APPENDIX B

Air Quality and Greenhouse Gas Study

MAPLE & MAIN PROJECT AIR QUALITY AND GHG EMISSIONS ASSESSMENT

Hayward, California

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Introduction

The purpose of this report is to address air quality and greenhouse gas (GHG) emission impacts associated with the proposed Main & Maple project in Hayward, California. We understand that the project proposes a five-story residential building and an existing medical office building. The new residential building has 235 residential units with three outdoor courtyards, a clubhouse with fitness facilities, and ground floor retail and leasing office. The residential component of the project includes mostly enclosed parking. The existing medical office on the corner of Maple Court and McKeever Avenue will be reduced in size to approximately 60,000 square feet and the building will be improved and modernized.

Air quality and GHG emissions would occur due to temporary construction emissions and as a result of direct and indirect emissions from users of the new apartments and updated office buildings. The project locates new sensitive receptors (i.e., residents) near sources of air pollution such as traffic. This analysis of air quality impacts and GHG emissiions was conducted following guidance provided by the Bay Area Air Quality Management District (BAAQMD).

Air Quality Setting

The project is located in the western portion of Alameda County, which is in the San Francisco Bay Area Air Basin. Ambient air quality standards have been established at both the State and federal level. The Bay Area meets all ambient air quality standards with the exception of ground-level ozone, respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

High ozone levels are caused by the cumulative emissions of reactive organic gases (ROG) and nitrogen oxides (NO_x). These precursor pollutants react under certain meteorological conditions to form high ozone levels. Controlling the emissions of these precursor pollutants is the focus of the Bay Area's attempts to reduce ozone levels. The highest ozone levels in the Bay Area occur in the eastern and southern inland valleys that are downwind of air pollutant sources. High ozone levels aggravate respiratory and cardiovascular diseases, reduced lung function, and increase coughing and chest discomfort.

Particulate matter is another constituent that exceeds State Air Quality Standards in the Bay Area. Particulate matter is assessed and measured in terms of respirable particulate matter or particles that have a diameter of 10 micrometers or less (PM_{10}) and fine particulate matter where particles have a diameter of 2.5 micrometers or less ($PM_{2.5}$). Elevated concentrations of PM_{10} and $PM_{2.5}$ 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.

Toxic air contaminants (TAC) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, criteria air pollutants. TACs are commonly 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 the state's Proposition 65 or under 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.

Regulatory Setting

The U.S. Environmental Protection Agency (U.S. EPA) is responsible for enforcing the Federal Clean Air Act and the 1990 amendments to it, as well as the National Ambient Air Quality Standards (NAAQS) (federal standards) that the U.S. EPA establishes. These standards identify levels of air quality for six criteria pollutants, which are considered the maximum levels of ambient air pollutants considered safe, with an adequate margin of safety, to protect public health and welfare. The six criteria pollutants are ozone (O_3), carbon dioxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, and lead (Pb). The U.S. EPA also has regulatory and enforcement jurisdiction over emission sources beyond state waters (outer continental shelf) and sources that are under the exclusive authority of the federal government, such as aircraft, train locomotives, and interstate trucking. As part of its enforcement responsibilities, the U.S. EPA requires each State with nonattainment areas (i.e., areas that do not meet NAAQS) to prepare and submit a State Implementation Plan (SIP) that demonstrates the means to attain the federal standards. The SIP must integrate federal, State, and local plan components and regulations to identify specific measures to reduce pollution in nonattainment areas, using a combination of performance standards and market-based programs.

The CARB, a department of the California EPA, oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the 1989 amendments to the California Clean Air Act (CCAA), responding to the federal CAAA requirements, and regulating emissions from motor vehicles and consumer products within the state. CARB has established emission standards for vehicles sold in California and for various types of equipment available commercially. It also sets fuel specifications to further reduce

[1] Available online: http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm. Accessed: April 30, 2014.

vehicular emissions and develops airborne toxic control measures to reduce TACs identified under CARB regulations.

Both the U.S. EPA and CARB established ambient air quality standards for common air pollutants. These ambient air quality standards are prescribed levels of pollutants that represent safe levels that avoid specific adverse health effects associated with each pollutant. The ambient air quality standards cover what are called "criteria" pollutants because the health and other effects of each pollutant are described in criteria documents. The federal and State ambient standards were developed independently with differing purposes and methods, although both processes attempted to avoid health-related effects. As a result, federal and State standards differ in some cases. In general, California standards are more stringent. This is particularly true for ozone and PM_{10}. The BAAQMD is the regional agency tasked with managing air quality in the region. CARB oversees regional air district activities and regulates air quality at the State level. The BAAQMD has published the California Environmental Quality Act (CEQA) Air Quality Guidelines that are used in this assessment to evaluate air quality impacts of projects.[2]

National and State Ambient Air Quality Standards

The ambient air quality in a given area depends on the quantities of pollutants emitted within the area, transport of pollutants to and from surrounding areas, local and regional meteorological conditions, as well as the surrounding topography of the air basin. Air quality is described by the concentration of various pollutants in the atmosphere. Units of concentration are generally expressed in parts per million (ppm) or micrograms per cubic meter *(*$\mu g/m^3$).

As required by the Federal Clean Air Act, NAAQS have been established for six major air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), PM_{10}, $PM_{2.5}$, sulfur oxides, and lead. Pursuant to the California Clean Air Act, the State of California has established the California Ambient Air Quality Standards (CAAQS). Both State and federal standards are summarized in Table 1. The "primary" standards have been established to protect the public health. The "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation and other aspects of the general welfare. CAAQS are generally the same or more stringent than NAAQS.

Air Quality Monitoring Data

The significance of a pollutant concentration is determined by comparing the concentration to an appropriate ambient air quality standard. The standards represent the allowable pollutant concentrations designed to ensure that the public health and welfare are protected, while including a reasonable margin of safety to protect the more sensitive individuals in the population. The San Francisco Bay Area is considered to be one of the cleanest metropolitan areas in the country with respect to air quality. BAAQMD monitors air quality conditions at 25 locations throughout the Bay Area. BAAQMD published a summary of monitoring results for each year.[3] A monitoring station in Hayward only measures ozone. Over the last 3 years, this station measures exceedances of health-based ozone standards on 0 to 4 days per year. The

[2] Bay Area Air Quality Management District, 2011. *BAAQMD CEQA Air Quality Guidelines*. May.
[3] Bay Area Air Quality Management District Air Quality Summary Reports - http://www.baaqmd.gov/about-air-quality/air-quality-summaries. Accessed October 12, 2015.

closest particulate matter monitoring station is in Oakland, where $PM_{2.5}$ is measured every sixth day. Levels exceeding the standard were measured on 0 to 2 sampling days per year.

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 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 off-site sensitive receptors are residences on McKeever Avenue, adjacent to the northern boundary of the project site. Additional nearby residences are located across from the project site on McKeever Avenue and Main Street and at farther distances from the site. All project residential locations are considered sensitive receptors. This analysis assumed that all residential receptors included infants, children, and adults.

Greenhouse Gases

Gases that trap heat in the atmosphere, GHGs, regulate the earth's temperature. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate. The most common GHGs are carbon dioxide (CO_2) and water vapor but there are also several others, most importantly methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). These are released into the earth's atmosphere through a variety of natural processes and human activities. Sources of GHGs are generally as follows:

- CO_2 and N_2O are byproducts of fossil fuel combustion.
- N_2O is associated with agricultural operations such as fertilization of crops.
- CH_4 is commonly created by off-gassing from agricultural practices (e.g., keeping livestock) and landfill operations.
- Chlorofluorocarbons (CFCs) were widely used as refrigerants, propellants, and cleaning solvents but their production has been stopped by international treaty.
- HFCs are now used as a substitute for CFCs in refrigeration and cooling.
- PFCs and sulfur hexafluoride emissions are commonly created by industries such as aluminum production and semi-conductor manufacturing.

Each GHG has its own potency and effect upon the earth's energy balance. This is expressed in terms of a global warming potential (GWP), with CO_2 being assigned a value of 1 and sulfur hexafluoride being several orders of magnitude stronger with a GWP of 23,900. In GHG emission inventories, the weight of each gas is multiplied by its GWP and is measured in units of equivalent CO_2 (CO_2e).

An expanding body of scientific research supports the theory that global warming is currently affecting changes in weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates, and that it will increasingly do so in the future. The climate and

several naturally occurring resources within California could be adversely affected by the global warming trend. Increased precipitation and sea level rise could increase coastal flooding, saltwater intrusion, and degradation of wetlands. Mass migration and/or loss of plant and animal species could also occur. Potential effects of global climate change that could adversely affect human health include more extreme heat waves and heat-related stress; an increase in climate-sensitive diseases; more frequent and intense natural disasters such as flooding, hurricanes and drought; and increased levels of air pollution.

Bay Are Air Quality Management District

BAAQMD is the regional agency tasked with managing air quality in the region. At the State level, CARB (a part of the California EPA) oversees regional air district activities and regulates air quality at the State level. The BAAQMD has published CEQA Air Quality Guidelines that are used in this assessment to evaluate air quality impacts of projects.[4]

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

Table 1. Ambient Air Quality Standards[5]

Pollutant	Averaging Time	California Standards	National Standards [(a)]	
			Primary [(b,c)]	Secondary [(b,d)]
Ozone (O_3)	8-hour	0.070 ppm (137 µg/m^3)	0.075 ppm (147 µg/m^3)	—
	1-hour	0.09 ppm (180 µg/m^3)	—[e]	Same as primary
Carbon Monoxide (CO)	8-hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	—
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	—
Nitrogen Dioxide (NO_2)	Annual	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.18 ppm (339 µg/m^3)	0.100 ppm[f] (188 µg/m^3)	—
Sulfur Dioxide (SO_2)	Annual	—	—[g]	—
	24-hour	0.04 ppm (105 µg/m^3)	—[g]	—
	3-hour	—	—	0.5 ppm (1300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)	0.075 ppm[g] (196 µg/m^3)	—
PM_{10}	Annual	20 µg/m^3	—	Same as primary
	24-hour	50 µg/m^3	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	12 µg/m^3	
	24-hour	No Separate State Standard	35 µg/m^3	
Lead	Calendar quarter	—	1.5 µg/m^3	Same as primary
	30-day avg	1.5 µg/m^3	—	—

Notes: ppm = parts per million, µg/m^3 = micrograms per cubic meter, mg/m^3 = milligrams per cubic meter

(a) Standards, other than for ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

(b) Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.

(c) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the EPA.

(d) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

(e) The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005. A new 8-hour standard was established in May 2008.

(f) The form of the 1-hour NO_2 standard is the 3-year average of the 98th percentile of the daily maximum 1-hour average concentration.

(g) On June 2, 2010 the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of the 1-hour daily maximum. The EPA also revoked both the existing 24-hour and annual average SO_2 standards.

[5] CARB updated 6/4/2013: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf

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 and were posted on BAAQMD's website and included in the Air District's updated CEQA Guidelines (updated May 2011). The significance thresholds identified by BAAQMD and used in this analysis are summarized in Table 2.

However, the thresholds are currently not recommended for use by the BAAQMD due to pending litigation.[6] In July 2013, the Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC) approved the "Plan Bay Area" which is a long-range integrated transportation and land-use/housing strategy though 2040 for the San Francisco Bay Area. In that document, in which BAAQMD was a contributing agency, only a cumulative threshold was evaluated. Many jurisdictions (San Francisco, Fremont, and Pleasanton) are currently using only the cumulative source threshold. This analysis evaluated the Project under the more stringent BAAQMD single source threshold as well as the cumulative threshold. The May 2011 BAAQMD thresholds are presented in Table 2.

[6] A March 2012 Alameda County Superior Court judgment determined that the BAAQMD had failed to evaluate the environmental impacts of the land use development patterns that would result from adoption of the thresholds and ordered the thresholds set aside. Although the Court of Appeal reversed that judgment, the California Supreme Court is currently reviewing the limited issue of whether CEQA requires an analysis of the environment's impact on a project. Because the court order directing BAAQMD to set aside the thresholds remains in place pending final resolution of the case, BAAQMD currently does not recommend any specific threshold.

Table 2. Air Quality Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	Average Daily Emissions (lbs./day)	Annual Average Emissions (tons/year)
Criteria Air Pollutants			
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82	82	15
$PM_{2.5}$	54	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for New Sources			
Excess Cancer Risk	10 per one million		
Chronic or Acute Hazard Index	1.0		
Incremental annual average $PM_{2.5}$	0.3 µg/m^3		
Health Risks and Hazards for Sensitive Receptors (Cumulative from all sources within 1,000 foot zone of influence) and Cumulative Thresholds for New Sources			
Excess Cancer Risk	100 per one million		
Chronic Hazard Index	10.0		
Annual Average $PM_{2.5}$	0.8 µg/m^3		
Greenhouse Gas Emissions			
GHG Annual Emissions	Compliance with a Qualified GHG Reduction Strategy OR 1,100 metric tons or 4.6 metric tons per capita		
Note: ROG = reactive organic gases, NOx = nitrogen oxides, PM_{10} = course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (µm) or less, $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5µm or less; and GHG = greenhouse gas.			

Source: BAAQMD CEQA Air Quality Guidelines, May 2011

Impacts and Mitigation Measures

Impact: Conflict with or obstruct implementation of the applicable air quality plan? ***Less-than-significant.***

The most recent clean air plan is the *Bay Area 2010 Clean Air Plan* that was adopted by BAAQMD in September 2010. A proposed project would be considered to consistent with the goals of the Clean Air Plan if it would attain air quality standards, reduce population exposure

and protect public health in the Bay Area, and reduce GHG emissions and protect the climate. The proposed project would not conflict with the latest Clean Air planning efforts since: (1) the project would have emissions below the BAAQMD criteria air pollutant and GHG thresholds, (2) development of the project site would be considered urban "infill", (3) development would be located near employment centers, and (4) development would be near existing transit. Net emissions from the project would not exceed any of the significance thresholds and, thus, it is not required to incorporate project-specific transportation control measures listed in the latest Clean Air Plan.

Impact: Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? ***Less than significant.***

The Bay Area is considered a non-attainment area for ground-level ozone and$PM_{2.5}$ under both the Federal Clean Air Act and the California Clean Air Act. The area is also considered non-attainment for PM_{10} under the California Clean Air Act, but not the Federal Act. The area has attained both State and federal ambient air quality standards for carbon monoxide. As part of an effort to attain and maintain ambient air quality standards for ozone and PM_{10}, the BAAQMD has established thresholds of significance for these air pollutants and their precursors. These thresholds are for ozone precursor pollutants (ROG and NO_x), PM_{10}, and $PM_{2.5}$ and apply to both construction period and operational period impacts.

The California Emissions Estimator Model (CalEEMod) Version 2013.2.2 was used to predict emissions from construction and operation of the site assuming full build out of the project. This model is recommended by BAAQMD for analyzing construction and operational emissions from land use projects. The project land use types and size, and trip generation rate were input to CalEEMod for two different runs: (1) residential portion and (2) commercial building renovation. The proposed project land uses included 235 residential units entered as "Apartments Low Rise," 2,180 square feet of retail entered as "Strip Mall," and 235 parking structure spaces entered as "Unenclosed Parking with Elevator" on a 3-acre site. To model rennovations, a "Medical Office Building" use of 60,000 square feet and 162-space "Enclosed Parking with Elevator" use was modeled on a 3-acre site for construction emissions only.

<u>Construction period emissions</u>

CalEEMod provided annual emissions for construction. CalEEMod provides emission estimates for both on-site and off-site construction activities. On-site activities are primarily made up of construction equipment emissions, while off-site activity includes worker, vendor, and haul truck traffic. A construction schedule and equipment usage worksheet was provided that included the schedule for various construction activities (i.e., demolition, site preparation, grading/excavation, trenching, exterior building construction, interior building construction, and paving). For each activity, construction equipment usage was provided by specifying the type, quantity, days of use on site, and average hours of use per day. Detailed information was provided for demolition activities that included the tonnage of demolition material to be removed from the site. This information was input to the CalEEMod model.

CalEEMod also predicts emissions from worker, vendor, and hauling trips. Worker trips, which include autos and light-duty trucks, were estimated based on CalEEMod defaults. Vendor trips, which include medium and heavy-duty trucks, were also based on CalEEMod defaults. CalEEMod was used to predict truck hauling trips based on the amount of material to be imported or exported for Site Preparation and Grading phases. Cement and asphalt truck trips for the Exterior Building Construction and Paving phases were included based on the provided projection import/export quantities or anticipated truck trips. Truck hauling trips were based on the following:

- Demolition - 39,000 square feet of demolition plus the removal of 84,000 square feet of pavement or asphalt.
- Grading – soil impaort of 3,000 cubic yards.
- Building Construction – 900 cubic yards of cement, assuming 10 cubic yards per truck.

Attachment 1 includes the CalEEMod input and output values for construction emissions and the construction schedule and equipment list.

The modeling scenario assumes that the project would be built out over a period of one year, beginning in 2016, or an estimated 270 construction workdays. CalEEMod provided the total construction emissions in tons. Average daily emissions were computed by dividing the total construction emissions by the number of construction days. Table 3 shows average daily construction emissions of ROG, NO_X, PM_{10} exhaust, and $PM_{2.5}$ exhaust during construction of the project. As indicated in Table 3, predicted project emissions are below the BAAQMD significance thresholds.

Table 3. Construction Period Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust
Residential/Retail Construction emissions (tons)	3.25 tons	2.86 tons	0.13 tons	0.12 tons
Office Building Rennovation Construction emissions (tons)	0.72 tons	0.55 tons	0.03 tons	0.03 tons
Total Construction emissions (tons)	3.97 tons	3.41 tons	0.16 tons	0.15 tons
Average daily emissions (pounds)[1]	29.4 lbs.	25.3 lbs.	1.2 lbs.	1.1 lbs.
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	**No**	**No**	**No**	**No**

Note: [1] Assumes 270 workdays.

Construction activities, particularly during site preparation, remediation and grading would temporarily generate fugitive dust in the form of PM_{10} and $PM_{2.5}$, which would be controlled. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit dust or mud on local streets, which could be an additional source of airborne dust after it dries. Fugitive dust emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. Fugitive dust emissions would also depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater

distances from the construction site. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if controlled through best management practices to reduce these emissions.

Mitigation Measure AQ-1. Recommended Best Management Practices (BMPs) for construction activities are listed as follows:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible and feasible. Building pads shall be laid as soon as possible and feasible, as well, after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

<u>Operational Emissions Modeling Methodology</u>

Operational air emissions from the project would be generated primarily from autos driven by future residents, customers, and employees. Evaporative emissions from architectural coatings and maintenance products are other typical emissions from residential and commercial uses. CalEEMod was used to predict emissions from operation of the site assuming full build out of the project. The project land use types and size, and trip generation rates[7] were input to CalEEMod. Adjustments to the model are described below. Model output worksheets are included in *Attachment 1*.

The project would replace residential, commercial, and warehousing uses that would would no longer have emissions associated with them. The difference in emissions between the prosed project and the existing office uses were modeled.

[7] Wood & Rodgers, Inc., 2015. *Maple and Main Apartments*. September 25.

Land Uses

Project land uses inputs used in CalEEMod to model operational emissions from the entire project are as follows:

- 235 dwelling units, "Apartments Mid Rise,"
- 2,300 square feet retail, "Strip Mall,"
- 1,650 square feet leasing, "General Office Building;" and
- 557 parking spaces, "Enclosed Parking with Elevator."

Year of Analysis

Emissions associated with vehicle travel depend on the year of analysis because emission control technology requirements are phased-in over time. Therefore, the earlier the year analyzed in the model, the higher the emission rates CalEEMod uses. The earliest year the project could possibly be constructed and begin operating would be 2017. Use of this date is considered conservative, as emissions associated with build-out later than 2017 would be lower. In addition, an Existing CalEEMod run was conducted to determine project net emissions.

Vehicle Trips

CalEEMod allows the user to enter specific trip generation rates, which were input to the model using the trip generation provided in the project traffic report. Weekend rates used in CalEEMod were adjusted proportionally to the weekday rate. The default trip lengths and trip types specified by CalEEMod were used.

Area Sources

Adjustments were made to the area source inputs of CalEEMod. These include an adjustment that no residences would use wood-burning stoves or fireplaces. All fireplaces were assumed to be natural-gas fired. The number of wood-burning fireplaces assumed in CalEEMod was added to the number of natural gas fireplaces. Wood burning fireplaces and woodstoves were set to 0.

Consumer Products

No adjustments were made in CalEEMod for consumer products.[8] However, CalEEMod computes emissions associated with consumer products for all land uses, regardless of their types. This is an unrealistic default assumption because certain land uses (e.g., parking structures) are not associated with the use of consumer products.

Energy Efficiency

The CalEEMod default inputs for energy consumption (i.e., electricity and natural gas usage) were used.

Water and Wastewater

[8] Per the CalEEMod User's Guide: "Consumer products are chemically formulated products used by household and institutional consumers, including, but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; aerosol paints; and automotive specialty products"

Water consumption was based on the default rate assigned by CalEEMod.

Solid Waste

No adjustments were made to the CalEEMod default rate for solid waste production.

Existing Uses

The existing medical office building would be reduced in size to 60,000 square feet. The new office building was assumed to generate the same amount of traffic as the existing building, so office building emissions were not computed in this assessment.

Computed Operational Emissions

Table 4 reports the predicted emission in terms of annual emissions in tons and average daily operational emissions, assuming 365 days of operation per year. As shown in Table 4, average daily and annual emissions of ROG, NO_X, PM_{10}, and $PM_{2.5}$ emissions associated with operation would not exceed the BAAQMD significance thresholds. *Attachment 2* to this report includes the operational CalEEMod model output file for the proposed project.

Table 4. Operational Emissions

Scenario	ROG	NOx	PM_{10}	$PM_{2.5}$
Annual Project Operational Emissions	2.82 tons	1.97 tons	0.88 tons	0.26 tons
BAAQMD Thresholds (tons per year)	*10 tons*	*10 tons*	*15 tons*	*10 tons*
Exceed Threshold?	***No***	***No***	***No***	***No***
Average daily emissions (pounds)	15.5 lbs.	10.8 lbs.	4.8 lbs.	1.4 lbs.
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.
Exceed Threshold?	***No***	***No***	***No***	***No***

[1] Assumes 365-day operation.

Impact: Violate any air quality standard or contribute substantially to an existing or projected air quality violation? ***Less-than-significant.***

As discussed above, the project would have emissions less than the significance thresholds adopted by BAAQMD for evaluating impacts related to ozone and particulate matter. Therefore, the project would not contribute substantially to existing or projected violations of those standards. Carbon monoxide emissions from traffic generated by the project would be the pollutant of greatest concern at the local level. Congested intersections with a large volume of traffic have the greatest potential to cause high-localized concentrations of carbon monoxide. Air pollutant monitoring data indicate that carbon monoxide levels have been at healthy levels (i.e., below State and federal standards) in the Bay Area since the early 1990s. As a result, the region has been designated as attainment for the carbon monoxide standard. The highest measured level over any 8-hour averaging period in the Bay Area during the last 3 years is less than 3.0 ppm, compared to the ambient air quality standard of 9.0 ppm. The project would generate a relatively small amount of new traffic: 1,017 net new trips during the entire day or less than 200 trips during the busiest hour. BAAQMD screening guidance indicates that the project would have a less than significant impact with respect to carbon monoxide levels if project traffic projections indicate traffic levels would not increase at any affected intersection to

more than 44,000 vehicles per hour.[9] Because cumulative traffic volumes at all intersections affected by the project would have less than 44,000 vehicles per hour, the project will have a *less-than significant* effect with respect to carbon monoxide.

Impact: Expose existing sensitive receptors to substantial pollutant concentrations? ***Less-than-significant with mitigation.***

Sensitive receptors are locations where an identifiable subset of the general population (children, asthmatics, the elderly, and the chronically ill) that is at greater risk than the general population to the effects of air pollutants are likely to be exposed. These locations include residences, schools, playgrounds, childcare centers, retirement homes, hospitals, and medical clinics. Operation of the project is not expected to cause any localized emissions that could expose sensitive receptors to unhealthy air pollutant levels. Construction activity would generate dust and equipment exhaust on a temporary basis. There are nearby sources of air pollutant emissions, such as Foothill Boulevard (State Route 238 [SR-238])/A Street and stationary sources (e.g., emergency backup generators and gas-fueling facilities). Impacts from project construction and existing sources of air pollution are addressed below.

Cancer Risk Methodology

A health risk assessment for exposure to 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 CARB develop recommended methods for conducting health risk assessments. The most recent OEHHA risk assessment guidelines were published in February of 2015.[10] 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.[11] This health risk assessment used the recent 2015 OEHHA risk assessment guidelines and CARB guidance. While the OEHHA guidelines use substantially more conservative assumptions than the current BAAQMD guidelines, BAAQMD has not formally adopted recommended procedures for applying the newest OEHHA guidelines. BAAQMD is in the process of developing new guidance and has provided initial information on exposure parameter values they are proposing for use.[12] The OEHHA guidelines and newly recommended BAAQMD exposure parameters were used in this evaluation.

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

[9] For a land-use project type, the BAAQMD CEQA Air Quality Guidelines state that a proposed project would result in a less than significant impact to localized carbon monoxide concentrations if the project would not increase traffic at affected intersections to more than 44,000 vehicles per hour.

[10] 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.

[11] CARB, 2015. *Risk Management Guidance for Stationary Sources of Air Toxics*. July 23.

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

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), 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 for sources with long-term emissions (e.g., roadways).

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

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

The health risk parameters used in this evaluation are summarized in Table 5.

Table 5. Health Risk Parameters Used for Cancer Risk Calculations

Parameter	*Exposure Type*	Infant		Child	Adult
	Age Range	3rd Trimester	0<2	2 < 16	16 - 30
DPM Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$		1.10E+00	1.10E+00	1.10E+00	1.10E+00
Daily Breathing Rate (L/kg-day)*		361	1,090	572	261
Inhalation Absorption Factor		1	1	1	1
Averaging Time (years)		70	70	70	70
Exposure Duration (years)		0.25	2	14	14
Exposure Frequency (days/year)		350	350	350	350

Age Sensitivity Factor	10	10	3	1
Fraction of Time at Home	1.0	1.0	1.0	0.73

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

Project Construction Activity

Construction activity is anticipated to involve demolition of the existing on-site buildings and building construction. As discussed above, the project would have less-than-significant construction period emissions. While those thresholds primarily address the potential for emission to adversely affect regional air quality, localized emissions of dust or equipment exhaust could affect nearby sensitive land uses. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if controlled through best management practices to reduce these emissions.

Construction equipment and associated heavy-duty truck traffic generates diesel exhaust, which is a known TAC. Diesel exhaust poses both a 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 from construction emissions of DPM.[13] A dispersion model was used to calculate the off-site DPM concentrations resulting from project construction at sensitive receptors so that lifetime cancer risks could be predicted. The closest off-site sensitive receptors are residences on McKeever Avenue, adjacent to the northern boundary of the project site. Additional nearby residences are located across from the project site on McKeever Avenue and Main Street and at farther distances from the site. Figure 1 shows the project site and sensitive receptor locations (residences) used in the air quality dispersion modeling analysis where potential health impacts were evaluated.

Construction Emissions

The community risk assessment focused on modeling on-site construction activity. Construction period emissions were modeled using CalEEMod. 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 (haul trucks, vendor trucks, and worker vehicles), with total emissions of 0.141 tons (281 pounds). The on-road emissions are the result of haul truck travel, worker travel, and vendor deliveries during construction activities. A trip length of one mile was used to represent vehicle travel while at or near the construction site. Emissions from on-road vehicles traveling at or near the site were modeled as occurring at the construction site. Fugitive $PM_{2.5}$ dust emissions were calculated by CalEEMod as 93 pounds for the overall construction period.

Dispersion Modeling

The U.S. EPA ISCST3 dispersion model was used to predict concentrations of DPM and $PM_{2.5}$ concentrations at existing sensitive receptors in the vicinity of the project construction area. The ISCST3 dispersion model is a BAAQMD-recommended model for use in modeling these types

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

of emission activities for CEQA projects.[14] Emission sources for the construction site were grouped into two categories, exhaust emissions of DPM and fugitive $PM_{2.5}$ dust emissions. The ISCST3 modeling utilized four area sources to represent the on-site construction emissions, two area sources for DPM exhaust emissions, one for construction of the commercial area and one for the construction of the residential area, and two similar area sources for fugitive $PM_{2.5}$ dust emissions. For the exhaust emissions from construction equipment, 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 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 sources. Emissions from vehicle travel around the project site were included in the modeled area sources. Construction emissions were modeled as occurring daily between 7 a.m. and 4 p.m., when the majority of the construction activity involving equipment usage would occur.

The modeling used a five-year data set (1990-1994) of hourly meteorological data for Union City that was prepared by the BAAQMD for use with the ISCST3 model. Annual DPM and $PM_{2.5}$ concentrations from construction activities during 2016-2017 were calculated using the model. DPM and $PM_{2.5}$ concentrations were calculated at nearby residential receptors. The modeling used receptor heights of 1.5 meters (4.9 feet) and 4.5 meters (14.8 feet) to represent breathing heights of residences on the first and second levels of nearby homes and apartments.

Predicted Cancer Risk and Hazards

The maximum modeled DPM and $PM_{2.5}$ concentration occurred at a receptor just north of the site on McKeever Avenue. The location of this receptor is identified in Figure 1. Increased cancer risks were calculated using the modeled DPM concentrations and risk assessment methods for a infant exposure (3rd trimester through 2 years of age), child exposure, and adult exposure described above.[15] The cancer risk calculations were based on applying the age sensitivity factors to the DPM exposures. Infant and child exposures were assumed to occur at all residences during the entire construction period.

Results of this assessment indicate that, for project construction, the maximum residential increased cancer risk, assuming all infant exposure, would be 30.4 in one million and the increased residential cancer risk, assuming adult exposure would be 0.8 in one million. The maximum increased cancer risk would be above the BAAQMD significance threshold of a cancer risk of greater than 10.0 in one million, and would be considered a *significant impact*.

The maximum modeled annual $PM_{2.5}$ concentration was 0.3 $\mu g/m^3$. This $PM_{2.5}$ concentration is below the BAAQMD significance threshold of greater than 0.3 $\mu g/m^3$ used to judge the significance of health impacts from $PM_{2.5}$. This would be considered a *less-than-significant impact*.

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

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

Potential non-cancer health effects due to chronic exposure to DPM were also evaluated. 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). California's Office of Environmental Health Hazard Assessment (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 chronic inhalation REL for DPM is 5 $\mu g/m^3$. The maximum modeled annual DPM concentration was 0.185 $\mu g/m^3$, which is much lower than the REL. The maximum computed hazard index based on this DPM concentration is 0.04 which is much lower than the BAAQMD significance criterion of a HI greater than 1.0. This would be considered a *less-than-significant impact.*

Attachment 3 includes the emission calculations used for the modeling, summary of dispersion model inputs and outputs, and the cancer risk calculations.

The project would have a *significant impact* with respect to community risk caused by construction activities. Mitigation Measures AQ-2 would reduce this impact to a *less-than-significant* level.

Mitigation Measure AQ-2. Selection of equipment during construction of the residential portion of the project to minimize emissions by 70 percent or greater. This could be achieved by the following:

1. All diesel-powered off-road equipment larger than 50 horsepower and operating on the site for more than two days continuously shall, at a minimum, meet U.S. EPA particulate matter emissions standards for Tier 4 engines or equivalent; and
2. All diesel-powered portable equipment (i.e., air compressors, concrete saws, and forklifts) operating on the site for more than two days shall meet U.S. EPA particulate matter emissions standards for Tier 4 engines or equivalent.

Note that the construction contractor could use other measures to minimize construction period DPM emissions to reduce the predicted cancer risk below the thresholds. Such measures may be the use of alternative powered equipment (e.g., LPG-powered lifts), alternative fuels (e.g., biofuels), added exhaust devices, or a combination of measures, provided that these measures are approved by the City.

Fugitive dust will be controlled through the use of BAAQMD's Recommended BMPs for construction (see *Mitigation Measure AQ-1*), and would reduce exhaust emissions by 5 percent and fugitive dust emissions by over 50 percent. Implementation of *Mitigation Measure AQ-2* would further reduce on-site diesel exhaust emissions by over 80 percent. The computed maximum excess residential child cancer risk with implementation of *Mitigation Measures AQ-2* would be reduced to a child cancer risk of less than 6.1 in one million, which is below the BAAQMD threshold of 10 per one million. The computed $PM_{2.5}$ concentration with implementation of *Mitigation Measure AQ-1* and AQ-2 would be reduced to less than 0.1 $\mu g/m^3$, which is below the BAAQMD threshold of 0.3 $\mu g/m^3$. *After implementation of these recommended measures, the project would have a less-than-significant impact with respect to community risk caused by construction activities.*

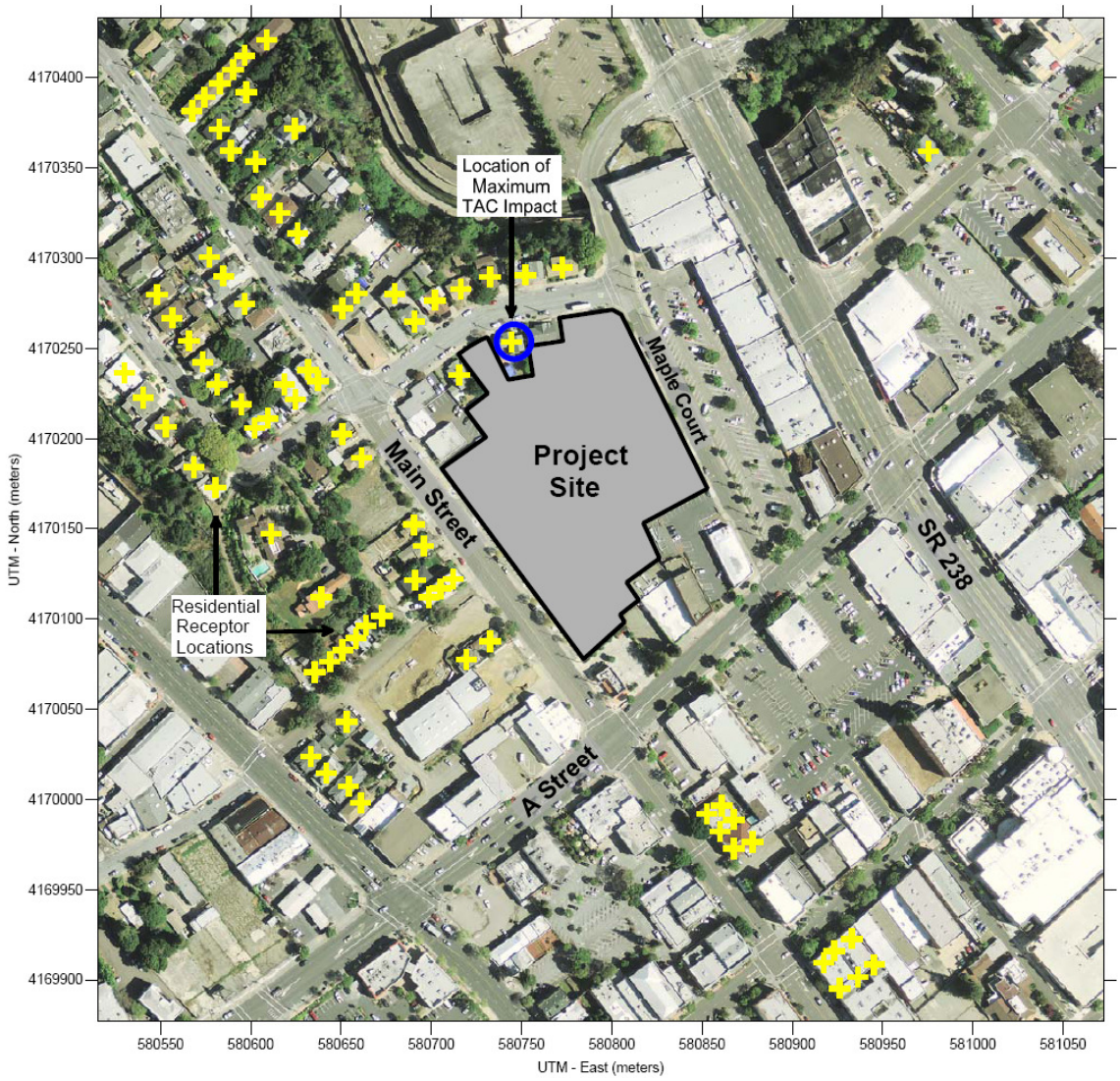
Project Opertaion

The project would include residences that are considered new sensitive receptors. For informational purposes, it is noted that sources of air pollutants and TAC emissions near the site could adversely affect these receptors. The effects of these sources upon the project were analyzed as roadways and stationary sources. Based on BAAMD 2011 Guidance, sources within 1,000 feet of the project iste were identified and evaluated.

SR-238 is considered a source of TACs that could affect the project site. Since southbound traffic on SR-238 uses the portion of A Street adjacent to the site, this analysis included that portion of the roadway. The analysis of Foothill Boulevard and A Street, which are a State Highway and high-volume roadways, utilized dispersion modeling; whereas, the analysis of the stationary sources used screening data provided by BAAQMD to identify the potential cancer risk and $PM_{2.5}$ exposure risks. Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the maximum impact sensitive receptor (sensitive receptors are described below) for each residential building. 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. Health risks potentially associated with concentrations of carcinogenic air pollutants were calculated as estimated excess lifetime excess cancer risks following the guidance provided by OEHHA and BAAQMD, described previously.

Evaluation of potential non-cancer health effects from exposure to short-term and long-term concentrations in the air was performed by comparing modeled concentrations in air with the RELs. A REL is a concentration in the air at or below which no adverse health effects are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential non-cancer effects were evaluated by calculating a ratio of the modeled concentration in the air and the REL. This ratio is referred to as a hazard quotient. The cancer potency factors, unit risk values, and RELs used to characterize health risks associated with modeled concentrations in the air were obtained based on information from the BAAQMD and the California OEHHA.

Figure 1 – Project Construction Site, Residential Receptor Locations, and Location of Maximum TAC Impacts



State Route 238 TAC Impacts

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 SR-238 traffic. The refined analysis involved predicting traffic emissions for the traffic volume and mix of vehicle types on SR-238. These emissions were input to a dispersion model to predict exposure to TACs. The associated cancer risk was computed based on the modeled exposures.

A review of the traffic information reported by the California Department of Transportation (Caltrans) indicates that in the vicinity of the project area, SR-238 has 30,500 average daily trips (ADT). This includes about 3.5 percent trucks, of which 1.8 percent are considered heavy duty

trucks and 1.7 percent are medium duty trucks.[16] The analysis included developing DPM, $PM_{2.5}$, and organic TAC emissions for traffic on SR-238 using the CARB EMFAC2014 vehicle emissions model and the traffic mix on SR-238 based on Caltrans traffic data.

DPM emissions are projected to decrease in the future and are reflected in the EMFAC2014 emissions data. CARB regulations require on-road diesel trucks to be retrofitted with particulate matter controls or replaced to meet new 2010 engine standards that have much lower DPM and $PM_{2.5}$ emissions. This regulation will substantially reduce these emissions between 2013 and 2023. While new trucks and buses will meet strict federal standards, this measure is intended to accelerate the rate at which the fleet either turns over so there are more cleaner vehicles on the road, or retrofitted to meet similar standards. With this regulation, older, more polluting trucks would be removed from the roads sooner.

Traffic Emissions Modeling

Emission factors for DPM ($PM_{2.5}$ exhaust from diesel vehicles) were developed for the year 2020 using the calculated mix of cars and trucks on SR-238. Default EMFAC2014 vehicle model year distributions for Alameda County were used in calculating emissions for 2020. Average hourly traffic volume distributions for Alameda County roadways were developed using the EMFAC model,[17] which were then applied to the local SR-238 ADT volumes to obtain estimated hourly traffic volumes and emissions for SR-238 traffic in the project area.

In the vicinity of the project SR-238 goes through a transition from a two-way road to a one-way road. South of A Street SR-238 is a four lane road with one-way traffic traveling north. North of A Street SR-238 a six lane road with two-way traffic (three lanes in each direction). At A Street south-bound traffic on SR-238 is directed to west-bound A Street, a four lane roadway. For estimating emissions from these road sections, vehicles were assumed to be traveling at an average speed of 25 mph (five miles below the speed limit on SR-238) except for a portion of south-bound SR-238 near the right hand turn from SR-238 to A Street. For this section of road, an average speed of 15 mph was assumed.

Year 2020 emissions were conservatively assumed as being representative of future conditions over the time period that cancer risks are evaluated (70 years) since, as discussed above, overall vehicle emissions and, in particular, diesel truck emissions will decrease in the future. Emissions of total organic gases (TOG) were also calculated for 2020 using the EMFAC2014 model. These TOG emissions were then used in the modeling of organic TACs (e.g., benzene). TOG emissions from exhaust and for running evaporative loses from gasoline vehicles were calculated using EMFAC2014 default model values for Alameda County along with the traffic volumes and vehicle mixes for SR-238.

Dispersion Modeling

[16] California Department of Transportation, 2014. *2013 Annual Average Daily Truck Traffic on the California State Highway System.*

[17] 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.

Dispersion modeling of DPM and organic TAC emissions was conducted using the CAL3QHCR model, which is recommended by the BAAQMD for this type of analysis.[18] Traffic on SR-238 and A Street in the vicinity of the project site was evaluated with the model. A five-year data set of hourly meteorological data (1990-1994) for Union City, formatted for use with the CAL3QHCR model by the BAAQMD, was used in the modeling. Other inputs to the model included road geometry, hourly traffic volumes, and emission factors. The modeling included on-site receptors placed in the proposed residential areas of the project. Receptor heights of 1.5 meters (4.9 feet) and 4.5 meters (14.8 feet), representative of breathing heights on the first and second levels of the project residential units, were used. Figure 2 shows the roadway segments modeled and residential receptor locations used in the modeling.

Computed Cancer Risk

Using the modeled annual DPM and TOG concentrations, the individual cancer risks were computed using the methods recommended by BAAQMD.[19] 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 that would reside at a site. This assessment conservatively assumed long-term residential exposures. BAAQMD has developed exposure assumptions for typical types of sensitive receptors. For residential exposures this includes nearly continuous exposure over 30 years for 24 hours per day. The cancer risk calculations for 30-year residential exposures reflect use of OEHHA's most recent cancer risk calculation method, adopted in 2015 and applied by BAAQMD[20]. The cancer risk calcualtions following OEHHA and BAAQMD guidance were discussed previously in this report where construction period cancer risk calculations were described.

The maximum increased cancer risk was computed as 1.5 in one million. This was modeled at a first floor receptor in the residential area in the eastern portion of the project residential area close to SR-238, and is shown in Figure 2. Cancer risks at other locations and higher floor levels would be lower than this maximum risk. The maximum increased cancer risk is below the BAAQMD's threshold of an increased cancer risk of greater than 10.0 in one million and would be considered a *less-than-significant impact*.

Non-Cancer Health Effects

Potential non-cancer health effects due to chronic exposure to DPM were evaluated based on the chronic inhalation REL for DPM of 5 $\mu g/m^3$. The maximum predicted annual DPM concentration from SR-238 traffic was 0.0016 $\mu g/m^3$, occurring at the same receptor that had the maximum cancer risk. The HI associated with this concentration is 0.0003. This HI is much 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

[18] BAAQMD, 2012. *Recommended Methods for Screening and Modeling Local Risks and Hazards*. May.
[19] BAAQMD, 2010. *Air Toxics NSR Program Health Risk Screening Analysis (HSRA) Guidelines*. January.
[20] Email from Virginia Lau, BAAQMD to Bill Popenuck of Illingworth & Rodkin, Inc, dated November 15, 2015.

In addition to evaluating the health risks from TACs, potential impacts from $PM_{2.5}$ emissions for vehicles traveling on SR-238 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 EMFAC2014 model for the 2020 traffic volumes. Additionally, $PM_{2.5}$ emissions from re-entrained roadway dust were calculated. 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 SR-238 traffic of 0.07 $\mu g/m^3$, which would occur at the receptor that had the maximum cancer risk. This $PM_{2.5}$ concentration would be well below the $PM_{2.5}$ threshold of 0.3 $\mu g/m^3$ and would be considered a *less than significant impact*.

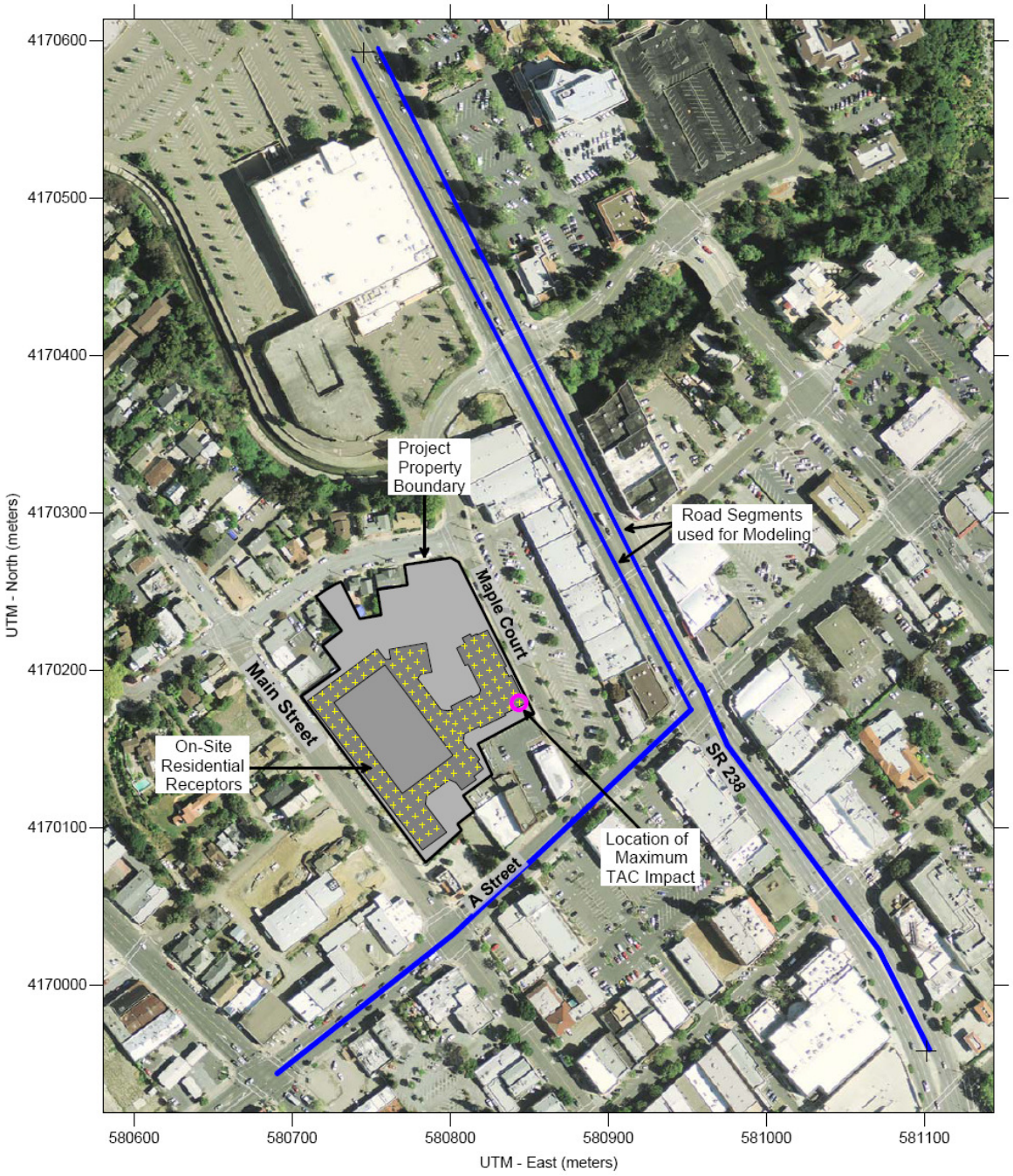
Summary of SR-238 Impacts

Table 6 summarizes the cancer risk, non-cancer hazard, and annual $PM_{2.5}$ concentration associated with SR-238 traffic at the project site. The emissions and dispersion modeling results, along with community risk calculations for impacts from this assessment are provided in *Attachment 4*.

Table 6. SR-238 Community Risk Levels at Project Dwelling Units

Source	Cancer Risk (per million)	Annual $PM_{2.5}$ ($\mu g/m^3$)	Acute or Chronic Hazard Index
Maximum SR-238 – 30,500 ADT (2013)	1.5	0.07	<0.01
BAAQMD Single Source Threshold	*10.0*	*0.3*	*1.0*
Significant?	***No***	***No***	***No***

Figure 2 - Project Site and On-site Residential Receptors, Road Segments Evaluated, and Locations of Maximum TAC Impact



Stationary Sources

Permitted stationary sources of air pollution near the project site were identified using BAAQMD's *Stationary Source Risk & Hazard Analysis Tool*. This mapping tool uses Google Earth to identify the location of stationary sources and their estimated screening-level risk and

hazard impacts. This tool identified two sources that could affect the project site (i.e., within 1,000 feet of the site):[21]

- Plant 13474 is an emergency back-up generator located at 1129 B Street, operated by Pacific Bell (or AT&T) about 1,000 feet southeast of the project site. Cancer risk and $PM_{2.5}$ concentration from the diesel generator were adjusted for distance based on BAAQMD's *Distance Adjustment Multiplier Tool for Diesel Internal Combustion (IC) Engines*. According to the BAAQMD screening data (and adjusted for the 1,000-foot distance), this facility would result in an excess cancer risk of 2.4 per million, $PM_{2.5}$ concentration of 0.0[22] and HI of <0.01, all of which would be elow BAAQMD thresholds of significance. The BAAQMD-recommended scaling factor to adjust cancer risk was applied, so that the cancer risk from the facility is 3.3 chances per million[23].

- Plant G9145 is a gas station at 898 A Street, about 700 feet southwest of the project site. Cancer risk and $PM_{2.5}$ concentration from the diesel generator were adjusted for distance based on BAAQMD's *Distance Adjustment Multiplier Tool for Gasoline Dispensing Facilties*. According to the BAAQMD screening data (and adjusted for the 1,000-foot distance), this facility would result in an excess cancer risk of 0.4 per million, no $PM_{2.5}$ emissions and an HI of <0.01, all of which would be below BAAQMD thresholds of significance. The BAAQMD-recommended scaling factor to adjust cancer risk was applied, so that the cancer risk from the facility is 0.5 chances per million.

Cumulative Community Risk

Cumulaitve Community Risk from Construction

Table 7 shows the cancer and non-cancer risks associated with each nearby source affecting the receptor most affected by project construction. The sum of impacts from combined sources (i.e., all sources within 1,000 feet of the project) would be below the BAAQMD risk thresholds. Therefore, the impact from cumulative community risk would be considered *less than significant*.

[21] Note that there are two dry cleaning operations identified within 1,000 feet; however, these facilties either already have or will phase out the use of TACs in there operations.
[22] $PM_{2.5}$ concentrations less than 0.05 are reported as 0.0.
[23] BAAQMD recommended a scaling factor of 1.3744 to convert cancer risk predicted using the OEHHA older method to the cancer risk based on the new 2015 method, based on a personal telephone conversation between Virginia Lau of BAAQMD and James Reyff of Illingworth & Rodkin, Inc. on 11/10/2015.

Table 7. Cumulative Construction Community Risk from Combined Sources

Source	Maximum Cancer Risk (per million)	$PM_{2.5}$ concentration ($\mu g/m^3$)	Hazard Index
Maximum Unmitigated Project Construction	30.4	0.3	0.04
State Route 238 (Foothill Blvd. and A Street)	<1.5	<0.1	<0.01
Plant 13474	<3.3	0.0	<0.01
Plant G9145	<0.5	0.0	<0.01
Combined Sources[1]	<35.7	<0.4	<0.07
BAAQMD Threshold – Combined Sources	***100***	***0.8***	***10.0***

Note: [1]The combined source level is an overestimate because the maximum impact from each source is assumed to occur at the same location.

Cumulaitve Community Risk from Operation

Table 8 shows the cancer and non-cancer risks associated with each nearby source affecting the project site. The sum of impacts from combined sources (i.e., all sources within 1,000 feet of the project) would be below the BAAQMD risk thresholds. Therefore, the impact from cumulative community risk would be considered *less than significant*.

Table 8. Cumulative Operational Community Risk from Combined Sources

Source	Maximum Cancer Risk (per million)	$PM_{2.5}$ concentration ($\mu g/m^3$)	Hazard Index
State Route 238 (Foothill Blvd. and A Street)	1.5	0.1	<0.01
Plant 13474	2.4	0.0	<0.01
Plant G9145	0.4	0.0	<0.01
Combined Sources[1]	<4.3	0.1	<0.03
BAAQMD Threshold – Combined Sources	***100***	***0.8***	***10.0***

Note: [1]The combined source level is an overestimate because the maximum impact from each source is assumed to occur at the same location.

Impact: Create objectionable odors affecting a substantial number of people? ***Less-than-significant.***

The project would generate localized emissions of diesel exhaust during construction equipment operation and truck activity. These emissions may be noticeable from time to time by adjacent receptors. However, they would be localized and are not likely to adversely affect people off site by resulting in confirmed odor complaints. The project would not include any sources of significant odors that would cause complaints from surrounding uses. This would be a *less-than-significant* impact.

Impact: Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? ***Less-than-significant.***

The BAAQMD CEQA Air Quality Guidelines contain methodology and thresholds of significance for evaluating GHG emissions from land use type projects. The BAAQMD thresholds were developed specifically for the Bay Area after considering the latest Bay Area GHG inventory and the effects of Assembly Bill 32 (AB 32) scoping plan measures that would reduce regional emissions. BAAQMD intends to achieve GHG reductions from new land use developments to close the gap between projected regional emissions with AB 32 scoping plan measures and the AB 32 targets. The BAAQMD has developed different thresholds for evaluating GHG emissions from projects:

1. Compliance with a qualified greenhouse gas reduction strategy
2. Annual emissions of less than 1,100 metric tons or 4.6 metric tons per capita per year.

Emissions of GHG are computed as CO_2e that considers the global warming potential of other gases emitted from typical land use projects such as methane and nitrous oxide.[24] In this analysis, project emissions are computed and then the project's consistency with the City's GHG reduction strategy is assessed.

GHG Emissions Modeling

GHG emissions were computed for the construction period and the build out (or operational) scenario of the proposed project. Specifically, emissions were computed for both construction and operation of the project using the CalEEMod model in the same manner as used to predict criteria air pollutants. The CalEEMod modeling for this project was described previously in this report.

Construction GHG Emissions

Construction phases included demolition, site preparation, site grading, trenching, some paving, building construction, and application of architectural coatings. Annual CO_2 emissions associated with construction would occur in from 2016 into 2017. Under this scenario, construction of the project would emit 680 metric tons (MT) of CO_2e. Neither the City of Hayward nor BAAQMD have quantified thresholds for construction activities. However, the annual emissions would be below the lowest project emission threshold considered by BAAQMD.

Operational GHG Emissions

The CalEEMod model along with the project vehicle trip generation rates and estimates were used to predict operational period GHG emissions associated with operation of a fully developed site under the proposed project. In order to reduce GHG emissions, the proposed project includes several features discussed below.

Table 9 presents the results of the CalEEMod model analysis in terms of annual MT of CO_2e/yr. These emissions are based on the output of CalEEMod for the proposed project. The increase

[24] BAAQMD. 2009. California Environmental Quality Act Guidelines Update Proposed Thresholds of Significance. December.

would be 1,680 MT of CO_2e/yr, which would exceed the bright-line significance threshold of 1,100 MT of CO_2e/yr. However, the per capita emissions of 2.2 MT of CO_2e/capita/yr would not exceed the threshold of 4.6 MT of CO_2e/capita/yr.

Table 9. Annual Project GHG Emissions in Metric Tons

Source Category	Proposed Project 2017 CO_2e Emissions In Metric Tons (MT)
Area	11
Energy Consumption	560
Mobile	1,003
Solid Waste Generation	51
Water Usage	55
Total	1,680
Per Capita Emissions[25]	2.2 MT/capita/year

Consistency with Adopted Climate Action Plan

Hayward's Climate Action Plan (CAP) was adopted by the City Council on July 28, 2009. The 2009 CAP was designed to reduce communitywide emissions 12.5 percent below 2005 levels by the year 2020, and to set the City on a course to achieve a long-term emission reduction goal of 82.5 percent below 2005 levels by the year 2050.

Operational emissions from existing development in Hayward in the years 2005 and 2010, as well as projected "Business As Usual" GHG emissions associated with forecasted growth in the City's population and employment in 2020, 2040, and 2050, were forecasted and summaries in Table 10, as provided in the Hayward 2040 Draft EIR.[26] The 2020, 2040, and 2050 projections reflect both existing and proposed land uses and population and employment growth assumed in the proposed General Plan, but did not take into account any specific GHG reduction measures associated with State or federal legislative actions or the City's 2009 CAP. Projected future emissions with the General Plan are also shown in Table 10.

[25] Based on U.S. Census data for Hayward of 3.21 persons per household in 2010

[26] Note that the 2005 projections were contained in the 2009 CAP, but were updated for 2010 for the 2040 General Plan.

Table 10. Hayward Communitywide GHG Emissions Baseline Inventories and Projections

Sector	GHG Emissions (MT CO2e/year)				
	Inventories		Projections ("Business As Usual")		
	2005	2010	2020	2040	2050
Residential Energy	158,528	154,424	169,696	200,241	215,514
Commercial/Industrial Energy	238,226	231,719	254,969	301,469	324,720
Transportation	734,087	702,552	748,550	982,017	1,086,054
Solid Waste	52,438	24,048	26,235	30,610	32,798
Water/Wastewater Treatment[1]	-	8,061	8,794	10,261	10,994
Total	**1,183,279**	**1,120,803**	**1,208,245**	**1,670,080**	**1,524,599**
Projected Emissions with 2040 General Plan			**934,845**	**1,087,601**	**1,185,781**

[1] Water and Wastewater Treatment GHG emissions were not accounted for in the 2005 baseline GHG inventory as part of the 2009 Climate Action Plan.

Source: City of Hayward 2009; StopWaste.org 2013; Data adjusted and modeled by Ascent Environmental, Inc. in 2013, as reported in the Hayward 2040 General Plan Draft EIR.

The recently adopted General Plan integrates and updates the comprehensive, communitywide GHG emission reduction strategy contained in the City's 2009 CAP to achieve a GHG emission reduction target of 20 percent below 2005 levels by the year 2020. The General Plan also recommends longer-term goals for GHG reductions of 61.7 percent below 2005 levels by the year 2040 and 82.5 percent below 2005 levels by the year 2050.

The Hayward 2040 General Plan Draft EIR contains a comprehensive list of specific General Plan policies and programs that constitute the City's updated GHG emission reduction strategy.[27] These policies and programs contain GHG emission reduction measures that apply to both existing and new development. Implementation of these measures would reduce GHG emissions by more than 20 percent below 2005 levels by the year 2020 when combined with State and federal programs. The City of Hayward considers the City's 2009 CA combined with the Hayward 2040 General Plan to be a Qualified Greenhouse Gas Reduction Strategy.[28]

One purpose of the Qualified Greenhouse Gas Reduction Strategy is to streamline the decision-making process regarding a proposed project's impact on GHG emissions within the City. The proposed project would not require a General Plan Amendment that would alter GHG emissions in the city, and thus the project's consistency with relevant CAP measures and actions has been used to evaluate the significance of this impact. As part of the evaluation of the project's consistency with the CAP, the project's incorporation of applicable strategies and measures from the plan as binding and enforceable components of the project. Projects that show consistency with the plan forecasts and implement applicable strategies included in the plan are considered to have less-than-significant GHG emissions.

[27] See Table 10.4 (pp 10-10 through 10-42) of the Hayward 2040 General Plan Draft EIR.

[28] Telephone conversation between James Reyff of Illingworth & Rodkin, Inc. and Sara Buizer of the City of Hayward, August 27, 2015.

Table 11. City of Hayward GHG Reduction Strategies Applicable to Proposed Project

Applicable Policy or Implementing Program	Goal/Policy/Implementation Program	Project Applicability
Policy NR-2.10 Zero-Emission and Low-Emission Vehicle Use	The City shall encourage the use of zero-emission vehicles, low-emission vehicles, bicycles and other non-motorized vehicles, and car-sharing programs by requiring sufficient and convenient infrastructure and parking facilities throughout the City.	Project would provide parking spaces with electric charging stations, bicycle parking and pedestrian access
Policy NR-4.1 Energy Efficiency Measures	The City shall promote the efficient use of energy in the design, construction, maintenance, and operation of public and private facilities, infrastructure, and equipment.	City Green Building Ordinance for Private Development would apply
Policy NR-4.11 Green Building Standards	The City shall require newly constructed or renovated public and private buildings and structures to meet energy efficiency design and operations standards with the intent of meeting or exceeding the State's zero net energy goals by 2020.	City Green Building Ordinance for Private Development would apply The project would be subject to local and state building codes that regulate energy efficiency
Policy NR-4.13 Energy Use Data	The City shall consider requiring disclosure of energy use and/or an energy rating for single family homes, multifamily properties, and commercial buildings at certain points or thresholds.	The project would make energy consumption data available upon request
Policy NR-6.9 Water Conservation	The City shall require water customers to actively conserve water year-round, and especially during drought years.	The project would utilize drought resistant landscaping, efficient drip irrigation systems, and low flow faucets and toilets
Policy M-1.6 Bicycling, Walking, and Transit Amenities	The City shall encourage the development of facilities and services, (e.g., secure term bicycle parking, street lights, street furniture and trees, transit stop benches and shelters, and street sweeping of bike lanes) that enable bicycling, walking, and transit use to become more widely used modes of transportation and recreation.	The project would include bicycle and pedestrian amenities to encourage these modes of transportation.
Goal M-5 Pedestrian Facilities	Provide a universally accessible, safe, convenient, and integrated pedestrian system that promotes walking.	See above
Policy M-6.5 Connections between New Development and Bikeways	The City shall ensure that new commercial and residential development projects provide frequent and direct connections to the nearest bikeways and do not interfere with existing and proposed bicycle facilities.	The project would implement bicycle access and amenities per City requirements and would not interfere with existing or planned bicycle facilities
Policy M-8.3 Employer-Based Strategies	The City shall encourage employers to participate in TDM programs (e.g., guaranteed ride home, subsidized transit passes, carpool and vanpool programs) and to participate in or create Transportation Management Associations to reduce parking needs and vehicular travel.	The proposed project would provide preferred parking for carpools.
Policy M-8.5 Commuter Benefits Program	The City shall assist businesses in developing and implementing commuter benefits programs (e.g., offers to provide discounted or subsidized transit passes, emergency ride home programs, participation in commuter rideshare programs, parking cash-out or parking pricing programs, or tax credits for bike	This policy is not applicable as the project applicant has no control over individual tenants that would occupy the renovated medical office

Applicable Policy or Implementing Program	Goal/Policy/Implementation Program	Project Applicability
	commuters).	building.
Policy M-9.9 Alternative Fuel Vehicle Parking	The City shall require new private parking lots to grant low-carbon vehicles access to preferred parking spaces, and shall require new private parking lots to provide electric vehicle charging facilities.	The project would provide electric vehicle parking stations.
Policy PFS-7.12 Construction and Demolition Waste Recycling	The City shall require demolition, remodeling and major new development projects to salvage or recycle asphalt and concrete and all other non-hazardous construction and demolition materials to the maximum extent practicable.	The project proposes to divert 50 percent of construction waste from landfills
Policy PFS-7.14 Commercial Recycling	The City shall encourage increased participation in commercial and industrial recycling programs, and strive to comply with the recycling provisions approved by the Alameda County Waste Management Authority Board.	This policy is not applicable as the project applicant has no control over individual tenants that would occupy the renovated medical office building.

Impact: Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The project would be subject to new requirements under rule making developed at the State and local level regarding greenhouse gas emissions and be subject to local policies, such as the City Climate Action Plan, that may affect emissions of greenhouse gases.

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July 21, 2016

Mr. Paul Stephenson, AICP
Impact Sciences, Inc.
505 14th Street, Suite 1230
Oakland, California 94612

Subject: Maple & Main Project, Hayward, CA
Addendum for Air Quality Assessment

Dear Mr. Stephenson:

Our air quality study for the proposed project that we completed in late 2015 addressed air quality impacts from project construction, project operational emissions (e.g., traffic generation) and community risk impacts to new project residents that would be near sources of air pollutants (e.g., busy roadways)[1]. We understand that the Maple & Main mixed-use project would consist of 240 residential units, which is an increase of five units from the original air quality study conducted in 2015. This letter addresses the effect of this change with respect to the CEQA Air Quality and Greenhouse Gas (GHG) significance finding in our report.

Construction Impacts

The change in the project design would have little change on the projected construction activities, so the predicted construction emissions and resulting community risk impacts to off-site sensitive receptors would not be measurably affected. Mitigation measures for construction impacts that applied to the previous project design that was evaluated would apply to this project design as well.

Operational Emissions of Criteria Air Pollutants and GHG

The increase of 5 units to the project would result in a very slight increase in emissions of about 2 percent. This slight increase in emissions would not change the results or conclusions regarding criteria air pollutant emissions in comparison with BAAQMD thresholds or GHG

[1] 2015. *Maple & Main Project Air Quality and GHG Emissions Assessment – Hayward, CA.* October 13, revised December 1.

emissions in terms of per capita emissions. The findings for those impacts remain less than significant.

Exposure of New Sensitive Receptors to Unhealthy Air Pollutant Levels

After reviewing the updated site plan, the increase in number of total units would not affect proximity of the building setbacks from nearby sources of air pollution. As a result, the findings in our report for community risk impacts are not changed.

♦ ♦ ♦

This concludes our subsequent review of the Maple and Main project in Hayward, California. Please contact us with questions or if your need additional information.

Sincerely,

James A. Reyff
Senior Consultant - Principal
Illingworth & Rodkin, Inc.