DOVE HILL ASSISTED LIVING FACILITY COMMUNITY RISK ASSESSMENT San Jose, CA

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Introduction

The purpose of this report is to address air quality community risk impacts associated with the Dove Hill Assisted Living Project in San Jose, California. The project would propose a convalescent hospital on the westernmost 3.2 acres of a 21.2-acre site located adjacent to Highway 101 in San Jose, CA. a convalescent hospital facility with two buildings containing a total of 155 patient rooms and up to 248 beds. The project would also include a dining hall, multi-purpose room and other ancillary uses, surface parking areas, landscaping, walkways, and approximately 28,500 square feet of landscaped common outdoor open space. The remaining approximately 18 acres of project property would be maintained as undeveloped, permanent private open space. This report evaluates community risk impacts associated with exposure of sensitive receptors to existing sources of toxic air contaminants (TACs) and impacts to existing sensitive receptors from project construction.

Previously, the project proposed 290 senior assisted living units in three buildings. Two of the proposed buildings will be 4-stories built on podiums to allow ground-level parking. The third building will be five levels. The project includes an uncovered parking area and a private garden and recreational area. The community risk assessment was prepared for this project in 2015. This analysis is an update to the previous analysis to address exposure of adults to existing sources of TACs with the new site plan and revise the cancer risk calculations to address the most current recommendations by the State's Office of Environmental Health Hazards Assessment (OEHHA) and the Bay Area Air Quality Management District (BAAQMD)

Air quality impacts could occur due to temporary construction emissions, with both local and regional impacts. The placement of new residences near U.S. 101 and stationary source of air pollutants would result in exposures of new project sensitive receptors to air pollutant emissions. This analysis addresses those issues following the guidance provided by the BAAQMD.

Setting

The project is located in Santa Clara County, which is in the San Francisco Bay Area Air Basin. Toxic air contaminants (TACs) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, the 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 freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, State, and federal level.

Diesel exhaust is the predominant TAC in urban air and is estimated to represent about three-quarters of the cancer risk from TACs (based on the Bay Area average). According to the California Air Resources 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 State Proposition 65 or the Federal Hazardous Air Pollutants programs.

CARB has adopted and implemented a number of regulations for stationary and mobile sources to reduce emissions of diesel particulate matter (DPM). Several of these regulatory programs affect medium and heavy-duty diesel trucks that represent the bulk of DPM emissions from California highways. These regulations include the solid waste collection vehicle (SWCV) rule, in-use public and utility fleets, and the heavy-duty diesel truck and bus regulations. In 2008, CARB approved a new regulation to reduce emissions of DPM and nitrogen oxides from existing on-road heavy-duty diesel fueled vehicles.[1] The regulation requires affected vehicles to meet specific performance requirements between 2014 and 2023, with all affected diesel vehicles required to have 2010 model-year engines or equivalent by 2023. These requirements are phased in over the compliance period and depend on the model year of the vehicle.

The BAAQMD is the regional agency tasked with managing air quality in the region. At the State level, the CARB (a part of the California Environmental Protection Agency [EPA]) oversees regional air district activities and regulates air quality at the State level. The BAAQMD has recently published California Environmental Quality Act (CEQA) Air Quality Guidelines that are used in this assessment to evaluate air quality impacts of projects.[2]

City of San Jose – Envision San Jose 2040 Toxic Air Contaminant Policies

The City's General Plan, i.e., Envision San Jose 2040, includes policies and implementing actions contained in Chapter 3 - Environmental Leadership that are intended to reduce exposure of people to TACs. The City's goal, policies and implementing actions are as follows:

Goal MS-11 – Toxic Air Contaminants: Minimize exposure of people to air pollution and toxic air contaminants such as ozone, carbon monoxide, lead, and particulate matter.

Policies – Toxic Air Contaminants

- MS-11.1 Require completion of air quality modeling for sensitive land uses such as new residential developments that are located near sources of pollution such as freeways and industrial uses. Require new residential development projects and projects categorized as sensitive receptors to incorporate effective mitigation into project designs or be located an adequate distance from sources of toxic air contaminants (TACs) to avoid significant risks to health and safety.

- MS-11.2 For projects that emit toxic air contaminants, require project proponents to prepare health risk assessments in accordance with BAAQMD-recommended procedures as part of environmental review and employ effective mitigation to reduce possible health risks to a less than significant level. Alternatively, require new projects (such as, but not limited to, industrial, manufacturing, and processing facilities) that are sources of TACs to be located an adequate distance from residential areas and other sensitive receptors.

[1] Available online: http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm. Accessed: November 21, 2014.
[2] Bay Area Air Quality Management District. 2011. BAAQMD CEQA Air Quality Guidelines. May.

- MS-11.3 Review projects generating significant heavy-duty truck traffic to designate truck routes that minimize exposure of sensitive receptors to TACs and particulate matter.

- MS-11.4 Encourage the installation of appropriate air filtration at existing schools, residences, and other sensitive receptor uses adversely affected by pollution sources.

- MS-11.5 Encourage the use of pollution absorbing trees and vegetation in buffer areas between substantial sources of TACs and sensitive land uses.

Actions – Toxic Air Contaminants

- MS-11.6 Develop and adopt a comprehensive Community Risk Reduction Plan that includes: baseline inventory of toxic air contaminants (TACs) and particulate matter smaller than 2.5 microns (PM2.5), emissions from all sources, emissions reduction targets, and enforceable emission reduction strategies and performance measures. The Community Risk Reduction Plan will include enforcement and monitoring tools to ensure regular review of progress toward the emission reduction targets, progress reporting to the public and responsible agencies, and periodic updates of the plan, as appropriate.

- MS-11.7 Consult with BAAQMD to identify stationary and mobile TAC sources and determine the need for and requirements of a health risk assessment for proposed developments.

- MS-11.8 For new projects that generate truck traffic, require signage which reminds drivers that the State truck idling law limits truck idling to five minutes.

<u>Sensitive Receptors</u>

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 14, 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. The closest sensitive receptors to the project site are residences about 500 feet east and northeast of the site.

Significance Thresholds

In June 2010, BAAQMD adopted thresholds of significance to assist in the review of projects under CEQA. These thresholds were designed to establish the level at which BAAQMD believed air pollution emissions would cause significant environmental impacts under CEQA. The significance thresholds identified by BAAQMD and used in this analysis are summarized in Table 1. The BAAQMD's adoption of significance thresholds contained in the 2011 *CEQA Air Quality Guidelines* was called into question by an order issued March 5, 2012, in California

Building Industry Association (CBIA) v. BAAQMD (Alameda Superior Court Case No. RGI0548693). The order requires the BAAQMD to set aside its approval of the thresholds until it has conducted environmental review under CEQA. The ruling made in the case concerned the environmental impacts of adopting the thresholds and how the thresholds would indirectly affect land use development patterns. In August 2013, the Appellate Court struck down the lower court's order to set aside the thresholds (Cal. Court of Appeal, First Appellate District, Case Nos. A135335 & A136212). CBIA sought review by the California Supreme Court on three issues, including the appellate court's decision to uphold the BAAQMD's adoption of the thresholds, and the Court granted review on just one: Under what circumstances, if any, does CEQA require an analysis of how existing environmental conditions will impact future residents or users of a proposed project? In December 2015, the Supreme Court determined that an analysis of the impacts of the environment on a project – known as "CEQA-in-reverse" – is only required under two limited circumstances: (1) when a statute provides an express legislative directive to consider such impacts; and (2) when a proposed project risks exacerbating environmental hazards or conditions that already exist (Cal. Supreme Court Case No. S213478). The Supreme Court reversed the Court of Appeal's decision and remanded the matter back to the appellate court to reconsider the case in light of the Supreme Court's ruling. In response to the legal issues, BAAQMD revised their CEQA Guidelines in May 2017. The thresholds identified in Table 1 represent the most recent guidance provided by BAAQMD that are used by the City of San Jose. Though not necessarily a CEQA issue, the effect of existing TAC sources on future project receptors (residences) is analyzed to comply with the Clean Air Plan key goal of reducing population TAC exposure and protecting public health in the Bay Area.

To meet Policy MS-11.1 of the Envision San Jose 2040 General Plan Update, the City requires air quality modeling for projects that contain sensitive land uses such as senior developments that are located near sources of pollution such as freeways and industrial uses. These projects are required to incorporate effective mitigation into project designs or be located an adequate distance from sources of TACs to avoid significant risks to health and safety per thresholds contained in the BAAQMD CEQA Air Quality Guidelines (i.e., Table 1 below).

Table 1. Air Quality Significance Thresholds

Health Risks and Hazards for Single Sources (highest from all sources within 1,000-foot zone of influence)	
Excess Cancer Risk	>10 per one million
Hazard Index	>1.0
Incremental annual $PM_{2.5}$	>0.3 µg/m^3
Health Risks and Hazards for Combined Sources (cumulative from all sources within 1,000-foot zone of influence)	
Excess Cancer Risk	>100 per one million
Hazard Index	>10.0
Annual Average $PM_{2.5}$	>0.8 µg/m^3

Project Operation Impacts – TAC Sources Affecting the Project

Operation of this proposed project is not considered a source of TAC or fine particulate matter ($PM_{2.5}$) emissions. The project would include two small emergency generators powered by diesel fuel. These generator engines are anticipated to be less than 50 horsepower; and therefore, result in less than significant impacts with respect to air pollutant emissions and community risk impacts. As a result, the project operation would not cause emissions that expose sensitive receptors to unhealthy air pollutant levels.

The project would include new sensitive receptors. Substantial sources of air pollution can adversely affect sensitive receptors proposed as part of new projects. A review of the area indicates that U.S. 101 is within 1,000 feet of the site and can adversely affect new residences. A review of BAAQMD's *Stationary Source Screening Analysis Tool* shows a stationary source of TAC emissions across the freeway at Hellyer Park.[3] There are thresholds that address both the impact of single and cumulative TAC sources upon projects that include new sensitive receptors (see Table 1).

Stationary Sources

The BAAQMD *Stationary Source Screening Analysis Tool* identified Plant ID# 1982 at Hellyer Park that is indicated as being within 1,000 feet of the proposed project. A *Risk & Hazard Stationary Source Inquiry Form* was submitted to BAAQMD for this plant. BAAQMD provided the emissions information for this plant, which is from a landfill gas collection system flare for a long ago closed landfill. The closed landfill and gas collection system appear to be over 1,200 feet from the site. As a result, this source was not considered to adversely affect the site since it is over 1,000 feet away.

Refined Highway Community Risk Impacts – U.S. Highway 101

A refined analysis of the impacts of TAC and $PM_{2.5}$ to new sensitive receptors is necessary to evaluate potential cancer risks and $PM_{2.5}$ concentrations from freeway traffic. A review of the traffic information reported by Caltrans indicates that U.S. 101 traffic includes 170,000 annual average vehicles per day that are about 7.9 percent trucks, of which 4.5 percent are considered heavy duty trucks and 3.4 percent are medium duty trucks.[4]

Traffic Emissions Modeling

Emission factors for DPM ($PM_{2.5}$ exhaust from diesel vehicles) were developed for the year 2018, 2020 and 2025 using the calculated mix of cars and trucks on U.S. 101 using the CARB EMFAC2011 vehicle emissions model. Default EMFAC2011 vehicle model fleet age distributions for Santa Clara County were assumed. Average daily traffic volume and truck

[3] See http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx , accessed December 10, 2014.
[4] California Department of Transportation. 2014a. *2013 Annual Average Daily Truck Traffic on the California State Highway System*

percentages were based on Caltrans data for U.S. 101 for 2013.[5] Traffic volumes were assumed to increase 1 percent per year. Average hourly traffic distributions for Santa Clara County roadways were developed using the EMFAC model,[6] which were then applied to the average daily traffic volumes to obtain estimated hourly traffic volumes and emissions for the highway. Year 2025 emissions were conservatively assumed as being representative of future conditions beyond 2025. Emissions of total organic gases (TOG) were also calculated for these same years using the EMFAC2011 model. These TOG emissions were then used in modeling the organic TACs (i.e., TACs associated with motor vehicle from TOG exhaust emissions and evaporative TOG emissions). TOG emissions from exhaust and for running evaporative loses from gasoline vehicles were calculated using EMFAC2011 default model values for Santa Clara County along with the traffic volumes and vehicle mixes for the highway.

For all hours of the day, other than during peak a.m. and p.m. periods, an average speed of 65 mph was assumed for all vehicles. Based on traffic data from the Santa Clara Valley Transportation Authority's 2012 Monitoring and Conformance Report, traffic speeds during the peak a.m. and p.m. periods were identified.[7] For a two-hour period during the peak a.m. period, average travel speeds of 15 mph and 60 mph were used for northbound and southbound traffic, respectively. During the p.m. peak period, and average speed of 60 mph was used for both travel directions.

Dispersion Modeling

Dispersion modeling of DPM and $PM_{2.5}$ emissions was conducted using the CAL3QHCR model, which is recommended by the BAAQMD for this type of analysis. A five-year data set (1991-1995) of hourly meteorological data from the San Jose Airport prepared by the BAAQMD was used in the modeling. Other inputs to the model included road geometry, road elevations, and hourly traffic volumes, emission factors and receptor locations. North and south bound traffic on U.S. 101 within about 1,500 feet of the project site were evaluated with the model.

The modeling used receptors placed at severa locations of the proposed new buildings. Receptor heights of 1.5 meters (4.9 feet) were used in modeling the sensitive receptors. Figure 1 shows the roadway links and receptor locations used in the modeling.

Computed Cancer Risk

Using the average DPM and TOG concentrations, the individual cancer risks were computed using the most recent methods recommended by BAAQMD and described in *Attachment 1*. The factors used to compute cancer risk are highly dependent on modeled concentrations, exposure period or duration, and the type of receptor. The exposure level is determined by the modeled concentration; however, it has to be averaged over a representative exposure period. The averaging period is dependent on many factors, but mostly the type of sensitive receptor being evaluated. BAAQMD does not publish guidance for assessing

[5] Caltrans, 2014b. *2013 Traffic Volumes on the California State Highway System.* Available: www.dot.ca.gov/hq/traffops/saferesr/trafdata/

[6] The Burden output from EMFAC2007, CARB's previous version of the EMFAC model, was used for this since the current web-based version of EMFAC2011 does not include Burden type output with hour by hour traffic volume information.

[7] Santa Clara Valley Transportation Authority. *2012 Monitoring and Conformance Report.* May, 2012.

exposures for land uses that include senior-adults. For this assessment, it was assumed that the project would only include chronic exposures of adults for a 30-year period, beginning in 2018. It should be noted that the cancer risk calculations for 30-year adult exposures reflect use of average breathing rates and no adjustments using age-sensitivity factors that were adopted in 2010. The age-sensitivity factors would reflect the greater sensitivity of infants and children to cancer causing TACs. Had a lifetime exposure period and age-sensitivity factors been used, cancer risk would have been about four times greater.

The maximum increased cancer risk from traffic on U.S. 101 was computed as 21.2 in one million. This was modeled at the project building closest to U.S. 101, as shown on Figure 1. Cancer risks from the highway at other locations would be lower than the maximum risk. However, cancer risk from U.S. 101 would be significant throughout the project site areas. The cancer risks are above the BAAQMD's threshold of 10 in one million excess cancer cases per million and would be considered a *significant impact*.

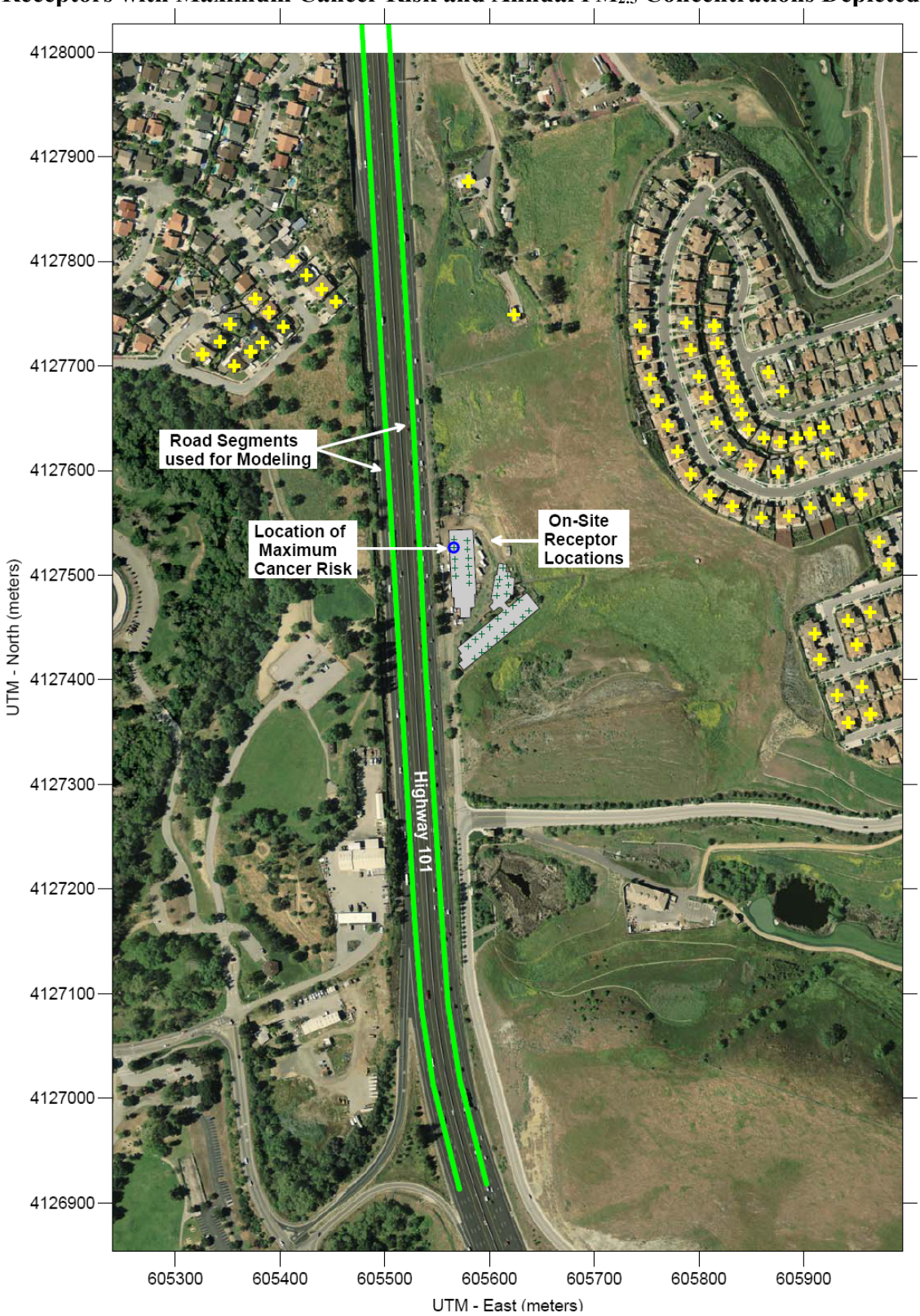
Non-Cancer Health Effects

Potential non-cancer health effects due to chronic exposure to DPM were evaluated based on the chronic inhalation reference exposure level (REL) for DPM of 5 $\mu g/m^3$. The maximum predicted annual DPM concentration from U.S. 101 traffic was 0.19 $\mu g/m^3$, occurring at the same receptor that had the maximum cancer risk. The Hazard Index (HI), which is the ratio of the annual DPM concentration to the REL, is 0.04. This HI is lower than the BAAQMD significance criterion of a HI greater than 1.0. The HI at all other receptors throughout the site would be lower than the maximum HI value. As such, this would be a *less-than-significant impact*.

$PM_{2.5}$ Concentrations from Modeled Roadways

In addition to evaluating the health risks from TACs, potential impacts from $PM_{2.5}$ emissions for vehicles traveling on U.S. 101 were evaluated. The same basic modeling approach that was used for assessing TAC impacts was used in the modeling of $PM_{2.5}$ concentrations. $PM_{2.5}$ emissions from all vehicles including those from tire and brake wear were used. These emissions were also calculated using the EMFAC2011 model for the 2018, 2020, and 2025 traffic volumes. Then, dispersion modeling using emission factors and traffic volumes was conducted. The dispersion modeling of traffic using the Cal3qhcr model was conducted in the same manner as the TAC modeling. The model predicted the maximum annual average $PM_{2.5}$ concentration from U.S. 101 traffic of 1.06 $\mu g/m^3$, which would occur at the receptor that had the maximum cancer risk. Annual $PM_{2.5}$ concentrations throughout the site are above the $PM_{2.5}$ threshold of 0.3 $\mu g/m^3$ and would be considered a *significant impact*.

Figure 1. Project Site, On-Site Sensitive Receptors, and Roadway Segments Modeled and Receptors with Maximum Cancer Risk and Annual $PM_{2.5}$ Concentrations Depicted



Summary of U.S. 101 Impacts

Table 2 summarizes the cancer risk, non-cancer hazard and annual $PM_{2.5}$ concentration associated with U.S. 101 at the project site. Figure 2 shows the range of modeled cancer risk across the project site and Figure 3 shows the range of annual $PM_{2.5}$ concentrations. The emissions and dispersion modeling results, along with health risk calculations for impacts from this assessment are provided as *Attachment 1*.

Table 2. U.S. 101 Community Risk Levels at Project Dwelling Units

Source	30-Year Adult Cancer Risk (per million)	Annual $PM_{2.5}$ ($\mu g/m^3$)	Acute or Chronic Hazard Index
Maximum U.S. 101 – 170,000 ADT (2013)	21.2	1.06	0.04
BAAQMD Single Source Threshold	*10.0*	*0.3*	*1.0*
Significant?	***Yes***	***Yes***	*No*

Combined Community Risk Impacts to Project Sensitive Receptors

U.S. 101 traffic is the only substantial source of TAC and $PM_{2.5}$ emissions within 1,000 feet of the project. No other sources contribute to the community risk exposure at the site.

Impact Finding

The project would have a *significant impact* with respect to community risk caused during project operation since single-source cancer risk would exceed 10 in one million, single-source annual $PM_{2.5}$ concentrations would exceed 0.3 $\mu g/m^3$ and cumulative-source annual $PM_{2.5}$ would exceed 0.8 $\mu g/m^3$.

Recommended Measure AQ-1 (exposure of sensitive receptors to substantial pollutant concentrations).

Maintained ventilation systems with high-efficiency air filtration of the fresh air supply would reduce overall concentrations of DPM and $PM_{2.5}$ concentrations, substantially lowering cancer risk and annual $PM_{2.5}$ concentrations. These systems should be installed on either an individual unit-by-unit basis, with individual air intake and exhaust ducts ventilating each unit separately, or through a centralized building ventilation system. Note that reducing annual PM2.5 concentrations to the threshold level would result in cancer risks below the significant threshold level.

Figure 2. Increased Cancer Risks (per million) From U.S. 101 Traffic

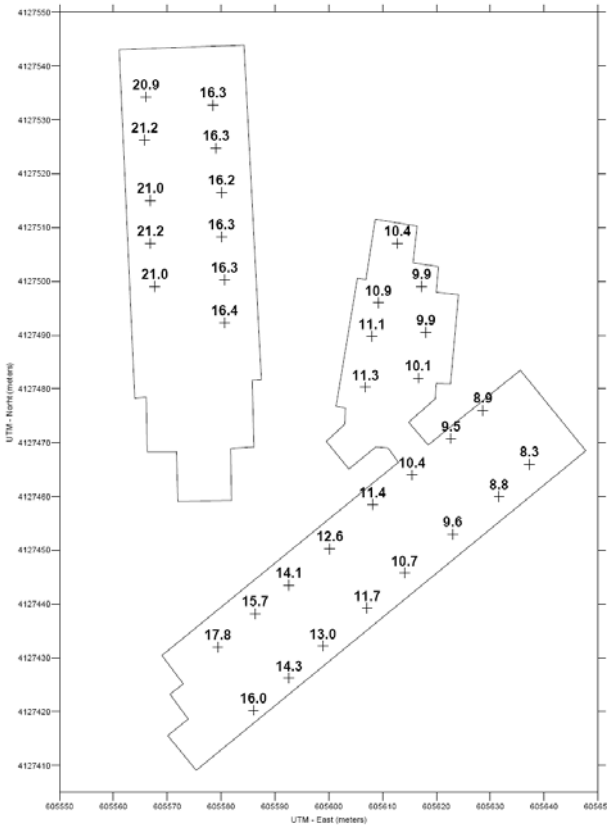


Figure 3. Annual $PM_{2.5}$ Concentrations ($\mu g/m^3$) From U.S. 101 Traffic

The U.S. EPA reports particle size removal efficiency for filters rated MERV13 of 90 percent for particles in the size range of 1 to 3 µm and less than 75 percent for particles 0.3 to 1 µm.[8,9] The BAAQMD's *Planning Healthy Places* guidance indicates that MERV13 air filtration devices installed on an HVAC air intake system can remove 80-90 percent of indoor particulate matter (greater than 0.3 microns in diameter).[10]

1. Design the site to limit exposure from sources of TACs and fine particulate matter ($PM_{2.5}$) emissions. To the greatest degree possible, plant vegetation along the project site boundary with U.S. 101and around outdoor use areas. This barrier shall include trees and shrubs that provide a dense vegetative barrier.

[8] American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 2007. *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. ANSI/ASHRAE Addendum b to Standard 52.2-2007

[9] United States Environmental Protection Agency (U.S. EPA), 2009. *Residential Air Cleaners (Second Edition): A Summary of Available Information*. U.S. EPA 402-F-09-002. Revised August 2009.

[10] Bay Area Air Quality Management District (BAAQMD), 2016. *Planning Healthy Places A Guidebook for addressing local sources of air pollutants in community planning*. May.

2. Install air filtration at all project rooms/units. Air filtration devices shall be rated MERV13 or higher. Alternately, at the approval of the City, equivalent control technology may be used if it is shown by a qualified air quality consultant or heating, ventilation, and air conditioning (HVAC) engineer that it would reduce risk below significance thresholds.
3. As part of implementing this measure, an ongoing maintenance plan for the buildings' heating, ventilation, and air conditioning (HVAC) air filtration system shall be required.

4. Ensure that the use agreement and other property documents (1) require cleaning, maintenance, and monitoring of the affected buildings for air flow leaks; (2) include assurance that new owners or tenants are provided information on the ventilation system; and (3) include provisions that fees associated with owning or leasing a unit(s) in the building include funds for cleaning, maintenance, monitoring, and replacements of the filters, as needed.

Effectiveness with the Implementation of Recommended Measure AQ-1

A properly installed and operated ventilation system with MERV 13 air filters will reduce $PM_{2.5}$ concentrations, including from DPM, from mobile and stationary sources by 80 percent or greater indoors when compared to outdoors. The U.S. EPA reports that people, on average, spend 90 percent of their time indoors.[11] The overall effectiveness calculations take into effect time spent outdoors. Assuming two hours of outdoor exposure plus one hour of open windows (calculated as outdoor exposure) per day, the overall effectiveness of the MERV 13 filtration systems would be 70 percent. The projected cancer risks and annual $PM_{2.5}$ exposures associated with use of these filtrations systems are shown in Figures 4 and 5 for the MERV13 filtration scenario. Use of MERV13 filtration would reduce the maximum cancer risk to 6.9 chances per million, annual PM2.5 levels to 0.3 ug/m^3 or less and the cumulative annual PM2.5 concentration to 0.3 ug/m^3. Implementation of Recommended Measure AQ-1 would reduce cancer risk and annual PM2.5 concentrations below the recommended BAAQMD significance thresholds.

[11] Klepeis, N.E., Nelsen, WC., Ott, WR., Robinson, JP., Tsang, AM., Switzer, P., Behar, JV., Hern, SC., and Engelmann, WH. 2001. *The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants*. J. Expo Anal Environ Epidemial. 2001 May-Jun;11(3):231-52.

Figure 4. Increased Cancer Risks (per million) From U.S. 101 Traffic with MERV13 Filtration

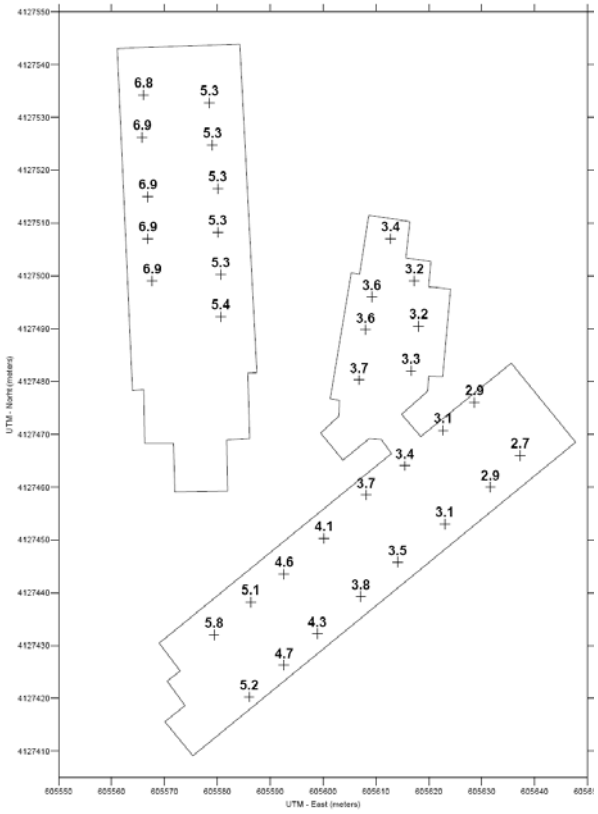


Figure 5. Annual $PM_{2.5}$ Concentrations ($\mu g/m^3$) From U.S. 101 Traffic with MERV13 Filtration

Project Construction Activity

Construction equipment and associated heavy-duty truck traffic generates diesel exhaust, which is a known TAC. These exhaust air pollutant emissions would not be considered to contribute substantially to existing or projected air quality violations. Construction exhaust emissions may still pose community risks for sensitive receptors such as nearby residents. The primary community risk impact issues associated with construction emissions are cancer risk and exposure to $PM_{2.5}$. Diesel exhaust poses both a potential health and nuisance impact to nearby receptors. A community risk assessment of the project construction activities was conducted that evaluated potential health effects of sensitive receptors at these nearby residences from construction emissions of DPM and $PM_{2.5}$.[12] The closest sensitive receptors to the project site are residences about 500 feet east and northeast of the site (see Figure 8). Additional residences are located farther away from project site, across the freeway to the northwest. Emissions and dispersion modeling was conducted to predict the off-site concentrations resulting from project construction, so that lifetime cancer risks and non-cancer health effects could be evaluated.

[12] DPM is identified by California as a toxic air contaminant due to the potential to cause cancer.

Construction Period Emissions

Construction activity is anticipated to include demolition, grading and site preparation, trenching, building construction, and paving. Construction period emissions were modeled using the California Emissions Estimator Model, Version 2013.2.2 (CalEEMod) with model defaults for a project of this type and size. The proposed project land uses were input into CalEEMod, which included 290 dwelling units entered as "Congregate Care (Assisted Living)" on a 3.0-acre site. Construction of the project is expected to occur over an approximate 13-month period beginning in 2016. Construction period emissions were modeled using CalEEMod along with the anticipated project 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 a site-specific construction schedule. The CalEEMod modeling included emissions from truck and worker travel, assumed to occur over a distance of 0.5 miles on or near the site.

The CalEEMod model provided total annual $PM_{2.5}$ exhaust emissions (assumed to be DPM) for the off-road construction equipment and for exhaust emissions from on-road vehicles, with total emissions from all construction stages of 0.040 tons (80 pounds). The on-road emissions are a result of haul truck travel during demolition and grading activities, worker travel, and vendor deliveries during construction. A trip length of 0.5 mile was used to represent vehicle travel while at or near the construction site. It was assumed that these emissions from on-road vehicles traveling at or near the site would occur at the construction site. Fugitive $PM_{2.5}$ dust emissions were calculated by CalEEMod as 0.014 tons (28 pounds) for the overall construction period.

Dispersion Modeling

The U.S. EPA AERMOD dispersion model was used to predict concentrations of DPM and $PM_{2.5}$ concentrations at existing sensitive receptors (residences) in the vicinity of the project construction area. The AERMOD dispersion model is a BAAQMD-recommended model for use in modeling analysis of these types of emission activities for CEQA projects.[13] The AERMOD modeling utilized two area sources to represent the on-site construction emissions, one for exhaust emissions and one for fugitive dust emissions. To represent the construction equipment exhaust emissions, an emission release height of 6 meters (19.7 feet) was used for the area source. The elevated source height reflects the height of the equipment exhaust pipes plus an additional distance for the height of the exhaust plume above the exhaust pipes to account for plume rise of the exhaust gases. For modeling fugitive $PM_{2.5}$ emissions, a near-ground level release height of 2 meters (6.6 feet) was used for the area source. Emissions from the construction equipment and on-road vehicle travel were distributed throughout the modeled area sources. Construction emissions were modeled as occurring daily between 7 a.m. to 4 p.m., when the majority of construction activity would occur. Figure 8 shows the project site and nearby sensitive receptor (residences) locations where health impacts were evaluated.

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

The modeling used a 5-year meteorological data set (2006 – 2010) from the San Jose Airport prepared for use with the AERMOD model by the BAAQMD. Annual DPM and $PM_{2.5}$ concentrations from construction activities during the 2016 through 2017 period were calculated using the model. DPM and $PM_{2.5}$ concentrations were calculated at nearby sensitive receptor locations at a receptor height of 1.5 meters (4.9 feet).

The maximum-modeled DPM and $PM_{2.5}$ concentrations occurred in the residential area northwest of the project site on the other side of U. S. 101. The location where the maximum $PM_{2.5}$ and DPM concentrations occurred (and maximum cancer risk) are identified on Figure 8.

Predicted Cancer Risk and Hazards

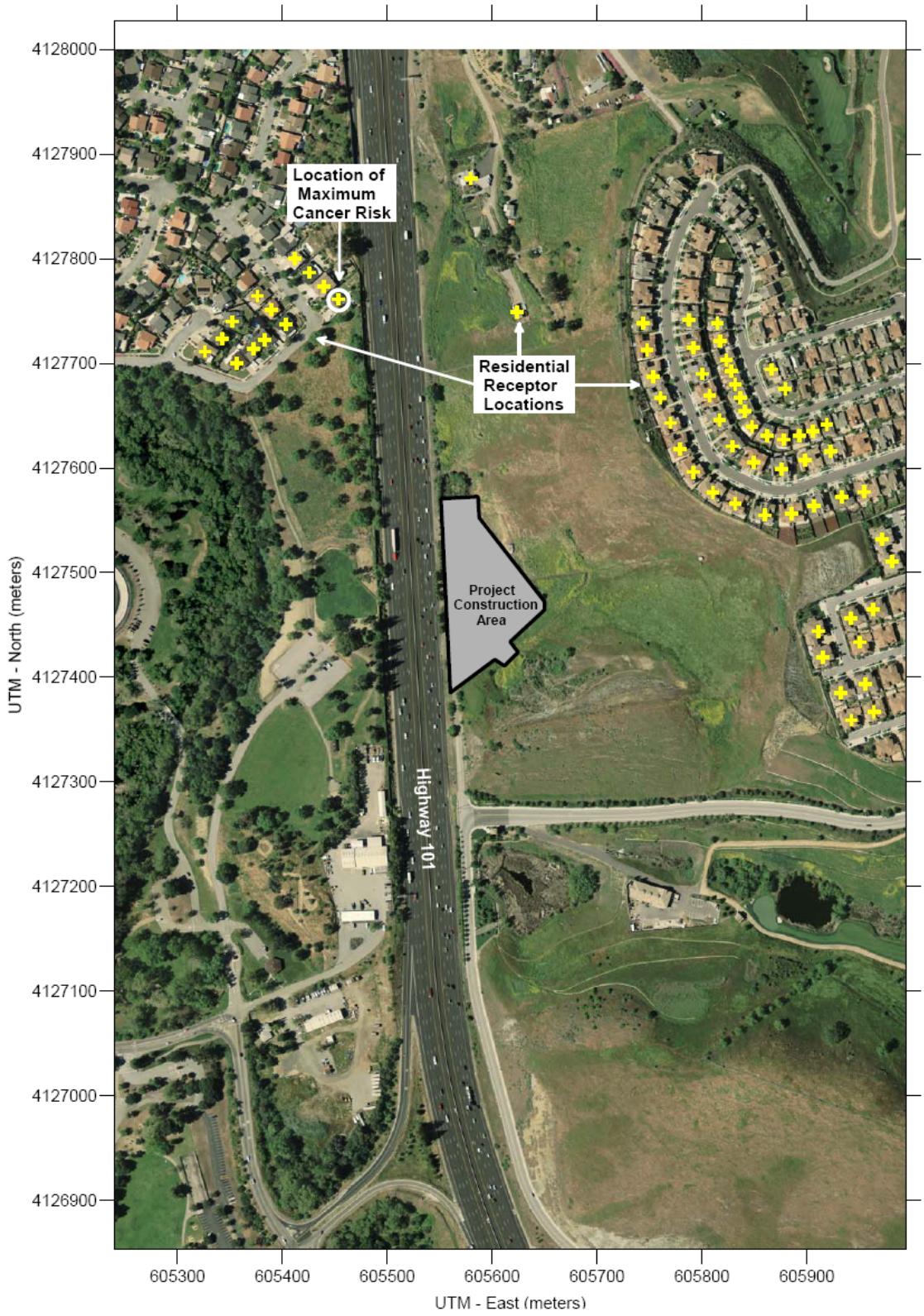
Increased cancer risks were calculated using the maximum modeled DPM concentrations and BAAQMD recommended risk assessment methods for infant exposure (3rd trimester through two years of age), child exposure, and for an adult exposure. The cancer risk calculations were based on applying the BAAQMD recommended age sensitivity factors to the TAC concentrations. Age-sensitivity factors reflect the greater sensitivity of infants and small children to cancer causing TACs. BAAQMD-recommended exposure parameters were used for the cancer risk calculations.[14] Infant, child, and adult exposures were conservatively assumed to occur at all residences through the entire construction period.

Results of the assessment for project construction indicate the maximum incremental residential child cancer risk at the maximally exposed individual (MEI) receptor would be 0.6 in one million and the residential adult incremental cancer risk would be 0.03 in one million. The maximum-modeled annual $PM_{2.5}$ concentration, which is based on combined exhaust and fugitive dust emissions, was 0.01 $\mu g/m^3$. The maximum modeled annual residential DPM concentration (i.e., from construction exhaust) was 0.007 $\mu g/m^3$, which is much lower than the REL. The maximum computed HI based on this DPM concentration is less than 0.01 which is 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 project construction activities, since cancer risk is below the single-source thresholds of 10.0 per million and annual $PM_{2.5}$ concentrations do not exceed 0.3 $\mu g/m^3$. *Attachment 2* includes the emission calculations and source information used in the modeling and the cancer risk calculations.

[14] Bay Area Air Quality Management District (BAAQMD), 2010, *Air Toxics NSR Program Health Risk Screening Analysis Guidelines*, January.

Figure 8. Project Construction Site and Locations of Off-Site Sensitive Receptors and Maximum Cancer Risks



Combined Construction Risk Assessment

The combined risk was computed by adding the effects of construction activities with U.S. 101 traffic risk. Construction risks from the project are based on those impacts described above. Effects of U.S.101 traffic was estimated based on BAAQMD's Google Earth *Highway Screening Analysis Tool*. This Google Earth map tool is used to identify screening estimated risk and hazard impacts from highways throughout the Bay Area. Community risk levels for this assessment were based on a distance of 150 feet at a 6-foot exposure height for U.S. 101 Link 512. The risk levels were the average of the posted levels for 100 and 200 feet from the roadway. Those cancer risk levels were adjusted to reflect newer cancer risk assessment methods recommended by OEHHA and BAAQMD in 2015.

Table 3 shows the community risk impacts associated with each source. The maximum combined cancer risk from unmitigated construction and U.S. 101 traffic is 67.5 in one million. The maximum annual $PM_{2.5}$ concentration would be 0.44 $\mu g/m^3$. For non-cancer health effects due to chronic exposure to DPM, the HI from all construction projects would be less than 0.07. These combined risk levels were found to be below the significance levels.

Table 3. Combined Construction Source Cancer Risks, $PM_{2.5}$ Concentrations, and Hazard Index

Source	Cancer Risk (per million)	$PM_{2.5}$ Concentration ($\mu g/m^3$)	Acute and Chronic Hazard (HI)
Proposed Project Construction	Infant: 0.8 Adult: <0.1	0.01	<0.01
U.S. 101 traffic at 150 feet	91.9	0.43	0.06
Total	**Infant: 92.7**	**0.44**	**0.07**
BAAQMD Thresholds	*100*	*0.8*	*10.0*
Significant?	***No***	***No***	***No***

Attachment 1: Highway Risk Modeling

Highway 101 - DPM and PM2.5 Emissions and Vehicle Traffic Volumes

4200 Dove Hilll, San Jose, CA
Highway 101
DPM Modeling - Roadway Links, Traffic Volumes, and DPM Emissions
Year = 2018

Road Link	Description	Direction	No. Lanes	Link Length (m)	Link Width (ft)	Link Width (m)	Release Height (m)	Diesel ADT	Average Speed (mph)
NB-101	Northbound 101	N	4	1115	68	20.6	0.0	4,010	Variable
SB-680	Southbound101	S	4	1119	68	20.6	0.0	4,010	Variable

2018 Hourly Diesel Traffic Volumes Per Direction and DPM Emissions - NB-101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	3.58%	144	0.1071	9	6.37%	255	0.1197	17	5.73%	230	0.0879
2	1.98%	80	0.0957	10	7.42%	297	0.1070	18	2.94%	118	0.0771
3	2.02%	81	0.0887	11	6.47%	260	0.1058	19	2.31%	93	0.0920
4	3.54%	142	0.1131	12	6.98%	280	0.1064	20	1.08%	43	0.0799
5	2.07%	83	0.1067	13	6.30%	253	0.1072	21	3.14%	126	0.0997
6	3.66%	147	0.1148	14	6.22%	249	0.1064	22	4.42%	177	0.1051
7	6.68%	268	0.1103	15	5.32%	213	0.1063	23	2.21%	89	0.1067
8	4.90%	197	0.1201	16	3.90%	156	0.1026	24	0.77%	31	0.1059
								Total		4,010	

2018 Hourly Diesel Traffic Volumes Per Direction and DPM Emissions - SB-680

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	3.58%	144	0.1071	9	6.37%	255	0.1054	17	5.73%	230	0.0879
2	1.98%	80	0.0957	10	7.42%	297	0.1070	18	2.94%	118	0.0771
3	2.02%	81	0.0887	11	6.47%	260	0.1058	19	2.31%	93	0.0920
4	3.54%	142	0.1131	12	6.98%	280	0.1064	20	1.08%	43	0.0799
5	2.07%	83	0.1067	13	6.30%	253	0.1072	21	3.14%	126	0.0997
6	3.66%	147	0.1148	14	6.22%	249	0.1064	22	4.42%	177	0.1051
7	6.68%	268	0.1103	15	5.32%	213	0.1063	23	2.21%	89	0.1067
8	4.90%	197	0.1064	16	3.90%	156	0.1026	24	0.77%	31	0.1059
								Total		4,010	

2020 Hourly Diesel Traffic Volumes Per Direction and DPM Emissions - NB-101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	3.65%	149	0.0988	9	6.52%	267	0.0951	17	5.78%	236	0.0733
2	1.98%	81	0.0873	10	7.08%	290	0.1021	18	3.01%	123	0.0632
3	2.01%	82	0.0808	11	6.54%	267	0.0961	19	2.38%	97	0.0813
4	3.55%	145	0.1042	12	7.11%	291	0.0968	20	1.16%	47	0.0678
5	2.04%	84	0.0983	13	6.44%	263	0.0974	21	2.87%	117	0.0999
6	3.60%	147	0.1058	14	6.36%	260	0.0967	22	4.13%	169	0.1027
7	6.41%	262	0.1056	15	5.41%	221	0.0963	23	2.17%	89	0.0984
8	5.02%	205	0.0948	16	4.06%	166	0.0927	24	0.76%	31	0.0972
								Total		4,091	

2020 Hourly Diesel Traffic Volumes Per Direction and DPM Emissions - SB-6101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	3.65%	149	0.0988	9	6.52%	267	0.0956	17	5.78%	236	0.0733
2	1.98%	81	0.0873	10	7.08%	290	0.1021	18	3.01%	123	0.0632
3	2.01%	82	0.0808	11	6.54%	267	0.0961	19	2.38%	97	0.0813
4	3.55%	145	0.1042	12	7.11%	291	0.0968	20	1.16%	47	0.0678
5	2.04%	84	0.0983	13	6.44%	263	0.0974	21	2.87%	117	0.0999
6	3.60%	147	0.1058	14	6.36%	260	0.0967	22	4.13%	169	0.1027
7	6.41%	262	0.1056	15	5.41%	221	0.0963	23	2.17%	89	0.0984
8	5.02%	205	0.0958	16	4.06%	166	0.0927	24	0.76%	31	0.0972
								Total		4,091	

2025 Hourly Diesel Traffic Volumes Per Direction and DPM Emissions - NB-101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	3.62%	156	0.0910	9	6.46%	279	0.0803	17	5.83%	252	0.0635
2	1.99%	86	0.0802	10	7.36%	318	0.0922	18	2.93%	127	0.0549
3	1.96%	85	0.0737	11	6.32%	273	0.0916	19	2.28%	99	0.0752
4	3.39%	146	0.0962	12	7.04%	304	0.0899	20	0.91%	39	0.0743
5	1.98%	86	0.0907	13	6.53%	282	0.0904	21	3.03%	131	0.0872
6	3.57%	154	0.0977	14	6.39%	276	0.0897	22	4.23%	183	0.0915
7	6.47%	279	0.0952	15	5.44%	235	0.0899	23	2.49%	107	0.0849
8	4.88%	211	0.0800	16	3.97%	172	0.0861	24	0.93%	40	0.0729
								Total		4,318	

2025 Hourly Diesel Traffic Volumes Per Direction and DPM Emissions - SB-6101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	3.62%	156	0.0910	9	6.46%	279	0.0890	17	5.83%	252	0.0635
2	1.99%	86	0.0802	10	7.36%	318	0.0922	18	2.93%	127	0.0549
3	1.96%	85	0.0737	11	6.32%	273	0.0916	19	2.28%	99	0.0752
4	3.39%	146	0.0962	12	7.04%	304	0.0899	20	0.91%	39	0.0743
5	1.98%	86	0.0907	13	6.53%	282	0.0904	21	3.03%	131	0.0872
6	3.57%	154	0.0977	14	6.39%	276	0.0897	22	4.23%	183	0.0915
7	6.47%	279	0.0952	15	5.44%	235	0.0899	23	2.49%	107	0.0849
8	4.88%	211	0.0893	16	3.97%	172	0.0861	24	0.93%	40	0.0729
								Total		4,318	

4200 Dove Hilll, San Jose, CA
Highway 101
PM2.5 & TOG Modeling - Roadway Links, Traffic Volumes, and PM2.5 Emissions
Year = 2018

Group Link	Description	Direction	No. Lanes	Link Length (m)	Link Width (ft)	Link Width (m)	Release Height (m)	ADT	Average Speed (mph)	Average Vehicles per Hour
NB-101	Northbound 101	N	4	1115	68	20.6	0.0	89,251	Variable	3,719
SB-680	Southbound101	S	4	1119	68	20.6	0.0	89,251	Variable	3,719

2018 Hourly Traffic Volumes Per Direction and PM2.5 Emissions - NB-101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	1.17%	1042	0.0352	9	7.11%	6343	0.0293	17	7.33%	6545	0.0228
2	0.41%	365	0.0411	10	4.41%	3937	0.0301	18	8.13%	7257	0.0214
3	0.36%	320	0.0434	11	4.67%	4165	0.0272	19	5.68%	5071	0.0218
4	0.30%	266	0.0823	12	5.90%	5270	0.0268	20	4.26%	3802	0.0213
5	0.50%	447	0.0398	13	6.16%	5497	0.0249	21	3.26%	2912	0.0240
6	0.94%	835	0.0442	14	6.04%	5389	0.0253	22	3.32%	2963	0.0259
7	3.85%	3435	0.0287	15	7.02%	6261	0.0238	23	2.46%	2192	0.0240
8	7.77%	6934	0.0261	16	7.11%	6349	0.0226	24	1.85%	1654	0.0214
								Total		89,251	

2018 Hourly Traffic Volumes Per Direction and PM2.5 Emissions - SB-680

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	1.17%	1042	0.0352	9	7.11%	6343	0.0257	17	7.33%	6545	0.0228
2	0.41%	365	0.0411	10	4.41%	3937	0.0301	18	8.13%	7257	0.0214
3	0.36%	320	0.0434	11	4.67%	4165	0.0272	19	5.68%	5071	0.0218
4	0.30%	266	0.0823	12	5.90%	5270	0.0268	20	4.26%	3802	0.0213
5	0.50%	447	0.0398	13	6.16%	5497	0.0249	21	3.26%	2912	0.0240
6	0.94%	835	0.0442	14	6.04%	5389	0.0253	22	3.32%	2963	0.0259
7	3.85%	3435	0.0287	15	7.02%	6261	0.0238	23	2.46%	2192	0.0240
8	7.77%	6934	0.0225	16	7.11%	6349	0.0226	24	1.85%	1654	0.0214
								Total		89,251	

2020 Hourly Traffic Volumes Per Direction and PM2.5 Emissions - NB-101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	1.17%	1062	0.0343	9	7.11%	6466	0.0282	17	7.33%	6667	0.0223
2	0.41%	375	0.0399	10	4.41%	4012	0.0293	18	8.13%	7398	0.0211
3	0.36%	325	0.0414	11	4.66%	4242	0.0266	19	5.68%	5167	0.0217
4	0.30%	270	0.0782	12	5.91%	5372	0.0262	20	4.26%	3876	0.0212
5	0.50%	456	0.0381	13	6.16%	5606	0.0245	21	3.26%	2965	0.0236
6	0.93%	849	0.0424	14	6.04%	5490	0.0248	22	3.32%	3018	0.0254
7	3.85%	3499	0.0279	15	7.02%	6383	0.0235	23	2.45%	2231	0.0236
8	7.77%	7068	0.0255	16	7.11%	6468	0.0223	24	1.85%	1686	0.0214
								Total		90,951	

2020 Hourly Traffic Volumes Per Direction and PM2.5 Emissions - SB-6101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	1.17%	1062	0.0343	9	7.11%	6466	0.0253	17	7.33%	6667	0.0223
2	0.41%	375	0.0399	10	4.41%	4012	0.0293	18	8.13%	7398	0.0211
3	0.36%	325	0.0414	11	4.66%	4242	0.0266	19	5.68%	5167	0.0217
4	0.30%	270	0.0782	12	5.91%	5372	0.0262	20	4.26%	3876	0.0212
5	0.50%	456	0.0381	13	6.16%	5606	0.0245	21	3.26%	2965	0.0236
6	0.93%	849	0.0424	14	6.04%	5490	0.0248	22	3.32%	3018	0.0254
7	3.85%	3499	0.0279	15	7.02%	6383	0.0235	23	2.45%	2231	0.0236
8	7.77%	7068	0.0223	16	7.11%	6468	0.0223	24	1.85%	1686	0.0214
								Total		90,951	

2025 Hourly Traffic Volumes Per Direction and PM2.5 Emissions - NB-101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	1.16%	1109	0.0331	9	7.11%	6772	0.0278	17	7.34%	6984	0.0221
2	0.41%	394	0.0387	10	4.42%	4203	0.0289	18	8.13%	7743	0.0210
3	0.36%	341	0.0395	11	4.66%	4439	0.0261	19	5.67%	5402	0.0215
4	0.29%	276	0.0734	12	5.91%	5624	0.0259	20	4.26%	4057	0.0211
5	0.50%	474	0.0366	13	6.16%	5867	0.0243	21	3.26%	3101	0.0233
6	0.94%	891	0.0410	14	6.04%	5754	0.0246	22	3.32%	3158	0.0250
7	3.84%	3655	0.0273	15	7.02%	6683	0.0233	23	2.46%	2341	0.0236
8	7.77%	7395	0.0253	16	7.12%	6775	0.0223	24	1.85%	1762	0.0211
								Total		95,201	

2025 Hourly Traffic Volumes Per Direction and PM2.5 Emissions - SB-6101

Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile	Hour	% Per Hour	VPH	g/mile
1	1.16%	1109	0.0331	9	7.11%	6772	0.0251	17	7.34%	6984	0.0221
2	0.41%	394	0.0387	10	4.42%	4203	0.0289	18	8.13%	7743	0.0210
3	0.36%	341	0.0395	11	4.66%	4439	0.0261	19	5.67%	5402	0.0215
4	0.29%	276	0.0734	12	5.91%	5624	0.0259	20	4.26%	4057	0.0211
5	0.50%	474	0.0366	13	6.16%	5867	0.0243	21	3.26%	3101	0.0233
6	0.94%	891	0.0410	14	6.04%	5754	0.0246	22	3.32%	3158	0.0250
7	3.84%	3655	0.0273	15	7.02%	6683	0.0233	23	2.46%	2341	0.0236
8	7.77%	7395	0.0221	16	7.12%	6775	0.0223	24	1.85%	1762	0.0211
								Total		95,201	

Hwy 101 - 2018 Vehicle Emission Factor Calculations at 65, 60 mph and 15 mph

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 65 mph

Analysis Year = ***2018***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2018 Number Vehicles (veh/day)	2018 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,529	113,955	0.33%	379	65	0.0150	0.0192	0.0015	0.0255	0.049
LDT	48,024	50,425	0.07%	36	65	0.0228	0.0195	0.0018	0.0426	0.114
MDT	5,708	5,994	6.47%	388	65	0.0213	0.0219	0.0029	0.0584	0.165
HDT	7,740	8,127	88.79%	7,216	65	0.1149	0.1444	0.1017	0.1186	0.138
Total	170,001	178,501	-	8,020	65	-	-		-	-
Mix Avg Emission Factor						**0.10524**	**0.02509**	**0.00616**	**0.03210**	**0.07239**
Increase From 2013		1.05								
Vehicles/Direction		89,250		4,010						
Avg Vehicles/Hour/Direction		**3,719**		**167**						

Traffic Data Year = ***2013***

Caltrans 2013 Truck AADT Data	Total	Total Truck	Truck by Axle 2	3	4	5
Rte 101, A Hellyer Ave	170,000	13,447	5,708	1,144	499	6,097
			42.45%	8.51%	3.71%	45.34%
Percent of Total Vehicles		7.91%	3.36%	0.67%	0.29%	3.59%

Traffic Increase per Year (%) = ***1.00%***

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 60 mph

Analysis Year = ***2018***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2018 Number Vehicles (veh/day)	2018 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,529	113,955	0.33%	379	60	0.0142	0.0190	0.0013	0.0226	0.049
LDT	48,024	50,425	0.07%	36	60	0.0221	0.0194	0.0016	0.0381	0.114
MDT	5,708	5,994	6.47%	388	60	0.0212	0.0219	0.0029	0.0584	0.165
HDT	7,740	8,127	88.79%	7,216	60	0.0945	0.1236	0.0808	0.1118	0.138
Total	170,001	178,501	-	8,020	60	-	-		-	-
Mix Avg Emission Factor						**0.08683**	**0.02398**	**0.00505**	**0.02882**	**0.07239**
Increase From 2013		1.05								
Vehicles/Direction		89,251		4,010						
Avg Vehicles/Hour/Direction		**3,719**		**167**						

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 15 mph

Analysis Year = ***2018***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2018 Number Vehicles (veh/day)	2018 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,529	113,955	0.33%	379	15	0.0364	0.0222	0.0045	0.0749	0.049
LDT	48,024	50,425	0.07%	36	15	0.0603	0.0233	0.0056	0.1270	0.114
MDT	5,708	5,994	6.47%	388	15	0.0614	0.0357	0.0167	0.2624	0.165
HDT	7,740	8,127	88.79%	7,216	15	0.1273	0.1476	0.1048	0.9528	0.138
Total	170,001	178,501	-	8,020	15	-	-	-	-	-
Mix Avg Emission Factor						**0.11955**	**0.02868**	**0.00975**	**0.10114**	**0.07239**
Increase From 2013		1.05								
Vehicles/Direction		89,250		4,010						
Avg Vehicles/Hour/Direction		**3,719**		**167**						

Hwy 101 - 2020 Vehicle Emission Factor Calculations at 65, 60 mph and 15 mph

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 65 mph

Analysis Year = ***2020***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2020 Number Vehicles (veh/day)	2020 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,562	116,161	0.33%	385	65	0.0121	0.0192	0.0015	0.0202	0.044
LDT	47,991	51,350	0.07%	37	65	0.0188	0.0195	0.0017	0.0333	0.103
MDT	5,708	6,108	6.48%	395	65	0.0192	0.0217	0.0027	0.0498	0.161
HDT	7,740	8,282	88.92%	7,364	65	0.1058	0.1356	0.0931	0.0905	0.115
Total	170,001	181,901	-	8,182	65	-	-		-	-
Mix Avg Emission Factor						**0.09684**	**0.02467**	**0.00575**	**0.02539**	**0.06557**
Increase From 2013		1.07								
Vehicles/Direction		90,950		4,091						
Avg Vehicles/Hour/Direction		**3,790**		**170**						

Traffic Data Year = ***2013***

Caltrans 2013 Truck AADT Data	Total	Total Truck	Truck by Axle: 2	3	4	5
Rte 101, A Hellyer Ave	170,000	13,447	5,708	1,144	499	6,097
			42.45%	8.51%	3.71%	45.34%
Percent of Total Vehicles		7.91%	3.36%	0.67%	0.29%	3.59%

Traffic Increase per Year (%) = ***1.00%***

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 60 mph

Analysis Year = ***2020***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2020 Number Vehicles (veh/day)	2020 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,562	116,161	0.33%	385	60	0.0111	0.0190	0.0013	0.0179	0.044
LDT	47,991	51,350	0.07%	37	60	0.0180	0.0193	0.0015	0.0298	0.103
MDT	5,708	6,108	6.48%	395	60	0.0190	0.0217	0.0027	0.0498	0.161
HDT	7,740	8,282	88.92%	7,364	60	0.0797	0.1107	0.0682	0.0864	0.115
Total	170,001	181,901	-	8,182	60	-	-		-	-
Mix Avg Emission Factor						**0.07330**	**0.02337**	**0.00445**	**0.02283**	**0.06557**
Increase From 2013		1.07								
Vehicles/Direction		90,951		4,091						
Avg Vehicles/Hour/Direction		**3,790**		**170**						

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 15 mph

Analysis Year = ***2020***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2020 Number Vehicles (veh/day)	2020 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,562	116,161	0.33%	385	15	0.0265	0.0223	0.0045	0.0620	0.044
LDT	47,991	51,350	0.07%	37	15	0.0473	0.0231	0.0054	0.1033	0.103
MDT	5,708	6,108	6.48%	395	15	0.0553	0.0339	0.0149	0.2145	0.161
HDT	7,740	8,282	88.92%	7,364	15	0.1022	0.1267	0.0841	0.7971	0.115
Total	170,001	181,901	-	8,182	15	-	-	-	-	-
Mix Avg Emission Factor						**0.09610**	**0.02766**	**0.00874**	**0.08310**	**0.06557**
Increase From 2013		1.07								
Vehicles/Direction		90,950		4,091						
Avg Vehicles/Hour/Direction		**3,790**		**170**						

Hwy 101 - 2025 Vehicle Emission Factor Calculations at 65, 60 mph and 15 mph

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 65 mph

Analysis Year = ***2025***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2025 Number Vehicles (veh/day)	2025 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,593	121,624	0.33%	399	65	0.0080	0.0193	0.0016	0.0162	0.037
LDT	47,960	53,715	0.07%	38	65	0.0132	0.0194	0.0017	0.0245	0.086
MDT	5,708	6,393	6.54%	418	65	0.0149	0.0213	0.0023	0.0329	0.145
HDT	7,740	8,669	89.77%	7,782	65	0.0977	0.1288	0.0866	0.0514	0.108
Total	170,001	190,401	-	8,637	65	-	-		-	-
Mix Avg Emission Factor						**0.08922**	**0.02440**	**0.00549**	**0.01935**	**0.05528**
Increase From 2013		1.12								
Vehicles/Direction		95,201		4,318						
Avg Vehicles/Hour/Direction		**3,967**		**180**						

Traffic Data Year = ***2013***

Caltrans 2013 Truck AADT Data	Total	Total Truck	Truck by Axle 2	3	4	5
Rte 101, A Hellyer Ave	170,000	13,447	5,708	1,144	499	6,097
			42.45%	8.51%	3.71%	45.34%
Percent of Total Vehicles		7.91%	3.36%	0.67%	0.29%	3.59%

Traffic Increase per Year (%) = ***1.00%***

4200 Dove Hilll, San Jose, CA
Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 60 mph

Analysis Year = ***2025***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2025 Number Vehicles (veh/day)	2025 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,593	121,624	0.33%	399	60	0.0068	0.0191	0.0014	0.0143	0.037
LDT	47,960	53,716	0.07%	38	60	0.0121	0.0192	0.0015	0.0219	0.086
MDT	5,708	6,393	6.54%	418	60	0.0148	0.0213	0.0023	0.0329	0.145
HDT	7,740	8,669	89.77%	7,782	60	0.0687	0.1016	0.0593	0.0402	0.108
Total	170,001	190,402	-	8,637	60	-	-		-	-
Mix Avg Emission Factor						**0.06295**	**0.02299**	**0.00408**	**0.01729**	**0.05528**
Increase From 2013		1.12								
Vehicles/Direction		95,201		4,318						
Avg Vehicles/Hour/Direction		**3,967**		**180**						

4200 Dove Hilll, San Jose, CA

Highway 101 Traffic Data and PM2.5 & TOG Emission Factors - 15 mph

Analysis Year = ***2025***

Vehicle Type	2013 Caltrans Number Vehicles (veh/day)	2025 Number Vehicles (veh/day)	2025 Percent Diesel	Number Diesel Vehicles (veh/day)	Vehicle Speed (mph)	Emission Factors: Diesel Vehicles DPM (g/VMT)	All Vehicles: Total PM2.5 (g/VMT)	All Vehicles: Exhaust PM2.5 (g/VMT)	Gas Vehicles: Exhaust TOG (g/VMT)	Gas Vehicles: Running TOG (g/VMT)
LDA	108,593	121,624	0.33%	399	15	0.0126	0.0227	0.0049	0.0512	0.037
LDT	47,960	53,715	0.07%	38	15	0.0284	0.0231	0.0053	0.0776	0.086
MDT	5,708	6,393	6.54%	418	15	0.0432	0.0305	0.0115	0.1195	0.145
HDT	7,740	8,669	89.77%	7,782	15	0.0863	0.1140	0.0717	0.3671	0.108
Total	170,001	190,401	-	8,637	15	-	-	-	-	-
Mix Avg Emission Factor						**0.08056**	**0.02721**	**0.00831**	**0.06279**	**0.05528**
Increase From 2013		1.12								
Vehicles/Direction		95,201		4,318						
Avg Vehicles/Hour/Direction		**3,967**		**180**						

Updated Cancer Health Risk Impacts from Highway 101 Traffic

4200 Dove Hill, San Jose, CA - Highway 101 DPM & TOG TACs
CAL3QHCR Risk Modeling Parameters and Maximum Concentrations
On-Site Adult Receptors (1.5 meter receptor heights)

Receptor Information

Number of Receptors	34
Receptor Height =	1.5 meters
Receptor distances =	variable

Meteorological Conditions

San Jose Airport - Hourly Met I	1991-1995
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

MEI Maximum Concentrations

Emission Period	DPM Concentration (µg/m^3)		
	DPM	Exh TOG	Evap TOG
2018-2019	0.19180	1.49418	2.96788
2020-2024	0.17726	1.21736	2.73138
2025-2047	0.17029	0.97318	2.41180

Emission Period	PM Concentration (µg/m^3)		
	PM	Exh TOG	Evap TOG
2018-2019	1.02341	1.49418	2.96788
2020-2024	1.02299	1.21736	2.73138
2025-2047	1.05781	0.97318	2.41180

4200 Dove Hill, San Jose, CA - Highway 101 Cancer Risks
On-Site Adult Receptors (1.5 meter receptor heights)
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

Cancer Potency Factors $(mg/kg\text{-}day)^{-1}$

TAC	CPF
DPM	1.10E+00
Vehicle TOG Exhaust	6.28E-03
Vehicle TOG Evaporative	3.70E-04

	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	1.00

* 95th percentile breathing rates for 3rd trimester and infants and 80th percentile for children and adults

Road Traffic Cancer Risk by Year - Maximum Impact Receptor Location

				Maximum - Exposure Information							
					Annual DPM Conc (ug/m3)			Cancer Risk (per million)			
Exposure Year	Year	Exposure Duration (years)	Age	Age Sensitivity Factor	DPM	Exhaust TOG	Evaporative TOG	DPM	Exhaust TOG	Evaporative TOG	Total
1	2018	1	1	1	0.1918	1.4942	2.9679	0.75	0.034	0.004	0.79
2	2019	1	2	1	0.1918	1.4942	2.9679	0.75	0.034	0.004	0.79
3	2020	1	3	1	0.1773	1.2174	2.7314	0.70	0.027	0.004	0.73
4	2021	1	4	1	0.1773	1.2174	2.7314	0.70	0.027	0.004	0.73
5	2022	1	5	1	0.1773	1.2174	2.7314	0.70	0.027	0.004	0.73
6	2023	1	6	1	0.1773	1.2174	2.7314	0.70	0.027	0.004	0.73
7	2024	1	7	1	0.1773	1.2174	2.7314	0.70	0.027	0.004	0.73
8	2025	1	8	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
9	2026	1	9	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
10	2027	1	10	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
11	2028	1	11	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
12	2029	1	12	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
13	2030	1	13	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
14	2031	1	14	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
15	2032	1	15	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
16	2033	1	16	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.69
17	2034	1	17	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
18	2035	1	18	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
19	2036	1	19	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
20	2037	1	20	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
21	2038	1	21	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
22	2039	1	22	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
23	2040	1	23	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
24	2041	1	24	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
25	2042	1	25	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
26	2043	1	26	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
27	2044	1	27	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
28	2045	1	28	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
29	2046	1	29	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
30	2047	1	30	1	0.1703	0.9732	2.4118	0.67	0.022	0.003	0.695
Total Increased Cancer Risk			**Total**					20.4	0.7	0.1	**21.2**

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.[15] 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.[16] 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.[17] 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 in the BAAQMD guidance, 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 for sources with long-term emissions (e.g., roadways).

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

[15] 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.
[16] CARB, 2015. *Risk Management Guidance for Stationary Sources of Air Toxics*. July 23.
[17] BAAQMD, 2016. *BAAQMD Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines*. January 2016.

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 (µg/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
	Age Range →	3rd Trimester	0<2	2 < 9	2 < 16	16 - 30
DPM Cancer Potency Factor (mg/kg-day)$^{-1}$		1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
Daily Breathing Rate (L/kg-day)*		361	1,090	631	572	261
Inhalation Absorption Factor		1	1	1	1	1
Averaging Time (years)		70	70	70	70	70
Exposure Duration (years)		0.25	2	14	14	14
Exposure Frequency (days/year)		350	350	350	350	350
Age Sensitivity Factor		10	10	3	3	1
Fraction of Time at Home		0.85-1.0	0.85-1.0	0.72-1.0	0.72-1.0	0.73

* 95th percentile breathing rates for 3rd trimester and infants and 80th percentile for children and adults

BAAQMD has provided screening tools for assessing impacts from stationary sources, highways and local roadways. These tools do not incorporate the latest OEHHA guidance described above. For these sources and sources with continuous emissions evaluated using the older 2010 guidance, BAAQMD recommends adjusting the lifetime cancer risk upwards with a 1.3744 factor. This factor was provided by BAAQMD for use with their CEQA screening tools that are used to predict cancer risk.[18]

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 residential projects located near roadways with substantial TAC emissions, the primary TAC of concern with non-cancer health effects is diesel particulate matter (DPM). For DPM, the chronic inhalation REL is 5 micrograms per cubic meter (µg/m^3).

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.

[18] Email from Virginia Lau, BAAQMD to Bill Popenuck, Illingworth & Rodkin, Inc, dated November 15, 2015.

Attachment 2: Construction Modeling

Construction Emissions and Health Risk Calculations

Dove Hill - San Jose, CA

DPM Construction 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 ($g/s/m^2$)
2016-2017	Construction	0.0399	CON_DPM	79.8	0.0243	3.06E-03	10,762	2.84E-07
		hr/day =	9	(7am - 4pm)				
		days/yr =	365					
		hours/year =	3285					

PM2.5 Fugitive Dust Construction 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 $g/s/m^2$
2016-2017	Construction	CON_FUG	0.0139	27.8	0.00846	1.07E-03	10,762	9.91E-08
		hr/day =	9	(7am - 4pm)				
		days/yr =	365					
		hours/year =	3285					

Dove Hill - San Jose, CA - Construction Health Impact Summary

Construction Health Impact Summary - Residential Receptors

Construction Year	Maximum Concentrations: Exhaust PM2.5/DPM ($\mu g/m^3$)	Maximum Concentrations: Fugitive PM2.5 ($\mu g/m^3$)	Cancer Risk (per million): Child	Cancer Risk (per million): Adult	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2016-2017	0.0072	0.0028	**0.63**	**0.03**	**0.001**	**0.010**

Dove Hill - San Jose, CA
Maximum DPM Cancer Risk Calculations From Construction
Off-Site Residential Receptor Locations - 1.5 meters

Cancer Risk (per million) = CPF x Inhalation Dose x 1.0E6

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

Inhalation Dose = C_{air} x DBR x A x EF x ED x 10^{-6} / AT

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)
ED = Exposure duration (years)
AT = Averaging time period over which exposure is averaged.
10^{-6} = Conversion factor

Values

Parameter	Child	Adult
CPF =	1.10E+00	1.10E+00
DBR =	581	302
A =	1	1
EF =	350	350
AT =	25,550	25,550

Construction Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Exposure Duration (years)	Child - Exposure Information: DPM Conc (ug/m3) Year	Child - Exposure Information: DPM Conc (ug/m3) Annual	Child - Exposure Information: Exposure Adjust Factor	Child Cancer Risk (per million)	Adult - Exposure Information: Modeled DPM Conc (ug/m3) Year	Adult - Exposure Information: Modeled DPM Conc (ug/m3) Annual	Adult - Exposure Information: Exposure Adjust Factor	Adult Cancer Risk (per million)	Fugitive PM2.5	Total PM2.5
1	1	2016-2017	0.0072	10	0.63	2016-2017	0.0072	1	0.03	0.0028	0.010
2	1		0.0000	10	0.00		0.0000	1	0.00		
3	1		0.0000	4.75	0.00		0.0000	1	0.00		
4	1		0.0000	3	0.00		0.0000	1	0.00		
5	1		0.0000	3	0.00		0.0000	1	0.00		
6	1		0.0000	3	0.00		0.0000	1	0.00		
7	1		0.0000	3	0.00		0.0000	1	0.00		
8	1		0.0000	3	0.00		0.0000	1	0.00		
9	1		0.0000	3	0.00		0.0000	1	0.00		
10	1		0.0000	3	0.00		0.0000	1	0.00		
11	1		0.0000	3	0.00		0.0000	1	0.00		
12	1		0.0000	3	0.00		0.0000	1	0.00		
13	1		0.0000	3	0.00		0.0000	1	0.00		
14	1		0.0000	3	0.00		0.0000	1	0.00		
15	1		0.0000	3	0.00		0.0000	1	0.00		
16	1		0.0000	3	0.00		0.0000	1	0.00		
17	1		0.0000	1.5	0.00		0.0000	1	0.00		
18	1		0.0000	1	0.00		0.0000	1	0.00		
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65	1		0.0000	1	0.00		0.0000	1	0.00		
66	1		0.0000	1	0.00		0.0000	1	0.00		
67	1		0.0000	1	0.00		0.0000	1	0.00		
68	1		0.0000	1	0.00		0.0000	1	0.00		
69	1		0.0000	1	0.00		0.0000	1	0.00		
70	1		0.0000	1	0.00		0.0000	1	0.00		
Total Increased Cancer Risk					**0.63**				**0.03**		