (if the area is unincorporated).

When the user has completed the data entries, the screening level PM2.5 annual average concentration and the cancer risk results will appear in the Results Box on the right. Please note that the roadway tool is not applicable for California State Highways and the District refers the user to the Highway Screening Analysis Tool at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

Notes and References listed below the Search Boxes

Search Parameters

County	Alameda
Roadway Direction	North-South
Side of the Roadway	West
Distance from Roadway	470 feet
Annual Average Daily Traffic (ADT)	50,000

Results

Alameda County

NORTH-SOUTH DIRECTIONAL ROADWAY

PM2.5 annual average

0.078 ($\mu g/m^3$)

Cancer Risk

4.51 (per million)

Hopyard

Data for Alameda County based on meteorological data collected from Pleasanton in 2005

Adjusted for 2015 OEHHA and EMFAC2014 for 2018

3.10 (per million)

Note that EMFAC2014 predicts DSL PM2.5 aggragate rates in 2018 that are 46% of EMFAC2011 for 2014. TOG gasoline rates are 56% of EMFAC2011 year 2014 rates. This is for light- and medium-duty vehciles traveling at 30 mph for Bay Area

Notes and References:

1. Emissions were developed using EMFAC2011 for fleet mix in 2014 assuming 10,000 AADT and includes impacts from diesel and gasoline vehicle exhaust, brake and tire wear, and resuspended dust.
2. Roadways were modeled using ~~CALINE4~~ Cal3qhcr air dispersion model assuming a source length of one kilometer. Meteorological data used to estimate the screening values are noted at the bottom of the "Results" box.
3. Cancer risks were estimated for 70 year lifetime exposure starting in 2014 that includes sensitivity values for early life exposures and OEHHA toxicity values adopted in 2013.